



**48. GEODETSKI DAN**  
**Geodezija za kakovostne odločitve v  
prostoru in času**

***48<sup>th</sup> SLOVENIAN LAND SURVEYING DAY***  
***Geodesy and quality of geospatial data***  
***for good decision-making***

**KNJIGA POVZETKOV**  
**ABSTRACT BOOK**

**Ljubljana, 12.–13. marec 2020**



## **Knjiga povzetkov 48. Geodetskega dne**

**Abstract book of the 48<sup>th</sup> Slovenian Surveying Day**

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**Dostop:** <http://gd.lgd.si/>

### **Izdala in založila:**

Zveza geodetov Slovenije

Zemljemerska ulica 12, SI-1000 Ljubljana

in

Ljubljansko geodetsko društvo

Cankarjeva cesta 1/III, SI-1000 Ljubljana

CIP - Kataložni zapis o publikaciji

Narodna in univerzitetna knjižnica, Ljubljana

528.3(082)

GEODETSKI dan (48 ; 2020 ; Ljubljana)

Geodezija za kakovostne odločitve v prostoru in času = Geodesy and quality of  
geospatial data for good decision-making : povzetki predavanj / 48. geodetski dan  
= 48th Slovenian Land Surveying day, Ljubljana, 12.-13. marec 2020. - Ljubljana :  
Zveza geodetov Slovenije : Ljubljansko geodetsko društvo, 2020

ISBN 978-961-93656-5-6 (Zveza geodetov Slovenije)

1. Gl. stv. nasl. 2. Vzp. stv. nasl. 3. Triglav Čekada, Mihaela

COBISS.SI-ID 304269568



**48. GEODETSKI DAN**  
**GEODEZIJA ZA KAKOVOSTNE ODLOČITVE V**  
**PROSTORU IN ČASU**

*48<sup>TH</sup> SLOVENIAN LAND SURVEYING DAY*  
*GEODESY AND QUALITY OF GEOSPATIAL DATA*  
*FOR GOOD DECISION-MAKING*

**KNJIGA POVZETKOV**  
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**LJUBLJANA, 12.–13. MAREC 2020**



## 48. GEODETSKI DAN

Geodezija za kakovostne odločitve v prostoru in času

### 48<sup>th</sup> SLOVENIAN LAND SURVEYING DAY

*Geodesy and quality of geospatial data for good decision-making*

#### PROGRAM / PROGRAMME

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#### Četrtek, 12. 3. 2020 / Thursday March 12, 2020

16.30 *Odprtje razstavnega prostora / Opening of the exhibition*

18.00 *Slavnostna akademija / Formal ceremony*

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#### Petek, 13. 3. 2020 / Friday March 13, 2020

*Program posveta / Programme of the symposium*

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8.00 - 9.00 Registracija / Registration

9.00 - 11.00 UVODNI POZDRAVI IN PLENARNA PREDAVANJA  
WELCOME SPEECHES, PLENARY LECTURES

*Pozdravni govori / Welcome speeches*

**Prelomne (geo)tehnologije in njihovi vplivi**

*Disruptive (geo)technologies and their impacts*

*Prof. Dr. Joep Crompvoets (EuroSDR in KU Leuven, Belgija / EuroSDR in KU Leuven, Belgium)*

**Nove tehnologije za boljšo uporabnost uradnih prostorskih podatkov**

*New technologies for better usability of official geospatial data*

*Dr. Ing. Markus Seifert (Geodetska uprava Bavarske, Nemčija / Landesamt für Digitalisierung, Breitband und Vermessung, Bavaria, Germany)*

11.00 - 11.30 *Odmor za kavo / Coffee break*

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11.30 - 13.00 PREDAVANJA II / LECTURES II

**Korektna uporaba letalnikov v geodeziji**

*Correct application of UAVs in geodesy*

*Dr. Dejan Grigillo, dr. Dušan Petrovič, dr. Klemen Kozmus Trajkovski, dr. Tilen Urbančič, dr. Mojca Kosmatin Fras (UL Fakulteta za gradbeništvo in geodezijo / University of Ljubljana, Faculty of Civil and Geodetic Engineering)*

**Nova evropska pravila v zvezi z uporabo brezpilotnih zrakoplovov**

*New European rules on unmanned aircraft*

*Ana Hožič (Javna agencija za civilno letalstvo RS / Civil Aviation Agency Slovenia)*

**Vzpostavitev in vzdrževanje prostorskih letalskih podatkov in informacij**

*Establishment and maintenance of spatial aviation data and information*

*Primož Kete (Geodetski inštitut Slovenije / Geodetic Institute of Slovenia)*

**GeoBIM – izzivi za geodezijo in geoinformatiko**

*GeoBIM – challenges for surveying and geoinformatics*

*Alen Šraj (Igea d.o.o.), Jernej Tekavec, dr. Anka Lisec (UL Fakulteta za gradbeništvo in geodezijo / University of Ljubljana, Faculty of Civil and Geodetic Engineering)*

**Koordinatni sistemi kot temelj za kakovostne odločitve v prostoru**

*Coordinate systems as a basis for good decision making in physical space*

*Mag. Klemen Medved, Sandi Berk (Geodetska uprava Republike Slovenije / Surveying and Mapping Authority of the Republic of Slovenia), dr. Božo Koler, dr. Oskar Sterle, dr. Bojan Stopar (UL Fakulteta za gradbeništvo in geodezijo / University of Ljubljana, Faculty of Civil and Geodetic Engineering)*

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13.00 - 14.30 Daljši odmor, predstavitve razstavljalcev  
Break for refreshment and presentations of exhibitors

14.30 - 16.00 **PREDAVANJA III / LECTURES III**  
**Modeli vrednotenja 2020**  
Valuation Models 2020  
*Mag. Martin Smodiš (Geodetska uprava Republike Slovenije / Surveying and Mapping Authority of the Republic of Slovenia)*

**Funkcionalne regije v Sloveniji**  
Functional regions in Slovenia  
*Dr. Samo Drobne (UL Fakulteta za gradbeništvo in geodezijo / University of Ljubljana, Faculty of Civil and Geodetic Engineering)*

**Uporaba ocene zmogljivosti komunalne infrastrukture pri pripravi prostorskih aktov**  
Using the estimated capacity of municipal infrastructure in the drafting of spatial planning acts  
*Ajda Kafol Stojanovič (Geodetski inštitut Slovenije / Geodetic Institute of Slovenia), dr. Daniel Kozelj, dr. Maruška Šubic Kovač (UL Fakulteta za gradbeništvo in geodezijo / University of Ljubljana, Faculty of Civil and Geodetic Engineering)*

**eGraditev**  
eConstruction  
*Jurij Mlinar, Jan Brezec, dr. Nikolaj Šarlah (Ministrstvo za okolje in prostor RS / Ministry of the Environment and Spatial Planning), Martina Strniša (Geodetska uprava Republike Slovenije / Surveying and Mapping Authority of the Republic of Slovenia)*

**Evidentiranje nepremičnin – novi predpisi in informacijske rešitve**  
Real estate registration – new regulations and information solutions  
*Mag. Ema Pogoreličnik, Franc Ravnihar (Geodetska uprava Republike Slovenije / Surveying and Mapping Authority of the Republic of Slovenia)*

**Zaključek / Conclusion**

**Pogostitev in druženje / Lunch and social gathering**



v sodelovanju z



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## **Uvodnik predsednice programskega odbora Editorial by the chair of the programme committee**

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*Mihaela Triglav Čekada*

### **UVODNIK**

Letošnji naslov geodetskega dne »Geodezija za kakovostne odločitve v prostoru in času« povzema rdečo nit letošnjih predavanj: kako smiselno obdelati in uporabiti različne prostorske podatke, ki jih geodeti lahko izdelamo, da bomo omogočili kakovostne nadaljnje odločitve. Seveda ne smemo pozabiti, da moramo vseskozi skrbeti za kakovost teh podatkov, vedeti moramo, v katerem koordinatnem sistemu jih uporabljamo in kaj posamezna vrsta podatkov omogoča oz. za kateri namen jih še lahko uporabimo. Začeli bomo z dvema plenarnima predavanjema o novih tehnologijah: kaj te omogočajo in kaj novega prinašajo v stroko. V današnjem času imamo velike količine različnih prostorskih podatkov na brezplačnem dosegu roke, npr. podatke državnega laserskega skeniranja, ortofoto Cikličnega aerofotografiranja Slovenije, podatke satelitov Sentinel. Prav tako pa lahko zelo hitro sami generiramo velike količine podatkov, med drugim z letalniki ali terestričnim laserskim skeniranjem, a se lahko dokaj hitro znajdemo pred veliko dilemo. Takšni dodatni podatki bi nam sicer lahko koristili, vendar ne vemo, koliko časa in denarja bi morali vložiti v razvoj metodologije, s katero bi nadgradili svoje trenutne postopke dela s takimi podatki ter koliko nam bodo končni izvedeni rezultati v resnici koristili. Metapodatki sicer lahko povedo, da bi ti podatki znali biti uporabni za naše namene, vendar preden sami ne preverimo njihove kakovosti s pomočjo kontrolnih meritev, kar nam spet vzame čas in denar, jih ponavadi ne uporabljamo, saj nam predstavljajo le še ene dodatne oz. lahko celo moteče podatke.

Med takšne nove tehnologije štejemo tudi letalnike, ki lahko nosijo različne senzorje: od amaterskih fotoaparátov pa vse do hiperspektralnih senzorjev in lidarja. V prvem sklopu predavanj bo govor o tem, na kaj vse moramo biti pri njihovi uporabi pozorni, tudi z vidika kakovosti pričakovanih končnih rezultatov, in kaj bodo prinesla nova evropska pravila s tega področja. Od letalnikov bomo prešli na vzdrževanje prostorskih podatkov, ki jih potrebuje civilno letalstvo za varnost poletov. Nadaljevali bomo z osnovo katerekoli geodetske izmere, to so novosti s področja koordinatnih sistemov. Nenazadnje pa se bomo dotaknili še izzivov glede uvajanja GeoBIM v našo stroko.

V drugem sklopu predavanj bomo predstavili aktualne novosti s področja modelov vrednotenja nepremičnin, optimizacije postopkov na področju pridobivanja dovoljenj pri graditvi objektov (eGraditev) ter novih predpisov glede evidentiranja nepremičnin.

Torej treh aktualnih stebrov trenutnega razvoja državne službe na našem strokovnem področju. Opisane bodo tudi zelo aktualne funkcionalne regije ter uporabnost ocene zmogljivosti komunalne infrastrukture pri prostorskem načrtovanju.

Menim, da bomo s tako raznolikim programom odgovorili na aktualna vprašanja geodezije: s kako kakovostnimi podatki delujemo ter katere spremembe in izzive prinaša nova zakonodaja v naše delo v prihodnosti.

Želim vam, da bodo, tudi s pomočjo teh predavanj, vaše odločitve o vpeljavi novih tehnologij v vaše vsakodnevno delo lažje in da bodo te tehnologije morda tudi prelomne v luči prispevka k vašemu uspehu.

