REPUBLIKA SLOVENIJA MINISTRSTVO ZA OKOLJE IN PROSTOR
GEODETSKA UPRAVA REPUBLIKE SLOVENIJE

Report on the State of Cartography in Slovenia in the period of 2011 - 2015

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TABLE OF CONTENTS

1 Introduction

The report on the state of cartography provides an overview of the history of cartography in Slovenia with emphasis on a detailed overview of cartography in Slovenia in the years 2011 – 2015 with activities and cartographic products by the national land survey service and other institutions and companies. At the same time, it represents the third national report on cartography in Slovenia. Slovenia will present this report at the time of 27th conference of the International Cartographic Association (ICA) – in 2015 in Rio de Janeiru.

The Association of Land Surveyors of Slovenia became a member of the International Cartographic Association in 1995. Slovenia first participated as an independent country at the international cartographic conference in 1993 in Cologne, Germany. Two years later, in September 1995, as a participant at the 17th International Cartographic Conference in Barcelona, Spain, it was accepted as a full member of ICA. Since 2006, the Association of Land Surveyors of Slovenia has been represented in ICA by the Cartography Section, which was established in 2005.

2 Historical overview of cartography in Slovenia before 1991

The documented history of cartography in Slovenia begins with foreign authors' maps, which depicted this territory in their maps as early as the Antiquity and the Middle Ages, e.g. Ptolemy in the Geographia (2nd century).

Based on the documented cartographic works, the first recognized Carniolan cartographic or topographic author among the authors from the territory of the present-day Slovenia is the Vipava-native Žiga Herberstein (1486 - 1566). In the middle of the 16th century, he produced three versions of maps of the contemporary Russia (Figure 1) and thus established himself as an equal in European cartography and Central European scientific circles a century before the much better known Valvasor.

Figure 1: One of Žiga Herberstein's versions of the map of Russia

In the same period, Pietro Coppo, a well-known Izola-lived representative of Italian cartographers of the 16th century, also made his maps. Especially well known are his maps of Istria and the Adriatic Sea.

Janez Vajkard Valvasor (1641–1693) ranks among the most important Slovenian cartographers. He was a Carniolan aristocrat of Friulian descent, a soldier, polymath and land surveyor from Bogenšperk Castle near Litija. He systematically surveyed, observed and described this territory. In 1678, he installed a graphic and copper-carving workshop at his castle, where, with the help of other experts and colleagues, he printed

six historical-topographic works, among them also the *Glory of the Duchy of Carniola* (1689), his most extensive and most important work. It is a historical, topographic and ethnographic description of the Duchy of Carniola. His cartographic products are:

- two maps of Carniola for Schoenloeb's *Carniolia antiqua et nova* (1681),
- the map of Carinthia, included in the *Complete Topography of the Old and Contemporary Archduchy of Carinthia* (1688),
- the maps of Carniola (1684, Figure 2) and Croatia (1685), included in the *Glory of the Duchy of Carniola*, where he also added his map of the intermittent Cerknica lake.

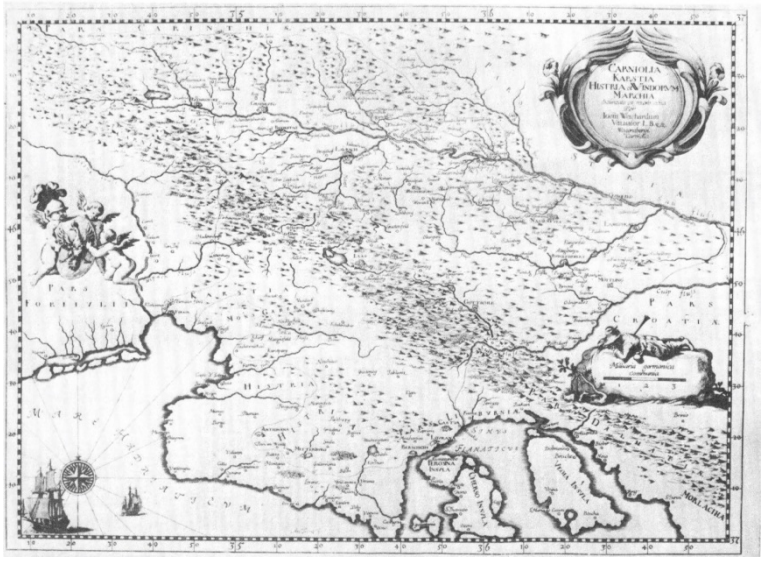

Figure 2: Janez Vajkard Valvasor's Map of Carniola (1684)

Some years later, Franc Anton Steinberg from Kalec castle near Pivka made a special map of the Inner Carniola region. It is a roadmap and it is actually a thematic map, since all the characteristic road points depicting the characteristics of the transversal road profile are marked and also described in the appended report.

In the early 18th century, one cannot neglect to mention Steinberg's map of Carniolan and Lower Styrian Waters from 1723. Five years later, he made a map of the mercury mine and its facilities in Idrija. Steinberg was a manager of the mine, performing technical as well as pedagogical works in Idrija speleometric school, where he trained cave surveyors, land surveyors, technical draughtsman and cartographers of great importance to the mine. This was the first and at the time only vocational school of its kind in Slovenia. Jožef Mrak, the most successful speleometric cartographer of the time

in Slovenia, who worked all over Carniola and made a number of mine maps, was also educated at this school.

A new step forward of the evolving Slovenian cartography and land surveying is the horographic map of the Duchy of Carniola (Figure 3), made in the 18th century, which was on a par with the topmost Central European cartography and land surveying of the time. This map, made by Janez Dizma Florjančič de Gruenfeld (1691–1757) from Šentvid nad Stično, at approximately scale 1: 100,000 is the most complete map of Carniola of the time, since it is far more accurate than Valvasor's map of Carniola. Triglav, the symbol of Slovenia and its highest mountain, is first mentioned on this map.

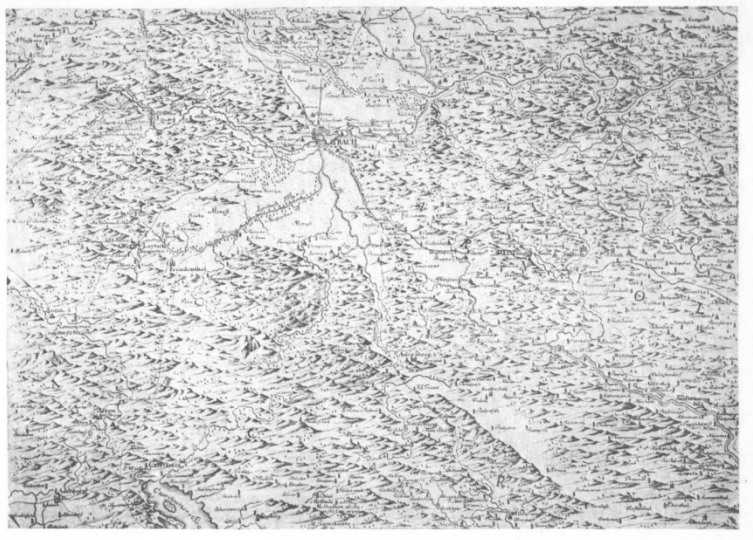

Figure 3: J. D. Florjančič's horographic map of the Duchy of Carniola

Drawing skill and the quality of maps made by Carniolan cartographers of the 6th and the following decades of the 18th century can best be demonstrated with the cartographic sketch from 1750 showing the Lower Carniolan and Styrian sections of both commercial roads of the time (Figure 4). In all likelihood, they were made by the cartographer Janez Jurij Elsner, who in the following years made Carniolan commercial roads maps, commissioned by the Graz court chamber, which was planning the roads' repairs. In 1763, Elsner drew a Commercial Map of Trade and Transportation Roads, leading from Austro-German lands towards Italy and France. The special feature of the map is its geographic extent, as the map extends well beyond the Carniolan boundaries.

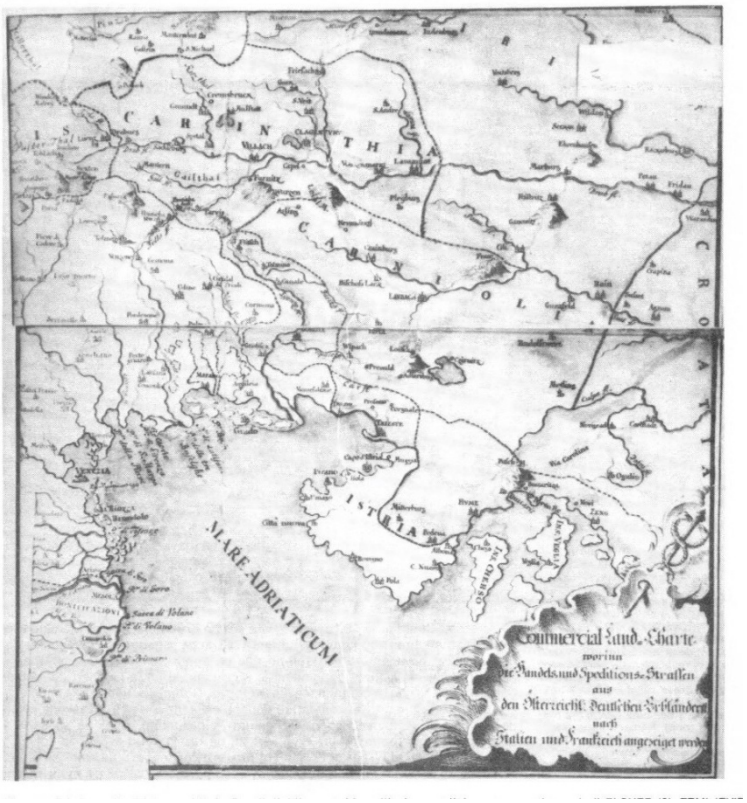

Figure 4: Commercial Map of Trade and Transportation Roads, leading from Austro-German lands towards Italy and France (Elsner).

