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Medvednica mountain streams in spatial planning of Zagreb

Medvednički potoci u prostornom planiranju Zagreba

This paper addresses the role of Medvednica Mountain streams in the past and present spatial planning of the City of Zagreb. A description of their main characteristics is followed by an examination of their historical role in spatial planning and spatial plans, and of their impact on the urbanisation of Zagreb over four characteristic periods from the second half of the 19th century to the time of writing. A survey was also conducted to determine the ways in which the people of Zagreb use these streams and their views on their potential development. The international practice of planning and management of urban streams is explained in selected examples. Finally, on the basis of the survey, field research, and a synthesis of foreign and domestic planning practice and literature, the authors summarise the results and findings of the research.

Key words: streams, spatial planning, greenways, Medvednica, Zagreb

Rad se bavi ulogom medvedničkih potoka u povijesnom i suvremenom prostornom planiranju grada Zagreba. Nakon opisa osnovnih obilježja potoka proučava se njihova uloga u prostornom planiranju i planovima te utjecaj na urbanizaciju Zagreba kroz četiri karakteristična razdoblja od polovice 19. stoljeća do danas. Provedeno je i anketno istraživanje u svrhu utvrđivanja načina korištenja zagrebačkih potoka i stavova ispitanika o potencijalima njihova razvoja. Na odabranim međunarodnim primjerima prikazana je praksa planiranja i uređenja urbanih potoka. U konačnici, na temelju provedene ankete, terenskoga istraživanja te sinteze strane i domaće planerske prakse i literature, sažimlju se rezultati i nalazi istraživanja.

Ključne riječi: potoci, prostorno planiranje, zeleni koridori, Medvednica, Zagreb

INTRODUCTION

The development of Zagreb has always been closely linked with Medvednica Mountain streams (hereinafter Medvednica streams). In the past, their role was more significant than that of the nearby Sava River, as its flood plain was a limiting factor for the city's expansion and development until relatively recently. The relationship between Zagreb, i.e. its inhabitants and urbanists, and Medvednica streams was less unilateral. Although they too were (and to a lesser extent still are) regarded a flood risk, they also formed the backbone of the daily lives of citizens and inhabitants of surrounding areas. Some streams, such as Medveščak Creek, played a considerable role in the development of Zagreb. Others had only local significance in the suburban villages that have grown to become Zagreb's contemporary neighbourhoods, and are largely forgotten today (Mohorovičić, 1952; Knežević, 2019).

Industrial development and rapid expansion of Zagreb from the end of the 19th century to the time of writing have changed the way in which citizens and professionals perceive Medvednica streams. Their social role is now mostly gone; the watercourses are polluted and their urbanistic potential is mostly seen in canalisation and as part of surface drainage systems. This paradigm has never been seriously challenged in Zagreb.

However, urban streams in other countries increasingly represent the backbone of modern green urban development and greenways (Fábos and Ryan, 2004; Hellmund and Smith, 2006; Giannakis et al. 2016). With design, wise management, and public involvement and participation (Garcia et al., 2017; Verbrugge et al., 2019; Gottwald et al., 2021), the maintenance of urban streams and other watercourses is becoming an increasingly important segment of planning (Turner, 2006).

Few articles have been published on the role of streams in Zagreb's spatial planning. Streams are mentioned only sporadically in connection with various aspects of the city's development. The paper by Knežević (2019) is worth mentioning, in which, among other issues, the author discusses the role of streams in the first regulatory foundations of Zagreb in the second half of the 19th century. Among recent research, two stand out that are thematically and spatially similar

UVOD

Razvoj Zagreba oduvijek je bio usko povezan s medvedničkim potocima. Oni su u prošlosti Zagreba imali čak i značajniju ulogu od same rijeke Save, čija je poplavna snaga dugo vremena bila ograničavajući faktor širenja i razvoja grada. Odnos Zagreba, odnosno njegovih stanovnika, i urbanista prema medvedničkim potocima bio je manje jednostran. Iako su također bili (i u manjoj mjeri još uvijek jesu) izvor opasnosti od poplava, činili su i okosnicu svakodnevnoga života brojnih građana i stanovnika zagrebačke okolice. Neki su potoci, poput Medveščaka, odigrali važnu ulogu u razvoju Zagreba, drugi su imali tek lokalno, danas gotovo zaboravljeno značenje u prigradskim selima koja su u međuvremenu prerasla u četvrti modernoga Zagreba (Mohorovičić, 1952; Knežević, 2019).

Industrijski razvoj i brzo širenje grada od kraja 19. stoljeća do danas promijenili su percepciju medvedničkih potoka među građanstvom i strukom. Njihova je društvena uloga uglavnom nestala, tokovi su im zagađeni, a urbanistički potencijal potoka vidio se pretežno u njihovu kanaliziranju i pretvaranju u dio sustava odvodnje površinskih voda. Takva paradigma u Zagrebu do danas nije ozbiljnije dovedena u pitanje.

Međutim, urbani potoci u inozemstvu sve više su okosnice modernoga, zelenoga razvoja gradova i tzv. zelenih koridora (Fábos i Ryan, 2004; Giannakis i dr. 2016; Hellmund i Smith, 2006). Uređenje, svrsishodno upravljanje, uključivanje i participacija javnosti (Garcia i dr., 2017; Verbrugge i dr., 2019; Gottwald i dr., 2021), briga o urbanim potocima te ostalim vodotocima postaje sve važniji segment planiranja (Turner, 2006).

O ulozi potoka u zagrebačkom prostornom planiranju objavljeno je malo radova. Potoci se spominju tek sporadično u kontekstu različitih aspekata razvoja grada. Vrijedi spomenuti rad Knežević (2019) u kojem se, između ostaloga, dotiče i potoka u prvim regulatornim osnovama Zagreba u drugoj polovici 19. stoljeća. Među recentnim istraživanjima ističu se dva koja su predmetno i prostornim obuhvatom slična

to this work, but differ in their theoretical and methodological approaches: (Zeneral, 2021; Gašparović et al., 2022).

Gašparović et al. (2022) assessed the impact of urban development on stream landscapes and the role that blue-green infrastructure (BGI) along streams can play in spatial planning. In this sense, they proposed a holistic approach to BGI analysis and planning for the purpose of future sustainable urban development. They analysed trends in dynamic changes in stream landscapes in the second half of the 20th century in Zagreb. They then addressed the development of relevant criteria for assessing these changes and proposed indicators that could be used to identify areas of critical urbanization pressure on BGI, emphasizing the need for an urban planning/social-ecological approach to assessing and monitoring urban stream systems. They confirmed the trend of negative changes in BGI, which is evident in its current state (disruption of open watercourses, reduction, fragmentation, and disconnection of BGI) and in the planned neglect of streams (further closure and reduction of public green spaces). Zeneral (2021) addressed how to improve urban planning from the perspective of affirming watercourses in establishing BGI and criteria for their more successful integration into spatial plans.

The importance of streams in cities, their role in spatial planning, and the need for landscaping and research can be seen from all this.

SUBJECT, OBJECTIVES, AND RESEARCH METHODS

This paper examines the role of Medvednica streams in the spatial planning of the city, existing spatial plans, and possibilities for future use and development of these streams and their corridors.

The main objectives of this paper are to determine the role of the Medvednica streams in the current spatial plans of the City of Zagreb (as of January 2022), and to contribute to the understanding of the spatial-temporal context that has led to the current attitude of the profession and public towards the streams; this will be accomplished primarily via analysis of past spatial plans. In line with

ovom, ali se razlikuju u teorijsko-metodološkom pristupu (Zeneral, 2021; Gašparović et al., 2022).

Gašparović i dr. (2022) procjenjuju utjecaj urbanoga razvoja na potočne pejzaže te ulogu koju plavo-zelena infrastruktura (PZI) uz tokove tekućica može imati u prostornom planiranju. U tom smislu predlažu holistički pristup analizi i planiranju PZI-a u svrhu budućega održivog razvoja grada. Analiziraju trendove dinamičkih promjena potočnih pejzaža u drugoj polovici 20. stoljeća (i kasnije) u Zagrebu. Zatim se bave izradom relevantnih kriterija za evaluaciju tih promjena te predlažu indikatore kojima bi se mogla odrediti područja kritičnoga pritiska urbanizacije na PZI, pritom naglašavajući potrebu urbanističko-socijalno-ekološkoga pristupa procjenjivanju i nadgledanju sustava urbanih potoka. Potvrđuju trend negativnih promjena u PZI-u, evidentan u postojećem stanju (prekid otvorenih vodotoka, redukcija, fragmentacija i nepovezanost PZI-a), kao i u planiranom zanemarivanju potoka (daljnje zatvaranje i smanjenje javnih zelenih površina). Zeneral (2021) se osvrće na pitanja mogućnosti unaprjeđenja urbanističkoga planiranja grada aspektima afirmacije vodotoka u uspostavljanju PZI-a i kriterija za uspješniju integraciju u prostorne planove.

Iz svega navedenoga razabire se važnost koju potoci imaju u gradovima, njihova uloga u prostornom planiranju, potreba za uređenjem i istraživanjima.

PREDMET, CILJEVI I METODE ISTRAŽIVANJA

Predmet istraživanja ovoga rada jest uloga medvedničkih potoka u prostornom planiranju grada, zatim njihova uloga u postojećim prostornim planovima te mogućnosti budućega iskorištavanja i uređivanja potoka i njihovih koridora.

Osnovni ciljevi rada uključuju utvrđivanje uloge medvedničkih potoka u važećim prostornim planovima grada Zagreba (prema stanju iz siječnja 2022.) te doprinos razumijevanju prostorno-vremenskoga konteksta koji je doveo do današnjega odnosa struke i javnosti prema potocima, što će se prvenstveno učiniti analizom povijesnih prostornih planova. Po-

this, the role of streams in the city's development will also be explained. Another objective is to identify other options for using Medvednica streams in the spatial planning of Zagreb.

These objectives and the subject matter of the research give rise to key questions to be answered in this paper:

- Did the planning profession and their resulting plans primarily perceive Medvednica's streams as an obstacle to urban expansion and development?
- Do the current spatial plans and planning practices in Zagreb reflect the wishes and needs of the inhabitants living near these streams?
- Is Zagreb's urbanism lagging behind European and global trends in the inclusion of urban streams and other greenways in spatial plans?

The methods used in this paper include an analysis and synthesis of all significant spatial plans of Zagreb from the mid-19th century to the time of writing; field work, i.e. research of the present courses of Medvednica streams (all significant streams in the Zagreb area were visited during 2021 and 2022); and surveys amongst the inhabitants of city neighbourhoods through which these streams run.

The study area includes the surface and underground stream courses that have their sources on the south-facing slopes of Medvednica and that flow within the statistical settlement of the administrative City of Zagreb, i.e. that are found within the scope of the current General Urbanistic Plan of the City of Zagreb (ISPCZ, 2016). Stream courses located within Medvednica Nature Park are examined only in passing, while the focus is on the urbanised areas of Zagreb. Considering the nature of the subject matter of research, this paper is not restricted exclusively to stream beds and also addresses the impact that stream management has on the immediate and distant surroundings.

In terms of the time period, the authors examine the period from the formal appearance of Zagreb, i.e. the settlements of Gradec and Kaptol in the Middle Ages, though the main focus is on the period following the adoption of the First Regulatory Plan of Zagreb in 1865 up to 2022.

vezano s time objasnit će se i uloga potoka u razvoju grada. Daljnji je cilj utvrđivanje alternativnih mogućnosti korištenja medvedničkih potoka u prostornom planiranju Zagreba.

Vezano uz ranije postavljene ciljeve i predmet istraživanja postavljaju se ključna pitanja na koja će se odgovoriti u radu:

- Je li planerska struka, i proizašli planovi, tijekom vremena medvedničke potoke prvenstveno smatrala smetnjom širenju i razvoju grada?
- Odgovaraju li važeći prostorni planovi i planerska praksa u Zagrebu željama i potrebama stanovnika koji žive uz medvedničke potoke?
- Zaostaje li zagrebački urbanizam za onim europskim i svjetskim po uključivanju urbanih potoka i drugih zelenih koridora u prostorne planove?

Metode korištene u ovom radu uključuju ponajprije analizu i sintezu svih važnijih prostornih planova Zagreba od sredine 19. stoljeća do danas, zatim terensko istraživanje današnjih tokova medvedničkih potoka (pri čemu su 2021. i 2022. obiđeni svi značajni potoci na prostoru Zagreba) te anketiranje građana gradskih četvrti kroz koje protječu medvednički potoci.

Prostor obuhvaćen ovim radom prvenstveno uključuje površinske i podzemne tokove potoka s izvorištima na južnim padinama Medvednice, a koji prolaze unutar granica Zagreba kao statističkoga naselja administrativnoga Grada Zagreba, odnosno unutar obuhvata važećega Generalnog urbanističkog plana grada Zagreba (ZPUGZ, 2016). Tokovi potoka unutar granica Parka prirode Medvednica bit će obrađeni samo marginalno, dok će fokus biti na urbaniziranom području Zagreba. Priroda predmeta istraživanja takva je da se rad ne može ograničiti isključivo na korita potoka, nego će se baviti i utjecajem njihova uređivanja na bližu i dalju okolicu.

U vremenskom smislu istraživanje obuhvaća period od formalnoga nastanka Zagreba – odnosno naselja na Gradecu i Kaptolu – u srednjem vijeku, ali će fokus biti na razdoblju nakon donošenja Prve regulatorne osnove Zagreba 1865., a zaključno s 2022.

The set of observed streams will be referred to as the *Mt. Medvednica streams*, where it refers exclusively to the scope of streams defined earlier, unless stated otherwise.

MAIN CHARACTERISTICS OF MEDVEDNICA STREAMS

In order to begin addressing the topic of Medvednica streams in Zagreb, we first have to specify which streams are considered. Traditionally, there are 18 larger and named streams that flow through the City of Zagreb (Fig. 1). From west to the east, they are: Dolje, Dubravica, Orešje/Borčec[1], Vrapčak, Kustošak, Črnomerec, Kuniščak, Jelenovac, Kraljevec, Tuškanac, Medveščak, Ribnjak, Gračanec, Remetinec, Bliznec, Štefanovec, Trnava and Reka (Čučerska Reka or Rijeka). In addition to these streams, there is a number of smaller, often unnamed brooks. If we add the ephemeral streams that appear after abundant precipitation events, the number of streams in the inner Zagreb area can reach up to 30.

The majority of streams of Zagreb spring on Medvednica itself, with only a small number originating in the foothills. Streams that surface in the lower foothill belt usually have less water and are more ephemeral. In this paper, we primarily examine middle- (foothills) and low-lying (valleys) segments of Medvednica streams as they lie within the scope of Zagreb's General Urbanistic Plans. It is worth noting that after decades of technical management and canalisation, the streams of foothill segments have lost some of their natural characteristics, while those in the lowland segments have lost nearly all of their natural characteristics.

The hydrological properties of the streams of Zagreb play a major role in determining their urbanistic potential (Šaler, 1988; Roglić, 2006). A significant characteristic of the springs is that they are

1 In the 2016 Zagreb GUP, this creek is referred to as Medpotoki and the valley through which it flows is called Medpotoki–Orešje (ISPCZ, 2016), while in the 1971 GUP the mentioned creek has two names: Perjavica and Medpotoki (UICZ, 1971). People who live near the creek mention the names Medpotoki, Orešje and Borčec. In this paper, we will avoid the name Medpotoki on etymological grounds: the toponym Medpotoki itself implies the space that exists between two streams, so it can hardly be the original name of this particular creek.

Skup promatranih potoka nazivat će se *medvedničkim potocima*, pri čemu se naziv odnosi isključivo na ranije definiran obuhvat potoka, osim ako nije drugačije naglašeno.