*Doc. dr. Mihaela Triglav Čekada, predsednica programskega odbora 48. Geodetskega dne*

## **EDITORIAL**

The title of this year's Surveying Day "Geodesy and quality of geospatial data for good decision-making" summarises the basic topic of this year's lectures: how to meaningfully process and use various spatial data that surveyors can produce to enable more accurate decisions afterwards. Of course, we must remember that we always have to take care about the quality of generated data, we need to know in which coordinate system we use them and what each type of data allows us to do or which was the primary purpose of this data being produced for at first place. We will start with two plenary lectures on new technologies: what they enable us to do and if they present disruptive technologies. Today, we have large amounts of different geospatial data at our fingertips, e.g. national laser scanning data, orthophotos of the Cyclic aerial photographing of Slovenia, data from Sentinel satellites. We can also generate large amounts of data by ourselves very quickly, including those produced by drones or terrestrial laser scanning, but we can soon face a dilemma. While such additional data might be useful to us, we do not know how much time and money we would have to invest in developing a methodology to upgrade our current workflow with such data and how much the final results will, in reality, be beneficial to us. Metadata, though, tells us that this data might be useful for our purposes, but before we check the quality of such data by using control measurements, which again takes time and money, we usually do not use it, as we regard them only as additional or even as disruptive data.

Such new technologies include drones that can carry a variety of sensors, from amateur cameras to hyperspectral sensors and lidar. The first part of the lectures will be about what we need to pay attention to when using drones, also in terms of expected data quality, and what new European rules in this field will bring us. We will move from drones to the maintenance of the spatial data needed by civil aviation for flight safety. We will continue with a basis of any geodetic survey, that is, novelties in the field of reference coordinate systems. Last but not least, we will discuss future challenges, which might be brought by the introduction of GeoBIM into our profession.

In the second set of lectures, we will present the latest developments in the field of the real estate mass valuation models, optimisation activities of the procedures in the field of building permission issuing (eSpace), and new regulations in the field of the real estate registration. This way, three currently fundamental pillars of the ongoing development in state surveying will be presented. Further on, currently, highly actual functional regions will be presented, as well as the assessment of the utility infrastructure capacity calculation for spatial planning.

I believe that with such a diverse programme, we will answer on the major actual questions in the surveying: how good is the quality of the data we operate with and what changes and challenges new legislation brings to our work in the near future.

These lectures, I hope, will contribute to your decisions on how to introduce new technologies into your daily work easier, as they will not present only a disruptive technologies from the perspective of your future success, but rather an asset.

*Assist. Prof. Mihaela Triglav Čekada, the chair of the programme committee of the 48th Surveying Day*

## Uvodnik predsednika Zveze geodetov Slovenije

### Editorial of the president of the Association of Surveyors of Slovenia

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*Blaž Mozetič*

#### UVODNIK

Zbornik je na svojevrsten način inventura oziroma presek stanja v geodetski stroki. Pravzaprav je pogled v ogledalo, ki odseva, kaj smo geodeti storili dobro, kaj bi lahko še boljše, vendar okoliščine tega niso dovoljevale, in morebiti česa nismo storili. Iz današnje perspektive se najbrž z nekaterimi našimi odločitvami morda ne strinjamo več, odločili bi se drugače, kdo ve, vendar sem prepričan, da so bile takrat sprejete odločitve najbolj optimalne v danih okoliščinah. Najslabše se je ne odločiti. Na drugi strani pa je to tudi pogled skozi okno, ven, v širni svet in v prihodnost, na pot razvoja in izzivov, ki čakajo geodetsko stroko in družbo v naslednjih letih.

Geodetska stroka dobesedno leti v nebo, vendar na drugi strani ostaja trdno vpeta v zemeljske izzive družbe in uporabnikov geodetskih storitev in izdelkov. Že danes se ukvarjamo s številnimi izzivi, ki so predstavljeni tudi v tem zborniku, vendar jih morda geodeti še nismo dovolj posvojili, da gre za tiste priložnosti stroke, ki bodo geodezijo postavile v funkcijo kakovostnih odločitev v prostoru in času, čeprav bodo najbrž strateške odločitve sprejemali drugi in ne geodeti. Geodeti se moramo zavedati moči in pomembnosti geodetske stroke, da brez nas kakovostnih odločitev v prostoru in času ni, pa če nam to drugi priznajo ali ne. Brez nas imajo samo prostor v času.

Srečno in obilo strokovnih užitek!

*mag. Blaž Mozetič*  
*predsednik Zveze geodetov Slovenije*

## **EDITORIAL**

These proceedings are in a unique way, an inventory or a cross-section of the situation in the surveying profession. In fact, as looking in the mirror, this is a reflection of what we surveyors did well, what could have been done better, but the circumstances did not allow it, and perhaps what we did not do at all. From today's perspective, we may not agree with some of our previous decisions, as now we would have decided otherwise, who knows, but I am sure that the decisions made at that time were the most optimal under those circumstances. The worst is not to decide at all. On the other hand, it is also a view out the window, out, into the wider world and into the future, into the path of development and the challenges that await the surveying and society in the upcoming years.

The surveying profession literally flies into the sky, but on the other hand, remains firmly entrenched in the global challenges of society and users of surveying services and products. Today, we are dealing with many challenges, which are also presented in this volume, but perhaps surveyors have not yet adopted them enough, to resolve that these are also opportunities of this profession that will place the surveying in the function of quality decisions in space and time, although they will probably be strategic decisions accepted by others and not surveyors themselves. Surveyors must be aware of the power and importance of our surveying profession, that without us, there is no good decision-making in space and time, whether others acknowledge it or not. Without us, they only have a place in time.

Good luck and a lot of professional enjoying moments!

*Blaž Mozetič, MS*

*President of the Association of Surveyors of Slovenia*

## **Uvodnik predsednika organizacijskega odbora** **Editorial by the chairman of the organising committee**

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*Milan Brajnik*

### **UVODNIK**

Geodeti imamo veliko tehnično znanje, ki ga znamo in moramo razumljivo predstaviti uporabnikom naših storitev in izdelkov. Novostim, aktualnim dosežkom stroke, napredku in bodočim usmeritvam je namenjen tudi tokratni posvet v okviru 48. Geodetskega dne, pa vendar ne smemo pozabiti na minulo obdobje, na naše strokovne predhodnike, na zgodovinska dejstva, na njihov vpliv na stanje evidenc in njihov vpliv na izvedbo naših današnjih in bodočih nalog. Ker je ob široki uporabi novih tehnologij spominska komponenta pridobila nekoliko drugačen, kar nekam slabšalni značaj in iskanje napotkov nekakšno instant spletno obliko, s konzumacijo veliko lažnih ali pomanjkljivih podatkov, si drznem na tem mestu posebej opozoriti na pomen uporabe preverjenih, »uradnih« objav – pričujoča publikacija je namenjena prav takšnemu izogibanju pozabe v deročem strokovnem toku aktivnosti.

Začetki organiziranega združevanja geodetskih strokovnjakov na našem ozemlju segajo že v daljno leto 1911. Vse do decentralizacije tedanje državne uprave leta 1955 so ti delovali pod okriljem enotne organizacije, zatem je sledilo ustanavljanje lokalnih združenj. Na območju Ljubljane je funkcijo podružnice še naprej opravljalo republiško geodetsko društvo kot pomemben nosilec strokovnega razvoja v državi in šele 21. februarja 1958 je po koncu občnega zbora Društva geodetskih inženirjev in geometrov LR Slovenije potekal še ustanovni občni zbor podružnice Ljubljana, ki se je kasneje razvila v Ljubljansko geodetsko društvo. S tokratno organizacijo že 48. stanovskega posveta Društvo vztrajno nadaljuje s poslanstvom in doprinosom k ohranitvi strokovne odličnosti in dobre podobe stroke v javnosti.

Kakšen je torej pravi obraz stroke? Kako nas vidi okolica? Geodeti se ne hvalimo prav radi. Zaradi narave dela se verjetno za ta poklic odločamo sicer natančni, a praviloma bolj tihi ljudje, ki nimamo preveč radi javnega nastopanja. Pravzaprav smo geodeti običajno res opazni šele, ko je z našim delom, z evidencami o prostoru nekaj narobe, ko uporabniki ne dobijo pravega, popolnega ali pa sploh nobenega podatka.

Potrudimo se, da nas bo okolica bolje razumela. Vztrajno iščimo boljše, razumljivejše načine predstavitve naših vsebin in v prvi vrsti, le-te neprestano izboljšujmo! Predpogoj za uspešno delo je torej neprekinjeno izobraževanje in razvojno raziskovalno delo, temu pa moramo slediti prav vsi v stroki, če želimo izboljšati našo podobo v družbi.

Današnji posvet naj kolegom drugih strok pomaga k boljšemu razumevanju geodetske srenje, nam geodetom pa k še bolj kakovostni izvedbi nalog, zato naj ne utone v pozabo!

*Milan Brajnik, predsednik Ljubljanskega geodetskega društva*

## EDITORIAL

Surveyors have a wealth of technical knowledge that we need to present to users of our services and products, I am sure we can do this understandable. This year's consultation within the framework of the 48th Surveying Day is intended for novelties, current achievements of the profession, progress and future directions, but we must not forget the past period, our professional predecessors, historical facts, their influence on the present state of records and their influence to accomplish our present and future tasks. Under the influence of the widespread use of new technologies, the memory component has acquired a slightly different, somehow degrading character and guidance, a kind of instant web form, with the consumption of a lot of false or flawed data, because of that I dare to point out the importance of using verified, "official" posts – this publication is intended precisely to avoid such forgetting in the turbulent professional workflow.

The beginnings of an organised association of surveyors in our territory go back to 1911. Until the decentralisation of the state administration in 1955, they operated under the auspices of a single organisation, followed by the establishment of local associations. In the territory of Ljubljana, the function of the branch continued to be performed by the Republic Surveyors Society as an important carrier of professional development in the country, which later evolved into the Ljubljana Surveyors Society. With the organisation of this 48th professional symposium, the Society has steadily continued its mission and contribution to maintaining professional excellence and a good image of the profession in public.

So, what is the real image of the profession? How do our surroundings understand us? Surveyors do not brag about it. Due to the nature of the work, this profession is likely accepted by otherwise precise but generally quieter people who do not like to perform profession publicly. Surveyors are usually only noticeable when there is something wrong with our work, space records when users do not get the right, complete, or no information at all.

We must do our best to make our surroundings understand us better. We need to constantly search for better, more understandable ways of presenting our content and, first of all, constantly improving it! A precondition for successful work is, therefore, continuous education and research and development work, which must be followed by everyone in the profession, if we want to improve our image in society.

Today's consultation should help colleagues of other professions to understand surveyors work better, and to surveyors to improve the quality of our tasks, so this symposium should not sink into oblivion!

