

PHYSICAL PLANNING INFORMATION SYSTEM OF CROATIA: OVERVIEW OF THE CONTENTS AND CURRENT STATUS OF DEVELOPMENT

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ABSTRACT

The Physical Planning Information System was introduced in 2013 as the Croatian central physical planning point. It consists of a publicly accessible geoportal and a variety of modules, which are separate custom-made web applications for entering, uploading and editing alphanumeric and/or georeferenced graphic data by authorized users. Each module, such as *eDozvola* (ePermit), *ePlanovi* (ePlans), *eNekretnine* (eProperties) and a few others, supplemented by submodules in some cases, deals with specific tasks and processes in accordance with the regulations in the field of construction, physical planning, property appraisal, etc. In this paper we will present the concept of the information system as a whole, briefly review the functionalities of the recently redesigned geoportal, as well as some of the key modules, with an emphasis on the *eKatalog* (eCatalogue) module, which serves as a platform for discovery of spatial plans in force and other kinds of documents relevant for physical planning (i.e. territorial monitoring reports, scientific and expert papers, sectorial documents, etc.) by means of INSPIRE-compliant and custom metadata, and for publishing spatial plans and documents on the geoportal so as to make them available to the general public. Plans for the future development of the information system will also be outlined.

KEYWORDS _ *physical planning information system, PPIS, ISPU, geoportal, spatial plans*

INTRODUCTION

The Physical Planning Information System (hereinafter: ISPU) has been undergoing development since 2013 by the Ministry of Construction and Physical Planning of Croatia. Along with the Ministry, in the period from 2014 to 2018 the Croatian Institute for Spatial Development was responsible for the development of the ISPU components (so-called modules) dedicated to physical planning, i.e. *eKatalog* and *ePlanovi* modules, as well as the ISPU geoportal and the ISPU lokator tool. From the beginning of 2019, the Institute has continued its activities as an expert organization unit within the Ministry.

In order to officialize the ISPU and its modules, i.e. precisely define its contents, built-in procedures and groups of users authorized for entering/uploading/editing data in the modules, the appropriate legal framework has been established. Regulations focusing on the components of the ISPU related to physical planning include the Physical Planning Act (Official Gazette 153/2013, 65/2017, 114/2018, 39/2019, 98/2019, hereinafter: PPA), the Regulation on the Physical Planning Information System (Official Gazette 115/2015) and the Ordinance on the State Plan for Spatial Development (Official Gazette 122/2015). Moreover, as of March 2020, the Ordinance on Spatial Plans, which shall regulate the form and the content of spatial plans, is in the final drafting phase undergoing verification and adjustments through simultaneous spatial plans' test drafting in the *ePlanovi* editor

submodule, which shall later on allow direct import in the ePlanovi module and publishing the plans on the ISPU geoportal. The spatial plans drafted in the ePlanovi editor, employing GIS technologies, new methodology, prescribed spatial layers' structure, symbology and topological control, and subsequently imported, verified and published via the ePlanovi module, are called new generation spatial plans, as opposed to the old generation spatial plans drafted in compliance with the "Ordinance on the content, criteria for map projections, required spatial indicators and the standards of physical planning studies" issued in 1998.

The ISPU definition and description are set out in Art. 31 of the PPA: "the ISPU shall be established and maintained for the purpose of developing, adopting, implementing and monitoring spatial plans and continuous spatial monitoring and monitoring in the field of physical planning, and for the purpose of drafting the territorial status reports, pursuant to the PPA and other regulations. It shall be established and managed as an interoperable and multiplatform system linking information systems of individual public law bodies, which pursuant to the PPA and special regulations produce and/or maintain spatial data and other data relevant for physical planning." The ISPU concept and its contents, along with an overview of the ISPU geoportal and the eKatalog module recent redesign are described more in depth in the following chapters.

THE ISPU CONCEPT

The central point of the ISPU is its publicly accessible geoportal (<https://ispu.mgipu.hr>). The ISPU geoportal was first established in 2013 and serves for visualization of data entered via the ISPU modules or retrieved via network services from external sources. It encompasses typical geoportal functionalities (positioning, zooming, search, layer management, base map selection, a variety of tools for drafting, measuring, import/export or sharing of data, etc.).

