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Brief Chronological Overview of Mapping Bosnian and Herzegovinian Territories – Since the occurrence of the term Bosnia and Herzegovina till 1992 –

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ABSTRACT. The territory of today's Bosnia and Herzegovina has historically been part of the various empires or communist states of the Socialist Federal Republic of Yugoslavia. Very little research in the field of cartography related to the historical account of the territory of Bosnia and Herzegovina has been done. However, recently more and more attention is paid to this topic. The article was created on the basis of an independent long-term research by the author, and was motivated by the lack of literature in this field. Therefore, this text will give a brief overview of the development of cartography until 1992, when the war in Bosnia and Herzegovina began. It will also show the historical timeline of representing the territory of Bosnia and Herzegovina on maps.

Keywords: cartography, map, topographic map, distribution of maps.

1. Introduction

Today, Bosnia and Herzegovina is a country with a specific arrangement, i.e. it is divided into two entities (the Federation and the Srpska Republic) and Brčko District. Since 1995, cartography has been developing differently in each of the Bosnia and Herzegovina's entities. The differences stem from the fact that each entity has its own Constitution and separate jurisdictions when it comes to cartography. At the state level, cartography is under the jurisdiction of the Ministry of Civil Affairs, but for now no major activities have been undertaken. Map production and the cartographic reproduction were mostly done outside of today's Bosnia and Herzegovina (B&H). Maps of Bosnia and Herzegovina according to Gasparović (1970) have three levels of representation, which are formed on the basis of:

– Travel writing and compilation of existing maps,

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- Compilation of existing maps and additional territory measurement,
- Geodetic and topographic surveys.

Representations of the territory of Bosnia and Herzegovina on maps, at a time when data was collected through traveling and collecting existing maps, depended greatly on: skills of the author who drew the landscape, their degree of knowledge of the geographical and topographical characteristics of the country, and the purpose of these maps. The maps showing this area can be found as depictions of a separate province or as part of the then state which Bosnia and Herzegovina was a part of (e.g. Ottoman Empire, Austria-Hungary, the Kingdom of Serbs, Croats and Slovenes – abbreviation Kingdom of SCS, Kingdom of Yugoslavia, Socialist Federal Republic of Yugoslavia – abbreviation SFRY).

2. The Occurrence of the Term and the State of Bosnia and/or Herzegovina

During the reign of Ban Kulin (1180–1204) medieval Bosnia was completely affirmed as a political unit. Bosnia, during Banus Stjepan Kotromanić (1322–1353), expanded to the western part of Hum and Dalmatia (from Cetina to Dubrovnik). It also included Završje with three fields: Glamoč, Livno, and Duvno. The culmination of the territorial and political expansion, Bosnia experienced in the second part of the Tvrtko I Kotromanić's rule (1353–1391). Kotromanić named himself the King of Serbia, of Bosnia, Pomorje, and the Western lands, and thus Bosnia became a kingdom in 1377. The first known geographic map with Bosnia mentioned was created in 1339, and was made by Angelino Dulcert from Mallorca on two parchments using color (Šehić and Tepić 2002).

3. Travel Writing and Compilation of Existing Maps

Bosnia and Herzegovina was poorly and defectively represented on maps from 15th to 18th century compared to the representations of other states of the time. One of the few exceptions is the map made by the Italian cartographer Giacomo Cantelli da Vignola in 1689. It is difficult to determine the sources based on which the maps were made. Travel writing was characteristic for this period and based of which they determined the location of the geographic characteristics in space. Maps that were made based on travel writing or by compiling existing maps (which more often than not did not show Bosnia and/or Herzegovina), were full of errors when determining the position of topographic characteristics – relief, settlements, rivers, forests and roads.

One of the first maps that show the area of present-day Bosnia and Herzegovina, which was done based on travel writing or a compilation of existing maps, is the Ptolemy's fifth map² (from the works *Geographia*³), the so-called *Tabula Europaea*, showing the southeastern part of Europe. Compared to present day topographical features of Bosnia and Herzegovina, only the Neretva River is recognizable. Based on Ptolemy's work, Nicolaus Cusanus (1401–1464) produced a map showing the

² Ptolemy's maps are based on mathematic principles – the calculations of the coordinates.