OSNOVNA OBILJEŽJA MEDVEDNIČKIH POTOKA

Da bismo mogli početi obrađivati temu medvedničkih potoka u Zagrebu, najprije moramo odrediti o kojim se potocima zapravo radi. Tradicionalno se navodi da područjem grada Zagreba teče 18 većih, imenovanih potoka (sl. 1). Od zapada prema istoku ti potoci su: Dolje, Dubravica, Orešje/Borčec[1], Vrapčak, Kustošak, Črnomerec, Kuniščak, Jelenovac, Kraljevec, Tuškanac, Medveščak, Ribnjak, Gračanec (Gračanski potok), Remetinec (Remetinečki potok), Bliznec, Štefanovec, Trnava i Reka (Čučerska Reka ili Rijeka). Osim navedenih postoji i čitav niz manjih, često neimenovanih potoka. Pribrojimo li tomu popisu i nestalne tokove koji se pojavljuju nakon obilnijih padalina, možemo doći i do broja od 30-ak potoka na užem zagrebačkom području.

Većina zagrebačkih potoka ima izvorište na području Medvednice, dok manji broj izvire u medvedničkom prigorju. Potoci s izvorištem u nižem prigorskom pojasu uglavnom su siromašniji vodom i nestalnijega karaktera. U radu ćemo se pretežno baviti srednjim (prigorskim) i donjim (nizinskim) segmentima medvedničkih potoka jer se oni nalaze unutar obuhvata zagrebačkih generalnih urbanističkih planova. Vrijedi napomenuti i da su zagrebački potoci u prigorskom dijelu toka djelomično, a u nizinskom gotovo u potpunosti izgubili svoje prirodne karakteristike nakon desetljeća tehničkog uređivanja i kanaliziranja.

Hidrološka obilježja zagrebačkih potoka igraju bitnu ulogu u određivanju njihova urbanističkoga potencijala (Šaler, 1988; Roglić, 2006). Kao bitno obilježje ističe se slaba izdašnost njihovih

1 U GUP-u Zagreba iz 2016. ovaj se potok naziva Medpotoki, dok se dolina kojom prolazi naziva Medpotoki-Orešje (ZPUGZ, 2016), a u GUP-u iz 1971. spomenuti potok ima dva imena: Perjavica i Medpotoki (USGZ, 1971). U razgovoru sa stanovnicima okolnih ulica mogu se čuti nazivi Medpotoki, Orešje i Borčec. U ovome smo radu iz etimoloških razloga odlučili izbjegavati naziv Medpotoki za spomenuti potok: toponim *Medpotoki* sam po sebi implicira prostor između dvaju potoka te se stoga teško može raditi o izvornom imenu potoka.

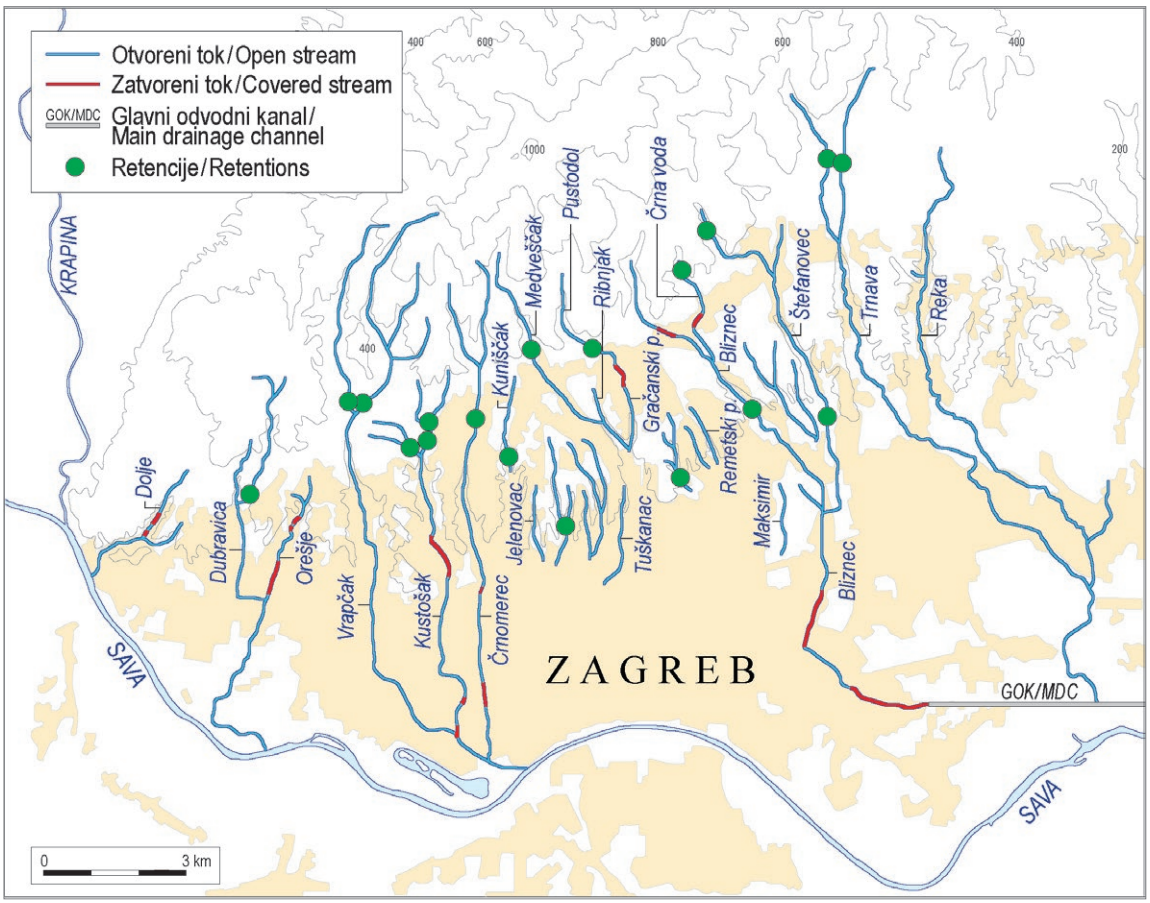

Fig. 1 Medvednica streams and retention basins in Zagreb (2022)
Sl. 1. Medvednički potoci i retencije u Zagrebu (2022.)

Source: Field work in 2021 and 2022
Izvor: Terenski rad 2021. i 2022.

not water-rich, which is why some streams run dry in the lower segments of their watercourses during summer. Dry stream beds along lowland watercourse segments certainly decreases their aesthetic value; this was not overlooked by spatial planners in drawing up the current Spatial Plan of the City of Zagreb (ISPCZ, 2014), which mentions the need to enclose 'dried streams (puddles)' in low-lying segments.

Another characteristic of Medvednica streams is their torrential nature. Abundant precipitation can cause streams to overflow their banks, raising flow and water levels to extremes. The absolute flow maximums can be more than 30 times greater than monthly median values (SMHS, 2022).

izvora, zbog čega neki od njih u ljetnim mjesecima presušuju u donjem toku. Suha korita potoka u nizinskom dijelu toka svakako uzrokuju gubitak njihove estetske vrijednosti, što nisu previdjeli ni prostorni planeri prilikom izrade važećega Prostornog plana Grada Zagreba, u kojemu se spominje potreba zatvaranja „isušenih (zabarenih) potoka" u njihovu donjem toku (ZPUGZ, 2014).

Drugo važno obilježje medvedničkih potoka jest njihova bujičnost. Obilne padaline mogu uzrokovati bujanje potoka, pri čemu njihov protok i vodostaj znaju porasti do ekstremnih razmjera – apsolutni maksimumi protoka tako mogu biti i preko 30 puta veći od mjesečnih srednjih vrijednosti (DHMZ, 2022).

THE ROLE AND SIGNIFICANCE OF MEDVEDNICA STREAMS IN THE SPATIAL PLANNING OF ZAGREB

In order to understand the present state of Medvednica streams and their role in the spatial planning of Zagreb, it is necessary to examine changes in the relationship of the city authorities and the profession towards them over time. There are four characteristic periods in the spatial planning and valuation of these streams.

Period preceding the first spatial plans

Throughout most of Zagreb's history, authorities focused on the development and exploitation of the potential of Medveščak Creek, which was an economic focal point around which the original core of what would become Zagreb developed. The streams to the east and to the west were only occasionally at the centre of interest of authorities (Premerl, 2005).

In the Middle Ages, numerous mills, public baths, and bridges began to appear along Medveščak Creek (Kampuš and Karaman, 1994). The first known management works were performed precisely to facilitate the use of these mills: the digging of an artificial mill canal (known as Pretoka, Prekopa or Melinski Creek) in the mid-13th century.

Conflicts between the two historical medieval towns that would become Zagreb—Gradec and Kaptol—often revolved around ownership over the mills and bridges on Medveščak Creek, which made arrangements to ensure its management and regulation more difficult. However, rather frequent flooding, sometimes with numerous human casualties, spoke to the need for some sort of flow regulation (Premerl, 2005[2]). Stream flooding also hindered the development of Lower Zagreb quarters. It is for these reasons that, in 1793, the Bishop of Zagreb, Maksimilijan Vrhovac, ordered the drafting of a regulatory plan for the segment of Medveščak Creek at the location of today's Splavnica, Ban Jelačić Square, and Jurišićeva Street. Despite flow regulation, the

2 The flood in 1651, for example, took 52 lives (Premerl, 2005). For comparison, 17 inhabitants of Zagreb lost their lives in the great Sava flood of 1964.

ULOGA I ZNAČENJE MEDVEDNIČKIH POTOKA U PROSTORNOM PLANIRANJU ZAGREBA

Za razumijevanje današnjega stanja medvedničkih potoka i njihove uloge u prostornom planiranju Zagreba potrebno je proučiti kako se odnos gradskih vlasti i struke prema njima mijenjao tijekom vremena. Izdvojena su četiri karakteristična razdoblja prostorno-planerskoga vrednovanja potoka.

Razdoblje prije donošenja prvih prostornih planova

Kroz najveći je dio gradske prošlosti fokus vlasti bio na uređenju i iskorištavanju potencijala potoka Medveščaka koji je činio ekonomsku okosnicu grada oko kojega se i razvila gradska jezgra. Potoci istočno i zapadno od nje tek su povremeno bili predmetom interesa gradske uprave (Premerl, 2005).

Na potoku Medveščaku od srednjega vijeka nalazili su se brojni mlinovi, javna kupališta i mostovi (Kampuš i Karaman, 1994). Upravo je za potrebe mlinova bio izveden i prvi poznati pothvat uređenja potoka: prokopavanje umjetnoga mlinskog kanala (poznatog kao Pretoka, Prekopa ili Melinski potok) polovicom 13. stoljeća.

Sukobi između povijesnih jezgara grada – Gradeca i Kaptola – često su se vrtjeli oko vlasništva nad mlinovima i mostovima na Medveščaku, što je uzrokovalo otežavanje dogovora oko uređenja i regulacije potoka. No, da je neka vrsta regulacije svakako bila potrebna, potvrđuju nam vrlo česte poplave, koje su znale rezultirati i brojnim ljudskim žrtvama (Premerl, 2005).[2] Potočne su poplave također otežavale razvoj podgrađa. Stoga je zagrebački biskup Maksimilijan Vrhovac 1793. naručio izradu regulacijskoga plana dijela potoka Medveščaka, konkretno na prostoru današnje Splavnice, Trga bana Jelačića i Jurišićeve ulice. Regulacija je zaista i provedena, no potok je nastavio poplavljivati, i to posebice u gornjem

2 Primjerice, poplava 1651. odnijela je čak 52 života (Premerl, 2005). Usporedbe radi, u velikoj poplavi Save 1964. poginulo je 17 Zagrepčana.

creek continued to flood, especially in its upper and middle unregulated segments (Premerl, 2005).

The development of manufacturing businesses in Zagreb in the 18th and early 19th centuries changed the face of Medveščak Creek (Kampuš and Karaman, 1994). They opened mostly along the watercourse with direct access to water, but they also polluted it, which is why the stream became a growing hygiene and health problem. The pollution of Medveščak Creek added yet another dimension to the danger it represented and practically sealed its fate after the adoption of Zagreb's first regulatory plans in the middle of the 19th century (Premerl, 2005).

Streams included in regulatory plans from the 1860s to the 1940s

The unification of Gradec and Kaptol under a single administration in 1850 facilitated the adoption of spatial plans, including more comprehensive regulation of Medvednica streams. The first spatial plans of Zagreb from the mid-19th century include data on streams in the city's periphery. As the city continued to grow, the focus of urbanists also expanded; their relationship towards the potential of Medvednica streams also changed. We would like to point out that important spatial plans regulating the development of the Lower Town, which would become the centre of contemporary Zagreb, were adopted in this period (Khale, 2004; Knežević, 2019).

The first true spatial planning document for the area of Zagreb was the General Regulatory Plan of 1865, which was actually a graphic supplement to the Building Order published in 1857. This Regulatory Plan is significant because it defined the future grid-like structure of the emerging Lower Town (Franković, 1981; Slukan-Altić, 2006; Šmit et al., 2019). The plan broached the burning issue at the very centre of the fast-growing city, Medveščak Creek, and sought its diversion, i.e. reconstruction (Knežević, 2019; 2020). There were no major interventions planned for the other streams within its scope.

Drastic changes were introduced in the Regulatory Plan of 1887, which finally defined a plan for the management of Medveščak Creek (Knežević, 2019) (Fig. 2). It was to be removed as an obstacle to the

i srednjem, neuređenom dijelu toka (Premerl, 2005).

Razvoj manufaktura u Zagrebu u 18. i ranom 19. stoljeću promijenio je lice potoka Medveščaka (Kampuš i Karaman, 1994). Uglavnom su osnivane uz tok kako bi imale izravan pristup vodi, no istovremeno su ga i zagađivale zbog čega je potok počeo biti sve veći higijenski i zdravstveni problem za grad. Zagađenje Medveščaka dodalo mu je još jednu dimenziju opasnosti i praktički zapečatilo sudbinu nakon donošenja prvih regulatornih osnova Zagreba sredinom 19. stoljeća (Premerl, 2005).

Potoci u regulatornim osnovama od 1860-ih do 1940-ih

Ujedinjenje Gradeca i Kaptola pod jedinstvenu gradsku upravu 1850. omogućilo je lakše donošenje prostornih planova, a time i sveobuhvatniju regulaciju medvedničkih potoka. Prvi prostorni planovi Zagreba iz sredine 19. stoljeća uključuju podatke o potocima na bližoj gradskoj periferiji. S rastom grada širio se i fokus urbanista, a mijenjao se i njihov odnos prema potencijalu medvedničkih potoka. Ističemo da su ovom razdoblju doneseni važni prostorni planovi regulacije razvoja Donjeg grada, koji će postati jezgra budućega modernog Zagreba (Khale, 2004; Knežević, 2019).

Prvi pravi prostorno-planski dokument za područje Zagreba bila je Generalna regulatorna osnova iz 1865., koja je zapravo grafička dopuna Reda građenja objavljenog 1857. Ta je regulatorna osnova bila bitna zbog određivanja buduće blokovske strukture nastajućega Donjeg grada (Franković, 1981; Slukan-Altić, 2006; Šmit i dr., 2019). Plan dotiče goruću problem u središtu brzorastućega grada – potok Medveščak te se traži njegovo premještanje odnosno rekonstrukcija (Knežević, 2019; 2020). Nekoliko drugih potoka koji su se nalazili unutar njezina obuhvata nisu se trebali značajnije uređivati.

