

# Implementing a WebGIS Solution in the City of Sinj in Accordance with the Needs of the City Stakeholders

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**Abstract.** The paper describes the establishment of a webGIS pilot project in the city of Sinj, based on the research of the development of local spatial data infrastructure (LSDI) as described in the doctoral thesis (Marasović 2020). A set of LSDI development indicators were tested in the pilot project. The indicators to be tested were discovered in the mentioned doctoral thesis using statistical regression, statistical correlation and focus groups. The following key indicators have been identified: 1) funding from the local level, 2) awareness, 3) support for development from the decision makers, and 4) administration and citizens recognized as the main LSDI user groups. As an example of LSDI, most main stakeholders of the city of Sinj were interviewed and mapped according to their relevant capabilities, working processes and interaction between the main stakeholders. All the identified indicators were confirmed. The pilot project confirmed that the decision on investment in LSDI from the local level decision makers is essential for its implementation. For such a decision, raising the awareness of the decision makers and citizens about the benefits of LSDI is vital. Citizens and city administration were mapped as two stakeholders which interact most among the stakeholders. Delegating an employee responsible for the implementation and support from the decision makers during the implementation process are essential for success. Human Resources and Public Relationships management activities were recognized as very important in the process of raising awareness of LSDI.

**Keywords:** pilot project, LSDI, webGIS, indicators of development

## 1 Introduction

Since around 75% of the population in Europe lives in cities, efficient management of cities as well as a high quality of life are very important. Among others, *Smart cities information systems* (SCIS) as an EU policy are used for improving the management and efficiency of cities using technological solutions like webGIS (European Commission 2018). Big cities according to their budget or population will more easily implement such technologies. The challenge is

higher with medium-sized cities, and greater yet with small cities. What makes medium and small cities decide to implement webGIS, what are the obstacles for its implementation and what is important for the webGIS environment in cities was questioned during the webGIS implementation pilot project (Marasović et al. 2019). The objectives of this research are two-fold. One objective is to implement a webGIS solution for city management, and the second is to analyse the Local Spatial Data Infrastructure (LSDI) environment in the chosen city from different perspectives. The

# Uspostava webGIS rješenja u gradu Sinju u skladu s potrebama gradskih dionika

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**Sažetak.** U radu je opisana uspostava pilot projekta webGIS rješenja u gradu Sinju bazirana na istraživanju razvoja lokalne infrastrukture prostornih podataka (LIPP) u doktorskom radu (Marasović 2020). Na uspostavljenom je pilot projektu testiran skup indikatora razvoja za daljnji razvoj LIPP-a. Indikatori koje je trebalo testirati otkriveni su u navedenom doktorskom radu koristeći statističku regresiju, statističku korelaciju i fokus grupe. To su: 1) financiranje s lokalne razine, 2) svijest o LIPP-u, 3) podrška razvoju od donositelja odluka i 4) administracija i građani prepoznati kao glavne grupe korisnika LIPP-a. Većina glavnih dionika grada Sinja intervjuirana je i shematski prikazana prema mogućnostima, radnim procesima, vrsti i intenzitetu interakcije između glavnih dionika. Svi su identificirani indikatori potvrđeni. Pilot projekt potvrdio je da je odluka o ulaganju u LIPP od donositelja odluka na lokalnoj razini bitna za provedbu. Za takvu je odluku ključno podizanje svijesti donositelja odluka i građana o prednostima LIPP-a. Građani i gradska uprava prikazani su na shemi kao dva dionika koja od svih dionika najviše komuniciraju. Odabir zaposlenika odgovornog za uspostavu sustava i podrška donositelja odluka tijekom procesa uspostave ključni su za uspjeh. Aktivnosti upravljanja ljudskim potencijalima i odnosima s javnošću prepoznate su kao vrlo važne u procesu podizanja svijesti o LIPP-u.

**Ključne riječi:** pilot projekt, LIPP, webGIS, indikatori razvoja

## 1. Uvod

Budući da oko 75% stanovništva Europe živi u gradovima, vrlo je važno da je upravljanje gradovima učinkovito te da kvaliteta života bude što veća. Između ostalog, informacijski sustavi pametnih gradova (engl. *Smart Cities Information Systems* - SCIS) kao politika Europske unije (EU) koriste se za poboljšanje upravljanja i učinkovitosti gradova korištenjem tehnoloških rješenja poput webGIS-a (Europska komisija 2018). Veliki gradovi, bilo po proračunu ili po broju

stanovnika, lakše će uspostaviti takve tehnologije, ali izazov je veći sa srednjim i, čak i više, malim gradovima. Što potiče srednje i male gradove da se odluče na uspostavu webGIS-a, koje su prepreke za uspostavu i što je bitno za webGIS okruženje u gradovima nešto je što bi se moglo prepoznati tijekom pilot projekta uspostave webGIS-a u odabranom gradu (Marasović i dr. 2019). Stoga, bila su dva cilja ovog istraživanja. Jedan je cilj bio uvođenje webGIS rješenja u upravljanje gradom, a drugi je bio analiza lokalne infrastrukture prostornih podataka (LIPP) okruženja u odabranom

results of this research were used for comparison with the key indicators for the development of Croatian LSDI in Marasović (2020). Through the implementation process, interviews with stakeholders were conducted to determine the working processes, possibilities and communication between the stakeholders regarding LSDI.

The WebGIS solution was selected based on the eligibility criteria of the city administration to invest in webGIS and the criteria of the most representative city in terms of population and budget indicators among all cities in Croatia

The complexity of this research was manifested through both the scientific and organizational challenges. It included planning the implementation process of a webGIS solution, selecting an appropriate city and webGIS solution provider, organizing the team for webGIS implementation, recognizing the LSDI stakeholders, organizing, conducting and analysing interviews. The process of implementation was conducted in the real environment with a number of stakeholders included, so it involved sensitive relations between people. One of the most important stakeholders, if not the most important, are citizens, so it was crucial to understand how public relations influence the citizens and how citizen opinion might be influencing the decision makers.

Koo and Lee (2001) researched the obstacles for the development of the Korean LSDI based on a survey on 32 local governments. They identified a lack of funds, lack of awareness from the decision makers, employee resistance, and a lack of departmental coordination, among others. Owusu (2005) recognized the need for awareness and support from management as the first problem for the development of GIS for urban green development in Ghana. Fountains spatial, inc. (2008) introduced the GIS implementation plan into city management based on the city's needs. McDougall (2006) found that "factor groups such as policy, organizational support, access to state data and business needs were identified as significant" in research carried out in Australia on the motivation and barriers for local governments to collaborate. Marasović (2020) identifies key indicators for the development of the Croatian LSDI which were used in this pilot project as the research starting point. The methods used in this project were interviews and a pilot project. The key indicators for the development of LSDI were recognized. The LSDI environment is observed not just through an analysis of the interviews, but from operational implementation in the real environment, revealing additional insights into the implementation process

which are important for the successful planning and implementation of LSDI. The results from this research can be used in the LSDI planning and implementation process in other cities.

## 2 Pilot Project Plan

Conducting the pilot project was a complex process which included a number of operational activities. Systemizing the implementation steps and experiencing the implementation of webGIS in a real environment was beneficial for understanding the challenges in implementation of webGIS and for comparing conclusions with the conclusions from research (Marasović 2020). There were ten important steps in conducting the pilot project:

- Selection of the company for webGIS implementation,
- Selection of a city for the pilot project,
- Organizing the team for webGIS implementation,
- Recognizing the stakeholders and working processes relevant for webGIS,
- Conducting interviews with stakeholders,
- Interview results coding,
- Interview interpretation,
- Implementation of webGIS,
- Measuring the influence of public relations on citizens,
- Gathering opinions of webGIS implementation team members about their experience on the pilot project.

## 3 Company for WebGIS Implementation

There were three main criteria for selecting the company for webGIS implementation. The first was the cost of implementation, since it is important for medium and small cities which do not have as many resources as the biggest cities. Also, small and medium cities decision makers are more likely to have a lower level of awareness of the benefits of LSDI, making it harder for them to decide to invest in webGIS. The second criterium was that the company has experience in implementing webGIS in cities, especially small and medium-sized ones. The third was the company's willingness to have a more academic and custom-made approach to the research, rather than a commercial one.

Meetings with three companies were held: "Geofoto, d.o.o.", Slovenska bistrica, the Republic of Slovenia, "GD i GISDATA d.o.o.", Zagreb, the Republic of Croatia and "Promet i prostor, d.o.o.", Zagreb, the Republic of Croatia. After the meetings, the company

gradu. Rezultati analize korišteni su za usporedbu s otkrivenim ključnim pokazateljima razvoja hrvatskog LIPP-a iz rada Marasovića (2020). Kroz proces uspostave obavljen je intervju s dionicima kako bi se prepoznali radni procesi, mogućnosti i komunikacija između dionika vezano uz LIPP. WebGIS rješenje odabrano je na temelju kriterija prihvatljivosti gradskoj upravi da uloži u webGIS te kriterija najrepreszentativnijega grada po pokazateljima broja stanovnika i proračunu među svim gradovima u Hrvatskoj.

Složenost ovog istraživanja očitovala se i kroz znanstvene i kroz organizacijske izazove. Uključivala je planiranje procesa uspostave webGIS rješenja, odabir odgovarajućega grada i pružatelja webGIS rješenja, organizaciju tima za uspostavu webGIS-a, prepoznavanje dionika LIPP-a te organiziranje, vođenje i analizu intervjua. Proces uspostave odvijao se u stvarnom okruženju s brojnim dionicima, tako da je uključivao i brigu o međuljudskim odnosima. Jedan su od najvažnijih dionika, ako ne i najvažniji, građani. Bilo je važno razumjeti kako odnosi s javnošću utječu na građane te kako mišljenje građana utječe na donošenje odluka.

Koo i Lee (2001) proveli su istraživanje o preprekama za razvoj korejskog LIPP-a na temelju ankete u 32 lokalne samouprave prepoznajući nedostatak financijskih sredstava, nedostatak svijesti donositelja odluka, otpor zaposlenika i nedostatak koordinacije među odjelima. Owusu (2005) prepoznaje potrebu za osvješćivanjem i podršku menadžmenta kao prvim problemom za razvoj GIS-a za urbani zeleni razvoj u Gani. Fontane spatial, inc. (2008) predstavljaju plan uvođenje GIS-a u upravljanje gradom na temelju gradskih potreba. McDougall (2006) je otkrio da su "skupine čimbenika kao što su politika, organizacijska podrška, pristup državnim podacima i poslovne potrebe identificirane kao značajne" u istraživanju motivacije i prepreka za suradnju lokalnih vlasti u Australiji. Marasović (2020) identificira ključne pokazatelje za razvoj hrvatskog LIPP-a koji su korišteni u ovom pilot projektu kao polazište za istraživanje. Metode korištene u ovom projektu bile su intervjui i pilot projekt. Prepoznati su ključni pokazatelji razvoja LIPP-a. LIPP okruženje promatra se ne samo kroz analizu intervjua, već i iz iskustva operativne uspostave u stvarnom okruženju, što otkriva dodatne uvide u proces uspostave koji je važan za uspješno planiranje i provedbu LIPP-a. Rezultati se ovog istraživanja mogu koristiti u planiranju i procesu uspostave LIPP-a u drugim gradovima.