³ A copy of this map can be found at the Department of Geography at the Natural sciences and Mathematics Faculty in Sarajevo. According to Gašparović (1970) this map was produced by Sebastian Münster in 1545.

“Regnum Bosnia” and the surrounding regions in 1439. Other notable maps from this period are Marcus Beneventanus⁴ – Tabula moderna Polonie, Ungarie Boemie, Germanie, Lithuanie (URL 1) and the map made by Martin Waldseemüller – Tabula moderna Bossinae, Serviae, Graeciae et Sclavoniae (Banfi 1954).

During the next century, or in 1556 to be more exact, Wolfgang Lazius made a map of Hungary using four sheets, where the territory of Bosnia and Herzegovina is shown on two sheets. Cartographer Augustin Hirschvogel, in 1565 made a map entitled Sclavoniae, Croatiae, Carniae, Istraiae, Bosniae⁵... However, the most prominent map originating from this period was created by Mecator (1512–1594) entitled Sclavonia, Croatia, Bosnia, cum Dalmatiae parte (published in 1590) that can be considered the forerunner of modern regional maps and which shows a more complete view of Bosnia and Herzegovina⁶.



Fig. 1. Map of *Illyricum Hodiernum* – representing the partial map of Croatia and Bosnia and Herzegovina (Blaeu and Wolfgang 1680ca).

⁴ Map of Martin Waldseemüller. Strasbourg: J. Schott, 1513, <http://documents.mx/documents/ptolemyobjectlist11-15-07.html>.

⁵ The map is currently held at State Archives – Zagreb, Croatia, http://cartographic-images.net/Cartographic_Images/313_Ruysch.html.

⁶ The map is currently held at State Archives – Zagreb, Croatia.

In the 17th century the production of Atlases named according to the authors was widespread. Best known atlases are Mercator, Hondius, Blaeu and Wolfgang, but the representation of B&H in these atlases is very scarce. Around 1680, Johannes Blaeu and Abraham Wolfgang published a map called *Illyricum Hodiernum Quod Scriptorum communiter Slavoniam, Itali Schiavoniam, nuncupare Solent, in Dalmatiam, Croatiam, Bosnam, et Slavoniam distinguitur*⁷ (Figure 1). During this period the development of cartography is significantly affected by the development of geodetic methods to capture the details and instruments for surveying and mapping. In 1654 Nicolas Sanson published his Atlas representing the political map of Turkish provinces, and showing the position of three present-day Bosnia and Herzegovinian cities (Zvornik, Jajce, Banja Luka and Bihać) and large rivers.

During the second half of the 17th century the representation of B&H territory was taken over by Italian cartographers. So in 1684 Giacomo de Rossi publishes his map: *Dalmatiae, Istria, Bosnia, Servia, Croatia e parti di Schiavonia*⁸. On this map the territory of Bosnia stretches from the river Vrbas to the river Drina and the territory of Herzegovina stretched around the Neretva River. Giacomo Cantelli da Vignola made a map of Bosnia and Herzegovina (*Il regno della Bossina diviso nelle sue provincie principali*) in 1689. This map shows the B&H as a separate territorial unit and its administrative division⁹.

4. Maps of Bosnia and Herzegovina made from Compilation of Existing Maps and additional Territory Measurement

The beginning of the 18th century saw the emergence of maps based on territory measurements and/or compiling existing maps. The territory of B&H was surveyed and mapped using the latest technologies of the time, but it was done in secret (however, with the approval of the Turkish authorities). With the beginning of the century, the cartographers were mainly Austrian military cartographers Heise Ing. Hauptmann, Freytag and Berndt (Bunjevac, 2015) who first recorded the northern parts of B&H, from the river Una to the river Drine, and then made a map in scale 1:172000, which is today considered the first map of B&H¹⁰ made by territory measurement. This map marks the beginning of a more thorough topographic representation of B&H territory. In 1738, Etienne Briffaut presented the territory of B&H with toponyms written in Latin, while the map title and some explanations are in French in the 1:560000 scale¹¹.

With the end of the 17th and the beginning of the 18th century, with the beginning of the Austrian and Turkish confrontation, there was an increase of so-called war maps of the region of Bosnia and Herzegovina. The important period for Bosnian-Herzegovinian topographic maps occurred while Austria was preparing to attack Turkey at the end of the 18th century. The first officers-cartographers who entered the country at that time were Held and Scmidht. During 1783 they

⁷ The map is currently held at War Archive Vienna – Austria.

