SLOVENSKA ZEMLJA

NA KATASTRSKIH NAČRTIH

SLOVENIAN LAND

ON CADASTRAL MAPS

Geodetska uprava Republike Slovenije
Surveying and Mapping Authority of the Republic of Slovenia

Slika z naslovnice prikazuje naselje Lichtenwald (danes Sevnica) v različnih upodobitvah.

V zgornji polovici kroga je panoramska slika s starim trškim jedrom, ki se odseva na gladini reke Save, nad naseljem je na grajskem pobočju viden obnovljen vinograd z gradom in Lutrovsko kletjo.

Spodnja polovica kroga (180 stopinj) prikazuje zemljiškokatastrske načrte v času od leta 1825 do leta 2005 (180 let).

Desna slika je izsek iz franciscejskega katastra iz leta 1825, ki se je uporabljal do leta 1875. Slika na sredini je izsek iz reambulančnega katastrskega načrta v uporabi od leta 1875 do 1974. Tega leta dobi mesto Sevnica novo izmero v Gauss-Krügerjevem koordinatnem sistemu. Načrti so se vzdrževali na papirju do sredine leta 2004 (slika levo).

Od leta 2005 dalje se katastrski načrti za to območje vzdržujejo digitalno – v državnem računalniškem oblaku (simbolično to predstavlja modrina oblakov nad gradom na zgornji panoramski sliki).

Vse upodobitve so vkomponirane v sliko ure (podnaslov knjige Zemljiškokatastrski načrti skozi čas).

Naselje Sevnica se kot Liehtenwalde prvič omenja leta 1275. Grad (franciscejski kataster iz leta 1825 ga prikazuje pod stavbno parcelo 167 v katastrski občini Lichtenwald v izmeri 374 m2) pa kot castellum Liehtenwalde šele v salzburškem urbarju za Brežice in Sevnico iz leta 1309.

V času hrvaško-slovenskega kmečkega upora leta 1573 se je za razliko od mnogih drugih izognil uničenju. V tem obdobju je bila na grajskem pobočju verjetno zgrajena tudi Lutrovska klet (franciscejski kataster jo prikazuje pod stavbno parcelo 170 v izmeri 129 m2), ki naj bi jo občasno obiskoval Jurij Dalmatin (ok. 1547–1589).

Sevnici so bile trške pravice podeljene leta 1322, pravico do sejmov ji je podelil salzburški nadškof šele leta 1513, cesar Jožef II. pa ji je leta 1783 dovolil prirejanje letnih živinskih sejmov.

Sevnica je postala mesto leta 1959.

(Vir: http://www.gradovi.net/grad/sevnica_grad)

Vinograd (franciscejski kataster ga prikazuje pod parcelno številko 931 v izmeri 432 m2) je zasadil Johann Nepomuk Händl – kasneje povzdignjen v plemenitega Rebenburga, ki je lastnik gradu postal leta 1803. Grad je uredil v udobno sodobno bivališče in temeljito prenovil okolico. Odstranil je obzidje, zasul obrambne jarke, na južnem grajskem pobočju, do tedaj porastlem s trnovjem, pa je s precejšnjim posegom v teren zgradil škarpirane terase, nanje pa posadil vinsko trto in žlahtno sadje. Vinograd v taki obliki je bil ohranjen še nekaj let po II. svetovni vojni, zatem pa zanj ni skrbel nihče več.

Leta 2007 je bil vinograd obnovljen. V njem raste petsto trt modre frankinje. Tu domuje tudi hčerka mariborske stare trte z Lenta.

(Vir: https://www.drustvo-vinogradnikov.si)

The cover image shows the settlement of Lichtenwald (today called Sevnica) in various depictions.

In the upper half of the circle, there is a panoramic picture with the old market core, which is reflected on the surface of the river Sava. Above the settlement on the castle slope, you can see a restored vineyard with a castle and a Lutheran cellar.

The lower half of the circle (180 degrees) shows cadastral plans for the period from 1825 to 2005 (180 years).

The picture on the right is an excerpt from the Franciscan cadastre from 1825, which was used until 1875. The picture in the middle is an excerpt from the revised cadastral plan in use from 1875 to 1974. That year, the town of Sevnica got a new measurement in the Gauss-Krüger coordinate system. The plans were maintained on paper until mid-2004 (pictured left).

Since 2005, cadastral plans for this area have been maintained in electronic form - in the national computer cloud (symbolically this is represented by the blue of the clouds above the castle in the panoramic image above).

All depictions are incorporated into the image of a clock (subheading of the book, Cadastral Plans Through Time).

The settlement of Sevnica was first mentioned as Liehtenwalde in 1275. And the castle (the Franciscan cadastre from 1825 shows it under building plot 167 in the cadastral municipality of Lichtenwald, measuring 374 m2) as castellum Liehtenwalde in the Salzburg land register for Brežice and Sevnica from 1309.

During the Croatian-Slovenian peasant uprising in 1573, unlike many others, it avoided destruction. During this period, the Lutheran cellar (the Franciscan cadastre shows it under building plot 170, measuring 129 m2) was probably built on the castle slope, which was supposedly occasionally visited by Jurij Dalmatin (around 1547–1589).

Sevnica was granted market rights in 1322, while the right to fairs was not granted until 1513 by the Archbishop of Salzburg. However, in 1783, Emperor Joseph II allowed Sevnica to hold annual livestock fairs.

Sevnica became a town in 1959.

(Source: http://www.gradovi.net/grad/sevnica_grad)

The vineyard (the Franciscan cadastre shows it under plot number 931, measuring 432 m2) was planted by Johann Nepomuk Händl - later elevated to the noble Rebenburg, who became the owner of the castle in 1803. He transformed the castle into a comfortable modern residence, and thoroughly renovated the surroundings. He removed the walls, filled in the moats, and on the southern slope of the castle, which had been overgrown with thorns until then, he built terraces with considerable transformation of the terrain, and planted grapevines and noble fruit on them. The vineyard was preserved in such form for several years after World War II. However, no one attended to its upkeep afterwards.

In 2007, the vineyard was renovated. Five hundred grapevines of the Blue Franconian variety grow in the vineyard. The vineyard also houses the offspring of Maribor's oldest grapevine from Lent.

(Source: https://www.drustvo-vinogradnikov.si)

SLOVENSKA ZEMLJA NA KATASTRSKIH NAČRTIH
SLOVENIAN LAND ON CADASTRAL MAPS
ZEMLJIŠKOKATASTRSKI NAČRTI SKOZI ČAS
CADASTRAL PLANS THROUGH TIME

Zbral in uredil: mag. Janez Slak
Collected and edited by: M.Sc. Janez Slak

Avtorji: mag. Janez Slak, dr. Jože Triglav, Karolina Koračin, Franc Ravnihar
Authors: M.Sc. Janez Slak, Ph.D. Jože Triglav, Karolina Koračin, Franc Ravnihar

Uvodna beseda: Tomaž Petek
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CADASTRAL PLANS THROUGH TIME

REPUBLIKA SLOVENIJA
MINISTRSTVO ZA OKOLJE IN PROSTOR
GEODETSKA UPRAVA REPUBLIKE SLOVENIJE
REPUBLIKA SLOVENIJA
MINISTRSTVO ZA OKOLJE IN PROSTOR
EVROPSKA UNIJA
EVROPSKI SKLAD ZA REGIONALNI RAZVOJ
NALOŽBA V VAŠO PRIHODNOST
eProstor
EN PROSTOR ZA VSE
I FEEL SLOVENIA

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1 UVOD

Že od samega začetka sodobne civilizacije je nadzor nad ozemljem ključnega pomena za delovanje in obstoj posamezne družbene skupnosti. Prva tisočletja je bilo razumevanje lokacije in obsega zemljišč, ki so pod določenim nadzorom, izjemno nenatančno. Skozi zgodovino pa so kartografski zapisi dejanskega stanja in lastništva nepremičnin postajali vse bolj kakovostni in točni. Takšen zapis, ki ohranja ne le dimenzije in obliko zemljiške parcele v posesti na zemeljski površini, temveč tudi prostorsko razmerje vseh takšnih parcel druga do druge zadnjih dvesto let, imenujemo zemljiškokatastrski načrt. Zemljiškokatastrski načrti so pomemben sestavni del zemljiške administracije v večini držav in tako je tudi v Sloveniji. Zemljiškokatastrski načrti so sestavni del postopkov pri evidentiranju in upravljanju nepremičnin, preurejanju in delitvi zemljišč, melioracijah, vrednotenju nepremičnin, obdavčitvi zemljišč ter kot orodja racionalnega upravljanja z zemljišči in objekti. Čeprav zemljiškokatastrske načrte mnogokrat jemljemo kot samoumevne, so pogosto eden najmanj razumljenih izdelkov, ki jih izdeluje geodetska stroka.

Digitalni podatki o prostoru in okolju so danes osnovni informacijski vir z dokazno družbeno, gospodarsko in okoljsko dodano vrednostjo. Geodetski podatki v povezavi s podatki drugih sektorjev postanejo prostorske informacije, ki omogočajo organom javne uprave, gospodarstvu ter posameznikom in institucijam, da na podlagi lokacije povežejo svoje vsebine na skupnem referenčnem okviru. Podatek o lokaciji je postal sestavni del našega sodobnega življenja, zato je odgovornost za njihovo kakovost še toliko večja. V skoraj vseh razvitih državah so potrebe zemljiških in geografskih informacijskih sistemov (LIS/GIS) nujno spodbudile informatizacijo zemljiškokatastrskih načrtov in oblikovanje digitalnih baz katastrskih podatkov (DCDB). Ta postopek ustvarja številne institucionalne, pravne, tehnične in upravne težave.

V knjigi, ki jo držite v rokah, je na enem mestu zbran pregled aktivnosti, ki jih je državna geodetska služba skupaj z zasebnim sektorjem v Sloveniji izvajala pri pretvorbi analognih zemljiškokatastrskih načrtov v digitalni zapis (DKN). Opisani so postopki skeniranja analognih zemljiškokatastrskih načrtov z razpačenjem ter vektorizacija skenogramov in združevanje listov znotraj istega območja zajema, priprava slojev listov in priprava seznama napak, kot tudi postopek geolociranja vektoriziranih območij zajema v približen koordinatni sistem D48/GK. Temu je sledilo naporno usklajevanje podatkov, dodajanje ZK-točk in natančnejše geolociranje območij zajema ter izdelava skupnih izrisov. Podrobno je pojasnjen tudi proces nastanka digitalnega grafičnega prikaza zemljiškega katastra (digitalni katastrski načrt – DKN, zemljiškokatastrski prikaz – ZKP, zemljiškokatastrski načrt različne natančnosti – ZKN), ki še danes mnogim povzroča težave pri razumevanju vsebine in razlik med omenjenimi izdelki.

V strokovni javnosti smo bili v preteklih letih priča dolgim in poglobljenim razpravam o položajni natančnosti in točnosti grafičnih podatkov zemljiškega katastra. V knjigi so opisani postopki za ugotavljanje dosežene položajne natančnosti kot tudi napori za izboljšanje prekrivanja in medsebojne položajne usklajenosti podatkov DKN in digitalnega ortofota – DOF.

V zadnjem delu knjige pa so predstavljeni napori Geodetske uprave RS za izboljšanje položajne natančnosti grafičnega dela zemljiškega katastra. Geodetska uprava RS skupaj z Ministrstvom za okolje in prostor v finančni perspektivi 2017–2021 izvajata »Program projektov e-Prostor«, s katerim bodo ustvarjeni pogoji za izboljšanje konkurenčnosti in ozelenitev gospodarstva ter izboljšanje poslovnega okolja na področju prostorskega načrtovanja, graditve in evidentiranja nepremičnin. Hkrati bo s tem zagotovljena državna prostorska infrastruktura, ki bo skladna s standardom INSPIRE. Sestavni del programa projektov e-Prostor je tudi naloga »Lokacijska izboljšava zemljiškokatastrskega prikaza«. Položajna točnost grafičnih podatkov zemljiškega katastra na ozemlju Republike Slovenije se namreč po območjih zelo razlikuje. Namen naloge je doseči večjo homogenost, zmanjšati oziroma odpraviti sistematične pogreške, zamike položajev katastrskih mej in določiti numerične koordinate v državnem referenčnem koordinatnem sistemu D96/TM. V okviru te naloge je izvedena položajna izboljšava za območje celotne Slovenije ter vzpostavitev in kasneje hranjenje in vzdrževanje enotnega, integriranega grafičnega sloja katastra nepremičnin. V okviru naloge so bili odpravljeni tudi nekateri grobi pogreški izmer in vklopov ter vzpostavlja podlaga za ocenitev kakovosti koordinat (točnost, zanesljivost).

Vse predstavljene in v tej knjigi opisane aktivnosti sodijo v prizadevanja državne geodetske službe kot tudi geodetske stroke v celoti, da z boljšim razumevanjem zgodovine sprememb damo podatkom in izdelkom geodetske službe tisto veljavo in mesto v sodobni družbi, ki jo zaslužijo. Ivan Tavčar je davnega leta 1883 zapisal »O pomenu mape ali katastra ima priprosti narod misli, katere se ne morajo preostro in preobilokrat pobijati. Naš kmet goji namreč mnenje, da je kataster ali davkarijska mapa za lastninsko pravico merodajna.«

Naša skupna odgovornost in dolžnost je, da ohranimo in upravičimo zaupanje uporabnikov v podatke in storitve geodetske službe. Želim vam prijetno branje!

Tomaž Petek
Generalni direktor Geodetske uprave RS

1 INTRODUCTION

Since the very beginning of modern civilization, control over territory has been crucial for the functioning and existence of individual social communities. During the early millennia of recorded history, the understanding of the location and extent of land plots was extremely inaccurate. But throughout history, cartographic records of the actual condition and ownership of real estate have increased in accuracy and quality. This type of record, containing not only the dimensions and shape of the land plot on an area of land but also the spatial ratio of all such land plots in relation to one another over the last two centuries is called a cadastral plan. Cadastral plans are an important element of land administration in most countries, as is the case in Slovenia. Cadastral plans are integral to the procedures used in the recording and management of real estate, rearrangement and division of land, land improvement, real estate valuation, land taxation, and as tools for the rational management of land and buildings. Although cadastral plans are often taken for granted, they are among the least understood products created within the field of geodesy.

Today, digital spatial and environmental data is a basic source of information with proven social, economic and environmental added value. Geodetic data, in conjunction with data from other sectors, becomes spatial information, which enables public authorities, the economy and individuals and institutions to connect their content to a common frame of reference on the basis of their location. Location data has become an integral part of modern life, leading to higher demands on their quality. In almost all developed countries, the needs of land and geographic information systems (LIS/GIS) have spurred the informatization of cadastral plans and the creation of digital cadastral databases (DCDB). This process presents a number of institutional, legal, technical and administrative difficulties.

This book contains an overview of the activities carried out by the National Geodetic Service in cooperation with the private sector in Slovenia in the conversion of analogue cadastral plans into digital format (DKN). Described within are the procedures for scanning analogue cadastral plans with rubber-sheeting and the vectorization of scans and grouping of sheets within the same area of coverage, the preparation of sheet layers and the error list, and the procedure of geolocation of vectorized areas of coverage in the D48/GK approximate coordinate system. This was followed by a strenuous coordination of data, adding of LC points, more precise geolocation of the areas of coverage, and the production of joint mappings. The process of creating a digital graphic representation of the land cadastre (digital cadastral plan – DKN, cadastral index map – ZKP, land cadastre plans of varying accuracy – ZKN) is also described in detail.

In recent years, the professional public has seen lengthy and in-depth discussions on positional accuracy and the accuracy of graphical data in the land cadastre. This book describes the procedures to determine the level of positional accuracy achieved, as well as efforts to improve the overlapping and relative positional consistency of the data of the DKN and the digital orthophotograph – DOF.

The final part of the book presents the efforts of the Surveying and Mapping Authority of the Republic of Slovenia towards improving the positional accuracy of the graphical part of the land cadastre. From a financial perspective for 2017–2021, the Surveying and Mapping Authority of the Republic of Slovenia, in conjunction with the Ministry of the Environment and Spatial Planning, is implementing the "e-Prostor Project Programme", which will create conditions for improving competition, economic recovery and the business environment in the field of spatial planning, construction, and recording of real estate. This will also result in the provision of a national spatial infrastructure that will be consistent with the INSPIRE standard. An integral part of the e-Prostor project programme is also the task of "Improving positional accuracy of the cadastral index map". The positional accuracy of graphical data of the land cadastre in the territory of the Republic of Slovenia varies greatly by area. The purpose of the task is to achieve greater homogeneity, to reduce or eliminate systematic errors and shifting of cadastral border positions, and to establish numerical coordinates in the D96/TM national reference coordinate system. This task provided an improvement to positional accuracy for the entire territory of Slovenia as well as the establishment and subsequent storage and maintenance of a single integrated graphic layer of the cadastre of immovable property. The task also involved eliminating some notable errors in measurements and establishing a basis for assessing the quality of coordinates (accuracy, reliability).

All the activities presented and described in this book are part of the efforts of the State Surveying and Mapping Authority, as well as of the surveying profession as a whole, to give the data and products of the Surveying and Mapping Authority the recognition and place in modern society they deserve through a better understanding of the history of changes. In 1883, Ivan Tavčar wrote: "Ordinary people have thoughts about the importance of a map or cadastre which cannot be too crudely or too often changed. Our farmer is of the opinion that the cadastre or tax file is binding in terms of property rights."

It is our common responsibility and duty to maintain and justify the trust of users in the information and services of the surveying service. I hope you enjoy reading the book!

Tomaž Petek
Director-General of the Surveying and Mapping Authority of the Republic of Slovenia

2 Zgodovina
History

Zemljiški kataster je temeljna evidenca o prostoru, ki pokriva območje celotne države. Evidenca zemljiškega katastra je bila poleg evidentiranja oblike in lege zemljišč sprva zlasti pomembna z davčnega vidika.

Z vidika upodabljanja in dojemanja predstav o svetu imajo karte, načrti, zemljevidi v družbi mnogokrat prav tako pomembno vlogo kot besedilni opisi, saj so zaradi svoje vizualne moči zelo uporaben medij za prenašanje informacij.

Za območje današnje Slovenije sega nastanek zemljiškega katastra v sredino 18. stoletja, ko je v takratnih delih habsburške monarhije (Avstriji) cesarica Marija Terezija uvedla popisni kataster – terezijanski kataster. Osnova za obdavčitev je zajemala kapitalski donos glede na vrsto posestva, ki se je delilo na dominikalno (gosposko) ali rustikalno (kmečko). Zemljišča niso bila izmerjena, temveč je bila njihova velikost ocenjena po povprečni količini posejanega žita, velikost travniških zemljišč je bila ocenjena po povprečnem donosu sena in otave, izraženo v eno- ali dvovprežnih vozovih, velikost gozdnih parcel pa so ocenili po količini dnevnega dela v gozdu. Terezijanski katastrski operat je bil izdelan v letih od 1748 do 1756.

Leto 1764 je zabeleženo kot pričetek prve deželne izmere (jožefinske), ki je bila prva vojaška izmera celotne monarhije v merilu 1 : 28 800 kot posledica odredbe cesarice Marije Terezije. Služila naj bi kot osnova za izdelavo enotne državne karte. Naloga se je končala leta 1787.

Jožef II, naslednik Marije Terezije, je dal zemljišča dobrih 30 let pozneje izmeriti, ne pa tudi izrisati. Monarhija je izvedbo izmere organizirala preko nabornih okrajev oziroma naborних gospostev in sosesk (občin). Župan in izvoljeni odborniki soseske so bili člani komisije za izmero in ocenitev donosa zemljišč. V želji, da se uvede enotni davčni sistem, po katerem bo zemlja obdavčena ne glede na posebnosti lastnika, ampak samo glede na plodnost zemlje, resnično rabo zemljišča in zahteve države, je v obdobju od leta 1785 do 1789 nastal katastrski operat, tako imenovani jožefinski kataster.

Meritev zemljišč se je opravila s predpisanim merilnim orodjem, ki so ga sestavljali lesena letva v točni izmeri ene dunajske klaftre. Ta je morala biti merosodno preverjena, njena dolžina pa je morala biti razdeljena na šest enakih delov, to je šest čevljev. Merilna veriga ali merilna vrv je morala meriti točno deset dunajskih klafter. Merilna vrv se je zaradi klimatskih okoliščin krčila oziroma raztezala, zaradi česar jo je bilo treba vedno sproti naravnati. Pri merjenju so merilno vrv

The land cadastre is a fundamental record of the area, covering the territory of the entire country. In addition to recording the shape and location of land plots, the cadastral record has been particularly important from a taxation perspective.

In terms of depicting and perceiving ideas about the world, maps and plans often play a role in society that is just as important as text descriptions, as their visual element makes them a very useful medium for transmitting information.

For the territory of present-day Slovenia, the formation of the land cadastre dates back to the mid-18th century, when Empress Maria Theresa introduced a census cadastre – the Theresian cadastre – in the territory of the Habsburg Monarchy (Austria). The basis for taxation included the capital yield in relation to the type of property, which was divided into dominical (lordly) or rustic (peasant). Land was not measured; its size was estimated by the average amount of grain sown, the size of grasslands was estimated by the average yield of hay and oats, expressed in single or double carriages, and the size of forest plots was estimated by the amount of daily work in the forest. The Theresian cadastral record was produced between 1748 and 1756.

The year 1764 is recorded as the beginning of the first land survey (the Josephine Survey), which was the first military survey of the entire monarchy on a scale of 1:28,800, ordered by Empress Maria Theresa. It was intended as a basis for the creation of a single country map. The task was completed in 1787.

Joseph II, the successor of Maria Theresa, had the land measured some 30 years later, but did not have it mapped. The monarchy organized the survey through recruitment districts or recruitment lordships and neighbourhoods (municipalities). The mayor and elected district councillors were members of the commission for the measurement and assessment of the yield of lands. Between 1785 and 1789, cadastral records were established in the attempt to introduce a unified tax system according to which land would be taxed not according to the details of the owner, but only according to the fertility of the land, actual land use and state requirements – the so-called Josephine cadastral records.

Land measurement was carried out with a prescribed measuring tool, which consisted of a wooden slat in the exact measurement of one Viennese fathom. The tool had to be meticulously checked, and its length had to be divided into six equal parts, that is, six feet. The measuring chain or measuring rope had to measure exactly ten Viennese fathoms. Climatic conditions would make the measuring rope shrink or stretch, so it was necessary to constantly adjust it. During measurement, the measuring rope was pulled taut, and a measuring rod was placed under it, thus performing an accurate

nategnili, pod njo pa so polagali merilno letvo ter tako opravili podrobno izmero zemljišča. Pri izmeri detajla med dvema točkama sta se uporabljala lesena kola, ki sta morala biti na spodnjem debelejšem koncu ošiljena. Kola so zabili v tla. Mednju pa so ob merjenju napeli merilno verigo oziroma merilno vrv. Za merjenje na pobočjih in po strminah so potrebovali do tri klaftre dolge drogove. Za merjenje na strminah so

measurement of the land. When measuring the detail between two points, wooden stakes pointed at the lower thicker end were used. The stakes were driven into the ground and a measuring chain or rope was stretched between them during the measurement. For measuring on slopes, rods with a length of up to three fathoms were required. Special instructions were also issued for measuring on slopes, which determined the method of measurement. If the commission, which consisted of farmers, was not able to perform

Kostanjevica na Krki – dolenjske Benetke

Kostanjevica na Krki je najmanjše in eno najstarejših slovenskih mest, hkrati pa najstarejše na Dolenjskem. Je pravi čudež narave in popolnoma upravičeno nosi polno ime Kostanjevica na Krki, saj se stari del mesta nahaja na otoku v meandru reke Krke. Prvič je bila omenjena leta 1220 kot sedež župnije, mestne pravice pa je dobila leta 1252. Mestna struktura z dvema paralelnima ulicama se je ohranila vse do danes, ko je kraj razglašen za kulturni spomenik prve kategorije in v celoti zaščiten. Zaradi pogostih poplav v preteklosti se je mesta oprijelo ime "dolenjske Benetke", saj je bilo gibanje po mestu mogoče le s čolni. Na približno 500 metrov dolgi in 200 metrov široki otok vodita dva večja lesena mostova, namenjena prometu, poleg tega je čez Krko speljan še Tercialski most, ki ga uporabljajo le pešci. Na skrajni severni strani otoka, ločena od strnjenega niza hiš, se bohoti župna cerkev sv. Jakoba, ki je bila kot del utrdbenega sistema ob severnem mostu zgrajena v XIII. stoletju, v času največjega blagostanja Kostanjevice na Krki. Na južnem delu otoka stoji dragocen sakralni spomenik, podružnična cerkev sv. Miklavža, sicer pa ima mesto še več elementov sakralne dediščine. Kostanjevica na Krki je živo mesto na otoku, ki s svojo bogato zgodovino, arhitekturo in lepoto privablja veliko obiskovalcev od blizu in daleč.

Kostanjevica na Krki – the Venice of Dolenjska

Kostanjevica na Krki is the smallest and one of the oldest towns in Slovenia, and also the oldest in Dolenjska. It is a true miracle of nature and justifiably bears its full name, as the old part of the town is located on an island in a meander of the river Krka. It was first mentioned in 1220 as a parish centre and was granted municipal rights in 1252. The structure of the town with two parallel streets has been preserved throughout the ages, and the town was declared a first-class cultural monument and is fully protected. Due to frequent flooding in the past, it was dubbed the "Venice of Dolenjska", as movement around the city was only possible by boat. Traffic runs through the island, which is about 500 metres long and 200 metres wide, via two large wooden bridges, and there is also a pedestrian pathway traversing Krka via Tercialski Bridge. On the northernmost point of the island, separated from the compact set of houses, is the parish church of St Jacob, which was constructed as part of a fortification system along the north bridge in the 13th century, during a very prosperous time for Kostanjevica na Krki. The southern part of the island features a valuable sacral monument, the Filial Church of St Nicholas, and the town boasts several other elements of sacral heritage. Kostanjevica na Krki is a lively island town whose rich history, architecture and sights attract many visitors from near and far.

Prikaz kraja na prvi vojaški karti iz let 1784–1785 (na levi) in katastrski karti habsburškega cesarstva k. o. Landstrass iz leta 1824 (na desni).
Vir: https:// mapire.eu, vir fotografije: https://www.izletko.si/

The town on the first military map from 1784–1785 (on the left) and on the cadastral plans of the Habsburg Empire CM Landstrass from 1824 (on the right).
Source: https:// mapire.eu, Photo source: https://www.izletko.si/

bila izdana posebna navodila, s katerimi je bil določen način izmere. Če komisija, sestavljena iz kmetov, ni bila sposobna opraviti meritve, je merjenje opravil inženir, član podkomisije, in so njegovo izmero posebej navedli v fasijo.

» *Patent Jožefa II. Dunaj, 20. april 1785*

Z njim cesar Jožef II. odreja, da se na Češkem, Moravskem, v Šleziji, Galiciji, Avstriji nad in pod Anižo, na Štajerskem, Koroškem, Kranjskem, Goriškem in v Gradiški popiše in izmeri vsa plodna zemljišča in določi donosnost v zrnju po rodovitnosti zemljišča.

Patentu so priloženi: pouk za delo pri popisovanju, izmeri in napovedi zemljišč, obrazci za prisego za vodjo del davčne regulacije ter obrazci za jožefinski kataster.

Vir: Arhiv Slovenije, Graščinski arhiv XV – Krumperk, fasc. 8 **«**

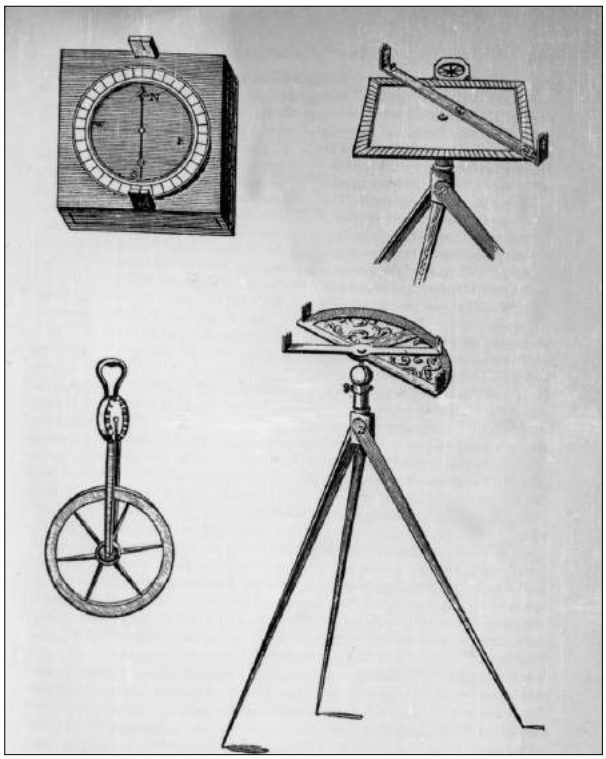
the measurement, the measurement was performed by an engineer, who was a member of the subcommittee, and this measurement was specifically reported in the record.

» *The Patent of Joseph II Vienna, 20 April 1785*

With this, Emperor Joseph II decreed that in Czechia, Moravia, Silesia, Galicia, Austria above and below Aniža, in Styria, Carinthia, Carniola, Goriška and Gradiška, all fertile land be surveyed and measured and the yield in grain determined according to the fertility of the land.

The Patent included the following: instruction for census work, measurement and reporting of land, oath forms for the head of tax regulation, and forms for the Josephine cadastre.

Source: Archives of the Republic of Slovenia, Castle archives XV - Krumperk, fasc. 8 **«**



Slika 2.1: Mersko orodje zemljemerca iz 18. stoletja (kockasti kompas z alhidado, merilna mizica z dioptrom in kompasom, odometer (perambulator) za odmerjanje neravnih linij in polkrožni kotomer).
Vir: Arhiv GURS

Figure 2.1: An 18th century surveyor's measuring tools (square compass with alidade, plane table with dioptre and compass, odometer (perambulator) for measuring uneven lines, and a semi-circular protractor).
Source: The SMARS archive

2.1 Koordinatni sistemi prvih grafičnih izmer
Coordinate systems used in the first graphical measurements

V fazi priprave na vzpostavitev stabilnega katastra (grafične izmere) je takratna oblast – cesar nekaj časa celo vztrajal, da bi za osnovo privzeli model milanskega katastra, kar bi pomenilo, da bi za vsako katastrsko občino izmerili bazo in njeno orientacijo. Po preučitvi drugačnih možnosti (tudi zaradi časa Napoleonovih vojn, ki je za določeno obdobje nastavitev stabilnega katastra odložil) je bila sprejeta odločitev, da je navezava na trigonometrično mrežo najboljša rešitev, kar se je kasneje izkazalo za pravilno potezo. Celotna izmera torej sloni na računski in grafični triangulaciji.

In the preparation phase for the establishment of a stable cadastre (graphic measurements), the authority at the time – the Emperor even insisted for some time on adopting the Milan cadastre model as a basis, which would mean measuring the base and its orientation for each cadastral municipality. After taking time to examine alternative options (also due to the Napoleonic Wars, which delayed the establishment of a stable cadastre), it was decided that using a trigonometric grid would be the best solution, which later proved to be correct. The whole survey is therefore based on computational and graphical triangulation.

2.1.1 Triangulacija
Triangulation

Grafični zemljiški kataster ali stabilni kataster, kot se ga dostikrat poimenuje, sloni na predhodno izvedeni triangulaciji, tj. geodetsko določeni mreži trikotnikov. Začetek priprav na triangulacijo in njeno izmero seže v leto 1806.

» Leta 1806 je bil izdan ukaz o drugi deželni izmeri na astronomsko-geodetski podlagi in s tem pričetek vojaške triangulacije 1. in 2. reda ter postavitev osnov za franciscejsko deželno izmero. To pomeni začetek enotne geodetske službe v Avstriji. «

The graphic land cadastre or the stable cadastre, as it is often called, is based on pre-emptive triangulation, i.e. a geodetically determined triangle grid. The start of preparations for triangulation and its measurement dates back to 1806.

» In 1806, an order was issued for a second land survey on an astronomical-geodetic basis, thus beginning the 1st and 2nd order military triangulation and laying the foundations for the Franciscan land survey. This marks the beginning of a unified surveying service in Austria. «


INSTRUCTION

FÜR DIE BEY DER

K. K. ÖSTERREICHISCHEN

LANDES-VERMESSUNG

ANGESTELLTEN HERREN OFFICIERE.

WIEN.
AUS DER K. K. HOF- UND STAATSDRUCKEREY.
1810.

Slika 2.1.1.1: Naslovnica inštrukcij za triangulacijo iz leta 1810.

Figure 2.1.1.1: Title page of triangulation instructions from 1810.


INSTRUCTION

FÜR DIE

IM CALCULS-BUREAU

DER K. K. ÖSTERREICHISCHEN

LANDES-VERMESSUNG

ANGESTELLTEN HERREN OFFICIERE.

WIEN.
AUS DER K. K. HOF- UND STAATSDRUCKEREY.
1810.

Slika 2.1.1.2: Naslovnica inštrukcij za triangulacijo iz leta 1810.

Figure 2.1.1.2: Title page of triangulation instructions from 1810.

Triangulacija je bila vzpostavljena na podlagi naslednjih predpisov, inštrukcij v cesarskih patentih Franca I:

- Instruction für die bey k.k. österreichischen Landes-Vermessung angestellten Herren Officiere, Dunaj, 1810
- Instruction für die im Calculs-Bureau der k.k. österreichischen Landes-Vermessung angestellten Herren Officiere, Dunaj, 1810

Sredi 19. stoletja je bila izdana dopolnjena posodobljena inštrukcija:

- Instruction für die bei der astronomisch-trigonometrischen Landesvermessung und im Calcul-Bureau der Militair Geografischen Institutes angestellten Individuen, Dunaj, 1845.

Triangulation was established on the basis of the following regulations and instructions included in the imperial patents of Franz I:

- Instruction für die bey k.k. österreichischen Landes-Vermessung angestellten Herren Officiere, Vienna, 1810
- Instruction für die im Calculs-Bureau der k.k. österreichischen Landes-Vermessung angestellten Herren Officiere, Vienna, 1810

A supplemented updated instruction was issued in the mid-19th century:

- Instruction für die bei der astronomisch-trigonometrischen Landesvermessung und im Calcul-Bureau der Militair Geografischen Institutes angestellten Individuen, Vienna, 1845.

Uvod Inštrukcije za oficirje računske pisarne c. -kr. avstrijske zemljiške izmere, Dunaj, 1. avgust 1810.

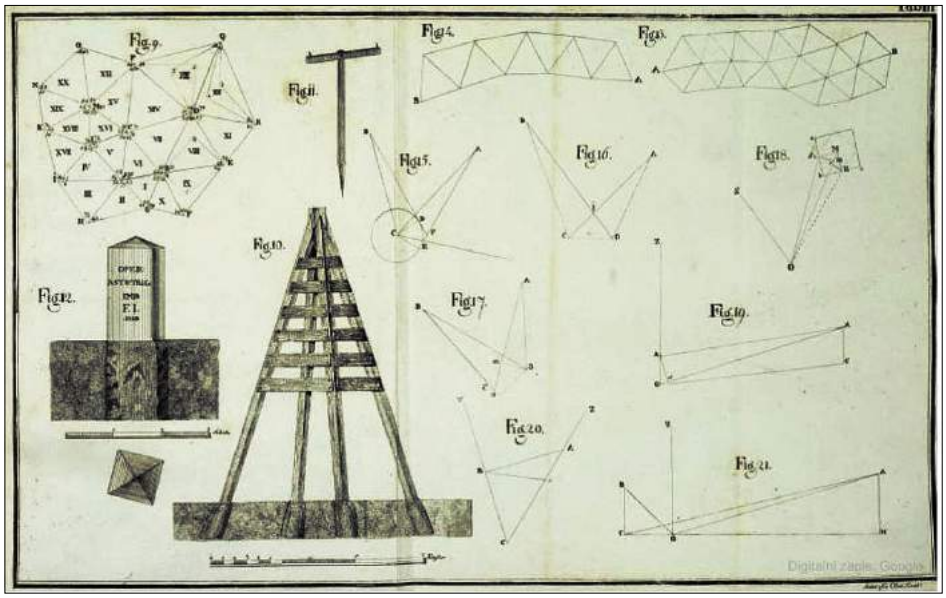
Raznolikost vrst računov, s pomočjo katerih so pridobljeni rezultati trigonometričnih opazovanj, je razlog, da je Direkcija za triangulacijo izdala trenutna navodila za vse tiste, ki so zaposleni v računski pisarni c. -kr. avstrijske zemljiške izmere s ciljem, da bi dosegli takšno enotnost, ki omogoča vsakemu kalkulatorju, da lahko vedno prevzame in nadaljuje izračune svojega sodelavca, če tega prekine kakršna koli okoliščina. Zaradi tega je za gospode, zaposlene v tem poslu, najbolj priporočljivo držati se predpisanih računov, tudi če bi sami prišli do preprostejših formul.

Richter von Binnenthal, Generalni terenski nadzornik

Introduction to the Instructions for Officers of the Austrian Imperial-Royal Land Survey, Vienna, 1 August 1810.

The variety of the types of calculations used in obtaining the results of trigonometric observations was why the triangulation directorate issued updated instructions for all those employed in the accounting office of the Austrian Imperial-Royal land survey, with the aim of achieving an uniformity that would allow for the calculations to be halted, taken over, and continued by another worker if such a situation should arise. For this reason, it is most advisable for people employed in this business to follow the prescribed calculations, even if they themselves devise simpler formulae.

Richter von Binnenthal, General field supervisor



Slika 2.1.1.3: Priloga III inštrukcije s prikazom nekaterih pravil merjenja triangulacije in stabilizacije triangulacijskih točk.
Vir: Instruction für die bey k.k. österreichischen Landes-Vermessung angestellten Herren Officiere, Dunaj, 1810

Figure 2.1.1.3: Annex III to the instructions showing some of the rules for measuring triangulation and stabilization of triangulation points.
Source: Instruction für die bey k.k. österreichischen Landes-Vermessung angestellten Herren Officiere, Vienna, 1810

V skladu s tema inštrukcijama iz leta 1810 se je izvedla računska triangulacija za vzpostavljeno mrežo na terenu stabiliziranih triangulacijskih točk z gostoto treh točk na kvadratno

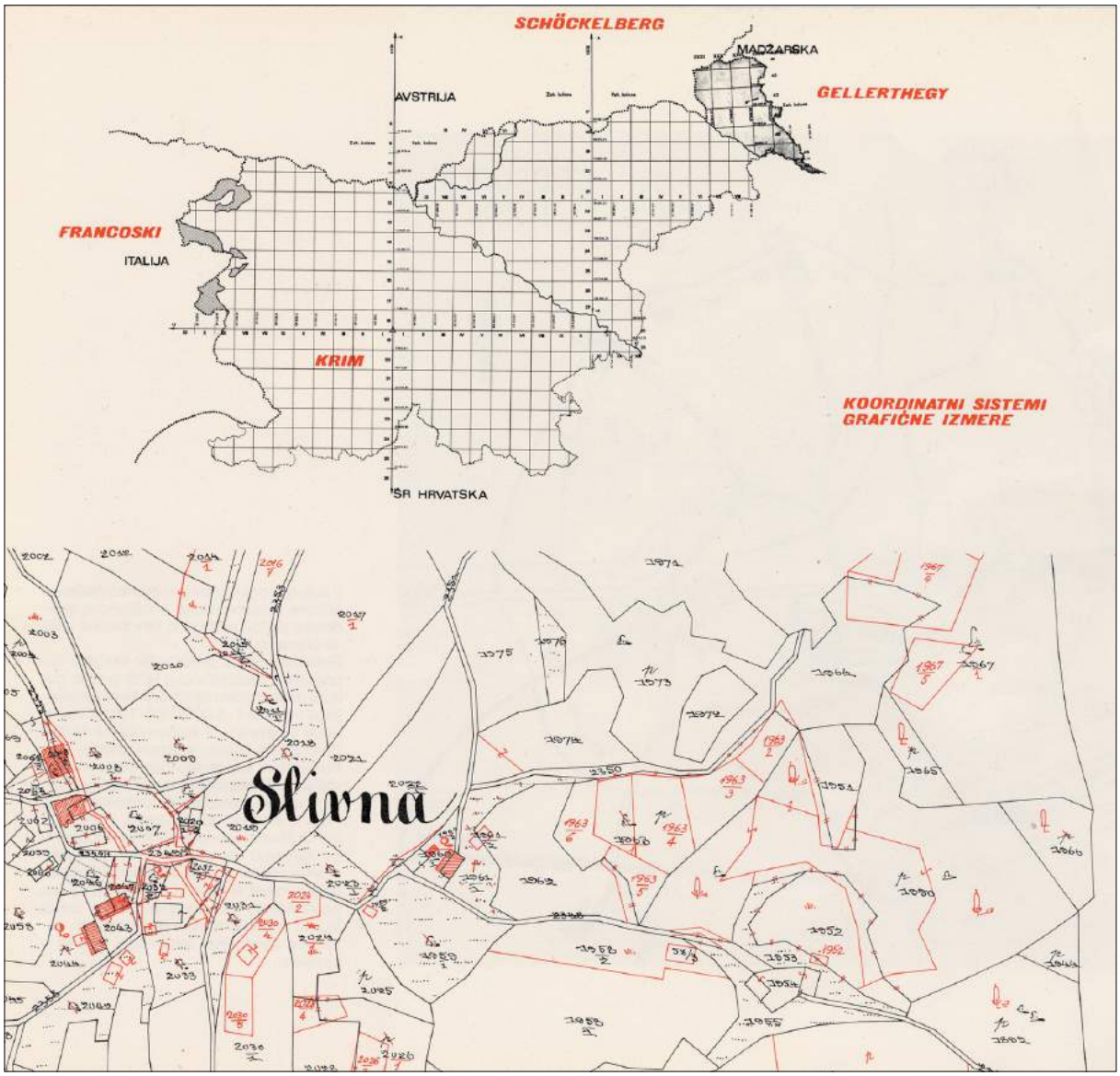
In accordance with these instructions from 1810, computational triangulation was performed for an established grid of stabilized triangulation points with a density of three points per square mile

miljo (1 milja = 7,585936 km; 1 kvadratna milja = 57,55 km²), kar ustreza trikotnikom z dolžinami stranic približno 5 km. Mrežo triangulacijskih točk so določale točke:

- I. reda – glavna (velika) mreža, stranice 10.000 do 16.000 sežnjev,
- II. reda – dopolnilna (mala) mreža, stranice 2000 do 5000 sežnjev,
- III. reda – mreža stranskih trikotnikov z merjenima dvema kotoma, stranice 800 do 1500 sežnjev,
- IV. reda – grafična triangulacija – grafično zgoščena s presekom po treh smereh za vsako točko.

(1 mile = 7.585936 km; 1 square mile = 57.55 km²), which corresponds to triangles with side lengths of about 5 km. The triangulation point grid was determined by the following types of points:

- 1st order – the main (large) grid, sides of 10,000 to 16,000 fathoms,
- 2nd order – supplementary (small) grid, sides of 2000 to 5000 fathoms,
- 3rd order – a grid of side triangles with two measured angles, sides of 800 to 1500 fathoms,
- 4th order – graphical triangulation – graphically condensed with a cross section in three directions for each point.



Slika 2.1.1.4: Koordinatni sistemi ob nastavitvi grafičnega katastra in izsek katastrskega načrta z vrisanimi spremembami skozi čas.
Vir: Arhiv GURS

Figure 2.1.1.4: Coordinate systems in setting up the graphic cadastre and a section of the cadastral plan with changes over time plotted.
Source: The SMARS archive

IV. red grafične triangulacije je bil vzpostavljen, ker se je za zemljiškokatastrsko detajlno izmero potrebovalo še več točk geodetske mreže, skupno 60 na vsako kvadratno miljo (tj. po tri točke na vsak detajlni list katastrskega načrta, kar približno ustreza gostoti ene točke na kvadratni kilometer), ki pa so se določevale z grafično triangulacijo s pomočjo merske mizice in točkovno označile neposredno na načrtih t. i. triangulacijskih listov v merilu 1 : 14.400 (petkratnik modula merila 1 : 2880), nalepljenih na steklo, s katerih se je z merilom neposredno odčitavalo koordinate triangulacijskih točk. Triangulacijski list je geodet – triangulator razdelil na 'mrežo' dvajset enakih pravokotnikov, katerih dimenzije so bile 1000 sežnjev v smeri vzhod–zahod in 800 sežnjev v smeri sever–jug (1896,5 m × 1517,2 m). Vsak tak pravokotnik je predstavljal mapni list katastrskega načrta v merilu 1 : 2880. Geodet – triangulator je moral s pomočjo treh danih točk grafično določiti toliko novih točk grafične triangulacije, da so bile na vsakem listu določene po tri točke oz. skupno 3 × 20 = 60 točk grafične triangulacije na triangulacijskem listu. Točke je geodet – triangulator določal z metodo grafičnega zunanjega ureza tako, da je z obstoječih točk triangulacije viziral proti novim točkam in smeri vizure zarisal na triangulacijski list. V presečišču vizur oz. črt na triangulacijskem listu je bila določena lega nove točke. Praviloma se je vsako grafično točko določalo s tremi smermi. Ocenjena natančnost tako določenih presekov smeri je bila za vsak par smeri 0,2 mm × 14.400 = 2,88 m v naravi. Raziskava z uporabo 248 točk IV. reda je pokazala srednji pogrešek določitve koordinat ±3,8 m in maksimalni pogrešek ±9 m. Koordinate izmerjenih triangulacijskih točk so se izračunavale v pravokotnem ravninskem koordinatnem sistemu. Ukrivljenost zemeljske oble ob tem ni bila upoštevana. Zaradi zmanjšanja kartografskih popačenj kot posledice učinka ukrivljenosti zemeljske oble je bilo območje monarhije razdeljeno na več območij s svojimi koordinatnimi sistemi. Znotraj posameznega koordinatnega sistema se je Zemlja obravnavala kot ravnina.

Za območje Slovenije je v Arhivu RS zbirka gradiva o triangulaciji za zemljiškokatastrske izmere za obdobje med letoma 1820–1941 zbrana v fondu SI AS 1959 in obsega 502 knjigi in 7 map v skupnem obsegu 7,2 tekoča metra. Gradivo sestavljajo topografije triangulacijskih točk, karte triangulacijskih mrež različnih stopenj s triangulacijskimi točkami (novomeška kresija), grafični triangulacijski listi, triangulacijske točke za reambulančno izmero ipd.

Vir: Arhiv RS, zbirka SI AS 1959

The 4th order of graphical triangulation was established because the detailed land cadastral survey required a higher number of points on the geodetic grid, a total of 60 per square mile (i.e. three points per each detail sheet of the cadastral plan, which roughly corresponds to a density of one point per square kilometre), where miles were determined by graphical triangulation using a plane table and were marked directly on the plans of the so-called triangulation sheets in a scale of 1:14,400 (five times the module of the scale of 1:2880), which were affixed to glass, from which the coordinates of the triangulation points were read directly using the scale. The triangulation sheet was divided by the surveyor - triangulator into a 'grid' of twenty identical rectangles, whose dimensions were 1000 fathoms in the east-west direction and 800 fathoms in the north-south direction (1896.5 m × 1517.2 m). Each rectangle represented a map sheet of the cadastral plan in a scale of 1:2880. The surveyor-triangulator had to graphically determine a sufficient number of new points of graphical triangulation with the help of three given points, so that the three points were determined on each sheet, for a total of 3 × 20 = 60 points of graphical triangulation on the triangulation sheet. The points were determined by the surveyor-triangulator using the method of graphic resection by aiming the vistas from the existing points of the triangulation towards the new points and then plotting the directions of the vistas on the triangulation sheet. The position of the new point was determined to lay at the intersection of vistas or lines on the triangulation sheet. As a rule, each graphic point was determined by three directions. The estimated accuracy of the direction cross-sections determined in this way was 0.2 mm × 14,400 = 2.88 m in the field for each pair of directions. A survey using 248 points of the 4th order showed a mean coordinate determination error of ± 3.8 m and a maximum error of ± 9 m. The coordinates of the measured triangulation points were calculated in a rectangular plane coordinate system. The curvature of the surface of the Earth was not taken into account. In order to reduce cartographic distortions as a consequence of the effect of the curvature of the globe, the territory of the monarchy was divided into several areas with their own coordinate systems. Within each coordinate system, the Earth was treated as a plane.

For the territory of Slovenia, the Archives of the Republic of Slovenia keeps a collection on triangulation for land cadastral measurements for the period between 1820–1941 in the SI AS 1959 fund, which comprises 502 books and 7 maps with a total volume of 7.2 running metres. The materials include the topography of triangulation points, maps of triangulation grids of varying degrees with triangulation points (Novo mesto district office), graphical triangulation sheets, triangulation points for revision measurement, etc.

Source: Archives of the Republic of Slovenia, the SI AS 1959 collection

2.1.2 Razdelitev na sekcije
Division into sections

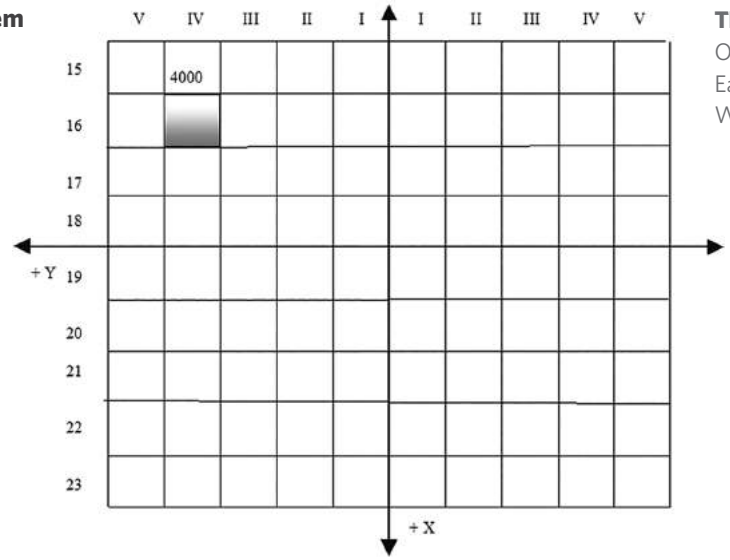
V okviru teh koordinatnih sistemov sta bila določena tudi format in lega detajlnih listov. Koordinatni sistemi imajo x os usmerjeno v smer sever–jug (pozitivna smer je proti jugu), y os pa v smeri vzhod–zahod (pozitivna smer je proti zahodu). Območje koordinatnega sistema je razdeljeno

The format and position of the detail sheets were also determined within these coordinate systems. The coordinate systems have the x-axis oriented north-south (the positive direction is south) and the y-axis oriented east-west (the positive direction is west). The area of the coordinate system is divided into columns (eastern and

na kolone (vzhodne in zahodne – rimska oštevilčba) ter na vrste (od severa proti jugu – arabske oštevilčbe). Z razdelitvijo so dobljeni kvadrati s stranicami dolžine 1 poštne milje oz. 4000 sežnjev ali 7585,94 m.

western – Roman numerals) and types (from north towards south – Arabic numerals). This division yields squares with sides of 1 post mile or 4000 fathoms or 7585.94 m.

Krimski koordinatni sistem
Izhodišče 18
Vzhod XIII
Zahod XIX



The Krim coordinate system
Origin 18
East XIII
West XIX

Slika 2.1.2.1: Krimski koordinatni sistem in razdelitev na liste.
Figure 2.1.2.1: The Krim coordinate system and division into sheets.

2.1.3 Razdelitev na detajlne liste
Division into detail sheets

Vsaka kvadratna milja (trigonometrični list) se najprej deli od vzhoda na zahod na štiri oddelke, označene z a, b, c, d in od severa na jug na pet oddelkov, označenih z e, f, g, h, i. Tako nastane 20 pravokotnikov, vsak z dolžino 1000 sežnjev (1896,5 m) in višino 800 sežnjev (1517,2 m). Ti pravokotniki določajo osnovno merilo 1 : 2880. Poleg osnovnega merila so do leta 1873 za območje večjih mest uporabljali tudi merilo 1 : 1440, za najbolj strnjena in pozidana območja pa 1 : 720. Za gorata območja je bilo ponekod uporabljeno merilo 1 : 5760.

Pri razdelitvi na detajlne liste so se torej uporabljala prej navedena merila:

- osnovno merilo;
  - 1 palec na načrtu = 40 sežnjev v naravi

To razmerje so kasneje pretvorili v merilo 1 : 2880, ki ga dobimo iz razmerij enot v seženjskem sistemu:

- 1 seženj (dunajska klaftra) = 6 čevljev (1 seženj = 1.896484 m);
- 1 čevelj = 12 palcev.
- Torej je palec na načrtu 40 × 6 × 12 = 2880 palcev v naravi.

Each square mile (trigonometric sheet) is first divided into four sections from east to west, marked a, b, c, d, and into five sections from north to south, marked e, f, g, h, i. This yields 20 rectangles, each with a length of 1000 fathoms (1896.5 m) and a height of 800 fathoms (1517.2 m). These rectangles define the basic scale of 1:2880. In addition to the basic scale, 1:1440 was also used up to 1873 for the areas of larger cities, and 1:720 for the most compact and built-up areas. For mountainous areas, a scale of 1:5760 would sometimes be used.

In the case of division into detail sheets, the abovementioned scales were used:

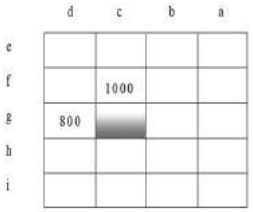
- basic scale:
  - 1 inch on the map = 40 fathoms in nature

This ratio was later converted into a scale of 1:2880, which is obtained from the unit ratios in the fathom system:

- 1 fathom (Viennese fathom) = 6 feet (1 fathom = 1.896484 m);
- 1 foot = 12 inches.
- Therefore, an inch on the map is equal to 40 × 6 × 12 = 2880 inches in nature.

- double scale:
  - 1 inch on the map = 20 fathoms in nature (1:1440)

- dvakratno merilo
  - 1 palec na načrtu = 20 sežnjev v naravi (1 : 1440)
- štirikratno merilo
  - 1 palec na načrtu = 10 sežnjev v naravi (1 : 720)



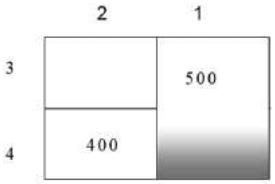
Slika: 2.1.3.1: Razdelitev listov v merilu 1 : 2880.

Figure: 2.1.3.1: Division of sheets in a scale of 1:2880.

Izmere so bile prvotno večinoma izdelane v osnovnem merilu. Posamezne dele so v večjih merilih izmerili kasneje (v merilu 1 : 1440).

- polovično merilo
  - 1 palec na načrtu = 80 sežnjev v naravi (1 : 5760)

- quadruple scale:
  - 1 inch on the map = 10 fathoms in nature (1:720)

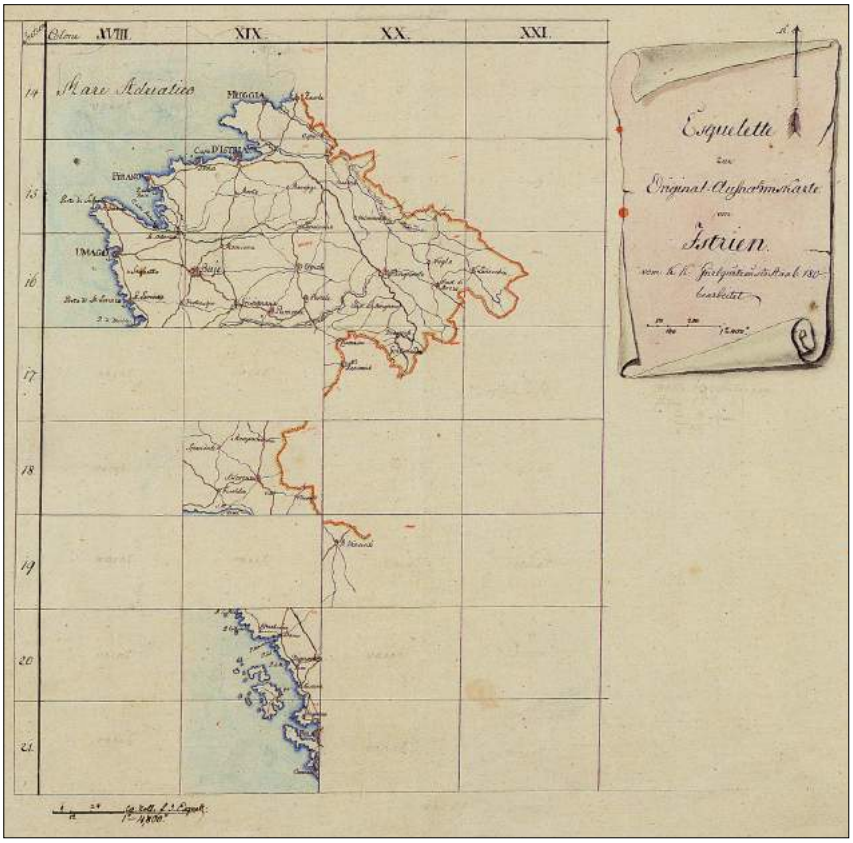


Slika 2.1.3.2: Razdelitev listov v merilu 1 : 1440.

Figure 2.1.3.2: Division of sheets in a scale of 1:1440.

The measurements were originally mostly performed on the basic scale. Individual parts were subsequently measured on larger scales (in a scale of 1:1440).

- half-scale
  - 1 inch on the map = 80 fathoms in nature (1:5760)



Slika 2.1.3.3: Razdelitev na sekcije vojaške karte za Istro, iz katere se vidi, da je bila razdelitev na kolone in na vrste urejena podobno kot pri detajlni izmeri grafičnega katastra.
Vir: Arhiv GURS

Figure 2.1.3.3: Division into military map sections for Istria, showing that the division into columns and rows was arranged similarly to the detailed measurement of the graphic cadastre.
Source: The SMARS archive

2.2 Prvih sto let razvoja katastra
The first hundred years of cadastre development

Po končanih strahovitih francoskih vojskah je cesar Franc zaukazal grunte meriti in od vsakega zemljišča čisti dohodek izračuniti in zapisati. Od tega se je imela cesarska gruntna dača računiti.

Vir: Politična zgodovina Štajerskih Slovencev, Ivan Lapajne, 1884

V začetku 19. stoletja so se začele priprave na nov kataster – franciscejski kataster, po cesarju Francu I. 23. decembra 1817 je namreč cesar Franc I. izdal znameniti Zakon o zemljiškem davku (nem. Grundsteuerpatent), ki je s svojimi obsežnimi podzakonskimi tehničnimi in izvedbenimi predpisi ter zakonskimi prenovitvami in dopolnitvami tudi na Slovenskem postavil temelje katastrskega sistema za dobro stoletje, vse do izdaje starojugoslovanske katastrske in zemljiškoknjižne zakonodaje v 30. letih prejšnjega stoletja.

Novost franciscejskega katastra je bila v tem, da so se parcele za vsako katastrsko občino v celotnem cesarstvu izmerile in izrisale v predpisanem merilu – sprva z izjemo ogrskih dežel, ki so spadale pod t. i. Štefanovo krono.

Sama izmera je bila za takratne razmere izredno natančna ter pomeni velik uspeh tedanje Avstrije na področju geodetske službe in zemljemerstva. Nekdanji ročni sistem merjenja zemljišč je nadomestilo merjenje z merilnimi inštrumenti. Merjenje so opravili šolani zemljemerci, ki so bili za ta namen pritegnjeni iz vojaških vrst, ter zemljemerci, ki so izšli iz vrst diplomantov Politehničnega inštituta na Dunaju, ustanovljenega 6. 11. 1815.

Pri pripravah in izvedbi zemljiške izmere so bili soudeleženi naslednji izvajalci: triangulacijski poddirektor, pristojen za vodenje trigonometričnih operacij, deželni direktor za mapiranje, ki je vodil merjenje v vseh sestavnih delih, inšpektor za mapiranje, ki je vodil potek izmere v posameznih okrajih, grafični triangulator, ki je določal grafične točke in vodil snemanje teh točk, geometer za popis občinske meje, ki je izdelal skico občinske meje in sodeloval pri izdelavi popisa občinske meje, geometer za podrobno merjenje, ki je izdelal katastrski operat, pomočnik geometra, ki je sodeloval pri merjenju in izračunavanju zemljiških površin, merilni pomočnik ter merilni strežnik, indikator, ki ga je imenovala občina in je bil dober poznavalec stanja občinskih mej in mej posameznih parcel. Indikatorja je v primeru neustreznosti geometer lahko odpustil in zahteval od občine, da mu dodeli novega.

After the retreat of the vast French armies, Emperor Franz ordered the lands to be measured and the net income from each land to be calculated and recorded. This information was to be used to calculate the imperial land tax.

Source: The Political History of Styrian Slovenes, Ivan Lapajne, 1884

At the beginning of the 19th century, preparations began for a new cadastre – the Franciscan cadastre, named after Emperor Franz I. On 23 December 1817, the Emperor issued the famous Land Tax Act (Ger. Grundsteuerpatent), whose extensive technical and implementing regulations, as well as legal revisions and supplements, laid the foundations of the cadastral system in Slovenia for a good century, until the issuance of the old Yugoslav cadastral and land registry legislation in the 1930s.

The novelty of the Franciscan cadastre was that the land lots for each cadastral municipality in the entire empire were measured and plotted in the prescribed scale – initially excluding Hungarian lands, which belonged to the crown of Stephen (Stephen I of Hungary).

The measurement was extremely precise for the time and constitutes a major success for Austria in the field of surveying and geography. The former manual land measurement system was replaced by measurement using measuring instruments. The measurement was performed by trained surveyors recruited from the military for this purpose and surveyors from the ranks of graduates of the Polytechnic Institute of Vienna, founded on 6 November 1815.

The preparation and implementation of the land survey included the following personnel: a triangulation sub-director responsible for managing trigonometric operations, a regional mapping director who managed all parts of the measurement, a mapping inspector who led the progress of the survey measurement in individual districts, a graphic triangulator who determined graphic points and led the recording of these points, a surveyor for the census of municipal borders who made a drawing of the municipal borders and participated in the preparation of the municipal border census, a surveyor for detailed measurement who produced cadastral records, an assistant surveyor who participated in the measurement and calculation of surface areas, a measuring assistant and a measuring server, and an indicator appointed by the municipality who was knowledgeable in regard to municipal borders and borders of individual plots. In cases where the indicator was inadequate, the surveyor could dismiss him and request the municipality to assign a new one.

» *Odlomek iz prevoda Zakona o zemljiškem davku (nem. Grundsteuerpatent), Dunaj, 23. december 1817*

Ključno določilo zakona v 9. členu zahteva enotno predpisano izdelavo katastrskih načrtov, kar je bistvena izboljšava v primerjavi s starejšima katastroma, terezijanskim in jožefinskim.

Mi, Franc I., ...

ob upoštevanju neusklajenosti, ki se pojavljajo ob porazdelitvi bremen zemljiškega davka po obstoječih merilih za celotne dežele, okrožja, okraje in katastrske občine, kakor tudi za posamične zavezance ...

Zato ukazujemo:

...

§.9 Za vsako katastrsko občino bo po enakem postopku izrisan njen načrt, v katerem bodo po svoji topografski legi in obliki ter v sprejetem predpisanem merilu slikovno predstavljeni obseg in meje občine ter vsako posamično zemljišče v občini glede na različnost v vrsti rabe, osebe posestnika ter naravne in umetne razmejitve.

Vir: Grundsteuerpatent – Zakon o zemljiškem davku, 1817 «

» *Excerpt from the translation of the Land Tax Act (Grundsteuerpatent), Vienna, 23 December 1817*

The key provision of the Act requires in Article 9 a unified prescribed preparation of cadastral plans, which is a significant improvement in comparison with the older Theresian and Josephine cadastres.

We, Franz I., (...)

in regard to the inconsistencies arising from the distribution of the burden of land tax under existing criteria for whole provinces, districts, counties and cadastral municipalities, as well as for individual taxpayers (...)

Hereby order that:

(...)

§.9 For each cadastral municipality, a map will be drawn according to a single procedure, which will visually present, in the prescribed scale, the extent and borders of the municipality and each individual piece of land in the municipality according to its topographic location and shape, as well as natural and artificial demarcations.

(...)

Source: Grundsteuerpatent – Land Tax Act, 1817 «

Začelo se je z izmero območja Dunaja leta 1817 in zaključilo z izmero Tirolske leta 1861. V teh dobrih štirih desetletjih se je samo v avstrijskem oz. t. i. cisleitanskem/cislajtanskem/ delu monarhije (tj. zahodno od oz. tostran reke Leitha) izmerilo 30.556 katastrskih občin s skupno površino 300.082 km^2 in določilo približno 50 milijonov parcel, ki so bile izrisane na 164.357 detajlnih listih katastrskih načrtov. Izmeri so sledili postopki izračuna površin, ocene katastrskih dohodkov in določitev zemljiškega davka. Katastrska izmera ogrskih dežel oz. translajtanskega dela monarhije (tj. vzhodno od oz. onstran reke Leitha) pa se je začela leta 1856.

This began with the measurement of the territory of Vienna in 1817 and concluded with the measurement of Tyrol in 1861. During these four decades, 30,556 cadastral municipalities were measured within the Austrian or so-called Cisleithan part of the monarchy (i.e. west of the Leith river) alone, with a total area of 300,082 km^2, and about 50 million land plots were identified, which were drawn on 164,357 detail sheets of cadastral plans. The measurements were followed by procedures for calculating areas, estimating cadastral income and determining land tax. The cadastral survey of Hungarian lands or the Transleithan part of the monarchy (i.e. east of the Leith River) began in 1856.

Katastrska izmera dežel na Slovenskem je z izjemo Prekmurja potekala v začetnem obdobju franciscejske izmere, kot je prikazano v spodnji tabeli (z dodanimi tedanjimi nemškimi imeni dežel) s pripadajočimi izhodišči koordinatnih sistemov.

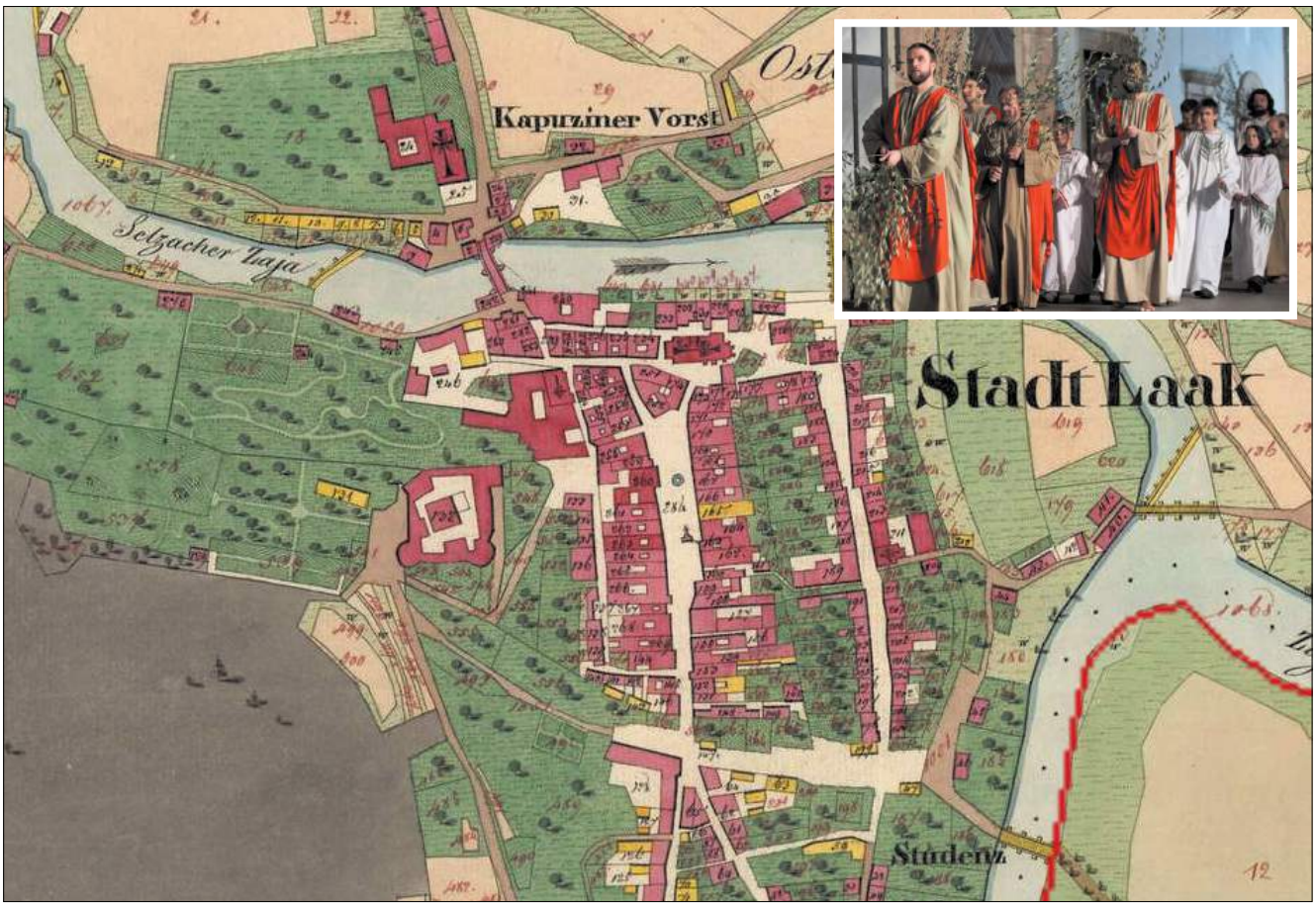
Dežela	**Obdobje izdelave**	**Izhodišče koordinatnega sistema**
Primorje z Istro (nem. Küstenland)	1818–1822	hrib Krim južno od Ljubljane, Slovenija
Kranjska (nem. Krain)	1823–1826	
Koroška (nem. Kärnthen)	1826–1828	
Štajerska (nem. Steyermark)	1820–1825	hrib Schöckelberg severno od Gradca, Avstrija
Prekmurje (nem. Eisenburger und Szalader Comitat)	1856–1867	hrib Gellérthegy v Budimpešti, Madžarska

Škofjeloški pasijon

V Loki so pasijon prvič izvedli že leta 1713, ko je škof Kaunitz posvetil kapucinsko cerkev, zadnjič pred oživitvijo pa leta 1767. Pristni Škofjeloški pasijon v obliki procesije je spet zaživel z izvedbo leta 1999 in potem še 2000, 2009 in 2015 (naslednja bo 2021). Predstava temelji na najstarejšem ohranjenem dramskem besedilu v slovenskem jeziku iz leta 1721, ko ga je napisal kapucin Lovrenc Marušič, imenovan tudi Romuald Štandreški. Njegov rokopis hranijo v Kapucinskem samostanu, faksimile pa je na ogled v kapucinski knjižnici v Škofji Loki. Poleg tega, da je Škofjeloški pasijon najstarejše ohranjeno dramsko besedilo v slovenskem jeziku, je tudi najstarejša ohranjena dramska režijska knjiga v Evropi ter največja gledališka predstava na prostem v Sloveniji. Zaradi svoje izvirnosti in pomena, bogastva izraženega slovenskega jezika ter samega obsega predstave je Škofjeloški pasijon razglašen za živo mojstrovino državnega pomena. Škofjeloški pasijon je vpisan na seznam UNESCO nesnovne kulturne dediščine človeštva.

The Škofja Loka Passion Play

In Loka, the Passion was first performed as early as 1713, when Bishop Kaunitz consecrated the Capuchin Church, and the last enactment before the revival was in 1767. The authentic Škofja Loka Passion in the form of a procession was revitalized in 1999 and then in 2000, 2009 and 2015 (the next one will be in 2021). The play is based on the oldest preserved theatrical text in the Slovene language from 1721, written by the Capuchin Lovrenc Marušič, also called Romuald Štandreški. His manuscript is kept in the Capuchin Monastery, and the facsimiles are on display in the Capuchin Library in Škofja Loka. In addition to being the oldest preserved theatrical text in the Slovene language, the Škofja Loka Passion is also the oldest preserved theatre director's book in Europe and the largest outdoor theatrical performance in Slovenia. Due to its originality and significance, the richness of the Slovene language used and the sheer scale of the performance, the Škofja Loka Passion has been declared a living masterpiece of national importance. The Škofja Loka Passion is included on the UNESCO List of Intangible Cultural Heritage of Humanity.

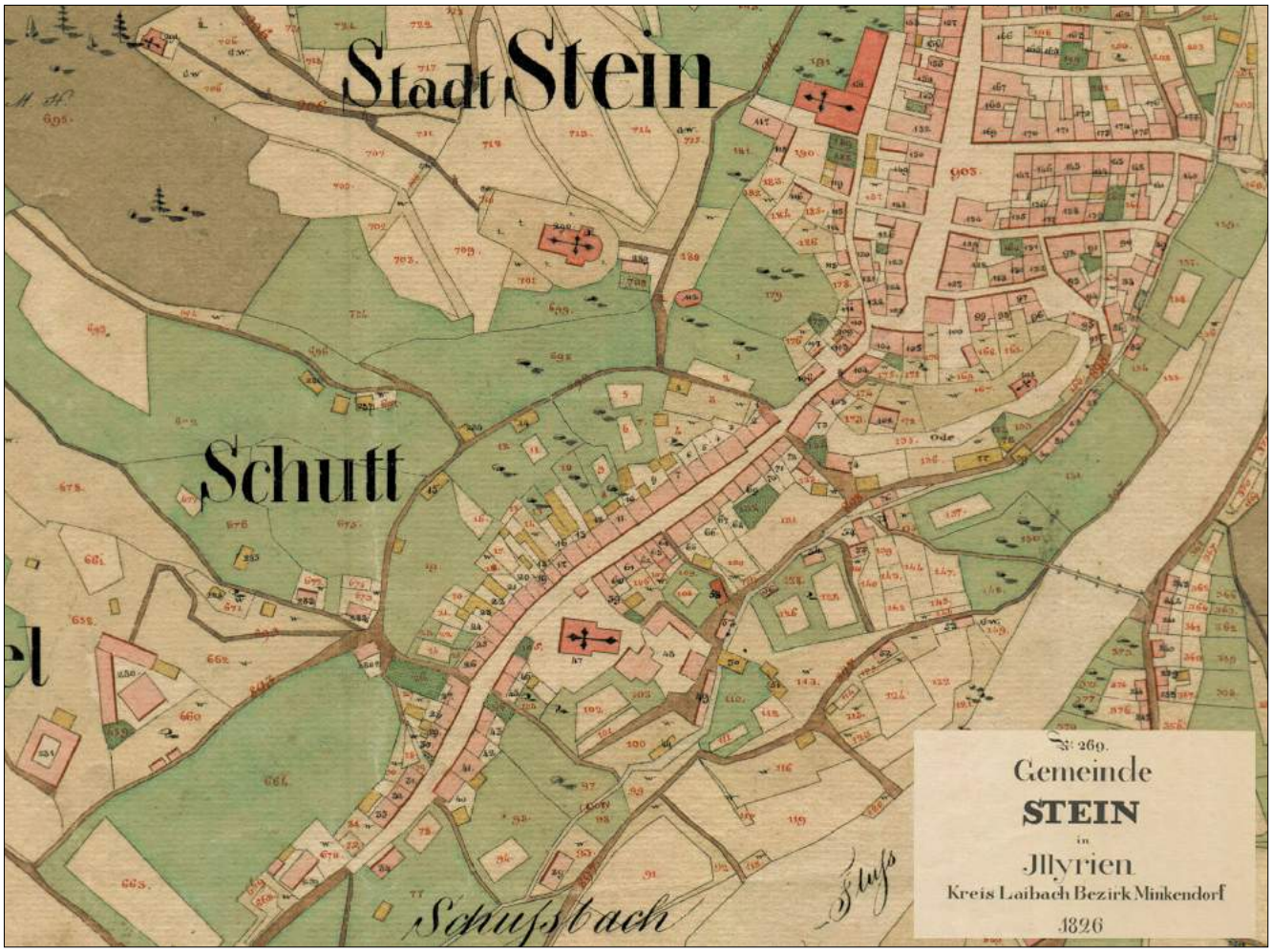


Prikaz starega mestnega jedra Loke, (po ulicah katerega je potekala procesija včasih in poteka tudi po oživitvi leta 1999), na katastrski mapi Habsburškega cesarstva k. o. Stadt Laak iz leta 1825.
Vir: https:// mapire.eu/, vir fotografije: http://www.delo.si/

A view of the old town centre of Loka, (on the streets where the procession took place in the past, and does so again after the revival in 1999), on the cadastral plan of the Habsburg Empire CM Stadt Laak from 1825.
Source: https:// mapire.eu/, Photo source: http://www.delo.si/

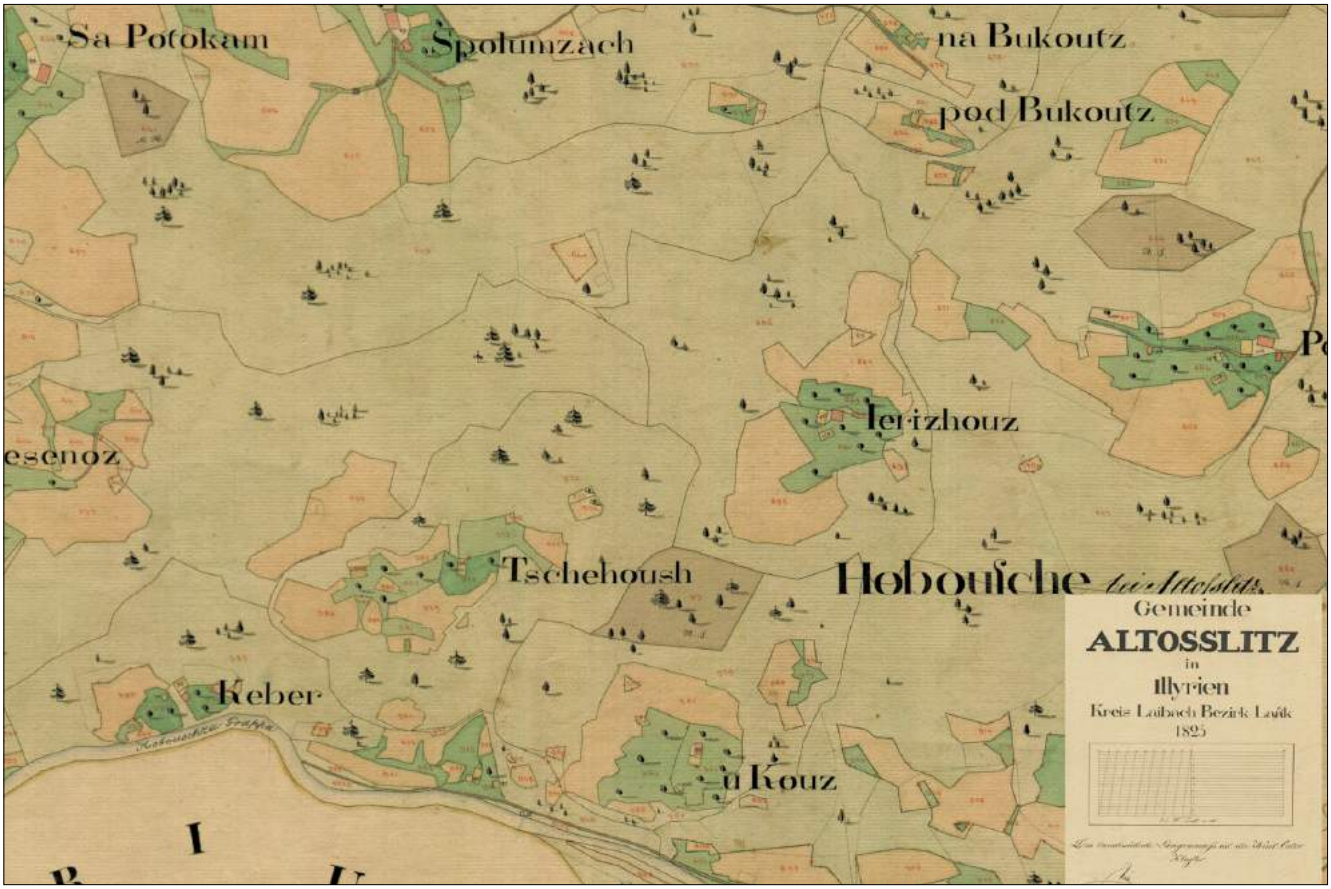
The cadastral measurements of the regions in Slovenia, with the exception of Prekmurje, took place in the initial period of the Franciscan survey, as shown in the table below (also showing the German names used at the time) with the corresponding coordinate system origins.

Region	Period of production	Origin of the coordinate system
Littoral with Istria (Ger. Küstenland)	1818–1822	the Krim Hill south of Ljubljana, Slovenia
Carniola (Ger. Krain)	1823–1826	
Carinthia (Ger. Kärnthen)	1826–1828	
Styria (Ger. Steyermark)	1820–1825	the Schöckelberg Hill north of Graz, Austria
Prekmurje (Ger. Eisenburger und Szalader Comitat)	1856–1867	the Gellérthegy Hill in Budapest, Hungary



Slika 2.2.1: Katastrski načrt mesta Kamnik, izdelan leta 1826.
Vir: Arhiv Slovenije, franciscejski kataster

Figure 2.2.1: The cadastral plan of Kamnik, made in 1826.
Source: Archives of the Republic of Slovenia, Franciscan cadastre



Slika 2.2.2: Katastrski načrt k. o. 2055 Stara Oselica izdelan 1826 - kmetijsko gozdno območje s poimenovanjem ledin po domačih imenih lastnikov domačij. Vir: Arhiv Slovenije, franciscejski kataster

Figure 2.2.2: The cadastral plan of CM 2055 Stara Oselica, produced in 1826 – agricultural forest area showing the naming of fallows after the names of local homestead owners.
Source: Archives of the Republic of Slovenia, Franciscan cadastre

Grafična metoda izmere je še danes osnova za zemljiški kataster na skoraj 70 % površine Slovenije. Prvič je bila preizkušena in tudi uporabljena za izdelavo Milanskega katastra v letih 1718–1722. Njen utemeljitelj je Johann Jacob Marinoni (1676–1755), ki je izboljšal tudi instrument za izvajanje grafične izmere, t. i. mersko mizo. Izmera se je izvajala po navodilih iz leta 1817. Glede na praktične izkušnje so bila pozneje v letu 1824 izdana nova, prirejena navodila, ki so veljala do konca celotne izmere.

The graphic method of measurement is still the basis for the land cadastre for almost 70% of the territory of Slovenia. It was first tested and used for the production of the Milan cadastre between 1718 – 1722. It was supported by Johann Jacob Marinoni (1676 – 1755), who also improved the instrument for performing the graphic measurement, the so-called plane table. The survey was carried out in accordance with the instructions from 1817. In view of the practical experience gained, new and modified instructions were issued later in 1824, which were valid until the conclusion of the survey.

» *Okrožnica Ilirskega gubernija. Ljubljana, 5. maj 1818.*

Ilirski gubernij določa pogoje za sprejem v službo geometra za katastrsko izmero. Geometer mora izpolnjevati naslednje pogoje: biti mora moralno neoporečen, obvladati mora računovodstvo, geometrijo, planimetrijo, in uporabo merilne mizice, deželni jezik v pokrajini, predložiti mora overovljena spričevala in prošnjo za sprejem v službo, ki se jo vloži pri kresijskem uradu.

Vir: Arhiv Slovenije, Gr. XV - Krumperk, fasc. 9. «

» *Letter from the Illyrian Governorate. Ljubljana, 5 May 1818.*

The Illyrian Governorate determines the conditions for admission to the service of a surveyor for cadastral surveying. The surveyor must meet the following requirements: he must be morally sound, he must be skilled in accounting, geometry, planimetry, the use of a plane table, and the language of the province, he must submit verified certificates and an application for employment, which is to be submitted to the district office.

Source: Archives of the Republic of Slovenia, C. XV – Krumperk, fasc. 9. «

Cilj izmere je bil, da se skladno s sprejetimi predpisi izdela zanesljiv kataster zemljišč, ki bi zagotavljal pravično obdavčitev kmetijske proizvodnje. V ta namen je bilo treba z izmerjenimi zemljišči povezati tudi podatke o osebah, ki imajo na teh zemljiščih lastniške pravice in druge pravice uporabe. Vsaki posesti so bile določene tudi fizične lastnosti njenih zemljišč. Povezava teh grafičnih in opisnih podatkov ter lastnosti v sistem katastra zemljišč je omogočala trden temelj za obdavčitev.

Splošni razglas kresijskega glavarja Novo mesto. Novo mesto, 11. april 1822

Kresijski glavar v Novem mestu razglaša začetek priprav za trigonometrično in grafično triangulacijo, izmero in mapiranje za novi kataster. Začetek del bosta opravila dva triangulatorja in popisovalec meja. Priprave del bodo izvedene v skladu z odredbo Dvorne komisije za regulacijo zemljiškega davka in dekreta Ilirskega gubernija iz leta 1822 ter v skladu z inštrukcijo o katastrski izmeri.

Vir: Arhiv Slovenije, Gr. - Krumperk, fasc. 8.

Zagotovo ni mogoče mimo dejstva, da s takratno tehnologijo oziroma nenatančnimi instrumenti geodeti niso mogli izvesti izmere tako natančno, kot bi jo danes. Ob tem pa je treba upoštevati takratno veliko produktivnost, ki je danes z vso sodobno tehnologijo ni mogoče doseči. To je svojevrsten fenomen. Takratna natančnost je povsem zadovoljevala potrebe po obdavčenju zemljišč. Težje je za geodeta danes samo takrat, ko lastnik zahteva, da mu določi mejo do centimetra natančno.

V spodnji razpredelnici je prikazan kratek pregled zgodovine delovanja cesarsko-kraljeve (c. kr.) Generalne direkcije zemljiško-davčnega katastra v obdobju od leta 1810 do leta 1918.

1810–1827	K. k. Grundsteuerregulierungs-Hofkommission	C. kr. Dvorna komisija za regulacijo zemljiškega davka
1827–1848	K. k. Vereinigte Hofkanzlei	C. kr. Združena dvorna pisarna
1848–1850	K. k. Finanzministerium	C. kr. Finančno ministrstvo
1850–1864	K. k. Generaldirektion des Grundsteuerkatasters	C. kr. Generalna direkcija zemljiško-davčnega katastra
1864–1865	K. k. Generaldirektion für die direkten Steueren	C. kr. Generalna direkcija za direktne davke
1865–1910	K. k. Finanzministerium	C. kr. Finančno ministrstvo
1910–1918	K. k. Generaldirektion des Grundsteuerkatasters	C. kr. Generalna direkcija zemljiško-davčnega katastra

The goal of the survey was to draw up a reliable land cadastre in accordance with the provisions adopted to ensure fair taxation of agricultural production. To this end, the measured land also had to be connected to the information on the persons having proprietary rights and other rights of use on those lands. The physical properties of the land were also determined for each property. The integration of this graphic and descriptive data and properties into the land cadastre system provided a solid foundation for taxation.

General Proclamation of the Novo mesto District Governor. Novo mesto, 11 April 1822

The District Governor in Novo mesto hereby announces the beginning of preparations for the trigonometric and graphical triangulation, surveying and mapping for a new cadastre. The beginning of the work will be carried out by two triangulators and a border surveyor. Preparations for the works will be carried out in accordance with the order of the Court Commission for the Regulation of Land Tax and the Decree of the Illyrian Governorate of 1822 and in accordance with the instructions on cadastral surveying.

Source: Archives of the Republic of Slovenia, C. - Krumperk, fasc. 8.

We should certainly consider the fact that with the technology or the inaccurate instruments of the time, surveyors were unable to perform measurements as accurately as they are today. At the same time, we must also take into account the high productivity of that time, which cannot be achieved by today's modern technology. This is a peculiar phenomenon. The level of precision at the time fully met the needs for land taxation. Today, a surveyor is only presented with greater difficulty when a landowner requests a border be calculated to the centimetre.

The table below shows a brief overview of the history of the Imperial-Royal Directorate General of the Land Tax Cadastre in the period from 1810 to 1918.

1810–1827	K. k. Grundsteuerregulierungs-Hofkommission	Imperial-Royal Court Commission for the Regulation of Land Tax
1827–1848	K. k. Vereinigte Hofkanzlei	Imperial-Royal United Court Chancellery
1848–1850	K. k. Finanzministerium	Imperial-Royal Ministry of Finance
1850–1864	K. k. Generaldirektion des Grundsteuerkatasters	Imperial-Royal Directorate General for the Land-Tax Cadastre
1864–1865	K. k. Generaldirektion für die direkten Steueren	Imperial-Royal Directorate General for Direct Taxes
1865–1910	K. k. Finanzministerium	Imperial-Royal Ministry of Finance
1910–1918	K. k. Generaldirektion des Grundsteuerkatasters	Imperial-Royal Directorate General for the Land-Tax Cadastre

Dne 21. 8. 1810 je bila s cesarskim ukazom ustanovljena Dvorna komisija za regulacijo zemljiškega davka (nem. K. k. Grundsteuerregulierungs-Hofkommission), ki naj uredi sistem regulacije zemljiškega davka. Njeno delo je bilo v letih 1813–1815 prekinjeno. Katastrska merjenja je vodil department za merjenja (nem. Vermessungs-department), ki se je delil na dva oddelka: I. za trigonometrično regulacijo in litografski inštitut (nem. Abteilung für die trigonometrische Triangulierung und das Lithographische Institut) in II. za mapiranje ali detajlno merjenje (nem. Abteilung für die Mappierung oder Detailvermessung). Leta 1818 je bila za izvedbo triangulacije ustanovljena Podkomisija triangulacijskega in kalkulacijskega biroja (nem. Unterkommission des Triangulierungs- und Kalkulbüros).

Konec leta 1827 je Dvorna komisija za regulacijo zemljiškega davka prenehala delovati in njene posle je prevzela Združena dvorna pisarna (nem. Vereinigte Hofkanzlei) do leta 1848. Najvišje vodstvo tehničnih del je prevzela Centralna komisija katastrskega merjenja (nem. Katastralvermessungs-Zentralkommission). Ta je bila leta 1831 razpuščena in leta 1835 ponovno vzpostavljena. V letih 1848–1850 so bili posli katastrskih operacij podrejeni C. kr. Finančnemu ministrstvu (nem. K. k. Finanzministerium). Leta 1850 je bila ustanovljena Generalna direkcija zemljiško-davčnega katastra (nem. Generaldirektion des Grundsteuerkatasters), delovala je do leta 1864.

Po letu 1850 sta bila oba oddelka ločena in Triangulacijski in kalkulacijski biro je prešel v delokrog Vojnega ministrstva (nem. K. k. Kriegsministerium). V letu 1860 se oba oddelka ponovno združita in Podkomisija triangulacijskega in kalkulacijskega biroja se preimenuje v Direkcijo triangulacijskega in kalkulacijskega biroja (nem. Direktion des Triangulierungs- und Kalkulbüros). V letih 1864–1865 je posle Generalne direkcije zemljiškega katastra prevzela Generalna direkcija za direktne davke (nem. Generaldirektion für die direkten Steueren). Od leta 1865 je zemljiško–davčni kataster spadal pod Sekcijo za upravno službo (nem. Sektion für den Verwaltungsdienst) c. kr. finančnega ministrstva.

Dne 24. 5. 1869 je bil izdan zakon o regulaciji zemljiškega davka. Zakon o evidenci zemljiško-davčnega katastra je dne 23. 5. 1883 to nalogo poveril Finančnemu ministrstvu. Leta 1890 je bil na Finančnem ministrstvu ponovno ustanovljen Triangulacijski in računski biro.

Dne 30. 3. 1910 je bila ustanovljena Generalna direkcija zemljiško-davčnega katastra (nem. K. k. Generaldirektion des Grundsteuerkatasters). Njen generalni direktor je bil dr. Vladimir Globočnik plemeniti Sorodolski.
Vir: Arhiv Slovenije 1102

On 21 August 1810, the Court Commission for the Regulation of Land Tax (German: K. k. Grundsteuerregulierungs-Hofkommission) was established by imperial decree, the purpose of which was to manage the land tax regulation system. Its operation was suspended between 1813 and 1815. Cadastral measurements were overseen by the Measurement Department (German: Vermessungs-department), which was divided into two sections: Section I for Trigonometric Regulation and the Lithographic Institute (Abteilung für die trigonometrische Triangulierung und das Lithographische Institut) and Section II for Mapping or Detailed Measurement (German: Abteilung für die Mappierung oder Detailvermessung). In 1818, the Subcommission of the Triangulation and Calculation Bureau (Unterkommission des Triangulierungs- und Kalkulbüros) was established to carry out triangulation.

At the end of 1827, the Court Commission for the Regulation of Land Tax ceased to operate and its operations were taken over by the United Court Chancellery (Vereinigte Hofkanzlei) until 1848. High-level management of technical works was taken over by the Central Cadastral Measurement Commission (Katastralvermessungs-Zentralkommission). The latter was dissolved in 1831 and re-established in 1835. Between 1848–1850, the affairs of cadastral operations were subject to the Imperial-Royal Ministry of Finance (German K. k. Finanzministerium). In 1850, the Directorate General for the Land-Tax Cadastre (Generaldirektion des Grundsteuerkatasters) was established, which operated until 1864.

After 1850, the two departments were separated, and the Triangulation and Calculation Bureau passed into the remit of the Ministry of War (German K. k. Kriegsministerium). In 1860, the two departments were reunited, and the Subcommittee of the Triangulation and Calculation Bureau was renamed the Directorate of the Triangulation and Calculation Bureau (Direktion des Triangulierungs- und Kalkulbüros). In 1864–1865, the operations of the Directorate General of the Land Cadastre were taken over by the Directorate General for Direct Taxes (German: Generaldirektion für die direkten Steueren). From 1865, the land tax cadastre belonged to the Administrative Service Section (German Sektion für den Verwaltungsdienst) of the Imperial Royal Ministry of Finance.

The Land Tax Regulation Act was issued on 24 May 1869. On 23 May 1883, the Land Tax Cadastre Register Act entrusted this task to the Ministry of Finance. In 1890, the Triangulation and Accounting Bureau was re-established at the Ministry of Finance.

On 30 March 1910, the Directorate General of the Land Tax Cadastre (German K. k. Generaldirektion des Grundsteuerkatasters) was established. Its Director General was dr. Vladimir Globočnik plemeniti Sorodolski.
Source: Archives of the Republic of Slovenia 1102

Evidenca zemljiškega katastra je bila poleg evidentiranja oblike in lege zemljišč sprva zlasti pomembna z davčnega vidika. Vsebina stabilnega zemljiškega katastra je že od nastanka sestavljena iz opisnega in grafičnega dela, ki se kot zaključena celota vodi po katastrskih občinah. Podatki o zemljiščih se vodijo na enoten način za celotno državo, vendar so obstoječe evidence zelo različne kakovosti. Katastrski načrti, ki z atributnim delom tvorijo osnovni del evidence zemljiškega katastra, so na različnih območjih zelo različne kakovosti. Marsikje so slabo uporabni ali pa celo neuporabni.

In addition to recording the shape and location of land plots, the cadastral record has been particularly important from a taxation perspective. Since the very establishment of the land cadastre, its content has consisted of a descriptive and graphic part, which are kept in cadastral municipalities as a single unit. Land data is kept in a uniform way for the whole country, but the existing records are of varying quality. The quality of the cadastral plans, the attribution part of which forms the core of the land cadastre records, varies significantly in different areas. Many of them are barely usable or completely unusable.

Lekarna v samostanu Olimje – tretja najstarejša v Evropi

Olimski samostan ima zanimivo zgodovino. Na mestu sedanjega samostana je nekoč stal stolp, ki je bil verjetno zgrajen okrog leta 1015, iz katerega se je razvilo grajsko poslopje. Leta 1663 so si patri v njem uredili samostanski kompleks. Leta 1782 je bil samostan razpuščen, leta 1805 ga je kupil grof Attems in leta 1807 podrl dva trakta gradu. Med 2. svetovno vojno je bila stavba nacionalizirana. Grad je v zelo slabem stanju tik pred osamosvojitvijo prevzela v najem mariborska škofija in ga leta 1990 izročila redovnikom minoritom, ki so oživili tradicijo samostanskega lekarništva. V samostanu je tretja najstarejša lekarna v Evropi s svojimi izredno sporočilnimi freskami, ki govorijo o poti do zdravja in sreče. Pred samostanom je vrt zdravilnih rastlin. Na gredicah je posajenih okrog dvesto primerkov zdravilnih rastlin. Označene so s slovenskim in latinskim imenom, skupaj s podatki o tem, kateri deli rastline služijo v zdravilne namene in za kakšne bolezni se uporabljajo. Vrt izhaja iz časa patrov pavlincev, ki so v sedemnajstem stoletju tukaj začeli sistematično proučevati zelišča.

Pharmacy in the Olimje Monastery – the third oldest in Europe

The Olimje Monastery has an intriguing history. In the place of the present-day monastery, there once stood a tower, probably built around 1015, which became the basis for the development of a castle building. In 1663, the residing priests arranged a monastery complex inside it. In 1782, the monastery was dissolved, and in 1805 it was bought by the Count Attems, who demolished two tracts of the castle in 1807. During World War II, the building was nationalized. The castle was taken over by the Maribor diocese in a very poor condition just before independence, and in 1990 it was handed over to the Minorite monks, who revived the tradition of monastic pharmacy. The monastery is the third oldest pharmacy in Europe with its extremely evocative frescoes that speak of the path to health and happiness. In front of the monastery is a garden of medicinal plants. The flowerbeds are host to about two hundred specimens of medicinal plants. They are marked with Slovene and Latin names, along with information on which parts of the plant are used for medicinal purposes and for which diseases they are used. The garden dates back to the time of the Pauline Fathers, who began to systematically study herbs here in the seventeenth century.

Katastrski načrt iz leta 1825 za k. o. Sopote prikazuje samostan po porušitvi dveh traktov gradu leta 1807. Vrt iz sedemnajstega stoletja, ki je prikazan pod samostanom (na načrtu jugovzhodno), se je na tem mestu ohranil vse do danes.
Vir: https://mapire.eu, vir fotografije: https://www.seviqc-brezice.si/, vir topografije: https://sl.wikipedia.org/

A cadastral plan from 1825 for CM Sopote depicts the monastery after the demolition of two tracts of the castle in 1807. The seventeenth-century garden below the monastery (on the south-east side of the map), has been preserved to this day.
Source: https://mapire.eu, Franciscan cadastre, Photo source: https://www.seviqc-brezice.si/, Topography source: https://sl.wikipedia.org/

V letih od 1867 do 1869 je bila opravljena reambulacija trigonometrične mreže in domeritve prvotne grafične izmere. Sama reambulacija se je pričela s preverjanjem oboda katastrske občine, ki je zraven izrisa vključevala tudi natančen opis mej. Pripravljene so bile nove indikacijske skice, ki so vsebovale vse spremembe parcel in njihovih lastnikov. Pri vnosu novih lastnikov v indikacijske skice so sodelovali zastopniki posameznih občin.

» *Koncept dopisa Deželne vlade v Ljubljani vsem okrajnim uradom. Ljubljana, 26. april 1867*

V dopisu se sporoča, da bodo na Kranjskem začeli z reambulacijo katastra, in sicer bodo začeli s trigonometričnimi deli, ki bodo osnova reviziji katastrskega operata. Delo bodo opravili inšpektorati postaj Kranj, Ljubljana in Novo mesto. Reambulacijo bodo začeli 1. maja v davčnih okrajih: Radovljica, Kranj, Škofja Loka, Ljubljana okolica, Kamnik, Brdo, Stična, Litija, Radeče, Trebnje, Žužemberk. Dopisu je priložen slovenski prevod teksta storitev občin, ki jih je predpisalo Finančno ministrstvo.

Vir: Arhiv Slovenije, Dež. Vlada v Ljubljani, 1867, fasc. 38-5, spis 3657, priloga «

Z revizijo izmere ugotovljene spremembe so se z rdečim tušem vrisale v načrte prvotne izmere, ob končanem vrisu pa so bili izdelani novi odtisi načrtov. Izvorne načrte iz obdobij pred reambulacijo hrani Arhiv Slovenije.

Do leta 1861 so bili načrti tiskani na običajni način na vlažnem papirju, zaradi česar so bili odtisi načrtov obremenjeni z velikim skrčkom (2 % in več). Po letu 1861 je bil na podlagi več poskusnih primerov uveden suhi tisk.

Leta 1867 je v izdelavo reambulančnih katastrskih operatov uveden slovenski jezik.

» *Leta 1867 dne 21. decembra je cesar Franc Jožef podpisal osnovne državljanske pravice. V njih je slovenski kmet, Slovenec s slovensko govorico vred proglašen za jednakopravnega državljana. Slovenec in njegov jezik je pridobil v Avstriji tiste pravice v uradih, šoli in javnem življenji, katere je užival že od nekdaj Nemec in nemški jezik. To pravico je svetli cesar Franc Jožef dne 21. decembra 1867 podpisal in proglasiti dal. Zato pa naj ne preminejo slovenskemu kmetu iz spomina trije cesarji: Maksimilijan, Ferdinand in Franc Jožef. Prvi je zatrl sužanstvo, drugi podložništvo s tlako in desetino, tretji pa povzdignil slovenskega kmeta do časti v sem drugim jednakopravnega državljana. Večna hvala in slava jim!*

Vir: Politična zgodovina Štajerskih Slovencev, Ivan Lapajne, 1884 «

» *Dopis Finančne direkcije v Ljubljani Deželni vladi v Ljubljani. Ljubljana, 1. junij 1867*

Finančna direkcija prosi v imenu Inšpektorata za reambulacijo Deželno vlado za mnenje o uporabi slovenskega jezika pri izdelavi reambulančnega katastrskega operata. Mnenje Deželne vlade bodo predložili v odločitev finančnemu ministrstvu. Finančna direkcija še pristavlja, da bo treba, če bodo občinski predstavniki zahtevali izdelavo reambulančnega elaborata v slovenskem jeziku, vse tehnične izraze prevesti v

From 1867 to 1869, the trigonometric grid was revised, and the original graphical measurements were updated with additional measurements. The revision began with checking the perimeter of the cadastral municipality, which, in addition to mapping, also included a detailed description of the borders. New field cadastral plans were drawn up, which contained all changes to the parcels, and their respective owners. Representatives of individual municipalities participated in the entering of new owners into the field cadastral plans.

» *The draft of the letter of the provincial government in Ljubljana to all district offices. Ljubljana, 26 April 1867*

The letter announces the beginning of cadastre revision in Carniola, starting with trigonometric works, which will be the basis for the revision of the cadastral records. The work will be performed by inspectorates of the offices in Kranj, Ljubljana and Novo Mesto. The revision will begin on 1 May in tax districts: Radovljica, Kranj, Škofja Loka, Ljubljana surroundings, Kamnik, Brdo, Stična, Litija, Radeče, Trebnje, and Žužemberk. The letter is accompanied by a Slovenian translation of the text of municipal services prescribed by the Ministry of Finance.

Source: Archives of the Republic of Slovenia, Provincial Government in Ljubljana, 1867, fasc. 38-5, file 3657, annex «

The changes identified in the revision of the surveys were drawn into the original survey maps with red ink, and new map prints were produced with the inscriptions included. The original maps from before the revision are kept in the Archives of the Republic of Slovenia.

Up to 1861, maps were normally printed on damp paper, subjecting the map prints to significant constrictions (2% and more). After 1861, dry printing was introduced on the basis of a number of test cases.

In 1867, the Slovene language was introduced into the production of revised cadastral records.

» *On 21 December 1867, Emperor Franz Joseph signed the Basic Law on Civil Rights. These include the proclamation of the equal rights of Slovenian farmers, along with the Slovenian language. The Slovenian people and language in Austria thereby acquired all those rights in offices, school and public lives that were already enjoyed by the German people and language. This right was signed and proclaimed by the great Emperor Franc Joseph on 21 December 1867. There are three emperors whose names should not pass from the memory of the Slovenian farmer: Maximilian, Ferdinand and Franz Joseph. The first abolished slavery, the second ended serfdom, forced labour and tithes, and the third granted the Slovenian farmer the privilege of equal citizenship. Eternal thanks and glory to them!*

Source: The Political History of Styrian Slovenes, Ivan Lapajne, 1884 «

» *Letter from the Financial Directorate in Ljubljana to the Provincial Government in Ljubljana. Ljubljana, 1 June 1867*

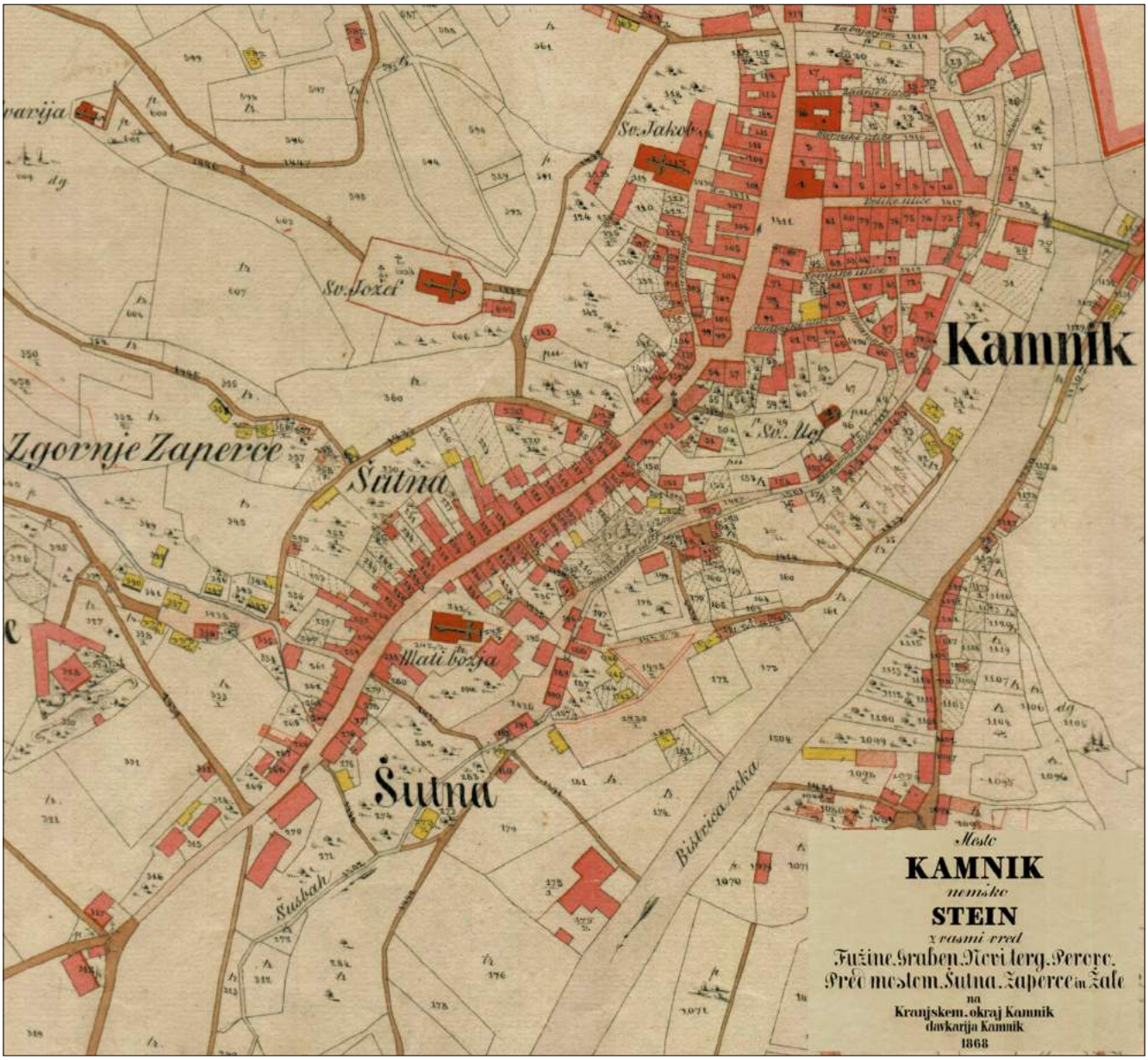
The Financial Directorate requests on behalf of the Inspectorate of the provincial government an opinion on the use of the Slovenian language in the production of revised cadastral records. The opinion of the provincial government will be submitted for a decision to the Ministry of Finance. The Financial Directorate also notes that if the municipal representatives request the preparation of revised cadastral records in the Slovene lan-

slovenski jezik ter jih razločno zapisati v tabele tega elaborata.

Vir: Arhiv Slovenije, Dež. Vlada v Ljubljani, 1867, fasc. 38-5, spis 4676, priloga. «

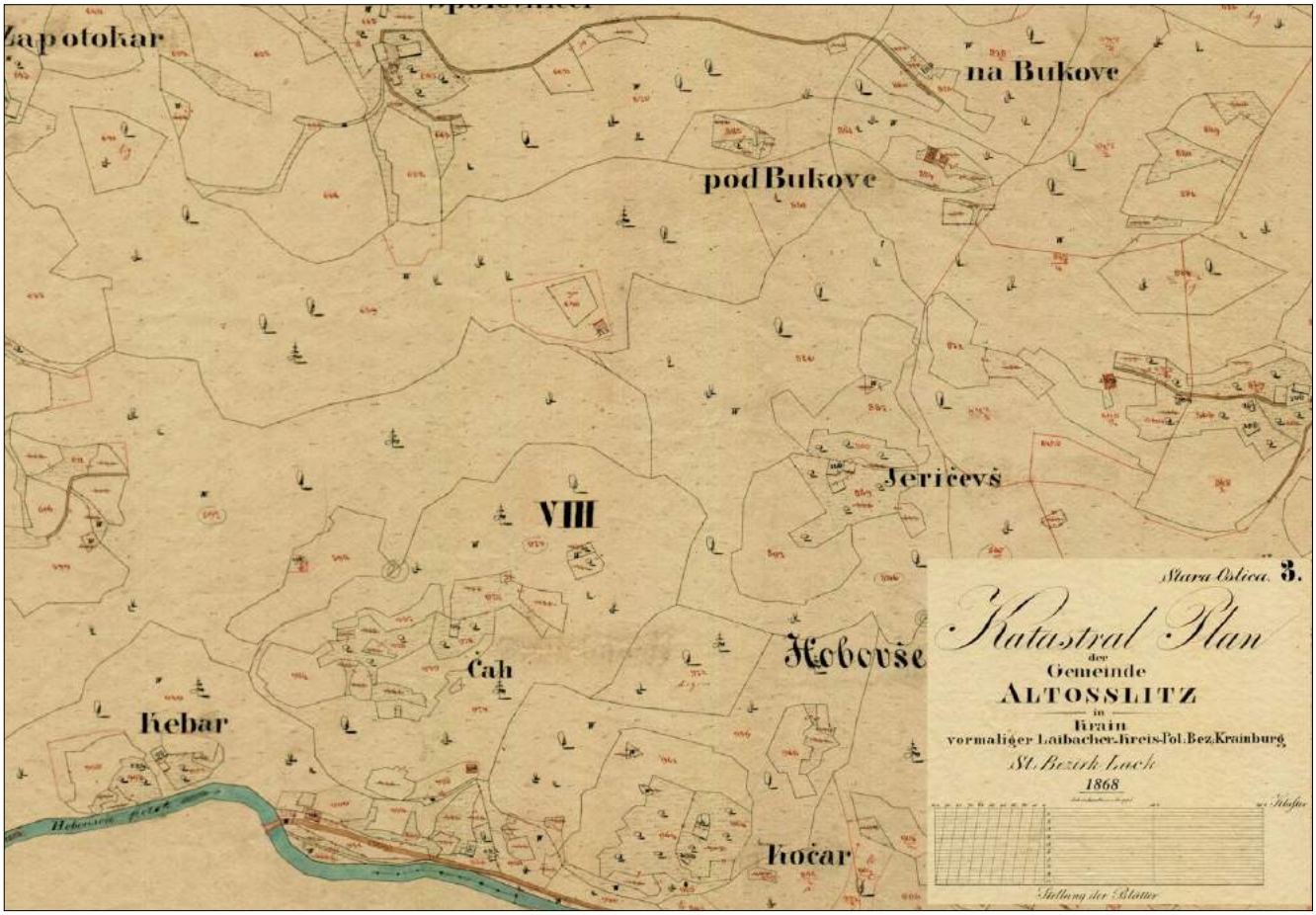
guage, it will be necessary to translate all technical terms into the Slovene language and clearly tabulate them within these records.

Source: Archives of the Republic of Slovenia, Provincial Government in Ljubljana, 1867, fasc. 38-5, file 4676, annex. «



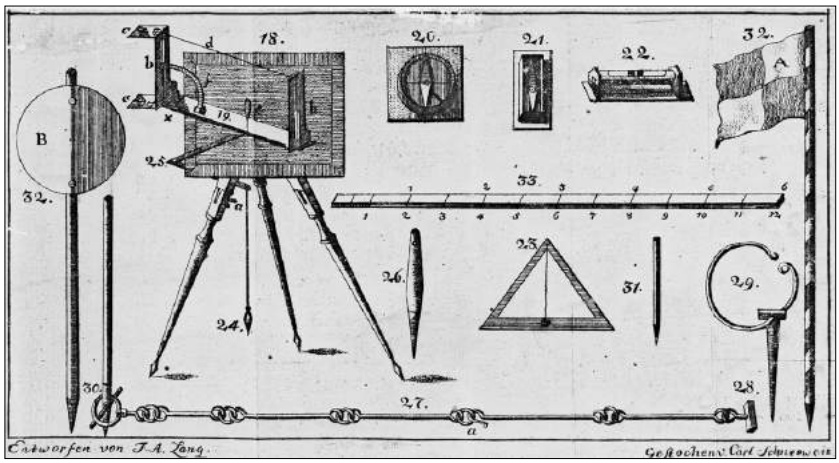
Slika 2.2.3: Reambulirani katastrski načrt k. o. 1911 Kamnik iz leta 1868, kjer se uporablja slovenski jezik.
Vir: Arhiv Slovenije, reambulančni kataster

Figure 2.2.3: Revised cadastral plan of CM 1911 Kamnik from 1868, using the Slovenian language.
Source: Archives of the Republic of Slovenia, revised cadastre



Slika 2.2.4: Reambulirani katastrski načrt k. o. 2055 Stara Oselica iz 1868, kjer se uporablja slovenski jezik.
Vir: Arhiv Slovenije, reambulančni kataster

Figure 2.2.4: Revised cadastral plan of CM 2055 Stara Oselica from 1868, using the Slovenian language.
Source: Archives of the Republic of Slovenia, revised cadastre



Slika 2.2.5: Obvezna merska oprema za detajlno izmero v prvi polovici 19. stoletja in pozneje tudi pri reambulaciji grafičnega katastra (merilna mizica, vodna tehtnica, dioptrsko ravnilo, svinčnica, 10 col dolga merska veriga in risalni pribor).
Vir: arhiv GURS

Figure 2.2.5: Mandatory measuring equipment for detailed surveying in the first half of the 19th century and later also in the revision of the graphic cadastre (plane table, spirit level, dioptre, plummet, 10-inch-long measuring chain and drawing accessories).
Source: The SMARS archive

» *Leto 1883 je bilo odločilno leto za uvedbo poligonalne izmeritvene metode ter prepoved uporabe merske mize za izmero mest in pomembnejših krajev oziroma dragocenejših vrst katastrskih kultur.* «

» *The year 1883 was decisive for the introduction of a polygonal measurement method and a ban on the use of plane tables for surveying cities and important locations or the most valuable types of cadastral cultures.* «

Novi katastrski predpisi, uveljavljeni po letu 1896, so naložili, da je treba spremembe sprotno evidentirati, in s tem dopolnili določila zakona iz leta 1883, ki je predvideval evidenco sprememb le z revizijo. K taki spremembi je pripomogla povezava katastra in zemljiške knjige, kar je pomenilo skupen vnos podatkov o spremembi parcelnega stanja in lastništva. Tako kataster ni bil več samo davčni sistem. Zakon iz leta 1883 je predvidel, da se v vsaki provinci ustanovi civilna katastrska služba (izmeritveni oddelek), ki je imela svoj izmeritveni okoliš (pokrival je enega ali več sodnijskih okolišev zaradi povezave z zemljiško knjigo).

Leta 1883 izide Zakon o vzdrževanju zemljiškega katastra, ki je veljal v Avstriji 75 let. Glavni namen: usklajenost katastrskega operata s spremembami v naravi ter zemljiško knjigo.

To leto je tudi prelomno leto, kar se tiče stalne zaposlitve uradnikov, ki so se ukvarjali s katastrsko izmero. Na 320 izmeritvenih okrajih se je zaposlilo 370 geometrov za vzdrževanje katastra. V nadaljevanju so izmeritveni uradi postali katastrski uradi in domala takšno ureditev poznamo še danes. 370 uradnikov je bilo zaposlenih na območju celotne tedanje avstrijske dežele.

V obdobju stare Jugoslavije je bilo na območju Slovenije 22 katastrskih uradov, kjer je bilo zaposlenih 31 geodetskih strokovnjakov.

The new cadastral regulations, established after 1896, stipulated that changes should be recorded in real time, thus supplementing the provisions of the 1883 act, which provided for recording changes only upon revision. This change was facilitated by the connection between the cadastre and the land register, which meant the joint entry of data on changes in the condition and ownership of a land plot. Thus, the cadastre was no longer just a tax system. The 1883 Act provided for the establishment of a civil cadastral service (measuring department) in each province, which had its own survey district (covering one or several judicial districts due to its connection to the land register).

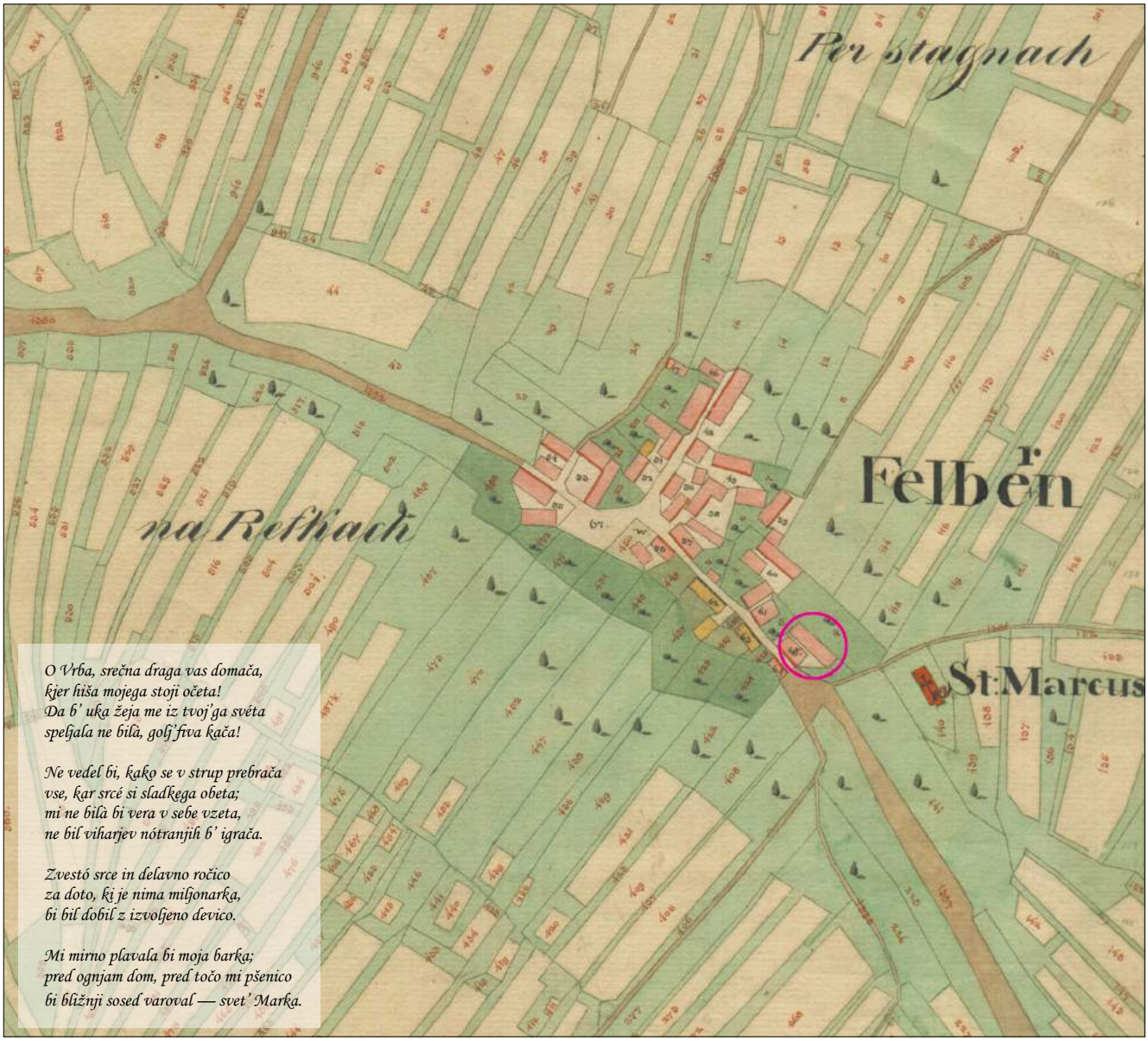
In 1883, the Land Cadastre Maintenance Act was passed, which would remain in force in Austria for 75 years. Its main purpose was harmonization of the cadastral records with changes in nature and the land register.

This year was also a turning point in terms of the employment of cadastral survey officials on a permanent basis. In order to maintain the cadastre, 370 surveyors were employed in 320 survey districts. Subsequently, survey offices became cadastral offices, which were fairly similar to the situation we have today. 370 officials were employed throughout the then Austrian lands.

In the period of the old Yugoslavia, 22 cadastral offices operated in Slovenia, employing 31 surveying experts.

Slika 2.2.6: Katastrski načrt k. o. 2181 Zabreznica z vrisanimi spremembami od leta 1869 do 1962.
Na parcelni številki 679 stoji rojstna hiša dr. Franceta Prešerna.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 2.2.6: Cadastral plan of CM 2181 Zabreznica with changes drawn from 1869 to 1962.
On land plot number 679 stands the birth house of dr. France Prešeren.
Source: the e-ZKN archive land cadastre map viewer



Slika 2.2.7: Katastrski načrt k. o. 2181 Zabreznica iz leta 1826 (čas mladosti našega največjega pesnika).
Vir: Arhiv Slovenije, franciscejski kataster

Figure 2.2.7: Cadastral plan of CM 2181 Zabreznica from 1826 (time of the youth of our greatest poet).
Source: Archives of the Republic of Slovenia, Franciscan cadastre

Dopis c. kr. Ministrstva za poljedelstvo na Dunaju Deželni vladi v Ljubljani. Dunaj, 26. februar 1875

Poljedelsko ministrstvo pošilja brošuro s predpisi o uvedbi metrskih mer in novih utežnih mer, ki jih določa zakon z dne 23. julija 1871. V členu IV tega zakona so določene nove dolžinske mere, v členu V pa nove površinske mere, ki bodo uveljavljene 1. januarja 1876.

Vir: Arhiv Slovenije, Dež. Vlada v Ljubljani, 1875, fasc. 31-1

Letter from the Imperial-Royal Ministry of Agriculture in Vienna to the Provincial government in Ljubljana. Vienna, February 26 1875

The Ministry of Agriculture sends a pamphlet with regulations on the introduction of metric measures and new weight measures laid down by the Act of 23 July 1871. Article IV of this Act determines new length measures, and Article V determines new surface measures, which are to be enforced on 1 January 1876.

Source: Archives of the Republic of Slovenia, Provincial Government in Ljubljana, 1875, fasc. 31-1

Leta 1873 je bil v Avstriji uveden metrski sistem in s tem nova razdelitev na liste in nova merila načrtov 1 : 2500, 1 : 1250 in 1 : 625. Leta 1914 so se pojavila tudi nova merila 1 : 2000 in 1 : 1000.

Na predlog Vladimirja Globočnika pl. Sorodolskega – slovenskega pravnika (leta 1910 je na finančnem ministrstvu na Dunaju postal generalni direktor Generalne direkcije zemljiško davčnega katastra) je bivša Avstrija leta 1909 začela izvajati triangulacijska dela, kjer je bila podlaga Gaussova konformna projekcija. Z uvedbo Gaussove projekcije so triangulacijska dela dobila solidno matematično in kartografsko osnovo.

In 1873, the metric system was introduced in Austria and thus a new division into sheets and new map scales of 1:2500, 1:1250 and 1:625. In 1914, new scales emerged as well, i.e. 1:2000 and 1:1000.

At the suggestion of Slovenian lawyer Vladimir Globočnik pl. Sorodolski (who in 1910 became Director General of the Directorate General of the Land Tax Cadastre at the Ministry of Finance in Vienna), the former Austria commenced triangulation work in 1909 based on the Gauss Conformal Projection. With the introduction of the Gauss projection, the triangulation works were given a solid mathematical and cartographic basis.

2.3 Drugih sto let razvoja katastra
The second hundred years of cadastre development

Po 1. svetovni vojni in razpadu avstro-ogrske monarhije je bila 1. decembra 1918 ustanovljena Kraljevina Srbov, Hrvatov in Slovencev, ki je 3. oktobra 1929 postala Kraljevina Jugoslavija. Do sprejetja lastnih predpisov na področju državne in katastrske izmere so v kraljevini glede pravil poslovanja katastrske službe in vzdrževanja katastrskih podatkov veljali še predpisi iz avstro-ogrske monarhije.

Od odločitve komisije, sestavljene iz predstavnikov Vojnogeografskega inštituta in Generalne direkcije katastra, se je dne 21. marca 1924 na ozemlju bivše Jugoslavije za sistematično izmero začela uporabljati Gauss-Krügerjeva konformna projekcija meridianskih con. Kraljevina je bila razdeljena na tri cone s po 3° geografske dolžine s srednjimi poldnevniki na 15°, 18° in 21° geografske dolžine vzhodno od Greenwicha. Vsaka cona predstavlja lastni koordinatni sistem. Območje Republike Slovenije leži v petem koordinatnem sistemu z izhodiščnim poldnevnikom 15°. Tedanji način razdelitve na trigonometrične sekcije in detajlne liste se sicer razlikuje od današnje razdelitve.

Leta 1929 je bil v kraljevini izdan Zakon o katastru zemljišč, ki je bil v naslednjih letih podprt s celo vrsto pravilnikov, s katerimi so bile določene tehnične norme za vzpostavitev in vzdrževanje zemljiškega katastra – podrobneje glej npr. publikacijo Dediščina katastrov na Slovenskem na povezavi https://www.projekt.e-prostor.gov.si/fileadmin/user_upload/gradiva/Dediscina_katastrov_na_Slovenskem.pdf.

After World War I and the disintegration of the Austro-Hungarian Monarchy, the Kingdom of Serbs, Croats and Slovenes was established on 1 December 1918, which later became the Kingdom of Yugoslavia on 3 October 1929. Until the adoption of its own regulations in the field of state and cadastral surveying, the kingdom was still subject to regulations from the Austro-Hungarian Monarchy regarding the rules of operation of the cadastral service and the maintenance of cadastral data.

Following the decision of the commission, which consisted of representatives of the Military Geographical Institute and the Directorate General of the Cadastre, the Gauss-Krüger conformal projection of meridian zones came into use on 21 March 1924 for systematic measurement in the territory of the former Yugoslavia. The kingdom was divided into three zones, each of 3° longitude, with their middle meridians at 15°, 18° and 21° longitude east of Greenwich. Each zone had its own coordinate system. The area of the Republic of Slovenia lies in the fifth coordinate system with the original meridian of 15°. However, the method of division into trigonometric sections and detail sheets is different to the division used today.

In 1929, the Land Cadastre Act was issued in the kingdom, which was supported in the following years by a series of regulations that set out the technical standards for the establishment and maintenance of the land cadastre – for details see for example the publication The Cadastral Heritage of Slovenia at https://www.projekt.e-prostor.gov.si/fileadmin/user_upload/gradiva/Dediscina_katastrov_na_Slovenskem.pdf.

» *Dopis Finančne direkcije Ljubljanske pokrajine županu mestne občine V Ljubljani. Ljubljana, 1. marec 1943*

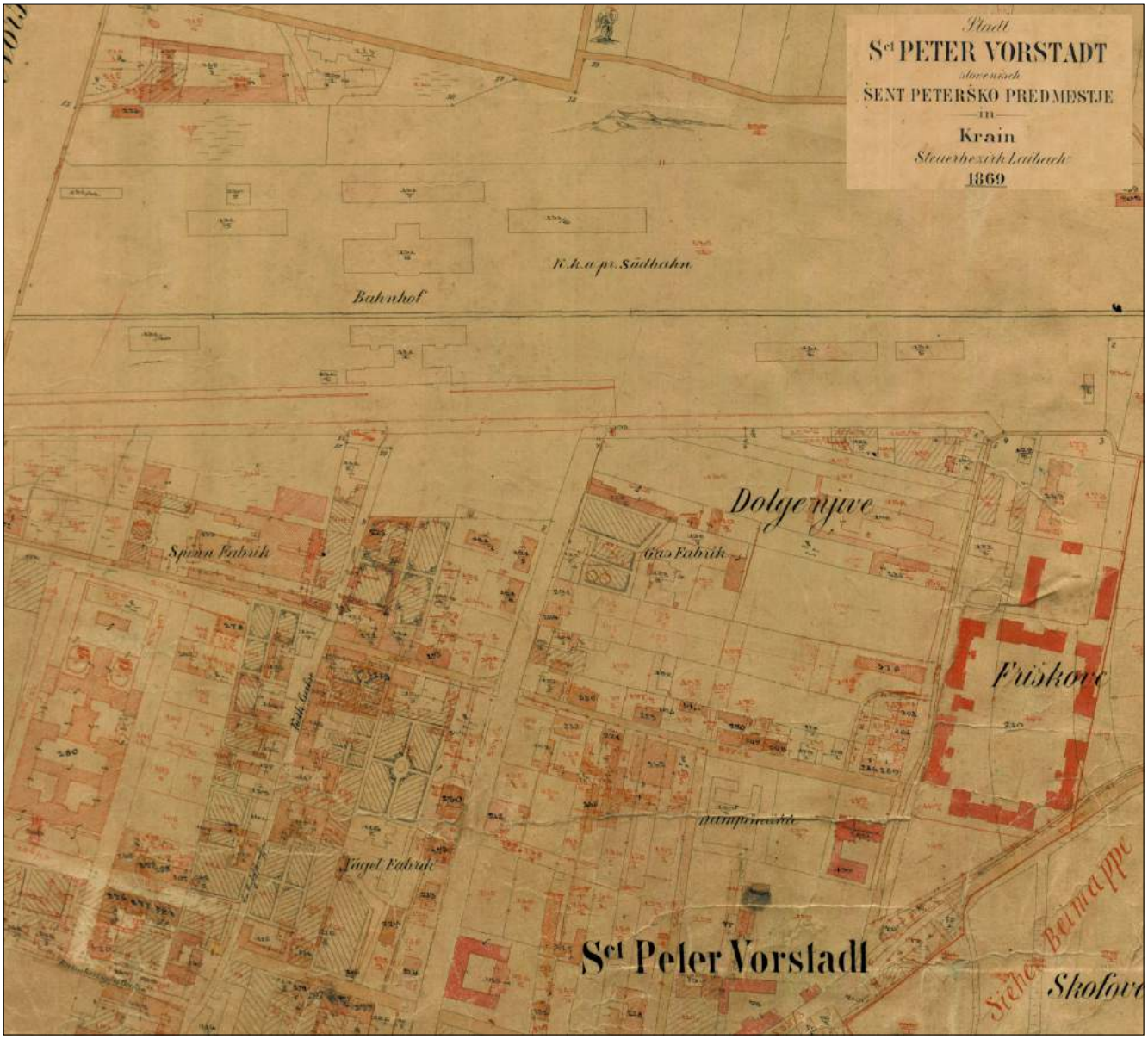
Finančna direkcija sporoča, da je bila v letih 1911–1914 za mesto Ljubljana opravljena nova izmera vključno s triangulacijsko in poligonsko mrežo. Ta mreža je bila zaradi tlakovanja in prekopavanja cest skoraj uničena, kar ustvarja zamudo in težave pri merjenju. Mestno upravo prosi, da sporoči krivce in odgovorne osebe, ki so zakrivili uničenje geodetskih točk. Katastrska uprava bo geodetsko mrežo obnovila in izvedla meritve v letu 1944.

Vir: Arhiv Slovenije, Fin. Dir., oddl. za kat., 1943, spis 53 «

» *Letter from the Financial Directorate of the Ljubljana Province to the Mayor of the Municipality of Ljubljana. Ljubljana, 1 March 1943*

The Financial Directorate reports that between 1911 and 1914 a new survey was carried out for the city of Ljubljana, including triangulation and a polygonal grid. This grid was almost destroyed due to paving and digging roads, which caused delays and difficulties in measurement. The city administration is requested to report the offenders and persons responsible for the destruction of the surveying points. The cadastral administration will restore the land survey grid and carry out measurements in 1944.

Source: Archives of the Republic of Slovenia, Fin. Dir., oddl. za kat., 1943, file 53 «



Slika 2.3.1: Katastrski načrt v k. o. 1726 Sv. Peter v M 1 : 2880 v veljavi od leta 1869 do 1914.
Vir: Arhiv Slovenije, franciscejski kataster

Figure 2.3.1: Cadastral plan in CM 1726 Sv. Peter, scale of 1:2880, in force from 1869 to 1914.
Source: Archives of the Republic of Slovenia, Franciscan cadastre

Slika: 2.3.2: Katastrski načrt v k. o. 1737 Tabor v M 1 : 1000 v veljavi od leta 1914 do 1973.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure: 2.3.2: Cadastral plan in CM 1737 Tabor, scale of 1:1000, in force from 1914 to 1973.
Source: the e-ZKN archive land cadastre map viewer

Koncept poročila Finančne direkcije v Ljubljani Šefu pokrajinske uprave v Ljubljani. Ljubljana, 19. januar 1944

Finančna direkcija sporoča, da je pogorel katastrski operat sodnih okrajev Kočevje, Ribnica in Velike Lašče. Ta operat bodo lahko obnovili na osnovi reambulančnega katastra iz let 1867/1868, ki ga hrani Mapni arhiv; brez novih meritev pa bi ga zmogli uskladiti z dejanskim posestnim stanjem na podlagi map, ki jih hranijo sodišča v Kočevju, Ribnici in Velikih Laščah. Šefa pokrajinske uprave prosi, naj izposluje pri Apelacijskem sodišču v Ljubljani, da bi navedena sodišča postopoma dostavljala sodne mape in parcelne zapisnike Finančni direkciji v Ljubljani.

Arhiv Slovenije, Fin. Dir., odd. za kat., 1944. spis 27

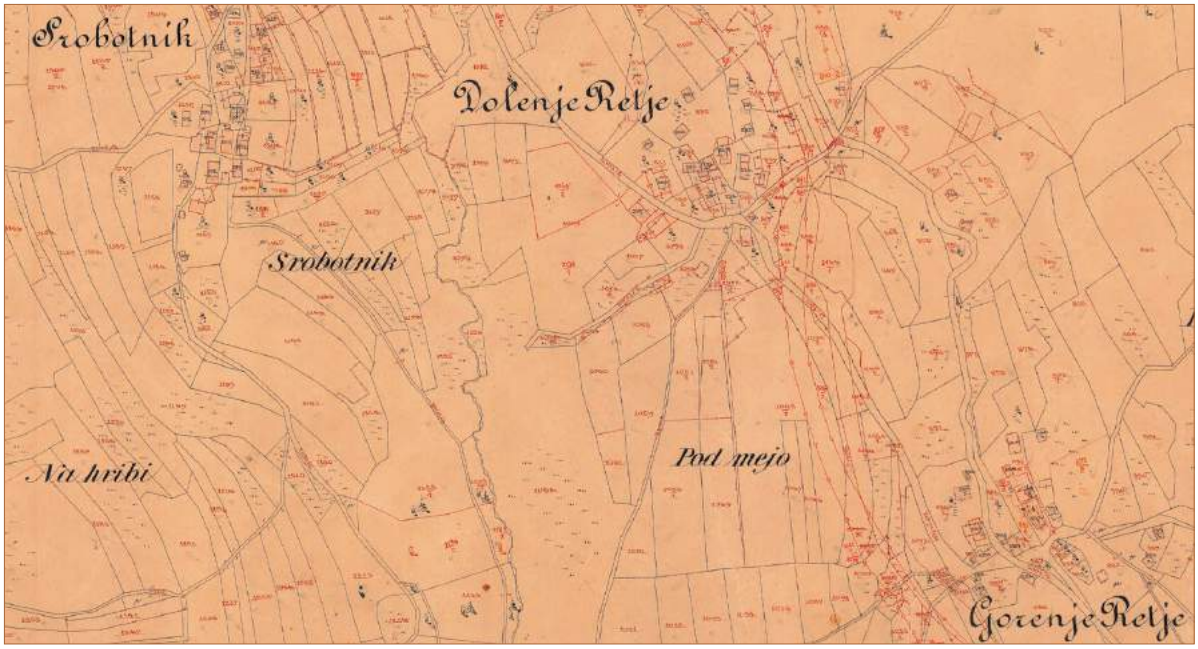
Del operata se je obnovil na podlagi dopisa Finančne direkcije. Slika v nadaljevanju kaže obnovo k. o. Velike Lašče.

Draft of the Report of the Financial Directorate in Ljubljana to the Head of the Provincial Administration in Ljubljana. Ljubljana, 19 January 1944

The Financial Directorate reports that the cadastral records of the judicial districts of Kočevje, Ribnica and Velike Lašče have been destroyed by fire. It will be possible to restore the records on the basis of the revised cadastre from 1867/1868, kept by the Map Archive. Without new measurements, they could also be recovered from the actual state of ownership on the basis of maps kept by the courts in Kočevje, Ribnica and Velike Lašče. The head of the provincial administration is requested to negotiate with the Court of Appeals in Ljubljana for the said courts to gradually deliver the court files and parcel minutes to the Financial Directorate in Ljubljana.

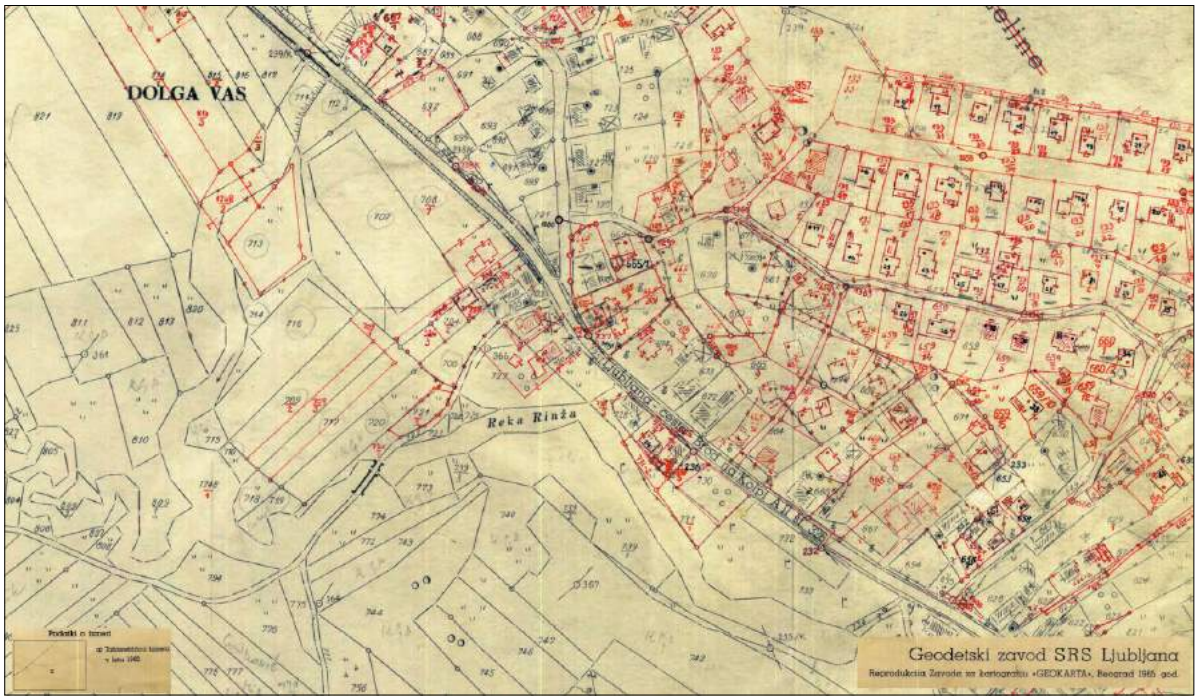
Archives of the Republic of Slovenia, Fin. Dir., cat. dept., 1944. file 27

Part of the records was restored on the basis of a letter from the Financial Directorate. The figure below shows the restoration of CM Velike Lašče.



Slika 2.3.3: k. o. 1717 Velike Lašče, izsek iz katastrskega načrta v M 1 : 2880, obnovljen na podlagi reambulančnih kart iz leta 1869.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 2.3.3: CM 1717 Velike Lašče, excerpt from the cadastral plan, scale of 1:2880, restored on the basis of revised maps from 1869.
Source: the e-ZKN archive land cadastre map viewer



Slika 2.3.4: k. o. 1581 Livold, tahimetrična izmera leta 1962. Za ostala območja (večji del) Kočevskega pa je bila v letih od 1962 do 1968 opravljena nova izmera. Predvsem se je izvajala tahimetrična izmera v M 1 : 2500, za urbane dela pa v M 1 : 1000.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 2.3.4: CM 1581 Livold, the tachymetric measurement of 1962. For (most of) the remaining areas of the Kočevje region, a new survey was carried out from 1962 to 1968. In particular, tachymetric measurement was performed in a scale of 1:2500, and for urban parts in a scale of 1:1000.
Source: the e-ZKN archive land cadastre map viewer

To pa ni bil edini primer v zgodovini katastra na Slovenskem, ko je operat pogorel.

Znano je, da je franciscejska davčna reforma najbolj udarila po kmečkem prebivalstvu v Kranjski deželi. Tako so se po vsej deželi v revolucionarnem letu 1848 začeli nemiri, kjer so se kmetje organizirali v okviru posameznih gospostev. Najdrznejši nastop so uprizorili podložniki Ižanskega gradu. V noči od 21. na 22. marec so vdrli v grad in ga poponoma razdejali. Bleiweisove »Novice« so v naslednjih dneh sporočile svojim bralcem.