## 2. Plan pilot projekta

Provođenje pilot projekta bio je složen proces koji je uključivao niz operativnih aktivnosti. Sistematiziranje koraka uspostave i iskustvo uspostave webGIS-a u stvarnom okruženju bilo je korisno za razumijevanje izazova u uspostavi webGIS-a. Ujedno je bilo korisno i za usporedbu zaključaka iz pilot projekta sa zaključcima iz drugog istraživanja (Marasović 2020). Bilo je deset važnih koraka u provođenju pilot projekta:

- odabir tvrtke za uspostavu webGIS-a
- odabir grada za istraživanje LIPP-a i uspostavu webGIS-a
- organizacija tima za uspostavu webGIS-a
- prepoznavanje dionika vezanih uz LIPP i radne procese relevantne za webGIS
- vođenje intervjua s dionicima
- kodiranje rezultata intervjua
- interpretacija intervjua
- uspostava webGIS-a
- mjerenje utjecaja odnosa s javnošću na građane
- prikupljanje mišljenja članova tima za uspostavu webGIS-a o iskustvu na ovom pilot projektu.

## 3. Tvrtka za uspostavu webGIS-a

Postojala su tri glavna kriterija za odabir tvrtke za uspostavu webGIS-a. Prvi je bio trošak uspostave budući da srednji i mali gradovi nemaju tako velike mogućnosti kao najveći gradovi. Također, vjerojatnije je da će donositelji odluka u malim i srednjim gradovima imati nižu razinu svijesti o prednostima LIPP-a, što otežava donošenje pozitivne odluke o ulaganju u uspostavu webGIS-a. Drugi je kriterij bio da ta tvrtka ima iskustva u uspostavi webGIS-a u gradove, posebice male i srednje gradove. Treće je bila spremnost tvrtke da ima akademski pristup i mogućnost uspostave rješenja prilagodljivog potrebama grada umjesto predodređenog.

Održani su sastanci s tvrtkama „Geofoto, d.o.o.“, Slovenska Bistrica, Republika Slovenija, „GDi GISDATA d.o.o.“, Zagreb, Republika Hrvatska i „Promet i prostor, d.o.o.“, Zagreb, Republika Hrvatska. Nakon sastanaka je, kao najprikladnija za projekt, odabrana tvrtka „Promet i prostor, d.o.o.“ (Marasović 2020).

## 4. Odabir grada za uspostavu webGIS-a

Cilj je bio pronaći grad s najviše problema koje gradovi u Republici Hrvatskoj imaju i u kojem bi se webGIS mogao uspješno uspostaviti. Najveći gradovi

**Table 1** List of chosen stakeholders for interview (Marasović 2020).**Tablica 1.** Popis odabranih dionika za intervju (Marasović 2020).

| Stakeholder<br>Dionik                                      | Group of ownership<br>Grupa vlasništva | Date of interview<br>Datum intervjua | Duration<br>Trajanje |
|--|--|--------------------------------------|----------------------|
| City of Sinj/ Grad Sinj                                    |  | 23.04.2019.                          | 22'40"               |
| Water Supplier Company/ Vodoopskrba                        | First group/ Prva grupa                | 27.12.2018.                          | 38'27"               |
| Waste Treatment Company/ Odvodnja                          | First group/ Prva grupa                | 27.12.2018.                          | 46'52"               |
| Police/ Policija   | Second group/ Druga grupa              | 23.04.2019.                          | 25'51"               |
| Electric Supplier Company/ HEP                             | Second group/ Druga grupa              | 19.04.2019.                          | 32'33"               |
| Fire department/ Javna vatrogasna postrojba                | First group/ Prva grupa                | 27.12.2018.                          | 21'45"               |
| Risk management group/ Stožer civilne zaštite              | First group/ Prva grupa                | 20.04.2019.                          | 39'28"               |
| State geodetic administration/<br>Državna geodetska uprava | Second group/ Druga grupa              | 12.09.2019.                          | 53'52"               |
| Croatian county roads/ Županijske ceste                    | Second group/ Druga grupa              | 23.04.2019.                          | 13'56"               |
| Touristic community/ Turistička zajednica                  | First group/ Prva grupa                | 28.01.2019.                          | 20'30"               |
| Local action group/ Lokalna akcijska grupa                 | Second group/ Druga grupa              | 13.10.2019.                          | 35'36"               |
| Croatian waters/ Hrvatske vode                             | Second group/ Druga grupa              | 28.06.2019.                          | 25'52"               |
| Parking Management Comp./ Parking                          | First group/ Prva grupa                | 27.12.2018.                          | 23'14"               |
| Land registry/ Zemljišne knjige                            | Second group/ Druga grupa              | 28.06.2019.                          | 18'27"               |

Legend: First group – city ownership, Second group – not owned by the city.

Legenda: Prva grupa – vlasništvo grada Sinja, Druga grupa – nije vlasništvo grada Sinja

“Promet i prostor, d.o.o.” was selected as the most suitable for the project. (Marasović 2020).

#### 4 Selection of a City for WebGIS Implementation

The goal was to find a city with most of the problems that cities in the Republic of Croatia generally have and in which webGIS could be successfully implemented. The biggest cities were not representative in this case, since they already had LSDI or webGIS, they have much greater capacities and they do not have the same problems as most of the cities. On the other hand, the smallest cities were also not representatives since they depend on some services of the middle and big sized cities in their vicinity, they have fewer capacities and different problems than most cities in the Republic of Croatia. Furthermore, most of the cities in the Republic of Croatia are middle-sized cities categorized by population (Zimmermann 1999). It was essential that city leaders have the will to enter the project and support it in the process of implementation. From the researcher's perspective, it was vital that with the least effort, time, and finance, the necessary business and social relationships can be established on a local level in order to conduct this kind of a pilot project.

The selection criteria for choosing the best candidate were (Marasović 2020):

- The candidate who could successfully achieve the main goal,
- The candidate representing most of the cities in the Republic of Croatia,
- The candidate which will be the least time and finance consuming to finish the project,
- The candidate willing to go through the process and to provide support in the implementation from the top management level,
- The candidate in which the researcher can establish the necessary business, social and other relationships to finish the project most efficiently.

Marasović (2020) defines medium small cities as a category which represents most of the cities in the Republic of Croatia. Also, this category of cities should have the capacity and potential to implement webGIS successfully. Since the best social and business relationships for the researcher were in the medium small city of Sinj, it was a good candidate for the project. Furthermore, the decision-makers in the city of Sinj were most likely support the project.

#### 5 Team for webGIS Implementation

Essential for the pilot project was the city's decision to invest in this project and to support it during the implementation. It was very important to

u ovom slučaju nisu bili reprezentativni jer su već imali LIPP ili webGIS, imaju puno više kapaciteta i nemaju problema kao većina gradova. S druge strane, nisu bili reprezentativni ni najmanji gradovi jer ovise o nekim službama srednjih i velikih gradova iz svog susjedstva, imaju manje kapacitete i različite probleme od većine gradova u Republici Hrvatskoj. Nadalje, većina gradova u Republici Hrvatskoj gradovi su srednje veličine kategorizirani po broju stanovnika (Zimmermann 1999). Bilo je bitno da gradski čelnici imaju volju ući u projekt i podržati projekt u procesu provedbe. Iz perspektive istraživača bilo je od vitalnog značaja da se uz najmanje truda, vremena i financija uspostave potrebni poslovni i društveni odnosi na lokalnoj razini za provedbu takvog pilot projekta.

Kriteriji za odabir najboljeg kandidata bili su (Marasović 2020):

- kandidat koji bi mogao uspješno ostvariti glavni cilj
- kandidat predstavlja većinu gradova u Republici Hrvatskoj
- kandidat koji će oduzeti najmanje vremena i sredstava za završetak projekta
- kandidat koji je voljan proći kroz proces i koji će dati podršku u uspostavi s najviše razine menadžmenta
- kandidat u kojem istraživač može uspostaviti potrebne poslovne, društvene i druge odnose kako bi projekt završio što učinkovitije.

Marasović (2020) definira srednje male gradove po kategoriji proračuna kao kategoriju koja predstavlja većinu gradova u Republici Hrvatskoj. Također, ta bi kategorija gradova trebala imati kapacitet i potencijal za uspješnu uspostavu webGIS-a. Budući da su najbolji društveni i poslovni odnosi za istraživača bili u gradu Sinju, grad Sinj bio je dobar kandidat za projekt. Nadalje, bilo je izvjesno da će projekt imati podršku donositelja odluka u gradu Sinju.

## 5. Tim za uspostavu webGIS-a

Za pilot projekt ključna je bila odluka Grada da investira u taj projekt te da ga podrži tijekom provedbe. Također, bilo je vrlo važno uspostaviti komunikaciju između dionika i unutar gradske uprave, podršku tvrtke za uspostavu webGIS-a, podršku Državne geodetske uprave (DGU) u pogledu dostupnosti prostornih podataka i na kraju organizirati sve potrebne aktivnosti.

Upriličen je prvi sastanak i dogovor oko projekta s gradonačelnicom Sinja. Pročelnica Upravnog odjela za prostorno uređenje, komunalne djelatnosti,

gospodarstvo i upravljanje imovinom izabrana je kao odgovorna osoba u Gradu za proces uspostave. Za tehničke je poslove u uspostavi webGIS rješenja bio zadužen predstavnik tvrtke „Promet i prostor, d.o.o.“. Istraživač je organizirao sastanak gore navedenih dionika radi dogovora i pokretanja projekta. Prije početka sastanka organiziran je niz sastanaka kako bi se pripremio projekt, sudionici upoznali s mogućnostima webGIS-a te s mogućim rizicima tijekom provedbe projekta i razjasnile sve nedoumice. Zasebno, sastanak s Državnom geodetskom upravom održan je uz istraživača i uz podršku mentora istraživanja te opisan u doktorskom radu Marasovića (2020).

## 6. Dionici i radni procesi vezani uz LIPP

Nakon uspostavljanja tima sljedeći je zadatak bio prepoznavanje dionika grada Sinja u radnim procesima vezanim uz LIPP okruženje. Svim su prepoznatim dionicima predstavljene mogućnosti webGIS-a kako bi lakše odredili u kojim bi im radnim procesima moglo pomoći webGIS rješenje. Predstavnici visokog menadžmenta svakog dionika odabrani su za intervju (tablica 1) budući je bilo potrebno imati najšire znanje o organizaciji dionika i poslovnom dijelu operativnih procesa. Ako nisu mogli sudjelovati u intervjuu, od njih se tražilo da, na temelju svrhe intervjua, odluče o predstavniku dionika s kojim će se intervju provoditi (Marasović 2020). Svi su dionici grupirani na temelju vlasništva. U prvoj su skupini dionici vlasništvu Grada, a u drugoj su dionici koji nisu u vlasništvu Grada. U tablici je prikazano trajanje svakog intervjua.

Bilo je važno prepoznati koji radni procesi mogu imati najviše koristi od webGIS-a. Ekonomsku dobit nije bilo moguće identificirati pa je procijenjena. Podrška građana također je bila vrlo važna. Proces prepoznavanja radnih procesa bio je iterativan. Prepoznavanje radnih procesa vršilo se kroz pet procesa (Marasović 2020):

- radni procesi koje prepoznaje pročelnica Upravnog odjela za prostorno uređenje, komunalne djelatnosti, gospodarstvo i upravljanje imovinom
- radni procesi koje prepoznaje istraživač (pregled literature i istraživanja)
- radni procesi koje prepoznaju dionici
- radni procesi prepoznati od tvrtke za uspostavu webGIS rješenja i
- radni procesi prepoznati kroz istraživanje temeljeno na kriteriju od kojega građani mogu imati najviše koristi.

