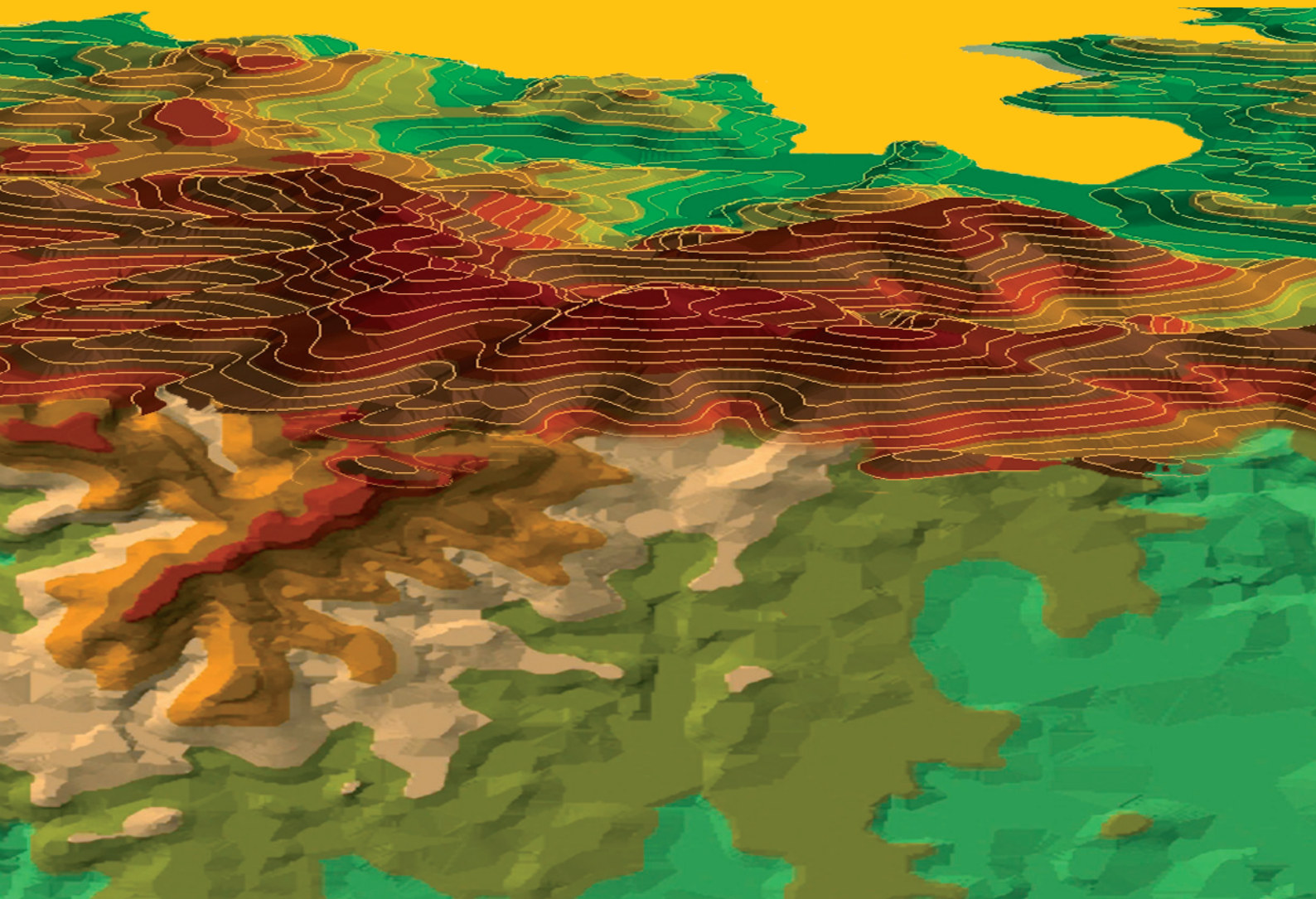


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# MORAVIAN GEOGRAPHICAL REPORTS





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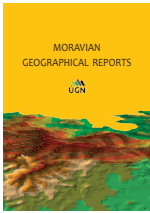
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# Spaces of internal displacement: Understanding the hidden urban geographies of armed conflict in Ukraine

Oleksii HAVRYLIUK<sup>a,b\*</sup>

## Abstract

*Ukraine, like some other Eastern European post-communist countries, faced a military-political crisis during its subsequent development that led to a 'new' category of migrants: internally displaced persons (IDPs). This paper aims to deepen the understanding of the hidden urban geographies of internal displacement and the consequences of armed conflicts in large cities, in the context of the Russo-Ukrainian armed conflicts with a focus on major Ukrainian cities as primary recipients of Ukrainian IDPs. The difficulties faced by Ukrainian urban IDPs in adapting to new geopolitical and life realities and integrating into host communities are examined, as well as an elaboration of the spatial intra-urban patterns of IDP distributions. Both qualitative and quantitative methods were used to achieve the goals of the research. The data set consisted of official data, generalised survey results, and materials from in-depth interviews with urban IDPs from Donbas/Crimea. The empirical results of the study of urban IDPs in Ukraine shed light on patterns of the adaptation and integration of IDPs in large Ukrainian cities and help to understand more deeply the hidden urban geographies of internal displacement in large cities, in particular an understanding of the nature of intra-urban patterns of Ukrainian IDP distributions.*

