

State Map Projection in Croatia

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Abstract:

One of the basic issues of official cartography is the choice of a national projection, or rather the choice of a national coordinate system. Such a choice was relevant at the beginning of the 20th Century, then with the creation of the Independent State of Croatia, and it was also relevant at the turn of the 20th and 21st centuries. In other words, after political-territorial changes, the issue of introducing a new map projection is usually discussed.

We inherited several coordinate systems from the Austro-Hungarian Monarchy. Every geodetic expert knows the worries and difficulties caused by numerous detailed points, or cadastral plans in different coordinate systems, and their connection into a whole.

The Gauß-Krüger projection has a very wide application in geodetic practice. In many European countries, this projection was accepted as the official state projection. It is known that it was chosen back in 1924 for the territory of the former Yugoslavia and that, until recently, the rectangular coordinates of the points of state triangulation were calculated and displayed in this projection.

Nikolaj Pavlović Abakumov wrote about the issue of choosing the most appropriate projection for the Independent State of Croatia in 1942 and considered two variants of the Gauß-Krüger projection, their advantages and disadvantages.

Given the new circumstances that arose in the 1990s, and especially with regard to the shape of the Republic of Croatia and its extent, it was necessary to research and find the best possible map projection.

In early January 2000, a contract was signed between the State Geodetic Administration and the Faculty of Geodesy, University of Zagreb, on the development of the project *Geodetic and Cartographic Datums of the Republic of Croatia*. One of the three sub-projects was entitled *Proposal for Official Map Projections of the Republic of Croatia*, and the purpose of adopting this proposal was to:

- analyze existing map projections in the Republic of Croatia and the relationship of these projections to new technologies in geodesy,
- take into account the recommendations and experiences of international bodies and associations for the proposal of official map projections,
- maximally adapt the proposal of official map projections to national interests and needs for defining the geodetic spatial system of the Republic of Croatia,
- unambiguously define map projections with regard to existing map projections in Croatia, but also global world projection systems,
- propose the method and dynamics of introducing official map projections, and
- analyze the proposed method and dynamics of introduction in terms of the total costs of establishing official map projections in the Republic of Croatia.

The Government of the Republic of Croatia, at its session held on 4 August 2004, adopted a *Decision on the establishment of official geodetic datums and planar map projections of the Republic of Croatia*. This Decision states, among other things:



1. The coordinate system of the Transverse Mercator (Gauss-Krüger) projection – abbreviated HTRS96/TM, with the central meridian $16^{\circ}30'$ and the linear scale on the central meridian 0.9999 is determined by the projection coordinate system of the Republic of Croatia for the area of cadastre and detailed state topographic cartography.
2. The coordinate system of the normal Lambert Conformal Conic projection – abbreviated HTRS96/LCC, with the standard parallels $43^{\circ}05'$ and $45^{\circ}55'$ is determined by the projection coordinate system of the Republic of Croatia for the area of overview state cartography.
3. The coordinate systems of map projections are based on the Croatian terrestrial reference system defined in point 1 of this Decision.
4. For the needs of the Armed Forces of the Republic of Croatia, the Universal Transverse Mercator (UTM) projection coordinate system is adopted in accordance with the Standardization Agreement "STANAG 2211", NATO member states, 5th edition of 15 July 1991.

Furthermore, the State Geodetic Administration was tasked with introducing new official geodetic datums and map projections into official use, no later than January 1, 2010.

The lecture will discuss the definition of the HTRS96/TM projection, as HTRS96/LCC has not yet found application. Reflections on the need to introduce new official map projections in Croatia began 30 years ago, and more than 20 years have passed since the official decision on new projections. Therefore, it is necessary to consider the consequences of changing the coordinate system in Croatia on maps and other forms of spatial data, on their quality, possibilities of use, and what advantages or problems it has brought.

The implementation of the HTRS96/TM system in the past 20 years since its official adoption, or 15 years since the official entry into force of the new geodetic reference system, has largely failed. Research has shown that the lengths, and especially the areas of parcels in the cadastre, are recorded and stored with distortions due to the projection.

Then it should not be surprising that the actual situation and that recorded in the cadastre, or land register, are incoherent. Neither satellites nor drones will solve the problems described. It is solely a matter of (lack of) knowledge.