Odabir radnih procesa bio je iterativan postupak u kojem su svi dionici morali biti svjesni prednosti

establish communication between the stakeholders and within the city administration, to have support of the company for webGIS implementation, to have support from the State Geodetic Administration (SGA) regarding accessibility to spatial data and, finally, to organize all of the above stated processes.

The initial meeting and agreement about the project were made with the mayor of the City of Sinj. The head of the administrative department of spatial planning, communal activities, economy and property management was selected as the responsible person on behalf of the city for the process of implementation. A representative of the company “Promet i prostor, d.o.o.” was responsible for the technical tasks in the implementation of webGIS solutions. The researcher organized a meeting of the abovementioned stakeholders to come to an agreement and to kick off the project. Before the initial meeting, a number of meetings were organized to prepare the project, introduce the participants to the possibilities of webGIS, clear all doubts and get to know the possible risks during the implementation of the project. Meetings with SGA took place separately with the support of mentors from the research as described in Marasović (2020).

## 6 Stakeholders and Working Processes Related to LSDI

After setting up the implementation team, the next task was to identify the stakeholders of the working processes related to the LSDI environment in the city of Sinj. Possibilities of webGIS were introduced to all the identified stakeholders, so that they could more easily recognize the working processes where a webGIS solution could help them. Representative of the management level were selected (Table1) since they should have the broadest knowledge about the stakeholder’s organization of operational processes. If they couldn’t participate in an interview, they were asked to decide, based on the purpose of interviews, on the stakeholder’s representative to be interviewed (Marasović 2020). All stakeholders are grouped based on ownership. The first group consists of city-owned stakeholders, while the second of stakeholders not owned by the city. Table 1 shows the duration of each interview.

It was important to recognize which working processes could benefit most from webGIS. It was not possible to identify an economic benefit, so general benefit was estimated. Support from citizens for the working processes was also very important. Working

processes were identified through five streams (Marasović 2020):

- Working processes identified by the head of the administrative department of spatial planning, communal activities, economy and property management,
- Working processes identified by the researcher (literature review and research),
- Working processes identified by the stakeholder’s management,
- Working processes identified by the company for implementing the webGIS solution and
- Working processes identified through research based on the criterium “*working processes from which citizens could benefit most*”.

The process of selecting the working processes was more an iterative process than a concise one. It was essential to make everyone aware of the possibilities and benefits of webGIS. So, some examples of best practices were introduced to the stakeholders during the interviews. Citizens are final, direct or indirect users of outputs of webGIS working processes and as voters, have an impact on the decision-makers. The strength of the stakeholders’ influences on decision-makers is represented in Table 2 where Correa Gomez (2005) recognizes the central government, councillors, citizens, management team, and partner agencies as the most relevant stakeholders.

## 7 Interviews with Stakeholders

Interviews took place in offices of the interviewed representative of the stakeholder and lasted from 14 to 54 minutes. The duration of interviews mostly depended on the length of argumentation of the interviewee. The interviewees were introduced to the topic of the interview before the interview by email or by direct communication. During the interview, a representative of the stakeholder and researcher were alone and sat at the table face to face. The researcher’s goal during the interviews was to be objective and balanced in communication in all interviews. The interviews were audio-recorded after the approval of interviewee. They were told that minutes of the interview will not be published under their names. Field notes were taken during the interviews.

The procedure for each interview was as follows (Marasović 2020):

1. Take care of the sitting orientation of the interviewee and researcher
2. Introduce the research to the interviewee

**Tablica 2.** Relevantni dionici za donositelje odluka u lokalnoj samoupravi (Correa Gomez 2005).**Table 2** Relevant stakeholders to decision-makers in local government (Correa Gomez 2005).

| Stakeholders<br>Dionici                                | Geographical Distribution<br>Geografska podjela |                  | Political Leadership<br>Distribution<br>Politička podjela |      |     | Overall<br>Nomination<br>Nominalno |
|--|---|------------------|---|------|-----|------------------------------------|
|  | Non-Rural<br>Neruralno                          | Rural<br>Ruralno | Lab   | Con  | NOC |                                    |
|  | Audit Commission/ Revizija                      | 29%              | 29%   | 24%  | 22% |                                    |
| Central Government/ Vlada                              | 100%  | 92%              | 100%  | 89%  | 96% | 97%                                |
| Citizens/ Građani                                      | 94%   | 92%              | 100%  | 100% | 92% | 93%                                |
| Contractors/ Ugovaratelji                              | 35%   | 29%              | 38%   | 33%  | 38% | 36%                                |
| Councilors/ Vijećnici                                  | 65%   | 67%              | 62%   | 67%  | 83% | 67%                                |
| Employees/ Zaposlenici                                 | 68%   | 71%              | 81%   | 56%  | 75% | 70%                                |
| Fire Authorities/ Vatrogasna društva                   | 44%   | 29%              | 57%   | 22%  | 46% | 41%                                |
| Further Education/<br>Ustanove za doškolovanje         | 35%   | 21%              | 52%   | 22%  | 21% | 33%                                |
| Health Authorities/ Zdravstvo                          | 82%   | 63%              | 81%   | 67%  | 75% | 75%                                |
| Local business/ Lokalni poduzetnici                    | 85%   | 92%              | 81%   | 100% | 83% | 89%                                |
| Local Media/ Lokalni mediji                            | 53%   | 54%              | 52%   | 56%  | 58% | 56%                                |
| Lower The Authorities/<br>Donja predstavnička tijela   | 32%   | 38%              | 29%   | 67%  | 38% | 34%                                |
| Management Team/ Menadžment                            | 32%   | 29%              | 29%   | 33%  | 38% | 34%                                |
| Other Local authorities/<br>Ostali predstavnici vlasti | 32%   | 21%              | 38%   | 11%  | 29% | 31%                                |
| Partner Agencies/ Partnerske agencije                  | 32%   | 38%              | 24%   | 33%  | 38% | 38%                                |
| Police Authorities/ Policija                           | 85%   | 63%              | 81%   | 67%  | 75% | 77%                                |
| Political Parties in General/ Političke stranke        | 41%   | 33%              | 43%   | 44%  | 38% | 41%                                |
| Pressure Groups/ Aktivističke grupe                    | 62%   | 50%              | 67%   | 67%  | 75% | 77%                                |
| Service Users/ Korisnici usluga                        | 56%   | 46%              | 52%   | 67%  | 63% | 54%                                |
| Trade Unions/ Udruženja za trgovinu                    | 24%   | 25%              | 24%   | 22%  | 25% | 28%                                |
| Upper Tie Authorities/<br>Gornja predstavnička tijela  | 50%   | 54%              | 62%   | 44%  | 63% | 51%                                |
| Voluntary Sector/ Volonteri                            | 77%   | 63%              | 71%   | 78%  | 63% | 72%                                |

Lab -Labour authorities/ laburistička stranka na vlasti

Con - Conservative authorities/ konzervativna stranka na vlasti

NOC - No-overall control authorities/ bez stranke u većini na vlasti

webGIS rješenja. Kako bi to osigurali, tijekom intervjua su predstavljeni primjeri najbolje prakse. Građani su konačni, izravni ili neizravni, korisnici usluga proizašlih iz radnih procesa webGIS-a koji kao birači snažno utječu na donositelje odluka. Taj je utjecaj prikazan u tablici 2 gdje Correa Gomez (2005) prepoznaje najrelevantnije dionike kao što su središnja vlada, vijećnici, građani, upravljački tim i partnerske agencije.

## 7. Intervjui s dionicima

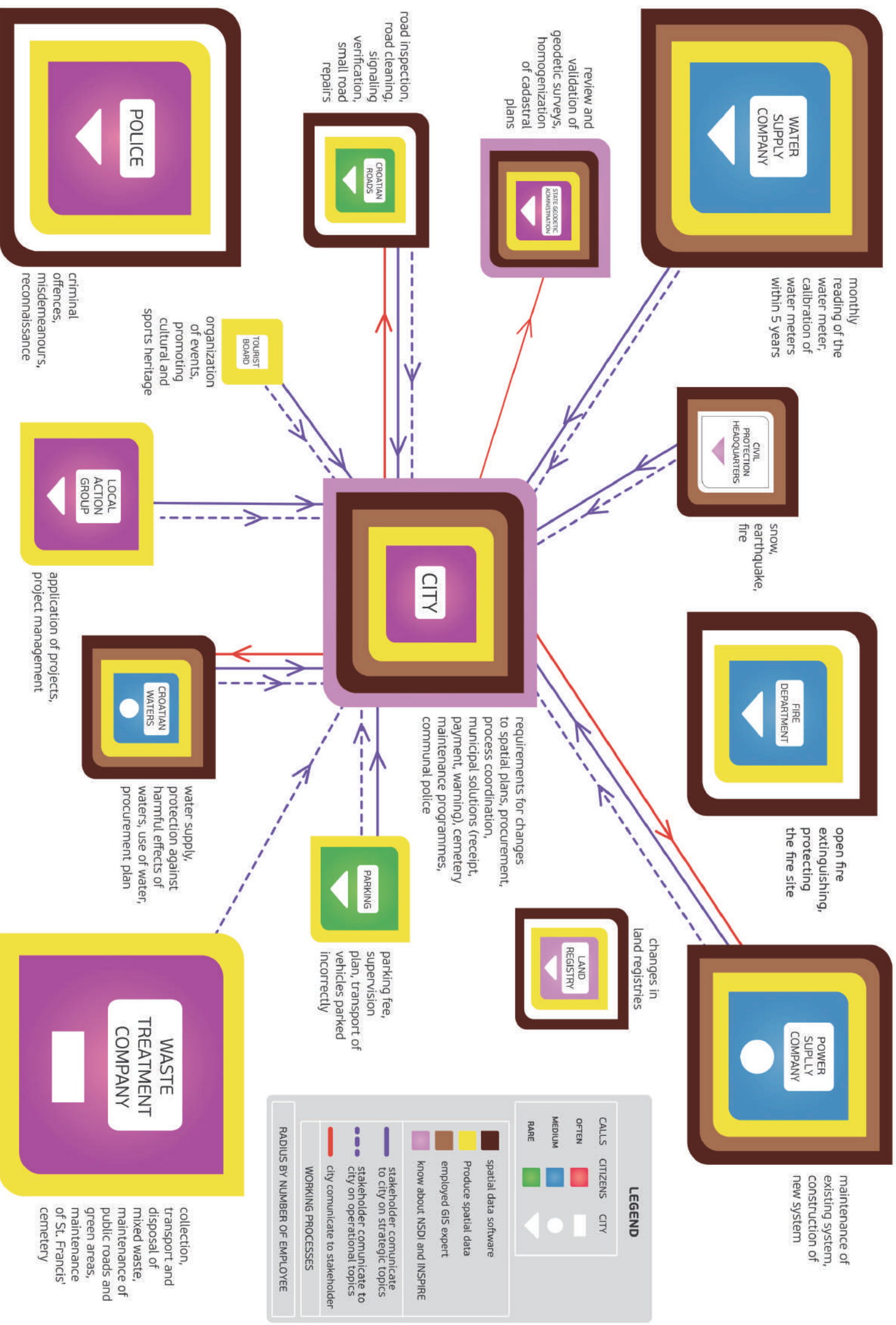
Intervjui su obavljeni u uredima intervjuiranog predstavnika dionika i trajali su od 14 do 54 minute. Duljina trajanja ovisila je o trajanju argumentacije ispitanika po pojedinom pitanju, a ispitanici su s temom

intervjua upoznati putem e-pošte ili izravnom komunikacijom. Tijekom intervjua predstavnik dionika i istraživač bili su sami i sjedili su za stolom licem u lice. Cilj istraživača tijekom intervjua bio je zadržati objektivnost i uravnoteženost u komunikaciji u svim intervjuiima. Intervjui su snimljeni zvučnim zapisom nakon odobrenja intervjuiranog predstavnika dionika. Upoznati su da zvučni zapis ili zapisnik s razgovora neće biti objavljeni kao niti njihova imena. Tijekom intervjua vođene su terenske bilješke.