**Keywords:** forced internal displacement; conflict-affected IDPs; urban IDPs; armed conflict; Russo-Ukrainian armed conflict; Ukraine

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## 1. Introduction

“Ukraine is facing the biggest displacement crisis in Europe since the Balkan Wars. Over 3.4 million conflict-affected people in Ukraine require humanitarian assistance” (Dr. Thomas Lothar Weiss, International Organization for Migration (IOM) Ukraine’s Chief of Mission, 2018).

More than five years ago, the Revolution of Dignity took place in Ukraine, but in parallel with it, Ukraine faced the annexation of Crimea and the beginning of armed conflict in eastern Ukraine, which is ongoing at present (see Haran et al., 2019; Hauter, 2021; Karácsonyi et al., 2014a; Kuzio, 2017; Mykhnenko, 2020; Nitsova, 2021; Yekelchik, 2015; Zhurzhenko, 2021). These events led to an explosion of mass forced displacement of numerous families from non-government-controlled areas (NGCAs) to the government-controlled areas (GCAs) of Ukraine, and beyond (chiefly Russia and certain EU countries). This paper concerns the internally displaced in Ukraine, with a focus on the geographical patterns of their settlement in government-controlled urban areas.

Globally, the phenomenon of forced internal migration is not something new for the current world community, as it is common in countries with different levels of development, but the push factors of forced internal displacement in countries differ (e.g. climate-induced internally displaced persons (hereinafter IDPs), conflict-induced IDPs, etc.). In less than the last two decades, the number of internally displaced persons in the world has increased more than ten-fold from 4.2 million in at the end of 2003 to 45.7 million in at the end of 2019; simultaneously, the share of this category among forced migrants has approximately tripled (UNHCR, 2004; UNHCR, 2021). In contrast, during this period, the proportion of refugees (including Palestinian refugees under the mandate of The United Nations Relief and Works Agency for Palestine Refugees (hereinafter UNRWA)) among forced migrants declined from two-thirds to one-third, but their absolute number increased from 13.7 million at the end of 2003 to 26 million in at the end of 2019 (*ibidem*). Despite this growing dynamic trend of IDPs,

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“[the] IDPs tend to attract less international attention than refugees who become a political, legal or social policy issue by crossing interstate borders”, according to Gwendolyn Sasse (2020, p. 347).

Moreover, during the last decade (2010–2019), there was a global polarisation reversal in the localisation of IDPs, as at the beginning of the decade, most IDPs lived in rural areas, but at the end of 2019 the ratio between urban and non-urban IDPs was 2 : 1, i.e. two out of three IDPs live in urban or semi-urban areas (UNHCR, 2021). Nevertheless, a small body of scholarly literature is devoted to the study of urban IDPs, which mainly emphasises the lack of international and research attention to the needs of this category of IDPs. Moreover, the World Bank, understanding the unrestrained urbanisation processes in the world, underscores those other approaches that need to be sought to understand IDPs in cities (The World Bank, 2017). In addition, it is important to rethink existing approaches to aid and protection to urban IDPs (Earle et al., 2020), and to shift the focus of the humanitarian response to displacement situations from rural and camp settings to urban areas (Cotroneo, 2017).

Frequently, IDPs in urban areas face poverty, exploitation, and unemployment, combined with living in overcrowded slums and shantytowns, which are infamous for their unsanitary conditions, high crime rates and lack of access to basic social services (Crisp et al., 2012, p. S25). Many urban IDPs and their needs are ‘invisible’, ‘hidden’, ‘excluded’, and ‘ignored’ by researchers, state and local authorities, and international agencies (e.g. Badescu, 2015; Bradley, 2017; Crisp et al., 2012; Davies and Jacobsen, 2010; Fielden, 2008; Kirbyshire et al., 2017; Montemurro and Walicki, 2010; Orendain and Djalante, 2021), all of which creates ‘hidden’ urban geographies of internal displacement.

Based on this situation, the main aim of the present study is to deepen understanding of the hidden urban geographies of internal displacement and the consequences of armed conflict in large cities. The paper explores these issues in the context of the Russo-Ukrainian armed conflict.

## 2. Theoretical and historical background

Typically, as Nina Birkeland (2009, p. 498) points out, internally displaced persons

“disperse within urban areas, in some cases relying on ‘invisibility’ for security reasons, and in others being forced to move again within the city limits by local conflicts and actions of city authorities”.