⁸ The map is currently held at State archive Dubrovnik – Croatia.

⁹ The map is currently held at State archive Zagreb and State archive Dubrovnik.

¹⁰ Kept in the War archive Vienna, however a reproduction of the map can be found in the Journal of the National Museum of B&H from 1907 – appendix XIX.

¹¹ State archive Zagreb.

collected geographic, topographic, cultural, agricultural, ethnical and other data concerning Bosnia and based on them they made the maps and the reports. These maps were done on a 1:115200 scale and can be found in the War Archive in Vienna. The maps included data on roads, rivers and city buildings. Mountains and uninhabited areas were not shown on these maps. At that time, these were the most accurate and most detailed maps of certain areas of Bosnia and Herzegovina. The next important step in B&H mapping was done by Major Božić. In 1785 he created the topographic-topometric description of Bosnia and the plan of part of Bosnia on 16 sheets in a scale of 1:115200. These maps show areas beyond the roads, which wasn't the case till then. The preparations for the war included the display of B&H's marginal areas.

In this period, the cartographers made maps of Bihać (Figure 2) in scale of 1:38000, Tešanj and Livno in scale of 1:7200, Jajce in scale of 1:14400 and Maglaj in 1:5760. Vukasović (an officer in the Habsburg army) 1788 made the first map of Herzegovina in the scale of 1:230000¹². This map gives a brief description of fortresses in the Herzegovinian cities (Mostar, Blagaj, Stolac, Hutovo, Ljubinje, Trebinje and

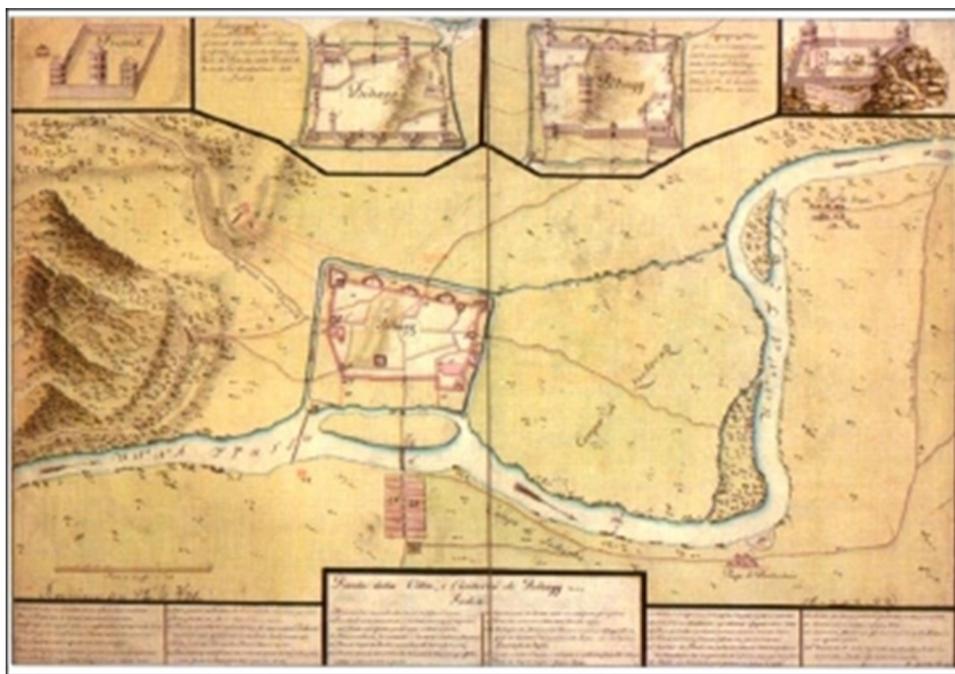


Fig. 2. *Reliefs pour le dessin de la ville de Biach suivant les remarques faites du fort, le foible l'occasion d'un siege dans les formalites* – Figure presents orthogonal horizontal projection of the Bihać city and its surrounding area. Upper part of the map contains attached perspective views of the city Panoramic view of Bihać from 1717 (Šehić and Tepić 2002).

¹² War archive in Vienna.