Procedura za svaki intervju bila je (Marasović 2020):

1. voditi računa o orijentaciji sjedenja između predstavnika dionika i istraživača
2. objasniti razlog zašto se provodi intervju
3. zatražiti dozvolu za snimanje zvučnog zapisa





**LEGEND**

|        |          |      |
|--------|----------|------|
| CALLS  | CITIZENS | CITY |
| OFTEN  |          |      |
| MEDIUM |          |      |
| RARE   |          |      |

**WORKING PROCESSES**

- stakeholder communicate to city on strategic topics
- stakeholder communicate to city on operational topics
- city communicate to stakeholder

**RADIUS BY NUMBER OF EMPLOYEE**

- spatial data software
- Produce spatial data
- employed GIS expert
- know about NSDI and INSPIRE

4. predstaviti pojedine podteme intervjuja
5. upoznati predstavnika dionika s predviđenim vremenom trajanja intervjuja
6. ustupiti kontakt za sva daljnja moguća pitanja
7. upoznati predstavnika dionika s predviđenim vremenom za njegova pitanja.

Tijekom intervjuja istraživač predstavlja LIPP i navodi neke dobre primjere iz LIPP-a u Hrvatskoj. Ako nije bilo saznanja o LIPP-u ili NIPP-u, istraživač je upoznao intervjuiranog predstavnika dionika s pojmovima NIPP i INSPIRE. Pitanja polustrukturiranog intervjuja podijeljena su u sljedeće tematske grupe (Marasović 2020):

- (1) Organizacijska – organizacija dionika, djelovanje dionika, radni procesi
- (2) Javni prostorni podatci – potrebni prostorni podatci u radu dionika, proizvodnja prostornih podataka
- (3) Suradnja – interakcija s drugim institucijama, građanima i gradom kao institucijom
- (4) Ljudski potencijali – ukupan broj zaposlenih i kompetencije
- (5) Hardver i softver – postojeći hardver i softver za korištenje prostornih podataka
- (6) Svijest o IPP-u i INSPIRE-u – znanje o NIPP-u

Pitanja su pripremljena kako bi se dobile informacije o sadržaju radnih procesa, mogućnostima dionika, interakciji dionika s građanima te organizacijskoj i operativnoj interakciji svakog dionika i gradske uprave. Prije intervjuja ispitanici nisu dobili unaprijed definirana pitanja. Kroz intervju su se mogli testirati i drugi aspekti LIPP okruženja, ali su pitanja prilagođena trenutnoj razini zrelosti LIPP-a u prosječnom gradu u Republici Hrvatskoj.

## 8. Rezultati intervjuja

Svi su intervjui preslušani nekoliko puta kako bi se izvod iz intervjuja kodirao u pripremljenom obrascu. Obrasci s kategorijama tema i podtema definirani su pitanjima pripremljenima za intervju i korišteni su za kodiranje i analizu. Audio zapisi i bilješke na terenu korišteni su za popunjavanje obrasca za svaku dionicu, a dionici LIPP-a u gradu Sinju opisani su kroz četiri aspekta vezana uz radne procese (Marasović 2020):

1. prepoznati radni procesi po sadržaju
2. mogućnosti dionika

◀ **Fig. 1** LSDI environment in the city of Sinj defined through four criteria.

3. interakcija dionika naspram građana i dionika naspram gradske uprave
4. organizacijska i operativna komunikacija između dionika i gradske uprave.

Za svaki su radni proces identificirani sudionici radnih procesa. Grad i građani su prepoznati kao najvažniji dionici. S jedne strane, Grad se brine za pružanje javnih usluga, a s druge strane, građani dobivaju usluge od svih dionika. Dubina rasprave o LIPP-u ovisi o poznavanju – svijesti o (L)IPP-u. Dakle, pitanja su uravnotežena između potreba istraživanja s jedne strane i mogućnosti prikupljanja relevantnih podataka na terenu s druge strane. Učinkovitost procesa nije bila mjerljiva te nije ocjenjivana, a na slici 1 dani su radni procesi pored dionika odgovornog za radne procese.

Mogućnosti dionika u LIPP okruženju prikazane su na slici 1 s definiranim "orbitama" oko oblika dionika. Veličina oblika dionika povezana je s brojem zaposlenih. Što je veći broj zaposlenika u dioniku, oblik koji predstavlja dionika je većih dimenzija. Postojanje "orbita" definira (Marasović 2020):

- ima li dionik znanje o NIPP-u i INSPIRE-u
- koristi li softver za prostorne podatke
- proizvodi li prostorne podatke
- ima li zaposlenog GIS stručnjaka.

Ukoliko oko dionika ne postoji „orbita“, znači da postoji nedostatak znanja o (L)IPP-u, ili nedostatak korištenja softvera za prostorne podatke, ili nedostatak proizvodnje prostornih podataka, ili nema zaposlenog stručnjaka za GIS u gradu.

Interakcija s građanima definirana je bojom ispunjenog unutarnjeg "kvadrata" svakog dionika. Tako ljubičasta označava čestu interakciju, plava srednju, a zelena rijetku interakciju dionika i građana. Oblik unutarnjeg "kvadrata" dionika predstavlja interakciju između dionika i gradske uprave. Kvadrat je za čestu interakciju, krug za srednju interakciju i trokut za rijetku interakciju između dionika i gradske uprave.

Komunikacija gradske uprave prema dionicima predstavljena je linijama koje povezuju svakog dionika i Grad. Vrsta linije definira je li komunikacija na organizacijskoj ili operativnoj razini, dok boja linije označava smjer komunikacije. Crvena znači da je komunikacija pokrenuta od gradske uprave do dionika, a ljubičasta označava suprotan smjer.

Većina je radnih procesa definirana u gradskoj upravi, a svi radni procesi vezani su za zahtjeve građana ili su usluga građanima. Najčešće interakcije u radnim procesima s građanima ima gradska uprava koja je i nadležna za većinu radnih procesa definiranih zakonodavstvom Republike Hrvatske.

3. Get approval from the interviewee for audio recording
4. Introduce themes of the interview to the interviewee
5. Provide the interviewee with an estimated duration of interview
6. Give contact information to the interviewee for follow-up questions
7. Let the interviewee know that he will also have time for questions

During the interview, the researcher introduces the benefits of LSDI and provides some best practices from LSDI experiences in Croatia. If there was no knowledge about LSDI or NSDI, the researcher informs the interviewee about NSDI and INSPIRE. Questions for a semi-structured interview were split into thematic groups (Marasović 2020):

- (1) Organizational – organization, operation and working processes within the stakeholders
- (2) Public spatial data – necessary spatial data in stakeholder operations, production of spatial data
- (3) Cooperation – interaction with other institutions, citizens and the city
- (4) Human resources – the overall number of employees
- (5) Hardware and software – existing hardware and software for spatial data usage
- (6) Awareness about SDI and INSPIRE – knowledge about NSDI

Questions were formed to get information about the content of the working processes, capabilities of the stakeholder, the interaction of the stakeholder with the citizens, and organizational and operational interaction between each stakeholder and the city administration. Interviewees did not receive pre-defined questions before the interview. Other aspects of the LSDI environment could be addressed as well, but questions were adapted to the current maturity level of LSDI in an average city in the Republic of Croatia.

## 8 Interview Results

All interviews were listened to several times to make an interview extract in a prepared form. Forms with topic and subtopic categories defined by the questions prepared for the interview were used for coding and analysis. Audio records and field notes were used to populate the form for each stakeholder. LSDI stakeholders in the city of Sinj were described through four aspects related to their working processes (Marasović 2020):

1. Recorded working processes by content
2. Capabilities of the stakeholder

3. Interaction of the stakeholder with the citizens and the stakeholder with the city administration
4. Organizational and operational communication between the stakeholders and the city administration.

For each working process, participants in the working processes were identified. The city and the citizens are the most important stakeholders. On the one hand, the city takes care of delivering public services. On the other, citizens, receive services from all stakeholders. The depth of the discussion on LSDI depends on familiarity – awareness about (L)SDI. So, the questions balanced the needs of the research on the one hand, and the possibilities on the field to collect relevant data on the other. There is no use of evaluating performance if it is not measurable. In Figure 1 working processes are written next to the stakeholder responsible for the working processes.

The capabilities of the stakeholder in the LSDI environment are presented in Figure 1 with defined “orbits” around the stakeholder shape. The size of the stakeholder shape is related to the number of employees. The more employees, the larger the shape. The existence of “orbits” defines if the stakeholder (Marasović 2020):