Additionally, urban areas provide IDPs with access to informal employment opportunities, socialisation (through connections to dense social networks), and humanitarian assistance, which under certain conditions may influence IDPs’ decisions to move to (or within) a city (Khodor and Rigon, 2020). Once in urban areas, however, IDPs often find themselves in peripheral slums with urban poor, who, like them, live in unstable conditions and are socially and economically marginalised (ICRC, 2018; IDMC, 2018). Moreover, the insecurity, informality, and vulnerability of urban IDPs to access basic services and employment can hamper their efforts to reach long-term solutions, and increase their risk of becoming trapped in protracted, repeated or cyclical displacement (IDMC, 2018). Displacement to the capital city of their country is important to improve and stabilise the living conditions of conflict induced IDPs. As Nermin Oruc (2015, pp. 64–65) argues, after studying the experience of urban IDPs in Bosnia and Herzegovina:

“[the] IDPs who decided to move to the capital city are in a much better situation, i.e. they have higher consumption level and are significantly less likely to be poor than the ones who moved to other urban areas”.

The Russo-Ukrainian conflict has mostly affected about 10 million people (including Crimea) (Karácsonyi et al., 2014b). This armed conflict is not unique in the post-Soviet space, however, as the Donbas and Crimea simply expand the list of intermittent or ‘frozen’ conflicts such as the ones in Transnistria (Moldova), Nagorno-Karabakh (Azerbaijan), and South Ossetia and Abkhazia (Georgia). Even so, there are dissimilarities in the spatial dimensions and timekeeping of these post-Soviet conflicts.

Altogether, there are two major waves of internal displacement in post-World War II Europe (Cardona-Fox, 2020):

- i. The first major wave of internal displacement occurred in the 1990s as a result of armed conflicts following the collapse of the Soviet Union and Yugoslavia (Bosnia and Herzegovina, Croatia, Kosovo, Azerbaijan, Armenia, Georgia, Russia);
- ii. The second major wave of internal displacement took place in the mid-2010s, when Ukraine became the scene of armed conflict as a result of the conflict in breakaway territories of eastern Ukraine and the annexation of the Crimean peninsula by the Russian Federation in 2014.

In turn, forced internal displacement in Ukraine also includes several waves. Forced internal displacement began slowly, the first wave, from Crimea starting in March 2014 and the second wave from Donbas, starting in April 2014, and then gradually increased and became massive (Dean, 2017, p. 49). Displacement from the occupied territories has stabilised since 2017, and the number of IDPs officially registered by the Ukrainian authorities remains at about 1.5 million with some fluctuations (IOM, 2019a), with the number of IDPs from Crimea having stabilised within a few months after the annexation, and the number of IDPs from the Donbas having increased steadily during 2014–2015, until stabilising by 2016 (Pozniak, 2017, p. 96). Between 2016 and 2019 there was a decreasing trend the number of registered IDPs due to the return of some of the IDPs to the conflict zone (as a result, they lost their official status of IDPs), and intensified closer control by the social protection authorities according to the criteria for obtaining and prolonging IDP status. Starting from mid-2019 and until mid-2020, however, an increase in the number of IDPs was registered by almost 5% or more than 65 thousand people, due to the outbreak of the COVID-19 pandemic (in March 2020) in Ukraine. In addition, one sees in the world and its crisis consequences for the socio-economic and political situation of numerous countries, the return of IDP-workers from abroad and stimulated marginalisation among vulnerable categories of Ukrainian IDPs (Havryliuk and Pozniak, 2020, pp. 86–87).

The majority of Ukrainian IDPs, like the majority of European IDPs, originate from and live in urban settings, which is not unexpected, as most European countries (including Ukraine) are highly urbanised (Cardona-Fox, 2020; Libanova, 2014; Walicki, 2009). Typically, IDPs in Europe are discriminated and marginalised and tend to settle in disadvantaged urban settings, which are inherent in the periphery of urban centres. Moreover, IDPs are often traumatised by the fact that they have witnessed war, lost their homes and family members, and faced the daily life challenges of IDPs, such as poor housing conditions

and emotional stress which negatively affect their health (Cardona-Fox, 2020; Gogishvili, 2015; Gureyeva-Aliyeva and Huseynov, 2011; Montemurro and Walicki, 2010). Internally displaced persons adapt to new geopolitical and life realities in different ways, as their ability to adapt depends on their experience, gender, ethnic and cultural background, economic situation, and social networks before and after their displacement (IDMC, 2019).

Considering the above, we may hypothesise the existence of a 'poor neighbourhood effect' (van Kempen and Wissink, 2014) and 'high housing cost effect', as most IDPs in conflict-affected countries cannot afford to live in good and comfortable urban neighbourhoods with expensive housing, which impact the spatial distribution of IDPs in a city.

In fact, according to the Ministry of Social Policy (MSP) of Ukraine, as of 13.06.2019, 1,385,062 persons were officially registered as internally displaced. MSP registers persons who have applied for the payment of their right pensions or social benefits at the new place of residence, so it is appropriate to emphasise that the actual registration of MSP covers not only displaced persons, but also those who de facto live in NGCAs, because they do not have opportunities to rent housing in GCAs or did not want to leave their own housing in the occupied part of Ukraine (Ivashchenko-Stadnik, 2017, p. 28). Simultaneously, IDPs from NGCAs periodically come to receive pensions or social benefits in GCAs (Smal and Pozniak, 2016, p. 9): this phenomenon is better known as 'pension tourism/social benefits tourism' (Bulakh, 2020; Kuznetsova and Mikheieva, 2020, p. 699; Smal and Pozniak, 2016, p. 9) or 'shuttling IDPs' (Ivashchenko-Stadnik, 2017, p. 28).