»Deležnike hudodelstev na Igu bo zadela roka pravice, storjeno škodo bo treba solidarno poravnati, ker je vsakdo z vsem svojim premoženjem porok tudi za škodo, ki jo napravi njegov sosed. S tem, da so Ižanci sežgali spise gosposke in gruntne bukve, so si sami največjo škodo napravili. S tem, ko so posestne bukve zažgali, so pokončali tudi postavne priče za svoje posestne pravice, noben gruntar se ne bo mogel na svoje posestvo izposoditi denarja, nihče ne bo mogel svojih pravic odstopiti drugemu, dokler ne bodo gruntne bukve (na stroške kmetov) na novo napravljene. Vrh tega pa se marsikatera pravica sploh nikdar več ne bo dala izpričati.«

Vir: Kmetijske in rokodelske novice, 1848

Razlog, zakaj so se gruntne knjige, omenjene v članku zgoraj, hranile pri grajski gospodi, pojasnjuje spodnja okrožnica.

Okrožnica Notranje avstrijskega gubernija v Gradcu. Gradec, 20. maj 1789

Notranje avstrijski gubernij razglaša, da se mora vsakomur dovoliti vpogled v katastrske napovedi, da se mora poskrbeti za varnost napovedanih knjig, da se napovedane knjige, v kolikor nimata sodnik ali župnik ustreznih pogojev za varno hranjenje pred požarom, hranijo v pisarni okrajne gosposke, kjer so zmeraj in vsakomur dostopne na vpogled.

Vir: Arhiv Slovenije, Gr. XV – Krumperk, fasc. 8

Geodetska služba v Sloveniji za časa Jugoslavije

V Kraljevini Jugoslaviji je bila geodetska služba centralizirana v Beogradu. V posameznih pokrajinah oziroma banovinah so bili pri finančnih direkcijah ustanovljeni oddelki za kataster. Po okupaciji se je zemljiški kataster vzdrževal po prejšnjih načelih. Na osvobojenem ozemlju je bila geodetska sekcija ustanovljena 20. 1. 1944 z odredbo Glavnega štaba NOV in POS, ki mu je bila tudi podrejena.

Po osvoboditvi je bila geodetska služba tako pri Ministrstvu za finance z oddelkom za kataster, ki je sodeloval pri agrarni reformi, kot pri Ministrstvu za gradnje z geodetskim oddelkom, ki je bil zadolžen predvsem za inženirsko-geodetska dela pri gradbeni obnovi. Hkrati so pri Ministrstvu za gradnje ustanovili tudi Projektivni zavod.

Z Uredbo o ustanovitvi in pristojnosti Geodetske uprave pri Vladi LRS z dne 26. 3. 1947 (Ur. l. LRS, št. 14/47) je bila geodetska dejavnost v Sloveniji združena. Tehnično osebje je bilo 1. 7. 1947 vključeno v republiško podjetje Geodetski zavod, ki je leta 1952 dobilo položaj ustanove s samostojnim financiranjem. Republiška geodetska uprava pa je bdela nad geodetskim kadrom v posameznih občinah.

Vir: Arhiv Slovenije, fond SI AS 1138

Takoj po letu 1945 je zemljiški kataster skoraj v celoti izgubil svoj pomen, saj se je menilo, da je ta institucija del preživetega kapitalističnega sistema. A je glede ohranitve katastra in njegovega pomena prevladala razumna odločitev.

This was not the only case of cadastral records being destroyed by fire in the history of the cadastre in Slovenia.

It is known that the Franciscan tax reform was the most difficult for the farming population in Carniola. Thus, in the revolutionary year of 1848, riots began throughout the country, where farmers within individual lordships assembled. The most daring act was staged by the subjects of the Ig Castle. On the night of March 21-22, they stormed the castle and completely destroyed it. In the following days, Bleiweis's "Novice" communicated to its readers:

"The participants in the crimes in Ig will find their justice, the damage will have to be paid in solidarity, since every citizen, with all their property, is also a guarantor for the damage done by their neighbour. By burning the land ownership files and books, the people of Ig brought great damage upon themselves. The burning of the books also destroyed the witnesses to their property rights; no landowner will be able to borrow money on their property, no one will be able to assign their rights to another person until the land ownership files are remade (at the expense of the farmers). On top of that, many rights will never be enforceable again."

Source: Kmetijske in rokodelske novice, 1848

The reason why the land ownership books mentioned in the article above were kept by castle lords is explained in the letter below

Letter of the Inner Austrian Gubernium in Gradec. Gradec, 20 May 1789

The Inner Austrian Gubernium declares that anyone must be allowed access to cadastral declarations, that the security of the declared books must be ensured, that the declared books should be kept in the county lord's office if the judge or pastor does not have adequate conditions for safe storage against fire, and that they are always accessible to anyone.

Source: Archives of the Republic of Slovenia, C. XV – Krumperk, fasc. 8

Surveying service in Slovenia at the time of Yugoslavia

In the Kingdom of Yugoslavia, the surveying service was centralized in Belgrade. In individual provinces, known as banovinas, cadastral departments were established under the financial directorates. After the occupation, the land cadastre was maintained according to earlier principles. In the liberated territory, a surveying section was established on 20 January 1944 by order of the National Liberation Army headquarters and the POS, to which it was also subordinated.

After the liberation, there was a surveying service operating under the Ministry of Finance's cadastre department, which participated in the agrarian reform, as well as under the Ministry of Construction's surveying department, which was primarily in charge of engineering and survey works in reconstructions. At the same time, a design office was established at the Ministry of Construction.

With the Decree on the establishment and competences of the surveying administration of the Government of the PRS of 26 March 1947 (Official Gazette of the PRS, No. 14/47), the surveying activity in Slovenia was unified. On 1 July 1947, the technical staff were included in the republican company Geodetski zavod, which was granted the status of an institution with independent financing in 1952. The Republic surveying administration managed the surveying staff in individual municipalities.

Source: Archives of the Republic of Slovenia, the SI AS 1138 collection

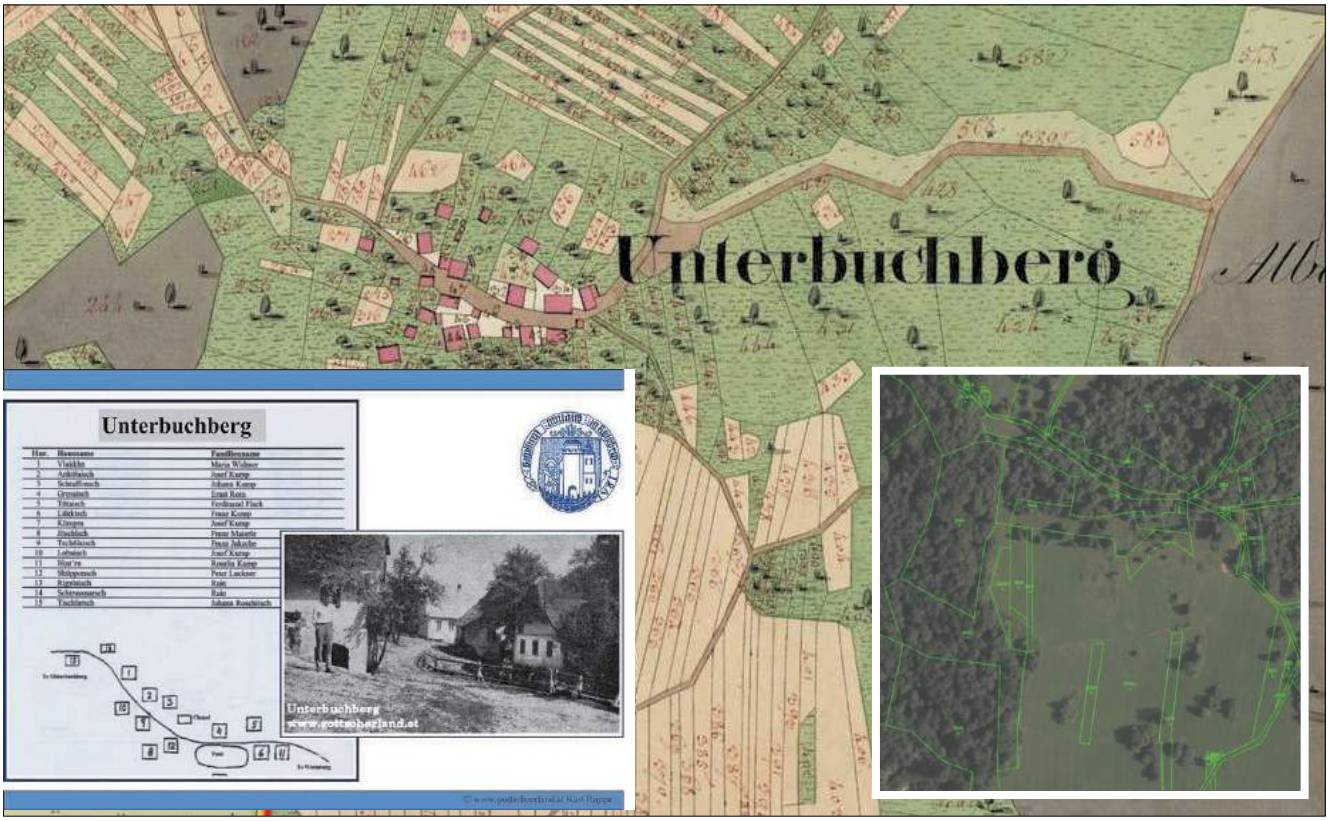
The land cadastre almost completely lost its significance immediately after 1945, as this institution was considered part of the past capitalist system. But reason nevertheless prevailed regarding the preservation of the cadastre and its significance.

Spodnja Bukova Gora – zapuščena kočevarska vas

Nekdanja kočevarska vas je ležala v bližini Koprivnika v kočevski občini. V tej vasi so do leta 1941 živeli Kočevarji, ki so na tem območju vztrajali polnih šest stoletij. Spodnja Bukova Gora je ob izselitvi premogla 15 hiš. Po izselitvi Kočevarjev je vas ostala prazna. Že leto pozneje je bila vas v Roški ofenzivi požgana in izropana, od takrat pa žalostno propada. Številne ruševine hiš, gospodarskih poslopij in vodnjakov pričajo o naseljenosti teh krajev. Gozd nezadržno zarašča nekdaj skrbno obdelano krajino in si jemlje nazaj tisto, kar so si s pridnim delom ustvarile generacije Kočevarjev. V bližini ruševin še vztrajajo stoletje stara sadna drevesa. Sadno drevje še obrodi, s pridelkom se jeseni posladka številna divjad, ki se pase po še nezaraščenih košenicah. Lepo se je v zimskih mesecih sprehoditi skozi to nekdanje naselje. Ruševine so takrat zaradi odpadlega listja še bolj vidne. Kakor da smo prišli v drug svet.

Spodnja Bukova Gora – an abandoned Gottscheer village

The former Gottscheer village was located near Koprivnik in the municipality of Kočevje. This village was inhabited by Gottscheers until 1941, who had persisted in this area for a full six centuries. At the time of eviction, Spodnja Bukova Gora contained 15 houses. After the eviction of the Gottscheers, the village remained empty. Only a year later, the village was burned and looted in the Roška offensive and has sadly been decaying ever since. Numerous ruins of houses, outbuildings and wells testify to the settlement of this area. The forest is uncontrollably overgrowing the once carefully cultivated landscape and reclaiming what generations of Gottscheers had earned with their hard work. Centuries-old fruit trees still stand near the ruins. These trees are still bearing fruit, and in the autumn, wild animals can be seen grazing on their yield. It is pleasant to walk through this former settlement in the winter months. The ruins are even more visible during that time due to the fallen leaves. It is like stepping into another world.



Prikaz vasi Spodnja Bukova Gora na katastrski mapi Habsburškega cesarstva k. o. Buchberg (Bukova Gora) iz leta 1824. Danes v zemljiškem katastru večine zemljišč pod nekdanjimi objekti ni več videti, izbrisani so bili šele v letu 1991 ob spremembi meje med k. o. 1537 Bukova Gora in k. o. 1599 Nemška Loka. Danes območje nekdanje vasi leži v k. o. 1599 Nemška Loka.
Vir: https:// mapire.eu/, vir manjših prikazov: https://www.lokalno.si/ in PREG, ekranska slika ZKP in DOF

A view of the village of Spodnja Bukova Gora on the cadastral plan of the Habsburg Empire CM Buchberg (Bukova Gora) from 1824. Today, most of the land under the former buildings is no longer visible in the land cadastre; they were erased in 1991 when the border between CM 1537 Bukova Gora and CM 1599 Nemška Loka was changed. Today, the area of the former village lies in CM 1599 Nemška Loka.
Source: https:// mapire.eu/, Source of smaller displays: https://www.lokalno.si/ and PREG, screen image of ZKP and DOF

Dopis Ministrstva za finance LRS, oddelek za kataster Ministrstvu za finance LRS, obči oddelek. Ljubljana, 21. junij 1945

Oddelek za kataster Ministrstva za finance LRS predlaga načrt razporeditve katastrskih razdelkov po okrožjih in okrajih v Sloveniji. Predlaga tudi, naj se osnujejo novi katastrski oddelki v Trebnjem, Slovenskih Konjicah, Slovenj Gradcu in Dravogradu. Dopisu je priložena razporeditev katastrskih razdelkov pri finančnih odsekih okrajnih narodno osvobodilnih odborov.

Vir: Arhiv Slovenije, Min. fin. LRS, 1945, spis 387PS.

Npr. v Trebnjem je bil katastrski urad ustanovljen 1956.

Z ustavnimi amandmaji leta 1974 je prišla geodetska služba pod republiško pristojnost, še istega leta pa izide tudi Zakon o geodetski službi in Zakon o zemljiškem katastru, ki je uzakonil mejni kataster. Določila pravijo, da je mejni kataster območje, kjer so vse zemljiškokatastrske točke na mejah parcel določene v mejnem ugotovitvenem postopku (MUP) in imajo Gauss-Krügerjeve koordinate. Zakon je določal, da se meja med parcelama različnih lastnikov oz. uporabnikov ugotavlja v MUP-u, če se ne ugotavlja v sodnem postopku. Postavljena so bila tri temeljna načela za evidentiranje posestnih meja v zemljiškem katastru in zemljiški knjigi:

- meja se ugotavlja in zamejniči s soglasjem lastnikov parcel oz. uporabnikov,
- navedeno soglasje mora biti jasno izraženo v ugotovitvenem zapisniku, ki ga podpišejo vsi lastniki parcel oz. uporabniki,
- ugotovitveni zapisnik je podlaga za poznejše vpise v zemljiški kataster in zemljiško knjigo.

Zakon o evidentiranju nepremičnin, državne meje in prostorskih enot (ZENDMPE), ki se je začel uporabljati 28. 12. 2000, je sistemski zakon, ki je urejal področje evidentiranja vseh nepremičnin v Republiki Sloveniji ter področje evidentiranja podatkov o prostorskih enotah in o državni meji.

Dne 25. 11. 2006 je bil objavljen Zakon o evidentiranju nepremičnin (v nadaljevanju ZEN). ZEN ureja evidentiranje nepremičnin, državne meje in prostorskih enot, postopek urejanja in spreminjanja meje zemljiških parcel, postopek vpisa podatkov o stavbah in delih stavb v kataster stavb ter vpisa njihovih sprememb, register nepremičnin, izdajanje podatkov in druga vprašanja, povezana z evidentiranjem nepremičnin, državno mejo in s prostorskimi enotami.

Letter from the Ministry of Finance of the People's Republic of Slovenia, cadastre department, to the Ministry of Finance of the People's Republic of Slovenia, general department. Ljubljana, 21 June 1945

The cadastre department of the Ministry of Finance of the People's Republic of Slovenia proposes a plan for the arrangement of cadastral divisions by districts and counties in Slovenia. It is also proposed that new cadastral departments be established in Trebnje, Slovenske Konjice, Slovenj Gradec and Dravograd. The letter is accompanied by the arrangement of cadastral divisions within the financial sections of the district national liberation committees.

Source: Archives of the Republic of Slovenia, Ministry of Finance of the PRS, 1945, file 387

PS. In Trebnje, for example, the cadastral office was established in 1956

With the constitutional amendments in 1974, the surveying service came under Republic jurisdiction, and in the same year, the Land Survey Activities Act and the Land Cadastre Act were issued, which gave legal status to the border cadastre. The provisions state that a border cadastre is an area where all land cadastre points on the borders of land plots are determined in a border identification procedure (MUP) and have Gauss-Krüger coordinates. The Act stipulated that the border between the land plots of different owners or users is identified by a border identification procedure if not established in court proceedings. Three basic principles were set for recording land borders in the land cadastre and the land register:

- the border is determined and marked out with the consent of the owners or users of the plots,
- this consent must be clearly expressed in the declaratory report, which shall be signed by all owners or users of the plots,
- the declaratory report is the basis for subsequent entries in the land cadastre and land register.

The Recording of Real Estate, State Border and Spatial Units Act (ZENDMPE), which came into force on 28 December 2000, is a systemic act that regulated the field of recording all real estate in the Republic of Slovenia and the field of recording data on spatial units and the state border.

On 25 November 2006, the Real Estate Records Act (ZEN) was published. ZEN regulates the registration of real estate, state borders and spatial units, the process of arranging and altering the borders of land parcels, the procedure of entering data on buildings and parts of buildings into the cadastre of buildings and their changes, the real estate register, issuing data, and other issues related to real estate registration, state borders, and spatial units.

2.4 Analogni zemljiškokatastrski načrti kot del katastrskega operata
Analogue cadastral plans as part of the cadastral record

Znano je, da človek 80 % informacij sprejme preko vida, zato vsebina zemljiškokatastrskega načrta nudi informacijo, ki najhitreje in celovito vodi k odločanju in doseganju končnega cilja.

Geodetski načrti in karte so osnova za najrazličnejša tehnična dela in planiranja. Ti načrti pa so koristni le, če je na njih prikazano stanje isto, kakor obstaja tudi na terenu. Glede na dejstvo, da je za grafično predstavitev vedno potreben čas, v katerem se stanje v naravi izmeri in prenese na papir ali drug medij, ni nikoli mogoče doseči časovne istovetnosti stanja v naravi s stanjem na načrtih. To dejstvo je treba vzeti v zakup in z interpretacijo vsebine zemljiškokatastrskih načrtov tudi tako ravnati.

V nadaljevanju se pojem analogni načrt nanaša na načrte z zemljiškokatastrsko vsebino, ne glede na to, ali so ti zapisani kot načrt, katastrski načrt, indikacijska skica, rektifikacijska mapa, zemljiškokatastrski načrt, situacijski načrt, topografski načrt, parcelacijski načrt ali načrt reambulančnega katastra.

Zapisnik 42. seje Narodne vlade SHS v Ljubljani. Ljubljana, 7. januar 1919

Narodna vlada SHS v Ljubljani je na seji razpravljala o poročilu dr. Dragotina Lončarja, da od Avstrije zahteva izročitev katastrskih map naših pokrajin, ki jih je izdelal Litografski zavod zemljiškega katastra na Dunaju, in kart našega ozemlja, ki jih je izdelal Vojaški kartografski zavod na Dunaju. Na seji je bil sprejet sklep, da zaprosijo konzularnega agenta na Dunaju dr. Petra Defranceschija, naj poskrbi za vrnitev teh map in kart.

Vir: Arhiv Slovenije, Narodna vlada SHS, fasc. Zapisniki sej.

V razvoju zemljiškega katastra so zemljiškokatastrski načrti odigrali prav posebno vlogo. Iz njih je razvidna lega zemljišč, ki so označena kot parcele ali parcelni deli, njihova oblika in velikost. Vrisane posestne meje omogočajo njihovo določitev v naravi, kadar so le-te nezaznavne ali sporne. Zemljiškokatastrski načrti so bili dolga leta edini, ki so sistematično, v natančno predpisani obliki in vsebini ter v sorazmerno velikem merilu upodabljali zemljiške parcele in nekatere naravne in umetne objekte na celotnem območju naše države.

Zemljiškokatastrski načrti grafične izmere so uporabni za proučevanje kmetijskih in gozdnih površin, prometne infrastrukture in vodnih površin, nekdanjih urbanih celot in njihove pozidave, razdrobljenosti in izrabe nepozidanih površin, skupaj z indikacijskimi skicami ali s pisnim delom operata pa tudi za študij posestnih stanj.

A person receives 80% of their information through sight, and so the contents of the land cadastral plan provide information that most quickly and comprehensively lead to making decisions and achieving the ultimate goal.

Geodetic plans and maps are the basis for a variety of technical works and planning. However, these plans only really fulfil their true when they show the actual situation in the field. Given the fact that a graphical representation always requires time for the situation in nature to be measured and transferred to paper or to another medium, it is never possible to achieve a simultaneous matching of the situation in nature to the situation in the plans. This fact must be taken into account and the interpretation of the content of land cadastral plans must be treated in the same way.

Hereinafter, the term analogue plan refers to plans with land cadastral content, regardless of whether they are written as a plan, cadastral plan, field cadastral plan, rectification map, land cadastral plan, situation plan, topographic plan, plot allocation plan, or revised cadastral plan.

Minutes of the 42nd session of the National Government of SHS in Ljubljana. Ljubljana, 7 January 1919

At the session, the National Government of SHS in Ljubljana discussed the report of dr. Dragotin Lončar, demanding that Austria hand over cadastral plans of our provinces, which were produced by the Lithographic Institute of the Land Cadastre in Vienna, and maps of our territory, produced by the Military Cartographic Institute in Vienna. A decision was made at the session to request that the consular agent in Vienna, dr. Peter Defranceschi, arrange for the return of these maps and charts.

Source: Archives of the Republic of Slovenia, National Government of SHS, fasc. Minutes of meetings.

Land cadastral plans played a particularly important role in the development of the land cadastre. They show the locations of areas, which are marked as land plots or parcel parts, along with their shape and size. Drawn property borders can be determined in nature if the borders are imperceptible or disputable. For many years, land cadastre plans were the only way of depicting land plots and some natural and artificial objects in the entire territory of our country systematically, in a precisely prescribed form and content, and on a relatively large scale.

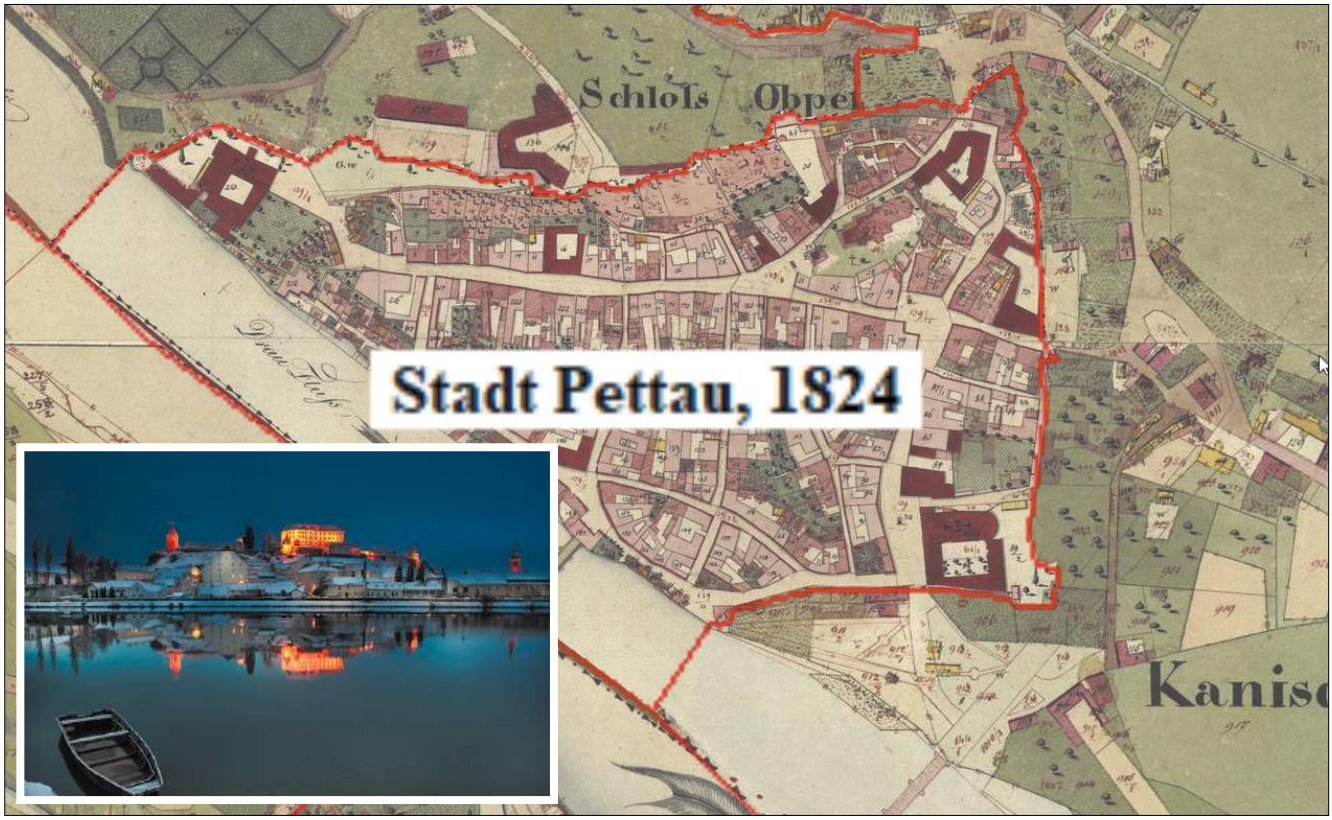
Graphic survey land cadastre plans are useful for studying agricultural and forest areas, transport infrastructure and water areas, former urban units and their construction, fragmentation and use of undeveloped areas, and, in conjunction with field cadastral plans or a written part of the records, also for the study of ownership.

Ptujski grad – mogočna utrdba na zadnjem obronku Slovenskih goric

Ptujski grad je mogočna zgradba, ki ponosno kraljuje nad mestom. Grajski kompleks sestavljajo nekdanje upravno poslopje, osrednja grajska stavba, žitnica, konjušnica, južni pravokotni stolp, zahodni stolp, južni okrogli stolp, vzhodni stolp, severni stolp, grajska pristava s tremi objekti in grajsko obzidje s tremi portali, zgodnjesrednjeveškim zemeljskim nasipom in stražarnico. Vsi objekti so na grajskem griču. Ptujski grad ima pestro zgodovinsko preteklost. Srednjeveška utrdba je nastala v 11. stoletju, grajski grič pa je bil poseljen že od 5. tisočletja pr. n. št. Pomembni lastniki so bili Salzburški nadškofi, gospodi Ptujski, grofje Leslie in grofje Herbersteini. Po drugi svetovni vojni je bil grad nacionaliziran. V Ptujskem gradu je danes Pokrajinski muzej Ptuj. Stalne zbirke na gradu so zbirka orožja, zbirka glasbil, zbirka fevdalne stanovanjske kulture, grajska galerija, zbirka slik na steklu, etnološka razstava in zbirka tradicionalnih pustnih mask. Najbolj reprezentančen prostor na gradu je slavnostna dvorana s kapelo, ki je primerna za razne svečane priložnosti, kot so poroke, simpoziji, koncerti, poslovna srečanja in sprejemi. S Ptujskega gradu je čudovit razgled na mesto Ptuj in bližnjo okolico.

The Ptuj Castle – a great fortress on the last hillside of Slovenske gorice

The Ptuj Castle is a monumental building proudly towering over the town. The castle complex consists of a former administrative building, a central castle building, a granary, a stable, a southern rectangular tower, a western tower, a southern round tower, an eastern tower, a northern tower, a castle manor with three buildings and a castle wall with three portals, an early medieval earthen embankment, and a guardhouse. All the buildings are located on the castle hill. The Ptuj Castle has a rich historical past. The medieval fortress was built in the 11th century, and the castle hill has been inhabited since the 5th millennium BC. Important historical owners include the Archbishops of Salzburg, the Lords of Ptuj, the Counts of Leslie and the Counts of Herberstein. After World War II, the castle was nationalized. Today, the Ptuj Castle houses the Ptuj Regional Museum. The permanent collections at the castle include a collection of weapons, a collection of musical instruments, a collection of feudal housing culture, a castle gallery, a collection of paintings on glass, an ethnological exhibition, and a collection of traditional carnival masks. The most prominent area in the castle is the ceremonial hall with a chapel, suitable for various festive occasions such as weddings, symposiums, concerts, business meetings and receptions. The Ptuj Castle offers a beautiful view of the city of Ptuj and the surrounding area.



Kot je razvidno iz katastrske mape habsburškega cesarstva iz leta 1824 za k. o. Stadtberg in k. o. Stadt Pettau, je grad Ptuj na griču nad mestnim jedrom ponujal dober razgled na celotno mesto, ki pa je bilo včasih precej manjše od današnjega Ptuja.
Vir: https://mapire.eu/, vir fotografije: https://sl.wikipedia.org/

As can be seen from the cadastral plan of the Habsburg Empire from 1824 for CM Stadtberg and CM Stadt Pettau, the Ptuj Castle, located on a hill above the city centre, offered a good view of the entire town of Ptuj, which used to be much smaller than it is today.
Source: https://mapire.eu/, Photo source: https://sl.wikipedia.org/

Poleg raziskovalcev zgodovinarjev prvotne grafične načrte s katastrskim operatom proučujejo še geografi, etnografi, jezikoslovci, pravniki, ekonomisti, urbanisti, agronomi, gozdarji, umetnostni zgodovinarji ter drugi raziskovalci, ki v celotnem katastrskem operatu najdejo dokumente in vire za svoje raziskovalno delo. Tako postajajo katastrski operati v arhivu najbolj uporabljano arhivsko gradivo.

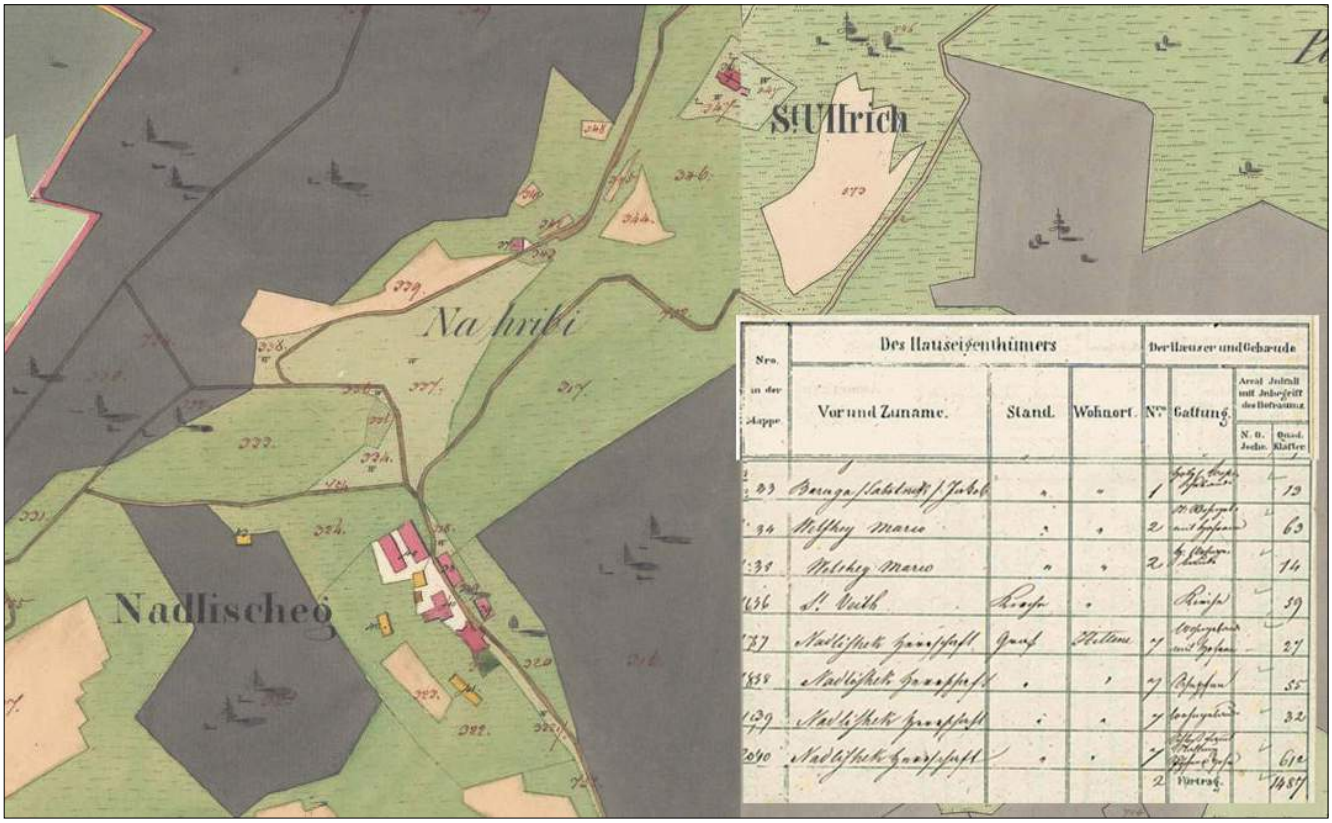
In addition to historical researchers, the original graphic plans with cadastral records are studied by geographers, ethnographers, linguists, lawyers, economists, urban planners, agronomists, foresters, art historians and other researchers whose research requires the data found in the land cadastre archives. Thus, the cadastral records are becoming the most commonly used archival material.

» *Legendarni silak Martin Krpan, naj je lik »resnične zgodovine« ali lik »zgodovinske resničnosti«, „kot trdi Karl Moritz, eden prvih dialektikov na tem področju, že konec 18. stoletja“ naj bi živel v času od leta 1680 do leta 1750 v koči na Vrhu pri Sveti Trojici.*

***Silvo Fatur**, slovenski literarni zgodovinar in učitelj slovenščine, rojen 2. 2. 1935 v Zagorju pri Pivki, častni občan občine Pivka, častni član Slavističnega društva Slovenije … , trdi, da je bil Martin Krpan doma z Vrha pri cerkvi sv. Trojice na vrhu griča Lonica na Pivškem, in s tem slavinski faran, torej Pivčan. Dovolj močan argument torej, da so ga Pivčani dali v svoj občinski grb.*

***Slavko Petrič**, gozdar, inovator, projektant in raziskovalec, rojen 30. junija 1928, v Lipsenju, Sveti Štefan, v občini Cerknica, pa je z dodatnimi raziskavami in s pomočjo podatkov iz franciscejskega katastra dokazal, da se vas, zaselek Vrh nahaja na severnem predelu Bloške planote, v bližini vasi Sveta Trojica in na terenu celo našel razvaline hiše, v kateri naj bi živel Levstikov literarni junak Martin Krpan. Po podatkih franciscejske katastrske mape iz leta 1823 je bilo bivališče Martina Krpana na stavbni parceli št. 37 k. o. Hiteno in meri 97 kvadratnih metrov (27 sežnjev) in je bilo last nadliškega grofa.*

Vir: Slavko Petrič, Nova vas 18. aprila 2015 «



Načrt franciscejskega katastra iz leta 1823, kjer je med nadliško pristavo in cerkvijo sv. Urha vrisan objekt št. 37 (domnevni dom Martina Krpana)
Vir: https://mapire.eu/
V seznamu stavbnih parcel franciscejskega katastra iz leta 1823 je pri lastnini Nadliške gospode vpisana parcela 37 v velikosti 27 klafter
Vir: Arhiv Slovenije, franciscejski kataster

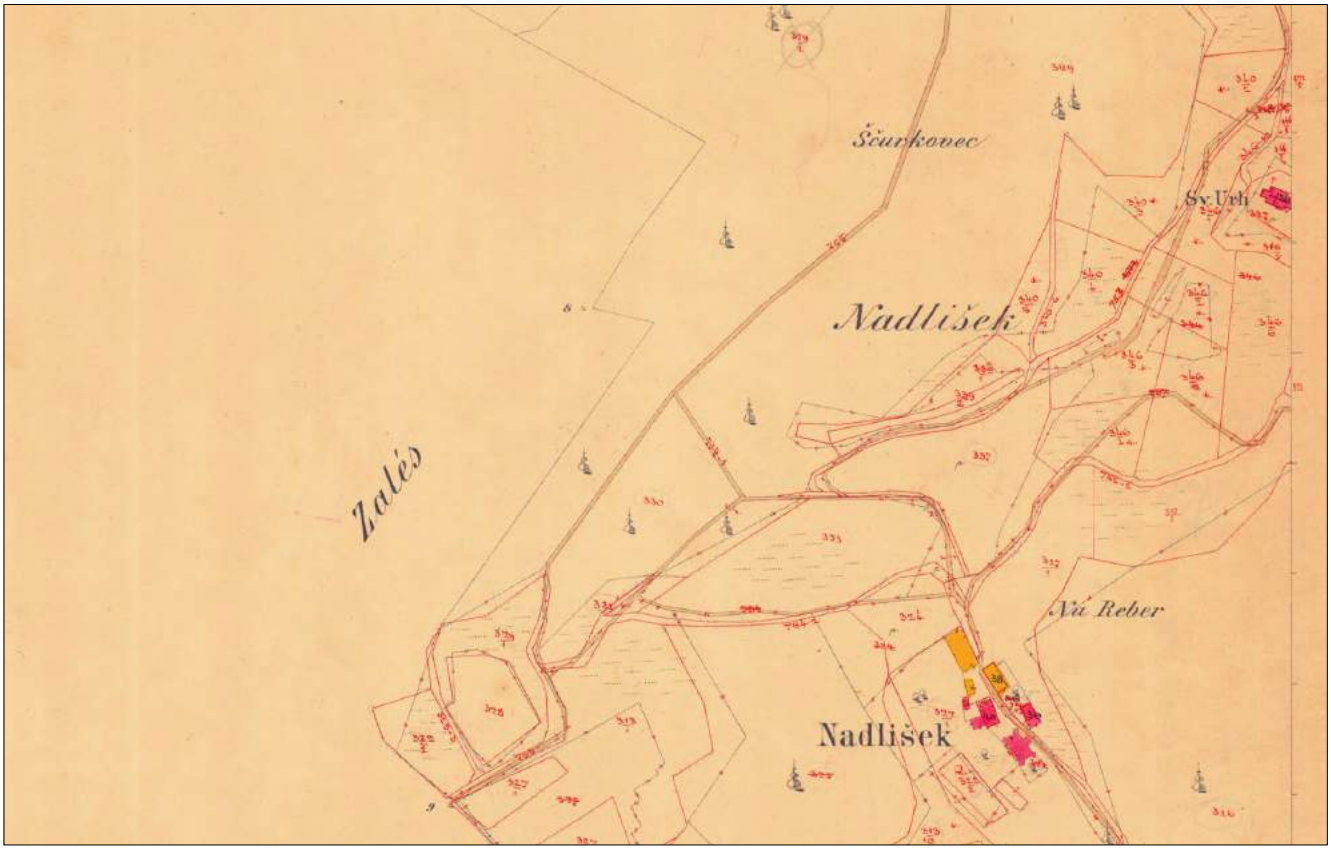
Franciscan cadastre map from 1823, showing building no. 37 (reputed home of Martin Krpan) drawn between the Nadlišek manor and the Church of St Ulrich.
Source: https://mapire.eu/
In the list of building plots of the Franciscan cadastre from 1823, plot 37 is entered as the property of the Lords of Nadlišek, measuring 27 fathoms.
Source: Archives of the Republic of Slovenia, Franciscan cadastre

The legendary strongman Martin Krpan, whether a character of "true history" or of "historical reality", is said to have lived in a hut at Vrh pri Sveti Trojici between 1680 and 1750, "according to Karl Moritz, one of the first dialecticians in this area, as early as the end of the 18th century".

***Silvo Fatur**, Slovenian literary historian and language teacher, born on 2 February 1935 in Zagorje near Pivka, an honorary citizen of the municipality of Pivka and an honorary member of the Slavicist Society of Slovenia etc., claims that Martin Krpan hailed from Vrh near the church of Sv. Trojica at the top of the Lonica hill in the Pivka region, and was thus a member of the Slavina parish and a Pivka local. A strong enough argument, then, that the people of Pivka included him in their municipal coat of arms.*

***Slavko Petrič**, forester, innovator, designer and researcher, born on 30 June 1928, in Lipsenj, Sveti Štefan, in the municipality of Cerknica, proved with additional research and data from the Franciscan cadastre that the village or hamlet of Vrh is located in the northern part of the Bloke plateau, near the village of Sveta Trojica, and he even located the ruins of the house in which Levstik's literary protagonist Martin Krpan was said to have lived. According to the Franciscan cadastral plan from 1823, the residence of Martin Krpan was on building plot no. 37 CM Hiteno, measuring 97 square metres (27 yards), which was the property of the Count of Nadlišek.*

Source: Slavko Petrič, Nova vas on 18 April 2015



Katastrski načrt v uporabi od 1903 do 2003, kjer je domnevna rojstna hiša Martina Krpana že pobrisana iz evidence
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Cadastral plan in use from 1903 to 2003, where the reputed birth house of Martin Krpan had already been deleted from the records.
Source: the e-ZKN archive land cadastre map viewer

Po nemškem kartografu Maxu Eckertu je kartografija zmes znanosti in umetnosti. Kartografija je res ena najmlajših znanosti, vendar pa so karte eden najstarejših načinov komunikacije, shranjevanja in prenosa podatkov.

German cartographer Max Eckert considered cartography a mixture of science and art. Cartography may well be one of the youngest sciences, but maps are one of the oldest ways of communicating, storing, and sharing information.

Za uveljavljanje stvarnopravnih pravic na zemljiščih in lege meje zemljišča v naravi so se uporabljali zemljiškokatastrski načrti, zato so tudi predstavljali podlago za prevedbo analognega grafičnega zemljiškega katastra v digitalno obliko.

Land cadastral plans were used to enforce property rights on land and the location of land borders in nature, so they also represented the basis for the digitalization of the analogue graphic land cadastre.

» Pred uveljavitvijo zemljiškokatastrskih načrtov so se stvarnopravne pravice na zemljiščih urejale po predpisih iz leta 1543. V nadaljevanju zapisano je veljalo pod žužemberško in soteško gorsko gosposko od konca 17. do začetka 19. stoletja.

Kot vir za spoznanje običajnega prava v okoliših žužemberške in soteške graščine se navaja soteški prevod gorskih bukev, ki jih je izdal Ferdinand I. na Dunaju, dne 5. februarja 1543.

Enotnost prava v državi je konec 18. stoletja slabela. Le še dve, tri desetletja se je običajno pravo borilo za svoj obstoj, oklepajoč se gorskih bukev iz l. 1543. V prvem desetletju 19. stoletja je ljudsko pravo podleglo, ostali so le še spomini na gorske bukve, v kolikor so ugajali patrimonialni gosposki, dokler ni še s temi pometlo leto 1848.

Nekaj zapiskov iz sodb ljudskega prava:

»Dne 30. septembra 1704 (Armberk in Lipnik, ki sta v bližini graščine Lanprež-»Landpreis«) je bil predmet tožbe, da delata dva oreha vinogradu tožnika senco in s tem škodo. Ugovor pa se je glasil, da stojita oreha na svetu Lanpreške graščine. Sodniki so izjavili, da za to pravdo niso pristojni. Krajevna pristojnost pa se ne določa po bivališču pravdnih strank, ampak po kraju, kjer leži vinograd, z drugo besedo stvarna pristojnost in krajevna pristojnost se morata kriti.«

»Naravnost o priposestvovanju vinograda govori zapisnik z dne 21. marca 1725 (Šmaver). Pravda je tekla radi vinograda, ki ga ima hči Mihe Trlepa v posesti, ki pa je bil v resnici last Ivana Terlepa, a tožiteljica ne priznava, da bi ga smeli dediči Ivana Terlepa obdržati, ter zahteva zato »einen gerichtlichen Auswurff«. Toženka je ugovarjala, da poseduje zase, s svojim možem vred vinograd preko 30 let in 1 dan, tožiteljica da se nahaja »infacto alieno«, ter naj se tožiteljici naloži »asilentium perpetuum«. Toženka je zmagala na celi črti.«

»Dne 9. oktobra 1725 je v Šmavru tožil Janc Perpar svojega zeta, češ, da mu naj vrne polovico vinograda, ki ga je le-ta priženil. Sodniki so odločili, da morata živeti obe stranki v medsebojnem miru in obdelovati vinograd po jednakih delih; ako pa bi se ena ali druga stranka ne hotela tega držati, zapade njegova polovica v korist drugi stranki. Bližnjih podatkov ni; domnevamo, da so hoteli sodniki zeta pripraviti do tega, da potrpi s starim tastom, sicer mu priženjeno polovico vinograda odrečejo.«

Vir: Dolenc, M. (1930), Časopis za zgodovino in narodopisje, Maribor «

V Sloveniji sta bili v zemljiškem katastru v uporabi dve vrsti načrtov. To so bile kopije ZKN-jev grafične izmere iz 19. stoletja in načrti numeričnih izmer, ki so se izdelovali od obdobja med obema vojnama do uveljavitve digitalnih grafičnih podatkov (DKN).

Največji delež, kar 66 % ZKN-jev, so pri nas še vedno predstavljali načrti grafične izmere v merilu 1 : 2880, zemljiškokatastrskih in topografskih načrtov numeričnih izmer v merilih 1 : 2500, 1 : 2000, 1 : 1000 in 1 : 500 pa je skupaj 33 %. Preostali del so predstavljali načrti v merilih 1 : 5760, 1 : 1440 in 1 : 720 (podatek Inštituta za geodezijo in fotogrametrijo iz leta 1996, stanje se do prehoda v digitalno obliko ni bistveno spremenilo).

» Prior to the land cadastral plans' entry into force, property rights on land were regulated in accordance with the regulations of 1543. The following was in force under the Žužemberk and Soteska highland lordships from the end of the 17th to the beginning of the 19th century.

The Soteska translation of the Viticulture books, issued by Ferdinand I in Vienna on 5 February 1543, is cited as a source for learning about common law in the districts of Žužemberk and the Soteska manor.

The unity of law in the country was weakened at the end of the 18th century. The common law fought for its existence for two or three more decades, clinging to the Viticulture books of 1543. In the first decade of the 19th century, the people's law succumbed, leaving only memories of the Viticulture books, before the patrimonial lords did away with those as well in 1848.

These are some notes from the judgments of the people's law:

"On 30 September 1704 (Armberk and Lipnik, near the manor of Lanprež – "Landpreis"), the subject of the action was that two walnut trees were casting shade on the plaintiff's vineyard, thus damaging it. The objection, however, was that the walnut trees stood on the soil of the Lanprež mansion. The judges decided they had no jurisdiction over the lawsuit. Territorial jurisdiction is not determined by the place of residence of the litigants, but by the place where the vineyard lies, in other words, substantive jurisdiction and territorial jurisdiction must overlap."

"The minutes of 21 March 1725 (Šmaver) directly mention the possession of the vineyard. A lawsuit was filed in relation to the vineyard owned by Miha Trlep's daughter, which was in fact owned by Ivan Terlep, but the plaintiff does not deem that Ivan Terlep's heirs should keep it, and therefore demands "einen gerichtlichen Auswurff" (court-ordered expulsion). The defendant objected that she had owned the vineyard with her husband for over 30 years and 1 day, that the plaintiff was located "infacto alieno", and that the plaintiff should be decreed with "asilentium perpetuum". The defendant decisively won the case."

"On 9 October 1725, Janc Perpar from Šmavr sued his son-in-law, claiming that the latter should return the half of the vineyard he had received by marriage. The judges ruled that both parties should live in peace with each other and cultivate the vineyard in equal parts; however, if one or the other party did not want to adhere to this, their half falls to the other party. There is no associated information; we assume that the judges wanted to force the son-in-law to put up with his father-in-law, otherwise they would take away his half of the vineyard."

Source: Dolenc, M. (1930), Journal of History and Ethnography, Maribor «

In Slovenia, two types of maps were in use in the land cadastre. These were copies of land cadastre plans of 19th-century graphic numerical measurements, produced from the inter-war period to the introduction of digital graphical data (digital cadastral pans).

The largest share, as much as 66% of land cadastre plans, was still represented by graphic measurement plans in a scale of 1:2880, while land cadastral and topographic plans of numerical measurements in scales of 1:2500, 1:2000, 1:1000 and 1:500 amounted to 33%. The remaining plans were drawing in scales of 1:5760, 1:1440 and 1:720 (data from the Institute of Geodesy and Photogrammetry from 1996, the situation did not change significantly up to the transition to digital form).

Slika 2.4.1: Situacijski načrt vrisa banske ceste II. reda v M 1 : 5760, ki ob potrditvi izkazuje dovoljeno mejo pogreška 1/200.
Vir: Arhiv GURS

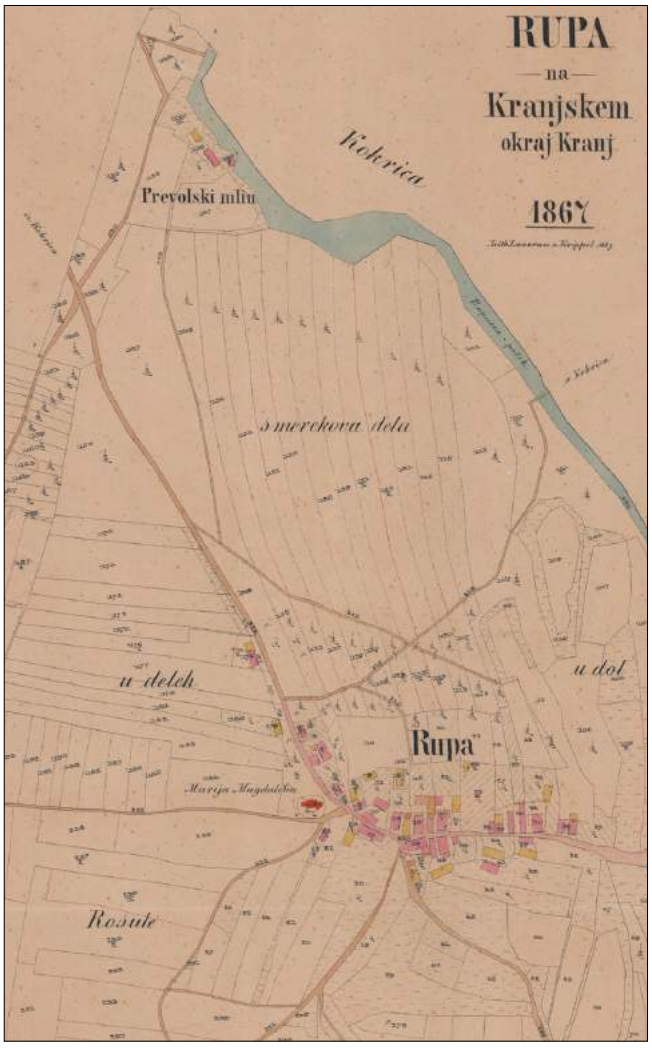
Figure 2.4.1: Situation plan of the Banska road of the second order in a scale of 1:5760, which upon confirmation shows the permissible error limit of 1/200.
Source: The SMARS archive

Originalnih katastrskih načrtov grafične izmere, ki so bili za območje Slovenije izdelani v prvi polovici 19. stoletja, se ne uporablja več, vendar so ti prikazi kljub temu zanimivi zaradi izraznih sredstev za prikaz vsebine načrtov.

Osnova večine (pribl. 70 %) ZKN-jev niso originalni načrti franciscejskega katastra, ampak reprodukcija reambuliranih originalnih načrtov, izdelanih v obdobju med letoma 1869 in 1883. Na kopije načrtov reambulančnega katastra so se bolj ali manj redno vrisovale spremembe in popravki parcelnega stanja. Po potrebi so se načrti tudi prerisovali ali pa se je naredil odtis z novim stanjem. S popravljanjem in prerisovanjem načrtov se je spreminjal tudi način prikaza vsebine.

The original cadastral plans of graphic measurements, which were made for the area of Slovenia in the first half of the 19th century, are no longer used, but these representations are nevertheless significant due to their expressive means of showing the content of the plans.

The basis of the majority (approx. 70%) of the land cadastre plans are not the original plans of the Franciscan cadastre, but reproductions of the revised original plans produced between 1869 and 1883. Copies of the plans of the revised cadastre were regularly supplemented by changes and corrections to the land plot situation. When necessary, the plans were also redrawn, or an imprint was made showing the new situation. Correcting and redrawing the plans also brought about changes in the ways of displaying content.



Slika 2.4.2: Katastrski načrt k. o. 2101 Rupa z vrisanimi spremembami, nastalimi do leta 1869.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

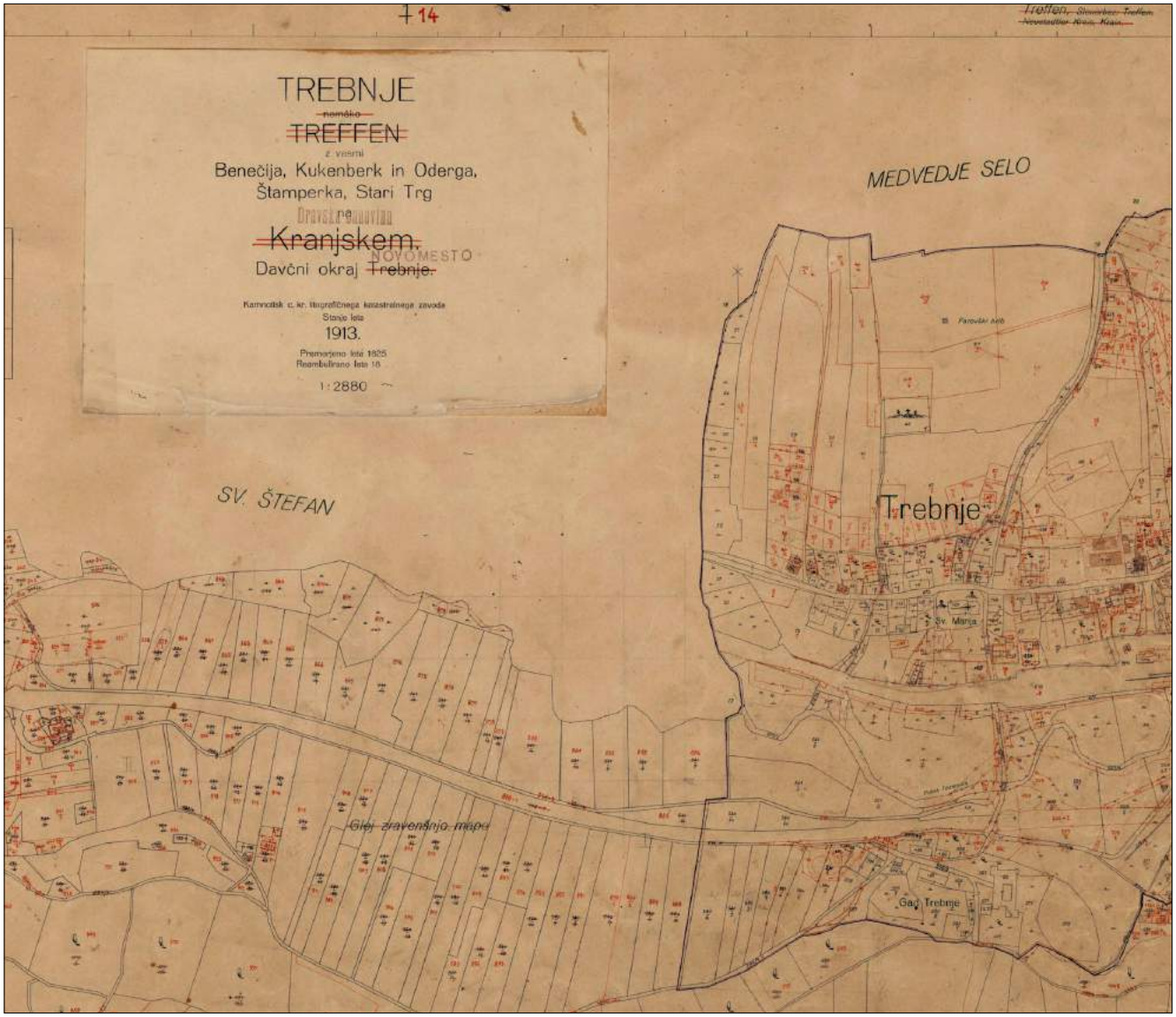
Figure 2.4.2: Cadastral plan of CM 2101 Rupa with inscribed changes made up to 1869.
Source: the e-ZKN archive land cadastre map viewer

Slika 2.4.3: Katastrski načrt k. o. 2101 Rupa, prerisan na obstojno folijo leta 1977 z vsemi popravki od leta 1869 do leta 1977.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 2.4.3: Cadastral plan CM 2101 Rupa, redrawn on durable foil in 1977 with all corrections from 1869 to 1977.
Source: the e-ZKN archive land cadastre map viewer

Načrti numeričnih izmer so se po materialu, merilu in vsebini razlikovali od katastrskih načrtov grafične izmere. Katastrski načrti numeričnih izmer so se izdelovali v merilih 1 : 500, 1 : 1000, 1 : 2000 in 1 : 2500, ki izhajajo iz metrskega sistema. Navedeni načrti numeričnih izmer so bili najprej izdelani na belem risalnem papirju, prosojnem papirju ali risani na papirju s kovinskim vložkom, nazadnje pa na plastičnih folijah, ki so dimenzijsko obstojnejše od papirja.

Numerical survey plans differed from graphic survey plans in their material, scale and content. Cadastral plans of numerical measurements were produced in scales of 1:500, 1:1000, 1:2000 and 1:2500, which are based on the metric system. These numerical measurement plans were first made on white drawing paper, translucent paper or drawn on paper with a metal insert, and ultimately on plastic foil, which is more dimensionally stable than paper.

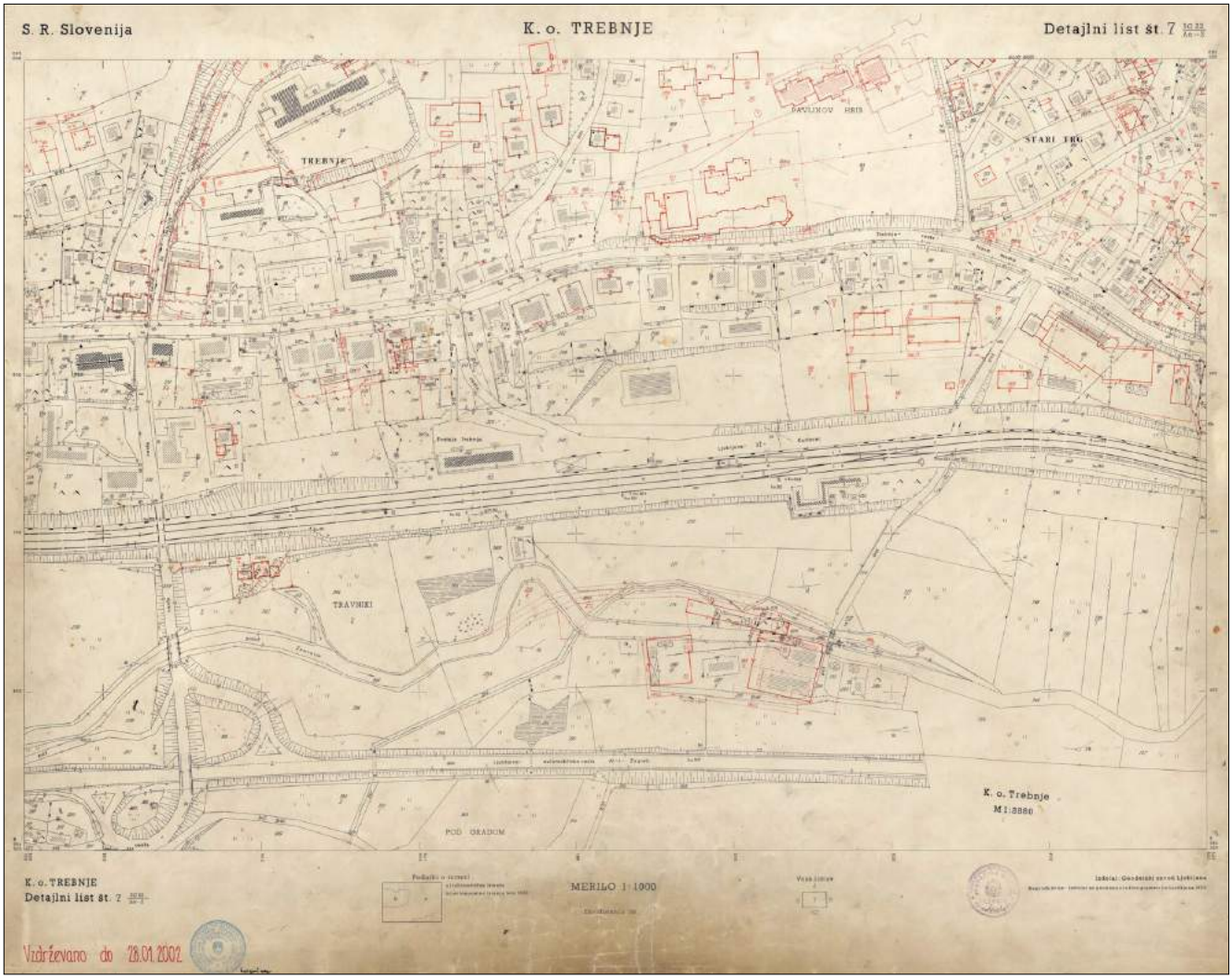


Slika 2.4.4: Načrt k. o. 1422 Trebnje list št. 14 v M 1:2880 z vrisanim območjem, za katerega je bil leta 1963 izdelan načrt numerično grafične izmere v M 1 : 1000.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 2.4.4: Plan of CM 1422 Trebnje, sheet no. 14, in a scale of 1:2880 with the area marked for which a plan of numerical graphic measurement was made in 1963 in a scale of 1:1000.
Source: the e-ZKN archive land cadastre map viewer

Nazadnje je bil v uporabi numerični način izmere, kar pomeni, da so bile mejne točke določene s koordinatami v veljavnem koordinatnem sistemu in so bile tudi površine določene iz koordinat. Izbira metode izmere, pa naj gre za klasične tradicionalno uveljavljene načine, za terestrično numerično ali fotogrametrično metodo izmere, je bila odvisna od več dejavnikov, in sicer od merskega instrumentarija, ki se je spreminjal z razvojem tehnologije, predpisane natančnosti, gostote pozidave, razgibanosti in velikosti območja ter časa, ki je bil na razpolago za izdelavo novega načrta.

Ultimately, the numerical method of measurement was used, meaning that the border points were determined by coordinates in the valid coordinate system, and the surface areas were determined from the coordinates as well. The selection of the method of measurement, whether classic traditional methods, terrestrial numerical or photogrammetric measurement methods, depended on several factors, namely the measuring instrumentation, which changed along with the development of technology, the prescribed accuracy, building density, variability and size of the area, and the time available to produce a new plan.



Slika 2.4.5: Načrt k. o. 1422 Trebnje D. L. 7 v M 1 : 1000 iz leta 1963 na risalnem papirju s kovinskim vložkom.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 2.4.5: Plan of CM 1422 Trebnje D. L. 7 in a scale of 1:1000 from 1963 on drawing paper with metal insert.
Source: the e-ZKN archive land cadastre map viewer

2.5 Značilnosti izdelave in vzdrževanja katastrskih načrtov
Characteristics of the production and maintenance of cadastral plans

Položajna natančnost katastrskega načrta grafične izmere je odvisna od parametrov, ki so veljali v vsaki fazi njihovega nastajanja:

- od grafične metode merjenja,
- instrumentov,
- metod izdelave
- ter vzdrževanja.

The positional accuracy of graphic measurement cadastral plans depends on the parameters that were valid at each stage of their development:

- the graphical method of measurement,
- the instruments,
- the period of production,
- and maintenance.

Slika 2.5.1: Merska orodja oz. geodetski instrumentarij iz začetka, sredine in konca 19. stoletja.
Vir: Slak, J. (2017) Geodetski instrumenti in oprema na Slovenskem (fotografije: Boštjan Pucelj)

Figure 2.5.1: Measuring tools – surveying instruments from the beginning, middle and end of the 19th century.
Source: Slak, J. (2017) Surveying Instruments and Equipment in Slovenia (photos: Boštjan Pucelj)

Slika 2.5.2: Geodetski instrumentarij iz začetka, sredine in konca 20. stoletja.
Vir: Slak, J. (2017) Geodetski instrumenti in oprema na Slovenskem (fotografije: Boštjan Pucelj)

Figure 2.5.2: Surveying Instruments from the Beginning, Middle and End of the 20th Century.
Source: Slak, J. (2017) Surveying Instruments and Equipment in Slovenia (photos: Boštjan Pucelj)

Slika 2.5.3: Geodetski instrumenti v 21. stoletju.
Vir: Slak, J. (2017) Geodetski instrumenti in oprema na Slovenskem (fotografije: Boštjan Pucelj)

Figure 2.5.3: Surveying Instruments in the 21st Century.
Source: Slak, J. (2017) Surveying Instruments and Equipment in Slovenia (photos: Boštjan Pucelj)

Položajna natančnost grafičnih načrtov je odvisna tudi od reliefne značilnosti terena (hriboviti ali ravninski predeli, nepregledni gozdovi ipd.) in od značilnosti merjenja detajla. Poznano je, da je bila večja prioriteta merjenja dana gosposkim in cerkvenim posestvom ter parcelam ravninskega sveta, manjša pa gozdnim parcelam in stavbam.

Vsekakor pa je relativna natančnost katastrskih načrtov grafične izmere bistveno boljša od absolutne.

Dotrajanost 200 let stare evidence zemljiškega katastra je nesporna. Kaj vse je v dveh stoletjih vplivalo na to, je opisano v nadaljevanju.

- Franciscejska izmera posestnih parcelnih meja zemljišč je bila opravljena za večji del območja današnje Slovenije (razen Prekmurja) pred več kot 190 leti. Znano je, da se meje niso trajno označile. Verjetnost ugotovitve identičnosti mejnih točk v sodobnem času s položajem zabeleženja v času nastavitve katastra je zato komaj verjetna.
- Izmera je temeljila na računski in grafični triangulaciji, detajlna izmera parcele pa je bila opravljena grafično z mersko mizo direktno na papir v letih 1823–1826 (Kranjska dežela), 1826–1828 (Koroška), 1820–1825 (Štajerska) in 1856–1867 (Prekmurje).
- Originalna katastrska mapa je bila izdelana kot avtentičen zaris stanja vseh zemljišč v katastrski občini praviloma v merilu 1 : 2880. Originalne katastrske mape so bile izdelane na izredno kvalitetnem papirju ročne izdelave z vodnim znakom tvrdke, ki ga je izdelala, in grbom. Vsak posamezen list katastrske mape meri 71,5 cm × 58 cm.

The positional accuracy of the graphical plans also depends on the relief characteristics of the terrain (hilly or flat areas, opaque forests, etc.) and on the characteristics of the detail measurement. Higher priority of measurement was given to manorial and ecclesiastical estates and plots located in flat areas, while forest plots and buildings were less important.

In any case, the relative accuracy of graphical survey cadastral plans is significantly higher than their absolute accuracy.

The obsolescence of the 200-year-old land cadastre record is indisputable. Below are presented the factors that influenced this fact over the course of two centuries.

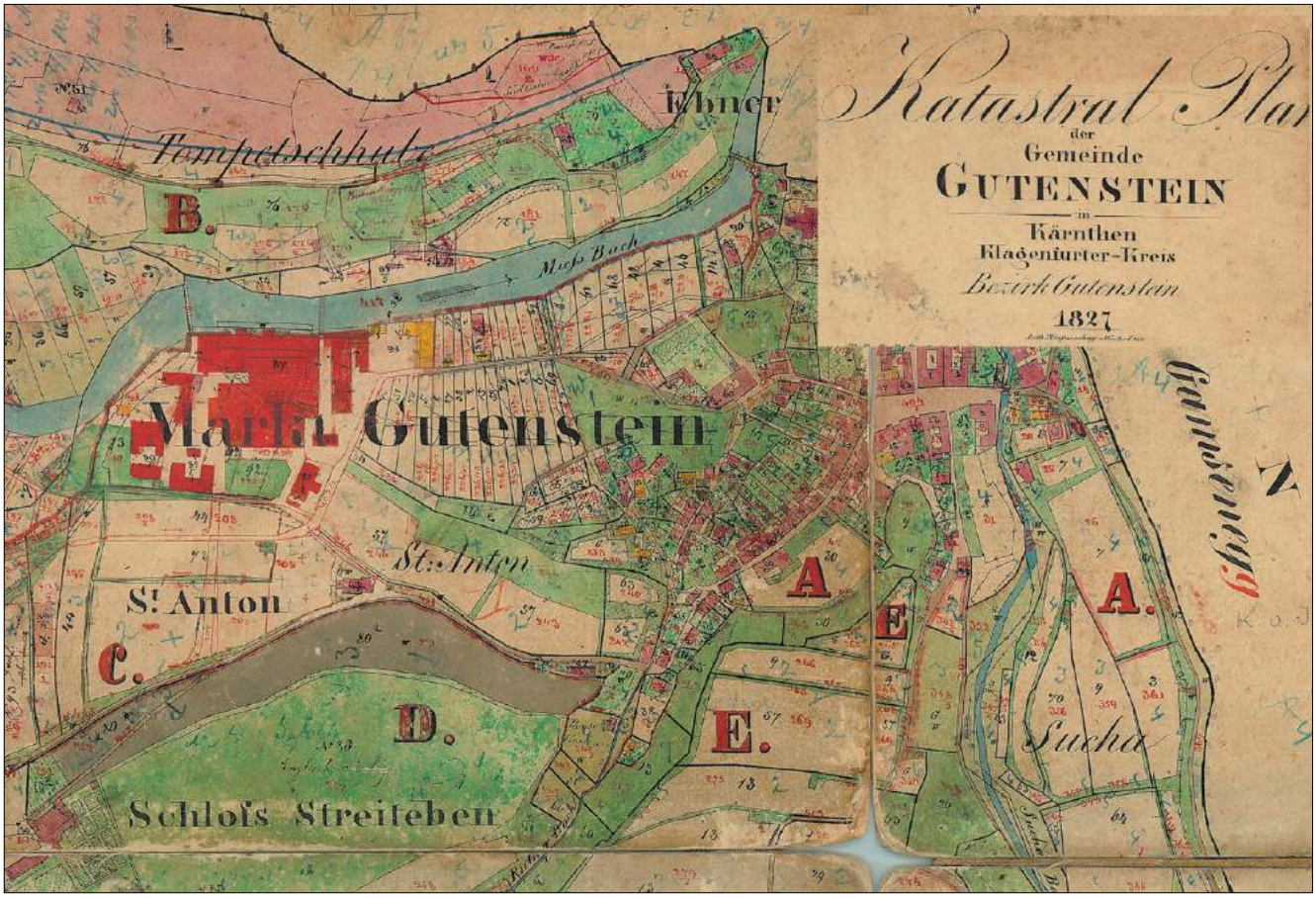
- The Franciscan survey of land plots was carried out for most of the area of present-day Slovenia (except Prekmurje) more than 190 years ago. It is apparent that the borders were not permanently marked. It is therefore nearly impossible to match up border points in modern times with the position of recording at the time of setting up the cadastre.
- The survey was based on computational and graphical triangulation, and a detailed measurement of the plot was performed graphically with a plane table directly on paper in 1823–1826 (Carniola), 1826–1828 (Carinthia), 1820–1825 (Styria) and 1856–1867 (Prekmurje).
- The original cadastral plan was made as an authentic outline of the condition of all land in the cadastral municipality, generally in a scale of 1:2880. The original cadastral plans were produced on high-quality hand-made paper, including a watermark of the manufacturing firm and a coat of arms. Each individual sheet of the cadastral plan measures 71.5 cm × 58 cm. Each sheet has a prescribed edge of 2.5 cm, which was not to be used for sketches of cadastral areas. The original

Vsak list ima predpisan rob 2,5 cm, ki se ni smel uporabiti za zajemanje narisa katastrskih površin. Originalna katastrska mapa je obarvana z barvami, določenimi za označitev posameznih katastrskih kultur po navodilih za izvedbo katastrske izmere. Barvni toni posameznih katastrskih kultur v okviru ene katastrske občine so se morali pokrivati, na kar so morali inšpektorji ob končnem pregledovanju mape posebej paziti. V obarvano mapo so vpisali in vrisali ostale napise in oznake. Stavbne parcele so oštevilčili s črnim tušem, zemljiške parcele pa z rdečim.

- Poleg originalnega katastrskega načrta je bila izdelana tudi indikacijska skica, ki se po točnosti in izdelavi skoraj povsem približuje zarisu zemljišč v originalni katastrski mapi. Indikacijska skica je bila izdelana v istem merilu kot original. En list originalne katastrske mape predstavlja štiri liste indikacijske skice. Velikost lista indikacijske skice je 34 cm × 27,5 cm. Indikacijska skica je izdelana na kartonu kot podloga za komisijski ogled o opravljeni izmeri na terenu. V indikacijske skice so poleg vpisov, ki jih vsebuje originalni mapni list, vneseni še podatki o lastniku zemljišča, hišna številka, kraj bivanja lastnika in izmera zemljišča. V posameznih parcelah so tudi vrisani konvencionalni znaki za označevanje posameznih katastrskih kultur. Indikacijske skice so bile izdelane zaradi preverjanja pravilnosti opravljene izmere na terenu.
- Originalna katastrska mapa je grafični zaris zemljišč, ki ga je geometer izdelal ob merjenju na terenu. Mapni list je bil ob merjenju na terenu prilepljen z jajčnim beljakom na merilno mizico. S tem je bila zagotovljena nepremičnost mapnega lista na mizici ob merjenju oziroma zajemanju parcel na mapni list.
- Pri postavljanju osnov za nastavitev grafičnega katastra naj bi bila za izračun trigonometrijskih točk I. reda (glede na analize še to nedosledno) uporabljena Cassini-Soldnerjeva projekcija, katere značilnosti so naraščajoče, neenakomerne deformacije.
- Označena in izračunana je bila le osnovna mreža I. reda, toda, raziskave kažejo, da je bila ta večinoma izravnana v ravnini na ravninske trikotnike (na 180°). Ohranjene so le redke označbe.
- Poudarek izmere je bil na »posestnih mejah«, stavbe so bile locirane le z eno točko znotraj parcele, na nekaterih področjih pa naknadno izmerjene s precej manjšo natančnostjo. Posebej problematične so meje med vrstami rabe zemljišč in konstrukcije mej »v tablah« gozdnih kompleksov.

cadastral plan uses colouring in line with the specifications for marking individual cadastral cultures in accordance with the instructions for carrying out cadastral surveys. The colour tones of individual cadastral cultures had to overlap within a single cadastral municipality, which the inspectors had to pay special attention to during the final inspection of the map. Other inscriptions and markings were entered and drawn in the coloured maps. Building plots were numbered with black ink and land plots with red ink.

- In addition to the original cadastral plan, a field cadastral plan was also produced, which, in terms of accuracy and construction, almost completely reflects the outline of the land in the original cadastral plan. The field cadastral plan is made to the same scale as the original. One sheet of the original cadastral plan represents four sheets of the field cadastral plan. The size of a field cadastral plan sheet is 34 cm × 27.5 cm. The field cadastral plan is made on cardboard as a basis for a commission inspection of the field measurement performed. In addition to the entries contained in the original map sheet, field cadastral plans also include information on the owner of the land, the house number, the place of residence of the owner and a land survey. Conventional signs for marking individual cadastral cultures are also drawn in individual plots. Field cadastral plans were made in order to verify the correctness of the field survey.
- The original cadastral plan is a graphical drawing of the land, made by the surveyor during field measurements. The map sheet was pasted with egg white onto the plane table during field measurement. This ensured the immobility of the map sheet on the table when measuring or recording plots on the map sheet.
- The Cassini-Soldner projection, which is characterized by increasing, uneven deformations, is said to have been used for the calculation of first-order trigonometric points when laying the foundations for setting up the graphic cadastre (which is, however, inconsistent with this analysis).
- Only a basic grid of the first order was marked and calculated, but research shows that it was generally adjusted to plane triangles (at 180°). Very few markings are preserved.
- The emphasis of the survey was on "property borders", the buildings were marked with only a single point within the plot, and in some areas, they were measured subsequently with much less accuracy. Especially problematic are the borders between types of land use and the constructions of borders "in the tables" of forest complexes.



Slika 2.5.4: Indikacijska skica k. o. 882 Guštajn (od leta 1952 dalje Ravne na Koroškem) iz leta 1827.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 2.5.4: Field cadastral plan of CM 882 Guštajn (Ravne na Koroškem from 1952 onwards) from 1827.
Source: the e-ZKN archive land cadastre map viewer

Slovenska realnost glede reda na posestnih mejah

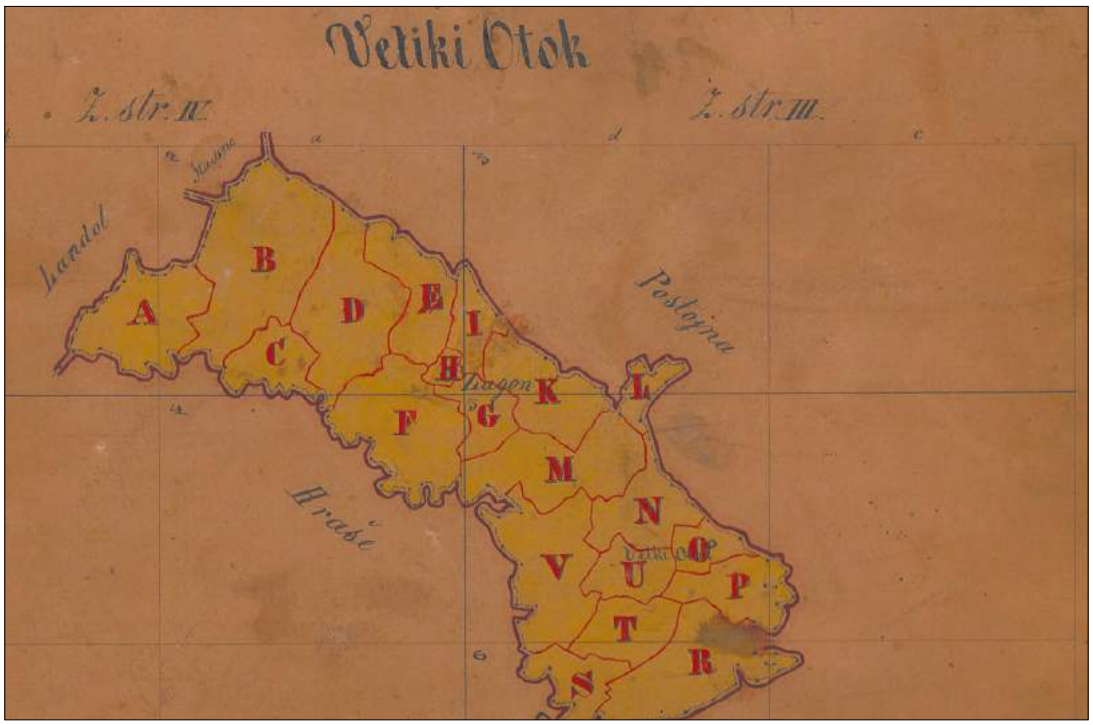
Neurejenost meja je posebno pereča v naši kmečki, drobni zasebni posesti; mnogi za svojo posest niti ne vedo. Na primer povprečna slovenska gozdna posest je velika okoli 2,5 hektarja, ta pa je še nadalje razdeljena na posamezne parcele, ki so med seboj lahko zelo oddaljene. Pričakovati, da se bo lastnik gozda, ki niti ne ve, kje ima parcelo, odgovorno obnašal do svoje lastnine, je verjetno iluzorno. Eden od verjetnih vzrokov za neurejenost meja v gozdovih je gotovo tudi slab odnos do zasebne lastnine same. Če meja ob prodaji posesti ni urejena, bo na trgu ta parcela dosegala tudi nižjo ceno, lahko se tudi zgodi, da v primeru gozdnih parcel revirni gozdar ne bo hotel označiti dreves za posek in izdati primerne odločbe, če lastnik ne bo znal meje pokazati in zanjo tudi odgovarjati. Edina prava in uradna meja med parcelami je meja, označena na terenu z mejnimi znamenji (mejnik) in postavljena v soglasju z ostalimi sosedi. Posest nad nepremičnino pomeni tudi določeno obveznost, ena od teh pa je tudi imeti urejene meje in urejene odnose s sosedi, ker v nasprotnem primeru služijo tretji (odvetniki).

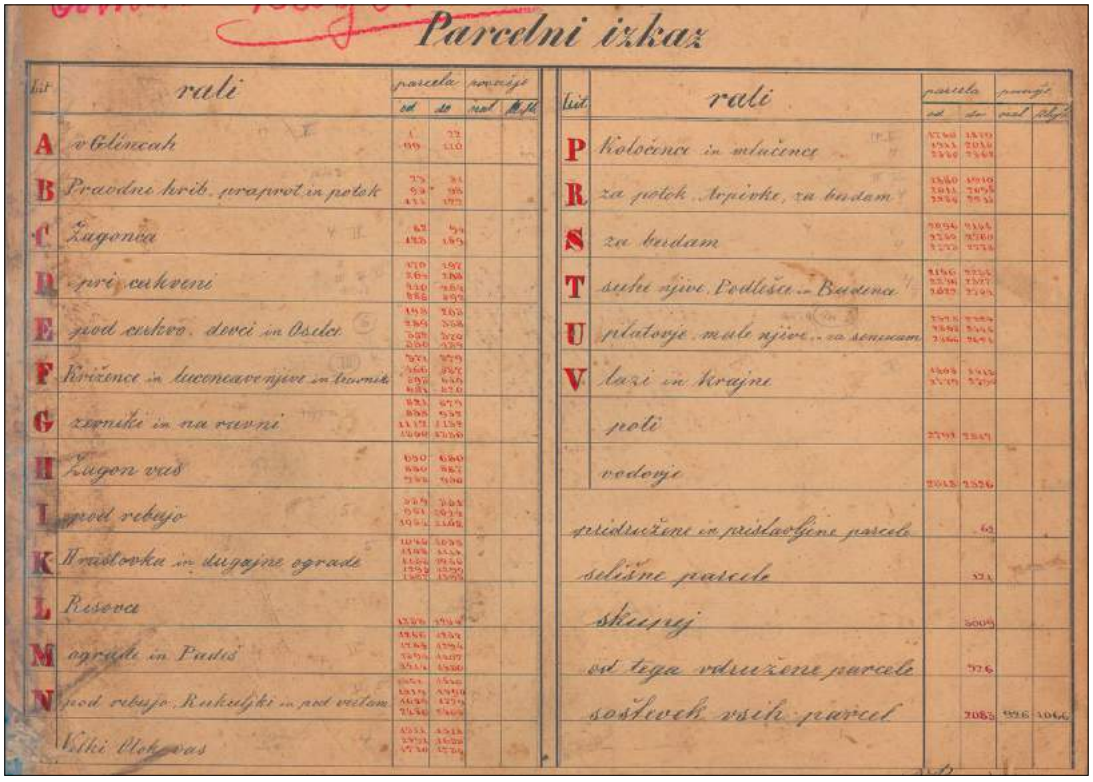
Vir: Zdravko Turk, Z. 2012, Urejena meja sosede spremeni v prijatelje, Dnevnik

The situation regarding property borders in Slovenia

The non-regulation of borders is particularly present in small rural private estates; many people are not even fully aware of the extent of their own property. For example, the average Slovenian forest estate measures about 2.5 hectares, and it is further divided into individual plots, which may be very far apart. It is unrealistic to expect a forest owner who does not even know the location of their plot to be a responsible landlord. One of the probable reasons for the non-regulation of borders in forests is certainly the poor attitude towards private property itself. If the border is not regulated at the time of sale of the property, the plot will have a lower price in the market. It may also occur in the case of forest plots that the district forester will not agree to mark the trees for felling and issue appropriate decisions since the owner cannot indicate the border and does not have responsibility for it. The only true and official border between plots is the border marked in the field with border markers (landmark) and set in agreement among the neighbours. Possession of real estate also comes with certain obligations, one of which is to have regulated borders and regulated neighbour relations, since otherwise it becomes necessary to involve third parties (legal experts).

Source: Zdravko Turk, Z. 2012, A Regulated Border Turns Neighbours into Friends, Dnevnik





Slika 2.5.5: Shematski prikaz delitve k. o. 2477 Zagon na ledine, njihovo poimenovanje in seznam parcelnih številk znotraj posamezne ledine.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 2.5.5: Schematic representation of the division of CM 2477 Zagon into fallow lands, their naming, and a list of lot numbers within each fallow land.
Source: the e-ZKN archive land cadastre map viewer

- Listi detajla so bili v povprečju razdeljeni na 5–7 območij, imenovanih ledine. Za vsako ledino je bila opravljena izmera posebej (otočno). Tako kot niso združljive meje med posameznimi k. o., niso združljivi niti detajli na mejah med ledinami. Geometer je podrobno merjenje opravil v okviru občine po posameznih listih in po ledinah. Če določena ledina še ni imela svojega imena, ji ga je lahko dal geometer. Take ledine so bile nove tvorbe pri rajonizaciji zemljišč v okviru katastrske občine in so nastale zaradi olajšanja dela pri izvedbi izmere.
- Približno 20 let po nastanku originalne mape je bila izdelana rektifikacijska mapa. Za rektifikacijske mape so uporabljali nebarvane mapne kopije. Ta mapa je vsebovala vse popravke in dopolnitve, ki so nastale v času po prvotni katastrski izmeri. V mapi so z rdečim tušem izrisani popravki na parcelah, kjer so nastale spremembe, zlasti v času razdeljevanja velikih srenjskih parcel med več lastnikov, ob delitvah kmetij, gradnji novih prometnih poti in v zvezi z industrializacijo v naseljenih krajih. Pri popravkih so zadržali staro parcelno številko, ki so ji v obliki ulomka dodali še podštevilko od 1 naprej. Rektifikacijska mapa je skupaj z originalno mapo tvorila osnovo za izdelavo reambulančnih katastrskih operatov.
- Po letu 1867 je bila franciscejska izmera obnovljena (reambulančni katastrski načrti). Stojišča stare – osnovne izmere iz že prej navedenih razlogov niso bila označena. Natančnost vrisa domerjene vsebine oz. parcelnih mej je bila obremenjena s kakovostjo zelo različnih položajnih vklopov v osnovni načrt. Enako velja tudi za poznejše vzdrževanje vse do pretvorbe analognih načrtov v digitalni zapis.
- Stabilizacija točk grafične mreže ni bila predvidena, zato jih le izjemoma najdemo.
- Izvorni načrti v merilu 1 : 2880 imajo pomanjkljivost v tem, da je izmera detajla temeljila na grafični triangulacijski mreži, ki je bila zgoščena za potrebe merjenja detajla.
- Zaradi neenotnosti merila in orientacije katastrske triangulacije robovi listov po konformni transformaciji nimajo niti enotne dolžine niti premočrtnega poteka.
- Nesporno je neidentičnost lege mej na identičnih listih dveh sosednjih k. o. Predno se je lahko katastrsko mejo na posameznih katastrskih sekcijah vrisanih parcelnih mej spravilo v skupne liste za dve ali več sosednjih k. o., je bilo treba preizkusiti, ali so katastrske meje na posameznih sekcijah identične. Če se je izkazalo nesoglasje v grafični izmeri iste meje v sosednjih k. o., je pomenilo, da je bila meja v vsaki izmed občin drugače izmerjena.
- Nič manj pomemben vzrok za težave pa niso napake v detajlni izmeri, med njimi tudi grobe. Iz izkušenj izhaja, da so največ težav pri usklajevanju povzročale različne lokalne deformacije (napake v orientaciji ledin, osnovnih enot detajlne izmere). To se ugotavlja na podlagi dejstva, da je znotraj takšnih območij običajno dosežena zadovoljiva relativna natančnost.

- Detail sheets were divided on average into 5-7 areas called fallow lands. A separate survey was carried out for each fallow (insular). Just as the borders between individual CM are not mutually compatible, the same applies to the details at the borders between fallow lands. The surveyor would perform detailed measurements within the municipality by individual sheets and by fallow lands. If a particular fallow did not yet have a name, the surveyor could give it one. Such fallows were new formations in the zoning of land within the cadastral municipality and were created to facilitate the work of carrying out the survey.
- About 20 years after the original map, a rectification map was created. These were produced on uncoloured map copies and contained all the corrections and additions that occurred in the period after the original cadastral survey. The map shows in red ink the corrections to the land plots where changes took place, in particular the changes made during the distribution of large municipal plots among several owners, the division of farms, the construction of new traffic routes and industrialization in populated areas. The corrections retained the old parcel number, with the addition of a subheading from 1 onwards in the form of a fraction. The rectification map, along with the original, formed the basis for the production of revised cadastral records.
- After 1867, the Franciscan survey was revised (revised cadastral plans). The locations from the older base survey were not marked for the aforementioned reasons. The drawing accuracy of the additionally measured content or plot borders was subject to the varying quality of the different positions included in the base plan. The same applies to subsequent maintenance up until the digitization of the analogue plans.
- The stabilization of graphical grid points was not planned, so they are rarely encountered.
- Original plans in the scale of 1:2880 have the disadvantage that the detail survey was based on a graphical triangulation grid, which was condensed for the purpose of detail measurement.
- Due to the non-uniformity of the scale and the orientation of the cadastral triangulation, the edges of the sheets neither have a uniform length nor straight-line continuity after the conformal transformation.
- It is indisputable that the positions of borders on identical sheets of two adjacent CM were not identical. Before the cadastral borders on individual cadastral sections of drawn plot borders could be grouped into joint sheets for two or more adjacent CMs, it was necessary to test whether the cadastral borders in the individual sections were identical. If there was a discrepancy in the graphical survey of the same border in the adjacent CM, this meant that the boundary was measured differently in each of the municipalities.
- An equally important issue is errors in detail surveying, including gross errors. Experience shows that the greatest difficulties in coordination were caused by various local deformations (errors in the orientation of fallow lands, basic units of detail surveying). This is established on the basis of the fact that such areas usually achieved satisfactory relative accuracy.

O pomenu mape ali katastra ima priprosti narod misli, katere se ne morajo preostro in preobilokrat pobijati. Naš kmet goji namreč mnenje, da je kataster ali davkarijska mapa za lastninsko pravico merodajna.

Stvar se navadno takole prigodi! Kmetic zaide po kakem nesrečnem naključju v davkarijsko mapo, ter opazi s skrivnim veseljem, da pri ti ali oni njegovi parceli meja ni zakrivljena, kakor je doma na polju, temuč, da je ravna črta. Mož toraj opazi, kakor se pravi v življenju, „da mu mapa več kaže, kakor ima". Komaj čaka, da pride domu. In kadar prvič potem kosi ali orje, kosi ali orje tako, da je meja ravna črta, in da izgine kolobar, o katerem mapa ničesar ne ve. Tožba je narejena! Vžge se srdita pravda, med katero toženi vedno eno in tisto goni, da namreč mapa tako kaže.

Pred vsem se mora omenjati, da je davkarijska mapa silo površno napravljena, in da so parcele v mapi vedno drugačega izgledanja kot so v resnici. Zavoljo mape se tedaj lahko pri vsaki parceli pravda prične in žalostna resnica je, da ta mapa še sedaj provzročuje na stotine motenja v mirni posesti in da izbuja na kupe poželjivega hrepenenja po tuji zemlji.

Narodu se mora tedaj praviti in praviti, da nema mapa, kar se tiče lastninske pravice niti najmanjšega pomena ne. Ker se je mapa samo zavoljo davkov napravila, in ker je silno površno napravljena, nema pri pravdah zavoljo lastninske pravice nikake dokazilne moči. Če ti kaže mapa, da ima sosed na tisoče tvojih štirjaških sežnov, ki jih ima omenjeni sosed v oblasti in posesti, propal boš v vsaki pravdi, če nemaš druzega dokazilnega pripomočka kot mapo. Mapa ničesar ne dokaže. Kjer si nasprotujeta mapa in posest, premaga vselej posest. Zapazi naj se tedaj, da je posest več vredna kot mapa, kot kataster, ker je posest moč, kataster pa mrtev papir. Sedaj smo dospeli do tje, kjer nam je spregovoriti o tem, kar postave imenujejo „ posest".

Vir: Dr. Ivan Tavčar v Ljubljani. Izdala in založila Družba sv. Mohorja v Celovcu, v letu 1883

"Ordinary people have thoughts about the importance of a map or cadastre which cannot be too crudely or too often changed. Our farmer is of the opinion that the cadastre or tax file is binding in terms of property rights."

This is usually how it happens. By some unfortunate coincidence, the farmer accesses the tax file, and notices with hidden joy that a certain border of a certain plot he owns is not curved, as it is at home in the field, but that it is a straight line. The man therefore notices, we might say, "that the map is showing him more than he has." He cannot wait to get home. And then, the next time he mows or ploughs, he does it so that the border is a straight line, and the curve disappears without any trace in the map. A lawsuit is launched. An angry lawsuit ensues, during which the defendant keeps pointing to the map.

First of all, it must be mentioned that the tax map is very superficially made, and that the plots always look different in the map than they really are. The map, then, may spark disagreements on any plot, and the sad truth is that this keeps happening in hundreds of cases of disturbances of peaceful ownership and it awakens greed-driven desires for another's land.

The people then need to be told time and again that the map has absolutely no meaning in terms of ownership rights. Since the map was drawn up for the purpose of taxes and since its quality is severely lacking, it holds no probative value in lawsuits in terms of property rights. If the map shows that a neighbour holds thousands of yards of your land, which they have in their power and possession, you will fail in every lawsuit if the only evidence you have is the map. The map proves nothing. Where the map and land ownership come into conflict, the latter will always prevail. It should be noted then that land ownership is more valuable than the map and the cadastre, since land ownership is power, and the cadastre is dead paper. We have now reached the point where we have to talk about what the authorities call "land ownership".

Source: Dr. Ivan Tavčar in Ljubljana. Published by Družba sv. Mohorja in Klagenfurt in 1883

Slika 2.5.6: Izrez vsebine iz rektifikacijske mape k. o. 2027 Alten Laak (Stara Loka).
Vir: Arhiv Slovenije, franciscejski kataster

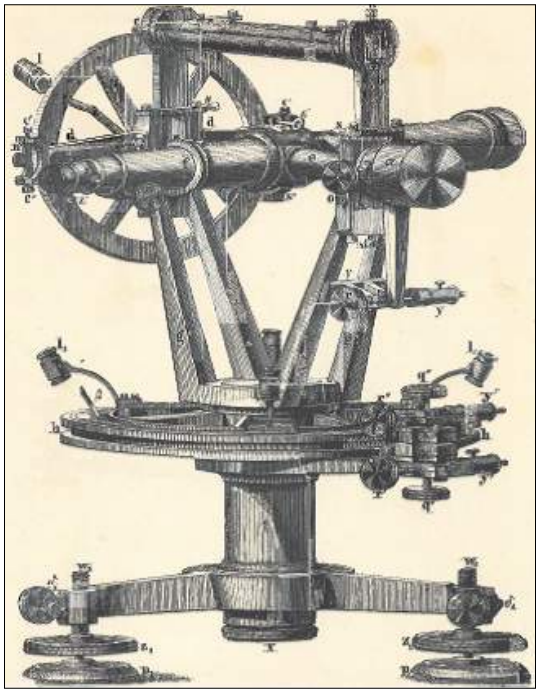
Figure 2.5.6: Excerpt from the rectification map of CM 2027 Alten Laak (Stara Loka).
Source: Archives of the Republic of Slovenia, Franciscan cadastre

Poleg zgoraj naštetega se lahko dotrajanosti in napakam grafičnega katastra doda še naslednje:

- Prve triangulacije II. in III. reda so bile opravljene z nerepeticijskimi teodoliti. Po letu 1821 so bili koti znotraj trikotnikov izmerjeni z repeticijskimi teodoliti, ki so omogočali odčitke od 4'' do 10'' natančno. Dosežena natančnost je bila pri zapiranju trikotnikov v večini primerov do 10'', pojavila pa so se tudi odstopanja do 30''.

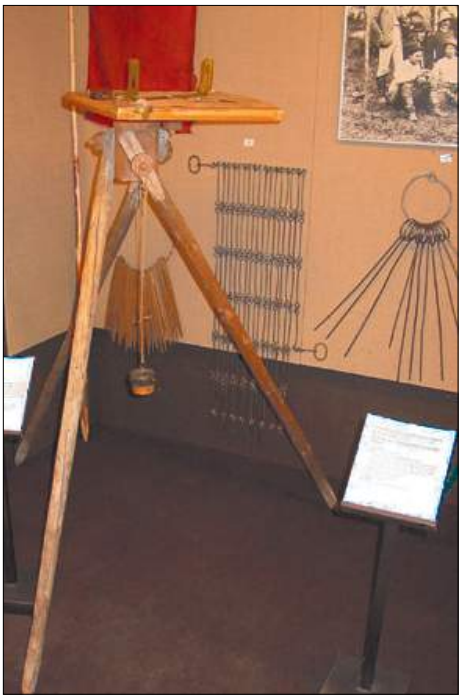
In addition to the above, the following should be noted in relation to the obsolescence and errors of the graphic cadastre:

- The initial triangulations of the second and third order were performed using non-repeating theodolites. After 1821, the angles inside the triangles were measured with repeating theodolites, which allowed readings with an accuracy of 4'' to 10''. In most cases, the accuracy achieved in closing the triangles was up to 10'', but deviations of up to 30'' also occurred.



Slika 2.5.7: Repeticijski teodolit znamke Ertl iz leta 1858.
Vir: Arhiv GURS

Figure 2.5.7: An Ertl repeating theodolite from 1858.
Source: The SMARS archive



Slika 2.5.8: Merska mizica in merska veriga.
Vir: Geodetska zbirka v gradu Bogenšperk

Figure 2.5.8: Plane table and measuring chain.
Source: Geodetic collection in the Bogenšperk Castle

- Natančnost grafične triangulacije (zgostitvene mreže) je bila pogojena z merskim orodjem (merska miza, merske verige itd.), kjer natančnost ne more presegati grafične natančnosti 0.2 mm x modul merila načrta.
- Čeprav je bila prvotna detajlna izmera stabilnega katastra sicer boljša od svoje predhodnice – jožefinske izmere, je njena položajna natančnost še vedno majhna.
- Stara katastrska izmera je tudi po številu uporabljenih koordinatnih sistemov v Sloveniji najbolj pisana, posebno še, če se v to šteje tudi številne samostojne koordinatne sisteme po k. o. na Primorskem. Izmero v nekaj občinah na meji Primorske in Furlanije so opra-

- The accuracy of the graphical triangulation (the densification grid) is based on the measuring tools used (plane table, measuring chains, etc.), where the accuracy cannot exceed the graphical accuracy of 0.2 mm x the plan scale module.
- Although the original detailed survey of the stable cadastre was better than its predecessor, the Josephine survey, the positional accuracy of the latter is still lacking.
- The old cadastral survey is also the most diverse in terms of the number of coordinate systems used in Slovenia, especially if we include the many independent coordinate systems by cadastral municipalities in the Primorska region. In several municipalities on the border of Primorska and Friuli, the survey was carried out by French surveyors between 1811 and 1813, and each municipality had its own local coordinate

vili francoski geometri v letih 1811 do 1813 in je imela v vsaki občini svoj lokalni koordinatni sistem. Ta izmera je kartirana v merilu 1 : 2000 na listih posebnega formata, ki se ne ujema niti s formatom po seženjskem, niti s formatom po metrskem sistemu.

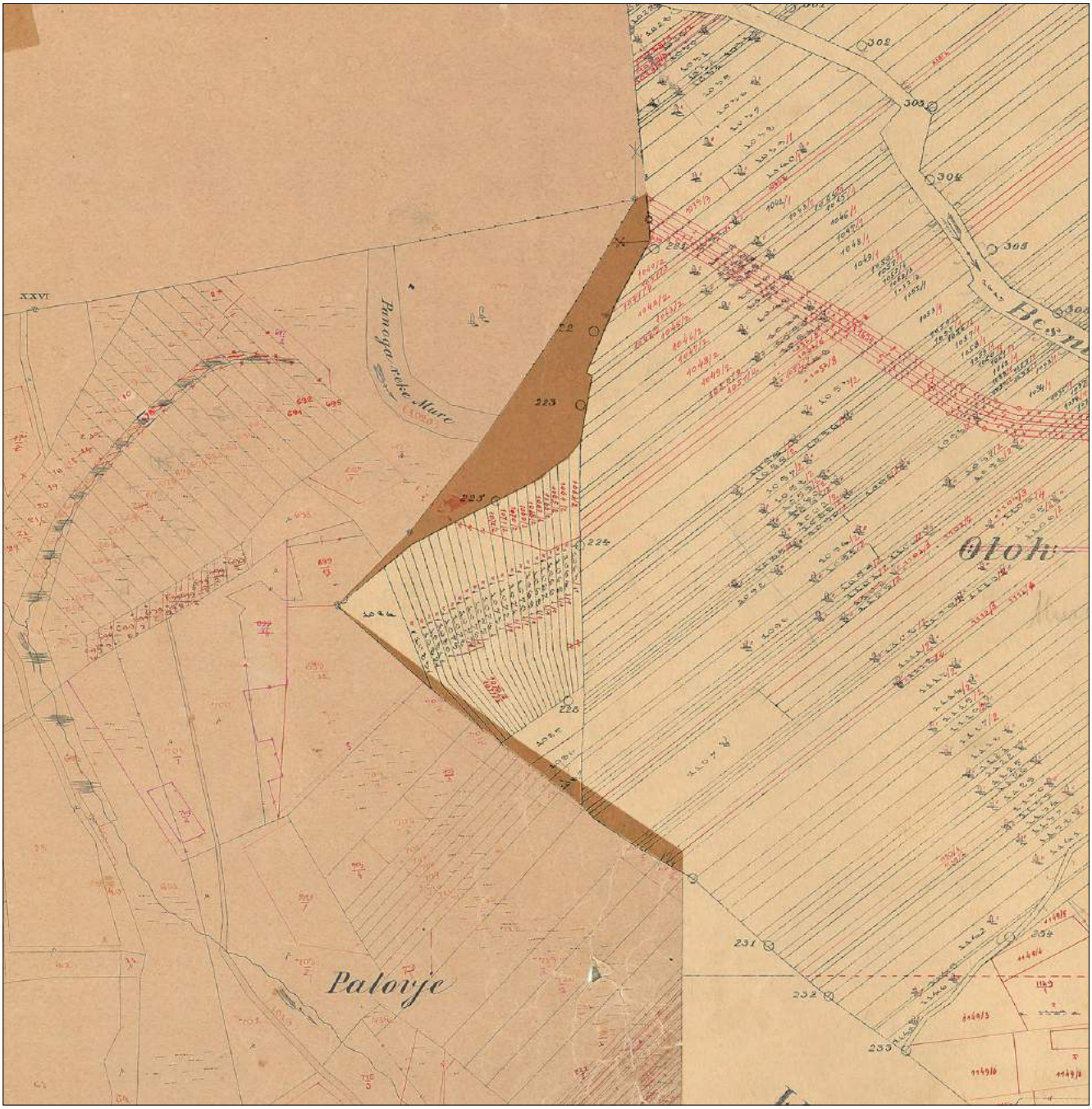
system. This survey is mapped in the scale of 1:2000 on sheets of a special format which does not correspond to either the format of fathoms or the metric system.

Slika 2.5.9: Leta 1908 narejen ponatis izvirnika iz leta 1811. Neorientiran Napoleonov kataster v metrskem sistemu M 1 : 2000 na Primorskem.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov, Arhiv Slovenije, Franciscejski kataster za Primorsko

Figure 2.5.9: A reprint of the original from 1811, made in 1908. The non-oriented. Napoleonic cadastre using the metric system, in the scale of 1:2000, in the Primorska region
Source: the e-ZKN archive land cadastre map viewer, Archives of the Republic of Slovenia, Franciscan cadastre for Primorska

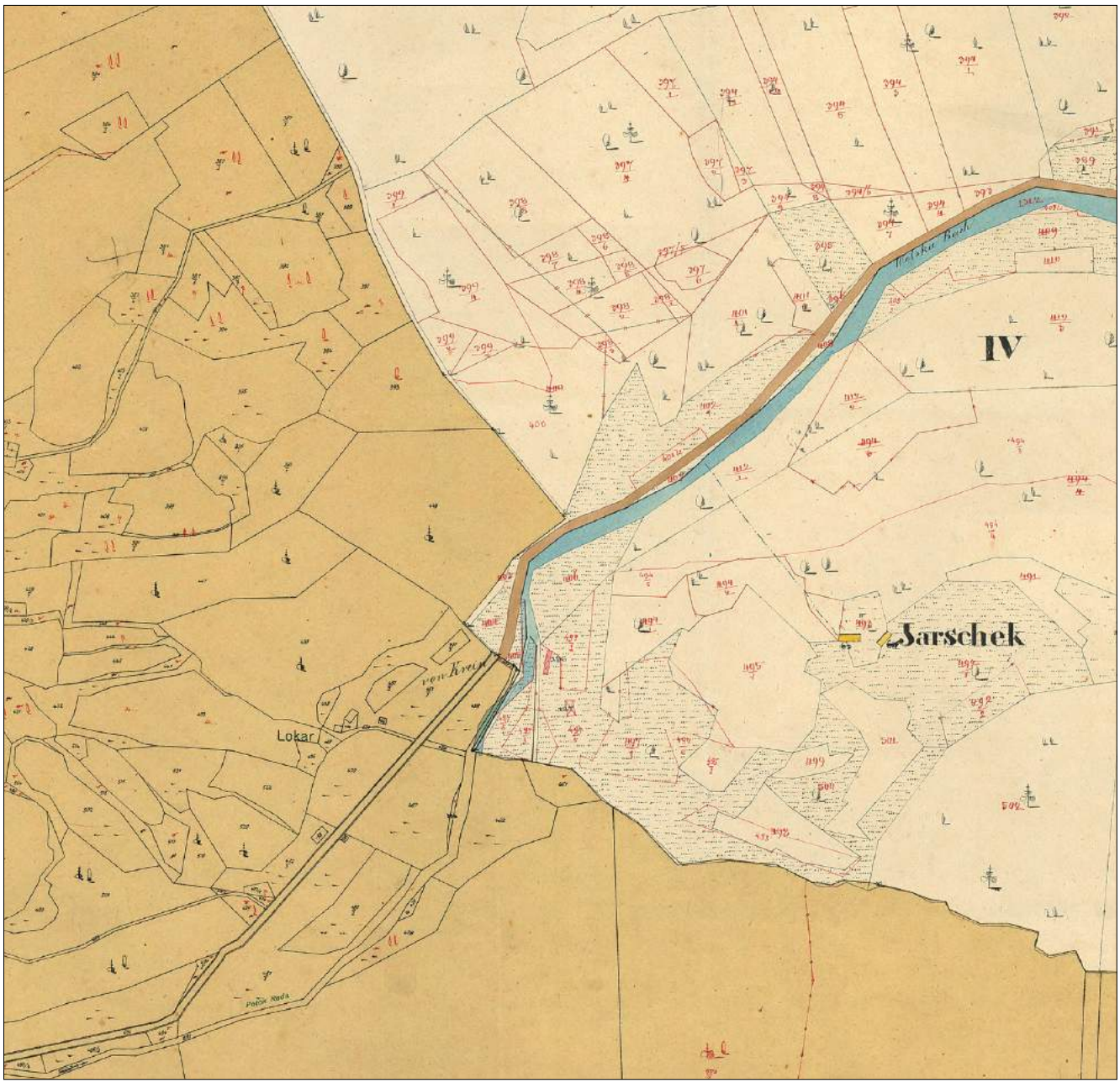
- Na mejah med grafičnimi koordinatnimi sistemi (Krim, Schöckelberg in Gellèrthegy) so se pojavila obsežna prekrivanja vsebine ali praznine, ki so naključne.

- Extensive overlaps of content and random gaps appeared at the borders between graphical coordinate systems (Krim, Schöckelberg and Gellèrthegy).



Slika 2.5.10: Izrez iz katastrskega načrta k. o. 230 Vučja vas izmerjenega z izhodiščem v koordinatnem sistemu na Schöckelbergu in k. o. 127 Krog izmerjenega v koordinatnem sistemu Gellerthegy.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 2.5.10: Excerpt from the cadastral plan of CM 230 Vučja vas, measured with the coordinate system origin at Schöckelberg, and of CM 127 Krog, measured in the Gellerthegy coordinate system.
Source: the e-ZKN archive land cadastre map viewer



Slika 2.5.11: Izrez iz katastrskega načrta k. o. 1014 Ločica izmerjenega z izhodiščem v koordinatnem sistemu na Schöckelbergu in k. o. 1923 Motnik izmerjenega v Krimskem koordinatnem sistemu.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 2.5.11: Excerpt from the cadastral plan of CM 1014 Ločica, measured with the coordinate system origin at Schöckelberg, and of CM 1923 Motnik, measured in the Gellèrthegy coordinate system.
Source: the e-ZKN archive land cadastre map viewer

- Izmera je bila opravljena brez upoštevanja ukrivljenosti zemeljske površine in je torej brez vsakršne matematične projekcije.
- Vse do uveljavitve zakona leta 1883 se vzdrževanje katastra ni opravljalo, čeprav so se kmalu po prvotni izmeri dogajale velike posestne in druge spremembe na zemljiščih. Še posebej se je veliko sprememb dogodilo po uvedbi zemljiške reforme po letu 1848.

Dne 7. septembra 1848 je cesar Ferdinand I. »Mili« podpisal najvišji patent, v katerem je bilo podložništvo s tlako, raboto, desetino in davščinami vred za vselej odpravljeno, Slovenski kmet za avstrijskega državljana, z volilno pravico previdenega, proglašen. Mahoma bila je 1000 letna veriga strašnega podložništva prekrhnjena; zadnje okove, ki so kmeta nemškej gospodi priklenjevale, za vselej zdrobljene. Po 1000 letnej temi zasije tudi slovenskemu kmetu ljubeznjivo solnce zlate svobode. Zemlja, katero je obdeloval, postala je njegova last, on sam z zarodom svoboden državljan.

Vendar cesar je tudi graščakom, prejšnjim lastnikom zemlje, dal nekaj veljati in je v istem patentu od 7. septembra 1848 zaukazal, da se jim ima primerna odškodnina plačati. V to svrho bila je na Dunaji osnovana posebna komisija, s podkomisijami po deželah. Te komisije so morale vrednost prejšnjih desetin in davščin itd. uceniti, kmetom pa uplačevanje posebne rešitve naložiti. Glavne točke pa, katere se je morala držati, bile so: 1/3 zgubijo graščaki, 1/3 vzame država na-se, 1/3 vplačajo kmetje sami.

Vir: Lapajne, I. (1884) Politična zgodovina Štajerskih Slovencev

- The survey was performed without taking into account the curvature of the earth's surface and therefore does not factor in any mathematical projection.
- Until the enactment of the Law of 1883, the cadastre did not undergo regular maintenance, although soon after the initial survey there appeared major changes in the land ownership and other aspects. In particular, many changes took place after the introduction of the land reform after 1848.

On 7 September 1848, Emperor Ferdinand I "the Gracious" signed the most important patent, in which serfdom with forced labour, tithes and taxes was abolished forever, and Slovenian farmers were declared Austrian citizens with the right to vote. Instantly, the 1000-year-old chain of horrible subjugation was broken; the last shackles that bound the farmer to the German lords were forever broken. The loving sun of golden freedom shone on the Slovenian farmer after 1000 years of darkness. The land he cultivated became his property, he himself and his family free citizens.

However, the Emperor did not neglect the manor lords, the previous owners of the land, and in the same patent of 7 September 1848, he ordered that they should be paid adequate compensation. To this end, a special commission was established in Vienna, with sub-commissions by country. These commissions were to evaluate the previous tithes and taxes and burden the farmers with an additional fee. The main points to be heeded were: 1/3 to be taken from the manor lords, 1/3 to be given by the state, 1/3 to be paid by the farmers themselves.

Source: Lapajne, I. (1884) The Political History of Styrian Slovenes

Zemljiška odveza v ožjem smislu besede pomeni izvedbo odprave neposredno podložniškega razmerja proti odškodnini ali brez nje. Zemljiška odveza je zaključni akt stoletnega stremljenja k osvoboditvi podložnega kmeta, za spremembo deljene zemljiške lastnine v nedeljeno ter za odpravo s podložniškim razmerjem neposredno združenih bremen.

Državni zbor na Dunaju je 6. septembra 1848 sprejel zakon o zemljiški odvezi.
Jedro večinoma vseh, dostikrat zelo strastnih razprav pred sprejetjem, je tvorilo vprašanje, kako naj se odpravi podložništvo in ali naj upravičenci zato dobe kako odškodnino ali ne. Zakon, kakršen je bil končno sprejet, nam kaže, da je prišlo v pogledu odškodnine do nekakih kompromisnih formul za katere imajo nesporne zasluge tudi kranjski poslanci, predvsem dr. Kavčič.
Vsekakor je bil najpomembnejši Kavčičev predlog o zemljiški odvezi z dne 9. avgusta 1848, ki je bil predlagan v 3 točkah:

1. Podložniško razmerje z vsemi iz njega izvirajočimi pravicami in dolžnostmi je odpravljeno, vendar ostane osmina (oktava) še 3 leta; enako so takoj odpravljene desetinske pravice.
2. Upravičenci naj dobe iz fonda, ki naj se ustvari na podlagi posebnega zakona, primerno odškodnino.
3. Namesto patrimonijalnih sodišč naj se takoj ustanove deželnoknežna sodišča.

Land absolution, in the narrower sense of the word, means the implementation of the abolition of the direct subordinate relationship, with or without compensation. Land absolution is the concluding act of a century-long aspiration to liberate the subjugated farmer, to change the divided land ownership into undivided, and to eliminate the burdens directly linked to the lord-serf relationship.

On 6 September 1848, the National Assembly in Vienna passed a law on land absolution.
The core of most of the often very passionate debates before the adoption was the issue of how to abolish serfdom and whether the beneficiaries should receive any compensation. The act, as it was finally adopted, shows that compromissorial formulae were used in relation to the compensation, credit for which is owed to the representatives from Carniola, particularly dr. Kavčič.
Certainly of utmost performance was Kavčič's proposal on land absolution of 9 August 1848, which proposed 3 items:

- The lord-serf relationship, with all the rights and duties arising from it, is abolished, but the eighth (octave) will remain for another 3 years; additionally, tithe rights are immediately abolished.
- Beneficiaries should receive appropriate compensation from the fund to be created on the basis of a special act.
- Instead of patrimonial courts, provincial courts should be established immediately.

The Order of the Ministry of the Interior on Executing the Procedures Related to the Division of Land in the Duchy of Carniola was

Ukaz ministrstva notranjih opravil, kako naj se izpeljejo postopki, povezani z razdelitvijo zemljišč v Kranjski kronovini, je bil izdan na Dunaju, dne 12. septembra 1849.

»Verordnung des Ministeriums des Innern, betreffend die Durchführung der Grundentlastung im Kronlande Krain. Wien, den 12. September 1849.«

O zemljiški odvezi je ministerialni komisar vodil poseben deželni zemljiškoodvezni kataster, ki ga je odobril notranji minister.

Posebej za to ustanovljene komisije so v letih od 1849 do 1854 vodile postopke izvedbe zemljiške odveze.

V občini Dovje so sredi 19. stoletja (leta 1844) sklenili do tedaj skupne gozdove razdeliti na posamezne lastnine. V tej želji po pospešitvi razslojevanja vaške družbe so bili sicer enotni, zapletlo pa se je že pri sami izvedbi, ko njihov dolgoletni, sicer od oblasti postavljeni rihtar večini ni bil več po volji in so ga samovoljno odstavili. Stara vaška enotnost in navade, ki so veljale »od zmeraj«, so se ob tem začele krhati.

Delitev gozdov je zastala v revolucionarnem letu 1848, župana in njegove občane pa je doletela še sekvestracija njihovih gozdov.

»Več let že se zavoljo gojzdov v soseskah Bela peč, Radeče, Podkoren, Krajnska Gora, Gojzd in srednji Verh, Dolgo polje (Dovje – op. pis.), Mojstrana, Hrušica, Jesenice, Sava, Planina, Potoke, Koroška Bela in Javornik ležečih pravdajo, čigavi da so, in te pravde so krive, da sedanji zahtevavci teh gojzdov tajistih ne obdeljujejo, kakor bi bilo treba, in tako ti gojzdi urno svojemu vkončenju nasproti hitijo. (...) Politični sekvester je c. kr. višji gojzdnik Alojzi Vede in temu je naročeno, s 15. dnem tega mesca svoje uredske dolžnosti v vsih rečeh spolnovati začeti, od imenovanega dne naprej nehajo tedej vse lastinske pravice druzih oseb v sekvestriranih gojzdih in nikomur ni več pripuščeno, gojzdne pridelke, in če bi bili tudi že pred ali po začeti sekvestracii napravljeni, brez dovoljenja imenovanega gojzdnega upravnika iz imenovanih gojzdov voziti. Dalje se opominja, da je gojzdni upravnik samo takrat opravičen, gojzdne pridelke oddajati, če okrajni ured za to privoljenje da. Zavoljo tega se imajo vsi, kteri so pri tem vdeleženi, ako kaj gojzdnih pridelkov potrebujejo, na c. kr. Okrajni ured v Krajnski Gori oberniti, kteri jim bo tudi še daljej posebej povedal, kako se jim je zaderžati.«

Zemljiškoodvezna in regulacijska deželna komisija za Kranjsko je s sodbo z dne 15. marca 1870, po več desetletnem pravdanju, odločilo, da imajo prebivalci občine Dovje nesporno lastniško pravico, ki jim je ne more izpodbijati nobeden od ostalih lastniških pretendentov, ker je v fasijah jasno zapisano, da so to uživali podložniki Dovjega in Mojstrane. Tudi ob uvedbi sekvestracije nihče ni dvomil, da občina te gozdove posestvuje, je še zapisano v sodbi. Gozdovi so bili torej končno priznani kot last Dovžanov in tako so se lahko ti povrnili k medsebojnim delitvenim sporom, »interni privatizaciji«, s katero so začeli že pred skoraj tridesetimi leti (1844).

Očitki so leteli sem in tja, nazadnje pa je bilo tako kot vedno – in naj se sliši še tako stereotipno: bogati in močni so najbolje poskrbeli zase.

Vir: Stariha, G. Občina Dovje in njeni gozdovi, 2016

issued in Vienna on 12 September 1849.

"Verordnung des Ministeriums des Innern, betreffend die Durchführung der Grundentlastung im Kronlande Krain. Wien, den 12. September 1849."

The ministerial commissioner kept a special provincial land cadastre for the land absolution, approved by the Minister of the Interior.

From 1849 to 1854, commissions specially set up for this purpose conducted the procedures for the implementation of land absolution.

In the middle of the 19th century (in 1844), the municipality of Dovje decided to divide the common forests into individual properties. They were united in this desire to accelerate the stratification of the village society, but complications arose in the implementation when their long-standing government-appointed judge fell from the favour of the majority and was removed from office. This put a strain on the old village unity and the customs that had always been followed in the past.

The division of forests came to a halt in the revolutionary year of 1848, and the mayor and his citizens were additionally hit by the sequestration of their forests.

"For several years now, the forests in Bela peč, Radeče, Podkoren, Krajnska Gora, Gojzd and Srednji Verh, Dolgo polje (Dovje – author's note), Mojstrana, Hrušica, Jesenice, Sava, Planina, Potoke, Koroška Bela and Javornik have been the subject of discussions about their ownership, and these arguments can be blamed for the fact that the present claimants are not cultivating these forests as they should, and so these forests are rushing towards their end with every hour. (...) The political sequester is the responsibility of the Imperial-Royal Senior Forester Alojzi Vede, who is ordered on the 15th day of this month to begin fulfilling his duties, and thus from the appointment day onwards, all property rights of other persons in the sequestered forests cease and no one is allowed to transport forest crops from the forests in question, whether produced before or after the start of sequestration, without the permission of the appointed Forest Manager. It should also be noted that the Forest Manager is only entitled to distribute forest products if the District Office has given its consent. For this reason, if any of those involved require any forest products, they should turn to the Imperial-Royal District Office in Krajnska Gora, where they will receive further instructions."

With the judgment of 15 March 1870, the Land Absolution and Regulatory Regional Committee for Carniola decided after several decades of litigation that the inhabitants of the municipality of Dovje had an undisputed property right which could not be challenged by any of the other property claimants, since it is written in the records that this was the right of the subjects of Dovje and Mojstrana. The verdict also reads that even with the introduction of sequestration, there was no doubt that the municipality owned these forests. The forests were thus finally recognized as the property of the people of Dovje, and so they were able to return to their internal disputes and "internal privatization", which had begun almost thirty years ago (1844).

The accusations flew, and ultimately it was as ever, as cliché as it may sound: the rich and powerful looked after themselves the most.

Source: Stariha, G. Municipality of Dovje and its Forests, 2016

Razsodba komisije je za vsakega zavezanca vsebovala sledeče predmete:

a) predmet odveze,
b) odškodninsko rento, ki jo je moral plačati zavezanec,
c) rentni kapital,
d) izjavo zavezanca glede načina vplačila kapitala oz. zaostankov,
e) bremena, ki so bila odpravljena brez odškodnine.

1/3 delež vrednosti nepremičnin, ki so ga morali kmetje odplačevati dvakrat letno glede na izjavo vsakega zavezanca o načini vplačila kapitala oz. zaostankov (5, 10, 15 ali 20 letni amortizacijski načrt) je bila, kljub prvotni evforiji, za marsikaterega »novonastalega« posestnika usodna.

Vsekakor pa je pomenila izvedba zemljiške odveze nov način odnosa med kmetom in državnim aparatom v smeri neposrednosti, pomenila je spremembo v pravnem položaju kmeta, ki ga je dvignila od položaja varovanca na stopnjo polne ravnopravnosti, s tem pa tudi spremenila način in obliko dajatev, ki so jih doslej kmetje plačevali neposredno in samo državi. Koristnik dajatev je bil zamenjan, a dajatve so v bistvu ostale. To dejstvo je kmete hudo razočaralo. V tem razočaranju in v nevajenosti kmetov za samostojno gospodarjenje pa je iskati vzroke kmečkega nezadovoljstva s svojim novim položajem, kar jih je zato hitro pripravilo do katastrofalno obsežnega bega z dežele v industrijske centre in čez morje.
Vendar je ta zemljiška odveza dosegla svoj glavni namen. Rešila je kmeta varuštva zemljiške gosposke s tem, da je odpravila tlako in dvolastništvo zemlje z vsemi privilegijami oz. dajatvami ki so iz tega razmerja izvirale.
Vir: Krošl, A. 1941 Zemljiška odveza na bivšem Kranjskem

» Petdeseta leta 19. stoletja so bila za slovenski prostor pomembna prelomnica v gospodarskem in družbenem razvoju. Z zemljiško odvezo, dokončno osvoboditvijo kmeta in svobodnejšo trgovinsko ter obrtno politiko se je tudi tukaj začel čas modernega tržnega gospodarstva. Velika prednost za Ljubljano v tem času je bilo dejstvo, da je bila med letoma 1849 in 1857 končna postaja južne železnice in posledično pomembno trgovsko in prometno središče. Od tega so imeli koristi mali obrtniki in železarji ter predvsem prevozniki, ki so prevažali blago med Ljubljano in tržaškim pristaniščem.

V drugi polovici desetletja, ko je poleti 1857 železnica dosegla tudi Trst, so se razmere vidno poslabšale. Kmetje, ki so v povprečju imeli za seboj nekaj zelo uspešnih gospodarskih let, so prisluženi denar v večini primerov zapravili, poleg tega pa so jih pestili davki z odškodnino za odvezo ter odprta vprašanja v zvezi z uporabo pašnikov in gozdov, ki so bila še vedno v rokah velikih zemljiških posestnikov. Zadolževanje je v naslednjih desetletjih spravilo mnoge kmečke lastnike ob hišo in kmetijo.

Vir: Bele M. Časopis za humanistične in družboslovne študije, Maribor, 2017 «

The decision of the commission contained the following subjects for each taxpayer:

a) subject of absolution,
b) the compensation to be paid by the taxpayer,
c) annuity capital,
d) statement of the taxpayer regarding the method of capital payment or deferral,
e) burdens that have been eliminated without compensation.

Despite the initial euphoria, the 1/3 share of the value of real estate which farmers had to pay twice a year in accordance with the statement of each taxpayer on the method of payment of capital or deferral (a 5, 10, 15 or 20 year depreciation plan), was devastating for many "new" landowners.

In any event, the implementation of the land absolution presented a new type of relationship between the farmer and the state apparatus in terms of directness; it meant a change in the legal situation of the farmer, who was elevated from the position of a ward to a position of equal rights, which also brought about changes in the manner and type of contributions that the farmers would from then onwards have to pay directly to the state. The beneficiary of the contributions was replaced, but the contributions essentially remained. This fact was severely disappointing to the farmers. This disappointment, along with the unaccustomedness of the farmers to self-management, is one of the core reasons for the dissatisfaction of the farmers with their new situation, which in turn caused a catastrophically large-scale flight from the rural areas to industrial centres and across the sea.
However, the land absolution achieved its main purpose. It freed the farmer from the servitude of a landlord by eliminating serfdom and dual ownership of land with all the privileges and benefits arising from this relationship.
Source: Krošl, A. 1941 Land Absolution in the Former Carniola

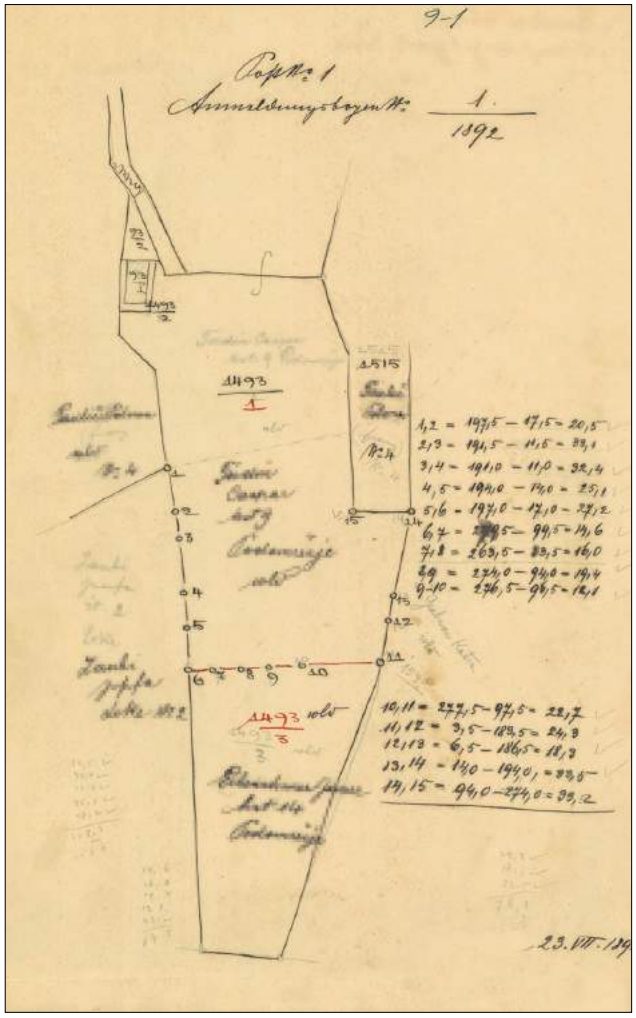
» The 1950s were a milestone in Slovenia's economic and social development. With the land absolution, the ultimate liberation of the farmer, and a more open trade and craft policy, this territory also saw the beginning of a modern market economy. A great advantage for Ljubljana at that time was the fact that it was the final station of the southern railway between 1849 and 1857, and consequently a major trade and traffic centre. This was beneficial for small craftspeople and ironworkers, and especially freight companies transporting goods between Ljubljana and the port of Trieste.

In the second half of the decade, when the railway also reached Trieste in the summer of 1857, the situation noticeably deteriorated. Farmers, who on average had had some very successful economic years, wasted their earnings in most cases, and were burdened by taxes from the compensation for the abolition and open issues concerning the use of pastures and forests, which were still owned by large landowners. In the following decades, borrowing caused many peasant owners to lose their houses and farms.

Source: Bele M. Journal for the Humanities and Social Sciences, Maribor, 2017 «

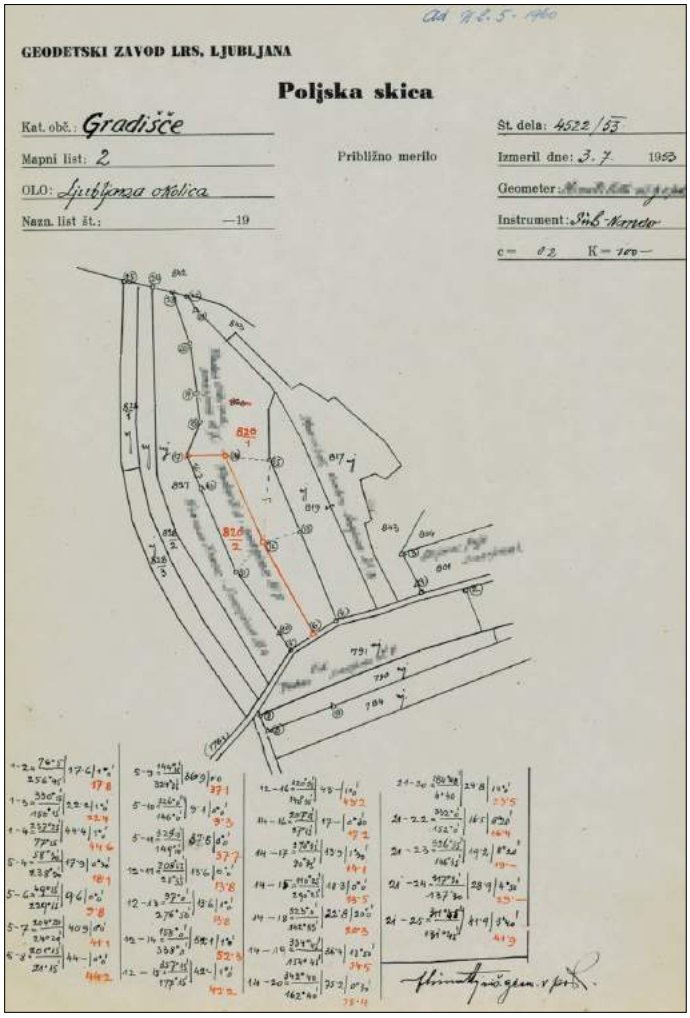
Tehnologija vzdrževanja zemljiškega katastra je bila na začetku, tj. ob koncu 19. stoletja, zelo zastarela, čeprav je veljalo pravilo, da morajo meritve v teku vzdrževanja biti vsaj iste natančnosti, kakor osnovne izmere v obstoječih načrtih. Meritve so se izvajale na primer z busolnimi instrumenti po merski metodi 'na preskok' brez zaključne kontrole in z merjenjem azimutov le na cele stopinje natančno.

Initially, at the end of the 19th century, the technology of land cadastre maintenance was very outdated, although the rule was that in the course of maintenance, measurements had to be at least as accurate as the base measurements in existing plans. The measurements were performed, for example, with compass instruments using the 'transit' measurement method without a final verification and by measuring azimuths only to full degrees.



Slika 2.5.12: Skica izmere k. o. 1927 Blagovica iz leta 1892 – osnovni način uporabe busolnega teodolita.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 2.5.12: Sketch of the survey of CM 1927 Blagovica from 1892 – the basic method of using a compass theodolite.
Source: ZK archive digital survey report viewer



Slika 2.5.13: Skica izmere k. o. 1710 Gradišče iz leta 1953, kjer se je meritev opravila z busolnim teodolitom na preskok.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 2.5.13: Sketch of the survey of CM 1710 Gradišče from 1953, where the measurement was made with a transit compass theodolite.
Source: ZK archive digital survey report viewer

Nestrokovno opravljenim meritvam na terenu je sledil prav tako situacijsko problematičen vklop novih mej v katastrske načrte.

The unprofessional field measurements were followed by the situationally problematic inclusion of new borders in cadastral plans.

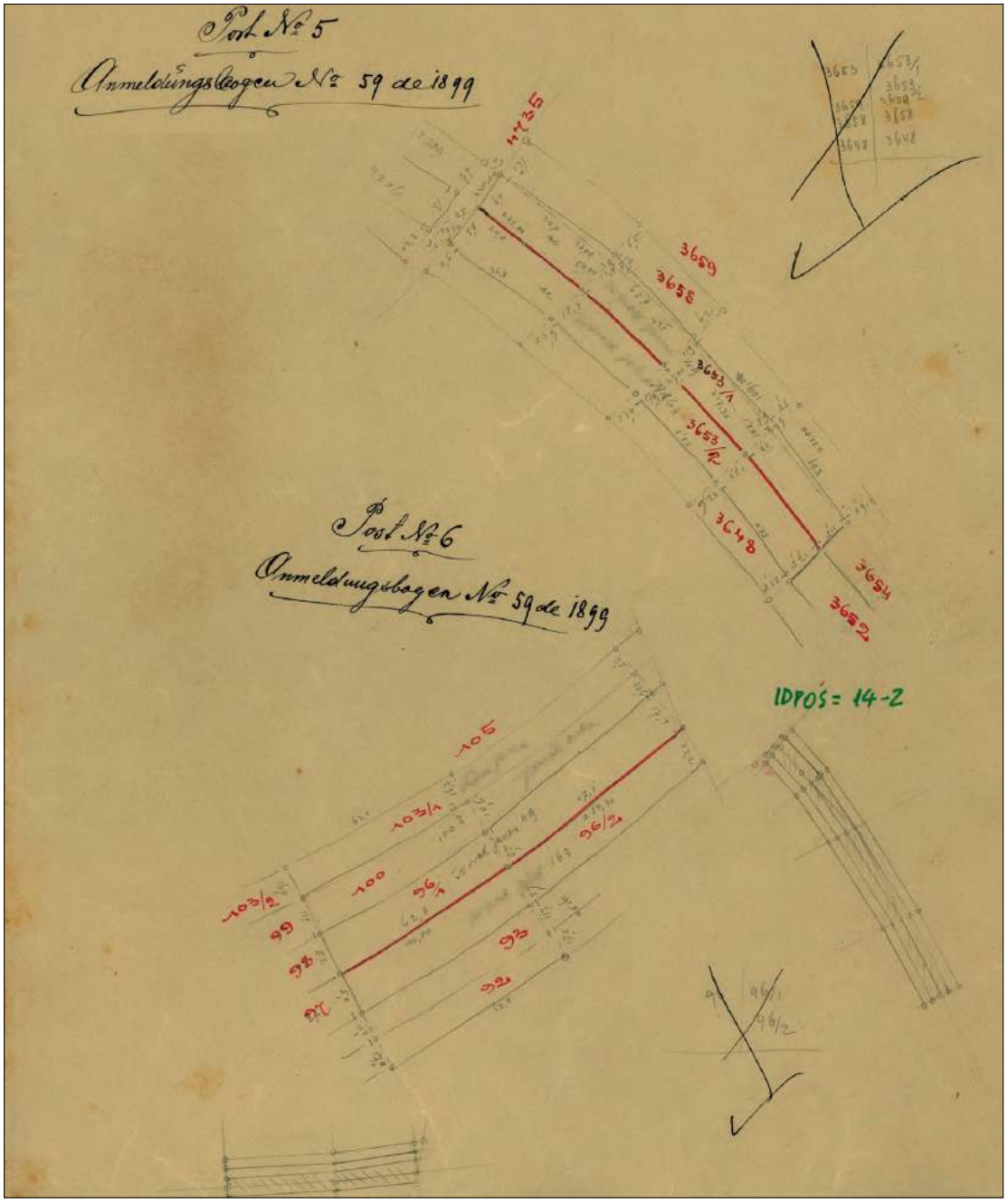
Tehnično pojmujemo vzdrževanje katastrskih načrtov kot vris sprememb glede na stanje na zemljišču (tj. razne

In technical terms, we define the maintenance of cadastral plans as the inscription of changes in relation to the situation in the field (i.e. various divisions, plot allocation, changes of crops, addi-

[1]Opomba: V dokumentih iz zbirke listin Zemljiškega katastra so varovani osebni podatki zakriti
[1]Note: Protected personal data is hidden in the land cadastre documents.

delitve, parcelacije, spremembe kultur, vris novih objektov in podobno v določenem obdobju). Takšen vris se je opravil na osnovi izmere dejanskega stanja na terenu, kartiranja v merilu katastrskega načrta ob upoštevanju skrčka lista in vklapljanjem novega stanja v obstoječi katastrski načrt.

tion of new buildings etc. within in a certain period). This type of inscription was made on the basis of surveying the actual situation in the field, mapping of the cadastral plan to scale while taking into account the constriction of the sheet, and incorporating the new situation into the existing cadastral plan.



Slika 2.5.14: Skica izmere in kartiranje k. o. 2511 Knežak iz leta 1899.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

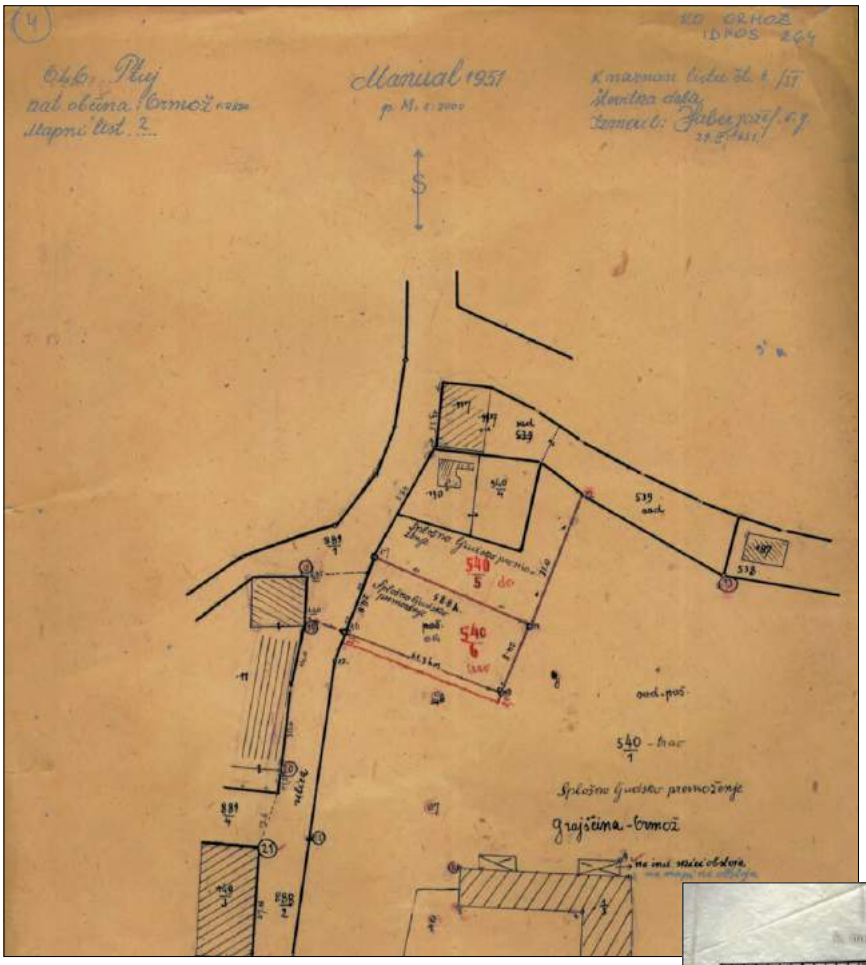
Figure 2.5.14: Sketch of the survey and mapping CM 2511 Knežak from 1899.
Source: ZK archive digital survey report viewer

[1]Opomba: V dokumentih iz zbirke listin Zemljiškega katastra so varovani osebni podatki zakriti
[1]Note: Protected personal data is hidden in the land cadastre documents.

Slika 2.5.15: Situacijski načrt k. o. 474 Cirkulane iz leta 1887.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

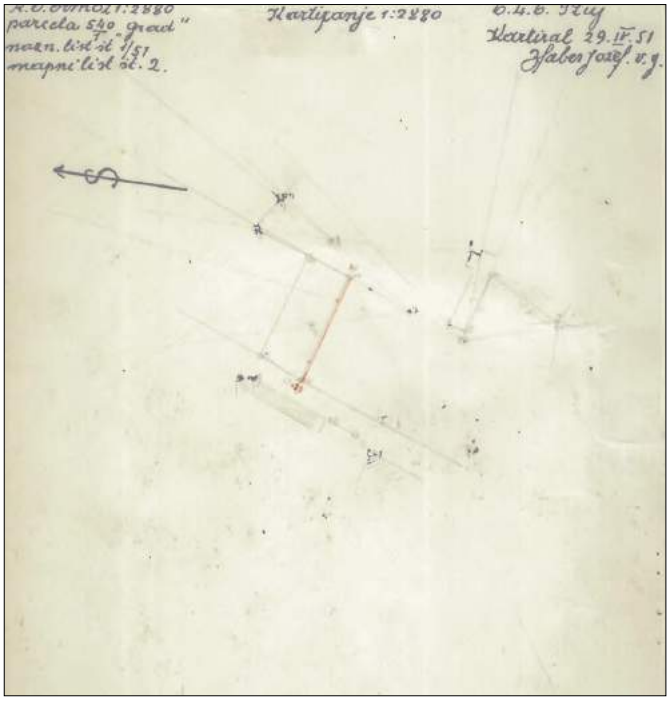
Figure 2.5.15: Situation plan for CM 474 Cirkulane from 1887.
Source: ZK archive digital survey report viewer

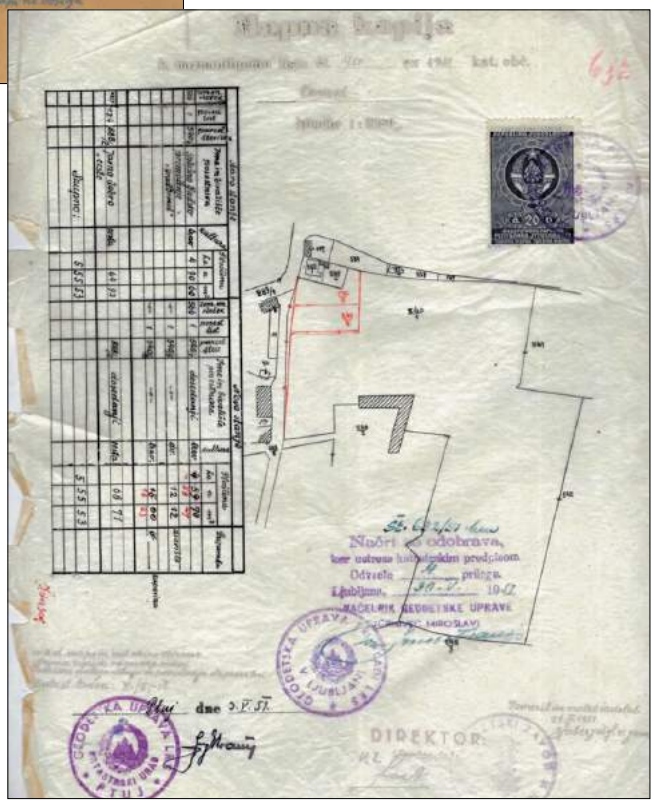
[1]Opomba: V dokumentih iz zbirke listin Zemljiškega katastra so varovani osebni podatki zakriti
[1]Note: Protected personal data is hidden in the land cadastre documents.