In the middle of the 18th century, the mercantile economic policy of Maria Theresa led to the creation of a number of interesting smaller maps, which can justifiably be termed customs and toll-maps given the reason for their creation. Unfortunately, most of them were not signed by the authors so it is difficult to ascertain whether they were the work of Slovenian cartographers.

At that time, deliberate spatial planning was born in the Slovenian territory. The plans for the regulation of the course of Ljubljanica and the well-known Gruber's canal were drawn at that time. The Situational Map of the Ljubljana Marsh and the Map of the Ljubljanica Basin from Vrhnika to the Sava Mouth were made at Gruber's initiative. Both maps were drawn by a group of land surveyors, among which the Slovenian Jurij Vega must be mentioned. With the intention of regulating the navigation route down the Sava between Zalog and Brežice, the General Map of Ljubljanica between Ljubljana and the Sava Mouth was drawn by Andrej Šemerl.

In the period of intensive land surveying and land parcel recording (for the creation of the Land Cadastre) there were on average fewer cartographic activities. Geometer-cartographers were not equal to the task of drawing maps of larger areas and we did not have any geographer-cartographers at that time. Worthy of mention is the well-known copy of "Tabula Peutingeriana", which was drawn by Valentin Vodnik.

Kozler's *Map of Slovenian Land and Regions* from 1853 at 1: 576,000 (Figure 5) is exceptionally significant for Slovenian geographic and cartographic spheres. Peter Kozler delineated the Slovenian ethnic boundary and provided arguments for it in the accompanying booklet *Brief Geography of Slovenia and an Overview of Political and Judicial Division of the Illyrian Kingdom and Styrian Duchy* with an accompanying Slovenian and German register of towns and places. The map encompasses all contemporary Slovenian lands. The map was drawn on the basis of an Austrian military topographic map with hatched relief. Names of towns, market towns and villages are inscribed in the map as well as post offices and mines. Unfortunately, the Austrian government prohibited the publication of the map arguing that it concerned a non-existent Slovenian land. The prohibition was in effect until 1860 when the first edition finally went on sale.

Figure 5: Kozler's "Map of Slovenian Land and Regions"

In 1864 in Ljubljana, the *Slovenska matica* literary society was established. It began its publishing mission by publishing the adapted general map at 1: 200,000 and the second edition of Kozler's Map of Slovenian Land and Regions. In 1868, the "publishing department" of *Slovenska matica* decided to publish the first edition of a Slovenian atlas. Matej Cigale was entrusted with the job of the editor and the atlas was supposed to be published in fascicules of two or three maps each year. By 1877, *Matica* had published 18 fascicules of the atlas with maps of different continents at different scales.

In that period, the educational system lacked geographical books and maps of local area. This prompted educators to prepare and publish the so-called local maps at different scales and using different cartographic techniques. Thus in 1872, the *Duchy of Carniola* map, created by the educator Feliks Stegnar, was published for educators and school use. Blaž Kocen, a school geographer and self-taught cartographer, then published wall maps of Styria and Carinthia.

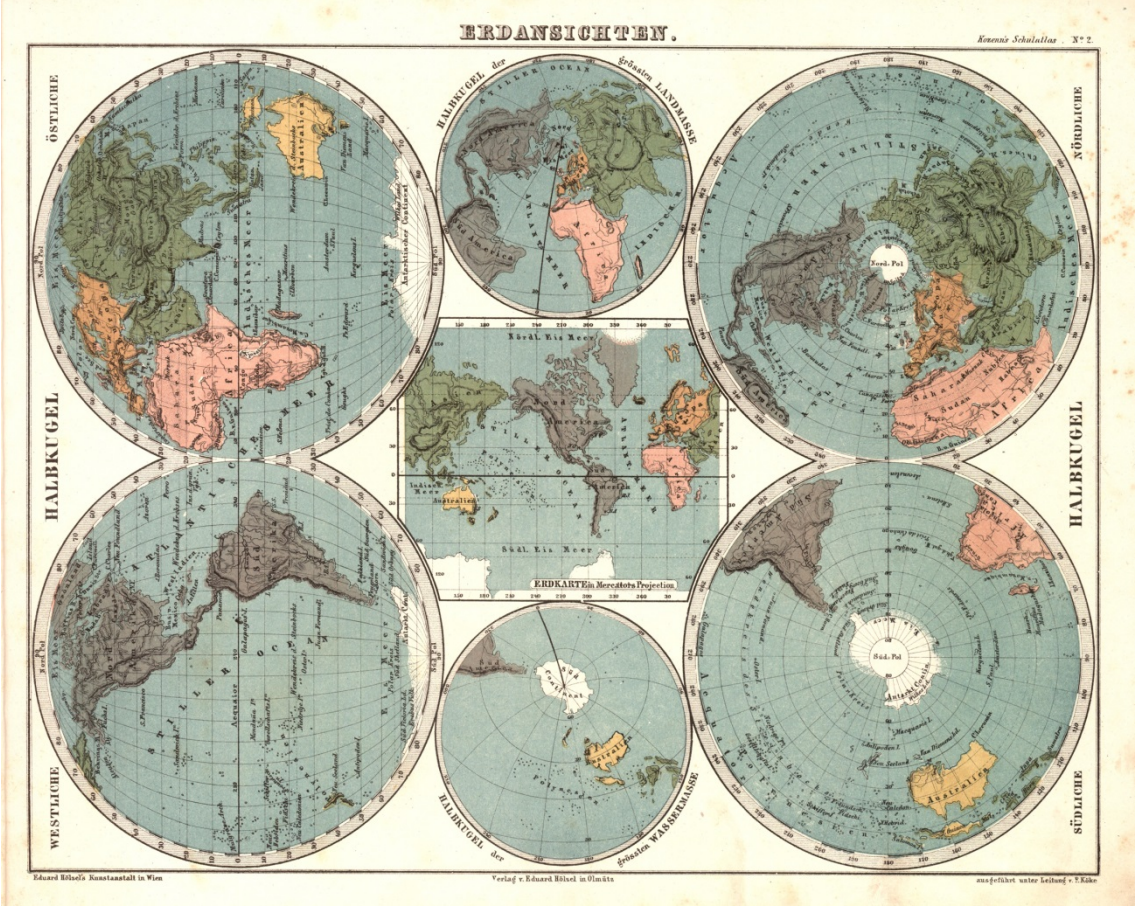

Figure 6: Insert form Kocen's atlas

At the same time, the educator Fran Vodopivec created and had the wall map of Goriško and Gradiščansko areas published. Around 1860, Blaž Kocen also published his school atlas, for which he drew the maps himself (Figure 6). Due to its ease of use and clarity, it grew to great popularity in schools across Austro-Hungary.

At the turn of the century, Fran Orožen published a map of both Earth hemispheres at 1: 20,000,000 on eight sheets and the map of Europe at 1: 4,000,000 on four sheets, thus filling the void in school maps. Among the higher quality maps of that time is the map of the Logatec county by Ferdinand Juvanc in 1910.

It was typical of the more complex maps of the period that from Kozler onwards they were commissioned principally from the Military Geographical Institute in Vienna and from the best known cartographic publishing houses Edvard Hoelzl in Vienna and Freytag & Berndt, where most Slovenian national maps were published. Our country did not have any local cartographers who, even when relying on military geographical

maps, were equal to the more demanding cartographic tasks. Even the land surveyors and topographers in *Matica*'s geographical department, who occasionally dabbled in cartography, were not capable of meeting this challenge.

In 1922, the Geographical Institute was established at the University of Ljubljana and soon became a professional and scientific establishment of broad national significance. In 1927, the Institute received its first trained cartographer Wolf Luckmann, who was the first person in our territory to delve into cartographic theory. The second important cartographer of that period was Maribor-native Slavoj Dimnik, the author of several maps of Slovenia, Yugoslavia and Europe. His Hand School Map of the Drava Province and the Border area of the Slovenian Territory at 1: 650,000 ranks among the most successful maps of the period.

In the decade before World War II, the drawing and printing of national and other maps was completely in the hands of the Royal Military Geographical Institute in Belgrade. Provincial and regional maps with different contents on severely reduced topographic bases were created on the drawing boards of the innumerous professional and amateur cartographers. The editorial board and assistants at *Slovenska matica* were aware that Slovenian territory was in sore need of cartographic amendments that would follow Kozler's example and exhibit a modern cartographic and topographic approach.

Outside the university and society circle of geographers, who only occasionally dealt with the issues of scientific cartography, Ivan Selan, a self-taught cartographer gained increasing prominence in the last years before World War II. He drew a number of tourist, administrative and mountaineering cartographic sketches and local maps, geographic and even panoramic maps.

In 1934, the Club of Prekmurje Academicians published the map Slovenian Region, the map of Prekmurje and Međimurje at 1: 150,000. The map was adapted by Jože Maučec and drawn by Vilko Finžgar, a cartographer of the Geographic Institute of the University of Ljubljana. The map is distinguished by the consistency of toponyms, a plastic but unobtrusive relief and a series of completely new topographic symbols.