On the one hand, 'shuttling IDPs' move back and forth without trying to integrate into a new community, and before a stricter payment control system was launched. Many of the 'shuttling IDPs' used their ambivalent status of 'being-here-and-there' to double social payments, both from Ukraine and from the self-proclaimed Donetsk and Luhansk people's republics (DPR/LPR) (Ivashchenko-Stadnik, 2017, p. 28). On the other hand, strict control over social benefits for 'shuttling IDPs' and their stigmatisation in Ukrainian society as 'pension tourists' and 'social benefits tourists' (Kuznetsova and Mikheieva, 2020, p. 699) – these are derogatory terms for approximately 0.5 million people who periodically cross the line of contact between GCAs and NGCAs, better known as the 427-kilometre Line of Contact (Wetterwald and Thaller, 2020, p. 23) – ignore the reality that for many retirees from NGCAs, payments from the Ukrainian state are their only source of income and that they have the full right, as citizens of Ukraine, to receive their pension (Bulakh, 2020). The loss of these payments can trigger socio-economic marginalisation of civilians on the other side of the armed conflict (i.e. NGCAs). Most people who crossed the 427-kilometre Line of Contact in 2019 were residents of NGCAs and were predominantly elderly (60+), as residents of NGCAs often need services (especially pensions and social benefits) that are unavailable or limited in NGCAs (CFRTP and UNHCR, 2020). Moreover, the stigma of 'pension tourists' or 'social benefits tourists', which is widely diffused through the Ukrainian media, reinforces the negative image of people with official IDP status (including those living in NGCAs) and hinders processes of social cohesion and reconciliation (Kuznetsova, 2017, p. 14; Kuznetsova and Mikheieva, 2020, p. 699).

Unfortunately, among Ukrainian IDPs, there is a group who refuse or cannot register their IDP status, which

increases the risk of being socially vulnerable and restricted in their rights. Usually, those who do not register are those who do not have documents (as is the case with displaced Roma people) or are unable to pay taxes, have concerns about the difficult and incomprehensible registration process (bureaucratic obstacles), or are afraid of conscription, or do not need government assistance (Dean, 2017, p. 50; IOM, 2017). Non-registration of IDP status is widespread among young Ukrainian IDPs (youth employed) who do not want to spend time on lengthy bureaucratic procedures, but simply seek to live in GCAs without wanting to return, even at the end of armed conflict (Ivashchenko-Stadnik, 2017, p. 28). Additionally, Ukrainian IDPs have difficulty registering marriages, births, and deaths in the face of lost or damaged identifications (Uehling, 2020). Summing up, Ukrainian IDPs who do not have official IDP status but live in GCAs, in combination with those who have official IDP status but de facto live within NGCAs, form a special category called 'hybrid IDPs' (Ivashchenko-Stadnik, 2017, p. 28), which is the result and marker of current socio-political perturbations in Ukraine.

Returning to the number of IDPs reported by MSP in mid-2019, a majority moved from their previous residences located in Donetsk (60%) and Luhansk (37%) oblasts, a minority or arithmetically speaking only 3% moved from the Autonomous Republic of Crimea, while one-half of registered IDPs permanently reside in GCAs of Donetsk and Luhansk oblasts, beyond the 20 km area along the contact line (IOM, 2019b). Although IDPs from Crimea amount to about 3% of Ukrainian IDPs, this figure is clearly underestimated, since the majority of Crimean IDPs are Crimean Tatars, who are less inclined to register their IDP status officially (Uehling, 2020).

According to the UN agencies in Ukraine, IDPs state that housing is their main priority. Moreover, many IDPs insist that permanent housing, especially in combination with a steady income and job, is the key and prerequisite for successful integration, as it will allow for social ties and stable employment/private enterprise (IOM, 2019b; IOM, 2020; UNHCR, 2019). In general, there are no regional restrictions or differences in affordable housing, but there are social and economic factors, such as income, household size, and work, thereby many IDPs simply cannot afford to move to Kyiv with its expensive residential real estate.

In addition, IDP social benefits are not enough to pay rent almost anywhere in Ukraine (Kuznetsova, 2017, p. 4). It should not be forgotten that most landlords add to the rent for accommodation another payment for utilities (gas, water, electricity, etc.), which further aggravates the socio-economic situation of IDP households: this is another argument that illustrates the importance of the above-mentioned 'high housing cost effect', which forces multiple housing mobility of IDPs within a city and reduces their chances of successful integration into urban host communities.