*Milan Brajnik, President of the Ljubljana Surveyors Society*



## Disruptive (geo)technologies and their impacts Prelomne (geo)tehnologije in njihovi vplivi

*Joep Crompvoets*

### SUMMARY

A current buzz word in our society is Disruptive Technologies, which can be defined as technologies that unexpectedly displace established technologies (Christensen, 1995). The PC, e-mail, cell phones and social media are past ground-breaking examples of technologies that made the existing ones obsolete. The following technologies are considered as the current disruptive technologies: Mobile internet, Drones (UAVs), Cloud technology, Internet of Things, Renewable energy, advanced robotics, and 3D printing. Many of these technologies are strongly location based. In order to review the impact of these geo-technologies, it is important to understand what is really meant with disruptive technologies and ask ourselves if these technologies are really so disruptive. This keynote presentation aims to explore what are the implications of disruptive (geo)technologies for individuals, geodesists, organisations, economies and governments. It can be concluded that disruptive technologies are new and they may turn out to be valuable for society including the geodetic community. Although, it would be wise not to expect miracles and radical changes from most of these technologies. Finally, it is important to be aware of the associated risks. In order to take control of disruptive technologies risks, it is strongly recommended to educate yourself about disruptive technology, terminology, innovations, and relevance; to expand your network and foster collaboration through cross-functional teams, and relationships and with outside experts; to push for investments in relevant data and analytics tools and skilled people to use them; and, to consider the wider impacts – beyond cybersecurity – of disruptive technology. This keynote presentation ends with a set of relevant provocative propositions in order to strengthen the discussion about the topic.

KEY WORDS: *disruptive technologies, geo-technology, drones, cloud technology, Internet of Things*

## POVZETEK

Trenutno zelo aktualna beseda v naši družbi so »prelomne tehnologije«, ki jih lahko opredelimo kot tehnologije, ki nepričakovano izpodrinejo uveljavljene tehnologije (Christensen, 1995). Računalnik, e-pošta, mobilni telefoni in družbeni mediji so pretekli prelomni primeri tehnologij, zaradi katerih so obstoječe tehnologije zastarele. Med trenutne prelomne tehnologije spadajo: mobilni internet, letalniki (UAV), storitve v oblakih, internet stvari, obnovljiva energija, napredna robotika in 3D-tiskanje. Mnoge od teh tehnologij temeljijo na lokaciji. Za pregled vpliva teh geotehnologij je pomembno razumeti, kaj v resnici pomeni termin prelomna tehnologija in se vprašati, ali so te tehnologije res tako prelomne. Cilj je predstaviti posledice prelomnih (geo)tehnologij za posameznike, geodete, organizacije, gospodarstva in vlade. Sklepamo lahko, da se nove prelomne tehnologije lahko izkažejo za koristne za družbo, vključno z geodetsko skupnostjo. Čeprav bi bilo pametno, da ne pričakujemo čudežev in korenitih sprememb od večine teh tehnologij. Nazadnje se je treba zavedati povezanih tveganj. Da bi prevzeli nadzor nad tveganjem, ki ga prelomne tehnologije prinašajo, zelo priporočamo, da se izobrazite o prelomnih tehnologijah, terminologiji, inovacijah in ustreznosti; razširite svojo mrežo in spodbujate sodelovanje s pomočjo večfunkcijskih timov ter odnosov z zunanjimi strokovnjaki; si prizadevate za naložbe v ustrezna orodja za hranjenje in analitiko podatkov ter v usposabljanje ljudi za njihovo uporabo; in, da upoštevate širše vplive prelomnih tehnologij, ki presegajo samo kibernetiko varnost. Predstavitev se bo zaključila z naborom ustreznih provokativnih predlogov, ki bodo okrepili razpravo o tej temi.

**KLJUČNE BESEDE:** *prelomne tehnologije, geotehnologije, letalniki, storitve v oblakih, internet stvari*

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## New technologies for better usability of official geospatial data Nove tehnologije za boljšo uporabnost uradnih geoprostorskih podatkov

*Markus Seifert*

### SUMMARY

At the beginning of 2018, the Official German Surveying (AdV) launched a joint project between the federal and state governments to make official cartography fit for the future and to develop innovative products. The innovation of the new project "Smart Mapping" lies in the redesign of a modular development platform for fast, agile and economical generation of cartographic products of the German surveying administrations. The aim of this platform is to gradually address the central development of the well-known AdV Standard Products and to test and deploy new or further developed cartographic products.

The characteristic of common AdV products from "Smart Mapping" is a uniform appearance, uniform conditions of use, full coverage of the Federal Republic and – apart from the initial data – a high up-to-date (currently up to 2 weeks) for the web presentation. Thanks to its modular design, the process can flexibly add new data sources and new tools and thus develop agilely.

This presentation introduces the first results of the Smart Mapping project for an official topographic map of the future. On the basis of the central development platform, a prototype for a (mobile) vector map with 3D buildings and contour lines is presented (German product name: basiskarte.de). With this presentation, the technical and organizational framework conditions, the technology used (Vector Tiles) as well as other innovation potentials of Smart Mapping will be presented.

An important aspect is the improvement of the usability of official data in order to combine it with data of other users and to develop any applications with little effort and technical expertise. Numerous examples of applications are shown to demonstrate the potential of this new technology.

<p><b>KEY WORDS:</b> <i>mapping, 3D buildings, vector tiles, Germany</i></p>
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## POVZETEK

V začetku leta 2018 je združenje Nemških geodetskih uprav (AdV) sprožilo skupni projekt deželnih uprav na federalni ravni, s katerim bi uradno kartografijo prilagodili potrebam prihodnosti in razvili inovativne izdelke. Inovativnost novega projekta »Pametno kartiranje« (angl. *Smart Mapping*) je v prenovi modularne razvojne platforme za hitro, okretno in varčno generiranje kartografskih izdelkov nemških geodetskih uprav. Namen te platforme je postopno nadgraditi osrednji razvoj znanih izdelkov »AdV Standard« ter preizkusiti in uporabiti nove ali na novo razvite kartografske izdelke.

Običajni izdelki AdV iz projekta »Pametno kartiranje« bodo imeli enoten videz, enotne pogoje uporabe, popolno pokritost Zvezne republike Nemčije in – razen prvotnih podatkov – bodo zelo ažurni v spletni različici (trenutno se posodablja na dva tedna). Zahvaljujoč modularni zasnovi lahko v proces zelo fleksibilno dodajajo nove vire podatkov in nova orodja ter so zato zelo agilni.

Predstavljeni bodo prvi rezultati projekta »Pametno kartiranje« pri izdelavi uradne topografske karte prihodnosti. Na podlagi osrednje razvojne platforme bo predstavljen prototip (mobilne) vektorske karte s 3D stavbami in plastnicami (nemško ime izdelka: basekarte.de). Predstavljeni bodo tehnični in organizacijski okvirni pogoji, uporabljena tehnologija prikaza območij vektorskih podatkov (angl. vector tiles) in drugi inovacijski potenciali pametnega kartiranja.

Pomemben vidik pametnega kartiranja je izboljšanje uporabnosti uradnih prostorskih podatkov, saj se ti lahko združijo s podatki drugih uporabnikov in razvijejo nove aplikacije z malo truda in tehničnega znanja. Prikazani bodo številni primeri uporabe, ki prikazujejo potencial te nove tehnologije.

KLJUČNE BESEDE: *kartiranje, 3D stavbe, vektorski sloji, Nemčija*

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## Korektna uporaba letalnikov v geodeziji Correct application of UAVs in geodesy

*Dejan Grigillo, Dušan Petrovič, Klemen Kozmus Trajkovski, Tilen Urbančič,  
Mojca Kosmatin Fras*

### POVZETEK

Daljinsko vodeni letalniki, opremljenimi z različnimi senzorji in napravami, se v geodeziji, pa tudi mnogih drugih okoljskih strokah, vedno pogosteje uporabljajo za zajem prostorskih podatkov. V prispevku se bomo omejili na letalnike s kompaktnim fotoaparatom in cenejšimi napravami za določanje položaja in orientacije. Podatki o površju se zajamejo s fotografiranjem z nižjih višin (okvirno 50 m – 150 m nad terenom), pri čemer se sosednje fotografije med seboj prekrivajo in jih v postopku obdelave obravnavamo kot fotogrametrični blok. Novi, učinkoviti postopki in algoritmi določanja značilnik in slikovnega ujemanja so omogočili razvoj SfM fotogrametrije. Kratica SfM izhaja iz angleškega opisa postopka – Structure from Motion – oziroma v prevodu struktura iz gibanja. Postopek izhaja iz področja računalniškega vida, ki se je začelo razvijati v 70. letih 20. stoletja, zato je terminologija precej drugačna od tradicionalne fotogrametrične. Bistvo postopka strukture iz gibanja je hkratio določanje položaja fotoaparata in geometrije 3D-površja objekta (v obliki oblaka točk) iz zaporedja prekrivajočih se fotografij. Na tržišču so dostopna različna programska orodja, ki omogočajo uporabo strukture iz gibanja, največkrat po načelu »črne škatle«, ki so enostavni za uporabo. Osnovna izdelka postopka sta oblak točk, iz katerega lahko z nadaljnjo obdelavo izdelamo digitalne modele terena in objektov, in ortofoto.

Ti dokaj enostavni postopki in programi sicer omogočajo široko uporabo, a ne jamčijo ustrezne kakovosti, ki je za geodetske izdelke nujna. Prednost geodetov pred ostalimi uporabniki teh tehnologij je tako v tem, da bolje razumemo te postopke, jih znamo pravilno uporabiti in znamo izdelati ustrezno oceno kakovosti izdelkov.

V procesu zajema in obdelave fotografij so nekatere faze še posebej pomembne. Pozorno moramo načrtovati že snemalno misijo in terenske priprave, poglobljeno moramo poznati teorijo in slediti priporočilom, ki sledijo iz kakovostnih raziskav. V prispevku bomo izpostavili predvsem naslednje teme: (a) zagotavljanje terenskih oslonilnih točk za namene georeferenciranja (označitev točk, metode izmere, potrebno število točk in njihova razporeditev v bloku idr.); (b) kalibracijo fotoaparata in problematiko uporabe postopkov samokalibracije (nestabilnost notranje orientacije, zagotavljanje ustrezne geometrije bloka, primernost predhodne kalibracije idr.); (c)

izdelavo oblaka točk in problematike v zvezi s postopki slikovnega ujemanja (pomanjkanje teksture in kontrasta na sliki, močne sence, različna perspektiva idr.); (d) ločljivost in razločljivost fotografije, položajno točnost izdelkov (definicije in pomen, ocena izravnave bloka fotografij, predvidevanje prisotnosti sistematičnih vplivov in uporaba ustreznih cenilk kakovosti, ocena položajne točnosti s kontrolnimi meritvami idr.). Opisane teme bomo predstavili s primeri iz znanstvene in strokovne literature ter lastnimi primeri.

**KLJUČNE BESEDE:** *daljinsko vodeni letalniki, geodezija, fotogrametrija, struktura iz gibanja, kalibracija fotoaparata, kakovost*

## SUMMARY

In geodesy and many other environmental professions, unmanned aerial vehicles (UAVs) are increasingly used for spatial data acquisition. They are equipped with various sensors and devices. The article focuses on UAVs with compact-cameras and cheaper positioning and orientation devices. Surface data are captured from lower altitudes (usually between 50 m and 150 m above ground level), with adjacent images overlapping each other. During the data processing, images are treated as a photogrammetric block. New computer vision's algorithms for effective key points localisation and image matching have enabled the development of Structure from Motion (SfM) photogrammetry. SfM is an area of computer vision that began to develop in the 1970s, so the terminology is quite different from the traditional photogrammetric one. SfM uses a sequence of overlapping images to simultaneously determine the position of the camera and the 3D surface geometry of the object (in the form of a point cloud). A variety of software tools are available on the market to enable the use of SfM; most often, these are easy-to-use black box tools. The basic products of SfM photogrammetry are a point cloud, which can be further processed to derive digital terrain models or 3D models of objects, and an orthophoto. These fairly straightforward procedures and programmes are widespread in use; however, they cannot guarantee appropriate accuracy, which is imperative for surveying products. In comparison with other users of these technologies, the surveyors have a better understanding of the procedures, know how to use them properly, and know how to make an appropriate assessment of the quality of products.