Drastične promjene dogodile su se s Regulatornom osnovom iz 1887., kojom je konačno određen plan uređenja Medveščaka (Knežević, 2019) (sl. 2). Valjalo ga je odstraniti iz tadašnjega grada zatvara-

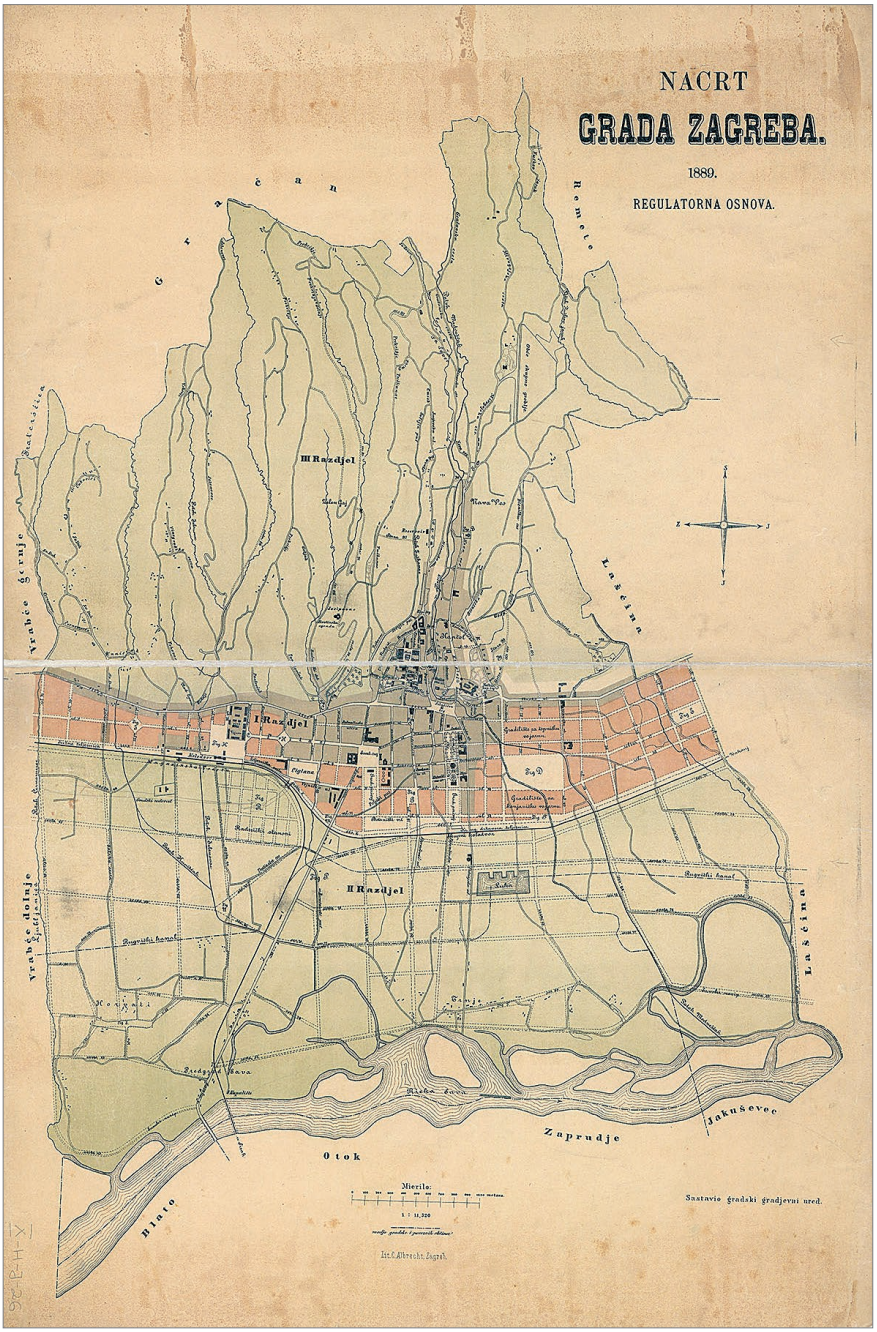

Fig. 2 Map of the city of Zagreb in 1889: Regulatory Plan (compiled by the City Construction Office)

Sl. 2. Nacrt grada Zagreba 1889.: regulatorna osnova (sastavio Gradski građevni ured).

Source: Collection of maps and atlases of the National and University Library (Maps and plans of the 19th century)

Izvor: Zbirka zemljovida i atlasa Nacionalne i sveučilišne knjižnice (Karte i planovi 19. stoljeća)

city's development by enclosing its bed below ground and relocating it eastwards after Gupčeva Zvijezda Square, i.e. underneath present day Medveščak Street. The now encased Medveščak Creek was supposed to flow along Ribnjak and Draškovićeva Street to the railway track, and from there flow to the Sava floodplains as a regulated but open stream. It is interesting to note that the Regulatory Plan of 1887 made

njem korita i premještanjem istočno nakon Gupčeve zvijezde, odnosno ispod današnje Ulice Medveščak. Novi je zatvoreni tok Medveščaka trebao ići uz Ribnjak i Draškovićevom ulicom do pruge, nakon čega je reguliranim, ali otvorenim tokom trebao otjecati u naplavnu dolinu Save. Zanimljivo da je Regulatornom osnovom iz 1887. bilo jasno određeno da nadsvođeni tok Medveščaka mora ostati

it clear that the enclosed watercourse of Medveščak Creek was supposed to remain separated from the planned sewer system in order to prevent the latter from being inundated with overflow during times of high flow, i.e. heavy precipitation (CCO, 1887).[3]

This Regulatory Plan also first mentioned management plans for other streams of Zagreb: Črnomerec, Kuniščak, Jelenovac, Kraljevac, and other smaller watercourses. Streams were primarily seen as a hygienic and flood threat that needed to be dealt with. In an administrative sense, Črnomerec Creek represented Zagreb's western city limit at the time (Kahle, 2004).

Until the Regulatory Plan of 1923 was adopted, there was no major progress in terms of management of Medvednica streams, save for the enclosure and diversion of Medveščak Creek, and the regulation of the lower parts of the Kuniščak and Jelenovac Creeks in open beds (except in the segment between the railroad tracks and Ilica Street where the watercourses were enclosed) (Radovanović, 2021); Kraljevec Creek was diverted into the sewer network in the vicinity of Britanski Square in 1909 (Deduš and Rogulja, 2001; Radovanović, 2020), and into segments of Laniščak Creek.

The 1923 Regulatory Plan did not venture into the periphery in any significant respect, including the then fast-growing workers' quarters like Trešnjevka and Trnje. This was a problem tackled in the spatial plan that followed in 1937 by the General Regulatory Plan of the City of Zagreb.

The 1937 plan envisaged urbanisation of the entire lowland area of Zagreb: from Ilica Street to the Sava River and from Črnomerec Creek in the west to Štefanovac (today, the tramway terminal in Dubrava) in the east. In terms of Medvednica streams, the plan was to enclose the watercourses in lowland Zagreb as part of the great metamorphosis of its urban morphology (Šmit et al., 2019). In the 1930s and early 1940s, segments along the lower courses of Kuniščak and Jelenovac Creeks in Trešnjevka, Laščinčak Creek south of Petrova Street, and Remetinec Creek south

3 Works on diverting Medveščak Creek began in 1896 and were completed two years later. However, the finished project differed in one significant respect from the settings defined in the Regulatory Plan: the covered watercourse was connected to the sewer system, which would later lead to a host of new problems (Deduš and Rogulja, 2001).

odvojen od planiranoga kanalizacijskog sustava da bi se spriječilo njegovo zagušenje bujičnim vodama s Medvednice (GGU, 1887).[3]

Istom su regulatornom osnovom prvi put spomenuti planovi uređenja drugih zagrebačkih potoka: Črnomerca, Kuniščaka, Jelenovca, Kraljevca i ostalih manjih tokova, a na potoke se prvenstveno gledalo kao na higijensku i poplavnu prijetnju koju valja ukloniti iz grada. U administrativnom smislu potok Črnomerec predstavljao je zapadnu gradsku među (Kahle, 2004).

Do trenutka donošenja Regulatorne osnove iz 1923. uređivanje medvedničkih potoka nije znatnije napredovalo, osim presvođenja i izmještanja Medveščaka, a uređeni su još bili samo donji tokovi Kuniščaka i Jelenovca u otvorenim koritima (osim na potezu između željezničke pruge i Ilice, gdje im je tok bio zatvoren) (Radovanović, 2021), potok Kraljevec koji se od 1909. ulijevao u kanalizacijsku mrežu u blizini Britanskog trga (Deduš i Rogulja, 2001; Radovanović, 2020) te dijelovi potoka Laniščaka.

Regulatornom osnovom iz 1923. nije bila ozbiljnije zahvaćena gradska periferija, uključujući tada brzorastuće radničke četvrti poput Trešnjevke i Trnja. Tomu se problemu pokušalo doskočiti već idućim prostornim planom – Generalnim regulacionim planom grada Zagreba iz 1937.

Planom je bilo predviđeno urbaniziranje čitavoga nizinskog dijela Zagreba, od Ilice do rijeke Save, te od potoka Črnomerca na zapadu do Štefanovca (današnjega okretišta tramvaja Dubrava) na istoku. Što se medvedničkih potoka tiče, bilo je planirano zatvaranje njihovih tokova u nizinskom dijelu grada, u sklopu velikoga preobražaja urbane morfologije Zagreba (Šmit i dr., 2019). Tijekom 1930-ih i ranih 1940-ih nadsvođeni su i s gradskom kanalizacijom spojeni dijelovi donjih tokova potoka Kuniščaka i Jelenovca na Trešnjevci, Laščinščaka južno od Petrove ulice te Remetinečkog potoka južno od Borongaja. Iako izvan tadašnjega administrativnog obuhvata

3 Prelaganje Medveščaka započelo je 1896. te dovršeno dvije godine kasnije. No, finalizirani je projekt imao jednu značajnu razliku u odnosu na postavke iz Regulatorne osnove: zatvoreni je tok Medveščaka na kraju ipak uključen u kanalizacijski sustav Zagreba, što će se kasnije pokazati kao nov izvor problema (Deduš i Rogulja, 2001).

of Borongaj were enclosed below ground and connected to the city sewer system. Although it was outside of the administrative scope of Zagreb at the time, Štefanovec Creek was also used as an open storm drain and accepted runoff from neighbouring streets. Štefanovec Creek was also used as a source of water for the local population if the wells dried (Strukić et al., 2012). Full implementation of this plan was thwarted by the outbreak of World War II. Its significance, however, lies in the fact that it was the basis for subsequent spatial plans in many respects.

In conclusion, the analysed plans (1865, 1887, 1923 and 1937) focused on removing all open watercourses from the town centre and the lowland periphery. This is evident from the practice of enclosing streams, starting with Medveščak Creek in 1898 and continued through the 1920s and 1930s. However, in the period between the two world wars, earlier plans to separate water from regulated streams and water in the sewer system were ignored, which led to problems later (e.g. Medveščak Creek).

Streams in the plans of the second half of the 20th century

The post-war period was marked by robust population and spatial growth of Zagreb, but it was also the time of some of the most ambitious spatial plans. The Regulatory Plan and Directive for the Regulation of the City of Zagreb from 1949 was an ambitious, modernistic plan for the development of Zagreb in the second half of the 20th century (Franković, 1985). It envisaged extensive green spaces not only within residential quarters but also as part of a protective green belt that would surround the city, with the compact, forested area of Medvednica at the centre. Medvednica's greenery and nature were meant to be embedded as deeply into the urban tissue of the city as possible. Stream valleys could serve (and perhaps were supposed to serve) this purpose, although they were not expressly mentioned in the text (Antolić, 1949). The final plan was proposed to the city authorities in 1953, but was never officially accepted. This was largely because the cost of maintenance of large green spaces envisaged in the plan was too high (Kolacio, 1963; Tandarić et al., 2019; Šmit et al., 2019).

Zagreba, spomenimo i da je potok Štefanovec u to vrijeme služio kao otvoreni odvodni kanal za padalinske vode, koje su se u njega trebale slijevati s okolnih ulica. Štefanovec je također služio i kao izvor vode za lokalno stanovništvo u slučaju presušivanja bunara (Strukić i dr., 2012). Potpunu realizaciju plana spriječilo je izbijanje Drugoga svjetskog rata. Značenje plana ogleda se u tome da je u mnogočemu činio osnovu za izradu kasnijih prostornih planova.

Zaključimo, analizirani planovi (1865., 1887., 1923. i 1937.) bili su orijentirani na uklanjanje otvorenih tokova potoka iz centra grada i nizinske periferije. To potvrđuje praksa presvođenja potoka, počevši s Medveščakom 1898., koja se nastavila 1920-ih i 1930-ih. Međutim, u međuratnom je razdoblju došlo i do ignoriranja ranijih postavki o odvajanju voda reguliranih potoka i kanalizacijskoga sustava iako ni ranije to nije bilo dosljedno praćeno, što se moglo vidjeti upravo na primjeru Medveščaka.

Potoci u planovima druge polovice 20. stoljeća

Poslijeratno razdoblje obilježeno je snažnim populacijskim i prostornim razvojem Zagreba, ali to je i vrijeme donošenja najambicioznijih prostornih planova. *Regulacioni plan i direktivna regulaciona osnova* Zagreba iz 1949. predstavljali su upravo takav ambiciozan, modernistički plan uređenja Zagreba za drugu polovicu 20. stoljeća (Franković, 1985). U njemu se spominju velike zelene površine ne samo u sklopu stambenih četvrti već i kao dijelovi zaštitnoga zelenog pojasa koji bi okruživao grad, a čija bi jezgra bila kompaktna šumska površina Medvednice. S Medvednice je, pak, bilo predviđeno „uvlačenje" zelenila i prirode što dublje u urbano tkivo grada. U tu su svrhu mogle (možda i morale) poslužiti potočne doline, no njih se izrijekom ne spominje u tekstu (Antolić, 1949). Sam je plan u konačnoj formi krajem 1953. bio predložen na prihvat gradskim vlastima, no nikad nije bio službeno prihvaćen, dobrim dijelom i zbog previsoke cijene održavanja velikih zelenih površina koje je predviđao (Kolacio, 1963; Tandarić i dr., 2019; Šmit i dr., 2019).

As this plan was being developed, the streams of Zagreb continued to be regulated and exploited in a number of ways. The last segment of Kuniščak Creek's lowland watercourse to its confluence where it joins the Sava River was enclosed by the 1950s and its former route from Trešnjevački Square to Vrbik transformed into a promenade, today called Gagarin's Way (Radovanović, 2021).

The next significant spatial planning document for the area of the City of Zagreb was presented in 1963 and adopted in 1965 (Šmit et al., 2019). It also focused on comprehensive urban planning and green space preservation, although to a somewhat lesser extent than before. The Urban Programme of the City of Zagreb, adopted in 1965, also mentions streams, mostly in terms of sewer system planning (Bencetić and Jurić, 2021). The emphasis was on preventing the threat that torrential waters from Medvednica presented to the sewer system. Streams that were not connected to the sewer system were supposed to be streamlined into canals and diverted to the Sava without any contact with the rest of the sewer system (UICZ, 1965).

The creeks Bliznec, Štefanovec, Trnava and Reka were to be connected to a storm canal that would flow north of Dubrava and, after receiving the waters of other creeks from Sesvete, join the Main Drainage Canal. As an additional security measure, Bliznec Creek was supposed to flow in a separate canalised streambed apart from the Main Drainage Canal. In the western part of the city, Črnomerec Creek was to be diverted to Kustošak Creek north of Ilica Street and from there its course would largely follow the course of Kustošak Creek, but enclosed below ground. The creeks Dubravica, Orešje and Vrapčak were to be connected by a canal south of the railroad tracks and flow into Kustošak Creek, now also managed through a canal. This shared watercourse would surface at Jarun and proceed to its confluence with the Sava River in an open streambed (UICZ, 1965).

The 1963/1965 Urbanistic Programme of the City of Zagreb played only a fleeting role in the development of spatial plans in the Zagreb area. The spatial plan that followed, i.e. the General Urbanistic Plan of the City of Zagreb of 1971, was much more detailed and significant (Uhlik, 1970).

Istovremeno s razradom neprihvaćenoga plana zagrebačke se potoke nastavilo uređivati i iskorištavati na razne načine. Do 1950-ih zatvoren je i posljednji dio nizinskoga toka Kuniščaka, sve do ušća u Savu, te je njegova nekadašnja trasa na potezu od Trešnjevačkog trga do Vrbika pretvorena u šetalište, danas Gagarinov put (Radovanović, 2021).

