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MACEDONIAN GEOGRAPHICAL SOCIETY

ГЕОГРАФСКИ РАЗГЛЕДИ

GEOGRAPHICAL REVIEWS

КНИГА 58 TOME

СКОПЈЕ - SKOPJE
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THE ARTS AND POLITICS: THE STATE OF YUGOSLAV SOCIETY THROUGH THE LYRICS OF AZRA AND ZABRANJENO PUŠENJE

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ABSTRACT

This paper critically examines the socio-political landscape of Yugoslav society through the lyrical narratives of two influential musical bands: Azra from Zagreb and Zabranjeno Pušenje from Sarajevo. Amidst rising Yugo-nostalgia and the idealization of the former Yugoslav state, the works of these rock bands provide an alternative perspective on the complexities and challenges of Yugoslav society. By conducting a thematic analysis of their lyrics, this research elucidates the cultural and political sentiments of the era, demonstrating how popular art functioned as a medium for incisive social commentary. The study underscores the importance of Azra and Zabranjeno Pušenje in articulating dissent and shaping public discourse, thereby contributing to a deeper understanding of Yugoslav identity. This examination reveals the enduring impact of their artistic expressions on contemporary interpretations of the Yugoslav socio-political context.

Keywords: Yugoslav society, Yugo-nostalgia, alternative perspective, Azra, Zabranjeno Pušenje

INTRODUCTION

In the 1949 film The Third Man, the character Harry Lime, played by the legendary Orson Welles, delivers a memorable line that goes: "In Italy for 30 years under the Borgias, they had warfare, terror, murder, and bloodshed, but they produced Michelangelo, Leonardo da Vinci, and the Renaissance. In Switzerland, they had brotherly love—they had 500 years of democracy and peace, and what did that produce? The cuckoo clock?" The quote is neither geographically, historically, nor

essentially accurate: Switzerland excelled in research fields such as linguistics, mathematics, and pharmaceutics, for example, besides producing painters, authors—such as Bodmer, Keller, Meyer, Burckhardt, etc.—and the like (Zwart, 2015), but it presents an ironic paradox: hard times foster greatness, while comfort breeds mediocrity. In this regard, art aligns seamlessly, as it is widely recognized—despite diverse definitions—as a human creative endeavor aimed at expressing emotion and/or conveying an idea through aesthetic means (see: Mijalov & Kitevski, 2018). Often abstract rather than direct, art is wrapped in symbols and perspectives, serving as a form of communication between the artist and a specific audience. This underscores the idea that hard and unstable times, as the quote suggests, provide ground in which art can flourish.

Rock music is a specific, and one of the most popular types of art. Ignored at first by social scientists, it has lately become the object of increasingly frequent scholarly analysis (Ramet, 2019, pg. 103). Generally present across Western societies, primarily in the USA and Great Britain, under specific political and historical circumstances, it took root in the former Yugoslavia. The Yugoslav rock generally stood for critical thinking, cosmopolitanism, openness, and personal autonomy (Spaskovska, 2011), and can be understood as a vigilant observer of the systemic weaknesses of the time. These qualities enabled it to serve as both a critique and a reflection of the sociopolitical conditions that defined the Yugoslav era, positioning the genre as an important cultural force that responded to and mirrored the complexities of the socialist system.

Amid the growing phenomenon of Yugonostalgia, academic discourse appears increasingly unable to effectively communicate the complex realities of the Yugoslav past to a broader public audience. In this context, the works of artists from that era take on a vital role, functioning as the voice of youth and critical reflection. Through their commentary and use of metaphor, these artists offer an alternative perspective on various aspects of Yugoslav life—ranging from the everyday struggles of the common man to the social and political order, as well as the prevailing economic conditions. Their work thus provides a culturally rich and nuanced critique that complements, and at times surpasses, the explanatory power of academic narratives. While the Yugo-nostalgic narrative often revolves around familiar phrases like "we lived in a great country," "those were golden times," "the worker and individual were valued," and "there was order and discipline," the art of that era—particularly the work of 1980s rock bands Azra (from Zagreb) and Zabranjeno Pušenje (from Sarajevo), as explored in this paper —offers a contrasting perspective. Their music highlights the societal flaws that challenge these nostalgic ideals, revealing a more nuanced view of Yugoslav society.

DATA AND METHODOLOGY

The primary sources for this analysis are the songs of two prominent music groups: Azra from Zagreb and Zabranjeno Pušenje from Sarajevo. Azra's extensive

discography includes over 16 albums and more than 300 songs, while Zabranjeno Pušenje (in its Yugoslav era) has released a total of 4 albums comprising 49 songs. The analysis encompasses a substantial portion, if not the entirety, of these songs, with references drawn only from those that are unequivocal and precise within the context of the study—specifically, 20 songs from Azra and 23 songs from Zabranjeno Pušenje.

The primary method employed in this study is thematic analysis, which involves identifying and analyzing recurring themes in the lyrics of the selected songs. This method is particularly suited to examining the complex layers of meaning embedded in the music, as it allows for the exploration of both explicit and implicit socio-political messages.

To fully understand the significance of the lyrics, the thematic analysis is supplemented by contextual research. The songs are situated within their historical, political, and cultural contexts by drawing on a diverse range of sources, including:

- Interviews with the band members and key figures from the era;
- Biographies and autobiographies of the musicians;
- Scholarly literature on Yugoslav history, culture, and politics;
- Media articles that provide context on the socio-political landscape.

This contextualization allows for a deeper understanding of how the bands' lyrics reflect the tensions, contradictions, and challenges facing Yugoslav society at the time. It also ensures that the analysis captures the broader cultural and political currents that influenced the creation of these songs.

Throughout the paper, the original names of the bands are retained, while all referenced albums and songs have been translated and academically adapted. Special attention has been taken to avoid the use of profane language, both in the lyrics and the titles of the analyzed songs.

While Azra and Zabranjeno Pušenje are not the only rock bands to critique Yugoslav society, they stand out for their explicit focus on fundamental societal and everyday life issues. Bands from other geographies, such as Skopje, Ljubljana, and Belgrade, could certainly enrich the analysis, but their inclusion risks oversaturating the scope of the research. Furthermore, Azra and Zabranjeno Pušenje were specifically chosen not only for their thematic relevance but also for how their active years align with Yugoslavia's final phase. Azra's rise coincided with the death of Josip Broz Tito, while Zabranjeno Pušenje formed shortly after, with both bands continuing to create until Yugoslavia's eventual dissolution.

THE SPECIFIC NOSTALGIA

It is neither new nor unexpected to see a narrative develop and deepen that the modern age, the qualities of society, and the state's organization are experiencing a downfall compared to their versions of the past. The idea of a better past appears to be as old as recorded civilization (Bonnet, 2010, pg. 19). Nostalgia, a compound word consisting of nostos (return) and algos (pain), literally means the suffering caused by

an unrelenting yearning for the homeland (Sedikides et al, 2008). It is a complex, multilayered, volatile, emotionally charged story that glorifies romanticized past times, people, objects, sentiments, and events using binary oppositions to juxtapose them against their inferior counterparts in the present (Velikonja, 2017). Yugonostalgia, specifically, is a particular kind of nostalgia (Simmons, 2009) for the fantasies associated with a country, the SFR Yugoslavia, which existed from 1945 to 1991 (Lindstrom, 2004); a very widespread phenomenon (Krašovec, 2011), as concluded by Kolstø (2014), who notes that there is a broad spectrum of nostalgia for large multicultural states that ended in the dustbin of history during the 20th century—such as Czechoslovakia and the USSR. Bošković (2013) states that it is nostalgia for socialism, and that the sentiment is the same everywhere, only under different names: for example, in East Germany, it is called Ostalgie.

The roots of nostalgia for Yugoslavia can be traced back immediately after the collapse of the country, aligning with the argument that people begin to develop memories once it becomes clear that their previous lifestyle has definitely ended—as if they want to conserve in their memories what they lost in real life (Breznik & Močnik, 2022). Just as the six republics that comprised the former Yugoslavia had their own experiences of the post-Yugoslav era, various expressions of Yugonostalgia have different nuances (Volčič, 2017), and it is remembered differently, either by condemning its repressive characteristics or by yearning for its inclusive policies (Aydoğan, 2022). For example, while in some countries, such as Bosnia and Herzegovina, Slovenia, and North Macedonia, Tito continues to be viewed positively, public opinion is considerably more divided in Croatia and Serbia, where his opponents hold him responsible for post-war repression, assassinations of outspoken émigrés, and the crushing of anti-Yugoslav nationalist movements (Pavlaković, 2020). Yugonostalgia, shaped by diverse Yugoslav and post-Yugoslav contexts and experiences, manifests in various forms. The most prevalent type centers on recollections related to social welfare, including healthcare, workplace security, and education. As Takševa (2019) observes, this nostalgia is less concerned with state formation or communist ideology, and more focused on a way of life and the patterns of social interaction that characterized that era.

By definition, Yugonostalgia should primarily exist among those who lived through and experienced life in Yugoslavia, having directly felt the system they now long for. However, this specific form of nostalgia is notably prevalent even among younger generations who have no memory of the "Third Yugoslavia" (1991-2003), revealing how the sentiment extends beyond personal experience to encompass collective memory and cultural transmission. Suleymanova says that young people, disappointed with contemporary times, turn to the "golden days," which, even if they were not perfect, were still "better than today." Epithets like "golden times" have become standard expressions in Yugo-nostalgic sentiment, and they are almost always identical, echoing the positive remarks found in Bancroft's research survey (2009), encapsulated in the classic statement: "We lived in an excellent country." Other common nostalgic reflections include: "[it was so safe that] one could freely sleep on a bench in a park," "We traveled freely with the red passport," "At that time,

there was order and discipline," "Quality was valued," and "We (Yugoslavia) had the fourth strongest army" (sometimes in Europe, sometimes globally). These remarks collectively represent the idealized memory of a bygone era. Above all, the main symbol of better times and the iconography of all Yugonostalgia is Josip Broz Tito (1892-1980)—the central character in the founding myth of Yugoslavia, in its most important community-building narrative, the multinational partisan struggle (Calic, 2019, pg. 190). Therefore, the nostalgia for the good, brave, just, and visionary leader Tito, Velikonja (2008) calls Titonostalgia.

THE SPECIFIC YUGOSLAVIA

History managed to produce a total of three Yugoslav state formations: the first version, the Kingdom of Serbs, Croats, and Slovenes, was formed in the aftermath of the First World War, on December 1, 1918, changing its name to “the Kingdom of Yugoslavia” (meaning “Kingdom of South Slavs”) in 1929 in order to symbolically reflect the union of South Slav peoples (but not including Bulgarians) into a single state (Trbović, 2008, pg. 104). Yugoslavia ceased to exist on 17 April 1941, the day it surrendered. Hitler and Mussolini plucked the country apart, turning it into a mosaic of annexed, occupied, and quasi-independent territories (Calic, 2019, pg. 125). The second version, the SFRY, was formed on almost the identical territory of the previous royal Yugoslavia, riding on the wave of victory in the Second World War. This republican model was initially designed according to the Soviet concept, with nominally six equal constituent republics: Serbia, Croatia, Bosnia and Herzegovina, Macedonia, Slovenia, and Montenegro, and with the Constitution of 1974, two new autonomous provinces within Serbia: Vojvodina and Kosovo (see: Kitevski, 2020). The second, socialist version of Yugoslavia is the carrier of the Yugoslav and also Yugo-nostalgic identity and sentiment. Therefore, the remark that Yugonostalgia is in fact Titonostalgia, and/or longing for socialism, is quite accurate. The Third Yugoslavia, formally known as the Federal Republic of Yugoslavia (FRY), was comprised solely of two republics: Serbia and Montenegro. This political entity existed until 2003, when it was restructured into the State Union of Serbia and Montenegro. The union persisted until 2006, at which point Montenegro, following a successful independence referendum, seceded and established itself as an independent state, thus marking the final dissolution of the Yugoslav framework.

Under the motto ‘No rest while we are rebuilding’, Yugoslavia undertook the great task of cleaning up and repairing (Calic, 2019, pg. 171). The process of reconstruction consisted in transforming Yugoslavia and its population—the majority then living off agriculture—into an industrialized and urbanized working-class society (Bernard, 2019, pg. 45). No other European country experienced faster urban growth after WW2 than Yugoslavia (Calic, 2019, pg. 195). Formatted in Soviet style, until their split in 1948, when Yugoslavia was expelled from the socialist realm. From then on, according to Županov (1989), the state tried to find a third solution—to pave a third path of social development and construct a new model of society—neither

capitalist nor state socialist—a third path called self-managed socialism. Welcoming the Yugoslav-Soviet rift, the West commenced a flow of economic aid in 1949; it saved the country from hunger in 1950, and covered much of Yugoslavia's trade deficit for the next decade (Curtis, 1992, pg. 47). Over $419 million came from the UN program for reconstruction and development alone, the highest amount awarded to any European recipient (Calic, 2019, pg. 171). This, of course, contributed to the great economic growth in the 1950s, when GNP grew at an annual rate of 8.1% (Bernard, 2019), the world's second-highest economic growth rate between 1957 and 1960 (Curtis, 1992). During the 60s, economic emigration was already legalized, leading to a large number of Yugoslavs leaving to work in the West, something that was mostly confined to the north-western Yugoslav border region (Brunnbauer, 2009).

In the 1970s, the Yugoslav economy entered a serious recession with increased oil prices worldwide and a huge growth in the country's debt (Katrine Haug, 2012). After Tito's death, socio-economic problems in Yugoslavia began to be multilayered, determined primarily by economic decline, caused by a dysfunctional economic and political order (Križan, 1989). For example, between 1972-1982, the Yugoslav external debt increased ninefold from $2.4 billion to $20.3 billion (Cvikl & Mrak, 1996). The declining economy, burdened with massive foreign debt, unleashed the forces of nationalism, represented in inter-republican rivalries (Trbović, 2008).

The deep crisis that shook the entire socialist world showed that Yugoslavia had never ceased to be part of that world, and that its economic, social, and political system had all the important characteristics of real socialism (Županov, 1989).

ARTE ET LABORE

One of the defining features of the cultural history of socialist Yugoslavia is the rise and flourishing of rock music. Unlike other socialist countries, where such forms of Western culture were often restricted, Yugoslavia became a unique space where rock music developed to such an extent that, in terms of popularity, energy, and quality, it could stand alongside its natural origins—the USA and Great Britain. This made Yugoslavia the only socialist nation where rock thrived as part of the global cultural movement. Marie-Janine Calic (2019, pg. 211) writes that the youth of Yugoslavia were enthusiastic about bands like The Rolling Stones, The Beatles, Jimmy Hendrix, and others, and despite the potentially subversive quality that this type of music had, with its critical texts and provocative poses, the state decided against repression. President Tito and his ideological theorist Edvard Kardelj are said to have personally decided against repressive responses (Ramet, 2002). Among other things, Yugoslav rock music was seen linking the youth cultures of the different republics (Volčič, 2017). According to Spaskovska (2011), punk/rock music in Yugoslavia was a well-thought reflection on socio-political reality, and it was the lyrics that mattered to fans more than the music itself.

One of the reasons rock music, as a popular art with social power, succeeded is

that institutional censorship was never publicly acknowledged, and there was never any government body established for the task of monitoring cultural production (Hoffman, 2017). In the absence of such a centralized institution or bodies, censorial practices were often hidden behind other regulatory strategies (Hoffman, 2017). As an illustration of how hidden regulatory strategies worked, we can refer to the case after the scandal with the affair Crk'o Marshal (The Marshal croaked—I mean, the amplifier), when the band Zabranjeno Pusenje almost disbanded, as their newly released album was boycotted by the media (see: Jankovic, N. 2014, pg. 262, 263). In one sense, to the extent that the communist regime left rock music alone, rock music in Yugoslavia remained "depoliticized." But on other levels, rock in Yugoslavia was political too (Ramet, 2019, pg. 126).

THE ROCK SOLID FOUNDATION

Azra was an influential rock and pop band. Formed in Zagreb in 1977, by the Skopje-born musician Branimir Štulić—now a withdrawn and ascetic man, considered a guru, a poet-philosopher (Perica, 2014, pg. 116). The band's work spanned through the 80s, hyperactively releasing over 16 albums (studio, live, singles, and compilations), with more than 300 songs, almost entirely written by Štulić himself. Although Azra officially disbanded in 1988, later releases continued to appear under Štulić's name, blurring the line between the band's legacy and his solo career, making it difficult to distinguish where Azra ends and Štulić's individual work begins. Azra's main identity lies in its explicit and precise social and political comments—a critical review of important segment of the Yugoslav system and everyday life. Štulić's lyrics, aphorisms, metaphors, and prophecies are part of the intellectual discourse in post-Yugoslav states (Perica, 2014, pg. 116).

Zabranjeno Pušenje, a rock band formed in Sarajevo in 1980, closely associated with the New Primitives movement. Over the years, the band experienced cyclical ups and downs: the release of their first album, Das ist Walter in 1984, sold in over 100,000 copies, significantly surpassed the record label's initial estimation. After the affair with Crk'o Marshal (November 1984), the band entered a period of stagnation, and by the time of their last album release (in 1989), they again had become one of the most popular acts in Yugoslavia. The band disbanded almost simultaneously with the breakup of the SFR Yugoslavia. However, the band resurrected again, this time in two factions—frontman Nenad Janković (who fled to Belgrade hours before the war in Bosnia and Herzegovina) restarted Zabranjeno Pušenje, referred to as Belgrade Zabranjeno Pušenje, while the main composer Davor Sučić, based in Zagreb, also started the band Zabranjeno Pusenje, referred to as Sarajevo Zabranjeno Pušenje, which remains active today as the legal successor of the original setup. In 1998, the world-renowned director Emir Kusturica joined the Belgrade faction, completely taking over the identity, and changing the name and concept to Emir Kusturica & No Smoking Orchestra. Since 2011, the band continued without Nenad Janković, who works under his previous established identity, as Dr.

Nele Karajlić. The core strength of New Primitivism lies in the humorous perception produced by translating the universal into the local (Prica, 1990, pg. 26)—where the setting of the work of Zabranjeno Pušenje is rooted - addressing sensitive social and political topics, humorously portraying the flaws of the Yugoslav order.

THE LYRICS

The point of view: Azra

Branimir Štulić is undoubtedly the most influential and famous (Croatian) singer-songwriter name of the New Wave. His intrinsic analysis and criticism of society, as well as the general critique of the political system, are directly or indirectly visible in most of his songs (Mrnjavčić, 2015). In songs like "The Time of Decision", "Do Something", "Hard Times", "I Can't Help Any of Us", "041", "Horror Is My Thing", "Smart and Bookish People", "When Miki Says He's Afraid", Štulić offers detailed portraits of individuals caught in the grind of modernity – overwhelmed by what is happening to them, paralyzed by the actions of others, simply angry and frustrated (Čirić, 2007, pg. 61). Zlatomir Gajić (2018, pg.181) believes that before Azra, there wasn't such a direct and unfiltered addressing of societal anomalies. And there are many of them: "Bloody Mary" (1980), where the consumerist peak of Yugoslav socialism is described – shopping tours in Trieste (Gajić, 2018, p. 248). Also, the portrait of a character "who has a successful career and works whenever he feels like it", is a portrait of an individual's disillusionment with a system in which he doesn't see a solid foundation or personal advancement through an honest and humane approach to everyday life. Instead, the lack of opportunities for planned advancement in the social hierarchy is compensated for by living on the edge of social conventions, acquiring material goods by any means necessary (Gajić, 2018, p. 248). In a similar context, but reflecting a heightened level of societal frustration, the song "Damn Angry" (1982) critiques the "all-out scramble for living space and titles," highlighting the ruthless pursuit of these goals without regard for the means employed. On the same album, Straight to the Bottom (1982), the song titled "Born to be a meek", which, according to Josip Čirić (2012, pg. 60), is the most disturbing one – a description of a person whose life is determined by the ambitions of others and who sees no meaning in what he is. "Horror Is My Thing" (1981) is a sharp commentary on urban and societal decay: "students without diplomas, women without beauty, bachelors without apartments, travelers without money" - society devastated in every segment. In the song "Always the Same Story" (1981), there is a high level of frustration with the inconsistencies of society, primarily targeting bureaucracy, the dysfunctional and corrupt, incompetence rewarding system. Through the song, it becomes evident that under socialism, work efficiency was generally low, reflecting the undervaluation of labor. At the same time, administrative roles were held in higher regard, offering better salaries and prestige, which is pretty unusual for working class ruled society. Clearly, even during that period, there were significant wage disparities

within the workforce. The pro-market economic reforms of the 1960s in Yugoslavia caused significant wage differences. Allegations of a huge discrepancy between the common worker's pay and that of a manager were widespread (Mihajlević, 2019, p. 34). Azra addresses the issue of nepotism and favoritism directly in the song "Strange Habits" (1981), where the protagonist "got hired through connections." This critique highlights a pervasive issue common in bureaucratically burdened societies, where personal connections and favoritism often supersede merit, perpetuating inequality and hindering social mobility. Disillusionment with bureaucracy is also evident in "When Miki Says He's Afraid" (1981), which observes the leveling mechanisms in Socialist Yugoslavia. One verse, "He bought an expensive car, now they're teasing him," reflects how, even in a society remembered (by the Yugonostalgia) for its egalitarianism, individuals who stand out, like the character who bought an expensive car, are singled out and mocked – a reminiscent of the Tall Poppy Syndrome observed and examined mainly in the Western societies and literature. Tall poppies are usually individuals who, on the basis of unwarranted self-adulation, itself a consequence of success, amassed fortune or fame, and have become targets for criticism; or, less frequently, individuals who, overcome by success, amassed fortune or fame, and on the mistaken assumption that they are above the law, have engaged in unlawful behavior, only to find that, eventually, the law catches up with them as well (Peeters, 2004). Social incompatibility is also woven into the song "Woman of Another System" (1980), where the protagonist is depicted as a woman with refined manners that are foreign to her surroundings, as the title itself suggests.

Elaborate protest is also present in the song "Weekly Commentary", where the group calls attention to the media practice of attacking people with different political ideas and alludes to Yugoslavia's presumption of being "the center of the world" in some usually ill-defined sense (Ramet, 2019, p. 115). Open resistance to the political regime is expressed through a paraphrase of verses from the partisan song "With Marshal Tito" (Mrnjavčić, 2015): "I'm reading the Sunday commentary which clearly says, whoever doesn't think this way is slandering and lying." Štulić also critiques media manipulation and the servility of system supporters within a dystopian urban setting in the song "City Without Love" (1981). A similar frustration with state-controlled media, misinformation, and the suppression of independent thought is echoed in "Satisfaction" (1987), further expressing disillusionment with the manipulation of public perception. Strong critiques of conformity, the fear-based pattern of everyday life, societal trends, rejection of societal pressure, media manipulation, norms, and expectations are shown in the song "Kiss Me" (1981). In "Sunny Side of the Street" (1981), through the point of view of a lonely and isolated participant in urban everyday setting, Štulić refers to people's preoccupations and worries about daily tasks, work, and societal pressure.

In "Don't Hit the Head, D.P." (1981), where the initials D.P. refer to "blue comrade" or police officer, the song delves into themes of personal freedom, particularly the desire for autonomy over narcotic use, while simultaneously addressing the issue of police brutality. The symbolism embedded in both the lyrics and the title reflects a broader societal acceptance of repression, portraying the tension between individual

liberty and authoritarian control as a normalized, yet troubling, aspect of everyday life; "68" is for failed revolutionaries, "Pavel" for romantic revolutionaries, "Bitter Taste" for political exiles, specifically referencing the ban on the collection of poems Woolen Times and the persecution of the author Gojko Djogo (Janjatović, 1998).

The song "Sons of Deceit" evokes a profound sense of fear, paranoia, and disappointment. The identity of "they" in the line "they are coming" remains deliberately ambiguous, leaving it unclear who or what this unstoppable force represents. Whether it's a reference to a political regime, societal pressures, or a more abstract threat, the portrayal of "they" as an inevitable, overpowering presence heightens the song's sense of dread and helplessness. According to some sources, the record company "Jugoton" insisted that the title of the song "Sons of Deceit" should include a note saying it is directed against "imperialism and hegemony,", and in addition, censoring the verse "The Russians are coming". It is believed that in the 1980s, Štulić was panic-stricken that the borders would be closed, that Yugoslavia would be occupied by the Soviets, and that he would be trapped in Yugoslavia forever (Radoš, 2022).

According to Jergović (2015), the song titled "Poland in My Heart" (1981) is the "birthplace of Yugoslav anti-communism". Dedicated to the emergence of the independent trade union Solidarity in Poland in 1980 (Ramet, 2019), it reflects the author's sentiment towards the societal conditions at the time. The song title "Who's Singing Over There" is borrowed from the movie comedy, directed by Slobodan Šijan in 1980, about petty bourgeois hypocrisy and the collapse of the Kingdom of Yugoslavia during World War II (Mrnjavčić, 2015). The song is dedicated to Josip Broz Tito, and instead of addressing him as "comrade," Štulić refers to him as "relative" throughout the song, rhetorically asking him, "Where to next?" while also telling him that abandoned girls, drug addicts, and prostitutes depend on him. What can be drawn from the sarcastic references is a sense of political inconsistency in Yugoslavia, lost direction, and ultimately decadent results in society. References to Tito are also present in the songs "A Bunch of Discord" and "Spring Is the 13th of December", dedicated to the dismantling of his cult (Mrnjavčić, 2015).

In the later albums, there is a noticeable shift in theme, reflecting the subject's growing despair over the political and social impossibility of change. In the songs from the album Between Extremes, Štulić completely abandons the critique of society and government (Mrnjavčić, 2015), and in later albums, Azra expresses a shift in focus, reflecting on personal disillusionment and societal struggles, marking a departure from Štulić's earlier politically charged critiques, opting instead for more introspective themes and a subtle critique of the human condition (Mrnjavčić, 2015).