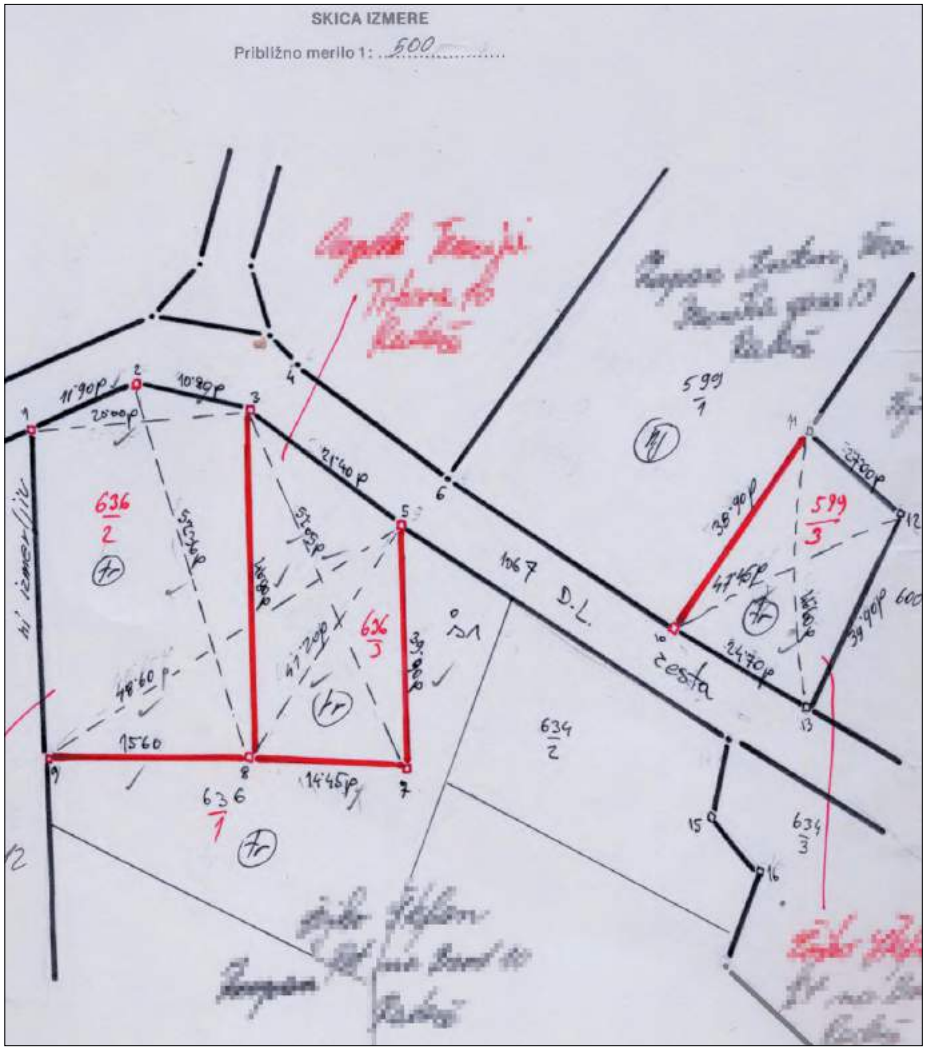


Slika 2.5.16: Elaborat k. o. 332 Ormož iz leta 1951 – Skica v merilu 1 : 2000, oleata kartiranja in mapna kopija v M 1 : 2880.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 2.5.16: Report for CM 332 Ormož from 1951 – Sketch in the scale of 1:2000, mapping oleate and map copy in the scale of 1:2880.
Source: ZK archive digital survey report viewer





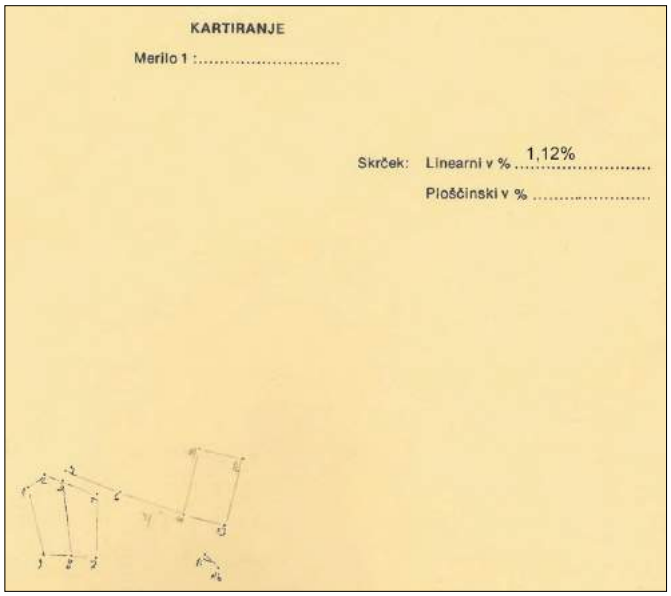


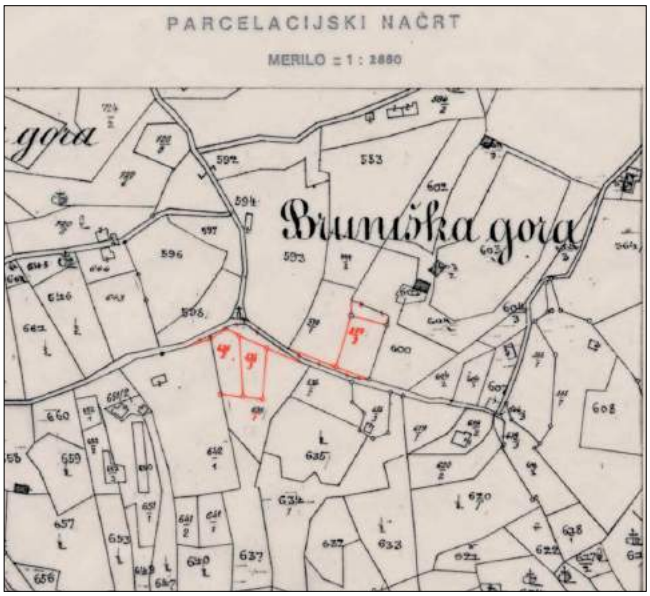
Slika 2.5.17: Skica izmere k. o. 1866 Hotemež v približnem merilu 1 : 500, parcelacijski načrt v M 1 : 2880 in kartiranje z upoštevanjem skrčka (elaborat iz leta 1989, zamejničenje ceste le z ene strani).

Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 2.5.17: Sketch of the survey of CM 1866 Hotemež in an approximate scale of 1:500, plot allocation plan in the scale of 1:2880, and mapping including constriction (study from 1989, marking out the road on one side only).

Source: ZK archive digital survey report viewer





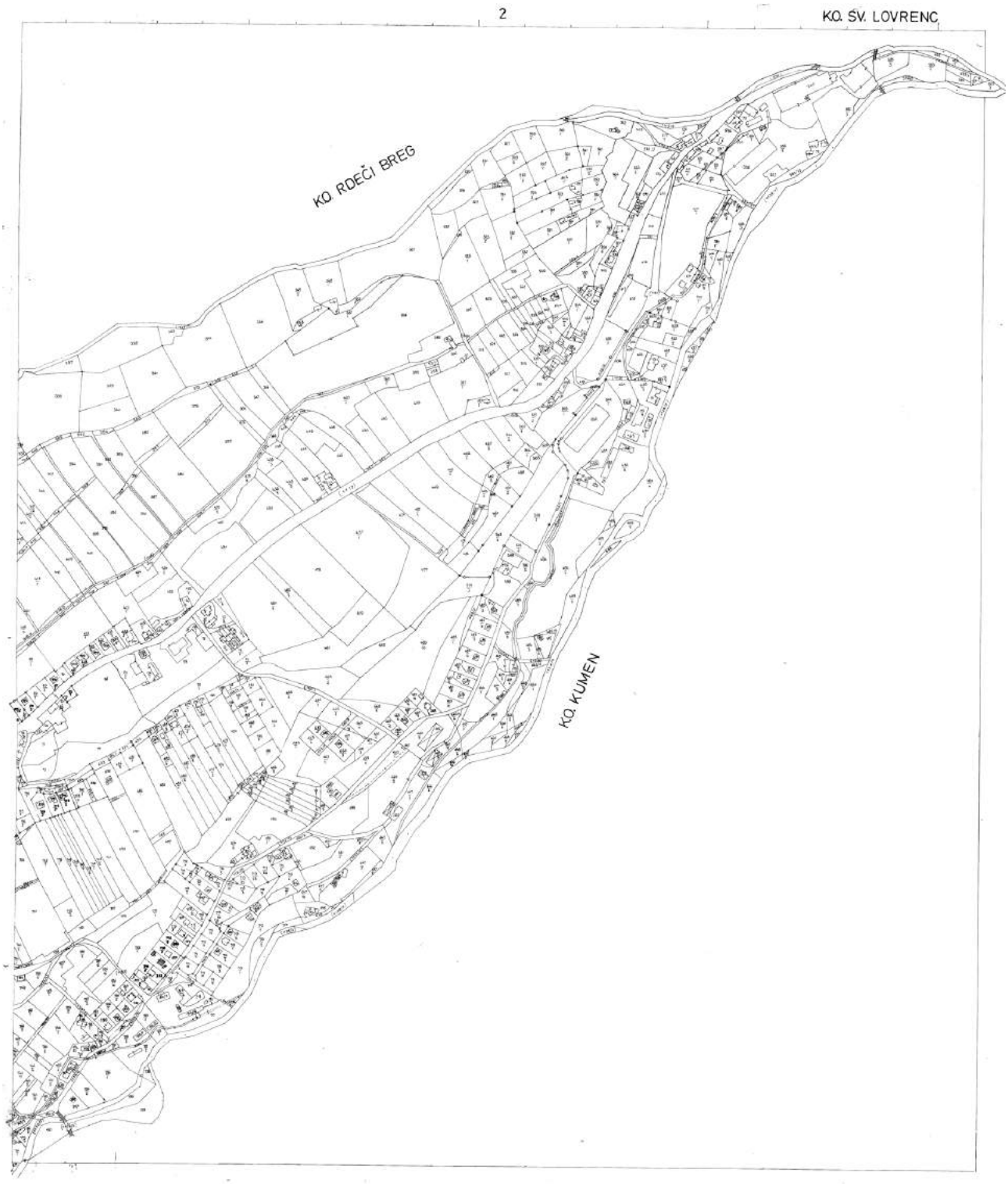
[1]Opomba: V dokumentih iz zbirke listin Zemljiškega katastra so varovani osebni podatki zakriti
[1]Note: Protected personal data is hidden in the land cadastre documents.

Poleg staranja se je kakovost načrtov slabšala tudi ob vsakokratnih reprodukcijah oz. prerisih načrtov.

In addition to aging, the quality of the plans also deteriorated with each reproduction or redrawing of the plans.

Slika 2.5.18: Načrt k. o. 669 Lovrenc na Pohorju, detajlni list 2, ki je bil v uporabi od leta 1907 do 1983.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 2.5.18: Plan of CM 669 Lovrenc na Pohorju, detail sheet 2, in use from 1907 to 1983.
Source: the e-ZKN archive land cadastre map viewer



Slika 2.5.19: Katastrski načrt k. o. 669 Lovrenc na Pohorju, prerisan na obstojno pokalon folijo leta 1983.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 2.5.19: Cadastral plan of CM 669 Lovrenc na Pohorju, redrawn on durable Pokalon foil in 1983.
Source: the e-ZKN archive land cadastre map viewer

Izmera in kartiranje ne predstavljata posebnega tehničnega problema, pač pa vklapljanje novega v staro stanje. Tako se je v različnih situacijah dogajalo, da je geodet pri vlaganju nove situacije ugotovil, da so stare spremembe vrisane nepravilno in je imel na izbiro, da meritev razširi, prvotno napako najde in popravi, ali pa se zadovolji s tem, da tudi sam vris novega stanja prilagodi nepravilno vrisanemu stanju. Vse prevečkrat je praksa sledila načinu približnega vnašanja, s čimer se je pozicijska natančnost v primerjavi s stanjem v naravi samo še zmanjšala.

Dr. Ivan Širko je v enem od svojih člankov leta 1905 zapisal in s tem hotel povedati, da se vedno na mejo, narisano v katastrskih mapah, ni zanašati.

»Iz svoje civilne prakse mi je znano, da se je začela praksa s silnim spoštovanjem do mape kot dokaznega sredstva in da je mapa često zadnije zatočišče za rešitev lastninskih sporov. To upoštevanje pa je vedno bolj ginilo, dokler ni popolnoma izginilo. Godilo se je mapi kakor priči, ki jo sodnik le prečesto zaloti na nezanesljivih izpovedbah; nazadnje ji veruje le še to, kar se ujema z vsem ostalim. Tako tudi pri mapi. Mapa je mrtva stvar, poleg in preko nje pa gre življenje, ki dnevno spreminja zemljiške meje. Vkljub temu se še ponovno stranke dogovore, da bodi za mejo med njima sporno odločilna mapna meja in zemljemerec; redoma se pri ureditvah meje sklicuje tista stranka, kateri bi utegnili mapni narisi ugodno kazati, krčevito nanjo kot dokaz za staro mejo.«

Vir: Širko, I. Poravnava na mapno mejo, Slovenski pravnik št. 3/4, 1905

Neskladnosti večjih razsežnosti med zemljiškim katastrom in stanjem v naravi se pojavljajo predvsem pri dolžinskih komunikacijskih objektih – poteh, cestah, vodah. Njihova lega se je v naravi glede na prvotno izmero bistveno spremenila, v zemljiškem katastru pa te spremembe večinoma niso bile evidentirane ali pa so bile ponekod evidentirane, dostikrat brez poprejšnjega zamejničenja in vzporedne ureditve premoženjsko-pravnih razmerij na njih (pri vklopih dolžinskih objektov v načrte se dostikrat opaža, da so se opravili parcialni vklopi, torej se je izmerjeni potek dolžinskega objekta delil na več delov in vklapljal v načrte tako, da se je na določenem delu načrta najbolj prilegalo stari situaciji okoliških objektov in mej).

Zemljiškokatastrska zakonodaja iz leta 1974 se je zavedala dotrajanosti grafičnega katastra. Zato je skušala v normativnih aktih spremeniti način vzdrževanja in primernost uporabe starih načrtov glede na natančnost zarisanega. Leta 1976 sprejeti pravilnik je predpisal mejno ugotovitveni postopek (MUP), katerega pogoj je bil zamejničenje in strokovno zavarovanje lege mejnikov ter površin parcel s koordinatami ne glede na staro stanje. Pri vzpostavitvi meje po podatkih grafičnega načrta s stanjem v naravi pa je bilo treba prej, kot bi se smel načrt uporabiti za prenos meje v naravo, ugotoviti zanesljivost starega načrta, tudi tedaj, če sta oba prizadeta lastnika poprej podpisala izjavo za prenos meje po podatkih zemljiškega katastra.

Surveying and mapping do not present a particular technical issue, but rather the incorporation of the new situation into the old one. Thus, it would happen that the surveyor, when submitting a new situation, found that the old changes were drawn incorrectly and had the choice to expand the measurement, to find and correct the original error, or to be content with the fact that inscribing the new situation would automatically adjust the incorrectly drawn situation. All too often, the practice followed the method of approximate inscription, thus further reducing the positional accuracy in comparison with the situation in nature.

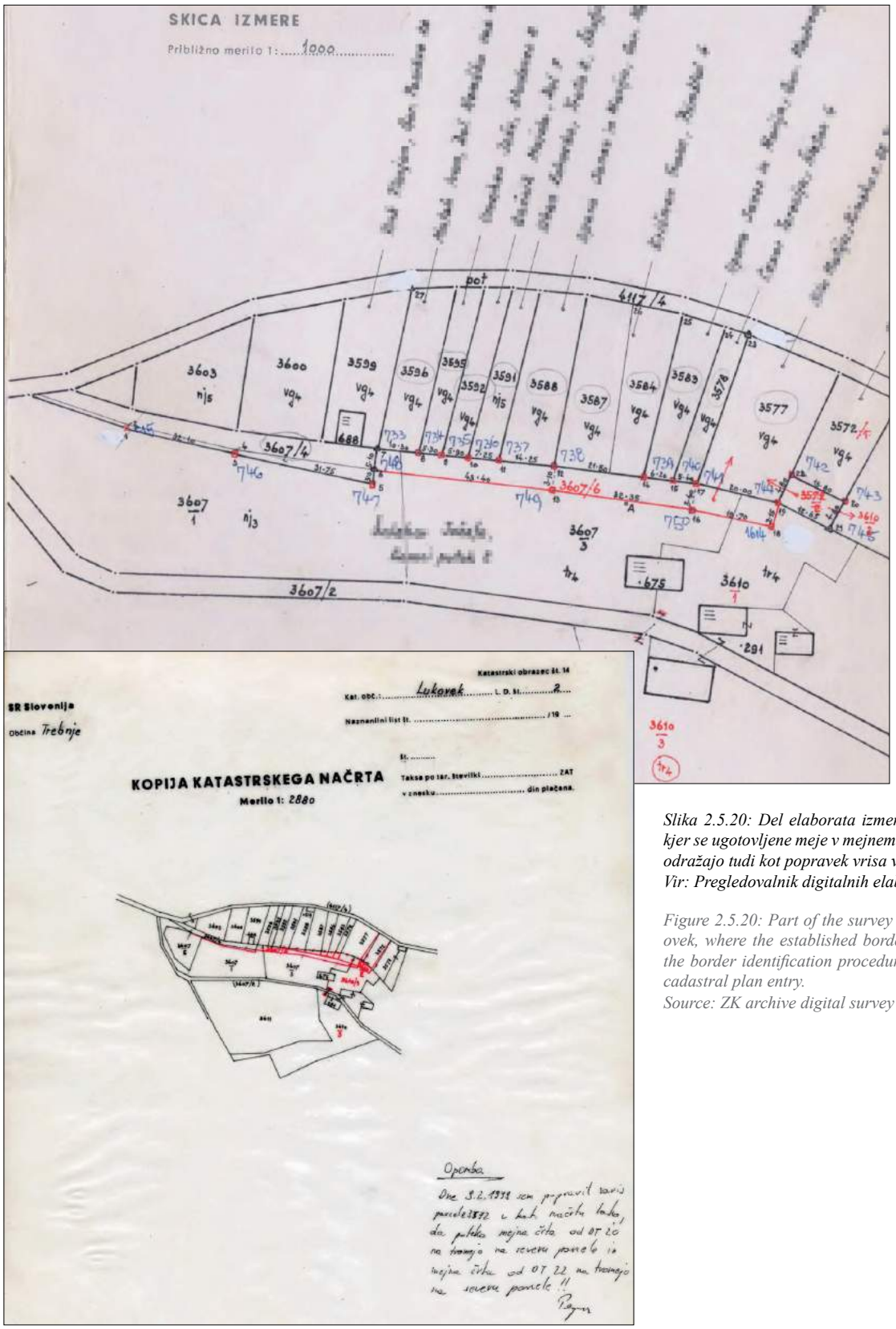
Dr. Ivan Širko wrote in one of his articles in 1905 that the borders drawn in cadastral plans are not always to be relied upon.

"I know from my civil practice that this practice began with the utmost respect for maps as a means of evidence and the fact that the map is often the last resort for resolving property disputes. This consideration, however, would steadily diminish, before eventually disappearing completely. All too often, the map would find itself in the position of a witness making unreliable claims to the judge; in the end, the only reliability such a witness holds is their concordance with everything else. This is also the case with the map. A map is a dead thing, and life flows around and beyond it, altering land borders on a daily basis. Nevertheless, parties still agree that the map border and the surveyor should be decisive in any border dispute; and it is often the case in border arrangements that the party that would gain benefit from the map drawing is the one zealously claiming that the map is adequate evidence for old borders."

Source: Širko, I. Synchronization of the Map Border, Slovenski pravnik no. 3/4, 1905

Major discrepancies between the land cadastre and the situation in nature occur mainly in longitudinal communication objects – paths, roads, waters. Their location in nature has changed significantly in comparison with the original measurement, but these changes were usually not recorded in the land cadastre or were recorded only in some places, often without prior marking out and parallel regulation of property relations to them (it would often happen during the inclusion of longitudinal objects in the plans that partial inclusions were made, that is, that the measured course of the longitudinal object was divided into several parts and included in the plans in such a way that it best suited the old situation of the surrounding structures and borders in a certain part of the plan).

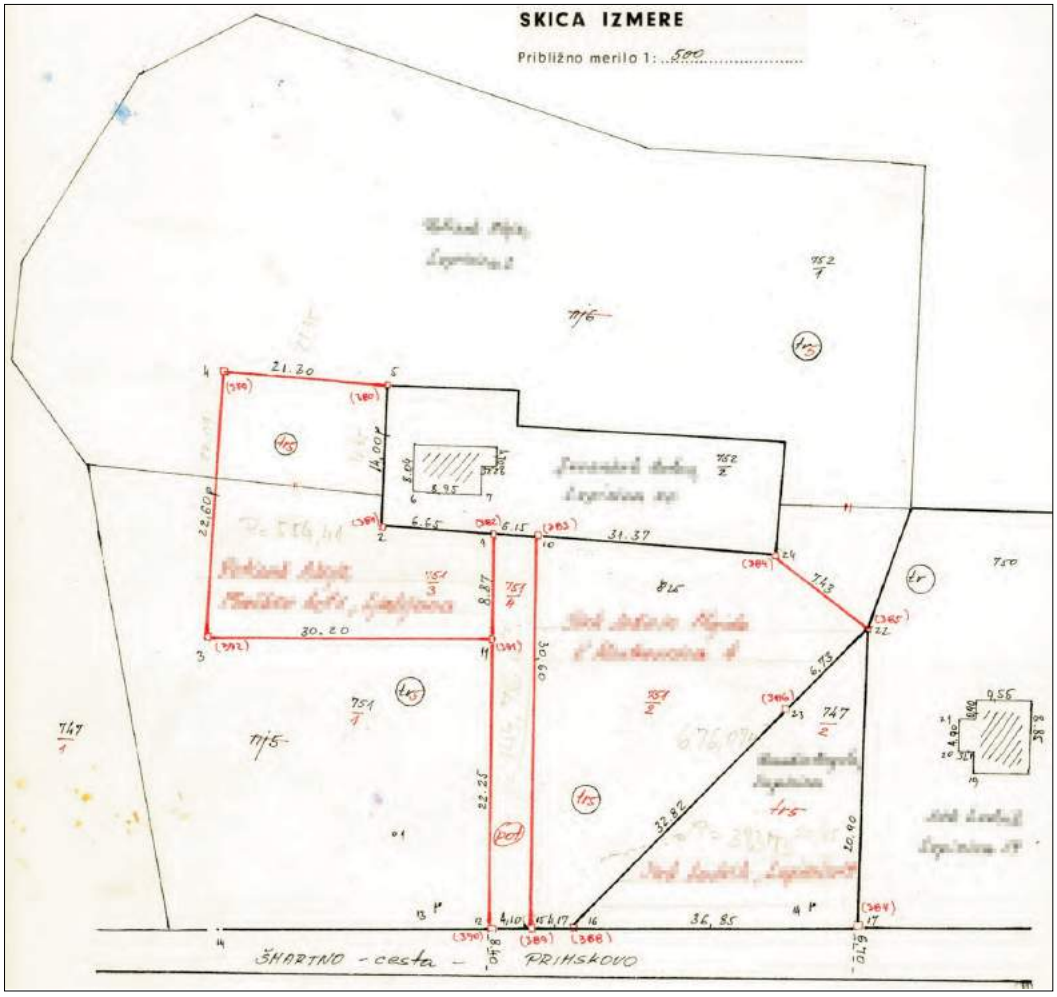
The land cadastre legislation from 1974 was aware of the obsolescence of the graphic cadastre. This led to it employing normative acts in order to change the method of maintenance and the appropriateness of the use of old plans according to the accuracy of the drawings. The rules adopted in 1976 prescribed the border identification procedure (MUP), the condition of which was the marking and professional securing of the locations of landmarks and surface areas of land plots with coordinates, regardless of the old situation. However, when establishing a border according to the graphic plan with the situation in nature, the reliability of the old plan should be established before the plan could be used to transfer the border to nature, even in the case when both affected owners had previously signed a declaration for transferring the border in accordance with the land cadastre.



Slika 2.5.20: Del elaborata izmere v k. o. 1418 Lukovek, kjer se ugotovljene meje v mejnem ugotovitvenem postopku odražajo tudi kot popravek vrisa v katastrski načrt.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 2.5.20: Part of the survey report in CM 1418 Lukovek, where the established borders are also recorded in the border identification procedure as a correction of the cadastral plan entry.
Source: ZK archive digital survey report viewer

[1]Opomba: V dokumentih iz zbirke listin Zemljiškega katastra so varovani osebni podatki zakriti
[1]Note: Protected personal data is hidden in the land cadastre documents.



Slika 2.5.21: Del elaborata v k. o. 1846 Liberga, kjer ugotovljene meje v mejnem ugotovitvenem postopku ne izkazujejo popravkov v katastrskem načrtu. Neskladje je lahko tudi odraz slabega vklopa ene od predhodnih parcelacij. Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 2.5.21: Part of the survey report in CM 1846 Liberga, where the borders established in the border identification procedure do not show corrections in the cadastral plan. This discrepancy may also be a reflection of a poor integration of a previous plot allocation.
Source: ZK archive digital survey report viewer

[1]Opomba: V dokumentih iz zbirke listin Zemljiškega katastra so varovani osebni podatki zakriti
[1]Note: Protected personal data is hidden in the land cadastre documents.

Vzdrževanja katastrskih načrtov po navodilih MUP so se izvajala različno od ene do druge geodetske uprave. Z ugotovitvijo obstoječih mej parcel v MUP-u so se z najboljšimi nameni popravljali zarisi meja v načrtih, s tem pa postopoma rušili in večinoma porušili skladnost (relativno natančnost) mejnih točk, meja in parcel. Taka praksa, ki eksplicitno ni bila nikjer zapisana, se je uporabljala četrt stoletja, vse do sprejetja nove zakonodaje leta 2000.

Takšno rešitev je dovoljeval tudi Zakon o evidentiranju nepremičnin, državne meje in prostorskih enot (ZENDMPE) in jo dovoljuje tudi Zakon o evidentiranju nepremičnin (ZEN), po katerih se zanesljivost in natančnost katastrskih podatkov poteka meje ugotavlja v določenem koridorju z opredelitvijo +/– položajnih odmikov, glede na zanesljivost izvornih podatkov. Treba je torej poudariti, da so v splošnem načrti grafične izmere slabe natančnosti, kritični pa so večinoma načrti, ki so nastajali v prvi polovici 19. stoletja, ter se nadalje skozi dve stoletji vzdrževali.

Iz dosedanjih izkušenj in analiz o zanesljivosti katastrskih načrtov lahko na kratko povzamemo:

- Ker Instrukcija iz leta 1824 za detajlno izmero ni predpisovala nobenih kontrolnih mer, kot npr. merjenje dolžin med dvema sosednjima z urezom določenima mejnima točkama, je vrednost izvršenega dela odvisna v prvi vrsti od vestnosti in 'izvežbanosti merjevca' ter od vrste, lege in oblike zemljišča. Načrti hribovitih in vinorodnih predelov so v splošnem slabši ali pa so bili izboljšani s kasnejšo reambulacijo, v ravninskih predelih pa so načrti primerni. V teh načrtih je polje predstavljeno z večjo natančnostjo kot gozdni kompleks.
- Pri gozdnih parcelah so na splošno čela dobro izmerjena. Pri merjenju vzdolž parcel pa se ugotavlja večja ali manjša neskladja s katastrskim načrtom, kar je povečini posledica prvotne nenatančne izbire samo glavnih prelomov.
- Meje katastrskih občin so zanesljive. Izmerjene so bile skrbneje in vsaj na grobo prekontrolirane. Ker so to običajno naravne meje, se z leti niso premikale. Sicer se ista meja v načrtih dveh sosednjih občin včasih ne prekriva natančno, vendar je večinoma po obliki enaka in se razhaja le po smeri, kar je posledica pogreškov v orientaciji merske mize. V gozdnih kompleksih se je morala meja izmeriti z busolo in mersko verigo. Ista občinska meja je bila izmerjena za vsako katastrsko občina posebej, torej v različnih dobah. Pri tem med drugim tudi nihče ni upošteval spremembe magnetne deklinacije čez leto.
- Tudi mejne točke mej parcelnih skupin (ledin), zlas-

The maintenance of cadastral plans according to the MUP instructions was carried out differently by each surveying administration. With the establishment of the existing borders of the land plot in the MUP, the outlines of the borders in the plans were corrected with the best intentions, but this gradually diminished and generally destroyed the compliance (relative accuracy) of border points, borders, and land plots. This practice, which was not explicitly recorded anywhere, was used for a quarter of a century, up until the adoption of new legislation in 2000.

This solution was also allowed by the Recording of Real Estate, State Border and Spatial Units Act (ZENDMPE), as well as the Real Estate Records Act (ZEN), according to which the reliability and accuracy of cadastral data of the border is determined in a particular corridor by defining +/– positional deviations, depending on the reliability of the source data. It should therefore be noted that the accuracy of graphical survey plans is generally poor, and especially those produced in the first half of the 19th century and maintained for two centuries.

From previous experience and analysis of the reliability of cadastral plans, we can summarize as follows:

- Since the instruction of 1824 did not prescribe any control measures for detailed surveying, such as, for example, measuring the lengths between two adjacent border points determined by resection, the value of the work performed depends primarily on the diligence and experience of the surveyor and on the type, location and shape of the land. Plans of hilly and wine-growing areas are generally in a worse state or have been improved by subsequent revision, while in flat areas the plans are suitable. These plans present fields with greater precision than forest complexes.
- In forest plots in general, the front lines are well measured. In the longitudinal measurement of plots, however, major or minor discrepancies within the cadastral plan can be found, mostly due to the initial inaccurate selection of only the major breaks.
- The borders of cadastral municipalities are reliable. They were measured more diligently and at least minimally monitored. Since these are usually natural borders, they have not moved over the years. Otherwise, the same border may not overlap exactly in the plans of two neighbouring municipalities, but it is generally of the same shape and differs only in its direction, owing to errors in the orientation of the plane table. In forest complexes, this border had to be measured with a compass and a measuring chain. The same municipal border was measured separately for each cadastral municipality, and therefore at different times. Among other things, the change in magnetic declination throughout the year was not taken into account.
- The border points of borders of parcel groups (fallows), especially where these are natural, are also generally considered to be good points of reference.
- A higher quality of measurement can be found in border points located close to the surveying location and where there are no obstacles in the direction of the vista.

ti tam, kjer so naravne, se šteje kot večinoma dobre oporne točke.

- Dobro so izmerjene tiste mejne točke, ki leže blizu stojišč, in kjer v smeri vizure ni ovir.
- Kulturne meje ne morejo služiti kot opora usklajevanja neke meritve z načrtom. Čeprav so bile v prvotnem načrtu dobro predstavljene, so se sčasoma močno premikale (njive se npr. vedno umikajo gozdu). Izjeme so tiste kulturne meje, ki so pogojene v obliki zemljišča, npr. pobočni greben ali hrbet, terenska stopnja, meja med humusnim in skalnatim zemljiščem in podobno.
- Pri fevdalnih in cerkvenih veleposestvih se lahko pričakuje večjo stalnost meja kot pri kmečkih, ker so te stalno nadzirali grajski uslužbenci. Nedvomno je tudi, da je geometer tedaj posvetil pravilni izmeri teh meja dovolj pazljivosti, kmeta pa je strah pred graščakom in peklom zadrževal pred uzurpacijo.
- Glede na takratne predpise o zamejničevanju posestnih mej je verjetnost, da so bile meje označene s kamnitimi mejniki, minimalna zlasti v krajih, kjer primernega kamenja na mestu samem ni bilo. Iz izkušnje izhaja, kako pogosto je tudi skozi vzdrževanje, ko so bili predpisi strožji in zanimanje za meje večje, težko doseči, da bi posestniki začasno zamejničenje s količki spremenili v trajno obliko.

- Cultural borders cannot serve as a reference for coordinating a measurement within a plan. Although they were well presented in the original plan, they have undergone significant movements over time (fields, for example, always move away from forests). Exceptions are those cultural borders that are conditioned by the type of the land, e.g. slopes or ridges, terrain level, border between humus and rocky soil etc.
- A greater permanence of borders can be expected in feudal and ecclesiastical estates than in farmers' estates, since the former were constantly supervised by castle officials. There is also no doubt that the surveyor at that time paid sufficient attention to the correct measurement of these borders, while fear of the manor lord and of damnation kept the farmer from usurping.
- In accordance with the regulations on property marking out borders at the time, there is a minimal probability that the borders were marked with stone landmarks, especially in places where there were no suitable stones on the site. Experience shows how often, even in maintenance, when regulations were stricter and interest in borders increased, it is difficult to get landlords to turn temporary border marking with stakes into permanent ones.

3 Pretvorba analognih zemljiškokatastrskih načrtov v digitalni zapis (DKN)

Conversion of analogue cadastral plans into digital format (DKN)

Zaradi poenostavitve vodenja in vzdrževanja opisnih podatkov zemljiškega katastra se je v preteklosti pojavila želja po digitalnem načinu vodenja. Tehnološko gledano je bilo v opisnem delu evidentiranje zemljišč, katastrskih vrst rabe in lastništva do 70. let prejšnjega stoletja urejeno pretežno v analogni obliki. Le del opisnega dela zemljiškega katastra (parcelni zapisniki, posestni listi) je bil urejen v zelo raznoliki digitalni obliki. Z izjemo podatka o vrsti rabe se v opisnem delu podrobnejši podatki o stavbah in delih stavb niso evidentirali. Opisni podatki o parcelah in lastnikih so se postopno (po katastrskih občinah) od sredine 60. let dalje začeli voditi in vzdrževati z računalniško tehnologijo. Zajem teh podatkov v digitalno obliko je bil za zadnjo katastrsko občino zaključen leta 1979. Sredi osemdesetih let je bil k lastnikom pripisan tudi EMŠO. Grafični del zemljiškega katastra je bil z nekaj izjemami (npr. nove izmere koordinatnega katastra v Prekmurju po letu 1974) vse do sredine 90. let prejšnjega stoletja še večinoma neinformatiziran.

Leta 1991 je Geodetska uprava RS pričela s poskusnim projektom »Digitalni zemljiški kataster (DZK)«, ki je bil zamišljen kot dosledna povezava atributnega in grafičnega dela zbirke podatkov zemljiškega katastra. Kriteriji so bili postavljeni tako dosledno ('ena na ena'), da je bilo po večletnih testiranjih ugotovljeno, da projekta v takšni obliki v doglednem času ne bo mogoče izvesti. Vse pridobljene izkušnje pa so se s pridom uporabile v nadaljevanju. Tako so se leta 1995 aktivnosti v zvezi z informatizacijo nadaljevale v smeri digitalizacije grafičnih podatkov, in sicer kot »Projekt izdelave digitalnih katastrskih načrtov (DKN)«.

Kot navedeno, se je projekt posodobitve zemljiškega katastra, ki se je na začetku imenoval DZK, začel izvajati v Sloveniji leta 1991. Leta 1995 pa so bili na osnovi testov v več okoljih v Sloveniji sprejeti tehnični pogoji za izdelavo DKN-ja. Prvotna ideja iz obdobja pred letom 1991 je bila, da bi izvedli le rastrski zajem načrtov (skeniranje) in ohranili vsebino načrtov, ki so uradna evidenca nepremičnin, povsem nespremenjeno. Odpravili bi se le ugotovljeni skrčki ali raztezki listov. Vendar pa je nadaljnji razvoj informacijskega sistema temeljil na vektorski topološko urejeni bazi. Zato je bila prvotna ideja nadgrajena tako, da je skeniranju načrtov

Due to the simplification of the management and maintenance of descriptive data of the land cadastre, a desire has arisen in the past for a digital method of management. From a technological point of view, the recording of property, cadastral types of use and ownership in the descriptive part of the cadastre was generally in analogue format until the 1970s. Only a part of the descriptive part of the land cadastre (land plot records, ownership lists) was arranged in a very diverse digital format. With the exception of data on the type of use, no detailed data on buildings and parts of buildings was recorded in the descriptive part. Computer technology has gradually been implemented in the management and maintenance of descriptive data on plots and owners since the mid-1960s (by cadastral municipalities). The recording of this data in digital format was completed in 1979 for the last cadastral municipality. In the mid-1980s, owners were also assigned a personal identification number (EMŠO). The graphic part of the land cadastre was still largely uncomputerized until the mid-1990s, with a few exceptions (e.g. new surveys of the coordinate cadastre in Prekmurje after 1974).

In 1991, the Surveying and Mapping Authority of the Republic of Slovenia initiated the "Digital Land Cadastre (DZK)" pilot project, which was designed to be a reliable connection between the attribute and graphic parts of the land cadastre database. The criteria were determined so consistently ("one to one") that it was found after several years of testing that a project of such scope would not be possible in the foreseeable future. However, all the experience gained was a great benefit for future work. Thus, in 1995, activities related to computerization continued in the direction of digitization of graphic data, in particular in the form of the "Project for the Production of Digital Cadastral Plans (DKN)".

As stated, the project of modernizing the land cadastre, initially called "DZK", was introduced in Slovenia in 1991. The technical conditions for the production of the DKN were adopted in 1995 on the basis of testing in several environments in Slovenia. The original goal from the period before 1991 was to perform only a raster recording of maps (scanning) and completely preserve their content, since they are an official record of real estate. The only intervention would be the elimination of identified constrictions or stretching. However, the further development of the information system was based on a topological vector database. Thus, the ori-

zemljiškega katastra sledilo še več korakov do končnega cilja, tj. vektorske topološko urejene baze grafičnih podatkov za celo državo.

Prvi korak je bila ekranska vektorizacija skenogramov z združevanjem vsebine listov znotraj posameznega območja zajema. Območje zajema je bilo območje grafičnih podatkov, ki so predstavljali zaključeno celoto in so bili izrisani na enem ali več zemljiškokatastrskih listih istega merila. Ekranski vektorizaciji je sledilo združevanje vsebine sosednjih listov istega območja zajema.

Temu je sledilo približno geolociranje vektorizirane vsebine območij zajema v enotni sistem, tj. Gauss-Krügerjev koordinatni sistem (v nadaljevanju: D48/GK). Za območje numeričnega katastra so bili katastrski načrti že dovolj kakovostni tudi v koordinatnem sistemu D48/GK, zaradi česar geolociranje DKN-ja teh območij v enotni sistem ni bilo problematično.

Za geolociranje grafičnega katastra je bilo potrebnega več dela. Pri grafičnem katastru so tehnični pogoji za izdelavo DKN-ja predvideli, da se območje zajema grafične izmere premakne v približen D48/GK-koordinatni sistem na osnovi obstoječih digitalnih meja katastrskih občin iz registra prostorskih enot (le izjemoma na osnovi drugih podatkov). Položajna natančnost, ki je bila dosežena s takim premikom, je bila lahko tudi samo približno 20 m.

Ker je vektorizacija z združevanjem listov prinesla digitalne grafične podatke, združene po območjih zajema, je bilo (po posameznih katastrskih občinah) le-te mogoče primerjati z opisnimi podatki, ki so bili že pred tem v digitalni obliki. Rezultat je bil seznam vsebinskih napak oz. neujemanj med opisnimi in grafičnimi podatki, ki jih je bilo treba odpraviti.

Rezultat zgornjih korakov so bili topološko pravilni vektorski grafični podatki po posameznih območjih zajema. Digitalizacija grafičnih podatkov pa je šla še naprej, in sicer v smeri vektorske topološko pravilne baze zemljiškega katastra za celo državo. Prvi nadaljnji korak k temu cilju je bilo kvalitetnejše geolociranje območij zajema grafične izmere s pomočjo nove transformacije na podlagi transformacijskih točk v lokalnem in koordinatnem sistemu D48/GK (ZK-točk, geodetskih točk ali točk, dobljenih s fotointerpretacijo DOF-točk) in praviloma Helmertove transformacije.

Na novo oz. dodatno geolocirana območja zajema so bila osnova za naslednji korak, tj. uskladitev meja območij zajema (katastrskih občin oz. delov katastrskih občin). Za pregled stanja (prekrivanja in 'lukenj') med posameznimi območji zajema so bili uporabljeni skupni izrisi sosednjih

ginal idea was upgraded so that the scanning of the land cadastre maps was followed by even more steps towards the final goal, i.e. topological vector graphic databases for the whole country.

The first step was the screen vectorization of scans by merging the contents of sheets within an individual area of coverage. An area of coverage was an area of graphical data that represented a complete whole and was drawn on one or more land cadastral sheets of the same scale. Screen vectorization was followed by merging the contents of adjacent sheets of the same area of coverage.

This was followed by the approximate geolocation of the vectorized content of the areas of coverage into a unified system, i.e. the Gauss-Krüger coordinate system (hereinafter: D48/GK). For the numerical cadastre area, the cadastral plans were of sufficient quality in the D48/GK coordinate system as well, meaning the geolocation of the DKN of these areas into a single system did not present any problems.

The geolocation of the graphic cadastre was more arduous. In the case of the graphic cadastre, the technical conditions for the production of the DKN provided for the area of graphical surveying to be moved into the approximate D48/GK coordinate system on the basis of the existing digital borders of cadastral municipalities from the register of spatial units (only exceptionally on the basis of other data). The positional accuracy achieved with this type of movement could be as low as about 20 m.

As vectorization by combining sheets yielded digital graphic data grouped by areas of coverage, it became possible to compare this data (by individual cadastral municipalities) with the descriptive data that was already in a digital format. The result was a list of content errors or discrepancies between descriptive and graphic data, which needed to be addressed.

The above steps resulted in topologically accurate vector graphic data grouped by individual area of coverage. Meanwhile, the digitization of graphic data continued in the direction of the topologically accurate vector land cadastre database for the entire country. The first next step towards this goal was better geolocation of areas covered by graphical surveys using a new transformation based on transformation points in the local and the D48/GK coordinate system (LC-points, geodetic points or points obtained by the photointerpretation of DOF-points) and Helmert's transformation.

The new, additional geolocated areas of coverage were the basis for the next step, the harmonization of the borders between areas of coverage (cadastral municipalities or parts of cadastral municipalities). To review the situation (overlaps and "gaps") between individual areas of coverage, common drawings of adjacent are-

območij zajema, tj. izrisi za preliminarne rešitve, ki so bili pripravljeni na podlagi natančneje geolociranih grafičnih podatkov.

Zadnji korak je predstavljala uveljavitev digitalnih katastrskih načrtov za posamezno katastrsko občino. Digitalni podatki so bili uveljavljeni z objavo sklepa v Uradnem listu.

»Projekt posodobitve evidentiranja nepremičnin« na področju zemljiškega katastra je bil za celo Slovenijo zaključen leta 2009, ko je bila uveljavljena zadnja izmed katastrskih občin v državi.

Poimenovanje »digitalni zemljiški kataster« je bil v geodetskih strokovnih krogih uveljavljen kot termin za zajem grafičnih podatkov v digitalno obliko in njihovo povezavo z opisnimi podatki v enotno digitalno bazo zemljiškega katastra.

Termin »digitalni katastrski načrt (DKN)« se je uporabljal za vektorsko topološko pravilno digitalno obliko grafičnih podatkov zemljiškega katastra v enotnem državnem koordinatnem sistemu.

Poudariti je treba, da noben izmed korakov pretvorbe ni vplival na (numerične) koordinate ZK-točk, ki so bile pridobljene v geodetskih postopkih. Za ZK-točke je bila opisna digitalna baza vzpostavljena že v letih od 1991 do 1993. Koraki pretvorbe grafičnih podatkov so vplivali le na prikaz v grafiki. Koordinate prikaza v grafiki so bile poimenovane kot grafične koordinate in so predstavljale nov dodaten atribut ZK-točk. Baza ZK-točk je bila tako kasneje razširjena tudi z možnostjo vpisa grafičnih koordinat ZK-točk, kar je bil predpogoj za izvedbo korakov pretvorbe.

as of coverage were used, i.e. drawings for preliminary solutions, which were prepared on the basis of more precisely geolocated graphical data.

The last step was the implementation of digital cadastral plans for each cadastral municipality. The digital data was made effective by the publication of a decision in the Official Journal.

The "Project of Modernization of Real Estate Registration" in the field of land cadastre was completed for the whole of Slovenia in 2009, when the last of the cadastral municipalities in the country was completed.

The name "digital land cadastre" has been established in geodetic circles as a term for recording graphic data in a digital format and connecting it with descriptive data in a unified digital land cadastre database.

The term "digital cadastral plan (DKN)" was used for the vector topologically precise digital form of graphic data of the land cadastre in the unified national coordinate system.

It should be noted that none of the conversion steps affected the (numerical) coordinates of the LC points obtained in the geodetic procedures. A descriptive digital database for LC points was set up between 1991 and 1993. The steps taken in the graphic data conversion only affected the display in the graphics. The coordinates of the display in the graphic were named graphical coordinates and they represented a new additional attribute of LC-points. The LC point database was thus later extended with the option to enter graphic coordinates of LC points, which was a prerequisite for the conversion steps.

3.1 Skeniranje analognih zemljiškokatastrskih načrtov z razpačenjem
Scanning of analogue cadastral plans with rubber-sheeting

Namen skeniranja analognih načrtov je bil priprava osnove za naslednji korak, tj. ekransko vektorizacijo, hkrati pa zagotoviti arhiv stanja pred vektorizacijo in uporabo skenogramov kot rastrskih podlag.

Analogni načrti (originali) so bili skenirani po območjih znotraj posameznih katastrskih občin. Eno območje je predstavljalo zaključeno celoto, ki je bila izrisana na enem ali več načrtih istega merila. Ta območja so bila poimenovana »območja zajema«.

V primeru poškodovanih načrtov ali pregostega detajla ali pa velikega števila vrisanih slabo preglednih sprememb je bilo

The purpose of scanning the analogue maps was to prepare the basis for the next step, i.e. screen vectorization, while at the same time providing an archive of the situation before vectorization and the use of scans as raster bases.

Analogue maps (originals) were scanned by areas within individual cadastral municipalities. An individual area represented a complete whole, drawn on one or more maps of the same scale. These areas were termed "areas of coverage".

Where maps were damaged, contained too dense details or included large numbers of unclear changes, it was possible to use the method of scanning matrices or regular digitization. The ma-

možno uporabiti metodo skeniranja matric ali pa klasične digitalizacije. Matrice so predstavljale čistoris zadnjega stanja in torej niso bile obremenjene z vrisanimi vsemi spremembami od nastanka analognega načrta pa do trenutka skeniranja in so zato olajšale nadaljnjo vektorizacijo.

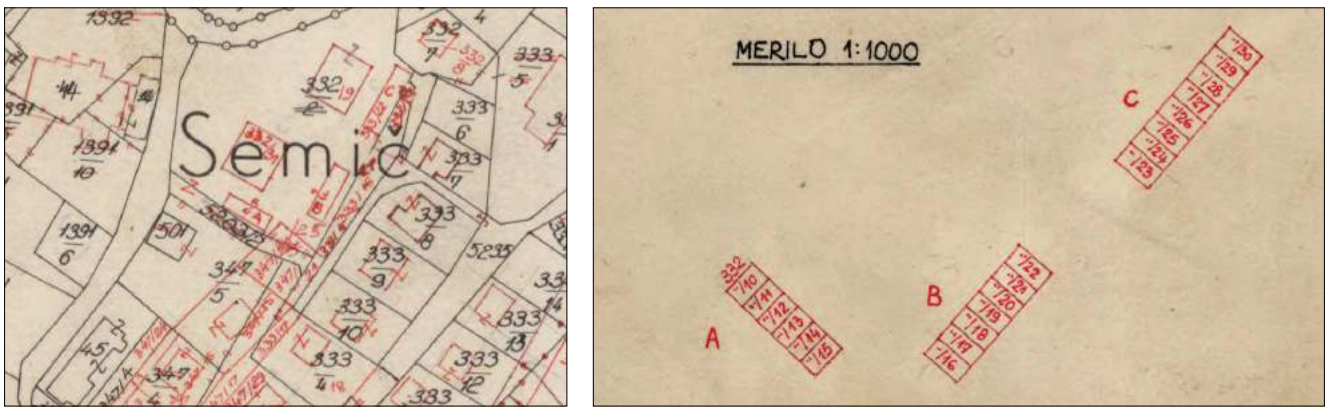
trices represented a clean copy of the most recent situation and therefore were not burdened with all the changes drawn from the creation of the analogue map to the moment of scanning, making them useful in further vectorization.

Slika 3.1.1: Izreza iz zelo obremenjenega in delno uničenega načrta grafične izmere k. o. 1412 Mokronog, ki je bil v uporabi in vzdrževanju v času od 1908 do leta 2002, tj. skoraj 100 let.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 3.1.1: Excerpts from a very worn and partly destroyed graphical survey map of CM 1412 Mokronog, which was in use and maintenance from 1908 to 2002, almost 100 years.
Source: the e-ZKN archive land cadastre map viewer

Pred skeniranjem je bilo treba načrte ustrezno pripraviti. Med to pripravo je sodilo npr. odprava očitnih napak, zaključek postopkov vzdrževanja v teku (zagotovitev istega časovnega preseka v grafičnih in opisnih podatkih), vris območij, zarisanih v večjem merilu na »praznem« delu načrta v osnovni načrt, kamor so sodila (če je bil vklop mogoč), poprava slabo izrisane mejne črte, ...

The maps had to be properly prepared before scanning. Preparation included, for example, the elimination of obvious errors, completion of maintenance procedures in progress (ensuring equal time intervals in graphical and descriptive data), adjustments for where "empty" areas of the basic map were used to draw details in larger scales and identifying where they belonged (if this was possible), and correction of poorly drawn border lines, etc.



Slika 3.1.2: Izreza iz načrta grafične izmere za k. o. 1527 Semič, na katerem so bili drobni detajli A, B in C vrisani v merilu 1 : 1000 na praznem delu lista v merilu 1 : 2880 in ga je bilo treba vklopiti v osnovni načrt merila 1 : 2880.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 3.1.2: Excerpts from the graphical survey map for CM 1527 Semič, where small details A, B and C were drawn in the scale of 1:1000 on a blank part of the sheet in the scale of 1:2880, and had to be included in the basic map in the scale of 1:2880.
Source: the e-ZKN archive land cadastre map viewer

Bernardin med morjem in soncem

Bernardin je turistični kraj, kjer se na 25 hektarjih med oleandri, palmami, rožmarini in lovorji razprostirata letovišče in srečevališče z dvoranami in hoteli različnih kategorij.

V začetku 70. let je bil okoli cerkvice sv. Bernardina zasnovan hotelski velikan, ki je učinkoval kot prikupno "pravljično" turistično mestece. Na mestu nekdanje ladjedelnice so zrastli 3 hoteli (sedanji: Grand Hotel Bernardin, Hotel Histrion in Hotel Vile Park). Bil je zalogaj, kakršnega turistična Slovenija dotlej ni poznala.

Bernardin between the sea and the sun

Bernardin is a tourist location of 25 hectares with oleanders, palm trees, rosemary and laurels growing around a resort and meeting place with halls and hotels of various categories.

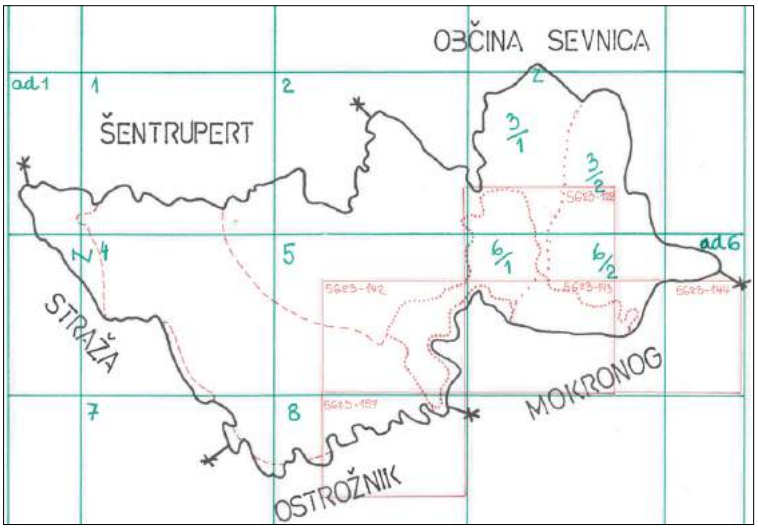
In the early 1970s, a great hotel was designed around the Church of St Bernardin, which acted as a charming "fairy-tale" tourist town. The site of the former shipyard has seen the construction of three hotels (currently: Grand Hotel Bernardin, Hotel Histrion and Hotel Vile Park). It was something that Slovenian tourism had never known before.

Obremenjen zemljiškokatastrski načrt v k. o. 2630 Piran kaže na del »uzurpacije« morja v letu 1976 za potrebe dela današnjega kompleksa Bernardin (Hotel Histrion in Hotel Vile Park).
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov, vir fotografije: https://www.hoteli-bernardin.si

The worn land cadastral plan of CM 2630 Piran indicates a part of the "usurpation" of the sea in 1976 for the needs of a part of today's Bernardin complex (Hotel Histrion and Hotel Vile Park).
Source: the e-ZKN archive land cadastre map viewer, Photo source: https://www.hoteli-bernardin.si

V skeniranje so bili poleg grafičnih podatkov (načrtov, ozalidnih kopij in matric) predani tudi opisni podatki o parcelah ter podatki o ZK-točkah s koordinatami v D48/GK. Za vsako katastrsko občino je bila pripravljena tudi shema razdelitve na liste in prav tako tudi podatki o listih ZKN.

In addition to graphical data (of maps, Ozalid prints and matrices), descriptive data on plots and data on LC points with coordinates in D48/GK were also submitted for scanning. A scheme of division into sheets was prepared for each cadastral municipality, as well as data on the ZKN sheets.



Slika 3.1.3: Grafični prikaz razdelitve k. o. 1398 Bistrica na liste zemljiškokatastrskih načrtov, ki so bili predani v skeniranje (prikazani so vsi listi v vseh merilih). Posebnost: Detajlni list 3 ni obstajal, obstajala sta lista 3/1 in 3/2, katerih vsebina skupaj je predstavljala vsebino »neobstoječega lista 3«. Analogno velja za list 6 oz. 6/1 in 6/2.
Vir: Arhiv GURS

Figure 3.1.3: Graphical representation of the distribution of CM 1398 Bistrica into sheets of land cadastral plans that were submitted for scanning (all sheets are shown in all scales). Special feature: There was no detail sheet 3, only sheets 3/1 and 3/2, the contents of which represented the contents of "non-existent sheet 3". The same applies to sheet 6 or 6/1 and 6/2.
Source: The SMARS archive

Izpostava območne geodetske uprave	Ime TREBNJE	Šifra 044
Katastrska občina	Ime BISTRICA	Šifra 1398

Območje zajema	vrsta GRAFIČNI	šifra 1

Datum zajema	
Razpačevanje	

Podatki o ZK načrtih

Zap. številka lista	Lokalna oznaka	Splošna oznaka	Merilo	Nosilec	Vrsta načrta	Original Matrica	Oleata ZK točk	Ozalidna kopija
1	1	VZH.K.VII.18-cf	1:2880	PAPIR	GRAFIČNI	ORIGINAL	NE	DA
2	ad1	VZH.K.VII.18-df	–"–	–"–	–"–	–"–	–"–	–"–
3	2	VZH.K.VII.18-bf	–"					
4	3/1	VZH.K.VII.18-af	–"					
5	3/2	VZH.K.VII.18-af	–"					
6	4	VZH.K.VII.18-cg	–"					
7	5	VZH.K.VII.18-bg	–"					
8	6/1	VZH.K.VII.18-ag	–"					
9	6/2	VZH.K.VII.18-ag	–"					
10	ad6	VZH.K.VII.18-dg	–"					
11	7	VZH.K.VII.18-cg	–"					
12	8	VZH.K.VII.18-bg	–"					

Izpostava območne geodetske uprave	Ime TREBNJE	Šifra 044
Katastrska občina	Ime BISTRICA	Šifra 1398

Območje zajema	vrsta MEJNI	Šifra 2

Datum zajema	
Razpačevanje	

Podatki o ZK načrtih

Zap. številka lista	Lokalna oznaka	Splošna oznaka	Merilo	Nosilec	Vrsta načrta	Original Matrica	Oleata ZK točk	Ozalidna kopija
1	Bistrica 9	5623 - 128	1:2000	FOLIJA		ORIGINAL	NE	DA
2	Bistrica 10	5623 - 142	–"–	–"–	–"–	–"–	–"–	–"–
3	Bistrica 11	5623 - 145	–"–	–"–	–"–	–"–	–"–	–"–
4	Bistrica 12	5623 - 144	–"–	–"–	–"–	–"–	–"–	–"–
5	bistrica 8	5623 - 157	–"–	–"–	–"–	–"–	–"–	–"–

Slika 3.1.4: Opisni podatki o listih zemljiškokatastrskih načrtov v k. o. 1398 Bistrica po območjih zajema.
Vir: Arhiv GURS

Figure 3.1.4: Descriptive data on the sheets of land cadastral plans in CM 1398 Bistrica by areas of coverage.
Source: The SMARS archive

Zemljiškokatastrski načrti, ki so bili predmet skeniranja, so bili raznih formatov in meril, izdelani na različnih materialih iz različnih obdobij in različno obremenjeni z gostoto detajla in številom/gostoto sprememb zaradi vzdrževanja ter različnim skrčkom ali raztezkom.

Vsak skenogram je bil pregledan in ocenjen z vidika primernosti za nadaljnjo vektorizacijo. Neprimerna območja so bila posebej označena, naveden pa je bil tudi vzrok uvrstitve med neprimerna območja.

V okviru skeniranja je bila odpravljena tudi deformacija nosilca (odprava skrčka ali raztezka) na osnovi okvirja lista ali pa decimetrske mreže (možnost samo v ustreznih merilih).

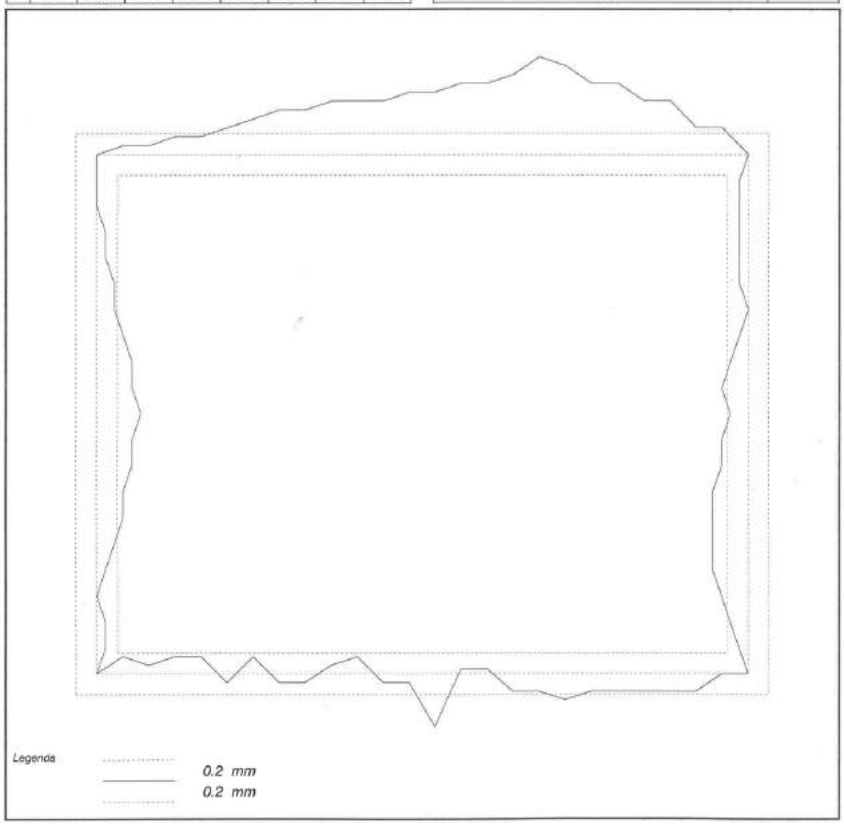
The land cadastral plans that were scanned were of various formats and scales, made of different materials, from different periods and contained different levels of detail density and number/density of maintenance changes, as well as various levels of constriction or stretching.

Each scan was reviewed and evaluated for suitability for further vectorization. The unsuitable areas were specifically marked, along with the reason for their classification as unsuitable.

In the course of the scanning, the deformation of the medium was eliminated (elimination of constriction or stretching) on the basis of the sheet frame or a decimetre grid (possible only with the appropriate scales).

	Pred razpačenjem				Po razpačenju			
	Helmert		Afina		Helmert		Afina	
	X	Y	X	Y	X	Y	X	Y
1	-2.40	-0.69	-2.84	-1.41	0.02	-0.03	0.00	0.00
2	3.63	1.14	2.83	1.40	-0.02	-0.03	0.00	0.00
3	2.02	1.67	2.82	1.40	0.02	0.03	0.00	0.00
4	-3.25	-2.12	-2.81	-1.39	-0.02	0.03	0.00	0.00

Primernost za skaniranje	☹
Primernost za vektorizacijo	☹



Slika 3.1.5: Prikaz odstopanja na razpačenem skenogramu v k. o. 1412 Mokronog z navedbo primernosti za skeniranje in vektorizacijo (list ni bil primeren). Vir: Arhiv GURS

Figure 3.1.5: Deviation on a rubber-sheeting scan in CM 1412 Mokronog with indication of suitability for scanning and vectorization (the sheet was not suitable). Source: The SMARS archive

Rezultat skeniranja so bili torej v rastrsko digitalno obliko pretvorjeni vsi analogni zemljiškokatastrski načrti po območjih znotraj katastrskih občin, pri čemer je bilo izvedeno tudi njihovo razpačenje.

The scanning resulted in all the analogue land cadastral plans having been converted by areas within the cadastral municipalities into raster digital form and also having undergone rubber-sheeting.

3.2 Vektorizacija skenogramov in združevanje listov znotraj istega območja zajema, priprava slojev listov in priprava seznama napak

Vectorization of scans and grouping of sheets within the same area of coverage, preparation of layers of sheets and preparation of a list of errors

Namen vektorizacije je bil zagotoviti topološko pravilno vektorsko digitalno obliko grafičnih podatkov za vsa območja zajema znotraj katastrskih občin.

V vektorizacijo so bili poleg razpačenih skenogramov zemljiškokatastrskih načrtov predani tudi opisni podatki o parcelah, shema razdelitve na liste, podatki o listih zemljiškokatastrskih načrtov in ozalidne kopije zemljiškokatastrskih načrtov.

Vektorizacija je bila izvedena kot ekranska vektorizacija skenogramov. Če skenograma zaradi slabega stanja lista ni bilo mogoče zagotoviti (ni bilo izvedeno niti skeniranje matric), je bila vsebina načrta zajeta s klasično digitalizacijo. Vsak list je predstavljal zaključeno celoto.

Pri vektorizaciji je bila zajeta samo katastrska vsebina (brez morebitne topografske vsebine, ki jo je lahko vseboval načrt). Zajeti so bili parcelni deli (vsaka parcela ima vsaj en parcelni del). Le zaradi potreb baze zemljepisnih imen pa so bila zajeta tudi ledinska imena.

Parcelni deli so bili zajeti kot zaključeni poligoni. Vsak poligon je imel centroid, na katerega je bila vezana parcelna številka. Centroid s parcelno številko je predstavljal identifikator parcelnega dela. V primeru, ko je imela parcela več parcelnih delov, je bil vsakemu izmed njih pripisan (drug) centroid z isto parcelno številko.

Za poligon parcelnega dela so morali biti poleg centroida s parcelno številko definirani vsi lomi, kot tudi vsi preseki z medsebojnimi mejami sosednjih parcelnih delov in preseki mej parcelnih delov z robom lista. Točke preseka so bile zajete kot linijske točke. Za zajem stavb so bila določena posebna pravila, ki so ohranjala pravokotnost stavb (če je ta bila na analognem načrtu), in vzporednost ob dolžinskih objektih (če je ta bila na analognem načrtu). V primeru parcel na robu lista (ko je bil en del parcele narisan na enem listu, drug del parcele pa na sosednjem listu) so bili parcelni deli zaprti z robom lista, da je bil poligon zajema parcelnega dela na enem listu zaključen.

The purpose of vectorization was to provide a topologically correct digital vector form of graphical data for all areas of coverage within the cadastral municipalities.

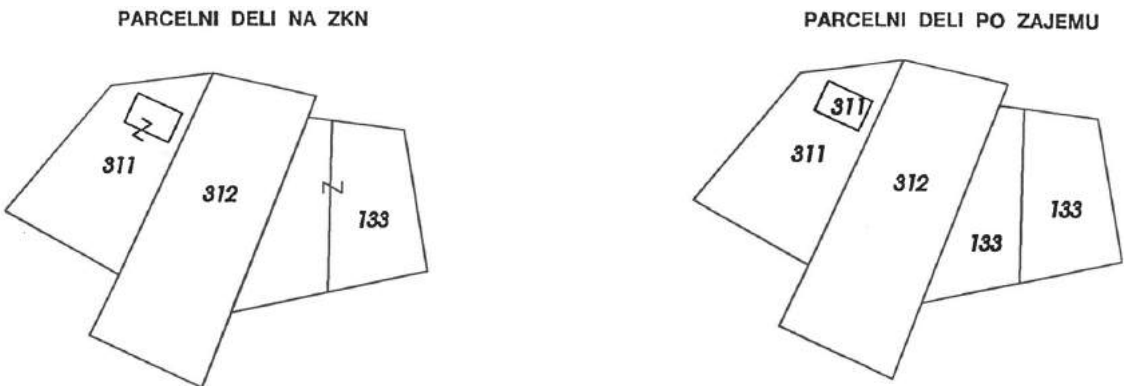
In addition to the rubber-sheeted scans of land cadastral plans, descriptive data on plots, a scheme of division into sheets, data on sheets of land cadastral plans and Ozalide copies of land cadastral plans were also submitted for vectorization.

The vectorization was performed as a screen vectorization of the scans. If a scan could not be completed due to the poor condition of the sheet (not even scanning of the matrices was performed), the content of the map was recorded by regular digitization. Each sheet represented a complete whole.

Only cadastral content was included in the vectorization (without any topographic content that the map might contain). Plot parts were covered (each plot has at least one plot part). The names of fallows were also included, but only due to the needs of the database of geographical names.

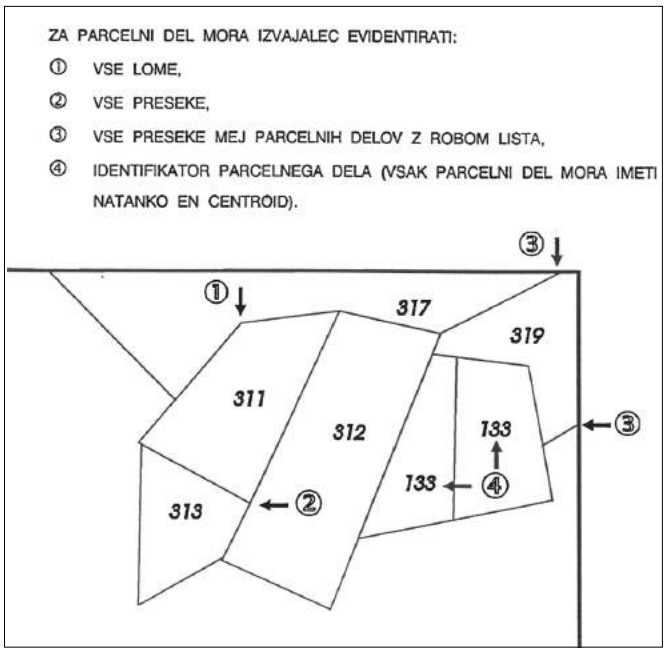
The plot parts were included as completed polygons. Each polygon had a centroid with a plot number. The centroid with the plot number represented the plot part identifier. In the case where a plot had several plot parts, each was assigned a (different) centroid with the same plot number.

In addition to the centroid with the plot number, a plot part polygon had to have all gradients identified, along with all intersections with mutual borders of adjacent plot parts and intersections of plot borders with the edge of the sheet. Intersection points were recorded as line points. Special rules were laid down for the recording of buildings, which maintained the right angles of buildings (if present on the analogue map) and parallel lines along longitudinal structures (if present on the analogue map). In the case of plots at the edge of the sheet (when one part of the plot was drawn on one sheet and the other part of the plot on the adjacent sheet), the plot parts were lined up with the edge of the sheet so that the polygon covering the plot part was completed on a single sheet.



Slika 3.2.1: Pravila za vektorizacijo – razlika med izvornim zemljiškokatastrskim načrtom (identičen je bil tudi prikaz na skenogramu) in vektoriziranimi podatki.
Vir: Arhiv GURS

Figure 3.2.1: Rules for vectorization – the difference between the original land cadastral plan (the display on the scan was identical) and the vectorized data.
Source: The SMARS archive

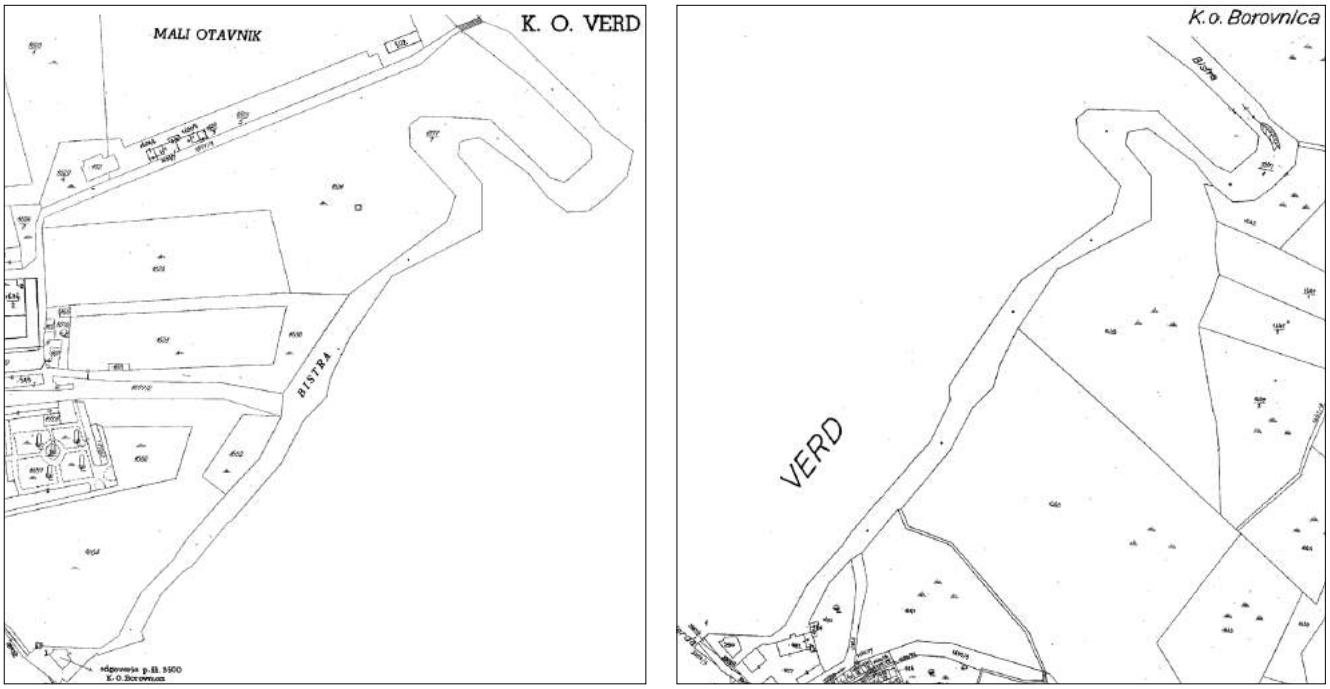


Slika 3.2.2: Pravila za vektorizacijo – zajem lomov in presekov ter »zapiranje« poligonov.
Vir: Arhiv GURS

Figure 3.2.2: Rules for vectorization – recording of gradients and intersections, "closing" of polygons.
Source: The SMARS archive

Skupni dolžinski objekti (vodotoki, ceste, poti, ki so pripadali dvema katastrskima občinama (vsaki do polovice širine)), so bili zajeti v obeh katastrskih občinah v celi širini (če so bili tako zarisani na analognem načrtu), poleg tega pa je bila vektorizirana še »namišljena« meja po sredini skupnega objekta. Zaključen poligon, ki je predstavljal polovico dolžinskega objekta v sosednji katastrski občini, je dobil namesto številke parcele skrajšano obliko imena sosednje katastrske občine

Shared longitudinal objects (watercourses, roads, paths belonging to two cadastral municipalities (each up to half the width)) were covered in both cadastral municipalities in full width (if they were so drawn on the analogue map), and in addition, the "imaginary" border in the middle of the shared object was vectorized as well. The completed polygon, which represented half of the longitudinal object in the neighbouring cadastral municipality, was given an abbreviated form of the name of the neighbouring cadastral municipality instead of a plot number.



Slika 3.2.3: Prikaz zarisa skupnega dolžinskega objekta (reke Bistre) na ZKN, ki je bil vektoriziran v celotni širini in dodatno še po »namišljeni« sredinski črti tako v k. o. 2003 Verd kot v k. o. 2004 Borovnica.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

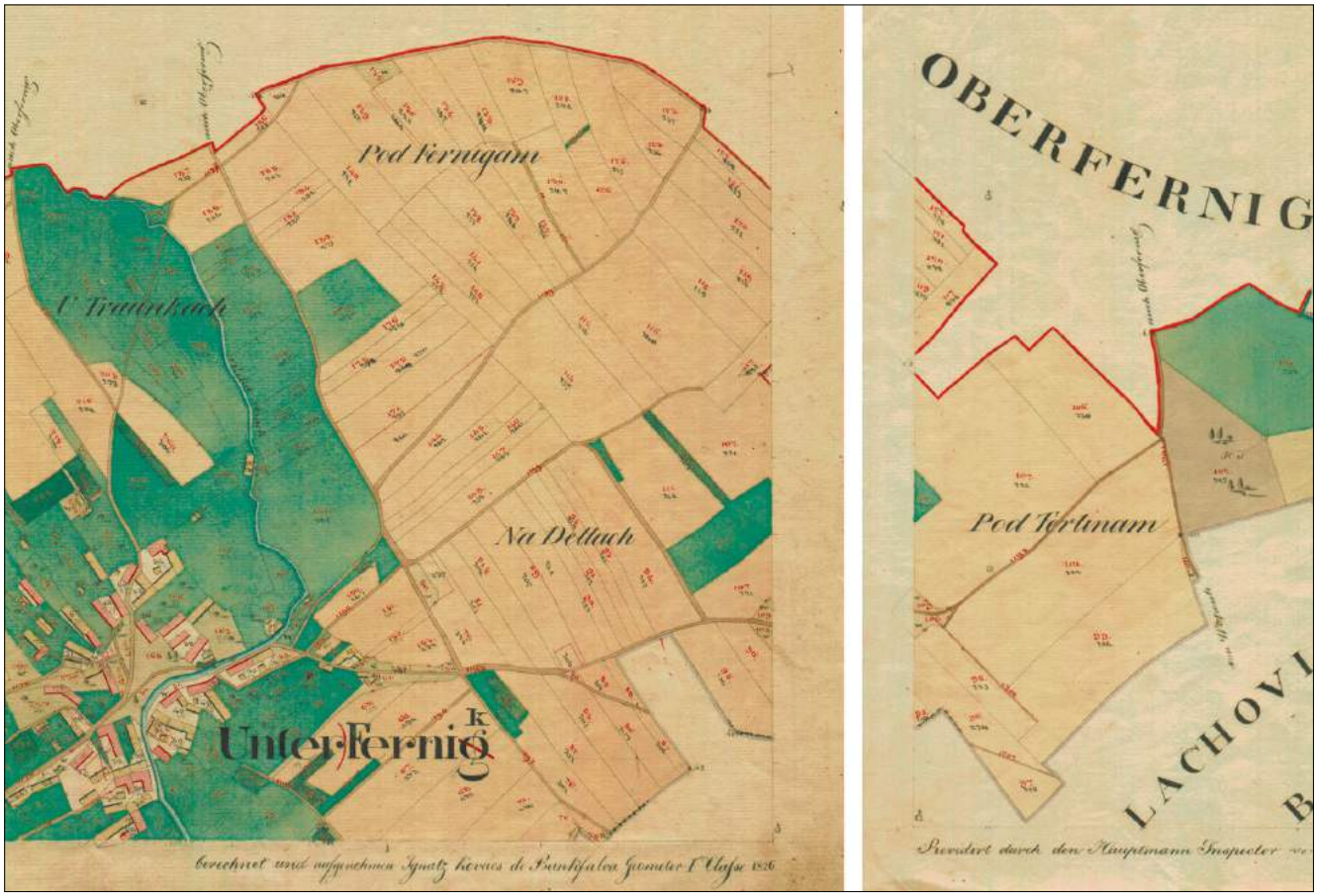
Figure 3.2.3: The outline of a shared longitudinal object (the river Bistra) on the ZKN, which was vectorized in its entire width and additionally along the "imaginary" centre line in CM 2003 Verd and in CM 2004 Borovnica.
Source: the e-ZKN archive land cadastre map viewer

Zahteve za topološko pravilnost vektoriziranih podatkov enega lista so bile: poligoni morajo biti zaključeni, ne sme biti visečih linij in vsak poligon ima natanko en centroid.

Katastrske občine z območji zajema, ki obsegajo en sam zemljiškokatastrski načrt, so redke ali pa jih sploh ni, zato je bilo v okviru vektorizacije vedno treba pristopiti še k združevanju sosednjih listov (istega območja zajema) z namenom, da se za eno območje zajema pridobi tudi eno samo zaključeno območje digitalnih podatkov.

The requirements for the topological precision of the vectorized data of one sheet were as follows: the polygons must be completed, there must be no loose lines, and each polygon must have exactly one centroid.

Cadastral municipalities with areas of coverage comprising a single land cadastral plan are rare or non-existent, so in the context of vectorization it was always necessary to combine adjacent sheets (of the same area of coverage) in order to obtain a single completed area of digital data for one individual area of coverage.



Slika 3.2.4: Prikaz detajla na dveh listih v k. o. 2116 Spodnji Brnik. Razdelitev se je kljub reprodukcijam ohranila vse do pretvorbe v DKN. Posamezne k. o. so razdeljene v povprečju na od 4 do 15 detajlnih listov, ki jih je bilo treba za zvezni prikaz spojiti med seboj.
Vir: Arhiv Slovenije, Franciscejski kataster za Kranjsko

Figure 3.2.4: Detail on two sheets in CM 2116 Spodnji Brnik. The division was maintained despite reproductions up until the conversion to DKN. Individual CMs are divided on average into 4 to 15 detail sheets, which had to be merged for a continuous display.
Source: Archives of the Republic of Slovenia, Franciscan cadastre for Carniola

Združeni so bili vektorizirani podatki sosednjih listov, ki so predstavljali vsak zase (po vektorizaciji) zaključene celote. Listi so bili združeni po dveh metodah, in sicer odvisno od izmere. Listi območja numerične izmere so bili združeni po koordinatah okvirjev/decimetrski mreži.

Listi območja grafične izmere so bili združeni tako, da je bila izvedena primerjava detajla dveh sosednjih listov.

Lista sta bila po skupnem robu združena tako, da je bilo zagotovljeno ujemanje čim večjega števila po vsebini identičnih presekov na robu lista.

Vectorized data from adjacent sheets was merged, each of them representing (after vectorization) a complete whole. The sheets were merged according to two methods, depending on the type of survey. The sheets of the numerical survey area were merged by frame coordinates/the decimetre grid.

The sheets of the graphic survey area were merged by comparing the details of two adjacent sheets.

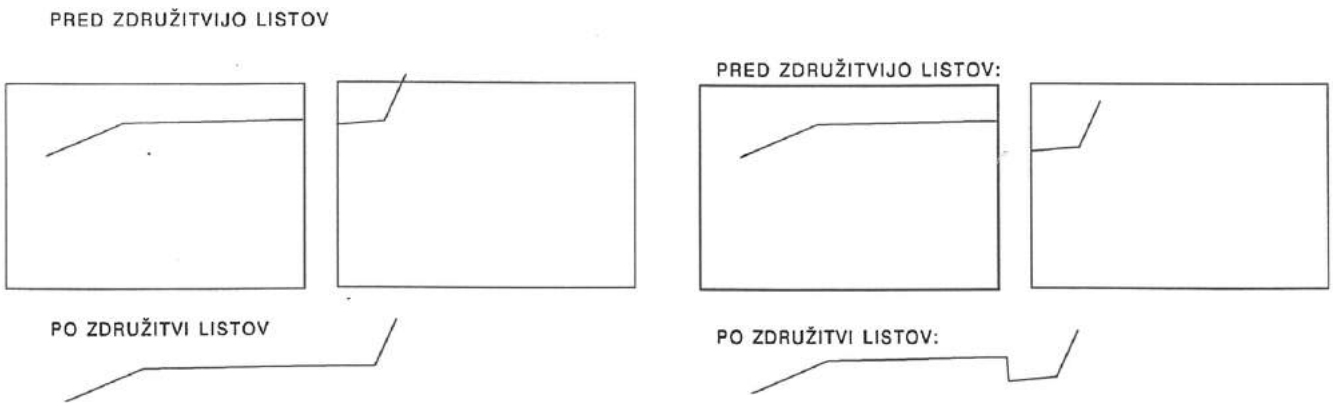
The sheets were merged along the common edge so as to guarantee the matching of the maximum number of identical intersections on the edge of the sheet.

Slika 3.2.5: Izrez iz zemljiškokatastrskega načrta k. o. 2071 Železniki, na katerem je razvidno, da je detajl dorisan preko roba detajlnega lista (v takih primerih je bila odločitev o načinu združitve dveh sosednjih listov »lahka«).
Vir: Arhiv Slovenije, Franciscejski kataster za Kranjsko

Figure 3.2.5: Excerpt from the land cadastral plan of CM 2071 Železniki, showing that detail drawn over the edge of the detail sheet (in such cases, the decision on how to merge two adjacent sheets was "simple").
Source: Archives of the Republic of Slovenia, Franciscan cadastre for Carniola

Po združevanju listov je bilo treba dele poligonov (daljice), ki so predstavljali rob lista (ne pa tudi del poligona parcelnega dela) izločiti. Pri tem sta lahko nastopili dve situaciji. Če je bilo odstopanje po vsebini identičnih presekov (ki pa niso lomi parcelnih delov) z robom lista v mejah dopustnega odstopanja (1 mm v grafiki), so bili ti preseki izbrisani, poligoni pa zaprti tako, da sta bila povezana zadnji lom (pred robom lista) na enem listu z zadnjim lomom (pred robom lista) na drugem listu. Če je odstopanje presekov na robu lista preseglo dopustno odstopanje, pa sta bila preseka ohranjena, poligon pa je bil zaprt z njuno medsebojno povezavo/daljico po robu lista. Tovrstni način zapiranja poligonov izven dopustnega odstopanja je bil tudi posebej označen na ozalidni kopiji ZKN oz. posebnem obrazcu.

After combining the sheets, parts of the polygons (line segments) that represented the edge of the sheet (but not part of the polygon of the plot part) had to be extracted. This would yield two possible situations. If the deviation in the content-identical intersections (but which are not gradients of plot parts) in relation to the edge of the sheet was within the permissible limit (1 mm in the graph), these intersections were deleted and the polygons closed so that the last gradient of one sheet (before the edge of the sheet) was merged with the last gradient of the second sheet (before the edge of the sheet). If the deviation of the intersections at the edge of the sheet exceeded the permissible deviation, the two intersections were preserved, and the polygon was closed with the interconnection/line segment along the edge of the sheet. This method of closing polygons outside the permissible deviation was also specially marked on the Ozalide copy of the ZKN or a special form.



Slika 3.2.6: Pravila za vektorizacijo – prikazan je način združevanje vsebine sosednjih listov v primeru, ko so bili po vsebini identični preseki parcelnih mej na robu obeh listov znotraj dopustnega odstopanja, tj. 1 mm v grafiki (levo) in v primeru, ko je bilo dopustno odstopanje preseženo (desno).
Vir: Arhiv GURS

Figure 3.2.6: Rules for vectorization – a method of merging the contents of adjacent sheets is shown on an example where the content-identical intersections of plot borders at the edge of both sheets were within the permissible deviation, i.e. 1 mm in the graph (left), and on an example where permissible deviation has been exceeded (right).
Source: The SMARS archive

Kjer sta bila poligona istega parcelnega dela z dveh sosednjih listov združena, je prišlo do situacije, da je združeni poligon vseboval dva različna centroida z isto parcelno številko (vsak je bil ob vektorizaciji zajet na enem izmed sosednjih listov). V nadaljevanju je bil zato eden izmed centroidov izločen.

Where polygons of the same plot part from two adjacent sheets were merged, a situation arose where the merged polygon contained two different centroids with the same plot number (each was recorded on one of the adjacent sheets during vectorization). Therefore, one of the centroids was subsequently excluded.

Slika 3.2.7: Pravila za vektorizacijo – prikaz načina reševanja viška centroidov ob robu lista pri vektorizaciji.
Vir: Arhiv GURS

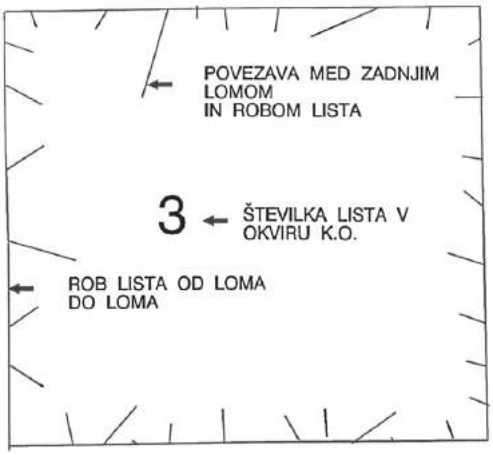
Figure 3.2.7: Rules for vectorization – showing the method of solving an excess of centroids at the edge of the sheet during vectorization.
Source: The SMARS archive

Vektorizirani podatki robov posameznega lista skupaj s povezavami med preseki mej parcelnih delov na robu lista do zadnjih lomov v notranjost lista so bili preneseni na svoj sloj, tj. sloj listov, ki se je ohranil za nadaljnjo uporabo.

Tudi združeni listi so morali zadostiti pogoju topološke pravilnosti (poligoni morajo biti zaključeni, ne sme biti visečih linij, vsak poligon ima natančno en centroid). Hkrati je bilo treba odpraviti vse tehnične napake samega zajema, ki so bile posledica napačnega zajema podatkov ob vektorizaciji.

The vectorized data of the edges of each sheet along with the connections between the intersections of the borders of the plot parts at the edge of the sheet and the last gradients within the interior of the sheet were transferred to their own layer, i.e. a layer of sheets that has been preserved for further use.

The merged sheets also had to meet the condition of topological correctness (polygons must be completed, there must be no loose lines, each polygon must have exactly one centroid). At the same time, it was necessary to eliminate all technical errors of the coverage itself, which were the result of incorrect data capture during vectorization.



Slika 3.2.8: Pravila za vektorizacijo – prikaz vsebine, ki je bila prenesena na sloj listov.
Vir: Arhiv GURS

Figure 3.2.8: Rules for vectorization – content transferred to a sheet layer.
Source: The SMARS archive

Vsebinske napake, ki so obstajale že na analognih zemljiško-katastrskih načrtih (npr. parcele niso imele parcelne številke, parcele so imele vpisane več parcelnih številk, parcelni del je pripadal več parcelam, ...), so še ostale tudi po zaključku vektorizacije, a so bile vse evidentirane za nadaljnje delo.

Nad vektoriziranimi podatki je bilo omogočeno tudi izvajanje določenih analiz. V okviru samega postopka vektorizacije je bila narejena analiza skladnosti opisnih in grafičnih podatkov. Rezultat analize so bili seznami:

- seznam parcel, ki so obstajale v grafiki in jih ni bilo v opisnem delu
- seznam parcel, ki so bile v opisnem delu in jih ni bilo v grafiki
- seznam parcel z več nesosednjimi parcelnimi deli.

Rezultat vektorizacije je bil torej poleg topološko pravilnih digitalnih podatkov po območjih zajema tudi sloj listov in seznam vsebinskih napak po katastrskih občinah ter prikaz spajanj na robovih listov v primeru nedopustnih odstopanj med preseki mej parcelnih delov na robovih listov.

Substantive errors that had already existed on the analogue land cadastral plans (e.g. plots without a plot number, plots with several plot numbers, a plot part belonging to several plots, ...) remained after the completion of vectorization, but all were recorded for further work.

It was also possible to carry out certain analyses with the vectorized data. As part of the vectorization process itself, an analysis of the consistency of descriptive and graphical data was made. The results of the analysis were the following lists:

- a list of plots that existed in the graphic and were not in the descriptive part,
- a list of plots that were in the descriptive part and were not in the graphic,
- a list of plots with several non-adjacent plot parts.

Thus, in addition to topologically accurate digital data by areas of coverage, the result of vectorization was a sheet layer and a list of content errors by cadastral municipalities, as well as the recording of merging at the edges of sheets in the case of inadmissible deviations between intersections of plots at the edges of sheets.

3.3 Geolociranje vektoriziranih območij zajema v približen koordinatni sistem D48/GK
Geolocation of vectorized areas of coverage in the D48/GK approximate coordinate system

S postopkom vektorizacije so bili zagotovljeni digitalni podatki po območjih zajema v vektorski obliki, ki pa niso bili vsi v enotnem koordinatnem sitemu, ampak vsako območje zajema v svojem lokalnem sistemu, zato je bil v nadaljevanju za območja v lokalnem koordinatnem sistemu izveden zgolj premik v približen sistem D48/GK.

The process of vectorization provided digital data by areas of coverage in vector form, which were not all in a single coordinate system, but rather each area was recorded in its own local system, so areas in the local coordinate system only underwent a shift to the D48/GK approximate coordinate system.

Za premik so bile uporabljene identične točke, ki jih je določila posamezna organizacijska enota Geodetske uprave RS. Če take točke niso bile določene, je bil premik izveden na podlagi digitalnih grafičnih in opisnih podatkov katastrskih občin iz baze RPE (poligona KO s centroidom, ki nosi informacijo o šifri in imenu KO). Praviloma so bile za premik uporabljene točke RPE.

Nadaljnja obdelava podatkov z določenimi programskimi paketi je zahtevala pozitivno vrednost koordinat, in sicer dolžine maksimalno 5 celih mest. V ta namen je bil posameznim lokacijam določen še premik koordinatnega sistema, ki je bil zaokrožen na 50.000 m.

Približne koordinate D48/GK so bile tako v nadaljevanju še obdelane z navedenim premikom koordinatnega sistema.

The shift utilized the identical points determined by each organizational unit of the Surveying and Mapping Authority of the Republic of Slovenia. Where no such points had been determined, the shift was performed on the basis of digital graphical and descriptive data of cadastral municipalities from the RPE database (a CM polygon with a centroid bearing information on the code and name of the CM). As a rule, shifts were performed using RPE points.

Further data processing using certain software packages required a positive coordinate value, namely of a maximum length of 5 integers. For this purpose, a shift of the coordinate system was determined for individual locations, which was rounded to 50,000 m.

The approximate coordinates in the D48/GK were thus further processed with the stated coordinate system shift.

ŠIFRA IGU	IME IOGU	Y SHIFT	X SHIFT
46	ŽALEC	450000	100000
1	AJDOVŠČINA	400000	50000
2	BREŽICE	500000	50000
3	CELJE	500000	100000
5	DOMŽALE	450000	100000
6	GORNJA RADGONA	550000	150000
7	GROSUPLJE	450000	50000
8	IDRIJA	400000	50000
9	ILIRSKA BISTRICA	400000	0
10	JESENICE	350000	100000
11	KAMNIK	450000	100000
13	KOPER	350000	0
12	KOČEVJE	450000	0
14	KRANJ	400000	100000
15	KRŠKO	500000	50000
16	LAŠKO	500000	50000
17	LENDAVA	550000	100000
18	LITIJA	450000	50000
19	LJUBLJANA	400000	50000
20	LJUTOMER	550000	100000
21	LOGATEC	400000	50000
22	MARIBOR	500000	100000
23	MOZIRJE	450000	100000
24	MURSKA SOBOTA	550000	150000
25	NOVA GORICA	350000	50000
26	NOVO MESTO	450000	50000
27	ORMOZ	550000	100000
28	POSTOJNA	400000	50000
29	PTUJ	550000	100000
30	RADOVLJICA	400000	100000
31	RAKEK	400000	0
32	RAVNE NA KOROŠKEM	450000	100000
34	SEŽANA	350000	0
33	SEVNICA	500000	50000
35	SLOVENJ GRADEC	450000	100000
36	SLOVENSKA BISTRICA	500000	100000
37	SLOVENSKE KONJICE	500000	100000
41	TOLMIN	350000	50000
42	TRBOVLJE	450000	100000
43	TREBNJE	450000	50000
44	VELENJE	450000	100000
45	VRHNIKA	400000	50000
38	ŠENTJUR PRI CELJU	500000	100000
39	ŠKOFJA LOKA	400000	50000
40	ŠMARJE PRI JELŠAH	500000	50000
4	ČRNOMELJ	500000	0

Slika 3.3.1: Podatki za premik koordinatnega sistema po posameznih organizacijskih enotah Geodetske uprave RS zaradi zahtev programske opreme. Vir: Arhiv GURS

Figure 3.3.1: Data for the coordinate system shift by individual organizational units of the Surveying and Mapping Authority of the Republic of Slovenia due to software requirements.
Source: The SMARS archive

Rezultat geolociranja so bili v približen sistem D48/GK premaknjeni digitalni podatki območij zajema, pri čemer je bila vrednost grafičnih koordinat prilagojena/popravljena glede na omenjeni premik koordinatnega sistema in sama po sebi torej ni izkazovala prave vrednosti.

The result of the geolocation was the shifting of digital data of the areas of coverage to the approximate D48/GK system, where the values of the graphic coordinates were adjusted/corrected according to the stated coordinate system shift and therefore did not show the true value.

3.4 Usklajevanje podatkov
Coordination of data

Namen usklajevanja podatkov je bil poiskati rešitev vsebinskih napak in neskladij, ki so bila ugotovljena in evidentirana ob vektorizaciji zemljiškokatastrskih načrtov in odprava le-teh. Vzrok so bile lahko napake v izvornih analognih načrtih, ki so bili skenirani in vektorizirani, ali izvornih seznamih parcel, ki so bili pretvorjeni v digitalno obliko. Večina napak prenosa iz enega na drug medij je bila odpravljena že ob prenosu samem (t. i. tehnične napake). Če ni bilo tako, so bile ob odpravi vsebinskih napak odpravljene tudi (preostale) tehnične napake.

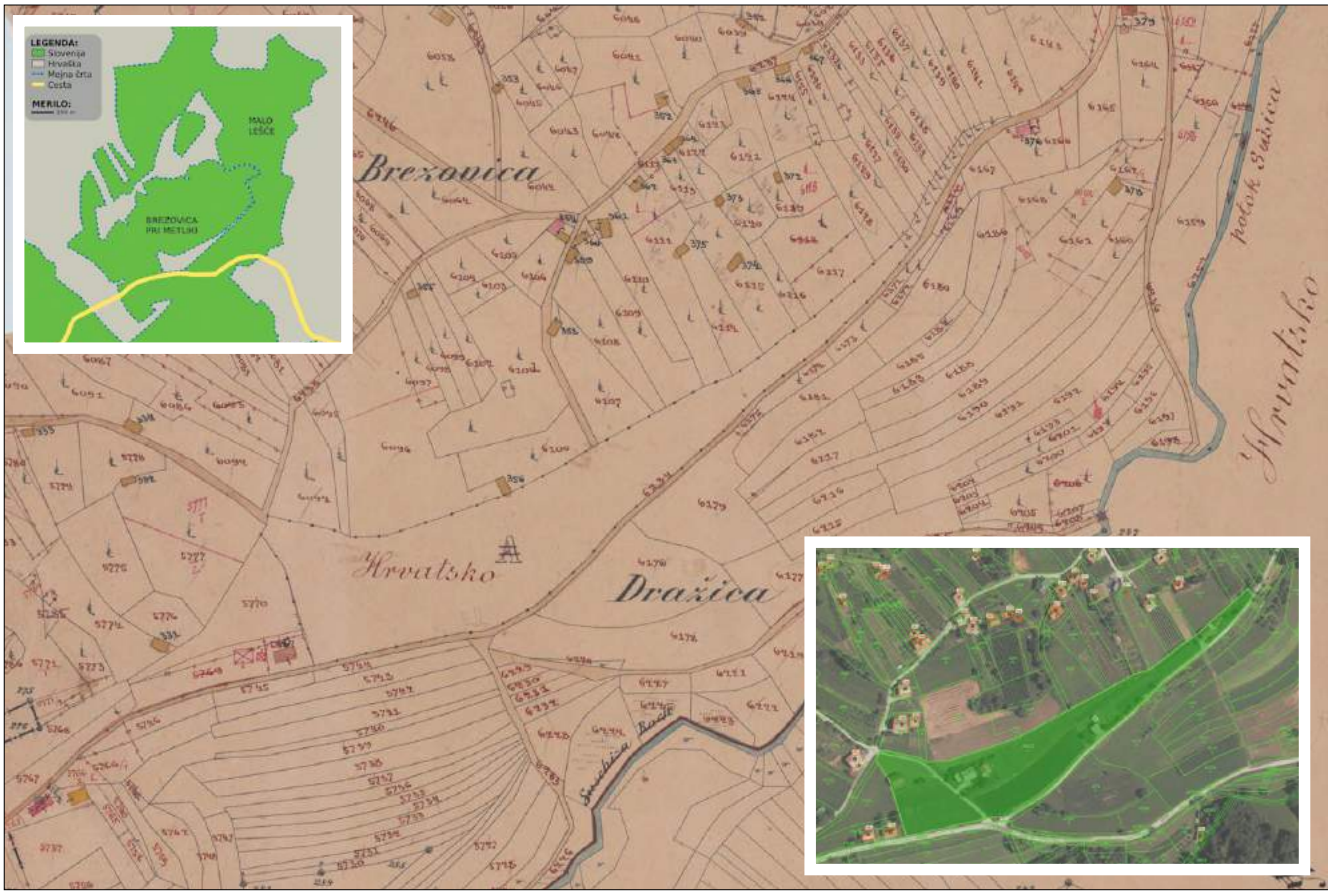
The purpose of data harmonization was to find solutions for substantive errors and inconsistencies that were identified and recorded during the vectorization of land cadastral plans, and to eliminate them. These could be errors in the original analogue maps, which were scanned and vectorized, or in the original lists of plots, which were digitized. Most errors in transmission from one medium to another had already been rectified during the transmission itself (i.e. technical errors). Where this was not the case, the (remaining) technical errors were also eliminated when correcting substantive errors.

Hrvaški »otok« v Sloveniji

Brezovica pri Metliki je razložena obmejna vas v Občini Metlika, ki stoji pod južnim pobočjem Gorjancev severno od doline potoka Sušica. Manjši del naselja stoji na hrvaškem ozemlju, kjer je voden pod imenom Brezovica Žumberačka. Na območju vasi je mejni prehod za obmejni promet, ki pa po dogovoru med državama ni posebej nadzorovan. Območje vasi je zanimivo zaradi močno vijugaste meje, ki sledi razdrobljenemu katastru zemljišč. Državna meja med drugim večkrat prečka lokalne ceste, kar povzroča nevšečnosti lokalnim prebivalcem. Posebnost je tudi enklava (»otok«) hrvaškega ozemlja, ki jo povsem obkroža slovensko ozemlje, edini tak primer v Sloveniji. V enklavi, ki meri približno 250 m v dolžino in 30 v širino, stoji nekaj hiš.

A Croatian "island" in Slovenia

Brezovica near Metlika is a fragmented border village in the Municipality of Metlika, located below the southern slope of the Gorjanci north of the Sušica stream valley. A small part of the settlement is in Croatian territory, where it is managed under the name Brezovica Žumberačka. There is a border crossing in this part of the village, which is not specifically controlled by agreement between the two countries. The area of the village is interesting because of the particularly winding border that the fragmented land cadastre follows. Among other things, the state border crosses local roads in several places, causing inconvenience to local residents. A special feature is the enclave ("island") of Croatian territory, which is completely surrounded by Slovenian territory, the only such case in Slovenia. The enclave, which is about 250 m in length and 30 m in width, comprises a few houses.



Hrvaški »otok« je bil tu že pred arbitražo o meji med Hrvaško in Slovenijo. Zaradi zahtev vodenja digitalnih katastrskih podatkov je v zemljiškem katastru poligon, ki predstavlja omenjeni »otok«, voden pod namišljeno parcelno številko 9902/2 v k. o. 1505 Bušinja vas, ki nima znanega lastnika (ta parcela ni predmet evidentiranja v zemljiški knjigi, saj gre za hrvaško ozemlje).

Vir: eZKN pregledovalnik arhivskih zemljiškokatastrskih načrtov, vir manjših prikazov: https://sl.wikipedia.org in PREG, ekranska slika ZKP in DOF

The Croatian "island" was already here before the arbitration on the border between Croatia and Slovenia. Due to the requirements of digital cadastral data management, the polygon in the land cadastre, which represents the aforementioned "island", is managed under the imaginary plot number 9902/2 in CM 1505 Bušinja vas, which has no known owner (this plot is not subject to registration in the land register, as it is Croatian territory).

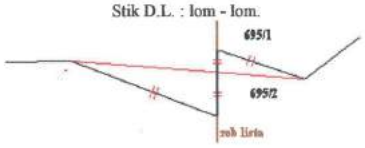
Source: the e-ZKN archive land cadastre map viewer, Source of smaller displays: https://sl.wikipedia.org and PREG, screen image of ZKP and DOF

Uskladitev podatkov je bila namenjena odpravi naslednjih vsebinskih napak:

- poligoni, ki so predstavljali parcele ali parcelne dele brez parcelnih številk na analognem načrtu
- poligoni, ki so predstavljali parcele z več parcelnimi številkami ali dvomljivimi parcelnimi številkami na analognem načrtu
- poligoni, ki so bili v grafičnem delu, parcele pa niso bile v opisnem delu
- parcele, ki so bile v opisnem delu, poligoni pa niso bili v grafičnem delu
- odvečni poligoni
- manjkajoči poligoni (npr. posledica slabe vidljivosti na skenogramu)
- nepravilno spojene meje parcel na robovih listov
- večja površinska odstopanja med opisnimi in grafičnimi podatki

The goal of data harmonization was to eliminate the following substantive errors:

- polygons representing plots or plot parts without plot numbers on the analogue map
- polygons representing plots with multiple plot numbers or dubious plot numbers on the analogue map
- polygons that were included in the graphic part, but where the plots were not included in the descriptive part
- plots that were included in the descriptive part, but where the polygons were not included in the graphic part
- redundant polygons
- missing polygons (e.g. due to poor visibility on the scan)
- incorrectly merged borders at the edges of sheets
- major surface discrepancies between descriptive and graphical data

Zap. št.	Št. D.L.	Arhiv (IDPOS)	Skica (staro stanje je črno, novo stanje je rdeče)	Odpravi IOGU na načrtu	Odprava nesoglasja na parceli št.
1	4	5023		da	664
2	4	5690	Glej ozalidno kopijo (ali kontrolni izris DKN).	da	661/2, 661/2
3	3,4	Glej original ZKN iz leta 1955		da	695/1, 695/2
4	3,4			da	720/3, 700

Slika 3.4.1: Usklajevanje podatkov po vektorizaciji – primer seznama evidentiranih napak s podatki o odpravi le-teh.
Vir: Arhiv GURS

Figure 3.4.1: Synchronization of data after vectorization – an example of a list of recorded errors along with data on their elimination.
Source: The SMARS archive

Rezultat usklajevanja podatkov so bili vsebinsko pravilni digitalni grafični (in opisni) podatki, pri čemer je bila vrednost grafičnih koordinat še vedno določena glede na prej omenjeni premik koordinatnega sistema.

The results of data harmonization were substantively correct digital graphic (and descriptive) data, where the values of graphic coordinates were still determined on the basis of the aforementioned shift of the coordinate system.

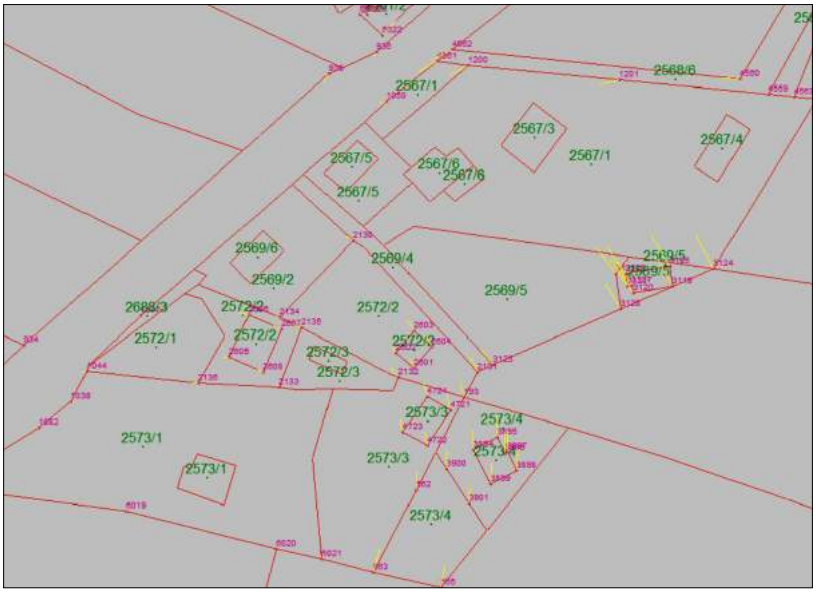
3.5 Dodajanje ZK-točk lokacijski bazi (»napenjanje ZK-točk«)
Adding LC-points to the location base ("tensioning of LC points")

Digitalna evidenca izmerjenih ZK-točk (opisnih podatkov o ZK-točkah) je bila praviloma nastavljena že pred samim skeniranjem, in sicer neodvisno od grafičnih podatkov. Ko so bili v digitalno obliko pretvorjeni še grafični podatki, je bilo mogoče ZK-točkam določiti pripadajoč lom v digitalni grafiki in jim s tem pripisati še dodatni atribut, to so grafične koordinate.

Dodajanje ZK-točk lokacijski bazi je bilo poenostavljeno poimenovano kar »napenjanje ZK-točk na lome v grafiki«, čeprav to vedno ni bilo res. V primeru grafičnih izmer so bile ZK-točke dejansko pripojene/pripete obstoječim lomom v grafiki in ZK-točkam so bile v tem primeru kot grafične koordinate pripisane koordinate lomov. S tem so nastali »repki« ali vektorji kot razlika med grafično in izmerjeno koordinato ZK-točke. V primeru numeričnih izmer pa so bile kot grafične koordinate ZK-točkam pripisane kar izmerjene koordinate. Pripadajoči lomi v grafiki, katerim so pripadale take ZK-točke (identični lomi), so bili posledično premaknjeni na lokacijo prave izmerjene koordinate. Zaris poligonov v grafiki je bil torej popravljen tako, da je ustrezal omenjenemu pripisu grafičnih koordinat pri ZK-točkah. Na ta način »repki« ali vektorji niso nastali.

Generally, the digital record of measured LC points (descriptive data on LC points) had been set up before the scan, independently of the graphic data. When the graphic data was converted into digital format, it was possible to determine the LC points and their corresponding gradients in the digital graphics and thus assign them an additional attribute, i.e. graphic coordinates.

Adding LC points to the location base has been simplified as "tensioning of LC points to gradients in the graphic", although this has not always been the case. For graphical surveys, LC points were actually attached to the existing gradients in the graphic, and in this case, the LC points were assigned gradient coordinates in the place of graphical coordinates. This created "tails" or vectors arising as the difference between the graphical and the measured coordinate of the LC point. In the case of numerical surveys, the measured coordinates were assigned to the LC points as graphic coordinates. The corresponding gradients in the graph to which such LC points belonged (identical gradients) were consequently moved to the location of the true measured coordinate. The outline of the polygons in the graphic was therefore corrected to correspond to the aforementioned attribution of the graphic coordinates at the LC points. This prevented the "tails" or vectors from occurring.



Slika 3.5.1: Prikaz vektorjev (v rumeni barvi) na območju grafičnega katastra v k. o. 1412 Mokronog (zaradi preglednosti prikazano že po zadnjem koraku - uveljavitvi DKN). Vektorji so različnih dolžin in smeri, kar kaže na nehomogene vklope.
Vir: PP SysGeoProTM, ekranska slika uvoženih podatkov zemljiškega katastra

Figure 3.5.1: Vectors (in yellow) in the area of the graphic cadastre in CM 1412 Mokronog (shown for the sake of clarity after the last step – the implementation of DKN). The vectors are of different lengths and directions, indicating inhomogeneous inclusions.
Source: PP SysGeoProTM, screen image of imported land cadastre data

Rezultat dodajanja ZK-točk je bil pripis grafičnih koordinat med atribute ZK-točk v opisni bazi ZK-točk ter prikaz ZK--točk v sami digitalni grafiki, skupaj z »repki« oz. vektorji. Le-ti niso izkazovali prave velikosti, saj so bile grafične koordinate še vedno »popačene« s premikom koordinatnega sistema zaradi zahtev programske opreme.

The result of adding LC-points was the addition of graphic coordinates among the attributes of LC-points in the descriptive database of LC-points and the display of LC-points in the digital graphics themselves, along with the "tails" or vectors. The latter did not show the correct size, as the graphic coordinates were still "distorted" by the shift of the coordinate system due to software requirements.

3.6 Natančnejše geolociranje območij zajema in izdelava skupnih izrisov meje sosednjih območij zajema (transformacija DKN-DOF)

More precise geolocation of the areas of coverage and production of joint mappings of the borders of adjacent areas of coverage (DKN-DOF transformation)

Za vsa območja zajema grafičnega katastra, kjer se lokacijski podatki niso vodili v državnem koordinatnem sistemu, je bila opravljena natančnejša transformacija v državni koordinatni sistem D48/GK (v tretjem koraku je bil narejen zgolj približen premik v isti sistem). Metodologija je opredelila, da se natančno geolociranje zajetih digitalnih podatkov izvede s transformacijo na podlagi točk digitalnih ortofoto načrtov (DOF), geodetskih točk in izmerjenih ZK-točk. Od tod tudi poenostavljen izraz za ta korak »transformacija DKN-DOF«. Na ta način so bila območja zajema locirana v isti sistem kar najbolje za potrebe izvedbe nadaljnje uskladitve meja med območji zajema. Metodologija je zato tudi določala, da se že v okviru tega koraka pripravijo po transformaciji tudi izrisi meja sosednjih območij zajema, ki bodo služili koraku usklajevanju meja teh območij.

Transformacija grafičnih koordinat je bila torej izvedena iz lokalnega sistema (tj. iz približnega sistema D48/GK, dobljenega večinoma na podlagi točk RPE) v D48/GK sistem. Postopek je potekal v dveh neodvisnih fazah dela, in sicer:

- določitev transformacijskih točk (identičnih točk v obeh koordinatnih sistemih) z izračunom transformacijskih parametrov in nato
- izračun koordinat ostalih točk s transformacijo.

Osnovne značilnosti transformacije grafičnih podatkov o parcelnih delih so določali tehnični pogoji, navedeni v nadaljevanju.

Za transformacijo je bila praviloma uporabljena Helmertova metoda. Odločilna težnja, katero metodo uporabiti, je bila težnja po nespremenljivosti oblike in površine parcele. Če so bili rezultati po Helmertovi metodi neustrezni, je bila izjemoma lahko izvedena afina transformacija. Razlog za uporabo afine transformacije je bilo treba dokumentirati v elaboratu.

For all the areas of coverage in the graphic cadastre where location data was not held in the national coordinate system, a more precise transformation into the D48/GK national coordinate system was performed (in the third step, only an approximate shift to the same system was made). The methodology stipulated that accurate geolocation of recorded digital data should be performed by transformation based on points of digital orthophoto maps (DOF), survey points and measured LC-points. Hence the simplified term for this step, the "DKN-DOF transformation". In this way, the areas of coverage were located in the same system as best as possible for the purpose of further harmonization of the borders between areas of coverage. Thus, the methodology also dictated that delineations of the borders of neighbouring areas of coverage should be prepared already within this step, after the transformation, which then serves to harmonize the borders of these areas.

The transformation of the graphic coordinates was then performed from the local system (i.e. from the approximate D48/GK system, obtained mainly on the basis of RPE points) to the D48/GK system. The procedure was performed in two independent phases of work, namely:

- determination of transformation points (identical points in both coordinate systems) by calculating the transformation parameters and then
- calculation of the coordinates of other points by transformation.

The basic characteristics of the transformation of graphic data on plot parts were determined by the technical conditions listed below.

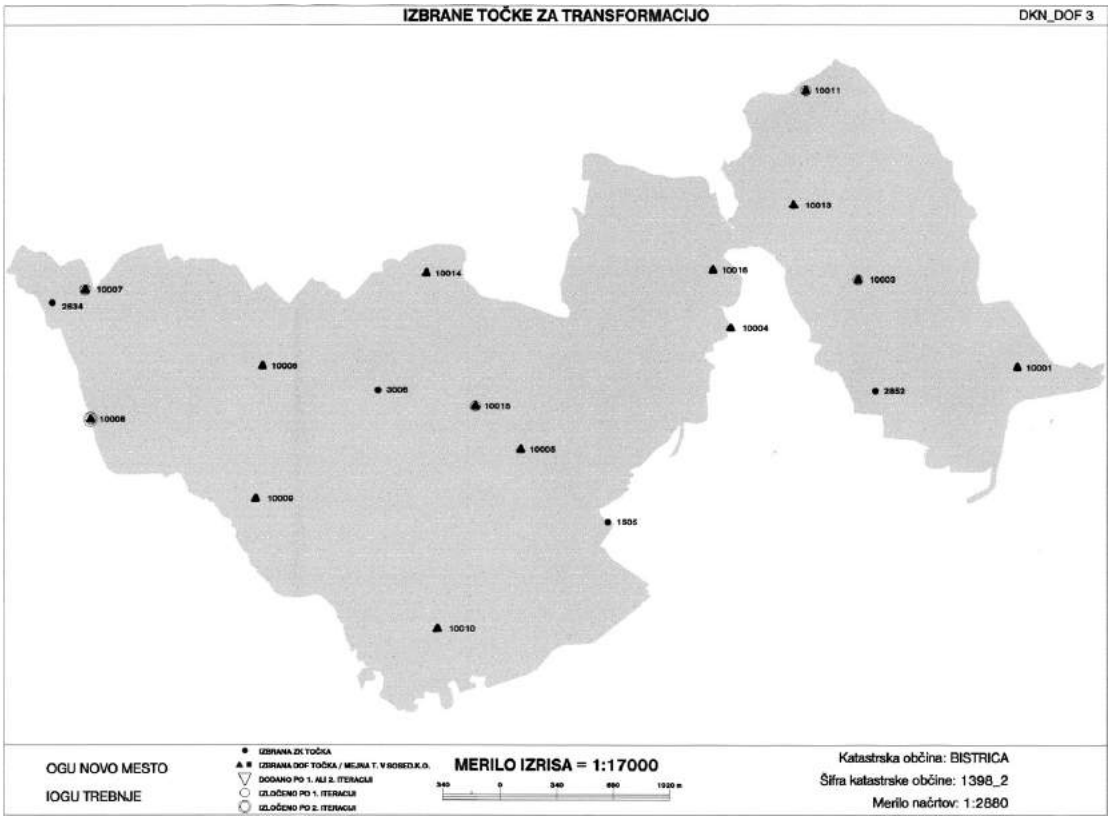
As a rule, the transformation was performed using the Helmert transformation method. A decisive tendency in regard to the method used was to preserve the shape and surface of the plot. If the results according to the Helmert method were inadequate, an affine transformation would exceptionally have been performed. The reason for using the affine transformation had to be documented in the report.

Stanje pred transformacijo je bilo dokumentirano kot izris netransformirane grafične vsebine območja zajema skupaj z DOF-om.

Transformacijske točke so bile izbrane v čim bolj pravilnem gridu velikosti pribl. 500 m, in sicer glede na prioriteto: najprej ZK-točke z D48/GK koordinatami, nato geodetske točke in kot zadnje točke, katerim so bile D48/GK-koordinate določene s fotointerpretacijo DOF. Ob nastavitvi zemljiškega katastra vse parcelne meje niso bile izmerjene z enako natančnostjo. Najbolj natančno so bile izmerjene meje katastrskih občin, nato meje ledin, meje cerkvenih posesti in veleposestev, lastniške meje, najmanj natančno pa meje objektov, gozdnih parcel in katastrskih kultur. Poznejše vzdrževanje katastrskih načrtov je to zaporedje lahko porušilo, zato so bile kot identične točke praviloma izbrane tiste točke grafične izmere, ki so bile v naravi še vedno na istem mestu kot ob prvotni grafični izmeri (niti na terenu niti v zemljiškem katastru niso bile zaznane spremembe na takih mejah). Ker niso bile obremenjene z načinom vzdrževanja, so služile kot najprimernejša osnova.

The pre-transformation state was documented as a plot of the untransformed graphic content of the area of coverage, along with the DOF.

The transformation points were selected in an approx. 500 m grid that was as correct as possible, according to the following priority: first the LC points with D48/GK coordinates, then survey points, and finally the points whose D48/GK coordinates were determined by the photointerpretation of the DOF. When setting up the land cadastre, not all plot borders were measured with the same accuracy. The borders of cadastral municipalities were measured most accurately, followed by the borders of fallow lands, borders of church estates and large estates, ownership borders, and least accurately the borders of buildings, forest plots and cadastral cultures. Subsequent maintenance of cadastral plans may have disrupted this sequence, so as a rule, those points of the graphic survey which were still in the same place in nature as in the original graphic survey were chosen as identical points (where no changes were detected in the field or the land cadastre). Since they were not burdened by this type of maintenance, they served as the most suitable basis.

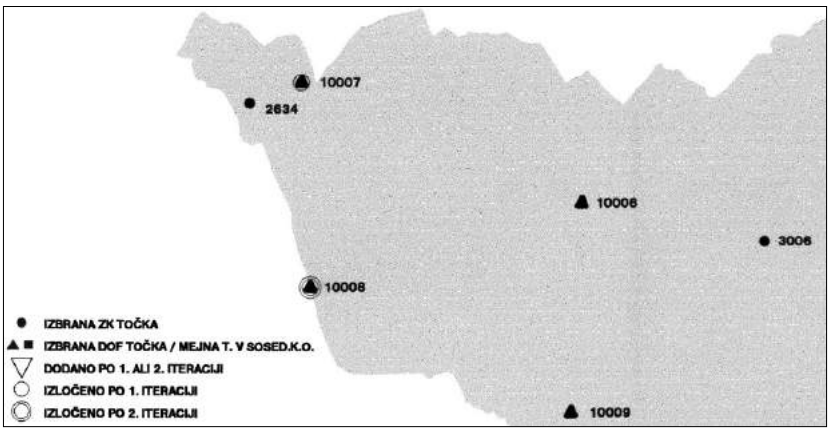


Slika 3.6.1: Grafični prikaz (čim bolj enakomernega) izbora ZK-točk za transformacijo v delu grafičnega katastra v k. o. 1398 Bistrica. Vir: Arhiv GURS

Figure 3.6.1: Graphic representation of a selection (as even as possible) of LC-points for transformation in a part of the graphic cadastre in CM 1398 Bistrica. Source: The SMARS archive

Transformacija je bila izvedena v najmanj treh iteracijah. Po vsaki iteraciji so bile izločene točke z največjimi odstopanji. Cilj iteracij je bil določiti kombinacijo transformacijskih točk, ki imajo najmanjši srednji pogrešek transformacije. Ob transformaciji grafičnih podatkov o parcelnih delih je bila z istimi parametri izvedena tudi transformacija okvirov listov.

The transformation was performed in at least three iterations. After each iteration, the points with the largest deviations were eliminated. The goal of the iterations was to determine the combination of transformation points that had the smallest mean transformation error. Along with the transformation of graphic data on plot parts, the transformation of sheet frames was also performed with the same parameters.

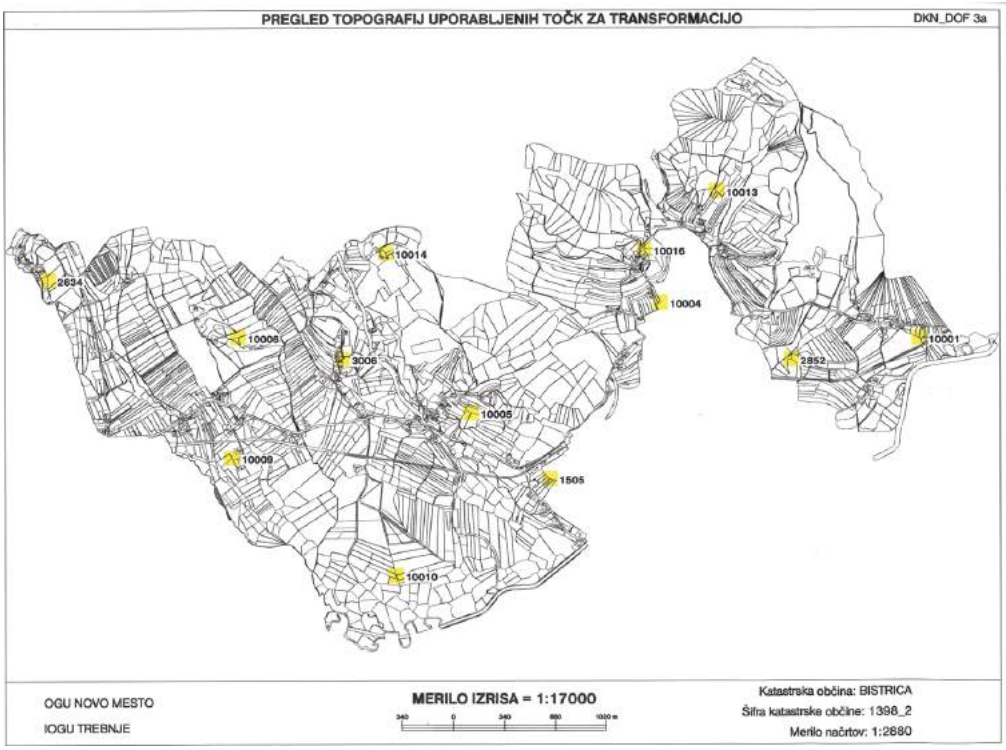


Slika 3.6.2: Izrez grafičnega prikaza izbranih točk z njihovo »funkcijo« v transformaciji v delu grafičnega katastra v k. o. 1398 Bistrica.
Vir: Arhiv GURS

Figure 3.6.2: Excerpt from a graphical display of selected points with their "functions" in the transformation in a part of the graphic cadastre in CM 1398 Bistrica.

Uporabljene transformacijske točke so bile dokumentirane z izrisom le-teh v okviru območja zajema, za tiste brez grafičnih koordinat pa je bila izrisana tudi topografija.

The transformation points used were documented by plotting them within the area of coverage, and for those without graphical coordinates, the topography was plotted as well.



Slika 3.6.3: Grafični prikaz uporabljenih točk za transformacijo v zadnji iteraciji v delu grafičnega katastra v k. o. 1398 Bistrica.
Vir: Arhiv GURS

Figure 3.6.3: Graphical representation of the points used for the transformation in the final iteration in a part of the graphic cadastre in CM 1398 Bistrica.
Source: The SMARS archive

Enačbe, po katerih je bila izvedena transformacija, in izračun standardnih odklonov so bili zapisani v tehničnem poročilu za vsako katastrsko občino.

Prav tako so v tehničnem poročilu za uporabljene transformacijske točke izpisane grafične koordinate pred transformacijo, koordinate ZK- in DOF-točk ter grafične koordinate po transformaciji (za vsako iteracijo).

Rezultat transformacije je bil prikazan kot odstopanja na uporabljenih transformacijskih točkah, standardni odkloni po obeh oseh, skupni standardni odkloni in transformacijski parametri, skupaj s prikazom transformacijskih točk, ki so bile izločene v posameznih iteracijah.

The equations for carrying out the transformation and the calculation of standard deviations were recorded in the technical report for each cadastral municipality.

The technical report for the transformation points used also shows the graphical coordinates before the transformation, the coordinates of the LC and DOF points, and the graphical coordinates after the transformation (for each iteration).

The result of the transformation was shown as deviations in the transformation points used, standard deviations along both axes, total standard deviations and transformation parameters, along with a representation of the transformation points that were eliminated in individual iterations.

	1.ITERACIJA		2.ITERACIJA		3.ITERACIJA	
Št.trans. tock	Vy	Vx	Vy	Vx	Vy	Vx
2634	-0.09	+0.20	-0.18	-1.08	-1.30	-0.65
3006	+1.27	+1.21	+0.53	+0.73	-0.08	+0.86
1505	+4.74	+1.40	+3.66	+1.67	+3.39	+1.46
2852	-0.89	-2.95	-2.87	-2.52	-2.62	-2.63
10001	+4.87	+1.70	+2.49	+2.32	+2.99	+2.19
10003	-4.89	-0.03				
10004	+1.81	-1.69	+0.08	-1.68	+0.10	-1.61
10005	+1.06	-1.08	+0.08	-1.15	-0.32	-1.19
10006	+3.31	-0.09	+2.81	-0.83	+2.01	-0.60
10007	-2.42	-2.68				
10008	-4.21	+1.73	-4.18	+0.81		
10009	+1.59	+2.55	+1.35	+2.13	+0.48	+2.13
10010	-0.17	-1.54	-0.63	-1.31	-1.25	-1.62
10011	-4.87	-3.00				
10013	-2.29	-1.44	-4.40	-1.62	-4.20	-1.37
10014	+1.44	+3.55	+0.37	+2.87	-0.10	+3.18
10015	-2.92	+2.34				
10016	+2.67	-0.17	+0.88	-0.34	+0.90	-0.16
Sr.pogr.Myx	2.99	1.93	2.33	1.67	2.03	1.72
Sr.pogr.Mp	3.56		2.87		2.66	
Parametri trans. Mp						
A	1.000502		1.000917		1.000631	
B	0.006716		0.007017		0.006938	
Cy	-861.99		-1099.64		-946.42	
Cx	3376.56		3492.14		3478.06	

Slika 3.6.4: Prikaz rezultata transformacije po posameznih iteracijah v tabeli (z odstopanji, pogreški in transformacijskimi parametri) v delu grafičnega katastra v k. o. 1398 Bistrica.
Vir: Arhiv GURS

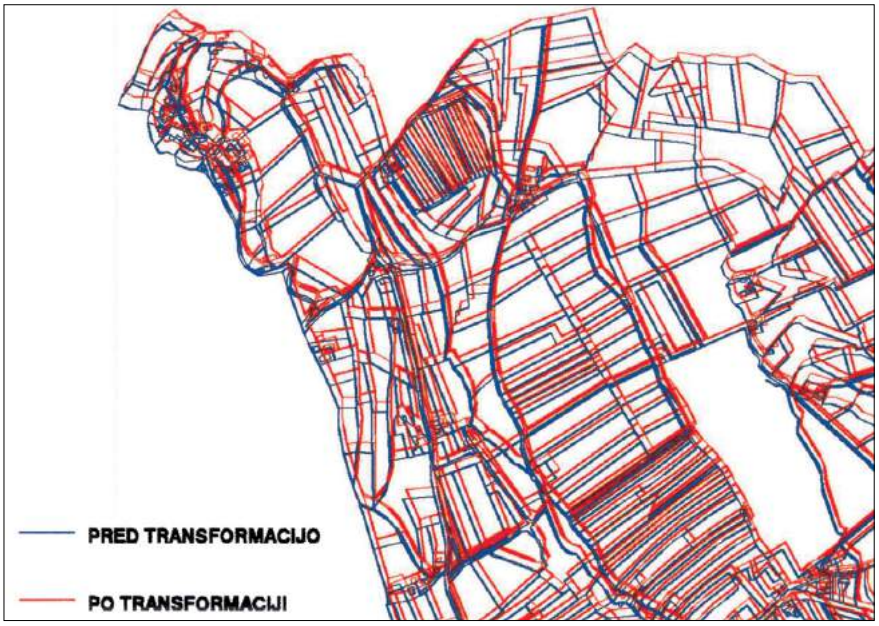
Figure 3.6.4: Results of the transformation by individual iterations in a table (with deviations, errors and transformation parameters) in a part of the graphic cadastre in CM 1398 Bistrica.
Source: The SMARS archive

Poleg tega je bil rezultat transformacije prikazan tudi grafično kot skupen izris stanja pred transformacijo in po njej ter izris stanja po transformaciji skupaj z DOF.

Rezultat transformacije je bil preverjen s primerjavo koordinat kontrolnih točk. Transformirane koordinate so bile primerjane s koordinatami istih točk, ki so bile dobljene s fotointerpretacijo DOF. Za vsako točko je bil izračunan srednji pogrešek (po oseh in skupni). Rezultat ocene usklajenosti je bila primerjalna tabela koordinat in pogreškov ter izris vektorjev odstopanj.

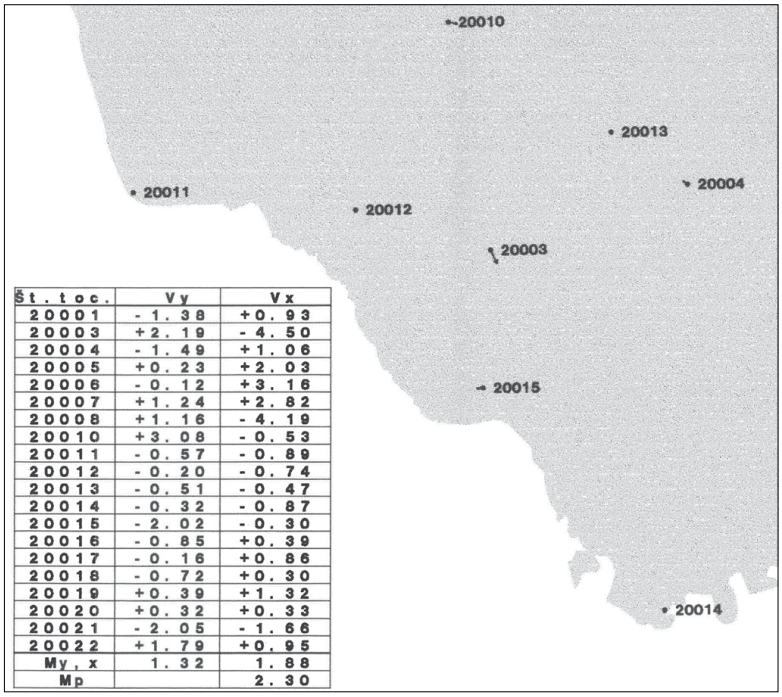
In addition, the result of the transformation was also shown graphically as an overall plotting of the situation before and after the transformation, and a plotting of the situation after the transformation together with the DOF.

The result of the transformation was verified by comparing the coordinates of the control points. The transformed coordinates were compared with the coordinates of the same points obtained by the photointerpretation of the DOF. The mean error (by axes and overall) was calculated for each point. The result of the harmonization assessment was a comparative table of coordinates and errors and a plot of deviation vectors.



Slika 3.6.5: Rezultat transformacije (izrez) v delu grafičnega katastra k. o. 1398 Bistrica prikazan grafično na skupnem izrisu (modro izrisano je stanje pred transformacijo, rdeče izrisano pa stanje po njej).
Vir: Arhiv GURS

Figure 3.6.5: Result of transformation (excerpt) in a part of the graphic cadastre in CM 1398 Bistrica, shown graphically on the overall plotting (the situation before the transformation is drawn in blue, and after in red).
Source: The SMARS archive



Št. toč.	Vy	Vx
20001	-1.38	+0.93
20003	+2.19	-4.50
20004	-1.49	+1.06
20005	+0.23	+2.03
20006	-0.12	+3.16
20007	+1.24	+2.82
20008	+1.16	-4.19
20010	+3.08	-0.53
20011	-0.57	-0.89
20012	-0.20	-0.74
20013	-0.51	-0.47
20014	-0.32	-0.87
20015	-2.02	-0.30
20016	-0.85	+0.39
20017	-0.16	+0.86
20018	-0.72	+0.30
20019	+0.39	+1.32
20020	+0.32	+0.33
20021	-2.05	-1.66
20022	+1.79	+0.95
My, x	1.32	1.88
Mp		2.30

Slika 3.6.6: Izrez iz grafičnega prikaza kontrolnih točk s seznamom odstopanj na kontrolnih točkah v delu grafičnega katastra v k. o. 1398 Bistrica.
Vir: Arhiv GURS

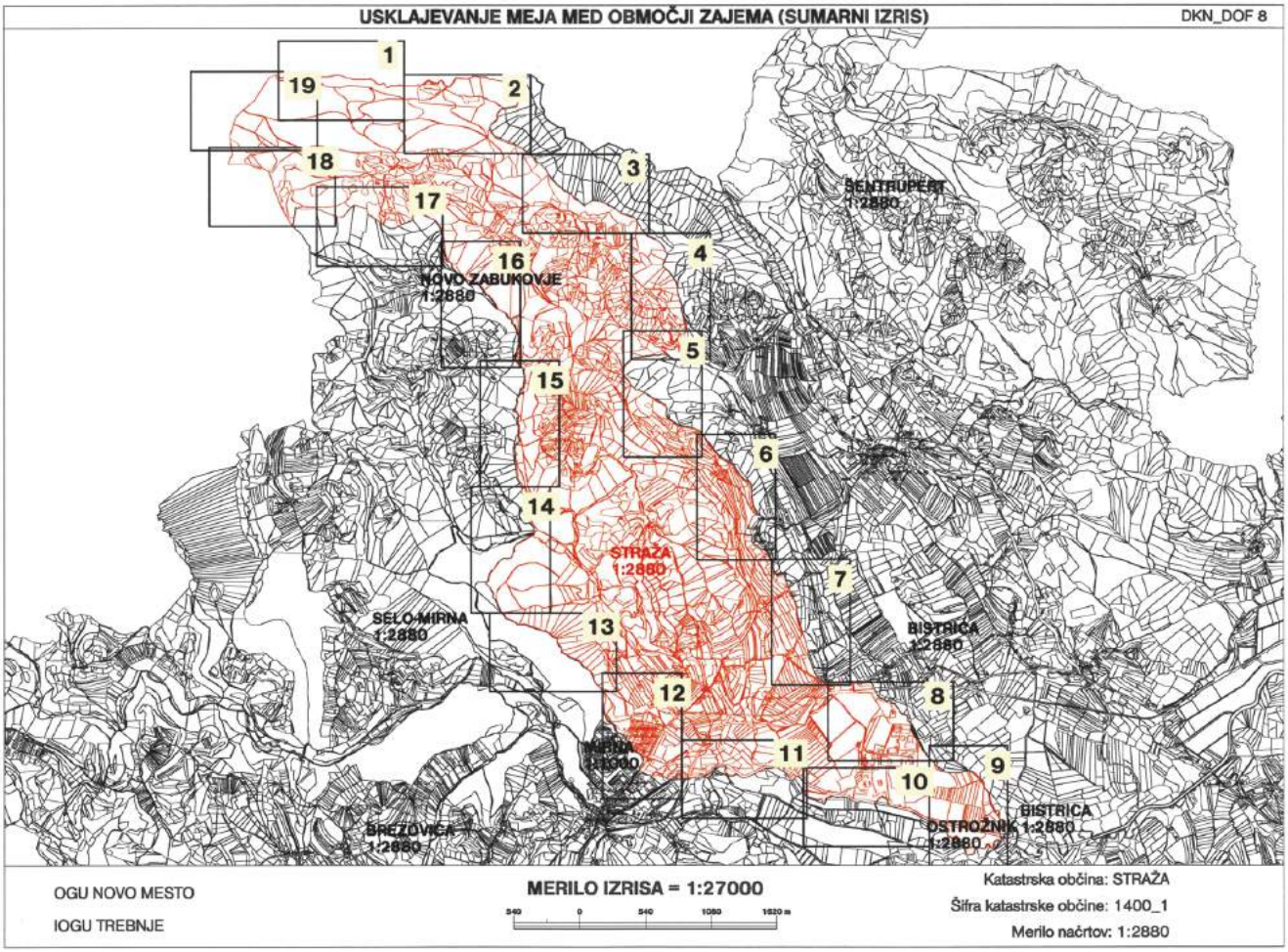
Figure 3.6.6: Excerpt from the graphical display of control points with a list of deviations at control points in a part of the graphic cadastre in CM 1398 Bistrica.
Source: The SMARS archive

Ob transformaciji so bili pri grafičnih koordinatah odpravljeni tudi premiki koordinatnega sistema, ki so bili vzpostavljeni zaradi zahtev programske opreme (ob izvedbi vektorizacije).

In the case of graphic coordinates, the shifts of the coordinate system which were performed due to the software requirements (when performing vectorization), were also eliminated during the transformation.

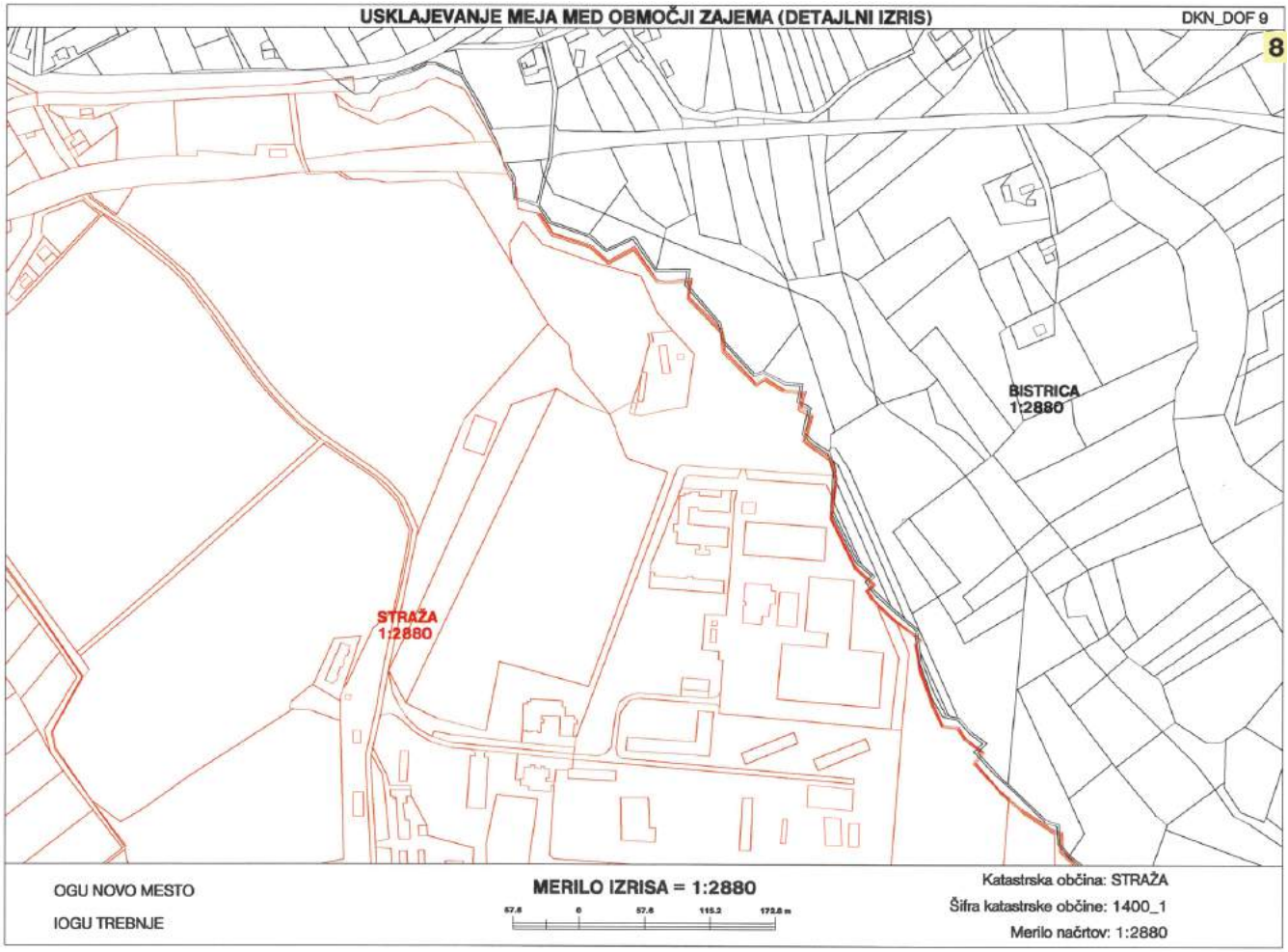
Transformirani grafični podatki po območjih zajema so bili predpogoj za nadaljnji korak, tj. uskladitev vsebine na mejah območij. Zato so bili takoj po transformaciji za ta namen pripravljeni skupni izrisi sosednjih območij zajema (združeni izris z območji detajlnih izrisov in posamezni detajlni izrisi).

Transformed graphical data by areas of coverage was a prerequisite for the next step, i.e. the harmonization of content at area borders. Therefore, merged plottings of adjacent areas were prepared for this purpose immediately after the transformation (a combined plotting with areas of detailed drawings and individual detailed drawings).



Slika 3.6.7: Združeni izris za preliminarne rešitve je predstavljal izris katastrske vsebine »glavne« in sosednjih katastrskih občin s preglednim izrisom območij detajlnih izrisov in njihovo oštevilčbo, primer za k. o. 1400 Straža.
Vir: Arhiv GURS

Figure 3.6.7: The merged plotting for preliminary solutions was a plotting of the cadastral content of the "main" and neighbouring cadastral municipalities with a clear plotting of the areas of detailed drawings and their numbering, for example CM 1400 Straža.
Source: The SMARS archive



Slika 3.6.8: Na detajlnem izrisu je bila izrisana vsebina ob meji k. o. 1400 Straža s sosednjo k. o. 1398 Bistrica v preglednem merilu, ki je omogočala vsebinske odločitve glede načina uskladitev vsebine ob meji k. o. (prikazano na primeru Zavoda za prestajanje kazni Dob pri Mirni).
Vir: Arhiv GURS

Figure 3.6.8: The detail drawing shows content drawn along the border of CM 1400 Straža with the adjacent CM 1398 Bistrica in a clear scale, which enabled substantive decisions regarding the manner of harmonization of content along the border of the CMs (shown on the example of the penitentiary at Dob pri Mirni).
Source: The SMARS archive

3.7 Dovzdrževanje za vmesni čas od skeniranja načrtov dalje
Maintenance in the intermediate period after map scanning

Zemljiški kataster se je vzdrževal na analognih zemljiškokatastrskih načrtih nemoteno naprej tudi po skeniranju le-teh. Ker je od samega skeniranja do vključno transformacije preteklo več let, je bilo treba zagotoviti dopolnitev transformiranih grafičnih podatkov z vsemi postopki vzdrževanja v vmesnem obdobju.