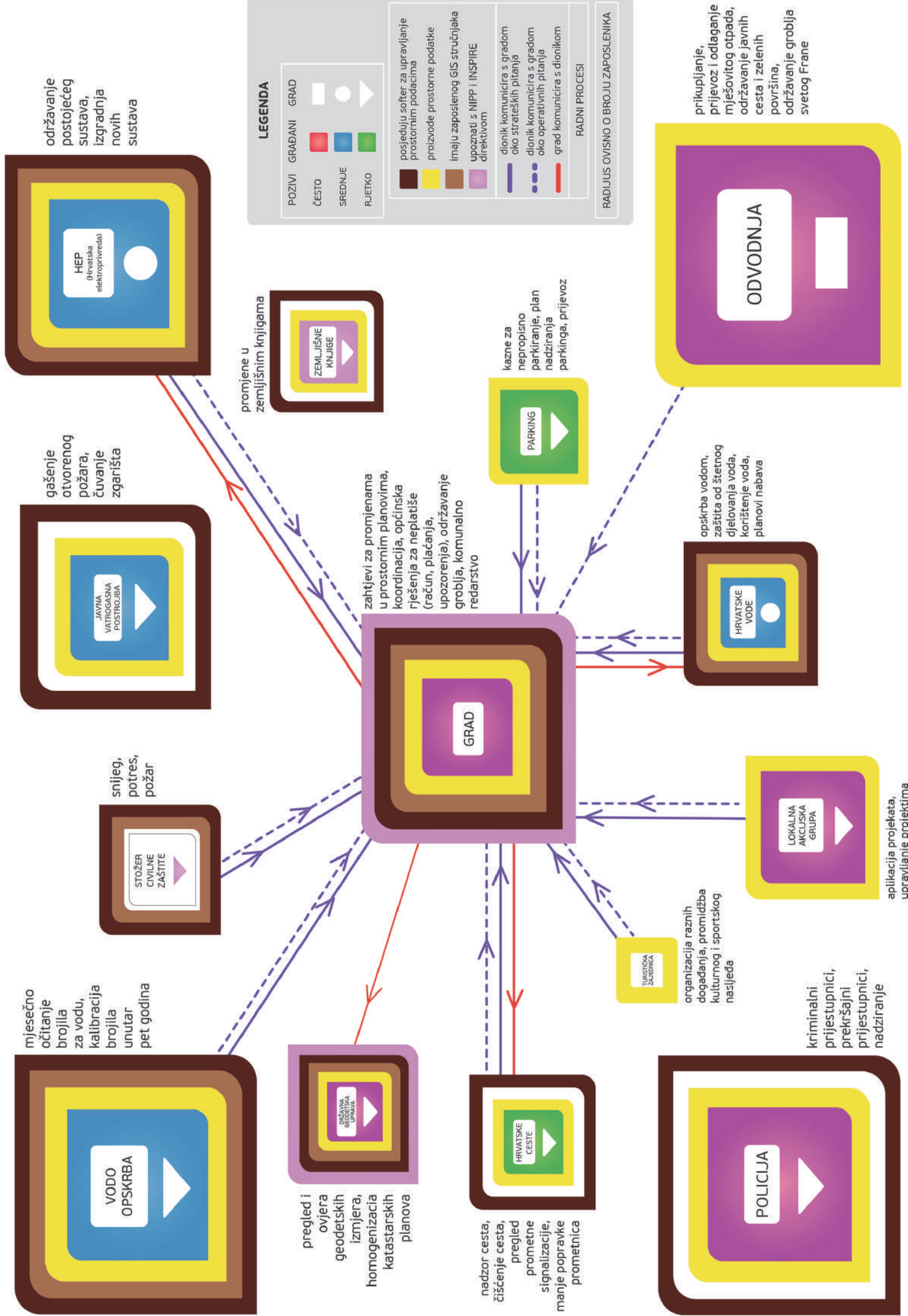
- knows about NSDI and INSPIRE,
- uses spatial data software,
- produces spatial data and
- employs a GIS expert.

If there is no existence of a certain “orbit” around a stakeholder, it means that there is a lack of knowledge about (L)SDI, or lack of usage of software for spatial data, or lack of production of spatial data or there is no GIS expert employed in the city.

Interaction with citizens is defined by the fill colour of each stakeholder’s inner “square”. Purple stands for frequent interaction, blue for medium and green for rare interaction between the stakeholder and citizens. The shape inside the stakeholder’s inner “square” represents the interaction between the stakeholder and city administration. A square stands for frequent interaction, circle for medium interaction and triangle for rare interaction between the stakeholder and city administration.

Communication from city administration to the stakeholder is represented through lines connecting each stakeholder and the city. The type of line defines if communication is on an organizational

**Slika 1.** LIPP "okoliš grada Sinja" ►  
definiran s pomoću četiri kriterija.



level or operational level. The colour of the line indicates the direction of communication. Red means that communication is initiated from city administration to the stakeholder, while violet means the opposite direction.

Most working processes were defined in the city administration. All working processes in all stakeholders are related to demands from the citizens or are a service for citizens. City administration has the most frequent interaction in working processes with citizens. The city administration has jurisdiction on most working processes with citizens defined by the legislation of the Republic of Croatia.

From more than one interviewed person, it was stated that citizens often call city administration for issues which are not in the jurisdiction of the city administration. Interaction of citizens with stakeholders correlates with the number of working processes. Interaction is more frequent if more working processes exist in the stakeholder and less frequent if fewer working process exist. Citizens are stakeholders who most frequently call the other stakeholders, while the city does not call the other stakeholders frequently, but rarely.

Most organizational and operational communication comes from the second group (not owned by the city) to the city administration. There is no organizational or operational communication at all between the city and some stakeholders. Mostly, those stakeholders are not owned by the city. It should be taken into consideration that communication with (other) stakeholders could be unknown to the interviewed stakeholder representative, but that such communication still exists. The person who was interviewed might not know about the processes going on in other departments so he/she cannot know about the organizational and operational communication in other departments (Marasović 2020).

## 9 Interpretation of Interview Results

The organizational aspect of the working processes, capabilities, interaction, communication types and direction of communication is grouped into two groups. The first group consists of the stakeholders owned by the city. The business strategy, organization, communication and operation of stakeholders in this group are defined either by themselves or in interaction with the city administrations in line with the legislation. The second group consists of stakeholders who are not owned by the city, but are most often owned by the state. The business strategy and organization in this group are defined on the national

level. These stakeholders have much greater capabilities than stakeholders in group one due to their financial, logistical and networking possibilities. Such capabilities are visible through the “orbits” of the stakeholders. The first group is noticeably “poorer” with “orbits” than the second group, except the city as the top of the vertical in the first stakeholder group (Marasović 2020).

Citizens are the stakeholder with the most frequent and comprehensive communication with the city administration. Citizens even call the city for matters out of the city’s jurisdiction. It is most likely that citizens recognize the city as a service hub, since there are a number of processes between the city and the citizens. The city needs a tool for communicating with the citizens, as well as with other stakeholders. This tool could raise the city’s efficiency in delivering public services to citizens directly or via other stakeholders. Likewise, the citizens could use an online tool for interaction and communication with the city. At this time, citizens come to the offices regarding all sorts of matters. It is time-consuming, negatively affects the motivation and concentration of the employees and disturbs the daily routines.

## 10 Implementation of WebGIS

Based on the agreement between the city and the company for webGIS implementation, seven new modules and eleven layers selected by the city administration were implemented in webGIS. The implemented modules are (Marasović 2020):

- M1 Comments (spatial notes)
- M2 Address register
- M3 Roads
- M4 Records of agricultural land
- M5 Module for citizens to propose changes into spatial plans
- M6 Evidence of utility services payers

During the implementation phase, the SGA was contacted by the researcher with two goals. The first goal was an interview with SGA as an LSDI stakeholder in the city of Sinj. The second goal was to make an agreement on donation between SGA and the city of Sinj. SGA donated several data sets: cadastre parcels, a topographic map (1:25 000), a Croatian basic map (1:5000), central register of spatial units and digital orthophoto maps (1:5000) for all area of the city of Sinj used by the city administration. From this interaction one more module was implemented - Cadastral parcels (M7).

For additional modules to be implemented by the webGIS company as part of the research process, the

Više intervjuiranih osoba naglasilo je da građani često kontaktiraju gradsku upravu za pitanja izvan njezine nadležnosti. Interakcija građana s dionicima korelira s brojem radnih procesa te je češća ako postoji više radnih procesa. Građani su dionici koji najčešće nazivaju druge dionike. S druge strane, Grad druge dionike zove rijetko.

Većina organizacijske i operativne komunikacije dolazi iz druge skupine (nije u vlasništvu Grada) prema gradskoj upravi. Između Grada i nekih dionika uopće ne postoji organizacijska ili operativna komunikacija. Uglavnom, ti dionici nisu u vlasništvu Grada. Treba uzeti u obzir da postoji mogućnost da je predstavniku dionika koji je intervjuiran komunikacija s dionicima nepoznata, a da takva komunikacija ipak postoji. Osoba koja je intervjuirana možda ne zna za procese koji se odvijaju u drugim odjelima pa ne može znati ni za organizacijsku i operativnu komunikaciju u drugim odjelima (Marasović 2020).

## 9. Interpretacija rezultata intervjuja

Organizacija radnih procesa, mogućnosti, interakcija, vrste interakcije i smjer komunikacije grupirani su u dvije skupine. U prvoj su skupini dionici koji su u vlasništvu grada. Poslovna strategija, organizacija, komunikacija i djelovanje dionika te skupine definiraju ili sami dionici ili u interakciji s gradskom upravom u skladu sa zakonima. U drugoj su skupini dionici koji nisu u vlasništvu grada, a najčešće su u vlasništvu države. Poslovna strategija i organizacija u toj skupini definirani su na nacionalnoj razini. Ti dionici imaju mnogo više mogućnosti od dionika u prvoj skupini zbog financijskih, logističkih i mogućnosti umrežavanja s drugim sustavima. Takve su mogućnosti vidljive kroz "orbite" dionika. Prva je skupina uočljivo "siromašnija" "orbitama" od druge skupine izuzev grada kao vrha vertikale u prvoj skupini dionika (Marasović 2020).

Građani su dionik s najčešćom i najobuhvatnijom komunikacijom s gradskom upravom koja je nerijetko izvan nadležnosti gradske uprave. Najvjerojatnije građani prepoznaju grad kao svoje središte usluga upravo zbog niza međusobnih radnih procesa i usluga. Gradu je potreban alat za komunikaciju s građanima, ali i ostalim dionicima te bi alat poput webGIS-a mogao povećati učinkovitost grada u pružanju javnih usluga građanima. Isto tako, građanima je potreban online alat za interakciju i komunikaciju s gradom. U ovom trenutku u urede dolaze građani oko svih pitanja te to dugotrajno negativno utječe

na motivaciju i koncentraciju zaposlenika i remeti svakodnevnu rutinu.

## 10. Uspostava webGIS-a

Na temelju sporazuma između Grada i tvrtke za uspostavu webGIS-a, u webGIS je uvršteno sedam novih modula i jedanaest slojeva kao izbor gradske uprave. Uvršteni moduli su (Marasović 2020):

- M1 Komentari (prostorne bilješke)
- M2 Adresni registar
- M3 Ceste
- M4 Evidencija poljoprivrednog zemljišta
- M5 Modul za prijedloge građana za izmjene prostornih planova
- M6 Dokaz o obveznicima komunalnih usluga.

Tijekom faze provedbe istraživač je kontaktirao DGU s dvama ciljevima. Prvi je cilj bio intervju s DGU-om kao dionikom LIPP-a u gradu Sinju, a drugi je cilj bio sklapanje ugovora o donaciji između DGU-a i Grada Sinja. DGU je donirala više skupova podataka: katastarske čestice, topografsku kartu (1 : 25 000), osnovnu kartu Hrvatske (1 : 5000), središnji registar prostornih jedinica i digitalne ortofotokarte (1 : 5000) za cijelo područje grada Sinja za potrebe gradske uprave. Kao posljedica te interakcije dodan je još modul Katastarske parcele (M7).

Za dodatne module, koji bi trebali biti primijenjeni kroz istraživanje, plan je bio izračunati ekonomsku dobit od svakog mogućeg modula na temelju radnih procesa. Budući da nije bilo moguće izračunati ekonomsku vrijednost na jednostavan način, kriteriji su bili procjena istraživača o najboljem interesu najvažnijih dionika – građana i gradske uprave. Osim najboljeg interesa građana i gradske uprave, podrška građana webGIS-u mogla bi pozitivno utjecati na donositelje odluka o potpori daljnjem razvoju webGIS-a u gradu Sinju. Prvi odabrani modul je modul za prijavu komunalnih problema (M8) (web i mobilne aplikacije s besplatnim pristupom građanima). Drugi je odabrani modul bio modul za upravljanje katastrofama (M9). Budući da grad Sinj ima relativno značajan rizik od elementarnih nepogoda, taj bi modul mogao biti ključan u vrijeme i neposredno nakon katastrofa.