Following World War II, the tasks of the pre-war Royal Military Geographic Institute were carried on by the Military Geographical Institute of the Yugoslav People's Army in Belgrade (VGI). The entire country was covered by a system of accurate and modern topographic maps at 1: 25,000, 1: 50,000, 1: 100,000 and 1: 200,000, general topographic maps at smaller scales, aerial photos and other thematic maps. Nautical maps were drawn by the Hydrographic Institute in Split.

Slovenia was the only Republic of the former SFRY which developed certain parts of the cartographic system under the sponsorship of the Republic Surveying and Mapping Authority: it covered the entire territory with the sheets of a basic topographic map at 1: 5,000 and 1: 10,000 (TTN 5/10); from the Military Geographical Institute it commissioned the so-called economic edition of the topographic map at 1: 25,000 (TK 25 VGI) and in addition to the printed copies it also obtained the copies of reproduction originals; it created its own map at 1: 50,000 (TK 50 GZS), created and updated a system of general maps (PK) between 1: 250,000 and 1: 1,000,000 and finally, it created the first topographic records DMR 100 (digital terrain model), ROTE (register of spatial units) and EHIŠ (register of house numbers) for the entire territory. The institutional cartography in Slovenia began in the 1950s at the Institute for Geodesy and Photogrammetry (present-day Geodetic Institute of Slovenia) and the *Geodetski zavod Slovenije* institute. Their constant development and attention to the situation abroad in the 1950s brought Slovenian cartography on a par with world cartography both in the sphere of thematic maps as well as systemic maps.

3 Development of cartography in Slovenia after 1991

With the attainment of independence, the administration of the system of national maps and topographic databases was in entirety taken over by the Surveying and Mapping Authority of the Republic of Slovenia. Of the topographic, general topographic and other VGI maps, only the reproduction originals of the TK 25 VGI sheets (showing the 1985/86 situation) were in Slovenia. Of the other maps, there were only limited numbers of printed sheet copies in Slovenia. The VGI maps and Slovenia-made maps (TTN 5/10, TK 50 GZS, and PK) were not harmonized in terms of content and accuracy. In terms of content, many VGI maps were outdated and due to the inexistence of the production materials, their restoration was mostly impossible. Without exception, all the maps were made with the classical cartographic technology, which was already outdated in the early 1990s. They were not adapted to the needs of the users (digital format, new media) and they were also not in line with the systems of the neighboring countries as well as international associations and organizations (NATO). In this situation, the Surveying and Mapping Authority's priorities in the field of the national topographic-cartographic system were to establish and restore the cartographic system and the system of topographic databases, to restore the basic geodetic system and magnetometric surveys, to link the national coordinate system with those of the neighboring countries. With desire to effect the most efficient establishment of the own system of national maps and topographic databases, in 1994 the Ministry of Defense and the Ministry of the Environment and Spatial Planning entered into the Agreement on Joint Activities in the Geodetic Field. The agreement was complemented by the Civil Defense Administration and the Surveying and Mapping Authority's agreement on the joint production of topographic maps and other materials. The system and assignments were defined in more detail in the Strategy of the Topographic and Cartographic System of the Republic of Slovenia (TKSS) project, which was created in 1996 by the Institute for Geodesy and Photogrammetry. Since then, individual system elements have been regularly created and appropriately updated.

4 Cartography of the national land survey service

The Surveying and Mapping Authority of the Republic of Slovenia is a body within the Ministry of Environment and Spatial Planning. The competence of the Surveying and Mapping Authority of the Republic of Slovenia comprises the assignments of the national land survey service, which include the creation, administration and updating of databases related to the basic geodetic system, real estate, state border, spatial units and house numbers, and to the topographic and cartographic system.

The Sector for the Topographic System is responsible for administering the topographic system of the Republic of Slovenia, which is the official system of the topographic and cartographic data and materials. It implements professional, technical, coordinative and supervisory assignments concerning the administration of the following maps and databases:

- basic topographic map at 1: 5,000 and 1: 10,000 (TTN),
- topographic database (DTK 5),
- national topographic maps at 1: 25,000 (DTK 25) and 1: 50,000 (DTK 50),
- national general maps (DPK),
- generalized cartographic database (GKB),
- aerial and orthophoto images,
- digital height models (DMV),
- Register of Geographical Names (REZI) and
- the Consolidated Cadastre of Public Infrastructure.

4.1 National topographic and general maps

The maps are organized by scales that follow each other at a ratio of 1: 2, beginning with 1: 5,000 and ending with 1: 1,000,000. Maps and orthophotos are graphic products. The older products were created using the classical, analogue technology, which is why they exist in the physical, analogue form and additionally in the digital form as raster images. Newer maps have been created using computers and have been first and foremost stored in a digital form as raster images or vector data.

4.1.1 Basic topographic map (TTN) and the topographic database at 1: 5,000 (DTK 5)

The largest-scale systemic map in Slovenia is the basic topographic map – TTN (Figure 7 left). Most of the territory is depicted at 1: 5,000 (2537 TTN 5 sheets). The less intensive areas are shown at 1: 10,000 (258 TTN 10 sheets). The division into sheets is done using the rectangular network of the Gauss-Krueger projection. The size of a TTN 5 sheet is 2.25 km × 3 km and 4,5 km × 6 km for TTN 10 50 TTN 5 sheets are joined into 22.5 km × 15 km trigonometric sections. This map places Slovenia among the rare few countries whose entire territory is depicted at such a large scale. It was produced in the 1960s. The sheet restoration was limited and unsystematic and after 1997, it completely stalled. That is why the present up-to-dateness is very heterogeneous. Many sheets depict the situation as it existed in the 1960s. The map was created and updated using classical cartographic procedures. Until 1980, the sheets were printed. Today the reproduction originals of individual contents are available on plastic-foil as well as the merged plastic -foil copy. Scans of all originals at the resolution of 300 dpi are also available. The TTN accuracy has not been ascertained. There are estimates but they are unreliable.

In the early 1990s, the project of the establishment of the high-accuracy topographic database was implemented (TBVN). It was to implement the vectorization of TTN 5/10 sheets and to establish a topographic database, however, only a few test sheets were produced. Subsequently, in 1998 began the changed project for establishing a TBVN digital topographic database. Therefore, the existing TTN sheets have since 2001 been replaced by the topographic database DTK 5, which admittedly contains fewer objects than the TTN did.

The essential purpose of DTK 5 is the linking of the existing topographic records and the minimal capture of the required contents. The source of data are the cyclic aerial survey (CAS) images. In terms of content, it is divided into four objest classes: buildings, transport, land cover and hydrography. Each object class is further divided into object types.

The contents may be cartographically modelled (Figure 7 fight), furnished and plotted as a map. In the period between 2002 and 2014, 2141 3-km × 2.25-km sheets (out of 3258 DTK 5 sheets which cover the entire territory of Slovenia) were captured using cyclic aerial survey stereo pairs and other sources. The created sheets cover all the bigger settlements and we estimate that the DTK 5 encompasses no less than 85 per cent of the population. The capture of DTK 5 for the entire country is contingent on financial resources. Each individual sheet is stored in the *shp* format.

In the period between 2002 and 2004, the so-called geodetic groundworks for the depiction of spatial acts as standard cartographically processed graphical products were created using the captured DTK 5 topographic data. For 25 per cent of the surface of Slovenia the so-called geodetic groundworks were created using orthophoto images.

Figure 7: TTN 5 insert and DTK 5 representation

4.1.2 National Topographic Map 1: 25,000 (DTK 25)

The largest scale topographic map, which the uniformly covers the entire territory of Slovenia, is the national topographic map at 1: 25,000 (DTK 25). It comprises 198 7,5´× 7,5´ sheets (Figure 8). The VGI-made topographic map at 1: 25,000 (TK 25 VGI), which was primarily used by the Yugoslav People's Army, served as the basis for the map. In the 1970s, Slovenia commissioned from VGI a production of a civilian (so-called economic) version of TK 25, which did not contain strategic military objects and was printed in four colors (the military map had six). The last restoration was implemented in 1985 and 1986. The map was assigned with level of confidentiality. At the time of attainment of independence, the copies of reproduction originals

representing the situation in 1985 were in Slovenia. In 1993, the Surveying and Mapping Authority of the Republic of Slovenia in cooperation with the Ministry of Defense commissioned the preparation of the DTK 25 project. It was to be implemented by restoring the old TK 25 VGI maps using the classical analogue procedure and the familiar technology. Unfortunately, after only 11 sheets it became evident that due to limited financial resources only a limited restoration would be possible. That is why the first 11 DTK 25 sheets different from the rest in the degree of updating and certain topographic symbols. With other sheets, the degree of updating was limited to only the inclusion of new connecting roads and railroad tracks, larger groups of new objects or larger individual objects, and the inclusion of new water-storage reservoirs. The map was also updated with the border with Croatia using the boundaries of the border cadastral areas, all double-lined roads were colored ochre, all the mistyped or renamed settlement names were corrected, Italian and Hungarian names were added for the bilingual areas, the abbreviations were translated (in TK 25 VGI the abbreviations were Serbian) and all the names in Italy, Austria and Hungary were written in the original (TK 25 VGI spelled all the names phonetically). The marginal content with the legend of a part of topographic symbols, the mathematical elements of the map, explanations and colophon were completely re-designed.