The land cadastre was maintained on analogue land cadastral plans without interruption even after they were scanned. As several years passed between the scanning itself and the transformation, it was necessary to ensure that the transformed graphical data was supplemented with all the maintenance procedures performed during this period.

Dovzdrževanje je bilo izvedeno na podlagi elaboratov posameznih postopkov in na podlagi vrisov v analogni načrt.

The maintenance was performed on the basis of records of individual procedures and drawings in the analogue plan.

Rezultat dovzdrževanja je moral biti topološko pravilen za posamezno območje zajema.

The result of the maintenance had to be topologically correct for each area of coverage.

3.8 Uskladitev meja območij zajema
Harmonization of area of coverage borders

Oboda transformiranih podatkov za sosednja območja zajema se praviloma nista ujemala, med njima so bile posamezne praznine ali pa tudi prekrivanja vsebine. To pomeni, da za posamezna manjša ali večja območja ob meji sosednjih območij zajema ali ni bilo podatkov (praznine) ali pa so bili vodeni dvojni podatki o parcelnih številkah (vsaka iz enega območja zajema, kar pomeni lahko tudi različne katastrske občine), ki jim območje pripada (prekrivanje). To je bilo nedopustno.

Cilj uskladitve meje med območjema zajema je bilo popolno ujemanje meje. Skupna medsebojna meja je morala biti po uskladitvi enovita, tj. v obeh območjih zajema povsem identična, tako glede števila lomov kot tudi koordinat lomov.

Predpogoj za uskladitev meja območij zajema je bila predhodno izvedena natančnejša geolokacija območij grafične izmere s transformacijo.

Če so določena območja zajema nastala kot posledica vzdrževanja na način vrisa povečanega detajla ali posamezne meritve na prazen del zemljiškokatastrskega načrta, namesto v sam načrt, je bilo treba taka območja (praviloma manjša, t. i. »otoki«) vklopiti v osnovni (večji) načrt, s čimer se je zmanjšalo število območij zajema (če to ni bilo narejeno že v zgodnejših korakih). Vklop je moral biti izvršen tako, da je bilo večje območje po vklopu topološko pravilno.

Izhodišče za uskladitev meje med območji zajema je bilo, da se meje enega območja zajema prilagajajo meji drugega območja na celotni medsebojni meji, ki se usklajuje. Uskladitev meje med območjema zajema je pomenila prevzem meje območja zajema, ki se ni usklajevalo, in poprava zarisa meje parcel (praviloma) do zadnjih lomov sosednjega območja zajema, ki se je usklajevalo.

Kriteriji za usklajevanje meja so bili:

- Osnovno načelo je bilo premik manj natančnega k bolj natančnemu (npr. območje v merilu 1 : 2880 se je v celoti prilagajalo območju v merilu 1 : 1000).

The perimeters of transformed data for adjacent areas of coverage would generally not match completely; there were individual gaps or even content overlaps between them. This means that individual smaller or larger areas along the borders of neighbouring areas of coverage either had no data (gaps) or had two sets of data on plot numbers (one from each area of coverage, which could also mean different cadastral municipalities) belonging to the area (overlap). This was not acceptable.

The aim of harmonizing borders between areas of coverage was to match the borders perfectly. After harmonization, the common border had to be uniform, that is, completely identical in both areas of coverage, both in terms of the number of gradients and the coordinates of gradients.

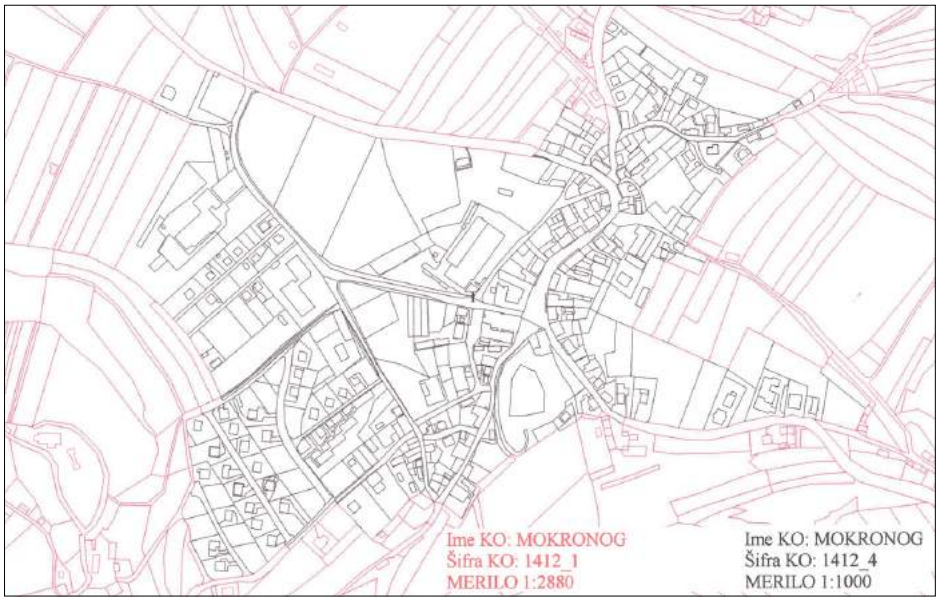
A precondition for the harmonization of the borders of areas of coverage was the previously performed precise geolocation of the areas of graphic surveying by transformation.

If any areas of coverage were created as a result of maintenance by drawing an enlarged detail or individual measurements on an empty part of the land cadastral plan, instead of the plan itself, such areas (usually smaller areas, so-called “islands”) had to be included in the basic (larger) plan, which resulted in the reduction of the number of areas of coverage (if this had not already been done in earlier steps). The inclusion had to be done in such a way that the larger area remained topologically correct.

The starting point for the harmonization of the border between areas of coverage was the adaptation of the borders of one area of coverage to the border of another area along the entire length of the mutual border undergoing harmonization. The harmonization of the border between the areas of coverage meant taking the border of a non-harmonized area of coverage and correcting the outline of the plot border (generally) to the last gradients of the adjacent area of coverage.

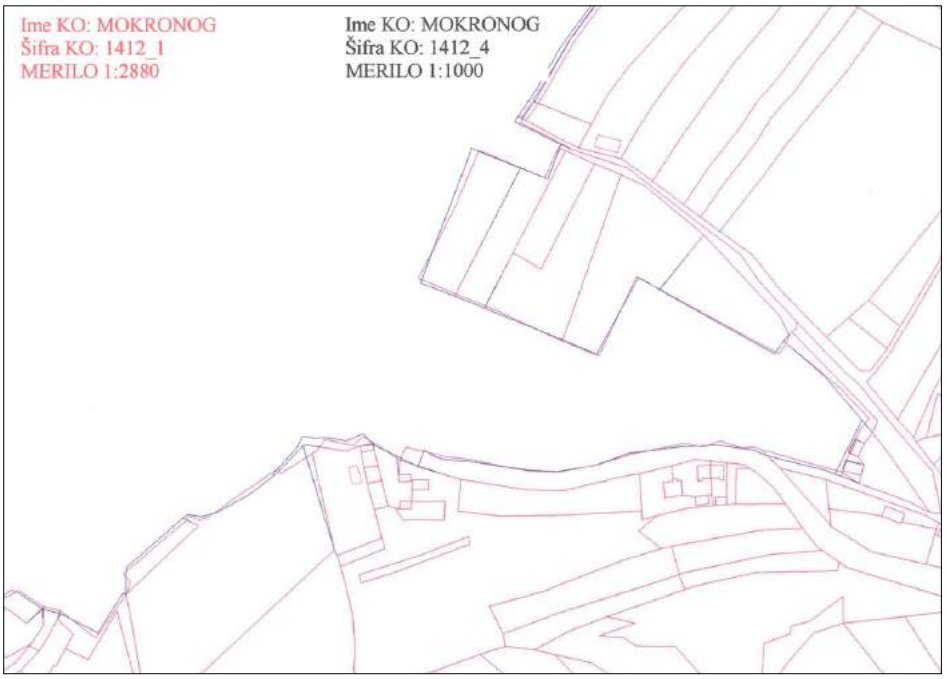
The criteria for border harmonization were:

- The basic principle was to move from less precise to more precise (e.g. an area in a scale of 1:2880 was fully adapted to an area in the scale of 1:1000).



Slika 3.8.1: Čistoris stanja po uskladitvi meje med območjem grafičnega katastra (rdeče izrisano stanje) in območjem grafično-numerične izmere (črno izrisano stanje) v k. o. 1412 Mokronog.
Vir: Arhiv GURS

Figure 3.8.1: Clean state sheet after the harmonization of the border between the area of the graphic cadastre (red plotted state) and the area of the graphic-numerical measurement (black plotted state) in CM 1412 Mokronog.
Source: The SMARS archive



Slika 3.8.2: Izrez iz prikaza poprave meje območja grafičnega katastra na območje grafično-numeričnega katastra; staro stanje območja grafičnega katastra pred uskladitvijo je prikazano v modri barvi, novo stanje istega območja (popravki) pa v rdeči barvi, prikazano na primeru k. o. 1412 Mokronog.
Vir: Arhiv GURS

Figure 3.8.2: Excerpt from the correction of the border of an area of the graphic cadastre to the area of the graphic-numerical cadastre; the old state of the area of the graphic cadastre before harmonization is shown in blue, and the new state of the same area (corrections) in red, shown on the example of CM 1412 Mokronog.
Source: The SMARS archive

- Pri usklajevanju meje dveh območij grafičnega katastra, ki sta v istem merilu in z istim načinom izdelave načrtov, je bil kriterij za izbiro območja, ki se ni usklajevalo, manjši standardni odklon transformacije območja.

Če je pri uskladitvi meja območij po naštetih kriterijih prišlo do situacije, da je območje, ki bi moralo ostati nespremenjeno (pa so ob meji velike parcele), prekrilo določene manjše parcele oz. objekte iz sosednjega območja, je bila uskladitev izvedena v nasprotju z zgornjimi kriteriji. Uskladitev je bila izvedena na način, ki je pomenil manjši popravek DKN-ja in ohranitev manjših parcel na načrtu v približno enakem obsegu. Spreminjal se je zaris meje tistih parcel, za katere je to glede na površino pomenilo odstotkovno relativno manjšo spremembo.

- Za usklajevanje dveh območij numerične izmere, za katere so obstajale merjene ZK-točke na obodu, so veljala posebna pravila. Meja med območjema je bila usklajena tako, da so bile za grafične koordinate meje prevzete merjene koordinate ZK-točk in je bila posledično usklajena baza takih ZK-točk. Tak primer je lahko nastopil zaradi morebitnih napak ali nedoslednosti ob vektorizaciji oz. je do razhajanj na meji območij prišlo ob dovzdrževanju.

- Meje katastrskih občin, ki so potekale po sredini skupnih dolžinskih objektov, so bile usklajene tako, da sta bila usklajena dotedanja zarisa meje sosednjih katastrskih občin. Prekrivajoči poligoni (praviloma) polovice širine dolžinskega objekta, ki so nastali ob vektorizaciji načrta (na analognem načrtu je bila vrisana celotna širina skupnega objekta v obeh katastrskih občinah), so bili izločeni. Po uskladitvi je v takih primerih polovica skupnega objekta še vedno ostala v eni, polovica pa v drugi katastrski občini.

Uskladitev je potekala najprej kot uskladitev na izrisih, ki so bili pripravljeni že ob transformaciji (preliminarna rešitev). Po pregledu in potrditvi preliminarne rešitve je bila le-ta prenesena še v digitalno obliko. Sledila je topološka kontrola izvedene uskladitve.

Rezultat uskladitve meja območij je bila torej popolnoma usklajena meja med območji zajema. Dodatno je bil pripravljen tudi seznam parcel, katerih zaris je bil z uskladitvijo spremenjen, in njihovih površin pred uskladitvijo in po njej, v posebnih primerih pa tudi podatki za uskladitev baze ZK-točk.

Usklajene meje med območji so bile kot rezultat tudi prikazane na združenih izrisih z detajlnimi skicami in na posameznih detajlnih skicah. Vsako območje detajlne skice je bilo prikazano večkrat:
- Izrisano stanje sosednjih območij zajema po uskladitvi (čistoris; meja območij izrisana v različnih barvah)
- Izrisano stanje območja, ki je bilo usklajeno, in sicer

- When harmonizing the borders of two areas of the graphic cadastre which are in the same scale and which used the same method of plan making, the criterion for selecting an area that was not harmonized was the smaller standard deviation in the area transformation.

If a situation arose during harmonizing the borders of the areas according to the listed criteria where the area which should have remained unchanged (but where there were large plots along the border) covered certain smaller plots or objects from the neighbouring area, the harmonization was carried out contrary to the above criteria. The harmonization was carried out in a way that represented a minor correction of the DKN and the preservation of the dimensions of smaller plots on the plan. The outline of the borders was changed in those plots where this meant a relatively small change in terms of the percentage of area changed.

- Special rules applied in the coordination of the numerical survey areas with existing measured LC points on the perimeter. The border between the areas was harmonized in such a way that the graphical coordinates of the border were taken from the measured coordinates of the LC points, and, consequently, the database of such LC points was harmonized. Such a case may have occurred due to potential errors or inconsistencies in the vectorization, or divergences at the area borders may have occurred during maintenance.

- The borders of cadastral municipalities running along the middle of common longitudinal structures were harmonized by harmonizing the previous outlines of the borders of the neighbouring cadastral municipalities. Overlapping polygons of half the width of the longitudinal structure, which were created during the vectorization of the plan (the entire width of the common structure in both cadastral municipalities was plotted on the analogue plan), were eliminated. In such cases, after harmonization, half of the common structure remained in one, and the other half in the other cadastral municipality.

The harmonization took place first as a harmonization on the plottings that were prepared at the time of the transformation (preliminary solution). After reviewing and confirming the preliminary solution, it was transferred to digital form. This was followed by a topological test of the harmonization performed.

The result of the harmonization of the borders of areas was therefore a fully harmonized border between the areas of coverage. In addition, a list was drawn up of plots whose outline was changed with the harmonization and their areas before and after the harmonization, and in special cases also data for the harmonization of the database of LC points.

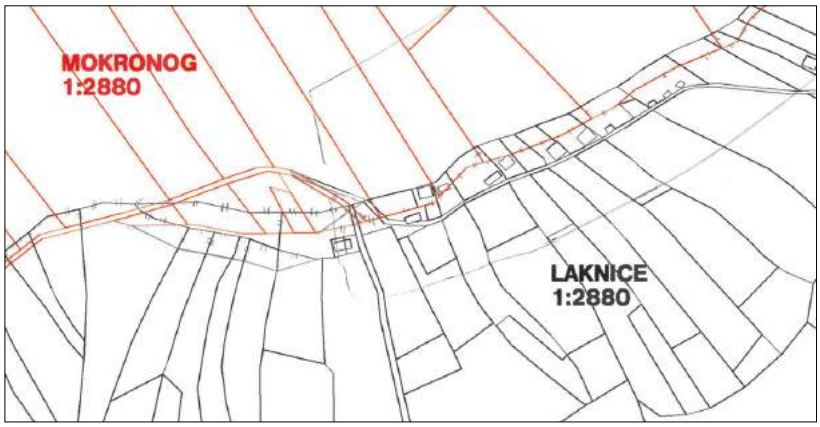
Harmonized borders between areas were also shown as results on the merged plottings with detail sketches and on individual detailed sketches. Each area of the detail sketch was shown several times:
- The plotted states of adjacent areas of coverage after harmonization (clear print; the borders of areas are drawn in different colours)
- The plotted state of the area that was harmonized, before and

pred uskladitvijo in po njej (ločeno z barvami)
- Če je bila uporabljena uskladitev v nasprotju z osnovnim načelom (tj. npr. kot zgoraj navedeno na primeru prekritja manjših parcel), pa so bila taka območja na izrisih dodatno označena/obkrožena.

Spodaj je prikazan del rezultata uskladitve med dvema območjema za ponazoritev zgoraj opisanega (z izrisom preliminarne rešitve pred samo uskladitvijo).

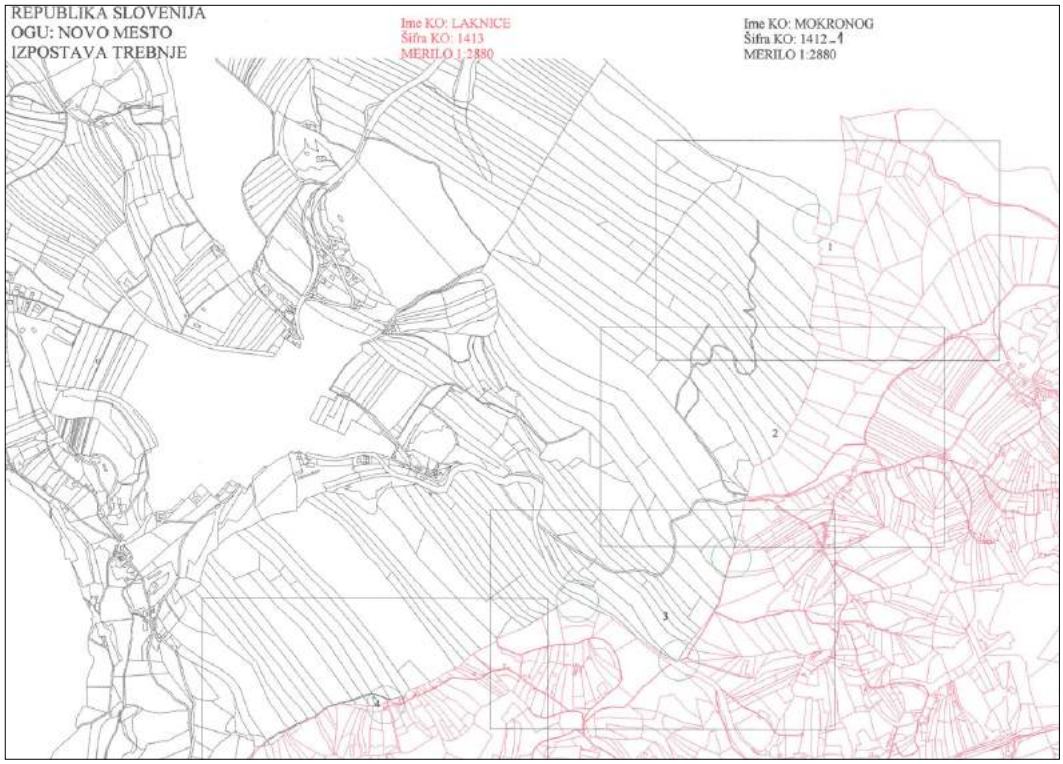
after harmonization (differentiated by colour)
- Where harmonization was used contrary to the basic principle (that is, for example, as mentioned above in the case of overlapping smaller plots), such areas were additionally marked/circled in the drawings.

Below is a part of the result of the harmonization between two areas to demonstrate the above (by plotting the preliminary solution before the harmonization itself).



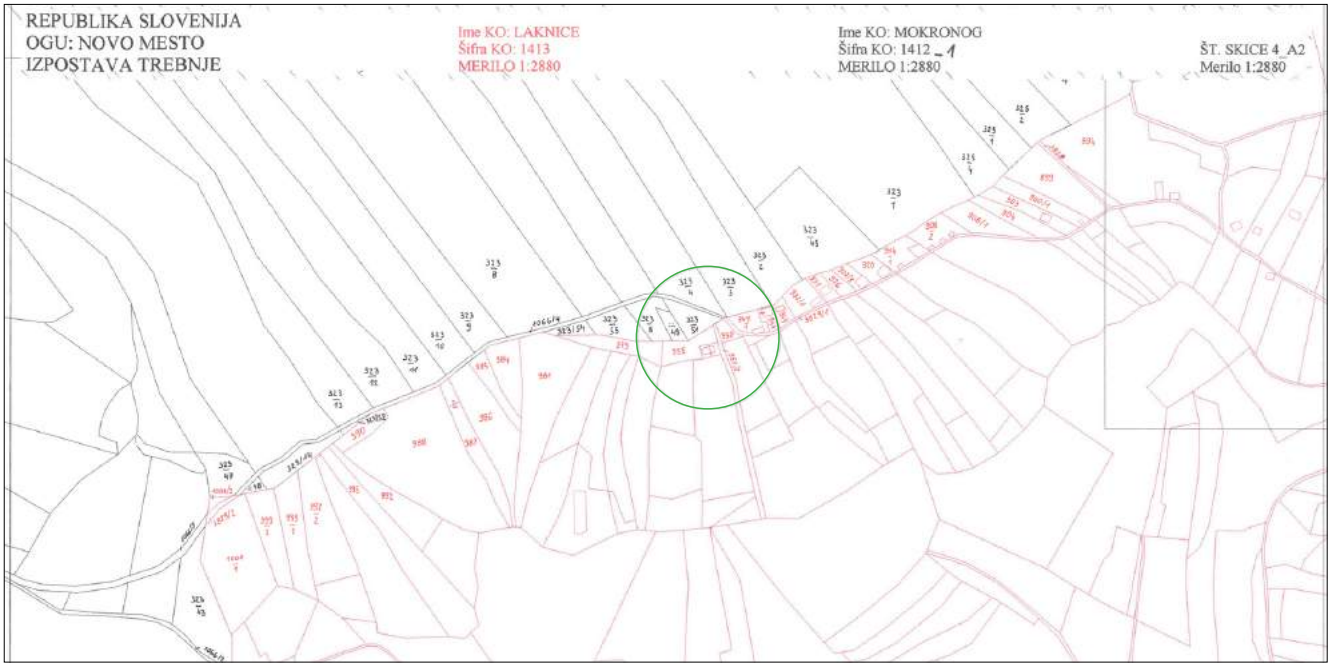
Slika 3.8.3: Na detajlnem izrisu za preliminarno rešitev je organizacijska enota Geodetske uprave zarisala način uskladitve v svinčniku, primer meje med k. o. 1422 Mokronog (ki se v osnovi ne usklajuje) in k. o. 1413 Laknice (ki se v osnovi usklajuje), kjer je bila uporabljena izjema.
Vir: Arhiv GURS

Figure 3.8.3: The method of alignment was drawn in pencil on a detail drawing for the preliminary solution by the organizational unit of the Surveying and Mapping Authority; example of the border between CM 1422 Mokronog (which is generally not harmonized) and CM 1413 Laknice (which is generally harmonized), where the exception was applied.
Source: The SMARS archive



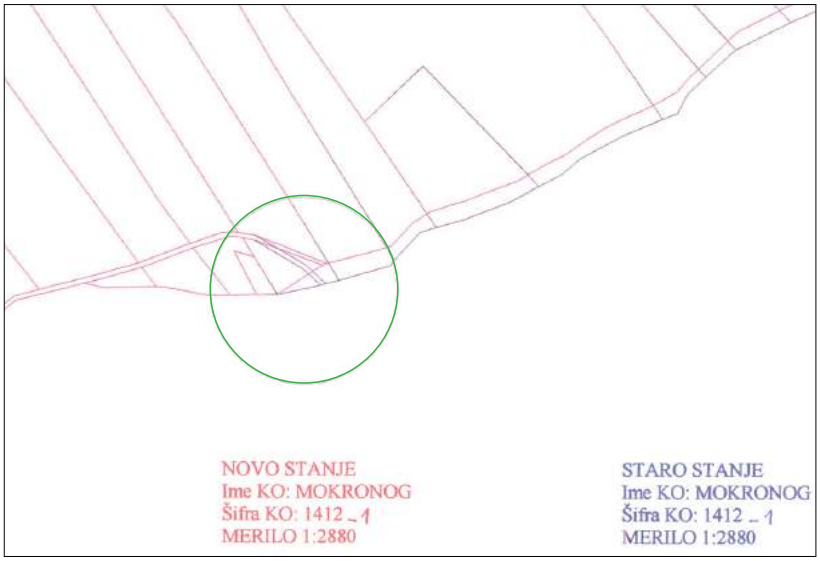
Slika 3.8.4:Združeni čistoris stanja po uskladitvi dveh območij grafičnega katastra v k. o. 1412 Mokronog in k. o. 1413 Laknice, barvi prikazujeta vsebino različnih območij; glede na pogreške se je prilagajalo območje, ki je izrisano rdeče; s krogi pa so označene izjeme od osnovnega pravila.
Vir: Arhiv GURS

Figure 3.8.4: Merged clean state sheet after harmonization of two areas of the graphic cadastre in CM 1412 Mokronog and CM 1413 Laknice, the colours showing the contents of different areas; the area drawn in red was adjusted according to the errors; and the circles indicate exceptions to the basic rule.
Source: The SMARS archive



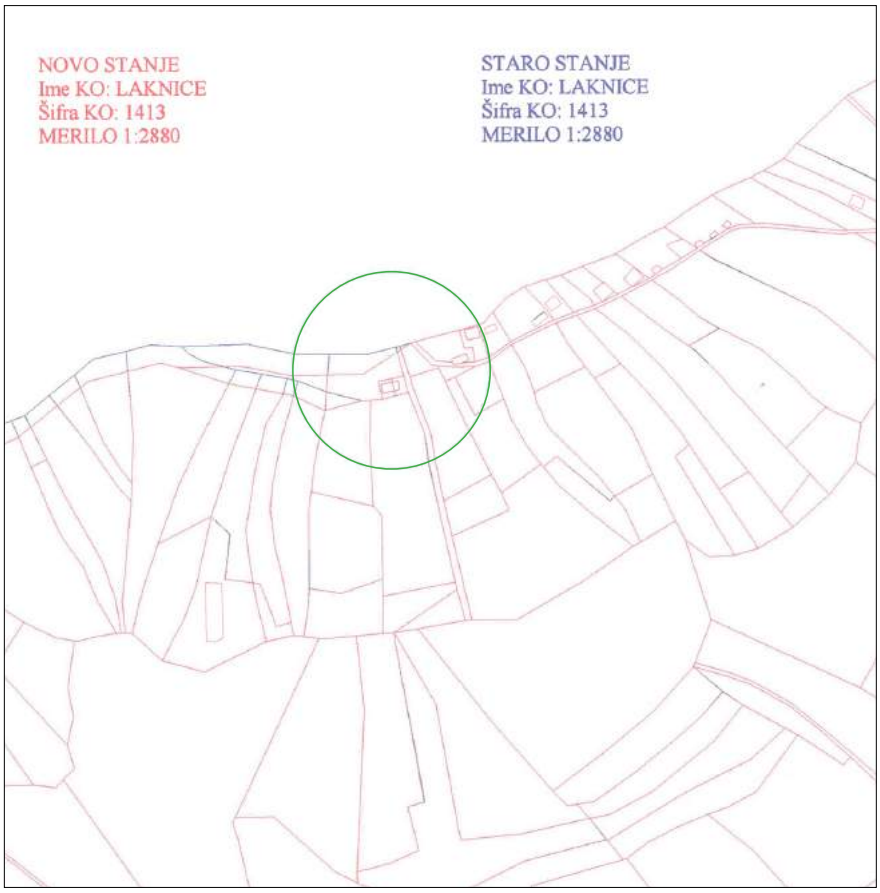
Slika 3.8.5: Identična vsebina prikazana še na detajlni skici (zelena oznaka (krog) pomeni, da je bila tu (lahko pa tudi v okolici) uporabljena izjema pri uskladitvi, ko ni bilo upoštevano osnovno pravilo glede prilagajanja glede na velikost pogreškov); parcele so bile dopisane zaradi lažje nastavitve podatkov arhiva; niso nujno prisotne v vseh izrisih, primer meje med k. o. 1412 Mokronog in k. o. 1413 Laknice.
Vir: Arhiv GURS, OGU Novo mesto

Figure 3.8.5: Identical content shown in the detail sketch (the green mark (circle) denotes an exception to the harmonization in that location (or in the surroundings) where the basic rule regarding adjustment according to the size of errors was not observed); the plots were added for easier setting of archival data; they are not necessarily present in all drawings; example of the border between CM 1412 Mokronog and CM 1413 Laknice.
Source: The SMARS archive, OGU Novo mesto



Slika 3.8.6: Prikaz sprememb pred (modro)/po (rdeče) uskladitvi na detajlni skici za območje, ki se sicer ni prilagajalo, tu pač (uporabljena je bila izjema zaradi drobne parcelacije), zelen krog označuje mesto začetka/konca uporabljene izjeme, primer meje med k. o. 1412 Mokronog in k. o. 1413 Laknice.
Vir: Arhiv GURS, OGU Novo mesto

Figure 3.8.6: Display of changes before (blue)/after (red) harmonization on a detail sketch for an area that was not otherwise adjusted, but was adjusted in this case (an exception was used due to small plot division), the green circle indicates the start/end of the applied exception; example of the border between CM 1412 Mokronog and CM 1413 Laknice.
Source: The SMARS archive, OGU Novo mesto



Slika 3.8.7: Prikaz sprememb pred (modro)/po (rdeče) uskladitvi na detajlni skici za območje, ki se je praviloma prilagajalo, tu pač ne (uporabljena je bila izjema zaradi drobne parcelacije), primer meje med k. o. 1412 Mokronog in k. o. 1413 Laknice.
Vir: Arhiv GURS, OGU Novo mesto

Figure 3.8.7: Display of changes before (blue)/after (red) harmonization on a detail sketch for an area that was otherwise adjusted, but not in this case (an exception was used due to small plot division); example of the border between CM 1412 Mokronog and CM 1413 Laknice.
Source: The SMARS archive, OGU Novo mesto

Uskladitev je bila praviloma za vsa območja zajema iste katastrske občine izvedena naenkrat. S tem so bili vzpostavljeni vektorski topološko pravilni grafični podatki za celotno katastrsko občino in ne zgolj za posamezno območje zajema znotraj katastrske občine.

Ko je bila uskladitev narejena za vse katastrske občine določene organizacijske enote Geodetske uprave, je to pomenilo, da so bili tudi za celo organizacijsko enoto vzpostavljeni vektorski topološko pravilni grafični podatki.

In ko je bila uskladitev zaključena za vse organizacijske enote GU, je bila vzpostavitev vektorske topološko pravilne baze grafičnih podatkov zaključena za celo državo. Manjkala je le še pika na i.

As a rule, harmonization was carried out at the same time for all areas covered by the same cadastral municipality. This yielded topologically correct graphic vector data for the entire cadastral municipality and not only for an individual area of coverage within the cadastral municipality.

When the harmonization was implemented for all cadastral municipalities under individual organizational units of the Surveying and Mapping Authority, this meant that topologically correct graphic vector data were also established for the entire organizational unit.

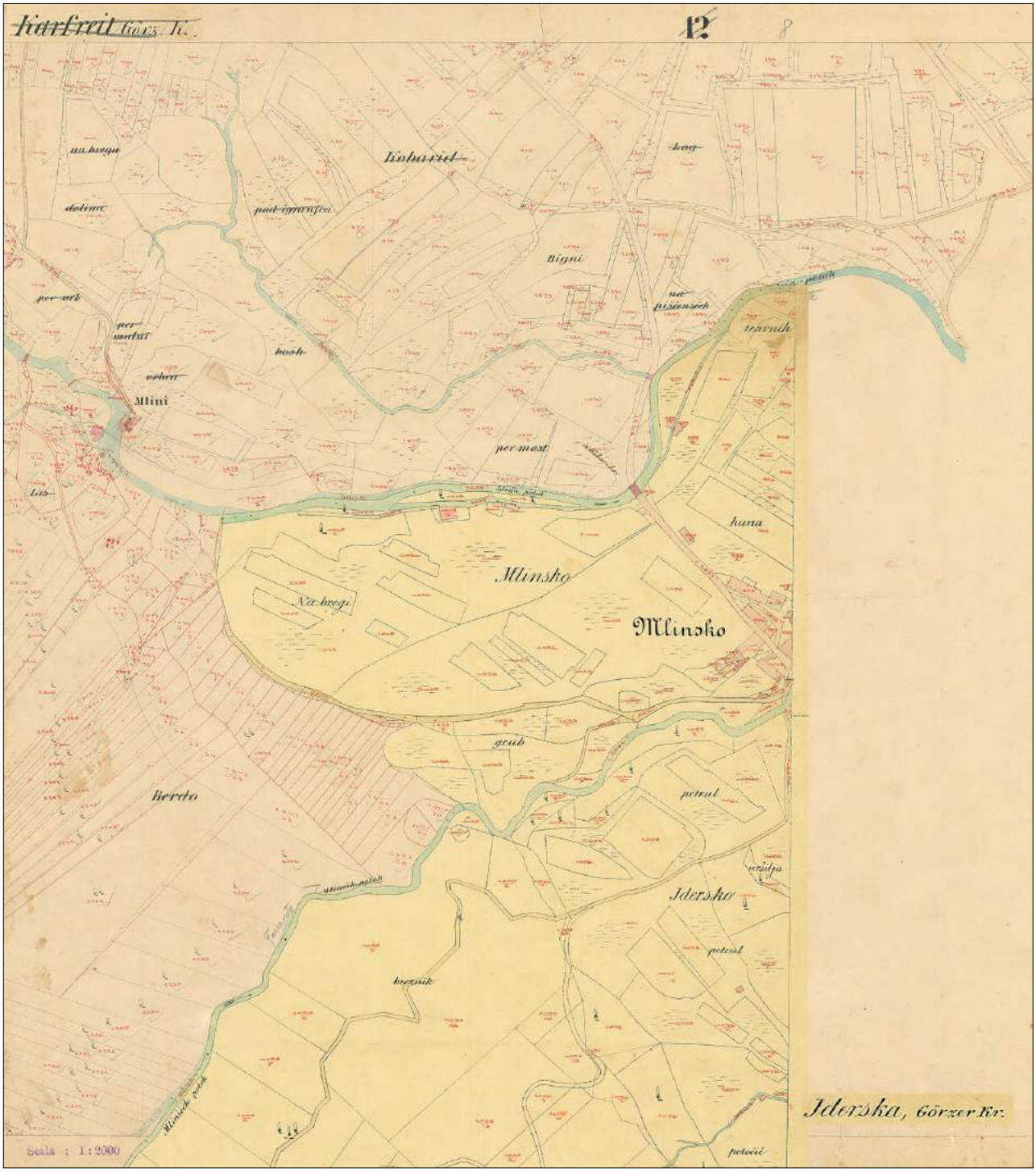
And when harmonization was completed for all the organizational units, the establishment of a topologically correct vector graphic database was completed for the whole country. All that was missing was the final touch.

» *Ob nastavitvi stabilnega katastra se pod pojmom Bled razume samo blejski grad (Burg Veldes) in vasica vzhodno od gradu. Vasi pod njim in okoli jezera, Grad, Rečica, Mlino, Želeče in Zagorice, so z leti zrasle v mesto Bled, uradno leta 1960.* «

» *Wen setting up a stable cadastre, the term Bled encompasses only Bled Castle (Burg Veldes) and the village east of the castle. The villages below it and around the lake - Grad, Rečica, Mlino, Želeče and Zagorice - have grown over the years into the town of Bled, officially recognised in 1960.* «

Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Source: the e-ZKN archive land cadastre map viewer



Izsek iz katastrskega načrta k. o. 2223 Kobarid in k. o. 2229 Idrsko. Iz prikaza je razvidno, da je bila izmera na območju Napoleonovega katastra za vsako k. o. posebej orientirana in zgolj slučajno proti severu.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Excerpt from the cadastral plan of CM 2223 Kobarid and CM 2229 Idrsko. It can be seen from the display that the survey in the area of Napoleon's cadastre for each CM was specifically oriented, incidentally to the north.
Source: the e-ZKN archive land cadastre map viewer

3.9 Uveljavitev DKN (pika na i)
Implementation of DKN (final touch)

V letu 1999 je bilo izdano Navodilo o začetku uradne uporabe digitalnega katastrskega načrta (DKN). Pogoji za uradno uporabo so bili določeni v 2. členu:

- DKN je moral biti izdelan za celo katastrsko občino
- DKN je moral biti izdelan v državnem koordinatnem sistemu (tedaj D48/GK)
- parcele in parcelni deli so morali homogeno in zvezno pokrivati območje cele katastrske občine
- meje sosednjih katastrskih občin so morale biti med seboj usklajene
- podatki o parcelah so morali biti usklajeni v opisnem in grafičnem delu zemljiškega katastra
- vzpostavljeni sta morali biti evidenca elaboratov in evidenca zemljiškokatastrskih točk

Pogoj o usklajenosti v opisnem in grafičnem delu zemljiškega katastra v praksi ni bil vedno v celoti upoštevan. Razlog je bila zapletenost in dolgotrajnost rešitve nekaterih neskladij, ki bil lahko v določenih primerih uveljavitev odmaknila tudi za več let v prihodnost.

O začetku uradne uporabe DKN za posamezno katastrsko občino je bil izdan sklep, ki je bil objavljen v Uradnem listu. Z dnem sprejema sklepa se je začel DKN uporabljati kot uradni grafični prikaz podatkov zemljiškega katastra, istega dne so analogni zemljiškokatastrski načrti postali sestavni del arhiva zemljiškokatastrskega operata. V te načrte se vse nadaljnje spremembe niso več vrisovale. Evidentiranje sprememb je potekalo samo še v digitalnih podatkih.

In 1999, the Instruction on the Commencement of the Official Use of the Digital Cadastral Plan (DKN) was issued. The conditions for official use were defined in Article 2:

- The DKN had to be drawn up for the whole cadastral municipality.
- The DKN had to be drawn up in the national coordinate system (then D48/GK).
- Plots and plot parts had to homogeneously and continuously cover the area of the entire cadastral municipality.
- The borders of neighbouring cadastral municipalities had to be harmonized.
- Data on plots had to be harmonized in the descriptive and graphic part of the land cadastre.
- A record of reports and a record of land cadastral points had to be established.

The condition in regard to harmonization in the descriptive and graphic part of the land cadastre has not always been fully complied with in practice. The reason for this is the complexity and duration of resolving some of these inconsistencies, which in certain cases may have delayed implementation for several years.

A decision was issued on the commencement of the official application of the DKN for individual cadastral municipalities, which was published in the Official Gazette. On the day the decision was adopted, the DKN came into use as the official graphic representation of land cadastre data, and on the same day, analogue land cadastre plans became an integral part of the archives of the land cadastral record. No further changes were drawn into these plans. Changes were recorded exclusively in digital form.

MINISTRSTVA

3903. Sklep o začetku uradne uporabe digitalnega katastrskega načrta

Na podlagi drugega odstavka 3. člena navodila o začetku uradne uporabe digitalnega katastrskega načrta (Uradni list RS, št. 57/99) je minister za okolje in prostor dne 27. 9. 2000 sprejel

SKLEP
o začetku uradne uporabe digitalnega katastrskega načrta

1

Za katastrske občine 695 Bohova, 656 Brezje, 2712 Dobrava, 658 Koroška vrata, 653 Košaki, 657 Maribor grad, 655 Melje, 2713 Ob železnici, 681 Pobrežje, 660 Studenci, 659 Tabor in 680 Tezno se z dnem uveljavitve tega sklepa začne uporabljati digitalni katastrski načrt kot uradni grafični prikaz podatkov zemljiškega katastra.

2

Ta sklep se objavi v Uradnem listu Republike Slovenije.

Št. 453-00-15/00
Ljubljana, dne 27. septembra 2000.

Minister
za okolje in prostor
dr. Andrej Umek l. r.

Slika 3.9.1: Prvi objavljeni sklep o začetku uporabe digitalnega katastrskega načrta za 12 katastrskih občin.
Vir: Uradni list RS, št. 91/2000
Prvi sklep je bil objavljen dne 27. 09. 2000, zadnji pa dne 04. 12. 2009.

Figure 3.9.1: The first published Decision on the Commencement of the Use of the Digital Cadastral Plan for 12 cadastral municipalities.
Source: Official Gazette of the RS, no. 91/2000
The first Decision was published on 27 September 2000 and the last on 4 December 2009.

3.10 Posebnosti pretvorbe za območje grafično-numeričnega in koordinatnega katastra

Special features of conversion for the area of the graphic-numerical and co-ordinate cadastre

Posebnosti bodo ponazorjene za območje Prekmurja, ki je glede geodetskih katastrskih podatkov in načrtov zemljiškega katastra specifično, tako v zgodovinskem kot v časovnem in vsebinskem vidiku. Glede na večino ostalih območij Slovenije je za kataster v Prekmurju značilna občutno višja izvorna kakovost podatkov, ki je bila eden od temeljnih razlogov za posebno prilagojen pristop k izdelavi zemljiškokatastrskih prikazov (ZKP) oz. zemljiškokatastrskih načrtov (ZKN) v katastrskih občinah na območju nekdanje občinske geodetske uprave Murska Sobota oz. današnje geodetske pisarne Murska Sobota.

Vrste katastrskih načrtov

Vrste katastrskih načrtov so v vsaki k. o. neposredno pogojene z vrstami katastrskih izmer in časovnimi obdobji, v katerih so bile te izmere izvajane. S tem je bila bistveno pogojena tudi priprava vhodnih digitalnih podatkov za prevedbo analognih načrtov v digitalno vektorsko obliko kakor tudi sama izvedba prevedbe v digitalno obliko. Čeprav so zemljiškokatastrski prikazi na prvi pogled navzven oblikovno in vsebinsko enaki po vseh katastrskih občinah v Sloveniji, je kakovost zemljiškokatastrskega prikaza v vsaki posamezni katastrski občini ključno pogojena s kakovostjo vhodnih podatkov, na podlagi katerih je bil prikaz izdelan. Na to pa poleg izvorne položajne kakovosti vhodnih podatkov vpliva več dejavnikov, od načina, kako so bili vhodni podatki preneseni v zemljiškokatastrski prikaz, do postopkov kontrol digitalnih podatkov med izdelavo prikazov in po njej.

Na območju geodetske pisarne Murska Sobota je 135 katastrskih občin, ki jih glede na vrste katastrskih načrtov oz. katastrskih izmer lahko v grobem vsebinsko razvrstimo v pet osnovnih skupin. Glede na pomen, ki so ga imele za izvedbo vektorizacije, se navedbe v spodnji tabeli nanašajo na čas v začetku 90. let prejšnjega stoletja, ko so bili postopki prevedbe katastrskih načrtov v digitalno obliko večinoma še v začetni fazi. Danes je stanje po kategorijah vrst izmere že bistveno drugačno, predvsem zaradi velikega števila komasacij, ki so bile izvedene v zadnjih treh desetletjih, pa tudi zaradi nekaterih izvedenih novih izmer v tem obdobju. Posodobljeni grafični prikaz stanja novih izmer in komasacij je prikazan v slikah 3.10.1 in 6.2.7.

Special features will be demonstrated for the area of Prekmurje, which is specific in terms of geodetic cadastral data and land cadastre plans, both from a historical and a temporal and substantive perspective. In comparison to most other areas in Slovenia, the cadastre in Prekmurje is characterized by a significantly higher original quality of data, which was one of the main reasons for a specially adapted approach to the production of cadastral index maps (ZKP) or land cadastral plans (ZKN) in cadastral municipalities in the area of the former municipal surveying administration in Murska Sobota, or today's Murska Sobota Surveying and Mapping Office.

Types of cadastral plans

The types of cadastral plans in each CM are directly conditioned by the types of cadastral surveys and the time periods in which these surveys were carried out. These conditions also significantly affected the preparation of digital input data for the translation of analogue plans into digital vector form, as well as the implementation of the translation into digital form itself. Although the cadastral index maps are at first glance identical in form and content in all cadastral municipalities in Slovenia, the quality of the cadastral index map in each individual cadastral municipality is significantly conditioned by the quality of the input data on the basis of which the index map was made. In addition to the original positional quality of the input data, this is influenced by several factors, from the way the input data was transferred to the cadastral index map to the digital data control procedures used during and after the production of the index maps.

In the area of the Murska Sobota Surveying and Mapping Office, there are 135 cadastral municipalities, which can be roughly classified into five basic groups according to the types of cadastral plans or cadastral surveys. Given their importance in the implementation of vectorization, the indications in the table below refer to the circumstances in the early 1990s, when the procedures for translating cadastral plans into digital form were still in their initial phase. The situation of the categories of survey types has changed significantly, mainly due to the large number of land consolidations that have been carried out in the last three decades, but also due to some new surveys carried out in this period. An updated graphical representation of the state of new surveys and land consolidation is shown in Figures 3.10.1 and 6.2.7.

Koordinatni sistem	Število k. o.	Površina izmer [ha]	Vrsta izmere	Časovno obdobje	Merilo načrtov
Gellérthegy	15	≈ 7 000	Ortogonalna	1923–1947	1 : 2880
D48/GK	73	≈ 38 000	Tahimetrija (trinitna, avtoredukcijska), ortogonalna	1948–1974	1 : 2500 1 : 1000
D48/GK	6	≈ 4 600	Enoslikovna fotogrametrija in tahimetrija (trinitna, avtoredukcijska)	1953–-1960	1 : 2500
D48/GK	41	≈ 16 000	Stereofotogrametrija in precizna tahimetrija	1975–1992	1 : 2500 1 : 1000
D48/GK	*25	≈ 3 560	Precizna tahimetrija, ortogonalna	1975–1992	1 : 2500
Skupaj	135	69 162			

*Opomba: Število *25 v predzadnji vrstici tabele se nanaša na komasacije, ki so bile izvedene v delih k. o. na območjih katastrskih izmer, ki so že bile v državnem koordinatnem sistemu D48/GK in se zato njihovo število ne šteje v seštevek števila k. o.*

Coordinate system	CM no.	Area measured [ha]	Type of measurement	Time period	Merilo načrtov
Gellérthegy	15	≈ 7000	Orthogonal	1923–1947	1 : 2880
D48/GK	73	≈ 38,000	Tacheometry (horizontal longitude, auto-reducing), orthogonal	1948–1974	1 : 2500 1 : 1000
D48/GK	6	≈ 4600	Single-image photogrammetry and tacheometry (horizontal longitude, auto-reducing)	1953–-1960	1 : 2500
D48/GK	41	≈ 16,000	Stereophotogrammetry and precision tacheometry	1975–1992	1 : 2500 1 : 1000
D48/GK	*25	≈ 3560	Precision tacheometry, orthogonal	1975–1992	1 : 2500
Total	135	69,162			

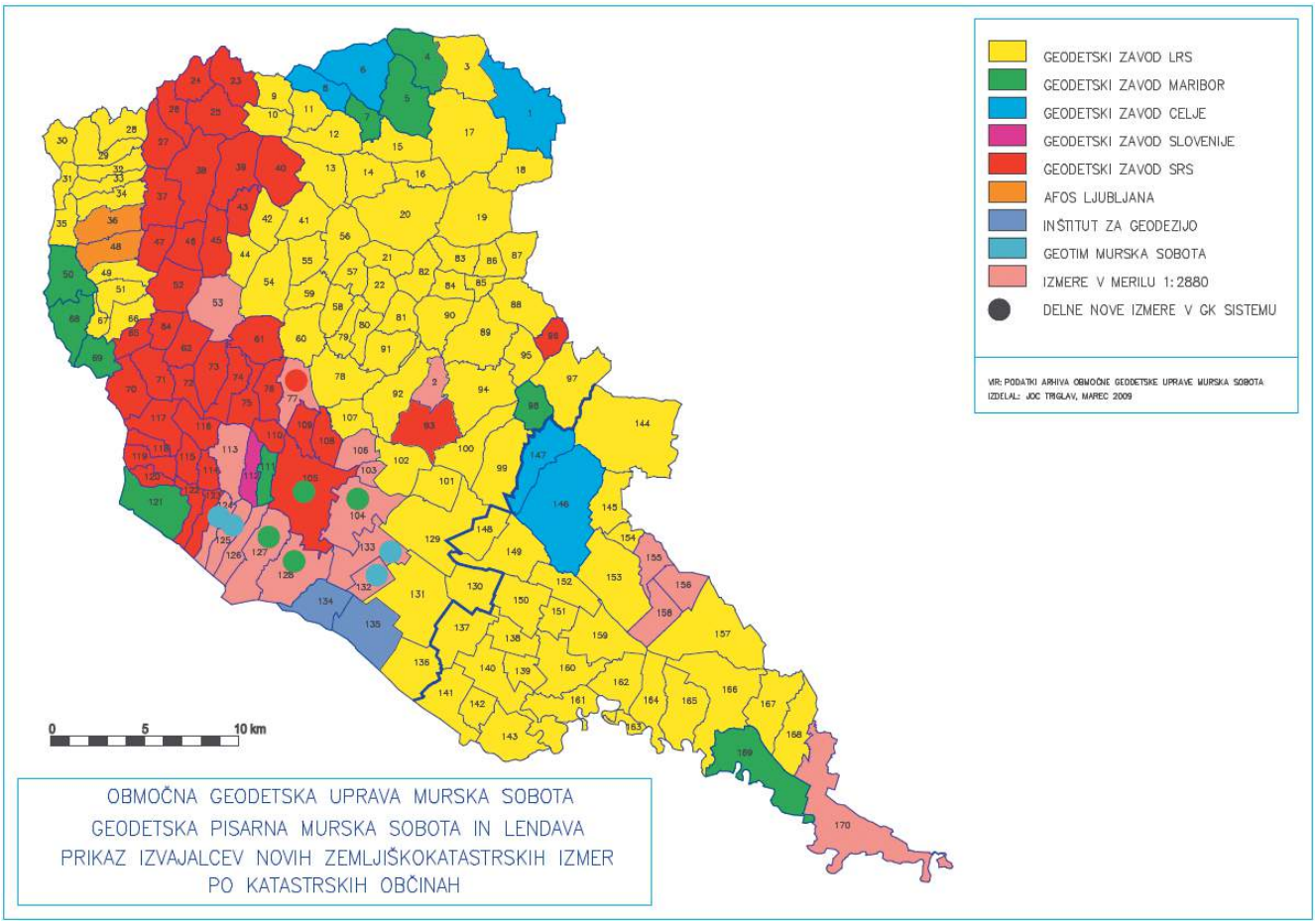
*Note: The number *25 in the second to last row of the table refers to the land consolidations carried out in parts of CMs in the areas of cadastral surveys, which were already in the D48/GK national coordinate system, and therefore their number is not counted in the sum of the number for the CM.*

Izdelava numerično-grafičnih katastrskih načrtov v Gauß-Krügerjevem koordinatnem sistemu v Prekmurju je bila obsežneje opisana v Geodetskem vestniku (Triglav, 2010). Tudi primeri izdelave zemljiškokatastrskih prikazov za katastrske občine na območju Prekmurja, kjer so bili izvorni grafični katastrski načrti izdelani v starem koordinatnem sistemu Gellérthegy, so opisani v literaturi na primerih katastrskih občin Bodonci (Triglav, 1993) in Tešanovci (Triglav, 2013a).

Nekatera dodatna dejstva o vrstah katastrskih izmer so zapisana v nadaljevanju v poglavju 5.

The production of numerical-graphic cadastral plans in the Gauß-Krüger coordinate system in Prekmurje was described in more detail in Geodetski vestnik (Triglav, 2010). Examples of the production of cadastral index maps for cadastral municipalities in the Prekmurje area, where the original graphic cadastral plans were made in the old Gellérthegy coordinate system, are described in the literature on the examples of cadastral municipalities Bodonci (Triglav, 1993) and Tešanovci (Triglav, 2013a).

Some additional facts about the types of cadastral surveys are described below, in Chapter 5.



Slika 3.10.1: Prikaz izvajalcev novih zemljiškokatastrskih izmer v Prekmurju po katastrskih občinah. Seznam šifer in imen k. o. je dostopen na http://cen.gov.si/JavniVpogled/help/KO.htm.
Vir: Arhiv GURS, OGU MS

Figure 3.10.1: Entities implementing new land cadastral surveys in Prekmurje by cadastral municipalities. List of codes and names of CM can be found at http://cen.gov.si/JavniVpogled/help/KO.htm.
Source: The SMARS archive, OGU MS.

Vhodni podatki v koordinatni in vektorski obliki

Koordinatna in vektorska grafična katastrska vsebina se je na geodetski upravi Murska Sobota vodila in sproti vzdrževala od leta 1984 najprej na lastni programski opremi HP grafične postaje, kasneje pa v programu AutoCAD oz. od leta 1996 naprej v programu AutoCAD Map. Pri obravnavi vhodnih podatkov je bilo treba posebno pozornost posvetiti dejstvu, da je v eni sami katastrski občini lahko več različnih območij zemljiškokatastrskih izmer in komasacij, ki se praviloma razlikujejo po času in načinu izvedbe izmer ter kakovosti izmerjenih podatkov (glej npr. Triglav, 1993 in 2013a, 2013b).

Vhodni podatki ZK-točk v koordinatni obliki so se na geodetski upravi ročno vodili od leta 1975 dalje za vse katastrske občine koordinatnega katastra v državnem koor-

Input data in coordinate and vector form

Coordinate and vector graphic cadastral content has been managed and maintained at the Surveying and Mapping Authority of Murska Sobota since 1984, initially using the Authority's own software on the HP graphic station, and later using the AutoCAD software, particularly AutoCAD Map since 1996. When processing the input data, special attention had to be paid to the fact that a single cadastral municipality may contain several different areas of land cadastral surveys and land consolidations, which usually differ in the time and method of surveying and quality of measured data (see, for example, Triglav, 1993 and 2013a, 2013b).

Input data of LC points in coordinate form have been manually kept at the Surveying and Mapping Authority since 1975 for all cadastral municipalities of the coordinate cadastre in the D48/GK

dinatnem sistemu D48/GK. Pisni seznami koordinat so vsebovali stanje ZK-točk ob nastavitvi posamezne nove izmere in vse ZK-točke, ki so nastale v postopkih nadaljnjega vzdrževanja katastra. Za vse ostale k. o., izvorno izmerjene pred letom 1974, se seznami koordinat ZK-točk nekje do leta 1980 še niso vodili, ker se v teh k. o. tudi koordinate v državnem koordinatnem sistemu D48/GK niso sistematično izračunavale in vodile. Zato so bili v večletnem pripravljalnem obdobju na prevedbo analognih katastrskih načrtov v digitalno vektorsko obliko v vseh teh k. o., ne glede na to ali so bili načrti izvorno izdelani kot načrti grafične izmere ali kot načrti numerično-grafične izmere, sistematično izvedeni obsežni izračuni koordinat ZK-točk za vse meritve v geodetskih postopkih, izvedenih po uveljavitvi zakona o zemljiškem katastru leta 1974.

Tako izračunane ZK-točke so se potem tekoče vodile v urejenih seznamih po posameznih k. o. Za vsako k. o. so bili potem v digitalno obliko pretvorjeni celotni seznami ZK-točk. Skupno s prepisom koordinat novih izmer in komasacij z magnetnih trakov tedanje Republiške geodetske uprave je bilo digitalno zapisanih preko 300.000 ZK-točk na območju današnje geodetske pisarne Murska Sobota. Vzporedno je bil iz pisnih seznamov koordinat v digitalno obliko za vseh 135 katastrskih občin kontrolirano sistematično izveden ročni vnos oziroma prepis podatkov za vse obstoječe točke geodetske mreže trigonometrične, navezovalne in poligonske mreže ter mreže linijskih točk, skupno približno 34.000 točk geodetske mreže.

Na območjih katastrskih izmer koordinatnega katastra in komasacij je sledil vnos povezav ZK-točk iz seznamov povezav mejnih točk posestnih kosov, kot so bile zapisane v seznamih povezav mejnih točk obodov posestnih kosov v zvezkih računalniških izpisov računanj površin parcel v originalih elaboratov novih izmer. Iz datotek ZK-točk in datotek povezav posestnih kosov so bile v programu AutoCAD izdelane vektorske dwg-slike posestnih kosov, kjer so bile vse meje posestnih kosov že zaradi samega načina izdelave vektorske grafike izvorno 'napete' na ZK-točke. Na območjih načrtov, izvorno izdelanih z grafično izmero ali numerično-grafično izmero, so bile posestne meje v programu AutoCAD povezane na podlagi ciljnega povezovanja ZK-točk (angl. point object snap) z daljicami skladno z izdelanimi analognimi prosojnicami MUP-točk. Na tak način so bile izdelane dwg-datoteke vektorskih slik katastrske vsebine, v katerih so bile mejne linije napete na obstoječe ZK-točke. To vektorsko vsebino je bilo treba dopolniti še s preostalo katastrsko vsebino. V ta namen je bilo treba za vse k. o. skenirati analogno vzdrževane katastrske načrte in z njih vektorsko zajeti to dopolnilno vsebino.

national coordinate system. Written lists of coordinates included the status of LC points at the setting of each new survey and all the LC points that were created in the procedures of subsequent maintenance of the cadastre. For all other CMs, originally measured before 1974, no lists of LC point coordinates were kept until 1980, because the coordinates in the D48/GK national coordinate system were not systematically calculated and managed for these CMs. Therefore, for the multiannual preparatory period for the translation of analogue cadastral plans into digital vector form in all these CMs, regardless of whether the plans were originally made as graphic survey plans or as numerical-graphic survey plans, extensive calculations of LC-point coordinates were systematically performed for all measurements in geodetic procedures carried out after the entry into force of the Land Cadastre Act 1974.

The LC points calculated in this way were listed by individual CM, and for each CM, the entire lists of LC points were then digitized. Together with the transcript of coordinates of new surveys and land consolidations from magnetic tapes of the then Republic Geodetic Administration, over 300,000 LC points were digitally recorded in the area of the present-day surveying service in Murska Sobota. In parallel, manual entry or transcription of data for all existing points of the geodetic network, of the trigonometric, connecting and polygonal networks, and the line point network – a total of approximately 34,000 points of the geodetic network – was systematically implemented from written lists of coordinates in digital form for all 135 cadastral municipalities.

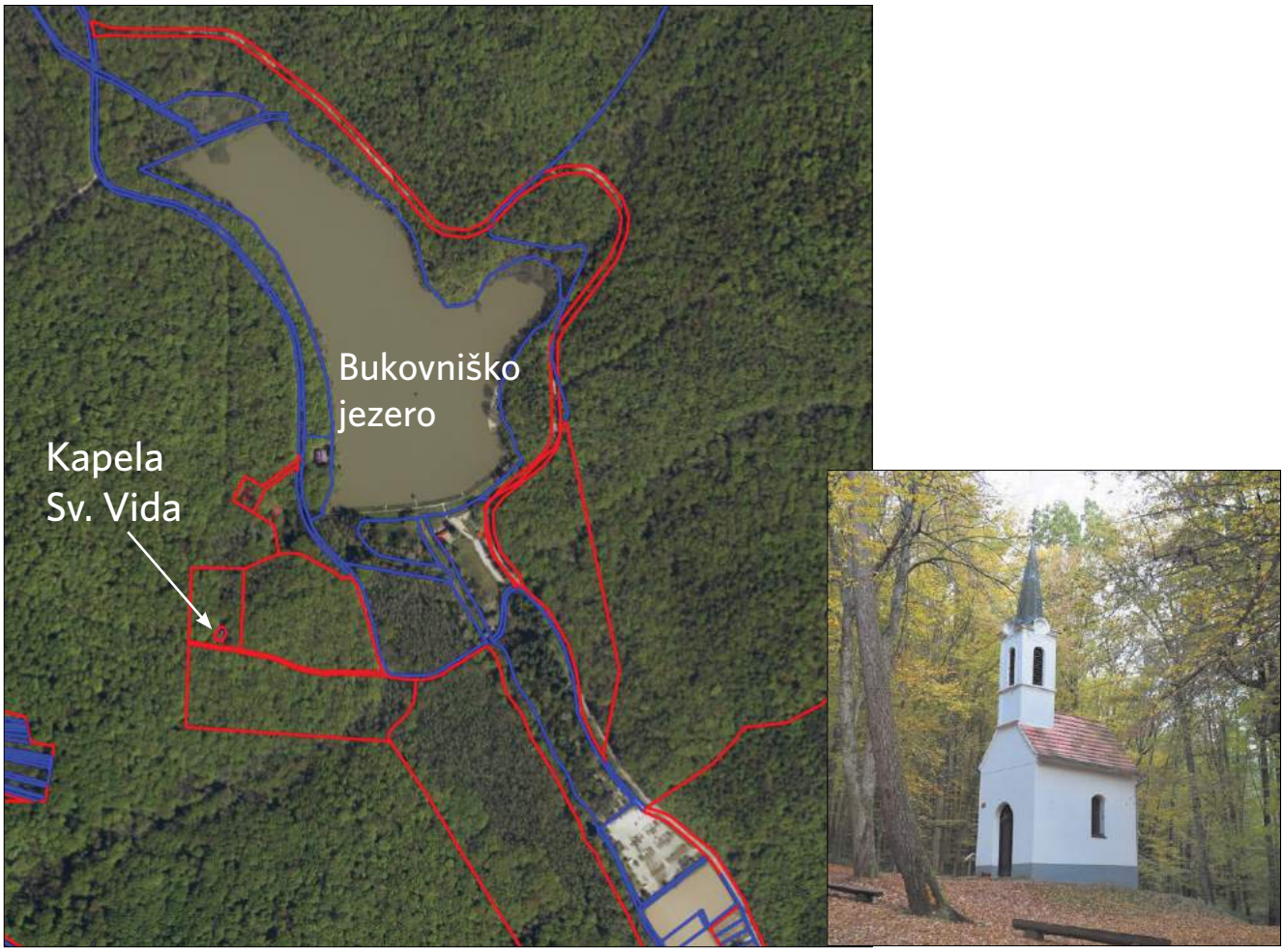
In the areas of cadastral measurements of the coordinate cadastre and land consolidation, there then followed the entry of LC--point connections from the lists of connections of border points of land parts, as recorded in the lists of connections of border points of the perimeters of land parts in volumes of computer printouts of plot area calculations in the original reports of new surveys. Using AutoCAD, vector dwg-images of land parts were created from the files of LC points and connection files of land parts, where all borders of land parts were originally 'tensioned' to LC points due to the method of producing the vector graphics. In the areas of plans originally created by graphical survey or numerical-graphical survey, the property borders in AutoCAD were connected on the basis of the target connection of LC points (point object snap) with line segments in accordance with the analogue transparent slides of MUP points created. This yielded dwg-files of vector images of cadastral content, in which the border lines were tensioned to the existing LC points. This vector content had to be supplemented with the remaining cadastral content. To this end, it was necessary to scan the analogue-maintained cadastral plans of all the CMs and record this supplementary content in vector form.

» ***Energijski park Bukovniško jezero***

Že lokalne »čarovnice« so znale pripovedovati, da je kapelica sv. Vida, ki je postavljena v gozdu nedaleč od Bukovniškega jezera, nekaj posebnega. Številne in stare so legende o bajeslovni moči izvira sv. Vida v bližini kapelice in o dobrem počutju, ki ga počitek v njeni bližini prinese. Leta 2001 so radiostezisti področje raziskali in na njihovo presenečenje naleteli na več kot 50 energetskih točk. Ugotovili so, da v okolici potekata dve »liniji moči« ki ju imenujejo tudi zmajeve črte, ki naj bi se križali ravno na mestu, kjer stoji kapelica. 26 energetskih točk so posebej označili in jim določili namen zdravljenja in potreben čas, ki naj bi ga preživeli ob točki za dosego učinka. **«**

» ***The Bukovnik lake energy park***

A local "witches" tale says that the chapel of St Vid, located in a forest not far from the Bukovnik lake, is a special place. There are many old legends about the mythological power of the spring of St Vid near the chapel and about the well-being that resting near it brings. In 2001, dowsers explored the area and, to their surprise, encountered more than 50 energy points. They found two "lines of power" in the area, also called dragon lines, which are supposed to intersect exactly at the chapel. 26 of the energy points were specifically marked and assigned healing properties and the time required to spend at the point to achieve the effect. **«**



Kljub temu, da je kataster na tem območju v k. o. 147 Strehovci zelo natančen, energijskih točk na zemljiškokatastrskem načrtu ni mogoče najti. Ker niso odmerjene kot samostojne parcele, niso predmet evidentiranja v zemljiškem katastru. Za natančno lokacijo (in učinek) je treba Energijski park Bukovniško jezero obiskati. Na načrtu je označena lokacija kapele, ki pa je evidentirana.
Vir: PREG ekranski prikaz, vir fotografije: https://www.prlekija-on.net/

Despite the fact that the cadastre in this area in CM 147 Strehovci is very precise, energy points cannot be found on the land cadastral plan. As they are not measured as independent plots, they are not subject to registration in the land cadastre. For the exact location (and effect), the Bukovnik Lake energy park should be visited in person. The plan does indicate the location of the chapel.
Source: PREG, screen display, Photo source: https://www.prlekija-on.net/

Skeniranje in priprava združenih skenogramov katastrskih načrtov

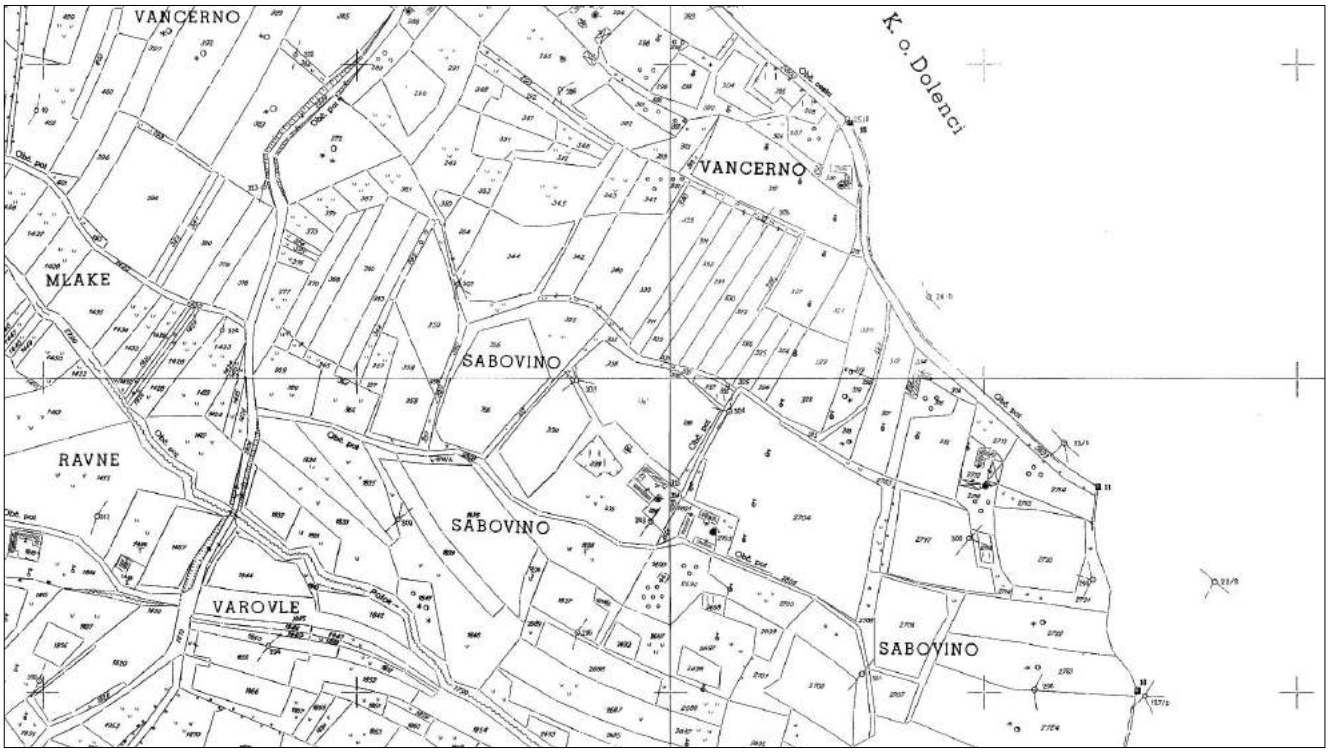
Detajlni listi katastrskih načrtov so bili skenirani z ločljivostjo 300 dpi v tiff-datoteke. Za vsako k. o. je bil izdelan pregledni prikaz lege vseh detajlnih listov katastrskih načrtov v posamezni k. o. Za vsak detajlni list so bile določene lastnosti: ime lista in pripadnost k. o., merilo, dimenzije okvirja načrta in geolokacija, morebitni izris vsebine preko okvirja lista in primernost rastrske slike načrta za vektorizacijo. Vsi skenogrami so bili rastrsko očiščeni s postopkom avtomatskega izločevanja pack in šumov (angl. despeckling). Okvirji listov so bili natančno poravnani s koordinatnima osema Y in X, nato je bila obrezana izvenokvirna vsebina skenogramov, obrezani skenogrami pa z afino transformacijo natančno razpačeni na znane točne dimenzije okvirjev listov katastrskih načrtov.

Obrezani skenogrami načrtov so bili razpačeni na vogale lista in na decimetrsko mrežo lista, kar npr. pri listu načrta v merilu 1 : 2500 standardne dimenzije okvirja 90 cm × 60 cm pomeni kvadratno mrežo 70 veznih točk za afino razpačitev skenogramov. Vse transformacijske točke so bile izmerjene na skenogramu na osnovi primerjave rastrske vsebine s prototipom vogala lista oz. križca decimetrske mreže (angl. template matching) z uporabo izravnave po metodi najmanj-

Scanning and preparation of merged scans of cadastral plans

The detail sheets of cadastral plans were scanned at a resolution of 300 dpi into tiff files. For each CM, an overview was made of the locations of all detail sheets of cadastral plans in each CM. The following properties were determined for each detail sheet: sheet name and affiliation with CM, scale, dimensions of the plan frame and geolocation, potential plotting of the content outside the sheet frame, and suitability of the raster image of the plan for vectorization. All scans were rasterized and the process of automatic despeckling applied. The sheet frames were precisely aligned with the Y and X coordinate axes, then the out-of-frame contents of the scans were trimmed, and the trimmed scans were rubber-sheeted by affine transformation to the known exact dimensions of the cadastral plan sheet frames.

The cropped scans of the plans were rubber-sheeted to the corners of the sheet and on the decimetre grid of the sheet, which, for example, in the case of a plan sheet in a scale of 1:2500 and with standard frame dimensions of 90 cm × 60 cm, means a square grid of 70 tie points for the affine rubber-sheeting of scans. All transformation points were measured on a scan on the basis of a comparison of the raster content with the prototype of the corner of the sheet or the cross of the decimetre grid (template matching), using least squares adjustment. Thus, data on trans-



Slika 3.10.2: Primer izseka iz združenega skenograma detajlnih listov katastrskih načrtov numerično-grafične izmere za k. o. 4 Budinci. Vidne so stične linije listov in na njih natančno sovpadajoči križci decimetrske mreže.
Vir: Arhiv GURS, OGU MS.

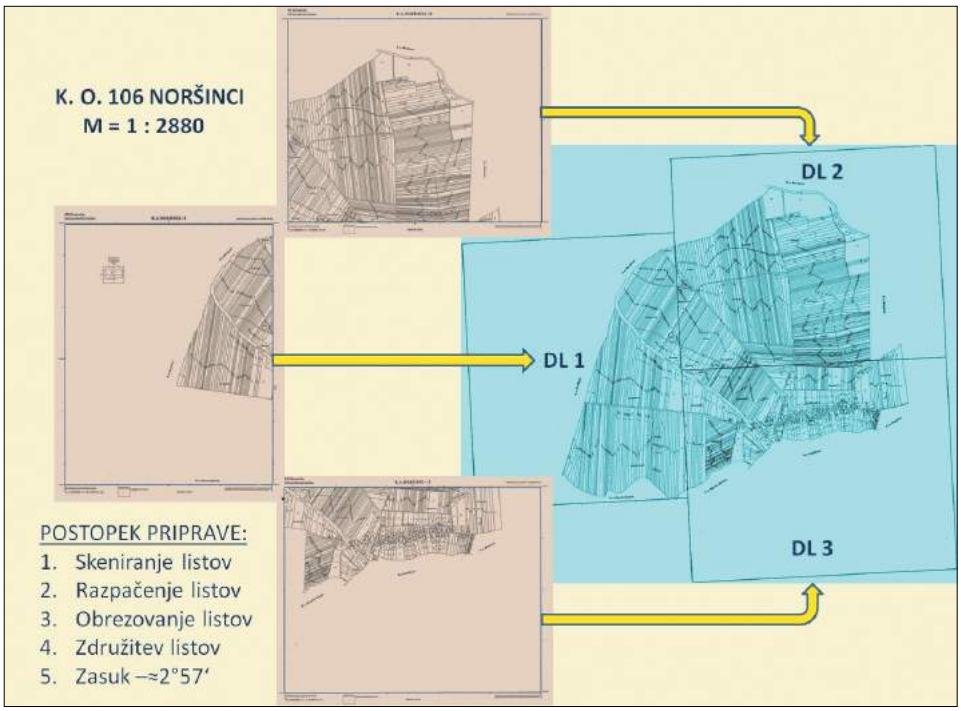
Figure 3.10.2: Example of an excerpt from a merged scan of detail sheets of cadastral plans of the numerical-graphic survey for CM 4 Budinci. The contact lines of the sheets are visible, along with the exactly aligned crosses of the decimetre grid.
Source: The SMARS archive, OGU MS

ših kvadratov. Tako so bili pridobljeni podatki o transformacijskih točkah v koordinatnem sistemu rastrske slike z visoko natančnostjo 0,2 piksla, kar je zagotovilo najkakovostnejše podatke za razpačenje rastrske slike skenograma. Vsi skenogrami detajlnih listov katastrskih načrtov po posameznih k. o. so bili po razpačenju nato združeni v eno samo tiff-datoteko s pripadajočo standardno geolokacijsko tfw-datoteko, ki je geolocirala združeni skenogram neposredno v Gauß--Krügerjev državni koordinatni sistem D48/GK. To pomeni, da so bili v posamezni tiff-datoteki združeni razpačeni skenogrami vseh detajlnih listov posamezne k. o ...

Rastrske tiff-datoteke združenih skenogramov so bile zaradi opisanih postopkov majhne velikosti (reda velikosti 1 do 2 MB namesto izvornih velikosti reda nekaj deset MB), kar je omogočalo hitro obdelavo v programu za vektorizacijo. Podrobno je postopek priprave skenogramov opisan na primeru koordinatnega katastra (Triglav, 2013). Na enak način so bili pripravljeni tudi skenogrami katastrskih načrtov na območju numerično-grafičnega katastra (slika 3.10.2), medtem ko je bila pri skenogramih načrtov grafičnega katastra v merilu 1 : 2880 edina razlika od zgoraj opisanega postopka ta, da so bili detajlni listi afino razpačeni le na štiri vogalne točke okvirja lista načrta (slika 3.10.3).

formation points in the raster image coordinate system was obtained with a high accuracy of 0.2 pixels, which provided the highest quality data for the rubber-sheeting of the raster image of the scan. After rubber-sheeting, all the scans of the detail sheets of cadastral plans by individual CM were then merged into a single tiff file with a corresponding standard geolocation tfw file, which determined the geolocation of the merged scan directly in the Gauß-Krüger D48/GK national coordinate system. This means that each tiff file contained merged rubber-sheeted scans of all the detail sheets of each CM

Due to the procedures described, the tiff raster files of the merged scans were small in size (of the order of 1 to 2 MB instead of the original sizes of the order of tens of MB), which enabled quick processing in the vectorization software. The procedure for preparing scans is described in detail in an example from the coordinate cadastre (Triglav, 2013). The same method of preparation was used for scans of cadastral plans in the area of numerical-graphic cadastre (Figure 3.10.2), while scans of plans of the graphic cadastre in the scale of 1:2880 only differed in the above procedure in that the detail sheets were affinely rubber-sheeted only to the four corner points of the frame of the plan sheet (Figure 3.10.3).



Slika 3.10.3: Primer združevanja posameznih skeniranih listov katastrskih načrtov v izvornem merilu 1 : 2880 v skupni skenogram za k. o. Noršinci. Pri skupnem skenogramu k. o. je viden zasuk rastrske slike za kot -≈2° 57', kar je približna vrednost zasuka koordinatnega sistema Gellérthegy glede na državni koordinatni sistem D48/GK.
Vir: Arhiv GURS, OGU MS

Figure 3.10.3: Example of combining individual scanned sheets of cadastral plans in the original scale of 1:2880 into a merged scan for CM Noršinci. The merged scan of the CM shows the rotation of the raster image by an angle of -≈2°57', which is the approximate value of the rotation of the Gellérthegy coordinate system with respect to the D48/GK national coordinate system.
Source: The SMARS archive, OGU MS

Dopolnilna vektorizacija

Dopolnilna vektorizacija se je izvajala na teh združenih geolociranih tiff-skenogramih. S tem je odpadla ločena odprava napak na stikih detajlnih listov v 'notranjosti' k. o. in je bila tako omogočena 'zvezna', bistveno hitrejša in enostavnejša vektorizacija.

Za vsako posamezno k. o. je bila izdelana dwg-datoteka z obstoječo vektorsko zemljiškokatastrsko vsebino posameznih k. o. Vsa katastrska vsebina, ki je v dotedanjih postopkih že bila v vektorski obliki, je bila že predhodno izvorno napeta na ZK-točke in ni bila predmet vektorizacije. Za potrebe uvoza vektorske grafike v program za vektorizacijo (MapCAD, 1992) so bile dwg-datoteke tik pred vektorizacijo posamezne k. o. zapisane v dxf-datoteke. Obstoječe vektorske vsebine v procesu vektorizacije nikakor ni bilo dovoljeno lokacijsko premikati. Vso na novo vektorizirano vsebino je bilo treba obvezno prilagoditi obstoječi vektorski vsebini v dxf-datotekah. Na obstoječe vektorske linije mej parcel in parcelnih delov so bili možni le preseki ter podaljšanja ali krajšanja vektoriziranih linij na obstoječe linije in lome v dxf-datotekah. Razlogi za tak način vektorizacije so opisani v literaturi (Triglav, 1994). V vseh dxf-datotekah so bile v vektorski obliki že zajete vse meje k. o., ki so bile že predhodno usklajene z mejami sosednjih k. o., zato tudi vektorskih linij mej k. o. ni bilo dovoljeno lokacijsko premikati. Tudi tu so bili dovoljeni samo preseki na obstoječe vektorske linije meje k. o. ali povezave na lomne točke obstoječe vektorske linije meje k. o.

Na skenogramih so lomne točke na mejah parcel skoraj v vseh primerih označene kot pike, meje pa kot linije s presledki pri pikah. Pri izvajanju vektorizacije je bil uporabljen postopek povezovanja mejnih linij mej od pike do pike, to je z vklopljeno funkcijo "lovljenja sredine rastrskih pik". V primerih, ko je bila na lomni točki meje že vektorska točka, se je linija pripela neposredno na tako točko. V primerih, ko pike niso bile vidne, so se lahko uporabile druge funkcije vektorizacije, kot so preseki itd. Pri vektorizaciji tlorisov stavb so bile v skladu z ustaljenimi pravili uporabljene vektorske pogojne funkcije pravokotnosti, vzporednosti in kolinearnosti, kjerkoli je bilo to možno.

Morebitna vsebina skenogramov katastrskih načrtov, ki leži izven obstoječe vektorske linije meje k. o., se ni vektorizirala. Običajno so bile to bivše skupne poti ali potoki, ki so bili v vzporednih upravnih postopkih po uradni dolžnosti že odpravljeni tako, da so bili preneseni v eno samo k. o., in sicer praviloma v tisto, kjer je bila nova izmera izvedena kasneje oz. bolj kakovostno. Tisti potoki ali pota na mejah k. o., ki ohranjajo status skupnih objektov na mejah k. o., ker so hkrati tudi na meji upravnih občin, so bili natančno vektorizirani z dodatno vzdolžno sredinsko mejno linijo (Triglav, 2018a). V letu 2018 je bila izvedena še celovita uskladitev katastrskih mej na državno mejo z Avstrijo in Madžarsko (Triglav, 2018b).

Additional vectorization

Additional vectorization was performed on the aforementioned merged geolocated tiff scans. This removed the need for a separate elimination of defects at the contacts of detail sheets in the 'interior' of a CM, and thus enabled 'continuous', significantly faster and simpler vectorization.

A dwg file was created for each individual CM containing the existing vector land cadastral content of the individual CM. All cadastral content which had already been in vector format in previous procedures was also previously originally tensioned to LC points and was not subject to vectorization. For the purpose of importing vector graphics into the vectorization software (MapCAD, 1992), the dwg files of individual CMs were converted to dxffiles before vectorization. The locations of the existing vector content were in no way allowed to be moved in the vectorization process. All newly vectorized content had to be adapted to the existing vector content in the dxf files. On the existing vector lines of the borders of plots and plot parts, only intersections and extensions or shortenings of vectorized lines to existing lines and breaks in dxf-files were possible. The reasons for using this method of vectorization are described in the literature (Triglav, 1994). All the CM borders which had already been previously harmonized with the borders of neighbouring CM were recorded in vector format in all the dxf files, and thus the locations of the vector border lines of the CM were not allowed to be moved. Here, too, only intersections on existing vector lines of the border of the CM or connections to gradient points of an existing vector border line of a CM were allowed.

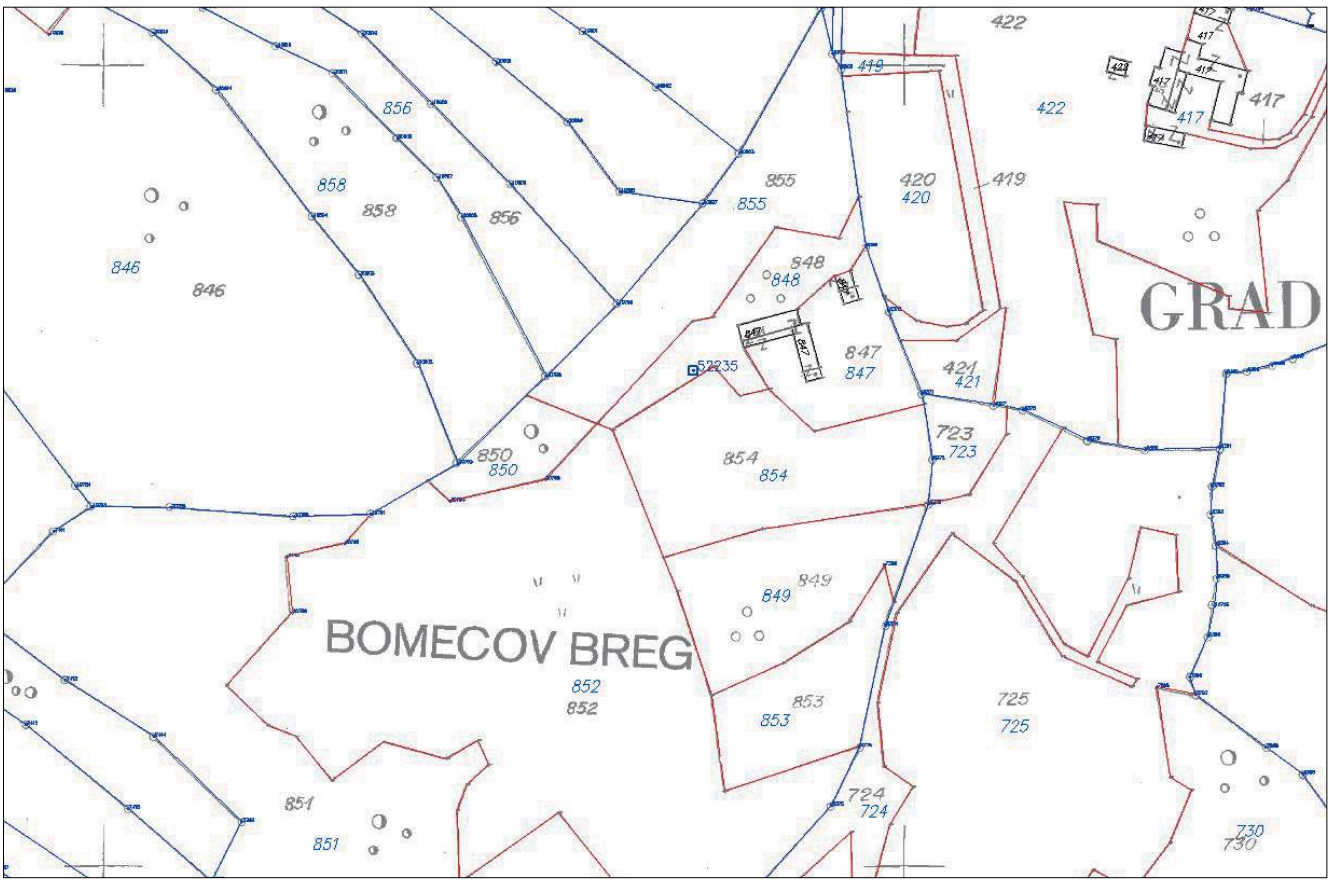
In the scans, the gradient points at the borders of plots are in almost all cases marked as dots, and the borders as lines with spaces and dots. During vectorization, the procedure of connecting the border lines of borders dot-to-dot was used, i.e. with the "raster dot centre capture" function enabled. In cases where there was already a vector point at the gradient point of the border, the line was attached directly to such a point. In cases where no dots were visible, other vectorization functions such as cross-sections, etc. could be used. In the vectorization of floor plans of buildings, in accordance with established rules, vector conditional functions of perpendicularity, parallelity and collinearity were used wherever possible.

Any potential content of the scans of cadastral plans located outside the existing vector line of the border of the CM was not vectorized. Generally, these were former common paths or streams that had already been eliminated by an official in parallel administrative procedures by being transferred to a single CM, typically into the one where the new survey was carried out subsequently or in better quality. The streams or paths on the borders of CMs which maintain the status of common objects on the borders of CMs since they are also located on the border of administrative municipalities were precisely vectorized with an additional longitudinal central border line (Triglav, 2018a). In 2018, a comprehensive harmonization of cadastral borders on the state border with Austria and Hungary was carried out (Triglav, 2018b).

It should be noted that, understandably, significantly less additional vectorization was required in cadastral municipalities with

Omeniti je treba pomemben podatek, da je bilo potrebne dopolnilne vektorizacije v katastrskih občinah z izdelanimi načrti koordinatnega katastra (slika 3.10.4) iz razumljivih razlogov bistveno manj kot v katastrskih občinah numerično-grafične izmere v izvornem merilu načrtov 1 : 2500 oz. 1 : 1000 ali grafične izmere v izvornem merilu načrtov 1 : 2880. Dodatna posebnost pri vektorizaciji skenogramov načrtov grafične izmere je bila ta, da so ti načrti izvorno izdelani v koordinatnem sistemu Gellérthegy, ki je glede na državni koordinatni sistem D48/GK zasukan za približni kot 2° 57', kar je treba s precizno nastavitvijo zasuka upoštevati pri geolociranju skenogramov oz. pri združevanju dopolnilne vektorizirane katastrske vsebine z obstoječo predhodno izdelano vektorsko vsebino.

prepared coordinate cadastre plans (Figure 3.10.4) than in cadastral municipalities of numerical-graphic surveys with plans in the original scale of 1:2500 or 1:1000 or graphic surveys with plans in the original scale of 1:2880. An additional feature in the vectorization of scans of graphical measurement plans was that these plans were originally produced in the Gellérthegy coordinate system, which is rotated by approximately 2°57' in relation to the D48/GK national coordinate system, which must be taken into account by precisely adjusting the rotation in the geolocation of scans or in merging supplementary vectorized cadastral content with existing vector content.



Slika 3.10.4: Primer dopolnilne vektorizacije načrtov koordinatnega katastra k. o. 38 Grad: Obstoječa predhodno izdelana vektorska vsebina ZK-točk, MUP mej posestnih kosov, parcelnih številk in točk geodetske mreže (prikazano v modri barvi) se je uvozila v sloje nad geolociranim skenogramom načrta (v sivi barvi). Dopolnilno se je po natančno določenih pravilih vektorizirala vsebina manjkajočih mej parcel znotraj posestnih kosov (v rdeči barvi) in parcelnih delov ter tlorisov stavb (v črni barvi). Vidno je točno položajno ujemanje vektorskih in rastrskih križcev decimetrske.mreže.
Vir: Arhiv GURS, OGU MS

Figure 3.10.4: Example of supplementary vectorization of coordinate cadastre plans of CM 38 Grad: The existing previously produced vector content of LC points, MUP borders of plot parts, plot numbers and points of the geodetic network (shown in blue) was imported in layers above the geolocated scan scheme of the plan (in grey). Additionally, the content of the missing borders of plots within the property parts (in red) and plot parts and floor plans of buildings (in black) was vectorized according to precisely defined rules. The exact positional matching of the vector and raster crosses of the decimetre grid is visible.
Source: The SMARS archive, OGU MS

Skupna lastnost izdelanih zemljiškokatastrskih prikazov za vse k. o. na območju geodetske pisarne Murska Sobota je, da so zemljiškokatastrski prikazi izdelani vedno skupaj za celo k. o., ne glede na morebitne različne vrste izvornih katastrskih izmer oz. načrtov znotraj posamezne k. o., in da se s podatki meritev v novih geodetskih postopkih vedno vzdržujejo na način neposrednega koordinatnega vnosa. Zemljiškokatastrski prikazi (ZKP) za vse k. o. ustrezajo kriterijem za zemljiškokatastrski načrt (ZKN). Pojma ZKP in ZKN sta podrobneje opisana v naslednjem poglavju.

A common feature of the cadastral index maps produced for all the CMs in the area of the surveying service of Murska Sobota is that the cadastral index maps are always made jointly for the whole CM, regardless of any different types of original cadastral measurements or plans within an individual CM, and that the data of measurements in new geodetic procedures are always maintained in the manner of direct coordinate input. The cadastral index maps (ZKP) for all CMs meet the criteria for the land cadastre plan (ZKN). The terms ZKP and ZKN are described in more detail below.

4 Digitalni grafični prikazi zemljiškega katastra (digitalni katastrski načrt – DKN, zemljiškokatastrski prikaz-ZKP, zemljiškokatastrski načrt različne natančnosti – ZKN)

Digital graphic representations of the land cadastre (digital cadastral plan – DKN, cadastral index map – ZKP, land cadastre plans of varying accuracy – ZKN)

Ko govorimo o digitalni obliki grafičnih podatkov zemljiškega katastra, za te uporabljamo različna poimenovanja.

Prvi digitalni grafični podatki zemljiškega katastra so bili poimenovani digitalni katastrski načrt (DKN). Kot povedano že zgoraj, so predstavljali vektorsko topološko pravilno digitalno obliko grafičnih podatkov v enotnem državnem koordinatnem sistemu. Osnova za prikaz so bile grafične koordinate lomov poligonov, ki so predstavljali parcelne dele. Nekateri lomi so bili označeni kot ZK-točke (praviloma izmerjene točke v postopkih vzdrževanja). V digitalni opisni bazi ZK-točk so bili vodeni vsi s predpisanimi atributi. DKN se ni smel neposredno uporabljati v postopkih ugotavljanja poteka mej parcel po podatkih zemljiškega katastra.

Spremembe glede poimenovanja digitalnih grafičnih prikazov zemljiškega katastra je v letu 2006 prinesel Zakon o evidentiranju nepremičnin - ZEN. Le-ta ni uvedel le novega poimenovanja/dveh poimenovanj, ampak tudi dva po vsebini različna načina grafičnega prikazovanja podatkov zemljiškega katastra, in sicer zemljiškokatastrski prikaz (ZKP) in zemljiškokatastrski načrt (ZKN). Tako poimenovanje je v uporabi še danes.

Evidentiranje sprememb se po vzpostavitvi izvaja tako v ZKP kot tudi ZKN, načina vzdrževanja sta predstavljena v nadaljevanju. Ne glede na način vzdrževanja pa je treba vedno poskrbeti, da sta oba sloja tudi po evidentiranju sprememb topološko pravilna.

We use various names for graphic data of the land cadastre that is in digital form.

The first digital graphic data of the land cadastre was called the digital cadastral plan (DKN). As explained previously, this term was used for the topologically precise digital vector form of graphic data of the land cadastre in the unified national coordinate system. The basis for the display were the graphical coordinates of the gradients of polygons, which represented plot parts. Some gradients were marked as LC points (generally the points measured in maintenance procedures). They were all recorded in the digital descriptive database of LC points, along with their prescribed attributes. The DKN was not permitted to be used directly in the procedures for determining the course of plot borders according to the data of the land cadastre.

Changes regarding the naming of digital graphic representations of the land cadastre were introduced in 2006 by the Real Estate Recording Act – ZEN. This Act not only introduced a new designation/two designations, but also two substantially different ways of graphically displaying land cadastre data, namely the cadastral index map (ZKP) and the land cadastral plan (ZKN). This naming is still in use today.

Since its establishment, the recording of changes is carried out in both the ZKP and the ZKN, and the methods of maintenance are presented below. Regardless of the method of maintenance, it is always necessary to make sure that both layers are topologically correct even after recording the changes.

4.1 Vzpostavitev ZKP (zemljiškokatastrskega prikaza)
Establishment of the ZKP (cadastral index map)

Zemljiškokatastrski prikaz (ZKP) je ime za digitalno sliko oblike in medsebojne lege meja parcel s parcelnimi številkami in zemljišč pod stavbo, in sicer na podlagi grafičnih

The cadastral index map (ZKP) is the name for a digital image of the shape and mutual positions of the borders of plots with plot numbers and land under buildings, based on the graphic coordina-

koordinat vseh lomov. ZKP je že od samega začetka zvezen sloj, ki pokriva območje cele države. Vsebinsko gre za prikaz, ki je bil predhodno poimenovan DKN. Zato enako tudi za ta sloj velja, da se ne sme neposredno uporabljati za ugotavljanje poteka mej parcel po podatkih zemljiškega katastra. Lahko pa se uporablja za prikaz drugih podatkov v geografskih informacijskih sistemih in za druge podobne namene z opozorilom, da je prikaz mej zgolj informativen.

Ker je ZKP zvezni sloj in je na voljo za celo državo, je njegova uporabnost široka. Vendar se je pri uporabi treba zavedati, da je lahko zelo nehomogene položajne natančnosti. Geodetski operativi ZKP nudi grobo osnovo za izvedbo geodetskih postopkov. Če ne obstajajo podatki ZKN, Geodetska uprava RS ZKP uporabi za določitev atributov parcele na podlagi grafičnih presekov. Posameznim resorjem občinske in državne uprave ZKP služi kot podlaga za vodenje politike gospodarjenja s prostorom, varovanja okolja, vrednotenja in obdavčevanja nepremičnin, upravljanju z objekti prometne in komunalne infrastrukture, ipd.

Kot omenjeno, je položajna natančnost ZKP lahko zelo različna in je na nekaterih območjih celo zelo slaba. Vzroki za nastalo slabost ZKP so geodetskim strokovnjakom znani in izhajajo predvsem iz zgodovine nastanka in vzdrževanja v preteklih dveh stoletjih. ZKP torej ne zagotavlja potrebne položajne natančnosti, vendar je bil to že nekaj let edini razpoložljivi zvezni sloj zemljiškega katastra za celotno državo, ki prostorske pojave poveže z lastniki.

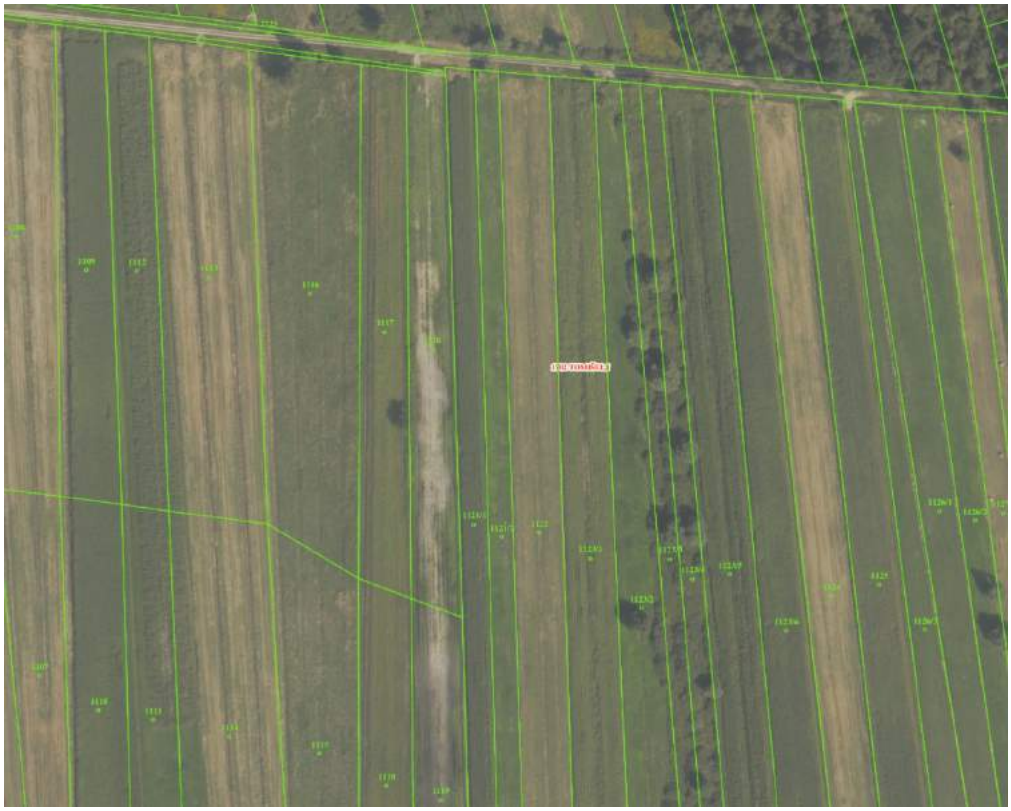
tes of all gradients. From the very beginning, the ZKP has been a uniform layer covering the entire territory of the country. In terms of its content, this is a display that was previously called the DKN. Therefore, it similarly applies to this layer that it should not be directly used to determine the course of borders of plots according to the land cadastre. However, it may be used to display other data in geographic information systems and for other similar purposes, noting that the display of borders is merely informative.

Since the ZKP is a uniform layer and is available for the entire country, it has a wide range of uses. However, it should be noted that its positional accuracy may be very inhomogeneous. The ZKP provides a rough basis for surveying operations in the implementation of surveying procedures. Where there is no ZKN data, the Surveying and Mapping Authority of the Republic of Slovenia uses the ZKP to determine the attributes of the plot on the basis of graphic cross-sections. The ZKP is also used by individual departments of municipal and state administration as a basis for the management of the policy of spatial management, environmental protection, real estate valuation and taxation, management of transport and communal infrastructure facilities, etc.

As mentioned, the positional accuracy of the ZKP can vary significantly, reaching very low quality in some areas. The reasons for the resulting weakness of the ZKP are known to survey experts and arise mainly from the history of its creation and maintenance in the past two centuries. The ZKP therefore does not provide the necessary positional accuracy, but for several years it was the only available uniform layer of the land cadastre for the entire country, which connected spatial phenomena with their owners.

Slika 4.1.1: Prikaz slabe položajne natančnosti ZKP na DOF na območju grafičnega katastra izvornega merila 1 : 2880 na primeru k. o. 1702 Tomišelj.
Vir: PREG, ekranska slika ZKP + DOF

Figure 4.1.1: Demonstration of poor positional accuracy of the ZKP on DOF in the area of the graphic cadastre in the original scale of 1:2880 in the example of CM 1702 Tomišelj.
Source: PREG, screen image ZKP + DOF



Slika 4.1.2: Prikaz dobre položajne natančnosti ZKP na DOF na območju grafičnega katastra izvornega merila 1:2880 na primeru k. o. 1702 Tomišelj.
Vir: PREG, ekranska slika ZKP + DOF

Figure 4.1.2: Demonstration of good positional accuracy of the ZKP on DOF in the area of the graphic cadastre in the original scale of 1:2880 in the example of CM 1702 Tomišelj.
Source: PREG, screen image ZKP + DOF

Kot navedeno, slabša položajna natančnost ZKP ni bistvena za izvajanje geodetskih storitev z namenom evidentiranja sprememb v zemljiškem katastru. Na to opozarja že ZEN v svojih določbah. Izvajalci geodetskih storitev imajo poleg ZKP na voljo še druge podatke iz zemljiškega katastra (podatki originalnih zemljiškokatastrskih načrtov, podatki iz digitalnega arhiva elaboratov in drugih listin, ki so bili podlaga za evidentiranje sprememb v zemljiškem katastru ...).

Slabosti omenjene položajne natančnosti ZKP se kažejo v izdelavi različnih presekov z drugimi nekatastrskimi vsebinami (DOF, dejanska raba, bonitete ...). Preseki zaradi tega ne izkazujejo dejanskega stanja in posledično je pripis atributov k parcelam, ki so pridobljeni z grafičnimi preseki, manj zanesljiv.

ZKP je torej zvezni sloj parcel za celo Slovenijo. Natančnost je odvisna od vrste katastra, načina izmere in merila katastrskega načrta, ki je bil vir za izdelavo prikaza.

As stated, poorer positional accuracy of the ZKP is not inevitable in order to provide surveying services for the purpose of recording changes in the land cadastre. This has already been noted in the provisions of the ZEN. In addition to the ZKP, geodetic service providers have at their disposal other data from the land cadastre (data from original land cadastral plans, data from the digital archive of records and other documents that were used as bases for recording changes in the land cadastre etc.).

The stated weaknesses of the positional accuracy of the ZKP are reflected in the production of various cross-sections with other non-cadastral contents (DOF, actual use, benefits etc.). As a result, the cross-sections do not show the actual situation, and furthermore, the attribution of attributes to plots obtained by graphic cross-sections is less reliable.

The ZKP is thus a uniform layer of plots for the whole of Slovenia. The accuracy depends on the type of cadastre, the method of surveying and the scale of the cadastral plan that was the source for producing the index map.

Srce med vinogradi

V Sloveniji boste našli ljubezen na vsakem koraku. Pot, ki se vije med vinogradi špičniških strmin (Svečinske gorice) v občini Kungota, se ob pogledu izpod kipca svetega Jurija na konju izriše kot »srce med vinogradi«. To je pravšnja prispodoba krajev, kjer se ljubezen do življenja in zlate kapljice bratita.

Vinograd, ki obdaja znamenito cesto in ji daje posebno obliko, je v lasti Vinogradništva Šerbinek, samo srce pa je vidno z dvorišča Stacionarnega izletniškega turizma Dreisiebner.

A heart among the vineyards

In Slovenia, you will find love at every turn. The path winding between the vineyards of the Špičnik slopes (Svečinske gorice) in the municipality of Kungota can be seen as a "heart among the vineyards" when viewed from under the statue of St George riding a horse. It is a true parable for these lands, a meeting place for the love of life and the love of the liquid gold.

The vineyard that surrounds the famous road, giving it its special shape, is owned by the Šerbinek Winery, and the heart itself is visible from the courtyard of the Dreisiebner stationary tourist excursion centre.

ZKP je ob dejstvu, da gre na območju za grafični kataster izvornega merila 1 : 2880 (k. o. 590 Špičnik), precej dobre položajne natančnosti. Kljub temu pa ne izkazuje oblike srca, ki se ponudi obiskovalcem tega kraja. In tega dejstva ne more spremeniti nobena lokacijska izboljšava ZKP.
Vir: PREG, ekranska slika ZKP + DOF, vir fotografije: https://www.kungota.si/

Given the fact that the area has a graphic cadastre in the original scale of 1:2880 (CM 590 Špičnik), the positional accuracy of the ZKP is rather good. Nevertheless, it does not show the heart shape that is offered to the visitors of this place, and no positional accuracy improvement of the ZKP can change this fact.
Source: PREG, screen image ZKP + DOF, Photo source: https://www.kungota.si/

4.2 Vzdrževanje ZKP (zemljiškokatastrskega prikaza)
Maintenance of the ZKP (cadastral index map)

Tehnično pojmujemo vzdrževanje katastrskih načrtov kot evidentiranje oz. vris sprememb izvedenih geodetskih postopkov glede na stanje na zemljišču. Geodetski postopki so predpisani v zakonodaji (npr. parcelacija, ureditev meje, izravnava meje, evidentiranje zemljišča pod stavbo, komasacija, ...).

V ZKP so meje parcel in zemljišč pod stavbo prikazane z grafičnimi koordinatami. Iz tega razloga je treba tudi pri vrisu sprememb v ZKP uporabiti grafične koordinate.

The maintenance of cadastral plans, in technical terms, is the recording or plotting of changes from the performed geodetic procedures in accordance with the situation of the land. Geodetic procedures are prescribed in legislation (e.g. plot allocation, border regulation, border alignment, registration of land under buildings, land consolidation, etc.).

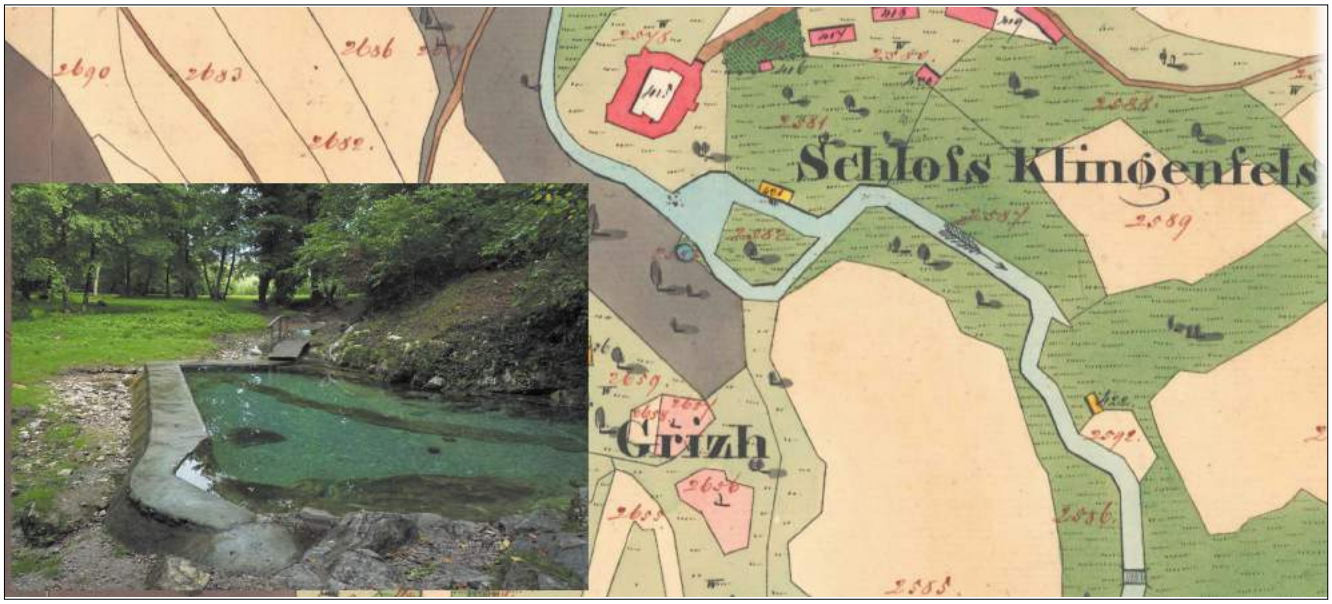
In the ZKP, the borders of plots and land under buildings are shown with graphical coordinates. For this reason, graphic coordinates must also be used when plotting changes in the ZKP.

Klevevž – naravna toplica

Klevevž je naravna toplica na Dolenjskem, kjer potok Radulja ustvarja prebojno sotesko z manjšimi slapiči, ki ga omenja že Janez Vajkard Valvasor v svoji Slavi vojvodine Kranjske. Soteska poteka med Homskim hribom in nekdanjim grajskim gričem, na katerem so ostanki gradu Klevevž, nemško Klingenfels (»zveneča skala«). Radulja se na dnu soteske umiri v manjšem zajetju, ki je služilo nekdanjemu grajskemu mlinu. Ob vznožju zadnjega slapu je na desnem bregu potoka bazen, v katerem se zbira voda izvira Klevevška toplica, ki ob geološkem prelomu na dan priteče s temperaturo 24,8 C. Klevevž sicer najdemo v bližini turistično bolj znanih Šmarjeških toplic.

Klevevž – a natural spa

Klevevž is a natural spa in Dolenjska, where the Radulja streamis carving out a breakthrough gorge with small waterfalls, previously mentioned by Valvasor in his "Glory of the Duchy of Carniola". The gorge runs between the Hom Hill and the former Castle Hill, housing the remains of the Klevevž Castle, German Klingenfels ("sounding rock"). At the bottom of the gorge, Radulja relents into a small catchment that was used by the former castle mill. At the foot of the last waterfall, on the right bank of the stream, there is a pool of water from Klevevž Spring, which flows at a temperature of 24.8 °C from a geological break. Klevevž is located near the more famous tourist centre of Šmarješke toplice.



Toplica Klevevž je bila nekdaj vrisana tudi na zemljiškokatastrskih načrtih, kot je tu primer katastrske mape Habsburškega cesarstva k. o. Swur iz leta 1825. Na današnjih načrtih v k. o. 1442 Zbure je ne moremo več najti, saj je bila skozi leta vzdrževanja iz načrtov izbrisana.
Vir: https:// mapire.eu, vir fotografije: https://sl.wikipedia.org/

The Klevevž spring was once also drawn on land cadastral plans, such as this example of a cadastral map from the Habsburg Empire of CM Swur of 1825. It can no longer be found in present-day plans in CM 1442 Zbura, as it was deleted from the plans throughout years of maintenance.
Source: https:// mapire.eu, Photo source: https://sl.wikipedia.org/

4.2.1 Spremembe na posameznih parcelah
Changes in individual land plots

Geodetski postopki se lahko izvajajo na posamezni parceli ali manjšem številu parcel.

Območje koordinatne izmere se je na analognih načrtih v takih postopkih vzdrževalo koordinatno. Danes se v digitalnih podatkih na območju koordinatnega katastra, ko so bile grafične in izmerjene koordinate ZK-točk ob nastanku DKN izenačene, ZKP vzdržuje z neposredno uporabo izmerjenih koordinat ZK-točk.

Geodetic procedures can be performed on a single plot or a small number of plots.

In such procedures, the coordinate survey area was maintained using the coordinate method on analogue plans. Today, the ZKP is maintained by direct usage of the measured coordinates of LC points using digital data in the area of the coordinate cadastre, with the graphical and measured coordinates of the LC points having been adjusted upon the formation of the DKN.

Slika 4.2.1.1: Prikaz vzdrževanja ZKP v k. o. 1483 Kandija z neposredno uporabo izmerjenih koordinat s pomočjo izrezov dveh sestavin elaborata, in sicer: levo je prikaz sprememb ZKP in desno je prikaz sprememb novega stanja ZKP in ZKN (prikaza se v celoti prekrivata, kar pomeni, da je ZKP na istem mestu kot ZKN).
Vir: Arhiv GURS

Figure 4.2.1.1: ZKP maintenance in CM 1483 Kandija with direct use of measured coordinates with the help of cut-outs of two components of the records: on the left is a display of changes to the ZKP and on the right is a display of changes to the new state of the ZKP and the ZKN (the displays completely overlap, which means that ZKP and ZKN have the same location).
Source: The SMARS archive

Enak pristop kot na območju koordinatne izmere se danes lahko uporablja tudi v primeru dobre položajne natančnosti grafičnega katastra, če se s tem ne spremeni medsebojna lega parcel in zemljišč pod stavbo.

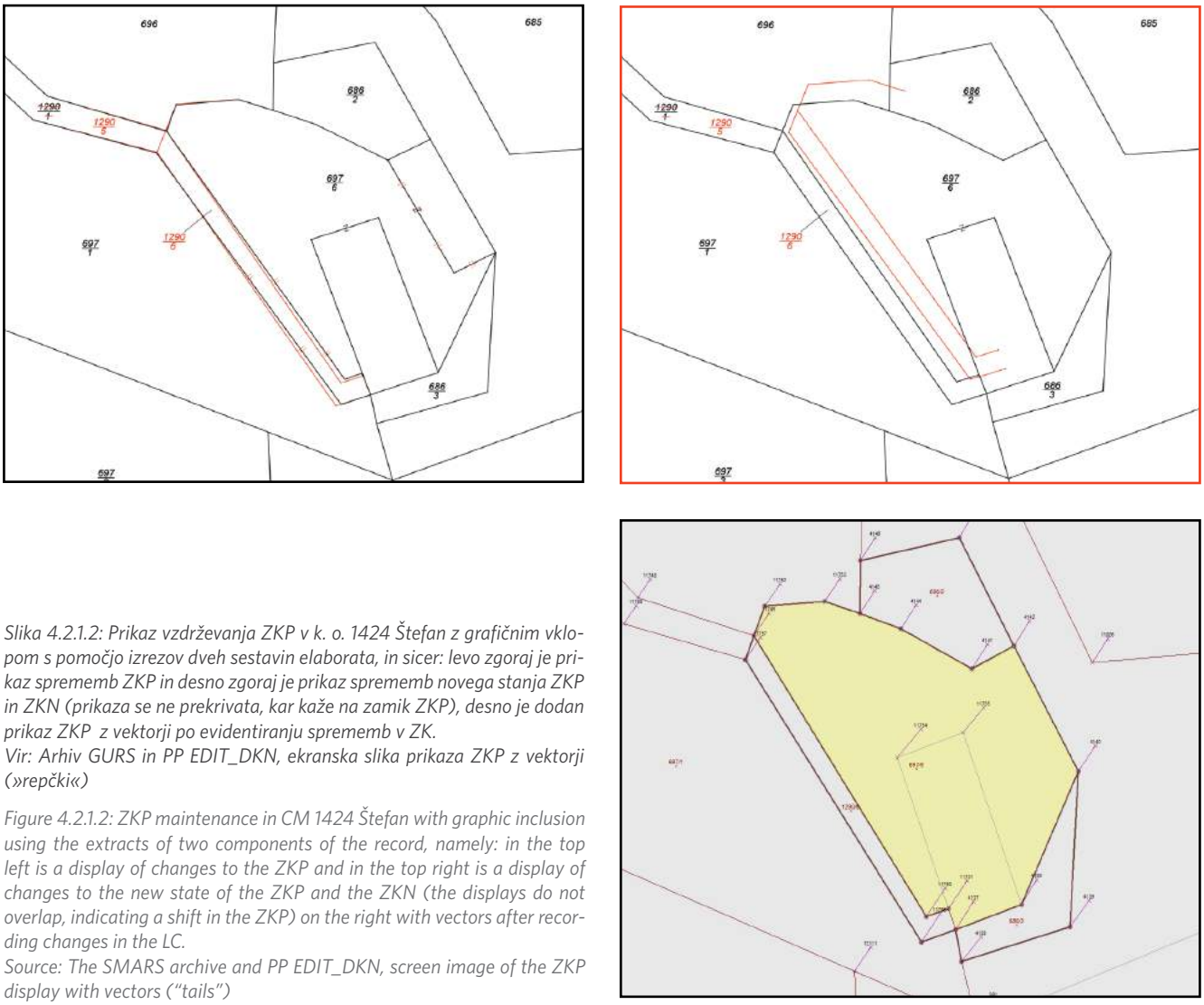
Pri vrisu sprememb so se na analognih načrtih grafične izmere in se tudi še danes v digitalnih podatkih uporabijo pravila grafičnega vklopa, ki ohranja relativna razmerja prikaza. Pri grafičnem vklopu se grafične koordinate ZK-točk določijo tako, da se zaris spremenjenih ali novih mej ter zemljišč pod stavbo s premikom, vrtenjem ter prilagoditvijo grafično vklopi v obstoječ ZKP. Temu sledi še poprava po-

The same approach as in the area of coordinate surveying can be used today where there is good positional accuracy of the graphic cadastre, as long as this does not affect the mutual position of plots and land under buildings.

When plotting the changes, graphic inclusion rules were applied to analogue plans in digital data, which is still done today, maintaining the relative proportions of the index map. In graphic inclusion, the graphic coordinates of the LC points are determined by plotting the changed or new borders and land under buildings by shifting, rotating and adjusting it to graphically include it in the existing ZKP. This is then followed by repairing the connections with the existing borders on the plots in the

vezav z obstoječimi mejami na parcelah v postopku, lahko pa tudi v okolici. Z grafičnim vklopom je zagotovljeno identično število ZK-točk, ki določajo mejo v naravi in število lomov v ZKP, podobnost oblike parcele v naravi in na ZKP ter čim bolj pravilni relativni odnosi do okoliških parcel.

process, and also optionally in the surrounding area. Graphic inclusion ensures an identical number of LC points, which determine the border in nature and the number of gradients in the ZKP, the similarity of the shape of the plot in nature and in the ZKP, and the most accurate relations to the surrounding plots.

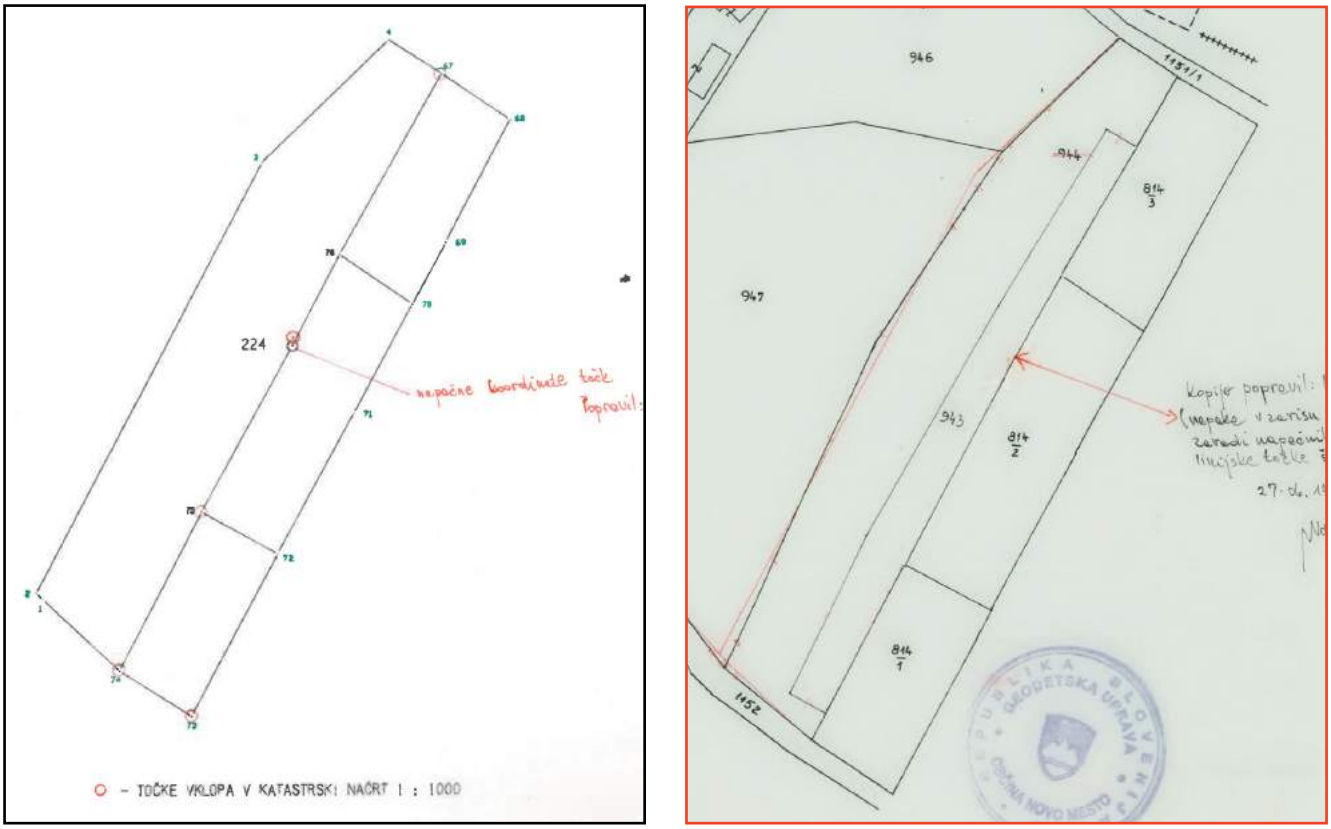


Slika 4.2.1.2: Prikaz vzdrževanja ZKP v k. o. 1424 Štefan z grafičnim vklopom s pomočjo izrezov dveh sestavin elaborata, in sicer: levo zgoraj je prikaz sprememb ZKP in desno zgoraj je prikaz sprememb novega stanja ZKP in ZKN (prikaza se ne prekrivata, kar kaže na zamik ZKP), desno je dodan prikaz ZKP z vektorji po evidentiranju sprememb v ZK.
Vir: Arhiv GURS in PP EDIT_DKN, ekranska slika prikaza ZKP z vektorji (»repčki«)

Figure 4.2.1.2: ZKP maintenance in CM 1424 Štefan with graphic inclusion using the extracts of two components of the record, namely: in the top left is a display of changes to the ZKP and in the top right is a display of changes to the new state of the ZKP and the ZKN (the displays do not overlap, indicating a shift in the ZKP) on the right with vectors after recording changes in the LC.
Source: The SMARS archive and PP EDIT_DKN, screen image of the ZKP display with vectors ("tails")

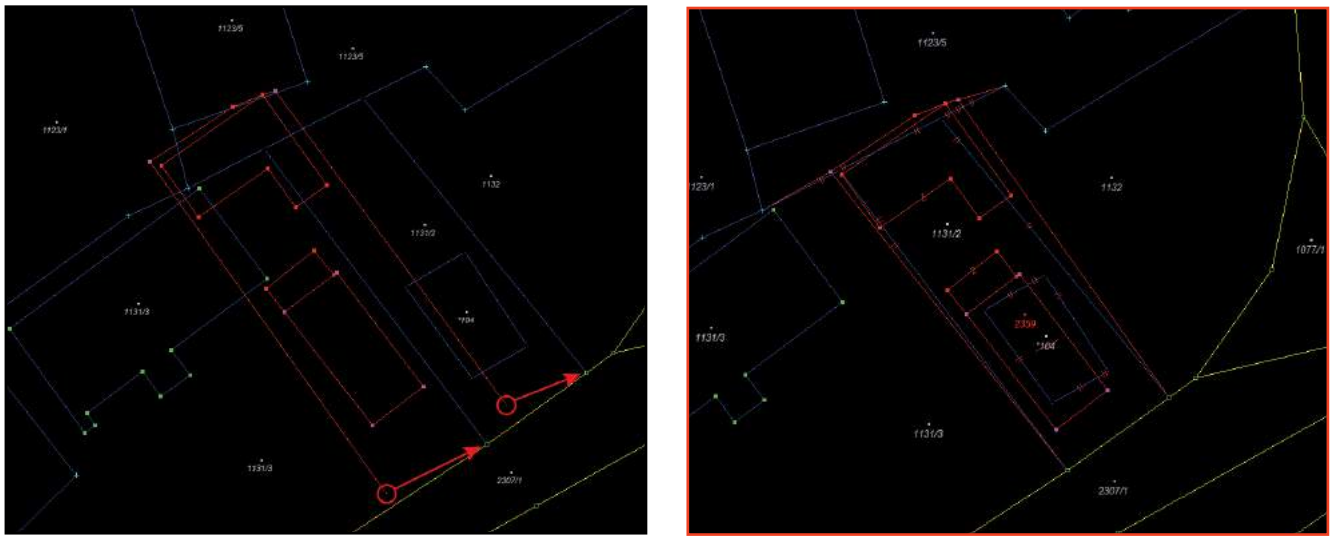
V času analognih načrtov je bil grafični vklop narejen s pomočjo prosojnice (oelate) kartiranja izmerjenih točk v postopku, na kateri so bile označene točke vklopa. To so bile tiste zanesljive izmerjene točke, ki so ustrezale že evidentiranim lomom v grafičnih podatkih (identične točke), na podlagi katerih je bilo kartiranje »uparjeno« z analognim načrtom. »Uparjanju« je sledil vris spremenjene vsebine grafičnih podatkov v načrt.

At the time of analogue plans, graphical inclusion was performed by means of a transparent mapping slide (oelate) of the measured points in the process, which had marked inclusion points. These were the reliable measured points that corresponded to the already recorded gradients in the graphical data (identical points), on the basis of which the mapping was "paired" with the analogue plan. The "pairing" was followed by an inscription of the changed content of the graphic data into the plan.



Slika 4.2.1.3: Na primeru v k. o. 1454 Daljni Vrh prikaz uporabe grafičnega vklopa: Izrez iz prosojnice (oelate) kartiranja in izrez katastrskega načrta s spremembami, ki je bil osnova za vzdrževanje analognega načrta.

Figure 4.2.1.3: Usage of graphic inclusion shown on an example from CM 1454 Daljni Vrh: Excerpt from the mapping slide (oelate) and excerpt from the cadastral plan with changes, which was the basis for maintaining the analogue plan.



Slika 4.2.1.4: Grafični vklop s pomočjo digitalne tehnologije, dodatno so označene točke za vklop z identičnimi lomi v ZKP.
Vir: GEOS, ekranski prikaz

Figure 4.2.1.4: Graphic inclusion using digital technology, additionally marked are inclusion points with identical gradients in the ZKP.
Source: GEOS, screen display

4.2.2 Spremembe na množici parcel (nova izmera, komasacija)
Changes for a group of land plots (new measurement, land consolidation)

Geodetski postopki se lahko izvajajo seveda tudi na množici parcel.

Če so se v času analognih načrtov geodetski postopki izvajali na celotnem zaključenem območju množice parcel grafične izmere, so bila pravila vzdrževanja drugačna. Primeri so npr. nove izmere ali komasacije.

V obeh primerih je šlo za postopek, katerega rezultat je bil v celoti nov grafični prikaz zaključenega območja. Ker se je ob tem spremenila tudi vrsta katastra (koordinatni), merilo prikaza in metoda vzdrževanja (koordinatna), je bilo novo stanje narisano na novih analognih zemljiškokatastrskih načrtih. Le-to je potem ob pretvorbi načrtov iz analogne v digitalno obliko predstavljalo samostojno območje zajema.

Ker je bila s postopkom na množici parcel, ki so tvorile zaključeno celoto, grafična vsebina prenesena na nove načrte, je bilo treba na analognih načrtih grafične izmere zarisati območje, ki je bilo preneseno v nove načrte. Zarisan je bil obod zaključenega območja, in sicer z grafičnim vklopom, ki je že opisan zgoraj, ter (praviloma) navedbo o tem, kje se je vodil grafičen prikaz zaključenega območja po novem. Pogostejši način (namesto grafičnega vklopa) je bila samo označitev obstoječih parcel v grafični izmeri, za katere je bil izdelan nov načrt.

Danes se v digitalnih podatkih evidentiranje postopkov na množici parcel izvede kar kot del obstoječega načrta (območja zajema) in se ne vrisuje v novo območje. S tem se izognemo problemom, ki jih za vzdrževanje v bodoče povzroča delitev katastrske občine na več območij v grafiki. Res pa je tudi, da za tako območje ne vodimo posebej podatka o (novem) merilu načrta, saj načrt v analogni obliki sploh ni bil izrisan. Poleg tega za taka območja ne vodimo posebej niti podatka o vrsti katastra (koordinatni) in metodi vzdrževanja (koordinatna). Lastnosti območja, v katero so spremembe vrisane, torej ne spreminjamo. Območje komasacije in nove izmere je tako vodeno v istem območju zajema, kot so bile parcele pred izvedbo postopka komasacije in nove izmere.

Za način vzdrževanja in izvedbo naslednjih geodetskih postopkov na takem območju je navedena »pomanjkljivost« vodenih lastnosti za taka območja nepomembna. Območje evidentirane komasacije ali nove izmere ima v celoti določene kvalitetne koordinate ZK-točk, ki so osnova za nadaljnje spremembe ne glede na to, ali je območje v grafičnih podatkih vodeno samostojno ali ne.

Surveying procedures can also be carried out on a multitude of plots.

If, at the time of analogue plans, geodetic procedures were carried out on an entire completed area of a set of plots of the graphic survey, the maintenance rules were different. Examples are new surveys or land consolidation.

Both are processes that result in an entirely new graphical representation of a completed area. As the type of cadastre (coordinate), the map scale and the maintenance method (coordinate) also changed, the new situation was drawn on new analogue land cadastre plans. This then represented an independent area of coverage when digitizing the analogue plans.

Since the procedure on a set of plots that formed a completed whole transferred content to the new plans, the area transferred to the new plans had to be plotted on the analogue graphic measurement plans. The perimeter of the completed area was plotted, with graphical inclusion, which has already been described above, and (generally) an indication of where the new graphical representation of the completed area was conducted. The more common way (instead of graphic inclusion) was to mark the existing plots in the graphic survey, for which a new plan was made.

Today, in digital data, the recording of procedures on a set of plots is performed as part of the existing plan (area of coverage) and is not drawn in the new area. This avoids problems for future maintenance caused by the division of the cadastral municipality into several areas in the graphic. However, it is also true that we do not keep data on the (new) scale of the plan for such an area, as the plan was not plotted in analogue form at all. In addition, we do not keep data for such areas on the type of cadastre (coordinate) and the method of maintenance (coordinate). The properties of the area in which the changes are plotted are therefore not changed. The area of land consolidation and new survey is thus managed in the same area of coverage as the plots before the implementation of the land consolidation procedure and new survey.

For the method of maintenance and implementation of the following geodetic procedures in this type of area, the stated "deficiency" of the managed properties is irrelevant for such areas. The area of recorded land consolidation or new surveys has fully defined quality coordinates of LC points, which are the basis for further changes, regardless of whether the area is managed independently in the graphic data or not.

Slika 4.2.2.1: Na listu grafične izmere je z odebeljeno rdečo črto zarisano območje parcel, za katere je bila izvedena nova izmera in so bile vrisane v nov načrt merila 1 : 1000, na katerem je potekalo tudi vse nadaljnje vzdrževanje, primer k. o. 1412 Mokronog.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 4.2.2.1: A graphic survey sheet where the bold red line marks an area of plots for which the new survey has been performed and which have been plotted in the new plan in the scale of 1:1000, on which all further maintenance also took place, example CM 1412 Mokronog.
Source: the e-ZKN archive land cadastre map viewer

4.3 Vzpostavitev ZKN (zemljiškokatastrskega načrta)
Establishment of ZKN (land cadastre plan)

Težave s položajno natančnostjo grafičnih podatkov odpravlja zemljiškokatastrski načrt (ZKN), ki je bil prvotno izdelan na podlagi kakovostnih podatkov, pridobljenih v postopkih vzdrževanja zemljiškega katastra.

Zemljiškokatastrski načrt (ZKN) predstavlja digitalno sliko medsebojne lege meja parcel s parcelnimi številkami in zemljišč pod stavbo na podlagi izmerjenih koordinat ZK-točk, ki so določene v državnem koordinatnem sistemu s predpisano natančnostjo. Vsi lomi v začetku niso imeli določenih ustreznih izmerjenih koordinat in niti niso bili označeni kot ZK-točke. Iz tega razloga sloj ZKN ni bil zvezen, ampak mozaičen. ZK-točke imajo različno natančnost, ki je odvisna od metode, s katero so bile ZK-točkam določene izmerjene koordinate. Z evidentiranjem sprememb na podlagi postopkov vzdrževanja se ta sloj vse bolj polni. Ko vsi lomi pridobijo izmerjene koordinate, tudi sloj ZKN za posamezno k. o. postane zvezen. Zveznost na nivoju cele države je bila dosežena z zaključkom množične izboljšave z metodo homogenizacije (2018–2020, opis v nadaljevanju).

Geodetska uprava RS je v letu 2011 začela iskati nove rešitve za izboljšanje položajne natančnosti grafičnih podatkov zemljiškega katastra, ki bi bili širše uporabni. Za območja s kakovostnejšimi podatkovnimi viri je bila tako izdelana nova grafična predstavitev podatkov zemljiškega katastra – zemljiškokatastrski načrt (v nadaljevanju ZKN). Izdelava ZKN je bila rezultat dveh projektov: »Izdelave metodoloških in tehnoloških zasnov za izvedbo projekta izboljšave pozicijske natančnosti zemljiško katastrskega prikaza« ter »Operativne izboljšave nepremičninskih evidenc in izboljšave lokacijske natančnosti zemljiškega katastra«. Po dveh letih testiranj je bil leta 2013 vzpostavljen prvi ZKN, ki je bil uporabljen za določitev atributa podrobnejše dejanske rabe trajnih nasadov na osnovi grafičnih presekov, vendar ni bil viden uporabnikom.

V Zakonu o evidentiranju nepremičnin (ZEN, 2006) je ZKN opredeljen kot grafični prikaz meja parcel s parcelnimi številkami in zemljišč pod stavbo na podlagi koordinat zemljiškokatastrskih točk, evidentiranih s predpisano natančnostjo v državnem koordinatnem sistemu (v času uveljavitve ZEN je bil to D48/GK, danes pa je to D96/TM).

V ZKN so prikazane meje parcel in meje zemljišč pod stavbo (pravih (ZPS) in prevedenih (ZPS*), ne pa tudi meje med ostalimi parcelnimi deli v ZKP (neprevedenimi vrstami rabe pod stavbo, med katastrskimi kulturami, ...). Op.: V

Issues with the positional precision of graphic data are eliminated by the land cadastre plan (ZKN), which was originally prepared on the basis of high-quality data obtained in land cadastre maintenance procedures.

The land cadastre plan (ZKN) represents a digital image of the mutual locations of borders of plots with plot numbers and land under buildings on the basis of measured coordinates of LC points, which are determined in the national coordinate system with the prescribed precision. Not all gradients were initially determined with appropriate measured coordinates and some were not even marked as LC points. For this reason, the ZKN layer was not uniform, but mosaic. LC points have different levels of accuracy depending on the method by which the measured coordinates were assigned to the LC points. By recording changes based on maintenance procedures, this layer is increasingly being filled. When all gradients obtain the measured coordinates, the ZKN layer for each CM becomes uniform. Country-level uniformity has been achieved by mass improvement through the method of homogenization (2018–2020, description below).

In 2011, the Surveying and Mapping Authority of the Republic of Slovenia began looking for new solutions to improve the positional accuracy of graphic data of the land cadastre, which would be more widely applicable. For areas with higher quality data sources, a new graphic representation of the land cadastre data was created – the land cadastre plan (hereinafter referred to as the ZKN). The preparation of the ZKN was the result of two projects: "Development of Methodological and Technological Concepts for the Implementation of the Project for Improving the Positional Accuracy of the Cadastral Index Map" and "Operational Improvements of Real Estate Records and Improving the Positional Accuracy of the Land Cadastre". After two years of testing, the first ZKN was established in 2013, which was used to determine the attribute of a more detailed actual use of permanent crops based on graphical cross-sections but was not accessible to users.

The Real Estate Records Act (ZEN, 2006) defines ZKN as a graphic representation of the borders of plots with plot numbers and land under a building on the basis of coordinates of land cadastre points recorded with prescribed accuracy in the national coordinate system (at the time of ZEN's entry into force, that was the D48/GK, and today it is the D96/TM).

The ZKN shows the borders of plots and borders of land under buildings (actual (ZPS) and translated (ZPS*), but not the borders between other plot parts in the ZKP (untranslated types

nadaljnjem tekstu se sicer za zemljišče pod stavbo uporablja termin parcelni del.

Pri izdelavi ZKN so bili uporabljeni vsi razpoložljivi in dovolj kakovostni podatki o mejah in koordinatah zemljiškokatastrskih točk, ki so obstajali v evidenci zemljiškega katastra. Ti podatki so bili:

- ZK-točke, ki so najbolj kakovosten vir podatkov za izdelavo ZKN. ZK-točke so točke na mejah parcel in parcelnih delov, katerih koordinate so bile pridobljene v okviru geodetskih postopkov (npr. s terenskimi meritvami, transformacijo, ...) in določene v državnem koordinatnem sistemu. Samo na podlagi ZK-točk še ni bilo mogoče izdelati ZKN. Potrebne so bile še povezave med ZK-točkami, ki sestavljajo mejo parcele. Urejene meje se v zemljiškem katastru evidentirajo šele od leta 2000 kot dokončne meje oziroma od leta 2006 kot urejene meje. Na podlagi baze ZK-točk, baze urejenih meja in obstoječih povezav v ZKP je bilo mogoče pri izdelavi ZKN formirati približno 900.000 parcel oz. parcelnih delov (13 % vseh parcelnih delov v RS). Tako je bil vzpostavljen »mozaični sloj« ZKN za parcele, ki so izpolnjevale pogoj za prikaz.

- Za izdelavo ZKN so bila primerna tudi območja numeričnega katastra, ki so se vzdrževala s koordinatnim vklopom, pogojno primerna pa so bila tudi območja numeričnega katastra, vzdrževana z metodo vklopa, če odstopanja niso presegla predvidene natančnosti ZKN. ZKP na območjih numeričnega katastra je bil izdelan z digitalizacijo analognih katastrskih načrtov numerične izmere. Ti načrti temeljijo na meritvah, izdelanih v koordinatnem sistemu D48/GK, in jih ni bilo treba transformirati v državni koordinatni sistem. Izdelani so bili z grafično natančnostjo risanja (0,2 mm v merilu načrta). V procesu analogno-digitalne pretvorbe in poznejše uporabe so na položajno natančnost vplivali le še postopki digitalizacije in vzdrževanja. Če je bilo vzdrževanje koordinatno, je bila ohranjena izvorna natančnost, če pa je bilo izvedeno na podlagi vklopa (metoda z vklopom), je bila položajna natančnost lahko poslabšana. ZKP, vzdrževan z metodo vklopa, je bil zato pogojno primeren za izdelavo ZKN, če odstopanja niso presegala predvidene natančnosti. Po obsegu je bil tako ZKN dopolnjen z ZKP na območju numeričnega katastra, vzdrževanega s koordinatnim vklopom za približno 900.000 parcel oz. parcelnih delov oziroma 13 % vseh parcelnih delov v Sloveniji. ZKP je bil nadalje dopolnjen še na območju numeričnega katastra, vzdrževanega z metodo z vklopom, za približ-

of use under buildings, between cadastral cultures, etc. Note: In the following, the term "plot part" is used for land under buildings.

All available and sufficiently high-quality data on the borders and coordinates of land cadastral points that existed in the land cadastre records was used in the production of the ZKN. This data included:

- LC points, which are the highest quality data source for preparing the ZKN. LC points are points on the borders of plots and plot parts whose coordinates were obtained in surveying procedures (e.g. by field measurements, transformation, etc.) and determined in the national coordinate system. It was not possible to create a ZKN based only on LC points. Connections were still required between the LC points that make up the plot border. Regulated borders have been registered in the land cadastre only since 2000 as final borders or since 2006 as regulated borders. On the basis of the database of LC-points, the database of regulated borders and the existing connections in the ZKN, it was possible to form approximately 900,000 plots or plot parts (13% of all plot parts in the Republic of Slovenia). Thus, a "mosaic layer" of the ZKN was established for plots that met the conditions for representation.

- Also suitable for the production of the ZKN were areas of the numerical cadastre maintained by coordinate inclusion, and conditionally also areas of the numerical cadastre maintained by the integration method, insofar as the deviations did not exceed the expected precision of the ZKN. In areas of the numerical cadastre, the ZKP was produced by digitizing analogue cadastral plans of numerical surveys. These plans are based on measurements made in the D48/GK coordinate system and did not need to be transformed into the national coordinate system. They were made with graphical drawing precision (0.2 mm in the scale of the plan). In the process of analogue-to-digital conversion and subsequent use, the only additional factors affecting positional precision were the procedures used for digitization and maintenance. If the maintenance was of the coordinate-type, the original accuracy was maintained, but if it was performed on the basis of integration (integration method), the positional accuracy could be impaired. The ZKP maintained by the integration method was therefore conditionally suitable for the production of the ZKN, if the deviations did not exceed the required precision. In terms of scope, the ZKN was supplemented by the ZKP in the area of the numerical cadastre, maintained by coordinate inclusion for approximately 900,000 plots or plot parts, or 13% of all plot parts in Slovenia. The ZKP was further supplemented

no 400.000 parcel oz. parcelnih delov oziroma 6 % vseh parcelnih delov v Sloveniji.

Na podlagi opisanih metod se je izdelal kakovosten ZKN za približno 2.200.000 (= 900.000 + 900.000 + 400.000) parcel oz. parcelnih delov oziroma 32 % vseh parcelnih delov v Sloveniji.

Položajna natančnost tako izdelanega ZKN je boljša od dveh metrov, kar je bilo v okviru izhodiščno postavljene položajne natančnosti ZKN.

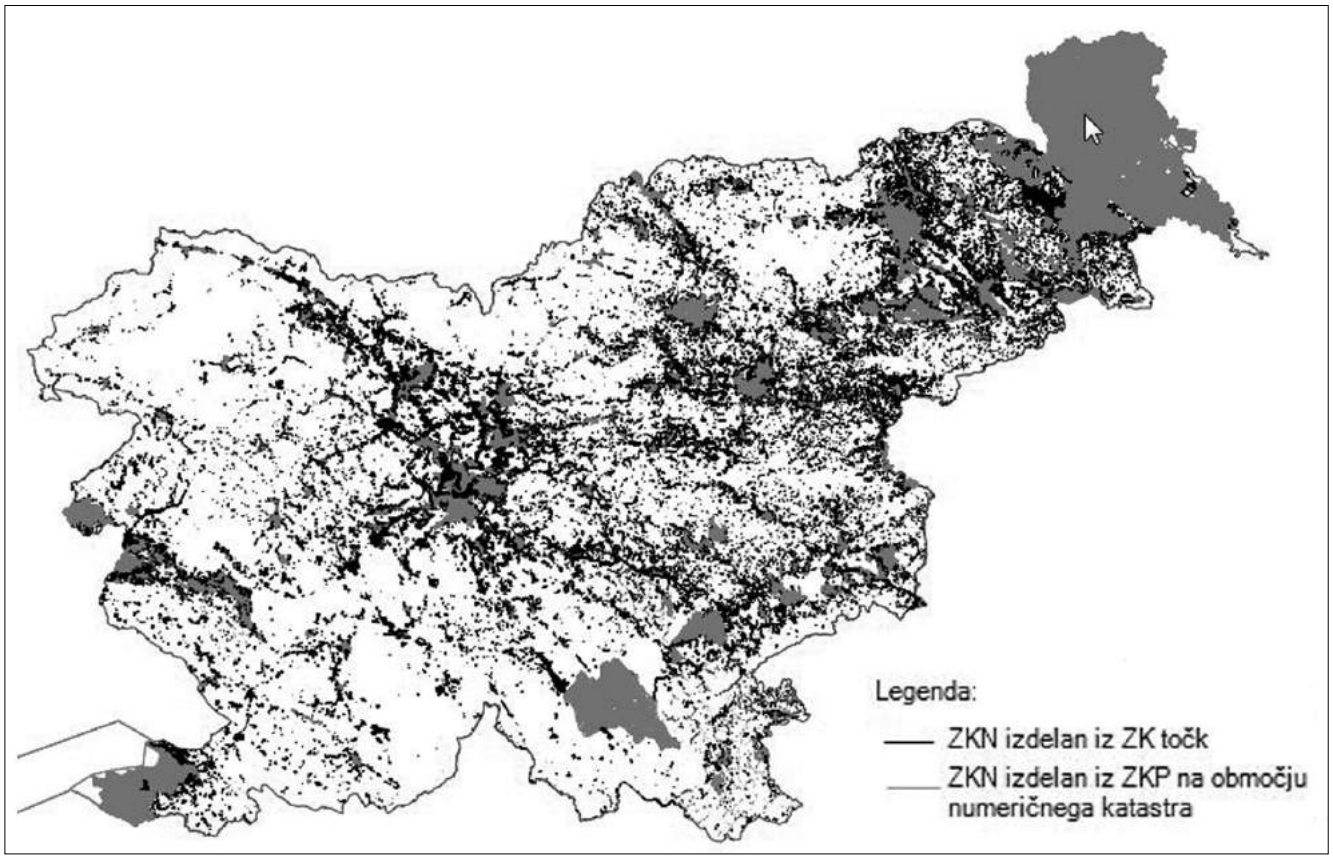
Celoten proces izdelave ZKN je bil zasnovan na uporabi obstoječih podatkov zemljiškega katastra. Tako izdelan ZKN je kot nov grafični sloj zemljiškega katastra na razpolago širšemu krogu uporabnikov. Med slabostmi tako izdelanega ZKN je predvsem njegova »mozaičnost«, saj ne zagotavlja zvezne pokritosti celotnega območja Slovenije, temveč je izdelan le za območja, za katera obstajajo dovolj kakovostni podatki.

in the area of the numerical cadastre, maintained by the integration method, for approximately 400,000 plots or plot parts, or 6% of all plot parts in Slovenia.