Other ISPU components are so-called ISPU modules which are custom-made web applications for entering, uploading and editing alphanumeric and/or georeferenced graphic data by authorized users. Each one of the modules deals with specific procedures prescribed by law under jurisdiction of the Ministry, such as permits' issuance (eDozvola) or real estate appraisal (eNekretnine) and has its own pool of authorized users.



_ Figure 1: Concept of the ISPU: geoportal & modules

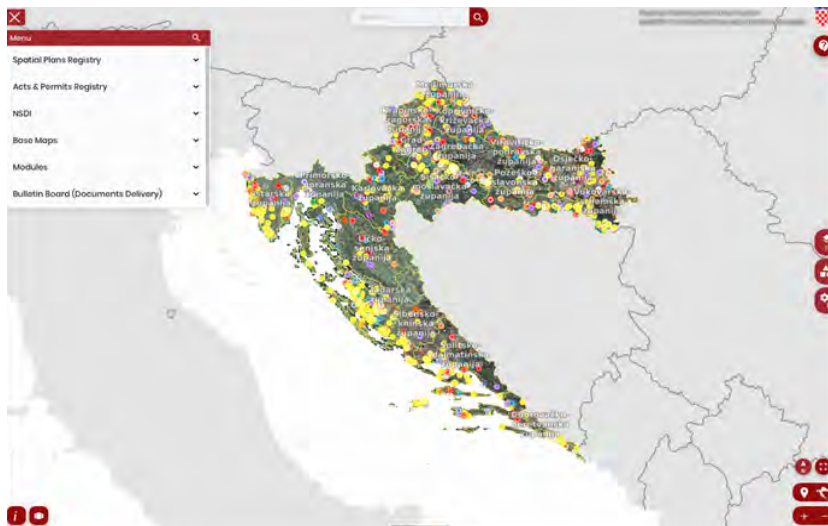
Furthermore, there is the ISPU lokator, a tool for assigning a spatial component to records in an alphanumeric database so as to enable their visualization on the geoportal or any interactive map. It can be connected to any ISPU module or independent application. For instance, the ISPU lokator is used by the eArhiv submodule, a part of the eDozvola module, which presently contains data on legalized buildings, but in the future metadata, scans and locations of all kinds of permits issued since 1968 up to the introduction of the eDozvola in 2015 will also be available.

The ISPU components that are either fully functional or in the high stage of development in March 2020 are shown in Figure 1.

ISPU GEOPORTAL REDESIGN 2019

The first version of the ISPU geoportal was developed in 2013. Featuring a very simple layout, it was meant to be user friendly to the general public, with no knowledge of advanced functionalities of geoportals. As such it fulfilled its role rather well for 5-6 years. However, search options were limited and not self-evident. It was not fully functional on mobile devices and was lacking some useful tools (measurement, user annotation, sharing of locations, etc.). Over the same time span some new possibilities for external data retrieval became available as well, such as refreshing of the digital cadastral plan and the address registry via State Geodetic Administration network services. For these reasons, the ISPU geoportal was completely redesigned in 2019 and the new version, shown in Figure 2, was made available to the public in early November 2019.

Besides greatly enhanced performance on both desktop computers and mobile devices due to responsive design, other improvements encompass the following:



_ Figure 2: The ISPU geoportal after the 2019 redesign

- _ navigation: menu reorganization and layer grouping, more easily accessible layer-info tool, i.e. access to vector layers' attributes
- _ new zooming and positioning options: current user location, retention of last view and map position, positioning on a search result
- _ facilitated and accelerated search: searchable layers and fields predefined and indexed, search results grouped by topics
- _ weekly refreshing of the digital cadastral plan and the address registry

- _ new base maps and spatial layers (digital orthophoto maps, streets, street numbers, permits registry, etc.)
- _ cater for multilingualism: Croatian and English versions active, new languages to be introduced in the future.