Osim navedenih modula uvršteno je i jedanaest slojeva: šumska područja (L1), biciklističke staze (L2), pješačke staze (L3), Hrvatske šume (wms servis) (L4), „Natura 2000“ - zaštićena područja u okolišu (wms servis) (L5), prostorni planovi (L6), naselja (L7), granice općina (L8), lokalna samouprava (L9), mreža javnih cesta 2016 (službeni podaci DGU) (L10) i MGIPU urbana područja (podaci MGIPU) (L11) (Marasović 2020).

**Table 3** The number of hits two days before and after the event - date of module added or public announcement about it (Marasović 2020).

**Tablica 3.** Broj ulazaka dva dana prije i nakon događaja – datum dodavanja modula ili javne objave o dodanom modulu (Marasović 2020).

| Date of added module or public release about it<br>Datum dodavanja modula ili javne objave o dodanom modulu | Number of hits two days before the event<br>Broj ulaza na stranicu dva dana prije događaja | Number of hits two days after the event<br>Broj ulaza na stranicu dva dana poslije događaja | Growth rate<br>Stopa rasta | Average hits per day before the event<br>Prosječni broj ulazaka na stranicu dan prije događaja | Average hits per day after the event<br>Prosječni broj ulazaka na stranicu dan poslije događaja |
|---|--|---|----------------------------|--|---|
| 12.12.2020.   | 0  | 68  | -%                         | 0  | 34  |
| 24.06.2020.   | 12   | 12  | 100%                       | 6  | 6   |
| 26.06.2020.   | 12   | 143   | 1192%                      | 6  | 72  |
| 27.06.2020.   | 18   | 183   | 1017%                      | 9  | 92  |
| 09.07.2020.   | 51   | 108   | 212%                       | 26   | 54  |
| 15.07.2020.   | 21   | 62  | 295%                       | 11   | 31  |

After public release/ Poslije javne nabave

After adding module without public releases/ Poslije dodavanja modula bez javne objave

plan was to calculate the economic gain from each possible module based on the working processes. Since it was not possible to calculate the economic value in a reasonably uncomplicated way, the criteria were the researcher’s estimate of the best interests of the most important stakeholders – the citizens and city administration. Besides the best interests of the citizens and city administration, the support of citizens for webGIS could positively influence the decision-makers’ support for the further development of webGIS in the city of Sinj. The first module was a module for reporting utility problems (M8) (web and mobile applications with free access for citizens). The second selected module was a module for disaster management (M9). Since the city of Sinj has a relatively significant risk of natural disasters, this module could be critical in a time of and just after disasters.

Besides those modules, eleven layers were implemented: forest areas (L1), cycle lines (L2), walking trails (L3), Croatian forests (wms service) (L4), natura 2000 protected areas (wms service) (L5), spatial plans (L6), settlements (L7), municipality borders (L8), local government (L9), public roads network 2016, (official SGA information) (L10) and MGIPU building areas (information from MGIPU) (L11) (Marasović 2020).

## 11 Public Release Measurement

During the implementation phase, hits on the city of Sinj webGIS portal were measured. Hits were measured before and after public communication in local media related to the implementation of an individual module (Marasović, 2020). Public releases which were measured by hits were (Marasović, 2020):

- 12 December 2019: Public releases about an added module for citizens to give suggestions on spatial plans online (M5); released on the official website of the city of Sinj and local digital media (City of Sinj (2019)).
- 24 June 2020: Added module and mobile application for citizens to report any trouble or irregularities in any infrastructure or the environment (M8) and presentation of the draft version of the disaster management module (M9) in the area of the city of Sinj.
- 26 June 2020: Public releases about an added module and mobile application for citizens to report any trouble or irregularities in any infrastructure or the environment (M8); released on the official city of Sinj website (City of Sinj (2020)).
- 27 June 2020: Public releases about an added module and mobile application for citizens to report any trouble or irregularities in any infrastructure

## 11. Mjerenje javne objave

Tijekom uspostave izmjereni su pristupi građana grada Sinja webGIS-u. Izmjereni su podatci prije i nakon javnih objava u lokalnim medijima. Javna priopćenja koja su utjecala na mjerenja bila su (Marasović 2020):

- 12. prosinca 2019. Priopćenja za javnost o dodatnom modulu za davanje prijedloga prostornih planova građanima putem interneta (M5); objavljeno na službenim web stranicama Grada Sinja i lokalnim digitalnim medijima (Grad Sinj 2019).
- 24. lipnja 2020. Dodan modul i mobilna aplikacija za građane za prijavu bilo kakvih poteškoća ili nepravilnosti u bilo kojoj infrastrukturi ili okolišu ili na području grada Sinja (M8) te prezentacija nacrtu modula za upravljanje katastrofama (M9) na području grada Sinja.
- 26. lipnja 2020. Javna priopćenja o dodanom modulu i mobilnoj aplikaciji za građane za prijavu bilo kakvih poteškoća ili nepravilnosti u bilo kojoj infrastrukturi ili okolišu ili na području grada Sinja (M8); objavljeno na službenim web stranicama Grada Sinja (Grad Sinj 2020).
- 27. lipnja 2020. Javna priopćenja o dodanom modulu i mobilnoj aplikaciji za građane za prijavu bilo kakvih poteškoća ili nepravilnosti u bilo kojoj infrastrukturi ili okolišu ili na području grada Sinja (M8); prvo javno objavljivanje u lokalnim digitalnim medijima (Hit radio d.o.o. 2020a).
- 9. srpnja 2020. Javna priopćenja o dodanom modulu i mobilnoj aplikaciji za građane za prijavu bilo kakvih poteškoća ili nepravilnosti u bilo kojoj infrastrukturi ili okolišu ili na području grada Sinja (M8); drugo javno objavljivanje na lokalnim digitalnim medijima (Hit radio d.o.o. 2020b).
- 15. srpnja 2020. Priopćenje za javnost o dodanom modulu i mobilnoj aplikaciji za građane za prijavu eventualnih poteškoća ili nepravilnosti u bilo kojoj infrastrukturi (M8) i razvoju modula za upravljanje katastrofama na području grada Sinja; javno priopćenje u jednom od vodećih nacionalnih medija (Hanza Media d.o.o. 2020).

Broj ulazaka mjeren je nakon uvrštavanja modula: prije javne objave (u tablicama označeno plavom bojom) i nakon javne objave (u tablicama označeno crvenom bojom). Cilj je bio otkriti moguću promjenu u broju pogodaka ako je javno objavljivanje uključeno ili nije. Razlika u broju pogodaka ukazuje na utjecaj javne objave na interes građana za javne usluge koje pruža LIPP. Korištenje webGIS-a potaknuto je PR akcijama. Važna je i snaga medija (lokalnog ili regionalnog). Što su mediji jači, to je značajniji utjecaj na broj ulazaka. Iz

tablice 3 vidljivo je da postoji snažan utjecaj javnih objava na broj ulazaka. Stopa rasta ulazaka ide od 212% do 1192%. nakon javnih objava Ako nema javnih objava, broj pogodaka prije i poslije je isti.

Evidentno je da broj ulazaka nakon javnih objava raste ne samo u dva dana, nego i mnogo dulje nakon objavljivanja. Usporedimo li broj posjeta nakon svakog javnog objavljivanja s početnim brojem ulaza (12), imamo još značajniji utjecaj odnosa s javnošću na broj ulazaka (tablica 4) (Marasović 2020).

Na broj instalacija mobilne aplikacije (Promet i Prostor d.o.o. 2019) za građane za prijavu bilo kakvih poteškoća ili nepravilnosti u bilo kojoj infrastrukturi ili prirodi na području grada Sinja (M8) utjecale su i javne objave (tablica 5) (Marasović 2020).

Očito je da je utjecaj javnih objava na instalacije mobilnih aplikacija izuzetno jak i iznosi od 140% do 620%.

## 12. Mišljenja članova provedbenog tima

Završni korak ovog projekta bio je prikupljanje mišljenja članova tima za uspostavu webGIS-a, odnosno odgovorne osobe Grada Sinja i tvrtke angažirane za uspostavu webGIS-a. Predstavnik tvrtke izjavio je (Marasović 2020):

*“Uspostava webGIS sustava u gradu Sinju, kao i u većini drugih LIPP-a kao korisnika takvog sustava, prvenstveno je posljedica potrebe rješavanja konkretne zakonske obveze, kao što je uspostava registra katastra komunalnih djelatnosti (najčešće nerazvrstane ceste, javna rasvjeta, zelene površine), evidencija raspolaganja poljoprivrednim zemljištem, vođenje registra nekretnina i sl. Ostali važni razlozi za uspostavu su: povećanje prihoda jedinica lokalne samouprave (porezi, komunalne naknade), optimizacija poslovnih procesa radi smanjenja rashoda (održavanje komunalne infrastrukture, digitalizacija raznih procedura, digitalizacija podataka), olakšana dostupnost prostornih podataka građanima i povećanje kvalitete života itd.*

*Uspješna uspostava webGIS-a u gradu Sinju rezultat je ispunjenih nekoliko kriterija:*

1. *Odobrenje i podrška odgovorne osobe (gradonačelnika)*
2. *Upravljanje provedbom od odgovorne osobe Upravljačkog tijela, što je bitno zbog:*
  - a. *lakšeg odobravanja troškova i drugih resursa početne uspostave i naknadnih nadogradnji*
  - b. *naredbe nižim gradskim službenicima da koriste takav sustav.*
3. *Dostupnost podataka u digitalnom formatu (nerazvrstane ceste, komunalne obveznice, prostorni planovi) kako ne bi bilo potrebno u proces uspostave uključivati prikupljanje i digitalizaciju baze podataka.*



**Table 4** The number of hits two days before adding the module and two days after each public release (Marasović 2020).**Tablica 4.** Broj pogodaka dva dana prije dodavanja modula i dva dana nakon svake javne objave (Marasović 2020).

| Date of added module or public release about it<br>Datum dodavanja modula ili javne objave o dodanom modulu | Number of hits two days before the event<br>Broj ulaza na stranicu dva dana prije događaja | Number of hits two days after the event<br>Broj ulaza na stranicu dva dana poslije događaja | Growth rate<br>Stopa rasta | Average hits per day before the event<br>Prosječni broj ulazaka na stranicu dan prije događaja | Average hits per day after the event<br>Prosječni broj ulazaka na stranicu dan poslije događaja |
|---|--|---|----------------------------|--|---|
| 24.06.2020.   |  | 12  | 100%                       |  | 6   |
| 26.06.2020.   |  | 143   | 1192%                      |  | 72  |
| 27.06.2020.   | 12   | 183   | 1525%                      | 6  | 92  |
| 09.07.2020.   |  | 108   | 900%                       |  | 54  |
| 15.07.2020.   |  | 62  | 517%                       |  | 31  |

After public release/ Poslije javne nabave

After adding module without public releases/ Poslije dodavanja modula bez javne objave

or the environment (M8); first public release on local digital media (Hit radio d.o.o. 2020a).