During image acquisition and processing, some phases are particularly important. We need to carefully plan the flight mission and the field preparations, we must have a

thorough knowledge of the theory and follow the recommendations obtained from quality research.

The following topics will be highlighted in the article: (a) control points (GCPs) for georeferencing purposes (surveying methods, GCP's signalisation, required number of GCPs and their distribution in a block, etc.); (b) camera calibration and problems of using self-calibration procedures (instability of interior orientation, appropriate block geometry, pre-calibration of the camera, etc.); (c) generation of a point cloud and problems related to image matching processes (lack of contrast and image texture, shadows, different perspectives, etc.); (d) image resolution and interpretability, positional accuracy of products (definitions and meaning, assessment of bundle block adjustment, prediction of the systematic errors and use of appropriate quality estimators, assessment of positional accuracy with control measurements, etc.). The described topics will be presented with examples from scientific and professional literature and our own examples.

**KEY WORDS:** *unmanned aerial vehicles, geodesy, photogrammetry, Structure from Motion, camera calibration, quality*

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## Nova evropska pravila v zvezi z uporabo brezpilotnih zrakoplovov New European rules on unmanned aircraft

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### **POVZETEK**

Danes lahko operaterji oziroma upravljavci uporabljajo brezpilotne zrakoplove na podlagi domače, slovenske zakonodaje. Od julija letos pa bomo morali vsi, tako uporabniki brezpilotnih zrakoplovov kot tudi pristojni organi, izvrševati določila evropske zakonodaje, ki se od trenutne slovenske precej razlikuje.

Področje brezpilotnih zrakoplovov urejata dva evropska predpisa. Izvedbena uredba Komisije (EU) 2019/947 z dne 24. maja 2019 o pravilih in postopkih za upravljanje brezpilotnih zrakoplovov določa pravila za upravljanje sistemov brezpilotnih zrakoplovov, pa tudi za osebje, vključno s piloti na daljavo, in organizacije, ki izvajajo navedene operacije. Delegirana uredba Komisije (EU) št. 2019/945 z dne 12. marca 2019 o sistemih brezpilotnega zrakoplova in operatorjih sistemov brezpilotnega zrakoplova iz tretjih držav pa določa zahteve za proizvajalce, uvoznike, distributerje itd. brezpilotnih zrakoplovov. Zahteve se nanašajo zlasti na določitev tehnične dokumentacije glede proizvoda in njegovo ustrezno označevanje (oznaka CE, izjava ES o skladnosti, serijska številka proizvoda itd.). Uredba določa obveznost nadzora trga glede brezpilotnih zrakoplovov, ki naj jo izvaja organ, pristojen za nadzor trga.

Ker uporabo brezpilotnih zrakoplovov oziroma pravila za upravljanje sistemov brezpilotnih zrakoplovov ureja Izvedbena uredba Komisije (EU) 2019/947, so v nadaljevanju predstavljene njene pglavitne zahteve.

V skladu z navedeno uredbo se bodo brezpilotni zrakoplovi lahko uporabljali v treh kategorijah:

1. ODPRTA,
2. POSEBNA in
3. CERTIFICIRANA.

ODPRTA kategorija se deli na podkategorije A1, A2 in A3, vsaka od teh kategorij pa bo z vidika proizvodnje brezpilotnega zrakoplova sodila v razred C0, C1, C2, C3 ali C4 (gre za obveznost proizvajalca, da ustrezno označi svoj proizvod). Za vsako od podkategorij so predpisane zahteve za pilota na daljavo in brezpilotni zrakoplov, višina letenja, ki ne sme biti več kot 120 m nad tlemi, oddaljenost od ljudi in objektov itd. Ta kategorija se lahko

izvaja z brezpilotnimi zrakoplovi do 25 kg. Piloti na daljavo bodo morali opraviti spletni tečaj usposabljanja in spletni teoretični izpit.

POSEBNA kategorija se bo lahko izvajala v odvisnosti od stopnje tveganja posamezne operacije na podlagi tako imenovane izjave o skladnosti s standardnim scenarijem, operativnega dovoljenja ali spričevala lahkega sistema brezpilotnega zrakoplova. Pravila za izvedbo ocene operativnega tveganja so določena v uredbi in od bodočega operatorja zahtevajo temeljito analizo nameranih operacij. V to kategorijo spadajo operacije, ki presegajo zahteve za ODPRTA kategorijo, na primer letenje na višini večji od 120 m, uporaba brezpilotnega zrakoplova težjega od 25 kg, brezpilotni zrakoplov ni v vidnem polju ipd.

CERTIFICIRANA kategorija: v tej kategoriji se bodo izvajale operacije z brezpilotnimi zrakoplovi, ki bodo certificirani po postopku, za katerega bo pristojna Evropska agencija za varnost v letalstvu. Operacije se bodo lahko izvajale nad skupinami ljudi, s tovrstnimi brezpilotnimi zrakoplovi bo možen prevoz ljudi ali nevarnega tovora. V tej kategoriji se seveda zahteva certifikacijski postopek v smislu spričevala letalskega prevoznika, piloti na daljavo morajo imeti licence, biti zdravstveno sposobni itd. Zahteve za navedeno kategorijo bodo podrobno urejene z ločeno uredbo, ki bo vsebovala podobne zahteve, ki danes veljajo za zrakoplove s posadko.

Izvedbena uredba Komisije (EU) 2019/947 zahteva od držav članic vzpostavitev tako imenovanih geografskih con, v katerih je letenje z brezpilotnimi zrakoplovov prepovedano ali omejeno. Pri določanju geografskih con je potrebno poleg zagotavljanja letalske varnosti upoštevati še naslednje vidike: varnost, varovanje, zasebnosti in okolja, zato bo nabor teh con potrebno oblikovati v okviru širše medresorske razprave.

Novi predpisi vzpostavljajo obveznost registracije operatorjev sistemov brezpilotnih zrakoplovov. V okviru ODPRTA kategorije se morajo registrirati operatorji sistemov brezpilotnih zrakoplovov, če upravljajo katerega koli od naslednjih brezpilotnih zrakoplovov:

- zrakoplov z največjo vzletno maso 250 g ali več ali zrakoplov, ki lahko v primeru trčenja na človeka prenese več kot 80 joulov kinetične energije;
- zrakoplov, opremljen s senzorjem, ki lahko zajame osebne podatke, razen če je v skladu z Direktivo 2009/48/ES.

V okviru POSEBNE kategorije se registrirajo brezpilotni zrakoplovi s katerokoli maso. Lastnik brezpilotnega zrakoplova, katerega zasnovo je treba certificirati (CERTIFICIRANA

kategorija), registrira brezpilotni zrakoplov v skladu s Prilogo 7 k Čikaški konvenciji (nacionalnost in registracijska oznaka brezpilotnega zrakoplova se določita tako, kot to velja za zrakoplove s posadko).

Uredba določa posebne zahteve za operacije sistemov brezpilotnih zrakoplovov v okviru letalskih modelarskih klubov in združenj.

Pristojni organ bo moral torej vse obstoječe imetnike dovoljenj ali potrdil, izdanih v skladu z Uredbo o sistemih brezpilotnih zrakoplovov, na novo certificirati oziroma umestiti v eno od zgornjih kategorij. Popoln prehod na uporabo novih evropskih predpisov se bo pričel v letu 2022, do tedaj bodo operatorji lahko izkoristili možnosti uporabe obstoječih brezpilotnih zrakoplovov pod določenimi (omejenimi) pogoji.

KLJUČNE BESEDE: *brezpilotni zrakoplov, uredba*

## SUMMARY

For the time being, operators can use unmanned aircraft based on the national, Slovenian legislation. As of July this year, all unmanned aircraft operators and competent authorities will have to comply with the provisions of European legislation which varies considerably from the current regulations.

Two European laws regulate the operation of unmanned aircraft. The Commission Implementing Regulation (EU) 2019/947 of 24 May 2019 on the rules and procedures for the operation of unmanned aircraft provides rules for the operation of unmanned aircraft systems as well as personnel, including remote operators, and organisations performing those operations. The Commission Delegated Regulation (EU) 2019/945 of 12 March 2019 on unmanned aircraft systems and third-country operators of unmanned aircraft systems, however, establishes requirements for manufacturers, importers, distributors, etc. of unmanned aircrafts. The requirements relate in particular to the determination of technical documentation of the product and its proper marking (CE marking, EC declaration of conformity, product serial number, etc.). The Regulation lays down the obligation to monitor the market in respect to unmanned aircraft by the authority responsible for market surveillance.

As the use of unmanned aircraft or the rules for the operation of unmanned aircraft systems is regulated by the Commission Implementing Regulation (EU) 2019/947, its main requirements are set out below.

According to the Regulation, the operation of unmanned aircraft systems (UAS) shall be performed in three categories:

1. OPEN,
2. SPECIFIC and
3. CERTIFIED.

The OPEN category is divided into subcategories A1, A2 and A3. Each of them will fall in a class (C0, C1, C2, C3 or C4) with regard to the production of an unmanned aircraft (i.e. the obligation on the manufacturer to mark its product appropriately). For each of the subcategories, the regulation provides requirements for remote pilots and unmanned aircraft, flight height which cannot be higher than 120 m above the ground, distance from people and buildings, etc. In this category, the operations shall be performed with unmanned aircraft of up to 25 kg. Remote pilots will have to undergo an online training course and pass an online theoretical exam.

The SPECIFIC category may be performed with regard to the level of risk of an individual operation on the basis of the so-called declaration of compliance with the standard scenario, operational authorisation or light UAS operator certificate. The rules for the performance of a risk assessment are laid down in the Regulation and require a thorough analysis of the intended operations by the prospective operator. This category covers operations which exceed the requirements for the OPEN category, e.g. the aircraft is maintained higher than 120 m, an unmanned aircraft heavier than 25 kg is used, or the unmanned aircraft is outside the field of vision etc.

The CERTIFIED category: Operations shall be classified as UAS operations in the CERTIFIED category only where the UAS is certified pursuant to the procedure established by the European Aviation Safety Agency. It will be possible to conduct such operations over assemblies of people, and such unmanned aircraft will be able to transport people or carry dangerous goods. This category, of course, requires a certification process within the meaning of the Air Operator's Certificate. Remote pilots should be licensed, be medically fit, etc. The requirements for that category will be regulated in detail by a separate regulation containing similar requirements than those for manned aircraft today.

The Commission Implementing Regulation (EU) 2019/947 requires the Member States to establish the so-called geographical zones where the operation of unmanned aircraft is prohibited or restricted. In determining geographical zones, in addition to ensuring aviation safety, the following aspects shall be taken into account: safety, security,

privacy and environment. Therefore, the set of these zones will need to be determined in the context of a broad, inter-ministerial discussion.