Point of view: Zabranjeno Pušenje

The majority of Zabranjeno Pušenje's musical works contain social and/or political commentary. Some are deeply embedded in metaphor, such as "Sunday When Hase Left" (1985), which tells the story of footballer Asim Ferhatović Hase's departure, but

in reality, refers to the death of Josip Broz Tito, with lines like "The flags of the 'Koševo' stadium lowered, a Sunday stopped so May, May could continue" Similarly, "Pklatovi" (I and II, 1989) is entirely shrouded in metaphor, leaving the lyrics open to interpretation—one of which suggests that the "Pklatovi" may represent the invasion of corrupt politicians. Some songs are more transparent: in "Selena, Come Back, Selena", the idealization of Western societies and the erosion of local culture and identity under the influence of Western values is criticized through metaphors. In "Pisonja and Žuga in the Hell of Drugs" (1989), a reference is made to the state of drug problems and societal decadence. "Girls with Fragrant Skin" (1985) refers to the culture of social pretense and fabricating backgrounds in order to gain admiration—reflecting societal pressure to conform to an image of success.

In the song "Journey in the Center of the Kreka-Banovići Mine" (1984), the protagonist, a ghost of a deceased miner, who died in a mining accident, mockingly watches charity concerts on TV, and then visits the castles of the revolutionaries from the 'fifties', evoking the irony of how the socialists very soon became precisely what they fought against (a reference to the Yugoslav red bourgeoisie). Thematically close to the story of Kreka Banovići, about the misdirection and inconsistency of the system, references are also found in the lyrics of the work "Heart, Hands, and a Shovel" (1987): the protagonist of the story is Alija Sirotanović, Hero of Socialist Labor of Yugoslavia—a symbol of the rebuilding efforts of post-World War II Yugoslavia, who, in the wake of industrialization and modernization, started to be forgotten, symbolizing the loss of personal connection to socialist values. In the song "Abid" (1984), through dialogue and a series of metaphors, the main protagonist, Abid, embodies optimism and enthusiasm as he tirelessly works for a better future. Despite being fully aware of the corruption and unfairness within the system, Abid remains dedicated to his efforts. The narrator subtly guides the conversation, further emphasizing the tension between Abid's hopeful outlook and the harsh realities of the world around him.

In the song "Wolf" (1985), the narrator yearns to embody the traits of a wolf, a necessity in a cutthroat society where one must metaphorically "step over dead bodies" to survive and succeed—a cynical commentary likely born from observing the realities of the time. Political inconsistency is also addressed in "Brut" (1985), where the story follows a character who transforms from an ordinary individual into "someone important." When reuniting with his old group of friends, he promises them a factory—symbolizing the hollow political promises that go unfulfilled.

"The Boss's Son" satirically portrays the daily life of a character surrounded by wealth and privilege. The verse "today I got my new Porsche and I'll take a little ride with it, because… I am the Boss's Son!" encapsulates the stark irony of a society where the children of leaders who advocate for equality live in luxury and hedonism. This highlights the inconsistency between the promoted ideals and the realities of the elite's lifestyle. The song "Murga the Cop" (1987) tells the story of Murga, a police officer notorious for his brutal enforcement of "law and order." In one instance, Murga mistreats the son of a prominent leader, but once he realizes the boy's identity, he bows and apologizes. This scene symbolizes the abuse of power and the corruption

within the system, where authority figures oppress ordinary citizens yet remain submissive to the elite. One of the most controversial songs by Zabranjeno Pušenje, "Republic Day" (1987), contains multiple references to the state of Yugoslav society, with a part where the protagonist, Dragan, nostalgically longs for the better times of the past on the day of the creation of the SFRY – explicitly pointing out that in the context of nostalgia, including Yugonostalgia, the time passed is always the better one. One of the most explicit critiques of socialism's inconsistencies is found in the song "Good Friends" (1987). It begins by invoking the familiar proverb, "Money spins where a drill cannot," symbolizing the influence of wealth. The song then becomes more specific, stating that "money can buy you politicians, judges, and newspapers," cynically highlighting the deep-rooted corruption within the political system and society at large. However, this critique is cleverly masked beneath an optimistic narrative suggesting that, despite everything, money cannot buy (only) sincerity and true friendship. A subtle critique of social stagnation and inequality is present in the song "The Ballad of Pišonja and Žuga" (1987), where two teenagers steal a bus, driven by their desire to visit the seaside—one of the hallmarks of Yugoslav tourism, symbolizing the idea that everyone could afford a vacation. After their plan fails, the protagonists gaze at the moon and ask rhetorically: "How can some go up (the Moon), while we can't even go to the sea?" This line powerfully illustrates the contrast between society's advancements, like reaching the Moon, and the inability of ordinary people to afford even a modest holiday, highlighting the persistent inequalities.

In the song "Uncle Sam," the protagonist is a Yugoslav citizen who owes $6,000 on the day the debt is due, symbolizing Yugoslavia's economic subjugation. The character attempts to justify the debt by stating that the country is still developing and trade exchange is weak, adding that "our wealth is brotherhood and unity, and the legacy of the People's Liberation War." Uncle Sam, the personification of the U.S. responds by asserting that he "buys everything," illustrating how, in order to service its debt, Yugoslavia is willing to surrender its core values—values that Western powers are willing to take. Zabranjeno Pušenje also refers to emigration in Yugoslav society. The temporary employment of Yugoslav citizens in Western countries was one of the most important migration phenomena in socialist Yugoslavia. In the early 1970s, one in every four Yugoslavs employed outside of agriculture and craft work was a Gastarbeiter (guest worker), representing Europe's second-highest emigration rate (Bernard, 2019). In "While You're Heading Towards Germany", the harsh and exploitative conditions in work abroad (specifically West Germany) are portrayed, emphasizing the personal sacrifice of the protagonist to have "a beautiful white German car". The harsh realities of illegal, morally questionable, and degrading work abroad are vividly portrayed in "All or Nothing." The protagonist is lured by false promises that "the job is good, and the earnings are easy," and promptly leaves for the West, presumably the Netherlands. As the story unfolds, it is implied that he has died, and Šefket Ramadani, the character who arranged the job, sends 3,000 German marks to his family. The author cynically remarks, "that's how much life abroad seems to be worth (in the West)," illustrating the devaluation of Yugoslav workers in Western societies and the reality of their exploitation. The situation with

migration trends in Yugoslavia is also illustrated in the controversial "Republic Day" (1987) – the verse "Everyone is waiting for a passport to go abroad" was censored, but only in a substantive manner: the word "everyone" was removed, so in the final version, "they are waiting for a passport to go abroad" was allowed. Davor Sučić, the author of the song, explained in an interview (Balkast, 2023) that they had to agree to the "censorship" because the very verse containing the word "everyone" is factually inaccurate. However, the final version is still precise in explaining the situation that many people saw their future outside Yugoslavia. A different type of migration is metaphorically addressed in the song "Cheyenne are Leaving" from Zabranjeno Pušenje's first album, Das ist Walter (1984). The lyrics describe the Cheyenne tribe leaving their land without resistance because it is "too small for two," while the Shoshone advance—serving as a metaphor for the situation in Kosovo and the mass displacement of the Serb population. The song's author, Nenad Janković, later elaborated on this metaphor in his book Closing Time in Sarajevo (2014), where he recalls being summoned to the Secretariat of Internal Affairs in Sarajevo even before the album's release to explain the song's meaning, highlighting its politically sensitive nature.

The Kosovo issue is again portrayed on the final, strongly politically charged album, Little Stories of Great Love (1989). In "The Guard Next to Prizren", the tragedies of war and the immense losses as a result of the manipulation of political leaders and political ambitions are depicted. Similar, almost apocalyptic, prophetic narratives are present in "Drina Canyon", and "Star Over the Balkans". The first is full of metaphors and geography-driven symbolism (river Drina, mountain Romanija, Brijuni islands) illustrating personal anxiety in an atmosphere of societal regression and accumulation of power by corrupt political leaders, but with a glimpse of optimism—"the snow is melting, nothing will stop the arrival of a new spring (meaning: changes)." The final song of the album, and of the band, called "Star Over the Balkans", presents dreamlike, symbolic imagery where, since ancient times, a bright star—representing the star of war—has been expected to appear. In the end, the narrator reveals that he dreamt it finally did, which shows that the fears of a bloody outcome in the Yugoslav wars (1991–1995) were justified, and the reasons for the conflict were evident. With this song, the album ends, the band disbands, and so does Yugoslavia.

RESULTS AND DISCUSSION

The analysis of the lyrics produced by Azra and Zabranjeno Pušenje offers a critique of Yugoslav society during the 1980s, providing key insights into the complexities and contradictions inherent in the socialist state. Both bands, utilizing different stylistic approaches, present an alternative perspective to the commonly nostalgic view of Yugoslavia, critically engaging with the political, social, and cultural context of the period. Their music functions as a form of dissent, highlighting systemic contradictions, social decline, and the growing disillusionment that characterized the

late socialist era.

Azra's lyrics focus primarily on the systemic dysfunction within Yugoslav society, highlighting social decay, bureaucratic inefficiency, and the prevalence of nepotism, where personal connections often take precedence over merit. The band critiques the rewarding of incompetence, low work efficiency, and widening wage disparities, while also addressing media manipulation and state repression. Through this lens, Azra portraits a society where corruption and structural pressures hinder individual advancement and autonomy.

Zabranjeno Pušenje directs its critique towards the erosion of socialist values and the rise of a corrupt political elite. Their lyrics emphasize societal decay, cultural degradation, and the personal sacrifices linked to emigration, reflecting a broader sense of disillusionment with the society. Through apocalyptic narratives and reflections on social regression, the band critiques the tragedies of war and expresses anxieties about the impending disintegration of Yugoslavia. Both bands, in different ways, articulate a profound sense of disillusionment with the socialist state, offering critical insights into its systemic failures and cultural decline.

As the 1980s progressed, Štulić's lyrics evolved from overt political commentary to more introspective themes, mirroring the deepening economic and political crises of the period. His later songs reflect a personal sense of disillusionment and resignation, marking a shift from societal critique to an exploration of individual struggles within a decaying system. This transition symbolizes the broader loss of faith in the socialist project and underscores the internal conflict experienced by many in the face of the regime's failures.

In contrast to Azra, whose social and political commentary is concentrated in the early stages of the band's work, Zabranjeno Pušenje demonstrates a gradual evolution, culminating in their final album, where apocalyptic war narratives take center stage. This thematic progression reflects the intensifying political and social anxieties that accompanied the dissolution of Yugoslavia.

Although these artistic expressions may not fully capture the complexities of daily life and the political order of the time, they hold significant interpretative value when contextualized alongside scholarly sources. In conjunction with academic research, the lyrics of Azra and Zabranjeno Pušenje offer a multidimensional lens through which to analyze the socio-political realities of the period, providing a better understanding of historical conditions.

Finally, Josip Ćirić (2012, p. 63) asserts that Štulić's critique of the state's tendency to label dissenters as dangerous, while dictating acceptable norms and threatening those who challenge the status quo with accusations of slander, remains as relevant today as it was in the 1980s. While Ćirić's "today" refers to 2012, the conclusion is timeless, refuting the Yugo-nostalgic notion that modern societies are in decline. Rather, it suggests that the systemic issues critiqued by these bands—bureaucratic inefficiency, repression, and corruption—are enduring social dynamics that transcend specific historical contexts.

Thus, the lyrical critiques offered by Azra and Zabranjeno Pušenje serve not only as a reflection of the socio-political challenges of the 1980s but also as a broader

commentary on the enduring struggles of individuals within flawed systems, both past and present. This analysis underscores the enduring relevance of their work in understanding the decline of socialist ideals and their impact on society and culture.

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MODERN CHANGES IN HOUSEHOLDS IN THE REPUBLIC OF NORTH MACEDONIA

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ABSTRACT

Households represent some kind of peculiar cells in human society, special socio-economic communities, and demographic cores in which everything connected to the population changes takes place. Still, at the same time, they represent significant working units.

Data analysis shows that the number of households in the country notes a continuous increase in all inter-census periods, mainly following the changes in the population total number, except the last inter-census period. From 2002 to 2021, opposite to the total population reduction, the number of households has increased by 34,336 or 6.08%. Nearly a third of the households in 2021 were concentrated in the Skopje region. Parallel to the increase in the number of households, the process of their weakening in terms of demographic potential is taking place because on average, 3.07 people were registered in one household. The trend of increasing number of single-person households is pronounced as well.

The paper aims to show the modern changes in households in the last inter-census period, the regional specificities, with a special reference to households according to family composition, household size, and single-person households, but also a comparison between households in rural and urban areas.

Keywords: households, household size, individual households, family households, single-person households

INTRODUCTION

Considering that people are biological, but also social beings, forming the biosocial system, they are subject to the natural and social laws of development. As a social being, people form social groups and communities in which they organize

their lives.

One of those communities are households, which can be considered as special socio-economic communities where the overall life of individuals in a given society, that is, the population of a specific area, takes place. As the eminent Macedonian geographer Mitko Panov (1985) once stated: "Households represent basic population nuclei, while in the field of economy, they are basic work units". The demographic aspect of households is essential because more population elements can be perceived and their development can be predicted. Therefore, studying the households' structure is crucial (Panov, 1985).

Households in demogeography are defined as a kind of cells of human society, special socio-economic communities, demographic cores in which population changes take place, and at the same time important work units. Especially, they build the basic component of the development of particular areas, because through their characteristics they represent the basis for many socio-geographical processes and have an impact on the development of society in general (Madjevikj, 2011). In the direction of observing all segments of the demo-geographical development, it is inevitable to observe the development processes and changes in households, at the same time following the changes in socioeconomic development.

The overall development of the Republic of North Macedonia in the second half of the twentieth century was marked by the intense socio-economic changes accompanied by increased mobility of the population, its spatial conversion, and movement towards the more attractive parts of the country, which offered more favorable living and working conditions (Apostolovska Toshevska et al., 2017). That way, migration contributed to the relocation of the population and, relocation of individual members or entire households which was reflected in their spatial distribution and their demographic and socio-economic characteristics.

For those reasons, households as separate units with their characteristics should be the subject of special scientific interest. The transformations that occur within the framework of overall living and the need to plan and direct demographic development contribute to the inclusion of household research which covers household number, size, structure, and spatial distribution as an integral part of all population surveys.

The subject of research in the paper are the households in the Republic of North Macedonia and the changes that marked their development in the past period. In general, the most significant characteristics of households, their dynamics, and size (members per household), with special emphasis on the spatial aspect, have been elaborated. They are analyzed based on relevant statistical data from the censuses of the population, households, and dwellings that were conducted in the country, starting from 1948, till the last census in 2021.

The basis of the statistical data for households are the census data obtained through the household questionnaire, in which all members are recorded according to the criteria of kinship with the person who heads the household. The volume of questions contained in these questionnaires allows for a larger type of information and more detailed research of households, and this research uses data that can help understand the latest transformations in households.

METHOD

Household is a complex demographic-statistical category that is usually defined as a group of persons who live together and spend part of their income together (Nejašmić, 2005; Smajić, Kadusic, 2015).

According to the census methodology, a household is understood as any family or other group of persons who are declared to live together and jointly spend their income to meet basic life needs such as housing, food, etc., regardless of whether all members are constantly located in the place where the household is settled or some of them stay for a certain time in another place, that is, a foreign country, for work, schooling or other reasons. Following the definition of the total population, the total number of households includes households in which at least one person belongs to the total (resident) population category. Every person who lives alone ("single-person household") and who does not have his or her household elsewhere is considered a household. A single household can be settled in a separate or shared apartment, as a single tenant, or in a hotel for singles, etc., regardless of whether they live in the same room with another single person or with members of the landlord`s household, but does not spend their revenues together. A household is also considered a so-called collective household, i.e. a household of persons who live in institutions for the permanent care of children and adults, in monasteries and convents, and in hospitals for the accommodation of the terminally ill.

From a methodological point of view, the definition of a household is almost the same in all censuses, and households are treated as separate census units. With the census in 1953, the notion of two types of basic communities began to be monitored and differentiated: household as an economic community and family as a biological community. In the censuses, all members of the household who are permanent residents were recorded, regardless of whether they were found in the home at the time of the census or were temporarily absent.

Apart from the Censuses of the population, households, and dwellings, we can also obtain data on households from other surveys, especially surveys that focus on households and their socio-geographical characteristics. The United Nations Principles and Recommendations for Population and Housing Censuses classifies a household into one of two categories: a) a one-person household, in which one person makes provision for his or her food or other essentials for living without combining with any other person; or b) a multi-person household of two or more persons living together who make common provision for food or other essentials for living. Persons in a multi-person household may pool their incomes and have a common budget to a greater or lesser extent; they may be related or unrelated persons or a combination of persons both related and unrelated. The principles and recommendations note that an alternative definition used in many countries exemplifies the so-called household-dwelling concept, wherein a household consists of all persons living together in a housing unit. By both definitions, households are distinguishable from families in that: a) a household may consist of only one person, but a family must contain at least two members; and b) the members of a multi-person

household need not to be related to each other, while the members of a family must be related. Thus, a household may contain more than one family or no families at all, as in one-person households and households comprised of unrelated members (UN, 2022).

Households, apart from the number of members, can be analyzed according to other different criteria as well. What is particularly interesting, is their classification as individual and collective, their family composition, whether they are located in an urban or rural environment, etc.

From a demo-geographic point of view, we see households as a factor that in its specific way forms the structure of the population component in a particular area, because households, through their number and characteristics, represent a basic framework for the development of complex socio-geographical processes.

They have a significant role and a strong influence on socio-economic processes and transformations, through them, we perceive the characteristics of some of the development specificities of a particular area that have occurred so far. Based on the knowledge of their so far development, it is possible to forecast future development, predict and evaluate the directions of the development of other population elements, the population framework for carrying out certain economic and non-economic activities, to plan the future needs of different areas and more. For those reasons, knowing the situation with households has many-sided theoretical and practical significance. When researching the population of the Republic of Macedonia, it is inevitable to research the demographic aspects of households, the transformations that occur, and their territorial distribution (Madjevikj, 2011).

In previous geographic surveys, household data are often presented as an integral part of population surveys in combination with the number of the population (Daskalovski, 1985), or when studying the demographic development of the rural population (Daskalovski, 1999). Among the papers devoted entirely to household research, we should mention: the research on the dynamics and structural changes of households in SR Macedonia in the period from 1961 to 1981 (Panov, 1985), on households as a factor of agricultural production (Madjevikj, Apostolovska Toshevska, 2004), single-person households (Madjevikj, 2011), etc.

The study of households in this research is mostly done on a national and regional level (NTES 3), and partly at the NTES 4 level (municipalities). A total of eight statistical-planning regions have been set in the country, and in terms of administrative-territorial organization, there are a total of 80 municipalities (NTES 4). The analysis refers to individual households, which make up the largest part of households in the country.

RESULTS

Changes in the number of households and the average household size

The multiple changes in the demo-geographical development of the Republic of North Macedonia that took place in the past period were also reflected in the changes

in households. The transformations in social life, primarily of family and individual households, in conditions of stratification of larger families and households into smaller units according to their size, combined with the changes in the total population number, have a strong impact on the number and size of households. Any increase or decrease in the population, in conditions of intense changes in socio-economic living, the transformation of social occasions, etc., has visible implications on households as well. In that context, the changes that took place in our country from the second half of the twentieth century until today, primarily the processes of de-agrarization, industrialization, and urbanization, had a complex impact on the number and size of households. These processes led to changes in the economic and educational structure of the population, and then, to changes in the birth and fertility rates, and gross reproduction rates, which reflected the reduction of the number of members in the household.

Table 1. Number of households in the Republic of North Macedonia.

Year	Households	Population	Index, 1948=100		Members per household
			Household	Population	
1948	218819	1152986	100	100	5,27
1953	246313	1304514	112,6	113,1	5,30
1961	280214	1406003	128,1	121,9	5,02
1971	352034	1647308	160,9	142,9	4,68
1981	435372	1909136	199,0	168,8	4,39
1994	501963	1945932	229,4	165,6	3,88
2002	564296	2022547	257,9	175,4	3,58
2021	598632	1836713	273,6	159,3	3,07

Source: Statistical Yearbook of the Republic of North Macedonia, 2004 and 2023 https://www.stat.gov.mk/PrikaziPublikacija_1.aspx?rbr=897, last accessed March 27, 2023

The analysis of the relevant statistical data for the households shows that the continuous increase in their number is what marked their development during the analyzed period. Their number almost doubled in the period 1948-1981, that is, an increase of 99%, and their number continued to increase in the following period so from 1981 to 2021 it increased by 37.5%. According to the latest trends in the total population number change, the rate of increase compared to previous periods is lower and in the last inter-census period the number of households increased by only 6.08%.

The presented changes in the household number during the entire analyzed period show a positive value, but it has its specifics if it is compared with the change in the number of the population. In the first inter-census period 1948-1953, the change was similar to the total population dynamics. However, the transformations that took place in social and economic life since the sixties of the last century had a strong impact on the number and structure of households. The disintegration of traditional households consisting of several families and the transition to households consisting mostly of one family contributed to the increase in the number of households with a greater intensity than the changes in the total population number.

That change took place for several decades, and in the last inter-census period, although a decrease in the number of the population was recorded, an increase (but not that large) in the number of households was still registered.

From a geographical point of view, the spatial differences that are manifested in the changes in household numbers and their distribution are significant. To understand them better, an analysis at the NTES 3 level (statistical regions) for the period 2002-2021 is given in Table 2.

Table 2. Number of households per region in 2002 and 2021.

Regions	Census year		index	Concentration		Members per household	
	2002	2021	2002=100	2002	2021	2002	2021
RN Macedonia	564237	598632	106,1	100,0	100,0	3,6	3,1
East	57894	55781	96,4	10,3	9,3	3,1	2,7
Northeast	46295	48401	104,5	8,2	8,1	3,5	3,2
Pelagonia	72531	72440	99,9	12,9	12,1	3,3	2,9
Polog	69089	72343	104,7	12,2	12,1	4,4	3,5
Skopje	163612	192837	117,9	29,0	32,2	3,5	3,1
Southeast	49695	52537	105,7	8,8	8,8	3,5	2,8
Southwest	57652	57500	99,7	10,2	9,6	3,8	3,1
Vardar	47469	46793	98,6	8,4	7,8	3,2	3,0

Source: Authors' calculations using https://makstat.stat.gov.mk/PXWeb/pxweb/mk/MakStat/?rxid=46ee0f64-2992-4b45-a2d9-cb4e5f7ec5ef data

The regional-level data analysis indicates that there are significant differences in the dynamics and development of households, as well as changes in their average size.

In the 2002-2021 inter-census period, four regions showed an increase in the number of households, with the largest increase in the Skopje region (17.9%), while the other four regions showed stagnation or a minimal decrease in the number of households. The largest decrease was recorded in the East region (-3.6%). In terms of territorial distribution, the majority of households in both census years are concentrated in the Skopje region, while the least in the Vardar region. The Skopje region is the only region that increased its share in the total number of households so, in 2021, 32.2% of households in the country were concentrated there. In the Southeast region, the share remained unchanged, while in all other regions, it decreased. In essence, the share in the total number of households of each region follows their share in the total population number.

This is also related to the regional and overall development of the country, i.e., the mono-centric model of development where the Skopje region stands out as the core development, while other regions stagnate or grow with less intensity compared to the previous one (Madjevikj et al., 2013). The disparities of socio-economic development are also reflected in the demographic development.

When analyzing data on a NUTS 4 level, the municipalities of Vevchani (661 households) and Lozovo (795 households) stand out with the smallest number of

households. Most frequent are municipalities with up to 5,000 households, which comprise more than half of the municipalities (46).

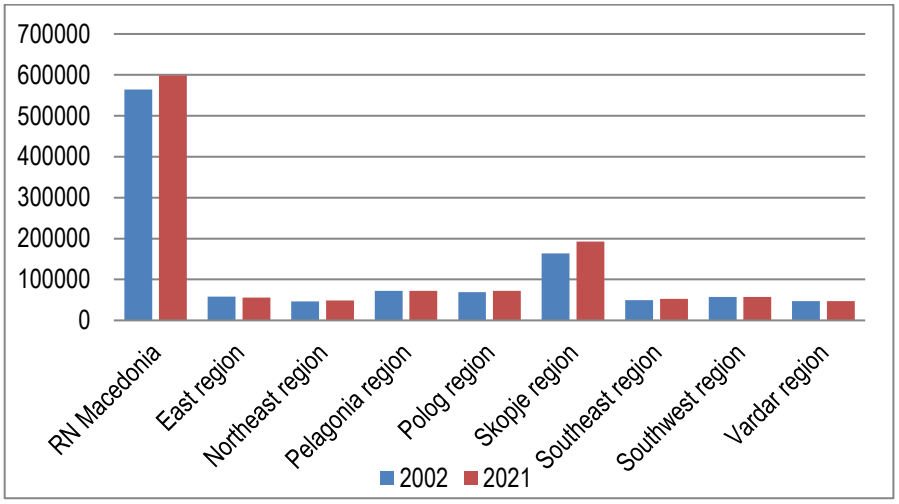


Figure 1. Number of households per region in 2002 and 2021.
Source: https://www.stat.gov.mk/PoslednoObjavenoVoMakstat_mk.aspx and author's calculations.

Seven municipalities belong to the group of up to 1,000 households, and, there are a total of 15 municipalities with 1,000-2,000 households. The largest number of households was recorded in the municipality of Kumanovo (30,450 households), which together with Bitola (30,154) are the only municipalities with over 30,000 households.

The demographic aspect of households is essential. Depending on the size and structural composition of the household, its function in society, the economic, cultural, and educational development is dictated especially in the urban and rural areas (Panov, 1985). The change in the number of the population and the number of households is also reflected in the change of the household size which is the average number of members per household. The continuous stratification of households from multi-family to single-family households since the middle of the last century has resulted in an obvious change in their size according to the average number of household members.

From the data presented in Table 2, can be noted that from once population-strong communities, whose average size exceeded five people, households have been transformed into small households over time.

According to the Census data of 1971, they consisted of less than five members, for the first time. Since 1994, their average size has been below four members. With 3.07 members per household, as data from the Census 2021 show, households are much lower in population size compared to the previous period. This situation is worrying because it is a sign of their weakening as bio-social and socio-economic

cells of society. The size of households along with the overall development, and the form of economic management are a consequence and a significant factor of any changes in the population in the domain of social, economic, and other characteristics. Accordingly, households are closely related to the complex various structural features of the population, depend on them, and at the same time exert certain feedback (Daskalovski, 1999).