According to the National Monitoring System (hereinafter NMS) by International Organization for Migration (hereinafter IOM), as of June 2019, a large majority of IDPs (91%) owned housing before displacement, and 86% reported that they had official documents confirming their ownership. Also, at the time of monitoring, 19% of IDPs noted that their homes were damaged (12%) or destroyed (7%), and about 70% knew that their homes were not affected by the armed conflict (IOM, 2019b). The most common problem for Ukrainian IDPs is the lack of their own housing; as of June 2019, many IDPs continue to

live in rented accommodation (a trend that has persisted since the beginning of the NMS in 2016 (IOM, 2017; IOM, 2019b)): 49% live in rented apartments, 10% in rented houses, and only 5% in rented rooms. In contrast, 12% of IDPs live in their own homes, which is 3% more than in June 2017, about 2% of IDPs live in collective centres (see Fig. 1), and the rest lives in other types of accommodation (e.g. host family/relatives, dormitory, etc.) (IOM, 2019b).

According to the Ministry for Temporarily Occupied Territories and Internally Displaced Persons of Ukraine, as of January 1, 2019, there were 161 collective centres in Ukraine (e.g. temporary settlements such as camps, dormitories, hotels, etc.), where about 7.7 thousand IDPs lived, but a total of 10,510 places in these collective centres. Most collective centres are located in Donetsk (39 collective centres), Dnipropetrovsk (34), Zaporizhzhia (15), Kharkiv

(12), and Kyiv (10) oblasts and Kyiv (9); in contrast, Volyn, Ivano-Frankivsk, Rivne, Ternopil, and Cherkasy oblasts have no collective centres. In addition, there are at least two cases of unauthorised places of contact residence (collective centres) in Ukraine, in which IDPs have arbitrarily occupied buildings, namely at 4 Uspenska Street (Odesa) and in Fontanka (Odesa oblast) (CFRTP and UNHCR, 2019).

The majority of Ukrainian IDPs report renting housing informally, i.e. without any contract or other documents. In addition, the IDPs' economic situation is hampered by the need to pay rent, with about a quarter of IDP tenants at risk of being evicted due to inability to pay rent (IOM, 2020). It is this tense housing situation and family ties that have been the main reasons for returning to NGCAs, and these reasons remain unchanged throughout all rounds of national monitoring (NMS) (*ibidem*).



Fig. 1: Typical collective centre for Ukrainian IDPs: IDP camp in Kharkiv (built-in January 2015 with the support of the German government). Source: Photographs by author, June 2019

As highlighted by previous studies of Ukrainian IDPs (e.g. Bulakh, 2017; IOM, 2019b; Krakhmalova, 2019; Smal and Pozniak, 2016; UNHCR, 2019), IDPs face various types of discrimination, which can lead to their marginalisation and fuel their intentions to return to NGCAs. Numerous IDPs have experienced discrimination and unfair treatment, mainly in health care, employment, housing, and in interactions with host community populations (IOM, 2019b). The real estate market and the labour market were and are especially important spheres for IDPs in their social integration, but it was in these spheres that a negative image of displaced persons was produced in the first years of the armed conflict (Bulakh, 2017, p. 54). Both markets began to openly filter out IDPs from potential contacts and the beneficiaries using the 'displacement/displaced people' marker in advertisement rubrics (*ibidem*). For example, based on data from olx.ua (cited in Bulakh, 2017, p. 54), in the spring of 2015 more than half of the ads for long-term rental apartments with reasonable prices in Kyiv had certain notes on 'displaced people and brokers, please do not disturb' or in some cases 'displaced people might be considered'.

Also, IDPs faced biased attitudes in the process of applying for pensions and social benefits. Less common are cases of discrimination in contacting state authorities or law enforcement agencies, but this relative rarity may be due to a banal lack of experience in applying to such authorities among most IDPs (Smal and Pozniak, 2016, p. 22). Furthermore, Ukrainian IDPs experienced discrimination against their voting rights in municipal elections – or as this phenomenon has been called 'freezing' Ukrainian IDPs' voting (electoral) rights (Krakhmalova, 2019) – which lasted

more than five years and contradicted their electoral rights and freedoms as citizens of Ukraine. Only relatively recently, in 2020, the voting rights of IDPs have been 'unfrozen' in the local elections of host communities (CFRTP, 2020; COE, 2020).

Thus, stigmatisation, discrimination, unsatisfactory living conditions and the routine life of Ukrainian IDPs in the realities of the ongoing armed conflict affect the health of IDPs. As the results of the first representative nation-wide survey of Ukrainian IDPs on their mental health show, three-quarters of adult IDPs need psychological assistance, but for various reasons did not receive it, due to ignorance of the need for treatment, self-treatment, high cost of treatment and medication, or the low quality of the care available (Roberts et al., 2019, p. 109).

The literature on the socio-economic predicament of IDPs in Ukraine typically examines the issue at a national/subnational (i.e. macro-scale) or regional scale.