The new rules establish the obligation to register operators of unmanned aircraft. In the context of the OPEN category, operators of unmanned aircraft systems must be registered if they operate any of the following unmanned aircraft:

- with a maximal take-off mass of 250 g or more, or which in the case of an impact can transfer to human kinetic energy above 80 Joules;
- that is equipped with a sensor able to capture personal data unless it complies with Directive 2009/48/EC.

When operating within the SPECIFIC category, an unmanned aircraft of any mass shall be registered. The owner of an unmanned aircraft whose design is subject to certification (CERTIFIED category) shall register the unmanned aircraft in line with ICAO Annex 7 to the Chicago Convention (the nationality and registration mark of the unmanned aircraft shall be established as for manned aircraft).

The Regulation lays down specific requirements for operations of unmanned aircraft systems in the context of activities of model aircraft clubs and associations.

The competent authority will need to certify all existing holders of authorisations or certificates issued under the Regulation on unmanned aircraft systems or classify them in one of the above categories. The full transition to the application of the new European rules will start in 2022. Until then, operators will be able to use existing unmanned aircraft under certain (limited) conditions.

KEY WORDS: *unmanned aircraft, regulation*

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# Vzpostavitev in vzdrževanje prostorskih letalskih podatkov in informacij

## Establishment and maintenance of spatial aviation data and information

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*Primož Kete*

### **POVZETEK**

Vsaka država, članica EU, mora za potrebe civilnega letalstva skladno z »Uredbo Komisije (EU) o zahtevah glede kakovosti letalskih podatkov in letalskih informacij za enotno evropsko nebo« zagotavljati standardizirane geodetske podatke in njihovo vzdrževanje ter verificiranje. Med te podatke sodijo predvsem elektronski podatki o terenu in ovirah (angl. *electronic terrain and obstacle data, eTOD*) in podatki o magnetni deklinaciji. Ker geodezija lahko ponudi rešitve za te potrebe, je Ministrstvo za infrastrukturo v sodelovanju z Javno agencija za civilno letalstvo Republike Slovenije leta 2016 angažiralo Geodetski inštitut Slovenije za vzpostavitev sistema zagotavljanja letalskih podatkov in informacij za ozemlje Republike Slovenije.

Po začetni vzpostavitvi relevantnih podatkovnih slojev se letno izvajajo aktivnosti vzdrževanja in verificiranja podatkov eTOD in podatkov o magnetni deklinaciji, upravljanja s podatki in vodenja arhiva, distribucije in izmenjave podatkov ter podatkovne in kartografske podpore proceduram v civilnem letalstvu s strokovno-tehnično podporo na področju prostorskega načrtovanja.

V prispevku bodo predstavljene osnovne vsebinske in tehnične zahteve za prostorske letalske podatke in informacije kot tudi osnovna načela vzdrževanja, upravljanja in distribucije teh podatkov.

Predstavljene bodo tudi zahteve, ki izhajajo iz zahtevane mednarodne povezljivosti prostorskih podatkov za letalstvo, za katere bi bilo dobro zagotoviti sistemske rešitve na ravni države.

**KLJUČNE BESEDE:** *eTOD, prostorski podatki, letalstvo*

## SUMMARY

Each EU country must provide standardised geodetic data and their maintenance and verification in accordance with the "Commission Regulation (EU) on the quality of aeronautical data and aeronautical information for the single European sky". These include, in particular, electronic terrain and obstacle data (eTOD) and magnetic declination data. Because geodesy can offer solutions to these needs, in 2016 the Ministry of Infrastructure, in cooperation with the Civil Aviation Agency of the Republic of Slovenia, engaged the Geodetic Institute of Slovenia to establish a system of providing spatial aviation data and information for the territory of the Republic of Slovenia.

Following the initial establishment of the relevant data sets, annual activities of maintaining and verifying eTOD data and magnetic declination data, data management and archive management, data distribution and exchange, data and cartographic support to civil aviation procedures, with substantive and technical support in the field of spatial planning are carried out.

This paper will outline the basic substantive and technical requirements for spatial aviation data and information, as well as the basic principles for maintaining, managing and distributing this data.

Requirements arising from the required international interoperability of spatial data for aviation, for which it would be advisable to be provided with system solutions at the national level, will also be presented.

KEY WORDS: *eTOD, spatial data, aviation*

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## GeoBIM – izzivi za geodezijo in geoinformatiko

### GeoBIM – challenges for surveying and geoinformatics

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*Alen Šraj, Jernej Tekavec, Anka Lisec*

#### **POVZETEK**

Tehnološki napredek 21. stoletja se med drugim odraža tudi v vse bolj kompleksnem grajenem okolju. Obstoječi prostorski podatki, ki so ključnega pomena za odločanje v prostoru, ne obvladujejo novih struktur urbanih okolij. Možna rešitev se ponuja v 3D-modeliranju prostora, ki je danes vse bolj prisotno tako v gradbeništvu, na primer informacijsko modeliranje stavb BIM (angl. *building information modeling*), kot v geografskih informacijskih sistemih (GIS), kjer uporabljamo 3D-modele predvsem za vizualizacijo prostora, vse več pa tudi za prostorske analize, navigacijo in evidentiranje nepremičnin. Ideja po vzpostavitvi informacijske medopravilnosti na tem področju ni nova in zaradi omenjenih izzivov postaja vse aktualnejša na področju raziskav in razvoja.

Premoščanje razlik med 3D-modeliranjem grajenega okolja v gradbeništvu, geodeziji in drugih inženirskih strokah izhaja predvsem iz dejstva, da so te stroke v procesu gradnje zelo povezane, a se med drugim razlikujejo v informacijskih okoljih in rešitvah. Mednarodne organizacije s teh področij in tudi državne geodetske službe vlagajo vse več sredstev v raziskave in razvoj rešitev za doseganje informacijske medopravilnosti na področju 3D-modeliranja stavb oziroma mest. Prizadevanja za standardizacijo na omenjenih področjih so prispevala k razvoju standarda IFC za področje BIM in standarda CityGML, ki velja za enega izmed vodilnih na področju topografskega modeliranja mest in pokrajine v GIS.

V prispevku predstavljamo projekt GeoBIM organizacije EuroSDR, katerega namen je preučevati medopravilnost na področju 3D-modeliranja stavb in mest – tako na procesni kot tudi podatkovni ravni. V sklopu projekta je bila izvedena raziskava poznavanja in uporabe koncepta GeoBIM, v katero so bili vključeni predstavniki gradbenih in projektantskih podjetij, geodetskih uprav ipd. Podobno raziskavo smo izvedli tudi v sklopu magistrske naloge z naslovom Študija možnosti uporabe koncepta GeoBIM v Sloveniji. V sklopu naloge so na podlagi intervjujev s strokovnjaki predstavljeni rezultati študije poznavanja in priložnosti uporabe koncepta GeoBIM v Sloveniji. V letu 2019 je bil nadalje organiziran GeoBIM benchmark, s katerim so ugotavljali stanje na področjih programskih rešitev v BIM, možnosti georeferenciranja BIM-podatkov, podpore za standard CityGML v programskih rešitvah GIS in kakšne so možnosti pretvorbe podatkov BIM, ki so skladni s standardoma IFC in CityGML.

Študije kažejo, da se prepoznavnost koncepta GeoBIM izboljšuje tako na mednarodni ravni, kot tudi v Sloveniji. Zaenkrat ostajajo številne nejasnosti, ki otežujejo splošno uporabo. Primeri različnih študij, kot so možnosti ponovne uporabe podatkov v procesu projektiranja, pridobivanja gradbenega dovoljenja in evidentiranja nepremičnin, uporabe podatkov za namene lokacijskih storitev ipd., pa prinašajo veliko priložnosti in izzivov tudi na področju geodezije in geoinformatike.

**KLJUČNE BESEDE:** *3D-modeliranje, BIM, CityGML, GeoBIM, geoinformatika*

## SUMMARY

Technological development in the 21st century is reflected, among others, in the increasing complexity of our built environment. The current spatial data and spatial models, which are crucial to spatial decision-making, are not appropriate to support our decisions in complex urban environments. A possible solution might be in 3D geospatial modelling, which has been increasingly applied in civil engineering, for building information modelling (BIM), as well as in geoinformatics and geographic information systems (GIS), where 3D geospatial models are primarily used for geospatial visualisation, spatial analysis, navigation and real estate registration. The idea of developing a solution for data interoperability in these areas is not new and based on the above-mentioned challenges it has become a topic of several research and innovation (R&I) initiatives.

The need to bridge the gaps between 3D building modelling in civil engineering, surveying and other engineering professions is mainly derived from the fact that all these disciplines are strongly linked to each other in the construction process, but currently, different data, spatial models and information environments are used. Many international organisations, as well as state surveying and mapping authorities, are investing resources in research and development of solutions aiming to contribute to the information interoperability in 3D modelling of buildings and cities. Standardisation efforts in these fields have, until now, contributed to the development of the IFC standard for BIM and CityGML standard, which is shaping the development in 3D geospatial modelling of cities and landscape in GIS.

Here we aim to present the GeoBIM project, which is organised within the EuroSDR. The project aims to investigate the state-of-the-art regarding the interoperability in the field

of 3D modelling of buildings and cities – both, from the procedural as well as the data levels. Within the framework of the project, a survey was conducted about the GeoBIM knowledge and its application opportunities among civil engineering and architecture companies, surveying and mapping authorities etc. A similar study has been done in Slovenia within the framework of the master thesis Feasibility study of introducing GeoBIM concept in Slovenia. In 2019, the GeoBIM benchmark was furthermore organised to investigate the available technical solutions to support research and activities related to GeoBIM. Within the benchmark, the support for IFC within BIM (and other) software was investigated, options for geo-referencing BIM data were studied, the support for CityGML within GIS (and other) tools were tested, and options for conversion IFC and CityGML models were investigated.

Studies show that the GeoBIM concept is becoming a well-known concept at the international level as well as in Slovenia. There are many ambiguities that make its use difficult. However, many good practices, such as the possibilities of reusing data in the design process, in the processes of issuing of building permits and real estate registration, for supporting location-based services, etc., are bringing many opportunities and challenges in geodesy and geoinformatics.

KEY WORDS: *3D-modelling, BIM, CityGML, GeoBIM, geoinformatics*

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## **Koordinatni sistemi kot temelj za kakovostne odločitve v prostoru** **Coordinate systems as a basis for good decision making in physical space**

*Klemen Medved, Sandi Berk, Božo Koler, Oskar Sterle, Bojan Stopar*

### **POVZETEK**

Prostorski podatki se uporabljajo pri oblikovanju strateških in političnih odločitev, določanju ukrepov, ki so vezani na prostor in prostorski razvoj, ter za spremljanje izvajanja teh ukrepov, zato je bistvenega pomena zagotavljati njihovo ustrezno kakovost. Nujni pogoj za kakovostne prostorske podatke je vzpostavitev kakovostnega državnega prostorskega koordinatnega sistema. Njegovo kakovost lahko zagotovimo z upoštevanjem vseh fizikalnih in geometrijskih lastnosti fizičnega prostora. Kakovost vzpostavitve koordinatnega sistema mora biti za nekaj stopenj višja od želene kakovosti georeferenciranja prostorskih podatkov. Pomemben vidik pri njegovem vzdrževanju in vodenju je tudi vzdržnost oz. trajnost; treba se je izogniti nepotrebnemu spreminjanju koordinat v zbirkah prostorskih podatkov, ki bi bile posledica vzdrževanja koordinatnega sistema.