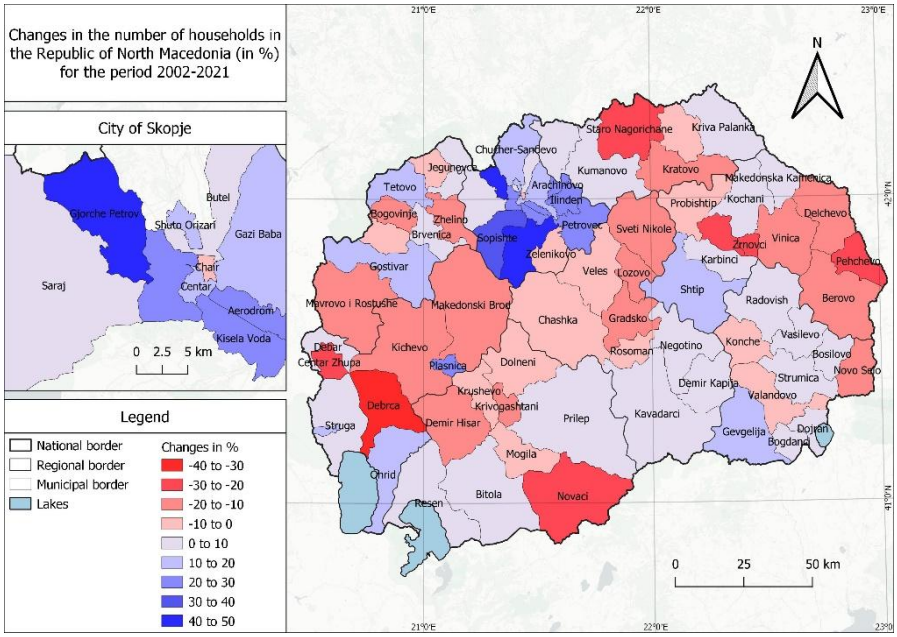


Figure 2. Changes in the number of households in the Republic of North Macedonia (in%) for the period 2002-2021.
Source: https://www.stat.gov.mk/PoslednoObjavenoVoMakstat_mk.aspx and author's calculations.

Smaller households have a greater number of limitations related to their development potentials, conditions, and opportunities. Compared to other countries, the household size is larger than that of the Republic of Serbia, where according to the 2022 Census data, the average household size was 2.55 members, while in the Republic of Croatia, according to the 2021 Census data, the average size was 2.7 members (individual households).

The situation with the size of households is even more worrying from a regional point of view. Out of the eight statistical-planning regions (NUTS 3) in 2021, the largest average number of members per household was registered in the Polog region (3.5 members), followed by the Northeast, Skopje, Southwest, and Vardar regions, which have an average household size of three persons or slightly above that value. The remaining three regions have less than three persons in a household. Opposite to this, 2002 census data show that households were larger. Polog region

was the only region that had an average number of members per household higher than four, while in all other regions, the numbers ranged between 3.1 (East region) and 3.8 people (Southwest).

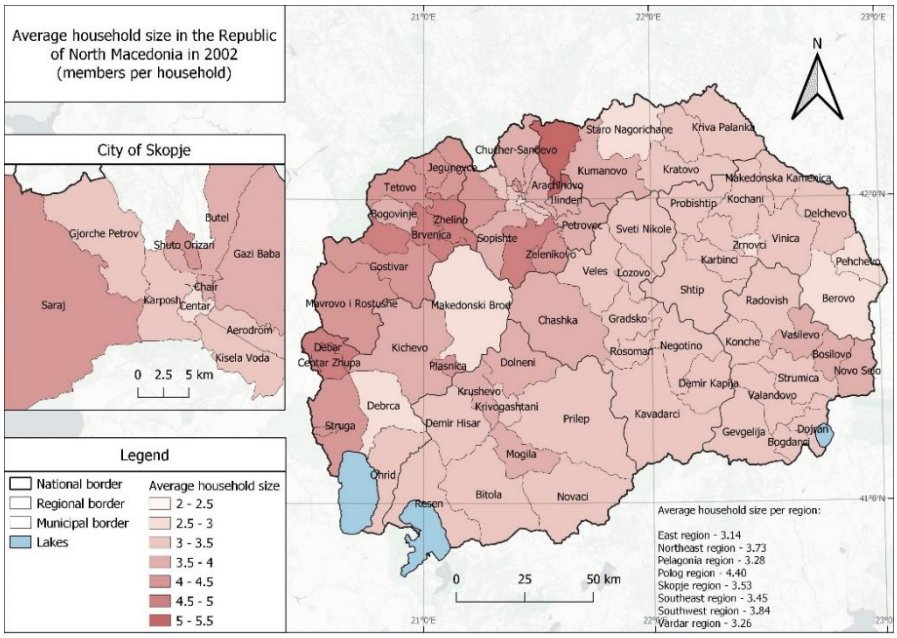


Figure 3. Average household size in the Republic of North Macedonia in 2002 (members per household).
Source: https://www.stat.gov.mk/PoslednoObjavenoVoMakstat_mk.aspx and author's calculations.

The index of change in the number of households and their size for the last inter-census period shows that the largest decrease in the size of households was recorded in the Southwest region, from 3.8 persons in 2002 to 3.1 persons in a household in 2021, which represents a decrease of 19.9%.

In 2021, according to the number of members per household, the smallest households were those in the municipalities of Makedonska Kamenica (2.43) and Novo Selo (2.49), while the largest were those of the municipalities of Arachinovo and Zhelino (4.45) and Saraj (4.44). A total of 46 municipalities had a household size smaller than or equal to the national average, while the rest had larger household sizes. Only 6 municipalities had more than four persons in a household. The number and size of households indicate serious changes but also indicate to the future directions in the development of households.

In the total number of households, individual households are dominant, participating with 99.99%. A total of 81 households in the country belong to the category of collective households.

In terms of size, the majority of households consist of two members (26.85%), and households with three or four members account for approximately one-fifth. In

fact, 83% of households have up to four members, of which 44.1% have one or two members. Even 65.7% of households belong to the category of 2, 3, or 4 members, which includes 72% of household members. Larger households have a smaller share in the total number of households. Unfortunately, we have a high proportion of single-person households and their number has doubled compared to the 2002 census data.

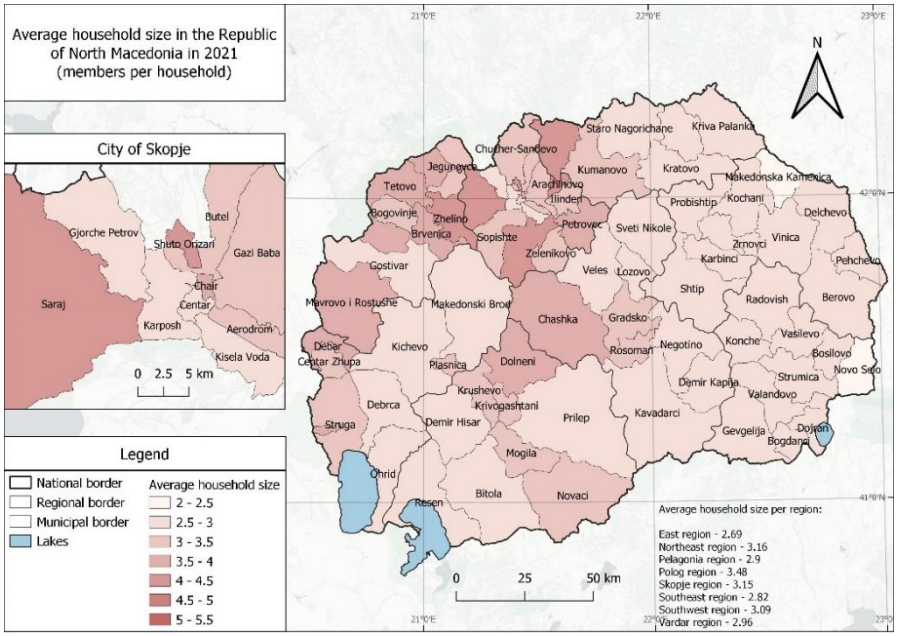


Figure 4. Average household size in the Republic of North Macedonia in 2021 (members per household).
Source: https://www.stat.gov.mk/PoslednoObjavenoVoMakstat_mk.aspx and author's calculations.

Table 3 Households, household members, and number of persons living in collective households in 2021

Households	Number		Structure	
	Households	Household members	Households	Household members
Total	598713	1836713	100	100
Individual households	598632	1833716	99,99	99,84
1 member	103237	103237	17,25	5,63
2 members	160715	321430	26,85	17,53
3 members	115732	347196	19,33	18,93
4 members	117084	468336	19,56	25,54
5 members	55102	275510	9,20	15,02
6 members	27414	164484	4,58	8,97
7 members	11056	77392	1,85	4,22
8 members and more	8292	76131	1,38	4,15
Collective households	81	2997	0,01	0,16

Source: https://www.stat.gov.mk/PoslednoObjavenoVoMakstat_mk.aspx

A great disadvantage is that census data do not provide information regarding the age of household members. Considering the intensive process of demographic aging and the increase in the population's average age, we assess that a large part of single-person households consists of people aged 65 and older, but modern living trends contribute to an increasing number of single-person households among young people as well. Namely, in modern society, the practice of establishing a single household in the period before creating a family is common (Petrović, 1995; Bobić, 2004).



Figure 5. Households and household members in 2021.
Source: https://www.stat.gov.mk/PoslednoObjavenoVoMakstat_mk.aspx and author's calculations.

In addition to these factors, the observed changes were probably influenced by a decrease in the fertility rate, a decrease in the number of marriages, an increased number of divorces (Kaludjerovic, 2018), as well as by the increase in the level of literacy and education of the population, increase in the share of the economically active population in secondary and tertiary activities, etc. (Smajić, Kadusic, 2015).

Households by the type of settlement (urban and rural)

The urban population in the country dominates which is further followed by an adequate share of households from urban and rural settlements. This situation can be analyzed on a regional and municipality level.

In the total number of households, those located in urban areas dominated, with a share of 64.4% in 2021.

The largest number of households was recorded in the Skopje region, where 73.8% of households were concentrated in urban settlements, and this share is

similar to the one in the Vardar region, which has the highest value (74%). The smallest share of households from urban settlements was recorded in the Polog region (39.6%), while less than half of the households in the Southeast region were registered in urban areas.

Table 4. Households by the type of settlement (urban and rural) in 2021.

Regions	Number of households						Structure	
	Total	%	Urban	%	Rural	%	Urban	Rural
RN Macedonia	598632	100,0	385571	100,0	213061	100,0	64,4	35,6
East	55781	9,3	39505	10,2	16276	7,6	70,8	29,2
Northeast	48401	8,1	30520	7,9	17881	8,4	63,1	36,9
Pelagonia	72440	12,1	52501	13,6	19939	9,4	72,5	27,5
Polog	72343	12,1	28681	7,4	43662	20,5	39,6	60,4
Skopje	192837	32,2	142381	36,9	50456	23,7	73,8	26,2
Southeast	52537	8,8	26028	6,8	26509	12,4	49,5	50,5
Southwest	57500	9,6	31339	8,1	26161	12,3	54,5	45,5
Vardar	46793	7,8	34616	9,0	12177	5,7	74,0	26,0

Source: https://www.stat.gov.mk/PoslednoObjavenoVoMakstat_mk.aspx and authors' calculations.

On the other hand, the share of households located in rural settlements is lowest in the Vardar region, while it is highest in the Polog region, exceeding 60%.

Given that the largest number of households are located in the Skopje region, this region has the highest concentration of households from urban (36.9%) and rural settlements (23.7%) in the country.

The Polog and Pelagonia regions have an identical share in the total number of households, with the one difference that the Pelagonia region has almost twice the share of urban households, while the Polog region has a larger share of households in rural areas.

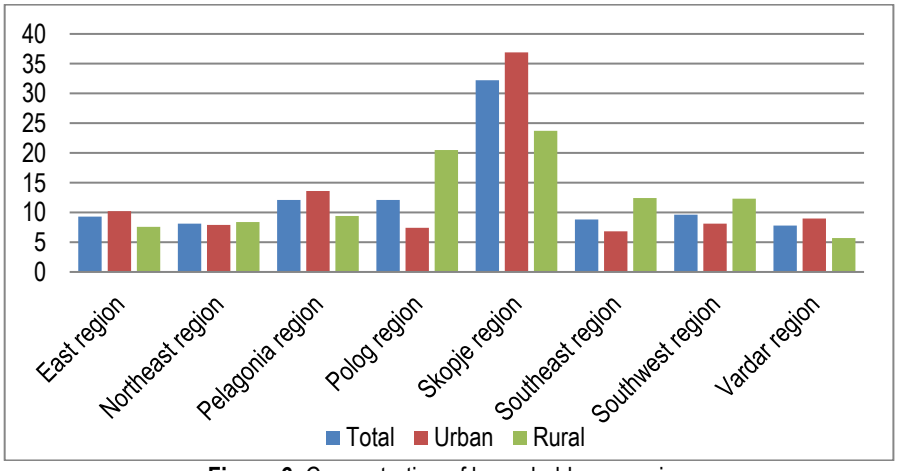


Figure 6. Concentration of households per region.
Source: https://www.stat.gov.mk/PoslednoObjavenoVoMakstat_mk.aspx and authors' calculations.

The number of households in urban and rural settlements is changing compared to the previous period but the existence of a large number of single households, mainly composed of persons older than 65, especially in rural areas, is a prerequisite for serious economic and social problems (Madjevikj, Apostolovska Toshevska, 2004).

Households by family composition

It was the changes in the size of the families in correlation with the influence of other factors that contributed to the increase in the number of households. Although scientists tend to assume that a household is synonymous with a family, the number of non-standard family and non-family households is increasing (Wallace, 2002).

Therefore, the research on households by family composition is very challenging. Unfortunately, there is no available data on the number of households according to family composition, so researchers must analyse the number of members per household indirectly based on family composition. It's interesting to see how these factors impact household dynamics.

In terms of family composition on a national level, 92.9% of household members are in family households, while 7.1% are in non-family households. In family households, the majority are in single-family households, which account for 82.2% of members in family households, while 17.8% are in multi-family households. In the category of non-family households, 78.9% of the members belong to single-person households, while 21.1% belong to households composed of several members.

Table 5. Number of household members according to family composition and type of settlement, 2021.

Type of household	Number of household members						Structure (%)	
	Total	%	Urban	%	Rural	%	Urban	Rural
Total	1836713	100	1131356	100	705357	100	61,6	38,4
Family households	1705805	92,9	1041469	92,1	664336	94,2	61,1	38,9
One family households	1401814	76,3	892878	78,9	508936	72,2	63,7	36,3
Multy-family households	303991	16,6	148591	13,1	155400	22,0	48,9	51,1
Non-family households	130908	7,1	89887	8,0	41021	5,8	68,7	31,3
Single person	103237	5,6	70916	6,3	32321	4,6	68,7	31,3
Multiple people	27671	1,5	18971	1,7	8700	1,2	68,6	31,4

Source: https://www.stat.gov.mk/PoslednoObjavenoVoMakstat_mk.aspx and authors' calculations.

The analysis of households by family composition considering the type of settlement gives even more interesting results. A greater part i.e., 61.1% of the members of family households are in urban areas, while 38.9% are in rural areas. Even 63.7% of people live in single-family households in urban areas, compared to

36.3% in rural areas. When it comes to multi-family households, the differences are smaller, but their higher share in rural areas by several percentages is evident and they represent 51.1% of the total number of members in multi-family households. In terms of non-family households, the situation is similar to that of family households, with over two-thirds of members located in households in urban areas.

The separate analysis of urban and rural households shows that in the structure, the share of members from family households is slightly higher in rural areas (94.2%), but in single-family households, it is higher in urban settlements (78.9%). In households with multiple families, the share of members is higher in rural areas (22%). The intense demographic changes have resulted in a higher share of members in single-person households and other non-family households from the urban areas.

The intense demographic changes have contributed to an increase in the number of single-person households and socioeconomic changes. In the past, migration from rural towards urban settlements, not only caused a significant reduction in the population number in some parts of the municipalities but as a consequence of these migration processes occurred the process of de-agrarisation or abandonment of the agricultural land (Ljakoska, Madjevikj, 2017). On the other hand, the intensive process of de-agrarianization came as a result of the appearance of single-person households, mostly composed of persons of the older age groups, i.e., older than 65. Also, the inappropriate and rapid transition from one type of household to another, for example from agricultural to non-agricultural or mixed type, weakened the economic aspect of the household and its function in rural areas (Panov, 1985). The presence of single-person households is also increasing in urban areas.

The analyzed trends, which show that there has been an increase in the number of households, a decrease in their average size, as well as a change in household structure in favour of single-person households as well as those with one family, follow trends that are also present in other European countries, especially those from the eastern and southern parts of the continent, but also in the developed countries of the world (Kaludjerovic, 2018).

Even more pronounced changes in households are expected in the future. One study, based on existing projections in certain countries, predicts the continuation of the described trends. Thus, for example, an increase in the number of households with one member is predicted in almost all OECD countries (OECD, 2011).

Therefore, it is important to monitor changes in family and household structures as they are relevant to socio-economic outcomes. Paying more attention to future changes in household spatial mobility patterns is necessary (International Futures Programme, 2011), because only by knowing the situation of households it is possible to plan activities for directing the overall development.

CONCLUSION

The results obtained from household data analyses indicate the development processes that they were affected by. In general, during the entire analyzed period,

the number of households marked a continuous increase. The increase follows the total population growth, except for the period 2002-2021, when the number of the population recorded a decrease, while the number of households increased by several per cent points.

This situation is primarily due to the multi-decade stratification of larger households, which included a larger number of members. For those reasons, we have a decrease in the size of households, and thus their weakening as socio-economic communities.

The process of urbanization and the rapid increase in the number of the population in the cities, together with the intensive emigration to the urban areas and outside the country, have contributed to the increase in the number of households in the urban areas. At the same time, there are spatial differences in the distribution and size of households, with the Skopje region dominating in terms of concentration and size of households. Such a situation brings in certain problems.

The reduction of households weakens the potential for population development and creates limitations in the direction of planning future development, sustainability of certain rural areas, reduction of capacities, transformation of certain service needs and material goods, etc. In future development, all aspects of the demographic characteristics of households, their size, and spatial distribution should be taken into account.

Single-person households are a growing segment of the population (Silva et. Al., 2004). Also, the increasing number of households mainly smaller in size opens up many questions regarding the needs of households, their involvement in socio-economic flow, and the serious and numerous challenges and existential problems they face regarding their sustainability. For example, one study considering their purchasing habits, suggest that greater attention should be paid to focusing policies on increasing the purchase and consumption of healthy food in this population (Silva et. Al., 2004).

Some questions considering households have become very important in the context of global development challenges and sustainable development. Having data on households and making analyses contributes to the valorisation of the multifunctional role of households. Further research should determine the other complex changes in households that have occurred from other demographic and socioeconomic aspects, the problems they face, and the consequences of those changes. Such research should represent a new way to perceive the possibilities for potential demographic revitalization in individual areas.

For example, when it comes to energy poverty considering the types of households, the most endangered are the people who live in single-person households, primarily older persons living alone (Poljak, 2022). So, if a comprehensive concept to support energy planning is developed, it will provide conditions for analysing the effects of household transition on the overall energy system of the country, region, or local community. An integrated approach will allow making projection of future energy demands for heating, arising from household behaviour, demographic trends, energy rehabilitation trends, etc. (Pavlović, 2023).

In this regard, the regional development policy should offer a set of measures for the development of the business sector, increasing investment, improving infrastructure, as well as improving conditions in the areas of education, health, and culture (Iliev, 2019), and protecting households at risk of poverty.

Other issues that arise precisely from the demographic aspects of the households can be added also. For those reasons, it is necessary to take into account future changes in households for planning future development. The probabilistic household scenario helps policymakers, planners, and other users of estimations in the fields of housing, energy, social security, etc. in making appropriate decisions, as some household variables are more uncertain than others (Alho, Keilman, 2010).

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СОВРЕМЕНИ ПРОМЕНИ НА ДОМАЌИНСТВАТА ВО РЕПУБЛИКА СЕВЕРНА МАКЕДОНИЈА

ПРОШИРЕН АПСТРАКТ

Домаќинствата се своевидни клетки на човековото општество, посебни социо - економски заедници, демографски јадра во кои се одвиваат популациските промени, а истовремено претставуваат значајни работни единици. Тие на посебен начин ја градат

основната компонента на развојот на еден простор, бидејќи преку своите обележја претставуваат основа за многу социо - географски процеси и имаат влијание врз развитокот воопшто.

Преку нив може да се предвидат и проценат некои други популациски елементи, условите за одвивање на одредени стопански и нестопански дејности, да се планираат идните потреби и друго. Поради тие причини познавањето на состојбата со домаќинствата има многустрано теоретско и практично значење.

Како основа за анализа на домаќинствата во Северна Македонија се статистичките податоци од Пописите на населението, домаќинствата и становите. Поточно, прашалникот за домаќинство, во кој се запишани сите членови според критериумите на сродство со лицето на кое се води домаќинството претставува база на бројни податоци и информации.

Анализата на податоците покажува дека бројот на домаќинства бележи континуиран пораст во сите меѓупописни периоди. Од 2002 до 2021 година наспроти намалувањето на вкупното население, бројот на домаќинствата се зголемил за 34336 домаќинства или за 6,08%. Близу третина од домаќинствата во 2021 година биле сконцентрирани во Скопскиот регион. Паралелно со зголемување на бројот на домаќинства се одвива процес на нивно слабеење во поглед на демографскиот потенцијал и во едно домаќинство се евидентираат по 3,07 лица.

Порастот на самечки домаќинства и бројот на домаќинства воглавно со помал број на членови отвара многу прашања во поглед на потребите на домаќинствата, нивна вклученост во општествено-економските текови и сериозните и бројни предизвици и егзистенцијални проблеми со кои се соочуваат во однос на нивната одржливост.

Постојаното намалување на нивната големина е резултат на следење на современите демографски процеси и трансформациите коишто се случуваат во општеството и семејството, не само во земјата туку и пошироко. Современите промени кај домаќинствата се видливи и во сите останати нивни белези.

Територијалната дистрибуција на домаќинствата и просторните разлики коишто постојат во поглед на нивната големина, нудат информации за многу сегменти во поглед на планирање на организација и користење на просторот. Со домаќинствата се поврзани планираните потреби од многу аспекти на човековото живеење: побарувачка, потрошувачка, станбени потреби, квалитет на живеење, користење на природно-географските ресурси и.т.н.

Трудот има за цел да ги прикаже современите промени на домаќинствата во последниот меѓупописен период, територијалните специфичности, со посебен осврт на домаќинставата според семејниот состав и самечките домаќинставата. Овој вид на истражување треба да помогне во креирање на идните политики поврзани со населението, неговата структура и разместеност, но и со политиките за просторното планирање.

Клучни зборови: домаќинства, големина на домаќинство, индивидуални домаќинства, семејни домаќинства, самечки домаќинства

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CAVES INVENTORY AND DATABASE IN GALICICA NATIONAL PARK

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ABSTRACT

More than 40 speleological objects were registered on the territory of the Galicica National Park. The majority of them are caves, however, there are also precipices, and along the coast of the Ohrid and Prespa Lake there are several rock shelters. Fourteen species of troglobites, twenty species of troglophiles, about ten species of trogloxenes and accidental trogloxenes were recorded in the caves. Nine species of bats use these caves as their habitat. Galicica National Park is the first protected area in North Macedonia for which a database of caves has been created. The database includes 39 caves, with a total of 22 features for each cave, separately.

Keywords: cave, cave fauna, database, Galicica National Park

INTRODUCTION

Galicica mountain is located in the southwestern part of North Macedonia, between the Ohrid and Prespa Lakes. It stretches in a meridian direction. The Triassic massive limestones with a thickness of 500-550 m (Думурџанов & Ивановски, 1978) enabled a strong karstification which is represented by surface (poljes) and underground (caves, pits) relief forms. Data on the underground karst relief forms were presented by Точковски (1970) and Андоновски & Колчаковски

(1990). The new research aimed to explore new caves, to determine the morphological characteristics of known caves and to start measuring some microclimatic elements in the cave ecosystem.

In terms of biospeleological research, Galicica National Park has received more attention compared to other Macedonian mountains. The first ever described troglobyte from Macedonian caves - *Ceuthophyes karamani* Jeannel, 1924 (Fig. 1) was discovered in Mečkina Dupka cave (Jeannel, 1924). Another endemic leiodid species (*Bathyscidius rambouseki* Knirsch, 1931) was described from an unknown cave in the vicinity of the village of Trpjeca (Knirsch, 1931). There are also published data for spiders, pseudoscorpions and orthopterans from caves on Galicica mountan (Ćurčić, 1984; Ćurčić et al., 1997; Karaman et al., 2011; Deltshev et al., 2013).



Figure 1. *Ceuthophyes karamani* (Jeannel, 1924), **autor:** S. Hristovski.

One of the goals was to study the diversity of cave species of invertebrates and analyze them from the aspect of their ecological adaptations (troglobites, troglophiles, trogloxenes and accidental trogloxenes).

The development of a cave database is very important in the process in promoting multisectoral approach in investigation and protection of cave ecosystems. This type of document does not exist in any protected area in North Macedonia as well as on national level (national cave database).

DATA AND METHODS

Various groups of methods were applied for investigating caves in Galicica National Park.

GPS Garmin Montana 680 was used for cave location (coordinates). Published cave maps made by different authors (Точковски, 1970; Андоновски & Колчаковски, 1990) were revised and added with new data. Cave surveying was done using Leica laser distance meter (DISTO D 330i), and Suunto compass and clinometer (SU-51-TANDEM). The preparation of the cave maps was done using the software CorelDraw as well as draft attempts to develop 3D maps of selected caves and testing them in the program Therion.

Air temperature and air humidity in the caves were measured *in-situ* using field-type instrument PeakTech 5090. In the caves Samotska Dupka and Leskoečka Peštera continuous measurings of air temperature and humidity were done by data loggers HOBO MX 2303 ONSET from 25.3.2023.

Cave invertebrates were collected manually or by pitfall traps during the period April-November 2023. The research of the caves Samotska Dupka, Leskoečka Peštera was carried out in March, May, August and September of 2023. Other caves were visited once or twice. Pitfall traps were placed in the caves of Samotska Dupka, Leskoečka Peštera, Svinska Strna and Krstova Peštera. Pitfall traps consisted of 0.5 L plastic containers filled with cca 200 ml of propylene glycol.