Idući je važan prostorno-planerski dokument za područje grada Zagreba predstavljen 1963., a usvojen 1965. (Šmit i dr., 2019). U njemu je nastavljena orijentacija na sveobuhvatno urbano planiranje i očuvanje zelenih površina, premda u nešto manjoj mjeri nego ranije. Urbanistički program grada Zagreba iz 1965. spominje i potoke, uglavnom u sklopu planiranja kanalizacijskoga sustava (Bencetić i Jurić, 2021). Naglasak je stavljen na sprečavanje ugroze koju za kanalizacijski sustav čine bujični tokovi s Medvednice. Potoke koji do toga trenutka nisu postali dijelom zagrebačkoga kanalizacijskog sustava trebalo je odvojeno kanalizirati te njihove vode provesti do Save bez kontakta s ostatkom kanalizacije (UZGZ, 1965).

Bliznec, Štefanovec, Trnavu i Reku planiralo se spojiti obrambenim kanalom koji bi tekao sjeverno od Dubrave te se nakon spoja s nekim sesvetskim potocima trebao uliti u Glavni odvodni kanal. Kao dodatnu mjeru sigurnosti Bliznecu je trebalo očuvati i zasebno kanalizirano korito do Glavnog odvodnog kanala. Na zapadnom dijelu grada, potok Črnomerec se planiralo preusmjeriti u Kustošak sjeverno od Ilice, nakon čega bi njegov tok pretežno pratio dotadašnji (i sadašnji) tok Kustošaka, premda sa zatvorenim koritom. Potoci Dubravica, Orešje i Vrapčak trebali su biti spojeni kanalom južno od željezničke pruge te se uliti u uređeni, odnosno kanalizirani Kustošak. Taj bi zajednički tok izbio na površinu na Jarunu pa otvorenim koritom tekao do Save (UZGZ, 1965).

Urbanistički program grada Zagreba iz 1963./65. zapravo je odigrao tek privremenu ulogu u razvoju prostornih planova zagrebačkoga područja. Idući je prostorni plan – Generalni urbanistički plan grada Zagreba iz 1971. – bio mnogo detaljniji i značajniji (Uhlik, 1970).

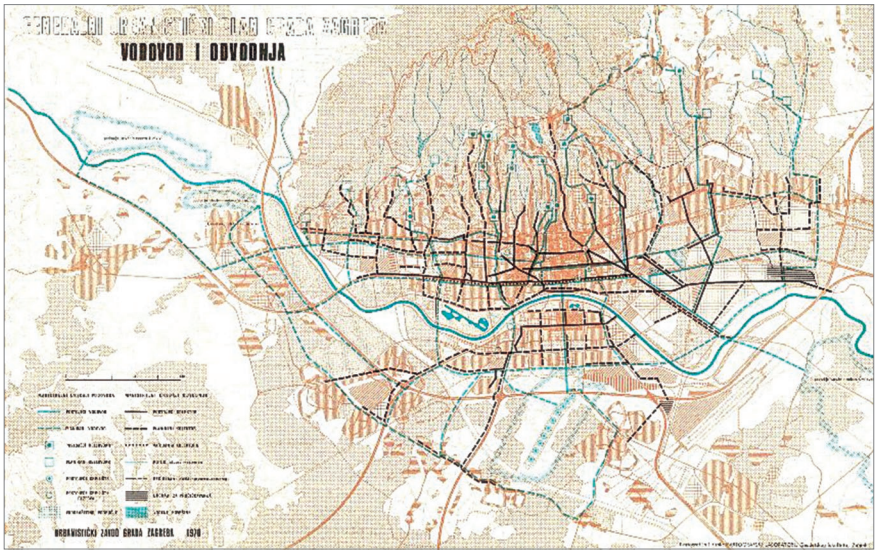

Fig. 3 Planned water supply and drainage system according to the 1971 GUP.

Sl. 3. Planirani sustav vodovoda i odvodnje prema GUP-u 1971.

Source: UICZ, (1971)

Izvor: UZGZ, (1971).

The latter GUP planned the fate of the Medvednica streams in much greater detail than was the case in the earlier spatial plans, although they were still addressed as part of a wider discussion on the development of the sewer system (Fig. 3). The torrential nature of Medvednica streams was considered the main threat. The plan proposed the construction of retention areas in the foothill belt to counter the impacts of torrential storm water, but also pointed out that hydrotechnical works must not have any detrimental impact on the biological characteristics of the Medvednica region. As in previous spatial plans, the 1971 GUP emphasised the problem of torrential water flowing into the sewer system in the city centre. This is why the plan reiterated the previous prohibition of connecting new streams to the sewer system and intended to counteract the negative impact of the existing streams via the construction of retention areas (UICZ, 1971).

The GUP envisaged stream management in three groups: eastern, central, and western. Streams belonging to the eastern group (Bliznec, Štefanovec, Trnava, Reka) were to be connected by a peripheral canal that would start south of the retention area in Jazbina and extend north from the urbanised parts of Dubrava, turning southwards between Dubrava and Sesvete and passing through the planned green belt all the way to the Main Drainage Canal. This project was to eliminate all surface streams in the eastern part of the city, thus resolving, according to the GUP,

U ovom je GUP-u sudbina medvedničkih potoka isplanirana detaljnije nego u ranijim prostornim planovima iako i dalje uglavnom u sklopu šire rasprave o razvoju kanalizacijskoga sustava (sl. 3). Kao osnovna opasnost koju predstavljaju medvednički potoci navodi se njihov bujični karakter. Protiv štetnoga utjecaja bujičnih tokova predlaže se izgradnja akumulacija u prigorskom pojasu, ali se ističe da hidrotehnički zahvati ne smiju imati štetan utjecaj na biološke značajke gorskoga područja Medvednice. Kao i u ranijim prostornim planovima, i u GUP-u iz 1971. naglašava se problem priljeva bujičnih voda potoka u kanalizacijski sustav u središnjem dijelu grada. Zato se ponavlja ranija zabrana priključivanja novih potoka kanalizacijskom sustavu, dok se negativan utjecaj postojećih potoka planira negirati izgradnjom akumulacija (UZGZ, 1971).

GUP je predviđao uređenje potoka u tri skupine: istočnoj, središnjoj i zapadnoj. Potoci istočne skupine (Bliznec, Štefanovec, Trnava, Reka) trebali su biti spojeni obodnim kanalom, koji bi započinjao južno od akumulacije u Jazbini i protezao se sjeverno od urbaniziranoga dijela Dubrave te između Dubrave i Sesveta skrenuo prema jugu i prolazio kroz predviđeni zeleni pojas sve do Glavnoga odvodnog kanala. Ovim su se projektom planirali ukloniti svi potoci s površine istočnoga dijela grada, čime bi se, prema GUP-u,

some of the difficulties in the construction of eastern and southeastern city quarters (UICZ, 1971).

The western group of streams (Dolje, Dubravica, Orešje/Borčec, Vrapčak, Kustošak, Črnomerec) was originally supposed to be regulated in a similar fashion, but the plan was abandoned because the area was too developed. Instead, Kustošak was supposed to be diverted to Črnomerec Creek before entering the Voltino quarter, while the course of the Črnomerec would continue along its former (and present) route to the Sava, although its bed would be enclosed so that the corridor could be used to build a new road (GPZSDI, 2022). The Dubravica and Orešje Creeks were to be enclosed and partly diverted to flow together to the Sava, while Dolje Creek was to be enclosed below ground in the centre of Podsused. Vrapčak Creek was an important exception in this GUP as it was to remain in an open, although somewhat diverted, bed throughout its course. The authors of this GUP explained their treatment of Vrapčak as being due to its constant water flow, which is much higher in volume than that of other streams (UICZ, 1971).

The central group of streams consisted of Kuniščak, Jelenovac, Kraljevec, Medveščak, Tuškanac, and Remetinec. Medveščak Creek was said to be the biggest problem because it was suffocating the drainage system. In order to resolve the problem, the construction of a retention area was planned above the Mihaljevac area, in the valley of Ribnjak Creek, that would receive the waters of the Medveščak (Kraljevčak) and Gračanski creeks. A botanical garden and a sports and recreation centre with a golf course were planned around the retention area (UICZ, 1971). Other, smaller streams in this group were still to flow into the city sewer system in the lowland area.

Several years of research and discussions yielded a new Spatial Plan of the City of Zagreb and General Urbanistic Plan of the City of Zagreb in 1986. These plans were somewhat more modest compared to the GUP of 1971, in line with the economic stabilisation regime of the time. Both plans placed greater emphasis on conserving existing natural heritage and inherited developed areas, whenever identified as being of great practical or symbolic significance to the local population.

uklonio dio teškoća u izgradnji istočnih i jugoistočnih gradskih četvrti (UZGZ, 1971).

Zapadna skupina potoka (Dolje, Dubravica, Orešje/Borčec, Vrapčak, Kustošak, Črnomerec) izvorno je trebala biti uređena na sličan način, ali se od toga odustalo zbog prevelike izgrađenosti prostora. Umjesto toga Kustošak se trebalo preusmjeriti u potok Črnomerec prije Voltinog naselja, dok bi tok Črnomerca išao dotadašnjom (i današnjom) trasom prema Savi, ali bi mu korito bilo zatvoreno te bi njegov koridor bio iskorišten za izgradnju nove prometnice (GPZIPP, 2022). Potoke Dubravicu i Orešje trebalo je nadsvoditi i djelomično im premjestiti korita da bi nakon spajanja tekli prema Savi, dok je Dolje trebalo biti nadsvođeno u centru Podsuseda. Vrapčak je bio važna iznimka među zagrebačkim potocima u ovome GUP-u tako što je čitavom dužinom trebao ostati u otvorenom, premda donekle izmještenom koritu. Različit odnos prema Vrapčaku autori GUP-a objašnjavaju njegovim stalnim protokom vode, koji je značajno veći od protoka u drugim potocima (UZGZ, 1971).

Središnja skupina potoka sastojala se od Kuniščaka, Jelenovca, Kraljevca, Medveščaka, Tuškanca i Remetinca. Medveščak je naglašen kao najveći problem zbog zagušivanja odvodnoga sustava. Da bi se riješio taj problem, planirana je izgradnja akumulacije iznad Mihaljevca, u dolini potoka Ribnjaka, u koju bi se ulijevali i tokovi Medveščaka (Kraljevčaka) i Gračanskog potoka. Oko te predviđene akumulacije trebao je biti uređen botanički vrt, ali i sportsko-rekreacijski centar s golf-terenom (UZGZ, 1971). Ostali, manji potoci u ovoj skupini, i dalje su se trebali slijevati u gradsku kanalizaciju u nizinskom prostoru.

Nakon višegodišnjih istraživanja i rasprava 1986. doneseni su novi Prostorni plan grada Zagreba i Generalni urbanistički plan grada Zagreba. U odnosu na GUP iz 1971. ti su planovi bili nešto skromniji, u skladu s tadašnjim režimom ekonomske stabilizacije. Oba su plana stavljala veći naglasak na očuvanje postojeće prirodne baštine, ali i naslijeđenih izgrađenih površina ako se odredi da su od velikoga praktičnog ili simboličkog značenja za lokalno stanovništvo.

Torrents and water pollution were identified as the main issues relating to Medvednica streams. The construction of retention basins and stream bed regulation were once again envisaged as a solution to the issue of torrential waters, but it was emphasised for the first time that such interventions "jeopardise the character of stream beds as an interesting landscape element in urban settings" (UICZ, 1986, 69). The spatial plan envisaged further enclosure of streambeds in the lower (lowland) segments of the streams of Zagreb, with four exceptions: Podsused's Dolje (also left open in previous plans), Vrapčak, Črnomerec, and Bliznec creeks, with respect to which the plan retained the possibility of open bed management through the urban zone due to their special landscape value. Streambed enclosures were to be avoided in the upper and middle watercourses of all streams (UICZ, 1986). Despite such provisions in the Spatial Plan, the 1986 cartographic presentation of the GUP showed that the Črnomerec corridor was envisaged as a planned route for a new north-south road (GPZSDI, 2022). This discrepancy in the provisions of higher and lower-level plans would be repeated in subsequent spatial plans.

The plan emphasised the problem of connecting the streams in the central part of the city to the sewer system, and expressly prohibits that the remaining streams be connected to the city sewer system. It set as priority the separation of stream waters from the sewer system in the central part of the city, which should be achieved by constructing retention basins and special canals for stream water. One of the intents of the plan was to prevent the release of effluent into open stream watercourses, which would result in negative sanitary conditions (UICZ, 1986).

The Spatial Plan and the General Urbanistic Plan of the City of Zagreb were the last spatial planning documents for the Zagreb area adopted during the Yugoslav era. The economic crisis, collapse of Yugoslavia and independence of Croatia, and the war led to non-compliance with many provisions included in the plans, while changes in socioeconomic policy resulted in changes of the urbanistic paradigm. Nonetheless, the 1986 Spatial Plan remained in effect until 2001, albeit with many amendments, while a new GUP was not adopted until 2003 (OJCZ, 2003).

Bujice i onečišćenje vode identificirani su kao osnovni problemi medvedničkih potoka. Za rješavanje problema bujičnih tokova ponovno je predviđena izgradnja retencija i regulacija potočnih korita, no prvi je put naglašeno da takve intervencije „ugrožavaju karakter potočnih korita kao zanimljivog elementa pejsaža u gradskim prostorima" (UZGZ, 1986, 69). Prostornim je planom u donjim (nizinskim) tokovima zagrebačkih potoka bio predviđen nastavak dotadašnje prakse zatvaranja korita uz četiri iznimke: podsusedsko Dolje (kojemu je i u ranijim planovima ostavljeno otvoreno korito) te Vrapčak, Črnomerec i Bliznec, za koje se ostavila mogućnost vođenja otvorenim koritom kroz gradsko područje zbog njihovih posebnih pejzažnih vrijednosti. U gornjem i srednjem toku svih potoka trebalo je izbjegavati zatvaranje korita (UZGZ, 1986). Usprkos tim postavkama Prostornog plana u kartografskom je prikazu GUP-a iz 1986. koridor Črnomerca bio predviđen za izgradnju nove prometnice u smjeru sjever-jug (GPZIPP, 2022). Ovakva diskrepancija između odredaba planova više i niže razine nastavit će se i u kasnijim prostornim planovima.

Plan još jednom naglašava problem uključivanja potoka u središnjem dijelu grada u kanalizacijski sustav te izričito zabranjuje spajanje preostalih potoka s gradskom kanalizacijom. Kao prioritet se postavlja odvajanje potočnih voda od kanalizacijskoga sustava u središnjem dijelu grada, što bi se trebalo postići podizanjem retencija i izgradnjom zasebnih kanala za potočnu vodu. Upozorava se i na pojavu otpuštanja otpadnih voda u otvorene tokove potoka, što za posljedicu ima stvaranje vrlo negativne sanitarne situacije (UZGZ, 1986).

Prostorni plan i Generalni urbanistički plan grada Zagreba posljednji su prostorno-planerski dokumenti zagrebačkoga područja doneseni za postojanja Jugoslavije. Ekonomska kriza, raspad bivše države i rat imali su za posljedicu nepoštivanje dobroga dijela odredaba ovih planova, a promjena socioekonomskoga uređenja rezultirala je i promjenom urbanističke paradigme. Usprkos tomu Prostorni plan iz 1986. ostao je na snazi do 2001., iako uz brojne izmjene i dopune, dok je novi GUP donesen tek 2003. (SGGZ, 2003).

Medvednica streams in contemporary spatial planning of Zagreb

The changes to the socioeconomic framework in the early 1990s did not engender immediate changes to spatial planning theory and practice. Spatial plans from the 1980s often remained in effect for years in other parts of Croatia too, which is not surprising because a new Spatial Planning Act was adopted only in 1994 (Prelogović et al., 2016; Tandarić et al., 2019).

Still, with the passage of time, spatial changes were becoming more and more apparent. Issues of illegal construction—the bane of urbanists even during socialism (Tandarić et al., 2019)—continued to make spatial planning difficult in newly-independent Croatia. Furthermore, the appearance of new actors in the spatial planning process, especially private investors, was a significant turning point. In market economies, including Croatia, "dotted urbanism" and "design planning" (Čaldarović, 2012; Čaldarović and Šarinić, 2017) were becoming increasingly present. In both cases, private, individual interests were allowed to take precedence over public and social interests as defined in spatial planning documents (Slavuj et al., 2009).