V Sloveniji smo v geodetske evidence pred kratkim dokončno uvedli realizacijo državnega horizontalnega koordinatnega sistema (referenčni sestav) z oznako D96/TM, ki je bila vzpostavljena na osnovi pred več kot 20-imi leti izvedenih EUREF GPS-izmer. S ponovno GNSS-izmero »EUREF Slovenija 2016« smo pridobili novo uradno realizacijo ETRS89 v Sloveniji z oznako ETRS89/D17. Neposredna primerjava koordinat med ETRS89/D96 in ETRS89/D17 daje odstopanja večja od 8 cm, kar je posledica uporabe različnih referenčnih sestavov (ITRF96/ETRF96 oz. IGB08/ETRF2000) pri obdelavi GNSS-izmer, pa tudi vplivov lokalne geodinamike. Sprejeta je bila odločitev, da do nadaljnjega obdržimo D96 kot uradni horizontalni geodetski datum, tako da nova realizacija ETRS89 ne bo vplivala na georeferenciranje v državnem koordinatnem sistemu. Izvedena pa je bila »osvežitev« sistema, in sicer so vse temeljne – aktivne in pasivne – mreže GNSS-točk dobile nove koordinate z oznako D96-17, ki v največji možni meri ohranjajo obstoječe D96-koordinate, vendar pa izboljšajo geometrijo in skladnost aktivnih in pasivnih GNSS-mrež v Sloveniji. S tem so bile odpravljene napetosti v teh omrežjih, kar bo omogočilo boljše skladnost določanja koordinat geodetskih točk v bodoče, in sicer ne glede na metodo izmere in izbor točk za navezavo.

V Sloveniji je bil pred kratkim uveden tudi nov državni višinski sistem z oznako SVS2010. Njegova uvedba v praksi ne pomeni samo spremembe višinskega datuma in s tem

določenega (konstantnega) zamika višin med obema sistemoma. Realizacija novega višinskega sistema namreč temelji na izmeri nove nivelmanske mreže 1. reda, sočasno izvedeni gravimetrični izmeri reperjev, uvedbi novega sistema normalnih višin, uvedbi novega višinskega datuma in tudi nove višinske referenčne ploskve (model kvazi-geoida). Ponovno so izračunani tudi nivelmanski poligoni nižjih redov, ki so bili izmerjeni pred več desetletji. Tako so razlike med višinami v starem in novem višinskem referenčnem sistemu v razponu od 5,3 cm do 21,0 cm. Žal tudi ni enostavne transformacije med obema višinskima referenčnima sistemoma, ampak mora geodet na podlagi danih podatkov in zahtevane natančnosti izbrati ustrezno metodo lokalne transformacije oz. preračuna.

Geodetska uprava Republike Slovenije je v sodelovanju s Fakulteto za gradbeništvo in geodezijo Univerze v Ljubljani pripravila novo Tehnično navodilo za uporabo novega državnega višinskega sistema. Na voljo je tudi spletni program SiVis za pretvorbo z GNSS-izmero določenih višin v oba višinska referenčna sistema (SVS2000 in SVS2010).

KLJUČNE BESEDE: *georeferenciranje, kakovost prostorskih podatkov, koordinate, referenčni sistem, višine*

## SUMMARY

Geospatial data are used in strategic and political decision-making associated with physical space and for spatial development initiatives, and in monitoring the implementation of these initiatives. Therefore, it is essential to ensure the proper quality of spatial datasets. A prerequisite of their quality is the establishment of a high quality national spatial coordinate system. Its quality can be assured by taking into account all the physical and geometric properties of the physical space. The quality of the established coordinate system must be several levels higher than the desired quality of geo-referenced spatial data. An important aspect in maintaining and managing it is also sustainability or durability; it is important to avoid unnecessary changes of the coordinates in the geospatial datasets which would result from the maintenance of the coordinate system.

In Slovenia, we have recently completed the implementation of the new national horizontal coordinate reference system (reference frame) with the abbreviation D96/TM, which was established on the basis of EUREF GPS campaign measurements performed over 20 years ago. By the repetitive EUREF GNSS campaign in 2016, a new

official implementation of ETRS89 in Slovenia was obtained, referred to as ETRS89/D17. A direct comparison of the final coordinates between ETRS89/D96 and ETRS89/D17 gave coordinate differences larger than 8 cm, which is due to the use of different reference frames (ITRF96/ETRF96 or IGB08/ETRF2000) in the GNSS processing, as well as the effects of local geodynamics. The decision was made to keep D96 as the official horizontal geodetic datum, so that the new ETRS89 implementation would not affect geo-referencing in the national coordinate system. Anyway, a ‘refresh’ of the system was performed, so that the fundamental – active and passive – GNSS-network sites in Slovenia got new coordinates denoted by D96-17, which keep as much as possible the existing D96 coordinates but improve the geometry and consistency of active and passive GNSS-networks in Slovenia. This eliminates the tensions in the networks and ensures better positioning in the future, regardless of the measurement method and selected reference points.

A new national height system, referred to as SVS2010, was recently introduced in Slovenia. Its implementation does not only bring a change in the height datum, which would result in a (constant) height shift between the two systems. The new height system is based on the new measurement of the 1st order leveling network, simultaneously performed gravimetric measurements of the benchmarks, the introduction of the new system of normal heights, the introduction of the new height datum and also the new height reference surface (quasi-geoid model). Lower order leveling polygons that were measured decades ago were also re-adjusted. Consequently, the differences between the old and new height reference systems can range from 5.3 cm to 21.0 cm. Unfortunately there is no simple transformation between the two height reference systems. The surveyor must choose the appropriate method of local transformation or recalculation based on the given data and the required accuracy.

The Surveying and Mapping Authority of the Republic of Slovenia in cooperation with the Faculty of Civil and Geodetic Engineering of the University of Ljubljana has prepared a new Technical instruction for the use of the new national height system. An online software called SiVis is also available for converting GNSS-based heights into both height reference systems (SVS2000 and SVS2010).

KEY WORDS: *coordinates, georeferencing, heights, reference system, spatial data quality*

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## Modeli vrednotenja 2020 Valuation Models 2020

*Martin Smodiš*

### POVZETEK

Množično vrednotenje je sistem standardiziranega ocenjevanja vrednosti nepremičnin. To je večnamenski sistem, ki se lahko uporablja za številne javne namene, kjer se potrebuje ocena vrednosti večjega števila nepremičnin. Vrednost je temeljni rezultat sistema. Posplošena vrednost je ocena tržne vrednosti nepremičnine, izračunane z modeli množičnega vrednotenja in podatki o nepremičnini.

V začetku leta 2018 je stopil v veljavo nov zakon o množičnem vrednotenju nepremičnin (ZMVN-1, Ur. l. RS št. 77/2017), ki odpravlja težave zaradi odločbe Ustavnega sodišča RS iz leta 2014. Bistvena novost, ki jo ZMVN-1 prinaša, je možnost uveljavljanja posebnih okoliščin. Lastniki nepremičnin bodo lahko imeli vpliv na posplošeno vrednost nepremičnine, v kolikor bi se zaradi kakšne lastnosti nepremičnine posplošena vrednost vsaj za eno leto spremenila za več kot 20 % oziroma za več kot 200.000 EUR. Kot posebne okoliščine se štejejo vplivi na vrednost, ki izvirajo iz mikrolokacije, kakovosti in poškodb nepremičnine. V ZMVN-1 pa je skladno z odločitvijo Ustavnega sodišča zajeta tudi vsebina, ki je bila prej določena v podzakonskih predpisih. Med drugim so tako v ZMVN-1 taksativno opredeljeni vsi modeli vrednotenja, podatki in načini vrednotenja za posamezno vrsto nepremičnin, podrobneje pa so določena tudi merila za umerjanje modelov.

Modeli vrednotenja so jedro sistema množičnega vrednotenja nepremičnin. Modeli so z metodami množičnega vrednotenja določena pravila, ki opredeljujejo, katere lastnosti nepremičnine vplivajo na njeno vrednost na trgu in velikost njihovega vpliva, ter omogočajo istočasen, sistematičen in enoten pripis posplošene vrednosti večjemu številu nepremičnin.

Postopek določanja modelov je zakonsko predpisan. Določanje modelov vrednotenja je strokovno zahtevna in časovno obsežna naloga. Prvi korak je oblikovanje osnutka predloga modelov vrednotenja na podlagi preverjenih podatkov o trgu nepremičnin, s katerim se najprej seznanijo strokovna javnost. Organ vrednotenja mora obravnavati priporočila strokovne javnosti in javno objaviti svoja stališča v povezavi s tem. Zatem sledi usklajevanje modelov vrednotenja z občinami ter poskusni izračun vrednosti z javno obravnavo modelov vrednotenja, preučevanjem pripomb lastnikov nepremičnin in upoštevanjem utemeljenih pripomb pri pripravi končnega predloga modelov

vrednotenja. Postopek določanja modelov vrednotenja se zaključi z njihovo obravnavo na Vladi Republike Slovenije. ZMVN-1 namreč določa, da vlada obravnava končni predlog modelov vrednotenja in izda predpis o določitvi modelov vrednotenja najkasneje do 31. 3. 2020. Zakon določa 17 modelov vrednotenja, od tega je 10 modelov, ki vrednotijo dele stavbe s pripadajočim zemljiščem, 4 modeli, ki vrednotijo zemljišča, in 3 modeli za posebne enote vrednotenja. Pri modelih za zemljišča je bistvena novost ta, da se vrednotijo glede na namensko rabo zemljišča, razen v primeru javnih cest, železnic oziroma vodnih zemljišč, ki se vrednotijo glede na dejansko rabo.

Predstavljeni bodo rezultati obravnave pripomb in predlogov lastnikov nepremičnin na javno objavljen predlog modelov vrednotenja v okviru poskusnega izračuna vrednosti. Poudarek bo na izboljšavi modelov vrednotenja za stanovanja, hiše, stavbna zemljišča, gozd in kmetijska zemljišča. Na kratko bo predstavljen končni predlog modelov vrednotenja, ki ga bo obravnavala vlada.

KLJUČNE BESEDE: *ZMVN-1, množično vrednotenje, modeli vrednotenja*

## SUMMARY

Mass valuation is a system of standardised valuation of real estate. It was developed as a multi-purpose system, which can be used for many public purposes, where the value estimation of many real estates is needed. Generalised value is a fundamental result of the system. It is an estimate of the market value of a real estate, calculated using mass valuation models and real estate data.