The monitoring of bats was done using the method of roost inspection. We identified the bats species, counted the number of individuals and took photos of the specimens and the colonies in each of the visited caves. In some cases, for proper identification of the species, we captured individuals inside the caves and recorded bat call using Pettersson D240x and BatLogger M bat detectors. The analysis of the recorded calls was done using the computer software BatSound v.4.0.

To prepare and standardize the first database of caves in Galicica National Park, the process included conducting extensive literature review (Speleološko društvo Velebit, Hrvatski planinarski savez & Hrvatska gorska služba spašavanja, 2019; Mudrak & Budaj, 1999/2021; QGIS Project, 2023) to gather existing data and knowledge about existing cave data bases in country and region (active and passive), identifying key areas (fields) for the attribute table (coordinates, length etc.), incorporating the database on free to use software's (Google Platform, Microsoft Excel and QGIS), validating, verifying and manual data entry of the collected data and capacity building for the users of the database.

RESULTS

Caves inventory

More than 40 speleological objects were registered on the territory of the Galicica National Park (Fig. 2). Majority of them are caves, the number of precipices is lower, and along the coast of the Ohrid and Prespa Lake there are several rock shelters. For the first time 8 caves (Fig. 3,4,5,6,7,8), 4 precipices (Fig. 9,10,11), and 5 rock shelters (Fig. 12) were observed. Around the top of Tomoros (1675 m), several natural depressions were widened by man and turned into ditches (Fig. 13).

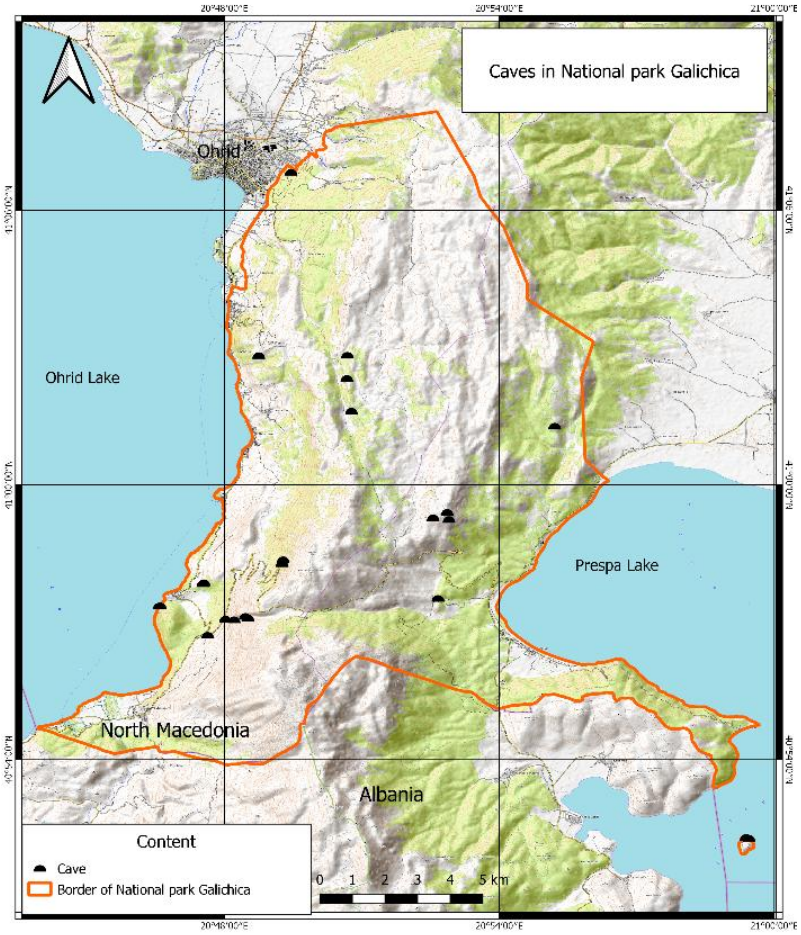


Figure 2. Map of caves in Galicica National Park.

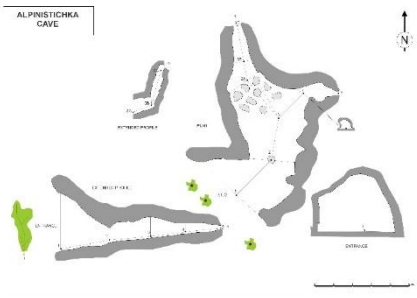


Figure 3. Map of cave Alpinistička Peštera.

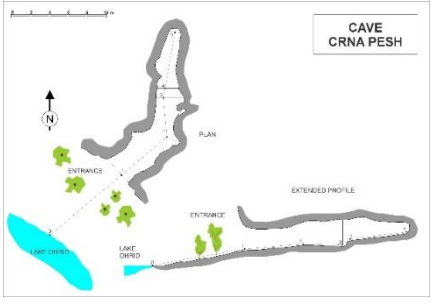


Figure 4. Map of cave Crna Peš.

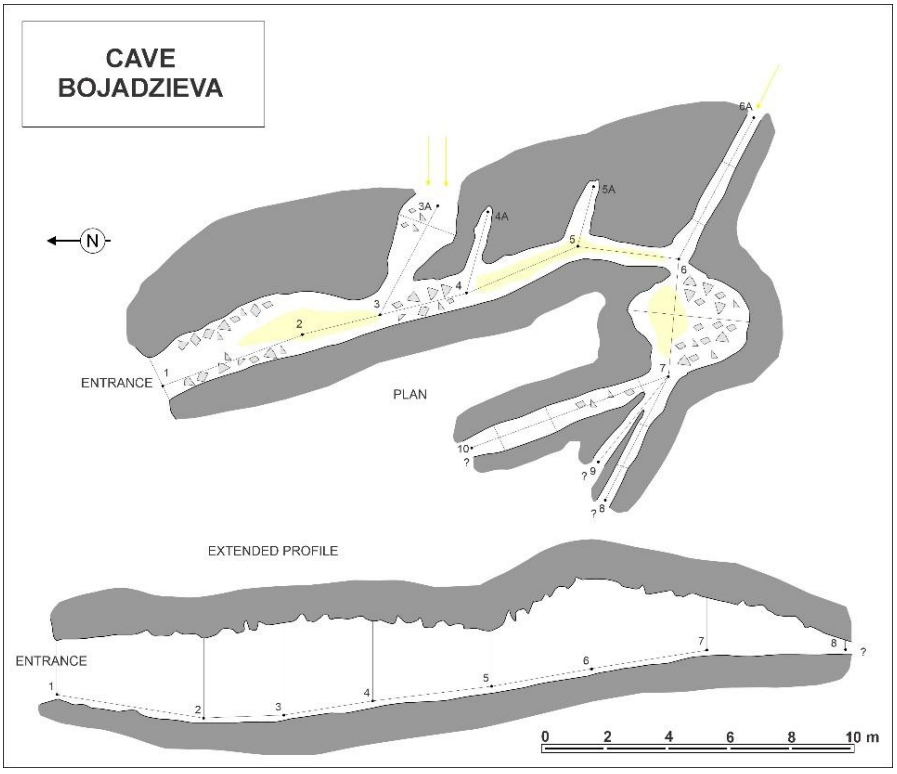


Figure 5. Map of cave Bojadžieva Peštera.

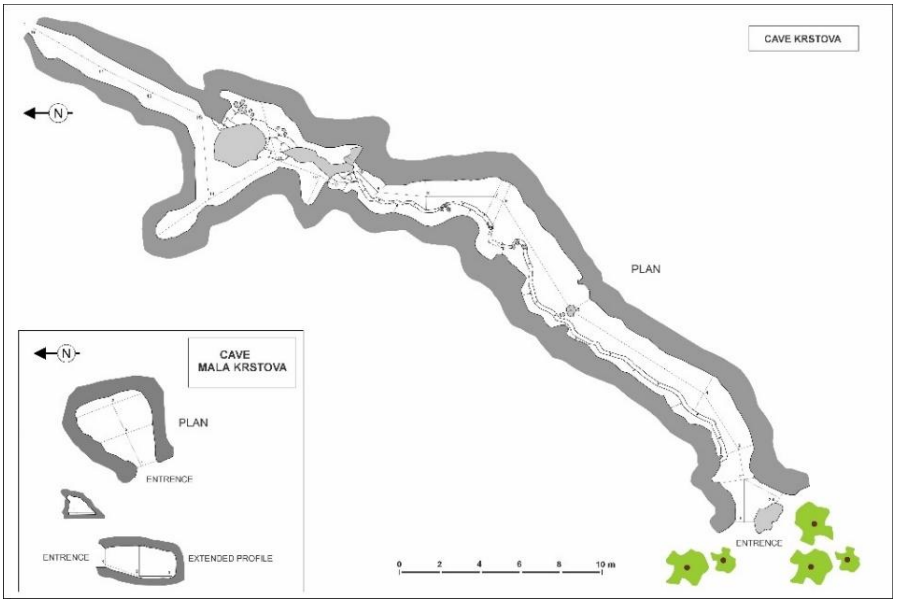


Figure 6. Map of Krstova cave.

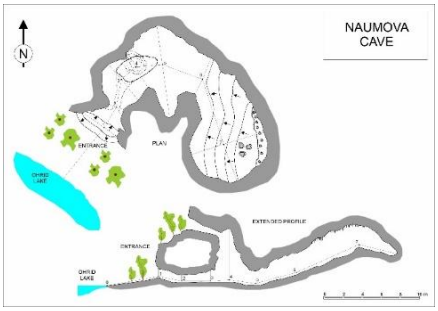


Figure 7. Map of Naumova cave.

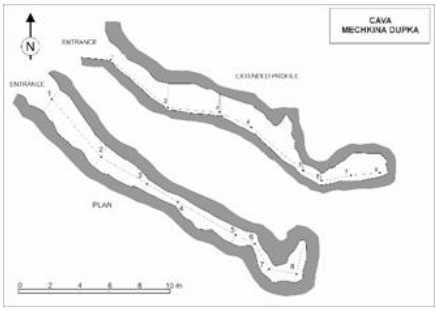


Figure 8. Map of Mečkina Dupka cave.

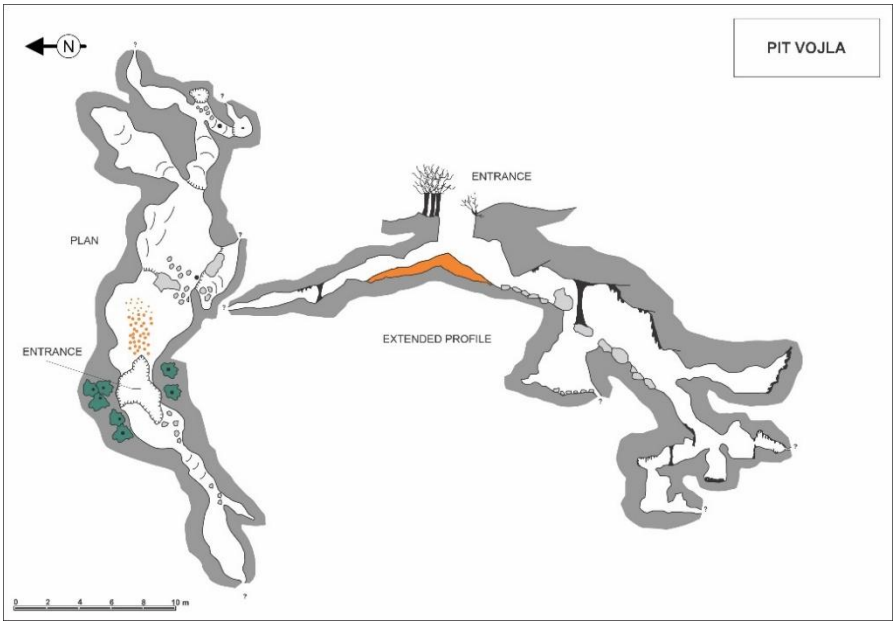


Figure 9. Map of Vojla pit.

The explored caves represent epigene caves. In hydrological point of view, all caves registered are dry and located in the vadose zone. Only, in the cave Bimbilova Peštera there was a cave lake which is connected with Prespa Lake. In some caves (Samotska Dupka, Leskoečka Peštera), one can clearly see traces of ground rivers that have flown through the cave passages and have modelled them, while others have been filled with breccia material (Krstova Peštera, Mečkina Dupka). Speleothems, depending on the environment in which they have formed, belong to three groups: speleothems formed by flowing and dripping water, basin sediments and evaporative formations.

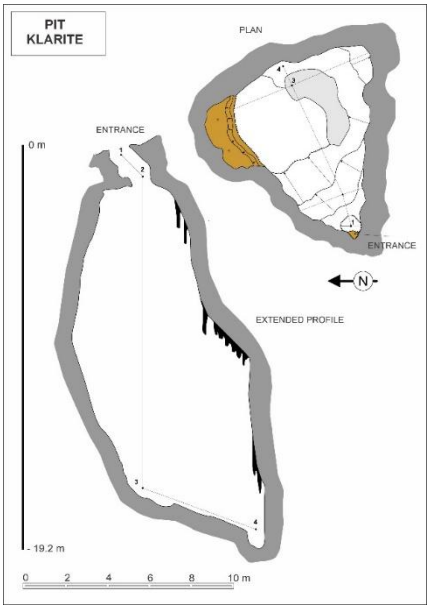


Figure 10. Map of pit Klarite.

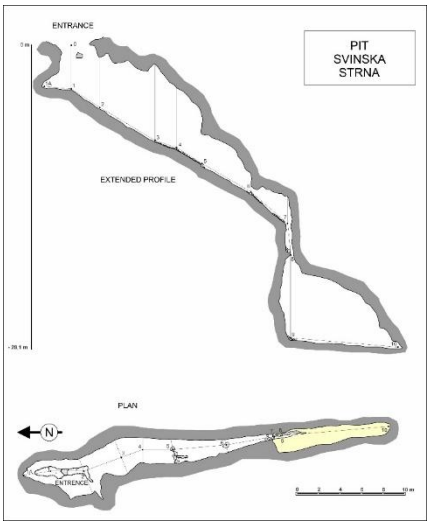


Figure 11. Map of pit Svinska Strna.

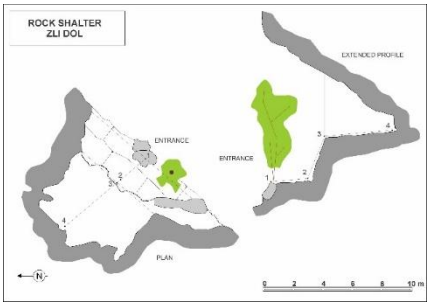


Figure 12. Map of rock shalter Zli Dol.

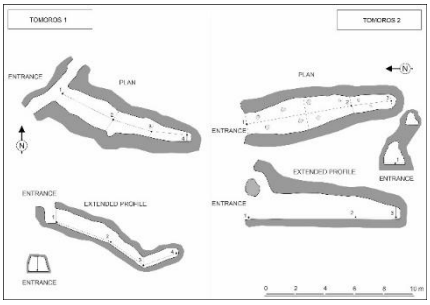


Figure 13. Map of ditches Tomoros 1 and Tomoros 2.

Air temperature in the caves at Galicica was different and ranges from 6°C to 16°C, while the air humidity in the cave environment varied from 55 to 99.98%. Average temperature of the air in the cave Samotska Dupka was 6.12°C and the average air humidity was high and amounted to 99.96%, whereas average temperature of the air in Leskoečka Peštera was 11.09°C, and the average air humidity amounted to 99.98%.

Diversity of invertebrates

The following species are known from the literature concerning the caves of Galicica National Park:

- *Ceutophyes karamani* Jeannel, 1924, *Cyphophthalmus ohridanus* Hadži, 1973 and *Neobisium ohridanum* Hadži, 1940 from Mečkina Dupka (Jeannel, 1924; Hadži, 1940, 1973);
- *Chthonius ohridanus* Ćurčić, 1997, *Chthonius lychnidis* Ćurčić, 1997 and *Roncus lychnidis* Ćurčić, 1984 from Orevče cave while *Roncus kikimora* Ćurčić, 1984 from the habitat in front of Orevče cave (Ćurčić et al., 1997; Ćurčić & Dimitrijević, 2004);
- *Acanthopetalum carinatum* (Brandt, 1840) from Leskoečka Peštera (Makarov et al., 2004);
- *Troglophilus cavicola* (Kollar, 1833) from Vojla cave (Karaman et al., 2011) and
- 11 species of spiders (Araneae): *Centromerus acutidentatus* Deltshev, 2002, *Nesticus cellulanus* (Clerck, 1758), *Lepthyphantes centromeroides* Kulczyński, 1914, *Lephthyphantes leprosus* (Ohlert, 1865), *Palliduphantes byzantinus* (Fage, 1931), *Palliduphantes trnovensis* (Drensky, 1931), *Meta menardi* (Latreille, 1804), *Gibbaranea bituberculata* (Walck,, 1802), *Oxyopes heterophthalmus* (Latreille, 1804), *Tegenaria domestica* (Clerck, 1757), *Tegenaria paragamiani* Deltshev, 2008 from caves Vojla, Leskoečka Peštera, Mečkina Dupka, Samotska Dupka, and Trpejca (Deltshev et al., 2013).

In total, more than 40 species of invertebrates were recorded during the field surveys in the caves in Galicica National Park. All of these species belong to different taxonomic groups, out of which spiders (Araneae) and beetles (Coleoptera) were the most numerous with 16 and 10 taxa, respectively.

Table 1. List of recorded species of invertebrates during the field surveys of caves in Galičica National Park.

Species	Ecological group	Bimbilova Peštera	Bojadžieva Peštera	Vojla	Dobroja	Klarite	Krstova Peštera	Leskoečka Peštera	Mečkina Dupka	Naumova Peštera	Samotska Dupka	Svinska Strna	Crna Peš
Araneae													
Centromerus acutidentatus Deltsh+ev, 2002	*f*							o					
Centromerus sp.	*t*			o							o		
Gen et sp? (Dysderidae)	*t*						o						
Harpactea sp.	*x*								o		o		
Lepthyphantes leprosus (Ohlert, 1865)	*f*							o					
Meta menardi (Latreille, 1804)	*f*						o						
Metellina merianae (Scopoli, 1763)	*f*	o	o							o			
Nesticus cellulanus (Clerck, 1757)	*f*	o					o	o					
Palliduphantes byzantinus (Fage, 1931)	*f*							o	o				
Palliduphantes trnovensis (Drensky, 1931)	*f*					o						o	
Tegenaria domestica (Clerck, 1757)	*f*	o					o			o			
Tegenaria faniapollinis Brignoli, 1978	*f*								o				
Tegenaria ferruginea (Panzer, 1804)	*f*		o										
Tenuiphantes tenuis (Blackwall, 1852)	*f*					o							
Troglohyphantes sp.	*t*					o	o						
Zygiella keyserlingi (Ausserer, 1871)	*x*	o											
Coleoptera													
Bathyscidius rambouseki Knirsch 1931	*t*						o						

Species	Ecological group	Bimbilova Peštera	Bojadžieva Peštera	Vojla	Dobroja	Klarite	Krstova Peštera	Leskoečka Peštera	Mečkina Dupka	Naumova Peštera	Samotska Dupka	Svinska Strna	Crna Peš
Blaps mucronata Latreille, 1804	***x***	o	o							o			
Ceuthophyes karamani Jeannel, 1924	***t***					o			o		o		
Cychrus semigranosus albanicus Hopp, 1929	***a***			o							o		
Duvalius cf. *vignai* Casale, 1983	***t***			o							o	o	
Enoplopus dentipes (Rossi, 1790)	***x***										o		
Helops sp.	***x***										o		
Laemostenus (*Antisphodrus*) *cavicola* sp.	***t***						o						
Laemostenus terricola punctatus (Dejean, 1828)	***f***			o				o					
Crustacea													
Niphargus sp.	***t***	o											
Diptera													
Limonia nubeculosa Meigen, 1804	***f***			o			o	o		o	o		o
Gastropoda													
Gyralina mirabilis Pintér & Riedel, 1973	***t***						o						
Helix lucorum Linnaeus, 1758	***x***						o			o			o
Helix schlaeflii Mousson, 1859	***x***										o		
Oxychilus sp.	***f***						o				o		
Zebrina detrita (O.F.Müller, 1774)	***x***										o		
Isopoda													
? *Alpioniscus* sp.	***t***			o				o	o		o		
Lepidoptera													
Autographa sp.	***x***							o					
Scoliopteryx libatrix (Linnaeus, 1758)	***f***										o		
Triphosa sp.	***f***										o		
Orthoptera													
Troglophilus cavicola (Kollar, 1833)	***f***			o	o		o	o			o		
Pseudoscorpiones													
Allochernes sp.	***f***									o			
Neobisium sp.	***x***					o	o				o		
Roncus sp.	***x***									o			

Ecological group: *t* - troglobite, *f*- troglophile, *x* - trogloxene and *a* - accidental trogloxene

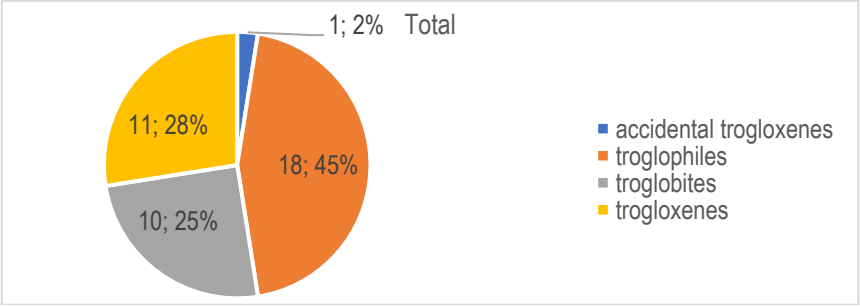


Figure 14. Number and percentual participation of ecological groups of invertebrates in caves of Galicica National Park.

The caves of Galicica National Park are inhabited by 10 species of troglobites which consist 25% of the invertebrate cave fauna. However, the most numerous in

species were trolophiles (18 species, 45 %). The trogloxenes and accidental trogloxenes were recorded with 12 species (Fig. 14). Presumably, the greatest attention during the field research was paid to troglobites and troglophiles which lead to small number of species of trogloxenes and accidental trogloxenes.

Diversity of bats

Nine bat species were recorded to roost in the caves: greater horseshoe bat (*Rhinolophus ferrumequinum*), lesser horseshoe bat (*Rhinolophus hipposideros*), Blasius' horseshoe bat (*Rhinolophus blasii*), Mediterranean horseshoe bat (*Rhinolophus euryale*), greater mouse-eared bat (*Myotis myotis*), lesser mouse-eared bat (*Myotis blythii*), long-fingered bat (*Myotis capaccinii*), Geoffroy's bat (*Myotis emarginatus*) and Schreiber's bent-winged bat (*Miniopterus schreibersii*) (Table 2). The numbers and the species composition of bats differ in all caves and vary seasonally. The largest mixed bat colony was found in Bimbilova cave with more than 4000 individuals of long-fingered bat and Schreiber's bent-winged bat.

Table 2. List of recorded bat species during the field surveys of caves in Galicica National Park.

Species	Samotska Dupka	Bimbilova Peštera	Vojja	Klarite	Krstova Peštera	Leskoečka Peštera	Mečkina Dupka	Naumova Peštera	Svinska Strna	Crna Peš
Rhinolophus ferrumequinum	+	+			+	+		+		
Rhinolophus hipposideros	+			+	+	+	+	+	+	+
Rhinolophus blasii						+	+			
Rhinolophus euryale		+	+		+	+		+		+
Myotis myotis	+									
Myotis blythii	+									
Myotis capaccinii		+						+		
Myotis emarginatus								+		+
Miniopterus schreibersii		+						+		

Cave's database

The prepared database contains in total 39 speleological objects. The database has in total 21 caves (Table 3), 6 pits (Table 4) and 12 rock shelters (Table 5).

The master table of the database (excel table on google drive) consists of total of 22 main types of data fields - Cave/Pit name, Coordinates, Type of speleological object, Altitude of entrance (meters), Location, Type of rocks, Geological age of rocks, Total length (meters), Hydrographic function, Physical characteristics (air

temperature, water temperature, humidity, snow masses, etc.), Cave fauna – troglobites, Cave fauna – troglophiles, Cave fauna – trogloxenes, Cave fauna – bats, Paleontology, Archaeology, Legends, Value, Protective category, Maps, Photographs, Literature and link to the literature).

Table 3. List of caves in Galicica National Park.

	Name	Location	Total Length (m)
1	Alpinistička Peštera	Dobroja (near via ferrata)	27.94
2	"B"	Prespa Lake, v. Evla	25
3	Bimbilova	Golem Grad	50
4	Bojadžieva	Golem Grad	50
5	Vojla (Sklana)	Asan Gjura	/
6	Gorno Studino	/	/
7	Duvalo-Trpejca	above the v. Trpejca	4-5 m
8	Dupkana	v. Konjsko	12
9	Dupka nad selo	v. Shipokno	25
10	Krstova Peštera	above the v. Trpejca	58.7
11	Leskoečka Peštera	v. Leskoeec	48
12	Mala Peštera (nad Krstova)	above the v. Trpejca	3.42
13	Mečkina Dupka	Ohrid, Bey Bunar	20.7
14	Naumova Peštera	v. Trpejca	31
15	Nevestulka	Zli Dol	/
16	Samotska Dupka	Asan Gjura	224
17	Svinska strna	Asan Gjura	-28.1
18	Tomoros 1	peak Tomoros	9.5
19	Tomoros 2	peak Tomoros	10
20	Tušena	/	/
21	Crna Pešt	v. Trpejca	17.6

Table 4. List of pits in Galicica National Park.

	Name	Location	Total Length (m)
1	Vetri Gumenja	Vetri Gumenja	/
2	Klarite	Ceremušana (Prespa valey)	-19.2
3	Kolkova Dupka (Kolkoa Dupka)	v. Ljubaništa (area Elenot)	/
4	Na Ploči	v. Konjsko	/
5	Rblok	v. Elšani	18.5
6	Tomoros 3	peak Tomoros	-4

Table 5. List of rock shelters in Galicica National Park.