Klobuk) and their positions. Following the signing of the peace treaty in Svištovo in 1791, Austria had to leave the occupied territories of the so-called European Turkey (i.e. Bosnia and Herzegovina). This led to the emergence of cartographers who didn't have access to military reports and maps, resulting in maps which were significantly weaker in content and accuracy compared to the technology of military cartography of the time.

Then came the French cartographers who developed maps based on earlier versions, such as Domenico Pagani's map of the Illyrian provinces and neighboring countries. Italian cartographer Pagani made a map that represents a synthesis of all materials collected by the French cartographers in the period from 1806 to 1814. Furthermore, numerous Austrian, German, French and Russian cartographers made maps of the European Turkey. Maps are characterized by small scales, and the representation of B&H using basic contours.

Numerous foreign offices open their doors in Sarajevo in 1850s and 1860s (Austrian, French, Russian, English, Prussian and Italian) whose main task, among others, was to collect data on Bosnia. In 1853, Heinrich Kiepert issued a new map of the European Turkey in the scale of 1:1000000¹³. This map was the highest quality map of this territory up to that point. Clear B&H borders were outlined on four sheets of map. This served as the basis for creating the general map of B&H in the scale of 1:300000¹⁴. In 1861, Otto Blau, a Prussian consul, issued a map of Herzegovina in the scale of 1:500000¹⁵ based on his own sketches and terrain measurements.

5. Creating Maps of Bosnia and Herzegovina based on Geodetic Surveys

Constant turbulence and unrest in the "European Turkey" culminated in an agreement of European superpowers in 1878 in Berlin, resulting in Austria receiving permission to occupy Bosnia and Herzegovina and establish its authority. In this pre-war and post-war period Austrian military cartographers established permanent points and determined the geographic coordinates of the main points, which served to produce accurate maps later on. In 1876 they created a general map of Bosnia, Herzegovina, Serbia and Montenegro in scale of 1:300000 (8 sheets are related to the B&H territory). After 1878, Austria developed triangulation and established the cadaster. Maps created after the completion of the topographic and cadastral survey (1884) were created on the results of survey of the territory of Bosnia and Herzegovina.

One of the first maps created based on cadaster measurements of B&H was the General karte von Bosnien und der Hercegovina¹⁶ in the scale of 1:150000, issued by the Militar-geografischen Institute (MGI) Vienna in 1884–1885. Map has 19 sheets.

Based on the graphic measurements were created Telegraphenkarte von Bosnien und der Herzegovina in the scale of 1:490000 issued by the Telegraphic bureau

¹³ War archive Vienna, War archive Vienna, War archive Zagreb.

¹⁴ Issued in 1876.

¹⁵ War archive Vienna.

¹⁶ Archive of Federation of Bosnia and Herzegovina.