At the beginning of 2018, a new Law on Mass Valuation of Real Estate (ZMVN-1, Official Gazette of the Republic of Slovenia No. 77/2017) came into force, which eliminates the problems caused by the decision of the Constitutional Court of the Republic of Slovenia in 2014. The essential novelty that ZMVN- 1 brings with it is the possibility of invoking special circumstances. Property owners will be able to have an impact on the generalised value if the real estate has such characteristics that influence the generalised value by more than 20% or more than EUR 200,000 for at least one year. Special circumstances can arise from the micro-location, quality and damage to the property. Following the decision of the Constitutional Court, the ZMVN-1 also covers the content previously defined in the by-laws. Among other things, in ZMVN-1, all valuation models, data and valuation methods for each type of real estate have been

accurately listed and defined, as well as criteria for calibrating models have been specified in detail.

Valuation models are at the heart of the mass valuation system. Models are equations that define what properties data affect its value on the market and the magnitude of their impact. Valuation models allow simultaneous, systematic and uniform calculation of generalised value to many real estates of the same type.

The procedure for the definition of valuation models is statutory. Valuation models defining is a professionally demanding and time-consuming task. The first step is to formulate a draft proposal for valuation models based on verified real estate market data that is first made known to the professional public. The evaluation body should consider the recommendations of the professional public and make public its views in this regard. The next step is the harmonisation of valuation models with municipalities followed by the trial calculation of value and public debate on valuation models, examining the comments of property owners and considering substantiated comments in the preparation of the final valuation model proposal. The process of defining valuation models ends with their consideration by the Government of the Republic of Slovenia. ZMVN-1 namely determines that the Government should consider the final proposal for valuation models and issue a Real estate valuation models decree by 31 March 2020 at the latest. The Act sets out 17 valuation models, of which 10 are models for valuation of the parts of the building with the corresponding land, 4 models for land valuation and 3 models for valuation of special units. For land models, the essential novelty is that they are valued according to the planned use of land, except in the case of public roads, railways or aquatic land that are valued according to actual use.

The results of the consideration of the comments and suggestions of the property owners on valuation models proposal will be presented. The focus will be on improving valuation models for apartments, houses, building land, forest and agricultural land. The final proposal of the valuation models will be briefly discussed.

**KEY WORDS:** *Mass Real Estate Valuation Act, Mass Valuation, Valuation Models*

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## Funkcionalne regije v Sloveniji

### Functional regions in Slovenia

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*Samo Drobne*

#### **POVZETEK**

Funkcionalne regije (FR) so območja posplošenih družbenih in gospodarskih funkcionalnih povezav, ki homogeno pokrijejo obravnavano ozemlje. Organiziranost FR temelji na medsebojnih odnosih med deli regije. FR je sistem funkcionalno povezanih osnovnih prostorskih enot regije. Pri FR ne obravnavamo geografskih danosti in zgodovinskih dejstev, temveč se usmerjamo predvsem na funkcionalno povezanost v prostoru.

FR modeliramo z različnimi vrstami tokov, kot so tokovi prebivalstva, prometni tokovi in tokovi dobrin, finančni tokovi, informacijski tokovi, tokovi plina/vode/elektrike in podobno. Najpogosteje pa v analizi FR uporabljamo različne gospodarske tokove. FR pogosto opredelimo kot območje z visoko frekvenco notranjih regionalnih gospodarskih interakcij, kot so delovna mobilnost ter regionalna trgovina dobrin in storitev, ter kot območje strnjene dejavnosti in prometne infrastrukture, ki omogoča veliko mobilnost ljudi, proizvodov in informacij. FR razumemo tudi kot prostorsko zvezno območje, na katerem se srečujeta skupna ponudba in povpraševanje po najrazličnejših družbenih in gospodarskih dobrinah.

Najpogosteje FR obravnavamo kot lokalne in/ali regionalne zaposlitvene sisteme, v katerih povpraševanju po delu ustreza sorazmerno enako velika ponudba delovnih mest in nasprotno. To je tudi razlog, da FR najpogosteje modeliramo s tokovi delovne mobilnosti. Delovna mobilnost, še posebej dnevna delovna mobilnost, je najmnožičnejša in najstabilnejša redna oblika tokov prebivalstva v prostoru. Zato manjše spremembe na trgu dela ne vplivajo bistveno na vzorec dnevnih tokov na delo in domov.

V literaturi zasledimo različna področja obravnave FR: od analiz trga dela ter drugih družbenogospodarskih vidikov, analiz funkcionalnih urbanih območij/regij, analiz administrativnih, planskih in statističnih regij, analiz statističnih funkcionalnih območij na mikro ravni, analiz lokalnega in regionalnega stanovanjskega trga, analiz trga blaga, analiz funkcionalnih regij za podporo v transportni in prometni politiki, analiz za podporo informacijsko-komunikacijski tehnologiji in drugim storitvam v prostoru do splošnih pregledov obravnave funkcionalnih regij/območij; za podroben pregled glej (Drobne, 2017).

V Sloveniji je koncept FR izveden v statističnih regijah, ki pa se zaradi izkazovanja podatkov v časovnih serijah zelo redko spreminjajo. Izvedenih je bilo tudi več študij spremljanja lokalnih in regionalnih zaposlitvenih sistemov, razvojnih virov in scenarijev za modeliranje FR ter FR kot možnih osnov za oblikovanje pokrajin v Sloveniji. V prispevku podrobno predstavimo in vrednotimo številne študije FR za Slovenijo.

**KLJUČNE BESEDE:** *funkcionalne regije, Slovenija*

## **SUMMARY**

Functional regions (FRs) are areas of generalised social and economic functional interactions that homogeneously cover an analysed territory. FR's organisation is based on interactions between parts of the region. A FR is thus a system of functionally linked basic spatial units. Rather than dealing separately with geographical features and historical facts, when addressing FRs our focus is on functional connectivity in space.

FRs are modelled by an array of spatial flows, such as population flows, traffic and commodity flows, financial flows, information flows, gas/water/electricity flows, and similar. FRs are most frequently determined based on economic flows. FR can be defined as an area characterised by a high frequency of intra-regional economic interaction, such as labour commuting and intra-regional trade in goods and services, and an area of agglomeration of activities and transport infrastructure facilitating significant mobility of people, products, and information. FRs are understood as a spatially continuous area in which aggregated supply and demand for various social and economic goods meet.

The most frequently, FR are considered as local and/or regional labour systems, in which labour demand is proportional to job supply, and vice versa. That is also the reason why FRs are modelled most often by using commuting flows. Labour commuting, particularly commuting with a daily periodicity, is the most frequent and stable regular movement of the population. Therefore, minor changes in the labour market do not significantly affect the pattern of daily flows to work and back home.

In the literature we find different fields of application in relation to FR: from labour market analyses to other socio-economic aspects, analyses of functional urban areas/regions, analyses of administrative, planning, and statistical regions, analyses of statistical functional areas at the micro-level, analyses of the local and regional housing

market, analyses of goods market, analyses of functional region in support of transport and traffic policy, analyses in support of information and communication technology, and other services in space, to general reviews of treating functional regions/areas; for a detailed review, see (Drobne, 2017).

In Slovenia, the concept of FR is implemented in statistical regions, which, however, are rarely changed due to the reporting of data in time series. Several studies of analysing local and regional labour systems, development resources and scenarios for modelling FRs and FRs as possible bases for the establishment of provinces in Slovenia have also been conducted. The paper presents in detail and evaluates numerous FRs' studies for Slovenia.

KEY WORDS: *functional regions, Slovenia*

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## Uporaba ocene zmogljivosti komunalne infrastrukture pri pripravi prostorskih aktov

### Using the estimated capacity of municipal infrastructure in the drafting of spatial planning acts

*Ajda Kafol Stojanović, Daniel Kozelj, Maruška Šubic Kovač*

#### POVZETEK

Cilj načrtovanja komunalne infrastrukture je kritje potreb po komunalnih storitvah tako v količinskem kot kakovostnem smislu. Pri načrtovanju se upoštevajo trenutne potrebe in tudi potencialne nove potrebe po komunalnih storitvah. Zato je smiselno, da poteka načrtovanje komunalne infrastrukture sočasno z načrtovanjem posameznih ureditev in določanjem izvedbene regulacije prostora. Izhodišče načrtovanju komunalne infrastrukture predstavlja analiza stanja obstoječe komunalne infrastrukture, predvsem ocena njene obstoječe zmogljivosti. Zmogljivost komunalne infrastrukture je opredeljena kot sposobnost obstoječe komunalne infrastrukture za zagotavljanje kritja določenega obsega potreb in je kot eden izmed dejavnikov pomembna za načrtovanje komunalne infrastrukture, opredelitev njenih stroškov gradnje in predvideno etapnost razvoja.

V prispevku je na primeru vodovodnega sistema Kranj predstavljena metodologija za oceno zmogljivosti obstoječe infrastrukture za oskrbo s pitno vodo in predvidenih investicij v obstoječo in novo komunalno infrastrukturo za potrebe izvedbe prostorskih ureditev iz prostorskih aktov občine. Najprej smo opredelili nova in obstoječa poselitvena območja, območja prenove, zgostitve in prestrukturiranja ter predvidene dejavnosti, pogoje gradnje in velikosti teh območij. Na podlagi tega smo ocenili prihodnje potrebe po pitni vodi. S pomočjo hidravlične preveritve vodovodnega sistema in uporabe kazalcev komunalne opremljenosti smo v sodelovanju z upravljavci gospodarske javne infrastrukture opredelili potrebne investicije v obstoječe in novo vodovodno omrežje. V obravnavanem primeru je bila kapaciteta vodovodnega sistema zadostna za izvedbo predvidene gradnje na nepozidanih stavbnih zemljiščih, potrebne bi bile le manjše investicije v obstoječi vodovodni sistem in investicije v sekundarno vodovodno omrežje za potrebe oskrbe s pitno vodo na posameznih območjih.

Ugotovili smo, da je oblikovana metodologija uporabna za presojo ustreznosti obstoječih kapacitet vodovodnega sistema in načrtovanje novih v procesu prostorskega načrtovanja, kar trenutno predstavlja manjkajočo podlago pri pripravi prostorskih aktov v Sloveniji. Podatek o stanju zmogljivosti obstoječe komunalne infrastrukture ter

potrebnih investicijah za kritje obstoječih in predvidenih potreb pripomore tudi k racionalnejšemu planiranju dejavnosti v prostoru. Na odločanje pri planiranju dejavnosti v prostoru sicer vpliva več dejavnikov, vendar bi znana ocena zmogljivosti obstoječe komunalne infrastrukture vključno z drugimi dejavniki lahko pripomogla k učinkovitejšemu usmerjanju poselitve in notranjemu razvoju naselij, predvsem bi omogočila opredelitev ekonomičnega obsega površin stavbnih zemljišč, določanje etapnosti uresničevanja načrtovanih prostorskih ureditev, smotrno in racionalno načrtovanje komunalnega opremljanja ter oceno potrebnih finančnih sredstev za razvoj stavbnih zemljišč.

**KLJUČNE BESEDE:** *zmogljivost komunalne infrastrukture, prostorsko načrtovanje, strokovne podlage, razvoj naselij, komunalno gospodarstvo, poraba pitne vode*

## SUMMARY

The goal of municipal infrastructure planning is to cover the needs for public utilities in both quantitative and qualitative terms. Planning takes into account current as well as potential new communal infrastructure needs. Therefore, municipal infrastructure planning should be carried out at the same time as spatial planning of different arrangements and spatial implementation conditions. The starting point for municipal infrastructure planning is the analysis of existing infrastructure, especially the assessment of its capacity. Municipal infrastructure capacity is defined as the ability of the existing infrastructure to provide coverage for a certain range of needs, and is one of the important factors for planning, defining construction costs and the stages of infrastructure development.