	Name	Location	Total Length (m)
1	Brli Kamen 1	Zli Dol	7.1
2	Brli Kamen 2	Zli Dol	/
3	Brli Kamen 3	Zli Dol	/
4	„V“	Prespa Lake, v. Evla	/
5	Gojdarnik	v. Peštani	/
6	Gorna Temnica	v. Peštani	/
7	Dobroja	Dobroja (via ferrata)	11.2
8	Dolna Temnica	v. Peštani	/
9	Kaj Vodana („A“)	Prespa Lake, v. Evla	8
10	Kobličina Dupka	v. Peštani	10 - 15
11	Nad Trpejca	near v.Trpejca	/
12	Orevče	v. Peštani	10

The main component of the database is based on Google platform, with separate folders for each possible cave (containing subfolders for Map, Literature and Photo) – connected to the active master table (excel). For the database to have a multidisciplinary approach, the Google Drive and Excel file is connected to QGIS attribute table, so each user can have access to all the data.

DISCUSSION

Most of the investigated caves in Galicica National Park represent well preserved ecosystems. They are suitable for research of cave evolution, geodiversity significance and determination of their value and possible protective status.

The continuous monitoring of the microclimate in the caves Samotska Dupka and Leskoečka Peštera, can determine the impact of the external environment to the caves. Such research should continue in the future to determine the degree of vulnerability of cave ecosystems to climate change.

The presented list of cave species is the first attempt to present the speleodiversity Galicica National Park. So far, only Dona Duka cave as well as caves in Matka have received such an attention (Kolcakovski et al., 2009a, 2009b). However, we are aware that many species were not recorded of different taxonomic groups and ecological preferences. We hope that this effort will motivate many taxonomic specialists to conduct the research on various groups in order to fill-in the gaps. There are some open taxonomic questions which will presumably result in description of new taxa for sciences (Coleoptera – Carabidae, Arachnida – Araneae, Pseudoscorpiones). Nevertheless, the diversity of specialized species in the caves of Galicica National Park is impressive and deserves special attention for the protection of these valuable habitats.

Caves in the area of Galicica National Park proved to be important roosting site for 9 bat species throughout the year or in a certain season. Bimbilova cave hosts the largest colony with several thousand individuals of at least two bat species throughout the year. It is also an important hibernacula for bats in Prespa region, and most probably as maternity roost. The other caves in Galicica hosts smaller bat populations throughout the year.

To ensure sustainability and proper use of the database, Manual on Macedonian language has been prepared on how to use the database, with step-by-step explanatory process to foster a culture of knowledge sharing and collaboration among the database users to maximize its utility and impact. The prepared database of caves unites the speleological and biospeleological features of the speleological objects of Galicica National Park. It is a strategic document for the management of the National Park in order to enhance the protection of the cave ecosystems.

CONCLUSION

The database in future can be populated with new information about the explored caves or update it through utilizing advanced techniques such as 3D mapping to provide more detailed representations of cave structures. For proper use of the database, trainings, workshops, and support to users of the database must be provided on annual level, ensuring proficiency in data input, usage, and backup procedures. To build upon the achievements of the conducted activities and further enhance the usage and impact of the cave database, the developed database can be used as an example to other protected areas, institutions, civil society etc. of free to use/access data base, not requiring paid programs, easy to use and accessible for users without GIS background (the part of the Google platform access of the data base). The prepared database is a representative case study and can serve as an example for preparation of a National database of caves.

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DYNAMICS AND PATTERNS OF URBANIZATION WITHIN THE SKOPJE REGION

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ABSTRACT

Urban expansion in North Macedonia is a dynamic and intricate process primarily instigated and propagated through policies integrated into national legislation, aligned with the European integration agenda. The decentralization program of 2004-2007 and the 2002 Law for Local Self-Government empowered municipalities to make decisions and implement initiatives at the local level, encompassing spatial and urban planning. The extent of urban expansion in North Macedonia is discernible through the regional dispersion of built facilities. This paper examines a distinctive trend within this phenomenon: the inclination of urban expansion to transgress planning constraints, leading to the emergence of urban agglomerations that continually challenge the administrative boundaries of the city. Utilizing data from geographic information systems (GIS), sourced from the Corine Land Cover and Microsoft Building Footprints programs, we conduct a cartographic and alphanumeric analysis of the state of urbanization in the Skopje region from 2002 to 2020. The analysis provides insights into the situation within the first and second contact zones of the city of Skopje, elucidating the extent and programmatic complexity of the built environment beyond the planning boundaries of the city. The conclusions are summarized based on a detailed elaboration of the indicated trends in four specific case studies.

Keywords: urban expansion, regional observation, territorial governance, digital transitions, GIS

INTRODUCTION

The driving processes of urban expansion are the significant population growth and natural increase in developed countries, migration from urban areas and the

transformation of rural areas into urban centers (Hegazy & Kaloop, 2015; Melchiorri, et al., 2018). This phenomenon entails the dynamic development of urban areas in peripheral urban and suburban zones, mainly at the expense of undeveloped agricultural land (Hennig, et al., 2016).

In North Macedonia, the degree of suburbanization is recognizable through the uncontrolled dispersion of built facilities (Gorin, et al., 2022). Functional transformations in the country tend to occur in the peri-urban zone, between the urban and the rural areas. In this space, there are usually deviations from the planning directions for the arrangement of settlements and the area as a whole. According to the Draft Plan of the Spatial Plan of the Skopje Region for 2005-2020 (Spatial planning agency, 2010), the processes manifested in the immediate surroundings of the city indicate the degradation of the natural environment through the permanent conversion of quality agricultural land. The occurrence can be attributed to inadequate planning and land utilization in the peripheral zones, stemming from demographic concentration, the expansion of highway and regional infrastructure, and, more recently, the proliferation of economic facilities.

According to the annual reports on the implementation of the Spatial Plan of the Republic of Macedonia (Spatial planning agency, 2006-2019), the mutual spatial physical connection of urban agglomerations and settlements in the suburban zone, especially present in the zone of influence of large and medium-sized urban settlements, takes the form of:

- continuous-linear built facilities along communication lines;
- radial expansion of built facilities and creation of compact built spaces with surrounding settlements.

Linear expansions and connections are intensive, especially along the highway infrastructure corridors, as well as along the regional routes. The most visible repercussion of this type of urbanisation is evident in the contact zones of the City of Skopje, mainly represented by the industrial development, and less so in the residential areas. The tendency of linear expansions is to detach from the city of Skopje and aggregate along the contact zone, especially in the immediate vicinity of existing roads.

A further increase in urban expansion is expected, so consistent data on the degree of outreach are needed, especially with a view to allowing for comparisons across Europe. To that end, the timely detection of changes in land use (LU) and land coverage (LC) is crucial for understanding the interaction between built facilities and spatial repercussions (Cieślak, et al., 2020; Feranec, et al., 2010; Wiatkowska, et al., 2011).

SUBJECT AND OBJECTIVES OF THE RESEARCH

The total area of North Macedonia is 25,713 km^2 and, according to the last population census in 2021, there are 1,836,713 inhabitants living within its borders. The Skopje Planning Region occupies the northern part of the country and extends

into the Skopje Valley. It is the smallest area (1,812 km^2) and covers only 7.3% of the total territory of the country. However, according to the data from 2021, it has the largest number of Inhabitants (607,007 or 33% of the total population) and it is also the most densely populated region in the country, with 336 inhabitants per km^2. A high concentration of material and human resources contributes to the Skopje Planning Region having the largest share in GDP (43%) according to 2018 data from the State Statistics Office.

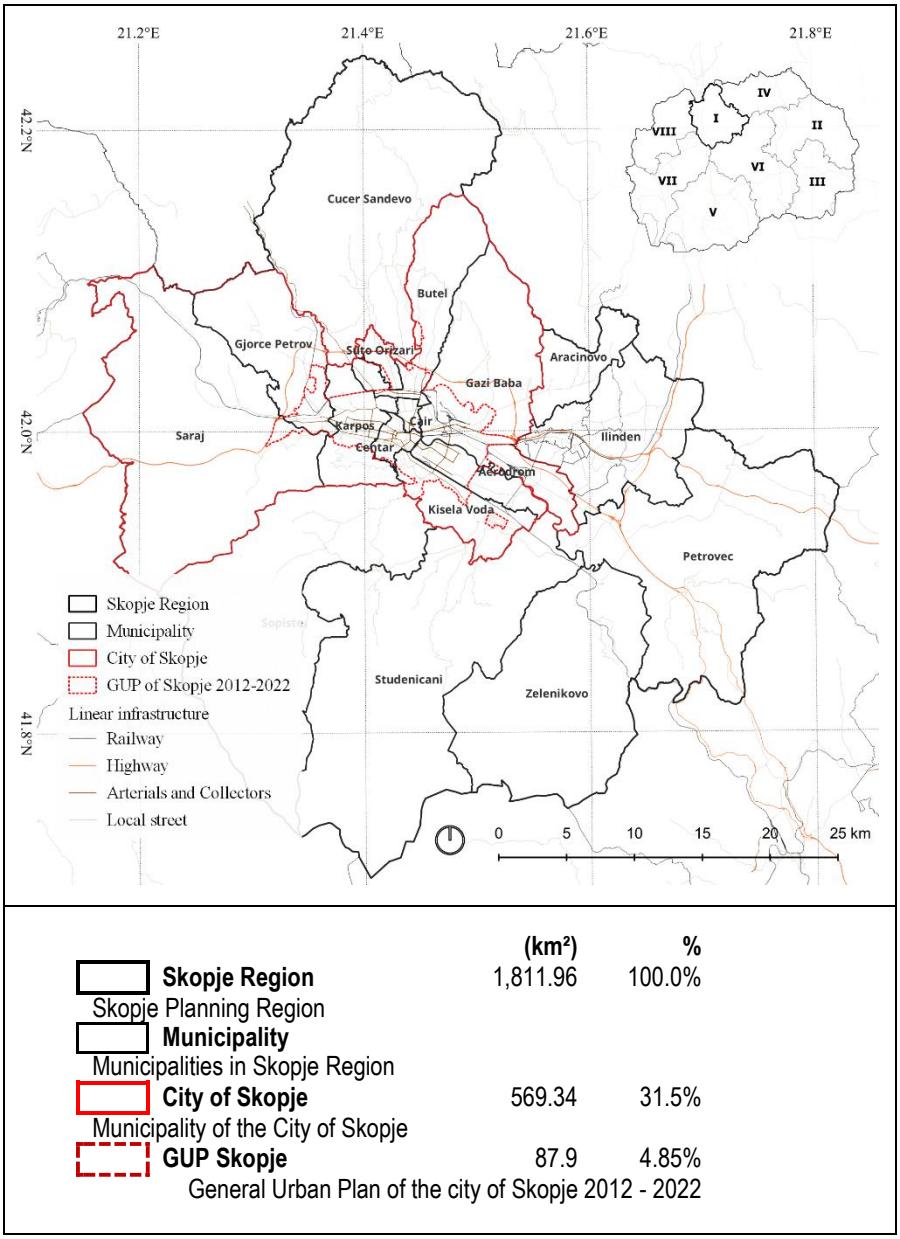
The city of Skopje, as a separate unit of local self-government, defined by the municipalities it includes, covers a total surface of 569.34 km^2, i.e. 31.5% of the entire Skopje Region. It is located in the central and western part of the Skopje Planning Region, and it is 22 km long and 11 km wide. In addition, it is regulated by the limits of the General Urban Plan (GUP) for the city of Skopje, which for the planning period 2012-2022 covers 87.9 km^2, i.e. 4.85% of the total area of the Skopje Region.

According to data from the 2021 census, the total number of inhabitants living in the municipalities within the borders of the City of Skopje is 526,502. Of these, 422,540 or 80.3% live in urban centers and 103,962 inhabitants or 19.7% populate rural areas. The rural population in the Skopje Region is distributed in such a way that 103,962 people live in so-called city municipalities, while 80,505 reside in municipalities based in villages. In the Skopje Region there are 145 villages and the city of Skopje is home to 607,007 inhabitants as per 2021 census data. Of these, 184,467 or 30.4% live in the rural environment (rural population), and 422,540 inhabitants or 69.6% reside in the urban environment (urban population), determined by the boundaries of the GUP of the city of Skopje (Markoski & Dimitrov, 2022).

Comparing the population data from the last two census cycles (2002 and 2021), a slight positive growth index can be observed at the level of the Skopje Region and the city of Skopje. In 2021, the latter recorded 19,576 inhabitants more than in 2002, which represents an increase of 3.9% in the number of the population. The former saw a population increase of 5% or 28,863 additional inhabitants.

Despite ongoing work tracking and supplementing the National Infrastructure for Spatial Data (NIPP), the information collected seems to be still dependent on inert synchronisation of multi-sector communication and cooperation. As such, planning processes continue to rely on data that do not give the real picture of the situation on the ground and do not guarantee the principles of sustainable development.

To that end, this research broadens the scope of the investigation of local dynamics to the entire geographical area of Skopje Region and aims to detect and analyse the built facilities and urban agglomerations in the region by combining global datasets and publicly available information. It then delves into four distinct case studies, representative of each of the primary and secondary contact zones within the planning boundaries of the city of Skopje. These cases, identified through comprehensive research, exhibit the most notable instances of urban expansion over the past two decades.



	(km²)	%
Skopje Region	1,811.96	100.0%
Skopje Planning Region		
Municipality		
Municipalities in Skopje Region		
City of Skopje	569.34	31.5%
Municipality of the City of Skopje		
GUP Skopje	87.9	4.85%
General Urban Plan of the city of Skopje 2012 - 2022		

Figure 1. The administrative-territorial organization of the (I) Skopje Region. II - Eastern, III - Southeastern, IV - Northeastern, V - Pelagonia, VI - Vardar, VII - Southwestern, VIII – Polog Planning Region.
Source: The State Statistical Office of the Republic of North Macedonia

METHODS AND SOURCES

The research method used includes a linear work process and obtains/generates/collects information by processing geospatial data sets for remote sensing of land coverage changes; data resources for detection and analysis of built facilities; planning documentation at national and local levels, and satellite data. The selected sources are processed using the geographic information system software Quantum GIS (QGIS), a software for geo-referenced cartography. The ensuing results are mapped and tabulated.

Geospatial datasets for remote sensing and LULC classification

The analysis of LU and LC changes is based on data from existing geospatial datasets, classified and developed by long-term Earth observation missions, like Corine Land Cover (CLC). The same programme also developed the Urban Atlas product, which uses high-resolution satellite data to produce digital LU and LC maps of Functional Urban Areas (FUA) for the most populated cities in Europe. Given that this product is used for the analysis of LU and LC in urban areas (2020), it becomes useful also for the purpose of this paper.

Data sources for detection and analysis of built-up area

Built facilities are a basic generative element of urban expansion and are analysed through GIS data processing. Two additional sources are used to upgrade the database for this procedure, namely:

1. BingMapsAI - Microsoft Building Footprints
   a) Retrieved on 15.October.2022
   b) Parts: 00051; 00179/
2. OSSP - Distribution Portal of the Real Estate Cadastre Agency
   a) Order made on 01.November.2022
   b) Sheet number: 682 – 3 – 3 ; 682 – 3 – 4; 732 – 1 – 1; 732 – 1 – 2/

The data is instantly transformed into tabular documentation through the processing of the cartographic material, in which the necessary features are generated for each built object, such as surface, region, purpose etc. The database aggregates in a single GIS model 129,000 built facilities for the territory of the Skopje region in 2022 (Table 1). Of these, 10.1% were taken from the Distribution Portal of the Real Estate Cadastre Agency, with a total built-up area of 2.5 km^2, while 89.9% were taken from Microsoft's programme for mapping with the help of artificial intelligence, with a total built-up area of 22.2 km^2.

Table 1. Fragment of summary data

id [1]	latitude and longitude [2]	source [3]	program [4]	region [5]	surface m²[6]
1	41° 58'29.88", 21° 13'58.42"	BingMapsAI	11240	1st contact zone	42.9
2	41° 58'30.53", 21° 14'5.194"	BingMapsAI	11240	1st contact zone	134.5
3	41° 58'25.71", 21° 14'2.549"	BingMapsAI	11240	1st contact zone	101.9
...					
128998	41° 59'29.07", 21° 31'5.804"	OSSP	12100	2nd contact zone	729.4
128999	41° 59'21.55", 21° 30'1.287"	OSSP	12100	2nd contact zone	1421.7
129000	41° 58'27.60", 21° 14'4.855"	BingMapsAI	11240	GUP	124.1

Source: Authors'Contribution

Planning documentation applied at national and local levels

The national spatial planning legislation is made up of the hierarchical order of planning documentation, starting from the spatial plan of the region, the general urban plan of Skopje (GUP) and the detailed urban plans.

Planning documents of the highest hierarchical order in the context of the Skopje Region, as a wider case study are:

- "Spatial plan of the Republic of Macedonia", planning period 2004-2020,
- "Spatial plan of the Skopje region", planning period 2005-2020 and a draft plan issued on 23.02.2011, and
- "General urban plan of the city of Skopje" (GUP), planning period 2012-2022.

Sectoral studies that precede the final version of the general urban plan look at the relationship between the general planning boundaries of the city of Skopje and its immediate surroundings. This research considers the following sectoral studies:

- Penev, P., 2011. City of Skopje with contact zones, General Urban Plan of the City of Skopje 2012-2022 [Градот Скопје со контактните зони, Генерален Урбанистички план на Град Скопје 2012-2022], Skopje: Spatial Planning Agency.
- Trpenoska-Simonovikj, L. & Lukikj, Korobar, A., 2022. Contact zone, General Urban Plan of the City of Skopje 2022-2032 [Контактна зона, Генерален урбанистички план на Град Скопје 2022-2032], Skopje: Spatial Planning Agency.

The development of the Skopje region can be based on spatial-urban archival documentation, which, used as a source of data, offers the opportunity to perceive the trends in separate segments of the development and a solid basis for future planning. The basis for coherent spatial and regional development of the Skopje region was laid in 1965 through a United Nations report on the Suburban Zone as part of the project for the post-earthquake reconstruction of Skopje (UN, 1970; Polservice - Warsaw & Institute of town planning and architecture - Skopje, 1970).

Prior to drawing its conclusions, the research zeros in few specific case studies, which represent a defined, predetermined territorial fragment of the first and second

contact zones of Skopje Region (their categorisation is explained in detail in section 3). Detail planning documents covering these areas were consulted in this research, covering the planning period 2008 to 2018, and a different time frame was determined for each of the plans.

Satelite data

To chronologically analyze the morphological and programme conditions of the built facilities in the selected case studies from the first and second contact zones, a high-resolution orthophoto map is used as a basis for manual detection of built facilities. The historical position is determined using an orthophoto map for a period beginning with 2003. The material is taken from the online platform of Google Earth Pro and is georeferenced in the appropriate research datasets:

- Google Earth Pro V 7.3.6.9345 (May 4, 2002). Skopje region. Cadastral Municipalities of Ilinden, Marino, Kadino, Mralino, Bunardzik, Ajvatovci, Trubarevo, Jurumleri, Idrizovo, Dolno Lisice, Dracevo 2 and Usje. 42O02'19.09"N, 21O24'15.67"E, Eye Alt 16640 ft. Landsat / Copernicus. Maxar Technologies 2023.

Consequently, these are used as a basis for manual processing of the digitised vector polygons to detect the built structure in 2003 and compare with the current percentage.

RESULTS

The compiled database allows for a cartographic-tabular analysis that focuses on:

- settlements and the population dynamics in the first and second contact zones;
- the class use and percentage of built facilities in the first and second contact zones;
- concluding analysis of chronological tendencies and differences in the use class of the built facilities in four specific case studies (i.e. cadastral municipalities of Usje, Dracevo 2, Dolno Lisice and agglomeration units Ilinden 1 and Gazi Baba 1).

Settlements and population dynamics in the first and second contact zones

The settlements of non-city municipalities are the subject of the sectoral studies during the preparation of the General Urban Plan of the City of Skopje (Penev, 2011; Trpenoska-Simonovikj & Lukikj Korobar, 2022). The sectoral studies were developed specifically for the contact zones and their relationship with the city. Two zones were defined: (1) individually recognized settlements in the immediate contact zone of the

city and (2) agglomerations of suburban villages in the wider contact zone of the city of Skopje.

The first contact zone covers settlements that have intensive development along the roads, and which spread radially from the city to its surroundings. It consists of newly built settlements, which are not predominantly agrarian, and whose population is mostly engaged/active in the city of Skopje. A total of 61,333 inhabitants are located in this group of 20 settlements according to the 2021 census, representing 10.1% of the total population in the Skopje Region. The population in the first contact zone records a positive dynamic, reflected in 5,862 more inhabitants in 2021 compared to the 2002 census. This change represents a population growth of 15.6%.

The second contact zone of suburban villages includes settlements that are not physically connected to the urban agglomeration. They have their own residential independence and physiognomy but are in the immediate surroundings of the city. 57 settlements are classified in the group of suburban villages, which are grouped into 14 agglomeration units. According to the 2021 census, a total of 96,970 residents lived in the second contact zone, which represents 16% of the total population in the Skopje region. Again, the dynamics of the population shows a positive tendency also in the second contact zone, with 12,794 more inhabitants in 2021 compared to the 2002 census.

This change marks a population growth of 15.2%. An additional number of 68 rural settlements are located in the peripheral zone of the Skopje Region. According to the 2021 census, 27,221 inhabitants live there, representing only 4.5% of the population of the region. The growth index in this category of settlements records a negative outcome, i.e. a reduction of the population by 2,065 inhabitants in 2021 compared to the 2002 census. Settlements of this type are located mainly in the hilly-mountainous and peripheral parts of the valley, and are mostly small in size.

Programme features and percentage of built-up area in the first and second contact zones

The parameters for the programme and territorial affiliation, as well as the percentage of built content are obtained through a software procedure. An interactive link is created between the Microsoft Building Footprints database, with 2022 as reference period, and the layer of Urban Atlas product, with 2018 as reference period. Finally, the software generates the information about the built area in m^2 or km^2 (aggregate).

The cartographic-tabular analysis in Figure 2 depicts the aggregated data for built facilities in relation to their use class, as well as in relation to their location (i.e. inside or outside the planning boundaries of the city). As can be seen, Urban fabric (1.1.1, 1.1.2) slightly dominates with 18.01 km^2 or 73% of the total area the Industrial units (1.2.1), which cover only 6.74 km^2 or 27% of the total built-up area.

In terms of territorial affiliation, the Urban fabric detected in the first and second contact zones occupies a total built-up area of 18.01 km^2, with an almost equal

representation of 8.97 km^2 or 49.8% within the GUP and 9.04 km^2 or 50.2% outside the GUP. In the first contact zone, this category represents 17.4% or 3.13 km^2 of the total built area, while in the second contact zone its spread almost doubles to 24.2% or 4.36 km^2 of the total built area. Industrial units occupy a total built area of 6.74 km^2 and are more dominant within the GUP with 4.2 km^2 or 62.9%, compared to outside the GUP (2.4 km^2 or 36.3% of the built area). In the first contact zone, this category represents 11.4% or 0.77 km^2 of the total built area, while in the second contact zone its coverage doubles again to 24.0% or 1.62 km^2 of the total built area.

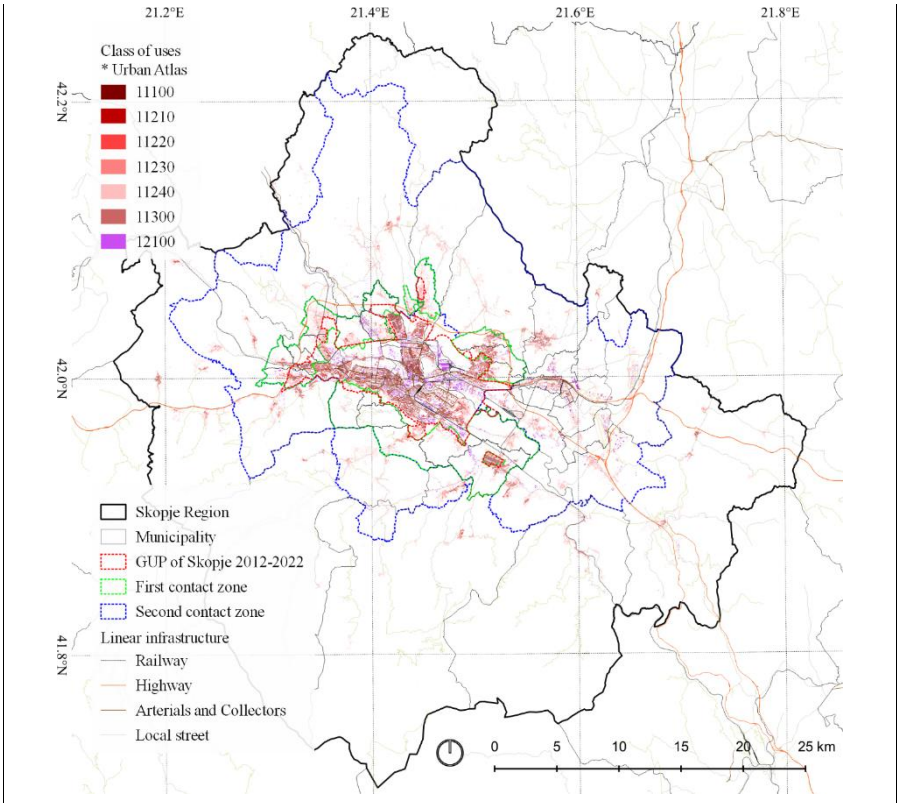
Stratified analysis allows us to establish that the built facilities are predominantly present within the GUP with 13.21 km^2 or 53.4%. However, it is important to note that the built facilities in the first contact zone represent 3.90 km^2 or 15.8%, and 5.98 km^2 or 24.2% in the second contact zone. Their total relative value is 40%, which is almost close to the total built-up area within the GUP. Given the intensity and quantity of the build-up area in the contact areas of Skopje, these results confirm the interest of the research problem on behalf of the phenomenon of urban expansion in the sub-urban area of the city.

The percentage of built-up areas in settlements and agglomeration units in the first and second contact zones of the Skopje Region is analyzed on the basis of the built content in 2022. The territorial framework is defined according to the cadastral municipalities, individually or within the established agglomeration (Figure 3). The results help us to classify settlements and agglomerations with a low or high percentage of built-up areas in the first and second contact zones of the city of Skopje.

In the settlements of the first contact zone, the average value of the built-up area is 4.2%. 8 out of the 18 settlements display a high percentage of construction. There is a tendency for settlements with the highest percentage of built-up areas to be located in the north-western and south-eastern part of the first contact zone of the city of Skopje.