Based on the methods described, a high-quality ZKN was produced for approximately 2,200,000 (= 900,000 + 900,000 + 400,000) plots or plot parts, or 32% of all plot parts in Slovenia.

The positional accuracy of the ZKN thus produced is higher than two metres, which falls within the initial positional accuracy of the ZKN.

The entire process of producing the ZKN was based on the use of existing land cadastre data. The ZKN produced in this way is available to a wider range of users as a new graphical layer of the land cadastre. Among the disadvantages of this type of ZKN is its "mosaic" quality, as it does not provide uniform coverage of the entire territory of Slovenia, but is produced only for areas for which there is data of sufficient quality.



Slika 4.3.1: Izdelava ZKN glede na vir podatkov (ZK-točke ali ZKP na območju numeričnega katastra).
Vir: Izdelava zemljiškokatastrskega načrta, Geodetski vestnik, 2012

Figure 4.3.1: Production of the ZKN by data source (LC points or ZKP in the area of the numerical cadastre).
Source: Preparation of a Land Cadastral Plan, Geodetski vestnik, 2012

Slika 4.3.2: Prikaz mozaične nastavitve ZKN na DOF-u (slika prikazuje ZKN ob nastavitvi »ZKN-0« in vse spremembe do dne 3.3.2020).
Vir: PREG, ekranska slika ZKN + DOF

Figure 4.3.2: Display of the ZKN mosaic setting on the DOF (the figure shows the ZKN with the setting "ZKN-0" and all changes up to 3.3.2020).
Source: PREG, screen image ZKN + DOF

Tako vzpostavljen sloj ZKN se je postopoma povečeval oz. dopolnjeval v zvezni sloj z:

- obstoječimi postopki vzdrževanja zemljiškega katastra; z vsako spremembo na podlagi izvedenih geodetskih meritev pridobimo kakovostne koordinate ZK-točk, ki so vključene v ZKN;
- vpeljavo poenostavljenih postopkov izdelave ZKN za posamezno parcelo, ki se lahko izvaja na zahtevo lastnika ali za večjo skupino parcel (na primer območja trajnih nasadov, kmetijska zemljišča).

Dokončno pa je bila zveznost sloja ZKN na nivoju celotne države dosežena v letu 2020, ko je bil zaključen projekt Lokacijske izboljšave ZKP z metodo homogenizacije.

This type of layer of the ZKN gradually increased or was supplemented into a uniform layer by:

- existing land cadastre maintenance procedures; with each change on the basis of the geodetic measurements performed, we obtain quality coordinates of LC points, which are included in the ZKN,
- introduction of simplified ZKN production procedures for the individual plot, which can be carried out at the request of the owner or for a larger group of plots (e.g. areas of permanent crops, agricultural land).

Finally, the uniformity of the ZKN layer at the level of the entire country was achieved in 2020 through the ZKP positional accuracy improvement project with the homogenization method.

Rang	Opis	Rang	Opis
10	natančnost določitve koordinat do 4 cm	60	natančnost določitve koordinat nad 100 cm
20	natančnost določitve koordinat od 5 cm do 12 cm	70	natančnost ni določena
30	natančnost določitve koordinat od 13 cm do 30 cm	80	natančnost določitve koordinat od 100 cm do 200 cm
40	natančnost določitve koordinat od 31 cm do 50 cm	90	natančnost določitve koordinat od 201 cm do 500 cm
50	natančnost določitve koordinat od 51 cm do 100 cm	100	natančnost določitve koordinat od 501 cm do 1000 cm

Slika 4.3.3: Opis rangov, ki so osnova za barvo prikaza v ZKN.
Vir: Arhiv GURS

Figure 4.3.3: Description of the ranges that are the basis for the colour of the display in the ZKN.
Source: The SMARS archive

»Kategorija (rang)«	"tip ZK točke v PREG"	" Šifra METEN"	Ime	Opis
20	B	11	Polarna 12	Polarna metoda natančnost določitve do 12 cm
30	B	12	Polarna 30	Polarna metoda natančnost določitve od 13 do 30 cm
50	B	13	Polarna 100	Polarna metoda natančnost določitve od 31 do 100 cm
60	C	14	Polarna nad 100	Polarna metoda natančnost določitve nad 100 cm
20	B	21	Ortogonalna	Ortogonalna metoda, presek premic, natančnost določitve do 12 cm
30	B	22	Ortogonalna	Ortogonalna metoda, presek premic, natančnost določitve od 13 do 30 cm
50	B	23	Ortogonalna	Ortogonalna metoda, presek premic, natančnost določitve od 31 do 100 cm
60	C	24	Ortogonalna	Ortogonalna metoda, presek premic, natančnost določitve nad 100 cm
20	B	41	Presek	natančnost določitve do 12 cm
30	B	42	Presek	natančnost določitve od 13 do 30 cm
50	B	43	Presek	natančnost določitve od 31 do 100 cm
60	C	44	Presek	natančnost določitve nad 100 cm
20	B	51	Fotogrametrija	Fotogrametrične metode in ortofoto, natančnost določitve do 12 cm
30	B	52	Fotogrametrija	Fotogrametrične metode in ortofoto, natančnost določitve od 13 do 30 cm
50	B	53	Fotogrametrija	Fotogrametrične metode in ortofoto, natančnost določitve od 31 do 100 cm
60	C	54	Fotogrametrija	Fotogrametrične metode in ortofoto, natančnost določitve nad 100 cm
40	B	61	Digitalizacija	Digitalizirani načrti 1:500
50	B	62	Digitalizacija	Digitalizirani načrti 1:1000
60	C	63	Digitalizacija	Digitalizirani načrti 1:2000
60	C	64	Digitalizacija	Digitalizirani načrti 1:2500
70	C	65	Digitalizacija	Digitalizirani načrti 1:720
70	C	66	Digitalizacija	Digitalizirani načrti 1:1440
70	C	67	Digitalizacija	Digitalizirani načrti 1:2880
70	C	68	Digitalizacija	Digitalizirani načrti 1:5760
70	C	77	Homogenizacija	Koordinate točk določene z homogenizacijo
80	C	85	Izboljšava lokacijskih podatkov	Koordinate ZK točk določeno z izboljšavo lokacijskih podatkov (1m≤X≤2m).
90	C	86	Izboljšava lokacijskih podatkov	Koordinate ZK točk določeno z izboljšavo lokacijskih podatkov (2m<X≤5m).
100	C	87	Izboljšava lokacijskih podatkov	Koordinate ZK točk določeno z izboljšavo lokacijskih podatkov (5m<X≤10m).
10	B	91	Terenska meritev	Geodetska izmera na terenu (do 4 cm)
50	B	92	Privzete	"Koordinate določene na podlagi DOF, geodetskih načrtov ali topografskih podatkov; koordinate delno urejenih točk so vedno pridobljene s to metodo (do 1 m)"
30	B	93	Transformirana	Koordinate dobljene s transformacijo terenskih D48/GK koordinat v D96/TM
40	B	97	ZPS - terenska meritev	Koordinate ZK točk ZPS

Slika 4.3.4: Del prikaza uvrstitve posamezne metode določitve koordinat ZK točk v range.
Vir: Arhiv GURS

Figure 4.3.4: Part of the classification of individual methods for determining the coordinates of LC points by range.
Source: The SMARS archive

Sloj ZKN je bil prvič pokazan širšim uporabnikom v letu 2015. Takrat je vseboval samo parcele, ki so v celoti izpolnjevale pogoj za prikazovanje. V začetku leta 2018 je bil sloj dopolnjen še z daljicami, ki so izpolnjevale pogoj za prikazovanje (niso pa tvorile zaključenega poligona).

Konec istega leta pa je bil dopolnjen še s parcelami in z daljicami, katerih krajišča so ZK-točke natančnosti slabše od 1 m (kamor sodijo npr. tudi točke lokacijske izboljšave z metodo homogenizacije). Kriterij za vključitev točk v natančnost do vključno 1 m oz. nad 1 m je atribut metode določitve, ki temelji na natančnosti ZK-točk. Točke se uvrstijo v posamezne range (10, 20, ..., 100). Rangi 10–50 predstavljajo ZK-točke z natančnostjo določitve do vključno 1 m.

The ZKN layer was first shown to a wider audience in 2015. At that time, it contained only plots that fully met the condition for display. At the beginning of 2018, the layer was supplemented with line segments that met the condition for display (but did not form a closed polygon).

At the end of the same year, it was supplemented with plots and line segments whose ends are LC points with an accuracy lower than 1 m (which includes, for example, points of positional accuracy improvement using the homogenization method). The criteria for the inclusion of points in the accuracy up to and including 1 m or above 1 m is an attribute of the determination method based on the accuracy of the LC points. The points are classified into individual ranges (10, 20 ... 100). Ranges 10–50 represent LC points with an accuracy of up to and including 1 m.

Slika 4.3.5: Prikaz ZKN na DOF na območju grafičnega katastra izvornega merila 1 : 2880 po izvedeni izboljšavi z metodo homogenizacije; v rdeči barvi so prikazane daljice z natančnostjo določitve ZK točk do 1 m, z modro pa vse ostale daljice (kamor sodijo tudi izboljšane), primer k. o. 1702 Tomišelj.
Vir: PREG, ekranska slika ZKN + DOF

Figure 4.3.5: ZKN in the DOF in the area of the graphic cadastre with the original scale of 1:2880 after improvement by the homogenization method; marked in red are line segments with LC point determination accuracy up to 1 m, and in blue all the other lines (which also include the improved ones), example for CM 1702 Tomišelj.
Source: PREG, screen image ZKN + DOF

Slika 4.3.6: Prikaz razlike med ZKP in ZKN na območju grafičnega katastra izvornega merila 1 : 2880 po izvedeni izboljšavi z metodo homogenizacije; v zeleni barvi je prikazan ZKP, ZKN je prikazan v dveh barvah, in sicer so v rdeči barvi prikazane daljice z natančnostjo določitve ZK-točk do 1 m, z modro pa vse ostale, primer k. o. 1702 Tomišelj.
Vir: PREG, ekranska slika ZKN + DOF

Figure 4.3.6: The difference between the ZKP and ZKN in the area of the graphic cadastre with the original scale of 1:2880 after improvement by the homogenization method; the ZKP is shown in green, and the ZKN is shown in two colours – marked in red are line segments with LC point determination accuracy up to 1 m, and in blue all the other lines (which also include the improved ones), example for CM 1702 Tomišelj.
Source: PREG, screen image ZKN + DOF

ZKN je bil ob vzpostavitvi nezvezen sloj parcel, ki imajo za vse točke (lome poligona) določene ZK-točke z določenimi koordinatami v državnem koordinatnem sistemu.

Koordinate ZK-točk so določene z meritvami in različnimi tehnikami in metodami izboljšave lokacijskih podatkov zemljiškega katastra. Lokacijsko se parcelne meje v ZKN pogosto ne ujemajo z mejami ZKP in urejenimi mejami. V ZKN danes v enem sloju z barvami ločimo prikaz točk glede na kakovost koordinat točk (rdeče - natančnost do vključno 1 m, modre – natančnost nad 1 m).

At the time of its establishment, the ZKN was a non-continuous layer of plots, all of whose points (polygon gradients) have corresponding LC points for all points in the national coordinate system.

The coordinates of LC points are determined by measurements and various techniques and methods of improving the location data of the land cadastre. The locations of plot borders in the ZKN often do not correspond to the ZKP borders and regulated borders. Today, the ZKN can display the points in one layer with colour coding according to the quality of the coordinates of the points (red – accuracy up to and including 1 m, blue – accuracy above 1 m).

4.4 Vzdrževanje ZKN (zemljiškokatastrskega načrta)
Maintenance of ZKN (land cadastre plan)

V ZKN so meje parcel in zemljišč pod stavbo prikazane z izmerjenimi koordinatami, zato je treba tudi pri vrisu sprememb v ZKN uporabiti (numerične) koordinate.

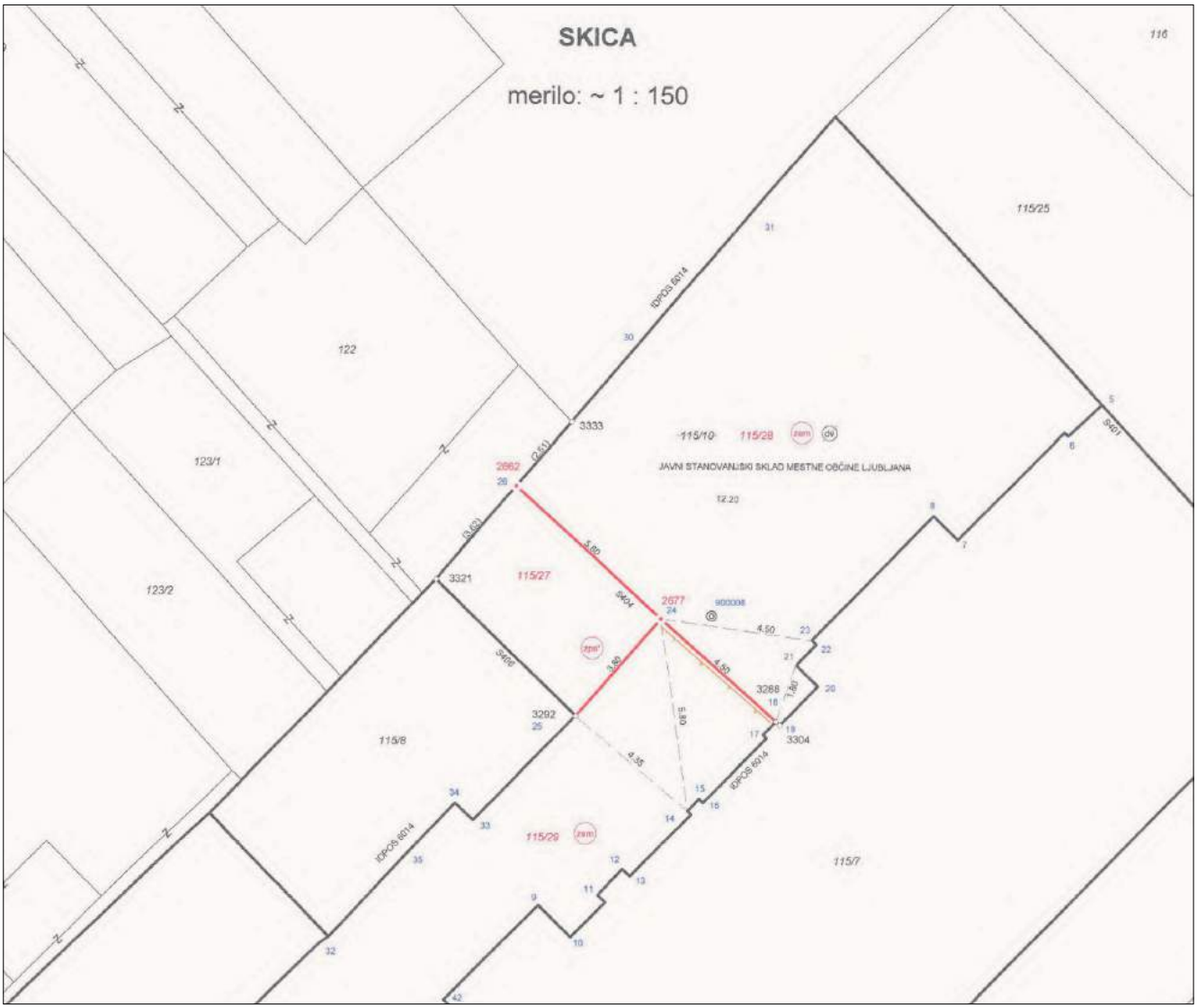
Vris sprememb v ZKN poteka z neposredno uporabo izmerjenih koordinat ZK-točk. S takim načinom vzdrževanja je zagotovljeno identično število ZK-točk, ki določajo mejo v naravi, in število lomov v ZKP, podobnost oblike parcele v naravi in na ZKP ter ohranitev absolutne točnosti in relativnih odnosov do okoliških parcel v ZKN.

Tovrstni način je v uporabi pri vseh geodetskih postopkih.

In the ZKN, the borders of plots and land under buildings are shown with measured coordinates, so (numerical) coordinates must also be used when plotting changes in the ZKN.

Changes in the ZKN are plotted by directly using the measured coordinates of LC points. This method ensures an identical number of LC points that determine the border in nature and the number of gradients in the ZKP, the similarity of the shape of the plot in nature and in the ZKP, and the most accurate relations to the surrounding plots.

This method is used in all surveying procedures.

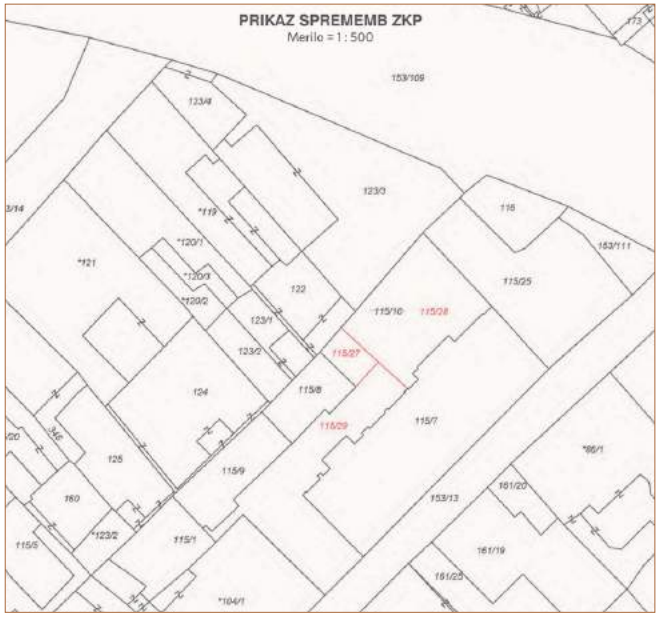


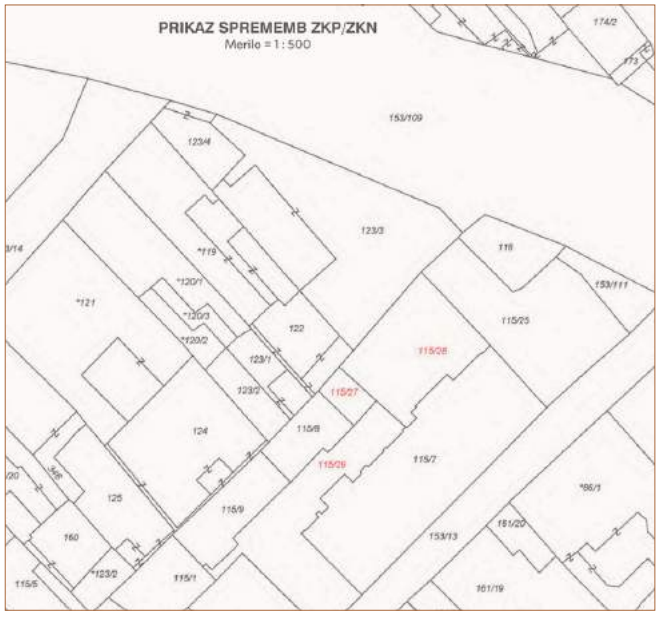
SEZNAM ZK TOČK PRED SPREMEMBO

KO	Štev.	E	N	GE	GN	H	Met. dol.	Upr. stat.	Način trans.	Vrsta mejn.	Met. H	Opomba	D

SEZNAM ZK TOČK PO SPREMEMBI

KO	Štev.	E	N	GE	GN	H	Met. dol.	Upr. stat.	Način trans.	Vrsta mejn.	Met. H	Opomba	D
1728	2662	461908.46	100733.14	461908.46	100733.14	294.13	91	9	0	6	14		D
1728	2677	461912.75	100729.25	461912.75	100729.25	293.78	91	9	0	6	14	24	D
1728	3288	461916.15	100726.26	461916.15	100726.26	0.00	93	9	2	0	00		N
1728	3292	461910.22	100726.41	461910.22	100726.41	0.00	93	9	2	0	00		N
1728	3321	461906.10	100730.39	461906.10	100730.39	0.00	93	9	2	0	00		N
1728	3333	461910.10	100735.04	461910.10	100735.04	0.00	93	9	2	0	00		N





Slika 4.4.1: Z vrisom sprememb v ZKN z neposredno uporabo izmerjenih koordinat je zagotovljeno identično število ZK-točk in število lomov v ZKP ter ohranitev absolutne točnosti in relativnih odnosov do okoliških parcel v ZKN.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 4.4.1: With plotting of changes in the ZKN by direct use of measured coordinates ensures the identical number of LC points and gradients in the ZKP, as well as the preservation of absolute accuracy and relative relations with the surrounding plots in the ZKN.
Source: ZK archive digital survey report viewer

5 Nove izmere v koordinatnem sistemu D48/GK
New measurements in the D48/GK coordinate system

Nova izmera, kot ga opredeljuje Zakon o evidentiranju nepremičnin, je postopek urejanja mej na območju, ki zajema najmanj deset parcel, ali na območju, večjem od treh hektarov, in ga izvede geodetsko podjetje v okviru geodetske storitve za celotno območje nove izmere. V postopku evidentiranja nove izmere se na podlagi elaborata nove izmere evidentirajo urejene meje.

V nadaljevanju opisani postopki nove izmere pa opisujejo nove izmere, ki so se izvajale po predpisih izpred leta 2006.

Ena glavnih nalog in hkrati najobsežnejša naloga geodezije je izmera zemljišč in objektov na zemeljskem površju in pod njim ter izdelava načrtov in kart, v katerih se ta izmerjena zemljišča in objekti evidentirajo. Načrti in karte se izdelujejo na podlagi podatkov, pridobljenih na sistematično organiziran način z različnimi geodetskimi metodami. Med take sistematično organizirane načine pridobivanja in evidentiranja geodetskih in katastrskih podatkov se štejejo tudi nove izmere.

Nove izmere se izvajajo v državnem koordinatnem sistemu s ciljem celovitega evidentiranja položajno kakovostnih katastrskih podatkov o zemljiščih v geodetskih evidencah. Nove izmere na območju Republike Slovenije so bile večinoma izvedene v drugi polovici 20. stoletja v državnem koordinatnem sistemu z oznako D48/GK, ki je bil na območju bivše Jugoslavije vzpostavljen leta 1948, zato nosi oznako D48, pri čemer se letnica nanaša na izračun položajev točk astrogeodetske mreže. Korenine tega koordinatnega sistema segajo v čas avstro-ogrske monarhije, ko je bila na hribu Hermannskogel na obrobju Dunaja postavljena izhodiščna (fundamentalna) točka koordinatnega sistema.

A new survey, as defined by the Real Estate Records Act, is a border regulation procedure in an area covering at least ten plots or in an area larger than three hectares, carried out by a surveying company as part of a surveying service for the entire area included in the new survey. In the process of recording a new survey, regulated borders are recorded on the basis of a report of the new survey.

The new survey procedures described below outline the new surveys that were carried out according to the regulations before 2006.

One of the main tasks, which is also the most extensive task of surveying, is the measurement of land and buildings on and below the earth's surface and the production of plans and maps in which these measured lands and buildings are recorded. Plans and maps are made on the basis of data obtained in a systematically organized way with various geodetic methods. Such systematically organized methods of obtaining and recording geodetic and cadastral data also include new surveys.

New surveys are carried out in the national coordinate system with the aim of comprehensively recording the positionally accurate cadastral data on land in the geodetic records. New surveys in the territory of the Republic of Slovenia were mostly carried out in the second half of the 20th century in the national coordinate system with the code D48/GK, which was established in the former Yugoslavia in 1948, the code D48 referring to the year of the calculation of positions of points on the astrogeodetic network. This coordinate system stems from the time of the Austro-Hungarian monarchy, when the origin (fundamental) point of the coordinate system was set on the Hermannskogel Hill on the outskirts of Vienna.

Slika 5.1: Parametri starega koordinatnega sistema D48/GK. Vir: Arhiv GURS.

Figure 5.1: Parameters of the old D48/GK coordinate system. Source: The SMARS archive

5.1 Koordinatni sistem D48/GK
The D48/GK coordinate system

Za sistematično, organizirano in kakovostno geodetsko delo je bilo treba na območju države načrtno vzpostaviti in na terenu stabilizirati mrežo geodetskih točk različnih redov po temeljnem načelu geodetskega dela »iz velikega v malo«. Dosedanji državni referenčni koordinatni sistem D48/GK definirajo koordinate trigonometričnih točk prvega reda, povezane v astrogeodetsko mrežo, ki jo sestavljajo trigonometrične točke 1. reda. Nanje se navezujejo mreže nižjih redov, sestavljene iz geodetskih točk. Tako ta koordinatni sistem v naravi sestavljajo položajne mreže na terenu stabiliziranih in označenih geodetskih točk različnih vrst. Horizontalne geodetske točke se delijo glede na natančnost in način nastanka mreže na:

- temeljne horizontalne geodetske točke in
- izmeritvene horizontalne geodetske točke.

V centralni bazi geodetskih točk se vodijo podatki za skoraj 30.000 temeljnih horizontalnih geodetskih točk in okoli 227.000 izmeritvenih geodetskih točk.

Systematic, organized and high-quality geodetic work in the territory of the country required establishing and stabilizing a network of geodetic points of various orders, following the basic principle of surveying "from large to small". The current national reference coordinate system, D48/GK, is defined by the coordinates of first-order trigonometric points connected to an astrogeodetic network consisting of first-order trigonometric points. Connected to it are networks of lower orders, consisting of survey points. Thus, this coordinate system in nature consists of positional networks in a field of stabilized and marked geodetic points of different types. Horizontal geodetic points are divided in terms of the accuracy and method of network formation into:

- base horizontal survey points, and
- measured horizontal survey points.

The central database of survey points holds data for almost 30,000 base horizontal survey points and about 227,000 measured horizontal survey points.

Slika 5.1.1: Prikaz točk geodetske horizontalne (zeleno) in vertikalne (vijolično) mreže na ožjem območju Ljubljane.
Vir: Arhiv GURS, vpogledovalnik Preg

Figure 5.1.1: Points of the geodetic horizontal (green) and vertical (purple) network in the narrower area of Ljubljana.
Source: The SMARS archive, the Preg viewer

5.1.1 Razdelitev na trigonometrijske sekcije in detajlne liste načrtov
Division into trigonometric sections and detail sheets of plans

Koordinatni sistem D48/GK v 5. meridianski coni je na območju Republike Slovenije razdeljen na črkovno označene kolone (od A na zahodu do L na vzhodu države) in številčno označene vrste (od 19 na jugu do 30 na severu države), ki jih sestavljajo pravokotniki z dimenzijami 22,5 km po osi Y in 15,0 km po osi X, imenovanimi trigonometrijske sekcije, ki so osnova za nadaljnje delitve na detajlne liste. Vsaka trigonometrijska sekcija ima splošno in krajevno označbo. Splošno označbo sestavlja označba koordinatnega sistema (meridianske cone), kolone in vrste. Krajevna označba je določena po najpomembnejšem kraju v trigonometrijski sekciji. Na naslednjih slikah so iz Pravilnika o znakih za temeljne topografske načrte (Uradni list SRS, št. 29/82) prikazane sheme razreza na trigonometrijske sekcije in detajlne liste različnih meril (slike 5.1.1.1 do 5.1.1.7).

Leta 1998 je novi pravilnik za območje Republike Slovenije predpisal koordinatni sistem D48/GK v eni razširjeni meridianski coni s širino meridianske cone $\Delta\lambda = 3°15'$. S tem sta bili na skrajnem vzhodu Slovenije dosedanji zahodni koloni A in B 6. meridianske cone s transformacijo prevzeti v najbolj vzhodno kolono L 5. meridianske cone, celotno območje Slovenije pa je bilo vključeno v koordinatni sistem 5. meridianske cone.

» *Določbe o državni kartografski projekciji in državnem koordinatnem sistemu v Republiki Sloveniji iz Pravilnika o uporabi Gauß-Krügerjeve projekcije pri izdelavi državne topografske karte v merilu 1 : 25.000 in razdelitev na liste, (Uradni list RS, št. 36/98)*

Državna kartografska projekcija na območju Republike Slovenije je Gauß-Krügerjeva projekcija s širino meridianske cone $\Delta\lambda = 3°15'$ in srednjim meridianom $\lambda = 15°$ vzhodne geografske dolžine glede na začetni meridian Greenwich. Državni koordinatni sistem je ravninski pravokotni koordinatni sistem, ki predstavlja projekcijsko ravnino Gauß-Krügerjeve državne kartografske projekcije. Navpična, proti severu usmerjena os (os X) je projekcija srednjega meridiana cone. Vodoravna, proti vzhodu usmerjena os (os Y) je projekcija ekvatorja.

Izhodišče državnega koordinatnega sistema je v presečišču obeh osi.

Pravokotni koordinati izhodišča sta $y_0 = 0$ m in $x_0 = 0$ m.

Geografski koordinati izhodišča sta $\lambda_0 = 15°$ in $\varphi_0 = 0°$.

Linijsko merilo na srednjem meridianu je $m_0 = 1{,}0000$.

Za potrebe praktičnih geodetskih, kartografskih in drugih del se uporablja spremenjen (modificiran) državni koordinatni sistem. Na srednjem meridianu se uvede linijsko merilo $m_0 = 0{,}9999$ (tudi: linijski modul). Z njim se pomnoži (reducira) vsako koordinato y in x, s čimer se dobi reducirane koordinate. Reducirane koordinate y se v izogib negativnim

The D48/GK coordinate system in the 5th meridian zone in the territory of the Republic of Slovenia is divided into letter-marked columns (from A in the west to L in the east of the country) and into numerically marked rows (from 19 in the south to 30 in the north of the country), comprised of rectangles with dimensions of 22.5 km along the Y axis and 15.0 km along the X axis, which are called trigonometric sections and represent the basis for further divisions into detail sheets. Each trigonometric section has a general and a local designation. The general designation consists of the designation of the coordinate system (meridian zone), column and type. The local designation is determined by the most important location in the trigonometric section. The following figures show diagrams of the divisions into trigonometric sections and detail sheets of various scales from the Character Policy for Basic Topographic Plans (Official Gazette of the SRS, No. 29/82) (figures 5.1.1.1 to 5.1.1.7).

In 1998, the new rules for the territory of the Republic of Slovenia prescribed the D48/GK coordinate system in one extended meridian zone with the width of the meridian zone $\Delta\lambda = 3°15'$. Thus, in the far east of Slovenia, the former western columns A and B of the 6th meridian zone were incorporated into the easternmost column L of the 5th meridian zone, and the entire area of Slovenia was included in the coordinate system of the 5th meridian zone.

» *Provisions on the National Cartographic Projection and the National Coordinate System in the Republic of Slovenia from the Rules on the Use of the Gauß-Krüger Projection in the Production of a National Topographic Map in the Scale of 1:25,000 and Division into Sheets, (Official Gazette of the Republic of Slovenia, No. 36/98)*

The national cartographic projection in the territory of the Republic of Slovenia is the Gauß-Krüger projection with the width of the meridian zone $\Delta\lambda = 3°15'$ and the middle meridian $\lambda = 15°$ east longitude with respect to the prime Greenwich meridian. The national coordinate system is a planar orthogonal coordinate system that represents the projection plane of the Gauß-Krüger national cartographic projection. The vertical, north-facing axis (X axis) is the projection of the middle meridian of the zone. The horizontal, east-facing axis (Y axis) is the projection of the equator.

The origin of the national coordinate system is at the intersection of both axes.

The rectangular coordinates of the origin are $y_0 = 0$ m and $x_0 = 0$ m.

The geographical coordinates of the origin are $\lambda_0 = 15°$ and $\varphi_0 = 0°$.

The line scale on the middle meridian is m0 = 1.0000.

A modified national coordinate system is used for the needs of practical geodetic, cartographic and other work. A line scale (also: line module) of $m_0 = 0.9999$ is introduced on the middle meridian. Each y and x coordinate is multiplied (reduced) by this to obtain reduced coordinates. The reduced

vrednostim povečajo za 500.000 m. Reducirane koordinate x se zaradi enostavnejše in krajše notacije zmanjšajo za 5.000.000 m. Pravokotni koordinati izhodišča državnega koordinatnega sistema zato postaneta:

$Y_0 = 500.000$ m in $X_0 = -5.000.000$ m.

Dosedanji način navajanja pravokotnih koordinat iz 3. člena se spremeni na naslednji način:

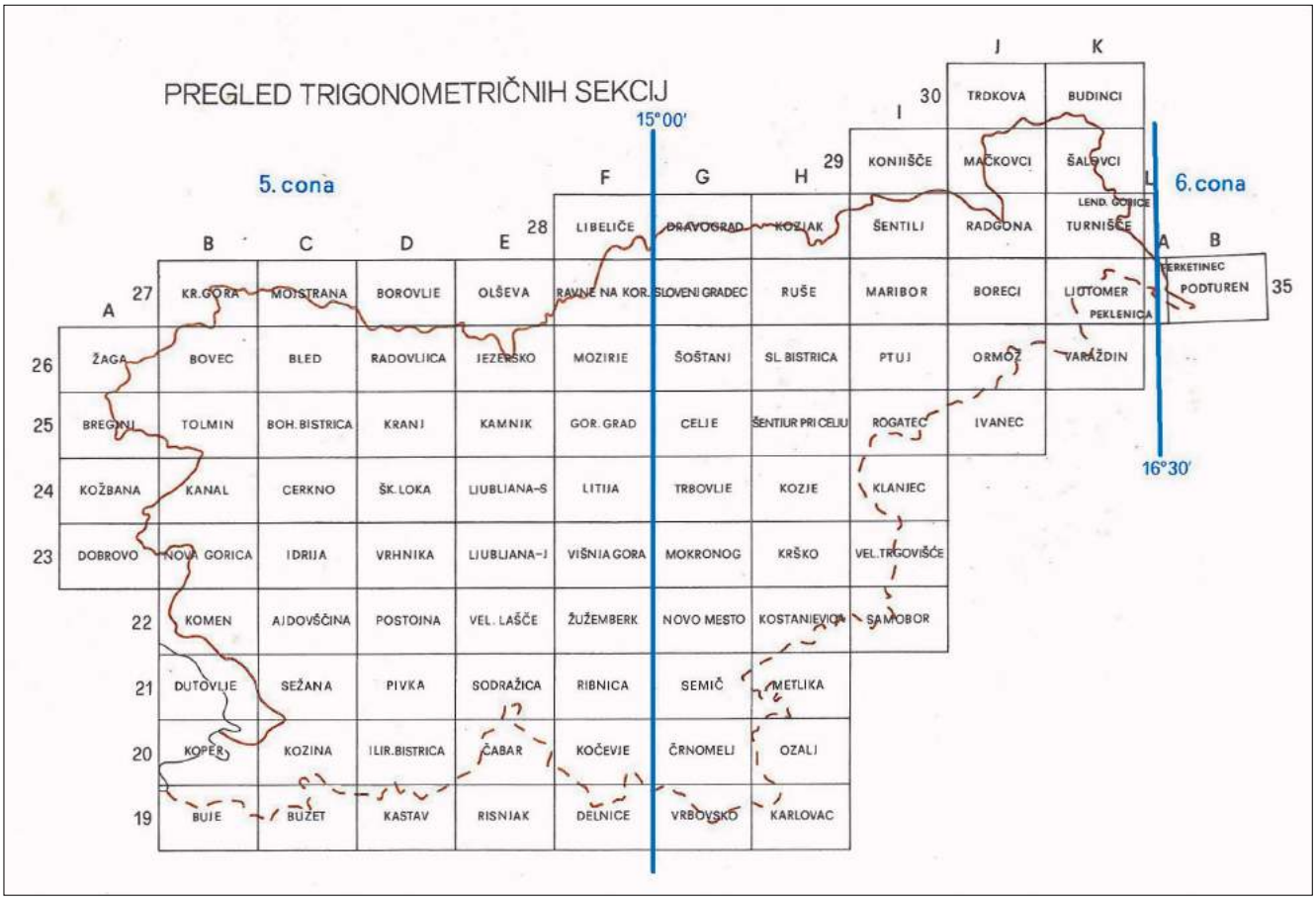
- *pri pravokotnih koordinatah y v dosedanji 5. meridianski coni se opusti prva številka z leve (številka 5), ki je označevala meridiansko cono,*
- *pravokotne koordinate x v dosedanji 5. meridianski coni se zmanjšajo za 5.000.000 m,*
- *pravokotne koordinate točk v dosedanji 6. meridianski coni se preračunajo v 5. meridiansko cono, nato pa jih obravnavamo v skladu s prvima gornjima dvema alinejama.* «

y coordinates are increased by 500,000 m to avoid negative values. The reduced x coordinates are reduced by 5,000,000 m for simpler and shorter notation. The rectangular coordinates of the origin of the national coordinate system therefore become:

$Y_0 = 500,000$ m and $X_0 = -5,000,000$ m.

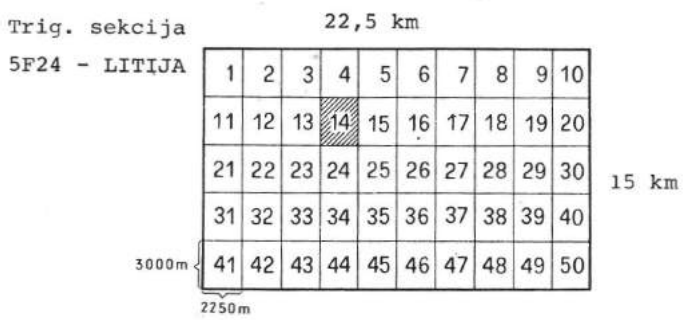
The current method of stating the rectangular coordinates referred to in Article 3 is altered as follows:

- *in the case of rectangular y coordinates in the former 5th meridian zone, the first number from the left is omitted (number 5), which marked the meridian zone,*
- *the rectangular x coordinates in the former 5th meridian zone are reduced by 5,000,000 m,*
- *the rectangular coordinates of the points in the former 6th meridian zone are converted into the 5th meridian zone and then processed in accordance with the first two indents above.* «



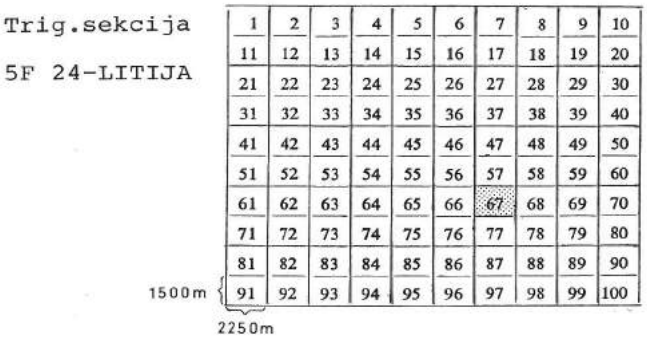
Slika 5.1.1.1: Razdelitev Slovenije na trigonometrijske sekcije v nekdanjem koordinatnem sitemu D48/GK 5. in 6. meridianske cone po Pravilniku iz leta 1982. Opomba: Leta 1998 je novi pravilnik za območje Republike Slovenije predpisal koordinatni sistem D48/GK v eni razširjeni meridianski coni s širino meridianske cone $\Delta\lambda = 3°15'$ – glej opis zgoraj.
Vir: Arhiv GURS

Figure 5.1.1.1: Division of Slovenia into trigonometric sections in the former D48/GK coordinate system of the 5th and 6th meridian zones in accordance with the policy of 1982. Note: In 1998, the new policy for the territory of the Republic of Slovenia prescribed the D48/GK coordinate system in one extended meridian zone with the meridian zone width of $\Delta\lambda = 3°15'$ – see description above.
Source: The SMARS archive



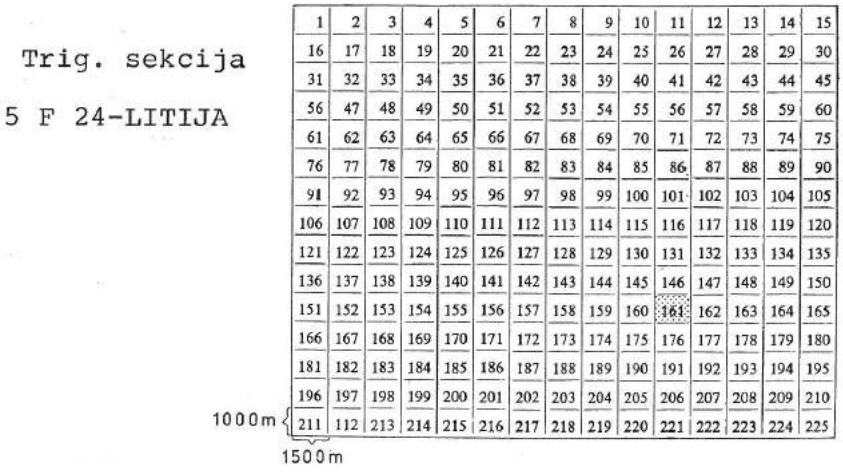
Slika 5.1.1.2: Sekcija razdeljena na 50 detajlnih listov načrtov merila 1 : 5000 (TTN5).
Vir: Arhiv GURS

Figure 5.1.1.2: Section divided into 50 detail sheets of plans in the scale of 1:5000 (TTN5).
Source: The SMARS archive



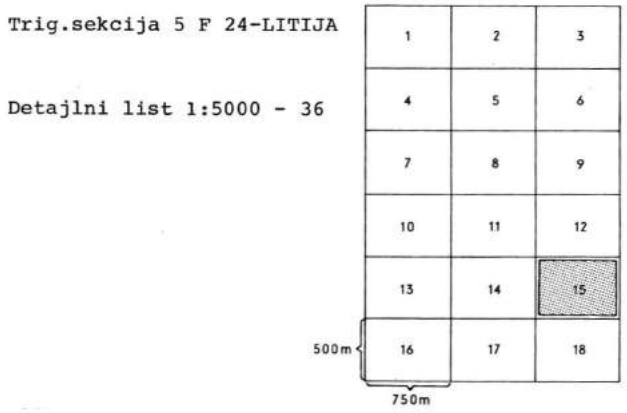
Slika 5.1.1.3: Sekcija, razdeljena na 100 detajlnih listov načrtov merila 1 : 2500.
Vir: Arhiv GURS

Figure 5.1.1.3: Section divided into 100 detail sheets of plans in the scale of 1:2500.
Source: The SMARS archive



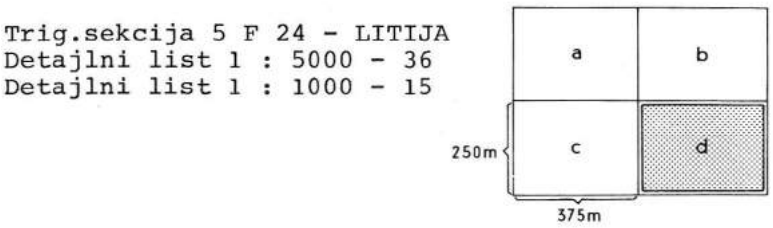
Slika 5.1.1.4: Sekcija, razdeljena na 225 detajlnih listov načrtov merila 1 : 2000.
Vir: Arhiv GURS

Figure 5.1.1.4: Section divided into 225 detail sheets of plans in the scale of 1:2000.
Source: The SMARS archive



Slika 5.1.1.5: Detajlni list TTN5, razdeljen na 18 detajlnih listov načrtov merila 1 : 1000.
Vir: Arhiv GURS

Figure 5.1.1.5: Detail sheet TTN5, divided into 18 detail sheets of plans in the scale of 1:1000.
Source: The SMARS archive



Slika 5.1.1.6: Detajlni list merila 1 : 1000, razdeljen na 4 detajlne liste načrtov merila 1 : 500.
Vir: Arhiv GURS

Figure 5.1.1.6: Detail sheet in the scale of 1:1000, divided into 4 detail sheets of plans in the scale of 1:500.
Source: The SMARS archive

MERILO	DIMENZIJE LISTA v naravi v m		na načrtu v cm		POVRŠINA ha	KVADRATNA MREŽA NA cm	POVRŠINA KVADRATNE MREŽE ha	OZNAČBA - NOMENKLATURA (PRIMERI)	
	y	x	y	x				SPLOŠNA	KRAJEVNA
1:500	375	250	75	50	9,375	10	0,25	5F24-36-15d	LITIJA-36-15d
1:1000	750	500	75	50	37,500	10	1,00	5F24-36-15	LITIJA-36-15
1:2000	1500	1000	75	50	150,0	10	4,00	5F24-161	LITIJA-161
1:2500	2250	1500	90	60	337,5	10	6,25	5F24-67	LITIJA-67
1:5000	2250	3000	45	60	675,0	5	6,25	5F24-36	LITIJA-36
1:10000	4500	6000	45	60	2700,0	5	25,00	5F24-7 5F23,24-14	LITIJA-7 VIŠNJA GORA, LITIJA-14

Slika 5.1.1.7: Preglednica razdelitve na detajlne liste.
Vir: Arhiv GURS

Figure 5.1.1.7: Table of division into detail sheets.
Source: The SMARS archive

5.2 Numerično grafični kataster
Numerical-graphical cadastre

V strokovni literaturi se za to vrsto katastra uporablja tudi pojem numerični kataster. S tem imenom se označujejo območja katastra, za katera so katastrski načrti izdelani z uporabo geodetske ortogonalne izmere ali tahimetrične izmere. Pri teh izmerah so terenski merski podatki v obliki terenskih skic za ortogonalne izmere oz. terenskih skic in tahimetričnih zapisnikov za tahimetrične izmere del geodetskega elaborata, ki je del trajnega arhiva zemljiškega katastra. Na podlagi teh merskih podatkov so bili z ročnim kartiranjem izdelani analogni katastrski načrti. Grafični izris katastrskih načrtov je bil torej izdelan s kartiranjem numeričnih merskih podatkov. V to skupino izmer štejemo tudi enoslikovne fotogrametrične izmere.

Nove izmere so se med letoma 1953 in 1965 izvajale skladno z določili zvezne Uredbe o zemljiškem katastru (Uradni list FLRJ, št. 43/1953, 23/1956, 52/1959 in 13/1961) in njenih izvedbenih podzakonskih predpisov, med letoma 1965 in 1974 pa skladno z določili zveznega Temeljnega zakona o izmeritvi zemljišč in zemljiškem katastru Uradni list SFRJ, št. 15/65) in njegovih izvedbenih podzakonskih predpisov.

Po končani izmeritvi vsake katastrske občine se je izvedla katastrska klasifikacija zemljišč po načinu uporabe (vrsti kulture) in kakovosti (boniteti, rodovitnosti) zemljišč. Po načinu uporabe (kulturi) so vsa rodovitna zemljišča delili na: njive, vrtove, sadovnjake, vinograde, travnike, pašnike in planine, gozdove, trstičja, močvirja, ribnike in jezera. Po kakovosti (rodovitnosti) se je vsaka od naštetih vrst delila na osem razredov po katastrskih okrajih. Klasifikacijo zemljišč je opravila posebna tričlanska komisija. Dva člana je določil pristojni občinski ljudski odbor iz vrst državljanov z območja katastrske občine, ki se je klasificirala, tretji član pa je bil agronom, ki ga je določil okrajni (mestni) ljudski odbor v sporazumu z Republiško geodetsko upravo.

Na podlagi podatkov izmeritve in katastrske klasifikacije zemljišč je bil izdelan katastrski operat, ki je obsegal:

a) zapisnik o določitvi mej katastrske občine,
b) detajlne skice o izmeritvi,
c) kopije detajlnih načrtov (map),
d) seznam parcel,
e) posestne liste,
f) sumarnik posestnih listov,
g) razvrstitev po kulturah in razredih,
h) abecedni pregled posestnikov,
i) številčni pregled posestnih listov,

In the professional literature, this type of cadastre is also termed the numerical cadastre. This term indicates the areas of the cadastre for which cadastral plans have been prepared using a geodetic orthogonal survey or a tachymetric survey. In these surveys, field measurement data in the form of field sketches for orthogonal surveys or field sketches and tachymetric records for tachymetric surveys is part of the surveying reports, which are part of the permanent archive of the land cadastre. Using this measurement data, analogue cadastral plans were made by manual mapping. The graphical plot of the cadastral plans was therefore made by mapping the numerical measurement data. This group of surveys also includes single-image photogrammetric surveys.

New surveys were carried out between 1953 and 1965 in accordance with the provisions of the Federal Land Cadastre Regulation (Official Gazette of the FPRY, No. 43/1953, 23/1956, 52/1959 and 13/1961) and its implementing regulations, and between 1965 and 1974 in accordance with the provisions of the Federal Basic Act on Land Measurement and Land Cadastre (Official Gazette of the SFRY, no. 15/65) and its implementing regulations.

After the survey of each cadastral municipality was completed, the cadastral classification of land was performed according to the method of use (type of culture) and quality (benefit, fertility) of land. In terms of the method of use (culture), all fertile lands were divided into: fields, gardens, orchards, vineyards, meadows, pastures, forests, reeds, swamps, ponds and lakes. In terms of quality (fertility), each of the listed types was divided into eight classes according to cadastral districts. The classification of land was carried out by a special three-member commission. Two members were appointed by the competent municipal people's committee from the ranks of citizens from the area of the cadastral municipality that was being classified, and the third member was an agronomist appointed by the district (town) people's committee in agreement with the Republic Geodetic Administration.

The survey data and cadastral classification of land served as a basis for producing the cadastral record, which included:

a) minutes on the determination of the borders of the cadastral municipality,
b) detail sketches of the survey,
c) copies of detail plans (maps),
d) list of plots,
e) property sheets,
f) summary of property sheets,
g) classification by cultures and classes,
h) alphabetical overview of landowners,

j) seznam vzorčnih zemljišč in
k) seznam koordinat in absolutnih višin (kot).

Nove izmere iz tega obdobja so bile v kataster vpisane praviloma na podlagi izvedene skupne javne zemljiškokatastrske in zemljiškoknjižne razgrnitve podatkov v izmerjenih katastrskih občinah, na katere so bili po urniku posamično s pisnim vabilom povabljeni vsi lastniki parcel oz. zastopniki vsakega gospodinjstva ali gospodarstva. Zoper podatke, vpisane v katastrskem operatu, razen zoper podatke o klasifikaciji zemljišč, so lahko prizadeti ugovarjali med samo razgrnitvijo. Komisija je morala odločiti o vseh ugovorih med razgrnitvijo podatkov. Naslednja možnost pritožbe za prizadete je bila pritožba na okrajni ljudski odbor v petnajstih dneh po končani razgrnitvi, če se niso strinjali s podatki, ki so se nanašali na klasifikacijo zemljišč, ali če se niso strinjali z drugimi podatki iz katastrskega operata. O teh pritožbah je odločala posebna komisija, ki jo je imenoval okrajni ljudski odbor. V tej komisiji je moral biti tudi zastopnik republiške geodetske uprave. Katastrski operat in začetek njegove uporabe je Republiška geodetska uprava potrdila z odločbo.

i) numerical inspection of property sheets,
j) a list of sample plots, and
k) list of coordinates and absolute heights (angle).

New surveys from this period were entered in the cadastre as a rule on the basis of a joint public land cadastre and land registry disclosure of data in the surveyed cadastral municipalities, to which all owners of plots and representatives of each household or holding were invited by written invitation and following a set schedule. The persons affected were able to object to the data entered in the cadastral record during the disclosure itself, with the exception of the data on the classification of land. The committee had to decide on any objections during the disclosure. Another option for those affected was to appeal to the county people's committee within fifteen days of the completion of the disclosure if they did not agree with data relating to the land classification or if they did not agree with other data from the cadastral record. These appeals were decided by a special commission appointed by the district people's committee. The committee also had to include a representative of the Republic Geodetic Administration. The cadastral record and the commencement of its use were confirmed by the Republic Geodetic Administration with a decision.

5.2.1 Zamejničenje mej katastrskih občin
Marking out the borders of cadastral municipalities

Pred novo izmero je bilo treba območje katastrske občine, ki je bila predmet nove izmere, točno določiti s terenskim obhodom in na terenu zamejničiti s trajnimi mejnimi kamni ter celotno mejo skrbno opisati v predpisanem zapisniku zamejničenja. Uredba o zemljiškem katastru je v II. poglavju o katastrskih občinah in katastrskih okrajih določala, da je osnovna katastrska področna enota katastrska občina, ki obsega vsa zemljišča na območju enega naselja (vasi, mesta), in se zanjo sestavi en katastrski operat.

Razmejitev območja posameznih katastrskih občin je opravila posebna komisija, ki sta jo sestavljali po dve osebi z območja katastrskih občin, katerih meje so se ugotavljale, in zastopnik okrajnega (mestnega) ljudskega odbora, ki je moral biti geodetski strokovnjak. Osebe z območja katastrskih občin je določil ljudski odbor pristojne občine in so bile praviloma osebe z dobrim poznavanjem terenskega in lastniškega stanja v svoji katastrski občini.

Spore glede razmejitve katastrskih občin na območju iste upravne občine je reševal občinski ljudski odbor. V primeru spora glede razmejitve katastrskih občin zaradi tega, ker je bila sporna meja med dvema upravnima občinama istega

Before the new survey, the area of the cadastral municipality which was the subject of the new survey had to be precisely determined by a field walk and demarcated in the field with permanent border stones, and the entire border was carefully described in the prescribed border marking record. The second chapter of the Decree on the Land Cadastre on Cadastral Municipalities and Cadastral Districts determined that the basic cadastral regional unit is the cadastral municipality, which includes all land in the area of one settlement (village, town), and for which one cadastral record is compiled.

The demarcation of the areas of individual cadastral municipalities was carried out by a special commission consisting of two persons from the area of cadastral municipalities whose borders were being determined and a representative of the district (town) people's committee, who had to be a surveying expert. Persons from the area of cadastral municipalities were appointed by the people's committee of the competent municipality and were, as a rule, persons with good knowledge of the field and ownership situation in their cadastral municipality.

Disputes regarding the demarcation of cadastral municipalities in the area of the same administrative municipality were resolved by the municipal people's committee. In the event of a dispute regarding the demarcation of cadastral municipalities due to the fact that

okraja, je o sporu odločil okrajni (mestni) ljudski odbor. V primeru spora zaradi tega, ker je bila sporna meja med dvema okrajema iste republike, je o sporu odločil republiški izvršni svet. V primeru spora zaradi tega, ker je bila sporna meja med dvema republikama, pa je o tem odločil Zvezni izvršni svet.

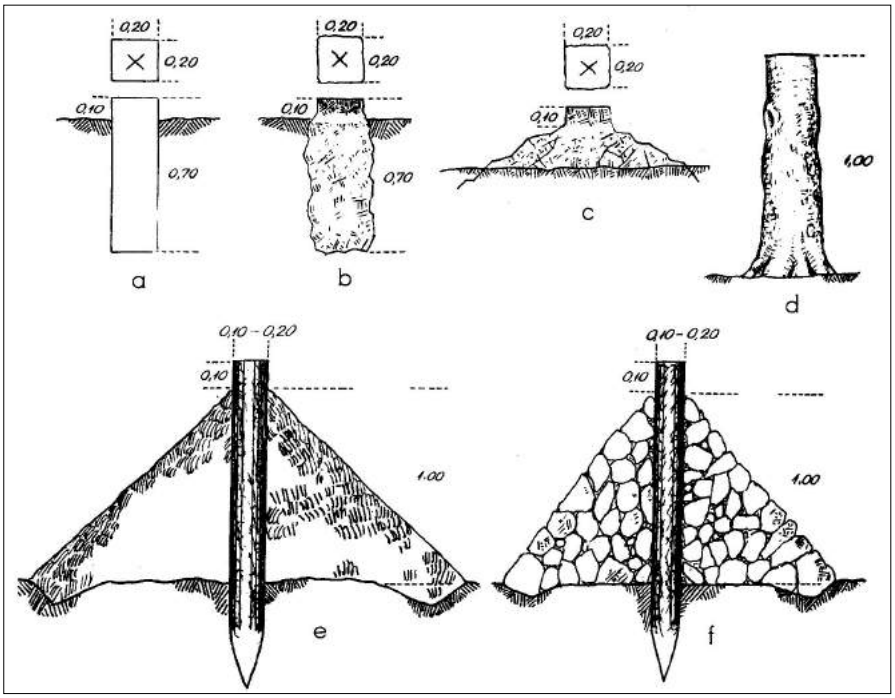
Zoper odločbo o razmejitvi katastrskih občin, ki jo je izdal občinski ljudski odbor, je bila dopustna pritožba na okrajni (mestni) ljudski odbor. Zoper odločbo, ki jo je izdal na prvi stopnji okrajni (mestni) ljudski odbor, je bila dopustna pritožba na republiški izvršni svet. Zoper odločbo okrajnega (mestnega) ljudskega odbora, izdano na drugi stopnji, in zoper odločbo republiškega in Zveznega izvršnega sveta je bil mogoč upravni spor.

Iz zgoraj zapisanega je razvidno, da je bilo izvajanje zamejničenja mej katastrskih občin podrobno predpisano in je vsebovalo ustrezno upravno varstvo. V tehničnem smislu pa so bila pravila in postopek zamejničevanja mej katastrskih občin natančno določena do vseh podrobnosti.

the disputed border was between two administrative municipalities of the same district, the dispute was decided by the district (town) people's committee. In the event of a dispute due to the fact that the disputed border was between two districts of the same republic, the dispute was decided by the Republic Executive Council. In the event of a dispute over the border between the two republics, however, this was decided by the Federal Executive Council.

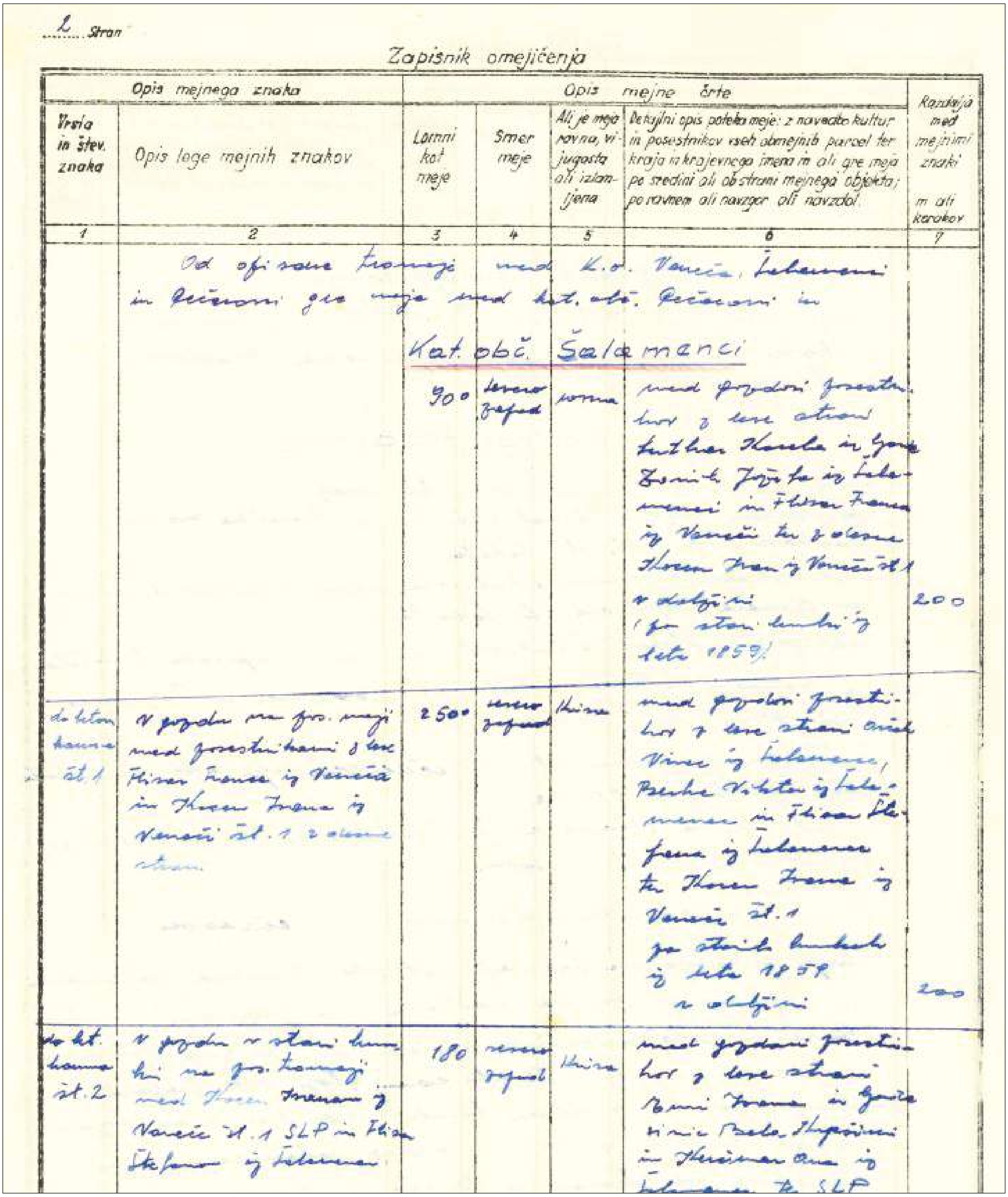
An appeal against a decision on the demarcation of cadastral municipalities issued by the municipal people's committee was admissible to the district (town) people's committee. An appeal against a decision issued at the first instance by the district (town) people's committee was admissible to the Republic Executive Council. An administrative appeal was admissible against a decision of the district (town) people's committee issued at the second instance and against the decision of the Republic and Federal Executive Councils.

It is evident from the above that the implementation of the demarcation of the borders of cadastral municipalities was prescribed in detail and included adequate administrative protection. The rules and procedures for the demarcation of borders of cadastral municipalities were specified in detail in technical terms as well.



Slika 5.2.1.1: Možne vrste označitve zamejničenja mej k. o. s trajnimi znamenji predpisanih dimenzij – a)betonski kamen, b) naravni kamen z obklesano glavo c) urezana oznaka v skalo, d) prisekano deblo, e) lesen kol v humki zemljine in f) lesen kol v humki zloženega kamenja.
Vir: Pravilnik za državni premer III. del iz leta 1958, 15. člen

Figure 5.2.1.1: Possible ways of marking out the border lines of CMs with permanent signs of prescribed dimensions – a) concrete stone, b) natural stone with carved head, c) mark carved in a rock, d) truncated trunk, e) wooden stake in a mound of earth, and f) wooden stake in a mound of stacked stones.
Source: Rules for the National Survey of 1958, Article 15



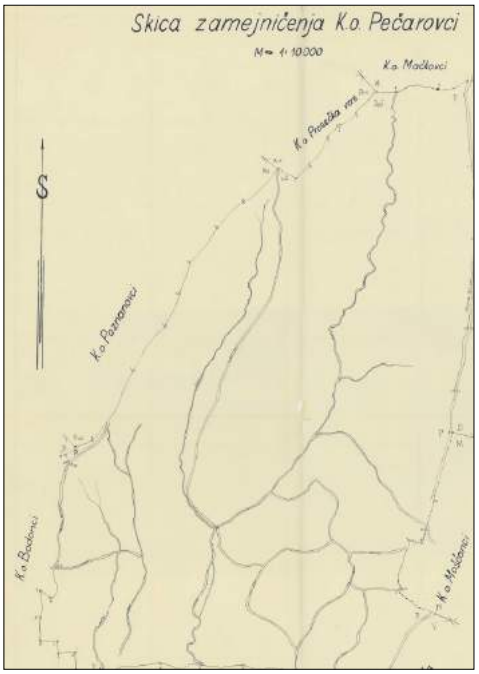
2 Stran

Zapisnik omejičenja

Opis mejnega znaka		Opis mejne črte				Razdalja med mejnimi znaki m ali korakov
Vrsta in štev. znaka	Opis lege mejnih znakov	Lomni kot meje	Smer meje	Ali je meja ravna, vijugasta ali izlomljena	Detajlni opis poteka meje: z navedbo kultur in posestnikov vseh obmejnih parcel ter kraja in krajevnega imena in ali gre meja po sredini ali ob strani mejnega objekta; po ravnem ali navzgor ali navzdol.	
1	2	3	4	5	6	7
	Kat. obč. Šalamenci					
		90°				200
do kat. kamna št. 1		250°				200
do kat. kamna št. 2		180				

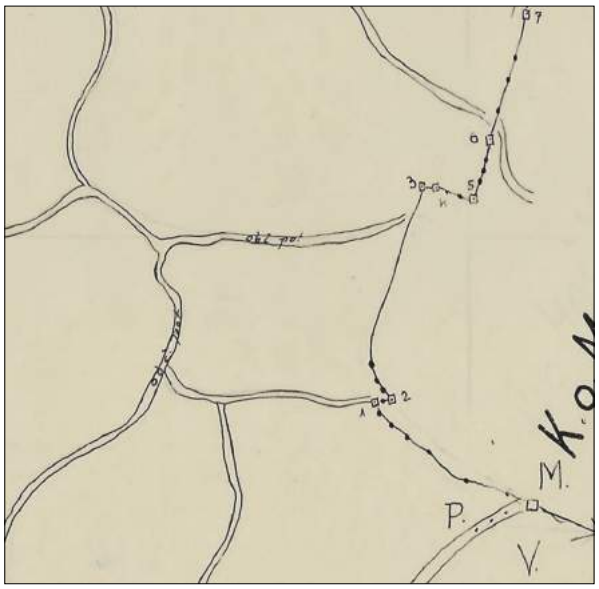
Slika 5.2.1.2: Primer zapisnika zamejničenja mej k. o. 54 Pečarovci po določilih Uredbe o katastru iz leta 1953.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.2.1.2: Example of a border demarcation record of CM 54 Pečarovci according to the provisions of the Decree on the Cadastre of 1953.
Source: ZK archive digital survey report viewer



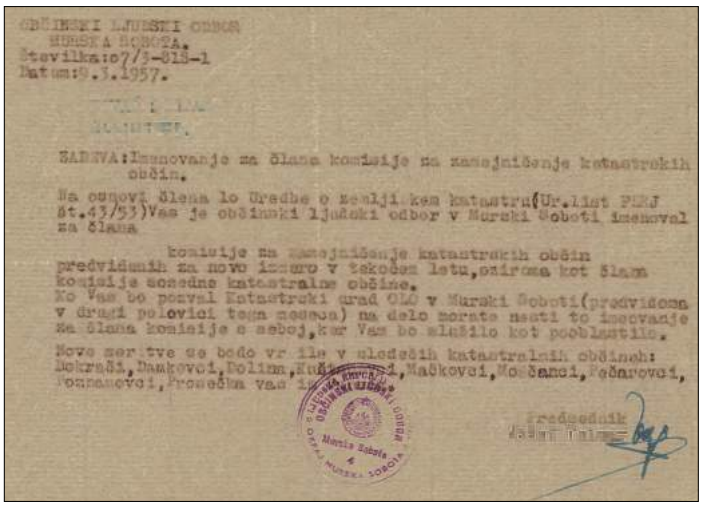
Slika 5.2.1.3: Skica zamejničenja mej k. o. kot sestavni del zapisnika. Na njej so označeni in oštevilčeni stabilizirani mejni kamni, ki so bili postavljeni na značilnih točkah mej k. o. in opisani v zapisniku.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.2.1.3: Sketch of the border demarcation of a CM as an integral part of the record. Border stones are marked and numbered, and were placed at characteristic points of the borders of CM and described in the record.
Source: ZK archive digital survey report viewer



Slika 5.2.1.4: Izrez iz skice zamejničenja mej k. o. s prikazanimi oznakami in številkami stabiliziranih mejnih kamnov.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.2.1.4: Sketch of the border demarcation of a CM with markings and numbers of stabilized border stones.
Source: ZK archive digital survey report viewer



OBČINSKI LJUDSKI ODBOR
MURSKA SOBOTA.
Številka:07/3-013-1
Datum:9.1.1957.

ZADEVA:Imenovanje za člana komisije za zamejničenje katastrskih občin.

Na osnovi člena 10 Uredbe o zemljiškem katastru(Ur.list FLRJ št.43/55)Vas je občinski ljudski odbor v Murski Soboti imenoval za člana

komisije za zamejničenje katastrskih občin predvidenih za novo izmero v tekočem letu,zaprisa kot član komisije sosednje katastralne občine.
Ko Vas bo pozval Katastrski urad OLO v Murski Soboti(predvidoma v drugi polovici tega meseca) na delo morate nasti to imenovanje za člana komisije s seboj,ker Vas bo služilo kot pooblastilo.

Nove meritve se bodo vršile v naslednjih katastralnih občinah: Dokležki,Damkovci,Dolina,Kuzmovci,Mačkovci,Mo.Šanci,Pečarovci, Ivanovci,Proseška vas i

Predsednik

Slika 5.2.1.5: Primer imenovanja člana komisije za zamejničenje katastrskih občin s strani občinskega ljudskega odbora iz leta 1957.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.2.1.5: Example of an appointment of a member of the commission for the demarcation of cadastral municipalities by the municipal people's committee from 1957.
Source: ZK archive digital survey report viewer

Ko je bilo zamejničenje meje k. o., ki je bila predmet nove izmere, na predpisan način zaključeno, so geodetske ekipe organizirano izvedle postopke geodetske izmere na enega od v nadaljevanju opisanih načinov.

When the demarcation of a border of the CM which was the subject of the new survey was completed in the prescribed manner, the surveying teams carried out the geodetic survey procedures in an organized manner in one of the ways described below.

5.2.2 Ortogonalna izmera
Orthogonal survey

Ortogonalna izmera se je uporabljala na območjih naselij, kjer je značilna velika gostota detajla in pozidanosti terena. Pri ortogonalni izmeri se za vsako točko detajla izmerijo pravokotne koordinate v lokalnem pravokotnem koordinatnem sistemu. Os x v tem lokalnem koordinatnem sistemu predstavlja smer stranice v poligonskem vlaku ali neke druge stranice z znanima koordinatama krajišč v državnem koordinatnem sistemu. Os y je pravokotnica na os x iz začetne točke stranice. V takem lokalnem koordinatnem sistemu geodet lokalne koordinate točk detajla določa z merjenjem dolžin vzdolž stranice, ki predstavljajo lokalno koordinato x

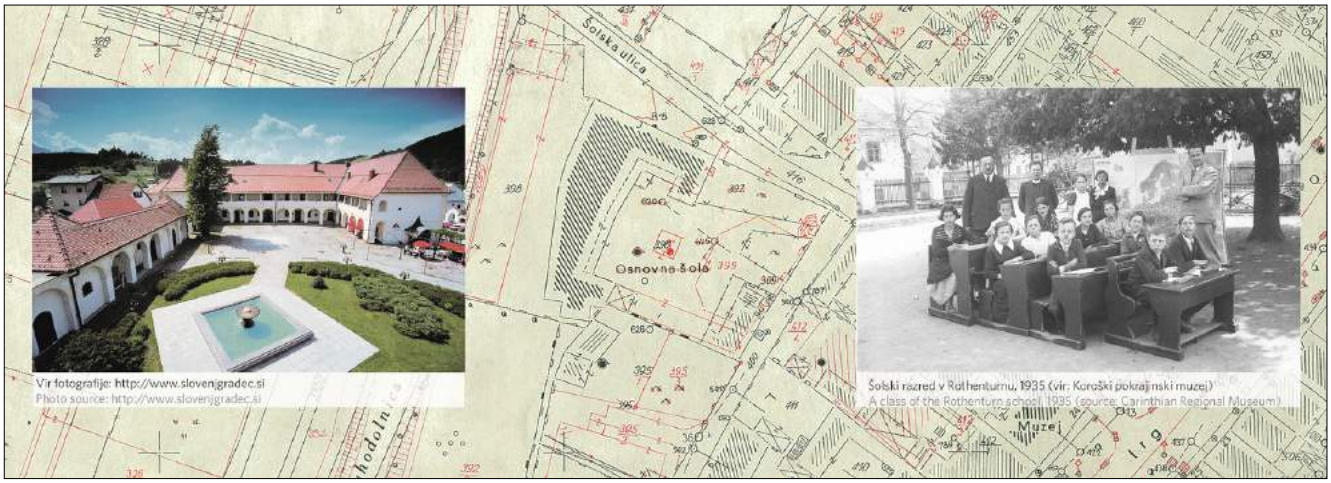
Orthogonal surveying was used in areas of settlements with high density of detail and built-up terrain. In orthogonal surveying, the orthogonal coordinates in the local orthogonal coordinate system are measured for each detail point. The x-axis in this local coordinate system represents the direction of the side in the polygon train or some other side with known corner coordinates in the national coordinate system. The y-axis is perpendicular to the x-axis from the origin point of the side. In this type of local coordinate system, the surveyor determines the local coordinates of the detail points by measuring the lengths along the side representing the local x-coordinate (the abscissa) and measuring the lengths of the lines perpendicular to the side representing the local y-coordinate

Grad Rotenturn

Grad Rotenturn stoji na robu starega mestnega jedra Slovenj Gradca. Slikovit dvorec z arkadnimi hodniki in lepim baročnim portalom se je z vrsto prezidav v stoletjih razrasel iz prvotnega obrambnega stolpa, prvič omenjenega v 15. stoletju, in iz dela mestnega obzidja. Zgledna prenova v zadnjih letih mu je dala pečat topline in pridih domačnosti, ne da bi mu odvzela kaj tiste lepote, ki so mu jo vtisnili predvsem ob zadnjih velikih prezidavah v 18. stoletju. Grad Rotenturn je še vedno tesno vpet v mestno življenje. Danes so tu sedež uprave Mestne občine Slovenj Gradec in županstvo. Atrij dvorca je v zadnjih letih postal osrednji slovenjgraški prireditveni prostor.

Rotenturn Castle

Rotenturn Castle is located on the edge of the old town centre in Slovenj Gradec. The picturesque mansion, with its arcaded corridors and a beautiful baroque portal, has grown over the centuries from its original structure of a defensive tower, first recorded in the 15th century, and from part of the city walls. The exemplary renovation in recent years has given it the seal of warmth and a touch of homeliness without depriving it of any of its adornments, particularly those made during the last major renovations in the 18th century. The Rotenturn Castle is still very present in city life. Today, it is the location of the headquarters of the Municipality of Slovenj Gradec and the Mayor's office. In recent years, the atrium of the mansion has become the central event space in Slovenj Gradec.

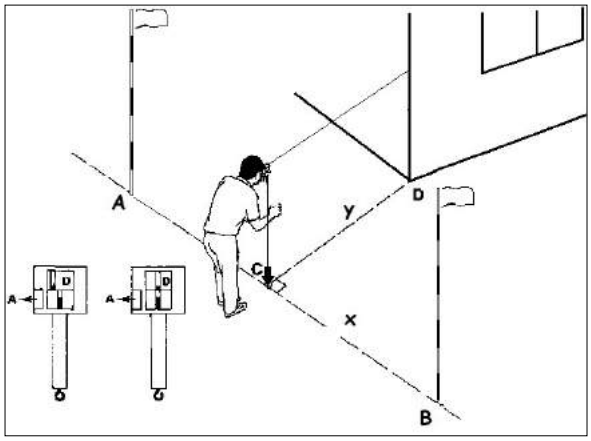


V dvorcu Rotenturn je od leta 1901 do 1967 delovala slovenska okoliška ljudska šola. Ob novi izmeri v k. o. 850 Slovenj Gradec v letu 1962 je bil ta podatek zabeležen (prav tako poimenovanje ulice, ob kateri objekt stoji) in nato na zemljiškokatastrskem načrtu nove izmere, ki se je začel uporabljati v letu 1969, tudi prikazan. Načrt je bil sicer v uporabi do leta 1999, prečrtan napis »Osnovna šola« pa kaže na to, da je bilo tudi prenehanje te dejavnosti zabeleženo. Poimenovanje ulice je ostalo vse do danes.
Vir: e-ZKN pregledovalnik arhivskih zemljiškokatastrskih načrtov

From 1901 to 1967, a Slovenian folk school operated in the Rotenturn Mansion. This information (along with the name of the street next to which the building stands) was recorded in the new survey in CM 850 Slovenj Gradec in 1962 and then also shown on the land cadastral plan of the new survey, which came into use in 1969. The plan was in use until 1999, and the crossed-out inscription "Primary school" indicates the recording of the cessation of this activity. The naming of the street has remained to this day.
Source: the e-ZKN archive land cadastre map viewer

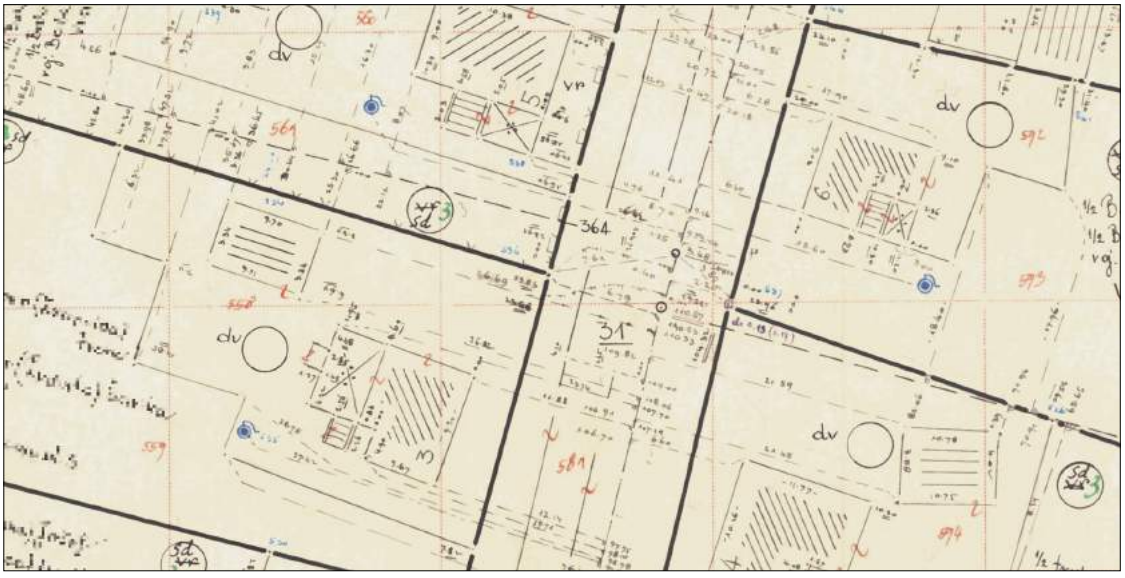
(t. i. abscisa), in merjenjem dolžin pravokotnic na stranico, ki predstavljajo lokalno koordinato y (t. i. ordinata). Vznožje pravokotnice na stranici se za vsako merjeno točko detajla določa z optičnim pripomočkom prizmo. Abscise se merijo na merskem traku, napetem v smeri stranice, ordinate pa s trakom od vznožja pravokotnice do merjene točke detajla. Z ortogonalno izmero se določa samo horizontalni položaj točk detajla. Višinski položaj točk detajla se določa ločeno z detajlnim nivelmanom.

(the ordinate). The base of the perpendicular on the side line is determined for each measured detail point by an optical device – a prism. Abscissas are measured on a measuring tape tensioned in the direction of the side line, and ordinates are measured with a tape from the base of the perpendicular to the measured detail point. The orthogonal measurement only determines the horizontal position of the detail points. The vertical position of the detail points is determined separately by detailed levelling.



Slika 5.2.2.1: Prikaz načina ortogonalne izmere: trasirki sta na krajiščih znanih točk A in B. Geodet se pomika po liniji med trasirkama in opazuje vogal stavbe D skozi prizmo. Ko sta v prizmi poravnani trasirki v isto vertikalo z vogalom stavbe, položaj svinčnice na liniji med A in B v vznožišču pri tleh v točki C določa absciso x in ordinato y do merjenega vogala stavbe D.

Figure 5.2.2.1: Demonstration of the orthogonal measurement method: the tracers are at the intersections of known points A and B. The surveyor moves along the line between the tracers and observes the corner of building D through the prism. When the traces are aligned in the prism in the same vertical line with the corner of the building, the position of the plummet on the line between A and B at the base at the ground at point C determines the abscissa x and ordinate y to the measured corner of building D.



Slika 5.2.2.2: Izrez iz skice ortogonalne nove izmere k. o. 105 Murska Sobota na območju mesta Murska Sobota iz leta 1967. V sredini slike sta vidni poligonska točka 31 in linijska točka 364, iz katerih prečno na smer ulice potekata dodatni abscisi za merjenje detajla v notranjosti parcel, ki ni vidna s ceste. Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.2.2.2: Excerpt from a sketch of a new orthogonal survey of CM 105 Murska Sobota in the area of the town of Murska Sobota from 1967. In the middle of the image, the polygon point 31 and the line point 364 are visible, from which additional abscissas run transversely in the direction of the street to measure the detail inside the plots, which is not visible from the road.
Source: ZK archive digital survey report viewer

[1]Opomba: V dokumentih iz zbirke listin Zemljiškega katastra so varovani osebni podatki zakriti.
[1]Note: Protected personal data is hidden in the land cadastre documents.

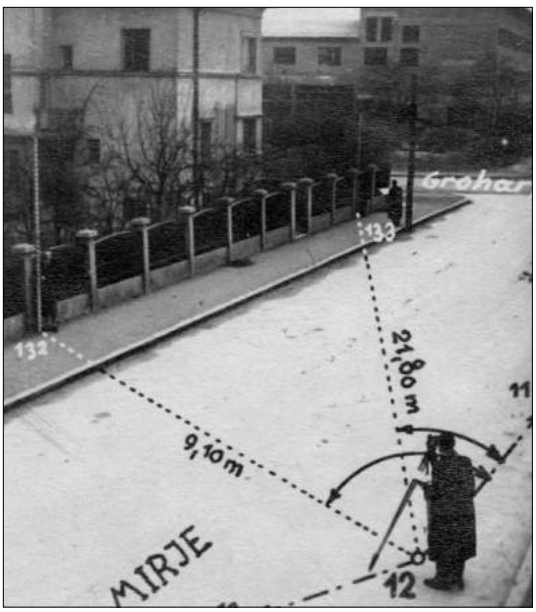
5.2.3 Tahimetrična izmera
Tachymetric survey

S tahimetrično izmero se za vsako točko detajla izmerijo njene polarne koordinate, t. i. polarni kot in polarna razdalja. Polarno os lokalnega polarnega koordinatnega sistema predstavlja smer proti sosednji poligonski točki oz. drugi točki z znanim položajem v državnem koordinatnem sistemu. Izhodišče lokalnega polarnega koordinatnega sistema je na točki z znanimi koordinatami v državnem koordinatnem sistemu, ki je tudi stojišče instrumenta. Polarne kote se meri z instrumentom – teodolitom. Polarne razdalje pa se lahko merijo na več načinov: s trinitnimi ali avtoredukcijskimi optičnimi razdaljemeri, z merskim trakom, v novejših časih nekje od leta 1975 naprej pa z elektronskim razdaljemerom oz. kasneje s t. i. elektronskimi totalnimi postajami.

Tahimetrična izmera je primerna za uporabo na terenih, ki so manj porasli, in brez goste pozidave oz. povsod tam, kjer je možno z enega stojišča instrumenta posneti čim več točk detajla. Zato se ta metoda pogosto uporablja za geodetsko izmero odprtih območij izven naselij in v naseljih z redko pozidavo. S tahimetrično izmero se poleg dolžin in horizontalnih kotov merijo tudi vertikalni koti, kar pomeni, da se poleg horizontalnega položaja točk detajla z izračunom višinskih razlik od stojišča določajo tudi nadmorske višine točk detajla.

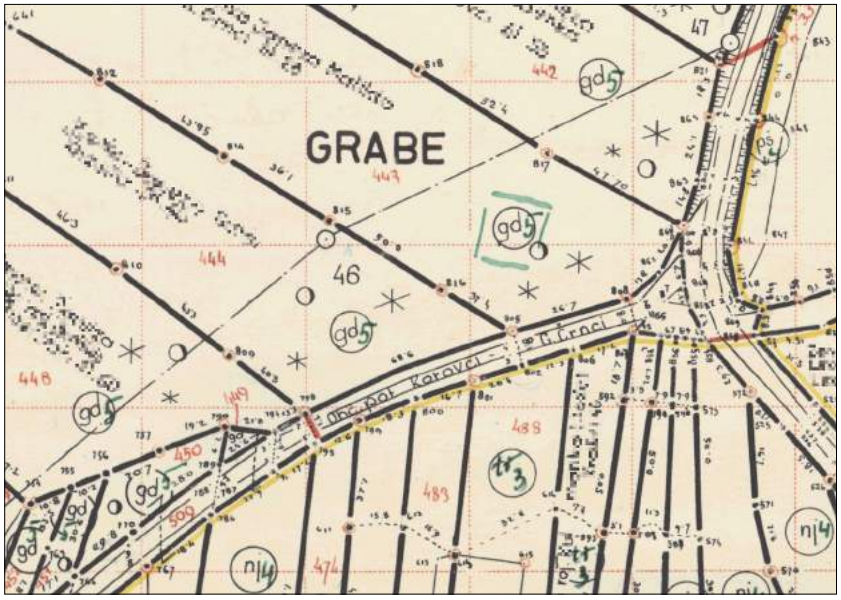
In tachymetric surveying, polar coordinates, i.e. polar angle and polar distance, are measured for each detail point. The polar axis of the local polar coordinate system represents the direction towards the adjacent polygon point or other point with a known position in the national coordinate system. The origin of the local polar coordinate system is at a point with known coordinates in the national coordinate system, which is also the position of the instrument. Polar angles are measured with an instrument – a theodolite. Polar distances can be measured in several ways: with horizontal longitude or auto-reducing optical rangefinders, with a measuring tape, and in modern times from around 1975 onwards with an electronic rangefinder or more recently with so-called electronic total stations.

Tachymetric surveying is suitable for use on terrains that are less overgrown and without dense construction or wherever it is possible to record as many detail points as possible from one instrument stand. This method is therefore often used for geodetic surveying of open areas outside settlements and in settlements with sparse construction. In addition to lengths and horizontal angles, tachymetric surveying also measures vertical angles, which means that in addition to the horizontal position of the detail points, the elevations of the detail points are also determined by calculating the height differences from the stand.



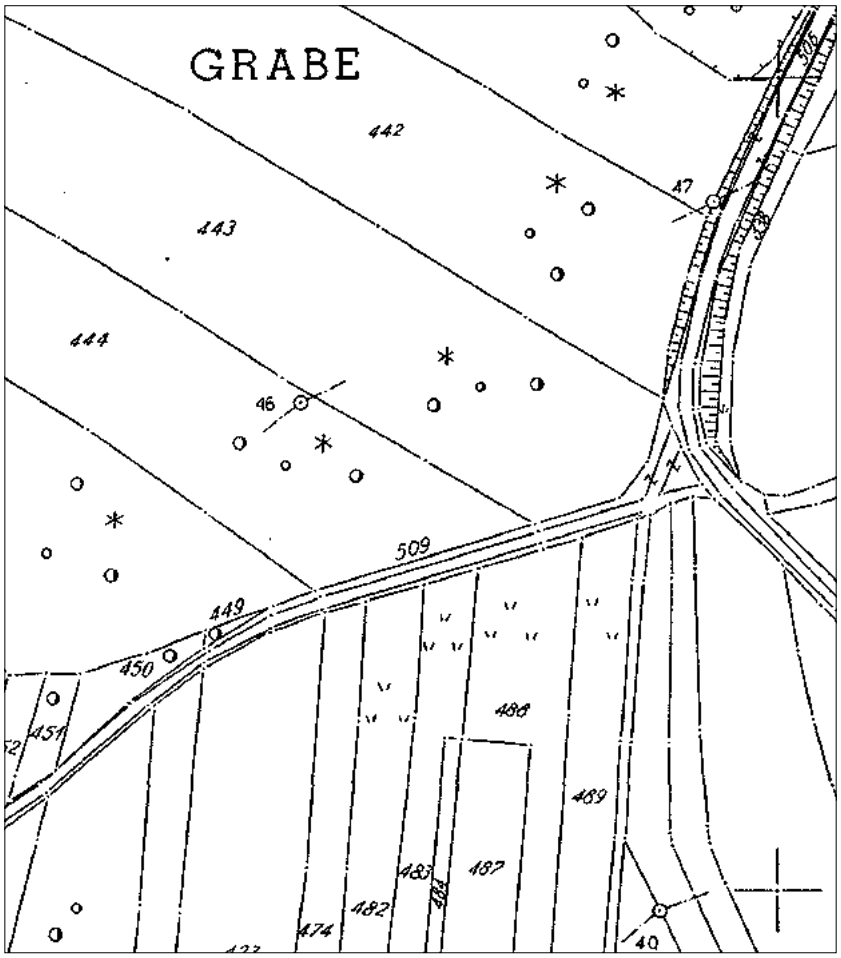
Slika 5.2.3.1: Prikaz načina polarnega snemanja.
Vir: Arhiv GURS

Figure 5.2.3.1: Display of the polar recording mode.
Source: The SMARS archive



Slika 5.2.3.2: Izrez iz skice tahimetrične nove izmere k. o. 67 Gornji Črnci. Na lomnih točkah parcelnih mej in mej vrst rabe so vidne številke tahimetrično izmerjenih detajlnih točk, za katere so merski podatki vpisani v tahimetričnem zapisniku. Vidne so tudi oznake poligonskih točk in smeri med njimi, oznake vrst rabe ter katastrskih kultur in razredov, topografske oznake in notranji opisi.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

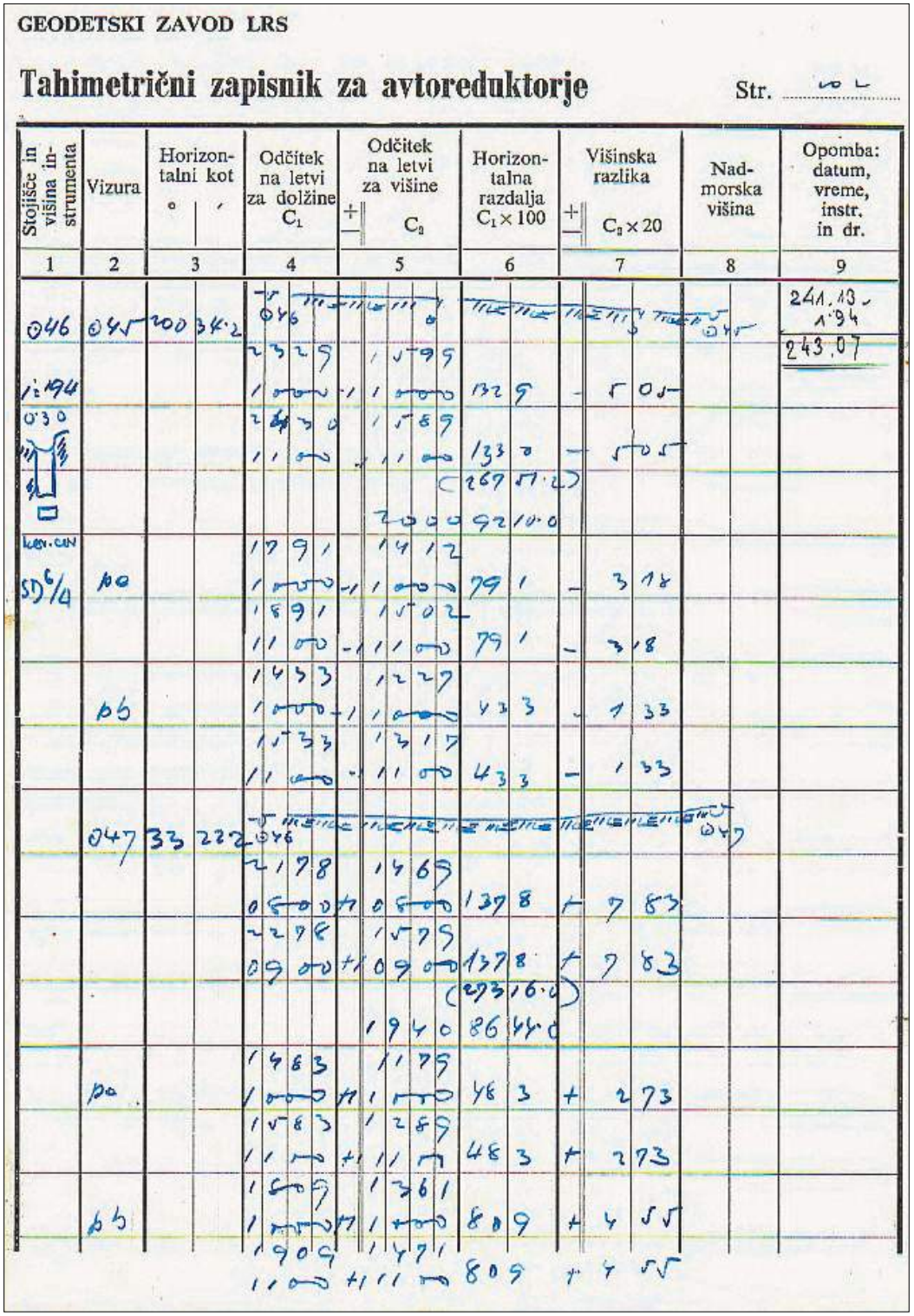
Figure 5.2.3.2: Excerpt from a sketch of a new tachymetric survey in CM 67 Gornji Črnci. The numbers of tachymetrically measured detail points, whose measurement data is entered in the tachymetric record, are visible at the gradient points of plot borders and borders of types of use. Shown as well are the markings of polygon points and directions between them, markings of types of use and cadastral cultures and classes, topographic markings and internal descriptions.
Source: ZK archive digital survey report viewer



Slika 5.2.3.3: Izrez iz zemljiškokatastrske nove izmere k. o. 67 Gornji Črnci. Kartiranje načrta je bilo izvedeno na podlagi tahimetričnih podatkov in terenske skice, ki je prikazana na prejšnji sliki.
Vir: e-ZKN pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 5.2.3.3: Excerpt from the new land cadastre survey in CM 67 Gornji Črnci. The mapping of the plan was performed on the basis of the tachymetric data and the field sketch shown in the previous figure.
Source: the e-ZKN archive land cadastre map viewer

[1]Opomba: V dokumentih iz zbirke listin Zemljiškega katastra so varovani osebni podatki zakriti.
[1]Note: Protected personal data is hidden in the land cadastre documents.


GEODETSKI ZAVOD LRS

Tahimetrični zapisnik za avtoreduktorje

Str.

Stojišče in višina instrumenta	Vizura	Horizontalni kot ° '	Odčitek na letvi za dolžine C_1	Odčitek na letvi za višine C_2	Horizontalna razdalja $C_1 \times 100$	Višinska razlika $C_2 \times 20$	Nadmorska višina	Opomba: datum, vreme, instr. in dr.
1	2	3	4	5	6	7	8	9
046	045	200 34.2	2329	1599				241.13 1.94
1.94			1	1	1329	− 505		243.07
0.30			2430	1589				
			1 1	1 1	1330	− 505		
					(269 51.2)			
				2000	9210.0			
KER.CIN			1791	1412				
SD 6/4	40		1	1	791	− 318		
			1891	1502				
			1 1	1 1	791	− 318		
			1433	1227				
	45		1	1	433	− 133		
			1533	1317				
			1 1	1 1	433	− 133		
	047	33 222	046				047	
			2178	1469				
			0 0	+ 0 0	1378	+ 783		
			2276	1579				
			09 00	+ 09 00	1378	+ 783		
					(2931 6.0)			
				1940	8644.0			
			1463	1179				
	40		1	+ 1	463	+ 273		
			1563	1259				
			1 1	+ 1 1	483	+ 273		
			1609	1361				
	45		1	+ 1	809	+ 455		
			1909	1471				
			1 1	+ 1 1	809	+ 455		

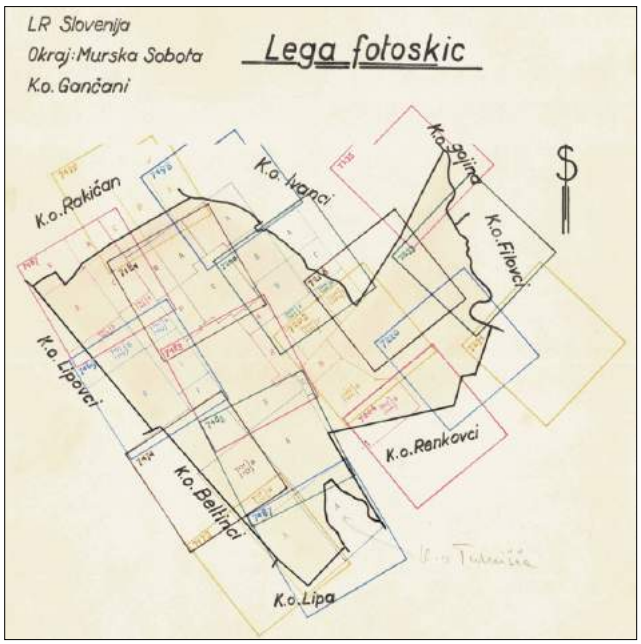
Slika 5.2.3.4: Primer tahimetričnega zapisnika z začetnimi priklepnimi vizurami s poligonske točke 46 na sosednji poligonski točki 45 in 47.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.2.3.4: Example of a tachymetric record with initial adjoining vistas from polygon point 46 to adjacent polygon points 45 and 47.
Source: ZK archive digital survey report viewer

5.2.4 Fotogrametrična izmera (enoslikovna)
Photogrammetric survey (single image)

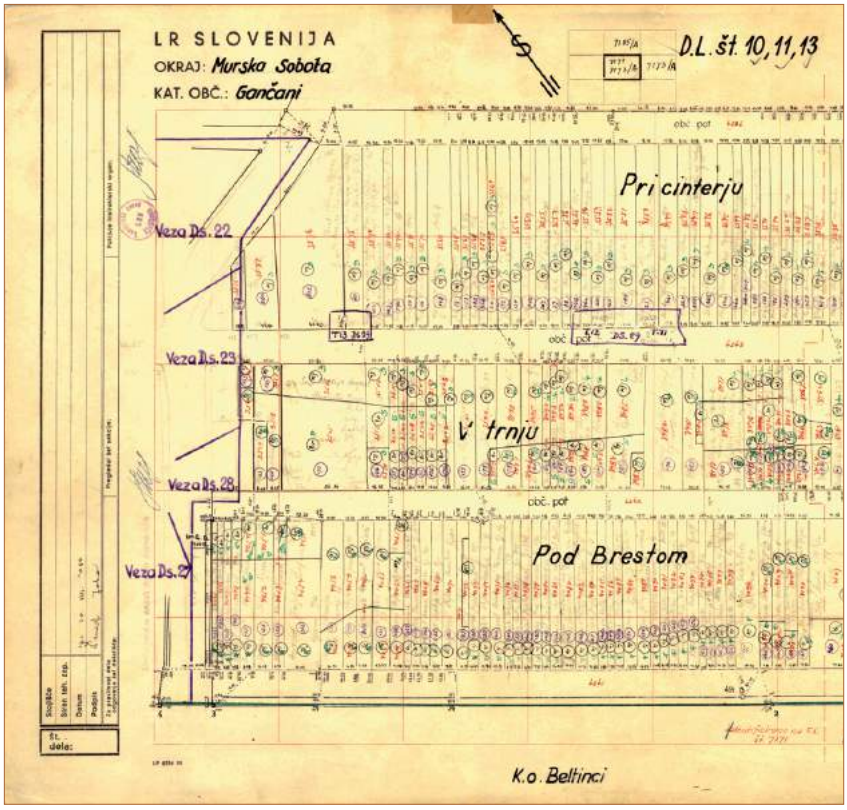
Enoslikovna fotogrametrična izmera spada še v področje analogne fotogrametrije, kjer so se merski postopki na fotografsko zajetih podatkih izvajali s pomočjo optično-mehanskih fotografskih in kartirnih naprav. V teh postopkih so bili katastrski načrti izdelani na podlagi kartiranja numeričnih podatkov terensko izmerjene in z letalskim snemanjem posnete geodetske mreže ter terensko izmerjenih dolžin in z reprografskim postopkom t. i. redresiranja aerofotogrametričnih slikovnih podatkov, na katerih so bili kot bele pike vidni mejniki, ki so bili na enega od predpisanih načinov ploskovno označeni/signalizirani na terenu (glej sliko 5.2.4.3). Z redresiranjem so se odpravile perspektivne deformacije posameznih posnetkov kot posledica nevzporednosti slikovne ravnine z ravnino terena. Absolutna orientacija je bila izvedena s pomočjo terensko izmerjenih in letalsko posnetih signaliziranih točk geodetske mreže. Uporaba te metode je bila zaradi tehničnih omejitev postopka redresiranja za dosego zahtevane položajne kakovosti katastrskih načrtov možna le na ravninskem terenu, zato se je na območju Slovenije izvajala predvsem na območju ravninskega jugovzhodnega dela Prekmurja v 50. letih prejšnjega stoletja. Tedanje fotogrametrične izmere so potekale v celoti na analogni način, brez računalniške podpore, in predstavljajo napreden tehnološki dosežek slovenske geodetske službe, ki je z inovativnimi pristopi že napovedoval kasnejši strokovno suveren prehod na analitično fotogrametrijo.

Single image photogrammetric surveying stems from the field of analogue photogrammetry, where measurement procedures were performed on photographically captured data with the help of optical-mechanical photographic and mapping devices. In these procedures, cadastral plans were prepared on the basis of a mapping of the numerical data from the field-measured and aerially-recorded geodetic grid and field-measured lengths, and with the reprographic procedure of so-called redressing of aerial photogrammetric image data, where white dots are used to represent border stones, which were marked/signalled in the field in one of the prescribed ways (see figure 5.2.4.3). Redressing eliminated the perspective deformations of individual images which were a result of the non-parallelity of the image plane with the terrain plane. Absolute orientation was performed with the help of field-measured and aerially-recorded signalling points of the geodetic network. Due to the technical limitations of the redressing process to achieve the required positional quality of cadastral plans, the use of this method was possible only on flat terrain, so in Slovenia it was carried out mainly in the flat south-eastern part of Prekmurje in the 1950s. The photogrammetric measurements of the time were carried out in an entirely analogue way, without computer support, and they represent an important technological achievement of the Slovenian Surveying and Mapping Authority, whose innovative approaches predicted the future transition to analytical photogrammetry.



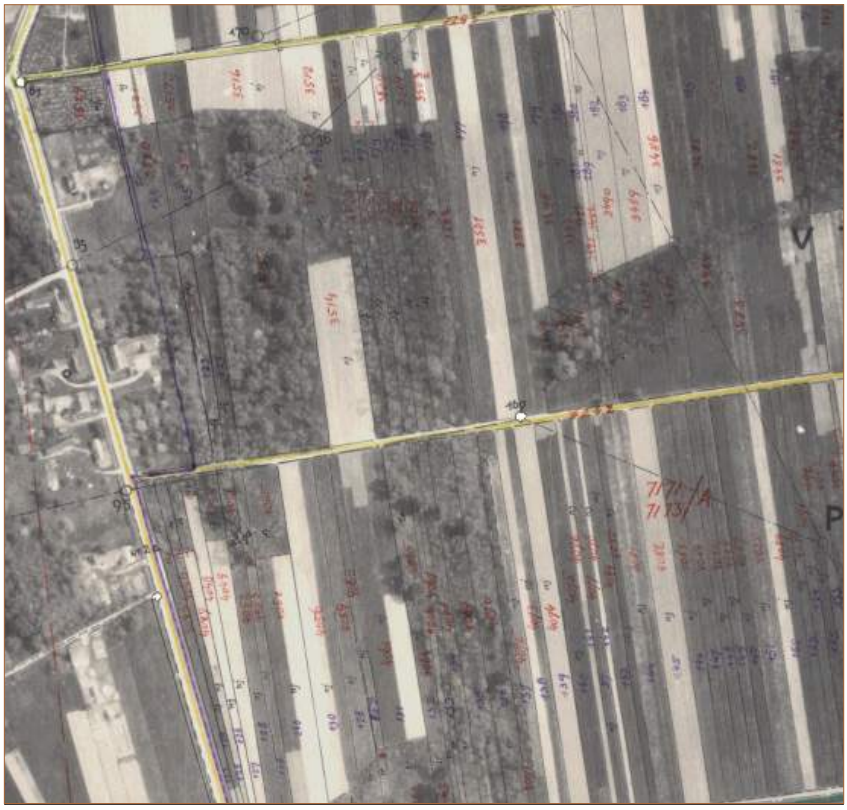
Slika 5.2.4.1: Prikaz lege fotoskic enoslikovne fotogrametrične izmere k. o. 129 Gančani.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.2.4.1: Positions of photo sketches in a single-image photogrammetric survey in CM 129 Gančani.
Source: ZK archive digital survey report viewer



Slika 5.2.4.2: Primer terenske skice enoslikovne fotogrametrične izmere k. o. 129 Gančani z merjenimi širinami parcel za skupno uporabo s fotoskicami.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.2.4.2: Example of a field sketch of a single-image photogrammetric survey in CM 129 Gančani with measured shared plot widths, along with photo sketches.
Source: ZK archive digital survey report viewer



Slika 5.2.4.3: Izrez iz fotoskice enoslikovne fotogrametrične izmere k. o. 129 Gančani. Ob poteh so v sliki vidne bele »pike«, ki predstavljajo mejne točke na parcelnih mejah, na terenu označene z belimi ploskvami na enega od možnih načinov. Glej naslednjo sliko.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.2.4.3: Excerpt from a photo sketch of a single-image photogrammetric survey in CM 129 Gančani. White "dots" are visible in the picture along the paths, which represent the border points on the plot borders, marked as white areas in the field in one of the possible ways. See the following figure.
Source: ZK archive digital survey report viewer

» Zgovoren je arhivski dokument iz leta 1959, ki je skupni poziv takratnih Geodetskega zavoda LRS in Geodetske uprave LRS lastnikom za zamejničenje zemljišč za potrebe aerofotogrametrične detajlne zemljiškokatastrske izmere zemljišč v šestnajstih katastrskih občinah vzhodnega dela Prekmurja.

Poziv (slika 5.2.4.4) je s svojimi slikami in besedilom dovolj zgovoren sam zase. Iz njega se lahko na kratko povzame, da se je v Sloveniji, konkretno v Prekmurju, že v petdesetih letih prejšnjega stoletja izvajalo fotogrametrično zemljiškokatastrsko izmero. Predmet izmere so bile vse posestne meje, meje cestne in potne mreže, vodnih površin, objektov in zgradb ter meje katastrskih kultur. Lastniki in upravljavci zemljišč so bili po zakonu dolžni posestne meje svojih zemljišč zamejničiti z vidnimi mejniki iz naravnega ali umetnega kamna, izjemoma tudi z debelimi lesenimi količi. V pozivu so zapisana osnovna pravila za izvedbo zamejničenja. Ker je bil način izmere fotogrametričen, je bilo treba okoli vsakega mejnika pripraviti trdno podlago kvadratne oblike dimenzije najmanj 40 × 40 cm, pobeljeno z apnom ali nasuto z belim peskom ali označeno s signalnimi kartoni bele barve. Vsak mejnik je moral biti s svojo belo ploskovno označbo viden iz zraka. Na začetek vsake parcele so morali lastniki v predpisani vsebini postaviti označevalne tablice z navedbo lastnika parcele, naslova in lastniškega deleža.

Izvajalci meritev so od vseh lastnikov pričakovali polno razumevanje in vso pomoč. Za lastnike, ki parcel ne bi zamenjičili, je bila določena kazen 10.000 din ali 30 dni zapora, za pravne osebe pa 100.000 din. Poleg kazni bi krivec moral plačati tudi stroške dopolnilnega merjenja. Glede na višino zagrožene kazni je razumna domneva, da kršilcev poziva ni bilo veliko.

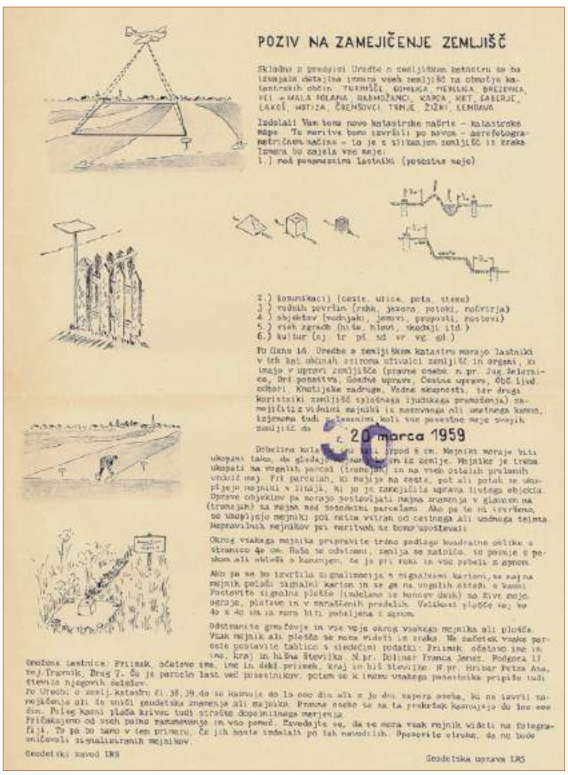
Mogoče pa se lahko v tem pozivu najde tudi namig za nove izmere v sodobnem času? «

» An archival document from 1959 is also very informative; it is a joint call of the then Surveying Office of the People's Republic of Slovenia and the Surveying Administration of the People's Republic of Slovenia to landowners to mark out borders for the purpose of aerial photogrammetric detailed land cadastral survey of land in sixteen cadastral municipalities in eastern Prekmurje.

This call (Figure 5.2.4.4), with its images and text, speaks for itself. It can be briefly summarized that photogrammetric land cadastral surveying was carried out in Slovenia, specifically in Prekmurje, as early as the 1950s. The subject of the survey was all property borders, borders of roads and the road network, water surfaces, buildings and structures, and borders of cadastral cultures. Landowners and land managers were obliged by law to mark out the ownership borders of their lands with visible landmarks made of natural or artificial stone, exceptionally also with thick wooden stakes. The call contains the basic rules for marking out border lines. Since the survey method used was photogrammetric, a solid square base had to be constructed around each border stone, measuring at least 40 × 40 cm, whitewashed with lime or white sand or marked with white signal boards. Each border stone had to be visible from the air by its white surface marking. The owners had to place signboards at the beginning of each plot, with the prescribed content; indicating the owner of the plot, address and ownership share.

The surveyors expected full understanding and assistance from the owners. For owners who would not mark out their plots, a fine of 10,000 dinars or 30 days in prison was imposed, and 100,000 dinars for legal entities. In addition to the penalty, the offender was also required to pay the costs of the supplementary survey. Given the size of the potential penalty, it is reasonable to assume that there were not many violators of the call.

But perhaps this call can also be seen as a herald of new surveying in modern times? «


POZIV NA ZAMEJIČENJE ZEMLJIŠČ

2.) komunikacij (ceste, ulice, pota, steze)
3.) vodnih površin (reke, jezera, potoki, močvirja)
4.) objektov (vodnjaki, jarkovi, propusti, mostovi)
5.) vseh zgradb (hiše, hlevi, skednji itd.)
6.) kultur (nj. tr. pš. sd. vr. vg. gd.)

20 marca 1959

Geodetski zavod LRS

Geodetska uprava LRS

Slika 5.2.4.4: Skupni poziv takratnih Geodetskega zavoda LRS in Geodetske uprave LRS lastnikom za zamejničenje zemljišč za potrebe aerofotogrametrične detajlne izmere zemljišč leta 1959 v katastrskih občinah v jugovzhodnem delu Prekmurja.
Vir: Arhiv GURS, OGU Murska Sobota

Figure 5.2.4.4: A joint call of the then Surveying Office of the People's Republic of Slovenia and the Surveying Administration of the People's Republic of Slovenia to landowners to mark out borders for the purpose of aerial photogrammetric detailed land cadastral survey of land in cadastral municipalities in eastern Prekmurje in 1959.
Source: The SMARS archive, OGU Murska Sobota

5.3 Koordinatni kataster
The coordinate cadastre

Koordinatni kataster je območje zemljiškega katastra, kjer imajo vse zemljiškokatastrske točke na mejah parcel določene koordinate v državnem koordinatnem sistemu. Vzdrževanje na tem območju se vrši koordinatno. Lokacijske koordinate ZK-točk so enake koordinatam v državnem koordinatnem sistemu, površine parcel so bile računane iz koordinat.

Na podlagi določb zakona o zemljiškem katastru (ZZKat, 1974) so se po letu 1974 začele izvajati meritve z novimi zemljiškokatastrskimi metodami povsod tam, kjer so bili katastrski podatki izrazito slabe kakovosti.

The coordinate cadastre is an area of the land cadastre where all land cadastral points on the borders of plots have certain coordinates in the national coordinate system. Maintenance in this area is performed using coordinates. The location coordinates of the LC points are the same as the coordinates in the national coordinate system, and the areas of the plots were calculated from the coordinates.

Based on the provisions of the Land Cadastre Act (ZZKat, 1974), surveying started being carried out with new land cadastre methods after 1974 wherever cadastral data was of extremely poor quality.

5.3.1 Stereofotogrametrična izmera
Stereophotogrammetric measurement

Nove izmere z uporabo postopkov stereofotogrametrije je v drugi polovici 70. let in v 80. letih prejšnjega stoletja izvajal predvsem takratni Geodetski zavod SRS. Snemanje so izvajali z lastnima letaloma Piper in Cessna, opremljenima z analognima letalskima kamerama. Izvrednotenje letalskih stereoposnetkov se je izvajalo z uporabo več stereokartirnih naprav in avtomatskih kartirnih miz – koordinatografov ter digitalizatorja. Računalniške obdelave so se izvajale na računalnikih PDP 11/45 in CDC Cyber70 z lastno programsko opremo in z dopolnilno masovno uporabo številnih žepnih računalnikov HP. Dopolnilne tahimetrične meritve, predvsem na gozdnih območjih, so se izvajale s teodoliti in elektronskimi razdaljemeri.

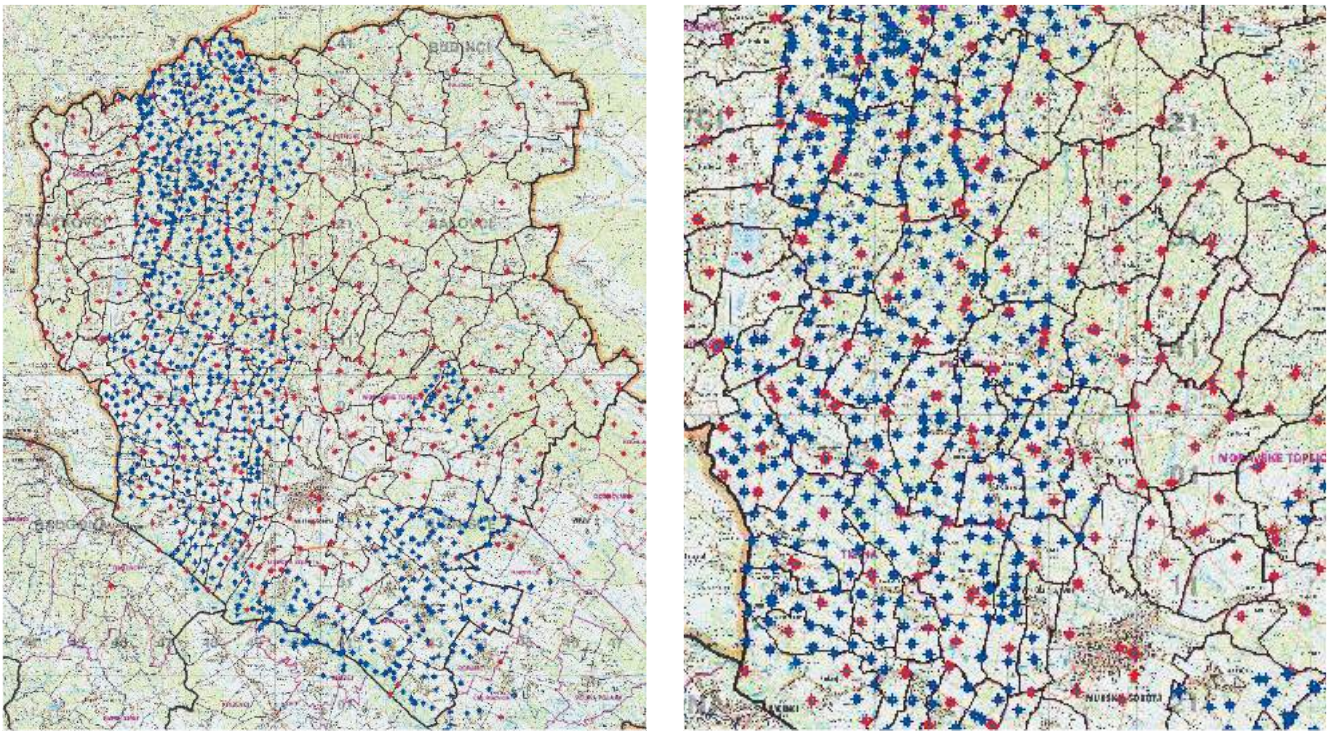
Stereofotogrametrična letalska izmera je potekala v več fazah. Najprej se je na terenu rekognosciralo obstoječe trigonometrične točke in vzpostavilo ter izmerilo dodatno geodetsko mrežo navezovalnih in poligonskih točk.

Za vse točke geodetske mreže so se dodatno izvedle t. i. križne fotosignalizacije z belimi plastičnimi trakovi. Iz zadnjih posnetkov cikličnega aerosnemanja, ki se je začelo sistematično izvajati leta 1975, so se s fotografsko povečavo izdelale fotoskice kot informativna grafična podlaga za izvedbo mejnih ugotovitvenih postopkov.

In the second half of the 1970s and in the 1980s, new surveys using stereophotogrammetry were carried out mainly by the then Surveying and Mapping Authority of the SRS. The recording was carried out with the Authority's own Piper and Cessna aircraft, equipped with analogue aircraft cameras. The evaluation of aviation stereo recordings was performed using several stereo mapping devices and automatic mapping tables – coordinatographs and a digitizer. Computer processing was performed on PDP 11/45 and CDC Cyber70 computers with the Authority's own software and with the supplementary mass use of multiple HP Pocket PCs. Supplementary tachymetric surveying, especially in forest areas, was performed with theodolites and electronic rangefinders.

The stereophotogrammetric aerial survey took place in several stages. First, the existing trigonometric points were recognized in the field and an additional geodetic network of connecting and polygon points was established and measured.

Additional so-called cross photo signalling with white plastic strips was performed for all points of the geodetic network. From the last images of cyclic aerial photography, which began to be carried out systematically in 1975, photo sketches were made with photographic magnification as an informative graphic basis for the implementation of border identification procedures.



Slika 5.3.1.1: Prikaz geodetske mreže trigonometričnih (rdeče točke) in navezovalnih (modre točke) točk na območju geodetske pisarne Murska Sobota. Obsežne stereofotogrametrične nove izmere so se v 70. in 80. letih prejšnjega stoletja izvajale v zahodnem delu območja geodetske pisarne, kjer je bila predhodno vzpostavljena tudi obsežna mreža navezovalnih točk.
Vir: Arhiv GURS, OGU Murska Sobota

Figure 5.3.1.1: Display of the geodetic network of trigonometric (red dots) and connecting (blue dots) points in the area of the Murska Sobota geodetic administration. Extensive new stereophotogrammetric surveying was carried out in the 1970s and 80s in the western part of the surveying administration area, where an extensive network of tie points had previously been established.
Source: The SMARS archive, OGU Murska Sobota

Na terenu so v skladu z določili Zakona o zemljiškem katastru (Uradni list SRS 16/74) in Navodila za ugotavljanje in zamejničenje posestnih meja parcel (Uradni list SRS, št. 2/1976) potekali mejni ugotovitveni postopki (MUP) z zamejničenjem posestnih kosov v sodelovanju z lastniki zemljišč. Mejne točke so se zamejničile praviloma z betonskimi mejniki ali drugimi trajnimi znamenji. Tudi na mejnikih se je izvedla križna fotosignalizacija s plastičnimi trakovi. Med mejniki so se na terenu razdalje izmerile z merskim trakom na centimeter natančno, prav tako prečne in kontrolne mere. Meje posestnih kosov so se na fotoskicah izrisovale v rdeči barvi odebeljeno. Parcelne meje znotraj posestnih kosov so geodeti vrisali v fotoskice po dejanskem stanju s tankimi linijami v črni barvi.

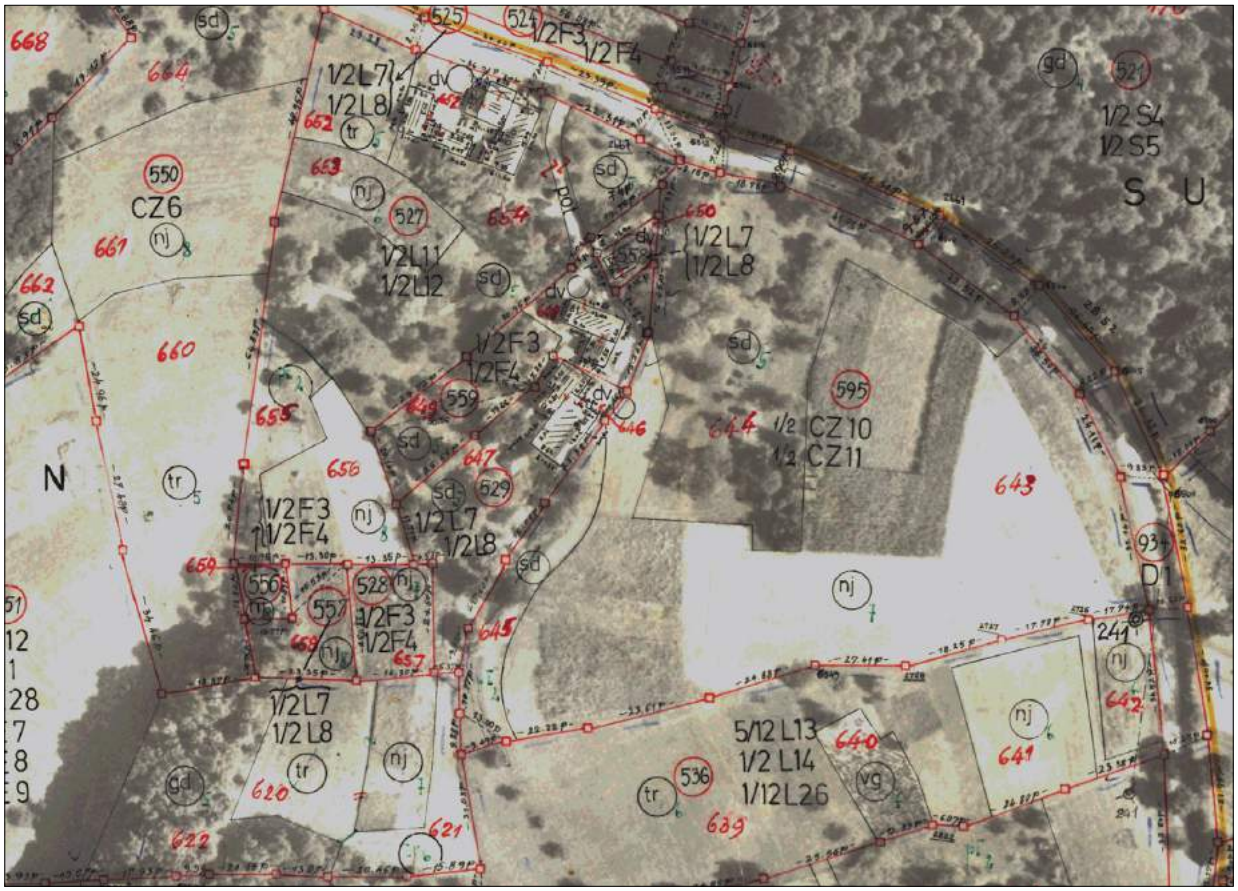
Tlorisi vseh stavb so se vrisovali s tankimi linijami v črni barvi in premerili z merskim trakom na centimeter natančno. Širine slemena oz. kapnice so se izmerile na decimeter natančno in vpisale v fotoskice. Po zaključku te-

In accordance with the provisions of the Land Cadastre Act (Official Gazette of the SRS 16/74) and the Instructions for Determining and Delimiting Property Borders of Plots (Official Gazette of the SRS, No. 2/1976), border identification procedures (MUPs) were carried out in the field by marking out the property parts in collaboration with the landowners. The border points were usually marked out by concrete border stones or other permanent signalization. Cross-photo-signalization with plastic strips was also carried out on the border stones. Distances between the border stones in the field were measured with a measuring tape to the centimetre, along with transverse and control measurements. The borders of property parts were drawn in bold red in the photo sketches. The plot borders within the property parts were drawn by surveyors in photo sketches according to the actual situation with thin black lines.

All the buildings' floor plans were drawn with thin black lines and measured with a measuring tape to the centimetre. Ridge widths and rain reservoirs were measured to the decimetre and inscribed in photo sketches. After the completion of the field geodetic

renske geodetske izmere je katastrsko klasifikacijo vrst rabe oz. katastrskih kultur in razredov izvedel agronom in na podlagi elaborata katastrske klasifikacije podatke vpisal v fotoskice.

survey, a cadastral classification of the types of use or of cadastral cultures and classes was carried out by an agronomist, who entered the data into the photo sketches on the basis of the cadastral classification report.



Slika 5.3.1.2: Izrez iz fotoskice stereofotogrametrične nove izmere k. o. 23 Trdkova. V rdeči odebeljeni barvi so vrisane meje posestnih kosov. V črni barvi so s tankimi linijami vrisane parcelne meje znotraj posestnih kosov in tlorisi stavb. Parcelne številke so v rdeči barvi. V črni barvi v rdečih krogcih so vpisane zaporedne številke podpisov lastnikov v zapisnikih MUP. V črni barvi v črnih krogcih so vpisane katastrske kulture s pripisanim katastrskim razredom v zeleni barvi. S šablono so v posestne kose vpisani lastniški deleži in oznake lastnikov.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.3.1.2: Excerpt from a photo sketch of a new stereophotogrammetric survey in CM 23 Trdkova. The borders of the property parts are drawn in bold red. Plot lines within property parts and floor plans of buildings are drawn in thin black. The plot numbers are in red. Serial numbers of the signatures of the owners in the minutes of the MUP are entered in black in red circles. Cadastral cultures are entered in black writing in black circles, along with their assigned cadastral class in green. Ownership shares and owners' marks are inscribed in the property parts using a template.
Source: ZK archive digital survey report viewer

Pred letalskim snemanjem se je izdelal plan leta za zagotovitev potrebnega vzdolžnega in prečnega prekrivanja letalskih posnetkov za izvedbo stereofotogrametričnega izvrednotenja snemanja. Po snemanju se je s postopki analitične fotogrametrije najprej izvedla relativna in absolutna orientacija stereoparov ter s postopkom aerotriangulacije skupna orientacija več posnetkov, ki so tvorili posamezni snemalni pas ali blok. Sledila je stereorestitucija za izde-

Prior to the aerial recording, a flight plan was prepared to ensure the necessary longitudinal and transverse overlap of the aerial images to perform a stereophotogrammetric evaluation of the recording. After recording, relative and absolute orientation of the stereopairs was performed with analytical photogrammetry procedures, and joint orientation of several images that formed an individual recording band or block was performed with the aero-triangulation procedure. This was followed by stereo-restituti-

lavo kartografskih originalov z zajemom koordinat mejnikov, mej in drugih vsebin katastrskega načrta. Po pregledu celovitosti ter pravilnosti zajetih vsebin in avtomatizirani verifikaciji s terenskimi kontrolnimi merami so se dokončali originali načrtov in izdelali delovni izvodi.

Rezultat stereofotogrametričnih novih izmer je bil koordinatni kataster. Vsak mejnik na mejah posestnih kosov je bil enotno oštevilčen znotraj vsake katastrske občine in imel določene koordinate v državnem koordinatnem sistemu D48/GK. Vse površine posestnih kosov so bile izračunane iz koordinat. Površine tlorisov stavb so bile izračunane iz na terenu izmerjenih mer stranic stavb. V primerih, ko je imel posestni kos več kot eno parcelo, so bile površine parcel v posestnem kosu določene grafično z digitalizacijo, prav tako tudi površine vrst rabe, kjer so obstajale znotraj posameznih parcel. Digitalizirane površine parcel in vrst rabe so bile izravnane na koordinatno določeno površino posestnega kosa.

Postopek terenske razgrnitve katastrskih podatkov nove izmere in zemljiške knjige ter uveljavitev podatkov so potekali vsebinsko podobno, kot je že opisano v poglavju o numerično grafičnem katastru.

on for the production of cartographic originals by capturing the coordinates of borderstones, borders and other contents of the cadastral plan. After reviewing the integrity and correctness of the content covered and automated verification with field control measurements, the originals of the plans were completed and working copies were made.

The result of the new stereophotogrammetric surveys was the coordinate cadastre. Each border-stone at the borders of property parts was uniformly numbered within each cadastral municipality and had coordinates assigned in the D48/GK national coordinate system. All surface areas of the property parts were calculated from the coordinates. The floor areas of buildings were calculated from the field measurements of the sides of the buildings. In cases where a property part had more than one plot, the areas of the plots in the property part were determined graphically by digitization, as well as the areas of types of land use, where these existed within individual plots. Digitized areas of plots and types of use were adjusted on the coordinate-determined area of the property part.

The process of field disclosure of cadastral data of the new survey and the land register and data implementation was similar in substance to the processes described in the chapter on the numerical and graphical cadastre.

Štev.dela: o-56-11/77 Zemljiško katastrski načrt 1 : 2 5oo

SEZNAM ELABORATA

1.	Trigonometrični obrazec "1S"	štev.zvezkov 1- 5	str. 1-2oo
2.	Tahimetrični zapisniki	štev.zvezkov 1-1o	str. 1-636
3.	Modelne koordinate točk	štev.zvezkov 1	str. 1-67
4.	Prostorska transformacija točk	štev.zvezkov 1	str. 1-78
5.	Trigonometrični obrazec št.28P	štev.zvezkov 1	str. 1-49
6.	Obrazec "K" (izrač.višin d.t.tah.)	štev.zvezkov 1	str. 1-22
7.	Trigonometrični obrazec št.19	štev.zvezkov 1	str. 1-44
8.	Ročna skica polig.vlakov,tahim. stojišč in register računanja	(ozalit kopija 1 mapa	priloge
9.	Računanje koordinat det.točk	štev.zvezkov 1-3	str. 1-47o
1o.	Register det.točk	štev.zvezkov 1	str. 1-61
11.	Zapisnik in skica zamejičenja meje katastrske občine	1 mapa	priloge
12.	Zapisnik o ugotavljanju in zamejičenj posestnih meja	1 mapa	priloge
13.	Fotoskice	1 mapa	Skupaj 1-29
14.	Primerjava kontrolnih mer-frontov	1 mapa	str. 1-286
15.	Kontrolni listi	1 mapa	str. priloge
16.	Hišni seznam (terenski original)	1 zvezek	str. 1-12
17.	Abecedni seznam posestnikov RAR ~~(iz dvojnika)~~		str. 1-29
18.	Računanje površin delov parcel	zvezek 1	str. 1-87
19.	Računanje površin parcel, skupin in oboda občine	zvezek 1	str. 1-159
2o.	Skica parcelnih skupin	1 list	
21.	Skica izmeritvene mreže, razdelitev na liste in fotoskice	1 list	
22.	Seznam koordinat in nadmor.višin	zvezek 1-3	str. 1-3o6
23.	Seznam površin ~~(iz dvojnika)~~	zvezek 1-~~3~~	str. 1-64
24.	Popisni listi	v škatli listov od	1 - 251
25.	Listi detajla - založniški originali na astralonu	L.D. 1 - 6	
26.	Oleate detajlnih točk (na pokalonu)	L.D. 1 - 6	
27.	~~Kos kopije listov detajla (na pokalonu)~~	~~L.D. 1 - 6~~	
28.	Mapa "RAZNO"	1 kom	priloge

V Ljubljani, 4. februarja 1983

GEODETSKI ZAVOD SRS LJUBLJANA

Sestavil:

Slika 5.3.1.3: Primer seznama geodetskega elaborata stereofotogrametrične izmere k. o. 23 Trdkova iz leta 1983.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.3.1.3: Example of a list from the geodetic report of the stereophotogrammetric survey in CM 23 Trdkova from 1983.
Source: ZK archive digital survey report viewer

5.3.2 Precizna tahimetrična izmera
Precise tachymetric measurement

Z razvojem računalništva, digitalnih merskih tehnologij in skokovitim napredkom zmogljivosti geodetskih instrumentov, ki bistveno olajšajo in pospešijo geodetsko delo na terenu in obdelavo rezultatov meritev v pisarni, bi bilo razumno pričakovati, da bo novih izmer vse več in da jih bodo geodeti izvajali vse hitreje ter vse bolj kakovostno in učinkovito. Praksa zadnjih dveh ali treh desetletij iz različnih razlogov tem pričakovanjem ne sledi.

Omeniti je treba le to, da so nove izmere z uporabo precizne tahimetrične izmere v Sloveniji zelo redke in lokacijsko zelo omejene na manjša območja naselij ali ožje pasove ob trasah izgradnje infrastrukturnih objektov, kot so avtoceste in železnice.

Geodetski postopki novih izmer so se od prenehanja veljavnosti Zakona o zemljiškem katastru leta 2000 do leta 2006 izvajali skladno z Zakonom o evidentiranju nepremičnin, državne meje in prostorskih enot (Uradni list RS, št. 52/00, 87/02 – SPZ in 47/06 – ZEN) in njegovimi podzakonskimi izvedbenimi predpisi, po letu 2006 pa se izvajajo skladno s trenutno veljavnim Zakonom o evidentiranju nepremičnin (Uradni list RS, št. 47/06, 65/07 – odl. US, 79/12 – odl. US, 61/17 – ZAID, 7/18 in 33/19).

Pomembna razlika teh postopkov novih izmer od prej opisanih starejših novih izmer je ta, da se v uradne evidence ne uveljavljajo več na preprost in učinkovit način z razgrnitvami, temveč z izdajanjem posamičnih odločb lastnikom nepremičnin in brez hkratne obnove zemljiške knjige.

With the development of computing, digital measurement technologies and advances in the performance of surveying instruments, which significantly facilitate and accelerate geodetic work in the field and processing of measurement results in the office, it would be reasonable to expect more and more new surveys of increasingly high quality and efficiency. The practice of the last two or three decades, however, does not follow these expectations for various reasons.

It should be noted that new surveys using precise tachymetric measurements in Slovenia are very rare and very limited in location to smaller areas of settlements or narrower tracts along the routes of construction of infrastructure facilities, such as motorways and railways.

Following the expiry of the Land Cadastre Act, from 2000 to 2006, geodetic procedures for new surveys were carried out in accordance with the Recording of Real Estate, State Border and Spatial Units Act (Official Gazette of the Republic of Slovenia, no. 52/00, 87/02 – SPZ and 47/06 – ZEN) and its implementing regulations, and since 2006, they have been implemented in accordance with the currently valid Real Estate Records Act (Official Gazette of the Republic of Slovenia, No. 47/06, 65/07 - dec. US, 79/12 – dec. US, 61/17 – ZAID, 7/18 and 33/19).

There is an important difference between these new survey procedures and the previously described older new surveys in that they are no longer enforced in official records in a simple and efficient way by disclosure, but by issuing individual decisions to property owners and without simultaneously updating the land register.

pred 1990
before 1990

Kern DKM 2 -AE in Kern DM500


Wild T2+ Di-3


Nicon C-100

pred 2000
before 2000

po 2000
after 2000

Sokkisha SET 4

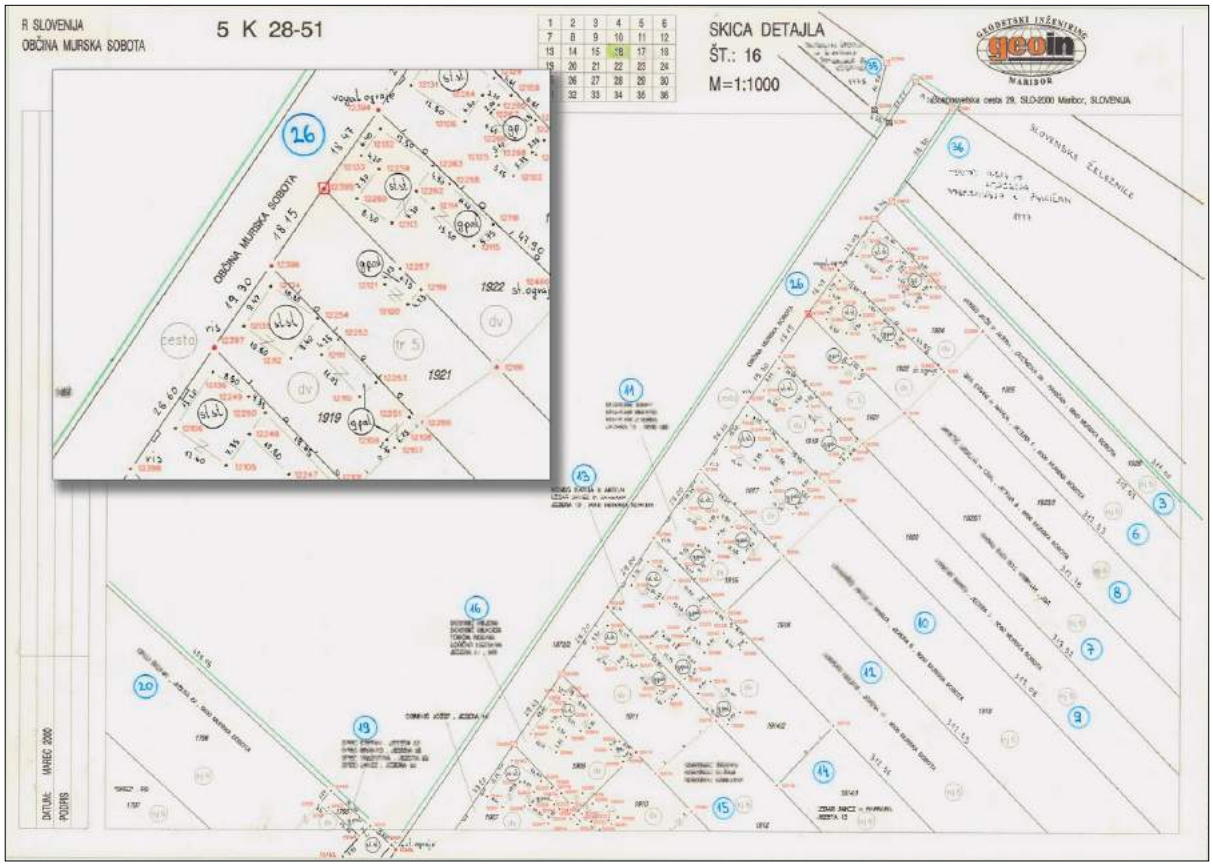
Leica TC 605

Leica MultiStation MS 50

Topcon GPS HiPer Pro+FC-100

Slika 5.3.2.1: Primeri geodetskih instrumentov iz različnih časovnih obdobij, s katerimi geodetska služba izvaja precizne tahimetrične izmere.
Vir: Slak, J. (2017) Geodetski instrumenti in oprema na Slovenskem (fotografije: Boštjan Pucelj)

Figure 5.3.2.1: Examples of geodetic instruments from different time periods used by the geodetic service to perform precise tachymetric measurements.
Source: Slak, J. (2017) Surveying Instruments and Equipment in Slovenia (photos: Boštjan Pucelj)



Slika 5.3.2.2: Primer dopolnilne nove izmere v k. o. 104 Rakičan iz leta 2000.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.3.2.2: Example of a supplementary new survey in CM 104 Rakičan from 2000.
Source: ZK archive digital survey report viewer

5.3.3 GPS/GNSS izmera
GPS/GNSS survey

Podobne ugotovitve kot za nove izmere s precizno tahimetrično izmero velja (vsaj zaenkrat) tudi za nove izmere z uporabo GNSS-tehnologije.

Iz navodil, ki jih je Geodetska uprava RS izdala leta 2007, je razvidno, da je od različnih metod GNSS- meritev za uporabo v zemljiškem katastru najprimernejša RTK-metoda v načinu meritev Stop&Go, ko se na merjeni točki ustavi (faza Stop) in izvaja opazovanja od nekaj sekund do nekaj minut, nato pa se prestavi na naslednjo točko (faza Go). RTK-metoda omogoča hitro in kakovostno določitev koordinat ZK- in detajlnih točk v realnem času. Uporaba te metode se priporoča vedno, ko so na območju delovišča izpolnjeni osnovni pogoji za GNSS- in RTK-izmero.

RTK metoda izmere je dinamična metoda GNSS-izmere, ki temelji na faznih opazovanjih in istočasni izmeri z dvema sprejemnikoma. En sprejemnik je postavljen na dani točki (t. i. bazni sprejemnik), z drugim sprejemnikom (t. i. premičnim sprejemnikom) pa se izvaja izmera. Bazni sprejemnik lahko nadomesti stalno delujoča GNSS-postaja ali omrežje stalnih GNSS-postaj. V Sloveniji je vzpostavljeno državno omrežje stalno delujočih GNSS-postaj SIGNAL.

Similar findings as for new surveys with precise tachymetric measurement also apply (at least for now) to new surveys using GNSS technology.

The instructions issued by the Surveying and Mapping Authority of the Republic of Slovenia in 2007 show that the most suitable of the various GNSS measurement methods for use in the land cadastre is the RTKmethod with the Stop & Go measurement mode, where there is a stop at the measured point (Stop phase) and observations are performed from a few seconds to a few minutes, before moving on to the next point (Go phase). The RTK method enables fast and high-quality determination of the coordinates of LC and detail points in real time. The use of this method is recommended whenever the basic conditions for GNSS and RTK surveying are met in the site area.