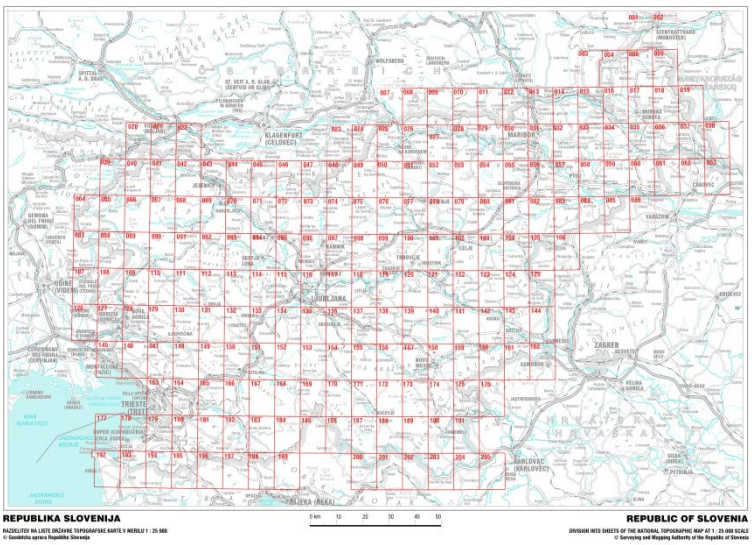

Figure 8: Index map of DTK 25 sheets

The map updating did not include the amendments to unpaved tracks and footpaths, nor did it include forest boundaries, nor were non-existent objects removed, nor were new individual objects added and neither was terrain altered (due to mudslides, quarries,

etc). In spite of these deficiencies, DTK 25 boasts an extremely accurate height representation of the terrain, high legibility, legibility with high density of displayed information and in general, good positional and height accuracy of all the displayed objects (Figure 9 left). All 198 sheets were produced (updated) between 1994 and 1999. They are available as sheets (unfolded) or folded to a pocket format. They were printed on three different types of paper. In digital form, the scans of all the reproduction originals are available at the resolution of 300 dpi. Certain elements of the map contents (roads, paths, tracks, contour lines and watercourses) were captured in vector form as generalized cartographic databases (GKB).

In 1999 and 2005, 5 sheets of the updated DTK 25 were produced as prototypes in digital form and in the updated format. Nevertheless, the decision to do a regular updating of all the sheets was not made.

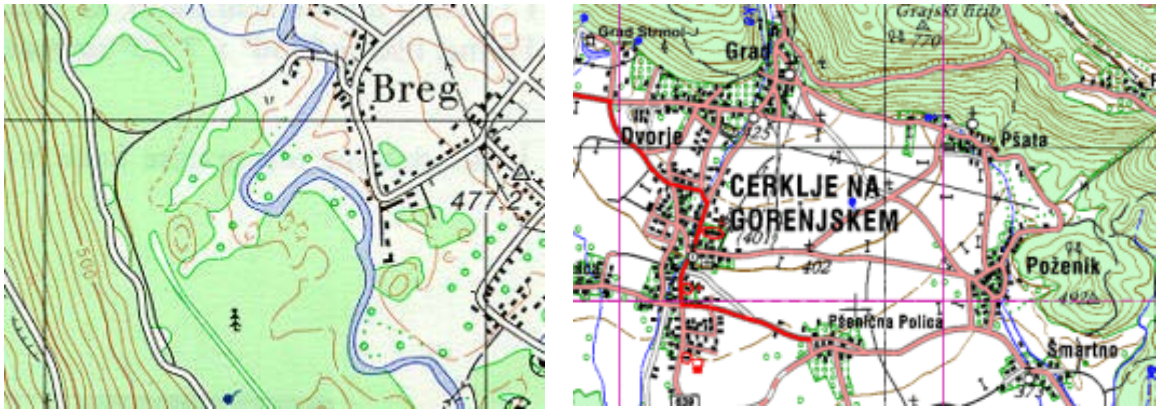

Figure 9: Inserts from the national topographic map DTK 25 (left) and DTK 50 (right)

4.1.3 National Topographic Map 1: 50,000 (DTK 50)

National topographic map at 1: 50,000 (DTK 50) is the latest topographic map of the Republic of Slovenia and represents the greatest achievement of Slovenian cartography since independence. The decision to produce DTK 50 was contingent on the inclusion of Slovenia into the Partnership for Peace and the efforts to join the NATO. In addition to the scale and the updated contents, the map must fulfill all the NATO standards from the geodetic perspective (WGS 84 datum, projection UTM, 20´×12´ sheet dimensions). Given the goal of lowering the costs and ensuring the appropriate quality, TK 50 VGI proved to be the most suitable source. Unfortunately, Slovenia only had the printed sheets encumbered by geometric errors. For the purpose of producing the map, an

original method of combining raster and vector map-making procedures was developed in Slovenia (Figure 9 right). In addition to the basic source, the data on amendments were acquired on the basis of the photogrammetric acquisition of stereo pairs of aerial surveys and field surveys, which were limited by the accessibility of the terrain to vehicles. Other available topographic databases were also used. After cartographic depiction and error and amendments generalization, in the final phase the map was ready for printing in two versions. as a national map (DTK) and a military map (VTK). The mathematical basis for the map is the UTM projection and datum WGS 84. In order to link to most spatial data in Slovenia, the DTK 50 map was also printed with the rectangular grid of the Gauss-Krueger projection. All 58 sheets of the map (Figure 10) were done in the period between 2000 and 2005. Raster images of the entire map or individual contents are available to the users. In 2006, the restoration of the map sheets began.

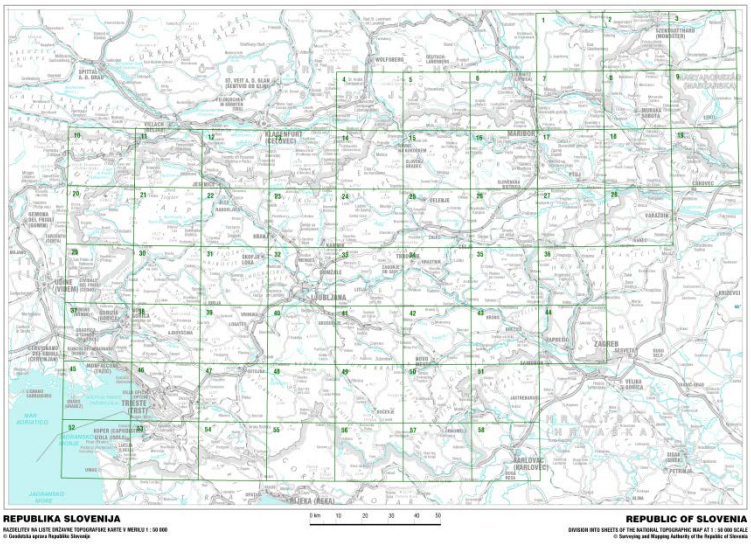

Figure 10: Index map of DTK 50 sheets

4.1.4 General national maps

General national maps of Slovenia show the entire area of Slovenia and parts of the neighboring countries on a single sheet. They are produced at 1: 250,000 (DPK 250), 1: 500,000 (DPK 500), 1: 750,000 (DPK 750) and 1: 1,000,000 (DPK 1000) (Figure 11). To a degree, the scales have been adjusted to the standard paper formats – DPK 1000 to the A4 format and DPK 750 to the A3 format. They are used as independent large-scale maps or as a cartographic basis for various thematic maps, as additions to

publications and so on. All maps have been made as vectored maps. Rocks and relief shading have been included as raster layers. The maps are available as raster images, in vector format and also as printed copies (except DPK 250). The new version of DPK 250, initially made in 2004 and last revised in 2013, is recognizable by its representation of settlements, which depicts their scattered character. The back side of the map consists the complette Register of Geographical Names for 1: 250.000 scale with 8000 names. Vector data are the basis for amending the EuroRegionalMap (ERM) toporgraphic database. The general national maps at four scales were made in UTM system and last updated in 2013/14. The DPK 1000 vector data were partially adjusted and included into the EuroGlobalMap (EGM).

Figure 11: Inserts from the general national maps DPK 250 (left) and DPK 1000 (right)

4.2 Other topographic data

Topographic databases are predominantly organized by content. They are intended primarily for various queries, spatial analyses and as a data basis for various depictions, including the cartographic ones.

4.2.1 Generalized cartographic database (GKB)

The Surveying and Mapping Authority of the Republic of Slovenia began establishing a cartographic database at 1: 25,000 in 1994. The basic source for data acquisition were the scans of reproduction originals of the national topographic map at 1: 25,000. The contents of individual scans were digitalized and recorded in vector form. Each object in the database was amended with the basic attributes of the object. As the data were acquired from the DTK 25 national topographic map, where some elements were

already partially generalized, the database was named the generalized cartographic database or simply GKB. The database was designed so that it links to other databases through individual objects' indicators. The database was created in its entirety in 1996.

The generalized cartographic database comprises four groups of objects: roads, waters, contour lines and railways. In addition to the general descriptions (source of data, data administrator, date of acquisition, date of last amendment, etc.), each object has special descriptions which were laid down in the data acquisition standards. As a basic geoinformation infrastructure, the database is intended for a wide range of users. The database can be upgraded by users to meet their needs and requirements.

4.2.2 Aerial survey images and orthophoto

The field of photogrammetry encompasses systemic aerial triangulation, planning, monitoring and supervision of aerial surveys and creation of standard photogrammetric products. Cyclic aerial surveys were implemented in 1970-ies, predominantly in the monochromatic photographic technique with an airplane-mounted analogue camera and, as a rule, in four-year cycles. The most common survey scale was 1: 17,500. From 2005 the territory of Slovenia have been surveyed with a digital camera in the visible color spectrum and infrared spectrum. Last aerial survey for most of the territoty was done in 2014. The CAS images are used as a source for data acquisition and amendments of topographic database and maps. Additionally, they are used as a basis for the creation of standard photogrammetric products. The primary product is an orthophoto.