In the agglomeration units of the second contact zone, the average value of the built-up area is 1.0%. 7 out of the 14 agglomerations there have a high percentage of build-up area. There is a tendency for the agglomerations with the highest percentage of built-up areas to be located in the eastern part of the second contact zone of the city of Skopje.

Planning documentation for the sub-regional development of Skopje published in the United Nations report on the Suburban Zone of Skopje in 1965, indicate future directions of urbanization for the eastern edge of the city of Skopje's planning boundaries. Applying the developed methodical procedure revealed is an increased dynamics and intensity of values in these areas, making them suitable case studies for further research. They are classified separately into the first and second contact belts of the Skopje region.



		GUP		1st contact zone		2nd contact zone		∑	
1.1.1	Continuous urban fabric	**(km²)**	**%**	**(km²)**	**%**	**(km²)**	**%**	**(km²)**	
11100	(sealed land > 80%)	4.02		0.03		0.03		4.11	
1.1.2	Discontinuous urban fabric								
11210	(50% - 80%)	3.46		0.86		0.78		5.28	
11220	(30% - 80%)	0.89		0.80		0.97		2.92	
11230	(10% - 30%)	0.46		0.84		0.97		2.48	
11240	(sealed land < 10%)	0.15		0.56		1.57		3.14	
1.1.3	Isolated structures								
11300		0.00		0.01		0.04		0.07	
		8.97	49.8%	**3.13**	17.4%	**4.36**	24.2%	**18.01**	**∑ 1.1.**
1.2.1	Industrial, commercial, public, military and private units								
12100	12100	4.24	62.9 %	0.77	11.4 %	1.62	24.0 %	**6.74**	**∑ 1.2.1.**
		13.21	53.4 %	**3.90**	15.8 %	**5.98**	24.2 %	**24.75**	**∑ 1.1. + 1.2.1**

Figure 2. Analysis of the built facilities in the Skopje region through their affiliation within or outside the planning boundaries of the city of Skopje in 2022.
Source: Microsoft Building Footprints, 2022 & Urban Atlas, 2018

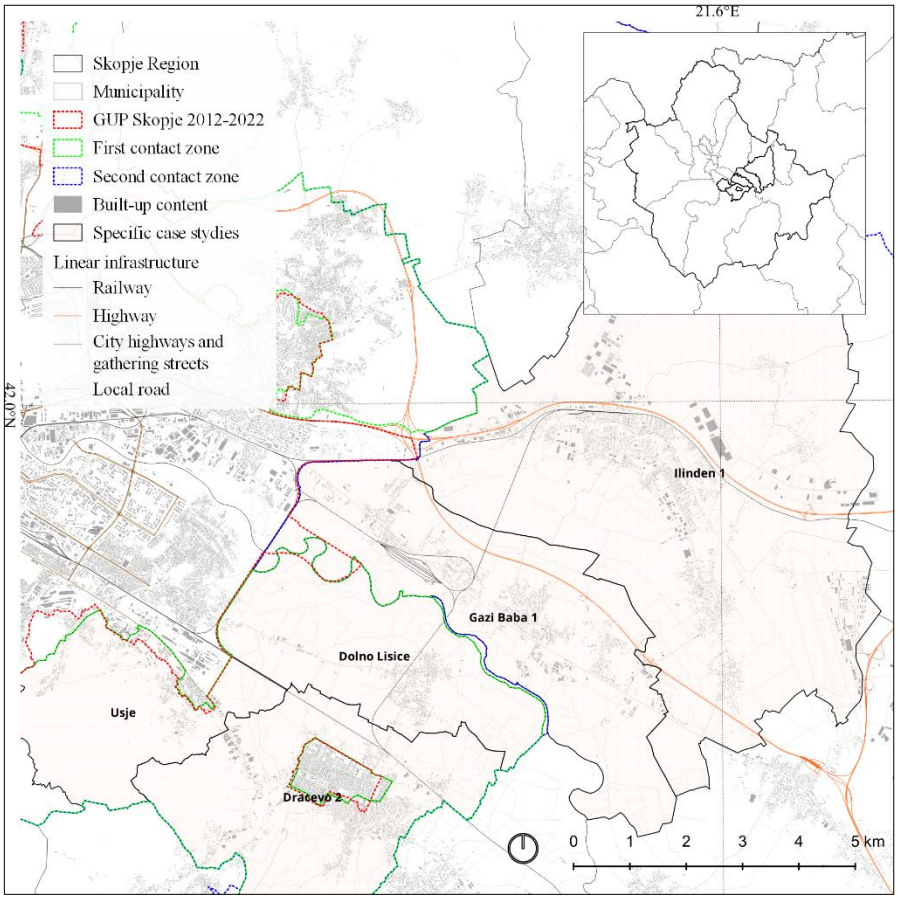


Figure 3. Cartographic representation of the spatial distribution of the selected case studies from the first and second contact belt of the City of Skopje.
Source: Authors' Contribution

Case studies from the first contact zone include territorial fragments of the Kisela Voda municipality, specifically defined by the cadastral municipalities (KO) Usje and Drachevo 2, and territorial fragment of the Aerodrom municipality, specifically defined by the cadastral municipality (KO) Dolno Lisice. Case studies from the second contact zone comprise a territorial fragment from the Ilinden municipality, forming the Ilinden 1 agglomeration unit, which consists of the cadastral municipalities (KO) Ilinden, Marino, Kadino, Mralino, Bunardzik, and Ajvatovci. Additionally, there is a territorial fragment from the Gazi Baba municipality forming the Gazi Baba 1 agglomeration unit, consisting of the cadastral municipalities (CO) Trubarevo, Jurumleri, and Idrizovo (see Figure 3).

Chronological analysis of the built-up area in two case studies

The results for these territorial fragments are presented in comparative perspective and are based on analysis of the chronological tendencies of the built-up area according to:

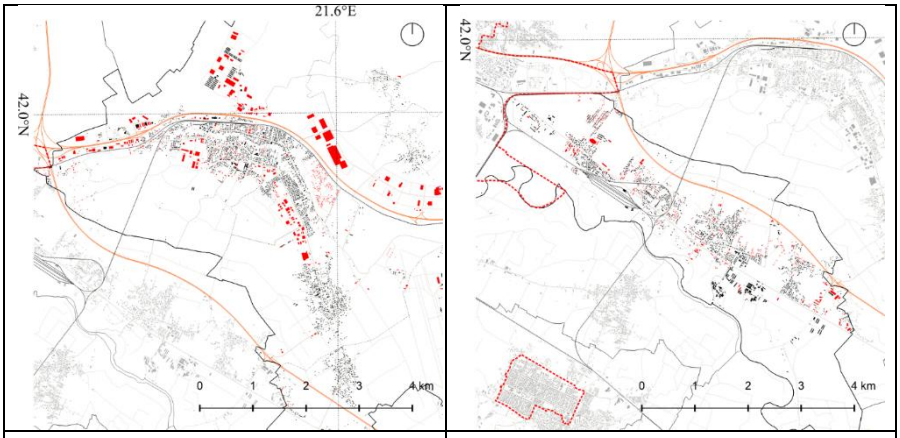
- percentage of built-up areas;
- planning use class.

The chronological overview is observed in a time frame of 20 years, from 2002 to 2020, taking 2002 as a reference period, a value that is dependent on publicly available databases, in this case a high-resolution orthophoto map. In this case, the results are shown synthetically and comparatively in one cartographic display, supplemented by a tabular analysis of the absolute and relative values (Figure 4). The results are based on the ratio between the built content and the chronological tendencies as the first characteristic and the class of uses as the second characteristic of the surface objects.

In all indicated case studies, an increased index of growth of the built content between the two reference years is noticeable, with some managing to double it. In the agglomeration unit Ilinden 1, a 92% growth of the built content is noticeable, which is the highest growth of the indicated studies. It is achieved by almost doubling the built area, which from 0.69 km^2 in 2002 is increases by 0.64 km^2 in 2022. In the agglomeration unit Gazi Baba 1, a 32% increase in the built content is noticeable. It is achieved by increasing the built area from 0.41 km^2 in 2002 by 0.13 km^2 in 2022. In the cadastral municipality of Dolno Lisiche, a 62% increase in the built content is noticeable. It is achieved by increasing the built area from 0.11 km^2 in 2002 by 0.07 km^2 in 2022. Synthetically for the cadastral municipalities of Drachevo 2 and Usje, a growth of the built content by 57% is achieved with an increase in the built area from 0.43 km^2 in 2002 to 0.25 km^2 in 2022.

The class use and function of the registered objects is formally and legally defined by the given class of use, a parameter of the urban planning documents. In the indicated case studies (Figure 5), it is recorded by downloading information from the planning documentation with responsibility at the local level, where the existing built content is associated with the assigned class of purposes of the corresponding urban planning documentation.

Such a chronological overview of the program characteristics of the built content in the indicated case studies (Figure 5) gives us conclusive observations about the still dominant representation of the class of uses A1 - housing in residential houses, but also about the increasingly present and drastic growth tendency of the use classes G2 - light industry, G3 - services and G4 - warehouses in the indicated case studies that reflect the situation on the eastern edge of the planning boundaries of the city of Skopje.

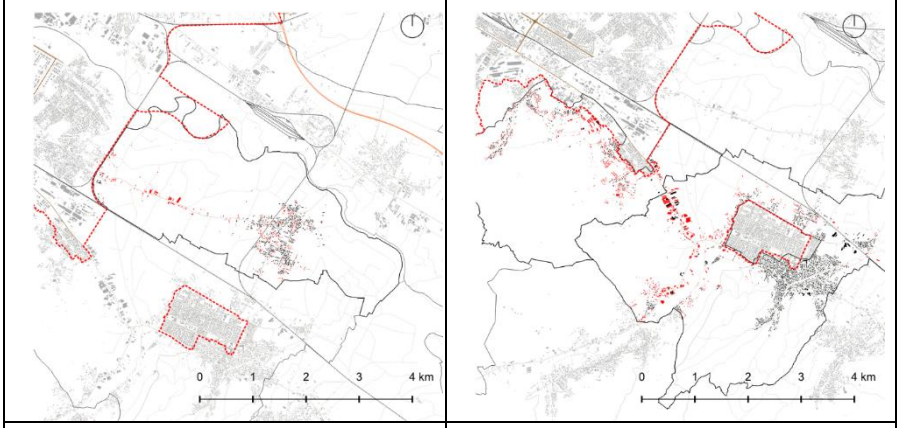


Ilinden 1

2002		2022		∑		*I* (%)	
km²	%	km²	%	km²	%	km²	%
0.69	51.9	0.64	48.1	1.33	100	192	92

Gazi Baba 1

2002		2022		∑		*I* (%)	
km²	%	km²	%	km²	%	*i*	%
0.41	75.3	0.13	24.7	0.55	100	132	32



Dolno Lisice

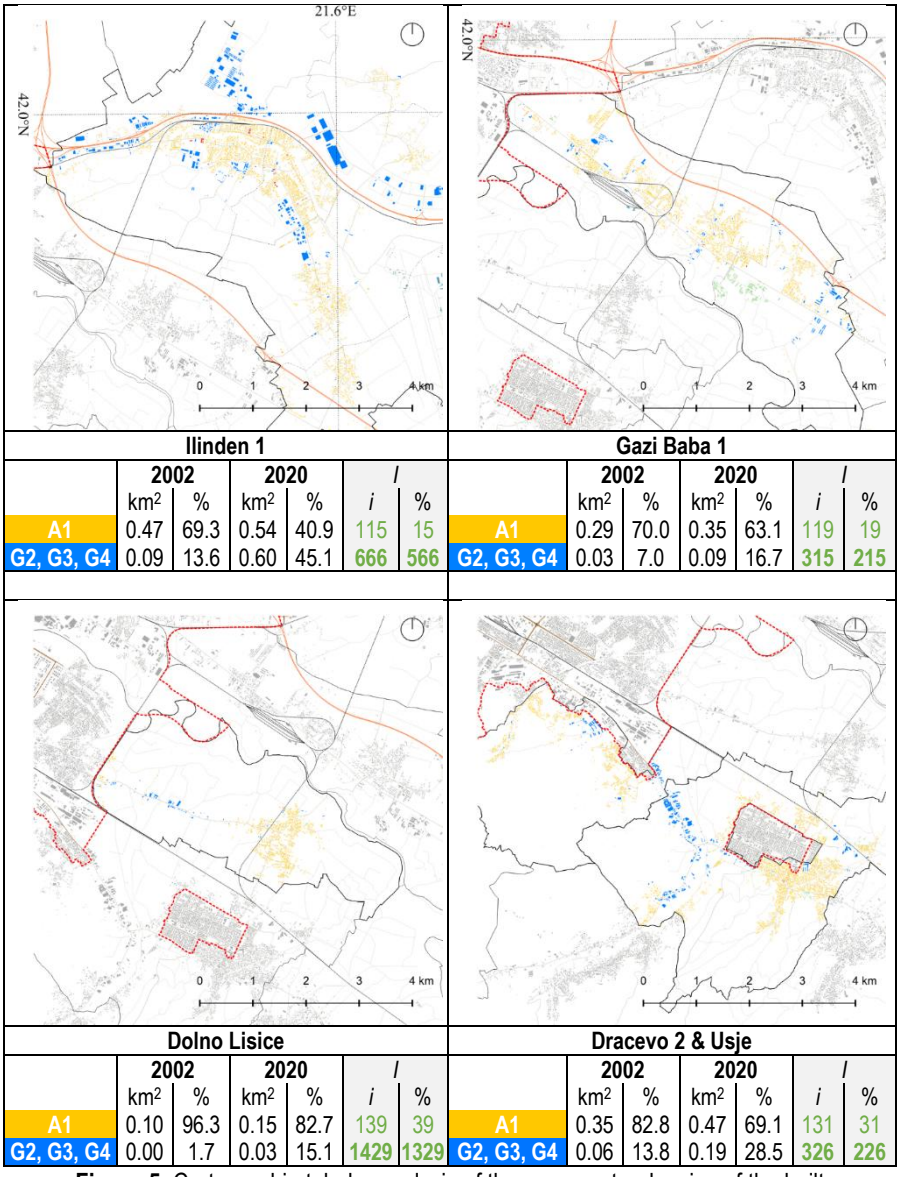
2002		2022		∑		*I* (%)	
km²	%	km²	%	km²	%	km²	%
0.11	61.7	0.07	38.3	0.18	100	162	62

Dracevo 2 & Usje

2002		2022		∑		*I* (%)	
km²	%	km²	%	km²	%	km²	%
0.43	63.4	0.25	36.6	0.68	100	157	57

Figure 4. Cartographic-tabular analysis of the chronology of built-up areas in the territorial fragments Ilinden 1, Gazi Baba 1, Dolno Lisiche, Drachevo 2 and Usje with a reference time period 2002-2022.

Source: Microsoft Building Footprints 2022 & Distribution Portal of the Real Estate Cadastre Agency, 2022



Ilinden 1

	2002		2020		*I*	
	km²	%	km²	%	*i*	%
A1	0.47	69.3	0.54	40.9	115	15
G2, G3, G4	0.09	13.6	0.60	45.1	666	566

Gazi Baba 1

	2002		2020		*I*	
	km²	%	km²	%	*i*	%
A1	0.29	70.0	0.35	63.1	119	19
G2, G3, G4	0.03	7.0	0.09	16.7	315	215

Dolno Lisice

	2002		2020		*I*	
	km²	%	km²	%	*i*	%
A1	0.10	96.3	0.15	82.7	139	39
G2, G3, G4	0.00	1.7	0.03	15.1	1429	1329

Dracevo 2 & Usje

	2002		2020		*I*	
	km²	%	km²	%	*i*	%
A1	0.35	82.8	0.47	69.1	131	31
G2, G3, G4	0.06	13.8	0.19	28.5	326	226

Figure 5. Cartographic-tabular analysis of the program tendencies of the built content for the territorial fragments Ilinden 1, Gazi Baba 1, Dolno Lisiche, Drachevo 2 and Usje with a reference time period 2002-2022

Source: Microsoft Building Footprints 2022 & Distribution Portal of the Real Estate Cadastre Agency, 2022

In the agglomeration unit Ilinden 1, the representation of class A1 is the dominant class of uses in 2002 and occupies 69.3% of the total built-up area, in contrast to the classes of uses G2, G3 and G4, which occupy 13.6% of the total built-up area. In

2020, use classes G2, G3 and G4 undergo a drastic 566% growth and occupy 45.1% of the total built-up area, in contrast to use class A1 which occupies 40.9% of the total built-up area and records a growth of 15%.

In the agglomeration unit Gazi Baba 1, the representation of class A1 is the dominant class of uses in 2002 and covers 70.0% of the total built-up area, unlike the classes of uses G2, G3 and G4, which occupy 7.0% of the total built-up area. In 2020, the dominant representation of class A1 still persists and occupies 45.1% of the total built area, however with a small percentage growth of 19%, in contrast to the classes of uses G2, G3 and G4 which undergo a high growth of 215%, however occupying only 16.7% of the total built area.

In the cadastral municipality of Dolno Lisice, the representation of class A1 is the dominant class of uses in 2002 and occupies 96.3% of the total built-up area, unlike the classes of uses G2, G3 and G4, which occupy 1.7% of the total built-up area. In 2020, the dominant representation of class A1 still persists and occupies 82.7% of the total built-up area, but with a small percentage growth of 39%, in contrast to the classes of uses that G2, G3 and G4 undergo a record growth of 1329%, but occupy only 15.1% of the total built area.

Synthetically, in the cadastral municipalities of Drachevo 2 and Usje, the representation of class A1 is the dominant class of uses in 2002 and occupies 82.8% of the total built-up area, in contrast to classes of uses G2, G3 and G4, which occupy only 13.8% of the total built-up area. In 2020, the dominant representation of class A1 still persists and occupies 69.1% of the total built-up area, however with a small percentage growth of 31%, in contrast to the classes of uses G2, G3 and G4 which undergo a high growth of 226% and occupy only 28.5% of the total built area.

CONCLUSION

The cartographic and alphanumeric results of this research inform a methodology for continuous regional observation of potential growth and urban expansion. The results also confirm the high/remarkable degree of urban expansion of the city of Skopje towards suburbs, as well as the concentration of construction along the marginal zones of the planning area. Consequently, the contact zone of the planning area is being challenged, although this aspect has so far been ignored in the process of developing the general and detailed planning documents and in territorial governance in general.

This paper sets up a system for continuous monitoring of the trends of the built-up areas, which can allow planning regulations and mechanisms to reflect these dynamics. The holistic approach proposed in this paper to study the evolution of the city and its surroundings highlights the numerous contact zones between Skopje and suburban settlements and identifies the most important aspects for mutual development.

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ANTHROPOGENIC PRESSURES ON AIR QUALITY IN THE SKOPJE AGGLOMERATION

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ABSTRACT

Air pollution in the Skopje agglomeration represents a decades-long, complex problem, which requires a profound approach. The expansion of the urban space, which has been especially intensified in the last decade, as well as other socio-economic factors in the capital, have led to an additional serious threat to the health of the population through air pollution. This paper aims to analyze the socio-economic characteristics of the Skopje agglomeration, which exert a great pressure on the environment, and are reflected with the greatest consequences on the air quality in the agglomeration. The location for the research was determined due to the fact that the largest population of residents from the Republic of North Macedonia is concentrated in the Skopje agglomeration and it has high concentrations of air pollutants from all types of pollution sources and pollutants, where the concentration of the population and industrial facilities cause a threat to the quality of the basic components of the environment.

Key words: air pollution, Skopje agglomeration, anthropogenic pressure.

INTRODUCTION

Air quality in cities is the result of a complex interaction between natural and anthropogenic environmental conditions. Air pollution in cities is a serious environmental problem especially in the developing countries (Mayer, 1999).

There are two types of sources of air pollutants: anthropogenic sources from activities that include: biomass burning, industrial processes, agricultural activities, solid waste incineration, fires etc., and also natural sources that pollute the air including the tiny cosmic particles that enter the Earth's atmosphere, then dust from

the Earth, smoke, gases, and other materials created by volcanic eruptions (Dimitrovska, 2011).

Air pollution has been progressively recognized as a serious problem for cities, through widespread effects on health and well-being (Bikis, 2023). People living in the Western Balkans breathe air that has concentrations of pollutants up to five times higher than levels specified in national and European guidelines (United Nations, 2021).

Today, many studies, world media and relevant institutions range Republic of N. Macedonia's capital - Skopje, among the first most polluted city in Europe where air pollutants reach alarmingly high concentrations in the winter season, resulting with higher rate of premature deaths than in most European Union states. (Manevska et. al., 2023; Al Jazeera, 2021; Euronews, 2021; BBC, 2020; World Bank, 2019). Urban areas in the Republic of N. Macedonia with their physical structures in the conditions of constant dynamic population concentration and their spatial expansion have a very negative impact on the air pollution and other crucial components of the environment (Selmani, Dimitrovska, 2005). In particular, if focusing on the anthropogenic sources of pollution, major sources for bad air quality in Skopje agglomeration are: heating (32%), industry (20%), followed by transport (19%), construction (12%) and waste (7%) (UNDP, 2020). While, the results from the researches, also show that the biggest contribution on the bad air quality in the city of Skopje have the households, which in purpose of heating use furnaces with inefficient combustion in which biomass is burned, i.e. wood, and also use fuels of low quality (Trpevska Trajkovska et al., 2019).

With a comparatively large number of industrial point sources and higher traffic flows than other cities in the country, the Skopje agglomeration has historically experienced frequent episodes of heavy pollution. During dry periods, the combination of mineral dust and emissions from residential heating, the transport sector, and industrial activities within the city increase the concentrations of inhalable particles (Martinez et. al., 2018).

STUDY AREA

The Skopje agglomeration is placed in the Skopje Valley, in the northern part of the Republic of North Macedonia 41° 42'15'' and 42°16'20'' N. and 21°09'40'' and 21°49'15'' E. along Grinich (Lazarevska, Markoski, 2019). The area is bounded by the mountain ranges of Karadzica and Goleshnica to the south, Gradeshka Mountain to the east extending to Ovche Pole, the Kumanovo Valley and Skopska Crna Gora massif to the north, and Zheden Mountain to the west, which separates it from the Polog Valley (Lazarevska, Markoski, 2019). The valley encompasses 1924.2 km^2, with 343.9 km^2 constituting flatland situated within a hypsometric range of 150 to 300 m.a.s.l. (Markoski, 2006).

Skopje agglomeration is the basis of Skopje region, which is also the smallest and most populated region of the total of eight regions in the country. Skopje

agglomeration has ten municipalities on its territory, while the whole region has seventeen municipalities and expands on an area of 1812 km2, the agglomeration extends over an area of 571.97 km2 (Odzaklieska, 2016).

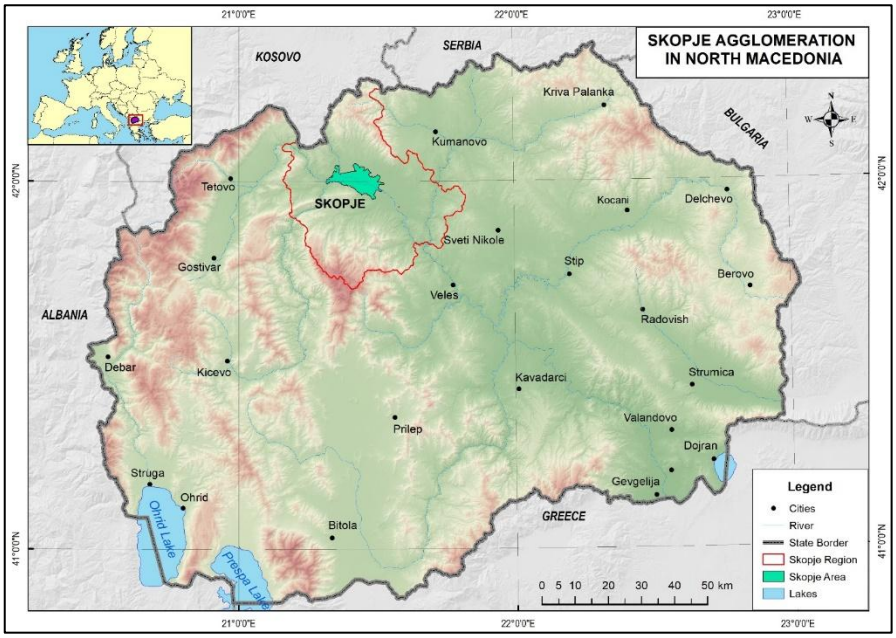


Figure 1. Geographical position of the Skopje agglomeration within the Republic of North Macedonia and the Skopje region.

Source: OSM, DEM – USGS

Despite the advantageous geographical location and well-developed traffic infrastructure of the Skopje agglomeration, traffic congestion remains a common occurrence due to its densely populated areas. According to the data from the last census in 2021, the Skopje agglomeration has a total population of 526,502 citizens, which is 27.7% of the total population in the Republic of North Macedonia (Census, 2021). Given that the majority of industrial, commercial, and service facilities are clustered within the Skopje agglomeration, internal migrations within the area are common due to employment opportunities, educational pursuits, healthcare needs, and other factors. Consequently, this leads to a growing population within the agglomeration.

As the city continues to expand rapidly, undergoing accelerated urbanization and embracing a fast-paced modern lifestyle, Skopje has become a focal point for research regarding decades-long issues with air pollution. This research seeks to understand the root causes, assess its impacts, and explore potential solutions to mitigate the current situation.

DATA AND METHODS

For the research on this paper, the main focus was placed on the analysis on the data from the state institutions of the Republic of North Macedonia. The anthropogenic pressures on the Skopje agglomeration were analyzed and detected based on the publications from the State statistical office and the Ministry for environmental protection and spatial planning. In order to have a greater credibility of the research many official studies and documents were utilized. The statistical method as well as the analysis method and comparative method was used to identify the concentrations of the average annual concentration of the pollutants SO_2 and PM_{10} for a ten year period (2012-2021). Based on the data from the pollutants were created the interpolation maps based on the inverse distance weighted technique in GIS for detection of the contours with the pollution levels in the different areas of the agglomeration.