The study presents the methodology for the estimation of water distribution system capacity and investments in the existing and new communal infrastructure for the realisation of planned arrangements from spatial plans. The methodology was developed on the example of the Municipality of Kranj. Firstly, we identified new and current settlement areas, areas of regeneration, concentration and restructuring, as well as planned activities, construction conditions and the size of these areas. On this basis, we estimated future average drinking water consumption. We identified necessary investments in the existing and new water supply system with the help of hydraulic validation of the water supply system and the use of communal infrastructure indicators in cooperation with public service companies. The results of our study

example in Kranj show that due to the generally sufficient capacity of the water supply system for carrying out the planned construction on vacant building land, only minor investments in the existing and new secondary water supply network are needed.

The results of the developed methodology proved to be useful for assessing the suitability of existing water distribution system capacities and for planning new ones. Such assessment represents the missing expert basis in the process of preparation and acceptance of spatial plans. Data on the capacity of existing municipal infrastructure and the necessary investments for covering the current and future needs for drinking water also contribute to a more rational activities allocation. While the decision-making of activities allocation is influenced by several factors, an estimation of water distribution system capacity and investments in the existing and new communal infrastructure could help to achieve a more efficient orientation and internal development of settlements. This would, in particular, determine the economic size of building land, the stages of implementation of planned arrangements, efficient and rational planning of new municipal infrastructure and the estimation of the necessary financial resources for the development of building land.

**KEY WORDS:** *municipal infrastructure capacity, spatial planning, expert basis, settlement development, municipal economics, drinking water consumption*

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## eGraditev eConstruction

*Jurij Mlinar, Jan Brezec, Nikolaj Šarlah, Martina Strniša*

### POVZETEK

Procesi na področju graditve objektov so še vedno obremenjeni s papirnim poslovanjem ter z razdrobljenimi zbirkami podatkov in podpornimi storitvami. Nova prostorska in gradbena zakonodaja podaja pravne podlage za vzpostavitev elektronskega poslovanja na področju graditve objektov (eGraditev). Prioritetna naloga ministrstva na tem področju je optimizacija postopkov, nadomestitev papirnega poslovanja z elektronskim in vzpostavitev manjkajočih zbirk prostorskih podatkov. eGraditev bo podpirala postopke graditve od priprave projektne dokumentacije, oddaje vlog, dovoljevanja in odpreme ter tudi relevantne podpostopke kot je priprava mnenj v fazi pred oddajo vloge. Za zagotavljanje celovite podpore pri elektronskem poslovanju bodo v okviru prostorskega informacijskega sistema vzpostavljeni še sistem za elektronsko poslovanje na področju prostorskega načrtovanja (ePlan), sistem spremljanja stanja prostorskega razvoja in enotna vstopna točka. Vzpostavitev vseh storitev v okviru prostorskega informacijskega sistema bo izvedena v okviru programa projektov eProstor.

Ministrstvo za okolje in prostor je odprlo javno spletno mesto prostorskega informacijskega sistema, ki je dostopno na naslovu <http://www.pis.gov.si>. Osrednja storitev, ki je dostopna preko spletnega mesta, je grafični pregledovalnik, ki omogoča vpogled v osnovne podatke o gradbenih in uporabnih dovoljenjih, ki se evidentirajo od 1. 6. 2015 naprej. Podatki so uporabnikom na voljo tudi preko javnih spletnih servisov. Ti so namenjeni dostopu in prevzemu prosto dostopnih podatkov za namene nadaljnjih analiz. Podprti so kartografski in objektni spletni servisi (WFS, WMS), kjer je uporabnikom na voljo tudi pomočnik za prenos podatkov.

Prostorski podatki, ki so na voljo preko spletnega mesta prostorskega informacijskega sistema, so v tem trenutku še informativne narave. S programom projektov eProstor ter z novima zakonoma na področju urejanju prostora in graditve objektov bo ministrstvo do leta 2021 vzpostavilo pogoje, da bodo podatki o prostorskih aktih, gradbenih in uporabnih dovoljenjih, ki bodo evidentirani v ePlan in eGraditev, pridobili status uradnih podatkov.

**KLJUČNE BESEDE:** *eGraditev, elektronsko poslovanje, gradbeno dovoljenje, prostorski informacijski sistem*

## SUMMARY

Procedures within the field of construction are still burdened with paper operations, fragmented databases and support services. The new spatial and construction legislation provides legal basis necessary for the establishment of electronic services in the field of construction (eConstruction). The main purpose of the ministry in this area is to optimise procedures, replace paper operations with electronic ones, and establish uniform spatial data sets. The eConstruction will provide support for construction procedures, from the preparation of project documentation, submission of applications to procedures regarding building consents during the pre-submission phase. To provide comprehensive support for electronic services, the establishment of spatial information system in the field of spatial planning (ePlan), a system for monitoring spatial development and a single entry point in the field of spatial planning and construction needs to be ensured. The establishment of all services within the Spatial Information System will be realised within the eProstor programme of projects.

The Ministry of the Environment and Spatial Planning established a public website within the Spatial Information System, which can be accessed at <http://www.pis.gov.si>. Currently, the central service that is accessible through this website is a graphical viewer that enables viewing of basic data of construction of buildings, in particular – data on building and operating permits, which are recorded starting with the 1 June 2015. The information is made available to users through online public services.

The status of spatial information available through the Spatial Information System is at the moment of informative nature. With the eProstor programme of projects and the new legislation in the field of spatial planning and construction, the ministry will, by 2021, establish the conditions for the registration of data on the spatial planning acts, construction and operating permits in a uniform way through the Spatial Information System. Data recorded after 2021 will have the status of official data.

KEY WORDS: *eConstruction, electronic services, building permit, Spatial Information System*

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## **Evidentiranje nepremičnin – novi predpisi in informacijske rešitve** **Real estate registration – new regulations and information solutions**

*Emo Pogorelčnik, Franc Ravnihar*

### **POVZETEK**

Ministrstvo za okolje in prostor je konec leta 2019 opravilo medresorsko obravnavo osnutka Zakona o katastru nepremičnin, ki ga je pripravila Geodetska uprava Republike Slovenije. Glavni cilj novega Zakona o katastru nepremičnin je vzpostavitev enotne evidence, imenovane »kataster nepremičnin«, v kateri bodo združeni podatki o parcelah, stavbah in delih stavb v Republiki Sloveniji. Namen vzpostavitve enotne evidence o nepremičninah je zagotavljanje večje učinkovitosti, medsebojne usklajenosti, kvalitetnega in lažjega dostopa do evidentiranih podatkov, uveljavljanja novih načinov vlaganja vlog s sredstvi informacijsko komunikacijske tehnologije, pospešitev postopkov vpisa sprememb, razvijanje novih storitev posredovanja obdelanih podatkov o nepremičninah in zagotovitev dostopa do celovitih podatkov o nepremičninah na enem mestu.

Zakon o katastru nepremičnin prinaša spremembe predvsem na področju naslednjih vsebin:

- vodenje podatkov o parcelah, stavbah in delih stavb v enotni evidenci,
- določitev enotnega postopka – t. i. "katastrskega postopka",
- evidentiranje območja služnosti in območja stavbne pravice,
- začasni vpis podatkov v kataster nepremičnin,
- vodenje sestavinah delov stavb (npr. atrijev, parkirnih mest),
- evidentiranje podatkov ob upoštevanju pravne varnosti lastnikov nepremičnin.

Predlog zakona določa dve poti vpisa podatkov o nepremičninah v kataster nepremičnin. Prva je vpis podatkov o nepremičninah z elaboratom, ki ga izdela geodetsko podjetje, projektant za nekatere spremembe podatkov, dogovorjene v zakonu, ali pa sodni izvedenec. Drugi način vpisa podatkov pa je preko vloge brez elaborata, kjer podatke vlagatelj priloži na predpisanem obrazcu.

Vzporedno s pripravo zakona se v okviru projekta eProstor izvaja tudi informacijska prenova nepremičninskih evidenc. Bistven doprinos informacijske prenove je vodenje vseh podatkov v enotni, povezani podatkovni zbirki, elaborate bo v informacijski sistem katastra vlagalo geodetsko podjetje (ali projektant ali sodni izvedenec), s čimer se bodo tehnične pomanjkljivosti elaborata preverile že ob njegovi oddaji. Prav tako bo zahtevo

za vpis podatkov oddalo geodetsko podjetje (ali projektant ali sodni izvedenec) kot pooblaščenec vlagatelja. V drugi polovici leta 2020 in v letu 2021 se bo izvajala implementacija celotnega prenovljenega informacijskega sistema. Predvideno je, da se zakon in prenovljen informacijski sistem prične uporabljati 29. oktobra 2021.

KLJUČNE BESEDE: *nepremičnina, kataster, parcela, stavba, del stavbe, prostorska enota*

## SUMMARY

At the end of 2019, the Ministry of the Environment and Spatial Planning carried out an interdepartmental reading of the draft Real Estate Cadastre Act prepared by the Surveying and Mapping Authority of the Republic of Slovenia. The main objective of the new Real Estate Cadastre Act is to establish a single record called the "real estate cadastre", which will combine data on parcels, buildings and building parts in the Republic of Slovenia. The purpose of the establishment of the unified real estate cadastre is to ensure greater efficiency, mutual harmonisation, better quality and easier access to the recorded data, to promote new ways how to enter data in unified real estate cadastre by applying new means enabled by the information and communication technology, to accelerate data entering of changes, to develop new services for the transmission of processed real estate data and to ensure access to comprehensive real estate information in one place.

The new Real Estate Cadastre Act brings changes mainly in the following areas:

- keeping records of parcels, buildings and building parts in a unified register,
- establishing a single procedure – i.e. "cadastral procedure",
- recording the easement and the building right,
- temporary entry of data into the real estate cadastre,
- managing the components of building parts (e.g. atriiums, parking spaces),
- recording data with respecting the legal security of the property owners.

The new Real Estate Cadastre Act defines two ways how to enter real estate data in the real estate cadastre. The first is the entry of real estate data with a detailed report prepared by a land surveyor, a certified civil engineer for some changes to the data agreed by the law or by a court expert. Another way of entering data is through an

application without surveyor's detailed report, where the applicant submits the information on the predefined prescribed form.

In parallel with the drafting of the law, the eProstor project is also carrying out an informatisation update of real estate records. The essential contribution of information renewal is the management of all data in a single, linked database, the surveyor's detailed report will be inserted in the cadastral information system by a land surveyor's enterprise (or certified civil engineer or court expert), and at this stage, the technical shortcomings of the surveyor's detailed report will be checked. Also, the request for data entry must be submitted by the surveyor's enterprise (or certified civil engineer or court expert) who will serve as the authorised assignee. In the second half of 2020 and in 2021, the entire updated information system will be implemented. It is predicted that the new law and the updated information system will apply from 29 October 2021.

**KEY WORDS:** *real estate, land cadastre, parcel, building, building part, spatial unit*

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# GEO Detski an 48

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