- 9 July 2020: Public releases about an added module and mobile application for citizens to report any trouble or irregularities in any infrastructure or the environment (M8); second public release on local digital media (Hit radio d.o.o. 2020b).
- 15 July 2020: Public release about an added module and mobile application for citizens to report any trouble or irregularities in any infrastructure (M8) and development of module for disaster management in the area; public release in one of the leading national media (M9) (Hanza Media d.o.o. 2020).

The number of hits was measured after implementing the module: before public releases (marked in blue in the tables) and after public release (marked in red in the tables). The goal was to detect a possible change in the number of hits if a public release is or is not included. The difference in hits indicates an influence of public releases on the citizens' interest in the public services provided by LSDI. The usage of webGIS was raised by PR actions. The strength of the medium (local or regional) is important as well. The stronger the media, the more significant the influence on the number of hits (Marasović 2020). It is evident from Table 3 that there is a strong influence of public releases on the number of hits. The rate of growth of hits goes from 212% up to 1192%. If there are no public releases, the number of hits before and after is the same.

It is evident that the number of hits after public releases rises not just in two days but much longer after release. If we compare the number of hits after each public release with the initial number of hit (12 hits), we have an even more significant influence of public relations on the number of hits (Table 4) (Marasović 2020).

The number of the mobile application installations (Promet i Prostor, d.o.o. 2019) for citizens to report any trouble or irregularities in any infrastructure or the environment (M8) was influenced by public releases as well (Table 5) (Marasović 2020).

It is obvious that the influence is extremely strong, going from 140% to 620%.

## 12 Implementation Team Members Opinions

The final step of this project was gathering opinions of the webGIS implementation team members. The responsible person from the city and from the webGIS implementation company gave their opinions.

The company representative stated (Marasović 2020):

*"The webGIS implementation in the city of Sinj, as well as in most other users of webGIS, is primarily due to the need to solve a specific legal obligation, such as the establishment of a utility cadastre register (most often: unclassified roads, public lighting, green areas), records of agricultural land disposal, keeping a real property register and similar. Other important reasons for the implementation are: increasing*

**Tablica 5.** Broj instalacija mobilne aplikacije dva dana prije prve javne objave modula i dva dana nakon svake javne objave.  
**Table 5** The number of installations of mobile application two days before the first public release of the module and two days after each public release (Marasović, 2020).

| Date of added module or public release about it<br>Datum dodavanja modula ili javne objave o dodanom modulu | Number of hits two days before the event<br>Broj ulaza na stranicu dva dana prije događaja | Number of hits two days after the event<br>Broj ulaza na stranicu dva dana poslije događaja | Growth rate<br>Stopa rasta | Average hits per day before the event<br>Prosječni broj ulazaka na stranicu dan prije događaja | Average hits per day after the event<br>Prosječni broj ulazaka na stranicu dan poslije događaja |
|---|--|---|----------------------------|--|---|
| 24.06.2020.   |  | 13  | 260%                       |  | 6,5   |
| 26.06.2020.   |  | 9   | 180%                       |  | 4,5   |
| 27.06.2020.   | 5  | 7   | 140%                       | 2,5  | 3,5   |
| 09.07.2020.   |  | 31  | 620%                       |  | 15,5  |
| 15.07.2020.   |  | 18  | 360%                       |  | 9   |

After public release/ Poslije javne nabave

After adding module without public releases/ Poslije dodavanja modula bez javne objave

Većoj brzini uspostave i bržoj i ugodnijoj uporabi za zaposlenike doprinijelo bi:

- ozbiljno uključivanje djelatnika LIPP-a odgovornih za upravljanje softverskim rješenjima i aplikacijama u proces uspostave
- donošenje službene odluke na razini grada o korištenju webGIS-a kao službenog sustava za upravljanje bazom podataka specifičnih baza podataka.

Važno je naglasiti da mlađi i informatički „pismeniji“ djelatnici obično postižu jednostavniju prilagodbu prema korištenju novog programskog sustava.

Osnovni kriteriji koje webGIS mora zadovoljiti da bi ga zaposlenici JLS-a (Jedinica lokalne samouprave) koristili u svojim svakodnevnim aktivnostima (ključ da programski sustav „živi“ u dugotrajnoj upotrebi):

- jednostavnost i brzo korištenje ažuriranih primarnih prostornih podataka iz nadležnosti DGU-a (registar prostornih jedinica, digitalni katastarski plan)
- integracija s ostalim IT sustavima i opremom koju koriste jedinice lokalne samouprave (javni servisi prostornih podataka, ERP sustav, GPS vozila, prometne i sigurnosne kamere, senzori)
- dostupnost pružatelja usluga za korisničku podršku (po mogućnosti isti zaposlenik davatelja usluga kao koordinator za rješavanje problema u korištenju).

Uspostavu webGIS-a u gradu Sinju obilježila je postupna nadogradnja softverskih modula (proširivanje baze podataka u GIS-u), što je pozitivno za postupno razvijanje i prihvaćanje njegove upotrebe od zaposlenika.”

Predstavnik Grada izjavio je:

“Iz mog iskustva za uspješnu uspostavu ovog sustava važno je:

- primjena adekvatne tehnologije i kontinuirana tehnička podrška
- aktivno uključivanje svih dionika (grada, komunalnih tvrtki, građana) i
- adekvatna organizacijska struktura.

U procesu provedbe važno je da ne postoji nedostatak koordinacije među dionicima. Također, da bi proces bio uspješan, potrebno je prilagoditi organizacijsku strukturu. Trenutne prednosti su što je građanima omogućen brži i moderniji pristup javnim uslugama, a unutar grada je veća razina transparentnosti internih procesa. S druge strane, rizici ovog sustava su zlouporabe (lažna upozorenja) i nepostupanje pojedinih pružatelja komunalnih usluga. Osobno iskustvo sudjelovanja u ovom projektu pomoglo mi je u svakodnevnim radnim zadacima i profesionalnom razvoju. Da bismo mogli procijeniti utjecaj cjelokupne radne zajednice, potrebno je proći više vremena od početka uspostave webGIS-a kako bi svi prepoznali sve njegove prednosti. Svakako vjerujem da bi adekvatna organizacijska kultura doprinijela boljem prihvaćanju tog sustava i time imala više koristi od njega.”

Istraživač je izjavio:

Iz perspektive istraživača, ključ za pokretanje razvoja webGIS-a je svijest o prednostima LIPP-a ili webGIS-a. Podizanje svijesti može se provoditi sustavno ili pojedinačno. U ovom slučaju, istraživač i predstavnik tvrtke za implementaciju webGIS-a su utjecali na svijest o prednostima

the revenue of local self-government units (taxes, municipal charges), optimizing business processes to reduce expenditures (maintenance of utility infrastructure, digitization of various procedures, digitization of data), sharing spatial data with citizens to facilitate data availability and increase the quality of life, etc.

The successful implementation of the webGIS system in the city of Sinj is a result of several fulfilled criteria:

1. Approval and support by the responsible person (mayor)
2. Implementation management by the responsible person of the managing authority, which is vital due to:
  - a. Easier approval of costs and other resources for the initial implementation and subsequent upgrades
  - b. Orders to lower-ranking city employees to use such a system
3. Availability of data in digital format (unclassified roads, utility bonds, spatial plans), so it was not necessary to include the collection and digitization of the database in the implementation process.

The following would contribute to a greater implementation speed and faster and more comfortable use from employees:

- Serious involvement in the implementation process of the LSDI employees responsible for managing software solutions and applications.
- Making an official decision at the city level (LSDI) to use the webGIS system as an official system for managing a database of specific databases.

It is important to emphasize that younger and technical educated staff usually achieve a more straightforward adjustment towards the use of the new programming system.

Essential criteria that WebGIS must meet for LSGU (Local Self-Government Units) employees to use it in their daily activities (key for the program system to “live” in long-term use) are:

- Simplicity of use of primary spatial data within the jurisdiction of the SGA (register of spatial units, digital cadastral plan).
- Integration with other IT systems and equipment used by local self-government units (public spatial data services, ERP system, GPS vehicles, traffic and security cameras, sensors).
- Availability of the service provider for user support (preferably the same service provider employee as coordinator for resolving any problems in use).

Implementation of the webGIS system in the city of Sinj was characterized by gradual upgrading of the software modules (expanding the database in GIS), which is positive for its development and acceptance by employees.”

A representative of the city stated:

“From my experience, for the successful implementation of this system, the following are important:

- Application of adequate technology and continuous technical support,
- Active involvement of all stakeholders (cities, utility providers, citizens) and
- Adequate organizational structure

In the implementation process, it is important that there is no lack of coordination among the stakeholders. Also, for the process to be successful, the organizational structure needs to be adapted. The current benefits are that citizens are given faster and more modern access to public services, and within the city, there is a higher level of transparency of internal processes. On the other hand, the risks of this system are that it will be misused (e.g., false alerts about irregularities in infrastructure) and failure to act by individual utility service providers. The personal experience of participating in this project has helped me in my daily work tasks and professional development. To be able to estimate the influence of the entire working community, it is necessary for more time to pass from the beginning of the implementation to recognize all of its advantages. I certainly believe that an adequate organizational culture would contribute to a better acceptance of this system and thus benefit more from this system.”

The researcher stated:

From the researcher’s perspective, the key for initiating the development of webGIS in the city is awareness about the benefits of LSDI or webGIS. Raising awareness can be done systematically or individually. In this case, it was done individually by the researcher and representative of the webGIS implementation company. Also, a low or lower price for the WebGIS implementation service than usual on the market was important for the decision to go ahead with the implementation of webGIS.

After the decision, the decision-makers do not participate in the operative tasks, but their constant support and interest in the process of implementation are essential. It could be that the intensity of interest also depends on awareness. A crucial part of this process is the selection of an employee responsible for the operative implementation of webGIS and communication between stakeholders. In this case, an employee had this task added to others. Most likely, it would have been better if the employee had had just this task or if this task had been the main one. Also, it seems that webGIS awareness and knowledge of this employee are also critical since they could influence motivation. It would be best if there were possibilities (financial and organizational) in the city to have one person responsible for this process exclusively. Moreover, it would be best if they are is an IT expert with specialization in GIS.

Moreover, the usage of webGIS by the city administration demands changes in the daily working routines which is usually followed by resistance. So, HR skills are advantageous

webGIS-a kod donositelja odluka. Također, niska ili niža cijena usluge uspostave WebGIS-a bila je važna za odluku da se krene u primjenu.

Nakon donošenja odluke, donositelji odluka ne sudjeluju u operativnim zadacima, ali je bitna njihova stalna podrška i interes za provedbu. Moguće da intenzitet interesa ovisi i o svjesnosti. Ključni dio ovog procesa je odabir djelatnika odgovornog za operativnu primjenu webGIS-a, kao i za komunikaciju između dionika. U ovom slučaju, zaposleniku je taj zadatak dodan drugim zadacima. Najvjerojatnije bi bilo bolje da je zaposlenik imao samo taj zadatak ili da je taj zadatak bio glavni. Također, čini se da je svijest i znanje o LIPP-u tog zaposlenika ključno jer može utjecati na motivaciju u vrijeme provedbe. Najbolje bi bilo da u gradu postoje mogućnosti (financijske i organizacijske) da za taj proces bude odgovorna isključivo jedna osoba. Štoviše, najbolje bi bilo da se radi o IT stručnjaku sa specijalizacijom za GIS.