ANTHROPOGENIC PRESSURES ON THE AIR QUALITY IN THE SKOPJE AGGLOMERATION

Skopje agglomeration is a typical example to be analyzed from the aspect of spontaneous expansion of cities that lacks proper planning regulation and respect for certain legalities in the socioeconomic sphere. Agglomeration systems, such as the Macedonian example in the City of Skopje, indicate negligence in society and its inability to protect spatial mobility and the corresponding geocomplexes, which results with expansion of the population in urban centers with continuously degradation processes in the environment of far-reaching consequences (Selmani, Dimitrovska, 2005).

Population and settlements

For the analysis of the fluctuations in population rates within the Skopje agglomeration, the focus was placed on municipalities situated within its territory: Aerodrom, Butel, Gazi Baba, Gjorche Petrov, Karposh, Kisela Voda, Saraj, Centar, Chair and Shuto Orizari.

Based on the data (Table 1), it can be noted that in the analyzed census years, the total number of the population in the Skopje agglomeration recorded a drastic increase, more precisely, in the period 1948-2021, the population increased for 415,879 inhabitants.

The participation of the population of the Skopje agglomeration in the total population of the Republic of North Macedonia from 9.6% in 1948 grew to 28.7% in 2021.

Immigration from other cities into the Skopje agglomeration is considered as one of the main problems for the agglomeration's congestion and the reason for building new housing facilities in the urban area. Over the years, the average number of

newcomers settling in the agglomeration has consistently hovered for around three thousand.

Table 1. Population rate in Skopje region and Skopje agglomeration

region/year	1948	%	1971	%	2002	%	2021	%
N. Macedonia	1152 980	100.0	1647308	100.0	2022547	100.0	1836 713	100.0
Skopje region	159 561	13.8	388 962	23.6	578 144	28.6	607007	33.0
Skopje agg.	110 623	9.6	312 091	18.9	506 926	25.1	526502	28.7

Source: Panov, 1976; DZSRSM 2005; DZSRSM 2022

Analyzed by municipalities (Table 2), in the Skopje agglomeration, according to the 2021 census, the municipality Aerodrom has the largest number of inhabitants (77,735 inhabitants), where the total population of the Skopje agglomeration is 14.8%, and the smallest is Shuto Orizari with (25,726 inhabitants) or with a share of 4.9% in the total population of the Skopje agglomeration.

Table 2. Numerical movement of the population by municipalities in the Skopje agglomeration

Municipality	Population rate, Year 2002	%	Population rate, Year 2021	%
Aerodrom	72 009	14.2	77 735	14.8
Butel	36 154	7.1	37 968	7.2
Gazi Baba	72 617	14.3	69 626	13.2
Gjorche Petrov	41 634	8.2	44 844	8.5
Karposh	59 666	11.8	63 760	12.1
Kisela Voda	57 236	11.3	61 965	11.8
Saraj	35 408	7.0	38 399	7.3
Centar	45 412	9.0	43 893	8.3
Chair	64 773	12.8	62 586	11.9
Shuto Orizari	22 017	4.3	25 726	4.9
Skopje agglomeration	506 926	100.0	526 502	100.0

Source: DZSRSM 2005,; DZSRSM, 2022

The number of households in 2021 compared to 2002 grew for new 24,605 households, while due to intensive construction, the number of apartments is higher and records an increase of 50,105 apartments for the same time period.

In the Skopje agglomeration there is total of 52 settlements, of which Saraj has 23 settlements and Gazi Baba with 13 settlements, while Centar and Chair don't have any settlements (Official Gazette of the Republic of Macedonia, 2004). Population density, i.e. the number of inhabitants per unit area, greatly affects the air quality in a certain area.

Based on the data from table 3, it can be observed that there is unevenness in the population density. The highest population density in 2021 is the municipality of Chair with 19,558 inhab./km2, followed by the municipalities of Centar with 6,088 inhab./km2, Shuto Orizari with 3,416 inhab./km2, Aerodrom with 3,314 inhab./km2,

Kisela Voda 1,971 inhab./km2, Karposh with 1,857 inhab./km2 and Saraj with 1,607 inhab./km2. In the rest of the municipalities that are part of the Skopje agglomeration, the population density is lower, where the municipality of Saraj has the lowest density which is only 166 inhab./km2.

Table 3. Population density in the Skopje agglomeration in 2021

Municipality	Area [km^2]	Population	Population density [inhabitant/km^2]
Aerodrom	23.46	77 735	3 314
Butel	54.55	37 968	696
Gazi Baba	112.39	69 626	619
Gjorche Petrov	66.97	44 844	670
Karposh	34.33	63 760	1 857
Kisela Voda	31.44	61 965	1 971
Saraj	230.89	38 399	166
Centar	7.21	43 893	6 088
Chair	3.20	62 586	19 558
Shuto Orizari	7.53	25 726	3 416
Skopje agglomeration	571.97	526 502	920

Source: DZSRSM, 2022

Overall, the Skopje agglomeration recorded an average density of 920 inhab./km^2 in 2021. Within the municipalities constituting the Skopje agglomeration, where the population concentration is higher, conditions are ripe for more intensive utilization of space and its resources. As a result, these areas face an increased risk of compromising air quality and other environmental factors.

Business entities in the Skopje agglomeration, represent 37.1% of the total number of active business entities in the Republic of North Macedonia and 94.4% of the total number of active business entities in the Skopje Region. It is noteworthy that the largest number of large enterprises (62.6% of all large enterprises in the Republic of North Macedonia) are registered in the Skopje agglomeration (DZSRSM, Makstat – database).

Pollution sources

Stationary sources of air pollution

Based on the data listed in the Updated Integrated Cadaster of Environmental Pollutants of the City of Skopje prepared in 2019 by Technolab DOO, Skopje, of total 1411 business entities - 994 are from non-production and 417 from production facilities, i.e. 1345 are collective and 66 point pollutants.

The business entities included in the database, according to their location, are distributed in: Urban zone (1057 business entities), Industrial zone (273 business entities) and rural zone (81 business entities). At a total of 1411 business entities -

stationary polluters, 591 emissions were recorded, of which: 140 were emissions from non-combustion processes and 451 were emissions from combustion processes. Emissions that originate from business entities that are located in the city area of Skopje have the largest share in the total amount of emissions of polluting substances in the air. The emission of polluting substances mostly originate from the point sources of emission, which, although they are in a smaller number (66 or 4.68%) in comparison to the collective ones, cause significant air pollution.

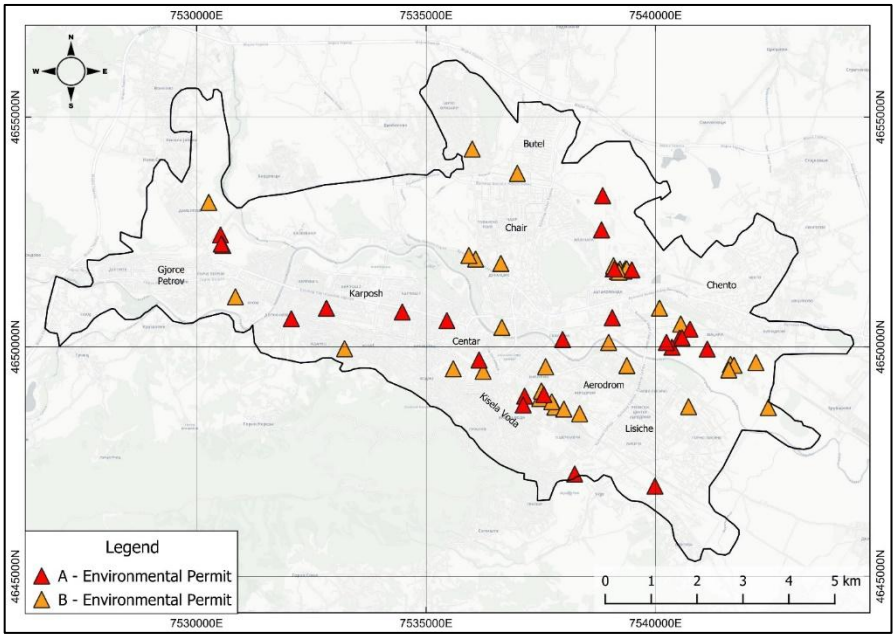


Figure 2. Geographical position of the business entities with A – environmental and B – environmental permit in the Skopje agglomeration,

Source: MOEPP, 2024

From the identified business entities in the territory of the Skopje agglomeration, 25 installations possess an A-Integrated environmental permit, which is under the jurisdiction of the Ministry of Environmental Protection and Spatial Planning. While 36 installations have B-Integrated environmental permit which is under the jurisdiction of the City of Skopje (MOEPP, 2024).

According to the survey on the method of heating households in the Skopje Valley, conducted in January 2017 with the support of the United Nations Development Program, the majority of households (about 47%) use solid fuels (firewood, coal, pellets, briquettes) in own combustion system, and third of the households are heated by electricity, while about 21% are connected to the the central heating system (Taseska Gjorgjievska et. al., 2019).

The results from researches, show that the biggest contribute of air pollutants in the Skopje agglomeration are the home fireplaces in which, in order to provide heat

energy for homes, frequently are used stoves with inefficient combustion, in which biomass, i.e. wood, is burned. The emission of polluting substances into the air from the burning of solid fuels is one of the factors that significantly affect the quality of the ambient air (Trpevska Trajkovska et. al., 2019).

Emissions from mobile sources of air pollution

The traffic in the Skopje agglomeration plays a significant role in air pollution, since there are a lot of internal migrations on a daily basis. The traffic bottlenecks in the urban part of Skopje agglomeration contribute to the air pollution in the central area (Selmani, Dimitrovska, 2004).

The expansion of the city proportionally creates conditions that encourage more people to own and use vehicles, resulting in an increase in the overall number of vehicles on the roads. This confirms the fact that from 2012 until 2021 the number of registered vehicles increased by 54,151 which is a significant contribution to the air pollution in the Skopje agglomeration (DZSRSM, Makstat – database).

Air quality analysis in the Skopje agglomeration

Skopje agglomeration has the most polluted air in the winter season in Europe (World Bank, 2019; United Nations, 2022; Euronews, 2022) and studious and analytical approach for providing data is the primary basis for analyzing and improving the air quality in the Skopje agglomeration. Today the air quality is regularly monitored by monitoring the concentrations of polluting substances in the air in the Skopje agglomeration. There are five monitoring stations on the territory of the Skopje agglomeration, located in Centar, Karposh, Gazi Baba, Lisiche, and in the courtyard of the Rectorate of the University of St. Cyril and Methodius (Rectorat monitoring station) (MOEPP, 2024).

In order to analyze the air quality in the Skopje agglomeration, in this paper are shown interpolation maps for the polluters SO_2 and PM_{10} which were made from average concentrations of the polluters for a ten year period of time (2012-2021).

SO_2 is mostly emitted into the atmosphere by the burning of coal, especially in the installations for production of electrical energy. This pollutant substance is also discharged by industrial processes that take place in smelters, oil refineries, the paper and cellulose manufacturing industries, metal industry and transport (Dimitrovska et. al., 2013). SO_2 is a suffocating gas with a sharp scent, formed by the burning of materials containing sulfur. It is a gas that, in typical ambient air concentrations, can react with humidity in the air thus forming sulfur acid. In combustion of fuel containing sulfur, the sulfur oxidizes to SO_2, further reacting with other polluting substances and thus forming aerosols. In liquid form it can be found in the clouds, fog, rain, aerosol and on the surface of the particles. SO_2 is also the main precursor of $PM_{2.5}$. Sulfur dioxide is mainly formed by coal combustion, especially in electricity producing installations. This pollutant is released from

industrial processes in smelters, oil refineries, paper and pulp processing industries, metal industry as well as in transport (MOEPP, 2024).

Particulate matter, also known as particle pollution or PM, is a term that describes extremely small solid particles and liquid droplets suspended in air. Particulate matter can be made up of a variety of components including nitrates, sulfates, organic chemicals, metals, soil or dust particles, and allergens (such as fragments of pollen or mould spores). Particle pollution mainly comes from motor vehicles, wood burning heaters and industry. During bushfires or dust storms, particle pollution can reach extremely high concentrations (NSW Government, 2020).

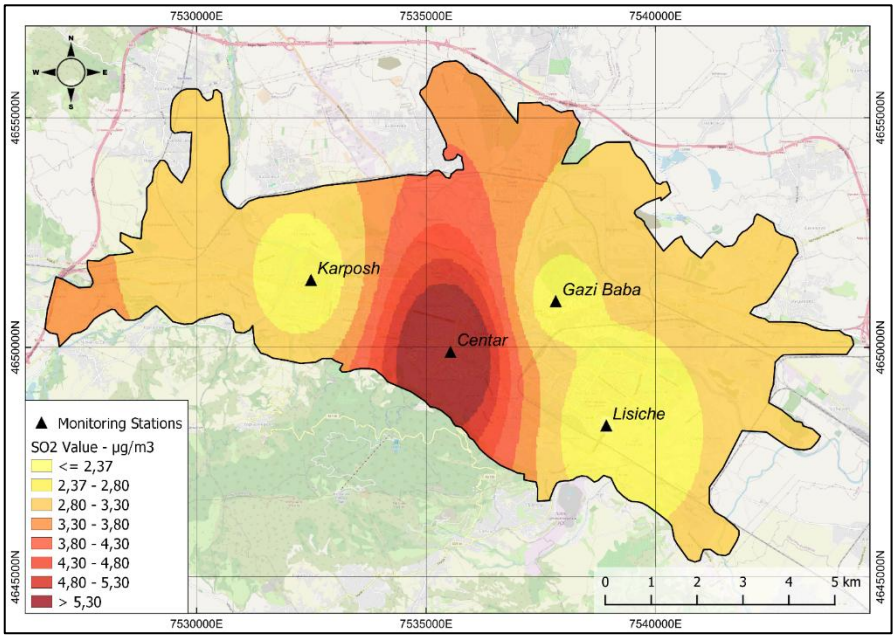


Figure 3. Interpolation (IDW) on the air pollution from SO_2 in the Skopje agglomeration
Source: OSM

Since many analysis show that there are highest concentrations of PM10 during the winter season, it can be concluded that the anthropogenic sources mostly contribute with high concentrations of PM10 (Manevska et. al., 2020; Trpevska Trajkovska et. al., 2019).

On the next figure we can notice the variations of the SO2 concentrations in different areas in the Skopje agglomeration.

The map (Figure 3) is showing the most polluted areas of SO_2 in the Skopje agglomeration. It can be noticed that in the municipality Karposh, Gazi Baba and Lisiche there's either minimal or no pollution from SO_2 where the concentrations get from 2.37 µg/m^3 – 2.80 µg/m^3.

The peaks of SO_2 are in the municipality Centar, i.e. the most urban area of the agglomeration where the concentrations get from 3.30 – 5.30 μg/m3 in the central part. It is worth mentioning that the analysis show that in every monitoring station, the SO2 concentrations are highest in January, February and December, a period which is a heating season and when the air temperature is lower (Manevska et. al., 2023). One of the main issues and big contributor to the air pollution in the municipality Centar is the constant urbanization, leading to the gradual reduction of green spaces within the agglomeration. This area of the agglomeration is also characterized by expansive boulevards and heavy traffic congestion. Studies examining the origins of SOx in the Skopje region, categorized by sectors, showed results that mobile sources (traffic) contributes with 56% of total emissions, while stationary sources contribute 33%. Diffuse sources, such as non-industrial combustion, make up 9%, and stationary sources like energy plants contribute 2%. (Finish Meteorological Institute, MOEPP, 2016). According to the state's criteria for permitted concentrations of harmful substances there are no exceedances above the air quality limit values at all monitoring stations in the Skopje agglomeration for the polluting substance SO2. For comparison, the pollution from the air polluter PM10 is shown on Figure 4.

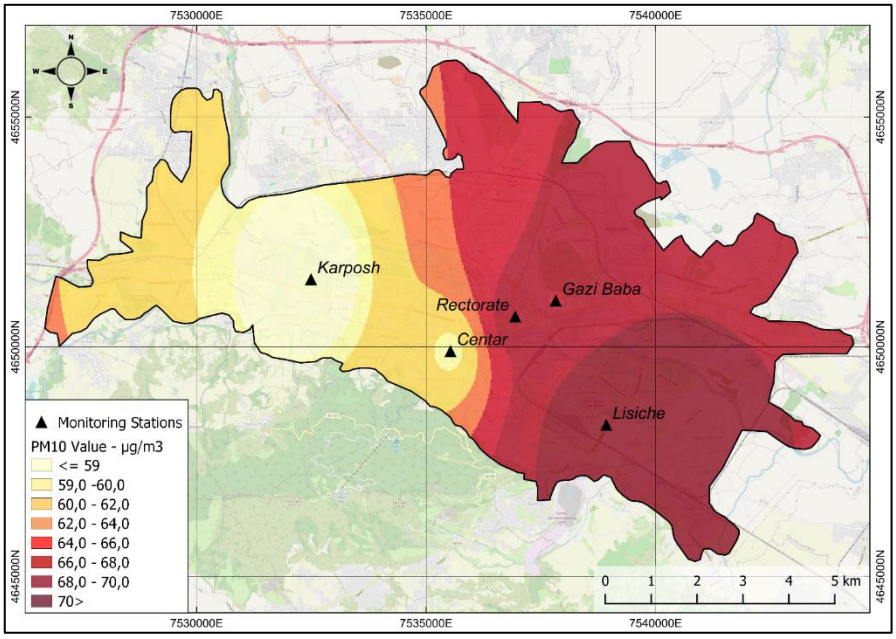


Figure 4. Interpolation (IDW) on the air pollution from PM_{10} in the Skopje agglomeration
Source: OSM

On the given figure, we can see variations from the concentrations of PM_{10} in the air. The lowest concentrations from the analyzed polluter are in the municipality

Karposh where the average concentrations get to 59 μg/m^3. The area between Karposh and Centar experiences higher pollution levels, while in the center or the urban area in the municipality of Centar there are lower concentrations of PM_{10}. Concentrations of PM_{10} increase from Centar to Rectorate and Gazi Baba where the concentrations of these monitoring stations get to 66 μg/m^3. The peaks of PM_{10} are observed at the Lisiche monitoring station which get to 70 μg/m^3. Since the permitted annual concentrations of PM_{10} in the Republic of North Macedonia is 40 μg/m^3 it can be concluded that all of the observed monitoring stations exceed the permitted limit. The permissible values of the targeted standards were exceeded, mostly, during the winter months, which is associated with the heating season (Manevska et. al., 2021).

From the maps we can see that monitoring station Lisiche showed the highest concentrations of PM_{10}. This can be a result of the large concentration of houses in that area that use solid fuels (firewood, coal, pellets, briquettes) in their own combustion system. European and world research shows that in the latter decade has seen an increase in the amount of biomass burned in the home fireplaces. The same tendency is observed in the Skopje agglomeration, where researches show that as much as 90% of the total emissions of PM particles come from household fireplaces and this is mostly due to the insulation characteristics of the buildings (Manevska et., al. 2021). The examination of ambient air pollution in the capital carried out by Tehnolab DOO Skopje gave similar results. The study was conducted in Lisiche where heating with firewood is predominant and Centar where heating in the households is mostly through the heating system of the city of Skopje. The results showed that the highest concentrations of PM_{10} are in the winter season which indicates that the heating of the households is a primary contributor to the air pollution especially in the areas where the heating in the households is from their own combustion system. Also the study showed that in the PM_{10} particles were found large amounts of levoglucosan. The levoglucosan comes from the burning of wood which is the main means of heating on the territory of the Skopje agglomeration. Furthermore, large quantities of mannosan and galactosan were found in the air which, again, come from the combustion of biomass (Trajkovska Trpevska et., al. 2019).

CONCLUSION

The Skopje agglomeration as the largest urban, industrial, administrative area in the Republic of N. Macedonia has a decade long challenge with air pollution. The air quality in the Skopje agglomeration is significantly affected by numerous factors, posing challenges to the sustainable management of ambient air quality in the urban area of the Skopje agglomeration. Some of the factors that influence the air quality in the agglomeration are the geographical position, the climate characteristics and the anthropogenic pressures. The air in the central city area is the most polluted which is as a result of the high population in the city, a lot of buildings which were built too close so there is no possibility of natural ventilation of the air, the intense

traffic, heating plants and industrial facilities in the city. In certain localities of the city, the climatic-meteorological and topographical characteristics, as well as the location can be factor for increasing ground-level air pollution with winter smog conditions (Manevska et. al., 2023). Although, Republic of N. Macedonia in the last years, has showed interest to solve the problem with the air pollution through participating in projects that mainly focus on analyzing and exploring the main sources of air pollution, one of the prevailing sources of the air pollution - the uncontrolled urbanization still persists in the central area of the agglomeration. Many researches have shown the air is most polluted in the winter season, when low air temperature is present and that as a main source of air pollution is the heating of the households. As most polluted area is the municipality Centar and Lisiche which have the highest concentrations of SO_2 and PM_{10} comparing to the other monitoring stations located in different municipalities. This proves that the anthropogenic pressure in the Skopje agglomeration is a significant concern and contributor to the air pollution in the urban area of the agglomeration.

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EVALUATING TOURISM SEASONALITY USING QUANTITATIVE INDICATORS: THE CASE OF THE OHRID–STRUGA SUB-REGION

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ABSTRACT

Seasonality in tourism, although one of its most prominent characteristics, remains a paradigm. Almost all world destinations experience a seasonal concentration of tourist activities, represented by a peak of tourists in a short period (usually weeks or months), with numerous positive and negative consequences. Although Ohrid is a well-known tourist center in the country, and several studies have been conducted, there is still a lack of research on the Ohrid-Struga sub-region.

The paper aims to analyze of tourist arrivals in the Ohrid-Struga sub-region, which is a significant part (26%) of the leading tourist region in North Macedonia. The analysis covers a period from 2004 to 2023, utilizing data from the State Statistical Office. Seasonality is presented and measured using the seasonality ratio, seasonality indicator, GINI coefficient, and seasonality index.

Keywords: tourism arrivals, seasonality, Ohrid–Struga sub-region, seasonality ratio, seasonality indicator, GINI coefficient, seasonality index

INTRODUCTION AND LITERATURE REVIEW

Seasonality is one of the most influential factors limiting continuous development. It is recognized as one of the most prominent characteristics of modern tourism, with most destinations experiencing some kind of seasonal pattern. Generally, seasonality signifies annual dependence, or more precisely, "seasonality is the systematic, although not necessarily regular, intra-year movement caused by the changes of the weather, the calendar, and timing of decisions, directly or indirectly through the production and consumption decisions made by the agents of the

economy" (Bigović, 2012). Thus, it can be understood as a phenomenon that provokes incomplete and unbalanced use of the means necessary for economic development (BarOn, 1973). This variation may occur throughout the year, within a month or a week, and even within a single day (Holloway, 1994). Biedermann (2008) stated that seasonality is a prevalent characteristic in travel and tourism, marked by sharp variations in demand depending on the time of the year. Seasonality is strongly linked to tourism development, reflecting the trend of concentrating tourism flows within a specific time segment. Such a concentration over a short period leads to several limitations in the social and physical environment and inefficiencies (Getz, Nilsson, 2004; Mitchell, Murphy, 1991). Tourism seasonality challenges everyone involved in the industry, including scientists, theorists, and tourism workers. It can be considered as a temporary imbalance in tourist activities, where a significant concentration of such activities occurs in a short period that repeats yearly, evidenced by increased tourist arrivals, nights spent, and tourist consumption, among other factors.

Seasonality is usually highlighted as a negative phenomenon in tourism. Tourism destinations with high demand variations are described as unstable labor markets. While tourism employers cannot afford workers' salaries during off-peak seasons, employees seek stable jobs (Chung, 2009). A range of studies have highlighted negative influences of peak seasons, including increased prices; pressure on infrastructure (Commons, Page, 2001); environmental problems, and reduced quality of service, which affects tourists' satisfaction (Baum, Morrison, 2004). It is treated as a weakness or a problem, not only in an economic sense, but also in a socio-cultural and ecological sense (Bigović, 2012). According to Koening-Lewis, Bischoff (2005), the consequences of tourism seasonality are generally categorized into three main groups: social, environmental, and sociocultural. Social quality of the tourism sector highlight that seasonality in tourism favors the construction industry because construction work in tourist destinations is usually done outside of the tourist season (Grant et al., 1997). Environmental issues can be considered positive because intense tourist activity in a particular place throughout the whole year can adversely affect the environment. Sociocultural, during the peak tourist season, residents frequently face overcrowded public spaces, bustling markets, traffic congestion, higher prices. During the off-season, residents may struggle with shortages of essential goods for their daily needs. The factors that determine tourism seasonality are divided into two categories: natural and institutional. Natural factors are represented by climate elements such as temperature, rainfall, snowfall (BarOn, 1975; Butler, 1994; Commons, Page, 2001; Goulding et al, 2004). In addition, institutional factors of seasonality include school and religious holidays (Goulding et al, 2004); and travel habits (Commons, Page, 2001; Goulding et al, 2004; Jang, 2004). Other reasons that influence seasonality in tourism are social pressure, fashion, imitation, inertia, tradition, etc. (Koenig-Lewis, Bischoff, 2005).

Tourist destinations with seasonality experience an annual cycle with two main seasons: peak and off-peak season, separated by two shoulder seasons. Destinations that depend on weather conditions experience a single peak season

(Wall, Mathieson, 2006). For instance, the Ohrid-Struga sub-region, where warm weather drives tourism demand, sees the highest number of visitors and arrivals during the summer months. A tourism-based economy supported by seasonality patterns (Petrevska, Nikolovski, 2018) puts Ohrid under anthropogenic pressure, particularly regarding heavy traffic, congestion, and coastal exploitation (UNESCO, 2019).

The literature typically assesses seasonality using four key indicators: the Seasonality Ratio, the Seasonality Indicator, the Gini Coefficient, and the Seasonality Index. The Seasonality Ratio is determined by dividing the highest seasonal value by the average, while the Seasonality Indicator is calculated as the average ratio to the highest value. The Gini Coefficient represents the maximum annual utilization factor influenced by seasonality. Lastly, the Seasonality Index measures seasonal fluctuations by comparing demand increases and decreases relative to the seasonal average.

METHODOLOGY

Karamustafa and Ulama (2010) compared the four identified methods of measuring seasonality, analyzing their advantages and weaknesses. They explained that the seasonality ratio assesses the intensity of seasonal fluctuations, while the seasonality indicator measures the capacity utilization of tourist arrivals. However, both methods have certain drawbacks, as they do not consider distributional skewness, are influenced by extreme values, and focus only on a single year's data. In contrast, the Gini coefficient provides a more comprehensive evaluation by analyzing the entire period and allowing for monthly comparisons. This makes it useful in assessing tourist numbers across different months, enabling managers to develop more effective marketing strategies for various markets.