There was no direct attack on Medvednica streams by design planning, at least as far as the watercourses themselves were concerned, mostly because their regulation and maintenance were managed by the public enterprise Croatian Waters. Streams, just like all other bodies of water in the Republic of Croatia, are a common good and may not be privately owned, which is why private initiatives to regulate and utilise streams are essentially impossible. However, streams and their corridors are still threatened, albeit indirectly, by unplanned construction, traffic infrastructure, destruction of green spaces, pollution, etc. (Gašparović et al., 2022) (Fig. 4).

The Spatial Plan of the City of Zagreb currently in effect was adopted in 2001 (OJCZ, 2001), while the latest amendments were passed in 2017. On the basis of this spatial plan, the City Assembly of the City of Zagreb adopted the new General Urbanistic Plan for the Zagreb City Core in 2003 (OJCZ, 2003). This plan was replaced by a new one

Medvednički potoci u suvremenom prostornom planiranju Zagreba

Promjena socioekonomskoga okvira početkom 1990-ih nije odmah rezultirala promjenama u prostorno-planerskoj teoriji i praksi. Prostorni planovi iz 1980-ih su i u ostatku Hrvatske često ostajali na snazi još godinama, što ne treba čuditi s obzirom na to da je novi Zakon o prostornom uređenju donesen tek 1994. (Prelogović i dr., 2016; Tandarić i dr., 2019).

Ipak, s vremenom su promjene u prostoru postajale sve očitije. Problem „divlje gradnje", s kojim se urbanisti nisu mogli nositi ni za vrijeme socijalizma (Tandarić i dr., 2019), nastavio je otežavati prostorno planiranje i u samostalnoj Hrvatskoj. Nadalje, pojava novih aktera u procesu prostornog planiranja, napose privatnih investitora, predstavlja značajan zaokret i promjenu. U tržišnim je ekonomijama, pa tako i u Hrvatskoj, sve prisutnija pojava tzv. „točkastog urbanizma" i „projektnog planiranja" (Čaldarović, 2012; Čaldarović i Šarinić, 2017). U oba slučaja privatni, pojedinačni interesi imaju primat nad javnim, društvenim interesom iskazanim u prostornim planovima (Slavuj i dr. 2009).

Medvednički potoci nisu bili pod izravnim udarom projektnoga planiranja, barem što se samih vodotoka tiče, uglavnom zbog toga što su za njihovo uređenje i održavanje odgovorne Hrvatske vode. Potoci su, kao i sva druga vodna dobra u Republici Hrvatskoj, opće dobro i ne mogu biti u privatnom vlasništvu zbog čega su privatne inicijative oko uređenja i korištenja potoka otežane ili u potpunosti onemogućene. No potoci i njihovi koridori ipak su ugroženi posredno urbanizacijom: neplanskom individualnom gradnjom, prometnom infrastrukturom, uništavanjem zelenih površina, onečišćenjem itd. (Gašparović i dr., 2022) (sl. 4).

Trenutno je važeći Prostorni plan Grada Zagreba donesen 2001. (SGGZ, 2001), a posljednje su mu izmjene i dopune usvojene 2017. Na temelju toga prostornog plana Gradska skupština Grada Zagreba 2003. donijela je i novi Generalni urbanistički plan za uže područje Zagreba (SGGZ, 2003). Taj je plan 2007. bio zamijenjen novim (SGGZ,

Fig. 4 Vrapčak Creek - canalized stream narrowed between the road and houses (Gornje Vrapče) (A); Gračanski Creek - extremely canalized stream along Gračanska Road (road) (B)

Sl. 4. Vrapčak – kanalizirani tok potoka Vrapčaka stiješnjenog između ceste i kuća (Gornje Vrapče) (A); Gračanski potok – iznimno kanaliziran tok Gračanskog potoka uz Gračansku cestu (B)

Photo: Marko Faber

Snimio: Marko Faber

in 2007 (OJCZ, 2007), still in effect today, while the most recent amendments were also adopted in 2017.[4]

The Spatial Plan of the City of Zagreb and the GUP of the City of Zagreb from 2001, i.e. 2007,

2007), koji je i danas na snazi, uz posljednje izmjene i dopune također usvojene tijekom 2017.[4]

Prostorni plan Grada Zagreba i GUP grada Zagreba iz 2001. odnosno 2007. ne odskaču

4 This paper uses the latest consolidated texts of the Spatial Plan of the City of Zagreb (ISPCZ, 2014) and the General Urbanistic Plan of the City of Zagreb (ISPCZ, 2016) as references. Subsequent amendments did not have substantial impact on the relevant parts of these plans.

4 U ovom će se radu kao reference koristiti posljednji pročišćeni tekstovi Prostornog plana Grada Zagreba (ZPUGZ, 2014) i Generalnog urbanističkog plana grada Zagreba (ZPUGZ, 2016). Kasnije izmjene i dopune nisu značajnije utjecale na relevantne dijelove tih planova.

are not significantly different from their 1986 predecessors in terms of their relationship towards Medvednica streams. The Spatial Plan envisages the protection of biological and landscape diversity in the inner city area, with special emphasis on its streams. The Lowland stream management plan was basically copied from the 1986 Spatial Plan: Dolje Creek retained its open bed, while the beds of other streams were to be enclosed below ground, with the potential exceptions of Vrapčak, Črnomerec, and Bliznec creeks (ISPCZ, 2014). The authors of the plan emphasised once again that the threat of torrential currents from Medvednica should be mitigated by the construction of retention basins.

In the Zagreb GUP currently in effect, streams also play a significant role. It says that streams should be directed through open beds whenever possible in order to enable landscaping development (Fig. 5). Stream retention basins are regarded as green spaces, and envisaged as recreational areas. This GUP granted protection to the valleys of nearly all Medvednica streams as particularly valuable landscapes, although exclusively in their middle courses. The practice of granting valuable landscape status in the GUP began in the 1980s and has grown since.

The current Zagreb GUP is somewhat less inclined to preserve open beds in the lowland course portion of Medvednica streams than is the case with the Spatial Plan of the City of Zagreb. Although the Spatial Plan envisages the possibility of regulating the flow of the Črnomerec and Kustošak creeks via an open bed, the GUP does not take advantage of this opportunity. The GUP mentions that the lower course of Kustošak Creek is to be diverted to the planned enclosed course of Črnomerec Creek (ISPCZ, 2016), while its cartographic presentation shows the Črnomerec corridor as the location of a new road (referred to in the text as the "planned street of Črnomerec") that would connect the Črnomerec neighbourhood to Jarun, and likely onward to Novi Zagreb (GPZSDI, 2022).

According to the current GUP, the dried bed of Kustošak is to be transformed into a green belt that would act as the boundary between the Voltino and Rudeš neighbourhoods, while south of Zagreb Avenue it would proceed to the location

mnogo od svojih prethodnika iz 1986. po pitanju odnosa prema medvedničkim potocima. Prostorni plan predviđa zaštitu biološke i krajobrazne raznolikosti u užem gradskom području, pri čemu su posebno naglašeni potoci. Plan uređenja potoka u nizinskom dijelu grada praktički je preuzet iz Prostornog plana iz 1986.: potok Dolje ostaje otvorenog korita, a ostalim se potocima korita zatvaraju – uz potencijalni izuzetak Vrapčaka, Črnomerca i Blizneca (ZPUGZ, 2014). Autori Plana ponovno naglašavaju prijetnju bujičnih tokova s Medvednice, koju treba otkloniti izgradnjom retencija.

U trenutno važećem GUP-u Zagreba potoci također igraju bitnu ulogu. Oni se prema GUP-u trebaju voditi otvorenim koritom gdje god je to moguće te se omogućuje njihovo pejzažno uređivanje (sl. 5). Površine potočnih retencija ovim se planom smatraju zelenim površinama i predviđa se njihovo korištenje u rekreativne svrhe. Doline gotovo svih medvedničkih potoka aktualnim su GUP-om dobile zaštitu kao posebno vrijedni krajobrazi, premda isključivo u svome srednjem toku. Utvrđivanje vrijednih krajobraza gradskim GUP-om praksa je započeta 1980-ih, a njihov je broj s vremenom samo povećavan.

Zagrebački GUP ipak je manje sklon očuvanju otvorenih korita u nizinskom dijelu toka medvedničkih potoka nego što je to slučaj s Prostornim planom Grada Zagreba. Premda je Prostornim planom ostavljena mogućnost vođenja potoka Črnomerca i Kustošaka otvorenim koritom, GUP tu mogućnost ne iskorištava: u tekstualnom je dijelu GUP-a spomenuto prelaganje donjega toka Kustošaka u planirani zatvoreni tok Črnomerca (ZPUGZ, 2016), dok je na njegovu kartografskom prikazu koridor Črnomerca iskorišten za izgradnju novoga cestovnog pravca (u tekstu nazvan „planirana ulica Črnomerec") koji bi spajao centar četvrti Črnomerec s Jarunom i dalje, vjerojatno s Novim Zagrebom (GPZIPP, 2022).

Isušeno korito Kustošaka prema važećem GUP-u ima se pretvoriti u zeleni pojas koji bi činio granicu Voltinog naselja i Rudeša, a južno od Zagrebačke avenije nastavljao bi se do mjesta današnjega ušća Kustošaka u Vrapčak (GP-

Fig. 5 Dubravica (Jankomir) - the landscape of Jankomir lakes (ponds) in the west of the city are fed by Dubravica Creek (A); retention in Jazbina at the Bliznec stream (B)

Sl. 5. Dubravica (Jankomir) – uređena Jankomirska jezera (ribnjake) na zapadu grada napaja potok Dubravica (A); Retencija u Jazbini na potoku Bliznec (B)

Photo: Marko Faber

Snimio: Marko Faber

of the contemporary confluence of the Kustošak and Vrapčak creeks (GPZSDI, 2022). It is interesting that this is also just an instance of "copying" from various, older spatial plans. The 1986 PPGZ retained the possibility of open stream management, while the GUP of the same year was more conservative and planned their enclosure, as is the case today.

ZIPP, 2022). Zanimljivo je da se i tu zapravo radi o „kopiranju" prostornih planova. PPGZ iz 1986. ostavljao je mogućnost otvorenoga vođenja potoka, dok je GUP iz iste godine bio konzervativniji i predviđao njihovo zatvaranje, kao i danas.

Samom Vrapčaku GUP-om je namijenjena kontradiktorna sudbina. Pogledamo li sloj Ko-

The GUP envisaged a contradictory fate for Vrapčak Creek. In the section entitled Uses and Purposes, according to Zagreb's GUP on the Zagreb Geoportal of spatial data on infrastructure, it is evident that its route from the railroad tracks to Zagreb Street is marked as an area that is intermittently under water, i.e. as an open streambed. Its further course to the confluence with the Sava River is marked as a green zone (GPZSDI, 2022). The Urbanistic Development Plan "Oranice—TEP Thematic Park" also mentions the maintenance of the Vrapčak open streambed and the construction of a path along the stream, which was not changed in subsequent amendments to the Urbanistic Development Plan (UPU) (ISPCZ, 2017). Still, the cartographic depictions of the water management system planned in the GUP (the water layer on the Geoportal) show a fully enclosed lowland course of Vrapčak Creek (GPZSDI, 2022). It is not completely clear which depiction is correct and what the plan is for the lowland course of Vrapčak Creek, but for the time being the situation shown in the UPU can be taken as referential in view of the need for alignment of urbanistic development plans with the General Urbanistic Plan (Fig. 6). The text of the GUP does not touch on this problem (ISPCZ, 2016). We draw attention to the microanalysis of this stream conducted by Gašparović et al. (2022). They concluded that intensive urbanization after the 1960s led to the devastation of public green areas, especially those along the stream itself, despite the intentions of planners from the 1970s to maintain a compact green belt along its bed. In the case of Vuger-Trnava, the situation is not so drastic, as the studied area started to become more urbanized only in the late 1980s and 1990s, but the authors note that the potential of developing green corridors was not used in this case (Gašparović et al., 2022).

According to the current GUP, Dolje Creek is to continue its flow in a mostly open bed, while the courses of Dubravica and Orešje/Borčec should be enclosed at the segment of the course along the railroad tracks and Karažnik Street. In the eastern part of the city, Trnava Creek should be connected to Čučerska Reka Creek north of Trnovčica by a canal, while the remaining lowland course of Bliznec Creek should be enclosed (GPZSDI, 2022).

rištenja i namjene prema Zagrebačkom GUP-u na Geoportalu Zagrebačke infrastrukture prostornih podataka, vidjet ćemo da je njegova trasa od željezničke pruge do Zagrebačke ceste označena kao područje povremeno pod vodom, odnosno kao otvoreni tok potoka. Dalji tok do ušća u Savu označen je kao zelena površina (GPZIPP, 2022). Održavanje otvorenoga toka Vrapčaka na području Oranica utvrđeno je i Urbanističkim planom uređenja „Oranice – TEP tematski park", u kojemu se spominje uređenje šetnice uz potok, što nije promijenjeno ni kasnijim izmjenama i dopunama UPU-a (ZPUGZ, 2017). Ipak, kartografski prikazi GUP-om planiranoga vodnogospodarskog sustava (sloj voda na Geoportalu) prikazuju potpuno zatvoren nizinski tok Vrapčaka (GPZIPP, 2022). Nije u potpunosti jasno koji je od tih prikaza ispravan i što se zapravo planira s nizinskim tokom Vrapčaka, no stanje prikazano UPU-om privremeno se može uzeti kao referentno zbog potrebe usklađenosti urbanističkih planova uređenja s Generalnim urbanističkim planom (sl. 6). Tekstualni dio GUP-a ne dotiče se ovoga problema (ZPUGZ, 2016). Ističemo mikroanalizu ovoga potoka koju su proveli Gašparović i dr. (2022). Zaključuju da je intenzivna urbanizacija nakon 1960-ih godina uzrokovala devastaciju javnih zelenih površina, posebice onih uz sam tok potoka, usprkos namjerama planera iz 1970-ih da zadrže kompaktan pojas zelenila uz njegovo korito. U slučaju Vuger-Trnave situacija još nije toliko drastična jer se analizirani prostor počeo jače urbanizirati tek krajem 1980-ih i 1990-ih, no autori napominju da ni u ovom slučaju potencijal razvoja zelenih koridora nije bio iskorišten (Gašparović i dr. 2022).

Potok Dolje bi prema važećem GUP-u trebao nastaviti teći pretežno otvorenim koritom, dok se tok Dubravice i Orešja/Borčeca planira zatvoriti u dijelu toka uz željezničku prugu i ulicu Karažnik. Na istoku grada potok Trnava trebao bi biti spojen kanalom s Čučerskom Rekom sjeverno od Trnovčice, a Bliznecu se planira zatvoriti i preostali nizinski dio toka (GPZIPP, 2022).