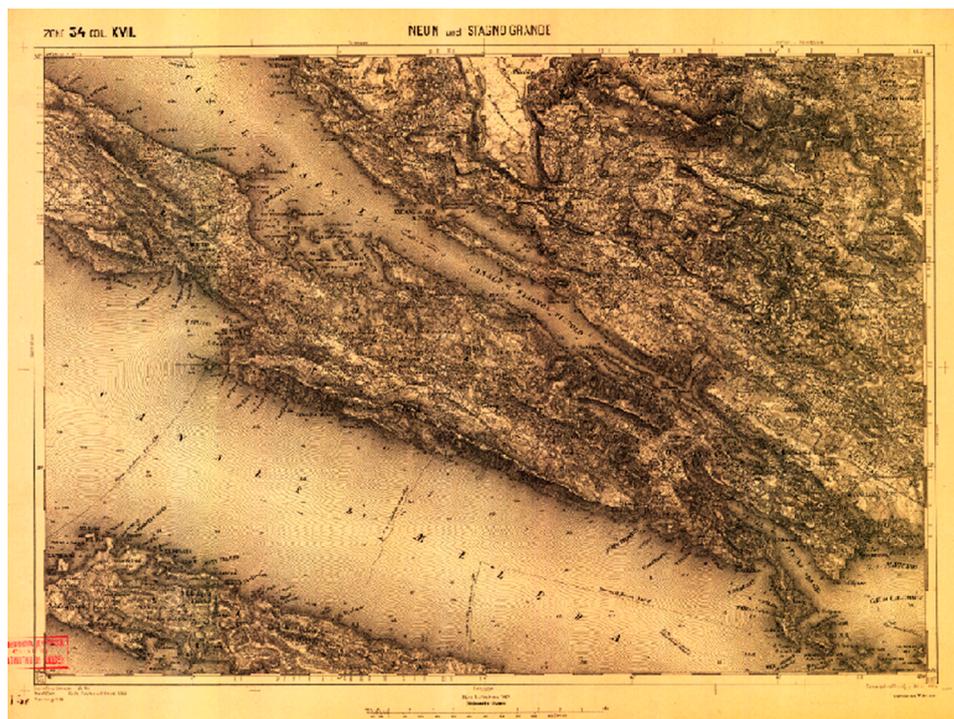


Fig. 3. *Special map of Bosnia and Herzegovina in the scale of 1:75000 (Neum und Stagno Grande) (Archive Administration for Geodetic and Property Affairs of the Federation of Bosnia and Herzegovina).*

(1884). Forstkarte von Bosnien und der Bosnien und Herzegowina (Map of forests) in the scale of 1:50000 issued by the Military geographic Institute in Vienna (1885). That same year the Austro-Hungarian authorities conducted population census. With it, three special maps (i.e. cartograms) were attached, showing the division of B&H into regions, free peasants and serfs as well as the density of the population. Karte der Strassenzüge von Bosnien und der Herzegowina (Map of the road network, scale 1:500000) and the Map of the railroad network in the scale of 1:300000 (1886).

1889 were created Special map of B&H in the scale of 1:75000 (Figure 3). Map is Southeast extension of Specialkarte der Osterreichisch-Ungarischen Monarchie. Made by resizing the original topographic field sheets (draught) to the scale of 1:25000. The entire B&H is presented on 66 sheets numbered according to zones and columns. They used the polyhedral projection with the division of latitudes and longitudes to 15' and 30'. The relief is presented by using isohypses whose equidistance is 100 m, and by hachures. It was issued by the MGI Vienna. That same year, they issued a school map of Bosnia and Herzegovina in $M = 1:300000$. And, 1898 – created sheets of the General Map of Central Europe (Generalkarte von Mitteleuropa) for the B&H area in 1:200000. Sheets were done by polyhedral projection with the division of 1° latitudinal and longitudinal. It was printed using 4 colors and issued by the MGI Vienna.

The Austrian military cartographers played the decisive role in the development of cartography in Bosnia and Herzegovina, who during and after the conquest of its territory brought the quality and quantity of the mapping, developed based on systematic collection of spatial data and establishment of cadaster.

6. Cartography of Bosnia and Herzegovina between the Two World Wars (1918–1941)

With the establishment of a new state system, first the Kingdom of SCS, and then the Kingdom of Yugoslavia, there was an unbalanced presentation of the new state on the maps. Countries that were under the Austrian rule had the geodetic basis and appropriate topographic maps based on which the restoration of the map content was carried out from 1929 to 1933. During this period the original topographic draught – field sheets of scale 1:50000 were assembled¹⁷. A topographic survey was carried out on the rest of the territory (Macedonia, Montenegro and Serbia).

Leveling networks were connected to the normal benchmarks in Trieste and in Thessaloniki (part of the repair along the river Drina – in Bosnia and Herzegovina, was associated with the repair in Thessaloniki¹⁸). Based on this, the Special Map of Yugoslavia was made in scale of 1:100000 using polyhedral projection. The network rests on the Parisian prime meridian. The new maps were almost identical to the Austro-Hungarian originals. The only difference was the color, representation of relief and printing toponyms. Relief is presented through contour lines in equidistance 20 m. The dimensions of each sheet (total number 197) was 30'x30', and was printed in four colors.

When using the polyhedral projection, each sheet is a unit for itself, i.e. there is no universal projection coordinate system. In 1924, the Gauss-Krüger projection method was implemented for state surveys. Since 1931, this map was issued in a larger scale (1:50000) with the rectangular grid of Gauss-Krüger's projection net added retroactively¹⁹. A Map of Kingdom of Yugoslavia was created from 1938 to 1940 in scale of 1:500000, and from 1939 to 1945 several maps were made in scale of 1:200000 (Figure 4). In 1934 topographic maps in 1:25000 (TM²⁰25) started to be issued, however this was interrupted by the WWII. 208 TM25 sheets showing the territory of Slovenia, Croatia and Serbia were done during this period. Production of maps for civilian purposes was limited to general geographic maps and atlases. The Geographical Society founded in 1926 in Sarajevo, did not participate in the production of maps (unlike similar societies founded in Ljubljana, Zagreb and Belgrade).