Additionally, some new technologies were implemented 'behind the scenes': open source Angular by Google for tool-rich responsive user interface, open source .NET Core microservice architecture by Microsoft, organized by tasks domains for better scalability and management facilitation, open source Elasticsearch by Elastic NV for search engine and Openshift by Red Hat for containerized applications' development, administration and management.

EKATALOG REDESIGN 2019

The eKatalog module is a centralized platform for discovery of spatial plans in force by means of National Spatial Data Infrastructure (NSDI) metadata profile v.2.0. INSPIRE-compliant (in effect at the time of its development) along with custom metadata. "Metadata is, obviously, the first call of duty for an SDI to secure understanding of the diverse datasets – their origin, contents, purpose, format, and access among others." (Nedović-Budić, 2011) The introduction of the eKatalog in 2013 enabled for the first time an overview of spatial plans in force in one place. Until that time, information on spatial plans as well as plans themselves were scattered over more than 500 county or local administrative units' websites. Although some county institutes for physical planning (e.g. the institutes of Slavonski Brod-Posavina County, Dubrovnik-Neretva County and Primorje-Gorski Kotar County, etc.) had spatial plans' registers in place, the registers were not (and are still not) made interoperable in any way. Therefore, metadata retrieval to the eKatalog is not possible. However, metadata exchange from the eKatalog to county registers has been possible since 2016 by means of an .XLSX export that can be generated by authorized users. In the future metadata harvesting from the eKatalog will be enabled by the catalogue network service (CSW).

Alati	Oreška	Županija / RH	Grad / općina	Status	Naziv revizije	Oznaka	Objava	Izvan snage	Prilozi	Aktivan
		Zagrebačka		Verificiran	PPRO Črikovec - Zračn...	HR-ISPU-PPRO01-0000...	2012	Ne	Ne	
		Šibensko-krška	MURTER - KORNATI	Verificiran	PPRO Žušica-slike etc...	HR-ISPU-PPRO01-0001...	2018	Ne	Ne	
		Špiltsko-dalmatinska		U radu	PPRO Zlatni rat (Napom...		1990	Ne	Ne	
		Špiltsko-dalmatinska		U radu	PPRO park kume Marjan			Ne	Ne	
		Republika Hrvatska		Verificiran	PPRO PP Medvednica	HR-ISPU-PPRO013-000...	2014	Ne	Ne	
		Republika Hrvatska		Verificiran	PPRO PP Biokovo	HR-ISPU-PPRO09-000...	2015	Ne	Ne	
		Republika Hrvatska		Verificiran	PPRO PP Vransko jezero	HR-ISPU-PPRO18-000...	2012	Ne	Ne	
		Republika Hrvatska		Verificiran	PPRO NP Kornati	HR-ISPU-PPRO02-000...	2003	Ne	Ne	
		Republika Hrvatska		Verificiran	PPRO NP Brinjuni	HR-ISPU-PPRO01-0000...	2001	Ne	Ne	
		Republika Hrvatska		Verificiran	PPRO PP Učka	HR-ISPU-PPRO16-000...	2006	Ne	Ne	

_ Figure 3: User interface of the 2019 eKatalog module for authorized users

Metadata entry and verification in the eKatalog are performed by more than 100 authorized users from the Institute for Spatial Development of the Ministry of Construction and Physical Planning

and from the institutes for physical planning of the counties and of the City of Zagreb, depending on the spatial plan levels. All verified metadata is available to the public (almost 6,400 metadata as of March 2020) and interoperable with the eDozvola.

Besides metadata entry form, the initial 2013 eKatalog release harbours additional rather rudimentary functionalities such as quick and detailed search, filtering and print. It is possible to attach any kind of documents to a metadata record and in that way publish maps and/or textual parts of a spatial plan in any format, as well as insert URLs of any relevant data source (a county, city or municipality website, local geoportal, etc.) (Habrun et al., 2016). Yet the georeferenced raster maps trimmed to fit plan borders presently accessible on the ISPU geoportal are not published via the eKatalog, but by way of a separate time-consuming and cumbersome procedure.