Važno je istaknuti i utjecaj mjesne samouprave na uređenje i planiranje medvedničkih po-

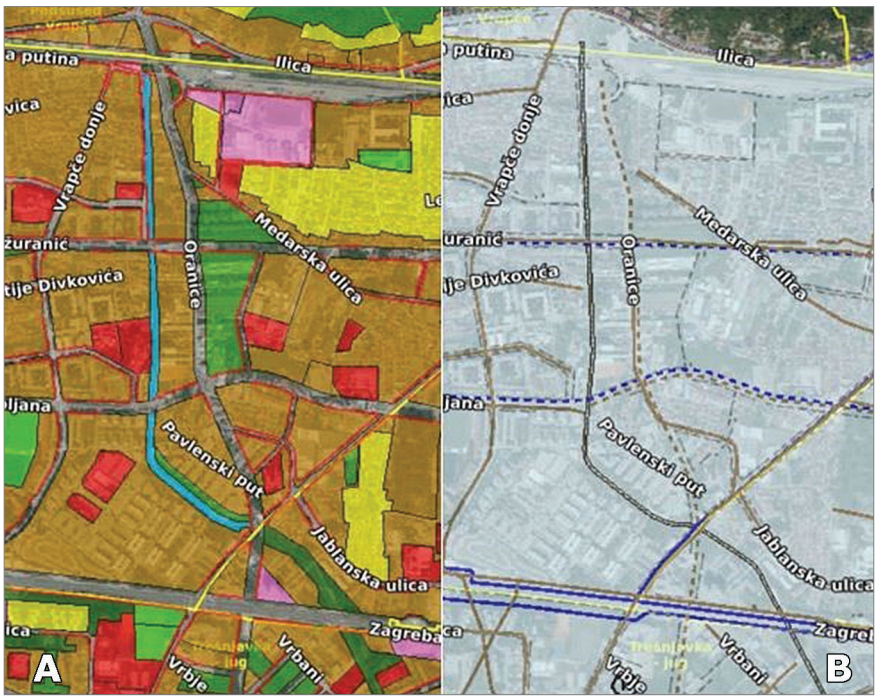

Fig. 6 A discrepancy in the current GUP in which, based on purpose, Vrapčak Creek is shown as V2 – surface intermittently under water (A), while in another layer it is shown with its bed enclosed below ground (B)

Sl. 6. Diskrepancija u važećem GUP-u u kojem je Vrapčak prema planiranoj namjeni prikazan kao V2 – površina povremeno pod vodom (A), dok je u drugom sloju prikazan sa zatvorenim koritom (B)

Source: GPZSDI, (2022)

Izvor: GPZIPP, (2022)

It is important to mention the impact of local self-government on the regulation and planning of Medvednica streams. Although they do not have the authority to regulate stream beds, city quarter councils of the City of Zagreb can principally influence their regulation in two ways: by lobbying the City Assembly of the City of Zagreb to ensure their regulation in a specific manner and via municipal activity plans (earlier called small municipal action plans), which are within their purview. While the first method is greatly dependent on political circumstances at the city level, municipal activity plans enable more direct influence of the local population on stream corridor regulation in their city quarters. Municipal activity plans are short-term, one-year plans by which city quarter councils fund municipal actions within their area of responsibility (road repair, green spaces, water supply and other infrastructure, and the procurement of equipment for local boards). With these municipal activity plans, city quarters can have a say in the regulation of the areas along the streams, thus potentially reviving the space and encouraging (or forcing) city authorities to ensure faster or alternative stream corridor development. City quarter councils rarely take advantage of the opportunity to regulate streams. Over the last several years, they have done so only a couple of

toka. Iako nemaju ovlasti uređivati sama korita potoka, vijeća gradskih četvrti Grada Zagreba kao organi mjesne samouprave mogu utjecati na njihovo uređenje na dva osnovna načina: lobiranjem za određeni način njihova uređenja pri Gradskoj skupštini Grada Zagreba te planovima komunalnih aktivnosti (ranije zvanima „planovi malih komunalnih akcija"), za čije su donošenje odgovorna upravo vijeća gradskih četvrti. Dok je prvi način izrazito ovisan o političkim prilikama na gradskoj razini, planovi komunalnih aktivnosti ostavljaju mogućnost neposrednijega utjecaja lokalnog stanovništva na uređenje koridora potoka u njihovim gradskim četvrtima. Planovi su komunalnih aktivnosti kratkoročni – jednogodišnji planovi kojima vijeća gradskih četvrti financiraju komunalne akcije na svom teritoriju (uređivanje cesta, zelenih površina, vodoopskrbne i druge infrastrukture te opremanja mjesnih odbora). Planovima komunalnih aktivnosti gradske četvrti mogu utjecati na uređenje prostora uz same potoke, čime se može postići revitalizacija toga prostora i potaknuti (ili prisiliti) gradske vlasti na brži ili drugačiji razvoj potočnih koridora. Vijeća gradskih četvrti rijetko koriste priliku za uređenje potoka. Proteklih je godina samo u nekoliko slučajeva to učinjeno u

times in small development projects on the Črnomerec and Bliznec creeks (OJCZ, 2020a, 2020b).

It is obvious that city quarter councils are not taking advantage of the full potential of their powers in terms of regulation of streams and their corridors. One could argue that their lack of initiative is simply a reflection of what the locals want to see in their neighbourhoods, i.e. the way they see the role and potential of urban streams, but as we see from the survey, this is not the case.

CITIZEN OPINIONS ON THE STATE AND REGULATION OF STREAMS—A SURVEY

As part of the study, an online survey was conducted to examine the views of people living in city quarters that are home to open watercourses on the current situation and opportunities available for using and regulating Medvednica streams.[5] The survey was open on two occasions: from January 6th to 13th, 2022, and from March 23rd to April 10th, 2022. It was circulated via Facebook groups and pages dedicated to the quarter's in question. An appropriate sample was used; although not ideal, it can be considered appropriate for two reasons. The first is the epidemiological situation, i.e. the COVID-19 pandemic, which was spiking in the winter of 2022, resulting in the authors' decision to avoid direct contact with interviewees. The second reason is the subordinate role that the survey holds in the paper itself. Its purpose is solely to strengthen certain claims and show possible discrepancies between the social perception of the streams of Zagreb and their role in planning practice.

A total of 667 responses were received. Of these, 166 respondents (24.9%) were male and 501 (75.1%) were female. Based on their age, the composition was as follows: < 18 years of age (nine interviewees or 1.3%), 19–29 (117 or 17%), 30–49 (372 or 55.8%), 50–64 (142 or 21.3%), and ≥ 65 (27 or 4.0%).

When asked how often they passed by the stream in their quarter, over half (50.1%) responded that they passed by the stream every day. The response "several times a week" was selected by 24.1% of inter-

5 The authors surveyed the population in the following quarters: Podsused-Vrapče, Stenjevec, Črnomerec, Podsljeme, Trešnjevka-North, Trešnjevka-South, Gornja Dubrava, and Donja Dubrava.

manjim zahvatima na potoku Črnomercu i Bliznecu (SGGZ, 2020a, 2020b).

Iz navedenoga je očito da vijeća gradskih četvrti ne koriste puni potencijal svojih ovlasti glede uređenja potoka i njihovih koridora. Taj manjak inicijative mogao bi se protumačiti kao odraz volje lokalnoga stanovništva, odnosno njihova viđenja uloge i potencijala urbanih potoka, no kao što ćemo vidjeti na primjeru provedene ankete, to zapravo nije slučaj.

STAVOVI GRAĐANA O STANJU I UREĐENJU POTOKA – ANKETNO ISTRAŽIVANJE

U sklopu istraživanja provedena je i *online* anketa kojom su se željeli ispitati stavovi stanovnika gradskih četvrti kroz koje protječu potoci otvorenim tokom o trenutnom stanju i mogućnostima korištenja i uređenja medvedničkih potoka.[5] Anketa je bila otvorena u dva navrata, 6. – 13. 1. 2022. te 23. 3. – 10. 4. 2022. Raširena je putem kvartovskih Facebook grupa i stranica pri čemu je korišten prigodni uzorak. Iako ovaj uzorak svakako nije idealan, smatramo ga opravdanim iz dvaju razloga. Prvi je razlog epidemiološka situacija, tj. pandemija bolesti COVID-19, koja je upravo u zimu 2022. doživljavala još jedan vrhunac te se odlučilo izbjegavati izravne kontakte s ispitanicima. Drugi je razlog sporedna uloga koju anketa ima u samome radu. Njezina je svrha tek pojačati određene tvrdnje i prikazati moguće diskrepancije između društvene percepcije zagrebačkih potoka i njihove uloge u planerskoj praksi.

Na anketna pitanja odgovorilo je 667 ispitanika, od toga 166 (24,9 %) muških i 501 (75,1 %) ženskih. Dobni sastav bio je sljedeći: < 18 godina (devet ispitanika, tj. 1,3 %), 19 – 29 (117, tj. 17 %), 30 – 49 (372, tj. 55,8 %), 50 – 64 (142, tj. 21,3 %), ≥ 65 (27, tj. 4 %).

Na pitanje koliko često prolaze kraj potoka u svojoj četvrti preko polovice ispitanika (50,1 %) odgovorilo je da svakodnevno prolazi kraj poto-

5 Anketirano je stanovništvo u sljedećim četvrtima: Podsused-Vrapče, Stenjevec, Črnomerec, Podsljeme, Trešnjevka – sjever, Trešnjevka – jug, Maksimir, Peščenica-Žitnjak, Gornja Dubrava i Donja Dubrava.

viewees; "once a week or less" by 22.2%; and "never" by 3.5%. At the city quarter level, there are certain observable differences in responses. Sixteen of the 68 interviewees (23.5%) from Gornja Dubrava responded to this question with "once a week or less" and "never". Seventeen of the 31 interviewees (54.8%) from Donja Dubrava pass by the stream once a week or less, i.e. almost never, and the reason is that the streams in this city quarter have practically vanished and they exist only in the form of streams enclosed in canals to the far east of the quarter. On the other hand, just 6.8% of interviewees from Podsused–Vrapče responded that they pass by the stream once a week or less, and not one selected the option "never". Somewhat surprisingly, one of these two options was selected by 23.8% of interviewees from Črnomerec and 22.9% of interviewees from Stenjevec. In terms of the Medvednica foothills area, which has numerous streams, 13.4% of interviewees from the Podsljeme quarter also rarely pass by the streams.

The next question related to the most frequented stream(s). It was possible to select several responses, i.e. mark more than one stream. Most interviewees responded Vrapčak (226 or 33.9%), followed by Črnomerec (197 or 29.5%), Kustošak (127 or 19%) and Bliznec (119 or 17.8%). The number of interviewees who were not certain of the name of the streams they visited was also significant: 104 interviewees (15.6%). The analysis showed that 46 (44.2%) interviewees who responded to the question about the name of the stream with "I don't know" pass by said stream on a daily basis or several times per week, which is certainly interesting.

The next question concerned the way a given stream, i.e. its urban corridor, is used. There were once again multiple responses to this question. The most popular was the option "walk", i.e. walking along the creek's banks, either to engage in daily activities or for recreational purposes (546 or 81.9%). Interviewees use the corridors for walking their pets and for other forms of recreation (mostly jogging/running). The corridors are not overly popular for cycling and there are several reasons: the steep hills north of the Ilica–Vlaška–Maksimirska line and excessively narrow or unkempt paths along streams, sometimes barely wide enough to accommodate pedestrians, don't leave much room for cyclists.

ka. Više puta tjedno prolazi njih 24,1 %, jednom tjedno ili rjeđe 22,2 %, a 3,5 % nikad. Spustimo li se na razinu gradskih četvrti, uočavaju se razlike u odgovorima. Šesnaest od 68 ispitanika (23,5 %) iz Gornje Dubrave na ovo je pitanje odgovorilo „jednom tjedno ili rjeđe" te „nikad". Među ispitanicima iz Donje Dubrave 17 od 31 ispitanika (54,8 %) prolazi kraj potoka tek jednom tjedno ili rjeđe, odnosno gotovo nikada, a uzrok tomu je što su potoci u toj gradskoj četvrti gotovo nestali te postoje još samo u obliku kanaliziranih potoka na krajnjem istoku četvrti. S druge strane, svega 6,8 % ispitanika iz četvrti Podsused-Vrapče odgovorilo je da prolazi kraj potoka jednom tjedno ili rjeđe, a nijedan nije izabrao opciju „nikad". Pomalo iznenađujuće, jednu od ovih dviju opcija izabralo je čak 23,8 % ispitanika iz Črnomereca i 22,9 % ispitanika iz Stenjevca. I u potocima bogatom Podsljemenu 13,4 % ispitanika rijetko prolazi uz njih.

Iduće se pitanje odnosilo na potok ili potoke uz koje ispitanici provode najviše vremena. Na pitanje je bilo moguće dati više odgovora, odnosno označiti više od jednoga potoka. Najviše je ispitanika odgovorilo Vrapčak 226 (33,9 %), zatim Črnomerec 197 (29,5 %), Kustošak 127 (19 %) i Bliznec 119 (17,8 %). Ističe se i broj ispitanika koji nisu sigurni kako se zovu potoci uz koje provode vrijeme: njih čak 104 (15,6 %). Analizom je utvrđeno da 46 (44,2 %) ispitanika koji su na pitanje o imenu potoka odgovorili „ne znam" uz navedene potoke prolazi svakodnevno ili više puta tjedno, što je svakako zanimljiv podatak.

Sljedeće se pitanje ticalo načina korištenja potoka, odnosno njihovih urbanih koridora. I na ovo je pitanje bilo moguće dati više odgovora, a daleko najpopularnijom pokazala se opcija „šetnja", tj. šetanje uz obale potoka, bilo za dnevne potrebe ili iz rekreacije (546, tj. 81,9 % ispitanih). Ispitanici koridore potoka koriste i za izvođenje kućnih ljubimaca i ostale oblike rekreacije (najčešće trčanje). Koridori potoka nisu pretjerano popularni za vožnju bicikla za što postoji više razloga: uzbrdice sjeverno od linije Ilica – Vlaška – Maksimirska te preuske ili neuređene staze uz potoke, ponekad jedva dovoljne za pješake.

Of the total number of interviewees, 58 (8.7%) do not use stream corridors for any activities. Of that number, 20 of them (34.5%) pass by the stream only once a week or less, i.e. (almost) never, but 38 (65.5%) responded that they pass by the stream every day. In the category "other", it should be mentioned that garden irrigation along the streams is a relatively frequent practice in the Podsljeme quarter and foothill segments of other quarters. Four interviewees expressly wrote that they use water from the stream to irrigate their garden plots, which was confirmed in a conversation with people living in houses along Medveščak Creek in the area of Mlinovi.

When asked what they regarded as the biggest problem concerning the stream in their quarter, most interviewees answered "pollution" (469 or 70.3%), "poor bed and bank maintenance" (330 or 49.5%), and "course concreting" (232 or 34.8%). "Lack of amenities along the banks" (217 or 32.5%) and "lack of greenery along banks" (182 or 27.3%) also received a significant number of responses. The response "flood threat" was selected by only 19 (2.8%) interviewees, which is a testament to the well-designed solution to said problem via the construction of retention basins over the past 40 years. Several interviewees emphasised the drying of streams in summer months as a significant problem.

In terms of the symbolic importance of these streams, interviewees were almost unanimous: streams are a significant element of their quarters and of Zagreb as a whole. Streams were regarded as an important element of their quarters by 91.2% of all interviewees and 92.7% regarded them as an important element of Zagreb. Of the 59 interviewees did not regard streams as symbolically significant for their quarter or had no opinion concerning the question, most of them were from Trešnjevka-North (10), but on a relative basis most were from Donja Dubrava (6 of 31, i.e. 19.4% of interviewees from that city quarter), Stenjevec (7 of 48 or 14.6%), and Gornja Dubrava (7 of 68 or 10.3%).

When asked about level of satisfaction with the current stream management practice in the quarter in which they live, interviewees were provided with a 5-point Likert-type scale, where 1 stood for completely dissatisfied with stream management and 5 for completely satisfied. The average was 2.41 and

Od ukupnoga broja ispitanika njih 58 (8,7 %) ne koristi koridore potoka ni za kakve aktivnosti. Od toga broja njih 20 (34,5 %) kraj potoka prolazi tek jednom tjedno ili rjeđe, odnosno (gotovo) nikad, no njih čak 38 (65,5 %) ranije je odgovorilo da kraj potoka prolazi svakodnevno. U kategoriji „ostalo" vrijedi spomenuti navodnjavanje vrtova uz potoke – relativno čestu pojavu u Podsljemenu i prigorskim dijelovima drugih gradskih četvrti. Četvero ispitanika izričito je napisalo da se koristi vodom iz potoka za navodnjavanje okućnica, što su u razgovoru potvrdili i stanovnici kuća uz potok Medveščak na području Mlinova.