At the macro-scale, scholars have studied changes in the living conditions of IDPs (housing and safety of living) during the years of armed conflict (e.g. Hnatyuk, 2020), issues of social adaptation and integration into host communities (e.g. Niemets et al., 2020), and socio-economic inequalities and discrimination against IDPs (e.g. Novikova and Shamileva, 2019). In recent years there has been an improvement in the living conditions of Ukrainian IDPs compared to the first years of the armed conflict, such as the inclusion of IDPs into the state lending programs for home purchase, and an increase in the share of the IDPs living in their own housing. At present, the IDPs highly value the quality of living conditions and the level of security of the living environment (Hnatyuk, 2020).

At the regional-scale, researchers have studied IDPs' discrimination issues (e.g. Vakhitova and Iavorskyi, 2020), IDPs' access to housing and good living conditions (e.g. Hnatyuk, 2016; NRC, 2016), and barriers to socio-economic integration and adaptation of IDPs to new geopolitical and life realities (e.g. IOM, 2016; Lohvynova, 2020). Also, the studies covered the impact of mass IDP flows on the socio-economic development of Ukrainian regions (e.g. Arakelova, 2017), as well as reasons why some regions of the country were more attractive for displaced people than others (e.g. Brenzel et al., 2015). As emphasised by Arakelova (2017), regions that have suffered serious socio-economic consequences due to the high concentration of IDPs are confined to the zone of armed conflict (Donetsk, Luhansk, Kharkiv, and Zaporizhzhia oblasts, and as an exception – the capital of Ukraine – Kyiv). Inter alia, these regions have not adapted their regional policies to effectively address the most pressing IDP issues in various aspects of their socio-economic life, which is hampering the integration of IDPs in the above-mentioned regions. Furthermore, in the first years of the military conflict, IDPs mostly moved to relatively prosperous regions of Ukraine with comparatively good working labour markets (Brenzel et al., 2015).

From the literature reviewed, it seems that the site of the everyday lives of the Ukrainian IDPs – the local and especially urban level – has been subject to very little scholarly work, although in Ukraine, as in other countries of post-communist armed conflicts (e.g. Georgia, Azerbaijan), urban communities are frequently the main recipients and final destinations of IDPs, where their further adaptation and integration takes place. Typically, IDPs concentrated in the capital and other major cities of their country, for example, Georgia (Mitchneck et al., 2009), Azerbaijan (Gureyeva-Aliyeva and Huseynov, 2011), and Ukraine is no exception (Libanova, 2014). Naturally, Ukrainian IDPs are more attracted to large cities, where it is usually easier to find accommodation and jobs – Kyiv, Kharkiv, Dnipro (ex-Dnipropetrovsk), Zaporizhzhia, Lviv, Odesa (Libanova, 2014, p. 16).

Roughly speaking, the main flows of internal displacement almost duplicate the main flows of internal migration in Ukraine, with respect to key recipient regions and recipient cities, as traditionally Kyiv has a positive migration balance of internal migration, as well as regions with the major Ukrainian cities – Dnipro, Kharkiv, Odesa, Lviv. Such movements are likely due to the location of leading educational institutions, which attracts young people to them; in addition, there is a favourable situation in the labour market (i.e. there is a demand for labour and high wages) (IOM, 2019a). In contrast, IDPs are least satisfied with the prospects of living in rural areas, which is understandable given that the lion's share of IDPs are urban residents (Libanova, 2014, pp. 16–17): most of them lived before the armed conflict in highly urbanised areas such as the Donetsk conurbation (Mykhnenko et al., 2010) and other smaller urban agglomerations in Donbas (Rechłowicz and Tkocz, 2013), which during the armed conflict were and still are undergoing a devastating military uricide (Slyvka and Zakutynska, 2016). Undoubtedly, the local urban scale is very important for understanding the current socio-economic situation of Ukrainian IDPs, as policymakers need to understand the constructive levers of improving IDP integration in host communities, and to slow down the process of returning IDPs to their places of origin in NGCAs.

Based on these previous studies, Ukrainian urban IDPs are an ignored topic in scholarly studies. This is not uncommon: urban IDPs, as Anne Davies and Karen Jacobsen (2010, p. 13) emphasise, “comprise a hidden population, and aid agencies and governments have difficulty identifying them and understanding their experiences relative to the host population amongst whom they live”. Moreover, “[l]ittle is known about their demographics, basic needs and protection problems, yet they are believed to be among the poorest and most vulnerable groups in many conflict-affected countries”. Concerning the latter, such socio-economic inequalities between IDPs and non-IDPs may lead to the spatial and social isolation of IDPs in the cities of conflict-affected countries (e.g. Georgia (see Gogishvili, 2015; Gogishvili and Harris-Brandts, 2019; Salukvadze et al., 2014)). This prompts the expression of a hypothesis about the effect of IDP segregation/isolation.

The present study opens new directions for research not anticipated by previous studies of Ukrainian IDPs' socio-economic conditions. In addition, the current paper aims to rectify lacuna in the study of IDPs that live in Ukrainian urban settings.

Accordingly, the following research questions were formulated:

- What spatial patterns of IDP distribution are observed in the major Ukrainian cities as the main recipients of IDPs?;
- To what extent does the spatial localisation/concentration of IDPs in different major Ukrainian cities depend on the key characteristics of the residential environment of urban districts that are important for the adaptation and integration of IDPs?; and
- What problems have IDPs most often faced and continue to face during their integration into the host communities of major Ukrainian cities?