Fernandez-Morales and Mayorga-Toledano (2008) noted that the Gini coefficient is more stable than earlier methods, as it is less affected by extreme values and more responsive to off-peak changes. The Seasonality Index, which utilizes multi-year data and moving averages, provides a stronger basis for forecasting. Although it is unsuitable for new destinations due to its data requirements (Karamustafa, Ulama, 2010), it is well-suited for established destinations like the Ohrid-Struga sub-region with rich historical records.

* The Seasonality Ratio is “the largest number of visitors (every month) in the year divided by the average number of visitors for the same year” (Yacoumis, 1980). Its values range from 1 to 12. This means that when the seasonality ratio equals 1, the number of visitors is constant each month (no seasonality). At the same time, 12 indicates the highest level of seasonality, meaning that visitors are concentrated in one month (Karamustafa, Ulama, 2010).

* The Seasonality Indicator is “the average number of visitors in the year divided by the largest number of visitors for the same year.” This means it is “the inverse value of the seasonality ratio.” The seasonality indicator value ranges from 1/12 to

1. If the number of visitors arriving is the same every month, the seasonality indicator equals 1. If the number of visitors arriving is concentrated in one month, then the seasonality indicator is 1/12.

* The Gini Coefficient was first developed and introduced in 1912. Since then, it has been one of the most commonly used coefficients for measuring revenue inequality caused by temporary disorders. The Gini coefficient (G) is derived from the Lorenz curve (Lundtorp, 2001). The famous Lorenz curve represents inequality, while the Gini coefficient measures this inequality (Bigović, 2012).

The Gini coefficient:

$$G = \frac{2}{n}\Sigma_{i=1}^{n}(x_i - y_i)$$

n = ratio value (in the case of this study, number of months = 12),
x_i = ratio order (i.e. 1/12, 2/12, … …., 12/12); and,

y_i = cumulative actual ratios in the Lorenz curve.

When the Gini coefficient is 0, the number of visitors remains the same throughout the year. If G equals 1, this indicates a complete inequality in the concentrations of monthly visitors/arrivals (Kulendran, Wong, 2005).

* The Seasonality Index is calculated using the following steps:

(1) Calculating the moving average of tourist arrivals for the first 12 months of the study year period (2004 in this case), the exact calculation continues through the subsequent 12 months of the second year until the final 12 months of the study period (2023).
(2) Calculate the central moving average for every two months (January and February, then February and March, etc.) throughout the entire study period.
(3) To calculate the seasonality index, the number of tourist arrivals for each month over all years is divided by the central moving average for that month.
(4) Calculate the total yield in step 3 for each month across all years (i.e., the total yield in step 3 for January throughout the entire study period from 2004 to 2023), and perform the same calculation for the other months.

Calculate the average by dividing the yield obtained in step 4 by the total number of years, which is 20.

Calculate the adjusted monthly averages so that their total equals 12, then multiply each adjusted value by 100. The result is the seasonal index.

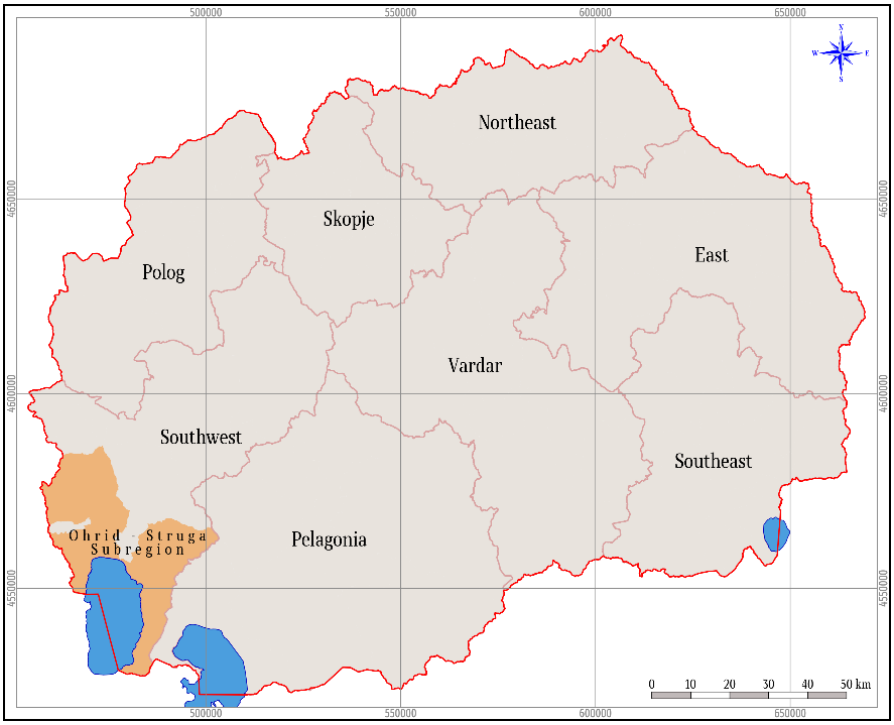
CASE STUDY OHRID – STRUGA SUB-REGION

Tourism plays a significant role in the economy of North Macedonia, bringing numerous economic benefits, such as revenue generation, increased employment, and support for small and medium-sized businesses. It also contributes to the

preservation of cultural heritage and the promotion of Macedonian traditions. However, seasonality remains a significant challenge.

North Macedonia (State Statistical Office) sees a 7,8% rise in tourism in 2024, with a significant increase in foreign visitors and overnight stays boosting the economy. While domestic tourists declined by 1%, international tourists rose by 13,1%.

Research indicates that the Ohrid-Struga sub-region, with an area of 879 km2 as part of the Southwestern Region (3.363 km2), Macedonia's most attractive tourist destination, is primarily a summer destination. However, the intensity of this seasonality has been decreasing in recent years as tourist arrivals during other periods have increased (excluding the pandemic year of 2020). Emphasizing the socio-cultural tourist values of Ohrid and Struga and boosting visitor numbers outside summer can partially mitigate the seasonal effects driven by destinations natural characteristics.



Map 1. Location of Ohrid - Struga sub-region in North Macedonia

The map illustrates the geographical area under study, situated within the Southwestern Statistical Region, as defined by the NUTS 3 classification system. It also shows this region's territorial placement within North Macedonia.

RESULT AND DISCUSSION

The number of tourists in the Ohrid-Struga sub-region during the analyzed period did not record any significant fluctuations. Over the entire two-decade period there was an increase of 226.306 arrivals, representing a growth of 105,8%. The fewest arrivals (excluding the pandemic year 2020) were recorded in 2004. The most significant drop occurred in 2020, with a decrease of 52,1% due to the COVID-19. Since then, until the last analyzed year, 2023, there has been an increase of 114,5%. Additionally, there is temporal variation in the number of arrivals each month throughout every year during the study period, as shown in Table 1, reflecting fluctuations in tourism demand in the Ohrid-Struga sub-region. On average, the highest number of arrivals is recorded in August, with 70.603, while the lowest average number of tourists (excluding the year 2020) is registered in February, with 4.510 visitors. The minimum arrivals (excluding 2020) were 2.024 in February 2012. Conversely, the highest recorded number of tourists occurred in August 2023, reaching 102.939.

Table 1. Number of arrivals in the Ohrid-Struga sub-region (2004-2023)

	month											
year	1	2	3	4	5	6	7	8	9	10	11	12
2004	3895	4825	4833	7812	17155	16963	63570	58493	11491	11946	5989	7024
2005	4318	3539	6912	10231	14471	18469	69574	58954	12766	13179	7169	7905
2006	3844	2781	7210	10593	16503	21911	64933	58741	14140	10022	5887	8702
2007	4482	3624	6498	10724	18815	20227	72970	64849	14714	12933	6806	8256
2008	5575	3569	6546	8901	25415	22573	68151	67719	15593	16055	7289	9406
2009	5177	4943	6027	9886	23189	21856	68357	66581	15746	13709	5743	4755
2010	3893	3630	3892	9620	21739	19964	61377	60430	15661	10948	5393	5823
2011	4497	3676	6509	10416	21174	20584	64434	60039	21601	13850	5400	5176
2012	4371	2024	4846	10576	23758	24697	60272	58027	22583	15511	6761	5465
2013	3402	2398	6169	11749	28816	28306	54995	61122	22929	20286	6228	5872
2014	4751	2688	7353	12269	31595	24938	53804	58788	25110	21954	7238	5879
2015	5082	3113	5348	14884	34507	27618	58897	67384	29020	18771	9110	10304
2016	7451	4616	8713	17994	36670	28658	64487	62513	32294	24846	9739	10795
2017	7840	5335	9189	23574	40128	31813	72826	74329	38610	25864	10910	12433
2018	10027	6219	12843	29227	40712	41694	80399	85427	42088	26894	13166	13891
2019	8527	6213	11637	31749	41437	46732	81695	87823	48209	34283	15742	14932
2020	11532	9390	4357	258	131	928	51667	83509	22683	8546	4437	7872
2021	4238	4585	4173	4267	12046	17872	71206	88201	29400	14327	8982	9170
2022	8271	6339	8522	13878	27731	32330	79837	86200	42521	30903	14341	11241
2023	7252	6687	9571	23086	41789	44641	91994	102939	50188	32504	16246	13405
total	118425	90194	141148	271694	517781	512774	1355445	1412068	527347	377331	172576	178306
avg.	5921	4510	7057	13585	25889	25639	67772	70603	26367	18867	8629	8915

Source: State statistical office

The trend in tourist arrivals from 2004 to 2023 is illustrated in Figure 1. The figure shows a generally upward trajectory in the average number of arrivals to the Ohrid-Struga sub-region during the examined timeframe. This sustained growth trend indicates a positive development in the region's tourism sector.

The seasonality ratio results are shown in Table 2. The values are 2,46 in 2019, indicating the weakest seasonality, rising to 4,88 in 2020, and 3,94 in 2021. The results suggest that although seasonality existed in the Ohrid-Struga sub-region, it was not significant according to this method (seasonality ratio).

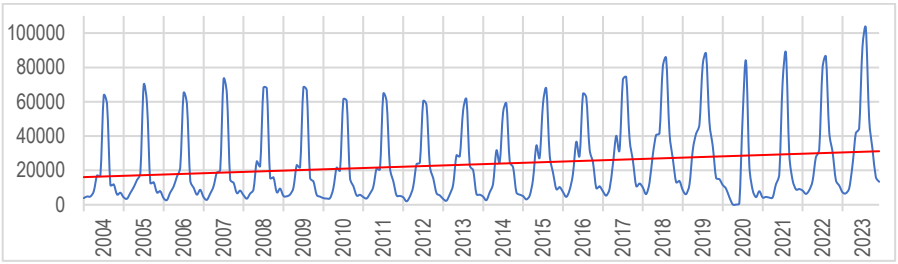


Figure 1. Trendline of tourist arrivals (2004 – 2023)

Using the available data for tourists arrivals in the Ohrid-Struga sub-region, seasonality was measured using the methods mentioned above.

Table 2. Seasonality ratio for arrivals in Ohrid–Struga sub-region (2004-2023)

month/ year	1	2	3	4	5	6	7	8	9	10	11	12	seasonality ratio
2004	0,22	0,27	0,27	0,44	0,96	0,95	3,56	3,28	0,64	0,67	0,34	0,39	3,56
2005	0,23	0,19	0,36	0,54	0,76	0,97	3,67	3,11	0,67	0,70	0,38	0,42	3,67
2006	0,20	0,15	0,38	0,56	0,88	1,17	3,46	3,13	0,75	0,53	0,31	0,46	3,46
2007	0,22	0,18	0,32	0,53	0,92	0,99	3,58	3,18	0,72	0,63	0,33	0,40	3,58
2008	0,26	0,17	0,31	0,42	1,19	1,05	3,18	3,16	0,73	0,75	0,34	0,44	3,18
2009	0,25	0,24	0,29	0,48	1,13	1,07	3,33	3,25	0,77	0,67	0,28	0,23	3,33
2010	0,21	0,20	0,21	0,52	1,17	1,08	3,31	3,26	0,85	0,59	0,29	0,31	3,31
2011	0,23	0,19	0,33	0,53	1,07	1,04	3,26	3,04	1,09	0,70	0,27	0,26	3,26
2012	0,22	0,10	0,24	0,53	1,19	1,24	3,03	2,91	1,13	0,78	0,34	0,27	3,03
2013	0,16	0,11	0,29	0,56	1,37	1,35	2,62	2,91	1,09	0,96	0,30	0,28	2,91
2014	0,22	0,13	0,34	0,57	1,48	1,17	2,52	2,75	1,18	1,03	0,34	0,28	2,75
2015	0,21	0,13	0,23	0,63	1,46	1,17	2,49	2,85	1,23	0,79	0,38	0,44	2,85
2016	0,29	0,18	0,34	0,70	1,43	1,11	2,51	2,43	1,26	0,97	0,38	0,42	2,51
2017	0,27	0,18	0,31	0,80	1,36	1,08	2,48	2,53	1,31	0,88	0,37	0,42	2,53
2018	0,30	0,19	0,38	0,87	1,21	1,24	2,40	2,55	1,25	0,80	0,39	0,41	2,55
2019	0,24	0,17	0,33	0,89	1,16	1,31	2,29	2,46	1,35	0,96	0,44	0,42	2,46
2020	0,67	0,55	0,25	0,02	0,01	0,05	3,02	4,88	1,33	0,50	0,26	0,46	4,88
2021	0,19	0,20	0,19	0,19	0,54	0,80	3,18	3,94	1,31	0,64	0,40	0,41	3,94
2022	0,27	0,21	0,28	0,46	0,92	1,07	2,65	2,86	1,41	1,02	0,48	0,37	2,86
2023	0,20	0,18	0,26	0,63	1,14	1,22	2,51	2,81	1,37	0,89	0,44	0,37	2,81

The seasonality indicator was calculated and presented in Table 3. The seasonality indicator values for the Ohrid-Struga sub-region ranged from 0,20 in 2020 and 0,25 in 2021, indicating the highest levels of seasonality during the study period, to 0,41 in 2019, reflecting the lowest level of tourism seasonality. These findings suggest that both methods used to measure seasonality yielded consistent results.

Table 3. Seasonality indicator for arrivals in Ohrid–Struga sub-region (2004-2023)

month/ year	1	2	3	4	5	6	7	8	9	10	11	12	seasonality indicator
2004	4,58	3,70	3,69	2,28	1,04	1,05	0,28	0,30	1,55	1,49	2,98	2,54	0,28
2005	4,39	5,36	2,74	1,85	1,31	1,03	0,27	0,32	1,48	1,44	2,64	2,40	0,27
2006	4,88	6,75	2,60	1,77	1,14	0,86	0,29	0,32	1,33	1,87	3,19	2,16	0,29
2007	4,55	5,63	3,14	1,90	1,08	1,01	0,28	0,31	1,39	1,58	3,00	2,47	0,28
2008	3,84	6,00	3,27	2,40	0,84	0,95	0,31	0,32	1,37	1,33	2,94	2,28	0,31
2009	3,96	4,15	3,40	2,07	0,88	0,94	0,30	0,31	1,30	1,50	3,57	4,31	0,30
2010	4,76	5,10	4,76	1,93	0,85	0,93	0,30	0,31	1,18	1,69	3,44	3,18	0,30
2011	4,40	5,38	3,04	1,90	0,93	0,96	0,31	0,33	0,92	1,43	3,66	3,82	0,31
2012	4,55	9,84	4,11	1,88	0,84	0,81	0,33	0,34	0,88	1,28	2,94	3,64	0,33
2013	6,18	8,77	3,41	1,79	0,73	0,74	0,38	0,34	0,92	1,04	3,38	3,58	0,34
2014	4,50	7,95	2,91	1,74	0,68	0,86	0,40	0,36	0,85	0,97	2,95	3,63	0,36
2015	4,66	7,60	4,43	1,59	0,69	0,86	0,40	0,35	0,82	1,26	2,60	2,30	0,35
2016	3,45	5,57	2,95	1,43	0,70	0,90	0,40	0,41	0,80	1,04	2,64	2,38	0,40
2017	3,75	5,51	3,20	1,25	0,73	0,92	0,40	0,40	0,76	1,14	2,70	2,37	0,40
2018	2,93	4,73	2,29	1,01	0,72	0,71	0,37	0,34	0,70	1,09	2,23	2,12	0,39
2019	4,19	5,75	3,07	1,13	0,86	0,76	0,44	0,41	0,74	1,04	2,27	2,39	0,41
2020	1,48	1,82	3,93	66,31	130,60	18,44	0,33	0,20	0,75	2,00	3,86	2,17	0,20
2021	5,28	4,88	5,36	5,24	1,86	1,25	0,31	0,25	0,76	1,56	2,49	2,44	0,25
2022	3,65	4,76	3,54	2,17	1,09	0,93	0,38	0,35	0,71	0,98	2,10	2,68	0,35
2023	5,06	5,49	3,83	1,59	0,88	0,82	0,40	0,36	0,73	1,13	2,26	2,74	0,36

The Lorenz curve illustrates the cumulative distribution of visitor/arrivals numbers, starting with the month with the fewest visitors (typically a winter month) on the left and progressing to the month with the most visitors on the right. If visitor numbers were consistent each month, the Lorenz curve would form a straight diagonal line, known as the line of equality. However, as seasonal variation increases, the Lorenz curve bows further away from this line, creating a larger area between the two.

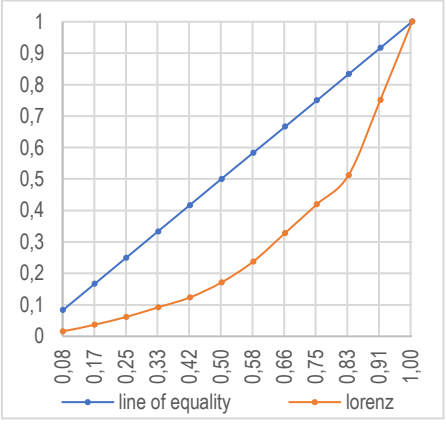
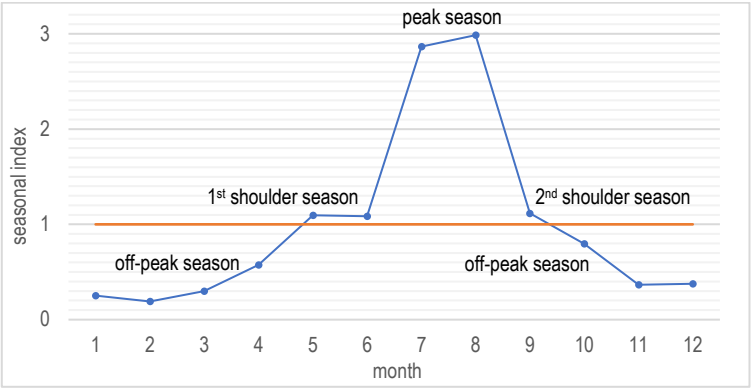


Figure 2. Lorenz curves of tourist arrivals (2004-2023)

The Gini coefficient was calculated to measure seasonality in the Ohrid-Struga sub-region. According to calculations, the average Gini coefficient for the study period from 2004 to 2023 was 0,23. The findings showed that the seasonal variation in monthly arrivals remained consistent throughout the study, and the larger the Gini

coefficient, the greater the inequality in tourism arrivals; conversely, the smaller the Gini coefficient, the lower the inequality in tourism arrivals in the Ohrid-Struga sub-region.

Figure 3. The seasonal index of arrivals to the Ohrid–Struga sub-region (2004-2023) uses the ratio to moving averages method.



Finally, the seasonal index was also calculated to measure the seasonality in the Ohrid-Struga sub-region, following the steps outlined in the methodology section of the study. According to the seasonal index, August had the highest seasonal index value (2,99) from 2004 to 2023, while February had the lowest value (0,19). We can observe the seasonal fluctuations between the months for the same period. Additionally, January, February, March, April, October, November, and December are considered as low peak season months. The first shoulder season is represented by May and June, while the second shoulder season is represented by September. July and August are peak season months with the highest number of arrivals.

CONCLUSION

Understanding seasonal trends and their influencing factors is crucial for effective tourism planning and development. Tourism seasonality produces many negative consequences evident across various societal domains, most notably in economic, social, and environmental contexts. These consequences often impact the sustainable development of tourism-dependent regions by fostering economic instability, promoting insecure and short-term employment, overburdening infrastructure and public services during peak season, and contributing to environmental degradation.

This study investigates tourism seasonality in the Ohrid-Struga sub-region, North Macedonia's leading tourist destination, from 2004 to 2023. Using a combination of methods, including descriptive statistics, the seasonality ratio, seasonality indicator,

Gini coefficient, and seasonality index, the research confirms the presence of seasonality in tourism arrivals.

While the seasonality ratio, indicator, and Gini coefficient revealed moderate seasonality, the seasonality index provided a clearer picture by identifying the peak season in July and August. Additionally, January, February, March, April, October, November, and December are considered as low peak seasons, with May and June representing the first shoulder season and September the second.

Based on this description, it can be estimated that tourism in the Ohrid-Struga sub-region consists of a low season lasting seven months (24% of arrivals), a shoulder season lasting three months (27% of arrivals), and a peak season lasting two months (49%) during the period from 2004 to 2023.

These findings underscore the importance of strategic planning. Promoting domestic tourism during off-peak months, diversifying tourism activities, and hosting events, during the low season could help mitigate the negative impacts of seasonality. It is clear why destinations strive to reduce seasonality. They do this by lowering prices to attract visitors, such as seniors with more flexible schedules, and by developing special events.

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ПРЕГЛЕД НА ЛИТЕРАТУРА
ОЛГИЦА ДИМИТРОВСКА (2024): ОСНОВИ НА ГЕОГРАФИЈАТА

На задоволство на географската и на поширокатa читателска публика неодамна во издание на издавачката куќа Тримакс од Скопје, излезе од печат универзитетскиот учебник Основи на географијата од авторот проф. д-р Олгица Димитровска.

Трудот е резултат на повеќегодишни истражувања, сублимирање на материјали и изведување на настава по предметот Основи на географијата на Институтот за географија при Природно-математичкиот факултет во Скопје. Имајќи ја предвид наставната програма по овој предмет, во овој универзитетски учебник акцентот е ставен на објаснување на основните и релевантните теоретски и методолошки поставки и развојот на географијата како наука, почнувајќи од првите географски сознанија во праисторијата, преку нејзиното научно втемелување, па сè до денес.

Материјалот содржински е изложен во осум поглавја каде на крајот од секое поглавје е приложена и користената и консултираната литература. Дополнително на крајот презентирана е Библиографијата како и Анекси со Хронологија на настани и Индекс на поими. Содржините се презентирани на 368 страници (B5 формат) заедно со 79 слики и карти испечатени во боја.

Првото поглавје ги опишува општите карактеристики на географијата како наука, каде што е опфатено и дефинирањето на поимот, предметот, целите и задачите на географијата. Презентирана е и поврзаноста на географијата со другите науки како и значењето на географијата во современото општество.

Во второто поглавје опишан е развојот на географските сознанија во праисторијата преку што е објаснета и појавата и потеклото на човекот и првите почетоци на географските претстави.

Третото поглавје опфаќа сеопфатен преглед на географските знаења и откритија од Стариот век. Во него се прикажани детално и живописно најголемите цивилизации, истакнувајќи го нивниот значаен придонес кон развојот на географијата и проширувањето на географскиот хоризонт.

Содржината е збогатена со картографски прикази кои го илустрираат развојот и распространувањето на секоја цивилизација во овој период.

Четвртото поглавје ги обработува географските знаења и откритија од Средниот век, прикажувајќи ги најзначајните достигнувања од овој период. Детално се опишани истражувањата на Норманите, Арапските знаења и откритија, патувањата и истражувањата на верските мисионери и трговци како и патувањата покрај бреговите на Африка во Атланскиот Океан. Деталниот опис на нивните откритија го носат читателот на патувањето низ времето на нивните истражувања. Ова поглавје е дополнето со сликовити описи, нудејќи живописен увид во нивните патувања и придонеси кон развојот на географијата.



Слика 1. Насловна страна од универзитетскиот учебник

Петтото поглавје е посветено на епохата на големите географски откритија со кои започнал златниот период во развојот на географијата. Од многубројните истражувачи од овој период посебно се истакнуваат Кристифор Колумбо, Америго Веспучи, Васко де Гама и Фернандо Магелан. Во ова

поглавје извонредно е прикажано откривањето на Новиот Свет, пронаоѓањето на морскиот пат до Индија, првото патување околу Светот, кои претставуваат кулминација на оваа значајна ера во историјата на географијата. На крајот од поглавјето е даден детален преглед за развојот на географијата во овој период.

Во шестото и седмото поглавје обработени се големите географски знаења, откритија и истражувања во XVIII, односно, XIX и XX век. Во шестото поглавја опишани се големите прекуморски експедиции и продлабочувањето на географските знаења. Седмото поглавје ги обработува географските истражувања на внатрешните делови на континентите а опфатени се и поларните истражувања.

Осмото поглавје е посветено на развојот на модерната географија. Ова поглавје нуди детален опис на создавањето на првите национални и меѓународни географски организации, теориско – филозофските правци во развојот на географијата и главните географски школи. Понатаму е обработен методолошкиот систем на географијата и поделбата на општа и регионална географија. Детално се опишани структурата и развојот на физичката географија, општествената географија, граничните научни дисциплини на географијата, географските методи и техники како и регионалната географија. На крајот е даден темелен осврт на развојот на географијата и географската мисла во Република Северна Македонија.

Дополнително, материјалот е збогатен со хронологија на настани каде на читателот му се нуди брз преглед на поважните датуми и настани кои придонеле за развојот на географската наука. На крајот е даден и индекс на поими.

Универзитетскиот учебник првенствено е наменета за студентите по географија на Институтот за географија при Природно-математичкиот факултет во Скопје. Меѓутоа, благодарение на опфатениот материјал, може да ја користат и наставниците по географија кои работат во училиштата, географите кои се занимаваат со научни истражувања, како и за сите љубители на географијата со желба да ги продлабочат своите географски знаења.

Подготвил: асс.м-р Емилија Манеска.