The RTK measurement method is a dynamic GNSS survey method based on phase observations and simultaneous measurement with two receivers. One receiver is placed at a given point (i.e. the base receiver) and the second receiver (i.e. the mobile receiver) is used to perform the measurement. The base receiver can be replaced by a permanent GNSS station or a network of permanent GNSS stations. Slovenia has a national network of permanently operating GNSS stations, called SIGNAL.

pred 200
before 2000 0

Trimble Navigation

po 2000
after 2000

Trimble R8

po 2015
after 2015

Javad GNSS

Slika 5.3.3.1: Primeri geodetskih GNSS-instrumentov iz različnih časovnih obdobij, s katerimi geodetska služba izvaja GNSS-izmere visoke natančnosti. Vir: Slak, J. (2017) Geodetski instrumenti in oprema na Slovenskem (fotografije Boštjan Pucelj)

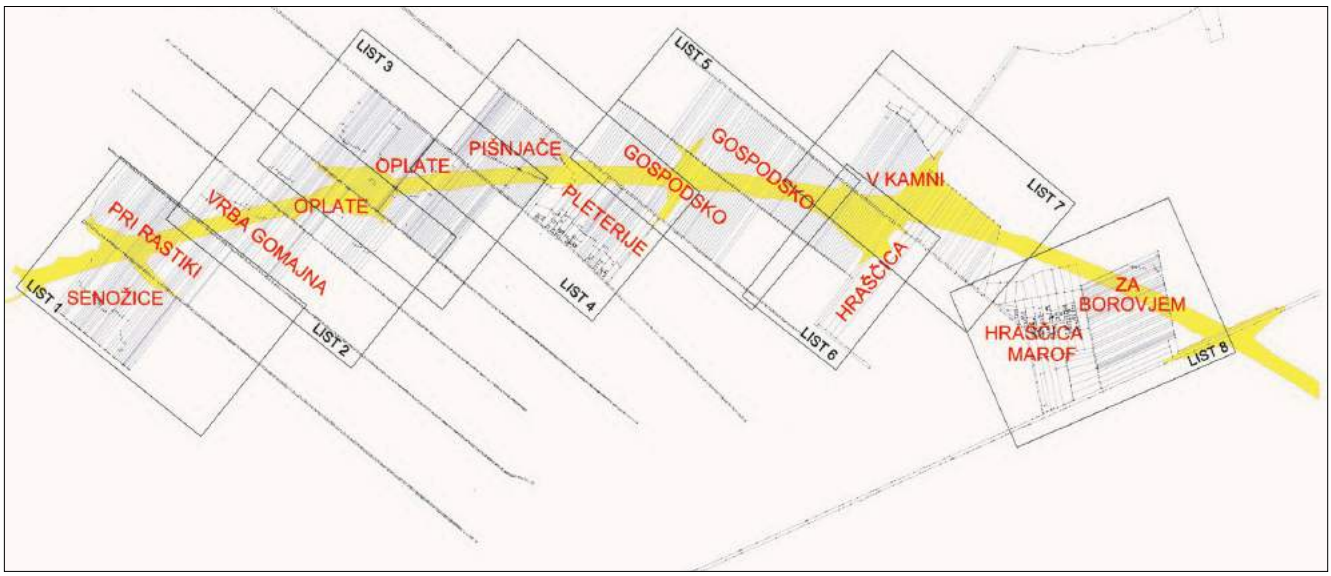
Figure 5.3.3.1: Examples of geodetic GNSS instruments from different time periods with which the geodetic service performs high-precision GNSS surveys. Source: Slak, J. (2017) Geodetic instruments and equipment in Slovenia (photos by Boštjan Pucelj)

Omrežje SIGNAL omogoča geodetske meritve in pridobitev položaja v novem referenčnem koordinatnem sistemu D96/TM, in sicer v realnem času in z nekajcentimetrsko natančnostjo na celotnem ozemlju Slovenije. Sestavlja ga 16 stalnih GNSS-postaj. Poleg tega so v omrežje vključene tudi obmejne stalne GNSS-postaje sosednjih držav (Avstrije, Madžarske in Hrvaške). Medsebojna oddaljenost sosednjih postaj omrežja je manjša od 70 km. Na vseh postajah omrežja so postavljeni GNSS-sprejemniki z antenami, ki izvajajo opazovanja neprekinjeno 24 ur na dan in 365 dni na leto. Rezultate opazovanj stalno sprejema nadzorni center v Ljubljani.

Razumno je pričakovanje, da se bo uporaba GNSS za sistematično izvedbo novih katastrskih izmer pomembno povečala s kombinirano rabo novih tehnologij in predvideno vgraditvijo standarda ISO 19152 LADM za zemljiško upravljanje neposredno v postopek izvedbe GNSS-meritev.

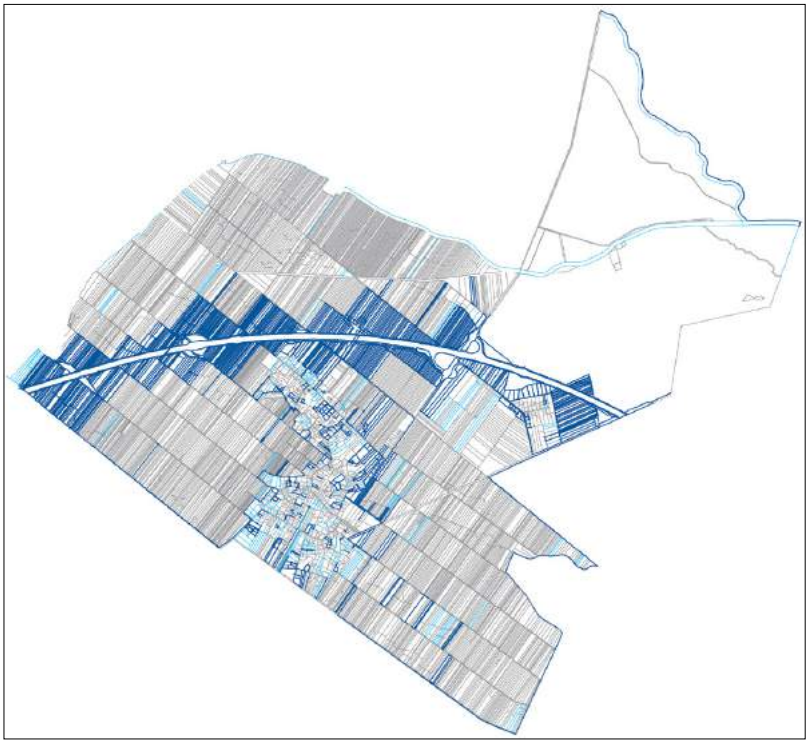
The SIGNAL network enables geodetic measurements to be made and location positions in the new D96/TM reference coordinate system to be obtained in real time and with an accuracy of few centimetres throughout the entire territory of Slovenia. It comprises 16 permanent GNSS stations. Additionally, the network includes permanent GNSS border stations of neighbouring countries (Austria, Hungary and Croatia). The distance between adjacent network stations is less than 70 km. GNSS receivers with antennas are installed at all stations of the network, which perform observations continuously 24 hours a day and 365 days a year. The results of observations are regularly sent to the control centre in Ljubljana.

It is reasonable to expect that the use of GNSS for the systematic implementation of new cadastral surveys will increase significantly with the combined use of new technologies and the envisaged incorporation of the ISO 19152 LADM standard for land management directly into the GNSS survey process.



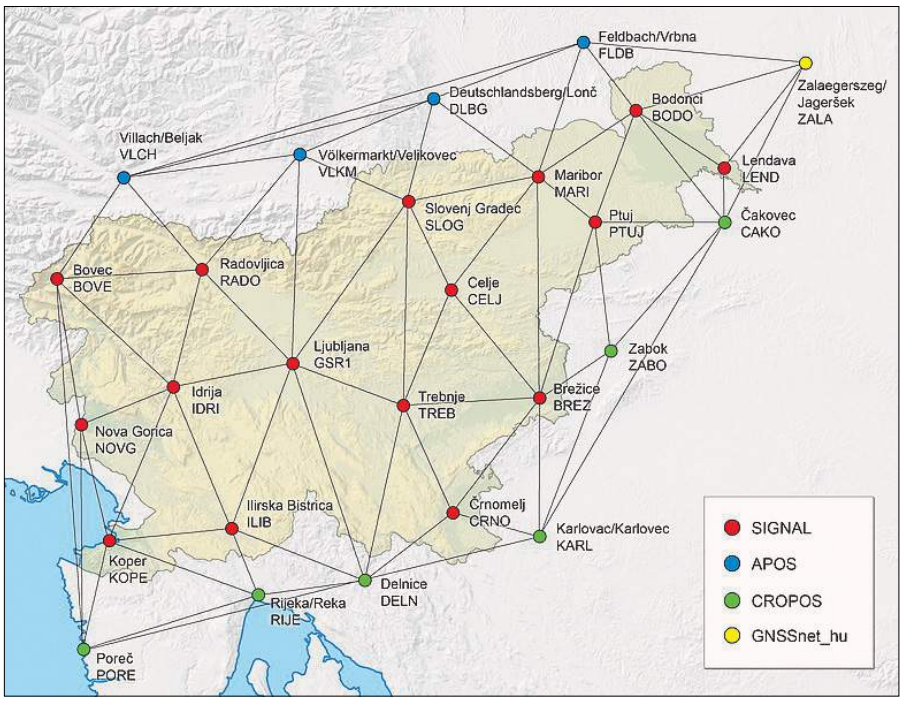
Slika 5.3.3.2: Prikaz območja nove GNSS-izmere iz leta 2005 na območju k. o. 129 Gančani na trasi avtoceste A5 Maribor-Pince s prikazom območja državnega prostorskega načrta za traso avtoceste in razrezom na detajlne liste skic nove izmere.
Vir: Pregledovalnik digitalnih elaboratov arhiva ZK

Figure 5.3.3.2: Demonstration of the area of the new GNSS survey from 2005 in the area of CM 129 Gančani on the route of the A5 Maribor-Pince motorway, showing the area of the national spatial plan for the motorway route and its section into detail sheets of sketches of the new survey.
Source: ZK archive digital survey report viewer



Slika 5.3.3.3: Primer območja nove izmere v k. o. 129 Gančani iz leta 2005 z evidentirano dokončno odmero trase avtoceste A5 Maribor-Pince (v temno modri barvi).
Vir: Arhiv GURS, OGU Murska Sobota

Figure 5.3.3.3: Example of a new survey area in CM 129 Gančani from 2005 with the recorded final assessment of the route of the A5 Maribor-Pince motorway (in dark blue).
Source: The SMARS archive, OGU Murska Sobota



Slika 5.3.3.4: V Sloveniji je vzpostavljeno državno omrežje za globalno določanje položaja z imenom SIGNAL (Slovenlja-Geodezija-NAvigacija-Lokacija). Omrežje SIGNAL se je začelo vzpostavljati leta 2000 in je bilo z letom 2006 dokončano in predano v operativno uporabo.
Vir: Arhiv GURS

Figure 5.3.3.4: Slovenia has a national global positioning network, abbreviated to SIGNAL (for Slovenia-Geodesy-Navigation-Location). The SIGNAL network began implementation in 2000 and was completed in 2006 and put into operational use.
Source: The SMARS archive.

5.4 Novi državni koordinatni sistem D96/TM
The new national coordinate system D96/TM

Strokovno tehnična definicija in fizična vzpostavitev sistema D48/GK ne ustrezata več sodobnim potrebam, saj sta se metodologija in tehnologija določanja položaja (koordinat) v zadnjih desetletjih popolnoma spremenili. Položaji se praviloma ne določajo več z uporabo klasičnih geodetskih mrež in s tradicionalnimi geodetskimi instrumenti in metodami, temveč večinoma z uporabo GNSS satelitske tehnologije za določanje položaja (kr. GNSS – globalni navigacijski satelitski sistemi), kot je opisano v prejšnjem poglavju.

Tako je bil v začetku leta 2019 v evidencah Geodetske uprave RS in v poslovanju znotraj geodetske službe kot državni koordinatni sistem prevzet D96/TM. Koordinatni sistem D48/GK je sicer prehodno še lahko, in v praksi tudi je, v uporabi pri drugih upravljavcih zbirk prostorskih podatkov, a morajo le-ti v skladu s predpisi, ki urejajo vzpostavitev in zagotavljanje infrastrukture za prostorske informacije v Republiki Sloveniji, na svoje stroške zagotoviti podatke v državnem prostorskem koordinatnem sistemu po določilih Zakona o državnem geodetskem referenčnem sistemu (ZDGRS) najpozneje leto dni za geodetsko upravo!

The technical definition and physical implementation of the D48/GK system no longer meet modern requirements, as the methodology and technology for determining the position (coordinates) have completely changed in recent decades. As a rule, positions are no longer determined using traditional geodetic networks, instruments and methods, but mostly using GNSS satellite positioning technology (abbr. for GNSS – Global Navigation Satellite Systems) as described in the previous chapter.

Thus, at the beginning of 2019, the D96/TM system was adopted as the national coordinate system in the records and operations of the Surveying and Mapping Authority of the Republic of Slovenia. The transient use of the D48/GK system is still present with other controllers of spatial data sets, but they must, in accordance with the regulations governing the establishment and provision of infrastructure for spatial information in the Republic of Slovenia, provide data for the Surveying and Mapping Authority in the national spatial coordinate system in accordance with the provisions of the National Land Survey Reference System Act (ZDGRS) after no more than one year, at their own expense.

6 Komasacije
Land consolidation

Komasacija (nlat. commasatio) je združevanje in zaokroževanje zemljišč. Osnovni namen komasacij je izboljšanje posestne strukture za večjo in gospodarnejšo kmetijsko proizvodnjo. Poleg zaokrožitve posesti je naloga komasacij tudi vzpostavitev nove mreže poti, ki predstavlja optimalen dostop od kmečkih gospodarstev do parcel, in ureditev vodnega režima. Izvedba komasacijskega postopka pomeni istočasno tudi pomemben prispevek k obnovi zemljiškega katastra.

Komasacije ali zložba zemljišč je prostorsko ureditvena agrarna operacija, pri kateri se najprej vsa zemljišča komasacijskih udeležencev na območju komasacije združijo-zložijo v komasacijski sklad. Nato se v novi parcelni ureditvi razdelijo med udeležence komasacije, tako da dobi vsak svoje zemljišče čim bolj zaokroženo.

Land consolidation or comassation (from New Latin commasatio) is the aggregation and rounding of land. The basic purpose of land consolidation is to improve the ownership structure for greater and more economical agricultural production. In addition to rounding of property, the task of land consolidation is also to establish a new network of paths, which represents optimal access from farms to plots, and to regulate the water regime. The implementation of the land consolidation procedure also constitutes an important contribution to the restoration of the land cadastre.

Land consolidation is a spatial planning agrarian operation in which all the participants' land in the land consolidation area is first consolidated/stacked into a land consolidation fund. Then, in the new plot arrangement, they are divided among the participants in the land consolidation, so that each participant receives their land as rounded as possible.

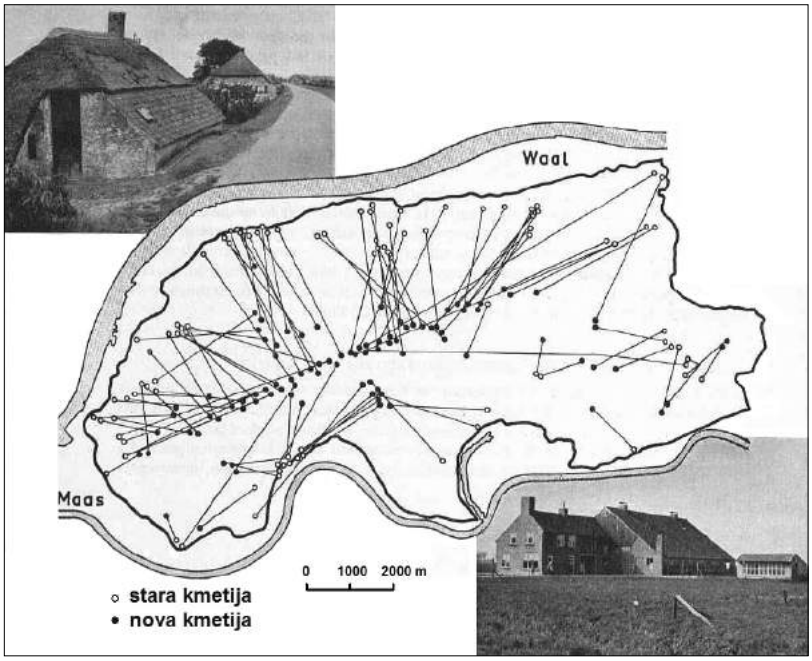
6.1 Zgodovina komasacij
History of land consolidation

Komasacije, kot jih poznajo danes v večini evropskih držav, so bile v Evropi uvedene konec 19. in na začetku 20. stoletja. Prve v literaturi omenjene komasacije v Evropi pa segajo v daljno 16. stoletje. Kot prva komasacija se pogosto navaja zložba zemljišč iz obdobja okrog leta 1550 na območju kneževine Kempten v jugozahodni nemški regiji Allgäu. Med prve države z urejeno zakonodajo na področju komasacij se šteje nordijske države, ki so uvedle prve sistemske rešitve že v 18. stoletju (Danska, Norveška in Švedska), po zelo številnih in obsežnih postopkih preurejanja prostora s komasacijami pa sta znani Nizozemska in Nemčija.

Na Slovenskem bogate tradicije pri celovitem urejanju kmetijskega prostora z agrarnimi operacijami žal ni. Agrarna prenaseljenost slovenske dežele v fevdalni dobi je izvirni razlog za zemljiško razdrobljenost posesti na podeželju. Sredi 19. stoletja, ko so se z ukinitvijo fevdalizma po Evropi pojavile potrebe po zemljiškem preurejanju skupnih in zasebnih zemljišč, se na območju naših dežel ni nihče poglabljal v težave z razkosanostjo kmečkih posestev. V večini primerov je praksa šla prav v nasprotno smer. Da bi rešili kmeta iz hude krize, se je namesto preureditve kmetijskega prostora in odprave razkosanosti posestev pojavilo razdeljevanje obsežnih vaških gmajn in gozdov, ki so v obliki majhnih parcel prišli v zasebno last posameznikov.

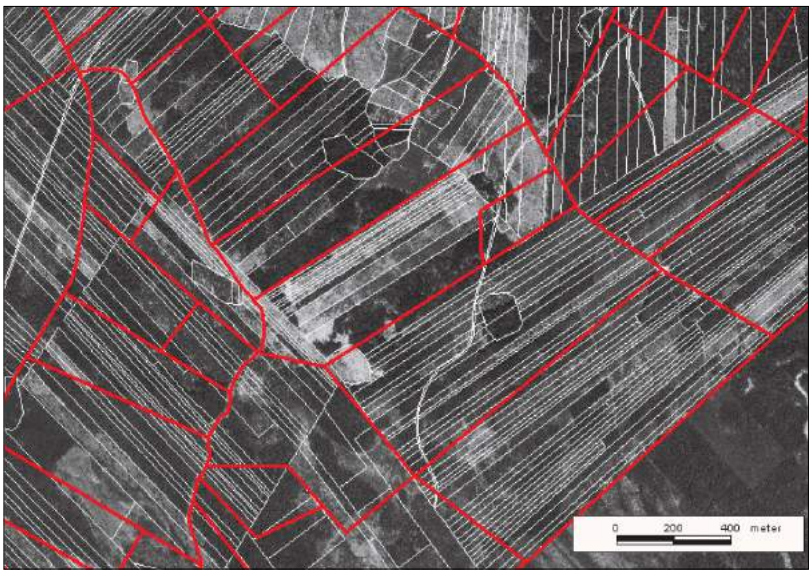
Land consolidation, as it is known today in most European countries, was introduced in Europe in the late 19th and early 20th centuries. The first land consolidations mentioned in the literature in Europe date back to the 16th century. Often cited to be the first is the land consolidation from around 1550 in the area of the Principality of Kempten in the south-western German region of Allgäu. The Nordic countries, which introduced the first systemic solutions as early as the 18th century (Denmark, Norway and Sweden), were among the first with regulated legislation in the field of land consolidation, and the Netherlands and Germany are known for their numerous and extensive land consolidation procedures.

Unfortunately, there is no rich tradition in Slovenia in terms of a comprehensive coordination of agricultural space with agrarian operations. The agrarian overpopulation of the Slovenian territory in the feudal era was the original reason for the fragmentation of land in the countryside. In the mid-19th century, when the abolition of feudalism in Europe gave rise to the need for the rearrangement of common and private lands, no one in this area addressed the issues of the fragmentation of farming land. In most cases, the practice was quite the opposite. In order to save the farmer from a severe crisis, instead of rearranging the agricultural area and eliminating the fragmentation of property, there was a distribution of extensive village groves and forests, which came into the private ownership of individuals in the form of small plots.



Slika 6.1.1: Primer komasacije iz sredine prejšnjega stoletja na Nizozemskem, v kateri so vse stare kmetije ob rečnih bregovih podrli in postavili nove kmetije ob glavni cesti v vasi. Take komasacije so bile v tistem času na Nizozemskem precej pogoste.
Vir: http://www.geodetski-vestnik.com/50/1/gv50-1_044-059.pdf

Figure 6.1.1: An example of land consolidation from the middle of the last century in the Netherlands, in which all the old farms along the riverbanks were demolished, and new farms were built along the main road in the village. Such land consolidations were quite common in the Netherlands at the time.
Source: http://www.geodetski-vestnik.com/50/1/gv50-1_044-059.pdf



Slika 6.1.2: Primer komasacije gozdnih zemljišč, ki so posebej razširjena na Švedskem in v Skandinaviji. Meje zemljišč pred komasacijo so v beli barvi, meje nove razdelitve zemljišč po komasaciji pa v rdeči barvi.
Vir: http://www.geodetski-vestnik.com/50/1/gv50-1_044-059.pdf

Figure 6.1.2: An example of forest land consolidation, particularly prevalent in Sweden and Scandinavia. Property borders before land consolidation are shown in white, and new property division borders after land consolidation are shown in red.
Source: http://www.geodetski-vestnik.com/50/1/gv50-1_044-059.pdf

6.2 Komasacije na Slovenskem
Land consolidation in Slovenia

Gospodarske stvari.

Kaj je bolje: da ima gospodar svoje zemljišče skupaj ali pa raztreseno na več krajih?

Za novo leto slov. kmetovalcem v prevdarek.

Čuden se bode zdel morebiti mnogim našim gospodarjem napis tega sestavka, ki bodo rekli: vsaj so „Novice“ že cele pôle napisale o tem vprašanji, kako da pridejo zdaj do tega, da nam zložbo zemljišč vnovič celó za novoletnico prinesó?

Res je to, da so „Novice“ že veliko pisale o koristi zloženih zemljišč in večkrat svetovale, naj se raztresena zemljišča odpravijo s tem, da si gospodarji zamenjajo svoja posestva tako, da vsak svoje bolj skupaj dobi, al — zgodilo se ni nič, ker dosihmal še nobene postave ni bilo, ki bila bi to ukazala, prostovoljno se pa malokdo za kaj tacega briga, kar ni lahko izpeljati.

Kmalu bo pa to drugače.

Ministerstvo kmetijstva je vzelo to stvar, kakor je podoba, resno v roke in je družbam kmetijskim poslalo načrt take postave, po kateri naj bi se zložila (vkup djala) zemljišča posameznih gospodarjev. Mini-

Slika 6.2.1: Izsek iz uvodnega dela članka o komasacijah avtorja dr. Janeza Bleiweisa iz Novic v božičnem času leta 1876.
Vir: Novice-gospodarske, obrtniške in narodne, XXXIV/52, 27. december 1876, http://www.dlib.si/details/URN:NBN:SI:DOC-HN1O4EFA

Figure 6.2.1: Excerpt from the introductory part of the article on land consolidation by dr. John Bleiweis from the Novice publication at Christmas time in 1876.
Source: Novice-gospodarske, obrtniške in narodne, XXXIV/52, 27 December 1876, http://www.dlib.si/details/URN:NBN:SI:DOC-HN1O4EFA

Gospodarske stvari.

Bolj na drobno o zložbi zemljišč (Commasation).

„Novice“ so v zadnjem lanskem listu priporočale našim gospodarjem, prevdarjati korist in dobiček zemljiške zložbe. Veseli nas, da to priporočilo ni bilo govorjenje v burjo, ampak da nam je od umnega kmeta iz Gorenskega došla želja, naj bi kaj več na drobno povedali, kako se ima zložba zemljišč izpeljati, da nameravana nova stvar postane kmetovalcem bolj jasna.

Radi vstrezamo tej želji in s tem, mislimo, najbolje, ako kmetovalcem naznanimo načrt postave za zložbo zemljišč po osnovi ministerskega svetovalca K. Peyrer-ja.

Tako-le se glasí omenjeni načrt, o katerem se vé da se more premeniti marsikaj:

O predmetih te postave.

§. 1. Ta postava se tiče zamene zemljišč, kedar gre za njihovo zložbo z namenom boljega gospodarstva in naprave skupnih poljskih potov (kolóvozov).

O vzajemnih pravicah zemljiških posestnikov.

Slika 6.2.2: Izsek iz uvodnega dela predstavitve priprave zakonodaje o komasacijah avtorja dr. Janeza Bleiweisa iz Novic v januarju leta 1877.
Vir: Novice-gospodarske, obrtniške in narodne, XXXV/2, 10. januar 1877, http://www.dlib.si/details/URN:NBN:SI:DOC-49CZQ5UF
Triglav, J. (2013b). Zanimiv zapis iz 19. stoletja o komasacijah. Geodetski vestnik, 57(2), 381–387. http://geodetski-vestnik.com/cms/images/57/2/gv57-2_mnenja2.pdf

Figure 6.2.2: Excerpt from the introductory part of the presentation of the preparation of legislation on land consolidation by dr. Janez Bleiweis from the Novice publication in January, 1877.
Source: Novice-gospodarske, obrtniške in narodne, XXXV/2, 10 January 1877, http://www.dlib.si/details/URN:NBN:SI:DOC-49CZQ5UF
Triglav, J. (2013b). An interesting record from the 19th century on land consolidations. Geodetski vestnik, 57(2), 381–387. http://geodetski-vestnik.com/cms/images/57/2/gv57-2_mnenja2.pdf

Komasacije so na območju današnje Slovenije postale predmet večje javne pozornosti v drugi polovici 19. stoletja. Zakonski temelji za zložbe zemljišč so bili na območju današnje Slovenije postavljeni v nekdanji avstro-ogrski državi, ki je 7. junija 1883 izdala naslednje zvezne zakone: Zakon o zložbi kmetijskih zemljišč (nem. Zusammenlegung landwirtschaftlicher Grundstücke), Zakon o odpravi tujih enklav v gozdovih ter arondaciji gozdnih zemljišč (nem. Bereinigung des Waldlandes von fremden Enklaven und die Arrondierung der Waldgrenzen) ter Zakon o razdelbi skupnih zemljišč in uredbi dotičnih skupnih pravic do njihovega uživanja in oskrbovanja (nem. Teilung gemeinschaftlicher und die Regulierung der hierauf bezüglichen gemeinschaftlichen Benützungs- und Verwaltungsrechte).

Za izvajanje agrarnih operacij so bile zadolžene deželne komisije za agrarne operacije. Na Kranjskem je bila takšna komisija ustanovljena na podlagi Zakona o razdelbi skupnih zemljišč in uredbi pravic do njih skupnega premoženja, uživanja in upravljanja z dne 26. 10. 1887. Komisija na Štajerskem je bila ustanovljena z zakonom z dne 26. 5. 1909, komisija za Koroško pa z zakonom z dne 5. 7. 1885. Med agrarne operacije so poleg komasacij kmetijskih zemljišč oziroma zložb spadale še razdelitve skupnih zemljišč in ureditev skupnih pravic do uživanja in oskrbovanja teh zemljišč, urejanje servitutnih pravic paše in pravic do skupnih planin oziroma planinskih pašnikov, melioracije in odprave enklav v gozdovih. Posamezne postopke so urejali področni zakoni. (Op.: Uradna objava besedila zakona o komasacijah iz leta 1883 v slovenskem jeziku je dostopna v obsežni zbirki besedil stare geodetsko-katastrske zakonodaje od leta 1785 naprej, ki je priloga članku Rjava , rdeča in zelena – barve naše stare geodetsko-katastrske tradicije, http://www.geodetski-vestnik.com/62/2/gv62-2_triglav1.pdf.)

Deželni zakoni so posebej urejali tudi komasacije, za Kranjsko je bil izdan 7. 11. 1900, za Koroško 21. 2. 1900, za Štajersko pa šele leta 1909. Posebnost je Prekmurje, ki je takrat spadalo v ogrski del tedanje države, tam pa so veljale drugačne zakonske ureditve. Tedanji uradi oziroma deželne komisije za agrarne operacije so se večinoma ukvarjali z delitvijo skupnih zemljišč ter urejanjem pravic na skupnih pašnikih.

V zbirki Arhiva Republike Slovenije Komisije za agrarne operacije (1889–1945) so razvidne posamezne zložbe na slovenskih tleh, ki so bile uvedene v obdobju pred prvo svetovno vojno in so se pogosto izvajale skupaj s postopki razdeljevanja skupne posesti ter melioracijami (urejanje vodotokov, izsuševanje ipd.).

Land consolidations became the subject of greater public attention in the area of today's Slovenia in the second half of the 19th century. The legal foundations for land consolidations in the area of present-day Slovenia were laid in the former Austro-Hungarian state, which issued the following federal laws on 7 June 1883: The Act on the Merging of Agricultural Land (Ger. Zusammenlegung landwirtschaftlicher Grundstücke), the Act on the Elimination of Foreign Enclaves in Forests and the Rounding of Forest Lands (Ger. Bereinigung des Waldlandes von fremden Enklaven und die Arrondierung der Waldgrenzen) and the Act on the Division of Common Land and the Regulation of Common Rights to their Use and Handling (Ger. Teilung gemeinschaftlicher und die Regulierung der hierauf bezüglichen gemeinschaftlichen Benützungs- und Verwaltungsrechte).

Agrarian operations were carried out by provincial commissions for agrarian operations. In Carniola, such a commission was established on the basis of the Act on the Division of Common Lands and the Decree on the Rights to Common Property, Use and Management of 26 October 1887. The commission in Styria was established by the Act of 26 May 1909, and the commission for Carinthia by the Act of 5 July 1885. In addition to land consolidation of agricultural land, agrarian operations also included the division of common land and the regulation of joint rights to the use and care of these lands, the regulation of easement grazing rights and rights to common mountains or mountain pastures, land reclamation and removal of enclaves in forests. The individual procedures were regulated by sectoral laws. (Note: The official publication of the text of the Land Consolidation Act of 1883 in the Slovenian language is available in the extensive collection of texts of the old geodetic and cadastral legislation from 1785 onwards, which is an appendix to the article entitled Brown, Red and Green – the Colours of our Old Geodetic and Cadastral Tradition, http://www.geodetski-vestnik.com/62/2/gv62-2_triglav1.pdf.)

Land consolidation was also specifically regulated by provincial laws; one was issued for Carniola on 7 November 1900, for Carinthia on 21 February 1900, and for Styria only in 1909. Prekmurje was a special case; at the time, it was under the Hungarian part of the country, and thus had different legal regulations. The administrations or provincial commissions for agrarian operations at the time were mostly concerned with the division of common lands and the regulation of rights on common pastures.

The collection of the Commission for Agrarian Operations (1889–1945) held in the Archives of the Republic of Slovenia shows individual consolidations on Slovenian soil, which were introduced in the period before World War I and were often carried out together with procedures for dividing common land and land reclamation (watercourses, drainage). etc.

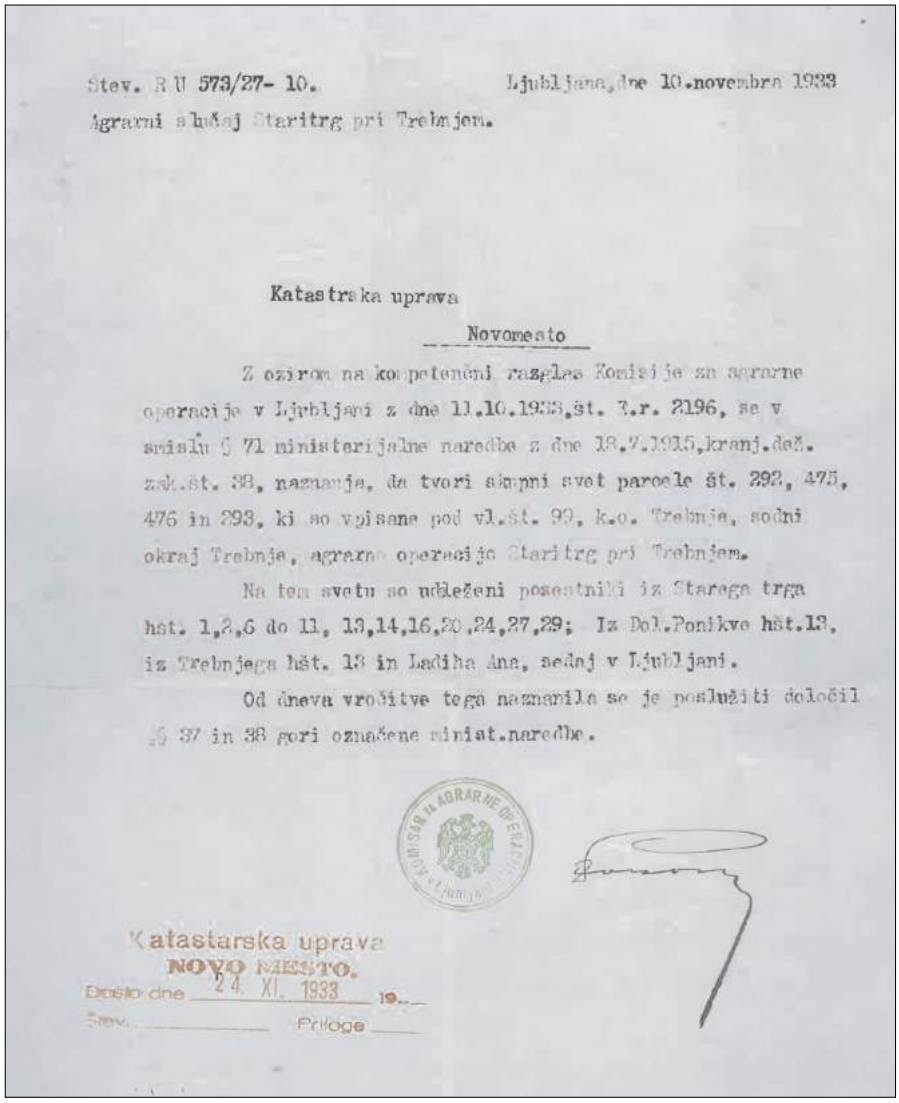
Zakon o občinah, komasacija občin, občinske volitve, šolske občine in učiteljstvo

S komasacijo občin je odpravljena ta ovira gospodarskega razvoja občin. Sedanje upravne občine s povprečno osnovo 100.000 dinarjev direktnih državnih davkov bodo v položaju pri smotrenem občinskem gospodarstvu nuditi tudi šolskim občinam potrebna materialna sredstva za zboljšavanje šolskih poslopij pri nastopu rednih gospodarskih razmer. V veliki večini upravnih občin bo sicer vključenih po več šolskih občin, kar pa nikakor ne bo oviralo napredka v gospodarstvu teh šolskih občin. Mogoči pomisleki, da bo občina z vzdrževanjem večjega števila šolskih občin temu primerno z dajatvami gospodarsko preobremenjena in ne bo kos stavljenim nalogam v pogledu šolstva, niso utemeljeni.

Po izvršeni komasaciji občin se je zmanjšalo število onih šolskih občin, ki so bile sestavljene iz delov večih občin. Zlasti v bivši mariborski oblasti smo imeli pred komasacijo občin šolske občine, sestavljene iz pet do osem upravnih občin, kar je v mnogih primerih oviralo redno gospodarstvo krajevnega šolskega odbora in posredno seveda tudi razvoj narodne šole v kraju. Zato moremo samo pozdravljati spojitev občin s stališča razvoja narodnega šolstva. Saj vidimo, da je v majhnih upravnih občinah razvoj narodnega šolstva najbolj oviran. To je razumljivo, in skoraj bi trdili tudi opravičljivo, če ugotovimo, da mala občina s par tisoč dinarjev direktnih davkov nikakor ni bila v položaju zadostiti potrebam narodne šole...

Slika 6.2.3: V stari Jugoslaviji so izvedli tudi komasacijo upravnih občin – izrez iz članka v glasilu Učiteljski tovariš, 12. oktobra 1933, letnik LXXIV, št. 10.

Figure 6.2.3: In the former Yugoslavia, a consolidation of administrative municipalities was also carried out – excerpt from an article in the journal Učiteljski tovariš, 12 October 1933, year LXXIV, no. 10



Štev. R U 573/27- 10. Ljubljana, dne 10.novembra 1933

Agrarni skupaj Staritrg pri Trebnjem.

Katastrska uprava

Novomesto

Z ozirom na kompetenčni razglas Komisije za agrarne operacije v Ljubljani z dne 11.10.1933,št. T.r. 2196, se v smislu § 71 ministerijalne naredbe z dne 18.7.1935,kranj.dež. zak.št. 38, naznanja, da tvori skupni svet parcele št. 292, 475, 476 in 293, ki so vpisane pod vl.št. 99, k.o. Trebnje, sodni okraj Trebnje, agrarne operacije Staritrg pri Trebnjem.

Na tem svetu so udeleženi posestniki iz Starega trga hšt. 1,2,6 do 11, 13,14,16,20,24,27,29; Iz Dol.Ponikve hšt.13, iz Trebnjega hšt. 13 in Ladiha Ana, sedaj v Ljubljani.

Od dneva vročitve tega naznanila se je poslužiti določil §§ 37 in 38 gori označene minist.naredbe.

KOMISIJA ZA AGRARNE OPERACIJE v Ljubljani

Katastarska uprava
NOVO MESTO.
Došlo dne 24. XI. 1933 19..
Štev. Priloge

Slika 6.2.4: Razglas skupnega sveta agrarne operacije Stari trg pri Trebnjem iz leta 1933. Vir: Arhiv GURS, OGU Novo mesto

Figure 6.2.4: Proclamation of the joint council of the agrarian operation Stari trg near Trebnje from 1933.
Source: The SMARS archive, OGU Novo mesto

Pred prvo svetovno vojno je bilo skupno zloženih nekaj več kot 1000 ha, kjer je sodelovalo nekaj več kot 250 posestnikov, nekaj zložb, ki so se začele v tem obdobju, pa je bilo končanih šele po prvi svetovni vojni. Leta 1919 je bila za območje takratne Slovenije ustanovljena Višja komisija za agrarne operacije v Ljubljani, ki se je leta 1921 preimenovala v Deželno komisijo za agrarne operacije in leta 1928 v Komisijo za agrarne operacije.

» *V priročniku Deželne komisije za agrarne operacije (Zložba poljedeljskih zemljišč, 1921) je zapisano: »Zložba poljedeljskih zemljišč, s tujim imenom komasacija, je pri nas še precej neznana, in to kljub temu, da je zložba izredne važnosti in velikanskega gospodarskega pomena za udeleženega poljedelca. Da ni zanimanja za to prevažno gospodarsko vprašanje, je največ krivo to, ker večina naših kmetovalcev tozdevnega zložbenega zakona in predpisov o zložbenem ravnanju ne pozna v tisti meri, kakor bi bilo v njihovo korist potrebno. V drugih deželah so v tem obziru veliko napredovali in že desetletja vrše zložbe leto za letom z velikem obsegu ter z izvrstnim uspehom.«* «

Med prvo in drugo svetovno vojno je bilo v Sloveniji zaradi pomanjkanja sredstev ter slabe ozaveščenosti javnih služb in lastnikov zemljišč izvedenih bore malo komasacij le na skupni površini približno 800 ha. Splošna gospodarska kriza pred drugo svetovno vojno in vse močnejši proces urbanizacije sta povzročila nadaljnje deljenje zemljiške posesti, in povprečna velikost parcele obdelovalnih zemljišč na območju tedanje Slovenije je s 30 arov v letu 1848 padla na 6 arov pred drugo svetovno vojno.

Po drugi svetovni vojni so bili ukrepi agrarne politike in povojna zemljiška politika usmerjeni v povečanje družbenih posesti. Kljub temu je v Sloveniji ostala v zasebni lasti večina obdelovalnih kmetijskih zemljišč in kmečka gospodarstva so ohranila drobno posestno strukturo. Komasacije in druge agrarne operacije je obravnaval zvezni Temeljni zakon o izkoriščanju kmetijskega zemljišča iz leta 1959. Pozneje je bil še večkrat noveliran (1962, 1965, 1967 in 1970). V Sloveniji smo svoj Zakon o komasacijah dobili leta 1957, leta 1963 ga je zamenjal Zakon o komasacijah, temu pa je leta 1964 sledila Uredba o postopku za komasacijo kmetijskih zemljišč.

Z letom 1958 je komasacije začel izvajati pri zadružni zvezi ustanovljeni Oddelek za urejanje kmetijskih zemljišč. Nekaj let je deloval tudi kot oddelek Kmetijskega inštituta, potem pa postal samostojen Zavod za urejanje kmetijskih zemljišč, a je leta 1975 prenehal delovati. V tem času je bilo komasiranih le približno 1300 ha zemljišč. Leta 1973 je začel veljati republiški Zakon o kmetijskih zemljiščih, ki je urejal tudi področje agrarnih operacij. Z njim se je uredilo financiranje agrarnih operacij, saj je predpisal prispevek za spremembo namembnosti kmetijskih zemljišč, ki je pome-

Before World War I, there were a total of just over 1000 ha of land consolidations, with a little more than 250 landowners involved, and some of the consolidations that began during this period were not completed until after World War I. In 1919, the Higher Commission for Agrarian Operations was established in Ljubljana for the territory of Slovenia, which in 1921 was renamed the Regional Commission for Agrarian Operations and in 1928 the Commission for Agrarian Operations.

» *The handbook of the Provincial Commission for Agrarian Operations (the consolidation of agricultural land, 1921) states: "The consolidation, or comassation, of agricultural land is still quite unknown to us, despite the fact that it is of great importance and enormous economic significance for participating farmers. The lack of interest in this crucial economic issue is mostly due to the fact that most of our farmers do not know the seemingly complex laws and regulations on consolidation behaviour to the extent that would be necessary to benefit them. Other countries have made a lot of progress in this regard, and have been performing consolidations for decades, year after year, with huge scope and great success."* «

Between the wars, there were very few consolidations in Slovenia due to a lack of funds and poor awareness of public services and landowners; a total area of 800 ha was consolidated. The general economic crisis before World War II and the growing process of urbanization led to further division of land ownership, and the average size of arable land in the area of Slovenia at the time dropped from 30 acres in 1848 to 6 acres before World War II.

After World War II, agrarian policy measures and post-war land policy were aimed at increasing social property. Nevertheless, most arable agricultural land in Slovenia remained privately owned, and agricultural economies retained a small ownership structure. Land consolidation and other agrarian operations were addressed by the Federal Basic Act on the Exploitation of Agricultural Land of 1959. It was subsequently amended several times (in 1962, 1965, 1967 and 1970). Slovenia received its Land Consolidation Act in 1957, replaced by the Land Consolidation Act of 1963, followed in 1964 by the Decree on the Procedure for Consolidation of Agricultural Land.

In 1958, land consolidation was started by the Department for Agricultural Land Management established at the Cooperative Association. It also operated as a department of the Agricultural Institute for a few years, then became an independent Institute for the Management of Agricultural Land but ceased to operate in 1975. During this time, only about 1300 ha of land were consolidated. In 1973, the Republic Agricultural Land Act came into force, which also regulated the field of agrarian operations. It regulated the financing of agricultural operations, since it prescribed a contribution for changing the use of agricultural land, which represented a dedicated source for co-financing the consolidation of

nil namenski vir tudi za sofinanciranje komasacij kmetijskih zemljišč. Z novim Zakonom o kmetijskih zemljiščih iz leta 1979 je bilo predpisano, da se lahko uvede predlog za komasacijo, če se s tem strinjajo lastniki zemljišč, ki imajo več kot 50 % površin vseh kmetijskih zemljišč na komasacijskem območju.

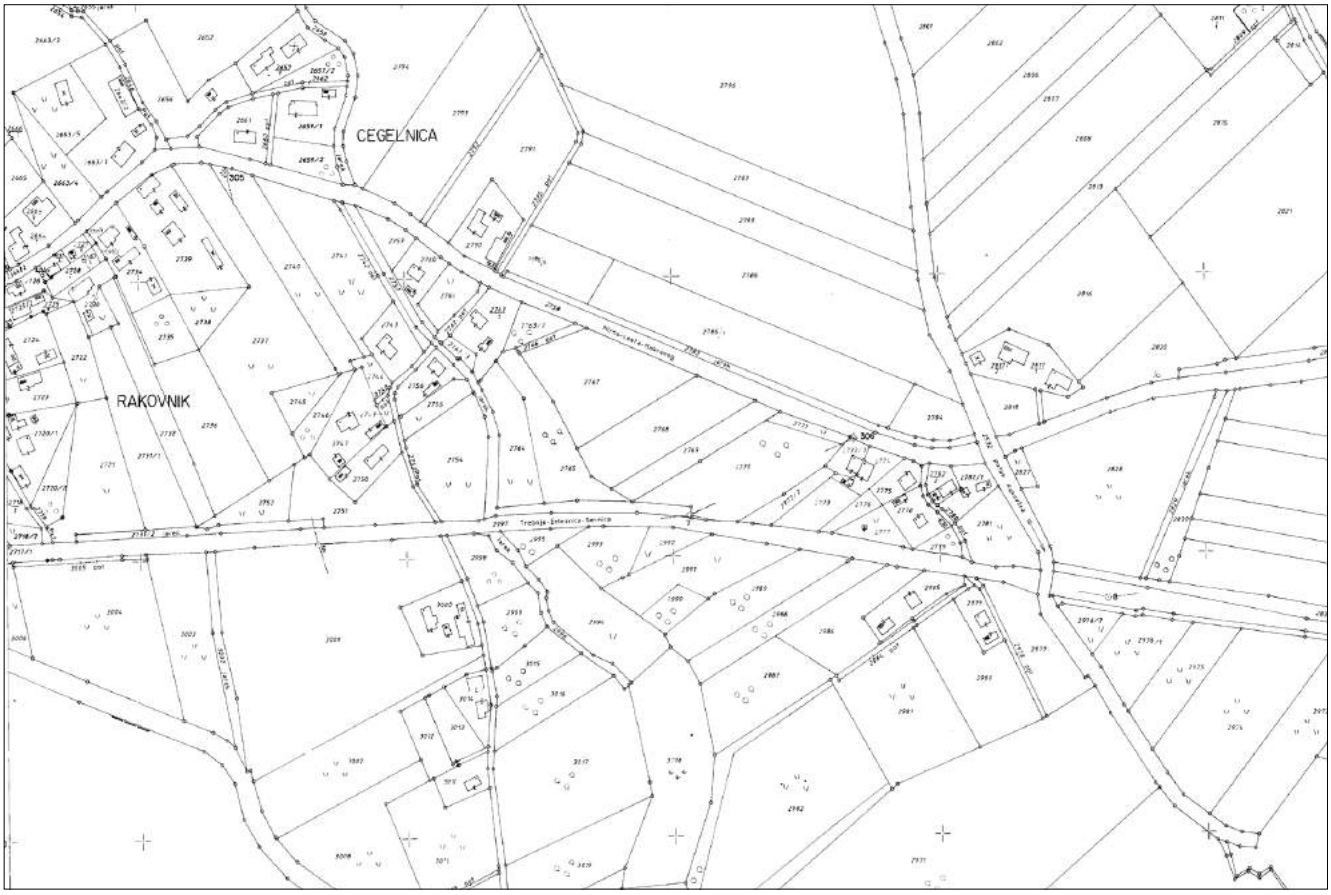
V zgodovini urejanja kmetijskih zemljišč v Sloveniji je bilo najbolj intenzivno obdobje 1981–1990, ko je bilo uvedenih največ komasacij. K temu sta pripomogla Zakon o zagotavljanju in usmerjanju sredstev za usposabljanje zemljišč za družbeno organizirano kmetijsko proizvodnjo v obdobju 1982–1985 in takratna organiziranost strokovne službe, ki je vodila postopke agrarnih operacij. Ta je delovala v okviru Zveze vodnih skupnosti, ki pa je bila po prenehanju interesnih skupnosti vključena v ministrstvo, pristojno za kmetijstvo.

agricultural land. The new Agricultural Land Act of 1979 provided that a proposal for land consolidation could be introduced upon agreement with the owners of more than 50% of the area of all agricultural land in the land consolidation.

The most intensive period in the history of agricultural land management in Slovenia was 1981–1990, when the highest number of land consolidations was introduced. This was facilitated by the Act on the Provision and Direction of Funds for the Development of Land for Socially Organized Agricultural Production in the Period 1982–1985 and the organization of a professional service that managed the procedures of agrarian operations. It operated within the Association of Water Communities, which was included in the Ministry for Agriculture after the termination of interest groups.

Slika 6.2.5: Izsek iz katastrskega načrta k. o. 1398 Bistrica, na območju katerega se je v letu 1989 izvedla komasacija. Komasacija (Rakovniško polje) je zajemala kmetijska in gozdna zemljišča ter izmero urbanega dela znotraj območja komasacije.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 6.2.5: Excerpt from the cadastral plan CM 1398 Bistrica, where land consolidation was carried out in 1989. The land consolidation (Rakovniško polje) included agricultural and forest land and a survey of the urban part within the land consolidation area.
Source: the e-ZKN archive land cadastre map viewer



Slika 6.2.6: Slika parcelnega stanja po izvedeni komasaciji Rakovniško polje.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 6.2.6: Image of the state of plots after the Rakovniško polje land consolidation.
Source: the e-ZKN archive land cadastre map viewer

Skupaj je bilo na območju Slovenije po drugi svetovni vojni do osamosvojitve Slovenije leta 1991 v komasacije vključenih več kot 53.300 ha zemljišč. V tem obdobju so se komasacije izvajale predvsem s ciljem povečanja družbene lastnine na zemljiščih, medtem ko povečevanju družinskih kmetij niso posvečali posebne pozornosti. Intenzivnemu uvajanju projektov komasacij pa ni sledila učinkovita izvedba, tako je bilo v začetku devetdesetih let preteklega stoletja po ocenah takratnega kmetijskega ministrstva kar 125 nedokončanih komasacij.

Z letom 1991 so se tako imenovane »prisilne« komasacije počasi nehale uvajati, predvsem zaradi priprav in spreminjanja zakonodaje s področja vračanja krivično odvzetih kmetijskih zemljišč in gozdov ter zaradi moratorija na osuševanje zemljišč, ki se je pogosto izvajalo vzporedno s komasacijami. Postopki komasacije so zaradi spremembe političnega sistema in (re)organizacije strokovnih služb

In total, more than 53,300 ha of land were included in land consolidation in the area of Slovenia after World War II up to Slovenia's independence in 1991. During this period, land consolidation was carried out mainly with the aim of increasing social ownership of land, while no special attention was paid to the growth of family farms. However, the intensive introduction of land consolidation projects was not followed by effective implementation, so in the early 1990s, according to the estimates of the then Ministry of Agriculture, there were as many as 125 unfinished instances of land consolidation.

In 1991, the so-called "forced" land consolidation was gradually discontinued, mainly due to preparations and amendments of legislation in the field of returning unjustly confiscated agricultural land and forests and due to the moratorium on land drainage, which was often carried out in parallel with land consolidations. Due to a change in the political system and the (re)organization of professional services, land consolidation procedures ceased in Slovenia for some time. Many land consolidations from the previo-

za nekaj časa v Sloveniji zamrli. Mnoge komasacije iz preteklega obdobja niso bile dokončane, pogosto pa tudi lastniki zemljišč z izvedbo del niso bili zadovoljni, saj so jim bili komasacijski postopki največkrat vsiljeni. Leta 1994 je bil izdelan program sanacije komasacij. Tako je bilo naslednje desetletje zaznamovano s sanacijami komasacijskih območij, ki pa še do danes niso povsem dokončane.

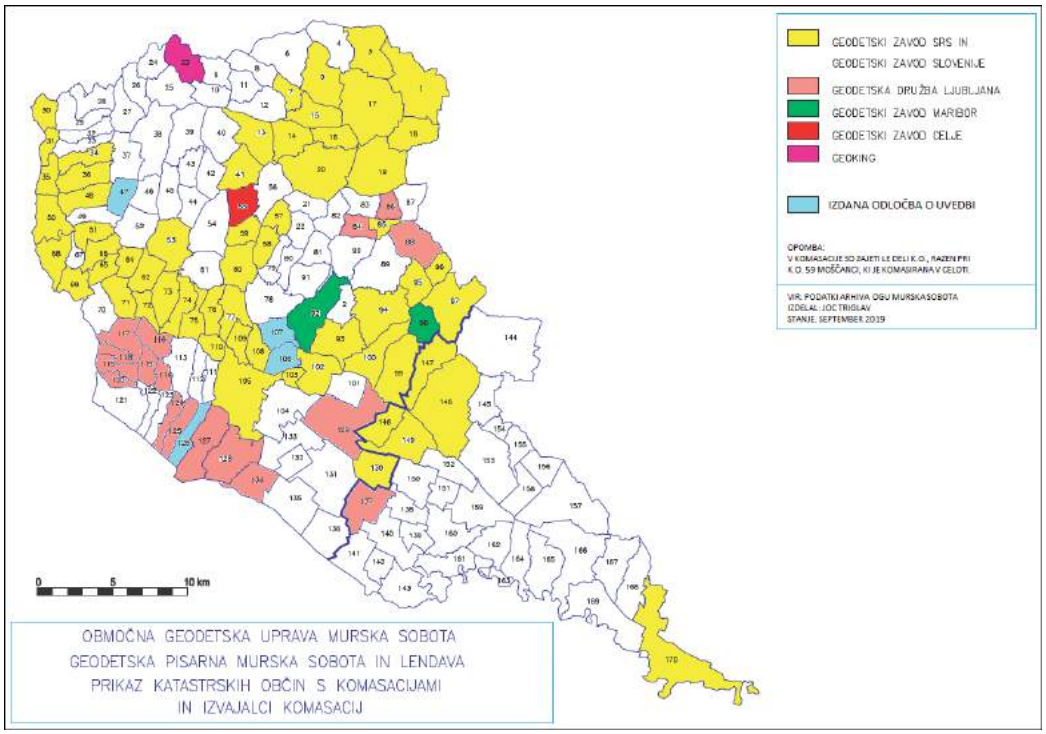
Danes področje komasacij kmetijskih zemljišč ureja Zakon o kmetijskih zemljiščih, ki izvira iz leta 1996. Za izvedbo komasacije kmetijskih zemljišč je predviden instrument upravne komasacije. Ta zahteva soglasje lastnikov zemljišč, ki imajo v skupni lasti več kot 67 % površin zemljišč na predvidenem komasacijskem območju (sprememba v letu 2011, prej je bil ta delež 80 %). S spremembo zakonodaje iz leta 2011 je bila uvedena tudi možnost pogodbene komasacije, ki je novost v slovenskem prostoru.

Zakon o urejanju prostora iz leta 2017 uvaja tudi pogodbeno in upravno komasacijo na območju stavbnih zemljišč. Komasacija se lahko izvede na podlagi veljavnega OPN ali OPPN ali pa se izvaja hkrati s pripravo OPPN.

us period were not completed, and often landowners were not satisfied with the execution of works, as land consolidation procedures were mostly imposed on them. In 1994, a land consolidation redevelopment program was introduced. Thus, the next decade was marked by the redevelopment of consolidation areas, which are still not fully completed to this day.

Today, the field of agricultural land consolidation is regulated by the Agricultural Land Act, which dates from 1996. An instrument of administrative consolidation is envisaged for the implementation of land consolidation. This requires the consent of landowners who jointly own more than 67% of the land area in the planned area of land consolidation (changed in 2011, previously this share was 80%). With the amendment of the legislation from 2011, the possibility of contractual consolidation was introduced, which is a novelty in the territory of Slovenia.

The Spatial Planning Act of 2017 also introduces contractual and administrative land consolidation in the area of building land. Land consolidation may be carried out on the basis of a valid OPN or OPPN or upon the preparation of an OPPN.



Slika 6.2.7: Prikaz katastrskih občin v Prekmurju, kjer so bile v delih k. o. izvedene upravne komasacije. Seznam šifer in imen k. o. je dostopen na http://cen.gov.si/JavniVpogled/help/KO.htm.
Vir: Arhiv GURS, OGU MS

Figure 6.2.7: Cadastral municipalities in Prekmurje where administrative consolidations were implemented in parts of the CM List of codes and names of CMs can be found at http://cen.gov.si/JavniVpogled/help/KO.htm.
Source: The SMARS archive, OGU MS

Pogodbena komasacija stavbnih zemljišč je prostorski ukrep, s katerim se na podlagi sklenjene pogodbe in pridobljenega komasacijskega soglasja vzpostavi takšna parcelna struktura stavbnih zemljišč, da omogoča izvedbo prostorskih ureditev, predvidenih s prostorskim aktom.

Upravna komasacija se izvede, če ni mogoče doseči pogojev za pogodbeno komasacijo.

V zadnjih letih se komasacije izvajajo na kmetijsko intenzivnih območjih Slovenije, največkrat na pobudo lokalne skupnosti ali kmetov samih. Komasacije kmetijskih in gozdnih zemljišč so v Sloveniji praviloma in v večinskem delu financirane s sredstvi Evropskega kmetijskega sklada za razvoj podeželja (EKSRP).

Contractual land consolidation of building land is a spatial measure by which, on the basis of a concluded contract and obtained land consolidation consent, such a plot structure of building land necessary to implement spatial arrangements provided for in the spatial plan is established.

If the conditions for contractual consolidation cannot be met, administrative land consolidation is carried out.

In recent years, land consolidation has been carried out in agriculturally intensive areas of Slovenia, mostly at the initiative of the local community or farmers themselves. Consolidation of agricultural and forest land in Slovenia is generally and mostly financed by the European Agricultural Fund for Rural Development (EAFRD).

6.3 Večplastni pomen komasacij
The multifaceted significance of land consolidation

Komasacije so ena ključnih zemljiških operacij v prizadevanju za reševanje vprašanja posestne in parcelne razdrobljenosti kmetijskih in gozdnih gospodarstev. Kljub temu da se na območju države že desetletja izvajajo komasacije, pa naša država v primerjavi z državami Zahodne in Srednje Evrope še vedno izstopa s parcelno razdrobljenostjo kmetijskih zemljišč.

Land consolidation is one of the key land operations aiming to address the issue of land and plot fragmentation in agricultural and forestry economies. Despite the fact that land consolidation has been carried out in the country for decades, our country still stands out in comparison with the countries of Western and Central Europe in terms of plot fragmentation of agricultural land.

» *Pomen zložb za zmanjševanje možnosti mejnih sporov.*

»Kdor ima veliko parcel, ima seveda tudi veliko mejašev, med katerimi se včasih nahaja tudi tak, ki iz nagajivosti ali celo grabežljivosti zaide s plugom v sosedovo zemljišče in si s tem prilasti del tuje zemlje. Kjer pa je veliko njiv, ki so zelo dolge, in če si tedaj tak nepošten mejaš prisvoji samo eno brazdo, je to vsled dolgosti njive že precejšen kos sveta. Posestnik tako odvzetega sveta nima samo te škode, ampak plačuje za ta svet tudi davke. Posledica takega prekoračenja meje, izvršenega s prioranjem, so največkrat pravde, ki povzročajo mnogo razprtij in sovraštva. Po zložbi zemljišč pa vse to odpade. Meje so ravne in dobro zaznamovane s kamni in ker je namesto mnogo majhnih parcel samo nekaj veliko kosov, je tedaj razmerno tudi veliko manj mejašev. Ker je manj mejá, se lažje nadzorujejo te meje, ki tvorijo ravno črto od pota do pota, in če se slučajno kak mejni kamen zgubi ali vsled zlobnosti odstrani, ga vsak posestnik na podlagi novo določene meje lahko sam postavi ...«

Vir Arhiv Slovenije, Zložba poljedeljskih zemljišč, 1921 «

» *The importance of land consolidation lies in reducing the possibility of border disputes.*

"Whoever has many plots also has many neighbours, which might at times include one that, out of mischief or even greed, ploughs into his neighbour's land and thus appropriates a part of his property. But where there are several long fields, and if then such a dishonest neighbour appropriates only a single furrow, this alone constitutes a considerable piece of the world due to the length of the field. The possessor of an area thusly appropriated bears not only this damage but is also taxed for this area. The consequences of such a border crossing carried out by ploughing are most often legal cases that cause much discord and hatred. After land consolidation, however, everything goes away. The borders are straight and well-marked with stones and, since instead of many small plots there are just a few big parts, then there are also comparatively fewer borders. With fewer borders, the ones which form a straight line from path to path can be more easily controlled, and if by chance a border stone is lost or removed by malice, each possessor may reposition it by himself on the basis of the newly determined border (...)"

Source: Archives of the Republic of Slovenia, Consolidation of Agricultural Land, 1921 «

Komasacijam se danes še vedno namenja bistveno premalo pozornosti. Razumeti je, da imajo v Sloveniji še vedno negativen prizvok zapletenih ter dolgotrajnih in težavnih postopkov.
Komasacije zemljišč bi morali obravnavati kot instrument javnega interesa, saj prinašajo številne prednosti, kot so

Land consolidation is still given far too little attention today. It is understandable that it still has a negative connotation of a complex, lengthy and difficult procedure in Slovenia.
Land consolidation should be seen as an instrument of public interest, as it brings about many benefits, such as improving agricultural production and rural development conditions, landscaping,

izboljšanje pogojev kmetijske pridelave in razvoja podeželja, urejanja krajine, posredno prispevajo k prehranski samooskrbi, da ne omenjamo drugih koristi, kot sta nova katastrska izmera in kakovostni prostorski podatki v okviru zemljiških in prostorskih informacijskih sistemov.

Mednarodna organizacija Združenih narodov za kmetijstvo in prehrano FAO (angl. Food and Agriculture Organization of the United Nations) opredeljuje vplive komasacij tako, da jih združi na treh različnih osnovnih ravneh (FAO, 2008):

- mikroraven, z neposrednimi učinki na udeležence komasacij,
- mezoraven, s posrednimi učinki na regionalno gospodarstvo in infrastrukturo, ter
- makroraven, na ravni družbe, gospodarstva, institucij in okolja neke države.

Na **mikroravni** komasacije spreminjajo kmetije in njihovo neposredno okolje tako, da kmetom omogočajo boljšo izrabo zemljišč in večjo produktivnost ter s tem večjo konkurenčnost kmetijske proizvodnje. Prej razdrobljene parcele so združene v večje parcele, ki so umeščene bližje kmetijam. S tem se zmanjša poraba goriva in količina škodljivih izpustov izpušnih plinov v okolje. Parcel, ki prej zaradi oddaljenosti od kmetije niso bile zanimive za obdelavo, po komasaciji ni več. S komasacijo se izvede tudi preoblikovanje parcel neprimernih oblik v parcele primernejših oblik s praviloma vzporednimi mejami, kar omogoča sodoben način kmetijske proizvodnje. Ozke parcele in parcele z ostro lomljenimi mejami npr. niso primerne za uporabo kmetijske mehanizacije. V komasaciji lahko kmetje tudi povečajo obseg svojih zemljišč, npr. z dokupom razpoložljivih zemljišč od države, občine ali zasebnih lastnikov, ki se ne morejo ali ne želijo več ukvarjati s kmetijstvom. Poleg tega se s komasacijo lahko izboljšajo fizične lastnosti zemljišč s planiranjem zemljišč in agromelioracijskimi ukrepi. Na ta način se zmanjšujejo proizvodni stroški in povečuje proizvodnja. Kmetje lahko v ta namen izrabijo tudi možnost zamenjave obstoječih boljših zemljišč za nova slabša zemljišča, ki jih pozneje usposobijo za kakovostno kmetijsko proizvodnjo. V okviru komasacij se praviloma obnovijo in dopolnijo obstoječi sistemi za odvodnjavanje in/ali namakanje kmetijskih zemljišč tako, da ustrezajo novi lastniški strukturi po novi razdelitvi zemljišč. Ena od velikih prednosti komasacij, ki jo cenimo predvsem geodeti in zemljiška knjiga, pa je vzpostavitev kakovostnega in urejenega katastra na območju komasacij in ureditev ter posodobitev zemljiškoknjižnih podatkov o lastnikih nepremičnin in nosilcih stvarnih pravic na nepremičninah. Posledično ima to multiplikativni pozitiven učinek na vse druge prostorske evidence (Triglav, 2010).

indirectly contributing to food self-sufficiency, in addition to other benefits such as new cadastral surveys and quality spatial data in land and spatial information systems.

The Food and Agriculture Organization of the United Nations (FAO) defines the effects of land consolidation by breaking them into three different basic levels (FAO, 2008):
the micro level, with direct effects on the participants in the land consolidation,

- the micro level, with direct effects on the participants in the land consolidation,
- the mezzo level, with indirect effects on the regional economy and infrastructure, and
- the macro level, at the level of the society, economy, institutions and environment of a country.

At the **micro level**, land consolidation includes changing farms and their immediate environment by enabling farmers to improve land use and increase productivity, thus increasing the competitiveness of agricultural production. Previously fragmented plots are grouped into larger plots that are located closer to the farms. This reduces fuel consumption and the amount of harmful exhaust emissions into the environment. After land consolidation, there are no more plots that were previously not useful for cultivation due to their distance from the farm. With land consolidation, plots of unsuitable shapes are transformed into plots of more suitable shapes with, as a rule, parallel borders, which facilitates modern agricultural production methods. Narrow plots and plots with sharply graded borders, for example, are not suitable for the use of agricultural machinery. In land consolidation, farmers can also increase the size of their land, e.g. by purchasing available land from the state, municipality or private owners who are unable or no longer willing to engage in agriculture. In addition, land consolidation can improve the physical properties of land through land planning and agromelioration measures. In this way, production costs are reduced, and production is increased. To this end, farmers can also use the possibility of replacing existing better land with new inferior land, which they later develop for quality agricultural production. As a rule, in the context of land consolidation, existing systems for drainage and/or irrigation of agricultural land are renewed and supplemented so that they correspond to the new ownership structure after the new division of land. One of the great advantages of land consolidation, which is especially appreciated by surveyors and the land register, is the establishment of a high-quality cadastre in the field of land consolidation and arrangements and the updating of land registry data on property owners and real estate holders. Consequently, this has a multiplicative positive effect on all other spatial records (Triglav, 2010).

Na **mezoravni** je učinek komasacij na podeželju viden predvsem v izboljšanju naravnega okolja, infrastrukture in prostorske razporeditve gospodarskih in družbenih aktivnosti. S komasacijami se ob upoštevanju naravnih danosti, potreb lokalne skupnosti, varovanja okolja in zaščite pred naravnimi nesrečami za posamezne namene uporabe zagotovijo najprimernejša zemljišča. Npr. na območjih močne erozije zemljišč ali na območjih pogostih poplav se na zemljiščih, ki zaradi naravnih pogojev niso primerna za kmetijsko obdelavo, lahko izvedejo npr. aktivnosti za spremembo v gozdove ali mokrišča in za ureditev vodnih teles ter zaščito mokrišč. Komasacije so lahko tudi sestavni del večjih investicijskih projektov na področju izgradnje in posodobitve infrastrukture. V takih primerih se v komasaciji v skladu s prostorskimi načrti zagotovijo zemljišča npr. za izgradnjo železnice, cest in poti, kolesarskih stez, kanalov za odvodnjavanje ali namakanje zemljišč, vodovodnih ali kanalizacijskih sistemov, energetskih ali telekomunikacijskih vodov ipd. Komasacije so vse pogosteje tudi vključene v razvojne strategije podeželja in projekte obnove vasi za izboljšanje življenjskih in delovnih pogojev prebivalstva. S takimi projekti se npr. določijo območja za stanovanjske, proizvodne in rekreacijske površine, prilagodi in preoblikuje se prometna infrastruktura za izboljšanje prometne varnosti ipd. Vsi ti pogoji iz projektov so potem upoštevani pri načrtovanju optimalne nove razdelitve zemljišč v komasaciji.

Na **makroravni** komasacije na državni ravni izboljšujejo kakovost življenja na podeželju ter povečujejo produktivnost in konkurenčnost kmetijskega sektorja. Hkrati izboljšujejo naravno okolje ter ekonomska in socialna razmerja na vseh ravneh. Z izboljšanjem infrastrukture komasacije prispevajo k razvoju vseh sektorjev gospodarstva. Komasacije pomagajo pri vzpostavljanju pogojev za ravnovesje med interesi kmetijstva, okolja, rekreacije, naravne in kulturne dediščine, turizma, prometa in drugih dejavnosti. Dobro zastavljene in korektno izpeljane komasacije so tudi pomemben dejavnik za vzpostavljanje in ohranjanje zaupanja med ljudmi in oblastmi, ki je v sodobnem času vse bolj pomembno. Komasacije tudi pomembno prispevajo k razvoju zemljiškega trga, in sicer neposredno z izvedbo prometa z zemljišči med komasacijo in posredno z informacijami o ponudbi in povpraševanju po kmetijskih zemljiščih ter njihovih cenah. Hkrati se z oblikovanjem večjih parcel v komasaciji olajša promet z zemljišči med zasebnimi lastniki samimi ter obojestranski promet z zemljišči med zasebnimi lastniki na eni strani ter državo ali lokalno skupnostjo na drugi strani.

Komasacije kot instrument razvoja podeželja bi morale biti na vseh ravneh načrtovanja in odločanja vključene v strate-

At the **mezzo level**, the effect of land consolidation in rural areas is seen mainly in the improvement of the natural environment, infrastructure and the spatial distribution of economic and social activities. Land consolidation, taking into account natural conditions, the needs of the local community, environmental protection and protection against natural disasters, provides the most suitable land for individual purposes. For example, in areas of severe soil erosion or in areas of frequent flooding, land that is not suitable for agricultural cultivation due to natural conditions can undergo activities for conversion into forests or wetlands and for the regulation of water bodies and the protection of wetlands. Land consolidation can also be an integral part of major investment projects in the field of infrastructure construction and modernization. In such cases, land consolidation, in accordance with spatial plans, provides for the construction of railways, roads and paths, cycle paths, land drainage or irrigation canals, water or sewage systems, energy or telecommunication lines, etc. Land consolidation is also increasingly included in rural development strategies and village renewal projects to improve the living and working conditions of the population. Such projects can, for example, determine areas for residential, production and recreational areas, adapt and transform transport infrastructure to improve traffic safety, etc. All these conditions from the projects are then taken into account when planning the optimal new land distribution in the land consolidation.

At the **macro level**, land consolidation improves the quality of life in rural areas at the national level and increases the productivity and competitiveness of the agricultural sector. At the same time, it improves the natural environment and economic and social relations at all levels. By improving the land consolidation infrastructure, it contributes to the development of all sectors of the economy. Land consolidation helps establish the conditions for an equilibrium between the interests of agriculture, the environment, recreation, natural and cultural heritage, tourism, transport and other activities. Well-established and correctly executed land consolidations are also an important factor in establishing and maintaining trust between people and authorities, which is becoming increasingly important in modern times. Land consolidation also makes an important contribution to the development of the property market, directly by carrying out property transactions during land consolidation, and indirectly by providing information on the supply and demand for agricultural land and its prices. At the same time, the formation of larger plots in land consolidation facilitates land transactions between private owners themselves and reciprocal land transactions between private owners on the one hand and the state or local community on the other.

Land consolidation as an instrument of rural development should be included at all levels of planning and decision-making in strate-

gije in aktivnosti, ki vplivajo na razvoj podeželja ali odločajo o njem, npr. v nacionalnih in sektorskih razvojnih programih, državnih in občinskih prostorskih načrtih, programu razvoja podeželja ipd. V Evropski uniji so možnosti za to v okviru zastavljenih politik in programov razvoja podeželja na formalni ravni vzpostavljene (FAO, 2008), praktična izraba teh možnosti pa je odvisna od interesa in sposobnosti posameznih držav članic.

gies and activities that affect or decide on rural development, for example in national and sectoral development programs, state and municipal spatial plans, rural development programs, etc. In the European Union, the possibilities for this are formally established within the framework of rural development policies and programs (FAO, 2008), and the practical use of these possibilities depends on the interest and capabilities of individual member states.

7 Položajna natančnost in izboljšava DKN
Positional accuracy and DKN improvement

Rezultat pretvorbe katastrskih načrtov, narisanih na papirju v digitalno obliko, je bil DKN. Le-ta je predstavljal neprekinjen vektorski sloj grafičnega dela zemljiškega katastra transformiran v državni koordinatni sistem (ob pretvorbi je bil to D48/GK).

Med skoraj dvesto leti vzdrževanja katastrskih načrtov je prihajalo do nekaterih grobih napak v zarisih parcelnih meja (sistematična revizija vrst rabe zemljišč je dodala svoj prispevek k manjši natančnosti), oštevilčenju parcel ipd., kar se je odražalo v slabi položajni natančnosti DKN in neusklajenosti z opisnim delom zemljiškega katastra.

Na kakovost podatkov digitalnega zemljiškega katastra so vplivali:
- postopki izdelave originalnih katastrskih načrtov,
- kakovost same izmere,
- postopki zajema,
- transformacije
- in drugi postopki, s pomočjo katerih je bil izdelan DKN.

Vzdrževanje DKN-ja se je izvajalo sproti z naslednjimi načini oz. metodami:
- metoda z vklopom (»papirčkova metoda«); uporablja se za območja grafičnega katastra (za vnos sprememb so potrebne oslonilne točke za vklop),
- koordinatna metoda; uporablja se za območja grafično-numeričnega in koordinatnega katastra: načrt je izdelan v državnem koordinatnem sistemu in vse spremembe se vnesejo na podlagi merjenih in izračunanih koordinat (numeričnih koordinat),
- koordinatna z vklopom se uporablja izjemoma za območja s tehničnimi osnovami (kombinacija med koordinatnim in grafičnim katastrom).

Natančnost vzdrževanja zemljiškega katastra je bila na DKN-ju za območja grafičnega in numeričnega katastra boljša kot na klasičnem načrtu. Vzdrževanje DKN je prineslo naslednje prednosti:
- Na grafičnem katastru so bili boljši relativni odnosi. Območje, kjer se je izvajalo vzdrževanje, je imelo medsebojne odnose pravilne, ker ni bilo obremenjeno s pogreškom kartiranja in vrisa v načrt.
- Na numeričnem katastru so bili boljši relativni odno-

The conversion of cadastral plans drawn on paper into digital form resulted in the DKN. It represented a continuous vector layer of the graphic part of the land cadastre, transformed into the national coordinate system (at the time of conversion this was D48/GK).

During almost two hundred years of maintaining cadastral plans, some significant errors occurred in the outlines of plot borders (systematic revision of land uses further reduced the accuracy), numbering of plots, etc., which was reflected in poor positional accuracy of the DKN and inconsistency within the descriptive part of the land cadastre.

The quality of the digital land cadastre data was influenced by:
- the procedures for producing the original cadastral plans,
- the quality of the survey,
- the recording procedures used,
- transformations,
- and other procedures applied in the production of the DKN.

The maintenance of the DKN was carried out continuously using the following methods:
- integration method (Sl. “metoda z vklopom”, “papirčkova metoda”) – used for areas of the graphical cadastre (supporting integration points are required for entering changes),
- coordinate method – used for areas of the graphical-numerical, and coordinate cadastre – the plan is made in the national coordinate system and all changes are entered on the basis of the measured and calculated coordinates (numerical coordinates),
- the coordinate method with integration is used exceptionally for areas with technical bases (combination between coordinate and graphical cadastre).

The accuracy of the maintenance of the land cadastre for the areas of graphic and numerical cadastre was better in the DKN than in the classical plan. The maintenance of the DKN brought about the following advantages:
- Improved relative positions in the graphical cadastre. The area where the maintenance was performed had the correct interrelationships since it was not burdened with the errors of mapping and plotting in the plan.
- Improved relative positions and absolute accuracy in the

si in absolutna točnost. Točka (mejnik) je na DKN-ju obremenjen samo z natančnostjo terenske določitve. Na klasičnem ZKN-ju numerične izmere, izdelanem v Gauss-Krügerjevem sistemu, je bila vnesena sprememba pri vzdrževanju obremenjena s pogreškom kartiranja in risanja, ki je bil običajno večji kot pri sami izdelavi načrta.

Zgoraj navedeno je med drugim razlog, da se je tudi po uveljavitvi DKN (in se tudi še danes) teži k zagotavljanju kar največje položajne natančnosti digitalnih grafičnih podatkov in boljše kvalitete vzdrževanja. Prvi poizkus izboljšave je bil narejen že kmalu po uveljavitvi DKN za večino katastrskih občin, naslednje izboljšave so sledile po letu 2006, ko sta bila grafična prikaza že dva (ZKP in ZKN).

numerical cadastre. The point (border stone) on the DKN is only reliant on the accuracy of determination in the field. On the classical ZKN of the numerical measurement made in the Gauss-Krüger system, the change made in maintenance negatively affected mapping and drawing errors, which were usually greater than in the production phase itself.

The above is one of the reasons why, even after the introduction of DKN (and still today), the goal is to ensure the highest possible positional accuracy of digital graphic data and better maintenance quality. The first attempt at improvement was made soon after the entry into force of the DKN for most cadastral municipalities, and subsequent improvements followed after 2006, when there were already two graphical representations in use (ZKP and ZKN).

7.1 Dosežena položajna natančnost DKN
DKN positional accuracy achieved

Po izdelavi DKN je bila ocenjena kakovost oz. položajna natančnost DKN za vsako katastrsko občino, in sicer po območjih zajema. Ocena glede na rezultate transformacije v državni koordinatni sistem D48/GK je znašala od nekaj metrov do več deset metrov, prikazana je v posebni tabeli.

Pod oceno kakovosti razumemo predvsem položajno natančnost digitalnega katastrskega načrta glede na državni koordinatni sistem.

Položajna natančnost zemljiškokatastrskega prikaza je ocenjena na tri načine:
- Položajna natančnost, ocenjena glede na kakovost vklopa v državni koordinatni sistem s pomočjo transformacijskih točk
- Položajna natančnost, ocenjena glede na ujemanje po transformaciji s pomočjo kontrolnih točk
- Položajna natančnost, ocenjena na podlagi zemljiškokatastrskih točk

Dobljene vrednosti so realna števila, ki predstavljajo standardni odklon položajev točk v metrih.

Če v tabeli podatka ni, ali pa so vrednosti enake 0, pomeni, da je to območje numerične izmere in v postopkih izdelave digitalnih katastrskih načrtov ni bila uporabljena transformacija.

After the production of the DKN, the quality or positional accuracy of the DKN for each cadastral municipality was assessed by areas of coverage. The assessment in terms of the results of the transformation into the D48/GK national coordinate system ranged from a few metres to several tens of metres and is shown in a special table.

Quality assessment mainly involves the positional accuracy of the digital cadastral plan in relation to the national coordinate system. The positional accuracy of the cadastral index map is assessed in three ways:
- positional accuracy, assessed in terms of the quality of integration into the national coordinate system using transformation points,
- positional accuracy, assessed in terms of matching after the transformation using control points, and
- positional accuracy, assessed in terms of land cadastral points.

The values obtained are real numbers representing the standard deviation of the positions of the points in metres.

Where there is no data in the table, or the values are equal to 0, this means that it is a numerical survey area and no transformation was applied in the digital cadastral mapping procedures.

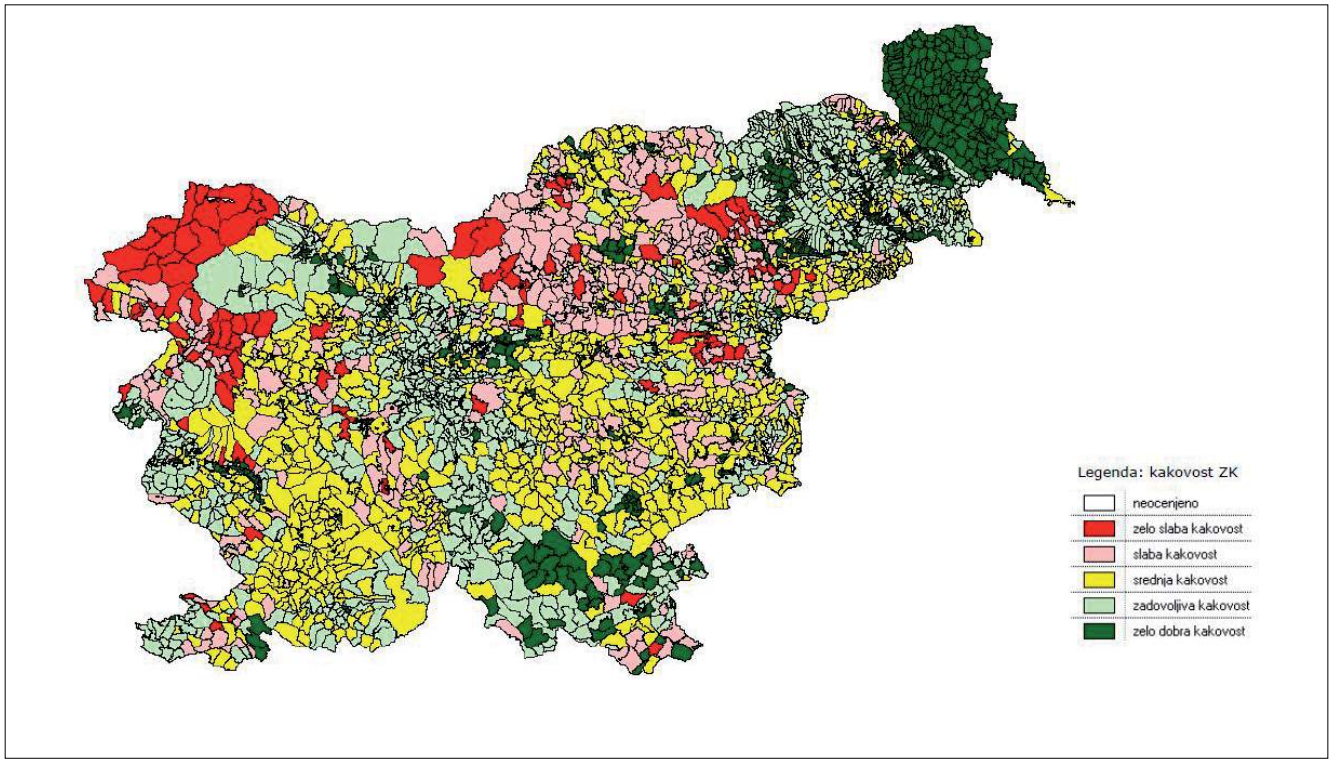
Šifra KO CM code	Del KO CM part	Ime KO Name of CM	OGU/Geodetska pisarna OGU/Geodetic Administration	Merilo Scale	Način vzdrževanja Maintenance method	Nat. transformacije Transformation acc.	Nat. kontrolnih točk Control point acc.	Nat. ZK-točk Acc. of LC points
154	1	KAMOVCI	LENDAVA	2000	koordinatni coordinate method	0	0	0
156	1	MOSTJE PRI LENDAVI	LENDAVA	2880	metoda z vklopom integration method	3,31	1,38	7,78448
220	3	SELIŠČI	GORNJA RADGONA	2880	metoda z vklopom integration method	1,65	1,7	12,35755
220	4	SELIŠČI	GORNJA RADGONA	2000	koordinatni coordinate method	0	0	0
288	1	KORAČICE	ORMOŽ	2880	metoda z vklopom integration method	3,546	5,178	5,7119
289	1	PRŠETINCI	ORMOŽ	2880	metoda z vklopom integration method	3,15	5,223	7,72697
703	1	RADIZEL	MARIBOR	2000	koordinatni coordinate method	0	0	0
705	1	SLIVNICA	MARIBOR	2880	metoda z vklopom integration method	3,006	4,449	5,75844
807	3	SPODNJA MUTA	SLOVENJ GRADEC	2880	metoda z vklopom integration method	2,16	0,98	6,22019
808	1	ZGORNJA MUTA	SLOVENJ GRADEC	1000	koordinatni coordinate method	0	0	0
919	1	BREZJE	MOZIRJE	2880	metoda z vklopom integration method	2,04	1,74	1,81515
920	1	MOZIRJE	MOZIRJE	1000	koordinatni coordinate method	0	0	0
1409	1	BREZOVICA	TREBNJE	2880	metoda z vklopom integration method	2,62	1,84	3,46497
1410	1	MIRNA	TREBNJE	1000	koordinatni coordinate method	0	0	0
1583	1	GOTENICA	KOČEVJE	2880	metoda z vklopom integration method	5,083	10,516	6,11642
1595	1	KUMROVA VAS	KOČEVJE	2880	metoda z vklopom integration method	2,43	0	0
1709	1	ŽELIMLJE	LJUBLJANA	1000	koordinatni coordinate method	0	0	0
1709	2	ŽELIMLJE	LJUBLJANA	2880	metoda z vklopom integration method	3,06	2,52	4,7873
1856	2	DOL PRI HRASTNIKU	TRBOVLJE	2880	metoda z vklopom integration method	2,63	1,6	6,63611
1857	1	MARNO	TRBOVLJE	1000	koordinatni coordinate method	0	0	0
1921	1	ŠPITALIČ	KAMNIK	2880	metoda z vklopom integration method	4,71	4,2	7,10317

Slika 7.1.1: Izrez iz tabele ocene položajne kakovosti DKN po posameznih katastrskih občinah.
Vir: Arhiv GURS

Figure 7.1.1: Excerpt from the table of the assessment of positional quality of the DKN by individual cadastral municipalities.
Source: The SMARS archive

Ocena kakovosti podatkov grafičnega dela zemljiškega katastra po pretvorbi je pokazala, da je bilo okoli 10 % DKN-jev zelo dobre kakovosti, na 29 % površine Slovenije je bila kakovost zadovoljiva (natančnost boljša od 5 m), na približno 35 % površine države je bil DKN srednje kakovosti, kjer so potrebni določeni posegi z eventualnimi dodatnimi meritvami, na približno 18 % površine države pa je bila kakovost opredeljena kot slaba – tu so potrebni večji posegi za izboljšanje ali pa nova izmera, za približno 8 % površine države pa je edina rešitev nova izmera.

The quality assessment of the data from the graphical part of the land cadastre after conversion showed that around 10% of the DKNs were of very good quality, 29% of the area of Slovenia had adequate quality (accuracy greater than 5 m), about 35% of the country's surface had DKNs of medium quality, requiring certain interventions with subsequent additional measurements, about 18% of the country's surface was defined as having poor quality – more improvement interventions are needed or a new survey, and for about 8% of the country's surface, a new survey is the only solution.



Slika 7.1.2: Ocenjena položajna kakovost DKN po posameznih katastrskih občinah v sliki (leta 2003).
Vir: Arhiv GURS

Figure 7.1.2: Assessed positional quality of the DKN by individual cadastral municipalities in the image (in 2003).
Source: The SMARS archive

DKN je bil zelo dobre kakovosti predvsem v Prekmurju in na območjih večjih mest. Zadovoljiva je bila kakovost v Podravju, Ljubljanski kotlini, na Gorenjskem brez visokogorja, na Dolenjskem v okolici Novega mesta in delu Bele krajine, v Vipavski dolini in na Goriškem ter na Obali. Po pričakovanjih je bil DKN najslabše kakovosti v visokogorju: Julijske, Kamniške in Savinjske Alpe, v delu Bele krajine in na Pohorju. Kakovost DKN je bila predvsem povezana z razgibanostjo terena in intenzivnostjo posegov v prostor skozi čas.

The DKN was of very good quality especially in Prekmurje and in the areas of larger cities. The quality was satisfactory in the Podravje region, the Ljubljana basin, in the Gorenjska region excluding highlands, in the Dolenjska region in the vicinity of Novo mesto and part of Bela krajina, in the Vipava valley, in the Goriška region and on the coast. As expected, the DKN was of the worst quality in the highlands: Julian Alps, Kamnik–Savinja Alps, part of Bela krajina, and Pohorje. The quality of the DKN was mainly related to the variability of the terrain and the intensity of interventions in space over time.

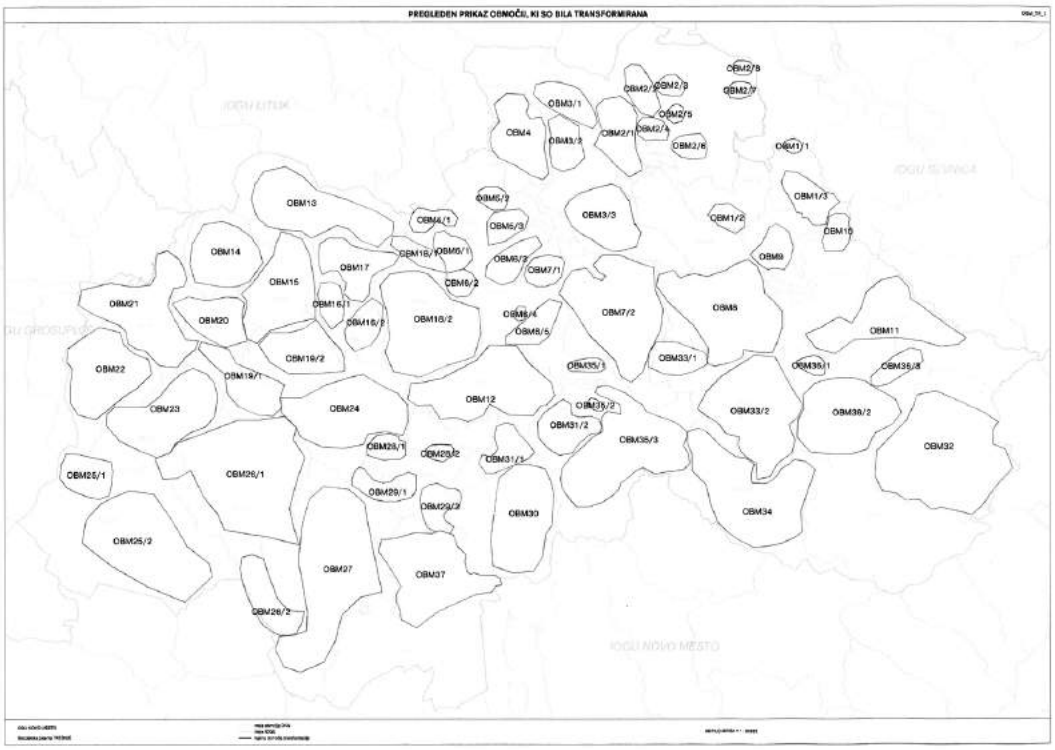
7.2 Izboljšava prekrivanja DKN-DOF
Improving DKN-DOF overlapping

Glede na analizo kakovosti je Geodetska uprava RS pristopila k poizkusu izboljšave položajne natančnosti, ki je bila poimenovana »izboljšava prekrivanja DKN-DOF«. Glavni namen pa je bil izboljšati položajno natančnost kmetijskih zemljišč.

V postopku so bila izboljšana posamezna območja, ki se nujno niso ujemala z območji zajema grafičnih podatkov.

Based on the quality analysis, the Surveying and Mapping Authority of the Republic of Slovenia started an attempt to improve positional accuracy, called the "Improvement of DKN-DOF Overlapping". The main purpose was to improve the positional accuracy of agricultural land.

In the process, individual areas were improved which did not necessarily correspond to the areas of graphic data coverage.

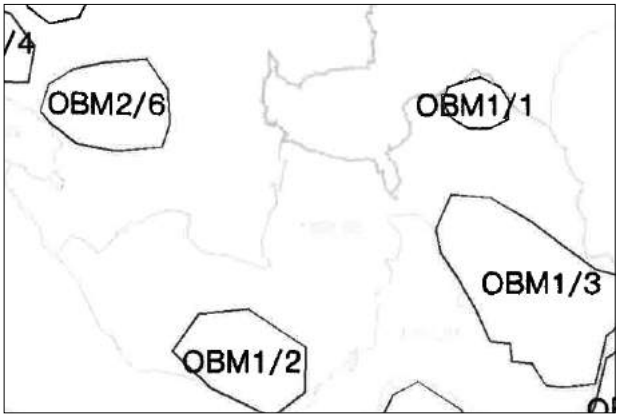


Slika 7.2.1: Pregledni prikaz transformiranih območij na območju nekdanje GP Trebnje, območja ne sovpadajo z območji zajema.
Vir: Pregledovalnik digitalnih elaboratov

Figure 7.2.1: Overview of transformed areas in the area of the former GP Trebnje; the areas do not coincide with the areas of coverage.
Source: Digital survey report viewer

Kriteriji za izbor območja za izboljšavo so bili: del območja grafične izmere, za eno izmed vrst transformacije je dovolj podatkov in postopek bo prinesel izboljšanje položajne natančnosti DKN. Meja območja je bila vnaprej določena zgolj okvirno kot čim bolj konveksen obod širšega homogenega območja. Dejanski obod je bil določen kot rezultat uporabljenih transformacijskih točk po zadnji iteraciji. Predpogoj za izvedbo je bila prej omenjena analiza dosežene položajne natančnosti DKN, ki je pokazala na slabšo kakovost DKN.

The criteria for selecting the area for improvement were: part of the area of the graphical survey, sufficient data for one of the types of transformation, and that the procedure will bring an improvement in the positional accuracy of DKN. The border of the area was predetermined only roughly as the most convex perimeter of the wider homogeneous area. The actual circumference was determined as a result of the transformation points used after the last iteration. A precondition for the implementation was the previously mentioned analysis of the achieved positional accuracy of the DKN, which showed poorer quality of the DKN.



Slika 7.2.2: Prikaz položaja treh območij za izboljšavo/transformacijo DKN/DOF (1/1, 1/2, 1/3) v istem območju zajema (svetlo sivo) v k. o. 1398 Bistrica.
Vir: Arhiv GURS

Figure 7.2.2: Positions of three areas for the improvement/transformation of the DKN/DOF (1/1, 1/2, 1/3) in the same area of coverage (light grey) in CM 1398 Bistrica.
Source: The SMARS archive

Metoda izboljšave je bila transformacija (afina, Helmertova ali pa trikotniško zasnovana odsekoma afina transformacija). Izbor vrste transformacije je bil odvisen od tega, katera transformacija je zagotovila boljše prekrivanje DKN in DOF. Možna je bila translacija, rotacija in sprememba merila.

The method of improvement was transformation (affine, Helmert or triangle-based piecewise affine transformation). The selection of the type of transformation depended on which transformation provided better overlapping of the DKN and the DOF. The transformations available were translation, rotation and changing the scale.

Transformacija se je izvedla po trikotniško zasnovani splošni linearni (afini) transformaciji. Celotno območje transformacije je bilo razdeljeno na trikotnike. Za oglišča trikotnikov so bile izbrane trenutne koordinate in želene koordinate. Le te so bile določene s pomočjo zemljiško katastrskih točk in ortofoto načrtov. Povezovanje točk v trikotnike je bilo izvedeno z Delaunayjevo triangulacijo, ki tvori trikotnike, ki so čim bliže enakostraničnim. Za vsak trikotnik so bili izračunani parametri afine transformacije in preračun vseh točk znotraj trikotnika po enačbi:

$$y_{tr_n} = Rx_n + Sy_n + Cy$$
$$x_{tr_n} = Px_n - Qy_n + Cx$$

pri čemer so P, Q, R, S, Cy in Cx transformacijski parametri, y_n in x_n koordinate točk pred transformacijo in y_{tr_n} in x_{tr_n} koordinate točk po transformaciji.
Za analizo deformacij posameznega trikotnika je bilo izračunano ploščinsko merilo (Dp) po enačbi:

$$Dp = P * S - Q * R$$

in največja kotna deformacija (Dk) po enačbi:

$$Dk = 2 * \arctan\left(\sqrt{\frac{(P-S)^2 + (Q+R)^2}{(P+S)^2 + (Q-R)^2}}\right)$$

Srednji pogreški so izračunani po enačbi:

$$Mx = \sqrt{\frac{1}{k}\sum_{n=1}^{k} Vx_n^2},$$

$$My = \sqrt{\frac{1}{k}\sum_{n=1}^{k} Vy_n^2},$$

$$Mp = \sqrt{My^2 + Mx^2},$$

pri čemer so Vx_n in Vy_n odstopanja na identičnih točkah, k število identičnih točk, Mx in My srednji koordinatni odstopanji na identičnih točkah po izvedeni transformaciji in Mp srednje položajno odstopanje.

Slika 7.2.3: Primer opisa uporabljene transformacije (trikotniško zasnovana odsekoma afina, ki je bila ena izmed možnih transformacij).
Vir: Arhiv GURS

Figure 7.2.3: Example of a description of the transformation used (triangle-based piecemeal affine transformation, which was one of the possible transformations).
Source: The SMARS archive

Transformacijske točke so bile treh vrst:

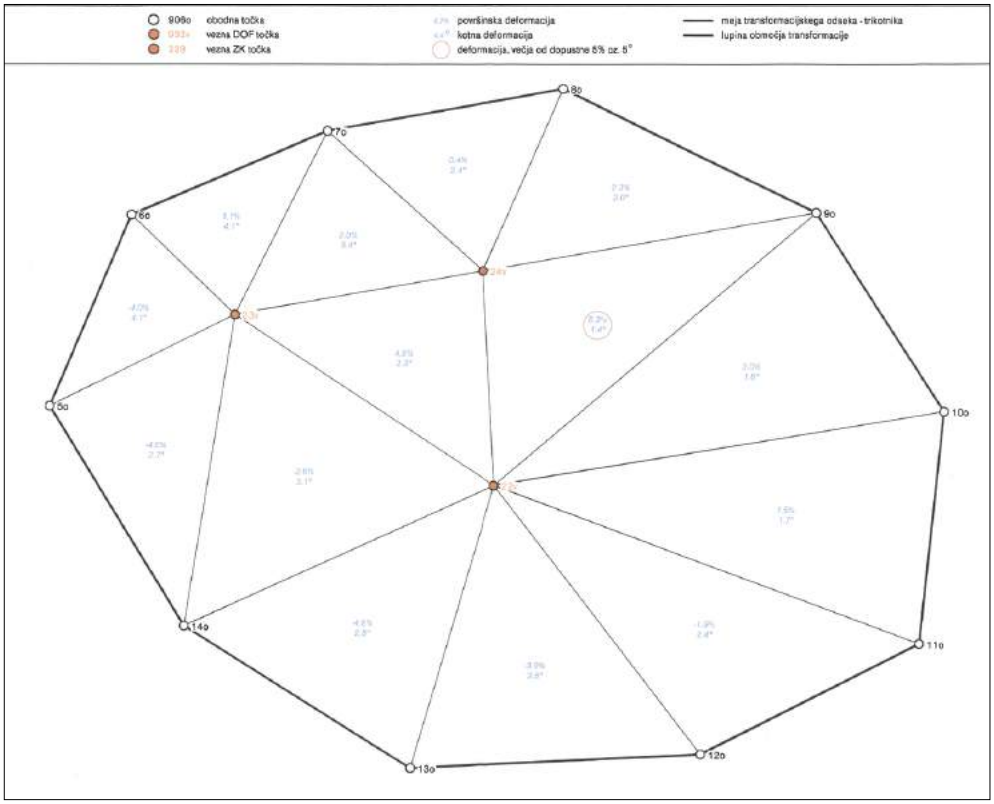
- zunanje točke, katerih konveksna lupina je v celoti zaobjela območje za transformacijo,
- obodne točke t. s. vse točke oboda (lomne točke oboda), katerih grafične koordinate se ob transformaciji niso spreminjale (so bile fiksne) in
- vezne točke, ki so omogočale razpačenje vsebine znotraj oboda območja (enakomerno razporejene, zanje poznamo grafične koordinate v DKN in (numerične) koordinate v naravi)

Razporeditev transformacijskih točk je morala biti čim bolj enakomerna, razdalja med dvema transformacijskima veznima točkama ni bila manjša od 50–70 m in ne večja od 150–200 m. Razmerje med najkrajšimi in najdaljšimi stranicami transformacijskih trikotnikov pa (praviloma) ni bilo manjše kot 1 : 3. Prioritetno so bile kot vezne točke določene ZK-točke, DOF-točke pa le v primeru nedvoumne identifikacije.

There were three types of transformation points:

- outer points, whose convex shell completely enclosed the transformation area,
- circumferential points, i.e. all perimeter points (perimeter gradient points) whose graphical coordinates did not change during the transformation (they were fixed), and
- tie points, which enabled the distribution of the content within the perimeter of the area (evenly distributed, with known graphical coordinates in the DKN and (numerical) coordinates in nature).

The distribution of the transformation points had to be as even as possible, the distance between two transformation tie points was no less than 50-70 m and no more than 150-200 m. The ratio between the shortest and longest sides of the transformation triangles (as a rule) was no less than 1:3. Priority in determining tie points was given to LC points, and DOF points only in the case of unambiguous identification.



Slika 7.2.4: Izris trikotnikov območja 1/1 pri uporabljeni trikotniško zasnovani odsekoma afini transformaciji v k. o. 1398 Bistrica. Vir: Arhiv GURS

Figure 7.2.4: A plot of triangles of area 1/1 in a triangle-based piecewise affine transformation in CM 1398 Bistrica. Source: The SMARS archive

Predmet transformacije je bil DKN in grafične koordinate ZK-točk izbranega območja. Posamezna območja so bila transformirana in nato vklopljena nazaj (v območje zajema, od koder so bila »vzeta«) tako, da so grafični podatki ostali zvezni in med njimi ni bilo niti prekrivanj niti lukenj. Grafične koordinate ZK-točk so bile zaokrožene na dve decimalni mesti (tj. na cm) in so se morale ujemati s koordinatami lomov v DKN.

The subject of the transformation was the DKN and the graphic coordinates of the LC points of the selected area. Individual areas were transformed and then re-integrated (into the area of coverage from which they were "taken") so that the graphical data remained continuous and there were no overlaps or gaps between them. The graphical coordinates of the LC points were rounded to two decimal places (i.e., to the cm) and had to match the gradient coordinates in the DKN.

SEZNAM KOORDINATNIH PAROV TRANSFORMACIJSKIH TOČK

Številka točke	Po transformaciji		Pred transformacijo	
	y	x	y	x
1940	509250.61	90924.68	509253.15	90920.53
2528	511886.93	91376.99	511888.13	91374.67
2705	512415.49	91313.68	512412.35	91311.87
2717	511458.16	91452.53	511462.96	91452.34
2833	511806.81	91185.52	511803.96	91189.24
2856	511541.05	91159.31	511545.00	91161.04
2958	512308.80	91457.86	512302.86	91457.72
3038	512121.90	91252.75	512120.08	91252.63
22v	511282.88	92827.44	511287.50	92834.00
23v	511129.57	92931.85	511134.29	92934.79
24v	511277.17	92959.51	511281.09	92960.59
25v	509618.00	90870.81	509615.85	90868.20
26v	509399.13	90697.92	509396.97	90691.87
27v	509475.50	90908.52	509474.60	90907.50
28v	509173.85	91107.62	509175.38	91105.31
49v	509591.56	90692.33	509588.22	90687.85
50v	511312.87	91644.78	511308.91	91646.78
51v	511181.90	91859.95	511183.29	91857.61
52v	511572.12	91694.81	511576.72	91689.95
53v	511935.91	90856.98	511936.16	90866.53
54v	512044.01	90977.09	512043.97	90987.00

Legenda:

3038	ZK točka
54v	točka na DOF-u

Slika 7.2.5: Primerjava grafičnih koordinat pred transformacijo in po njej za območje 1/1 ob uporabljeni trikotniško zasnovani odsekoma afini transformaciji v k. o. 1398 Bistrica.
Vir: Arhiv GURS