The working hypotheses based on the reviewed literature are as follows:

- Hypothesis 1 ('poor neighbourhood effect'): the lower level of the comfort of the urban district – the higher the probability of spatial concentration/localisation of IDPs;
- Hypothesis 2 ('high housing cost effect'): the higher the cost of housing within an urban district, the less likely there is a concentration/localisation of IDPs; and
- Hypothesis 3 ('segregation effect'): an essential spatial isolation (enclavisation) of IDPs is observed in major Ukrainian cities.

### 3. Data and methods

The major cities in Ukraine are Kyiv, Kharkiv, Donetsk (before the armed conflict in eastern Ukraine), Odesa, Dnipro (until 2016 Dnipropetrovsk) and Lviv (Mezentsev, 2005; Rudenko and Savchuk, 2013): see Figure 2. These are the cities that have become the main recipients of forced internal displacement flows from Donbas and Crimea to the macro-regions of which they are the centres. Thus, according to MSP, as of June 13, 2019, 61% of all IDPs in the Kyiv (or capital) macro-region are concentrated in Kyiv, similarly, 52% in Kharkiv, 48% in Odesa, 24% in Dnipro and 20% in Lviv.

The first component of the empirical data set is the official state statistics (Ministry of Social Policy and State Statistics Service of Ukraine): the registered number of internally displaced persons and the average annual population in



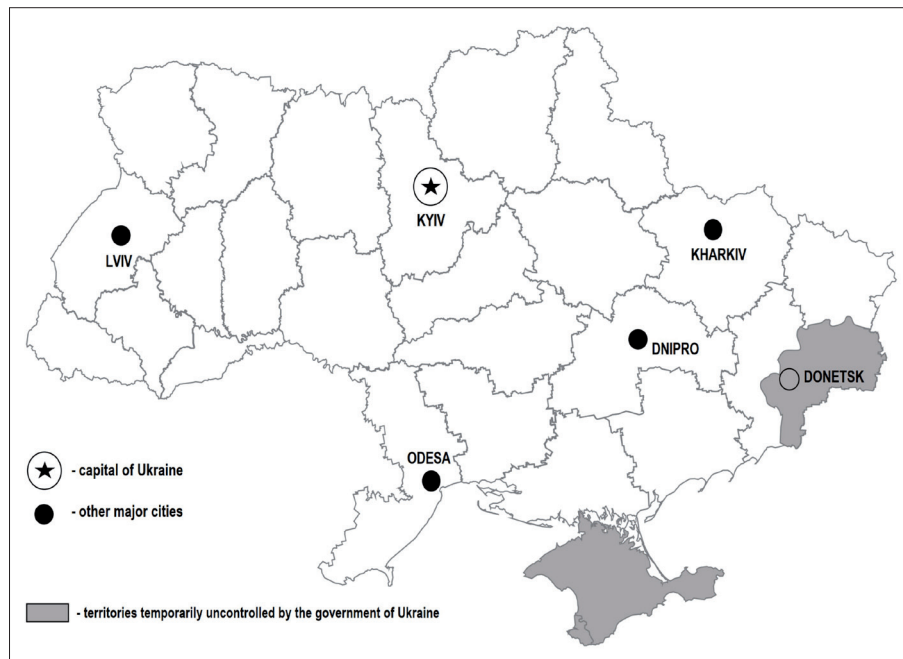


Fig. 2: Map of the major Ukrainian cities (as of February 23, 2022)

Source: author's elaboration

different urban districts of Kyiv, Kharkiv, Odesa, Dnipro, and Lviv. This study also used the results of surveys of urban residents on their assessment of the comfort of their residential environment (on a 5-point Likert scale) on the criteria of safety, cleanliness, infrastructure, transport accessibility, and quality of life in administrative districts of cities: Kyiv, Kharkiv, Odesa, Dnipro and Lviv (commissioned by the international company “OLX” (see OLX, 2019a–OLX, 2019e). In total, in January 2019, some 38 thousand respondents were interviewed in these cities. Specifically, more than 15.5 thousand people in Kyiv, 7 thousand people in Kharkiv, more than 5.5 thousand people in Odesa, more than 5 and 4.5 thousand people in Dnipro and Lviv, respectively. Another source of data is weekly data on the value of residential real estate in various urban districts of the afore-mentioned cities for all months of 2018, which are publicly available on the official website of the company “DOMIK.UA”.

And the last component of the empirical data set for this study is the materials of in-depth interviews conducted (during Autumn 2020–Spring 2021) by the author with IDPs from Donbas/Crimea, living in GCAs in some major cities, including Greater Dnipro (Dnipro-Kamianske or until 2016 Dnipropetrovsk-Dniprodzerzhynsk), Odesa and Kharkiv (for more details see Appendix 1). The purpose of the in-depth interviews was to scrutinise the life stories of urban IDPs and their current living and housing conditions, employment, state support, relations with the host community population, etc., and how this has changed over the years of armed conflict. The nonprobability sampling technique (i.e. reputational or snowball sampling) was chosen as the principal method of selecting informants, because IDPs often do not specify their status in social networks or life, or even hide it from non-IDPs. The informants' responses were recorded by hand and then transcribed in fully anonymised form. Further analysis of the results of the interviews was conducted using separate thematic blocks (such as IDP life stories; living and housing conditions; psychological consequences of armed conflict and sense of security, etc.).

