

Creation and Use of Topographic Maps in Georgia – History and Modernity

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Abstract:

The history of creating topographic maps in Georgia spans approximately a 150-year period; however, it is worth noting that preliminary work in this field began much earlier, dating back to the early 19th century. Within this history, three main stages can be distinguished:

The period of the Russian Empire (1801 - early 1920s);

The period of the Soviet Union (early 1920s - 1991);

The modern period (1991 - present).

It should be considered that the First Independent Republic of Georgia (1918-1921) is included in the first stage because no significant changes in this direction were observed during this period of time..

In the first period, starting from 1801, topographic and geodetic works began to be carried out in the South Caucasus, including the territory of Georgia. The implementation of these works logically led to the accumulation of the information necessary for the creation of topographic maps over several decades. In 1882, the longitude of the Tbilisi Observatory was determined by means of telegraphy, which subsequently served as the basis for the Caucasus triangulation network.

The first version of topographic maps for the territory of Georgia was created in the 1870s of the 19th century and is known as the so-called “verst maps.” The main scales of these maps were 1, 2, 3, 5, and 10 versts per inch, which correspond respectively to the scales 1:42,000, 1:84,000, 1:126,000, 1:210,000, and 1:420,000. The mathematical basis used was the “Bessel ellipsoid” and the “Gauss conformal projection.” Only graticule coordinates were depicted on the maps. The prime meridian used as the origin changed over time and, at different periods, corresponded to the Ferro, Greenwich, and Pulkovo meridians. Verst maps were characterized by lower content density and a different system of conventional symbols compared to the topographic maps of the subsequent period; however, their significance is extremely great. The publication of these maps was completed during the period of the First World War, but their use continued until the 1930s and they constituted the primary cartographic material for the country.

As already noted, at the beginning of the second period, verst maps continued to be actively used. From the 1930s of the 20th century, the creation of new topographic maps began. In 1936-1938, a topographic map at the scale of 1:200,000 was created, which represented the first topographic map compiled in the metric system. In addition to the graticule, a rectangular coordinate grid was also depicted on this map. The mathematical basis of the map was the Bessel ellipsoid and the Müfling polyhedral projection. The origin of the prime meridian was the Greenwich zero meridian, while the reference for elevation was the Baltic height system. The main cartographic basis of the map consisted of five-verst maps. In addition, materials from field surveys and aerial photography were used. The 1:200,000 scale topographic map represented an extremely important cartographic material in the initial period of the Second World War, and it was used for the spatial planning of state importance.

From the 1940s, a new era began in the production of topographic maps of the Soviet period, which continued until the dissolution of the Soviet Union (1991). During this period, topographic maps of various scales (1:1,000,000; 1:500,000; 1:200,000; 1:100,000; 1:50,000; 1:25,000; 1:10,000) and large-scale plans (1:5,000; 1:2,000) were created and published. Throughout this time, several editions of topographic maps were produced, based on corresponding updates of information. At different times, the mathematical basis of the maps included the Bessel ellipsoid, the 1942 coordinate

system, and the Gauss-Krüger conformal cylindrical projection. The origin of the prime meridian was the Greenwich zero meridian, while the reference for elevations was the Baltic Sea height system. The maps of this period were characterized by higher accuracy and greater content density, which was conveyed through an updated system of conventional symbols.

During the Soviet period, the territory of Georgia was fully covered by topographic maps of various scales, ranging from 1:1,000,000 to 1:25,000. Larger-scale topographic maps and plans covered the territory of Georgia only partially and represented mainly major settlements and the Black Sea coastal areas.

The third period began in 1991 and is associated with a major geopolitical change - the dissolution of the Soviet Union, as a result of which Georgia became an independent country. The 1990s of the 20th century proved significant for the development of digital technologies, which had a major impact on the map-making process. It was during this time that the introduction and development of GIS technologies began in Georgia, which continued to expand in subsequent periods and persists to the present day.

In 1999, a decree of the President of Georgia “On the Geodetic Coordinate System in Georgia” was adopted. According to this decree, the following was established: the international ellipsoid WGS 84 was adopted as the reference surface for the projection of geodetic measurement results of national significance in Georgia; the Universal Transverse Mercator (UTM) conformal projection was adopted as the mathematical basis for state topographic maps; and the Baltic Sea height system of 1977 was established as the reference datum for absolute elevations of points on the Earth’s surface relative to sea level.

After the restoration of independence, the first state project for the creation of topographic maps was the Georgian-Japanese project “Creation of Digital Topographic Maps of Georgia at a Scale of 1:50,000,” which was implemented in 2005-2008 with the financial support of the Japan International Cooperation Agency (JICA). Within the framework of this project, in accordance with the 1999 decree of the President of Georgia, 39 sheets of the 1:50,000 scale topographic map (30% of the territory of Georgia) were created using WGS84 and UTM, and a new version of the system of conventional symbols was developed.

The logical continuation of the work carried out within the Georgian-Japanese project was the topographic mapping activities conducted by the Cartography-Geodesy Department of the Ministry of Defense of Georgia, which began in 2011 and continues to the present day. As of today, the Cartography-Geodesy Department has created topographic maps of the following scales for the territory of Georgia and adjacent areas: 1:50,000 (153 sheets), 1:200,000 (24 sheets), 1:500,000 (42 sheets), and 1:10,000 (covering major cities of Georgia and areas adjacent to the state border). As a result of the implementation of the above works, in 2016, a transition to a new system (WGS84, UTM) took place, and in 2017, a digital cartographic portal (GIS Portal for MOD) was created.

In 2022–2026, the LEPL National Agency of Public Registry of the Ministry of Justice of Georgia created and published, in digital form, guidelines of conventional symbols for topographic maps and plans of various scales, which contain updated information.

The Cartography-Geodesy Department is currently the only state institution in Georgia where the full process of creation and publication of topographic maps is carried out. The topographic maps created by the Department have considerable practical significance and are actively used by various state institutions.