¹⁷ In the polyhedral projection.

¹⁸ This information was passed down from the participants of the 1920s surveys to Mr. Tomislav Krzyk, a geodesy engineer. Later on, the leveling technique would become the norm.

¹⁹ In 1931 the Military Geographical Institute (Kingdom of Yugoslavia) started inserting the Gauss-Krüger projection into topographic maps made in polyhedral projection.

²⁰ Topographic map – abbr. TM.



Fig. 4. Topographic map scale 1:200000 (source: Federal geodetic administration Federation of Bosnia and Herzegovina).

7. Cartography of Bosnia and Herzegovina from WWII to 1992

After World War II, the cartographic, military and civilian institutions were rebuilt. Already in 1945 the Military Geographic Institute in Belgrade issued a map of the Democratic Federal Republic of Yugoslavia in scale of 1:750000, which included the territory of B&H. From 1945 to 1951 maps showing B&H, as a part of Yugoslavia, were done in scale 1:200000²¹. A sheet of the TM200 map is taken as the basis for the nomenclature. Each sheet consists of four TM100 sheets. The title is assigned according to the most prominent settlement or the geographic object on that sheet, but apart from that the TM100 and TM200 are numbered according to rows going from north to south and in some rows even from west to east (Frančula 2000).

In 1948 made the first road map of Federal National Republic of Yugoslavia was created in scale 1:1000000 (URL 2). The end of 1970s saw the emergence of a topographic map made by using Lambert conformal conic projection (Bessel 1841 ellipsoid) in scale of 1:500000. The map of Yugoslavia in scale 1:1000000 was created in 1956 using the specifications set for international maps. From 1979–1983 several maps for the Geographic atlas of Yugoslavia were made using the Lambert conformal conic projection (Bessel 1841 ellipsoid) (Tutić 2009).

Based on the developed triangulation network (1889/1927/1949) and the unique precise leveling network, in 1948 begun the production of a topographic map in scale of 1:25000. The map was made in three zones of the Gauss-Krüger projection, based on the dimensions of the ellipsoid – Bessel 1841, and the height of the Normal benchmark in Trieste (determined on the basis of one year of observations of oscillations of the level of the Adriatic Sea in 1875). Prime meridian was set in Greenwich, and the relief on the map was represented by contour lines in equidistance 10 m. The Military Geographic Institute of Yugoslav National Army during the 50s and 60s printed topographic maps²² based on pre-war originals returned from Germany (Tuno et al. 2011). Map sheets TM25 are marked as TM100 and with additional numbers. In the second edition of TM25 in addition to the nomenclature the sheets are also titled. This map served as basis for maps of smaller scales (1:50000, 1:100000, 1:200000, 1:500000, 1:1000000) (Frančula 2004). This same map was later amended with aero-photogrammetric survey and was open for civilian use. During this period, there were 12 TM200, 39 TM100, 149 TM50 and 430 TM25 map sheets made for B&H territory. The Hydrographic Institute in Split surveyed the Adriatic coast and based on that survey made marine and other maps (general navigational maps, course maps, coastal maps, port plans, sea passages etc.). B&H was included in these maps.

Bosnia and Herzegovina, unlike other Yugoslavian republics, did not have special civil institutions for cartography except Geodetic Institute in Sarajevo which was established in 1975. It produced state base map 1:10000 and 1:5000, tourist maps and various special thematic maps. Few years after the disintegration of Yugoslavia did the Geodetic Institute in Sarajevo start reproducing topographic maps, whose originals were done in MGI Belgrade.

²¹ This map was based on the Special map 1:100000, using polyhedral projection, amended in 1946.

²² This refers to the maps in a scale 1:50000 and scale 1:100000.