An orthophoto is an aerial image that has been transformed into the national coordinate system by taking into account the image central projection and the digital relief model. In metric sense, an orthophoto is identical to a line map. Classical orthophotos began to be produced in the 1980s. Most often they were used for updating basic topographic maps at 1: 5,000. At the end of 1990s, began the systemic digital creation of orthophotos with the pixel size of 0.5 meters and at a standard scale of 1: 5,000 (DOF 5). Slovenia was first completely covered by DOF 5 in August 2001. The country is covered by 3258 2.25-km × 3-km orthophotos. 50 orthophotos are joined into 22.5-km

× 15-km trigonometric sections, same as TTN 5. Until and including 2004, orthophotos were monochromatic and since 2005 they have been polychromatic. Using the digital camera images from 2006, by June 2007 orthophotos with the resolution of 0.5 meters (DOF 050) for the entire territory of Slovenia have been supplemented by new 0.25 meters resolution (DOF 025). Additionally, an orthophoto in the infrared spectrum and with a 1-meter resolution was made. Orthophoto serves as a basis for the depiction of different spatial information, as a basis for acquiring derived data and for spatial analyses (Figure 12). It is available to the users as a raster file in several raster formats. Orthophoto updating is planned at 3- to 5-year cycles, depending on the number of changes in space as well as the interest and needs of users.

Figure 12: Insert from DOF 050

4.2.3 Digital height model (DMV)

The 25-meter × 25-meter digital relief model (DMR 25) was created in parallel with the creation of the digital orthophoto DOF 5. The average altitude accuracy is 1.5 m for open flat terrain, 3 m for rough terrain and 6,5 m for mountain terrain.

The 25-m × 25-m interferometric radar digital height model (InSAR DMV 25) was created using the radar interferometry technique from radar images by the European Space Agency (ESA). The images were made in the period between 1995 and 1999. The average altitude accuracy is 1.9 m for open flat terrain, 5.2 m for rough terrain and 13.8 m for mountain terrain. The average estimated accuracy for the entire Slovenia is 4.5 m.

In 2005, the digital relief model of Slovenia was made. The cell size was 12.5 m × 12.5 m (DMV 12.5). The model also covers the surroundings of Slovenia with the total area of 55,087.5 km2 and more than 353 million pixels. The new DMV incorporates

more than 25 different data sources, which have been captured since 1947 onwards (relief models with resolutions between 10 and 600 meters, digitized contour lines and road layers at different scales, geodetic points, etc.). The estimated accuracy of the model is 3.2 m for the entire territory of Slovenia (1.1 m for flat terrain, 2.3 m for low hills, 3.8 m for hills and 7.0 m for mountains). (Podobnikar. 2006). In addition to DMV 12.5, the two lower resolution relief models created from the same sources - at 25-m (DMV 25) and 100-m (DMV 100) resolutions – are also available to the users.

CAS 2006 was used to create the new, more detailed DMV for the entire territory of Slovenia and 250-meters wide buffer zone around borders with 5-meter cell size. The accuracy of DMV is 1 meter on open areas and 3 meters in vegetation covered areas.

In 2011 the first systematic airborn laser scanning (LiDAR) of Slovenia started, with ground densitiy from 2 to 10 point per sq. meter, depending on flood risk and population density of areas and is planned to be finished in 2015.

4.2.4 Register of Geographical Names (REZI)

Estimations done on the basis of cartographic material indicate that Slovenia has approximately 200,000 geographical names. The Register of Geographical Names uses cartographic sources to capture only the names with temporal, historical, ethnological and social identity. The main purpose of geographical names is orientation in space. There is a multitude of cartographic sources and it is possible that names of certain individual objects differ. The differences occur due to the failure to consider orthographic rules or due to a complete difference in the naming of specific objects. One of the main objectives underlying the creation of the Register of Geographical Names is the standardization of the written forms of individual names. These standardized names uniquely designate the position and hence orientation in space. The Register of Geographical Names has been created to meet three accuracy levels: For 1: 5,000 (REZI 5) scale – approximately 150,000 geographical names acquired from TTN 5 and TTN 10; for 1: 25,000 scale (REZI 25) – approximately 60,000 geographical names acquired from DTK 25; For 1: 250,000 scale – approximately 8,000 names acquired from DPK 250.

4.2.5 General Cadastre of Public Infrastructure (ZK GJI)

In the Consolidated Cadastre of Public Infrastructure are administered the data on the objects of the public infrastructure owned by the state (state roads, water infrastructure, etc.), municipalities (water supply network, sewage system, waste dumps, etc.) and private companies (cable networks, telecommunication devices and networks, etc.) On the basis of data registered in individual cadastres of public infrastructure, the Surveying and Mapping Authority of the Republic of Slovenia administers consolidated data on the type and kind of object, its location in space and its manager.

4.3 INSPIRE in Slovenia

Slovenian Inspire geoportal http://www.geoportal.gov.si/domov/ is a national access point to Slovenian Spatial Data Infrastructure according to Inspire directive.

The main goal of the geoportal is to provide adequate information and documentation related with the Slovenian Spatial Data Infrastructure. The portal includes available electronic services related with spatial data. One of the main services included is metadata system developed according to Inspire metadata implementation rules.

The geoportal is available in the Slovenian language at the moment since it is still in testing phase and will be available in English version as well.

5 State and official cartography outside the national land survey service

5.1 Ministry of Defense

The bearer of the development of the cartographic system for defense purposes is the Defence Affairs Directorate. They develop and plan the creation of the cartographic system in line with NATO standards. It takes into account the needs of users within the Ministry of Defense and harmonizes them with the plans of the Surveying and Mapping Authority of the Republic of Slovenia, since, in line with the 2004 agreement, for reasons of economy, military and civilian maps are largely prepared and created in parallel. The development of the cartographic system requires activities involving international cooperation as map-making does not end at the national border. Mutual agreements enable the exchange of geographic data. The department keeps abreast of the development of NATO standards and is responsible for their incorporation into Slovenian military standards.

5.1.1 Military topographic maps (VTK 25, VTK 50 and VTK 100)

Together with the creation of the national topographic map at 1: 25,000 (DTK 25) in the period between 1994 and 1999, the Ministry of Defense of the Republic of Slovenia upgraded the DTK 25 map with certain data important for defense purposes and published it as DTK 25 for defense purposes (DTK 25 MO). Characteristics of roads and bridges, the densities and types of forests were added and certain important objects were marked. Marginal contents were expanded. Since the source for the acquisition of additional data was the field acquisition, a portion of the contents is more up to date than on the civilian DTK 25 version. The map was not in line with the NATO standards (STANAG). Consequently, in 2004 began the transformation of DTK 25 MO into a military topographical map at 1: 25,000, which is in line with the basic requirements for the interoperability of cartographic bases and geoencoded data required by NATO.

It represents the first level in the cartographic system of criteria set out in the NATO STANAG 3677 standard. The map is suitable for field orientation and planning activities at the broader local level. In 2004 50 of 190 sheets were created. The map contents were minimally updated in comparison with the existing DTK 25 MO, however, VTK 25 has a different geodetic basis, has been designed in the UTM system and has a changed shape and size of sheets - 10´× 6´. In 2004 and 20015 Ministry lauched creation of two Military Topografhoc Mountain Map Sheets (Figure 13 left).

Military topographic map at 1: 50,000 (VTK 50) is a basic map of the cartographic system laid out by the NATO polices and STANAG 3677 standard. It was created in the UTM system on 20´×12´ sheets. The first 11 sheets for the territory of Slovenia were created in 1998 for NATO military exercises. The creation of all 58 sheets was implemented in the period between 2000 and 2005, together with the creation of DTK 50. The map was made in line with the NATO standards, which means that it is interoperable with maps created and used by NATO and Partnership for Peace members (Figure 13 right). The maps are available as printed sheets or as a raster image. Additionally, the object catalogue and the catalogue of cartographic symbols were made for the digital VMap 2. The updating of the contents of VTK 50 began in 2006 and will be finished in 2016.

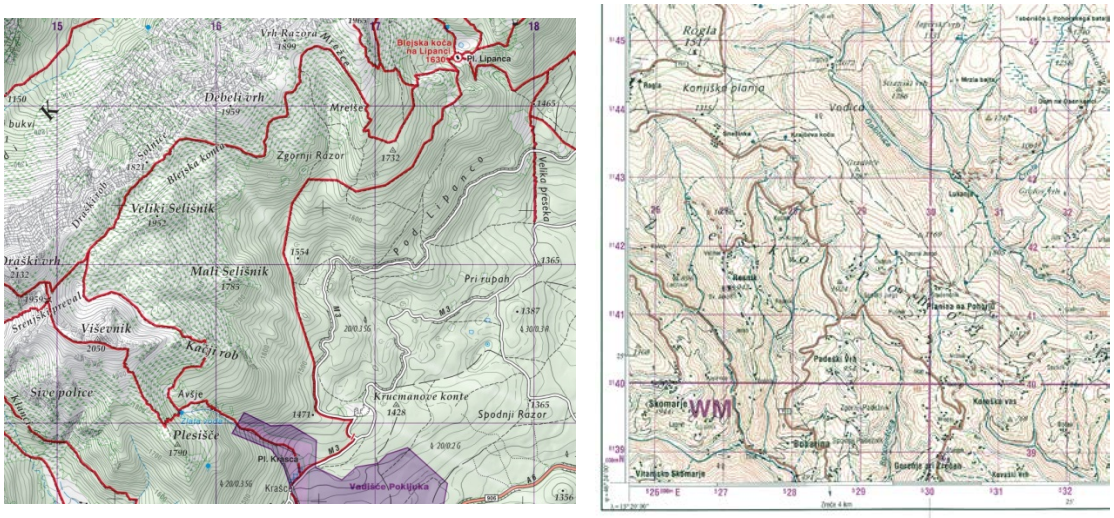

Figure 13: Inserts from VTPK 25 and VTK 50.