Nadalje, upotreba webGIS-a u gradskoj upravi zahtijeva promjene u svakodnevnim radnim navikama koje obično prati otpor. Dakle, vještine u odnosima s ljudima (engl. Human Resources skills) su poželjne, a posebno one vezane za uvođenje promjena u svakodnevne radne navike. To bi mogla biti značajna podrška za prihvaćanje sustava.

Konačno, čini se da promocija webGIS-a putem odnosa s javnošću pozitivno utječe na sve dionike. Nakon uspješnog završetka projekta, oni koji su sudjelovali, bili su ponosni i motivirani za nastavak. Građani su se upoznali sa sustavom i počeli ga koristiti, a gradska uprava ga s lakoćom prihvaća.

Na temelju uspješnog iskustva, čini se da će donositelji odluka biti spremniji ulagati u webGIS ako budu svjesni njegove prednosti. Također, nakon uspjeha spremni su platiti više za nove usluge, prvenstveno korisne gradskoj upravi i građanima, ali i ostalim dionicima. Većina pokazatelja iz statističke analize je potvrđena. Prepoznate su aktivnosti vezane za odnose s javnošću kao i za odnose s djelatnicima. Pilot projekt je potvrdio da je odluka donositelja odluka na lokalnoj razini o ulaganju u webGIS bitna za provedbu. Takva odluka uslijedila je nakon predstavljenih prednosti webGIS-a. Glavne prepoznate ciljne skupine su gradska uprava i građani. Osim potvrđenih pokazatelja, s praktične strane ključna je podrška s razine donositelja odluka u provedbi. Poznavanje webGIS-a od zaposlenika odgovornog za primjenu je ključno. Aktivnosti ljudskih potencijala bitne su za prihvaćanje promjena u dnevnim navikama zaposlenika. Odnosi s javnošću se čine vitalnim za podizanje svijesti i znanja građana o korisnosti webGIS-a.

### 13. Zaključak

Oba su postavljena cilja istraživanja postignuta. Pilot projekt i početna faza uspostave webGIS-a bili su uspješni. Nadalje, ovaj bi projekt trebao biti vođen isključivo iz grada, a najvjerojatnije će ovisiti o podršci donositelja odluka ili, bolje rečeno, svijesti donositelja odluka o prednostima LIPP-a.

Okruženje LIPP-a određeno je preprekama i ključnim pokazateljima uspješne uspostave. Ključ za ulaganje u ovaj pilot projekt bila je svijest o prednostima LIPP-a. Podizanje svijesti postignuto je izravnom komunikacijom između istraživača i predstavnika tvrtke za uspostavu LIPP-a s gradonačelnicom. PR aktivnosti se čine vitalnima za podizanje svijesti i znanja građana o korisnosti LIPP-a.

Glavna je prepoznata prepreka nedostatak podrške donositelja odluka za razvoj LIPP-a zbog nedostatka znanja, svijesti i financijskih mogućnosti. Financiranje ipak ovisi o svijesti donositelja odluka budući da oni odlučuju u što će ulagati. Ako postoji dovoljna svijest o prednostima LIPP-a, donositelji odluka odlučit će ulagati u LIPP i, nadalje, ulagati u ljudski kapital za pokretanje i korištenje te infrastrukture.

Glavna su ciljna skupina gradska uprava i građani. Da bi LIPP bio koristan i učinkovit, građani moraju znati o njemu i kako ga koristiti. Iako građani nisu bili uključeni u ovo istraživanje, moguće je da većina građana također ima nedostatak svijesti o LIPP-u i njegovim dobrobitima, što bi moglo dovesti do niske upotrebe LIPP-a.

Nakon donošenja odluke donositelji odluka ne sudjeluju u operativnim zadacima, ali je njihova stalna podrška i zainteresiranost za proces provedbe bitna. Ključni je dio ovog procesa odabir djelatnika odgovornog za operativnu uspostavu webGIS-a i komunikaciju između dionika. U ovom slučaju, zaposleniku je taj zadatak dodan drugim zadacima. Također, čini se da je svijest i znanje o LIPP-u tog zaposlenika također kritična jer može utjecati na motivaciju. Najbolje bi bilo da za taj proces bude odgovoran isključivo jedan zaposlenik. Štoviše, najbolje bi bilo da se radi o IT stručnjaku sa specijalizacijom za GIS. Odnosi s javnošću pomažu u podizanju svijesti dionika o LIPP-u.

Nadalje, korištenje webGIS-a u gradskoj upravi zahtijeva promjene u svakodnevnim radnim rutinama koje obično prati otpor. Dakle, aktivnosti ljudskih potencijala bitne su za prihvaćanje promjena u dnevnim rutinama zaposlenika.

and particularly those for implementing change in the daily working routines. This could be a significant benefit for accepting the tool.

Finally, the promotion of webGIS through PR seems to influence positively all of them. After the project finished successfully, those who participated were proud and motivated to carry on. Citizens got familiar with the tool and started using it, and the city administration easily accepts it.

Based on the successful experience, it seems that decision-makers will be more willing to invest in it if they are aware of the benefits of webGIS. Also, after the success they are willing to pay more for new services which are primarily useful for the city administration and citizens, as well as for other stakeholders. Most of the indicators from the statistical analysis were confirmed. HR and PR activities are recognized as well. The pilot project confirmed that the decision on investment in webGIS from the local level decision makers is essential for implementation of webGIS. Such a decision came after the presented benefits of webGIS. The main recognized target groups were the city administration and citizens. Besides the confirmed indicators, from the practical side, support from the decision makers level in implementation is crucial. Knowledge about webGIS of the employee responsible for the implementation is critical. Human resources activities are essential for accepting change in the daily routines of the employees. PR activities seem vital for raising awareness and knowledge of the citizens about the usefulness of webGIS.

### 13 Conclusion

Both of the research objectives have been achieved. The pilot project, the initial webGIS implementation phase was successful. In future this project should be driven from the city exclusively, and it will most likely depend on support from the decision-makers, or rather, the awareness of the decision-makers about the benefits of LSDI.

The LSDI environment is determined by obstacles and key indicators of successful implementation. The key for investment in this pilot

project was awareness about the benefits of LSDI. Raising awareness was done individually by the researcher and representative of the webGIS implementation company. PR activities seem vital for raising awareness and knowledge of citizens about the usefulness of LSDI.

The main recognized obstacle is lack of support from the decision-makers for LSDI development due to lack of knowledge, awareness and financial possibilities. Financing depends on the awareness of the decision-makers since they decide in what to invest. If there is enough awareness about LSDI benefits, the decision makers will decide to invest in LSDI and, furthermore, invest in human capital to implement and drive this infrastructure.

The main target group are the city administration and citizens. For LSDI to be useful and efficient, citizens must know about it and how to use it. Although citizens were not included in this research, it is possible that most of the citizens also lack awareness of LSDI and its benefits, which could lead to low use of LSDI.

After the decision, the decision makers do not participate in the operative tasks, but their constant support and interest in the process of implementation are essential. A crucial part of this process is the selection of an employee responsible for the webGIS operative implementation and communication between the stakeholders. In this case, an employee had this task added to other tasks. Also, it seems that awareness and knowledge about LSDI of this employee is also critical since it could influence the motivation. It would be best to have one employee responsible for this process exclusively. Moreover, it would be best if they were an IT expert specializing in GIS. Public relations influence awareness of LSDI.

Moreover, the usage of webGIS by the city administration demands changes in the daily working routines, which is usually followed by resistance. So, human resource activities are essential for accepting change in the daily routines of employees.

## References / Literatura

- Correa Gomes R (2005) Who Are the Relevant Stakeholders to the Local Government Context? Empirical Evidence on Environmental Influences in the Decision-Making Process of English Local Authorities, *Brazilian Administration Review – BAR*, v. 1, n. 1, Brazil
- Europska komisija (2018) Energy and smart cities [https://ec.europa.eu/energy/topics/technology-and-innovation/energy-and-smart-cities\\_en?redir=1](https://ec.europa.eu/energy/topics/technology-and-innovation/energy-and-smart-cities_en?redir=1) (25. 8. 2020)
- Fountains spatial inc. (2008) GIS Needs Assessment, Conceptual System Design, and Implementation Plan Report -Steuben County (New York), Schenectady, New York
- Grad Sinj (2019) Nova funkcionalnost na gradskom Geografskom informacijskom sustavu, Javna objava na lokalnom online portalu o dodanom modulu za javnost u svrhu davanja prijedloga na promjene prostornih planova online putem webGIS portala, <https://www.sinj.hr/uvodena-je-nova-funkcionalnost-na-gradskom-geografskom-informacijskom-sustavu-gis-u-modul-izmjene-prostornih-planova/> (21. 8. 2020)
- Grad Sinj (2020) Nastavak razvoja GIS sustava grada Sinja, Javna objava na portalu Grada Sinja o dodanom modulu za javnost u svrhu prijave nepravilnosti u komunalnoj infrastrukturi ili onečišćenja u okolišu online putem webGIS portala, <https://www.sinj.hr/nastavak-razvoja-gis-sustava-grada-sinja/>, / (21. 8. 2020)
- Hanza Media d.o.o. (2020) Sinjani razvili aplikaciju za upravljanje kriznim situacijama, a svoje će komunalne probleme od sada moći dojavljivati i virtualno, <https://slobodnadalmacija.hr/dalmacija/zagora/sinjani-razvili-aplikaciju-za-upravljanje-kriznim-situacija-a-svoje-ce-komunalne-probleme-od-sada-moci-dojavljivati-i-virtualno-1032496> (21. 8. 2020)
- Hit radio d.o.o. (2020a) Građani prijavljuju probleme na GIS, <https://www.ferata.hr/aktivirana-aplikacija-za-prijavu-problema/> (21. 8. 2020)
- Hit radio d.o.o. (2020b) Nastavak razvoja GIS sustava Grada Sinja, <https://www.ferata.hr/nastavak-razvoja-gis-sustava-grada-sinja/> (21.08.2020)
- Koo C, Lee K (2001) GIS Implementation at Korean Local Government: Analysis through Employees' Perception Survey, *Journal of the Korean Association of Geographic Information Studies*, Volume 4, Issue2, pages 61-70
- Marasović S (2020) Local Spatial Data Infrastructure assessment and development model in the Republic of Croatia, Doctoral thesis, University of Zagreb
- Marasović S, Cromptoets, J, Poslončec-Petrić, V (2019) State and development of local spatial data infrastructures in Croatia, *Journal of Spatial Science*, 64, 3; 405-422 doi:10.1080/14498596.2018.1429331
- McDougall K (2006) A local-state government spatial data sharing partnership model to facilitate SDI development, PhD thesis, Department of Geomatics, University of Melbourne
- Owusu A B (2005) Problem in the design and implementation of a GIS for urban green development in Ghana, *Colleague of Arts and Sciences of Ohio University*
- Promet i Prostor d.o.o. (2019) Popravimo, Mobilna aplikacija, <https://play.google.com/store/apps/details?id=hr.popravimo&pcampaignid=MKT-Other-global-all-co-prtnr-py-PartBadge-Mar2515-1> (26. 8. 2020)
- Zimmermann R (1999) Prijedlog određenja srednjih gradova u Hrvatskoj, *Ministarstvo prostornog uređenja, graditeljstva i stanovanja, Društvena istraživanja: časopis za opća društvena pitanja*, Vol. 8 No. 1 (39), Zagreb