Na pitanje što smatraju najvećim problemom potoka u svojoj četvrti većina je ispitanika odgovorila „onečišćenje" (469, tj. 70,3 %), zatim „slabo održavanje korita i obale" (330, tj. 49,5 %) te „betonizacija toka" (232, tj. 34,8 %). Znatan broj odgovora dobili su i „manjak sadržaja uz obale" (217, tj. 32,5 %) i „manjak zelenila uz obale" (182, tj. 27,3 %). Odgovor „opasnost od poplava" izabralo je svega 19 (2,8 %) ispitanika, što je prije svega testament dobroga rješavanja toga problema izgradnjom retencija i akumulacija u posljednjih 40-ak godina. Nekoliko je ispitanika kao bitan problem naglasilo i presušivanje potoka u ljetnim mjesecima.

Što se simboličke važnosti potoka tiče, ispitanici su gotovo jednoglasni: potoci su bitan element njihovih četvrti, ali i Zagreba u cjelini. Potoke smatra bitnim elementom svoje četvrti 91,2 % ispitanika, a 92,7 % ih smatra bitnim elementom Zagreba. Među 59 ispitanika koji potoke ne smatraju simbolički bitnima za svoju četvrt ili nemaju mišljenje o tome najviše je onih iz četvrti Trešnjevka-sjever (10), no u relativnom je smislu najviše onih iz Donje Dubrave (6 od 31, odnosno 19,4 % ispitanika iz te gradske četvrti), zatim iz Stenjevca (7 od 48, tj. 14,6 %) i Gornje Dubrave (7 od 68, tj. 10,3 %).

Na pitanje o zadovoljstvu trenutnim gospodarenjem potocima u svojoj četvrti stanovanja ispitanici su mogli odgovoriti na Likertovoj ljestvici s ponuđenim odgovorima od 1 do 5, pri čemu je 1 predstavljalo potpuno nezadovoljstvo gospodarenjem potocima, a 5 potpuno zadovoljstvo. Prosječna ocjena koju su dali ispitanici bila je

the mode was 3 (253 or 37.9% of interviewees gave that score). Only seven interviewees were completely satisfied with stream management in their quarter, while 117 were completely dissatisfied.

When asked about measures to regulate streams and their corridors that they would support, interviewees mostly supported the idea of further development of stream promenades (583 or 87.4%), greening of the space around streams (497 or 74.5%), and building bike lanes along stream banks (340 or 51%). Construction-related and technical measures to regulate streams, such as enclosing their courses below ground and building roads over stream corridors, were not popular amongst interviewees: only 13 (1.9%) and 15 (2.2%) interviewees selected the first and/or second options respectively.

Several conclusions can be drawn from the survey. First, a great majority of the inhabitants of Zagreb find that Medvednica streams are an important and integral part of their quarters and of Zagreb as a whole. Based on the responses of all interviewees, most interviewees spend some time along streams relatively often, mostly those that pass through their quarters. The potential of stream corridors is not utilised as much as it could be, as is evident from the fact that most interviewees use them only for walking, but that they are at the same time dissatisfied with the current state of stream management. In terms of the ways in which streams might be regulated, a large majority of interviewees advocated for "green" solutions, such as building promenades, improving the quality and quantity of public greenery along streams, building bike lanes, while the currently (and historically) prevalent practice of enclosing streams does not enjoy wide support from the public. It is evident that the historically most significant problem posed by Medvednica streams—torrents and flooding—is no longer on the radar of the people of Zagreb.

PLANNING AND REGULATION OF URBAN STREAMS IN THE WORLD – SELECTED EXAMPLES

Urbanists in Zagreb still view urban streams as a threat or hindrance—either in plans or in practice—though the social, ecological, recreational and wider potential of streams has been recognised the

2,41, a mod je 3 (253, tj. 37,9 % ispitanika dalo je tu ocjenu). Svega sedam ispitanika u potpunosti je zadovoljno gospodarenjem potocima u svojoj četvrti, dok je njih 117 u potpunosti nezadovoljno.

Upitani o mjerama uređenja potoka i njihovih koridora koje bi podržali, ispitanici su u najvećem broju podržali ideju daljnjega uređenja šetnica uz potoke (583 odgovora, tj. 87,4 %), ozelenjivanja prostora uz potoke (497, tj. 74,5 %) i uređenja biciklističkih staza uz obale potoka (340, tj. 51 %). Građevinske i tehničke mjere uređenja potoka – zatvaranje njihova toka i izgradnja cesta na koridorima potoka – nisu bile popularne među ispitanicima: svega 13 (1,9 %), odnosno 15 (2,2 %) ispitanika izabralo je prvu ili drugu od tih opcija.

Na temelju provedene ankete može se izvući nekoliko zaključaka. Prvo, velika većina Zagrepčana smatra medvedničke potoke bitnim sastavnim dijelom svojih četvrti, ali i čitavoga Zagreba. Gledamo li odgovore svih ispitanika, možemo vidjeti da većina njih relativno često provodi vrijeme uz potoke, uglavnom one koji prolaze njihovim četvrtima. Potencijal potočnih koridora nije iskorišten koliko bi mogao biti, što se vidi iz činjenice da ih većina ispitanika koristi samo za šetnju, ali da su istovremeno nezadovoljni trenutnim stanjem gospodarenja potocima. Što se tiče mogućega uređenja potoka, velika većina ispitanika zalaže se za „zeleno" uređenje – izgradnju šetnica, poboljšanje kvalitete i kvantitete javnoga zelenila uz potoke, izgradnju biciklističkih staza, dok danas (i povijesno) prevladavajuća praksa zatvaranja potoka nema širu podršku građana. Očito je i da povijesno najznačajniji problem medvedničkih potoka – bujice, odnosno poplave – više gotovo nisu „na radaru" stanovnika Zagreba.

PLANIRANJE I UREĐENJE URBANIH POTOKA U SVIJETU – ODABRANI PRIMJERI

Dok se u Zagrebu na urbane potoke i dalje uglavnom gleda kao na prijetnju ili smetnju – bilo u planovima bilo u praksi – u svijetu je već desetljećima prepoznat njihov društveni, ekološ-

world over for decades (Chazimentor et al., 2020; Gobster, 1995). In order to better understand the role that urban streams can have in spatial planning, it is useful to become acquainted with three significant concepts: greenways, linear parks and sense of place.

The concept of greenways in spatial planning is not new, but its popularity has grown in parallel with the expansion of ecological awareness, i.e. particularly after the 1970s. Hellmund and Smith (2006) defined greenways as land and water corridors (and networks of such corridors) designed and used for various purposes, such as nature preservation, recreation, precipitation and torrential water management, quality of life improvement and social equality, and landscape protection, with the overarching goal of preserving landscape integrity, including its natural and social components.

In China, a similar, albeit slightly more detailed definition, is used in practice: greenways are linear, green, open spaces along natural and transport corridors that comprise avenues, non-motorised vehicle routes, and cultural tourism routes. To be more precise, greenways are: transport routes for non-polluting vehicles; pedestrian and bike lanes; a means of improving stream water quality and protecting natural habitats; a method for separating various spaces with different purposes (e.g. residential from agricultural); or a way to protect the appearance or historical character of a particular area (Liu et al., 2019).

The spatial role of greenways can evidently be quite diverse and it is for this diversity that they appear under various names both in theory and practice (e.g. biological corridors, recreational corridors, green links, natural frameworks, etc.) (Hellmund and Smith, 2006). Greenways, therefore, can have diverse primary roles (from connecting habitats to creating recreational areas) but, in essence, they serve as a link that connects landscapes via a mixture of natural and social components. Streams and rivers, in view of their linear character and the fact that they connect different types of landscapes and habitats within and without urban settings, are quite often the very nucleus of greenways and, depending on their envisaged function, can be their sole significant component. Stream greenways have

ki, rekreacijski i širi potencijal (Chazimentor i dr., 2020; Gobster, 1995). Za bolje razumijevanje uloge koju urbani potoci mogu imati u prostornom planiranju korisno je upoznati se s trima važnim konceptima: zelenim koridorima, linearnim parkovima i osjećajem mjesta.

Koncept zelenih koridora u prostornom planiranju nije nov, ali je populariziran usporedno s razvojem šire ekološke svijesti, dakle posebice nakon 1970-ih. Hellmund i Smith (2006) definiraju zelene koridore kao kopnene i vodene koridore (i mreže takvih koridora) dizajnirane i korištene u različite svrhe, poput očuvanja prirode, rekreacije, upravljanja padalinskim i bujičnim vodama, poboljšanja kvalitete života i društvene jednakosti te zaštite pejzaža, s cjelokupnim ciljem očuvanja integriteta pejzaža, uključujući njegove prirodne i društvene sastavnice.

U Kini se u praksi koristi slična, ali malo detaljnija definicija: zeleni koridori su linearni zeleni otvoreni prostori duž prirodnih i prometnih koridora koji kombiniraju avenije, rute za nemotorizirana vozila i rute kulturnoga turizma. Preciznije, zeleni koridori su: prometne rute za vozila koja ne zagađuju okoliš, pješačke ili biciklističke staze, način poboljšanja kvalitete potočnih voda i zaštite prirodnih staništa, metoda razdvajanja površina različitih namjena (npr. stambene od poljoprivredne) ili način zaštite pogleda ili povijesnoga karaktera nekog područja (Liu i dr., 2019).

Kako vidimo, uloge zelenih koridora u prostoru mogu biti različite i zbog te se raznolikosti u teoriji i praksi pojavljuju pod različitim imenima; npr. biološki koridori, rekreacijski koridori, zelene poveznice, prirodni okviri itd. (Hellmund i Smith, 2006). Zeleni koridori, dakle, mogu imati različite primarne uloge, od povezivanja staništa do stvaranja prostora za rekreaciju, no u osnovi služe kao veza u pejzažu pomoću mješavine prirodnih i društvenih sastavnica. Potoci i rijeke – zbog svoga linearnog karaktera i povezivanja različitih tipova pejzaža i staništa unutar i izvan urbanih prostora – vrlo često čine osnovu zelenih koridora, a ovisno o predviđenoj funkciji mogu biti i njegova jedina značajna komponenta. Zeleni koridori potoka imaju i brojne društvene funk-

many social functions, from natural water purification to flood defence to recreation (Hellmund and Smith, 2006).

Greenways have been established in Germany to prevent and slow urban sprawl, for recreational purposes, and to improve environmental quality in industrialized urban areas, among other things (von Haaren and Reich, 2006). Ribeiro and Barão (2006) emphasized the importance of greenways as an integral part of strategies in the planning process that aim to preserve natural and cultural resources and subsequently rehabilitate abandoned land in rural and urban areas in Portugal. They placed special emphasis on their role in the recreational function and quality of the landscape. The example of Athens clearly proves that greenways in densely built urban areas can connect and integrate suburban green areas with the city core. This manner of planning promotes the cooperation of multiple actors in spatial planning as well as administrative units of different levels, and water areas are an integral part of green corridors (Tzortzi and Ioannou, 2021).

Linear parks follow a similar concept. Linear parks are, in brief, often significantly longer than they are wide and, in essence, follow a linear structure. They are formed within urban settings and their primary role is to offer space for recreation and to connect various parts of the city, while the ecological aspect may (but need not) be neglected. Linear parks are a relatively old concept (dating back to the end of the 19th century). Nowadays, they often arise in post-industrial European and US city landscapes where they represent an attempt to revive de-industrialised neighbourhoods (Faggi and Vidal, 2016) or other historical parts of cities. The Mauerpark in Berlin, which follows the layout of the former Berlin Wall, is an example of the latter. Streams, but also defunct railroad tracks, often serve as the basis for linear parks.

Another trend in contemporary spatial planning is the reconstruction or rehabilitation of urban streams, aimed at their ecological and social recovery. The existing literature on the topic mostly examines urban stream reconstruction from the ecological aspect by describing habitat and biodiversity revival procedures in rehabilitated streams and paying attention to the impact of such rehabilitation on

cije, od prirodnoga pročišćavanja vode do obrane od poplava i rekreacije (Hellmund i Smith, 2006).

Zeleni koridori u Njemačkoj su uspostavljeni, između ostaloga, da bi se spriječilo i usporilo širenje gradova, u rekreacijske svrhe i radi poboljšanja kvalitete okoliša u industrijaliziranim urbanim područjima (von Haaren i Reich, 2006). Ribeiro i Barão (2006) ističu važnost zelenih koridora kao sastavnoga dijela strategija u procesu planiranja čiji je cilj očuvanje prirodnih i kulturnih resursa, zatim rehabilitacija napuštenoga zemljišta u ruralnim i urbanim područjima Portugala. Poseban naglasak stavljaju na njihovu ulogu u rekreacijskoj funkciji i kvaliteti pejzaža. Primjer Atene zorno dokazuje da zeleni koridori u gusto izgrađenim gradskim područjima mogu povezati i integrirati suburbane zelene površine s gradskom jezgrom. Ovakav način planiranja potiče suradnju više aktera u prostornom planiranju, kao i administrativnih jedinica različite razine, a vodene su površine integralni dio zelenih koridora (Tzortzi i Ioannou, 2021).

Sličan su koncept linearni parkovi – parkovi koji su, ukratko, znatno duži nego što su široki, odnosno parkovi koji u svojoj osnovi prate linijsku strukturu. Linearni parkovi formiraju se unutar urbanih prostora i osnovna im je uloga rekreacija i povezivanje različitih dijelova grada, dok ekološki moment može biti zanemaren. Linearni su parkovi relativno star koncept (s kraja 19. stoljeća), a danas često nastaju u postindustrijskom pejzažu europskih i američkih gradova, gdje se njima pokušavaju revitalizirati deindustrijalizirane četvrti (Faggi i Vidal, 2016) ili na drugi način poviješću obilježeni dijelovi grada: kao primjer drugoga možemo uzeti berlinski Mauerpark koji prati pružanje nekadašnjega Berlinskog zida. Kao osnova linearnih parkova često znaju poslužiti upravo potoci, ali i npr. zatvorene željezničke pruge.

Još jedan trend u modernom prostornom planiranju jest obnova ili rehabilitacija urbanih potoka s namjerom njihova oporavka u ekološkom i društvenom pogledu. Obnova urbanih potoka u postojećoj se literaturi uglavnom proučava iz ekološkoga aspekta – opisuju se postupci obnove staništa i bioraznolikosti u rehabilitiranim potocima, uz davanje pozornosti utjecaju rehabilitaci-

how the local population experiences the site (Cho, 2010). Ecological reconstruction changes the geomorphological and biological (primarily vegetative) characteristics of streams to make them as similar as possible to their "natural" counterparts (Violin et al., 2011).

Therefore, urban stream reconstruction projects based on primarily ecological goals yield only partial improvement. On the one hand, rehabilitation of even short stream segments can result in increased biodiversity and local fauna populations (especially macrozoobenthos) (Purcell et al., 2002). However, Violin et al. (2011) cautioned that the rehabilitation of isolated urban stream segments does not lead to long-term qualitative biodiversity improvements. The authors concluded that ecological stream reconstruction cannot be successful if it is limited to only certain stream segments and that the scope of reconstruction must be expanded to include the entire course. Flooding due to urbanisation was also listed as a key issue in the reconstruction of stream habitats (Violin et al., 2011).

Hellmund and Smith (2006) described useful social functions of urban greenways, which often arise along streams: developing leisure and recreation zones, improving flood control systems, building "green" roads for pedestrians and cyclists, better connectedness between city quarters with diverse socioeconomic compositions (presumed to contribute to social equality), and the rise of real estate prices along new green corridors. The latter is also mentioned as a potential problem that might contribute to the gentrification of poorer parts of cities (Lee and Anderson, 2013). Spatial plans of the Japanese city of Sapporo dating back to 1999 include a plan for green space development, including greenways along city streams and rivers. According to research, most inhabitants of Sapporo who live near streams believe that they are pleasant places for walks, leisure, and recreation, but they mention the problem of polluted water and nearby green areas. The inhabitants also emphasised that they prefer "landscaped" greenery along stream corridors as opposed to "wild", unkempt natural habitats (Asakawa et al., 2004). Similar positive effects of planning of urban streams are also present in Seoul (Hwang, 2004).

je na doživljaj mjesta kod lokalnoga stanovništva (Cho, 2010). Ekološkom se obnovom potocima ciljano mijenjaju geomorfološke i biološke (prvenstveno vegetacijske) karakteristike da bi oni što više sličili svojim „prirodnim" pandanima (Violin i dr., 2011).