The third from the set of military topographic maps is the military topographic map at 1: 100,000. It is intended primarily for defense planning and regional operations. In

terms of contents, it is in line with VTK 50 and VTK 25. All 16 40´×24´ sheets were created in 2002 and 2003 through a partial renovation of the former TK 100 VGI.

5.1.2 Joint Operations Graphics 1501 G and A map (at 1: 250,000)

Joint Operations Graphics map (at 1: 250,000) is a map set out in the STANAG 3600 standard and STANAG 3677 criteria system. It is created as a ground map 1501 G (Ground) and air map 1501 A (Air). Its purpose is global military planning and it is set out in NATO geographic policy as well. The map has been created in the UTM system and divided into 2° × 1° sheets. The territory of Slovenian encompasses 5 sheets, which also cover large areas of the neighboring countries. The project of the creation of JOG 1501 G and A maps with the creation of a test sheet was finished in the beginning of autumn 2005 with the creation of the first sheet NL 33-05 and was financed by CRP funds -"Knowledge for Security and Peace 2004 – 2010". The primary source for the sheet creation was the general national map DPK 250. The data for the territories of the neighboring countries were obtained through the mutual exchange of spatial data (Figure 14).

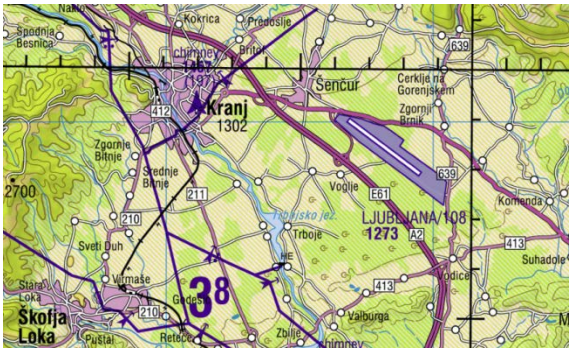

Figure 14: Insert from the Joint Operations Graphics – Air (JOG – A) map

5.1.3 General map of the Republic of Slovenia defense administrations with their branches at 1: 250,000

The general map of the Republic of Slovenia defense administrations with branches at 1: 250,000 displays on one sheet the administrative course of boundaries of defense administrations with their branches and respective seats. It was created on the basis of the National Map of the Republic of Slovenia at 1: 250,000, created by the Surveying and Mapping Authority of the Republic of Slovenia in 1994 and last thematically updated in 2003.

5.1.4 Air navigation map of the Republic of Slovenia at 1: 250,000 for the purposes of defense (VFR)

The 2006-made aviation navigation map of the Republic of Slovenia at 1: 250,000 for the purposes of defense (VFR) is intended for the use by members of the Slovenian army in planning and implementing aircraft training and other air assignments. It was made on the basis of the General national map of the Republic of Slovenia at 1: 250,000 and in line with the appropriate STANAG standards and actual special specifications in force for aviation maps (Figure 15).

Figure 15: Insert from VFR

5.1.5 Orthophotomaps of training areas

In 2004 and 2005, the orthophotomaps of the Slovenian army central training grounds Postojna – Poček and Bač at 1: 10,000 were created. The maps were created in line with the NATO standards. The data on the training grounds objects were acquired using a GPS survey.

5.2 Ministry of Transport, Maritime Directorate

In spite of a short coastline measuring only 46.6 km, Slovenia is also a maritime country. Primarily in the interest of the safe navigation of ships sailing into the Luka Koper port and additionally for reasons of the fast- growing maritime tourism, the Maritime Directorate, operating within the Ministry of Transportation, is implementing

the role of a national hydrographic administration in cooperation with the Geodetic Institute of Slovenia. The role of the hydrographic administration is to collect and disseminate important information for seafarers and to administer Slovenian nautical maps and other publications important for maritime transport. All maps and publications are prepared at the Geodetic Institute of Slovenia.

The Bay of Koper map at 1: 12,000 was created on the basis of the hydrographic survey by the American hydrographic ship in 1999. It was done using computer technology in Mercator projection on the WGS 84 ellipsoid, which allows the use of the GPS satellite system. It was followed by the international version of the map and the transformation of the map into an ENC (Electronic Nautical Chart) cell for use in the ECGIS system. In addition to this map, the following were published before 2002:

- MPZ-UP-1: IALA – Nautical symbols system, 1st edition 2000 and
- Cartographic key to symbols and abbreviations on Slovenian nautical maps, 1st edition in 2001.

In the period between 2002 and 2006, the following Slovenian nautical maps were created that are now regularly updated:

- Piran Bay 02, 1: 12,000, 1st edition 2004 (Figure 16),
- Bay of Trieste 03, 1: 75,000, 1st edition 2005,
- Bay of Koper INT 3469*, 1: 12,000, 1st edition 2005,
- Slovenian Sea – small maps, 1: 15,000, 1: 100,000, 1st edition 2005.

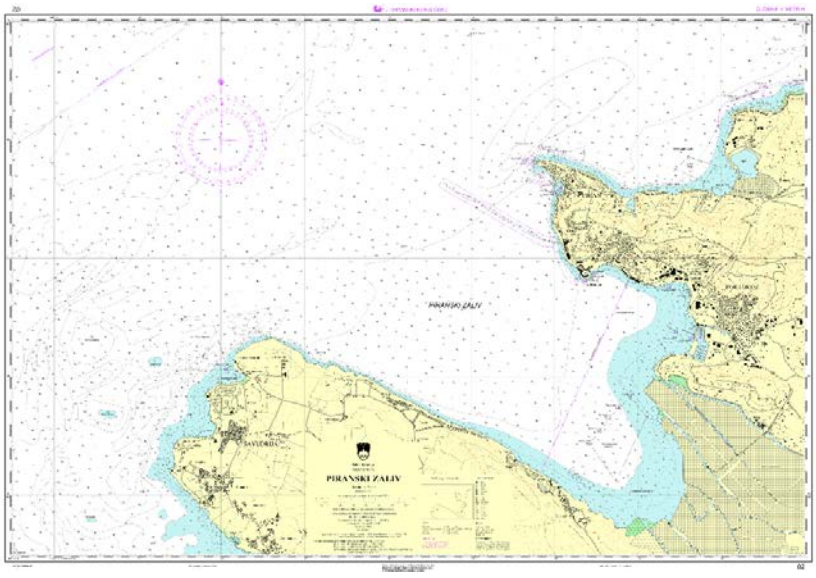

Figure 16: Map of Piran Bay

5.3 Environmental Agency of the Republic of Slovenia

The Environmental Agency of the Republic of Slovenia (ARSO) is a body within the Ministry of Environment and Spatial Planning. It implements professional, analytical and regulatory and administrative environmental assignments at the national level. Therefore, the mission of the agency is to monitor, analyze and forecast natural phenomena and processes in the environment and make efforts to reduce the danger to people and property from natural sources. National services for meteorology, hydrology and seismology belong among the assignments in this area.

In the period between 2001 and 2015, the Agency regularly prepared predominantly thematic maps concerning the environment. Many maps were made and they were submitted as reports at various conventions in the European Union or as appendices of the Agency's annual reports.

At http://gis.arso.gov.si/ the Environmental Agency of the Republic of Slovenia hosts an interactive natural sciences atlas, which contains information about the following thematic segments:

- Topographic maps,
- Digital relief model,
- Spatial units,
- Nature,
- Waters,
- Environment and
- EEA and EU reports.

The geodetic data for the atlas were provided by the Surveying and Mapping Authority of the Republic of Slovenia.

6 Other cartographic institutions and companies

6.1 University of Ljubljana

The Chair of Cartography, Photogrammetry and Remote Sensing operates within the Geodesy Department at the Faculty of Civil Engineering and Geodesy at the University of Ljubljana. Its purpose is to train professionals for dealing with problems in real life, to train them for research and pedagogic work, primarily in the fields of remote sensing, photogrammetry and cartography.

At the **Faculty of Arts** the students learn the basics of cartography in the study of geography.

6.2 Research Center of the Slovenian Academy of Science and Arts

The Research Center of the Slovenian Academy of Sciences and Arts (ZRC SAZU) is a humanities-oriented research institution that brings together eighteen research institutes. Their wide range of research areas can be summarized as the study of cultural, social, and natural phenomena, processes, and practices. Their research findings are presented not only in scholarly, technical, and popular science articles and volumes, but also in research-oriented and promotional films, maps, CDs, and online apps.

In cartography, the leading role among the ZRC SAZU research institutes is played by the Anton Melik Geographical Institute, which also includes a special Thematic Cartography Department. Between 2011 and 2015, two volumes were published as a result of historical cartography research. The volume *Kocenov srednješolski atlas kot didaktična prelomnica* (Kozenn's School Atlas as a Milestone in Education, 2011,m Figure 17) was released for the sesquicentennial of the publication of the first secondary-school atlas by Blasius Kozenn (Sln. *Blaž Kocen*). It emphasizes the historical facts of the compilation and the exceptional improvement of the atlas' value as a teaching tool, which Kozenn suggested based on his own teaching experience. His cooperation with the publisher Eduard Hölzel was of key importance.