Figure 7.2.5: Comparison of graphical coordinates before and after the transformation for area 1/1 using triangle-based piecewise affine transformation in CM 1398 Bistrica.
Source: The SMARS archive

```
Območje transformacije: OBM1/1

Število vseh trikotnikov je 14.
Trikotniki, pri katerih je ploščinsko merilo več kot 5%:
      9o - 22v - 24v (6.3%)
Ni trikotnikov s kotno deformacijo večjo od 5 stopinj.
Trikotnik z največjim ploščinskim merilom: 9o - 22v - 24v (6.3%).
Trikotnik z največjo kotno deformacijo: 5o - 6o - 23v (4.1°).
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Slika 7.2.6: Del poročila o transformaciji območja 1/1 pri trikotniško zasnovani odsekoma afini transformaciji v k. o. 1398 Bistrica
Vir: Arhiv GURS

Figure 7.2.6: Part of the report on the transformation of the 1/1 area in a triangle-based piecewise affine transformation in CM 1398 Bistrica.
Source: The SMARS archive

V okviru izboljšave prekrivanja DKN-DOF je bila narejena tudi ocena usklajenosti po izvedbi izbrane transformacije s pomočjo kontrolnih in ZK-točk. Če je bil izračunani srednji pogrešek odstopanja na kontrolnih točkah in ZK-točkah v katastrski občini še vedno večji od 2 m (to je bila pričakovana kakovost izboljšave), je bila podana ocena, da s temi metodami ni bilo mogoče doseči boljšega rezultata. Ta ocena je pomenila, da je izvedba tovrstnih transformacij vprašljiva, saj ni dosegla cilja glede položajne kakovosti.

Elaborat prekrivanja DKN-DOF je vseboval:

- podatke o transformaciji (vrsta, opis, formule transformacije in izračuna srednjih pogreškov),
- morebitno problematiko,
- seznam koordinat parov transformacijskih točk (točke DKN in ZK-točke ali točke na DOF)
- navedbo zadnje iteracije, če jih je bilo več
- srednji pogrešek transformacijskih točk in
- poročilo kontrole z oceno usklajenosti izvedene transformacije.

As part of the improvement of the DKN-DOF overlap, an assessment of compliance was also made after the implementation of the selected transformation with the help of control and LC points. If the calculated mean deviation error at the control points and LC points in the cadastral municipality was still greater than 2 m (this was the expected quality of improvement), it was estimated that these methods could not achieve a better result. This assessment meant that the implementation of such transformations was questionable, as it did not achieve the positional quality objective.

The DKN-DOF overlap report included:

- transformation data (type, description, transformation formulas and calculation of mean errors),
- potential problems,
- list of coordinates of pairs of transformation points (DKN and LC points or points on the DOF)
- an indication of the most recent iteration, if there was more than one,
- mean error of transformation points, and
- control report with assessment of the conformity of the performed transformation.

1. KONTROLNE TOČKE ZNOTRAJ OBMOČJA TRANSFORMACIJE

Območje transformacij: OBM1/1, OBM1/2, OBM1/3

Številka točke	Y_mora	X_mora	Y_je	X_je	Vy (m)	Vx (m)	Razdalja (m)
6k	511767.93	90984.63	511766.53	90985.68	1.40	-1.05	1.75
7k	511852.28	91672.13	511855.02	91673.91	-2.74	-1.78	3.27
8k	511131.53	91644.74	511133.31	91646.50	-1.78	-1.76	2.51
9k	512113.15	91169.98	512114.64	91171.25	-1.49	-1.28	1.96
10k	511421.39	91916.32	511421.77	91918.27	-0.38	-1.95	1.98
11k	511232.55	92921.25	511232.83	92920.43	-0.28	0.82	0.87
12k	511184.35	92923.59	511186.81	92924.59	-2.46	-1.00	2.66
13k	509265.62	90999.08	509266.18	90997.83	-0.56	1.25	1.37
14k	509701.95	90882.79	509699.76	90883.02	2.19	-0.23	2.20
15k	509590.71	90533.44	509588.73	90533.15	1.98	0.29	2.00

Standardni odklon y-koordinat točk je **1.74 m.**
Standardni odklon x-koordinat točk je **1.27 m.**
Standardni odklon položajev točk je **2.15 m.**

Slika 7.2.7: Ocena položajne kakovosti – standardni odklon na kontrolnih točkah znotraj območja transformacije po izboljšavi območja 1/1 pri trikotniško zasnovani odsekoma afini transformaciji v k. o. 1398 Bistrica.
Vir: Arhiv GURS

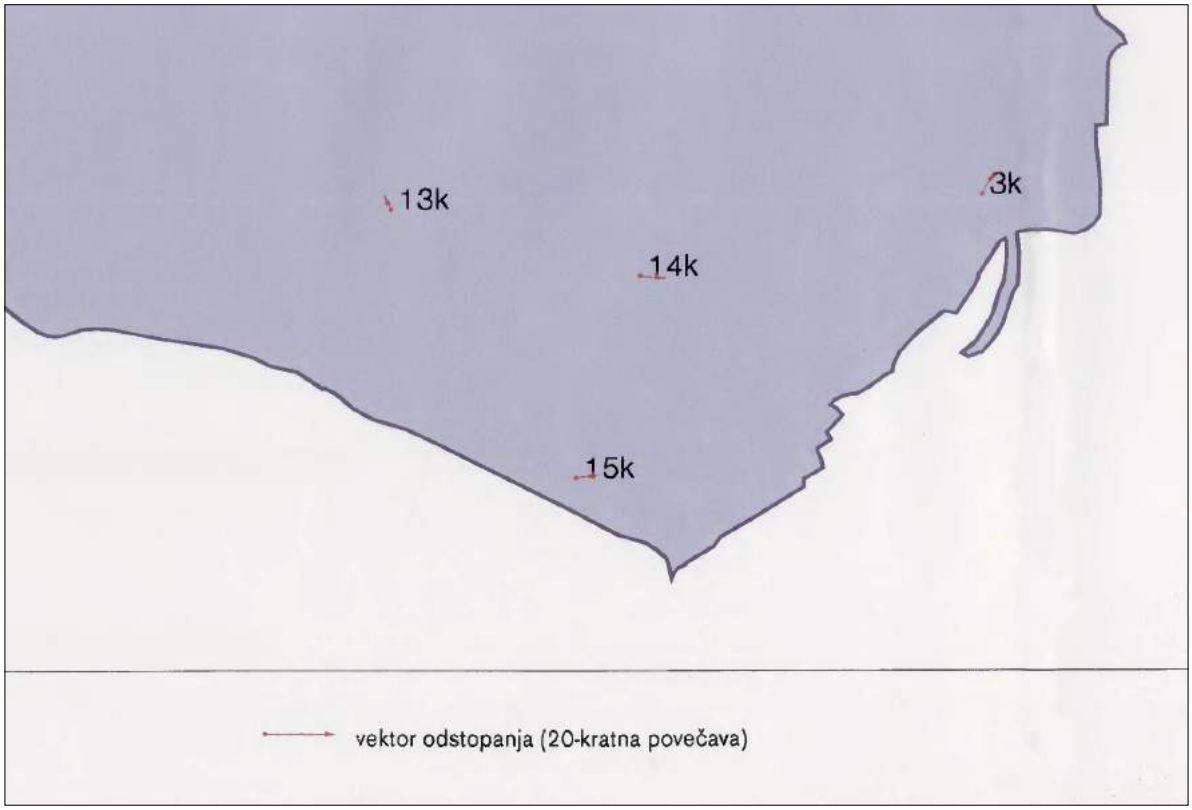
Figure 7.2.7: Assessment of positional quality – standard deviation at control points within the transformation area after improvement of the 1/1 area in triangle-based piecewise affine transformation in CM 1398 Bistrica.
Source: The SMARS archive

Poleg tega je vseboval tudi izrise:

- pregledni prikaz območij, ki so bila transformirana,
- izris DKN pred transformacijo in po njej,
- izris transformacijskih točk,
- izris transformacijskih odsekov v primeru trikotniške transformacije,
- prikaz ocene položajne kakovosti z vektorji odstopanj v večkratni povečavi,
- prikaz vklopa transformiranega območja v osnovni načrt (območje zajema).

In addition, it also contained the following:

- an overview of the areas that had been transformed,
- a plotting of the DKN before and after the transformation,
- a plotting of the transformation points,
- a plotting of the transformation sections in the case of triangular transformation,
- a display of the positional quality assessment with deviation vectors in multiple magnification,
- a display of the integration of the transformed area in the basic plan (area of coverage).



Slika 7.2.8: Grafični prikaz ocene položajne kakovosti z vektorji odstopanj na kontrolnih točkah po izboljšavi območja 1/1 pri uporabljeni trikotniško zasnovani odsekoma afini transformaciji v k. o. 1398 Bistrica.
Vir: Arhiv GURS

Figure 7.2.8: Graphical representation of the positional quality assessment with deviation vectors at control points after improvement of the 1/1 area in triangle-based piecewise affine transformation in CM 1398 Bistrica.
Source: The SMARS archive

Rezultat izboljšave prekrivanja DKN-DOF so mestoma (kjer je bila izboljšava narejena) lokacijsko bolj natančni in (še vedno) topološko pravilni podatki DKN v primerjavi s tistim ob uveljavitvi.

Ta izboljšava ni bila izvedena za celo državo, saj začetni rezultati niso dosegli pričakovanj (v večini je bil standardni odklon po transformaciji še vedno nad 2 m, ne glede na izbrano transformacijo).

Za postopke v delu, ki jih je »prehitela izboljšava«, je bilo treba sestavino elaboratov, ki je prikazovala spremembe v grafiki, izdelati na novo.

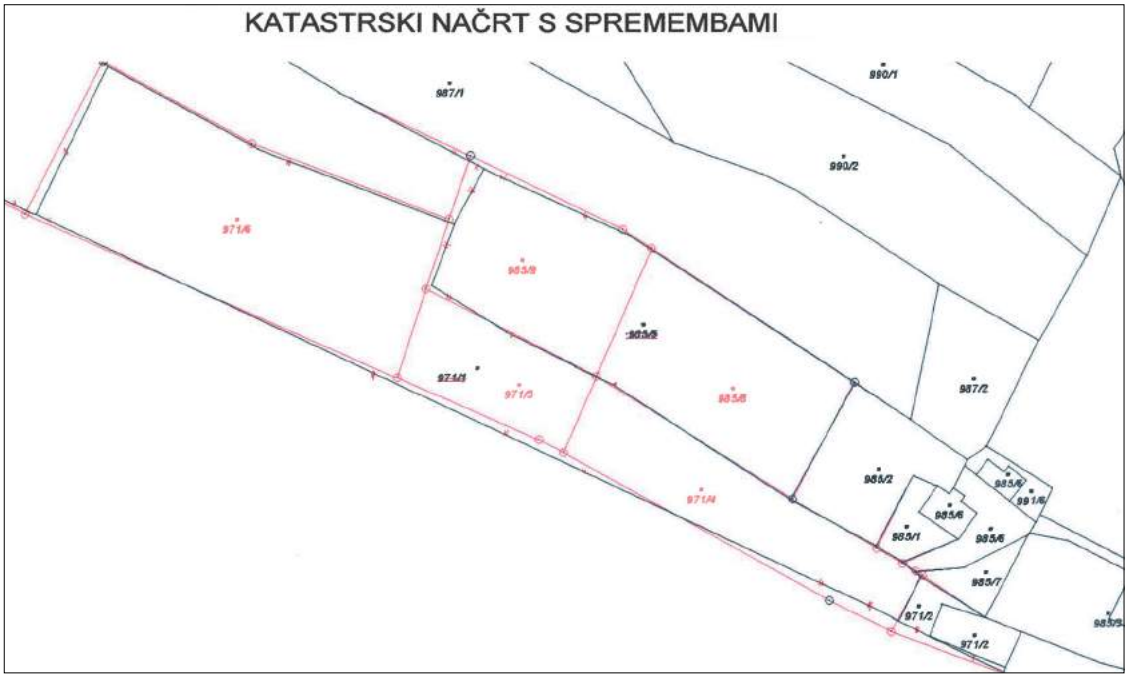
V nadaljevanju je prikaz primera sestavin elaborata vzdrževanja pred položajno izboljšavo in po njej, iz katerih je razvidna sprememba, ki jo je izboljšava povzročila na parcelah območja storitve (primerjati je treba črne povezave na katastrskem načrtu pred transformacijo in sive povezave v prikazu po njej).

The result of the DKN-DOF overlap improvement in some places (where the improvement was made) are positionally more accurate and (still) topologically correct DKN data compared to those at the time of implementation.

This improvement was not implemented for the whole country, as the initial results did not meet the expectations (for the most part, the standard deviation after the transformation was still above 2 m, regardless of the transformation method selected).

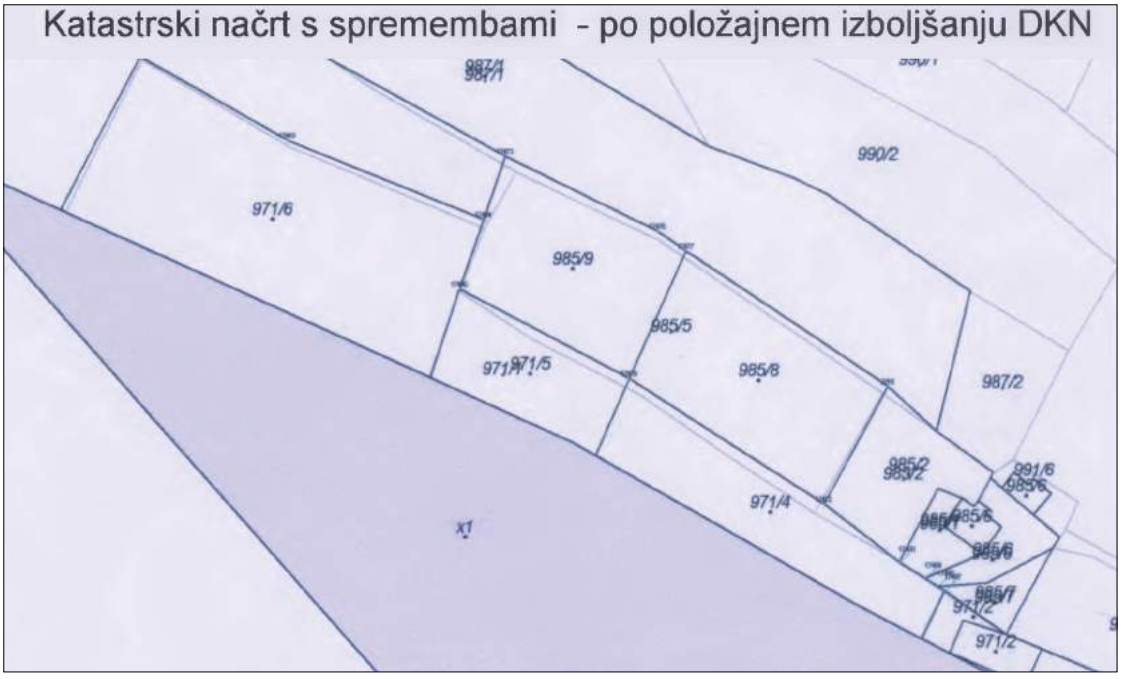
In work procedures that were "overtaken by the improvement", the component of the reports which showed changes in the graphics had to be redesigned.

Below is an example of the components of a maintenance report before and after the positional improvement, which show the change caused by the improvement on the plots of the service area (compare black connections on the cadastral plan before the transformation and grey connections in the index map after it).



Slika 7.2.9: Katastrski načrt s spremembami na neizboljšanih podatkih v k. o. 1398 Bistrica, črne povezave prikazujejo stanje pred spremembo.
Vir: Arhiv GURS, OGU Novo mesto

Figure 7.2.9: Cadastral plan with changes in unimproved data in CM 1398 Bistrica, black connections show the situation before the change.
Source: The SMARS archive, OGU Novo mesto



Slika 7.2.10: Prikaz sprememb na izboljšanih podatkih v k. o. 1398 Bistrica, sive povezave prikazujejo stanje pred spremembo.
Vir: Arhiv GURS, OGU Novo mesto

Figure 7.2.10: Changes in improved data in CM 1398 Bistrica, grey connections show the situation before the change.
Source: The SMARS archive, OGU Novo mesto

Kot v korakih pretvorbe analognih načrtov v DKN, ko smo se »ukvarjali« samo z grafičnimi koordinatami, je tudi izboljšava prekrivanja DKN-DOF povzročila spremembe samo na grafičnih koordinatah. Izmerjene koordinate ZK točk so ostale nespremenjene.

As in the steps of converting analogue plans to DKN, where we were dealing only with graphical coordinates, the improvement of the DKN-DOF overlap also caused changes only in the graphical coordinates. The measured coordinates of the LC points remained unchanged.

8 Lokacijska izboljšava ZKP
ZKP positional accuracy improvement

Tudi po letu 2006 je Geodetska uprava RS izvajala izboljšave digitalnih grafičnih podatkov z namenom, da bi bila dosežena boljša položajna natančnost. Če je do sedaj izboljšava pomenila spremembo na nivoju grafičnih koordinat, so izboljšave od vključno leta 2013 pomenile določitev izmerjenih koordinat ob nespremenjenih grafičnih koordinatah. Lokacijska izboljšava ZKP ima torej za rezultat izgradnjo ZKN za območje izboljšave, ki pa je lokacijsko bolj natančen od ZKP.

Even after 2006, the Surveying and Mapping Authority of the Republic of Slovenia carried out improvements to digital graphic data in order to achieve better positional accuracy. Although so far the improvement has meant a change in the level of graphical coordinates, the improvements since 2013 have included the determination of measured coordinates with unchanged graphical coordinates. The positional accuracy improvement of the ZKP has therefore resulted in the production of the ZKN for the area of improvement, which is more positionally accurate than the ZKP.

8.1 Lokacijska izboljšava na območjih trajnih nasadov – 2013
Positional accuracy improvement in areas of permanent crops – 2013

Kot je bilo že omenjeno, uporabo zemljiškokatastrskih podatkov lahko omejuje slabša natančnost lokacijskih podatkov zemljiškega katastra. Slabši lokacijski podatki otežujejo pripravo in uveljavljanje občinskih in državnih prostorskih načrtov, ukrepov kmetijske politike in drugih ukrepov, ki se uveljavljajo kot omejitve ali režimi po parcelah, ki so posledica grafičnih presekov dveh ali več vsebin, prostorsko opredeljenih z različno položajno natančnostjo (npr.: dejanska raba in zemljiškokatastrski prikaz).

V skladu z novim Zakonom o ugotavljanju katastrskega dohodka (ZUKD-1) so se za izračun katastrskega dohodka pričeli uporabljati podati o dejanski rabi zemljišč in boniteti zemljišč (namesto dotedanjih podatkov o katastrskih kulturah in katastrskih razredih). V zemljiški kataster je bilo za ta namen treba vključiti tudi dodatne – podrobnejše dejanske rabe kmetijskih zemljišč (trajni nasadi – vinogradi, hmeljišča, oljčniki, intenzivni sadovnjaki ...). Pripis osnovnih in podrobnejših dejanskih rab na parcelo se natančno izvaja na osnovi grafičnih presekov. Za pravilen rezultat grafičnega preseka je velikega pomena dobra položajna natančnost grafičnih podatkov zemljiškega katastra. Tedanja stopnja položajne natančnosti je predstavljala precejšnjo oviro. S ciljem, da se zagotovi čim boljši grafični prikaz zemljiškega katastra na območju kmetijskih zemljišč in gozdov, še posebej na območju trajnih nasadov, je bila v letu 2013 izvedena izboljšava zemljiškokatastrskega prikaza.

V okviru projekta Izboljšava lokacijske natančnosti na območju trajnih nasadov so bile vsem lomnim točkam parcel z dejansko rabo trajnih nasadov določene ZK-točke s čim

As mentioned, the use of land cadastral data may be limited by the poor accuracy of land cadastre location data. Poor location data complicates the preparation and enforcement of municipal and state spatial plans, agricultural policy measures and other measures that are enforced as restrictions or regimes by plots which resulting from graphic cross-sections of two or more sets of contents spatially defined with varying positional accuracy (e.g. actual use and cadastral index map).

In accordance with the new Cadastral Income Act (ZUKD-1), data on the actual use of land and the creditworthiness of land (instead of the previous data on cadastral cultures and cadastral classes) came into use for the calculation of cadastral income. For this purpose, additional and more detailed actual uses of agricultural land (permanent plantations – vineyards, hop fields, olive groves, intensive orchards etc.) had to be included in the land cadastre. The attribution of basic and more detailed actual uses to plots is carried out with accuracy on the basis of graphic cross-sections. Good positional accuracy of graphic data of the land cadastre is crucial for obtaining the correct result in the graphic cross-section. The level of positional accuracy at the time was a significant obstacle. In order to ensure the best possible graphical representation of the land cadastre in the area of agricultural land and forests, especially in the area of permanent crops, an improvement of the land cadastre was carried out in 2013.

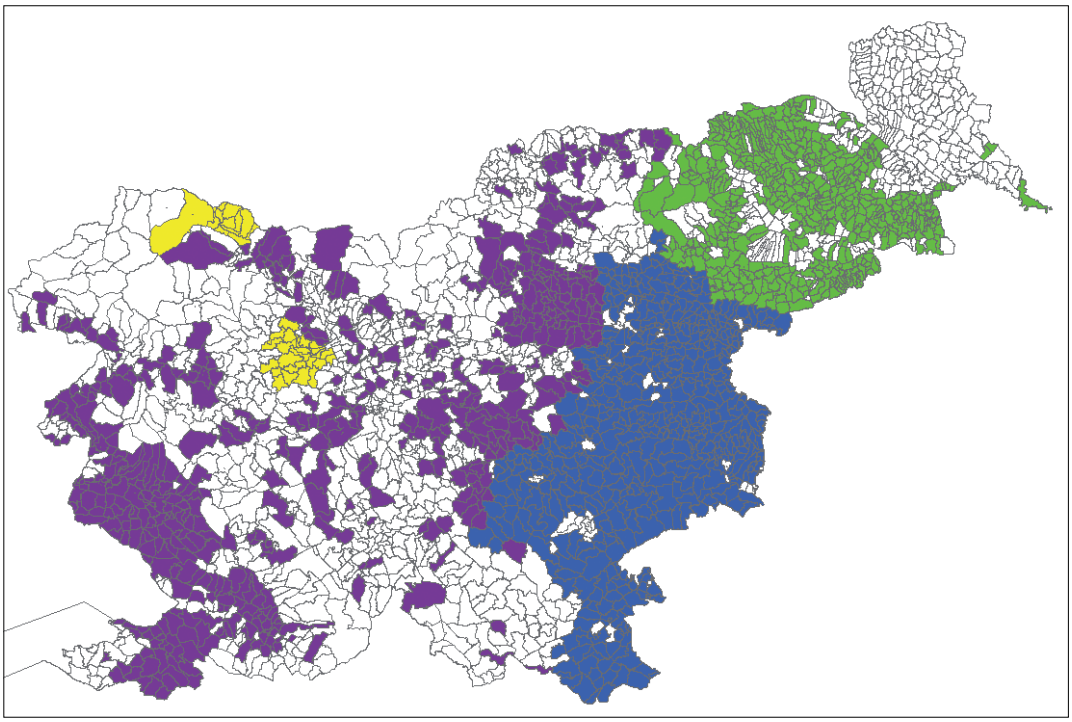
As part of the project entitled Improving the Location Accuracy in the Area of Permanent Crops, all the gradient points of plots with actual use of permanent crops were assigned LC points

bolj natančnimi koordinatami v državnem koordinatnem sistemu (tedaj D48/GK). Grafične koordinate niso bile spremenjene. Za izboljšavo lokacijskih podatkov zemljiškega katastra so bile uporabljene izmerjene koordinate točk in digitalni ortofoto (DOF). Z izboljšavo je bil na nivoju koordinat vzpostavljen lokacijsko pravilen grafični prikaz zemljiškega katastra (ZK), ki je omogočil neposredno uporabo lokacijskih podatkov ZK za izvedbo grafičnih presekov ZK z drugimi prostorskimi podatki, torej tudi za potrebe kmetijskih subvencij.

Za vse parcele, ki so bile predmet izboljšave (parcele trajnih nasadov in sosednje parcele), so bili določeni vsi atributi ZK-točk, kot so: številka, numerične D48/GK koordinate, metoda določitve numeričnih koordinat, upravni status, grafične koordinate in ostali atributi ZK-točk. V okviru projekta je bilo določenih 2.500.000 novih ZK-točk na lomnih točkah parcel, ki so bile predmet izboljšave. Že obstoječim ZK točkam na parcelah v izboljšavi pa so bile določene (numerične) koordinate in ustrezna metoda določitve le-teh, vendar le v primeru, če jih ZK-točke še niso imele.

with the most accurate coordinates in the national coordinate system (then D48/GK). The graphical coordinates were not changed. Measured point coordinates and digital orthophotography (DOF) were used to improve the location data of the land cadastre. With the improvement, a location-correct graphical representation of the land cadastre (LC) was established at the coordinate level, which enabled the direct use of LC location data in the implementation of LC graphic cross-sections with other spatial data, that is, also for agricultural subsidies.

For all plots that were subject to improvement (plots of permanent crops and adjacent plots), all attributes of LC points were determined, such as: number, numerical D48/GK coordinates, method of determining numerical coordinates, administrative status, graphical coordinates and other attributes of LC points. As part of the project, 2,500,000 new LC points were identified at the gradient points of the plots which were subject to improvement. The existing LC points on the plots undergoing improvement were given (numerical) coordinates and the appropriate method of determination, but only in cases where the LC points did not already have them.



Slika 8.1.1: Deli obarvanih k. o. so bili predmet lokacijske izboljšave za potrebe trajnih nasadov – različne barve ločijo delovišča. Rumeno obarvano delovišče ni predstavljalo lokacijske izboljšave za potrebe trajnih nasadov, ampak je predstavljalo lokacijsko izboljšavo vseh katastrskih občin političnih občin Škofja Loka in Jesenice (izvedba le-te je opisana v nadaljevanju).
Vir: Arhiv GURS

Figure 8.1.1: Parts of colourized CMs have been subject to positional accuracy improvement for the needs of permanent crops – different colours denote work sites. The yellow-coloured work site did not represent a positional accuracy improvement in terms of permanent crops, but represented a positional accuracy improvement of all cadastral municipalities of the political municipalities of Škofja Loka and Jesenice (its implementation is described below).
Source: The SMARS archive

Lokacijska izboljšava za potrebe trajnih nasadov je prinesla dopolnitev baze ZK točk z (numeričnimi) koordinatami obstoječih in novih ZK-točk (s pripisom ostalih ustreznih atributov). (Numerične) koordinate so bile dobljene z vklopom parcel v merjene točke ali točke, dobljene s fotointerpretacijo DOF. Kjer le-to ni bilo mogoče, so bile kot (numerične) koordinate prevzete kar grafične koordinate. V odvisnosti od tega, kako so bile pridobljene (numerične) koordinate ZK-točke, je bil ZK-točki nato pripisan tudi ustrezen atribut metode določitve (eden izmed treh (94, 95 ali 96)). Naloga se je izvedla v koordinatnem sistemu D48/GK.

Predmet izboljšave v okviru katastrske občine so bile vse parcele, na katerih so bili evidentirani trajni nasadi in njihove sosednje parcele.

Predpriprava na izvedbo je obsegala tudi izdelavo »nultega« stanja zemljiškokatastrskega načrta ZKN-0, ki je bil izdelan iz obstoječe baze ZK točk (pred izboljšavo) s koordinatami v državnem koordinatnem sistemu D48/GK.

Zaradi obsežnosti naloge, nadzora/spremljanja izvedbe naloge ter izvedbe avtomatskih kontrol je bila v ta namen kot podpora izvedbi razvita posebna aplikacija.

Za vsako parcelo:
- je bilo ugotovljeno, kakšna je možnost izboljšave lokacijskih podatkov zemljiškega katastra,
- je bila izvedena izboljšava lokacijskih podatkov povsod tam, kjer je bilo to mogoče in smiselno (določene so bile D48/GK koordinate ZK-točk, in
- so bili določeni ustrezni atributi vsem novim in spremenjenim ZK-točkam v bazi ZK-točk.

Vklopi so se izvajali:
- s pomočjo obstoječih ZK-točk v bazi ZK-točk ali
- s prilagajanjem vsebine ZKP na točke, fotointerpretirane na DOF, če ni bila možna identifikacija ustreznih ZK-točk.

Vklop parcel ZKP v ZKN in ostale ZK-točke je bil izveden na podlagi ZK-točk, identificiranih na ZKP. Vklop je bil izveden po obstoječih principih nastavitve, vodenja in vzdrževanja zemljiškega katastra, in sicer na podoben način kot grafični vklop, pri čemer so bile parcele iz ZKP vklopljene v matematično osnovo, ki so jo predstavljale ZK-točke in ZKN. Tehnično se je to izvedlo s premikom, vrtenjem, skaliranjem (spreminjanjem velikosti) in prilagoditvijo izbranih parcel ZKP na ZK-točke oziroma ZKN.

The positional accuracy improvement for the needs of permanent crops resulted in supplementation of the LC point database with (numerical) coordinates of existing and new LC points (with the attribution of other relevant attributes). The (numerical) coordinates were obtained by integrating plots in the measured points or points obtained by photointerpretation of the DOF. Where this was not possible, the graphical coordinates themselves were taken as the (numerical) coordinates. Depending on how the (numerical) coordinates of a LC point were obtained, the point was then assigned the corresponding attribute for the determination method (one of three (94, 95 or 96)). This task was performed in the D48/GK coordinate system.

The subject of improvement within the cadastral municipality were all plots on which permanent crops and their adjacent plots were recorded.

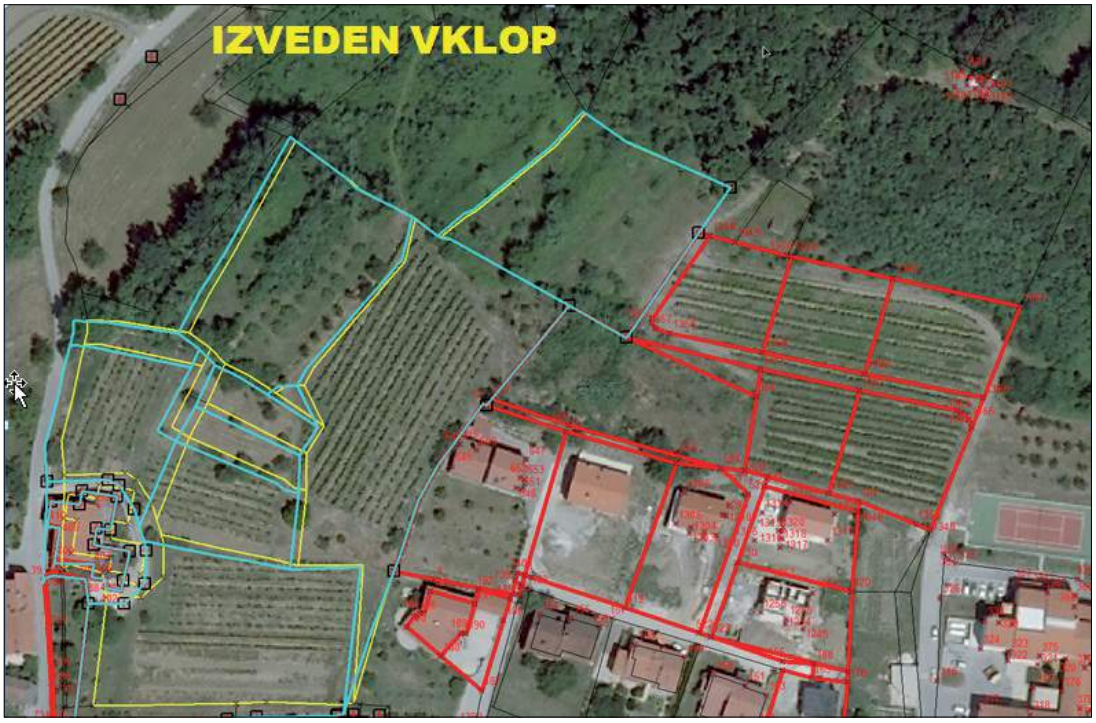
Preparation for implementation also included the preparation of the "zero" state of the ZKN-0 land cadastral plan, which was produced from the existing database of LC points (before improvement) with coordinates in the D48/GK national coordinate system.

Due to the scope of the task, control/monitoring of the task, and the implementation of automatic controls, a special application was developed in order to support the implementation.

For each plot:
- the possibility of improving the location data of the land cadastre was identified,
- the location data was improved wherever possible and reasonable (the D48/GK coordinates of LC points were determined, and
- the appropriate attributes were assigned to all new and changed LC points in the LC point database).

Integrations were performed:
- using existing LC points in the LC point database, or
- by adapting the content of the ZKP to the points interpreted on the DOF, where the identification of corresponding LC points was not possible.

The integration of ZKP parcels into the ZKN and the other LC points was carried out on the basis of the LC points identified on the ZKP. The integration was carried out in accordance with the existing principles of setting up, managing and maintaining the land cadastre, in a similar manner as the graphical integration, whereby the plots from the ZKP were included in the mathematical basis represented by LC points and the ZKN. Technically, this was done by translation, rotation, scaling (resizing) and adjustment of the selected ZKP plots to LC points or the ZKN.



Slika 8.1.2: Primer vklopa skupine parcel na podlagi ZK-točk in ZKN.
Vir: Arhiv GURS

Figure 8.1.2: Example of an integration of a group of plots based on LC points and the ZKN.
Source: The SMARS archive

Če ni bila možna identifikacija posameznih ZK-točk, možno pa je bilo prilagajanje skupine parcel, je bil vklop izveden s prilagajanjem vsebine ZKP na DOF. Zemljiškokatastrske meje namreč predstavljajo lastniško-pravna razmerja zemljišč. Kot take lahko ustrezajo vidnim detajlom na terenu, vendar je bilo treba pri tem upoštevati tudi dejstvo, da ni bilo nujno vedno tako. Kadar so detajli na terenu vizualno (po velikosti in obliki) ustrezali stanju mej v ZKP, se je izhajalo iz verjetnosti, da stanje v naravi odraža pravilna lastniško-pravna razmerja. To je veljalo predvsem na mejah posesti, zato se je pri vklopih dajal poudarek na meje med parcelami različnih lastnikov.

- Za izboljšavo je bila uporabljena translacija in rotacija čim večjega območja na položaj, ki je vizualno bolje ustrezal položaju detajlov na terenu in obstoječemu stanju merjenih detajlov (sloj ZKN in ZK-točke z merjenimi koordinatami).
- Izboljšava je bila izvedena tako, da so se relativna razmerja dolžin, kotov in površin čim manj spreminjala.
- Uporabilo se je načelo »iz velikega v malo«.
- Kjer konca premika ni bilo mogoče določiti nedvoumno, je bil premik zaključen na čim večjih parcelah in čim daljših stranicah parcel, da so se relativna razmerja (dolžine, koti in površine) čim manj deformirala.

Where it was not possible to identify individual LC points, but it was possible to adjust a group of plots, the integration was performed by adjusting the content of the ZKP to the DOF. Namely, land cadastral borders represent the ownership-legal relations of the land. As such, they may correspond to visible details in the field, but it has to be taken into account that this was not necessarily always the case. When the details in the field visually (in size and shape) corresponded to the state of the borders in the ZKP, it was assumed that the state in nature reflected the correct ownership-legal relations. This was especially true at the borders of property, so the integration focused on the borders between the plots of different owners.

- The improvement included translation and rotation of as large an area as possible to a position that visually better matched the position of the details in the field and the existing condition of the measured details (the ZKN layer and LC points with measured coordinates).
- The improvement was carried out in such a way that the relative ratios of lengths, angles and areas changed as little as possible.
- The "from big to small" principle was applied.
- Where the end of the displacement could not be determined unambiguously, the displacement was completed on the longer sides of plots as widely as possible, so that the relative ratios (lengths, angles and areas) were deformed as little as possible.

- V primerih zaključka premika na linijah z veliko lomi je bil dovoljen zvezen prehod iz manjšega premika v večji premik detajla preko več lomov (»mehak« prehod).

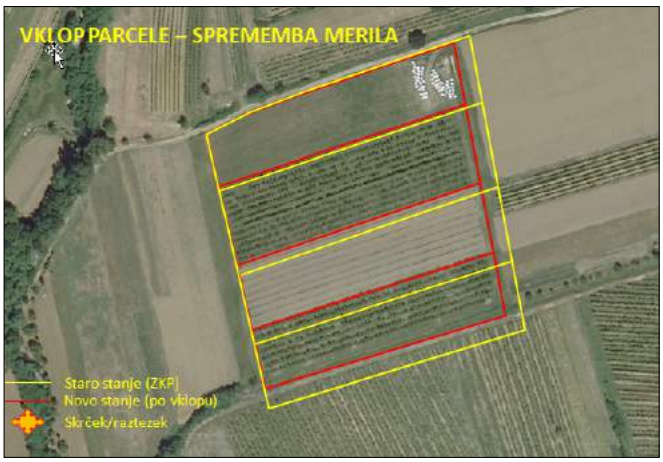
- In cases where the displacement ended on lines with several gradients, a continuous transition was used from a smaller displacement to a larger displacement of the part over several gradients (a "soft" transition).

Slika 8.1.3: Primer premika parcele.
Vir: Arhiv GURS

Figure 8.1.3: Example of plot displacement.
Source: The SMARS archive

Slika 8.1.4: Primer rotacije parcele.
Vir: Arhiv GURS

Figure 8.1.4: Example of plot rotation.
Source: The SMARS archive



Slika 8.1.5: Primer spremembe merila.
Vir: Arhiv GURS

Figure 8.1.5: Example of a change in the scale.
Source: The SMARS archive

Izboljšani lokacijski podatki zemljiškega katastra so bili izdelani za parcele trajnih nasadov in na njih ležeče parcelne dele stavb.

Pri vklopu je bilo treba upoštevati naslednje posebnosti za:

- spreminjanje obstoječih ZK-točk,
- izboljšavo lokacijskih podatkov ob državni meji,
- izboljšavo lokacijskih podatkov na meji katastrskih občin in
- izboljšavo lokacijskih podatkov parcelnih delov stavb.

Pravila za spreminjanje obstoječih ZK-točk:

Improved location data of the land cadastre was prepared for plots of permanent crops and plot parts of buildings located on these plots.

The following special features had to be taken into account in the integration:

- modification of existing LC points,
- improving location data along the country border,
- improving location data at the border of cadastral municipalities, and
- improving location data of the plot parts of buildings.

Rules for modifying existing LC points:

Pri izvedbi vklopa so praviloma morale vse ZK-točke v bazi ZK-točk z izmerjenimi koordinatami (tudi točke na meji s sosednjimi k. o. in točke državne meje) in vse ostale točke ZKN ostati nespremenjene (obdržati koordinato). V praksi so sicer nastopili izjemni primeri, pri katerih vklop z zadržanjem koordinat D48/GK ne bi bil smiseln.
Ti izjemni primeri so bili:

- ugotovljene napake v zapisu koordinat,
- ugotovljene napake pri določitvi koordinat ali
- ugotovljene napake, ki so povzročile topološke nepravilnosti.

Izboljšava lokacijskih podatkov ob državni meji:

Če je bila parcela ob državni meji, točke državne meje pa ni bilo mogoče identificirati na ZKP, se je izvedla poprava vklopa ob državni meji. Nove točke so se določile s presekom ali podaljšanjem parcelne meje vklopljene parcele z državno mejo.

As a rule, all LC points in the LC point database with measured coordinates (including points on the border with neighbouring CM and state border points) and all other ZKN points had to remain unchanged (keep the coordinate) in the integration. In practice, however, there were exceptional cases in which integration by retaining the D48/GK coordinates would not make sense.
These exceptional examples were:

- errors found in the coordinate record,
- errors found in determining coordinates, or
- errors found that caused topological irregularities.

Improving location data along the country border:

If the parcel was along the country border and a point of the state border could not be identified on the ZKP, the integration at the state border was corrected. The new points were determined by intersecting or extending the plot border of the plot included with the country border.

Slika 8.1.6: Primer poprave vklopa ob državni meji. Vir: Arhiv GURS

Figure 8.1.6: Example of a correction of the integration at the country border. Source: The SMARS archive

Izboljšava lokacijskih podatkov parcelnih delov stavb:

Na območju parcel trajnih nasadov se je vklop izvedel tudi za vse parcelne dele stavb, če so imeli v katastru stavb evidentiran tloris stavbe ali so bile stavbe vidne na DOF. Če je parcelni del stavbe že imel določene izmerjene koordinate v bazi ZK-točk, vklop ni bil izveden.

Vklop parcelnega dela stavbe se je izvedel v prvem koraku istočasno s parcelo. Če parcelni del stavbe po vklopu par-

Improving the location data of the plot parts of buildings:

In areas of permanent crop plots, the integration was also carried out for all plot parts of buildings, if the floor plan of the building was recorded in the building cadastre or the buildings were visible on the DOF. If the plot part of the building already had assigned measured coordinates in the database of LC points, the integration was not performed.

The integration of the plot part of a building was carried out in the first step, at the same time as the plot. If the plot part of the building

cele ni ležal znotraj tlorisa stavbe oz. na mestu, kjer je bila stavba vidna na DOF, se je v drugem koraku za parcelne dele stavbe izvedel še premik in/ali rotacija parcelnega dela stavbe tako, da je ustrezal tlorisu stavbe ali poziciji na DOF-u. Vse to le v primeru, da je evidentiran parcelni del predstavljal objekt na terenu.

Rezultat lokacijske izboljšave trajnih nasadov je na parcelah, ki so bile predmet izboljšave, prinesel oštevilčenje vseh lomnih točk parcele (s parcelnimi deli) z ZK-točkami s koordinatami v državnem koordinatnem sistemu D48/GK. S tem pa seveda tudi možnost prikaza dopolnjenega ZKN (in posledično izdelave grafičnih presekov). Lokacijska izboljšava je bila v času od aprila do vključno junija 2013 narejena na območjih trajnih nasadov za pribl. 250.000 parcel v 1521 katastrskih občinah (dobrih 56 % katastrskih občin).

did not lie within the floor plan of the building or in the location where the building was visible on the DOF, a translation and/or rotation of the plot part of the building was performed in the second step so that it corresponded to the floor plan of the building or the position on the DOF. This was carried out only in the case where the recorded plot part represented a building in the field.

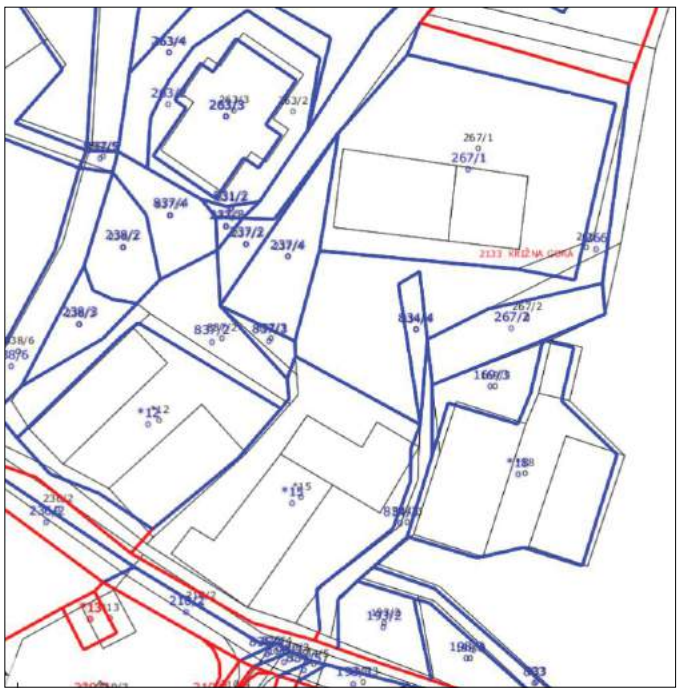
The result of the positional accuracy improvement of permanent crops on the plots that were the subject of improvement resulted in the numbering of all gradient points of the plot (with parcel parts) with LC points with coordinates in the D48/GK national coordinate system, and, of course, also the possibility of displaying the supplemented ZKN (and consequently the production of graphic cross-sections). The positional accuracy improvement was performed in the areas of permanent crops in the period from April to June 2013 for approx. 250,000 parcels in 1521 cadastral municipalities (more than 56% of cadastral municipalities).

Slika 8.1.7: Trajni nasad - prikaz v ZKN.
Vir: PREG, ekranska slika ZKN + DOF

Figure 8.1.7: Permanent crops – representation in the ZKN.
Source: PREG, screen image ZKN + DOF

Poleg izboljšave lokacijskih podatkov na območjih trajnih nasadov je bila v tem letu izvedena še lokacijska izboljšava vseh katastrskih občin na območju dveh političnih občin, in sicer Škofja Loka in Jesenice z namenom, da se ugotovi/predstavi možnost uporabe lokacijsko natančnejšega sloja ZKN za druge namene (npr. izdelavo OPN). V okviru te izboljšave je bilo izboljšanih pribl. 50.000 parcel v 35 katastrskih občinah. Izboljšane so bile vse lomne točke na meji parcel, ne pa tudi lomne točke na meji parcelnih delov, zato je bila predhodno izvedena samo oštevilčba lomnih točk na meji parcel.

In addition to improving positional data in areas of permanent crops, the positional accuracy improvement of all cadastral municipalities in the area of two political municipalities, namely Škofja Loka and Jesenice, was carried out this year in order to identify/present the potential of using a more precise ZKN layer for other purposes (e.g. production of an OPN). This improvement affected approximately 50,000 parcels in 35 cadastral municipalities. All gradient points at plot borders were improved, but not the gradient points at plot part borders, so only the numbering of gradient points at plot borders was performed pre-emptively.

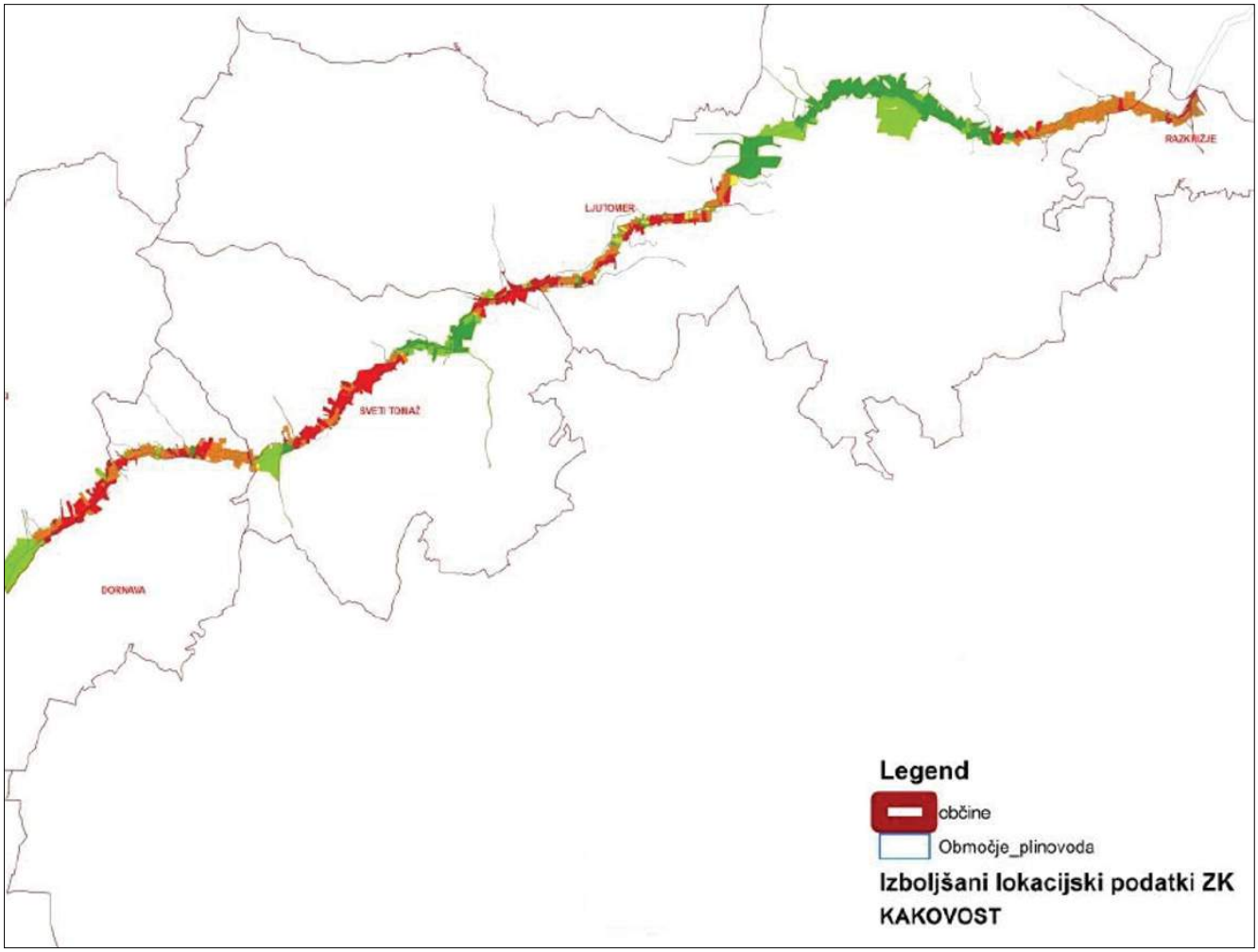


Slika 8.1.8: Lomi parcelnih delov, ki niso bili oštevilčeni, niso bili izboljšani in niso prikazani v ZKN (črno – ZKP, modro in rdeče – ZKN), primer k. o. 2133 Križna Gora.
Vir: PREG, ekranska slika ZKP + ZKN brez ZK-točk

Figure 8.1.8: Gradients of parcel parts that have not been numbered were not improved and are not shown in the ZKN (black – ZKP, blue and red – ZKN), example CM 2133 Križna Gora.
Source: PREG, screen image ZKP + ZKN excluding LC points

Izkušnje, pridobljene pri izboljšavi trajnih nasadov, so bile v letih 2013–2015 uporabljene (in nadgrajene) tudi pri projektu izboljšave ZKP na trasi plinovoda Južni tok. Osnova za izbor parcel za izboljšavo je bila v tem primeru trasa plinovoda (os plinovoda s koridorjem in varovalnim območjem, ki je znašal najmanj 30 m). Nadgradnjo je predstavljal preračun starih elaboratov in terenska izmera določenega števila točk. Uporabljena je bila Helmertova ali pa trikotniška transformacija. Prioritetno so bile kot vezne točke za transformacijo vzete ZK-točke. Po zaključeni izboljšavi je bila za vsako posamezno izboljšano parcelo v ZKN ocenjena kakovost glede na metodo določitve koordinat ZK-točkam. Ocena kakovosti je bila grupirana v pet razredov.

The experience gained in the improvement of permanent crops was also applied (and upgraded) in the ZKP improvement project on the South Stream gas pipeline route in 2013-2015. The basis for the selection of plots for improvement in this case was the route of the pipeline (axis of the pipeline with a corridor and a safety area of at least 30 m). The upgrade consisted of a recalculation of old reports and field survey of a set number of points. The Helmert or triangular transformation was used. As a priority, LC points were used as tie points for the transformation. After the completion of the improvement, the quality of each individual improved plot in the ZKN was assessed according to the method for determining the coordinates of the LC points. The quality assessment was grouped into five classes.



Parcela - Atribut	ZK točke, ki predstavljajo meje parcele -metoda določitve	Natančnost	Barva
1	<=93	do 0.5m	
2	<=93 in 94	do 1m	
3	94	do 1-2m	
4	94 in 95 95 <=93 in 95	od 2 do 3m	
5	<=93 in 96 94 in 96 95 in 96 96	> 3m	

Slika 8.1.9: Grafični prikaz ocene kakovosti na delu trase.
Vir: Arhiv GURS

Figure 8.1.9: Graphical representation of the quality assessment on part of the route.
Source: The SMARS archive

8.2 Lokacijska izboljšava z membransko metodo homogenizacije – 2017 »Program projektov e-Prostor«
Positional accuracy improvement with the membrane homogenization method – 2017, the "e-Prostor Project Programme"

Projekt »Lokacijska izboljšava zemljiškokatastrskega prikaza« iz »Programa projektov e-Prostor« je bila izvedena v času od začetku leta 2018 do konca leta 2020. Poudarek je bil na izboljšavi parcel poseljenih zemljišč. Projekt sta sofinancirala Republika Slovenija in Evropska unija iz Evropskega sklada za regionalni razvoj in je bil izveden v okviru Operativnega programa za izvajanje evropske kohezijske politike v obdobju 2014–2020.

The "Positional Accuracy Improvement of the Cadastral Index Map" project from the "e-Space Project Program" was implemented in the period from the beginning of 2018 to the end of 2020. The emphasis was on improving plots of inhabited land. The project was co-financed by the Republic of Slovenia and the European Union from the European Regional Development Fund and was implemented within the Operational Programme for the Implementation of the EU Cohesion Policy in the period 2014-2020.

8.2.1 Teoretična izhodišča
Theoretical starting points

Na podlagi teoretičnih spoznanj in rezultatov študij stroke v drugih evropskih deželah so avtorji Marjan Čeh, Anka Lisec, Miran Ferlan, Radoš Šumrada v članku »Geodetsko podprta prenova grafičnega dela zemljiškega katastra«, objavljenem v Geodetskem vestniku leta 2011, zapisali:

»Rezultati tujih študij (Gielsdorf, 2005) in naših preliminarnih študij kažejo, da je mogoče z uporabo membranske metode učinkovito izboljšati homogenost položajne natančnosti ZKP, pri tem pa nedvoumno uporabljati osnovna načela geodetske stroke (metode koordinatne geometrije, topologija, izravnava, zakon o prenosu pogreškov). Pri tem se izpostavlja težava optimizacije deleža terenskih in pisarniških opravil, predvsem identifikacija, število in prostorska razporeditev dodatno kakovostno izmerjenih točk in uporaba arhiviranih podatkov.

Cilj je učinkovit prenos izboljšave položaja s točk, ki imajo preverjeno kakovostne koordinate (na primer ZK-točke), na model (ZKP) za območja manj in bolj oddaljenih okoliških parcel na zvezen način. Za doseganje tega cilja je treba naenkrat obravnavati neko območje ZKP, na primer območje sistemske skice, območje snemalnega lista, območja ledine, območja celotne katastrske občine ali več katastrskih občin skupaj, kar je pri sedanjih zmogljivostih programskih rešitev mogoče učinkovito organizirati in hitro izvajati.

Za manjša območja, kjer tako položajno izboljšan ZKP kot model ne ustreza stanju v naravi, je možno ustrezno stop-

On the basis of theoretical findings and the results of studies in other European countries, the authors Marjan Čeh, Anka Lisec, Miran Ferlan and Radoš Šumrada wrote in the article "Survey--Supported Renovation of the Graphical Part of the Land Cadastre", published in the Geodetski vestnik journal in 2011:

"The results of foreign studies (Gielsdorf, 2005) and our preliminary studies show that the use of the membrane method can effectively improve the homogeneity of the positional accuracy of the ZKP, while unequivocally applying the basic principles of the geodetic profession (methods of coordinate geometry, topology, adjustment, error transfer law). In regard to this, we emphasize the issue of optimizing a part of field and office tasks, especially the identification, number and spatial distribution of additional qualitatively measured points and the use of archived data.

The goal is to effectively transfer position improvement from points that have verified quality coordinates (for example LC points) to a model (ZKP) for areas of less and more distant surrounding plots in a continuous manner. In order to achieve this, a whole ZKP area must be addressed at the same time, i.e. the system sketch area, the recording sheet area, fallow areas, areas of entire cadastral municipalities or several joined cadastral municipalities, which can be effectively organized and quickly implemented using current software solutions.

For smaller areas, where both the positionally improved ZKP and the model do not correspond to the state in nature, the

njo položajne natančnosti doseči le z geodetskimi postopki, ki vključujejo sodelovanje lastnikov in ob izvedeni geodetski izmeri. Izboljšave položajne natančnosti ZKP namreč ne smemo enačiti z upravno-tehničnimi postopki. Ločiti moramo izboljšavo položajne natančnosti ZKP od postopkov »spreminjanja objekta lastninske pravice«, ki se nanaša na katastrsko (pre)urejanje zemljišč. Ob tem pa se vsekakor pojavlja izziv nadgradnje konceptualnega modela zemljiškega katastra zaradi vzpostavljanja večnamenskega katastra, predvsem s tematskimi vsebinami, ki se nanašajo na pravne vsebine in vplivajo na upravljanje zemljišč oziroma nepremičnin.«

V sklepnih ugotovitvah članka »Pilotni projekt izboljšave kakovosti zemljiškokatastrskega prikaza v katastrski občini Črešnjice«, objavljenega v Geodetskem vestniku leta 2017, avtorji Marjan Čeh, Bojan Stopar, Barbara Trobec, Miran Brumec, Jernej Tekavec in Anka Lisec zapišejo takole:

»V geodetskih strokovnih krogih prevladuje mnenje, da je treba geometrijska razmerja nepremičnin (zemljiških parcel in stavb) in njihove lokacije na zemeljskem površju upravljati v obliki koordinatnega katastra. Mejne točke bi morale biti določene s koordinatami visoke točnosti in zanesljivosti, ki bi odražale najverjetnejše položaje mejnih znamenj na parcelnih mejah. Nove katastrske izmere (množične mejne obravnave z geodetsko izmero), ki s tehnično - inženirskega vidika dajejo najboljši rezultat, pogosto niso sprejemljiva rešitev za večja območja, saj ocenjeni stroški lahko presegajo predvidene koristi. Množična nova izmera, vzpostavitev katastra na podlagi geodetske izmere ali podobni instrumenti so še vedno najkakovostnejši pristopi k dolgoročni položajni in splošni kakovosti podatkov katastra. Zaradi visokih stroškov pa se države pogosto odločajo za kompromisne rešitve, kot je preračun katastrskih koordinat s kombinacijo izravnalnega računa z vključitvijo podatkov relativne geometrije preteklih lokalnih izmer, z upoštevanjem drugih geometrijskih pravil in z navezavo na skrbno izbrane, lahko tudi dodatno izmerjene referenčne točke, kar omogoča izboljšanje položajne in geometrične kakovosti katastrskih načrtov (koordinat lomnih točk).

Izpostaviti velja, da vključuje dokumentacija katastrskih postopkov pri vzpostavljanju in posodabljanju obstoječih podatkovnih nizov podatke meritev, ki dobro opredeljujejo relativne položaje mejnih točk nepremičnin. V idealnem katastrskem sistemu naj bi bili podatki meritev v okviru predpisanih dovoljenih odstopanj in primerno nadzorovani glede števila nadštevilnosti. Samo dovolj kakovostno opredeljene katastrske podatke bi nato lahko pretvorili v koordinatni kataster. Dodatna težava pa so relativne meritve.

appropriate level of positional accuracy can be achieved only by geodetic procedures, which include the participation of owners and performing geodetic surveying. Positional accuracy improvement of the ZKP should not be equated with administrative and technical procedures. It is important to distinguish positional accuracy improvement of the ZKP from the procedures of "changing the object of property rights", which refers to the cadastral (re)arrangement of land. At the same time, a challenge arises regarding upgrading the conceptual model of the land cadastre due to the establishment of a multi-purpose cadastre, in particular in regard to thematic contents that refer to legal contents and affect the management of land or real estate."

In the conclusions of the article "Pilot Project for Improving the Quality of the Cadastral Index Map in the Cadastral Municipality of Črešnjice", published in Geodestki vestnik in 2017, authors Marjan Čeh, Bojan Stopar, Barbara Trobec, Miran Brumec, Jernej Tekavec and Anka Lisec wrote:

"The prevailing opinion in professional geodetic circles is that the geometric proportions of real estate (land plots and buildings) and their locations on the Earth's surface must be managed in the form of a coordinate cadastre. Border points should be determined with coordinates of high accuracy and reliability, reflecting the most likely positions of border markers at the plot borders. New cadastral surveys (mass border surveys with geodetic surveying), which give the best result from a technical-engineering point of view, are often not an acceptable solution for larger areas, as the estimated costs may exceed the expected benefits. Mass new surveys, the establishment of a cadastre based on a geodetic survey or similar instruments are still the best approaches to the long-term positional and general quality of cadastre data. However, due to high costs, countries often opt for compromise solutions, such as recalculation of cadastral coordinates by combining an adjustment calculation with the inclusion of data from the relative geometry of past local surveys, following other geometric rules and with connections to carefully selected, possibly additionally measured reference points, which enables the positional and geometric quality of cadastral plans (coordinates of gradient points) to be improved.

It should be noted that the documentation of cadastral procedures in the establishment and updating of existing data sets includes measurement data that clearly define the relative positions of real estate border points. In an ideal cadastral system, the measurement data should be within the prescribed tolerances and adequately controlled in terms of the number of redundancies. Only sufficiently well-defined cadastral data could then be converted into a coordinate cadastre. An additional issue, however, are relative measurements.

To establish a coordinate cadastre in the reference coordinate system, we require coordinates of cadastral points that are de-

Za vzpostavitev koordinatnega katastra v referenčnem koordinatnem sistemu potrebujemo koordinate katastrskih točk, ki so kakovostno določene v referenčnem koordinatnem sistemu. Kot lepo kaže študijski primer, je informacija o položaju katastrskih točk v referenčnem koordinatnem sistemu zagotovljena le na lokacijah, kjer so ZK-točke določene v referenčnem koordinatnem sistemu ali so identične mejne točke ZKP-ja materializirane v naravi in jim je mogoče položaj določiti naknadno s terensko izmero. Take točke smo v študiji uporabili kot vezne oziroma referenčne.

Obe skupini meritev v okviru katastrske numerične evidence (relativne meritve in koordinate veznih točk) pa lahko vsebujeta slučajne pogreške, meritve so lahko dodatno obremenjene z grobimi ali sistematičnimi pogreški. Na slučajne pogreške nimamo vpliva. So tudi razlog, da je načeloma nemogoče določiti prave vrednosti koordinat mejnih točk. Cilj izračuna koordinat je zato določitev najverjetnejših koordinat mejnih točk. Ob tem pa je treba zagotoviti, da so izpolnjene dodatne zahtevne meritve, ki so uporabljene za katastrske izračune (meritve elementov relativne geometrije in za določitev koordinat točk), morajo biti v skladu s pravilniki o katastrski izmeri.

To pomeni, da odstopanja merjenih količin ne smejo presegati predpisanih vrednosti dopustnih odstopanj - opazovanja, uporabljena v izračunih, morajo biti ustrezno nadzorovana v okviru matematičnega modela izravnave opazovanj za določitev koordinat mejnih točk.

Pomemben rezultat študijskega primera so bili odkriti grobi pogreški (grobi pogreški koordinat, napake pri vključitvi novih podatkov v ZKP, topološke napake ipd.) ter uskladitev položaja ZKP s položaji kakovostnih ZK točk ter drugih veznih točk, ki smo jih uporabili kot referenčne točke. Pri tem se je ohranila topologija in notranja geometrija ZKP, kakovost končnega rezultata pa je odvisna predvsem od kakovosti in številnosti vhodnih referenčnih podatkov (število veznih točk, število geometrijskih pogojev, vključno s podatki relativnih meritev, privzeti iz elaboratov geodetskih storitev ipd.)

Cilj postopka, pri katerem se uporablja izravnalni račun za določitev najverjetnejših koordinat mejnih točk, postopki odkrivanja pogreškov ter ocenjevanje točnosti in zanesljivosti izračunanih koordinat točk, je izračun, s katerim bodo izpolnjene pravno-nepremičninske zahteve koordinatnega katastra. Tudi če izračunane koordinate točk zveznega grafičnega katastrskega sloja ne izpolnjujejo zahtev za registracijo nepremičnin v koordinatnem katastru, kar je pogosto, te koordinate še vedno ponazarjajo najverjetnej-

termined in high quality in the reference coordinate system. As shown in the case study, information on the position of cadastral points in the reference coordinate system is provided only at locations where LC points are determined in the reference coordinate system or where identical border points of the ZKP are materialized in nature and their position can be determined subsequently by field surveying. Such points were used as tie points or reference points in the study.

Both groups of measurements within the cadastral numerical records (relative measurements and coordinates of tie points) may contain random errors, and measurements can be additionally burdened with major or systematic errors. We have no influence over random errors. They are also the reason that it is, in principle, impossible to determine the true values of the coordinates of border points. The aim of the coordinate calculation is therefore to determine the most probable coordinates of the border points. At the same time, it must be ensured that the additional complex measurements used for cadastral calculations (measurements of elements of relative geometry and for determining the coordinates of points) are met, in accordance with the rules on cadastral surveying.

This means that the deviations of the measured quantities must not exceed the prescribed values of the permissible deviations - the observations used in the calculations must be adequately controlled within the mathematical model of the adjustment of observations to determine the coordinates of the border points.

An important result of the case study was the identification of major errors (major coordinate errors, errors in the inclusion of new data in the ZKP, topological errors, etc.) and the alignment of the ZKP position with the positions of high-quality LC points and other tie points used as reference points. The topology and internal geometry of the ZKP have been preserved, and the quality of the final result depends mainly on the quality and amount of input reference data (number of tie points, number of geometric conditions, including data of relative measurements taken from surveying service reports, etc.).

The goal of the procedure in which an adjustment calculation is used to determine the most likely coordinates of border points, the error detection procedures, and the assessment of the accuracy and reliability of the calculated coordinates of points, is a calculation that will meet the legal-property requirements of the coordinate cadastre. Even if the calculated coordinates of the points of the uniform graphical cadastral layer do not meet the requirements for real estate registration in the coordinate cadastre, which is often the case, these coordinates still illu-

še položaje mejnih točk, ki jih lahko pridobimo z upoštevanjem (vseh) razpoložljivih podatkov in informacij.

V primerjavi s koordinatami točk, pridobljenih z vektorizacijo, in »sestavljanjem« katastrskih načrtov v preteklosti, prinašajo rezultati izravnave in homogenizacije precejšnjo izboljšavo položajne in geometrične kakovosti grafičnega prikaza parcel in njihovih delov v zemljiškem katastru.«

strate the most probable positions of border points that can be obtained by considering (all) available data and information.

In comparison with the coordinates of points obtained by vectorization and the "compilation" of cadastral plans of the past, the results of adjustment and homogenization bring a significant improvement in the positional and geometric quality of the graphic representation of plots and their parts in the land cadastre."

8.2.2 Razlogi, namen in cilj
Reasons, purpose and objective

Zemljiški kataster je temeljna prostorska evidenca o zemljiščih. Slabša lokacijska natančnost podatkov zemljiškega katastra ne omogoča njegove polne in racionalne uporabe. Za potrebe zajema dejanske rabe pozidanih zemljišč s pomočjo grafičnih presekov je bilo treba zagotoviti lokacijsko kar najboljše podatke. Če so bili grafični podatki za večja mesta in naselja, v katerih je bila intenzivnost sprememb velika, praviloma že lokacijsko dovolj natančni, pa tega ni bilo mogoče ugotoviti za vsa ostala območja pozidanih zemljišč. Zanje je bilo treba zagotoviti boljšo lokacijsko natančnost.

Na obliko in zaris parcel v grafičnih podatkih je med stoletjem vplivalo več dejavnikov: natančnost izvornega načrta, načini vzdrževanja, različni vklopi, reprodukcija map, digitalizacija (DKN), usklajevanje meja k. o., nove tehnologije ipd. Najboljši lokacijski podatki so rezultat postopkov vzdrževanja z izmero koordinat ZK-točk s predpisano natančnostjo. Zahtevnost teh postopkov ne omogoča pridobitve ustreznih lokacijskih podatkov za območje cele države v realnem času, zato je bila sprejeta odločitev, da se lokacijsko bolj natančni podatki za potrebe zajema dejanske rabe pozidanih zemljišč pridobijo z izravnavo in homogenizacijo. Projekt pridobitve le-teh je bil poimenovan Lokacijska izboljšava ZKP.

Za izravnavo in homogenizacijo je bilo treba zagotoviti zadostno število veznih točk, ki so bile primerno razporejene. Omejitev lokacijske izboljšave zgolj na območja pozidanih zemljišč bi pomenila, da bi znotraj posameznih območij zajema imeli veliko število manjših območij (bistveno večje število kot v primeru izboljšave za potrebe trajnih nasadov), katerih obod se z izboljšavo ne bi smel spremeniti. To bi povzročalo velike težave in omejitve pri sami izvedbi, zato je bila sprejeta odločitev, da se lokacij-

The land cadastre is the basic spatial record of land. Poorer positional accuracy of land cadastre data prevents its full and rational use. In order to cover the actual use of built-up land with the help of graphic cross-sections, it was necessary to provide positional data of the best quality possible. Although the graphical data for larger towns and settlements, in which the intensity of changes was high, were usually already sufficiently accurate in terms of location, the same was not found for all other areas of built-up land. They required better positional accuracy.

The shape and outline of the plots in the graphical data have been influenced by several factors over the century: the accuracy of the original plan, maintenance methods, various integrations, map reproduction, digitization (DKN), coordination of borders of CM, new technologies, etc. The highest-quality location data result from maintenance procedures by measuring the coordinates of the LC points with the prescribed accuracy. The complexity of these procedures does not allow for obtaining relevant location data for the whole country in real time, so it was decided to obtain more positionally accurate location data for the needs of covering the actual use of built-up land by adjustment and homogenization. The project to acquire this data was called the ZKP positional accuracy improvement.

For adjustment and homogenization, a sufficient number of tie points had to be provided and appropriately distributed. Limiting the positional accuracy improvement to built-up areas only would mean that there would be a large number of smaller areas within individual areas of coverage (significantly more than in the case of improvement for permanent crops) whose perimeter would not change in the improvement. This would cause great problems and limitations in the implementation itself, so the decision was made to implement the ZKP positional accuracy improvement for the entire country, with an entire cadastral municipality being regarded

» *Tehniški muzej Slovenije v Bistri pri Vrhniki*

Tehniški muzej Slovenije domuje v nekdanjem samostanskem oz. grajskem kompleksu v Bistri pri Vrhniki. Naselje in grad nosita ime po bistri vodi kraških izvirov, ki dajejo okolju poseben čar. Bistra je svojo kulturno, politično, gospodarsko in družbeno vlogo v minulih stoletjih zamenjala kar trikrat: od leta 1260 do razpustitve v letu 1782 je bila kartuzija, po prenovi leta 1826 je služila kot graščina, od leta 1951 pa je stalno prebivališče Tehniškega muzeja Slovenije. Prve zbirke v Bistri, ki so obravnavale gozdarstvo in lovstvo, so odprle vrata javnosti leta 1953. Danes so na več kot 6000 m² razstavnih površin na ogled stalne zbirke s področij kmetijstva, prometa, gozdarstva, lesarstva, lovstva, ribištva, tekstila, tiskarstva in elektrotehnike. **«**

» *Technical Museum of Slovenia in Bistra near Vrhnika*

The Technical Museum of Slovenia is situated in a former monastery or castle complex in Bistra near Vrhnika. The settlement and the castle are named after the clear water of the karst springs which give the environment its special charm. Bistra has changed its cultural, political, economic and social role three times in the past centuries: from 1260 until its dissolution in 1782 it was a Carthusian monastery, after renovation in 1826 it served as a mansion, and since 1951 it has been the permanent residence of the Technical Museum of Slovenia. The first collections in Bistra, dealing with forestry and hunting, were opened to the public in 1953. Today, the permanent collections on agriculture, transport, forestry, woodworking, hunting, fishing, textiles, printing and electrical engineering are on display in more than 6000 m2 of exhibition space. **«**

Tudi Tehniški muzej v Bistri je po lokacijski izboljšavi ZKP v k. o. 2003 Verd v letu 2019 našel svoje pravo mesto. Pred izboljšavo je ZKP (zelene povezave) bistveno odstopal od tlorisov stavb (oranžne povezave), po izboljšavi pa je vidno boljše ujemanje ZKN (modre povezave) in tlorisov stavb.
Vir: PREG, ekranski prikaz ZKP, tlorisi stavb in DOF (levo) ter ZKN, tlorisi stavb in DOF (desno), vir fotografije: https://www.tms.si

The Technical Museum in Bistra, too, found its rightful place after the positional improvement of the ZKP in CM 2003 Verd in 2019. Prior to the improvement, the ZKP (green connections) deviated significantly from the floor plans of buildings (orange connections); after the improvement, there is a better match between the ZKN (blue connections) and the floor plans of buildings.
Source: PREG, ZKP screen display, floor plans of buildings and DOF (left) and ZKN, floor plans of buildings and DOF (right), Photo source: https://www.tms.si

ska izboljšava ZKP izvede za območje celotne države, pri čemer je enovito območje lokacijske izboljšave cela katastrska občina. Za zemljišča izven območij pozidanih zemljišč so bile zahteve po številu veznih točk manjše, prav tako je bil grid razporeditve točk večji. Dejansko je bila lokacijska izboljšava ZKP izvedena glede na tri nivoje atraktivnosti prostora (pozidana zemljišča, območja kmetijskih zemljišč in območja gozdnih zemljišč z visokogorjem. Zahteve so bile opredeljene z razdaljo med ZK-točkami in dodatnimi veznimi točkami z numeričnimi koordinatami (pozidana zemljišča - razdalje manjše od 300, kmetijska zemljišča – razdalje manjše od 600 in gozdna zemljišča z visokogorjem – razdalje manjše od 1200 m).

Kjer obstoječe ZK-točke niso zadostile zahtevam izravnave in homogenizacije, so bile posebej za namen tega projekta določene dodatne vezne točke, določeni pa so bili tudi posamezni pogoji za ohranitev relativnih razmerij. Z dodatnimi veznimi točkami je bila izboljšana razporeditev točk kot tudi povečano njihovo število, kar je izravnavo in homogenizacijo na nekaterih območjih sploh omogočilo, na drugih pa pripomoglo h kvaliteti rezultata.

Rezultati projekta Lokacijska izboljšava ZKP so pomembno izboljšali lokacijsko natančnost ZKP na način, da je bil izdelan ZKN za celotno državo. Le-ta pa je bil potem uporabljen za grafične preseke z dejansko rabo pozidanih zemljišč, kar je bil osnovni namen. Seveda pa je uporaba širša, saj se npr. vsi grafični preseki po novem izvajajo z ZKN in ne več z ZKP, a se je treba pri uporabi zavedati, da je tudi tako izdelan ZKN nehomogene natančnosti. Natančnost določitve koordinat v lokacijski izboljšavi ZKP je ocenjena na slabšo od 1 m, zato take ZK-točke niso uporabne za ugotavljanje meja v geodetskih storitvah, a je bilo dejansko mogoče povsod, kjer je potrebna uporaba zveznega sloja grafičnih podatkov, ZKP po zaključeni lokacijski izboljšavi ZKP zamenjati z lokacijsko bolj natančnim ZKN.

as an area for positional accuracy improvement. For land outside built-up areas, the requirements for the number of tie points were lower, and the point distribution grid was larger. The ZKP positional accuracy improvement was carried out according to three levels of development of the area (built-up land, areas of agricultural land, and areas of forest land with highlands). The requirements were defined by the distance between LC points and additional tie points with numerical coordinates (built-up land – distances less than 300, agricultural land – distances less than 600, and forest land with highlands – distances less than 1200 m).

Where the existing LC points did not meet the adjustment and homogenization requirements, additional tie points were set up specifically for the purpose of this project, and individual conditions for maintaining relative proportions were determined. Additional tie points improved the distribution of points and increased their number, which facilitated equalization and homogenization in some areas and contributed to the quality of the result in others.

The results of the ZKP positional accuracy improvement project significantly improved the positional accuracy of the ZKP by producing a ZKN for the entire country. This was then used for graphical cross-sections with the actual use of built-up land, which was the basic purpose. Of course, the scope of use is wider, since, for example, all graphic cross-sections are now performed with the ZKN and no longer with the ZKP, but it should be noted when using it that even this type of ZKN may be of inhomogeneous accuracy. The accuracy of determining the coordinates in the ZKP positional accuracy improvement is estimated at less than 1 m, therefore such LC points are not useful for determining borders in surveying services, but it was indeed possible to replace the ZKP, after its positional accuracy improvement, with the more positionally accurate ZKN wherever the use of a continuous layer of graphical data was necessary.

8.2.3 Območja
Areas

Lokacijska izboljšava ZKP je bila izvedena v več fazah. Ena faza je predstavljala vse katastrske občine ene ali več organizacijskih enot geodetske uprave RS (le izjemoma v posa-

The ZKP positional accuracy improvement was carried out in several phases. One phase represented all cadastral municipalities of one or more organizational units of the Surveying and Mapping Authority of the Republic of Slovenia (only exceptio-

mezni fazi samo del katastrskih občin ene enote).

Okvirni časovni okvir izvedbe Lokacijske izboljšave ZKP po organizacijskih enotah je razviden spodaj:

nally in an individual phase a single part of cadastral municipalities of one unit).

The approximate time frame for the implementation of the ZKP positional accuracy improvement by organizational units is shown below:

Murska Sobota*, Lendava	februar, marec 2018 February, March 2018
v celoti koordinatno vzdrževane KO po Sloveniji fully coordinate-maintained CMs throughout Slovenia	april 2018 April 2018
Novo mesto, Črnomelj, Kočevje-delno, Litija-delno, Sevnica-delno Novo mesto, Črnomelj, Kočevje (partial), Litija (partial), Sevnica-(partial)	maj–september 2018 May-September 2018
Litija-delno, Trbovlje, Sevnica-delno, Krško, Brežice Litija (partial), Trbovlje, Sevnica (partial), Krško, Brežice	oktober–december 2018 October-December 2018
Slovenj Gradec, Mozirje, Velenje, Slovenske Konjice, Slovenska Bistrica	januar–april 2019 January-April 2019
Gornja Radgona, Ljutomer	maj, junij 2019 May, June 2019
Šmarje pri Jelšah, Šentjur pri Celju, Celje, Žalec	julij–september 2019 July-September 2019
Ljubljana, Grosuplje, Domžale, Logatec, Kočevje-delno Ljubljana, Grosuplje, Domžale, Logatec, Kočevje (partial)	oktober–december 2019 October-December 2019
Maribor, Ptuj	januar–april 2020 January-April 2020
Radovljica, Kranj, Škofja Loka	maj, junij 2020 May, June 2020
Tolmin, Idrija, Ajdovščina, Nova Gorica	julij, avgust 2020 July, August 2020
Sežana, Postojna, Koper	september, oktober 2020 September, October 2020

** Vse ZK-točke so že imele določene koordinate v D48/GK. Postopek izboljšave se ni izvedel z membransko metodo homogenizacije, ampak so bile zgolj izračunane koordinate v D96/TM z metodo transformacije z državnim modelom transformacije, verzija 4.0.*

** All LC points already had coordinates assigned in the D48/GK. The improvement process was not performed with the membrane homogenization method, only the coordinates in the D96/TM were calculated using the transformation method with the national transformation model, version 4.0.*

8.2.4 Pripravljalna dela
Preparatory work

Pred izvedbo lokacijske izboljšave je bilo treba izvesti pripravljalna dela, ki so navedena v nadaljevanju. Le-ta so izboljšavo sploh omogočila, ali pa vsaj pomembno skrajšala čas izvedbe.

Prior to the implementation of the positional accuracy improvement, the preparatory work listed below had to be carried out. This enabled the improvement itself, or at least significantly shortened the time of implementation.

8.2.4.1 Skeniranje arhiva zemljiškega katastra
Scanning the land cadastre archive

Eden od predpogojev k racionalnem pristopu k izvedbi lokacijske izboljšave zemljiškokatastrskih načrtov je bil skeniran arhiv zemljiškega katastra. Le-ta je omogočil vključitev širše skupine referentov, ki so izvajali izboljšavo, saj so lokacijsko izboljšavo lahko izvajali za poljubno katastrsko občino na katerikoli organizacijski enoti Geodetske uprave, saj je bil po skeniranju arhiva ZK dostop do arhivskih podatkov možen od koderkoli.

Prve želje in potrebe po digitalnih podatkih elaboratov katastrskih meritev so se sicer pojavile okoli leta 2000. Na podlagi testiranj in pilotnih študij so bila izdelana osnovna vsebinska in tehnična izhodišča za digitalni arhiv. Gradivo elaboratov je nastajalo več kot 200 let in v tem obdobju se je spreminjala zakonodaja, ki je vplivala na strukturo, vsebino in obliko gradiva, na tehnologijo meritev in izdelke pa je vplival tudi tehnični razvoj.

Sistematična digitalizacija elaboratov zemljiškega katastra je sledila digitalizaciji katastrskih načrtov. Arhiv elaboratov je bil zložen na organizacijskih enotah geodetske uprave po oznakah katastrskih občin. V elaboratu so združeni vsi dokumenti, ki obravnavajo en tehnični postopek – geodetsko meritev.

Elaborat je danes strokovna podlaga za sprejemanje odločitev v upravnih postopkih, ki jih vodi geodetska uprava, in so podlaga za evidentiranje sprememb podatkov v evidenci zemljiškega katastra in katastra stavb ter pri drugih nalogah pri evidentiranju nepremičnin.

Skupaj z dokumenti, ki so ob evidentiranju postopka nastali na Geodetski upravi, je bil elaborat oštevilčen s številko IDPOS (tj. zaporedno številko v okviru katastrske občine) že ob nastavitvi opisnega dela (osnovnih podatkov) evidence elaboratov. S skeniranjem je bila zagotovljena še digitalna oblika pripadajočih dokumentov.

Danes je v digitalni obliki že več kot 23 milijonov strani dokumentov geodetskih meritev (število se z novimi elaborati vsak dan povečuje), to je več kot 5 TB podatkov. Podatki so shranjeni na strežnikih Ministrstva za javno upravo.

One of the prerequisites for a rational approach to the implementation of the positional accuracy improvement of land cadastral plans was a scanned archive of the land cadastre. This enabled the inclusion of a wider group of officers to carry out the improvement, as the positional accuracy improvement could be carried out for any cadastral municipality at any organizational unit of the Surveying and Mapping Authority, as the scanning of the LC archives enabled access to archival data from anywhere.

The first desires and needs for digital data of cadastral measurement report appeared around 2000. Basic substantive and technical starting points for the digital archive were developed on the basis of testing and pilot studies. The material of the reports was produced over more than 200 years, and during this period the legislation changed, which affected the structure, content and form of the material, and the technology of measurements and the products were also influenced by technical development.

Systematic digitization of land cadastre reports was followed by the digitization of cadastral plans. The archive of reports was compiled at the organizational units of the Surveying and Mapping Authority by cadastral municipalities codes. A report combines all documents that deal with one technical procedure – geodetic surveying.

Today, the report is a professional basis for decision-making in administrative procedures conducted by the Surveying and Mapping Authority, which are the basis for recording changes in data in the land cadastre and building cadastre and other tasks in recording real estate.

Together with the documents created at the Surveying and Mapping Authority when recording the procedure, the report was marked with an IDPOS number (serial number within the cadastral municipality) already upon preparation of the descriptive part (basic data) of the report records. Scanning also provided a digital form of the associated documents.

Today, more than 23 million pages of geodetic measurement documents are already in digital form (the number is increasing every day with new reports), which is more than 5 TB of data. The data is stored on the servers of the Ministry of Public Administration.

Podatki o elaboratu:

Šifra katastrske občine	Ime katastrske občine	Številka elaborata	Šifra postopka	Vrsta postopka	Zaključek postopka	Šifra faze	Naziv faze
1412	MOKRONOG	6344	40	EVIDENTIR.ZEMLJIŠČA POD STAVBO	27.07.2009	11	SPREMEMBA
1412	MOKRONOG	6344	53	PARCELACIJA (ZEN)	27.07.2009	11	SPREMEMBA

Spremenjene parcele v elaboratu:

Parcela	Delo
498/133	UKINJENA
498/135	UKINJENA
498/139	NOVA

Zemljiško katastrske točke elaborata:

Opozorilo: Podatki se lahko razlikujejo od trenutno veljavnega stanja zaradi sprememb v kasnejših postopkih.

Točka	Datum *	E / YGK *	N / XGK *	Z	GE / L_YGK *	GN / L_XGK *	YTM	XTM	Delo	Upravni status	Metoda določitve
5114	27.07.2009	.00	.00	256.27	510777.23	89046.34	510406.59	89531.49	0 - Nova ZK točka	8 - VRSTE RABE	91
5115	27.07.2009	.00	.00	256.33	510789.97	89045.85	510419.33	89531.01	0 - Nova ZK točka	8 - VRSTE RABE	91
5116	27.07.2009	.00	.00	256.36	510790.27	89054.44	510419.61	89539.6	0 - Nova ZK točka	8 - VRSTE RABE	91
5117	27.07.2009	.00	.00	256.32	510777.56	89054.90	510406.91	89540.05	0 - Nova ZK točka	8 - VRSTE RABE	91
5118	27.07.2009	.00	.00	256.3	510783.77	89046.09	510413.14	89531.24	0 - Nova ZK točka	8 - VRSTE RABE	91
5119	27.07.2009	.00	.00	256.3	510783.72	89044.79	510413.09	89529.94	0 - Nova ZK točka	8 - VRSTE RABE	91
5160	27.07.2009	.00	.00	256.33	510787.39	89044.65	510416.76	89529.81	0 - Nova ZK točka	8 - VRSTE RABE	91
5161	27.07.2009	.00	.00	256.32	510787.44	89045.95	510416.8	89531.1	0 - Nova ZK točka	8 - VRSTE RABE	91

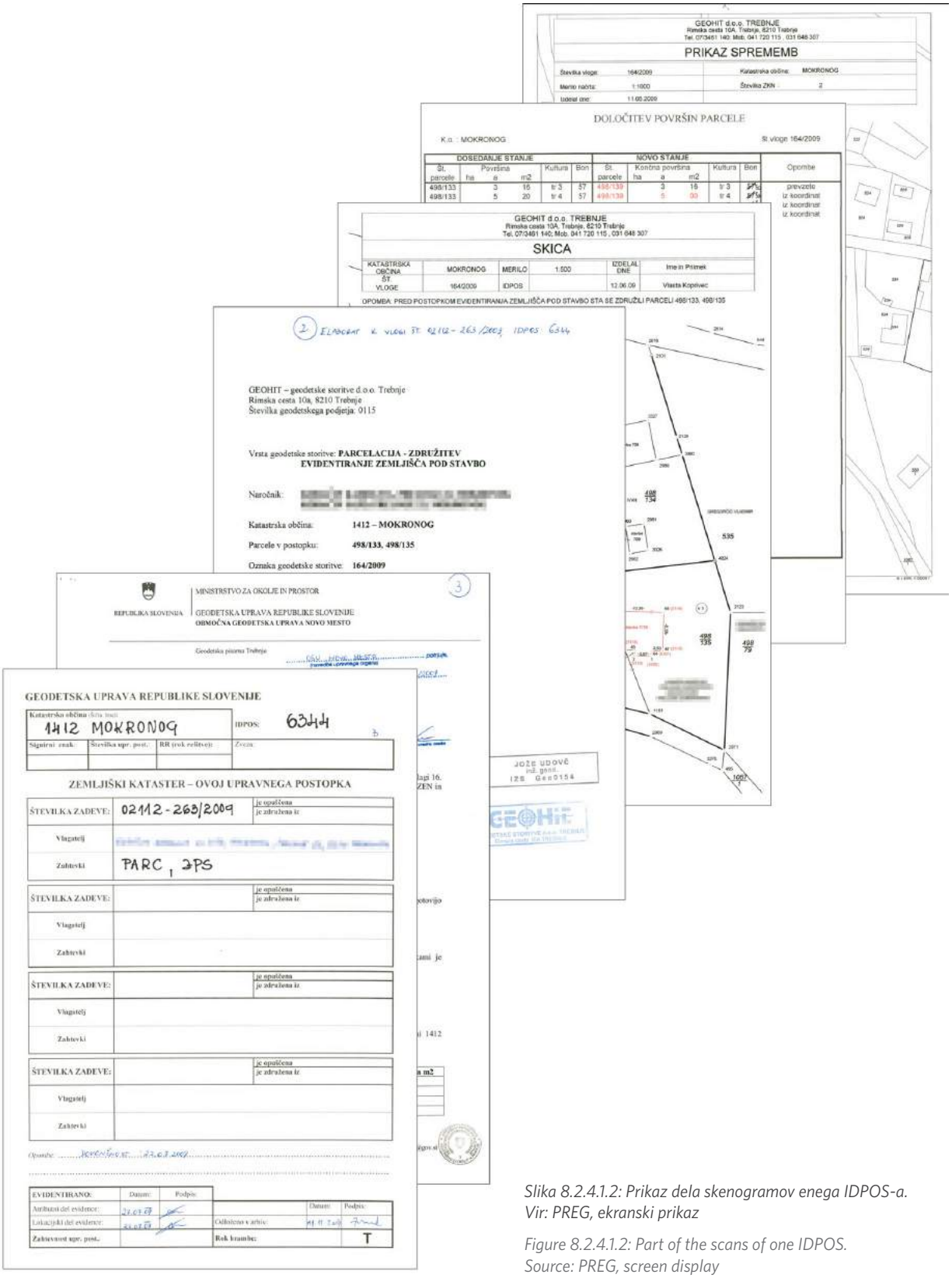
*Opozorilo: Če je »Datum« pred 21.1.2019, so pri podatku E/YGK, N/XGK, GE/L_YGK in GN/L_XGK koordinate zapisane v D48/GK.

Slika 8.2.4.1.1: Opisni podatki o IDPOS.
Vir: PREG, ekranski prikaz

Figure 8.2.4.1.1: Descriptive data on IDPOS.
Source: PREG, screen display

Poleg elaboratov arhiv zemljiškega katastra sicer vsebuje tudi zemljiškokatastrske načrte in indikacijske skice, ki prikazujejo spremembe zemljiškega katastra skozi zgodovino. Le-ti so bili v digitalno obliko spremenjeni že pred elaborati. Zaradi velikega povpraševanja in nenehne uporabe so bili nekateri arhivski dokumenti že zelo poškodovani, zato je bila njihova digitalizacija nujna za preprečitev nadaljnjega propadanja. S postopnim uveljavljanjem digitalnih katastrskih načrtov v uradni uporabi je geodetska uprava od leta 2000 do leta 2009 prenehala vzdrževati klasične katastrske načrte, ki se sedaj uporabljajo le kot arhivsko gradivo.

In addition to the reports, the land cadastre archive also contains land cadastral plans and indication sketches that show changes in the land cadastre throughout history. These were digitized before the reports. Due to high demand and constant use, some archival documents have already been severely damaged, so their digitization was necessary to prevent further deterioration. With the gradual introduction of digital cadastral plans into official use, the Surveying and Mapping Authority stopped maintaining classic cadastral plans from 2000 to 2009, which are now used only as archival material.



Slika 8.2.4.1.2: Prikaz dela skenogramov enega IDPOS-a.
Vir: PREG, ekranski prikaz

Figure 8.2.4.1.2: Part of the scans of one IDPOS.
Source: PREG, screen display

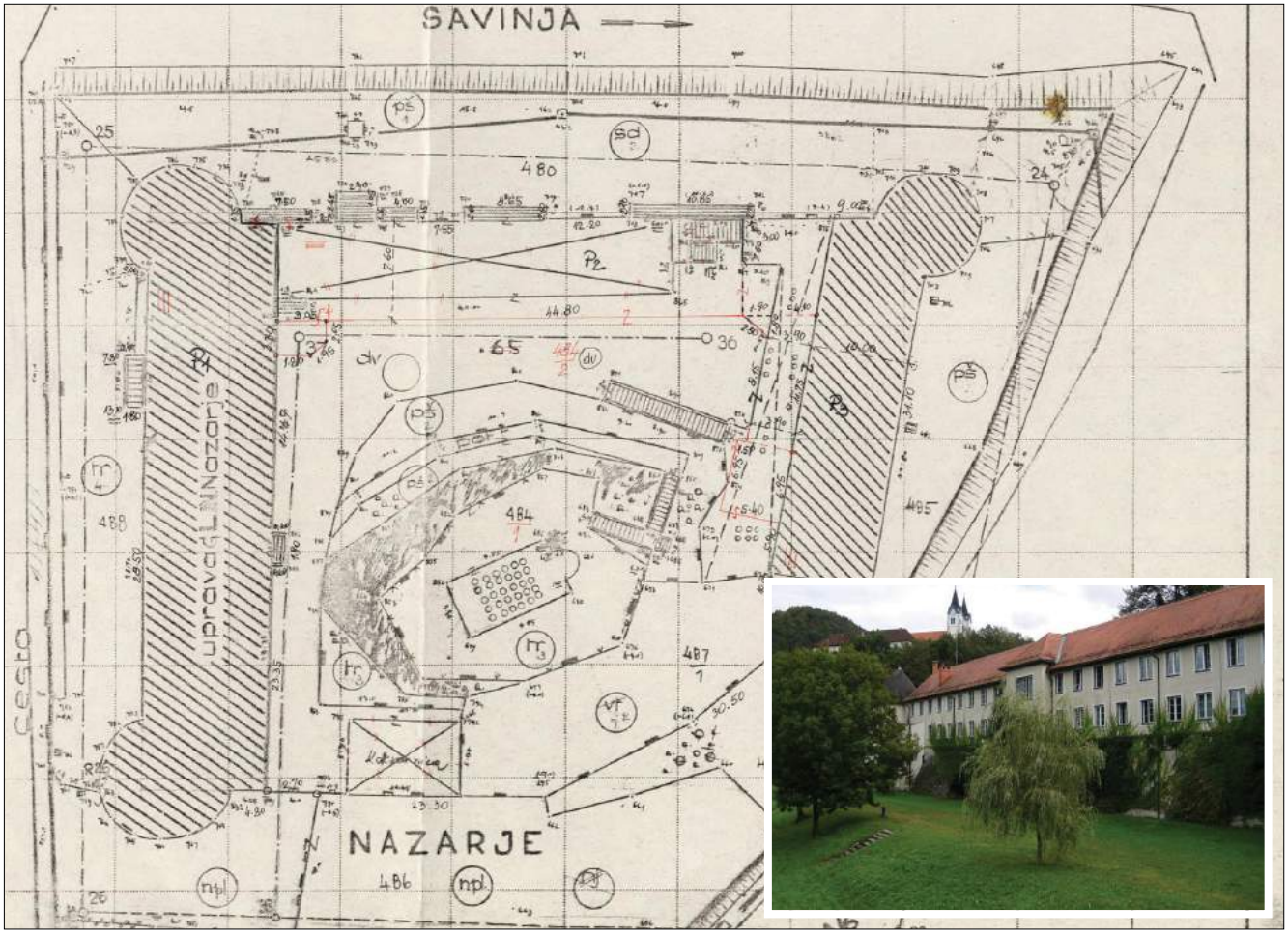
[1]Opomba: V dokumentih iz zbirke listin Zemljiškega katastra so varovani osebni podatki zakriti
[1]Note: Protected personal data is hidden in the land cadastre documents.

Grad Vrbovec

Grad Vrbovec v Nazarjah se nahaja na sotočju reke Savinje in Drete. Je eden izmed najlepših v Sloveniji. V pisnih virih se z nemškim imenom Altenburg prvič omenja leta 1248. Današnjo podobo je grad dobil okoli leta 1480. Lastniki gradu so bili oglejski patriarh, Vovbržani, grofje Celjski in Habsburžani. Ljubljanska škofija je grad Vrbovec odkupila leta 1615 in ga obdržala v svoji lasti vse do konca druge svetovne vojne. Leta 1944 so ga zažgali, ker je bila v njem okupatorjeva postojanka. Pred propadom je grad rešilo Gozdno gozdarstvo Nazarje, ki ga je obnovilo v letih 1988 do 1992. V novejšem času je služil v različne namene, kot so državna uprava veleposestev, urad državne oblasti, urad okraja in drugo. Danes so v gradu Vrbovec upravni prostori Občine Nazarje, gozdarske institucije tega območja, različna zasebna podjetja, gostišče, poročna dvorana ter muzej gozdarstva in lesarstva. Muzej je bil odprt leta 2001 in je edini te vrste v Sloveniji. Ukvarja se z varovanjem, zaščito in prezentacijo kulturne dediščine lesarstva in gozdarstva na območju Zgornje Savinjske doline.

Vrbovec Castle

Vrbovec Castle in Nazarje is located at the confluence of the Savinja and Dreta rivers. It is one of the most beautiful castles in Slovenia. The first mentions of Altenburg in written sources date back to 1248. The castle was given its present appearance around 1480. The owners of the castle were the Patriarch of Aquileia, the von Heunburgs, the Counts of Celje and the Habsburgs. The Diocese of Ljubljana bought Vrbovec Castle in 1615 and it remained in its possession until the end of World War II. In 1944, it was burned down for housing an occupier's outpost. The castle was saved from collapse by Gozdno gozdarstvo Nazarje, which restored it in the years from 1988 to 1992. More recently, it has served a variety of purposes, such as the state administration of large estates, the office of the state authority, the office of the county, and others. Today, Vrbovec Castle houses the administrative premises of the Municipality of Nazarje, forestry institutions in the area, various private companies, a guesthouse, a wedding hall and a museum of forestry and woodworking. The museum was opened in 2001 and is the only one of its kind in Slovenia. It deals with the protection, preservation and presentation of the cultural heritage of woodworking and forestry in the area of the Upper Savinja Valley.



Rezultat obnov v letih 1988 do 1992 je viden tudi na skici izmere iz leta 1992 v k. o. 180 Prihova..
Vir: e-ZKN Pregledovalnih arhivskih zemljiškokatastrskih načrtov, vir fotografije: https://kraji.eu/

The result of the renovations in the years from 1988 to 1992 can also be seen in the sketch of the 1992 survey in CM 180 Prihova.
Source: the e-ZKN archive land cadastre map viewer, Photo source: https://kraji.eu/

Želje lastnikov po analizi stanja nepremičnin v preteklosti, potrebe geodetskih izvajalcev po arhivskih podatkih grafičnega stanja nepremičnin in tudi zakonska določila o brezplačnih javnih zbirkah podatkov so narekovali razvoj aplikacije, ki omogoča vpogled v arhivske zemljiškokatastrske načrte, ki jih hranita geodetska uprava in Arhiv Republike Slovenije.

Rast števila uporabnikov kaže, da so izdelane informacijske rešitve ustrezne.

Digitalna oblika arhiva ima pred klasično vrsto prednosti:

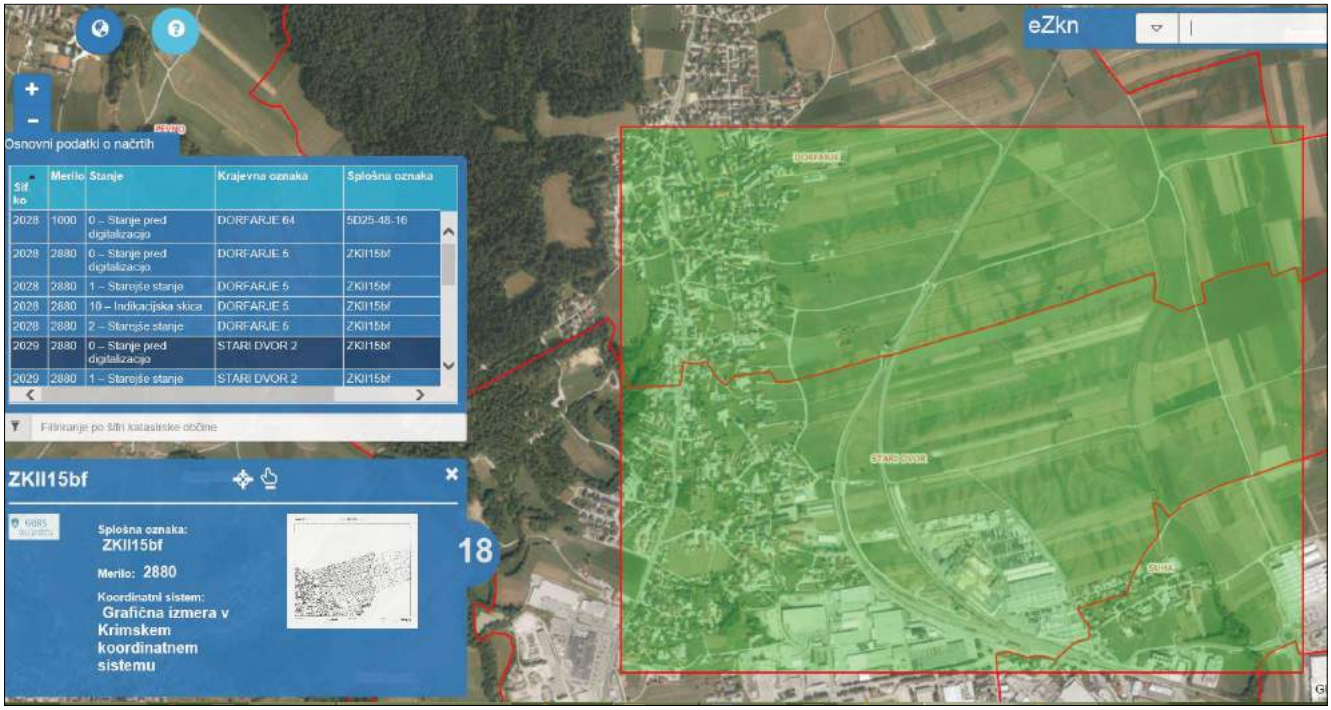
- 24-urna dostopnost za izvajalce geodetskih storitev,
- dokumentarno gradivo ostaja nepoškodovano,
- digitalizirani so vsi dokumenti trajnega značaja,
- digitalizirani so vsi formati.

Owners' wishes for the analysis of the condition of real estate in the past, the needs of geodetic contractors for archival data of the graphic condition of real estate, and also the legal provisions on free public databases dictated the development of an application that provides inspection of archival land cadastral plans kept by the Surveying and Mapping Authority and the Archives of the Republic of Slovenia.

The growth in the number of users shows that the information solutions that have been developed are appropriate.

The digital form of the archive has several advantages over the classic type:

- 24-hour accessibility for surveying service providers,
- the documentary material remains intact,
- all permanent documents are digitized, and
- all formats are digitized.

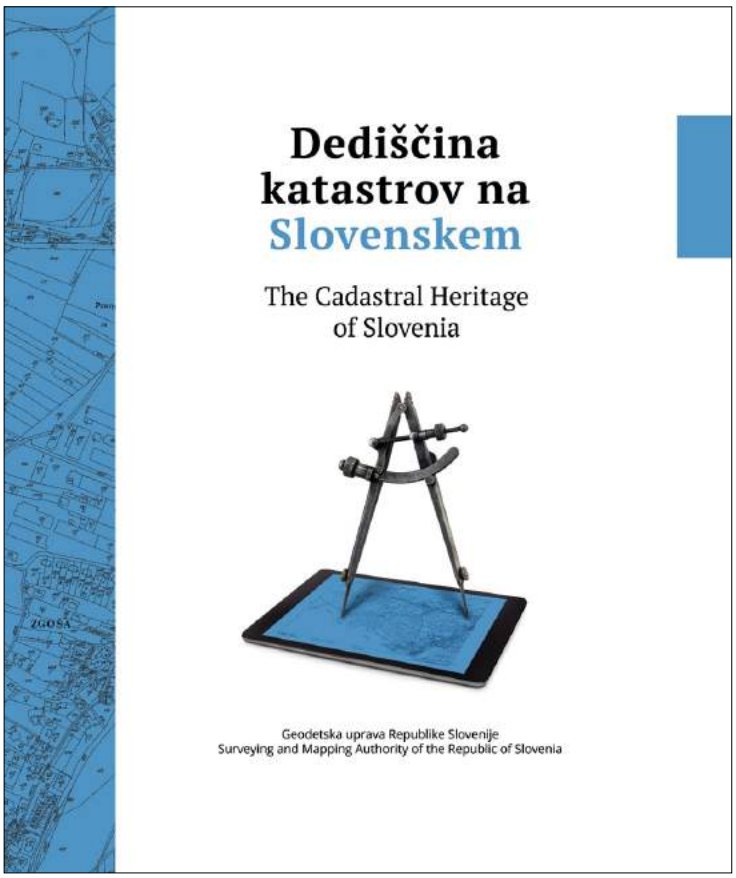


Slika 8.2.4.1.3: Ekranska slika aplikacije za pregled arhivskih zemljiško katastrskih načrtov.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 8.2.4.1.3: Screen image of the application for the review of archival land cadastral plans
Source: the e-ZKN archive land cadastre map viewer.

Podroben zapis o arhivu zemljiškega katastra na Slovenskem in njegovi prevedbi v digitalno obliko je v publikaciji Geodetske uprave RS z naslovom Dediščina katastrov na Slovenskem, ki je v digitalni obliki prosto dostopna na spletnem naslovu
https://www.projekt.e-prostor.gov.si/fileadmin/user_upload/gradiva/Dediscina_katastrov_na_Slovenskem.pdf

A detailed record of the land cadastre archive in Slovenia and its translation into digital form can be found in the publication of the Surveying and Mapping Authority of the Republic of Slovenia entitled The Cadastral Heritage of Slovenia, which is freely available in digital form at
https://www.projekt.e-prostor.gov.si/fileadmin/user_upload/gradiva/Dediscina_katastrov_na_Slovenskem.pdf



8.2.4.2 Prevedba v ZPS*
Translation into ZPS*

Zaradi ohranitve pravokotnosti poligonov, ki predstavljajo zemljišča pod stavbami v naravi, tudi po lokacijski izboljšavi ZKP, je bilo treba zagotoviti pogoje za čim lažje prepoznavanje tovrstnih poligonov. V ta namen je bila pripravljena metodologija, s katero je bila najverjetnejšim takim poligonom pripisana raba ZPS* (zemljišče pod stavbo, evidentirano pred letom 2006), če ni bila že prej vpisana raba ZPS (zemljišče pod stavbo, evidentirano po določbah ZEN). Poligoni z vpisanima rabama ZPS ali ZPS* so bili tisti, ki so bili podrobneje pregledani ob določanju pravokotnosti objektov v sami izboljšavi.

In order to preserve the perpendicularity of the polygons which represent land under buildings in nature even after the positional improvement of the ZKP, it was necessary to provide conditions for the simplest possible identification of such polygons. For this purpose, a methodology was prepared which attributed the most probable polygons of this type to the use of the ZPS* (land under buildings registered before 2006), if the use of ZPS (land under buildings registered under ZEN provisions) had not been registered in the past. The polygons with the ZPS or ZPS* uses entered were examined in more detail when determining the perpendicularity of objects during the improvement.

Jeseni 2017 je bila izvedena avtomatska prevedba »starih« vrste rabe s šiframi 201, 202, 203, 204, 205, 217, 218 in 219 v 221 - ZPS* (zemljišče pod stavbo pred l. 2006) za celotno območje RS. Izjemo je predstavljalo 119 katastrskih občin na območju OGU Maribor. Razlog za to je bila že izvedena testna prevedba v letu 2013 (kot priprava na kasnejšo prevedbo). Prevedeno je bilo 59,1 % (431.828) »starih« vrst rabe. Podatki »starih« vrst rabe, ki se niso prevedle, so v zemljiškem katastru ostali nespremenjeni.

»Stare« vrste rabe v zemljiškem katastru s šiframi od 201–216 določa še veljavni Pravilnik o vodenju vrst rabe zemljišč v zemljiškem katastru iz leta 1982, »stare« stavbne vrste rabe s šiframi 217–219 so bile dodane s kasnejšimi predpisi. Nomenklatura oz. pomen šifer vrst rabe v zemljiškem katastru je razviden v spodnji tabeli:

In autumn of 2017, an automatic translation of the "old" types of use was performed with codes 201, 202, 203, 204, 205, 217, 218 and 219 in 221 – ZPS* (land under buildings before 2006) for the entire territory of the Republic of Slovenia. The exception was 119 cadastral municipalities in the area of OGU Maribor. The reason for this was that the test translation had already been carried out in 2013 (as preparation for a later translation). 59.1% (431,828) of "old" types of use were translated. Data on "old" types of use that have not been translated have remained unchanged in the land cadastre.

The "old" types of use in the land cadastre with codes from 201-216 are also determined by the valid Rules on the Management of Types of Land Use in the Land Cadastre from 1982, and the "old" types of building use with codes 217-219 were added by later regulations. The nomenclature or the meaning of the codes of types of use in the land cadastre is presented in the table below:

Zemljišča pod gradbenimi objekti **Land under construction facilities**		
Šifra vrste rabe **Usage type code**	**Vrsta rabe-nomenklatura** **Usage type – nomenclature**	**Prevedba v 221-ZPS*** **Translation into 221-ZPS***
201	stanovanjska stavba / residential building	✓
202	poslovna stavba / office building	✓
203	gospodarsko poslopje / agricultural building	✓
204	garaža / garage	✓
205	funkcionalni objekt / functional facility	✓
206	spomenik / monument	x
207	porušeni objekt / demolished building	x
208	cesta / road	x
209	pot / path	x
210	železnica / railway	x
211	dvorišče / yard	x
212	prodajni trg / market	x
213	parkirišče / parking area	x
214	odprto skladišče / open warehouse	x
215	odlagališče odpadkov / landfill	x
216	odprti kop / open pit	x
217	stavbišče / building site	✓
218	stavba / building	✓
219	stanovanjska stavba-stavbišče / residential building-building site	✓

Prevedba je kot rezultat prinesla v grafičnem in opisnem delu zemljiškega katastra vpisano rabe 221-ZPS* in pripisano pripadajočo številko stavbe.

The translation resulted in the entry of usage types 221-ZPS* and the assigned building numbers in the graphical and descriptive part of the land cadastre.

Avtomatska prevedba v ZPS* je bila izvedena po zaporedju naslednjih korakov:

- povezava opisnih in grafičnih podatkov zemljiškega katastra (na podlagi pripisane šifre vrste rabe in primerjave grafične površine poligona in opisne površine vrste rabe),
- povezava parcelnega dela s številko stavbe (presek s tlorisi ali centroidi stavb),
- kontrola in dopolnitev podatkov na podlagi relacije stavba–parcela in dodatnih pogojev.

Avtomatska povezava opisnih in grafičnih podatkov zemljiškega katastra v pribl. 40 % ni uspela zaradi naslednjih razkorakov:

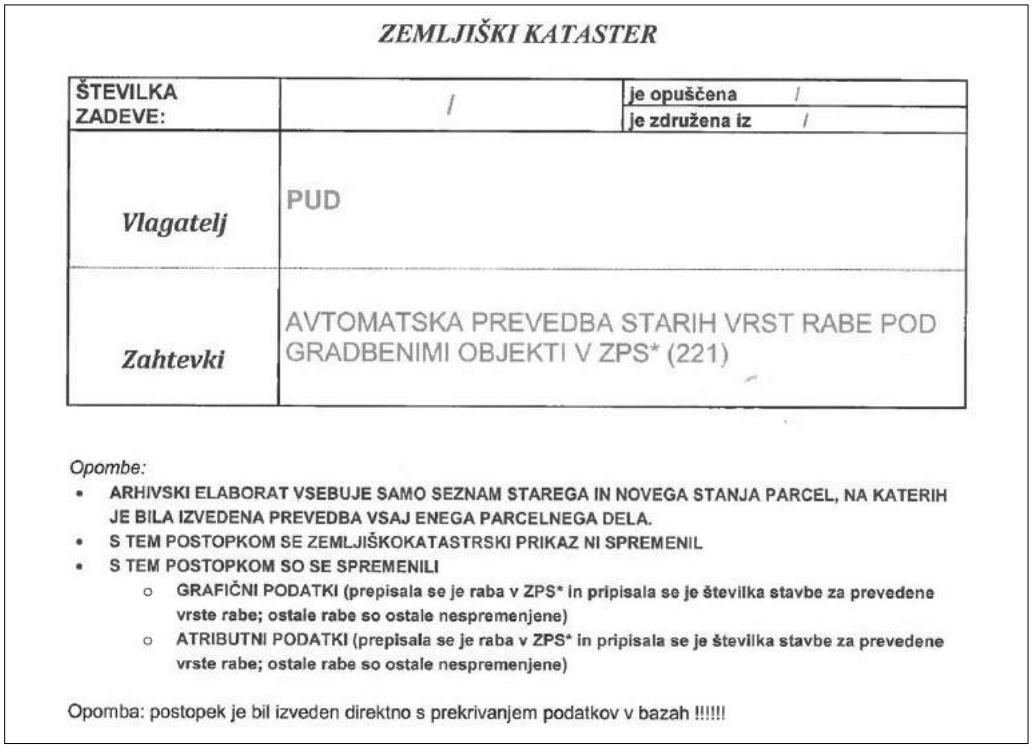
- N opisnih zapisov in M poligonov brez določenih šifer rabe (N:M),
- N : N in podobne površine,
- v opisnih podatkih en zapis (vsota površin) za več poligonov iste vrste rabe,
- zamenjane šifre rabe parcelnih delov,
- dve stavbi na enem parcelnem delu,
- zamik ZKP,
- stavba je več kot 50 % večja, kot je parcelni del stavbe.

The automatic translation in the ZPS* was performed in the following steps:

- connection of descriptive and graphical data of the land cadastre (based on the assigned code of the type of use and comparison of the graphical area of the polygon and the descriptive area of the type of use),
- connection of the parcel part with the building number (cross-section with floor plans or centroids of buildings), and
- control and supplementation of data on the basis of the building-plot relation and additional conditions.

Automatic connection of descriptive and graphic data of the land cadastre in approx. 40% failed due to the following discrepancies:

- N descriptive records and M polygons without specific use codes (N:M),
- N:N and similar areas,
- a single record (sum of areas) for several polygons of the same type of use in the descriptive data,
- changed codes of use of parcel parts,
- two buildings on one plot part,
- misalignment of the ZKP, or
- building more than 50% larger than the plot part of the building.



ZEMLJIŠKI KATASTER

ŠTEVILKA ZADEVE:	/	**je opuščena** / **je združena iz** /
Vlagatelj	PUD	
Zahtevki	AVTOMATSKA PREVEDBA STARIH VRST RABE POD GRADBENIMI OBJEKTI V ZPS* (221)	

Opombe:

- **ARHIVSKI ELABORAT VSEBUJE SAMO SEZNAM STAREGA IN NOVEGA STANJA PARCEL, NA KATERIH JE BILA IZVEDENA PREVEDBA VSAJ ENEGA PARCELNEGA DELA.**
- **S TEM POSTOPKOM SE ZEMLJIŠKOKATASTRSKI PRIKAZ NI SPREMENIL**
- **S TEM POSTOPKOM SO SE SPREMENILI**
  - **GRAFIČNI PODATKI (prepisala se je raba v ZPS* in pripisala se je številka stavbe za prevedene vrste rabe; ostale rabe so ostale nespremenjene)**
  - **ATRIBUTNI PODATKI (prepisala se je raba v ZPS* in pripisala se je številka stavbe za prevedene vrste rabe; ostale rabe so ostale nespremenjene)**

Opomba: postopek je bil izveden direktno s prekrivanjem podatkov v bazah !!!!!!

Slika 8.2.4.2.1: Izrez naslovnice IDPOS-a prevedbe z glavnimi poudarki o postopku.
Vir: Arhiv GURS

Figure 8.2.4.2.1: Excerpt from the IDPOS translation with main highlights of the process.
Source: The SMARS archive

8.2.4.3 Odprava napak v podatkih ZK
Eliminating errors in ZK data

Podatki zemljiškega katastra se dnevno spreminjajo zaradi evidentiranja novih geodetskih postopkov. Dnevno vzdrževanje lahko povzroči tudi napake in neskladja v podatkih, saj le-teh ni mogoče v celoti preprečiti z avtomatskim prepoznavanjem ob samem vzdrževanju, zato je odprava napak in neskladij med podatki vsakodnevna skrb referentov na območnih geodetskih upravah.

Due to the recording of new geodetic procedures, land cadastre data is changed on a daily basis. Daily maintenance can cause errors and inconsistencies in the data, as these cannot be completely prevented by automatic identification during maintenance, so the elimination of errors and inconsistencies in the data is a daily concern of the officers of regional surveying and mapping authorities.

Rezultat lokacijske izboljšave ZKP je moral biti topološko pravilen. Že pred samo izboljšavo je bilo treba odpraviti napake v podatkih zemljiškega katastra na ZKP, ZKN in ZK-točkah, ki so nastale do takrat. Le tako je bilo mogoče omejiti situacije, da bi referent, ki je izvajal izboljšavo, izgubljal čas z raziskovanjem predhodnih napak, namesto da bi se ukvarjal s svojo osnovno zadolžitvijo, tj. kar najbolje izboljšati lokacijsko natančnost ZKP ob danih vhodnih podatkih.

The result of the positional accuracy improvement of the ZKP had to be topologically correct. Even before the improvement, it was necessary to eliminate any errors in the data of the land cadastre at ZKP, ZKN and LC points. This was the only way to limit the situations in which the officer who carried out the improvement would waste time researching previous errors instead of performing their core task, that is, to improve the positional accuracy of the ZKP with the input data given in the best way possible.

Z aplikacijo KONTROLE NAPAK se izvaja kontrola podatkov zemljiškega katastra v centralni podatkovni bazi (v opisnem in grafičnem delu) sicer širše. Značilnosti so:

The checking of land cadastre data in the central database (in the descriptive and graphical part) is more widely implemented with the ERROR CHECK application. Its features:

- na področju zemljiškega katastra je v uporabi od 18. 4. 2016,
- izvajajo se periodično 1 x tedensko,
- izvajajo se na točkah, daljicah in poligonih,
- kontrole ZK-točk (podvojene, viseče, nepovezane, odstopanje med merjenimi D96/TM in transformiranimi D48/GK v D96/TM),
- kontrole parcel in ZPS v grafiki ZKP (sekanje, dotikanje, prekrivanje poligonov in točk),
- primerjava opisnega in grafičnega dela parcel (parcela brez grafike, brez opisnega dela),
- topološke kontrole slojev (ZKP, ZKN);
  - prekrivanje ali sekanje parcel in ZPS,
  - površine parcel manjše od 0,5 m²
- ipd.

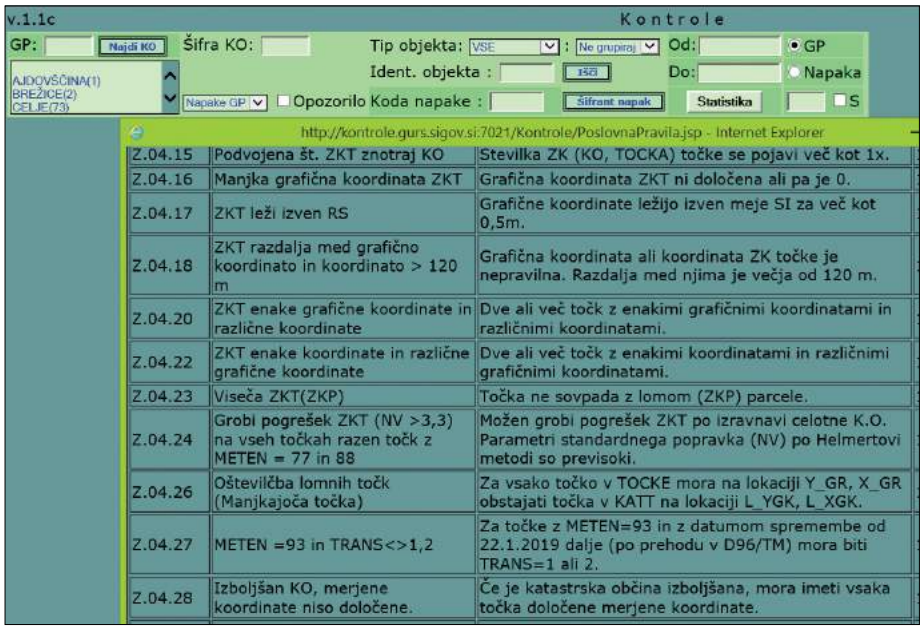
- has been in use in the field of the land cadastre since 18 April 2016,
- is carried out periodically once per week,
- is performed on points, lines and polygons,
- LC point checks (duplications, suspensions, disconnections, deviation between measurement in D96/TM and transformation from D48/GK to D96/TM),
- check of plots and ZPS in the ZKP graphics (crossing, touching, overlapping of polygons and points),
- comparison of the descriptive and graphical parts of the plots (plot without graphics, without descriptive part),
- topological layer checks (ZKP, ZKN);
  - overlapping or crossing plots and ZPS,
  - plot areas smaller than 0.5 m²
- etc.

Organizacijske enote Geodetske uprave Republike Slovenije so večino napak odpravile že pred pričetkom izboljšave na njihovem območju.

The organizational units of the Surveying and Mapping Authority of the Republic of Slovenia rectified most of the errors before the start of the improvement in their area.

Manjše število napak pa je bilo odpravljeno tik pred izboljšavo posamezne katastrske občine.

A small number of errors were eliminated just before the improvement of each cadastral municipality.



Z.04.15	Podvojena št. ZKT znotraj KO	Stevilka ZK (KO, TOCKA) točke se pojavi več kot 1x.
Z.04.16	Manjka grafična koordinata ZKT	Grafična koordinata ZKT ni določena ali pa je 0.
Z.04.17	ZKT leži izven RS	Grafične koordinate ležijo izven meje SI za več kot 0,5m.
Z.04.18	ZKT razdalja med grafično koordinato in koordinato > 120 m	Grafična koordinata ali koordinata ZK točke je nepravilna. Razdalja med njima je večja od 120 m.
Z.04.20	ZKT enake grafične koordinate in različne koordinate	Dve ali več točk z enakimi grafičnimi koordinatami in različnimi koordinatami.
Z.04.22	ZKT enake koordinate in različne grafične koordinate	Dve ali več točk z enakimi koordinatami in različnimi grafičnimi koordinatami.
Z.04.23	Viseča ZKT(ZKP)	Točka ne sovpada z lomom (ZKP) parcele.
Z.04.24	Grobi pogrešek ZKT (NV >3,3) na vseh točkah razen točk z METEN = 77 in 88	Možen grobi pogrešek ZKT po izravnavi celotne K.O. Parametri standardnega popravka (NV) po Helmertovi metodi so previsoki.
Z.04.26	Oštevilčba lomnih točk (Manjkajoča točka)	Za vsako točko v TOCKE mora na lokaciji Y_GR, X_GR obstajati točka v KATT na lokaciji L_YGK, L_XGK.
Z.04.27	METEN =93 in TRANS<>1,2	Za točke z METEN=93 in z datumom spremembe od 22.1.2019 dalje (po prehodu v D96/TM) mora biti TRANS=1 ali 2.
Z.04.28	Izboljšan KO, merjene koordinate niso določene.	Če je katastrska občina izboljšana, mora imeti vsaka točka določene merjene koordinate.

Slika 8.2.4.3.1: Ekranski prikaz PP KONTROLE NAPAK (prikazan je samo del kontrol, ki jih vsebuje).
Vir: PP kontrole napak

Figure 8.2.4.3.1: PP ERROR CONTROL screen display (only part of the controls is shown).
Source: PP Error Control

8.2.4.4 Oštevilčba lomnih točk ZKP
ZKP gradient point numbering

Kot je bilo že pojasnjeno, je ZKP nastal kot naslednik DKN. Kot je razvidno iz predhodno opisanih korakov prevedbe analognih načrtov v DKN, je bil le manjši del lomnih točk v grafiki oštevilčen z ZK-točkami, ki so v primeru, ko so imele določene koordinate v državnem koordinatnem sistemu, izpolnjevale tudi pogoj za prikaz v ZKN.

Rezultat lokacijske izboljšave ZKP je zagotoviti pogoje za zvezni sloj ZKN za celo državo. Ker se v ZKN prikazujejo le lomi iz grafike, ki imajo številko ZK-točke, je bilo pred samo izboljšavo treba oštevilčiti vse lomne točke v ZKP.

Oštevilčba lomnih točk ZKP je bila torej samostojna naloga, ki je bila izvedena za celo Slovenijo in za katastrske občine v osmih organizacijskih enotah Geodetske uprave v letu 2017, za ostale enote pa v prvih mesecih 2018.

Vse lomne točke v ZKP za posamezno katastrsko občino, ki dotlej še niso bile oštevilčene, so bile oštevilčene s številkami ZK-točk, ki so jim bili pripisani ustrezni atributi. ZK-točkam so bile ob oštevilčbi pripisane grafične koordinate lomnih točk iz ZKP, določen jim je bil upravni status »7-tehnične točke«, merjene koordinate pa jim niso bile določene. Le v primeru neoštevilčenih lomnih točk na meji ene katastrske občine, ki pa je v sosednji katastrski občini imela oštevilčen identičen lom z ZK

As discussed earlier, the ZKP was produced as the successor to the DKN. As can be seen from the previously described steps of translating analogue plans into the DKN, only a small part of the gradient points in the graph was numbered with LC points, which, upon having coordinates attributed in the national coordinate system, also met the condition for representation in the ZKN.

The result of the positional improvement of the ZKP was to provide conditions for a uniform ZKN layer for the entire country. Since the ZKN shows only gradients from the graph that have a LC point number, all gradient points in the ZKP had to be numbered before the improvement.

The numbering of ZKP gradient points was therefore an independent task performed for the whole of Slovenia and for cadastral municipalities in eight organizational units of the Surveying and Mapping Authority in 2017, and for the remaining units in the first months of 2018.

All gradient points in the ZKP for any individual cadastral municipality which had not yet been numbered were marked with the numbers of ZKP points with assigned relevant attributes. Upon numbering, all the LC points were assigned graphical coordinates of gradient points from the ZKP, along with the administrative status of "7-technical point", and their measured coordinates were not determined. In the case of non-numbered gradient points on the border of a cadastral municipality which had a numbered identical gradient with an LC point in the neighbouring cadastral

točko, so bili atributi prevzeti od obstoječe ZK-točke iz sosednje katastrske občine. V tem primeru je bil izdelan križni seznam identičnih točk.

municipality, the attributes were taken over from that existing LC point from the neighbouring cadastral municipality. In this case, a cross list of identical points was drawn up.

ZEMLJIŠKI KATASTER

ŠTEVILKA ZADEVE:	02112- 2109 /2016	je opuščena / je združena iz /
Vlagatelj	PUD	
Zahtevki	OŠTEVILČBA LOMNIH TOČK ZKP (2016)	

Opombe:
- S TEM POSTOPKOM SE ZEMLJIŠKOKATASTRSKI PRIKAZ NI SPREMENIL
- S TEM POSTOPKOM SO SE OŠTEVILČILE VSE LOMNE TOČKE ZKP KOT ZK TOČKE, TO SE V BAZO ZK TOČK SAMO DODALE NOVE TOČKE (ne pa obstoječe ZK točke tudi spre ali brisale)
  - METODA DOLOČITVE = 90 brez koordinat
  - UPRAVNI STATUS = 7 tehnična
  - YGK, XGK in YTM in XTM so = 0, ZK TOČKE IMAJO SAMO LOKACIJSKE KOOR.
  - IZJEMA: v kolikor je na meji KO v sosednji KO že obstajala ZK točka, so bili atrib točke (ne glede na zgornja pravila) prepisani k novi ZK točki v tej KO
- ARHIVSKI ELABORAT v analogni obliki vsebuje samo križni seznam za dodane ZK točke KO, ki so prevzela atribute od ZK točk iz sosednjih KO

Št. dodanih ZK točk	Od tega s prevzetimi atributi iz sosednje KO
16288 (od 7990 do 24277)	315

KRIŽNI SEZNAM OŠTEVILČBE LOMNIH TOČK NA MEJI KO 1489 CEROVEC S SOSEDNJIMI KO

Delovna KO	Ime KO	Točka	Sosednja KO	Ime KO	Točka
1489	CEROVEC	23963	1490	TEŽKA VODA	3450
1489	CEROVEC	23964	1490	TEŽKA VODA	3452
1489	CEROVEC	23965	1490	TEŽKA VODA	3455
1489	CEROVEC	23966	1490	TEŽKA VODA	3456
1489	CEROVEC	23967	1490	TEŽKA VODA	3457
1489	CEROVEC	23968	1490	TEŽKA VODA	3458
1489	CEROVEC	23969	1490	TEŽKA VODA	3526
1489	CEROVEC	23970	1490	TEŽKA VODA	3527
1489	CEROVEC	23971	1490	TEŽKA VODA	3528
1489	CEROVEC	23972	1490	TEŽKA VODA	3529
1489	CEROVEC	23973	1490	TEŽKA VODA	3530
1489	CEROVEC	23974	1490	TEŽKA VODA	3531
1489	CEROVEC	23975	1490	TEŽKA VODA	3536
1489	CEROVEC	23976	1490	TEŽKA VODA	3579
1489	CEROVEC	23977	1490	TEŽKA VODA	3582
1489	CEROVEC	23978	1490	TEŽKA VODA	3583

Slika 8.2.4.4.1: Izrez naslovnice IDPOS-a oštevilčbe z izrezom dela križnega seznama, ki prikazuje identične ZK točke na meji med k. o. 1489 Cerovec in k. o. 1490 Težka Voda.
Vir: Arhiv GURS

Figure 8.2.4.4.1: Excerpt from the cover of the IDPOS numbering with excerpt from part of the cross list showing identical LC points on the border between CM 1489 Cerovec and CM 1490 Težka Voda.
Source: The SMARS archive

Izjema opisanega postopka oštevilčevanja so ZK-točke s statusom »6-razgrnitev«, ki se vodi za vse ZK-točke, ki so bile že leta 2013 določene z oštevilčbo vektoriziranih lomnih točk na digitalnih zemljiškokatastrskih načrtih (ZKN) zemljiškokatastrskih izmer na območju geodetske pisarne Murska Sobota (šifre k. o. od 1 do 136). ZK-točke z upravnim statusom »6-razgrnitev« na območju geodetske pisarne Murska Sobota niso bile predmet postopkov izboljšave lokacijskih podatkov.
Vir:https://www.gov.si/assets/organi-v-sestavi/GURS/Dokumenti/Zakonodaja-dokumenti/ZEN/Tehnicne-specifikacije_objava-jan2020_podpisane.pdf

An exception to the described numbering procedure is LC points with the status "6-disclosure", which is kept for all LC points which had already been determined in 2013 by numbering vectorized gradient points on digital land cadastral plans (ZKN) of land cadastral surveys in the area of the Murska Sobota surveying office (codes from 1 to 136). The LC points with the administrative status of "6-disclosure" in the area of the Murska Sobota surveying office were not subject to the procedures for improving positional data.
Source:https://www.gov.si/assets/organi-v-sestavi/š/Dokumenti/Zakonodaja-dokumenti/ZEN/Tehnicne-specifikacije_objava-jan2020_podpisane.pdf

Po izvedeni oštevilčbi lomnih točk je bila v aplikaciji za vodenje in vzdrževanje podatkov zemljiškega katastra vključena avtomatska kontrola, ki je ob nadaljnjih postopkih vzdrževanja preprečevala nastajanje novih lomnih točk brez oštevilčbe ZK-točk.

After the numbering of gradient points, an automatic control was included in the application for the management and maintenance of land cadastre data, which prevented the formation of new gradient points without the numbering of LC points during further maintenance procedures.

8.2.5 Sistem IzbA
The IzbA system

Projekt Lokacijska izboljšava ZKP je bil zelo obsežen. Izvajal se je v vseh 2698 katastrskih občinah, vhodni podatki so se pripravljali na 37 organizacijskih enotah Geodetske uprave

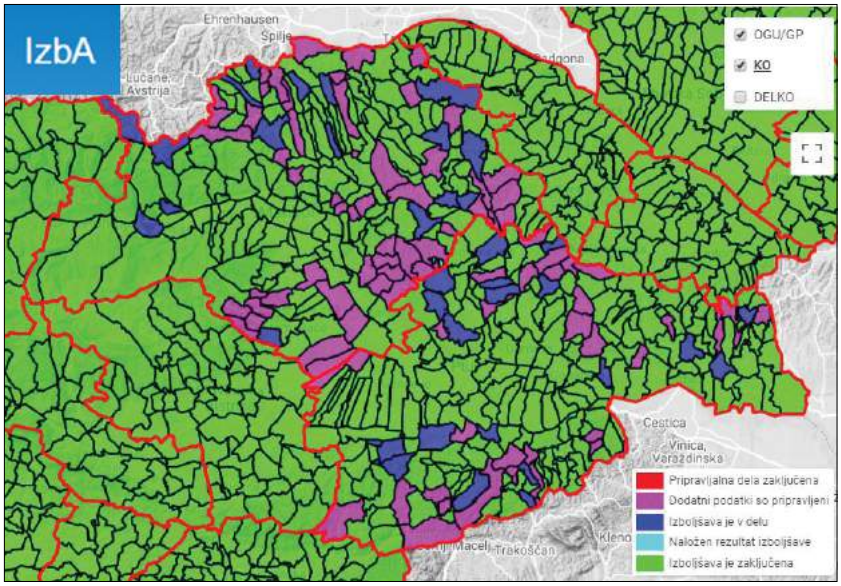
The ZKP positional accuracy improvement project was very extensive. It was carried out in all 2698 cadastral municipalities, input data was prepared at 37 organizational units of the

RS in je vključeval štiri vrste deležnikov, ki niso bili fizično prisotni na eni sami lokaciji.

Zato je bil razvit sistem IzbA, ki je omogočil spremljanje, administracijo in kontrolo projekta, sistem pa je bil namenjen tudi hranjenju vhodnih podatkov in rezultatov izboljšave v digitalni obliki na enem mestu za celo državo. Sistem zagotavlja opisni pregled posameznih faz po katastrskih občinah ter različne grafične prikaze in statistike.

Surveying and Mapping Authority of the Republic of Slovenia, and it included four types of participants who were not physically present at a given location.

The IzbA system was developed for this purpose; it enabled the monitoring, administration and control of the project, and the system was also intended to store input data and improvement results in digital form in one place for the entire country. The system provides a descriptive overview of individual phases by cadastral municipalities and various graphical representations and statistics.



Slika 8.2.5.1: Sistem IzbA - grafični prikaz stanja med izvedbo 7. faze (na dan 01. 03. 2020).
Vir: Sistem IzbA, ekranski prikaz

Figure 8.2.5.1: The IzbA system – graphical representation of the situation during the implementation of the 7th phase (on 1 March 2020).
Source: The IzbA system, screen display

Vsa komunikacija med navedenimi deležniki je potekala preko sistema IzbA in je tudi dokumentirana. Do sistema IzbA je dostopalo in preko sistema komuniciralo več kot 110 oseb.

All communication between these participants took place through the IzbA system and is also documented. More than 110 people accessed and communicated through the IzbA system.

8.2.6 Deležniki izvedbe
Participants in the implementation

Postopek izvedbe se je izvajal po korakih in je vključeval različne deležnike. V nadaljevanju je predstavljena vloga le-teh pri izvedbi projekta.

The implementation process was carried out step by step and involved various participants. Their roles in the implementation of the project are presented below.

8.2.6.1 Zunanji izvajalec
External contractor

Kot je bilo že omenjeno, so bili določeni podatki za izvedbo pridobljeni posebej za namen tega projekta. Pridobitev teh podatkov je bila izvedena v nalogi Lokacijska izboljšava ZKP znotraj istoimenskega projekta. Za izvedbo naloge je

As mentioned previously, certain implementation data was obtained specifically for the purpose of this project. The acquisition of this data was carried out under the ZKP positional accuracy improvement task within the eponymous project. An

bil na javnem razpisu izbran zunanji izvajalec. Le-ta je zagotovil:
- dodatne vezne točke (merjene koordinate točk) in
- dodatne pogoje za ohranitev relativnih razmerij.

Izvajalec je v ta namen najprej analiziral obstoječe stanje podatkov zemljiškega katastra (pokritost območij z veznimi točkami). Na podlagi analize je ugotovil prazna območja, to so območja brez ustreznega števila in razporeditve veznih točk.

Na takih območjih je poizkušal zagotoviti potrebne dodatne vezne točke najprej s terenskimi meritvami točk iz arhivskih elaboratov z vnaprej pripravljenega seznama elaboratov (nastali po letu 1976). Če to iz različnih razlogov ni bilo mogoče, so bile dodatne vezne točke zagotovljene na nedvoumno vidnih uživalnih mejah in sicer na enega izmed treh načinov: s terensko izmero, s fotointerpretacijo na osnovi DOF (na ravnem in nezaraščenem terenu je mogoče prepoznati meje med različnimi obdelavami, ograje, homogenost terena ...) ali s fotointerpretacijo na osnovi podatkov analitičnega snemanja (Lidar podatki) - PAS (dobro so vidni grebeni, prelomi terena, struge vodotokov, naravne terase, poti in vlake v gozdovih,..). Dodatne vezne točke so bile določene kot ZK-točke ali pa kot pomožne točke na liniji med dvema ZK-točkama. Glede na natančnost PAS in DOF so bile točke, dobljene s fotointerpretacijo, večinoma pomožne točke in so bile določene izven linije ZKP le v primeru, ko je bilo odstopanje prepoznane značilne točke na DOF/PAS od povezave v ZKP več kot 2 m.

Izvajalec je v nadaljevanju določil tudi pogoje za ohranitev relativnih razmerij (poravnave točk v linijo), in sicer iz uporabljenih elaboratov za določitev dodatnih veznih točk ter vseh elaboratov dolžinskih objektov, katerih seznam je bil prav tako pripravljen vnaprej. Pogoje poravnave treh točk v vrsto pa je bilo obvezno določiti tudi v primeru pomožnih točk (s tem je bila pomožna točka umeščena na linijo med dvema ZK-točkama, sicer je v izboljšavi ni bilo mogoče uporabiti).

Izvajalec je za potrebe ocene kakovosti izračunal in analiziral standardne popravke dodatnih veznih točk ter analiziral novo stanje (obstoječe stanje zemljiškega katastra, ki mu je dodal dodatno določene vezne točke).

Rezultat je izvajalec zapisal kot digitalne podatke v več datotek, ki so služile tudi za nadzor nad izvedbo. Kot dodatni podatki za homogenizacijo pa so bile pomembne le datoteke, v katerih so bile zapisane:
- koordinate E, N dodatnih veznih točk in
- pogoji poravnav več točk v vrsto.

Prevzem vhodnih podatkov in oddaja rezultatov je potekala preko sistema IzbA.

external contractor was selected in a public tender to carry out the task. The contractor provided the following:
- additional tie points (measured point coordinates), and
- additional conditions for maintaining relative proportions.

For this purpose, the contractor first analysed the existing state of land cadastre data (coverage of areas with tie points). Based on the analysis, they identified empty areas, meaning areas with an inadequate number and distribution of tie points.

In such areas, they attempted to provide the necessary additional tie points first from field measurements of points from archival reports from a pre-prepared list of reports (produced after 1976). If this was not possible for various reasons, additional tie points were provided at unambiguous usage borders in one of three ways: by field measurement, by photointerpretation based on DOF (borders between different treatments, fences, terrain homogeneity etc. can be identified on flat and non-overgrown terrain) or by photointerpretation based on analytical recording data (Lidar data) – PAS (good visibility of ridges, terrain grades, watercourses, natural terraces, paths and log hauls in forests, etc.). Additional tie points were designated as LC points or as auxiliary points on the line between two LC points. According to the accuracy of PAS and DOF, the points obtained by photointerpretation were mostly auxiliary points and were determined outside the ZKP line only in cases where the deviation of the recognized characteristic point on the DOF/PAS from the connection in the ZKP was greater than 2 m.

The contractor further determined the conditions for maintaining relative proportions (alignment of points in a line), namely from the reports used to determine additional tie points and all reports on longitudinal structures, the list of which was also prepared in advance. It was also obligatory to determine the conditions for the alignment of three points in a line in the case of auxiliary points (the auxiliary point was placed on the line between two LC points, otherwise it could not be used in the improvement).

For the needs of quality assessment, the contractor calculated and analysed the standard corrections of the additional tie points and analysed the new condition (the existing condition of the land cadastre with added additional determined tie points).

The result was recorded by the contractor as digital data in several files, which also served as control documents during the implementation. Additional data for homogenization was obtained only from files which contained the following:
- coordinates E, N of additional tie points, and
- conditions for the alignment of several points in a row.

Receipt of input data and submission of results took place via the IzbA system.

8.2.6.2 Geodetski inštitut Slovenije
The Geodetic Institute of Slovenia

Geodetski inštitut Slovenije je izvajal:
- spremljanje in nadzor procesa:
  - vzpostavitve in administracije sistema IzbA,
  - vnosa osnovnih podatkov o lastnostih katastrskih občinah, območjih dela in deležnikih, ki so dostopali do sistema IzbA,
  - izdelave statistik;
- kontrolo rezultatov izvajalca:
  - izvedbo avtomatskih kontrol,
  - izvedbo sistematičnih kontrol,
  - izvedbo vzorčnih kontrol (pri čemer je terenske vzorčne kontrole izvajala Geodetska uprava RS);
- kontrolo rezultatov izboljšave:
  - izvedbo avtomatskih kontrol,
- pripravo raznih poročil in poizvedb na posebno zahtevo Geodetske uprave RS.

Prevzem rezultatov zunanjega izvajalca in oddaja rezultatov kontrole sta potekala preko sistema IzbA.

The Surveying and Mapping Institute of Slovenia performed:
- process monitoring and control:
  - establishment and administration of the IzbA system,
  - entry of basic data on the characteristics of cadastral municipalities, work areas and participants who have accessed the IzbA system, and
  - production of statistics;
- control of the contractor's results:
  - implementation of automatic control,
  - implementation of systematic control, and
  - implementation of sample control (where field sample control was performed by the Surveying and Mapping Authority of the Republic of Slovenia);
- control of improvement results:
  - implementation of automatic control, and
- preparation of various reports and inquiries at the special request of the Surveying and Mapping Authority of the Republic of Slovenia.

The receipt of results from the external contractor and submission of control results took place via the IzbA system.

8.2.6.3 OGU/GP – referenti GP
OGU/GP – GP clerks

Vhodne podatke za zunanjega izvajalca in za izboljšavo je bilo treba pripraviti iz lokalnih baz zemljiškega katastra. To pomeni, da je bila priprava razdeljena med 37 organizacijskih enot Geodetske uprave RS.

Na vsaki izmed teh enot sta bila za opravljanje del v zvezi z izboljšavo določena po dva referenta GP. Poleg priprave vhodnih podatkov so referenti GP izvajali tudi evidentiranje rezultatov izboljšave (ponovno v lokalne baze zemljiškega katastra).

Nalaganje vhodnih podatkov in prevzem rezultatov izboljšave sta potekala preko sistema IzbA.

Input data for the external contractor and for the improvement had to be prepared from local land cadastre databases. This means that the preparation was divided among 37 organizational units of the Surveying and Mapping Authority of the Republic of Slovenia.

Each of these units had two GP officers assigned to carry out improvement work. In addition to the preparation of input data, the GP clerks also recorded the results of the improvement (again in the local land cadastre databases).

The loading of input data and the receipt of the results of the improvement took place via the IzbA system.

8.2.6.4 Operativna skupina GURS - referenti izboljšave (IZB)
The SMARS operational group – improvement clerks (IZB)

Za izvedbo same izboljšave na podlagi vhodnih podatkov zemljiškega katastra in dodatnih podatkov, ki jih je pripravil zunanji izvajalec, je bila na Geodetski upravi RS vzpostav-

To carry out the improvement on the basis of input data from the land cadastre and additional data provided by the external contractor, an operational group consisting of more than

ljena operativna skupina, sestavljena iz več kot tridesetih referentov izboljšave.

Operativna skupina je bila sestavljena iz članov projektne skupine, (ki je pričela z delom že pred začetkom projekta, in v tem času pripravila podrobno metodologijo izvedbe ter sodelovala pri izdelavi/testiranju vmesnika PP SysGeoProTM) in članov delovne skupine (ki je bila vzpostavljena, ko so bili zagotovljeni vsi potrebni pogoji za masovno izvedbo naloge).

Vsakemu članu operativne skupine je vodstvo projekta na začetku posamezne faze dodelilo kvoto katastrskih občin za izboljšavo. Referent izboljšave je izvedel izboljšavo po pripravljeni metodologiji.

Prevzem vhodnih podatkov in dodatnih podatkov ter nalaganje rezultatov izboljšave sta v celoti potekala preko sistema IzbA.

thirty improvement clerks was established at the Surveying and Mapping Authority of the Republic of Slovenia.

The operational group consisted of members of the project team (which started working before the start of the project, during which time they prepared a detailed implementation methodology and participated in the development/testing of the PP SysGeoProTM interface) and members of the work group (established when all the necessary conditions for the mass execution of the task were met).

At the beginning of each phase, the project management allocated a quota of cadastral municipalities for improvement to each member of the operational group. The improvement clerk carried out the improvement according to the prepared methodology.

The receipt of input data and additional data and the loading of the improvement results took place entirely through the IzbA system.

8.2.7 Metodologija izvedbe
Implementation methodology

V času priprave na projekt je Geodetska uprava RS skupaj s Fakulteto za gradbeništvo in geodezijo, oddelkom za geodezijo, razvila metodologijo dela. Projektna skupina je za operativno izvedbo nato pripravila podrobno metodologijo in 200 strani dolga operativna navodila za izvedbo.

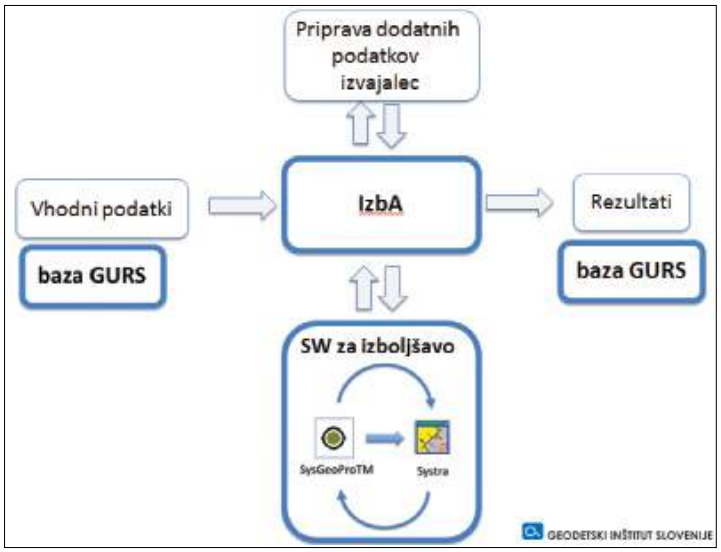
Zaradi iteracij, ki so bile posledica odprav ugotovljenih napak v vhodnih podatkih, in zagotavljanja topološko pravilnega rezultata, je postopek izboljšave za posamezno katastrsko občino potekal več dni (pribl. 5 dni za posamezno katastrsko občino). Da bi postopek izboljšave čim manj oviral redno vzdrževanje zemljiškega katastra, je bila izboljšava izvedena v dveh korakih. Prvi korak je trajal več dni in je predstavljal cel postopek do korektnega rezultata, izvajal pa se je brez zapore vzdrževanja baz zemljiškega katastra. Sledilo je ponovno naročilo vhodnih podatkov (z zaporo vzdrževanja), kjer so bili koraki ponovljeni, referent izboljšave pa se je ukvarjal samo še z morebitnimi novimi vsebinskimi problemi, ki so nastali v času zadnjega tedna dni. Ta drugi korak je praviloma trajal samo en dan.

Lokacijska izboljšava podatkov ZKP je bila izvedena z membransko metodo homogenizacije, ki omogoča prenos izboljšave položajev merjenih točk, ki imajo kakovostne koordinate, na model ZKP na zvezni način. Metoda temelji na mehanskem vidiku, ki geometrijo ZKP definira kot elastično membrano. Kakovostne merjene točke (vezne točke)

During the project preparation phase, the Surveying and Mapping Authority of the Republic of Slovenia developed a work methodology along with the Department of Geodesy at the Faculty of Civil Engineering and Geodesy. The project team then prepared a detailed methodology and 200-page operational implementation instructions for the operational implementation.

Due to iterations resulting from the elimination of identified errors in the input data and to ensure a topologically correct result, the improvement procedure took several days for an individual cadastral municipality (approximately 5 days each). In order to minimize the regular maintenance of the land cadastre, the improvement process was carried out in two steps. The first step took several days and represented the whole procedure up to the correct result and was carried out without interrupting the maintenance of land cadastre databases. This was followed by re-ordering the input data (with a maintenance interruption), where the steps were repeated, and the improvement clerk could address any new content issues that arose during the week. This second step typically took only one day.

The positional accuracy improvement of the ZKP data was performed using the membrane homogenization method, which enables the transfer of the improvements of positions of measured points with quality coordinates to the ZKP model in a uniform manner. The method is based on the mechanical aspect, which defines the geometry of the ZKP as an elastic



Slika 8.2.7.1: Diagram operativnega poteka projekta Lokacijska izboljšava ZKP.
Vir: Arhiv GURS

Figure 8.2.7.1: Diagram of the operational procedure of the ZKP positional accuracy improvement project.
Source: The SMARS archive

predstavljajo kline, na katere se pritrdi omenjeno elastično membrano, ki jo nato na podlagi izboljšanih položajev merjenih točk in z uvedbo dodatnih geometrijskih pogojev (pravokotnost, kolinearnost, poravnava točk v linijo ...) raztegujemo in krčimo glede na oddaljenost med točkami. Metoda omogoča prilagajanje glede na oddaljenost med točkami (angl. proximity fitting).

Za operativno računalniško izvedbo postopka izboljšave je bila uporabljena licenčna programska rešitev Systra nemškega podjetja Technet GmbH iz Berlina. Systra predstavlja zmogljivo programsko orodje, ki omogoča geometrijsko integracijo geodetskih meritev in različnih podatkovnih slojev GIS. Ker so bili podatki zemljiškega katastra v Sloveniji vodeni v lokalni aplikaciji Devo Servisi, ki je bila leta 1996 razvita posebej za slovenski trg, in je bilo tudi vzdrževanje podatkov zemljiškega katastra prilagojeno tej lokalni aplikaciji, komunikacija med Systro in Devo Servisi ni bila mogoča brez dodatne obdelave podatkov za prenos iz ene v drugo aplikacijo.

Da bi bil postopek za obdelavo podatkov med zemljiškim katastrom in Systro čim bolj avtomatiziran, je bil po zahtevah in ob sodelovanju projektne skupine razvit programski modul SysGeoProTM (avtor Geodetska družba d. d.).

Osnova za lokacijsko izboljšavo ZKP so bili podatki iz baze zemljiškega katastra – ZKP in ZK-točke, ki so bile klasificirane na:

- vezne točke – točke s koordinatami E, N in ustrezno metodo določitve (izločene so bile točke izboljšave za trajne nasade slabše kakovosti (po novem prevedena metoda 88)),
- in preostale točke, ki imajo samo grafične koordinate GE, GN.

membrane. Quality measured points (tie points) are wedges to which the mentioned elastic membrane is attached, which is then stretched and contracted according to the distance between points on the basis of the improved positions of measured points and the introduction of additional geometric conditions (rectangularity, collinearity, alignment of points in a line ...). The method allows adjustment according to the distance between points (proximity fitting).

The licensed software solution Systra from the German company Technet GmbH from Berlin was used for the operational computer implementation of the improvement process. Systra is a powerful software tool that enables geometric integration of geodetic measurements and various GIS data layers. As the land cadastre data in Slovenia was kept in the local application Devo Servisi, which was developed especially for the Slovenian market in 1996, and the maintenance of land cadastre data was adapted to this local application, communication between Systra and Devo Servisi was not possible without additional data processing for the transfer from one application to another.

In order to make the process of data processing between the land cadastre and Systra as automated as possible, the SysGeoProTM software module (produced by Geodetska družba d. d.) was developed according to the requirements and with the participation of the project team.

The basis for the positional improvement of the ZKP was the data from the database of the land cadastre – ZKP and LC points, which were classified into:

- tie points – points with coordinates E, N and the corresponding determination method (improvement points for permanent crops of poorer quality have been excluded) (presently translated method 88),
- and the remaining points, having only the graphical coordinates GE, GN˝.

Pri izravnavi in homogenizaciji so bili upoštevani tudi dodatni pogoji (opazovanja):

- pogoj pravokotnosti, dodan na centroide parcel s šiframi 201 (stanovanjska stavba), 202 (poslovna stavba), 203 (gospodarsko poslopje), 204 (garaža), 219 (stanovanjske stavbe – stavbišče), 220 (zemljišče pod stavbo) in 221 (zemljišče pod stavbo pred l. 2006); pri dodajanju pogojev pravokotnosti je bil upoštevan tolerančni kot;
  - za merila izvornih analognih načrtov 1 : 2000, 1 : 2500, 1 : 2880, 1 : 4000, 1 : 5000 in 1 : 5760 kot 6°,
  - za merila izvornih analognih načrtov 1 : 500, 1 : 1000 in 1 : 1440 kot 3°.
- poravnave točk v linijo (iz elaboratov za določitev veznih točk, iz elaboratov odmer dolžinskih objektov ...).

Additional conditions (observations) were also taken into account during the adjustment and homogenization:

- condition of perpendicularity added to the centroids of plots with codes 201 (residential building), 202 (office building), 203 (agricultural building), 204 (garage), 219 (residential buildings – building site), 220 (land under buildings) and 221 (land under buildings before 2006); when adding the perpendicularity conditions, the following tolerance angle was taken into account;
  - for original analogue plan scales of: 1:12000, 1:2500, 1:2880, 1:4000, 1:5000 and 1:5760, with an angle of 6°,
  - for original analogue plan scales of: 1:500, 1:1000 and 1:1440, with an angle of 3°.
- alignment of points in a line (from reports for determining tie points, from reports for assessment of longitudinal structures etc.).

Slika 8.2.7.2: Prikaz obdelave vhodnih podatkov za uvoz v Systro; ZK-točke so klasificirane na vezne točke (modre barve) in nevezne točke (rumene barve); dodani so tudi geometrijski pogoji: pravokotnost na stavbah (rdeče barve) , kolinearnost (odebeljena rumena linija).
Vir: PP SysGeoProTM, ekranski prikaz

Figure 8.2.7.2: Display of input data processing for importing into Systra; LC points are classified into tie points (blue) and non-tie points (yellow); geometric conditions are also added: perpendicularity on buildings (red), collinearity (bold yellow line).
Source: PP SysGeoProTM, screen display

Za kakovosten rezultat izravnave in homogenizacije je bila pomembna uporaba ustreznega števila kakovostnih veznih točk in njihova optimalna razporeditev. Vpliv veznih točk namreč z oddaljenostjo pada, zato je bilo pomembno, da so bile ustrezno enakomerno razporejene kakovostne vezne točke po celotnem obravnavanem območju.

Za katastrske občine ali območja, ki so imela način vzdrževanja ZKP z vklopom ali koordinatni z vklopom, pogoja

Achieving a high-quality quality result of adjustment and homogenization required the use of an appropriate number of high-quality tie points and their optimal distribution. The influence of the tie points decreases with distance, so it was important that the high-quality tie points were evenly distributed throughout the area.

For cadastral municipalities or areas that employed the integration method or the coordinate method with integration for maintaining the ZKP, the condition of even distribution with

enakomerne razporejenosti z obstoječimi veznimi točkami iz baz zemljiškega katastra ni bilo mogoče zagotoviti. Zato so bili v postopku uporabljeni še dodatni podatki, ki jih je pripravil zunanji izvajalec. Ti podatki so bili poimenovani kot domeritveni podatki.

Domeritvene podatke za zgoščevanje mreže veznih točk je torej zagotovil zunanji izvajalec že pred pričetkom izboljšave v obliki dodatnih veznih domeritvenih ZK-točk in pomožnih točk. Tem točkam so bile koordinate E in N določene z izmero (v primeru, ko so bile to točke brez koordinat iz elaboratov). V primeru, ko ustreznih arhivskih elaboratov na območju ni bilo, pa so bile koordinate lahko določene tudi na podlagi fotointerpretacije na PAS in DOF.

Izvajalec je vsaki dodatni vezni točki določil metode določitve, ki so bile predpisane in uporabljene samo v tem projektu in so bile pomembne z vidika natančnosti pri izravnavi in homogenizaciji.

the existing tie points from the land cadastre databases could not be provided. Therefore, additional data prepared by an external contractor was used in the procedure. This data was termed additional measurement data.

The additional measurement data for increasing the density of the network of tie points was therefore provided by an external contractor before the start of the improvement in the form of additional measurement tie LC-points and auxiliary points. The coordinates E and N of these points were determined by surveying (in the case when these were points without coordinates from the reports). In the absence of appropriate archival reports for the area, the coordinates could also be determined on the basis of photointerpretation on PAS and DOF.

For each additional tie point, the contractor identified determination methods that were prescribed and used only in this project and were important in terms of accuracy in the adjustment and homogenization.

Šifra MD **MD code**	**Opis metode določitve dodatnih veznih in pomožnih točk** **Description of the method of determining additional tie and auxiliary points**
101 / DOF	Določitev uživalne meje s fotointerpretacijo DOF Determination of usage borders by DOF photointerpretation
102 / PAS	Določitev uživalne meje s fotointerpretacijo PAS Determination of usage borders by PAS photointerpretation
103 / IZM	Terenska izmera meje (mejnik v naravi, na terenu konstruirana točka iz elaborata) Field survey of border (border stone in nature, field constructed point from the report)
104 / IZT	Transformacija točke iz elaborata, ki ni bila izmerjena na terenu, na podlagi dodatno izmerjenih točk iz elaborata Transformation of a point from the report that was not measured in the field, based on additionally measured points from the report
105 / IZU	Terenska izmera uživalne meje Field survey of usage borders

Referent izboljšave je lahko med postopkom izboljšave zaradi zagotavljanja čim boljšega rezultata izboljšave sicer pod istimi pogoji oz. po istih pravilih kot zunanji izvajalec zagotovil dodatne vezne in pomožne točke (z izjemo terenskih izmer) ter dodatne pogoje, lahko pa se je tudi (argumentirano) odločil, da določenih podatkov zunanjega izvajalca ne bo uporabil.

Izboljšava je bila izvedena po posameznih katastrskih občinah. Evidentiranje izboljšanih podatkov posamezne katastrske občine je bilo v zemljiškem katastru izvedeno v enem postopku (en IDPOS) ne glede na število delov (območij zajema), v katerih so bili vodeni grafični podatki posamezne katastrske občine.

Ob evidentiranju izboljšanih podatkov za posamezno katastrsko občino so bile hkrati evidentirane tudi spremem-

During the improvement process, in order to ensure the best possible result of the improvement, the improvement clerk could, under the same conditions or according to the same rules as the external contractor, provide additional tie and auxiliary points (with the exception of field surveys) and additional conditions, but they could also (reasonably) decide not to use certain data of the external contractor.

The improvement was carried out by individual cadastral municipalities. The recording of improved data of an individual cadastral municipality was performed in the land cadastre in one a single procedure (a single IDPOS), regardless of the number of parts (areas of coverage) in which the graphic data of an individual cadastral municipality were kept.

When recording improved data for an individual cadastral municipality, changes were also recorded in the neighbouring unimproved cadastral municipalities, namely only at LC points

be v sosednjih neizboljšanih katastrskih občinah, in sicer samo na ZK-točkah na meji z izboljšano katastrsko občino. S tem je neizboljšana sosednja katastrska občina dobila že izboljšano mejo katastrske občine, ki se naknadno ni več spreminjala (točke na meji so postale fiksne vezne točke v naknadni izboljšavi sosednje katastrske občine).

Najprej so bile izboljšane vse katastrske občine v Sloveniji, ki so se v celoti vzdrževale koordinatno. Sledila je izboljšava katastrskih občin po posameznih organizacijskih enotah Geodetske uprave. Delo je bilo razdeljeno na 10 faz, po vnaprej določenem terminskem planu.

Enota obdelave v postopku izravnave je bila del ali več delov katastrske občine z enakim načinom vzdrževanja. Zato so bili deli katastrskih občin obdelani v »Podprojektih«. Vrstni red in način obdelave katastrskih občin oz. delov katastrskih občin je bil določen po naslednjih pravilih:

- Najprej so bili obdelani vsi »koordinatno« vzdrževani deli iste katastrske občine (način vzdrževanja 1 – koordinatno), ki so bili izravnani skupaj in brez vpliva podatkov sosednje katastrske občine ali sosednjih delov iste katastrske občine.
- Temu je sledila obdelava »nekoordinatno« vzdrževanih delov iste katastrske občine (način vzdrževanja 2 – metoda z vklopom in 3 – koordinatni način z vklopom) po naslednjih pravilih:
  - »Nekoordinatno« vzdrževani sosednji deli iste katastrske občine so bili izravnani skupaj.
  - Fizično ločeni »nekoordinatno« vzdrževani deli katastrskih občin so bili izravnani ločeno.
  - Če je »nekoordinatno« vzdrževan del katastrske občine mejil na sosednjo »koordinatno« vzdrževano katastrsko občino ali pa na sosednji »koordinatno« vzdrževan del katastrske občine, je moral biti le-ta izboljšan pred »nekoordinatno« vzdrževanim delom. ZK-točke na meji s tako katastrsko občino ali delom katastrske občine so bile vezne točke (se niso izravnavale ponovno – fiksne vezne točke).
  - Če je »nekoordinatno« vzdrževan del katastrske občine mejil na sosednjo že izboljšano »nekoordinatno« vzdrževano katastrsko občino ali sosednji že izboljšan »nekoordinatno« vzdrževan del katastrske občine, so bile vse ZK-točke na meji s tako katastrsko občino ali delom katastrske občine vezne točke (se ne izravnavajo ponovno – fiksne vezne točke).
  - Če je »nekoordinatno« vzdrževan del katastrske občine mejil na drugo neizboljšano »nekoordinatno« vzdrževano katastrsko občino ali

on the border with the improved cadastral municipality. This gave the unimproved neighbouring cadastral municipality an already improved border of the cadastral municipality, which subsequently did not change (points on the border became fixed tie points in the subsequent improvement of the neighbouring cadastral municipality).

First, all cadastral municipalities in Slovenia which were fully maintained in terms of coordinates were improved. This was followed by the improvement of cadastral municipalities by individual organizational units of the Surveying and Mapping Authority. The work was divided into 10 phases according to a predetermined schedule.

The processing unit in the adjustment process was a part or several parts of a cadastral municipality with the same method of maintenance. Therefore, parts of cadastral municipalities were processed within "Subprojects". The order and method of processing cadastral municipalities or parts of cadastral municipalities was determined according to the following rules:

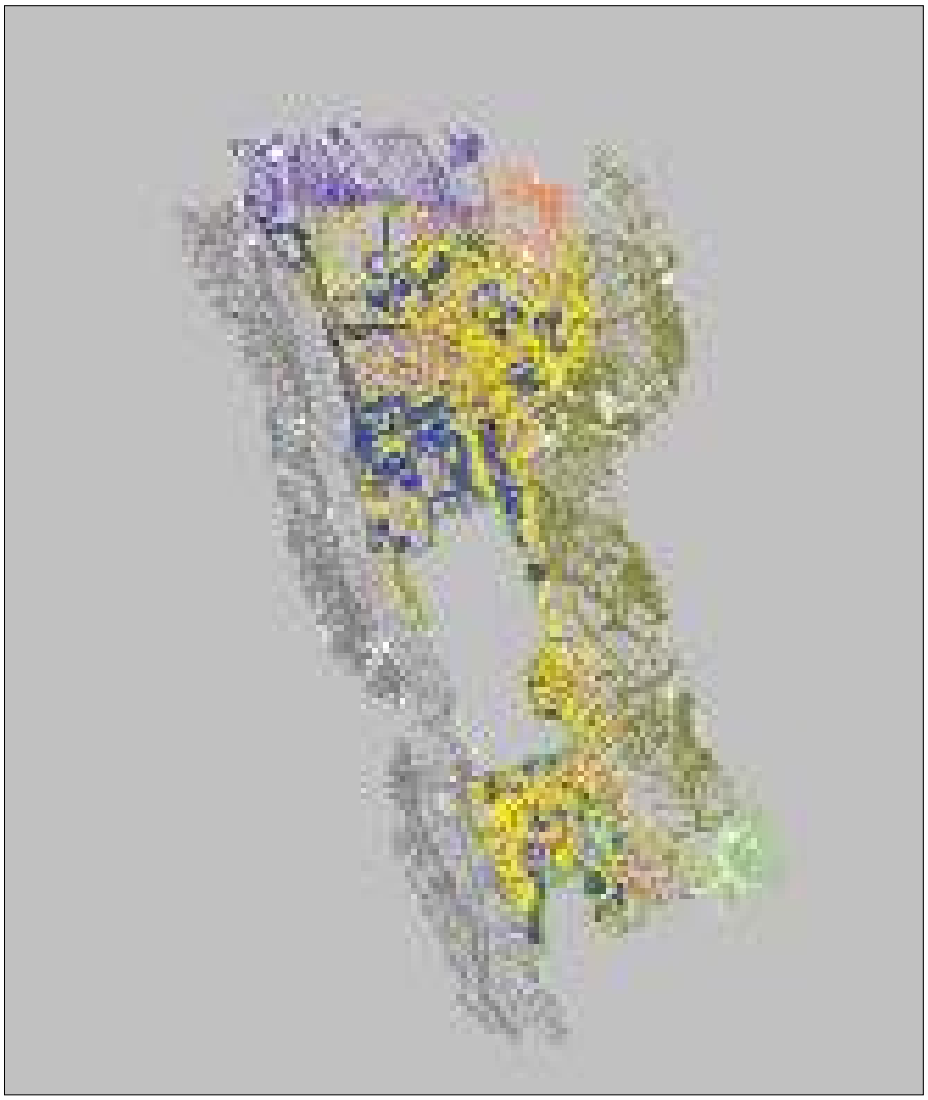
- First, all "coordinately" maintained parts of the same cadastral municipality (maintenance method 1 – coordinate type) were processed, which were adjusted and were not influenced by data from the neighbouring cadastral municipality or neighbouring parts of the same cadastral municipality.
- This was followed by the processing of "non-coordinately" maintained parts of the same cadastral municipality (maintenance method 2 – integration method and 3 – coordinate method with integration) according to the following rules:
  - The "non-coordinately" maintained neighbouring parts of the same cadastral municipality were adjusted.
  - Physically separated "non-coordinately" maintained parts of cadastral municipalities were adjusted separately.
  - If a "non-coordinately" maintained part of a cadastral municipality bordered on a neighbouring "coordinately" maintained cadastral municipality or on a neighbouring "coordinately" maintained part of a cadastral municipality, it had to be improved before the "non-coordinate" maintenance work. LC points on the border with such a cadastral municipality or part of a cadastral municipality were tie points (they were not adjusted again – fixed tie points).
  - When a "non-coordinately" maintained part of a cadastral municipality bordered on a neighbouring already improved "non-coordinately" maintained cadastral municipality or a neighbouring already improved "non-coordinately" maintained part of a cadastral municipality, all LC points on the border with such cadastral municipality or part of such cadastral municipality were tie points (not adjusted again – fixed tie points).
  - If a "non-coordinately" maintained part of a cadastral municipality bordered on another non-improved "coordinately" maintained cadastral municipa-

neizboljšan »nekoordinatno« vzdrževan del katastrske občine, je bil pri izravnavi upoštevan vpliv sosedov s pasom, običajno širokim 300 m.

lity or on a non-improved "coordinately" maintained part of a cadastral municipality, the neighbouring part with a strip of 300 m was applied in the adjustment.

Vse naštete vhodne podatke je v ustrezno obliko za Systro referent obdelal v programskem paketu SysGeoProTM.

All the listed input data was processed into the appropriate format for Systra by a clerk in the SysGeoProTM software bundle.

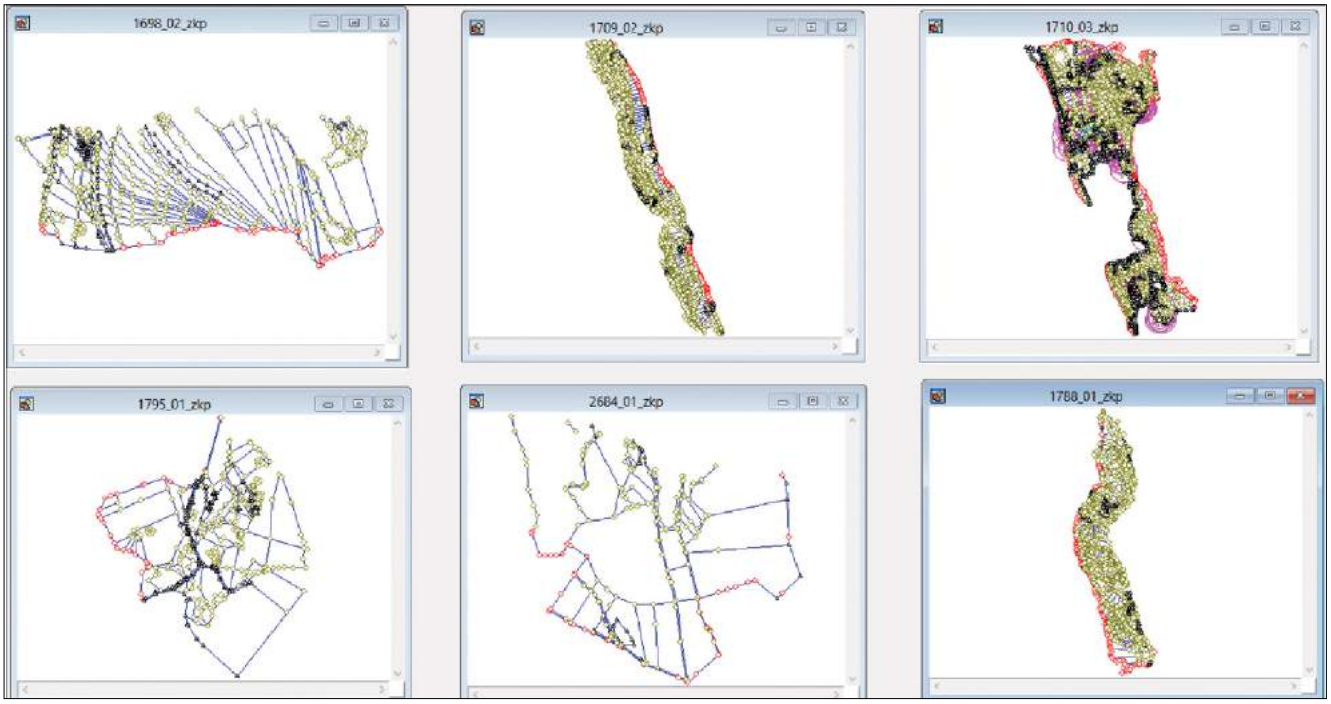


Slika 8.2.7.3: Obdelava vhodnih podatkov za uvoz v Systro; primer obdelovane katastrske občine s pasovi sosednjih katastrskih občin, vzetih v obdelavo.
Vir: PP SysGeoProTM, ekranski prikaz

Figure 8.2.7.3: Processing of input data for import into Systra; example of a cultivated cadastral municipality with strips of neighbouring cadastral municipalities taken for processing.
Source: PP SysGeoProTM, screen display

Referent je vhodne podatke v programu SysGeoProTM pripravil tako, da je vsako katastrsko občino ali del katastrske občine v Systro uvozil v svoj sistem, vezne točke pa v različne skupine. S tem je bil naknadno omogočen pripis različne vhodne natančnosti podatkom v Systri.

The clerk prepared the input data in the SysGeoProTM program by importing each cadastral municipality or part of cadastral municipality into Systra into its system, and the tie points into different groups. This subsequently enabled the attribution of different input accuracy values into the data in Systra.



Slika 8.2.7.4: Prikaz sistemov obdelovane katastrske občine in pasov sosednjih katastrskih občin.
Vir: PP Systra, ekranski prikaz

Figure 8.2.7.4: Display of systems of a cultivated cadastral municipality and strips of neighbouring cadastral municipalities.
Source: PP Systra, screen display

Vezne točke iz baze zemljiškega katastra se v postopku niso izravnavale (so bile fiksne). Vhodna natančnost za te točke (sigma P) je bila 0.00 m. Izjema so bile vezne točke z metodami izboljšave 85, 86 in 87, katerim je bila določena vhodna natančnost in so se izravnavale v okviru te natančnosti.

The tie points from the land cadastre database were not adjustment in the process (they were fixed). The input accuracy for these points (sigma P) was 0.00 m. Exceptions were tie points with improvement methods 85, 86 and 87, which had attributed input accuracy values and were adjusted within this accuracy.

Šifra MD MD code	Vhodna natančnost (sigma P) Input accuracy (sigma P)
85	1.00 m
86	2.00 m
87	5.00 m