Projekti obnove urbanih potoka iz primarno ekoloških razloga u tom pogledu donose samo djelomično poboljšanje. S jedne strane, čak i rehabilitacija vrlo kratkih dionica potoka može rezultirati povećanjem bioraznolikosti i brojnosti lokalne faune (osobito makrozoobentosa) u odnosu na ranije stanje (Purcell i dr., 2002). No, Violin i dr. (2011) upozoravaju da rehabilitacija izoliranih segmenata urbanih potoka ne donosi dugoročno kvalitativno poboljšanje bioraznolikosti. Zaključuje se da ekološka obnova potoka ne može biti uspješna ako se ograničava na određene segmente potoka te da se obuhvat obnove mora proširiti na njihov slijev u cjelini. Kao jedan od ključnih problema u obnovi potočnih staništa navode se urbanizacijom uzrokovane bujice (Violin i dr., 2011).

Hellmund i Smith (2006) opisuju korisne društvene funkcije urbanih zelenih koridora, koji vrlo često kao okosnicu imaju upravo potoke: stvaranje zona za odmor i rekreaciju, poboljšanje sustava obrane od poplava, formiranje „zelenih" prometnica za pješake i bicikliste, bolja povezanost gradskih četvrti različita socioekonomskoga sastava (za koju se pretpostavlja da pridonosi društvenoj jednakosti) te rast cijena nekretnina uz nove zelene koridore. Potonje se spominje i kao potencijalni problem koji može pridonijeti gentrifikaciji siromašnijih dijelova grada (Lee i Anderson, 2013). Prostorni planovi japanskoga grada Sappora od 1999. sadržavaju plan razvoja zelenih površina, koji uključuje i zelene koridore uz gradske potoke i rijeke. Prema provedenim istraživanjima većina stanovnika Sappora koji žive u okolici potoka smatra da su potoci ugodna mjesta za šetnju, odmor i rekreaciju, ali napominju problem onečišćenja vode i okolnih zelenih površina. Stanovnici su također naglasili da preferiraju „uređeni" krajolik uz potočne koridore naspram onoga „divljeg", odnosno neodržavanog (Asakawa i dr., 2004). Slični pozitivni učinci planiranja urbanih potoka prisutni su i u Seulu (Hwang, 2004).

Urban streams can have a negative impact on the local community, especially if they are poorly managed and/or polluted. Chen and Li (2017) described such negative impact of the polluted urban Huangpu and Chigang rivers on the price and desirability of housing in their vicinity. Using the example of a microdistrict in the city of Guangzhou, sandwiched between the two rivers over an area of 9.5 ha, they showed that property value drops in relation to proximity to the polluted rivers. It was found that the proximity to the polluted rivers caused the average price of apartments to drop; and that proximity to the slower and more poorly managed Chigang River had a more drastic impact on prices than proximity to the wider, faster, and better managed Huangpu River, which is also not so obviously aesthetically displeasing due to its size and speed. A better view of the Chigang River, described as being "ink-black" in colour, was also observed as a factor effecting housing prices negatively, while a view of the less unattractive Huangpu resulted in the opposite.

The concept of "sense of place" is increasingly affirmed in urban planning. According to Tuan (2001), sense of place is the way people think and feel about space, that is, how they form an attachment to a particular space. Helsinki, for example, launched the "adopt a stream" campaign in 2013 to support the local people take care of their streams. This is intended to foster residents' sense of place and strengthen their cognitive connection to and relationship with streams. The importance of local peoples' sense of place lies in the fact that it can help in finding sustainable solutions and improve the adaptive capacity of ecological and social systems in the planning process (Kati and Jari, 2016). Practices from other European countries and cities also point to increasing citizen participation in planning and decision making. A comparative analysis of five watercourses (smaller rivers and streams) in various planning, institutional, and geographic settings (Denmark, Germany, Switzerland, and Spain) showed that citizen participation, perceptions of space, and assessments of sense of place are very important in decisions regarding watercourse design and management (Verbrugge et al., 2019).

Urbani potoci mogu imati i negativan utjecaj na lokalnu zajednicu, osobito ako su loše uređeni i/ili onečišćeni. Chen i Li (2017) opisuju upravo takav negativan utjecaj zagađenih urbanih rijeka Huangpu i Chigang na cijenu i poželjnost stanova u njihovoj blizini. Na primjeru jednoga mikrorajona grada Guangzhoua površine 9,5 ha stiješnjenog između tih dviju rijeka dokazali su da vrijednost stanova opada što su bliži zagađenim rijekama. Utvrđeno je da približavanje zagađenim rijekama uzrokuje pad prosječne cijene stanova; približavanje sporijem i lošije uređenom Chigangu ima drastičniji utjecaj na cijenu nego približavanje širem, bržem i bolje uređenom Huangpuu, koji zbog svoje veličine i brzine nije tako očigledno estetski neugodan. Bolji pogled na Chigang – čija se boja u članku opisuje kao „crna poput tinte" – također je uočen kao faktor smanjenja vrijednosti, dok pogled na manje neprivlačan Huangpu rezultira rastom cijena.

U urbanom planiranju sve više se afirmira koncept osjećaja mjesta. Prema Tuanu (2001) osjećaj mjesta jest način na koji ljudi osjećaju i razmišljaju o prostoru, tj. kako stvaraju privrženost prema određenom prostoru. Primjerice, Helsinki je 2013. pokrenuo kampanju „udomi potok" da bi podržao lokalno stanovništvo u brizi o potocima. Time se želi potaknuti osjećaj mjesta kod stanovnika, ojačati njihove kognitivne veze i odnos prema potocima. Važnost osjećaja mjesta lokalnoga stanovništva može pomoći u pronalaženju održivih rješenja i poboljšanja sposobnosti prilagodbe ekoloških i društvenih sustava u procesu planiranja (Kati i Jari, 2016). Prakse iz drugih europskih zemalja i gradova također upućuju na sve veće sudjelovanje građana u planiranju i donošenju odluka. Komparativna analiza pet tokova (manjih rijeka i potoka) u različitim planerskim, institucionalnim i geografskim područjima (Danskoj, Njemačkoj, Švicarskoj i Španjolskoj) pokazala je da je sudjelovanje pojedinaca, njihova percepcija prostora i vrednovanje osjećaja mjesta izrazito važno pri donošenju odluka o uređenju i upravljanju vodotocima (Verbrugge i dr., 2019).

CONCLUSION

An analysis of the historical and contemporary urbanistic theory and practice of Zagreb and of the theory and practice of urban planning abroad leads us to several key conclusions in this paper.

All spatial plans of Zagreb from the mid-19th century to the time of writing focused most on the threats posed by Medvednica streams, i.e. flooding. Due to their torrential nature, floods were the main threat. This was somewhat addressed in the second half of the 20th century, though they continue to pose a hazard. That is why, in the context of stream management today, most space is dedicated to torrential flood control. Another problem with the streams of Zagreb is pollution, which is a matter of concern in spatial plans. It was the polluted water of Medveščak Creek that forced the city authorities to complete the project of its enclosure below ground and diversion away from the city centre. In the opinion of the people of Zagreb, pollution is still one of the biggest problems facing Medvednica streams, although certainly not anywhere near the levels experienced in the 19th and early 20th centuries.

Urbanists used to regard streams as a nuisance or, in the worst case scenario, a threat to the population and city property, which is why they were frequently enclosed or "concreted", especially their lower segments. It was only in the 1970s that their landscape and ecological value began to receive more attention, also mostly in the foothill regions of their watercourses. Lowland stream segments are still expected to be enclosed below ground, even when higher-level plans envisage the possibility of open courses. Urbanistic practice, in this respect, is less inclined towards streams than the theory.

Enclosure and construction-intensive stream management ("concreting") are implemented to improve the quality of life of the local population and of the wider city population either by opening new roads along the corridors of covered streams (such as Črnomerec), preventing potential sanitary catastrophes (Medveščak in the 1890s) and torrential floods, or improving the appearance of quarters by enclosing "dried streams (puddles)" in their lower watercourses. The local population is still not satisfied with such procedures, and there are several reasons why. Judging

ZAKLJUČAK

Analizom povijesne i sadašnje zagrebačke urbanističke teorije i prakse te teorije i prakse urbanoga planiranja u inozemstvu dolazimo do nekoliko ključnih zaključaka ovoga rada.

Svi su prostorni planovi Zagreba od sredine 19. stoljeća do danas najviše pozornosti davali prijetnjama koje dolaze s medvedničkim potocima. Zbog njihove bujične prirode osnovnu su prijetnju činile poplave, koje su donekle ukroćene tek u drugoj polovici 20. stoljeća, no i dalje su potencijalna opasnost. Zato se i danas u kontekstu uređivanja potoka najviše prostora daje upravo obrani od bujičnih poplava. Drugi je problem zagrebačkih potoka njihovo onečišćenje, na koje se također upozoravalo u prostornim planovima, ali i ranije. Upravo je zagađena voda Medveščaka natjerala gradske vlasti na što brže dovršenje projekta njegova nadsvođivanja i prebacivanja iz centra grada. Onečišćenje je i danas prema mišljenju Zagrepčana jedan od najvećih problema medvedničkih potoka iako ono svakako nije ni blizu razini iz 19. i ranoga 20. stoljeća.

Urbanistička je struka tijekom prošlosti potoke smatrala smetnjom ili, u najgorem slučaju, prijetnjom stanovništvu i imovini grada, iz čega je uslijedilo njihovo vrlo često zatvaranje ili „betoniziranje", osobito u donjem toku. Tek se od 1970-ih počelo pokazivati više obzira prema njihovoj pejzažnoj i ekološkoj vrijednosti, ali i tad uglavnom samo u prigorskom dijelu toka. Nizinske dijelove potoka i dalje očekuje zatvaranje korita, čak i kad je planovima više razine ostavljena mogućnost njihova puštanja otvorenim tokom. Urbanistička praksa u ovom je slučaju manje naklonjena potocima od teorije.

Zatvaranje i građevinski intenzivno uređivanje potoka („betonizacija") provodi se s namjerom poboljšanja kvalitete života lokalnoga i širega gradskog stanovništva, bilo putem otvaranja novih prometnica na koridorima zatvorenih potoka (primjer Črnomerca), zaustavljanjem potencijalne sanitarne katastrofe (Medveščak 1890-ih) i bujičnih poplava bilo s namjerom uljepšavanja četvrti zatvaranjem „isušenih (zabarenih) potoka" u donjem toku. Ipak, iz više razloga lokalno stanovništvo nije zadovoljno

by the results of the survey, the people of Zagreb are strongly attached to their local streams and they view Medvednica streams as an important complement to the city as a whole. While the local population primarily wishes to preserve open stream courses in their neighbourhoods by simply developing and procuring the required infrastructure (promenades, bike lanes, greenery, etc.), urbanists and the government have not abandoned their plans to enclose lowland stream segments, i.e. they do not plan to rehabilitate streams in the foothill belt. Medvednica streams in Zagreb certainly represent "places" in the context of the concept of sense of place, i.e. parts of space to which the people of Zagreb have attached an intangible value; parts of space to which the local population has connected emotionally and experientially and which have thus acquired meaning.

As we have shown, the role of greenways in urban and regional planning is on the rise in Europe, North America, and East Asia. In this respect, urban streams and rivers have a unique role in view of their linearity and the fact that they connect different habitats, regions, and parts of the city with diverse socioeconomic compositions. Internationally, the policy of building greenways has often become a matter of state interest, while in Croatia it depends on the initiative of local self-government units, which have yet to show much interest in their development. A similar situation exists in Zagreb, where the upper and lower stream segments are protected, but they largely remain disconnected, and do not form coherent ecological corridors or "green" roads in the form of pedestrian and biking corridors. Zagreb has the potential to develop such forms of green infrastructure because its stream corridors are in relatively good condition, the population is emotionally attached to the streams, the corridors generally run in a north-south direction, and there are no steep inclines in the foothill region.

Zagreb is often called the City on the Sava and the City beneath Medvednica, as the largest part of the city and almost all of its history are sandwiched between the river and the mountain. However, today they seem completely segregated. Other than by paved streets, they are connected by the threads of Medvednica streams, which form a living bond linking the mountain, city, and the river. The spatial plans in effect today envisage a definitive severing of

takvim postupcima. Štoviše, sudeći prema rezultatima ankete, Zagrepčani su izrazito vezani uz svoje lokalne potoke, a medvedničke potoke smatraju i bitnim elementom grada u cjelini. Dok lokalno stanovništvo prvenstveno želi očuvati otvoreni tok potoka u svojim četvrtima te ga urediti i opremiti potrebnom infrastrukturom (šetnice, biciklističke staze, zelenilo), gradski urbanisti i vlast do danas nisu odustali od namjere njihova zatvaranja u nizinskom toku, odnosno nemaju u planu rehabilitaciju potoka u prigorskom pojasu. Medvednički potoci u Zagrebu svakako predstavljaju „mjesta" u kontekstu koncepta osjećaja mjesta, tj. dijelove prostora kojima su Zagrepčani pridali neku nematerijalnu vrijednost, dijelove prostora s kojima se lokalno stanovništvo emocionalno i iskustveno vezalo i time mu ugradilo značenje.

Kako smo imali prilike vidjeti, u Europi, Sjevernoj Americi i Istočnoj Aziji zeleni koridori imaju sve veću ulogu u urbanom, pa čak i regionalnom planiranju. U tom pogledu urbani potoci i rijeke imaju jedinstvenu ulogu zbog svojih obilježja linearnosti i povezivanja različitih staništa, regija i gradskih dijelova raznolika socioekonomskoga sastava. I dok je u inozemstvu politika stvaranja zelenih koridora (*greenways*) često bivala i stvar državnoga interesa, u Hrvatskoj je ona zapravo ostavljena inicijativi jedinica lokalne samouprave koje, pak, ne iskazuju pretjeran interes. Slična je situacija i u Zagrebu, gdje su zaštićeni dijelovi gornjih i srednjih tokova potoka, ali oni uglavnom ostaju nepovezani, ne čine koherentne ekološke koridore ili „zelene" prometnice u vidu pješačkih i biciklističkih koridora. Za razvoj takvih oblika zelene infrastrukture u Zagrebu ima potencijala – zbog relativne očuvanosti potočnih koridora, emocionalne vezanosti stanovništva, njihove generalne orijentacije u smjeru sjever-jug te malih nagiba u prigorskom dijelu – ali je taj potencijal još uvijek netaknut.

Zagreb se često naziva gradom na Savi i gradom podno Medvednice. Između njih se smjestio najveći dio grada i gotovo sva njegova povijest. Ipak, oni se danas čine potpuno odvojenima. Međusobno ih osim asfaltiranih ulica povezuju i niti medvedničkih potoka, koji i danas čine živu sponu između gore, grada i rijeke. Važeći prostorni

that bond, despite objections voiced by the people of Zagreb and certain parts of the profession. Instead of being viewed as a permanent hindrance to the development of the city, streams should finally be seen for the great potential that they represent and which we still have time to realise. In the future, green infrastructure in cities will become a necessity, not just an exotic novelty; in this respect, Zagreb still rests on the good foundations formed by Medvednica streams, and these foundations should be built upon.

planovi predviđaju konačno prekidanje te spone usprkos protivljenju Zagrepčana, ali i dijela struke. Umjesto da se na njih gleda kao na stalnu smetnju razvoju grada, na potoke se treba početi gledati kao na velik potencijal koji još uvijek imamo prilike iskoristiti. U budućnosti će zelena infrastruktura u gradovima postati potreba, a ne puka egzotika – u tom pogledu Zagreb još uvijek ima dobre temelje u obliku potoka s Medvednice, ali na tim se temeljima treba početi graditi.

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