The main upgrade in the 2019 version of the eKatalog is the interface for loading of the maps and joining them to navigation menu items resulting in direct publishing on the ISPU geoportal. That way the authorized users will assume full control over the map publishing, consequently resulting in significantly accelerated and simplified publishing procedure.

Other distinctive new functionalities introduced in the new version include generating of predefined reports, filtering of plans in force for a location of interest by selection on an interactive map, system for notification of data entry errors and corrections monitoring.

Moreover, in addition to spatial plans, other kinds of documents relevant for physical planning (i.e. territorial monitoring reports, scientific and expert papers, sectorial documents, etc.) can be uploaded and described by means of somewhat truncated metadata, then published on the ISPU geoportal, therefore made available to the general public.

Furthermore, coding tables' maintenance has been amended, and data entry automatization and correctness verification improved. INSPIRE part is now harmonized with NSDI metadata profile v.2.1. Authorized user interface remains optimized for desktop computers, unlike public interface, which is responsive.

FURTHER STEPS

Notwithstanding recent upgrades, the development and upgrade of the ISPU and its modules continue. Some of the new features to be integrated rather soon are: additional maps comparison and data exchange tools, network services, connecting to additional external data sources (e.g. data on land owners from the Land Registry) and publishing of new spatial datasets created by the ISPU modules (e.g. data on brownfields, energy certificates, etc.). There are plans in place to establish the ISPU geoportal for registered users which will contain some advanced features such as: enlarged sets of attributes on permits and other documents, reporting system and data export possibilities. The new modules and submodules will also be developed.

Broaching the subject of external data sources, it is worth saying that availability of spatial datasets and network services in Croatia proves to be the most pronounced challenge in establishing both the ISPU and NSDI. Some of the key bodies responsible for datasets essential for physical planning, such as the Ministry of Culture (protected cultural heritage), the Ministry of State-Owned Assets (state-owned immovables) or the Ministry of Agriculture (particularly valuable agricultural land, state-owned agricultural land) until today have not set up any relevant interoperable registers with a spatial component. Some other key bodies, e.g. the Croatian Roads (Public Roads Register), even the State Geodetic Administration (cadastre, territorial units) need to upgrade the quality of their datasets. Therefore, the lack and the rather poor quality of the spatial datasets need to be addressed urgently on the government level, since it interferes with efficient land management and planning.

Some of the prominent scientific research topics will be tackled in the future as well. Currently the most elaborated among them is automated analysis of satellite images, both Copernicus and commercial. The findings of several recent case studies covering Croatia and the City of Zagreb (e.g. Lukić et al, 2016; Valozić, 2017) helped to establish the concept of the eSateliti module, essentially a tool for monitoring urban sprawl and land use changes in general. Vectorization of satellite images

is performed on the basis of calculation of various indices such as NDVI, NDBI, etc., which enable differentiation of built-up areas from non-built-up surroundings, with subsequent manual control. The development of the eSateliti module is ongoing and will be introduced in 2021.

Other open subjects/concepts related to planning which are being examined for a more advanced development in the not-so-close future include: use of parametric modelling in urban planning, i.e. visualization of different scenarios using standardized urban indicators (e.g. Beirão and Arrobas, 2013), integration of building information modelling (BIM) with GIS and introduction of 3D planning. However, besides a pressing need for additional staff to deal with the development of the ISPU, the prerequisites for these encompass a more widespread implementation of BIM in Croatia (which is rather scarce at the moment), high-resolution digital elevation model (presently available resolution is 25x25 m) and 3D cadastre (non-existent, although some basics have been investigated, e.g. Vučić et al., 2013; Vučić et al., 2014).

CONCLUSION

The paper describes the history and the concept of the ISPU, introduced in 2013, and some of its components with the emphasis on the components related to spatial planning. The main upgrades of the ISPU geoportal and the eKatalog module are outlined as well, along with a brief overview of development plans in the near future. The new version has facilitated the use of the ISPU geoportal and greatly improved user experience. Thanks to the eKatalog redesign, i.e. accelerated and simplified publishing procedure of the spatial plans and other types of documents relevant for spatial planning, the quantity and up-to-dateness of the ISPU geoportal contents are about to be significantly enriched.

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