Kozenn's crowning accomplishment was the first successful school atlas in the Austrian Empire, published in 1861. The atlas soon became the leading one in the empire. After Kozenn's death, the publisher decided to maintain his well-established brand, and so even one hundred fifty years after its first publication the *Kozenn-Atlas* is still a prominent name among school atlases in Austria and elsewhere (http://giam2.zrc-sazu.si/en/publikacije/kocenov-srednjesolski-atlas-kot-didakticna-prelomnica-1#v).

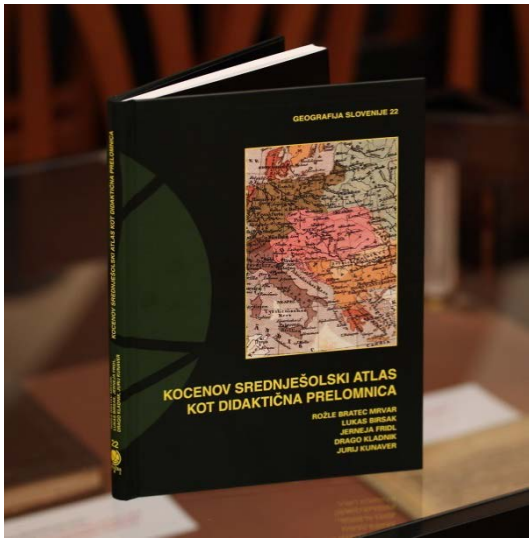

Figure 17: The monograph Kocenov srednješolski atlas kot didaktična prelomnica (Kozenn's School Atlas as a Milestone in Education).

2012 saw the publication of the volume *Zemljevid Ilirskih provinc iz leta 1812 / Carte des Provinces illyriennes de 1812* (Map of the Illyrian Provinces). The edition of this book was prepared to celebrate the two-hundredth anniversary of the Illyrian Provinces, to highlight the role of cartography in Slovenia, and to emphasize the importance of the historical moment of the causes and consequences of the Illyrian Provinces. The almost unknown Gaetano Palma created the cartographic display of the territory of the Illyrian Provinces. The merits of the map are its relatively large scale, quality cartographic representation of the terrain, and systematic breakdown of some cartographic elements. Therefore, the authors of the volume added several important aspects to the reproduction of this map. These include an overview of the status of the Illyrian Provinces, a clear outline of the main achievements of Napoleonic cartography in the eastern Adriatic and the eastern Alpine regions, and a detailed geographical description and index of geographical names. They presented the map and the events of

that time to modern readers (http://giam2.zrc-sazu.si/en/publikacije/zemljevid-ilirskih-provinc-iz-leta-1812-1#v).

In addition, two concept-based exhibitions that presented the historical development of cartography in Slovenia also enjoyed a wide public response. The Anton Melik Geographical Institute worked together with the National and University Library on the exhibition *Svet kartografov preteklosti – navdih sedanjosti* (The World of Cartographers in the Past: An Inspiration for the Present, 2012). This exhibition featured many rare exhibits and also included a short film (http://vimeo.com/57060385). It was an introduction to other Slovenian activities commemorating the five-hundredth anniversary of the birth of Gerardus Mercator.

In 2014, the institute hosted the exhibition by the Kočevje Regional Museum *Peter Kozler: Zemljovid slovenske dežele in pokrajin* (Peter Kosler; A Map of the Slovenian Land and Its Regions) in the ZRC atrium. The exhibition was staged to mark the 190th anniversary of the birth of the geographer, cartographer, politician, journalist, and patriot Peter Kosler, who was also an important figure in the national awakening movement. It featured the first display of the oldest (probably draft) copy of Kosler's map known so far, dated 1849.

Publications in Slovenian and international journals also presented research findings on modern thematic cartography and GIS. The majority were presented at the biennial symposium *Geografski informacijski sistemi v Sloveniji* (Geographic Information Systems in Slovenia). The eleventh issue of the series *Geografski informacijski sistemi v Sloveniji 2011–2012* (Geographic Information Systems in Slovenia 2011–2012, 2012) consisting of twenty-seven articles discussing the use of geographic information systems in geography, geodesy, cartography, geology, natural disasters, protection of natural and cultural heritage, and business (http://giam2.zrc-sazu.si/en/publikacije/geografski-informacijski-sistemi-v-sloveniji-20112012-1#v). The twelfth volume of publication, titled *Digitalni prostor* (Digital Space; 2014), clearly presents project results and research in areas such as geography, hydrology, protection against natural disasters, history, literary studies, regulation of traffic and mobility, agriculture, archaeology, remote sensing, and the energy industry (http://giam2.zrc-sazu.si/en/publikacije/digitalni-prostor-1#v).

In addition, an important assignment of the Anton Melik Geographical Institute was to monitor the work of the government Committee for the Standardization of Geographical Names and the work on national projects for standardizing geographical names in projects carried out for the Surveying and Mapping Authority of the Republic of Slovenia. The institute also published the *Slovar slovenskih eksonimov* (Dictionary of Slovenian Exonyms; 2013). It contains the 5,044 most frequently used exonyms or Slovenianized foreign geographical names, which were selected from among over 50,000 different forms recorded (http://giam2.zrc-sazu.si/en/publikacije/slovar-slovenskih-eksonimov-1#v).

In cooperation with the Institute of Slovenian Literature and Literary Studies, the Anton Melik Geographical Institute produced the *Literarni atlas Ljubljane* (Literary Atlas of Ljubljana, 2014, Figure 18). This is the first atlas of this type published in Slovenia, presenting the lives of ninety-four men of letters. It describes the periods in which the selected Slovenian writers lived in the Slovenian capital, ranging from the Reformation to the present. Individual locations are marked with numbers in the text, which makes it possible for the reader to find the places where the writers lived, went to school, worked, died, and were buried on the sixteen double-page maps in the atlas. These places also include the inns where they socialized and the jails where the authorities imprisoned them. In addition, the list also includes many locations of romances and heartbreaks, public scandals, and spectacular social events; mysterious disappearances are also mentioned. This extensive book is informative, instructive, entertaining, and a little bit spooky (http://pslk.zrc-sazu.si/en/literary-atlas-of-ljubljana/).

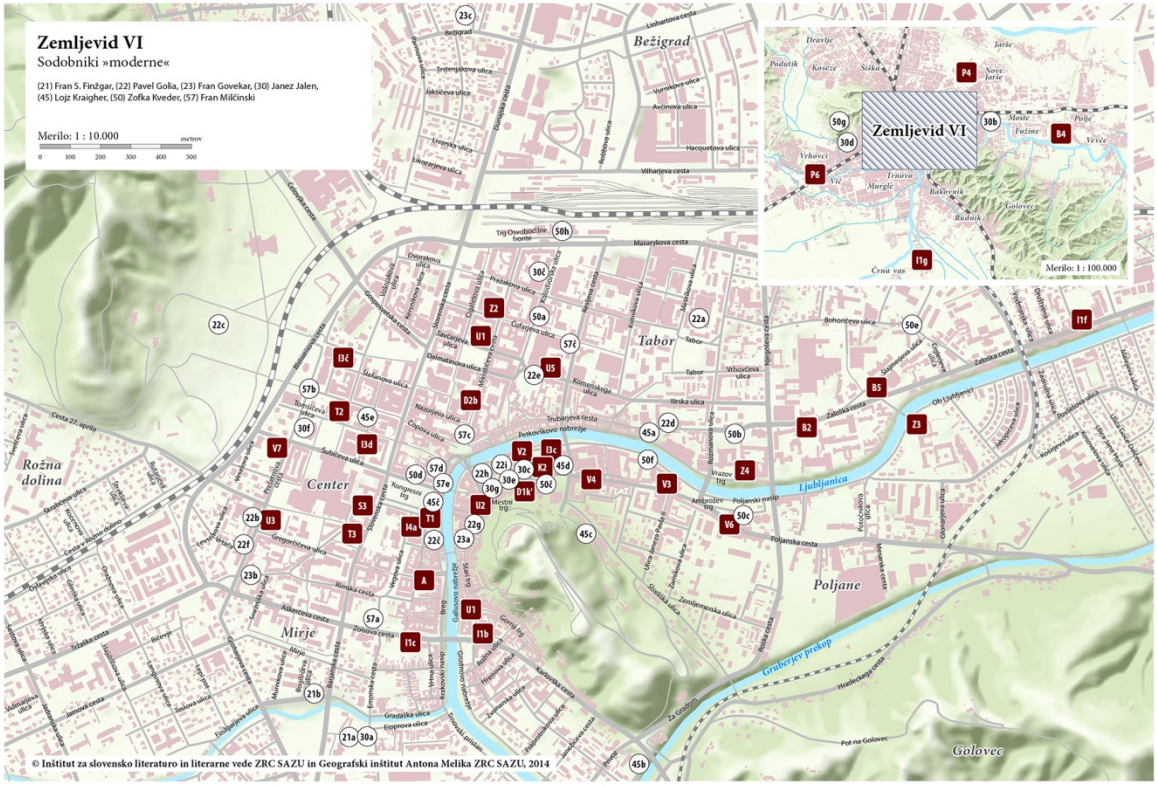

Figure 18: The map, Nr. 7, published in the *Literarni atlas Ljubljane* (Literary Atlas of Ljubljana).