Točke z metodo določitve 85, 86 in 87, ki so bile na meji obdelovane katastrske občine s sosednjimi predhodno homogeniziranimi (končanimi) katastrskimi občinami, pa so bile prav tako fiksne in zanje niso veljale natančnosti iz zgornje tabele in navedba o izravnavi.

However, the points with determination methods 85, 86 and 87 that were on the borders of cultivated cadastral municipalities with the neighbouring previously homogenized (completed) cadastral municipalities, were also fixed; the accuracy in the table above and indication of adjustment do not apply to them.

Dodatne vezne točke in pomožne točke, pridobljene z domeritvami izvajalca, so se izravnavale. Vhodna natančnost za te točke je bila odvisna od metode določitve in je znašala:

Additional tie points and auxiliary points obtained by the contractor's additional measurements were adjusted. The input accuracy for these points depended on the method of determination:

Šifra MD MD code	Vhodna natančnost (sigma P) Input accuracy (sigma P)
101 / DOF	1.00 m
102 / PAS	1.00 m
103 / IZM	0.04 m
104 / IZT	0.30
105 / IZU	1.0

Če je dodatne vezne točke in pomožne točke določil referent izboljšave sam, so bila pravila enaka.

Natančnost grafičnih koordinat GE, GN oz. vhodna natančnost ZKP je bila izračunana kot povprečje vektorjev odstopanj med grafičnimi koordinatami GE, GN in koordinatami E, N veznih točk in je bila določena za vsak del katastrske občine posebej. Tako izračunana natančnost ni bila nujno upoštevana kot vhodna natančnost v Systri. Pravila za določitev vhodnih natančnosti ZKP za Systro so namreč bila:

- Določitev vhodne natančnosti je bila odvisna od načina vzdrževanja ZKP dela katastrske občine.
- Za posamezno vrsto vzdrževanja so določene minimalne vrednosti vhodne natančnosti:
  - koordinatni način vzdrževanja ZKP: 0,50 m,
  - koordinatni način vzdrževanja ZKP z vklopom: 0,50 m,
  - nekoordinatni način vzdrževanja ZKP: 3,00 m.
- Če je bila vrednost izračunane vhodne natančnosti pod minimalno vrednostjo, je bila za take dele katastrskih občin upoštevana minimalna vrednost vhodne natančnosti (v odvisnosti od metode vzdrževanja).
- Če je vrednost izračunane vhodne natančnosti dosegla oz. presegla minimalno vrednost (v odvisnosti od metode vzdrževanja), je bila upoštevana izračunana vrednost.

Izboljšava z uporabo membranske metode homogenizacije je potekala v Systri iterativno v več korakih:

1. Korak izravnave - izračun približnih vrednosti

V prvem koraku so bile za neznane koordinate in transformacijske parametre za lokalne sisteme določene približne vrednosti koordinat, ki služijo kot privzete vrednosti v naslednjem koraku posredne izravnave. V postopku izračuna približnih vrednosti je bila izvedena avtomatska eliminacija največjih grobo pogrešenih opazovanj.

2. Korak izravnave - posredna izravnava in analiza

Postopek je proučil opazovanja in obravnaval grobe pogreške opazovanj. Izhodne koordinate so bile izračunane

If the additional tie points and auxiliary points were determined by the improvement clerk, the same rules applied.

The accuracy of graphical coordinates GE, GN or the input accuracy of the ZKP was calculated as the average of the vectors of deviations between the graphical coordinates GE, GN and the coordinates E, N of the tie points, and was determined separately for each part of the cadastral municipality. The accuracy thus calculated was not necessarily considered as the input accuracy in Systra. The rules for determining the input accuracy of the ZKP for Systra were as follows:

- The determination of the input accuracy depended on the method of maintaining the ZKP of a part of the cadastral municipality.
- Minimum values of input accuracy were determined for each type of maintenance:
  - coordinate method of ZKP maintenance: 0.50 m,
  - coordinate method of ZKP maintenance with integration: 0.50 m,
  - non-coordinate method of ZKP maintenance: 3.00 m.
- If the value of the calculated input accuracy was below the minimum value, the minimum input accuracy value was taken into account for these parts of cadastral municipalities (depending on the maintenance method).
- If the calculated input accuracy value reached or exceeded the minimum value (depending on the maintenance method), the calculated value was taken into account.

The improvement using the membrane homogenization method took place in Systra iteratively in several steps:

1. adjustment step – calculation of approximate values

In the first step, approximate coordinate values were determined for unknown coordinates and transformation parameters for local systems, which serve as default values in the next step of indirect adjustment. In the process of calculating the approximate values, the most grossly incorrect observations were automatically eliminated.

2. adjustment step – indirect adjustment and analysis

The procedure examined the observations and addressed gross errors in the observations. The output coordinates were calculated by using Gaussian least-squares adjustment, and

z izravnavo po Gaussovi metodi najmanjših kvadratov, pogreški opazovanj pa so bili odkriti s pomočjo statistične analize ((izračun standardiziranega popravka NV – razmerje med popravkom opazovanja in standardnim odklonom popravka opazovanja) nem. Normierte Verbesserung), ki temelji na postopku odkrivanja grobih napak t. i. »data snooping«, ki ga je v 60. letih prejšnjega stoletja razvil W. Baarda na Računskem centru Geodetskega inštituta v Delftu na Nizozemskem (angl. Computing Centre of the Delft Geodetic Institute).

errors in the observations were detected via statistical analysis ((calculation of the standardized NV correction – the ratio between the observation correction and the standard deviation of the observation correction), Ger. Normierte Verbesserung), which is based on the process of identifying major errors or so-called "data snooping", developed by W. Baard in the 1960s at the Computing Centre of the Delft Geodetic Institute in the Netherlands.

Normierte Verbesserungen NV_i

$$NV_i = \frac{|v_i|}{\sigma_{v_i}} = \frac{|v_i|}{\sigma_0 \cdot \sqrt{(q_{vv})_{ii}}}$$

3. Korak izravnave - homogenizacija

Po uspešni analizi in odpravi grobo pogrešenih opazovanj je sledil izračun homogenizacije. Homogenizacija je izravnava sosedstva grafičnih koordinat v okviru Gaussove izravnave. Pri tem je bila še enkrat opravljena (sicer v 2. koraku že izvedena) posredna izravnava. Grafične koordinate so bile sosedsko izravnane ob upoštevanju vnesenih dodatnih geometrijskih pogojev. Namesto opazovanj koordinat so bile kot opazovanja uvožene razlike koordinat stranic mreže trikotnikov, ki se je v tem koraku vzpostavil med točkami ZKP.

Po izvedeni posredni izravnavi (po 2. koraku izračuna) je bilo posebno pozornost treba nameniti analizi podatkov. Najpomembnejša karakteristika, ki jo je analiza ustvarila po izravnavi, je standardiziran popravek NV - mera za morebitno obremenitev opazovanja z grobimi pogreški. Na podlagi izračunanih standardiziranih popravkov je referent izboljšave pregledal vsa opazovanja, pri katerih so bili izračunani standardizirani popravki večji od mejnega standardiziranega popravka, saj je pri teh opazovanjih obstajala velika možnost prisotnosti grobega pogreška. Mejna vrednost standardiziranega popravka je bila določena izkustveno in je znašala 3.3 (splošno pravilo je sicer 2,5). Izjema so bile koordinatno vzdrževane katastrske občine ali deli katastrskih občin, pri katerih je bila za mejno vrednost standardiziranega popravka vzeta vrednost 0.8, ker so bila le tako ustrezno obravnavana grobo pogrešena opazovanja.

Z naraščajočo oddaljenostjo med točkami se popravki opazovanj manjšajo (izboljšava upada).

Če je bilo v postopku ugotovljeno, da so bile grafične koordinate GE-, GN-veznih točk grobo pogrešene (posledica nasilnih vklopov v načrt), je bilo treba njihov vpliv na izboljšavo okoliških točk v postopku izključiti.

Če je bila ugotovljena groba napaka opazovanja na vhodnih podatkih iz baze zemljiškega katastra (tj. v koordinatah E, N),

3. Adjustment step – homogenization

After the successful analysis and elimination of gross errors in the observations, a homogenization calculation followed. Homogenization is the adjustment of a neighbourhood of graphical coordinates with Gaussian alignment. Indirect adjustment was performed again (otherwise already performed in step 2). Adjacent graphical coordinates were adjusted, taking into account the entered additional geometric conditions. Instead of coordinate observations, the differences in the coordinates of the sides of the grid of triangles were imported as observations, which were established between the points of the ZKP in this step.

After the indirect adjustment was performed (after step 2 of the calculation), special attention had to be paid to the data analysis. The most important characteristic generated by the analysis after adjustment is the standardized NV correction – a measurement of the potential burden of the observation with gross errors. Based on the calculated standardized corrections, the improvement clerk reviewed all observations for which the calculated standardized corrections were greater than the marginal standardized correction, as these had a high possibility of gross errors. The limit value of the standardized correction was determined empirically and amounted to 3.3 (the general rule is 2.5). Exceptions were "coordinately" maintained cadastral municipalities or parts of cadastral municipalities where the limit value of the standardized correction was taken to be 0.8, since this was the only way to properly address the gross errors in the observations.

As the distance between the points increases, the corrections of the observations decrease (improvement decreases).

If it was established in the procedure that the graphical coordinates of GE-/GN-tie points had gross errors (as a result of forced integration into the plan), their influence on the improvement of the surrounding points in the procedure had to be excluded.

If a gross observation error was found on the input data from the land cadastre database (i.e. in E,N coordinates), the fin-

je bila ugotovitev posredovana organizacijski enoti Geodetske uprave RS v reševanje in odpravo. Izračunani standardizirani popravki, večji od mejnega standardiziranega popravka, so bili sicer v veliki meri posledica slabih ali napačnih vklopov podatkov izmer v grafično evidenco zemljiškega katastra. Vsaka poprava napake, spreminjanje pogojev, izključevanje točk in pogojev, je za referenta izboljšave pomenila nov krog zgoraj navedenih korakov.

ding was forwarded to the organizational unit of the Surveying and Mapping Authority of the Republic of Slovenia for resolution and elimination. Calculated standardized corrections larger than the marginal standardized correction were otherwise largely the result of poor or incorrect integration of measurement data into the graphic records of the land cadastre. Any correction of an error, change of conditions, or exclusion of points and conditions meant a new round of the above steps for the improvement clerk.

8.2.8 Rezultati
Results

Rezultat korakov v Systri je bila množica datotek z različnimi podatki, od katerih pa so izboljšan rezultat, ki je bil nato predmet evidentiranja v zemljiškem katastru, predstavljale koordinate E, N vseh zemljiškokatastrskih točk. Rezultat korakov v Systri je bil nato obdelan v SysGeoProTM z namenom priprave dokumentov elaborata izboljšave in izmenjevalnih datotek za vzdrževanje (npr. fiksne vezne točke iz izravnave niso bile predmet teh datotek, saj tam sprememb ni bilo; ZK-točkam je bilo treba pripisati ustrezne metode določitve; pripraviti je bilo treba tudi datoteke za ZK-točke na meji katastrske občine s sosednjimi neizboljšanimi katastrskimi občinami; pripravljene so bile različne analize). Izboljšava na upravne statuse ZK-točk ni vplivala.

Rezultat projekta Lokacijske izboljšave ZKP je bila izboljšana pozicijska natančnost ZKP za območje celotne Slovenije, in sicer v smislu izgrajenega zveznega topološko pravilnega sloja ZKN. ZKP je ostal nespremenjen, ZKN pa je bil dopolnjen/spremenjen z ZK-točkami, ki so koordinate E, N dobile v izboljšavi in tako postal zvezen sloj. ZK-točke, ki so dobile koordinate s postopkom izboljšave, se v ZKN prikazujejo kot ZK-točke, pri katerih natančnost presega 1 m (modro zarisane v ZKN). Zaradi zveznosti in izboljšane položajne natančnosti je bil sloj ZKN tisti, ki je pri uporabnikih zamenjal uporabo dosedanjega zveznega sloja ZKP.

ZK-točkam, ki so jim bile koordinate E, N določene z membransko metodo homogenizacije, je bila pripisana metoda določitve 77. Izjema so bile ZK-točke, ki so že pred izboljšavo imele koordinate E, N in eno izmed metod izboljšave z znano natančnostjo (85, 86 ali 87). Te so se v postopku izboljšave obnašale kot nefiksne vezne točke. To pa pomeni, da so se v okviru natančnosti metode lahko koordinate E, N spremenile. Kljub morebitni spremembi pa je bila tudi po izvedeni izboljšavi z membransko metodo homogenizacije metoda pri takih ZK-točkah ohranjena in ni bila spremenjena v 77.

V nadaljevanju je prikaz učinka izboljšave na enem primeru.

The result of the steps in Systra was a set of files with various data, of which the improved result, which would subsequently be the subject of registration in the land cadastre, was represented by the coordinates E, N of all land cadastral points. The result of the steps in Systra was then processed in SysGeoProTM in order to prepare improvement report documentation and exchange files for maintenance (for example, fixed tie points from adjustment were not part of these files, as there were no changes; LC points had to be assigned appropriate methods of definition; files had to be prepared for LC points on the border of a cadastral municipality with neighbouring unimproved cadastral municipalities; various analyses were prepared). The improvement did not affect the administrative status of LC points.

The result of the ZKP positional accuracy improvement project was an improved positional accuracy of the ZKP for the entire territory of Slovenia, namely in terms of a constructed uniform topologically correct layer of the ZKP. The ZKP remained unchanged, while the ZKN was supplemented/amended with ZK-points, which received E, N coordinates in the improvement and thus became a uniform layer. The LC points that have been given coordinates in the improvement process are displayed in the ZKN as LC points with an accuracy greater than 1 m (blue in ZKN). Due to the uniformity and improved positional accuracy, the ZKN layer replaced the use of the previous uniform ZKP layer for users.

LC points whose E, N coordinates were determined by the membrane homogenization method were assigned with determination method 77. Exceptions were LC points which already had E, N coordinates before the improvement and one of the methods of improvement with a known accuracy value had been applied (85, 86 or 87). These behaved as non-fixed tie points in the improvement process. This means, however, that in terms of the accuracy of the method, the E, N coordinates may have changed. Despite potential changes, the method was retained for such LC points even after the improvement with the membrane homogenization method and was not changed to 77.

Below is an image showing the effect of the improvement on one example.

Slika 8.2.8.1: Rezultat izboljšave je izrisan z neprekinjeno črto, za primerjavo je dodano stanje ZKP pred lokacijsko izboljšavo (prikazano z belo črtkano linijo).
Vir: PP SysGeoProTM, ekranski prikaz

Figure 8.2.8.1: The result of the improvement is plotted with a solid line, and the state of the ZKP before the positional accuracy improvement is added for comparison (with a white dashed line).
Source: PP SysGeoProTM, screen display

Slika 8.2.8.2: Vektorji na rezultatu izboljšave (kažejo približno v isto smer in so primerljivih dolžin); rumene nevezne točke dobijo koordinate v državnem koordinatnem sistemu E, N glede na vektorje na modrih veznih točkah in ob upoštevanju vnesenih dodatnih geometrijskih pogojev.
Vir: PP SysGeoProTM

Figure 8.2.8.2: Vectors on the improvement result (oriented approximately in the same direction and of comparable lengths); yellow non-tie points are given coordinates E, N in the national coordinate system with respect to the vectors at the blue tie points and taking into account the entered additional geometric conditions.
Source: PP SysGeoProTM

Slika 8.2.8.3: Sloj ZKN po izvedeni izboljšavi.
Vir: PP PREG, ekranska slika ZKN in DOF

Figure 8.2.8.3: The ZKN layer after improvement.
Source: PP PREG, screen image ZKN and DOF

Rezultat izboljšave ni bil povsod enako dober. Na kvaliteto izboljšave položajne natančnosti je vplivalo marsikaj:

- število in razporeditev veznih točk, ki je bila odvisna od zahtev glede na atraktivnost prostora (pozidana zemljišča, gozdovi z visokogorjem in vmesna območja) in možnosti pridobitve le-teh (ali so obstajali arhivski elaborati, ali so bile najdene točke iz elaboratov za izmero na terenu, ali je bila omogočena fotointerpretacija točka na podlagi PAS in DOF),
- kakovost obstoječih veznih točk (natančnost izmerjenih koordinat ZK-točk, ki so bile že vodene v zemljiškem katastru ter natančnost domeritvenih točk),
- vhodna položajna natančnosti ZKP (kaže na ujemanje evidentiranih podatkov glede na dejansko lokacijo na terenu),
- ustrezno evidentirano stanje v ZKP (npr. ne/homogenost vklopov skozi zgodovino) in
- metod vzdrževanja grafičnih podatkov zemljiškega katastra (npr. način evidentiranja sprememb, ki je bolj ali manj ohranil v grafiki dejanska relativna razmerja na terenu; vklopi odmer dolžinskih objektov; popačeni ali delni vrisi sprememb; izvorno neusklajene meje med katastrskimi občinami ali deli katastrskih občin in naknadna uskladitev meja območij zajema ob izdelavi DKN).

Najboljši rezultati so bili doseženi na območju poseljenih zemljišč, kjer je bila gostota veznih točk večja. Manjše število slabše razporejenih ZK-točk je bilo vzrok, da je rezultat predvsem na gozdnih zemljiščih in v visokogorju slabši.

The result of the improvement was not of equal quality throughout. Several factors influenced the quality of the positional accuracy improvement:

- the number and distribution of tie points, which depended on the requirements regarding the level of development of the area (built-up land, forests with highlands and intermediate areas) and the possibility of obtaining them (either there were archival reports, or points were found from field survey reports, or the photo-interpretation of the point based on PAS and DOF was enabled),
- the quality of the existing tie points (accuracy of the measured coordinates of the LC points that have already been kept in the land cadastre and the accuracy of the additional measurement points),
- input positional accuracy of the ZKP (indicates the correspondence of the recorded data with the actual location in the field),
- a properly recorded situation in the ZKP (e.g. non/homogeneity of integrations throughout history), and
- methods of maintaining graphic data of the land cadastre (e.g. the method of recording changes that more or less preserved the actual relative relationships in the field; inclusions of measurements of longitudinal objects; distorted or partial inscriptions of changes; originally uncoordinated borders between cadastral municipalities or parts of cadastral municipalities, and subsequent harmonization of the borders of areas of coverage in the production of the DKN).

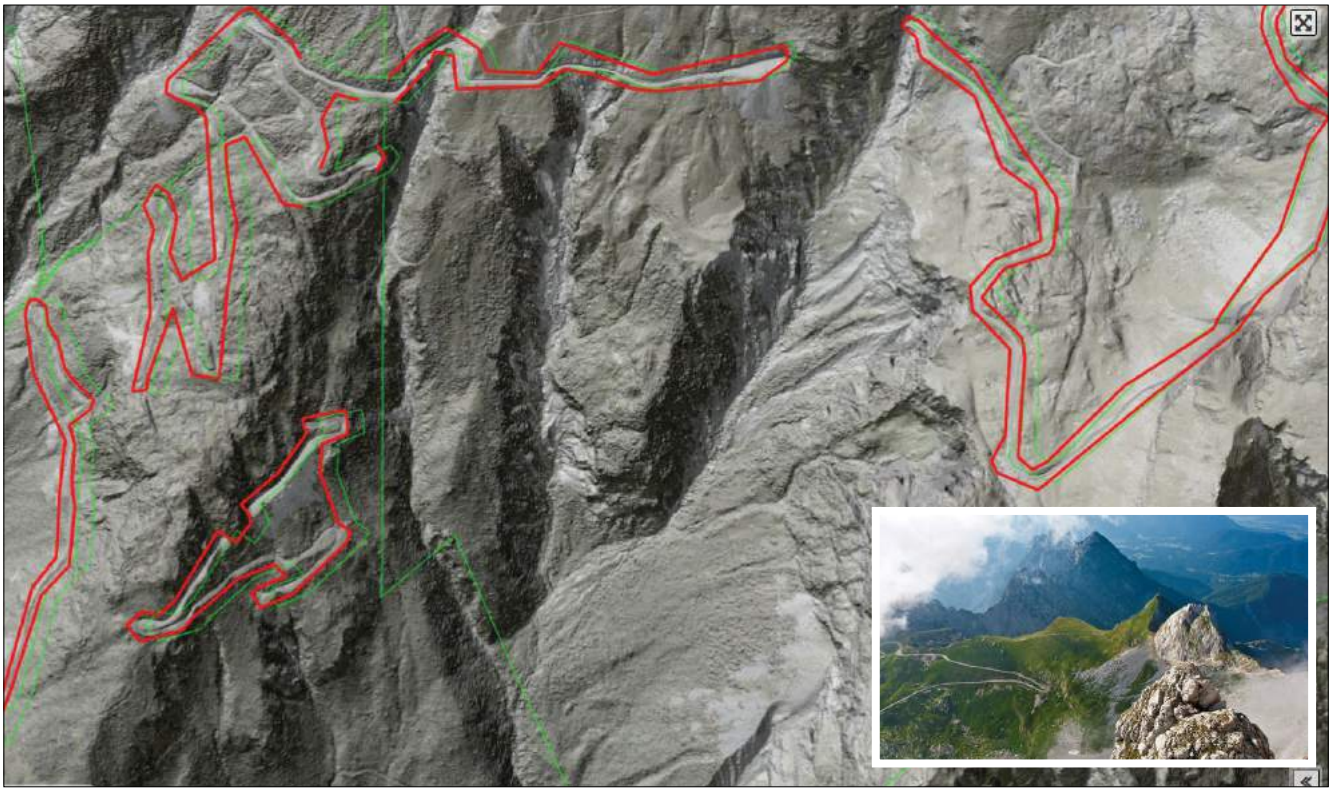
The best results were achieved in areas of inhabited land, where the density of tie points was higher. The smaller number of poorly distributed LC points was the reason that the result was worse particularly on forest lands and in the highlands.

Cesta na Mangartsko sedlo

Mangart je 2679 metrov visoka gora v Julijskih Alpah. Je četrti najvišji vrh v Sloveniji. Leži na meji z Italijo in zato privabi mnoge pohodnike z obeh strani meja. Odcep za cesto na Mangartsko sedlo je v bližini novega viadukta, ki se nahaja na poti med mejnim prehodom Predel in Logom pod Mangartom. Dvanajst kilometrov dolga stara vojaška cesta poteka skozi pet v živo skalo izklesanih predorov, premaga 980 metrov nadmorske višine in nas pripelje na Mangartsko sedlo, ki se nahaja na višini 2055 metrov in je tudi izhodišče za vzpon na Mangart. Vožnja po njej je neponovljivo doživetje. Zgrajena je bila leta 1938, kasneje pa večkrat obnovljena. Med vožnjo se nam ponujajo čudoviti razgledi na bližnjo in daljno okolico. Cesta je privlačen cilj za motoriste in kolesarje. Je najlepša gorska cesta v Sloveniji.

Road to the Mangart Saddle

Mangart is a 2679-metre-high mountain in the Julian Alps. It is the fourth highest peak in Slovenia. It lies on the border with Italy and therefore attracts many hikers from both sides of the border. The exit for the road to Mangart Saddle is near the new viaduct, which is located on the route between the Predel border crossing and Log pod Mangartom. The old twelve-kilometre military road runs through five bedrock-carved tunnels, scales 980 metres above sea level and brings us to the Mangart Saddle, located at an altitude of 2055 metres, which is also the starting point for the ascent to Mangart. Driving on it is a unique experience. The road was built in 1938 and subsequently renovated several times. The drive offers beautiful views of the near and far surroundings. The road is an attractive destination for motorcyclists and cyclists. It is the most beautiful mountain road in Slovenia.



Cesta na Mangartsko sedlo je bila v k. o. 2205 Strmec v letu 1999 na novo evidentirana v zemljiškem katastru. Glede na strm teren izboljšava s pomočjo fotointerpretacije DOF-točk ne bi mogla dati zadovoljive lokacijske natančnosti, saj je natančnost DOF na takem terenu nezanesljiva. Poleg tega cestno telo v tako strmem terenu obsega še mestoma bolj ali manj široko zemljišče izven asfaltirane površine, katerega obseg je nemogoče določiti »v pisarni«. V takih primerih je izvedba geodetskega upravnega postopka na terenu edina zadovoljiva »izboljšava«.
Vir: PREG, ekranska slika ZKP in ZKN ter PAS, vir fotografije: https://www.slotrips.si/

The road to the Mangart Saddle was newly registered in the land cadastre in CM 2205 Strmec in 1999. Due to the steep terrain, improvement with the help of photointerpretation of DOF-points could not give a satisfactory positional accuracy, as the DOF accuracy is unreliable in such terrain. In addition, the road body in such steep terrain comprises more or less wide strips of land in some places outside the paved surface, the extent of which is impossible to determine "in the office". In such cases, the implementation of the geodetic administrative procedure in the field is the only option for a satisfactory "improvement".
Source: PREG, ZKP and ZKN screen image, and PAS, Photo source: https://www.slotrips.si/

Ne glede na to velja splošna ocena, da je projekt prinesel kakovostnejše grafične podatke zemljiškega katastra glede položajne natančnosti. Z uporabljeno metodo izravnave in homogenizacije so bila pri delu uporabljena načela geodetske stroke (metode koordinatne geometrije, topologija, izravnava, zakon o prenosu pogreškov ...). Dosežena je bila precejšnja izboljšava položajne natančnosti grafičnega prikaza parcel (učinkovito so se odpravili sistematični zamiki).

Ob tem so bile odpravljene mnoge napake in neskladja v podatkih, ki so obstajali v evidenci zemljiškega katastra pred izboljšavo in so se pokazali šele med postopkom (Systra ima namreč vgrajene matematično-statistične analize za odkrivanje grobo pogrešenih opazovanj v bazi zemljiškega katastra; vsa taka opozorila so bila pregledana in tu so bile dodatno najdene napake, ki do takrat še niso bile odkrite).

Velik del procesa je bil s SysGeoProTM popolnoma avtomatiziran, zaradi česar so se referenti izboljšave lahko posvetili vsebinskim problemom in se niso ukvarjali z obdelavo podatkov za komunikacijo med aplikacijama Systra in Devo Servisi.

Ponovno velja poudariti, da so bile rezultat izboljšave (numerične) koordinate E, N vseh ZK-točk (s tem pa tudi vseh lomov v grafiki zemljiškega katastra). Omenjene koordinate so bile rezultat matematičnega izračuna v Systri in naknadno niso bile ročno popravljane/premaknjene (če npr. na posameznem območju rezultat ni bil najboljši). Na rezultat izboljšave je bilo mogoče vplivati le tako, da so bili vhodnim podatkom zemljiškega katastra dodani domeritveni podatki zunanjega izvajalca, dodatne vezne točke in pogoji za ohranjanje relativnih razmerij s strani referenta izboljšave ter na drugi strani s strani referenta izboljšave izločena grobo pogrešena opazovanja ali vpliv opazovanj na okolico. Če v postopku ni bilo mogoče zanesljivo ugotoviti, da gre za grobo pogrešeno opazovanje ali pa ni bilo mogoče pridobiti zanesljivih dodatnih veznih točk in pogojev, se je moral referent izboljšave zadovoljiti z rezultatom kljub temu, da ob vizualnem pregledu rezultata izboljšave z doseženim ni bil v celoti zadovoljen. V rezultatih postopka izboljšave so se pogosto pokazali nepravilno izvršeni vklopi v izvedenih postopkih vzdrževanja zemljiškega katastra skozi zgodovino.

Nevertheless, the general assessment is that the project has provided higher quality graphical data of the land cadastre in terms of positional accuracy. The method of adjustment and homogenization employed applied principles of the geodetic profession (methods of coordinate geometry, topology, adjustment, law of error transfer etc.). A significant improvement was achieved in the positional accuracy of the graphical representation of the plots (systematic offsets were effectively eliminated).

At the same time, many errors and inconsistencies were eliminated in the data that existed in the land cadastre records before the improvement and were only discovered during the procedure (Systra has built-in mathematical and statistical analyses to detect missing observations in the land cadastre database; all such warnings were reviewed and additional errors were identified).

A large part of the process was fully automated with SysGeoProTM, allowing improvement clerks to focus on content issues and not on data processing for the communication between the Systra and Devo Services applications.

It should be emphasized again that the results of the improvement were the (numerical) E, N coordinates of all LC points (and thus also all gradients in the land cadastre graphic). These coordinates were the result of a mathematical calculation in Systra and were not subsequently manually corrected/moved (if, for example, the result was not optimal in an individual area). The only way to influence the result of the improvement was by adding external contractor measurement data, additional tie points and conditions for maintaining relative relations by the improvement clerk to the input data of the land cadastre, and on the other hand, by the improvement clerk's elimination of gross errors in observations or the impact of observations on the surroundings. Where it was not possible to reliably determine within the process whether an observation was incorrect or whether it was not possible to obtain reliable additional tie points and conditions, the improvement clerk had to accept the result, despite the fact that a visual examination of the improvement result might not have yielded the best results. The results of the improvement process often showed incorrectly performed integrations in the land cadastre maintenance procedures performed throughout history.

8.2.9 Uporabnost, vplivi in posledice
Applicability, impacts and consequences

Postopek lokacijske izboljšave ZKP je bil tehnični postopek in ga ne smemo enačiti z upravnimi postopki. Z izboljšavo ni bilo mogoče rešiti neusklajenosti evidentiranega stanja v zemljiškem katastru z dejanskim stanjem na terenu, ki je posledica tega, da evidentiranje spremenjenega stanja sploh še ni bilo predlagano. Tovrstna neskladja je mogoče odpraviti le z rednimi upravnimi postopki.

The ZKP positional accuracy improvement procedure was a technical procedure and should not be equated with administrative procedures. The improvement could not solve the inconsistency of the situation recorded in the land cadastre with the actual situation in the field, which is a consequence of the fact that the recording of the changed situation has not even been proposed yet. Such inconsistencies can only be remedied through regular administrative procedures.

Slika 8.2.9.1: Prikaz zemljiškega katastra na DOF-u križišča Malence, ki ga ni bilo mogoče odpraviti z izboljšavo.
Vir: PREG, ekranski prikaz ZKP in DOF

Figure 8.2.9.1: Display of the land cadastre on the DOF of the Malence intersection, which could not be eliminated by improvement.
Source: PREG, ZKP and DOF screen display

Z rezultati projekta ni bilo poseženo v lastninske in stvarnopravne pravice lastnikov. Upravni statusi ZK-točk niso bili spremenjeni, prav tako niso bili spremenjeni opisni podatki o površinah parcel.

Geodetska podjetja morajo še naprej pripravo na izvedbo terenskih meritev/postopkov izvesti na enak način kot pred samo izboljšavo, saj so izboljšane ZK-točke definirane kot točke slabše natančnosti od 1 m. Zaradi pomanjkanja nadštevilčnih opazovanj, ki bi zagotavljala zanesljivost cenilk, ki jih Systra sicer izračuna, ocena natančnosti koordinat ni podana.

Metodologija določanja deležev nekaterih atributov na parceli, ki predvideva določitev vrednosti le-teh na podlagi grafičnih presekov zemljiškega katastra z ostalimi sloji, pa je imela takojšen vpliv. Po metodologiji se pri grafičnih presekih namreč za parcelo uporabi ZKN, če le-ta ni na razpolago, pa se uporabi ZKP. Z zaključkom projekta Lokacijska izboljšava ZKP je bil vzpostavljen zvezni sloj ZKN za obmo-

The results of the project did not violate the property and ownership rights of the owners. The administrative statuses of LC points were not changed, nor was the descriptive data on plot areas.

Surveying companies must continue to implement preparations for field measurements/procedures in the same way as before the improvement, since the improved LC points are defined as points with an accuracy of less than 1 m. Due to the lack of non-numerical observations which would ensure the reliability of the estimators otherwise calculated by Systra, an estimate of the accuracy of the coordinates is not given.

However, the methodology for determining the shares of certain attributes on a plot, which envisages determining their values on the basis of graphical cross-sections of the land cadastre with other layers, had an immediate impact. Within this methodology, the ZKN is used for a plot in graphical cross-sections, and if it is not available, the ZKP is used. With the completion of the ZKP positional accuracy improvement project, a uniform ZKN layer was established for the entire

čje cele Slovenije, kar je posledično pomenilo, da so bili od tistega trenutka dalje preseki za vse parcele narejeni z ZKN in ne več z ZKP. Na območjih koordinatno vzdrževanega katastra sprememb ni bilo oz. so bile minimalne, povsod drugod pa je zaradi zamenjave ZKP z ZKN pri grafičnih presekih lahko prišlo do bolj ali manj velikih sprememb (izjema so le v celoti odmerjene parcele v geodetskih postopkih s pridobitvijo (numeričnih) koordinat že pred samo izboljšavo). Podatki, ki se izkazujejo v podatkih Geodetske uprave RS in so rezultat grafičnih presekov, so: delež posamezne dejanske rabe, delež posebnih režimov, delež namenske rabe in površina zemljišč z bonitetnimi točkami. Ti podatki so uporabljeni tudi pri določanju vrednosti nepremičnin in katastrskega dohodka. Uporabniki bodo za zagotovitev skladnosti z izboljšano položajno natančnostjo grafičnih podatkov zemljiškega katastra izvedli postopek tehnične posodobitve grafičnega prikaza grafičnih slojev prostorskih podatkov, za katerih upravljanje so pristojni. Npr. v skladu z določili 126. člena zakona ZUreP-2 lahko za namen ažurnosti grafičnega prikaza namenske rabe prostora in uporabe njegovih podatkov za potrebe izvajanja ZUreP-2 in drugih zakonov občina tehnično posodobi grafični prikaz iz veljavnega OPN na veljaven zemljiškokatastrski prikaz (ki se je s postopkom opisane lokacijske izboljšave spremenil iz ZKP v ZKN).

Posledično sta/bosta zveznost in boljša položajna natančnost kot novi lastnosti ZKN vplivali tudi na delo drugih uporabnikov. Uporaba je/bo mogoča pri izdelavi OPN, ugotavljanju pogojev za zaščitene kmetije, izračunu pristojbin za gozdne ceste, izvajanju nove prostorske in gradbene zakonodaje, določanju pravice do socialnih transferjev, določanju davčne politike ...

territory of Slovenia, which consequently meant that from that moment on, cross-sections for all plots were made with the ZKN and no longer with the ZKP. In the areas of the coordinate cadastre, there were no changes or they were minimal, but everywhere else, due to the replacement of the ZKP with the ZKN in graphical cross-sections, more or less significant changes could occur (the only exception being fully measured plots in geodetic procedures with the acquisition of (numerical) coordinates before the improvement). The data disclosed in the data of the Surveying and Mapping Authority of the Republic of Slovenia and resulting from graphical cross-sections includes: share of individual actual use, share of special regimes, share of designated usage and the area of land with credit points. This data is also used in determining the value of real estate and cadastral income. To ensure compliance with the improved positional accuracy of the graphic data of the land cadastre, users will carry out the procedure of technical updating of the graphic display of the graphic layers of spatial data, the management of which is their responsibility. For example, in accordance with the provisions of Article 126 of the ZUreP-2, for the purpose of updating the graphic presentation of the intended use of space and the use of its data for the implementation of ZUreP-2 and other laws, a municipality may technically update the graphical display from the valid OPN to the valid land cadastral index map (which changed from the ZKP to the ZKN with the procedure of the described positional accuracy improvement).

As a result, the continuity and better positional accuracy, as well as new features of ZKN, have influenced and will continue to influence the work of other users. Its applications include the preparation of OPNs, determination of conditions for protected farms, calculation of fees for forest roads, implementation of new spatial and construction legislation, determination of the right to social transfers, determination of tax policy etc.

8.3 Lokacijska izboljšava kot samostojna geodetska storitev ni nova izmera
Positional accuracy improvement as an independent surveying service is not a new survey

Z novelo zakona o evidentiranju nepremičnin (ZEN-A) se uvaja nova geodetska storitev, katere namen je zagotavljati lokacijsko izboljšane podatke zemljiškega katastra. Določeni so pogoji, kdaj se meje parcel in zemljišča pod stavbo lahko spremenijo z lokacijsko izboljšavo, kdo je lahko naročnik te geodetske storitve, predpisana je izdelava in temeljna vsebina elaborata lokacijske izboljšave, predpisana pa so tudi postopkovna pravila evidentiranja lokacijsko izboljšanih podatkov v zemljiškem katastru ter pravila »obveščanja« o lokacijsko izboljšanih podatkih. Lokacijska izboljšava ne vpliva na lastninska in stvarnopravna razmerja med lastniki parcel.

An amendment to the Real Estate Records Act (ZEN-A) is introducing a new geodetic service, the purpose of which is to provide land cadastre data with improved positional accuracy. Conditions are determined regarding when the borders of plots and land under buildings can be changed with positional accuracy improvement, who can order this type of geodetic service, the preparation and basic content of the positional accuracy improvement report, as well as procedural rules for recording positionally improved data in the land cadastre and rules for the "notification" of positionally improved data. Positional accuracy improvement does not affect property and ownership relations between landowners.

In zakaj uvaja zakon novo storitev?
Lahko se zgodi, da lokacijski podatki zemljiškega katastra niso dovolj natančni zaradi različnih načinov merjenja mej in vzdrževanja zemljiškokatastrskih načrtov v preteklosti, zato se za njihovo izboljšavo uvaja nova, samostojna geodetska storitev »lokacijska izboljšava«. Kot je bilo že pojasnjeno, tudi rezultat množične Lokacijske izboljšave ZKP, ki je bila izvedena na območju cele Slovenije, ni povsod prinesel dobrih oziroma za vse uporabnike zadovoljivih položajnih natančnosti, saj je metodologija izhajala iz osnovnega namena ter bila prilagojena razpoložljivim podatkom in razpoložljivemu času za izvedbo. Za lokacijsko izboljšavo kot samostojno geodetsko storitev ima geodet več časa, gre za mikrolokacijo in geodet lahko uporabi vse razpoložljive podatke ter za namen izboljšave pridobi tudi dodatne podatke.

Čeprav ne gre za upravni postopek z vplivom na lastninska in stvarnopravna razmerja med lastniki, je tovrstna storitev za lastnike zanimiva zaradi učinka na podatke, ki so rezultat grafičnih presekov. Gre za tehnični postopek, ki se ob določenih pogojih evidentira celo prednostno in s tega vidika pomeni za lastnika tudi hitrejšo in posledično cenejšo rešitev.

Na območjih, kjer izboljšanje položajne natančnosti podatkov zemljiškega katastra z uporabo različnih, predvsem matematičnih metod transformacije ni zadovoljiva, pride v poštev »metoda izboljšave« podatkov s pomočjo različnih geodetskih upravnih postopkov (za manjše število parcel) ali nove izmere in komasacij (za večja zaključena območja množice parcel).

Why is the law introducing a new service?
It may happen that location data of the land cadastre is not accurate enough due to different ways of measuring borders and maintaining land cadastral plans in the past, so a new, independent geodetic service of "positional accuracy improvement" is being introduced in order to improve them. As already explained, the result of the mass ZKP positional accuracy improvement, which was carried out throughout Slovenia, did not bring good or satisfactory positional accuracy for all users, as the methodology was based on the core purpose and was adjusted to the available data and available time for implementation. The surveyor has more time for positional accuracy improvement as an independent surveying service since it involves micro-location and the surveyor can use all available data and obtain additional data for the purpose of improvement.

Although it is not an administrative procedure with an impact on property and ownership relations between owners, this type of service is relevant for owners because of its effect on data resulting from graphical cross-sections. It is a technical procedure which, under certain conditions, is even registered as a priority and from this point of view also represents a faster and consequently cheaper solution for the owner.

In areas where the improvement of the positional accuracy of land cadastre data using various, mainly mathematical transformation methods is not satisfactory, the "method of improving" data using different geodetic administrative procedures (for a smaller number of plots) or new surveys and land consolidation (for larger completed areas of a multitude of plots) can be used.

9 Kako naprej?

The way forward?

Za razvoj visoko produktivne nacionalne ekonomije je potreben zemljiški kataster visoke položajne in vsebinske kakovosti. Zemljiški kataster je temeljna državna evidenca, ključna povezava nepremičnin na območju države Slovenije z ljudmi, lastniki nepremičnin, ki smo ji v preteklosti, predvsem v drugi polovici prejšnjega stoletja, namenjali bistveno premalo kadrovskih, časovnih in finančnih resursov. Slovenski prostor nujno potrebuje natančne, točne, medsebojno usklajene kakovostne prostorske evidence, kar je temeljni pogoj za realno načrtovanje, vodenje in spremljanje razvoja vseh območij naše države, da bomo vzpostavili osnovne pogoje za kakovostno in trajnostno upravljanje prostora, brez katerih ni možno niti učinkovito upravljanje gospodarstva niti kakovostne javne storitve. V Sloveniji so zato napori geodetske službe usmerjeni tako, da bomo naloge katastrskih izmer lahko izvajali na znanstveno preverjenih osnovah z najsodobnejšimi metodami in tehnologijami daljinskega zaznavanja v kombinaciji s klasičnimi geodetskimi postopki. Hiter, učinkovit in kakovosten zajem prostorskih podatkov za katastrske izmere z najsodobnejšimi metodami in tehnologijami bo omogočil lažje umeščanje gospodarskih investicijskih projektov v okolje, hkrati pa bo zagotovilo podatkovno-informacijsko osnovo za kakovostno upravljanje zemljišč in urejanje prostora, na izvedbeni ravni pa na osnovi usklajenih prostorskih evidenc drugih služb tudi celovite, medsebojno povezane in usklajene prostorske politike različnih sektorjev.

Projekt »Lokacijska izboljšava zemljiškokatastrskega prikaza«, ki je bil sofinanciran s sredstvi EU, je bil sicer enkratno dejanje, ki se je zaključilo z izvedbo na vseh katastrskih občinah. Vendar pa lokacijska izboljšava po vsebini ni zgolj enkratno dejanje, temveč proces, ki se ga lahko v celoti ali pa le po posameznih območjih večkrat ponovi.

S projektom je bila zagotovljena prva izdelava ZKN kot zveznega sloja za celo Slovenijo. Seveda pa kvaliteta izboljšanih podatkov nikakor ne more nadomestiti nove izmere oz. drugih geodetskih upravnih postopkov niti odpraviti vseh napak in neskladij, ki so se skozi zgodovino »prikradla« v podatke zemljiškega katastra.

Ker zaradi obsežne kadrovske, časovne in finančne zahtevnosti postopka nove izmere ni mogoče pričakovati, da bo za celo Slovenijo le-ta tudi izvedena, je bilo že v letu 2017 prisotno zavedanje, da množična lokacijska izboljšava ZKP,

The development of a highly productive national economy requires a land cadastre of high positional and substantive quality. The land cadastre is a basic state record, a key link between real estate in the territory of Slovenia and people, property owners, to whom were allocated significantly insufficient staffing, time and financial resources in the past, especially in the second half of the last century. The area of Slovenia urgently requires high-quality precise, accurate, coordinated spatial records, which is a prerequisite for the realistic planning, management and monitoring of the development of all areas of our country in order to establish the basic conditions for high-quality and sustainable management of space. The latter are crucial for the efficient management of the economy and quality public service.In Slovenia, therefore, the efforts of the Surveying and Mapping Authority are oriented towards the possibility that cadastral surveying tasks can be performed on scientifically verified bases with the most modern methods and technologies of remote sensing in combination with traditional geodetic procedures.A fast, efficient and high-quality way of recording data for cadastral surveying with state-of-the-art methods and technologies will facilitate the placement of economic investment projects in the environment, while providing a data-information basis for quality land management and spatial planning, as well as comprehensive, interconnected and coordinated space policies for various sectors on the implementation level, on the basis of harmonised spatial records of other services.

The "Positional Accuracy Improvement of the Cadastral Index Map" project, which was co-financed with EU funds, was a single project that was ultimately implemented in all cadastral municipalities. However, positional accuracy improvement in terms of content is not just a single project, but rather a process that can be repeated several times in its entirety or only in individual areas.

The project ensured the first production of the ZKN as a uniform layer for the whole of Slovenia. Of course, the quality of improved data can in no way replace a new survey or other geodetic administrative procedures, nor can it eliminate all errors and inconsistencies that have "slipped" into the data of the land cadastre throughout history.

Since the extensive staff, temporal and financial complexity of the new survey procedure mean it cannot be expected that it will be carried out for the whole of Slovenia, there was already an awareness in 2017 that the 2018-2020 ZKP positional accuracy improvement is by no means a one-time act or a final improvement.

ki je bila izvedena s projektom v letih 2018–2020, nikakor ni enkratno dejanje oz. zadnja izboljšava.

Izvedena množična lokacijska izboljšava ZKP je bila le prvi korak v tem procesu. Na območjih z zadovoljivo položajno natančnostjo po množični izboljšavi je lahko celo edini korak (npr. območja koordinatnega katastra), na območjih s slabšo doseženo položajno natančnostjo pa začetek procesa večjega ali manjšega števila izboljšav (ponovnih izboljšav). Izkušnje iz projekta kažejo na to, da lahko ob naboru novih kvalitetnih veznih točk, pridobljenih z novimi geodetskimi postopki, ali s ponovno izmero v preteklosti že izvedenih lokalnih meritev, z izvedbo homogenizacije vpliv teh meritev učinkovito prenesemo na okolico. Prvotno razmišljanje o lokacijski izboljšavi kot o procesu se je skozi izvedbo projekta izkazalo za povsem utemeljeno.

Potek nadaljnjih korakov bo odvisen od potreb in možnosti pridobitve dodatnih podatkov. Ponovna izboljšava bo lahko izvedena le, če bodo pridobljeni dodatni podatki. Tako kot množična Lokacijska izboljšava ZKP bodo tudi ponovne izboljšave temeljile na uporabi matematičnih metod in uporabi PP Systra.

Dodatni podatki bodo lahko pridobljeni z izvedbo rednih postopkov, z rekonstrukcijo (vseh) arhivskih podatkov, z izboljšavami kot posamičnimi geodetskimi storitvami, z namenskimi domeritvami za potrebe izboljšave ... Z zbiranjem izvornih podatkov meritev (opazovanj) in izvedbo nadštevilčnih opazovanj bo mogoče ob ponovnih izboljšavah še v večji meri oziroma v celoti izkoristiti vse možnosti PP Systra. Ena od pomembnejših možnosti je zagotovo pridobitev in nadaljnja uporaba zanesljivih cenilk kakovosti.

Nove katastrske izmere (množične mejne obravnave z geodetsko izmero), ki s tehnično-inženirskega vidika dajejo najboljši rezultat, pogosto niso sprejemljiva rešitev za večja območja, saj ocenjeni stroški lahko presegajo predvidene koristi. Množična nova izmera, vzpostavitev katastra na podlagi geodetske izmere ali podobni instrumenti so še vedno najkakovostnejši pristopi k dolgoročni položajni in splošni kakovosti podatkov katastra. Zaradi visokih stroškov pa so pogosto sprejete kompromisne rešitve, kot je preračun katastrskih koordinat s kombinacijo izravnalnega računa z vključitvijo podatkov relativne geometrije preteklih lokalnih izmer, z upoštevanjem drugih geometrijskih pravil in z navezavo na skrbno izbrane, lahko tudi dodatno izmerjene referenčne točke, kar omogoča izboljšanje položajne in geometrične kakovosti katastrskih načrtov (koordinat lomnih točk).

Glede na tehnološki razvoj, ki smo mu v zadnjem obdob-

The implemented mass positional accuracy improvement of the ZKP was merely the first step in this process. In areas with satisfactory positional accuracy after the mass improvement, it may even be the only step (e.g. in coordinate cadastre areas), and in areas with poorer positional accuracy, it may be the start of a process including greater or lesser number of improvements (repeated improvements). Experience from the project shows that the identification of new high-quality tie points, obtained by new geodetic procedures or by repeating previously performed local surveys, and the impact of these measurements can be effectively transferred to the surroundings by performing homogenization. The initial concept of positional accuracy improvement as a process proved to be completely justified in the implementation of the project.

The course of further steps will depend on the needs and possibilities of obtaining additional data. A repeated improvement will only be possible when additional data is obtained. As with the mass ZKP positional accuracy improvement, repeated improvements will be based on the use of mathematical methods and the use of PP Systra.

Additional data can be obtained by performing regular procedures, by reconstructing (all) archival data, by improvements in the form of individual geodetic services, by dedicated measurements for the needs of improvement etc. Collecting the original data of surveys (observations) and performing supernumerary observations will enable even greater or full use of all the features of PP Systra. One of the more important options is certainly the acquisition and continued use of reliable quality estimators.

New cadastral surveys (mass border surveys with geodetic surveying), which give the best result from a technical-engineering point of view, are often not an acceptable solution for larger areas, as the estimated costs may exceed the expected benefits. Mass new surveys, the establishment of a cadastre based on a geodetic survey or similar instruments are still the best approaches to the long-term positional and general quality of cadastre data. However, due to high costs, compromise solutions are often accepted, such as recalculation of cadastral coordinates by combining an adjustment calculation with the inclusion of data from the relative geometry of past local surveys, following other geometric rules and with connections to carefully selected, possibly additionally measured reference points, which will enable the positional and geometric quality of cadastral plans (coordinates of gradient points) to be improved.

Given the recent technological developments in equipment and computer solutions, the new surveying method is

ju priča pri opremi in računalniških rešitvah, je v prihodnje pričakovati, da bo tudi metoda nove izmere sprejemljiva povsod tam, kjer vrednost nepremičnin predstavlja kapital, ki ga je treba z največjo stopnjo natančnosti evidentirati, in mu zagotoviti ustrezno pravno varnost.

Ciljno stanje grafičnih podatkov zemljiškega katastra oziroma predvidenega katastra nepremičnin, (ki poleg podatkov zemljiškega katastra zajema tudi podatke katastra stavb) je vodenje le-teh v enem samem sloju, tj. katastrskem načrtu v koordinatnem sistemu D96/TM, in sicer z vsebino: parcele, tlorisi stavb, zemljiškokatastrske točke, različna druga območja (gradbena parcela, območja stavbne pravice in služnosti, območja dejanske in namenske rabe zemljišč, območja raznih omejitev ...) s predpisanimi cenilkami kakovosti. Vzdrževanje vseh teh podatkov bi bilo lahko odvisno tudi od cenilk kakovosti. Že izvedena množična Lokacijska izboljšava ZKP in napovedane ponovne izboljšave so koraki k ciljnemu stanju, ki bo tudi formalno urejeno v novem Zakonu o katastru nepremičnin.

expected to be acceptable in the future wherever the value of a piece of real estate is represented by the capital to be recorded with the highest degree of accuracy and stated with adequate legal certainty.

The targeted aim of the graphic data of the land cadastre or the planned real estate cadastre (which, in addition to the data of the land cadastre, also includes the data of the building cadastre) is to manage the data in a single layer, that is, in the cadastral plan in the D96/TM coordinate system, with the following content: plots, floor plans of buildings, land cadastral points, and various other areas (building plot, areas of building rights and easements, areas of actual and intended land use, areas of various restrictions etc.) with prescribed quality estimators. The maintenance of all this data could also depend on quality estimators. The already implemented mass positional accuracy improvement of the ZKP and the announced repeated improvements are steps towards the target condition, which will also be formally regulated in the new Real Estate Cadastre Law.

10 PRILOGE
APPENDICES

»Noben velik človek ni živel zastonj. Svetovna zgodovina je le življenjepis velikih ljudi.«
Thomas Carlyle

"No great person lives in vain. The history of the world is but the biography of great men."
Thomas Carlyle

A Ni mogoče prezreti
Noteworthy

» Če se poleg katastra izpostavi še kartografija, potem pri velikih projektih na našem ozemlju v preteklosti ni mogoče prezreti vloge nekaterih pomembnih mož:

- Janez V. Valvazor, 1641–1693 (kranjski plemič, polihistor, risar, zbiratelj in založnik),

- Janez Dizma Florjančič, 1691–1757 (astronom, matematik, geograf in kartograf),

- Peter Kozler, 1824–1879 (slovenski pravnik, gospodarstvenik, geograf, kartograf in politik),

- Jožef Mrak, 1709–1786 (vrhunski jamomerec, geodet, kartograf, predavatelj na strokovnih šolah, slikar in graditelj »slovenskih piramid«),

- Jožef Šemrl, 1754–1844 (učenec Gabriela Gruberja, gradbenik, hidrotehnik, topograf, avtor učbenika o geodeziji, 1785),

- Jurij Vega, 1754–1802 (matematik, fizik, geodet, meteorolog, topniški častnik),

- Josef Ressel, 1793–1857 (gozdar, izumitelj, topniški častnik, ekonom, geodet, avtor strokovne literature s področja geodezije,) ... «

» If we are to address cartography in addition to the cadastre, then the role of some important people in the past in large projects in our territory should definitely not be overlooked:

- Janez V. Valvasor, 1641–1693 (Carniolan nobleman, polymath, draftsman, collector and publisher),

- Janez Dizma Florjančič, 1691–1757 (astronomer, mathematician, geographer and cartographer),

- Peter Kozler, 1824–1879 (Slovenian lawyer, businessman, geographer, cartographer and politician),

- Jožef Mrak, 1709–1786 (important cave surveyor, surveyor, cartographer, lecturer at vocational schools, painter and builder of the "Slovenian pyramids"),

- Jožef Šemrl, 1754–1844 (student of Gabriel Gruber, builder, hydraulic engineer, topographer, author of a textbook on geodesy, 1785),

- Jurij Vega, 1754–1802 (mathematician, physicist, surveyor, meteorologist, artillery officer),

- Josef Ressel, 1793–1857 (forester, inventor, artillery officer, economist, surveyor, author of professional literature in the field of geodesy, ...) «

Peter Kozler (tudi Kosler), slovenski pravnik, gospodarstvenik, geograf, kartograf in politik nemškega rodu. Od leta 1823 do 1884 je družina Kozler bivala v Ortneškem ali Starem gradu, ki stoji na hribu Veliki Žrnovec v bližini vasi Hudi Konec. Danes na grad spominjajo le razvaline.
Svoje otroštvo je na tem gradu preživljal tudi Peter Kozler.

Peter Kozler (also Kosler), Slovenian legal expert, entrepreneur, geographer, cartographer and politician of German descent. From 1823 to 1884, the Kozler family lived in Ortnek Castle (or the Old Castle), which stands on the Veliki Žrnovec Hill near the village of Hudi Konec. Today, only the ruins of the castle remain.
This is where Peter Kozler spent his childhood.

Slika 10.A.1: Grad Ortnek v 19. stoletju v času bivanja družine Kozler v njem. Vir: Wikipedija

Figure 10.A.1: Ortnek Castle in the 19th century during the Kozler family's stay. Source: Wikipedia

Slika 10.A.2: Grad Ortnek v 21. stoletju. Vir: Wikipedija

Figure 10.A.2: Ortnek Castle in the 21st century. Source: Wikipedia

Slika 10.A.3: Izrez iz načrta franciscejskega katastra k. o. 1616 Velike Poljane iz leta 1826.
Vir: Arhiv Slovenije, franciscejski kataster

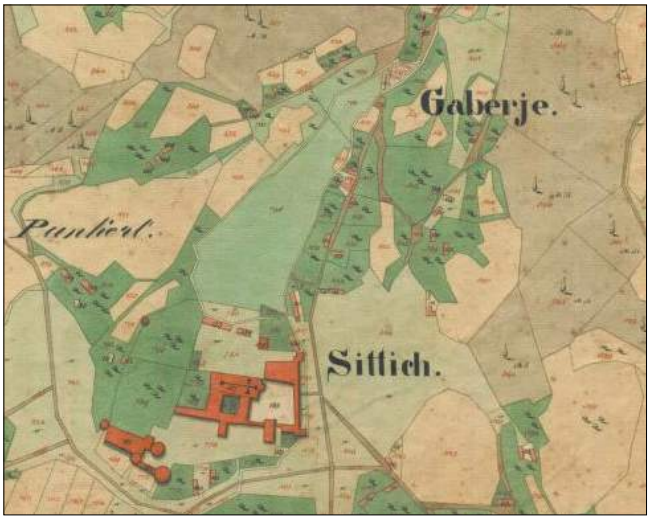
Figure 10.A.3: Excerpt from the Franciscan cadastre plan of CM 1616 Velike Poljane from 1826.
Source: Archives of the Republic of Slovenia, Franciscan cadastre

Slika 10.A.4: Izrez iz načrta k. o. 1616 Velike Poljane, vzdrževanega do leta 2004, na katerem je graščina še vedno vrisana.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 10.A.4: Excerpt from the plan of CM 1616 Velike Poljane, maintained until 2004, still showing the castle manor.
Source: the e-ZKN archive land cadastre map viewer

Janez Dizma Florjančič de Grienfeld (tudi Johannes (ali Ivan) Dizma Floriantschitsch de Grienfeld), astronom, matematik, geograf in kartograf, je opravljal vrsto pomembnih cerkvenih funkcij, nazadnje (leta 1757) je bil arhidiakon cistercijanskega samostana v Stični.
Cistercijanski samostan v Stični je bil posvečen 24. septembra leta 1136 in je najstarejši samostan na današnjem slovenskem ozemlju.

Janez Dizma Florjančič de Grienfeld (also Johannes (or Ivan) Dizma Floriantschitsch de Grienfeld), astronomer, mathematician, geographer and cartographer, performed a number of important ecclesiastical functions; his last position (in 1757) was Archdeacon of the Cistercian Monastery in Stična.
The Cistercian Monastery in Stična was consecrated on 24 September 1136 and is the oldest monastery in the territory of present-day Slovenia.



Slika 10.A.5: Izrez iz načrta franciscejskega katastra k. o. 1810 Stična (takrat Zatičina) iz leta 1826.
Vir: Arhiv Slovenije, franciscejski kataster

Figure 10.A.5: Excerpt from the Franciscan cadastre plan of CM 1810 Stična (then Zatičina) from 1826.
Source: Archives of the Republic of Slovenia, Franciscan cadastre

Slika 10.A.6: Izrez iz indikacijske skice k. o. 1810 Stična (takrat Zatičina) iz leta 1896.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 10.A.6: Excerpt from indication sketch of CM 1810 Stična (then Zatičina) from 1896.
Source: the e-ZKN archive land cadastre map viewer

Sredi 18. stoletja smo tudi Slovenci dobili svoje izvirno kartografsko delo Ducatus Carnioliae Tabula Chorographica. Zemljevid je sad avtorjevih desetletnih popisovanj in geodetskih meritev, o čemer priča tudi pojasnilo, ki sledi naslovu zemljevida: »... Jussu, Sumptuque Inclytorum Provinciae Statu um geometricè exhibita, Per Ioannem Dismam Floriantschitsch de Grienfeld, Paroch: et Consist.: Archid: Officij Sitticiensis, et per Abrahamum Kaltschmidt aeriincisa Labaci« (... ki jo je na ukaz in s stroški slavnih deželnih stanov geometrično prikazal Ivan Dizma Florjančič de Grienfeld, župnik in konzistorialni svetnik arhidiakonskega urada v

In the middle of the 18th century, Slovenes also received their first original cartographic work, Ducatus Carnioliae Tabula Chorographica. The map is the result of the author's ten years' worth of records and geodetic measurements, as evidenced by the explanation that follows the title of the map: "(...) Jussu, Sumptuque Inclytorum Provinciae Statuum geometricè exhibita, Per Ioannem Dismam Floriantschitsch de Grienfeld, Paroch: et Consist.: Archid: Officij Sitticiensis, et per Abrahamum Kaltschmidt aeriincisa Labaci" ('(...) which was, by the orders and at the expense of famous provincial estates, geometrically presented by Ivan Dizma Florjančič de Grienfeld, Pastor and Consistory Councillor of the Archdeacon's Office in Stična, and engraved in copper by Abraham

Slika 10.A.7: Ducatus Carnioliae Tabula Chorographica.
Vir: Wikipedija

Figure 10.A.7: Ducatus Carnioliae Tabula Chorographica.
Source: Wikipedia

Stični in v baker vrezal Abraham Kaltschmidt v Ljubljani).

Kot dokaz, da so bile njegove meritve zelo natančne, predvsem glede višin, ki so bile do tedaj manj dorečene, je na rob zemljevida za najvišjo goro Kranjske zapisal: »... dviga se navpično 1399 pariških šestkratnih čevljev nad ljubljanskim horizontom.« Današnjo višino Triglava je torej Florjančičeva meritev presegala le za 162 m. Posebej je treba omeniti, da se je na zemljevidu, namenjenem javnosti, prvič pojavilo ime naše najvišje gore v slovenščini kot Terglou.

V zgornjem desnem kotu zemljevida je veduta Ljubljane in načrt mesta.

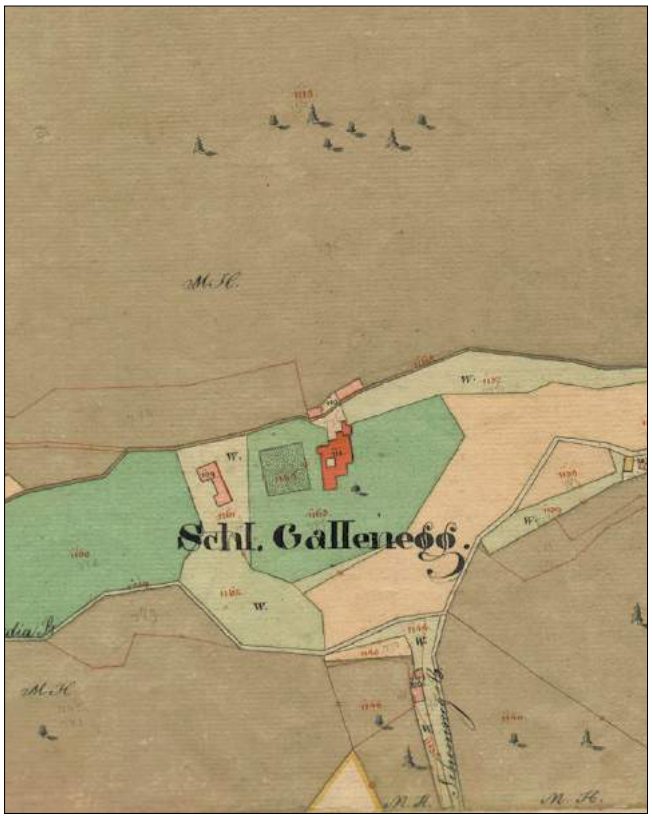
Kaltschmidt').

As proof that his measurements were very accurate, especially in terms of heights, which were less definite at the time, he wrote on the edge of the map, referring to the highest mountain in Carniola: "(...) rises vertically 1399 Paris feet above the Ljubljana horizon." Today's height of Triglav is therefore only 162 m lower than Florjančič's measurement. It should be noted that the name of our highest mountain in Slovene as it first appeared on a map intended for the public was Terglou.

In the upper right corner of the map is a view of Ljubljana and a city plan.

Janez Vajkard Valvasor, kartograf, geograf, zgodovinar, pisatelj, polihistor, založnik in zbiratelj, ki je leta 1689 v Nürnbergu izdal svoje najslavnejše delo – Slavo vojvodine Kranjske.

Janez Vajkard Valvasor, cartographer, geographer, historian, writer, polymath, publisher and collector, who published his most famous work in Nuremberg in 1689 – The Glory of the Duchy of Carniola.

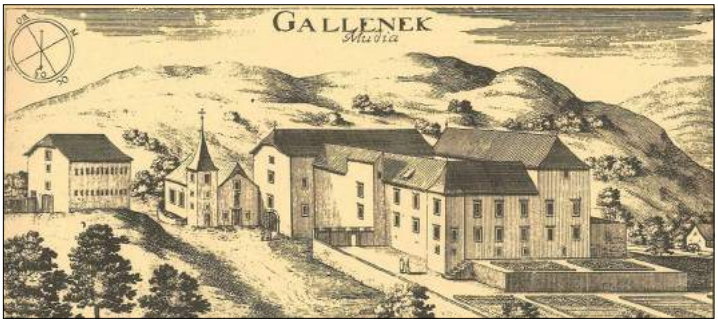


Slika 10.A.8: Izrez iz katastrskega načrta k. o. 1880 Kolovrat iz leta 1825 – Graščina Medija, kjer je svojo mladost prebil skupaj s 16 brati in sestrami Janez Vajkard Valvazor.
Vir: Arhiv Slovenije, Franciscejski kataster

Figure 10.A.8: Excerpt from cadastral plan CM 1880 Kolovrat from 1825 – the Medija Castle, where Janez Vajkard Valvasor spent his youth along with 16 siblings.
Source: Archives of the Republic of Slovenia, Franciscan cadastre

Slika 10.A.9: Izrez iz katastrskega načrta k. o. 1880 Kolovrat iz leta 1869.
Vir: Arhiv Slovenije, franciscejski kataster

Figure 10.A.9: Excerpt from the cadastral plan of CM 1880 Kolovrat from 1869.
Source: Archives of the Republic of Slovenia, Franciscan cadastre



Slika 10.A.10: Dvorec Medija , J.V. Valvasor, bakrorez iz Topografije Vojvodine Kranjske, 1679.
Vir: Wikipedija

Figure 10.A.10: The Medija Castle, J.V. Valvasor, copper engraving from the Topography of Vojvodina Kranjska, 1679.
Source: Wikipedia

Slika 10.A.11: Pogled na dvorec Medija z juga na stari razglednici iz leta okoli 1920.
Vir: Wikipedija

Figure 10.A.11: View of the Medija Castle from the south on an old postcard from around 1920.
Source: Wikipedia

Slika 10.A.12: Pogled na razvaline dvorca Medija s ceste danes.
Vir: Wikipedija

Figure 10.A.12: Present view of the Media Castle ruins from the road.
Source: Wikipedia

» *Na novo pritegnjeno gradivo iz arhivov na Dunaju in v Ljubljani je še podkrepilo spoznanje, da kranjski polihistor ni bil upravičen do baronskega naslova, s katerim se je naslavljal v naslovih svojih zadnjih, hkrati najpomembnejših delih, potem ko se je že prej predstavljal kot baron v tiskanem izkazu podrejenim vojakom ter v pisnih stikih z londonsko Kraljevo družbo. Pravico do uporabe baronskega naslova so imeli od leta 1667 samo polihistorjev starejši polbrat Karel ter vdova in dva otroka pokojnega bratranca Janeza Krstnika Valvasorja, vsi vključno s svojim potomstvom. Med plemiškimi diplomami v Avstrijskem državnem arhivu in diplomami kranjskega plemstva v Arhivu Republike Slovenije ni nobene, ki bi baronski naslov pozneje razširila še na katerega drugega Valvasorja. Tak dokument nikoli ni nastal in ga je zaman iskal že polihistorjev prapravnuk Franc Ksaver baron Dienersperg (1773–1846), ko se je konec tridesetih let 19. stoletja potegoval za naziv komornika.*

Vir: Golec B. Epilog k Valvasorjevemu baronstvu, družini, smrti, grobu in zapuščini,Zgodovinski časopis, 2014 «

» *The newly acquired material from the archives in Vienna and Ljubljana further "supported" the realization that the Carniolan polymath was not entitled to the baronial title, which he used in the titles of his last, most important, works, after he had previously already represented himself as a baron in a printed statement to his subordinate soldiers and in written contacts with the Royal Society of London. After 1667, the right to use the baronial title only belonged to the polymath's older half-brother Karel. The widow and two children of his late cousin John the Baptist Valvasor had titles, including all their descendants. Among the aristocratic diplomas in the Austrian State Archives and the diplomas of the Carniolan nobility in the Archives of the Republic of Slovenia, none can be found which would later extend the baronial title to other members of the Valvasor family. Such a document was never created and was sought in vain by the polymath's great-grandson Franc Ksaver baron Dienersperg (1773–1846), when he competed for the title of camerlegno in the late 1930s.*

Source: Golec B. Epilog k Valvasorjevemu baronstvu, družini, smrti, grobu in zapuščini, Zgodovinski časopis, 2014 «

B Doprinos znanega »Slovenca« Josipa Ressla k nastanku stabilnega katastra

The contribution of a well-known "Slovene", Josip Ressel, to the creation of a stable cadastre

Slika 10.B.1: Jossip Ressel ob prihodu v Kostanjevico leta 1817. Vir: Wikipedija

Figure 10.B.1: Josef Ressel upon his arrival in Kostanjevica in 1817. Source: Wikipedia

Življenjepis

Josef Ludvik František/Josef Ludwig Franz Ressel se je rodil 29. junija 1793 v Chrudimu, mestecu na vzhodu Češke (večji kraj v bližini je »hokejsko« mesto Pardubice), kot drugi otrok češke matere Marije Ane Konvičkove in nemškega očeta Antona Hermanna Ressla. Oče Hermann je bil mitničar in davčni nadzornik v dveh krajevnih pivovarnah, sicer pa odličen violinist. Družino so vseskozi pestile denarne težave. Josef je obiskoval župnijsko šolo v rojstnem kraju: očetov prijatelj Rykl ga je poučeval violino, nekdanji kapucin Kora pa ga je uvajal v skrivnosti latinščine, da se je leta 1806 lahko vpisal na gimnazijo v Linzu. Leta 1809 je začel dvoletni vojaški študij pri 4. artilerijskem regimentu v Čeških Budjejovicah, kjer se je izpopolnil v geometriji, trigonometriji in algebri. Šolo je uspešno končal, v vojaško službo pa ni bil sprejet, ker je bil »preveč slaboten«. V letih 1812–1814 je obiskoval dunajsko univerzo, kjer je hotel študirati medicino. To mu sicer ni uspelo, vzporedno se je izpopolnjeval v državnem računovodstvu, kemiji, veterini, agronomiji, hidravliki, arhitekturi, kar je pozneje odločilno vplivalo na njegovo raziskovalno delo. Ko so starši obubožali, je po očetovem nasvetu zaprosil za štipendijo na novoustanovljeni gozdarski akademiji v Mariabrunnu pri Dunaju. Odklonili so ga, češ da je »prešibek na pljučih«.

His life

Josef Ludvik František/Josef Ludwig Franz Ressel was born on 29 June 1793 in Chrudim, a town in eastern Bohemia (a larger town nearby is the "hockey" town of Pardubice), as the second child of Czech mother Maria Ana Konvičkova and German father Anton Hermann Ressel. His father Hermann was a customs officer and tax supervisor at two local breweries, and also an excellent violinist. The family was constantly plagued by financial problems. Josef attended the parish school in his hometown: his father's friend Rykl taught him the violin, and a former Capuchin Kora introduced him to the secrets of the Latin language, so that in 1806 he could enrol in the grammar school in Linz. In 1809, he began a two-year military study at the 4th Artillery Regiment in České Budějovice, where he excelled in geometry, trigonometry and algebra. He successfully finished school but was not accepted into the military service because he was "too weak". From 1812 to 1814 he attended the University of Vienna, where he wanted to study medicine. In this, he did not succeed, but at the same time he also specialized in state accounting, chemistry, veterinary medicine, agronomy, hydraulics, and architecture, which later had a decisive influence on his research work. When his parents became impoverished, he applied for a scholarship to the newly established Forestry Academy in Mariabrunn near Vienna following his father's advice. He was rejected for being "too weak

Honorar, ki ga je dobil od cesarja za izdelano miniaturo, ki je prikazovala bitko pri Leipzigu leta 1813, v kateri so evropski zavezniki porazili Napoleona, je Josefu Resslu omogočil dvoletni študij na gozdarski akademiji.

Po končanem študiju je bil imenovan za distriktnega (področnega) gozdarja v Pleterjah, kamor je prišel leta 1817 in po ukazu ljubljanskega gubernija vodil obsežna pogozdovalna dela. Od leta 1826 je bil primorski gozdarski mojster, kjer je ostal do leta 1832. Leta 1835 je delal v Motovunu v Istri kot višji gozdarski agent za oskrbo mornarice z ladjedelniškim lesom.

Leta 1821 se je poročil z Jakomino Orebič, hčerko motovunskega distriktnega komisarja, ki mu je rodila tri otroke, a je zelo mlada umrla. Drugič se je poročil s Terezijo Kastelic, hčerko mestnega sodnika iz Višnje Gore, in v njunem zakonu se je rodilo sedem otrok. Druga žena mu je vse do smrti zvesto stala ob strani, kar je bilo zelo pomembno, saj so Ressla zaradi njegove poštenosti in poslovne neizkušenosti grdo izkoriščali. Med letoma 1821 in 1845 se je Resslova družina zaradi finančnih stisk neštetokrat selila. Kmalu po moževi smrti leta 1857 se je Terezija preselila v Maribor, dve leti kasneje pa s sinom Henrikom v Gradec, kjer je leta 1872 umrla.

Prva služba in zemljemerstvo

Dne 16. marca 1817 je bil z odlokom samega cesarja Franca I. imenovan za distriktnega gozdarja pri posestvu študijskega zaklada v Pleterjah.

V obdobju od leta 1772, po ukinitvi jezuitskega reda, do leta 1839, ko postane zasebna lastnina, je Pleterje v državni lasti.

Odgovor na vprašanje, zakaj Ressel kot Čeh ni dobil službe na Češkem ali v Avstriji, temveč v Sloveniji, je iskati v tem, da v tedaj vodečih gozdarskih krogih, tako v Avstriji kot na Češkem, ni bil zaželen kot gozdarski strokovnjak zaradi visoke izobrazbe, za razliko od starejših kadrov brez posebne izobrazbe. Ravno tako bi lahko odgovor iskali v tem, da je osrednja dunajska oblast hotela na Kranjsko, zemljo Slovencev, postavljati Neslovence, vse z namenom slabitve slovenskih narodno prebujenjskih nagnjenj. No, Ressel ni bil nosilec germanizacije, kar dokazuje dejstvo, da se je takoj po prihodu naučil slovenskega jezika.

Poleg skrbi za dvig propadajočega gozdarstva se je ukvarjal z dolgotrajnim kartiranjem nižinskega hrastovega gozda v Krakovem. Pri delu mu je pomagal tudi njegov prijatelj Franc Škola, prav tako Čeh, ki je bil zaposlen v Novem mestu kot cestni asistent. Pomagal mu je predvsem pri geodetski izmeri (kartirala in merila sta namreč vso površino Kra-

in the lungs". The honorarium he received from the Emperor for a miniature made depicting the Battle of Leipzig in 1813, in which European allies defeated Napoleon, enabled Josef Ressl to study for two years at the Forestry Academy.

After completing his studies, he was appointed a district (sectoral) forester in Pleterje, where he arrived in 1817 and led extensive afforestation work by order of the Ljubljana governorate. From 1826, he was a forester in the Primorje region, where he remained until 1832. In 1835 he worked in Motovun in Istria as a senior forestry agent for the supply of the navy with shipbuilding timber.

In 1821 he married Jakomina Orebič, the daughter of the Motovun District Commissioner, who bore him three children, but died at a young age. His second marriage was to Terezija Kastelic, the daughter of a city judge from Višnja Gora, and seven children were born during their marriage. His second wife stood by him faithfully until his death, which was very important, since Ressel was badly exploited for his honesty and business inexperience. Between 1821 and 1845, the Ressel family moved several times due to financial hardship. Shortly after her husband's death in 1857, Terezija moved to Maribor, and two years later to Graz with her son Henrik, where she died in 1872.

First employment and surveying

On 16 March 1817, by the decree of Emperor Franz I himself, he was appointed a district forester on the estate of the "study treasure" in Pleterje.

Pleterje was state-owned in the period from 1772, after the abolition of the Jesuit order, to 1839, when it became private property.

As to why Ressel as a Czech national did not get a job in Czechia or Austria but in Slovenia, the answer can be found in the fact that in the then leading forestry circles, both in Austria and the Czech Republic, he was not desirable as a forestry expert due to his higher education, which the older staff did not have. The answer could also be sought in the fact that the central Viennese government wanted to place non-Slovenians in Carniola, the land of the Slovenes, with the aim of weakening Slovenian nationalist awakening tendencies. Ressel was not a bearer of the Germanization, which is proved by the fact that he learned the Slovene language immediately after his arrival.

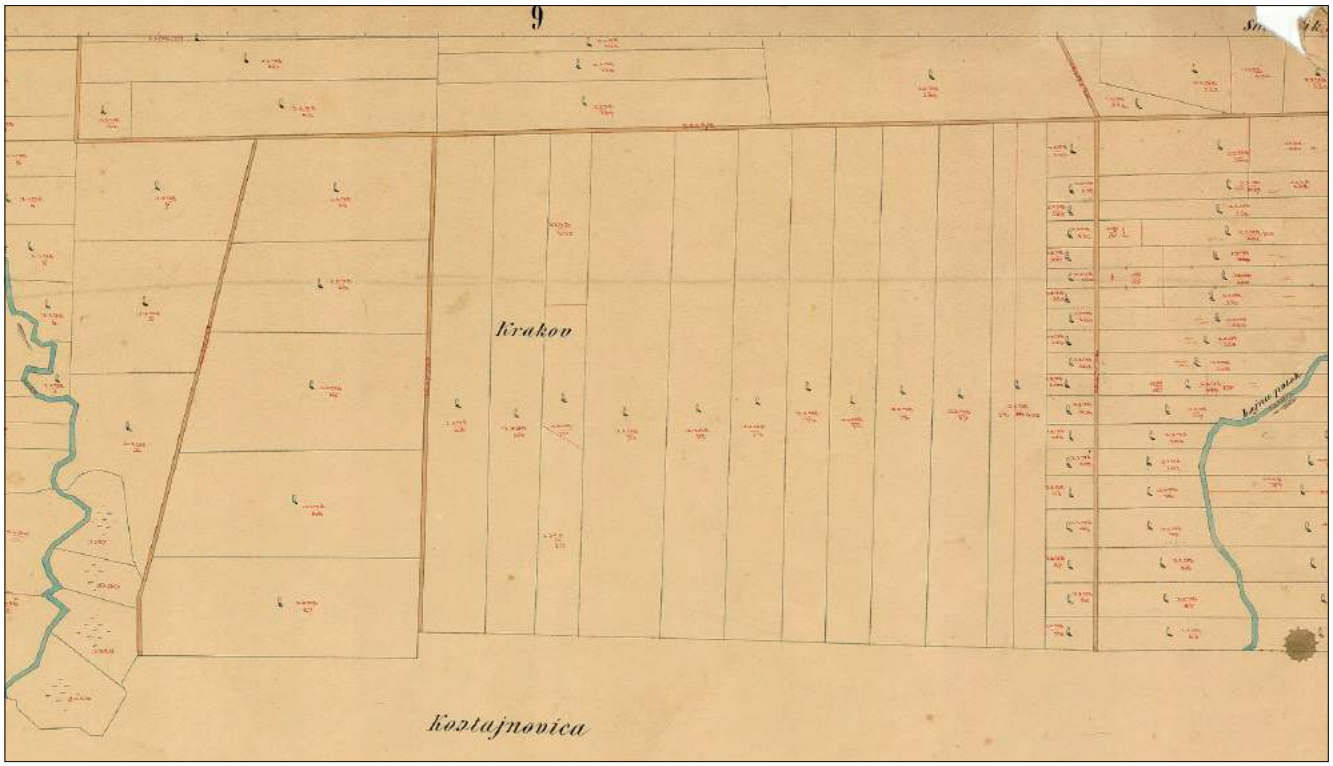
In addition to his attempts to revive the declining forestry industry, he was also involved in the long-term mapping of the lowland oak forest in Krakovo. He was also assisted in his work by his colleague Franc Škola, also a Czech who was employed in Novo mesto as a road assistant. He helped him mainly with geodetic surveying (they mapped and measured the entire area of the Krakovo Forest, which at that time was about 6000 cadastral acres or about 3500 ha). He used his experience working in

kovskega gozda, ki je bila takrat velika okoli 6000 oralov ali približno 3500 ha). Izkušnje pri delu v Krakovskem gozdu je uporabil za izdajo dveh tiskanih knjižic v nemškem jeziku, in sicer Navodila za hitro in pravilno izračunavanje površin (Anleitung zur schnellen und richtigen Flächen-Inhalts-Berechnung für Forst- und Landesvermesser, Dunaj 1817) ter Načrt distančnega merila (Entwurf eines Distanzmessers, Dunaj 1820).

Ressel je torej takratni nepregledni in neprehodni Krakovski gozd geodetsko razdelil s presekami pravokotne površine, usmerjene sever–jug, ki še sedaj rabijo gozdarski stroki kot oddelki.

the Krakovo Forest to publish two printed booklets in German, namely the Instructions for the Rapid and Correct Calculation of Forest and Rural Areas (Anleitung zur schnellen und richtigen Flächen-Inhalts-Berechnung für Forst- und Landesvermesser, Vienna 1817) and the Distance Scale Design (Entwurf eines Distanzmessers, Vienna 1820).

Ressel thus geodetically divided the then opaque and impassable Krakovo Forest with cross-sections of a rectangular surface oriented north–south, which are still used as sections in present day forestry professions.



Slika 10.B.2: k. o. 1328 Smlednik DL 9.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 10.B.2: CM 1328 Smlednik DL 9.
Source: the e-ZKN archive land cadastre map viewer

Josef Ressel je leta 1817, ko je izmeril krakovski gozd znotraj oddelkov, zaznamoval parcele, katerih meje so potekale v smeri sever–jug in vzhod–zahod. Iz gornje slike je razvidno, da se je taka razdelitev obdržala vse do današnjih dni.

Glede na to, da se je izmera Kranjske dežele začela leta 1822 in končala 1826, Ressel pa je svoje službovanje v Kostanjevici zaključil leta 1820, lahko sklepamo, da je bil Krakovski gozd izmerjen že pred tem.

In 1817, after measuring the Krakovo forest into divisions, Ressel marked plots whose borders were oriented north–south and east–west. It can be seen from the figure above that this division has persisted to this day.

Considering that the survey of the land of Carniola began in 1822 and ended in 1826, and that Ressel ended his service in Kostanjevica in 1820, we can conclude that the Krakovo Forest had been surveyed before that.

Pletersko-kostanjeviška legenda

V svojem času je bil Ressel tako priljubljen, da so mu celo Uskoki, ki so ga okradli, vrnili konja, uro in denar, ko so spoznali, kdo je bil okradenec. Ponoči so mu stvari prinesli nazaj, ga poklicali k oknu, da bi se opravičili, medtem pa se je v samostanskem prostoru, kjer je bival, udrl strop – tako so mu rešili še življenje.

Ressel kot izumitelj

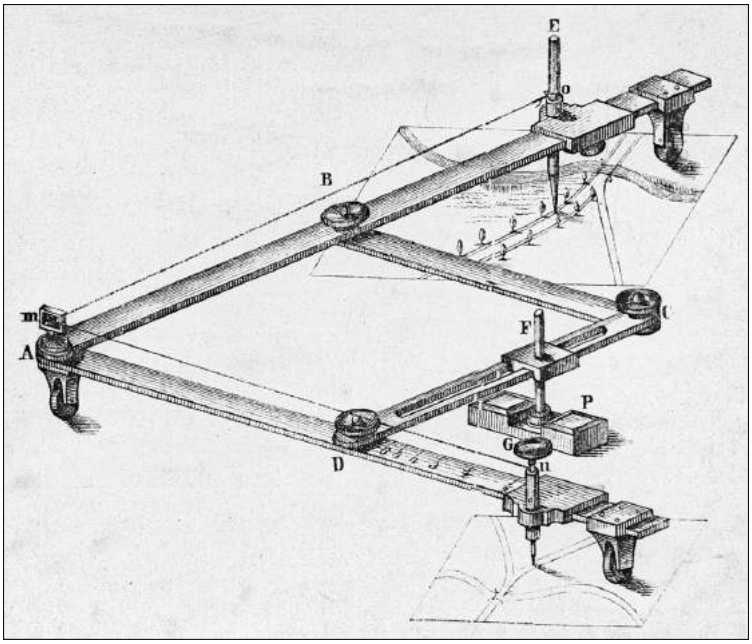
Znan je predvsem kot izumitelj, prednjači ladijski vijak (patent 1827, prva ladja z vijakom je preplula Atlantik leta 1845). Za rečni promet po Savi je predlagal mehanizem za vožnjo proti toku. Izdelal je načrte za plug s štirimi rezili, stiskalnico za olje in grozdje (edino zanju je prejel javno nagrado), sejalnik, valjčne in epicikloidne mline, brezsmradno stranišče, perkusijsko granato, netrzajni top, valjčni stroj za vroče stiskanje kovinskih predmetov, drsne ležaje je razvil v krogličnе in valjčne, načrtoval je naprave za prenos informacij (pnevmatična pošta, prenosni optični telegraf), železniške parne lokomotive, cestna parna vozila itd. Veliko iznajdb si je zamislil za mornarico: izboljšal je kompas, kronometer, pantograf – napravo za prenos risb v izbranem merilu in razvil vrsto drugih inovacij. Podelili so mu deset patentov, število iznajdb pa je vsaj petkrat večje in deloma še neraziskano.

The Pleterje-Kostanjevica legend

In his time, Ressel was so well-liked that when a group of Uskoks robbed him, they actually returned his horse, watch and money when they realized who he was. At night, they brought back his belongings and called him to the window to apologize, and precisely at that time, the ceiling of the convent room where he lived collapsed – and thus they also saved his life.

Ressel an inventor

He is best known as an inventor, particularly of a ship's propeller (patent in 1827, the first propeller ship to cross the Atlantic in 1845). For river traffic on the Sava, he proposed a mechanism for driving upstream. He created plans for a four-blade plough, an oil and grape press (the only ones for which he received a public award), a deseeder, roller and epicycloid mills, an odourless toilet, a percussion grenade, a non-recoil cannon, a roller machine for hot pressing metal objects, he developed sliding bearings into ball and roller bearings, and he designed information transmission devices (pneumatic mail, portable optical telegraph), railway steam locomotives, road steam vehicles, etc. Several of his inventions were related to the nautical field: he improved the compass, chronometer, and pantograph – a device for transforming drawings to a selected scale – and developed a number of other innovations. He was granted ten patents, and his inventions number at least five times higher and are still not fully discovered.



Slika 10.B.3: pantograf- naprava za prenos risb v izbranem merilu.
Vir: Arhiv GURS

Figure 10.B.3: The pantograph – device for transforming drawings to a selected scale.
Source: The SMARS archive

V rokopisu je ostalo več razprav: navodilo za delo okrožnih gozdarskih uradov (1827), o zgodovini gozdov na Krasu in vzrokih nepogozdenosti Krasa (1836), predlog o pogozditvi Krasa (ok. 1851, nedokončan), zgodovina mornariških gozdov (1855). Veliko se je ukvarjal z melioracijami: izsušitev delte Neretve, logov pri Dunaju, Ljubljanskega barja, regulacije Mirne, beneških lagun, načrt za namakanje Egipta itd.

Joseph Ressel je eden redkih, ki je razmišljal in se manifestiral na tako raznolikih področjih človeške dejavnosti. Joseph Ressel je bil vrhunski gozdarski strokovnjak, izumitelj širokega razpona, ekonomist z idejami, ki si zaslužijo visoke ocene. Bil je tudi humanist, saj je v vseh svojih idejah najprej pomislil na preprostega človeka. Pa vendar bi bilo njegovo splošno delo težko zabeleženo v enciklopedijah in leksikonih, če ne bi bilo izuma ladijskega vijaka.

Ladijski vijak mu je za časa njegovega življenja zagotovil slavo, nedvomno pa so mu dogodki v času izuma povzročili tudi največje ogorčenje. Ogorčenje zato, ker mu prvi poizkus praktične demonstracije s prvo testno vožnjo, ne po njegovi krivdi, ni uspel, in so njegov izum pograbili drugi.

Prihod prve tovrstne ladje v tržaškem pristanišču je doživel leta 1840, ne da bi omenili njegovo ime. In ni dočakal prvega večjega javnega priznanja s strani admirala Tegetthoffa, ki je izjavil, da je avstrijska mornarica leta 1866 zmagala v bitki pri Visu, zahvaljujoč pogonu s pomočjo ladijskega vijaka, katerega izumitelj je bil nekdanji študent gozdarske akademije v Mariabrunnu, Josef Ressel.

Čigav je Ressel

Josefa Ressla, izumitelja ladijskega vijaka, štejejo za svojega Čehi (po materi), Nemci (po očetu), Avstrijci (živel je v habsburški monarhiji), Italijani (delovanje v Trstu in Benetkah), Hrvati (delovanje v Istri in bil prvič poročen s Hrvatico) in Slovenci, ker je pretežni del svojega življenja in izumiteljskega snovanja preživel na naših tleh, bil drugič poročen s Slovenko in njegov zadnji dom je na Navju.

»Živel je na slovenski zemlji in je svoje iznajdbe, ki ga postavljajo med tehnike svetovnega imena, izumil pri nas,« je o njem leta 1937 zapisal nepodpisani avtor. »Ni ustvarjal slovenske znanosti, je pa ena izmed vezi, ki vežejo našo zemljo in z njo naš narod z ustvaritvami, ki so važne za vse človeštvo.«

Kako pomemben mož je bil

Kako pomemben mož je za svetovno zgodovino, pričajo

Several discussions remain in manuscript form: Instructions for the Work of the District Forestry Offices (1827), On the History of Forests in the Karst and The Causes of Non-afforestation of the Karst (1836), A Proposal on Afforestation of the Karst (around 1851, unfinished), and A History of Maritime Forests (1855). He was heavily involved in land reclamation: the draining of the Neretva delta, forests near Vienna, the Ljubljana marshes, the regulation of the Mirna, the Venetian lagoons, a plan for irrigating Egypt, and so on.

Joseph Ressel is one of the few people to have studied and proven himself in such diverse areas of human activity. He was a leading forestry expert, a wide-ranging inventor, and an economist with ideas that deserved high praise. He was also a humanist, for in all his ideas he would first think of the common person. Yet his general work would scarcely have been recorded in encyclopaedias and lexicons had it not been for his invention of the ship's propeller.

The propeller secured him fame during his lifetime, but undoubtedly the events at the time of the invention also caused him the most indignation. This was because his first attempt at a practical demonstration with the first test drive failed, although not through his fault, and his invention was taken over by others.

The arrival of the first ship of this kind in the port of Trieste took place in 1840, without a mention of his name. Sadly, he did not live to receive his first major public recognition from Admiral Tegetthoff, who declared that the Austrian navy had won the Battle of Vis in 1866 thanks to propeller propulsion, the inventor of which was a former student of the Mariabrunn Forestry Academy, Josef Ressel.

Who is Ressel?

Josef Ressel, the inventor of the propeller, is considered Czech (for his mother), German (for his father), Austrian (he lived in the Habsburg Monarchy), Italian (he worked in Trieste and Venice), Croatian (worked in Istria and his first marriage was to a Croatian), and Slovenian, since he spent most of his life and achieved most of his inventive design on this soil, had his second marriage to a Slovenian, and lived his final years in Navje.

"He lived on Slovenian soil, which is where he also achieved his inventions that place him among the engineers of world renown," an unnamed author wrote about him in 1937. "He did not create Slovenian science, but he is one of the ties that bind our land and our nation to creations that are important for all of mankind."

His importance

His importance in world history is attested to by numerous ar-

številni članki in znanstvene razprave širom sveta. Ni kolikor toliko omikane dežele, ki ne bi vedela o Resslu, izumitelju, znanstveniku s tako širokim znanjem, kot ga svet še dandanes ne premore.

Tako tudi ni nič nenavadnega, da se je njegov lik znašel na znamkah različnih dežel in celo na nacionalni valuti.

ticles and scientific discussions around the world. You would be hard-pressed to find a country where they haven't heard of Ressel, an inventor, a scientist with such a broad knowledge that he still has no match.

Thus, it is no wonder that his image could be found on the stamps of various countries and even on the national currency.

Slika 10.B.4: Na avstrijskem denarju.
Vir: Wikipedija

Figure 10.B.4: On Austrian money.
Source: Wikipedia

Slika 10.B.5: Na avstrijski znamki.
Vir: Wikipedija

Figure 10.B.5: On an Austrian mark
Source: Wikipedia

Slika 10.B.6: Na znamki Češkoslovaške republike.
Vir: Wikipedija

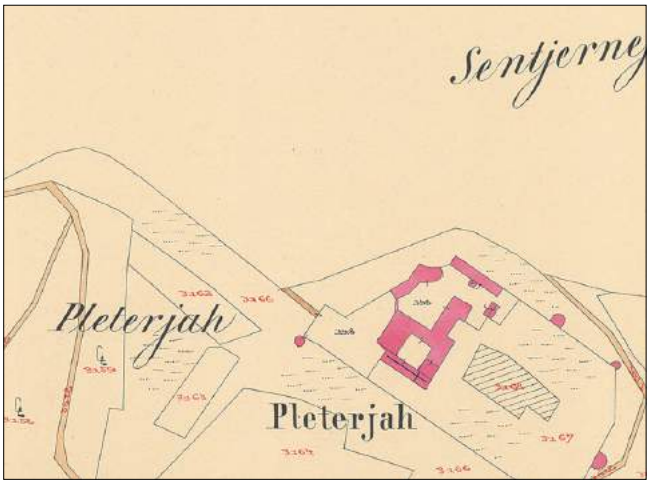
10.B.6: On a mark of the Czechoslovak Republic.
Source: Wikipedia

Kartuzija Pleterje je bila od leta 1772 do 1839 (torej tudi v času službovanja Ressla na tem kompleksu) v lasti države. Od leta 1839 do leta 1899 postane zasebna lastnina. Od 1899 dalje je v posesti kartuzijanskega reda. Od vrnitve kartuzijancev iz Francije (1899) do leta 1904 je potekala temeljita obnova.

Načrta spodaj prikazujeta stanje ob vzpostavitvi katastra in stanje po obnovi kartuzije.

The Pleterje Carthusian monastery was state-owned from 1772 to 1839 (also during Ressel's service at this establishment). Between 1839 and 1899 it became private property. It has been in the possession of the Carthusian Order since 1899. From the return of the Carthusians from France (1899) to 1904, a thorough restoration took place.

The plans below show the situation at the time of the establishment of the cadastre and the situation after the restoration of the Carthusian monastery.



Slika 10.B.7: Samostanski kompleks Pleterje, prikazan na načrtih zemljiškega katastra v času službovanja Josefa Ressla v teh krajih.
Vir: e-ZKN Pregledovalnik arhivskih zemljiško katastrskih načrtov

Figure 10.B.7: The Pleterje Monastery complex, shown on the land cadastre plans at the time of Josef Ressel's service in these locations.
Source: the e-ZKN archive land cadastre map viewer

Slika 10.B.8: Izrez iz katastrskega načrta, ki se je uporabljal v obdobju od leta 1892 do 1977, prikazuje močno razširjen samostanski kompleks, kot rezultat obnove iz leta 1904.
Vir: e-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov

Figure 10.B.8: An excerpt from the cadastral plan used in the period from 1892 to 1977 shows a heavily expanded monastery complex as a result of a 1904 restoration.
Source: the e-ZKN archive land cadastre map viewer

Slika 10.B.9: Samostan Pleterje v Resslovih časih.
Vir: Wikipedija

Figure 10.B.9: Pleterje Monastery in Ressel's time.
Source: Wikipedia

Slika 10.B.10: Posestvo kartuzijanskega samostana danes
Vir: Wikipedija

Figure 10.B.10: The present-day Carthusian
Source: Wikipedia

Josip Jurčič, avtor prvega slovenskega romana, je v povesti Kloštrski žolnir iz leta 1866, ki pa nima zgodovinske vrednosti, Josefa Ressla poimenoval Adam Zabranek.

Iz prvega dela njegove povesti izvemo, kdo je bil Josef Ressel, kje se je začelo njegovo prvo službovanje, kje se je nastanil, kakšnega videza je bil in kaj je počel.

Josip Jurčič, the author of the first Slovene novel, gave Josef Ressel the name Adam Zabranek in the short story Kloštrski žolnir from 1866, which is not historically accurate.

The first part of his story describes who Josef Ressel was, where his first service began, where he settled, what he looked like and what he was doing.

» Leta 1784 je zadela kostanjeviški klošter ista usoda kakor večino takih zavodov; cesar Jožef je namreč odpravil menihe, bogato lastnijo, polje in prostorne gozde pak je privrgel k državnemu verskemu zalogu. Poslopje nekdanjega kloštra se rabi dandanes za uradnijsko upravo; vendar v narodnih ustih uživa še vedno ime stana pobožne samije, dasi morda se marsikdo ne spominja več »kloštra« s tisto spoštljivostjo ko ob meniških časih. Ni tukaj na mestu, da bi sodili, ali je cesar Jožef prav ali napak storil, ko je odpravil samostane — celo v narodu čuješ razen glas o tem — gotovo pa nam pritegne vsak, tudi neprijatelj meništva, da so menihi vsaj v prejšnjih časih veliko storili za duševno omiko med ljudstvom.«

……

»Klošter je imel že staro pravdo z nekim sosednim graščakom in velikim posestnikom zavoljo mejnikov lepega gozda Krakovo, katerega velikanska, po planjavi ležeča širjava še današnji dan mika potnikovo oko, ako strme gleda z vinskih goric na prostrani ravnici, kjer bi rumenega polja pričakoval, stati velikanske sto in sto let stare hraste. Ker se je bil prepir znova vnel, hotel je prior Avguštin na vsak način, da se reč enkrat za vselej poravna. Zato je po njegovi prizadevi prišel v Kostanjevico zemljemerec, kateri je imel po starih zaznamih v kloštrskih zapisnikih razmeriti zemljišča in vsej pravdi konec storiti.

Ravno v plohi je dež lil neko pomladansko popoldne, kakor je pripovedovala botra Lešpeta še v poznih letih svoje starosti, ko so ljudje vprvič videli med seboj visokega mladega moža, ki je bil, kakor se je čulo, iz daljne dežele prinesel še bolj učeno glavo, kakor so jih imeli menihi. Poslednji so mu ponudili častno stanovanje v kloštru in prostor pri svoji mizi. Toda tuji zemljemerski učenjak je bil nekaj čudne nature, zahvalil se je menihom za ponudbo in je rajši v mestu v hiši vdove botre Lešpete najel borno izbico in je tam razložil svoja risanja in debele knjige. Kmetje od kraja niso vedeli, kako bi ga imenovali, kadar so o njem in njegovem početju govorili; kmalu pa so dobili na ušesa, da mu pravijo menihi »gospod inženir«, in ker njihov slovenski jezik ni mogel tuje besede s samoglasnikom od spredaj lahko izgovarjati, prekrstili so ga hitro in vsak je pravil le o »kloštrskem žolnirju«.

Z njim, to se ve, da niso mogli govoriti, ker je bil prvič tujec, grozno sam svoj in tih, da se ni za nikogar zmenil, vdrugič pa je neki jezik govoril, kateri ni bil niti tak, kakor so ga v Kostanjevici meščanke znale, niti kakor so ga sosednji Hrvatje govorili. Da pa ni latinski, kakor ga menihi imajo pri sv. maši, ali pa nemški, kakor ga Kočevarji kramljajo, to so kmalu uganile ubrisane kostanjeviške glave, kajti sem ter tja so ga vendar kako besedo razumeli. Mi, ki današnji dan že nekaj bolj poznamo narodnosti evropskega sveta, in ker se nam je na nekem lističu celo njegovo ime slovanske korenike, Adam Zabranek ohranilo, sodili bomo iz vsega tega, da je bil po rodu Čeh ali Poljak. Vendar to nič ne zaleže in se nam nikakor ne zdi tako važno, da bi reč iz temnih, samo verjetnih razlogov preiskovali; zato ga precej po njegovi vnanjosti in po telesnih in dušnih lastnostih bralcu pred oči postavimo.

Adam Zabranek je bil nenavadno visoke postave. Kar se je bila pa rast na daljavo prehitela, zamudila je bila nekoliko na širjavo, tako da je bil čez pas malo bolj tanek, kakor so moški sploh. Vendar ni mogel nihče reči, da bi ga bila ta vitka in pregibčna postava kazila; nikdar ne, temveč še rajši so ga dekliči pogledovali s skrivne strani in delavci, kateri so mu na njegovih opravkih mere in drugo učeno orodje nosili, ti so trdili, da je žolnir vragovo močen, čeravno ga ni videti čez pleča in čeravno gosposko suknjo nosi. Po svetli, črni bradi moral je biti svojih osemindvajset let star. Polno, gladko, malo zatemnelo lice kakor tudi lepo čelo in krasne, velike oči, ki so malokdaj okrog sebe pogledale, vse to je pri meščanih hčere in matere do izreka pripeljalo, da je kloštrski žolnir »prav čeden«. Po takem razsodku se pa tudi ne razume težko, da so mlade in stare prav po gostem in rade izpraševale njegovo gospodinjo, vdovo Lešpeto, kaj je pravzaprav lepemu žolnirju, da tako pusto oči v tla obrača, kaj doma dela, kaj pravi itd. Nič kaj pa ni bilo tem zvedavkam povšeči to, kar so izvedele. Botra Lešpeta je namreč vselej dva pota zamežala, potem pa z jezičkom zamigljala in skrivnostno ropotala: »Saj res, človek že dober čas živi in trpi na zemlji, da se Bogu smili; pa takega še nikdar ne. Dober gospod je, ta moj; kolikor sem mu dejala, da bi rada za izbico, toliko mi je dal; nič se ni pomišljal, ne bele ne črne ni rekel.

Saj res, do smrti mi bo žal, vse žive dni, da mu nisem rekla še enkrat toliko. Dal bi bil, dal, denarja ima, da sam ne ve koliko. Oh, kako bi si bil človek zlepo pošten kupček zaslužil! «

Izsek iz povesti Josipa Jurčiča, Kloštrski žolnir
Excerpt from a story by Josip Jurčič, Kloštrski žolnir

No, vsaj v dveh stvareh je Jurčič v začetku svojega romana pretiraval; starost, ob prihodu v Kostanjevico je bil Ressel star 24 let; in da je imel denarja, da sam ne ve, koliko. Vemo namreč, da je Ressel celo življenje tolkel revščino in kot revež tudi umrl. Tudi klošter in prior sta mašilo za začetek zgodbe, saj vemo, da je cesar Jožef samostan leta 1772 razpustil, zemljišča skupaj s poslopji pa so postala državna last.

Vsekakor je treba jemati Jurčičevo upodobitev »kloštrskega žolnirja« kot povest.

Jurčič exaggerated at least two facts at the beginning of his novel; Ressel's age of 24 upon his arrival in Kostanjevica; and his wealth. We know that Ressel struggled with poverty all his life and died a poor man. The monastery and the prior, as well, are not entirely true to reality, since we know that Emperor Joseph dissolved the monastery in 1772, and the land along with the buildings became state property.

In any case, Jurčič's portrayal of the "cloister soldier" is just a story and should be considered as such.

C Slikovno gradivo:
Image material:

Slika 10.C.1: Ekipa vojaško-geografskega voda slovenskega triglavskega planinskega polka leta 1936 nad Rudnim poljem – Pokljuka (Vojaške enote so bile pri triangulacijskih nalogah vključene v vseh obdobjih in v vseh političnih sistemih).
Vir: Arhiv GURS

Figure 10.C.1: A team of the military-geographical platoon of the Slovene Triglav Mountain Regiment in 1936 above Rudno polje – Pokljuka (Military units were involved in triangulation tasks in all periods and in all political systems).
Source: The SMARS archive

Slika 10.C.2: Terenska ekipa geodetov v začetku 60. let 20. stoletja.
Vir: Arhiv GURS

Figure 10.C.2: Field team of surveyors in the early 1960s.
Source: The SMARS archive

Slika 10.C.3: Do določenega kraja z avtom, naprej pa s konjem. Precej pogosta situacija pri določanju koordinat trigonometričnih točk na odročnih krajih.
Vir: Arhiv GURS

Figure 10.C.3: Part of the way by car and part by horse. Quite a common situation in determining the coordinates of trigonometric points in remote locations.
Source: The SMARS archive

Slika 10.C.4: Primer tahimetrične meritve povečane natančnosti s horizontalno lato.
Vir: Arhiv GURS

Figure 10.C.4: Example of a tachymetric measurement of increased accuracy with a horizontal rod.
Source: The SMARS archive

Slika 10.C.5: Geodetski instrumentarij je bil v 20. stoletju zelo podvržen vremenskim vplivom, istočasno je bil tudi geodet pri delu na terenu, po zaslugi instrumenta, deležen posebne ugodnosti.
Vir: Arhiv GURS

Figure 10.C.5: Surveying instruments in the 20th century were heavily exposed to the weather, so thanks to this instrument, the surveyor would also receive special benefits when working in the field.
Source: The SMARS archive

Slika 10.C.6: Pred aerosnemanjem se je v pisarni naredil točen načrt, po katerem je letalo slikalo teren. Kljub najsodobnejši tehniki tistega časa (aerosnemanje) pa se je za pripravo načrta še vedno uporabljalo logaritemsko računalo (nem. Rechenschieber).
Vir: Arhiv GURS

Figure 10.C.6: Prior to aerial photography, an accurate plan was made in the office, which the aircraft used when recording the terrain. Despite the state-of-the-art technique of the time (aerial photography), a slide rule (German Rechenschieber) was still used to produce the plan.
Source: The SMARS archive

Slika 10.C.7: Zaposleni na Republiški geodetski upravi leta 1982.
Vir: Arhiv GURS

Figure 10.C.7: Employees at the Republic Geodetic Administration in 1982.
Source: The SMARS archive

V letu 1980 je bil sprejet Zakon o imenovanju in evidentiranju naselij, ulic in stavb, na podlagi katerega so pristojnosti vodenja imen naselij, ulic in stavb prešle v pristojnost geodetske službe. Geodetska služba je nastavila novo evidenco Register prostorskih enot.

In 1980, the Act Regulating the Naming and Registration of Settlements, Streets and Buildings was adopted, on the basis of which the powers to manage the names of settlements, streets and buildings were transferred to the competence of the Surveying and Mapping Authority. The Surveying and Mapping Authority established a new register of spatial units.

Slika 10.C.8: Nov zakon, nov izziv pred geodetsko stroko.
Vir: Arhiv GURS

Figure 10.C.8: A new law, a new challenge for the surveying profession.
Source: The SMARS archive

Slika 10.C.9: Porastna mapa iz leta 1923 v M 1 : 5760 Gozdne uprave grofov Thurnov (danes je eden od kazalnikov vrednotenja gozdov rastiščni koeficient).
Vir: Arhiv GURS

Figure 10.C.9: Growth map from 1923 in scale 1:5760 of the forest administration of the Counts of Thurn (today one of the indicators in forest valuation is the site growth coefficient).
Source: The SMARS archive

Literatura in viri:
Literature and sources:

1. Bele, M.: 2017 Matija Burger, ljubljanski župan 1851–1857 Časopis za humanistične in družboslovne študije, Maribor
1. Bele, M.: 2017 Matija Burger, ljubljanski župan 1851–1857 Journal for the Humanities and Social Sciences, Maribor
2. Berk, S. 2001. Možnost transformacije katastrskih načrtov grafične izmere v državni koordinatni sistem. Geodetski vestnik 45, 12.
2. Berk, S. 2001. Možnost transformacije katastrskih načrtov grafične izmere v državni koordinatni sistem. Journal of Geodesy 45, 12.
3. Bleiweis, J., 1876. Kaj je bolje: da ima gospodar svoje zemljišče skupaj ali pa raztreseno na več krajih?. Kmetijske in rokodelske novice, letnik 34, številka 52 (27. 12. 1876). http://www.dlib.si/?URN=URN:NBN:SI:DOC-HN1O4EFA, pridobljeno marec 2020
3. Bleiweis, J., 1876. Kaj je bolje: da ima gospodar svoje zemljišče skupaj ali pa raztreseno na več krajih?. Kmetijske in rokodelske novice, year 34, issue 52 (27. 12. 1876). http://www.dlib.si/?URN=URN:NBN:SI:DOC-HN1O4EFA, acces sed on March 2020
4. Boldin, D. 2004. ZKN – del digitalnega arhiva. Geodetski vestnik. 48, 1.
4. Boldin, D. 2004. ZKN – del digitalnega arhiva. Journal of Geodesy. 48, 1.
5. Czechoslovakia Postage Stamp View; https://www.google.com/search?q=Josef+Ressel&hl=sl&tbm=isch&sou rce=iu&ictx=1&fir=Ma2UwYyzWqJyfM%253A%252Czp4-VNuxDqQk3M%252C%252Fm%252F03cj58&vet=1& usg=AI4_-kShFgocJToLZ9ww1SEt2Fk9OVUt8g&sa=X&ved=2ahUKEwjOmY6T_dzkAhXJb1AKHZG-BZwQ_B0wC noECAYQAw#imgrc=0M1Gx2cTOz7LJM, pridobljeno 19. 9. 2019
5. Czechoslovakia Postage Stamp View; https://www.google.com/search?q=Josef+Ressel&hl=sl&tbm=isch&sou rce=iu&ictx=1&fir=Ma2UwYyzWqJyfM%253A%252Czp4-VNuxDqQk3M%252C%252Fm%252F03cj58&vet=1& usg=AI4_-kShFgocJToLZ9ww1SEt2Fk9OVUt8g&sa=X&ved=2ahUKEwjOmY6T_dzkAhXJb1AKHZG-BZwQ_B0wC noECAYQAw#imgrc=0M1Gx2cTOz7LJM, accessed on 19. 9. 2019
6. Čeh, M., Stopar B., Trobec, B., Brumec, M., Tekavec, J., Lisec, A. 2017. Pilotni projekt izboljšave kakovosti zemljiško-katastrskega prikaza v katastrski občini Črešnjice, Geodetski vestnik (2017); http://geodetski-vestnik.com/61/1/ gv61-1_ceh.pdf, pridobljeno 16. 9. 2019
6. Čeh, M., Stopar B., Trobec, B., Brumec, M., Tekavec, J., Lisec, A. 2017. Pilotni projekt izboljšave kakovosti zemljiško-katastrskega prikaza v katastrski občini Črešnjice, Geodetski vestnik (2017); http://geodetski-vestnik.com/61/1/ gv61-1_ceh.pdf, accessed on 16. 9. 2019
7. Čeh, M., Lisec A., Ferlan M., Šumrada, R. 2011. Geodetsko podprta prenova grafičnega dela zemljiškega katastra« Geodetski vestnik (2011) https://core.ac.uk/download/pdf/12089258.pdf, pridobljeno 17. 9. 2019
7. Čeh, M., Lisec A., Ferlan M., Šumrada, R. 2011. Geodetsko podprta prenova grafičnega dela zemljiškega katastra« Geodetski vestnik (2011) https://core.ac.uk/download/pdf/12089258.pdf, accessed on 17. 9. 2019
8. Čuček, I., 1977. Vzdrževanje in obnova geodetskih načrtov od merila 1 : 500 do 1 : 2880, Raziskovalna naloga R-246-5988/77. Ljubljana, Inštitut za geodezijo in fotogrametrijo.
8. Čuček, I., 1977. Vzdrževanje in obnova geodetskih načrtov od merila 1 : 500 do 1 : 2880, Raziskovalna naloga R-246-5988/77. Ljubljana, Institute of Geodesy and Photogrammetry.
9. Čuček, I., Črnivec, M. 1977. Transformacija načrtov zemljiškega katastra 1 : 2880 v načrte nove izmere. Ljubljana, Inštitut za geodezijo in fotogrametrijo.
9. Čuček, I., Črnivec, M. 1977. Transformacija načrtov zemljiškega katastra 1 : 2880 v načrte nove izmere. Ljubljana, Institute of Geodesy and Photogrammetry.
10. Dolenc, M. 1930. Časopis za zgodovino in narodopisje, Maribor
10. Dolenc, M. 1930. Časopis za zgodovino in narodopisje, Maribor
11. Dolinar, K. 2008. Natančnost digitalnega katastrskega načrta ... https://core.ac.uk/download/pdf/12088391.pdf, pridobljeno 11. 9. 2019
11. Dolinar, K. 2008. Czechoslovakia Postage Stamp View; https://core.ac.uk/download/pdf/12088391.pdf, accessed on 11. 9. 2019

12. E-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov; https://gis.gov.si/ezkn/
12. E-ZKN Pregledovalnik arhivskih zemljiškokatastrskih načrtov; https://gis.gov.si/ezkn/
13. FAO, 2008. Opportunities to mainstream land consolidation in rural development programmes of the European Union. FAO Land Tenure Policy Series 2. Food and Agriculture Organization of the United Nations, Rome, 2008. 72 str. http://www.fao.org/3/i0091e/i0091e00.pdf, pridobljeno 19. 3. 2020
13. FAO, 2008. Opportunities to mainstream land consolidation in rural development programmes of the European Union. FAO Land Tenure Policy Series 2. Food and Agriculture Organization of the United Nations, Rome, 2008. 72 p. http://www.fao.org/3/i0091e/i0091e00.pdf, accessed on 19. 3. 2020
14. Ferlan, M. 2005. Geodetske evidence. Ljubljana, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo, Oddelek za geodezijo.
14. Ferlan, M. 2005. Geodetske evidence. Ljubljana, University of Ljubljana, Faculty of Civil Engineering and Geodesy, Department of Geodesy.
15. Ferlan, M. 2005. Zemljiški kataster, Ljubljana, Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo.
15. Ferlan, M. 2005. The land cadastre, Ljubljana, University of Ljubljana, Faculty of Civil Engineering and Geodesy, Department of Geodesy.
16. Gozdar Josef Ressel izumitelj ladijskega vijaka - Ognjišče, https://revija.ognjisce.si/iz-vsebine/priloga/1990-gozdar-josef-ressel-izumitelj-ladijskega-vijaka, pridobljeno september 2019
16. Gozdar Josef Ressel izumitelj ladijskega vijaka - Ognjišče, https://revija.ognjisce.si/iz-vsebine/priloga/1990-gozdar-josef-ressel-izumitelj-ladijskega-vijaka, accessed in September 2019
17. Gozdarski vestnik – ZGDS, http://zgds.si/wp-content/uploads/2017/01/gozdarskiVestnik1953.pdf; pridobljeno 5. 9. 2019
17. Gozdarski vestnik – ZGDS, http://zgds.si/wp-ontent/uploads/2017/01/gozdarskiVestnik1953.pdf; accessed on 5. 9. 2019
18. GURS (2017). Razpisna dokumentacija za oddajo javnega naročila po odprtem postopku. Lokacijska izboljšava zemljiškokatastrskega prikaza.
18. SMARS (2017). Razpisna dokumentacija za oddajo javnega naročila po odprtem postopku. Lokacijska izboljšava zemljiškokatastrskega prikaza.
19. (http://arsq.gov.si/query/detail.aspx?ID=25397), pridobljeno november 2019
19. (http://arsq.gov.si/query/detail.aspx?ID=25397), accessed in November 2019
20. http://arsq.gov.si/Query/detail.aspx?ID=27626, pridobljeno november 2019
20. (http://arsq.gov.si/Query/detail.aspx?ID=27626), accessed in November 2019
21. http://arsq.gov.si/Query/detail.aspx?ID=25493, pridobljeno november 2019
21. (http://arsq.gov.si/Query/detail.aspx?ID=25493), accessed in November 2019
22. https://memoriascripta.nuk.uni-lj.si/zbirke/o_redkosti.php?id=137&uid=139&pid=137, pridobljeno november 2019
22. (https://memoriascripta.nuk.uni-lj.si/zbirke/o_redkosti.php?id=137&uid=139&pid=137), accessed in November 2019
23. http://museums.eu/collection/object/232738/kartuzija-pleterje?pUnitId=28, pridobljeno 14. 11. 2019
23. http://museums.eu/collection/object/232738/kartuzija-pleterje?pUnitId=28, accessed on 14. 11. 2019
24. https://sl.wikipedia.org/wiki/Ortne%C5%A1ki_grad#/media/Slika:Valvasor_-_Ortne%C5%A1ki_grad.jpg, pridobljeno oktober 2019
24. https://sl.wikipedia.org/wiki/Ortne%C5%A1ki_grad#/media/Slika:Valvasor_-_Ortne%C5%A1ki_grad.jpg, accessed in October 2019
25. https://sl.wikipedia.org/wiki/Cistercijanski_samostan_Sti%C4%8Dna#/media/Slika:Sti%C4%8Dna_-_panorama.jpg, pridobljeno oktober 2019
25. https://sl.wikipedia.org/wiki/Cistercijanski_samostan_Sti%C4%8Dna#/media/Slika:Sti%C4%8Dna_-_panorama.jpg, accessed in October 2019
26. https://sl.wikipedia.org/wiki/Slika:Ducatus_Carnioliae_Tabula_Chorographica,_Jussu,_Sumptu%27que_Inclitorum_Provinciae_Statuum_geometrice_exhibita_1744.jpg, pridobljeno november 2019
26. (https://sl.wikipedia.org/wiki/Slika:Ducatus_Carnioliae_Tabula_Chorographica,_Jussu,_Sumptu%27que_Inclitorum_Provinciae_Statuum_geometrice_exhibita_1744.jpg), accessed in November 2019

27. https://sl.wikipedia.org/wiki/Cistercijanski_samostan_Sti%C4%8Dna, pridobljeno oktober 2019
27. https://sl.wikipedia.org/wiki/Cistercijanski_samostan_Sti%C4%8Dna, accessed in October 2019
28. https://www.e-prostor.gov.si/zbirke-prostorskih-podatkov/drzavni-prostorski-koordinatni-sistem/horizontalna-sestavina/drzavni-koordinatni-sistem-d48gk/, pridobljeno december 2019
28. https://www.e-prostor.gov.si/zbirke-prostorskih-podatkov/drzavni-prostorski-koordinatni-sistem/horizontalna-sestavina/drzavni-koordinatni-sistem-d48gk/, accessed in December 2019
29. https://www.facebook.com/photo.php?fbid=10208618051435534&set=a.10203097760231704&type=3&theater, pridobljeno oktober 2019
29. https://www.facebook.com/photo.php?fbid=10208618051435534&set=a.10203097760231704&type=3&theater, accessed in October 2019
30. https://www.facebook.com/photo.php?fbid=10208618051435534&set=a.10203097760231704&type=3&theaterhttp://www.gradovi.net/grad/data/medija/DSC05684.JPG, pridobljeno oktober 2019
30. https://www.facebook.com/photo.php?fbid=10208618051435534&set=a.10203097760231704&type=3&theaterhttp://www.gradovi.net/grad/data/medija/DSC05684.JPG, accessed in October 2019
31. http://www.gradovi.net/grad/data/medija/medija_1920.jpg, pridobljeno november 2019
31. (http://www.gradovi.net/grad/data/medija/medija_1920.jpg), accessed in November 2019
32. http://www.gradovi.net/grad/medija_dvor_dvorec;, pridobljeno oktober 2019
32. http://www.gradovi.net/grad/medija_dvor_dvorec, accessed in October 2019
33. https://www.izletko.si/, pridobljeno marec 2020
33. https://www.izletko.si/, accessed in March 2020
34. http://www.pasijon.si/, pridobljeno marec 2020
34. http://www.pasijon.si/, accessed in March 2020
35. https://www.seviqc-brezice.si/, pridobljeno marec 2020
35. https://www.seviqc-brezice.si/, accessed in March 2020
36. https://www.lokalno.si, pridobljeno marec 2020
36. https://www.lokalno.si, accessed in March 2020
37. https://kraji.eu/, pridobljeno marec 2020
37. https://kraji.eu/, accessed in March 2020
38. https://www.hoteli-bernardin.si, pridobljeno marec 2020
38. https://www.hoteli-bernardin.si, accessed in March 2020
39. https://sl.wikipedia.org/,pridobljeno marec 2020
39. https://sl.wikipedia.org/, accessed in March 2020
40. https://www.goprekmurje.si/, pridobljeno marec 2020
40. https://www.goprekmurje.si/, accessed in March 2020
41. https://www.kungota.si/, pridobljeno marec 2020
41. https://www.kungota.si/, accessed in March 2020
42. https://sl.wikipedia.org/, pridobljeno marec 2020
42. https://sl.wikipedia.org/, accessed in March 2020
43. http://www.slovenjgradec.si, pridobljeno marec 2020
43. http://www.slovenjgradec.si, accessed in March 2020
44. https://www.tms.si, pridobljeno marec 2020
44. https://www.tms.si, accessed in March 2020
45. https://kraji.eu/,pridobljeno marec 2020
45. https://kraji.eu/, accessed in March 2020
46. IzbA Sistem za spremljanje, administracijo in kontrolo projekta lokacijske izboljšave ZKP, (2017), Geodetski inštitut Slovenije
46. IzbA Sistem za spremljanje, administracijo in kontrolo projekta lokacijske izboljšave ZKP, (2017), Geodetski inštitut Slovenije

47. Javna naročila, Geodetska uprava RS, Izboljšava lokacijskih podatkov zemljiškega katastra na območju trajnih nasadov in na območju občine s pribl. 50.000 parcelami; http://www.gu.gov.si/si/javna_narocila/?tx_t3javnirazpis_pi1%5Bshow_single%5D=912
47. Javna naročila, Geodetska uprava RS, Izboljšava lokacijskih podatkov zemljiškega katastra na območju trajnih nasadov in na območju občine s pribl. 50.000 parcelami; http://www.gu.gov.si/si/javna_narocila/?tx_t3javnirazpis_pi1%5Bshow_single%5D=912
48. Josef Ressel: Forstmann und Erfinder; https://www.google.com/search?q=Josef+Ressel&hl=sl&tbm=isch&source=iu&ictx=1&fir=Ma2UwYyzWqJyfM%253A%252Czp4-VNuxDqQk3M%252C%252Fm%252F03cj58&vet=1&usg=AI4_-kShFgocJToLZ9ww1SEt2Fk9OVUt8g&sa=X&ved=2ahUKEwjOmY6T_dzkAhXJb1AKHZG-BZwQ_B0wCnoECAYQAw#imgrc=8Sc-bRnYCI7dzM, pridobljeno 19. 9. 2019
48. Josef Ressel: Forstmann und Erfinder; https://www.google.com/search?q=Josef+Ressel&hl=sl&tbm=isch&source=iu&ictx=1&fir=Ma2UwYyzWqJyfM%253A%252Czp4-VNuxDqQk3M%252C%252Fm%252F03cj58&vet=1&usg=AI4_-kShFgocJToLZ9ww1SEt2Fk9OVUt8g&sa=X&ved=2ahUKEwjOmY6T_dzkAhXJb1AKHZG-BZwQ_B0wC noECAYQAw#imgrc=8Sc-bRnYCI7dzM, accessed on 19. 9. 2019
49. Jurčič, J. 1949 Kloštrski žolnir, Zbrano delo 3, Kamnik (1949), https://sl.wikisource.org/wiki/Klo%C5%A1trski_%C5%BEolnir pridobljeno, september 2019 C:\Osebno\SlakJ55\BROSURA_LOKACIJSKA IZBOLJSAVA\JOC\ gozdarski vestnik – ZGDS,
49. Jurčič, J. 1949 Kloštrski žolnir, Zbrano delo 3, Kamnik (1949), https://sl.wikisource.org/wiki/Klo%C5%A1trski_%C5%BEolnir pridobljeno, september 2019 C:\Osebno\SlakJ55\BROSURA_LOKACIJSKA IZBOLJSAVA\JOC\ gozdarski vestnik – ZGDS,
50. Kartuzijanski samostan Pleterje; https://www.lepote-slovenije.si/samostan-pleterje/, pridobljeno 16. 10. 2019
50. Kartuzijanski samostan Pleterje; https://www.lepote-slovenije.si/samostan-pleterje/, accessed on 16. 10. 2019
51. Klarič, M. 1987. Obnova zemljiškega katastra. Geodetski vestnik.
51. Klarič, M. 1987. Obnova zemljiškega katastra. Journal of Geodesy.
52. Korošec, B. 1978. Naš prostor v času in projekciji, Oris razvoja zemljemerstva, kartografije in prostorskega urejanja na osrednjem Slovenskem. Ljubljana, Geodetski zavod Republike Slovenije.
52. Korošec, B. 1978. Naš prostor v času in projekciji, Oris razvoja zemljemerstva, kartografije in prostorskega urejanja na osrednjem Slovenskem. Ljubljana, Geodetic Institute of the Republic of Slovenia.
53. Krošl, A. 1941. Zemljiška odveza na bivšem Kranjskem (organizacija in delo zemljiškoodveznih organov 1849–1853)
53. Krošl, A. 1941. Zemljiška odveza na bivšem Kranjskem (organizacija in delo zemljiškoodveznih organov 1849–1853)
54. Lisec, A., Primožič, T., Pintar, M., Bovha, D., Ferlan, M., Prosen, A., Šumrada, R., Čeh, M., Drobne, S., 2013. Analiza stanja in izzivi na področju komasacij kmetijskih zemljišč v Sloveniji, Geodetski vestnik 57/4
54. Lisec, A., Primožič, T., Pintar, M., Bovha, D., Ferlan, M., Prosen, A., Šumrada, R., Čeh, M., Drobne, S., 2013. Analiza stanja in izzivi na področju komasacij kmetijskih zemljišč v Sloveniji, Journal of Geodesy 57/4
55. Mal, J. 1934. Zgodovina Slovenskega naroda, Zv. 12, Celje
55. Mal, J. 1934. Zgodovina Slovenskega naroda, Zv. 12, Celje
56. MapCAD 1992. MapCAD Reference Manual, Version 3.6. Visionglobal Ltd, London, 1992. 168 str.
56. MapCAD 1992. MapCAD Reference Manual, Version 3.6. Visionglobal Ltd, London, 1992. 168 p.
57. Marijan F. Kranjc , Josef (Jožef) Ressel, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwi-v7jT_7PkAhXF0KQKHYWfAqkQFjAAegQIARAC&url=http%3A%2F%2Ffreeweb.t-2.net%2FVojastvo%2Fdok%2FJosef_Ressel.pdf&usg=AOvVaw2yBrYzO8gsEDKGTLGmiCzc, pridobljeno september 2019
57. Marijan F. Kranjc , Josef (Jožef) Ressel, https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=2ahUKEwi-v7jT_7PkAhXF0KQKHYWfAqkQFjAAegQIARAC&url=http%3A%2F%2Ffreeweb.t-2.net%2FVojastvo%2Fdok%2FJosef_Ressel.pdf&usg=AOvVaw2yBrYzO8gsEDKGTLGmiCzc, accessed in September 2019
58. Mivšek, E., Ravnihar, F., Žnidaršič, H. 2012. Izdelava zemljiškokatastrskega načrta, Geodetski vestnik (2012); http://www.geodetski-vestnik.com/56/4/gv56-4_691-697.pdf, pridobljeno 16. 9. 2019
58. Mivšek, E., Ravnihar, F., Žnidaršič, H. 2012. Izdelava zemljiškokatastrskega načrta, Geodetski vestnik (2012); http://www.geodetski-vestnik.com/56/4/gv56-4_691-697.pdf accessed on 16. 9. 2019

59. Mlakar, G. 1986. Kataster 1, Zemljiški kataster in zemljiška knjiga. Ljubljana, Tehniška
59. Mlakar, G. 1986. Kataster 1, Zemljiški kataster in zemljiška knjiga. Ljubljana, Tehniška
60. založba Slovenije.
60. založba Slovenije.
61. Murko V., Slovenski biografski leksikon, https://www.slovenska-biografija.si/oseba/sbi503632/, pridobljeno sep tember 2019
61. Murko V., Slovenski biografski leksikon, https://www.slovenska-biografija.si/oseba/sbi503632/, accessed in Sep tember 2019
62. Navodilo za oštevilčbo lomnih točk ZKP (Februar 2018), Geodetska uprava RS. http://gublu5.gurs.sigov.si/pls/ portal/docs/PAGE/INTRANET/OSNOVNASTRAN/ZEMLJISKI%20KATASTER/TAB2064225/35311_2_2017_OSTE VILCBA%20LOMNIH%20TOCK%20ZKP_FEB2018.PDF pridobljeno januar 2020
62. Navodilo za oštevilčbo lomnih točk ZKP (February 2018), Surveying and Mapping Authority of the Republic of Slo venia. http://gublu5.GURS.sigov.si/pls/portal/docs/PAGE/INTRANET/OSNOVNASTRAN/ZEMLJISKI%20KATA STER/TAB2064225/35311_2_2017_OSTEVILCBA%20LOMNIH%20TOCK%20ZKP_FEB2018.PDF accessed in Ja nuary 2020
63. Novice, 1877. Bolj na drobno o zložbi zemljišč (Commasation). Kmetijske in rokodelske novice, letnik 35, številke 2–4 (10. 1. 1877–24. 1. 1877). http://www.dlib.si/?URN=URN:NBN:SI:DOC-49CZQ5UF, pridobljeno marec 2020
63. Novice, 1877. Bolj na drobno o zložbi zemljišč (Commasation). Kmetijske in rokodelske novice, letnik 35, številke 2–4 (10. 1. 1877–24. 1. 1877). http://www.dlib.si/?URN=URN:NBN:SI:DOC-49CZQ5UF, accessed in March 2020
64. Nove koordinate stalnih postaj omrežja SIGNAL na osnovi GNSS-izmere »EUREF Slovenija 2016« (koordina te ETRS89/D96-17)http://www.gu-signal.si/sites/default/files/Obvestilo_12_12_2019-EUREF_SVN_2016.pdf, pridobljeno oktober 2019
64. Nove koordinate stalnih postaj omrežja SIGNAL na osnovi GNSS-izmere »EUREF Slovenija 2016« (koordinate ETRS89/D96-17) http://www.gu-signal.si/sites/default/files/Obvestilo_12_12_2019-EUREF_SVN_2016.pdf, acces sed in October 2019
65. Ocena kakovosti podatkov zemljiškega katastra, http://e-prostor.gov.si/fileadmin/ZK/Ocena_kakovosti/kakovost. xls, pridobljeno 10. 9. 2019
65. Ocena kakovosti podatkov zemljiškega katastra, http://e-prostor.gov.si/fileadmin/ZK/Ocena_kakovosti/kakovost. xls, accessed on 10. 9. 2019
66. Osnovne značilnosti digitalnega katastrskega načrta. 1998. Geodetska uprava Republike Slovenije
66. Osnovne značilnosti digitalnega katastrskega načrta. 1998. Surveying and Mapping Authority of the Republic of Slovenia
67. Omrežje SIGNAL http://www.gu-signal.si/, pridobljeno oktober 2019
67. Omrežje SIGNAL http://www.gu-signal.si/, accessed October 2019
68. Petek T., Seliškar A.; Spremembe in dopolnitve v nepremičninski zakonodaji, Geodetski vestnik (2018), http://www. geodetski-vestnik.com/62/1/gv62-1_petek.pdf, pridobljeno 19. 9. 2019
68. Petek T., Seliškar A.; Spremembe in dopolnitve v nepremičninski zakonodaji, Geodetski vestnik (2018), http://www. geodetski-vestnik.com/62/1/gv62-1_petek.pdf, accessed on 19. 9. 2019
69. 35 let geodetske službe v RS Sloveniji. 1979. Ljubljana, Odbor za proslavo 35-letnice geodetske službe v SRS
69. 35 let geodetske službe v RS Sloveniji. 1979. Ljubljana, Odbor za proslavo 35-letnice geodetske službe v SRS
70. 500 Schilling Banknote 1965 Österreich; https://www.ma-shops.com/pollandt/item.php?id=35405&lang=en& curr=EUR, pridobljeno 19. 9. 2019
70. 500 Schilling Banknote 1965 Österreich; https://www.ma-shops.com/pollandt/item.php?id=35405&lang=en& curr=EUR, accessed on 19. 9. 2019
71. PP KONTROLE NAPAK Programski paket za pregledovanje in spremljanje napak v katastrih, http://kontrole.gurs. sigov.si:7021/Kontrole/Login.jsp, pridobljeno januar 2020
71. PP KONTROLE NAPAK Programski paket za pregledovanje in spremljanje napak v katastrih, http://kontrole.GURS. sigov.si:7021/Kontrole/Login.jsp, accessed in January 2020
72. Pregledovalnik digitalnih elaboratov arhiva ZK ; http://gublu3.gurs.sigov.si:7021/DAZK/DAZK.jsp
72. ZK archive digital survey report viewer http://gublu3.GURS.sigov.si:7021/DAZK/DAZK.jsp

73. PRAVILNIK o uporabi Gauß-Krügerjeve projekcije pri izdelavi državne topografske karte v merilu 1 : 25000 in razde litev na liste, http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV3171
73. PRAVILNIK o uporabi Gauß-Krügerjeve projekcije pri izdelavi državne topografske karte v merilu 1 : 25000 in razdelitev na liste, http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV3171
74. Pravilnik o tehničnih normativih za mreže temeljnih geodetskih točk (Uradni list SRS, št. 18/81 in Uradni list RS, št. 25/14 – ZDGRS) http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV3173
74. Pravilnik o tehničnih normativih za mreže temeljnih geodetskih točk (OG SRS, no. 18/81 and OG RS, no. 25/14 – ZDGRS) http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV3173
75. Pravilnik o znakih za temeljne topografske načrte (Uradni list SRS, št. 29/82 in Uradni list RS, št. 25/14 – ZDGRS), http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV3172, pridobljeno oktober 2019
75. Pravilnik o znakih za temeljne topografske načrte (Uradni list SRS, št. 29/82 in Uradni list RS, št. 25/14 – ZDGRS), http://www.pisrs.si/Pis.web/pregledPredpisa?id=PRAV3172, accessed in October 2019
76. PREG Vpogled v podatke o nepremičninah. Intranet GURS, http://prostor3.sigov.si/preg/
76. PREG Vpogled v podatke o nepremičninah. Intranet SMARS, http://prostor3.sigov.si/preg/
77. PROJEKT; Kontrola izdelave ZKN na področju trajnih nasadov, http://www.gis.si/media/pdf/projekt_izboljsava_zkn.pdf, pridobljeno 16. 9. 2019
77. PROJEKT; Kontrola izdelave ZKN na področju trajnih nasadov, http://www.gis.si/media/pdf/projekt_izboljsava_zkn.pdf, accessed on 16. 9. 2019
78. Ressel J. 1817 Anleitung zur schnellen und richtigen Flächen-Inhalts-Berechnung für... https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=2ahUKEwiQpJC0z7TkAhULr6QKHaoTA8cQFjABegQIABAB&url=https%3A%2F%2Fwww.europeana.eu%2Fportal%2Frecord%2F9200332%2FABO__2BZ167370505.html&usg=AOvVaw2OKAbwNPCSP9yHYAzu1fyF, pridobljeno september 2019
78. Ressel J. 1817 Anleitung zur schnellen und richtigen Flächen-Inhalts-Berechnung für ... https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=2ahUKEwiQpJC0z7TkAhULr6QKHaoTA8cQFjABegQIABAB&url=https%3A%2F%2Fwww.europeana.eu%2Fportal%2Frecord%2F9200332%2FABO__2BZ167370505.html&usg=AOvVaw2OKAbwNPCSP9yHYAzu1fyF, accessed in September 2019
79. Ressel J. 1820 Entwurf eines Distanzmessers; https://www.worldcat.org/title/entwurf-eines-distanzmessers/oclc/488994462, pridobljeno september 2019
79. Ressel J. 1820 Entwurf eines Distanzmessers; https://www.worldcat.org/title/entwurf-eines-distanzmessers/oclc/488994462, accessed in September 2019
80. Rotar, M., Murovec, K. 2019. Lokacijska izboljšava zemljiškokatastrskega prikaza. E-prosojnice predstavitve. Novo mesto: 47. Geodetski dan.
80. Rotar, M., Murovec, K. 2019. Lokacijska izboljšava zemljiškokatastrskega prikaza. E-prosojnice predstavitve. Novo mesto: 47. Geodetski dan.
81. Rotar, M., Murovec, K. 2019. Lokacijska izboljšava zemljiškokatastrskega prikaza. Geodetski vestnik, http://www.geodetski-vestnik.com/63/4/gv63-4_rotar.pdf, pridobljeno december 2019
81. Rotar, M., Murovec, K. 2019. Lokacijska izboljšava zemljiškokatastrskega prikaza. Geodetski vestnik, http://www.geodetski-vestnik.com/63/4/gv63-4_rotar.pdf, accessed in December 2019
82. SI AS 178 Franciscejski kataster za Koroško, 1823–1869
82. SI AS 178 Franciscejski kataster za Koroško, 1823–1869
83. SI AS 176 Franciscejski kataster za Kranjsko, 1823–1869
83. SI AS 176 Franciscejski kataster za Kranjsko, 1823–1869
84. SI AS 179 Franciscejski kataster za Primorsko, 1811–1869
84. SI AS 179 Franciscejski kataster za Primorsko, 1811–1869
85. SI AS 177 Franciscejski kataster za Štajersko, 1823–1869
85. SI AS 177 Franciscejski kataster za Štajersko, 1823–1869

86. Slika Ressel J. 12; https://www.google.com/search?q=Josef+Ressel&hl=sl&tbm=isch&source=iu&ictx=1&fir=Ma2UwYyzWqJyfM%253A%252Czp4-VNuxDqQk3M%252C%252Fm%252F03cj58&vet=1&usg=AI4_-kShFgocJToLZ9ww1SEt2Fk9OVUt8g&sa=X&ved=2ahUKEwjOmY6T_dzkAhXJb1AKHZG-BZwQ_B0wCnoECAYQAw#imgrc=I9DoAQs8VXSUmM, pridobljeno 19. 9. 2019
86. Image Ressel J. 12; https://www.google.com/search?q=Josef+Ressel&hl=sl&tbm=isch&source=iu&ictx=1&fir=Ma2UwYyzWqJyfM%253A%252Czp4-VNuxDqQk3M%252C%252Fm%252F03cj58&vet=1&usg=AI4_-kShFgocJToLZ9ww1SEt2Fk9OVUt8g&sa=X&ved=2ahUKEwjOmY6T_dzkAhXJb1AKHZG-BZwQ_B0wCnoECAYQAw#imgrc=I9DoAQs8VXSUmM, accessed 19. 9. 2019
87. Skupno poročilo o izdelavi ZKN – transformacija ZKP za potrebe longitudinalnih vodov (M9 Lendava Kidričevo, M10 Vodice Rateče in M9 Vodice Kidričevo), (Julij 2015), Geodetski zavod Celje
87. Skupno poročilo o izdelavi ZKN – transformacija ZKP za potrebe longitudinalnih vodov (M9 Lendava Kidričevo, M10 Vodice Rateče in M9 Vodice Kidričevo), (July 2015), Geodetic Institute Celje
88. Slovenian approach to the geolocation of digital cadastral maps on the basis of digital orthophoto maps,https://www.researchgate.net/publication/309804689_Slovenian_approach_to_the_geolocation_of_digital_cadastral_maps_on_the_basis_of_digital_orthophoto_maps, pridobljeno november 2019
88. Slovenian approach to the geolocation of digital cadastral maps on the basis of digital orthophoto maps,https://www.researchgate.net/publication/309804689_Slovenian_approach_to_the_geolocation_of_digital_cadastral_maps_on_the_basis_of_digital_orthophoto_maps, accessed November 2019
89. 160 let mapnega arhiva. 1987. Ljubljana, Republiška geodetska uprava
89. 160 let mapnega arhiva. 1987. Ljubljana, Republic Geodetic Administration
90. Svetik, P. Geodeti ob petkih in svetkih – utrinki z meritev v Prekmurju (1. del), str. 156–159 http://www.geodetski-vestnik.com/54/1/gv54-1_141-159.pdf
90. Svetik, P. Geodeti ob petkih in svetkih – utrinki z meritev v Prekmurju (1. del), p. 156–159 http://www.geodetski-vestnik.com/54/1/gv54-1_141-159.pdf
91. Svetik, P. Geodeti ob petkih in svetkih – utrinki z meritev v Prekmurju (2. del), str. 362–367 http://www.geodetski-vestnik.com/54/2/gv54-2_338-368.pdf
91. Svetik, P. Geodeti ob petkih in svetkih – utrinki z meritev v Prekmurju (2. del), p. 362–367 http://www.geodetski-vestnik.com/54/2/gv54-2_338-368.pdf
92. Svetik, P. Geodeti ob petkih in svetkih – utrinki z meritev v Prekmurju (konec), str. 563–566 http://www.geodetski-vestnik.com/54/3/gv54-3_556-576.pdf
92. Svetik, P. Geodeti ob petkih in svetkih – utrinki z meritev v Prekmurju (konec), p. 563–566 http://www.geodetski-vestnik.com/54/3/gv54-3_556-576.pdf
93. Širko, I. 1905. Poravnava na mapno mejo. Slovenski pravnik št. 3/4
93. Širko, I. 1905. Poravnava na mapno mejo. Slovenski pravnik št. 3/4
94. Tehnični pogoji za razpis za izdelavo skanogramov ZKN, (Februar 1999), Ljubljana, Geodetska uprava Republike Slovenije
94. Tehnični pogoji za razpis za izdelavo skanogramov ZKN, (February 1999), Ljubljana, Surveying and Mapping Authority of the Republic of Slovenia
95. Tehnični pogoji za razpis za zajem DKN, (Februar 1999) Ljubljana, Geodetska uprava Republike Slovenije
95. Tehnični pogoji za razpis za zajem DKN, (February 1999) Ljubljana, Surveying and Mapping Authority of the Republic of Slovenia
96. Tehnični pogoji za usklajevanje podatkov DKN, (Marec 2000), Ljubljana, Geodetska uprava Republike Slovenije
96. Tehnični pogoji za usklajevanje podatkov DKN, (March 2000), Ljubljana, Surveying and Mapping Authority of the Republic of Slovenia
97. Tehnični pogoji za uskladitev meja območij zajema DKN, (April 2001), Ljubljana, Geodetska uprava Republike Slovenije
97. Tehnični pogoji za uskladitev meja območij zajema DKN, (March 2001), Ljubljana, Surveying and Mapping Authority of the Republic of Slovenia
98. Tehnični pogoji za dovzdrževanje DKN, (Marec 2000), Ljubljana, Geodetska uprava Republike Slovenije
98. Tehnični pogoji za dovzdrževanje DKN, (March 2000), Ljubljana, Surveying and Mapping Authority of the Republic of Slovenia

99. Tehnični pogoji za transformacijo DKN – izboljšavo prekrivanja DKN-DOF, (September 2004), Ljubljana, Geodetska uprava Republike Slovenije
99. Tehnični pogoji za transformacijo DKN – izboljšavo prekrivanja DKN-DOF, (September 2004), Ljubljana, Surveying and Mapping Authority of the Republic of Slovenia
100. Tehnični pogoji za transformacijo DKN – DOF in izdelavo skupnih izrisov meja sosednjih območij zajema, (Marec 1999), Ljubljana, Geodetska uprava Republike Slovenije.
100. Tehnični pogoji za transformacijo DKN – DOF in izdelavo skupnih izrisov meja sosednjih območij zajema, (March 1999), Ljubljana, Surveying and Mapping Authority of the Republic of Slovenia.
101. technet GmbH (2016). Programmbeschreibung Systra, Release 8. Berlin.
101. technet GmbH (2016). Programmbeschreibung Systra, Release 8. Berlin.
102. Tehnično navodilo za uporabo novega koordinatnega sistema v zemljiškem katastru https://www.eprostor.gov.si/fileadmin/DPKS/Navodila/Tehnicno_navodilo_za_uporabo_novega_KS_v_ZK_v1_2007_GURS.pdf, pridobljeno fe bruar 2020
102. Tehnično navodilo za uporabo novega koordinatnega sistema v zemljiškem katastru https://www.eprostor.gov.si/fileadmin/DPKS/Navodila/Tehnicno_navodilo_za_uporabo_novega_KS_v_ZK_v1_2007_GURS.pdf, accessed in Fe bruary 2020
103. Tehnično poročilo prevedbe vrst rabe v zemljišče pod stavbami 221, (November 2017), Geodetski zavod Celje, http://gublu5.gurs.sigov.si/pls/portal/docs/PAGE/INTRANET/OSNOVNASTRAN/ZEMLJISKI%20KATASTER/TAB2064225/KONCNO_TEHNICNO%20POROCILO_SLOVENIJA.PDF , pridobljeno januar 2020
103. Tehnično poročilo prevedbe vrst rabe v zemljišče pod stavbami 221, (November 2017), Geodetski zavod Celje, http://gublu5.SMARS.sigov.si/pls/portal/docs/PAGE/INTRANET/OSNOVNASTRAN/ZEMLJISKI%20KATASTER/TAB2064225/KONCNO_TEHNICNO%20POROCILO_SLOVENIJA.PDF , accessed January 2020
104. Topografski ključ, http://www.izs.si/fileadmin/dokumenti/msgeo/topo_kljuc_maj_2006.pdf
104. Topografski ključ, http://www.izs.si/fileadmin/dokumenti/msgeo/topo_kljuc_maj_2006.pdf
105. Triglav, J. 2015, Opportunities to mainstream land consolidation in rural development programmes of the European Union. FAO Land Tenure Policy Series 2. Food and Agriculture Organization of the United Nations, Rome, 2008. 72 str., Gospodarski vestnik http://www.fao.org/3/i0091e/i0091e00.pdf, pridobljeno marec 2020
105. Triglav, J. 2015, Opportunities to mainstream land consolidation in rural development programmes of the European Union. FAO Land Tenure Policy Series 2. Food and Agriculture Organization of the United Nations, Rome, 2008. 72 p., Gospodarski vestnik http://www.fao.org/3/i0091e/i0091e00.pdf, accessed March 2020
106. Triglav, J. 1993. Project Bodonci – The Renewal of Cadastral Plans of Scale 1 : 2880. GIM International, 7(9), str. 69–73, https://www.researchgate.net/publication/275891253_Project_Bodonci_-_The_Renewal_of_Cadastral_Plans_of_Scale_12880
106. Triglav, J. 1993. Project Bodonci – The Renewal of Cadastral Plans of Scale 1 : 2880. GIM International, 7(9), p. 69–73, https://www.researchgate.net/publication/275891253_Project_Bodonci_-_The_Renewal_of_Cadastral_Plans_of_Scale_12880
107. Triglav, J. 1994. O zajemu digitalnih podatkov. Geodetski vestnik, 38(2), 129–134. https://www.researchgate.net/publication/275891348_O_zajemu_digitalnih_podatkov
107. Triglav, J. 1994. O zajemu digitalnih podatkov. Geodetski vestnik, 38(2), 129–134. https://www.researchgate.net/publication/275891348_O_zajemu_digitalnih_podatkov
108. Triglav, J. 2006. Razvoj podeželja s pomočjo komasacij kmetijskih zemljišč. Geodetski vestnik, 50 (1), 44–59. http://www.geodetski-vestnik.com/50/1/gv50-1_044-059.pdf
108. Triglav, J. 2006. Razvoj podeželja s pomočjo komasacij kmetijskih zemljišč. Geodetski vestnik, 50 (1), 44–59. http://www.geodetski-vestnik.com/50/1/gv50-1_044-059.pdf
109. Triglav, J. 2010. Zemljiški kataster, Prekmurje in ... jurčki. Geodetski vestnik, 54(3), 567–576.
109. Triglav, J. 2010. Zemljiški kataster, Prekmurje in ... jurčki. Geodetski vestnik, 54(3), 567–576.
110. http://www.geodetski-vestnik.com/54/3/gv54-3_556-576.pdf (od strani 567 naprej!)
110. http://www.geodetski-vestnik.com/54/3/gv54-3_556-576.pdf (from the page 567 onwards!)

111. Triglav, J. 2013a. Projekt Tešanovci – Obnova zemljiškokatastrskih načrtov. Geodetski vestnik, 57(1), 147–161. http://geodetski-vestnik.com/cms/images/57/1/gv57-1_mnenja1.pdf, pridobljeno december 2019
111. Triglav, J. 2013a. Projekt Tešanovci – Obnova zemljiškokatastrskih načrtov. Geodetski vestnik, 57(1), 147–161. http://geodetski-vestnik.com/cms/images/57/1/gv57-1_mnenja1.pdf, accessed in December 2019
112. Triglav, J. 2013b. Zanimiv zapis iz 19. stoletja o komasacijah. Geodetski vestnik, 57(2), 381–387. http://geodetski-vestnik.com/cms/images/57/2/gv57-2_mnenja2.pdf, pridobljeno december 2019
112. Triglav, J. 2013b. An interesting record from the 19th century on land consolidations. Geodetski vestnik, 57(2), 381–387. http://geodetski-vestnik.com/cms/images/57/2/gv57-2_mnenja2.pdf,, accessed December 2019
113. Triglav, J. 2013c. Koordinatni kataster v Prekmurju in digitalni katastrski načrti. Geodetski vestnik, 57(3), str. 600–612. http://geodetski-vestnik.com/cms/images/57/3/gv57-3_mnenja1.pdf
113. Triglav, J. 2013c. Koordinatni kataster v Prekmurju in digitalni katastrski načrti. Journal of Geodesy., 57(3), p. 600–612. http://geodetski-vestnik.com/cms/images/57/3/gv57-3_mnenja1.pdf
114. Triglav, J., 2015. Arhivi – skriti zakladi iz Murske Sobote. Geodetski vestnik, 2015/3, str. 609–618,
114. Triglav, J., 2015. Arhivi – skriti zakladi iz Murske Sobote. Journal of Geodesy, 2015/3, p. 609–618,
115. http://geodetski-vestnik.com/59/3/gv59-3_triglav.pdf, pridobljeno december 2019
115. http://geodetski-vestnik.com/59/3/gv59-3_triglav.pdf, accessed December 2019
116. Triglav, J. 2018a. Uskladitev skupnih katastrskih parcel na mejah upravnih občin. Geodetski vestnik, 62(3), str. 510–518. http://www.geodetski-vestnik.com/62/3/gv62-3_triglav2.pdf, pridobljeno december 2019
116. Triglav, J. 2018a. Uskladitev skupnih katastrskih parcel na mejah upravnih občin. Geodetski vestnik, 62(3), p. 510–518. http://www.geodetski-vestnik.com/62/3/gv62-3_triglav2.pdf, accessed in December 2019
117. Triglav, J. 2018b. Uskladitev zemljiškega katastra v Prekmurju s podatki evidence državne meje. Geodetski vestnik, 62(3), str. 491–500. http://www.geodetski-vestnik.com/62/3/gv62-3_triglav1.pdf, pridobljeno december 2019
117. Triglav, J. 2018b. Uskladitev zemljiškega katastra v Prekmurju s podatki evidence državne meje. Geodetski vestnik, 62(3), p. 491–500. http://www.geodetski-vestnik.com/62/3/gv62-3_triglav1.pdf, accessed in December 2019
118. Triglav, J. 2019. Galileo, LADM in kataster, Geodetski vestnik, http://www.geodetski-vestnik.com/63/4/gv63-4_triglav2.pdf , pridobljeno december 2019
118. Triglav, J. 2019. Galileo, LADM in kataster, Geodetski vestnik, http://www.geodetski-vestnik.com/63/4/gv63-4_triglav2.pdf , accessed in December 2019
119. Zakon o državnem geodetskem referenčnem sistemu (UL RS, št. 25/14 in 61/17 – ZAID) http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO6446
119. Zakon o državnem geodetskem referenčnem sistemu (OG RS, no. 25/14 and 61/17 – ZAID) http://www.pisrs.si/Pis.web/pregledPredpisa?id=ZAKO6446
120. Zakon o evidentiranju nepremičnin, državne meje in prostorskih enot-ZENDMPE, UL RS št. 52/2000 in 87/2002.
120. Zakon o evidentiranju nepremičnin, državne meje in prostorskih enot-ZENDMPE, OG RS no. 52/2000 and 87/2002.
121. Zakon o evidentiranju nepremičnin-ZEN, UL RS št. 47/2006, 65/2007, odl. US, 79/12, – odl. US, 61/17, 7/18 in 33/19)
121. Zakon o evidentiranju nepremičnin-ZEN, OG RS no. 47/2006, 65/2007, dec. US, 79/12 – dec. US, 61/17, 7/18 and 33/19).
122. Zakon o kmetijskih zemljiščih-ZKZ, UL RS, št. 71/11 – uradno prečiščeno besedilo
122. Zakon o kmetijskih zemljiščih-ZKZ, OG RS, no. 71/11 – official consolidated text
123. Zakon o zemljiškem katastru-ZZKat, UL SRS št. 16/1974.
123. Zakon o zemljiškem katastru-ZZKat, OG SRS no. 16/1974.
124. Zakon o urejanju prostora-ZUreP-2, UL RS, št. 61/17.
124. Zakon o urejanju prostora-ZUreP-2, OG RS no. 61/17.
125. Zgodovinski časopis, 1982. Ljubljana, Zveza zgodovinskih društev
125. Zgodovinski časopis, 1982. Ljubljana, Association of Historical Societies

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NALOŽBA V VAŠO PRIHODNOST

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I FEEL SLOVENIA

Če hočemo dodobra spoznati svojo preteklost, moramo poznati tudi zemljiško politiko, lastninske odnose na nepremičninah, nastajanje in razvoj naselij in prometa, nastajanje imen krajev, vrhov, rek, pokrajin, upravnih razdelitev in podobno. S tem so namreč povezani družbeni in socialni problemi, prizadevanja naroda za lastno samobitnost in uveljavitev. Mnogo teh vprašanj pomaga razrešiti zemljiški kataster z vso dokumentacijo, ki je bila narejena ob njegovem nastajanju in poznejšem vzdrževanju.

In order to thoroughly study our past, it is important to understand the land policy, property ownership, the formation and development of settlements and traffic, the formation of the names of places, peaks, rivers, landscapes, administrative divisions, and the like. This is related to social issues and the efforts of the nation to establish its independence and recognition. Many of these issues can be resolved with the help of the land cadastre along with all the documentation created upon its formation and subsequent maintenance.

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