All the administrative-territorial changes that occurred in B&H since the end of WWI were recorded by the Republic administration for geodetic and property affairs of B&H on maps in scale 1:300000. A Map of populated areas in B&H was also done, but in scale of 1:200000. The survey of B&H territory (up until 1992) was either complete or included 90% of the territory, while the general state map (GSM) was done in scale 1:5000 and 1:10000 and encompassed less than 50% of the territory. Along with producing maps, an economic survey on time and materials spent in the production was conducted. This showed that it was cartographically cheaper to produce a map in scale 1:5000 than a map in scale of 1:10000, but printing expenses are bigger (Zdjelar 1992). For the purposes of various economic branches, and in the absence a BSM, maps were made at a scale of 1:5000 and 1:10000, mainly of river valleys, industrial pools etc. of different content and purposes.

7.1. Basic state map 1:5000

The basic state map done in scale 1:5000 was initially done for lowland and urban areas only, but later on included the entire B&H. Both the horizontal and the vertical representation of the map sheet made separately (2 sheets).

BSM was derived mainly from topographic plans, and rarely from recent surveys. Creating publishing originals was possible by using blue copies or by directly drawing and engraving the content from the drafting-editing original. Basic Map 1:5000 was usually done in three colors (Figure 5).



Fig. 5. Detail of the basic state map (horizontal view) in scale 1:5000 (source: Federal geodetic administration Federation of Bosnia and Herzegovina).

For settlements, roads and other facilities, vegetation, borders, map grids and the overall description, except river names, black color was used. The reproduction original was acquired by hand copying the line elements, titles and descriptions of the published original. For representing hydrography the blue color was used, but the line elements of hydrography and names were printed in 100% of the blue color, and surface water elements were done in a smaller percentage of blue. To display relief (contour lines, elevations, drawings) brown was used. The basic map was printed on plastic sheets and cartographic paper in proper circulation, which is different for individual sheets and depends on user needs (multiple sheets covering urban areas) (Zdjelar 1992).

7.2. Basic state map 1:10000

Basic state map in scope of 1:10000 (BSM10) was done based on topographic plans created on the new survey of the B&H territory (Figure 6). This map used 4 colors. The color use is the same as for the BSM5, with the exception of the vegetation and forests done in green.

The publishing originals are yet to be done for hydrography, settlements, roads and other objects as well as for vegetation and relief. The basic state map in 1:10000, as well as BSM5, was done on plastic sheets and cartographic paper in limited issue (Zdjelar 1992).

8. Conclusion

The toponym Bosnia occurs in X century in the work *De administrant do Imperio* (On management of the realm) written by the Byzantine Emperor Constantine VII Porphyrogenitus. However, cartographically B&H was presented as a province and one of the regions of the maps of occupying empires. More substantial representation of Bosnia and Herzegovina territory on maps began only with the preparations of the Austro-Hungarian Empire to conquer the territory of the European Turkey. With the Austro-Hungarian survey of B&H, began the systematic territory measuring and detailed cartographic depiction. Another important event in cartographic development and production of B&H maps was the Gauss-Krüger's projection and the Lambert conformal conic projection (Bessel 1841 ellipsoid) as state projections during the Kingdom of Yugoslavia. The largest contribution in B&H cartography was the so-called new survey which resulted in systematic production of the basic state maps in scales of 1:5000 and 1:10000. The new survey was interrupted by war in 1992.



Fig. 6. Basic State Map Scale 1:10000 (source: Federal geodetic administration Federation of Bosnia and Herzegovina).

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Kratak kronološki pregled kartiranja teritorija Bosne i Hercegovine – Od pojave naziva Bosna i Hercegovina do 1992.

SAŽETAK. Teritorij današnje Bosne i Hercegovine, povijesno gledano, bio je dio raznih imperija, kao i komunističke države Socijalističke Federativne Republike Jugoslavije. Postoji vrlo malo istraživanja vezano za kartografski prikaz teritorija Bosne i Hercegovine kroz povijest. Međutim, nedavno se sve više pažnje posvećuje toj temi. Članak je izrađen na temelju neovisnog dugogodišnjeg istraživanja autorice, koja je bila motivirana nedostatkom literature u tom području. Stoga će se u radu dati kratak pregled kartografije ovog područja do 1992. godine, kada je započeo rat u Bosni i Hercegovini. Također, prikazat će se povijesna vremenska linija vizualiziranja teritorija Bosne i Hercegovine na kartama.

Ključne riječi: kartografija, karta, topografska karta, distribucija karata.

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