This atlas was only one of the results of the project *Prostor slovenske literarne kulture* (Space of Slovenian Literary Culture, 2011–2014, Figure 19). The project is the first in Slovenia to connect literary studies and geography in a systematic interdisciplinary study. In this project, which covered the period from 1780 to 1940, GIS tools were used to map and spatially analyze literary-historical information on the lives of important writers and their memorials sites, locations of media and institutions, and settings of historical novels. The findings of the analyses are publically accessible on an interactive map (http://pslk.zrc-sazu.si/en/#/layer/1).

The Institute for Archaeological and Anthropological Studies has been active in interpreting satellite data and primarily preparing web maps. In cooperation with the Slovenian Center of Excellence for Space Sciences and Technologies, we have developed a fully automatic satellite image processing chain that processes raw satellite data into orthophotos and delivers them via a web mapping application. In the case of natural disasters (e.g., floods), maps are being produced as needed. For the floods in 2007 and 2011, maps were produced at various scales and delivered to the Administration of the Republic of Slovenia for Civil Protection and Disaster Relief. The

maps include areas identified as flooded as an overlay on 1:25,000 topographic maps. In addition, damage maps have been produced comparing land use before and after these events.

The *Slovenian Linguistic Atlas* (SLA) is the basic work of modern Slovenian dialectology and geolinguistics at the Fran Ramovš Institute of the Slovenian Language. It studies the geographically delimited variants of the language (i.e. dialect groups and local dialects) in Slovenia, their distribution, and their classification. It is the culmination of decades of work by Slovenian dialectologists.

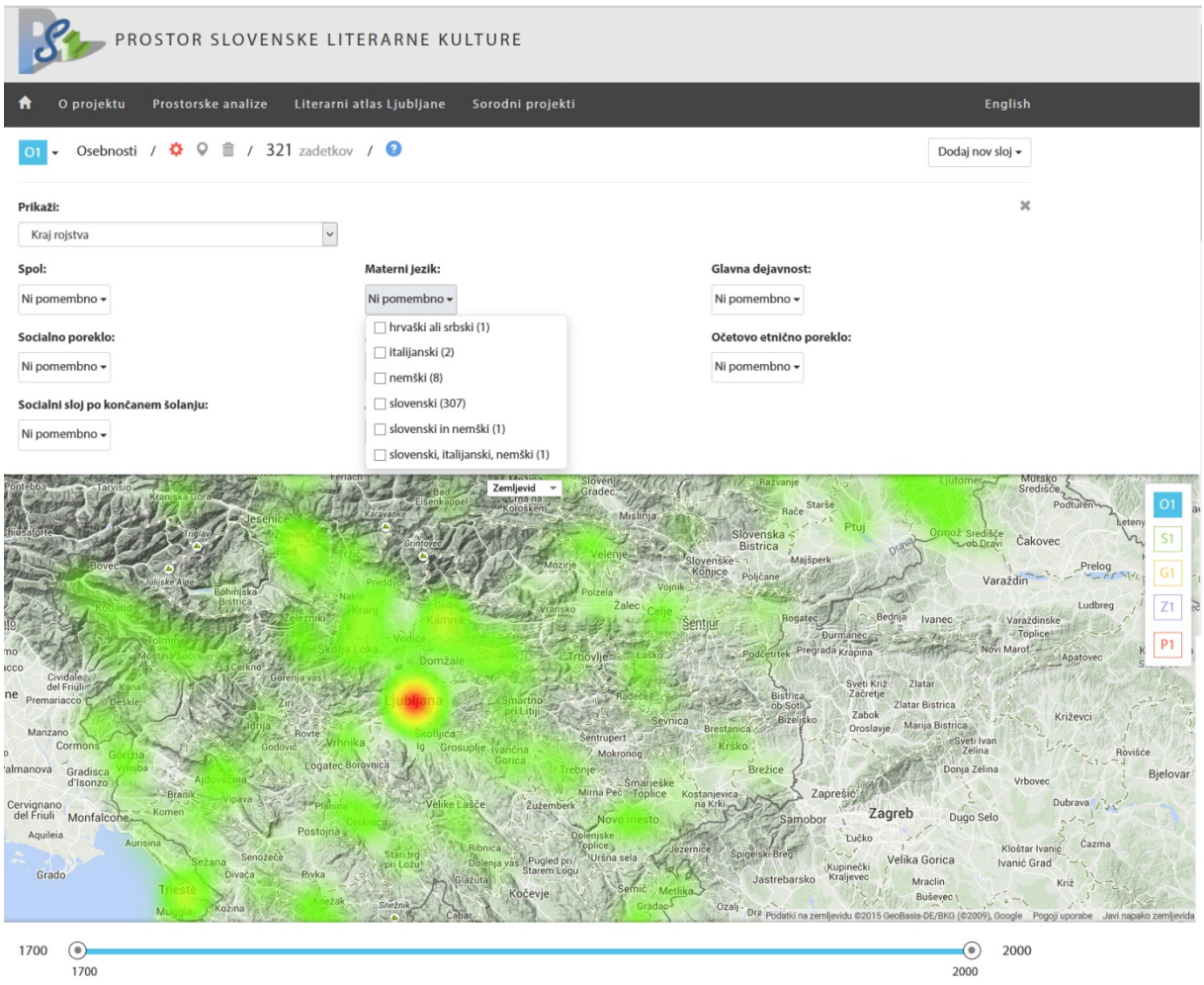

Figure 19: The interactive map of the project Space of Slovenian Literary Culture, 2011–2014 (http://pslk.zrc-sazu.si/en/#/layer/1).

In 2011, the first volume of the SLA was published, presenting SLA findings for the semantic field ‘Man’ (the Human Body, Illnesses, and Family) at 413 locations, mostly in Slovenia, but also in neighboring countries where Slovenian dialects are spoken. In the first volume a total of about 150 questions were thoroughly studied and presented. With the help of the Anton Melik Geographical Institute, the Institute of Anthropological and Spatial Studies, and some external experts, corresponding maps were prepared (one per question). A special set of characters and diacritic symbols for recording and for subsequent linguistic analysis was developed for this purpose.

The geographical presentation of the selected dialect material for geolinguistics is not so much a final result, but instead a starting point for interpretation and for further exploration of the language. In 2015 a second volume of the SLA will be published, as well as a revised map of Slovenian dialects.

6.3 Commercial and other cartography

The Geodetic Institute of Slovenia is a public institution, which was established by the state and implements various developmental and professional technical assignments of the national land survey service, including assignments in the fields of topography and cartography. The Institute implements other activities outside the scope of the public service. In the fields of topography and cartography the assignments include the acquisition of topographic data, their administration and depiction in the form of various maps, photogrammetric acquisition of topographic data on the basis of aerial photos using analytical and digital photogrammetric stations or satellite images. The Institute implements data acquisition through map vectorization and field surveys. In addition to technological and content designs, they also implement cartographic editing, counseling, comprehensive graphic design of maps, prospects, atlases and other publications as well as their preparation for polychromatic printing. They also create online and multimedia maps.

In the period between 2011 and 2015, the Geodetic Institute of Slovenia created a number of tourist, settlement, mountaineering, general and other maps. Some were published by the Institute and others were created for other clients.

Private cartographic firms (*Kartografija*, Monde Neuf, Map Design, Geodetska družba, Carto.Si…) in the period between 2011 and 2015 created a number of maps for both foreign and domestic clients. Some of that firms participated in the creation of national topographic maps and military topographic maps. Additionally, they cooperated with the Mountaineering Association of Slovenia in the creation of mountaineering maps. They authored and published maps for tourist outings, nautical outing maps, mountaineering maps, city maps, school maps (desk and wall maps), roadmaps, geographic and historical atlases, school and family atlases and various wall, hand and tourist maps. and atlases.

Recent years have witnessed a boom in online cartography: the interactive map attached to the Najdi.si search engine, the Municipality of Ljubljana website (an interactive map, which provides all kinds of information about Ljubljana), the interactive map of Slovenia - a part of the Telephone Directory of Slovenia, websites with descriptions and maps of bicycle routes and so on.

Maps are created under the sponsorship and for the needs of the Scouts Association of Slovenia and the Orienteering Association of Slovenia. Mountaineering maps are published by the Mountaineering Association of Slovenia.

List and meanings of abbreviations

ARSO - Environmental Agency of the Republic of Slovenia
CAS – Cyclic aerial survey
CEPP - Central Record of Spatial Data
CRP – goal oriented development program
DMR – digital relief model
DMV – digital height model
DOF - orthophoto
DPK – national general map
DTK – national topographic map
DTK 5 – topographic database
EGM – EuroGlobalMap
EHIŠ – house number record
ENC – Electronic Nautical Chart
ERM – EuroRegionalMap
FGG – Faculty of Civil Engineering and Geodesy
GKB – generalized cartographic database
GZS – Geodetski zavod Slovenije institute
ICA – International Cartographic Association
JOG – Joint Operations Graphics
MO – Ministry of Defense
MPZ – Ministry of Transport
NATO – North Atlantic Treaty Organization
PK – general map
REZI - Register of Geographical Names
ROTE – Register of Areas of Territorial Units
RS – Republic of Slovenia
SFRY – Socialist Federal Republic of Yugoslavia
STANAG – standardization agreement
TBVN - high-accuracy topographic database
TK – topographic map
TTN – basic topographic map
UTM – Universal Transversal Mercator projection
VGI – Military Geographic Institute (Yugoslav People's Army)
VMap – vector map
VTK – military topographic map
VTPK – military topographic mountain map
WGS 84 – world geodetic system 1984
ZK GJI - Consolidated Cadastre of Public Infrastructure
ZRC SAZU - Scientific Research Center of the Slovenian Academy of Science and Art