The following indicators of IDP distribution and key characteristics of the urban districts' residential environment of the major Ukrainian cities (Kyiv, Kharkiv, Odesa, Dnipro, and Lviv) were used in the present study:

- Rating of administrative districts of cities by the level of residential environment comfort (OLX survey in January 2019);
- [Share of] Registered number of IDPs in an urban district ([%] persons, as of June 13, 2019);
- [Share of] Average annual population in an urban district ([%] persons, in 2018);
- Index of IDP concentration in an urban district (number of internally displaced persons per 1,000 urban residents);
- Index of IDP localisation in an urban district (relative ratio of the spatial distribution of internally displaced persons to the spatial distribution of local residents within the city):

$$IL_{ij} = \frac{p_{ij}/c_{ij}}{P_j/C_j}$$

where  $IL_{ij}$  = IDP localisation index in the  $i$ -th district of the  $j$ -th major city of Ukraine;  $p_{ij}$  = the number of IDPs in the  $i$ -th district of the  $j$ -th city as of June 13, 2019;  $P_j$  = the number of IDPs in the  $j$ -th city as of June 13, 2019;  $c_{ij}$  = average annual population in the  $i$ -th district of the  $j$ -th city in 2018;  $C_j$  = average annual population in the  $j$ -th city in 2018; and

- Average annual cost of housing – the cost of apartments – in an urban district (USD/m<sup>2</sup>, 2018). In the case of Odesa, the average annual cost of housing was calculated as the weighted arithmetic mean of the population weighted by the population of the districts according to the 2001 census following to the formula:

$$\bar{p} = \frac{w_1 p_1 + w_2 p_2 + \dots + w_n p_n}{w_1 + w_2 + \dots + w_n}$$

where  $w_n$  = weights are calculated by population;  $p_n$  = average annual cost of housing. This technique is used because statistical information on the price of residential real estate is available only in terms of the old administrative districts of Odesa, which were merged or divided and formed the current administrative districts of Odesa from January 1, 2003. It is important to emphasise that this is a generalised estimate of the average annual cost of housing in urban districts of Odesa in 2018.

Both quantitative and qualitative methods were used to answer the research questions. Quantitative methods included normalisation, Pearson's correlation, cluster analysis and others that were used to analyse indicators of the distribution of IDPs and key characteristics of the residential environment of urban districts in major Ukrainian cities. Correlation analysis was used to confirm or refute the first two hypotheses ('poor neighbourhood effect' and 'high housing cost effect'). The technique of cluster analysis was chosen to confirm/refute the last hypothesis ('segregation effect'), as it is widely used in forced migration studies (e.g. Al-Temimi et al., 2018; de Hoon et al., 2021; Koning, 2019). Some qualitative methods included materials from in-depth interviews, which were analysed to better understand the everyday life of IDPs and their problems of adaptation and integration, as well as to clarify the results obtained using the quantitative methods. As for cluster analysis, to achieve uni-dimensionality and comparability of indicators, a normalisation technique (Wilkoosz-Mamcarczyk et al., 2020) was used for all indicators except the IDP localisation index. The technique or method of normalisation of the indicator in this study is as follows:

$$z_i = \frac{x_i}{\bar{x}}$$

where:  $x_i$  = the value of a particular indicator in the  $i$ -th district in a designated major city of Ukraine; and  $\bar{x}$  = the average value of the particular indicator in the designated city.

The main limitations of the present study are, to a certain extent, the discrepancy between the comparison of some available statistical data between different urban districts of major cities: in particular, this concerns the size of the districts by their population (see Appendix 2). To minimise the 'shuttling IDPs' effect, we study only IDPs living in major Ukrainian cities.

## 4. Results and discussion

### 4.1 IDP distribution and urban district residential environments

The results of the correlation analysis show that the intra-urban patterns of IDP distribution within the five major cities of Ukraine are different depending on the distance of the city from the conflict zone, the size of urban districts, population density, etc. (see Tab. 1). In particular, in Kharkiv, the localisation/concentration of IDPs is directly related to the level of residential environment comfort of an urban district ( $r = 0.85$ ) and the prestige and cost of its housing ( $r = 0.81$ ). The situation is almost similar in Dnipro, where the spatial distribution of IDPs is strongly related to the level of residential environment comfort of the urban district ( $r = 0.94$ ), and the cost of residential real estate plays a much smaller role ( $r = 0.76$ ). In contrast

to the two above-mentioned cities, in the case of Odesa, there is an 'absolute' positive correlation between the level of residential environment comfort of the district and the localisation/concentration of IDPs ( $r \approx 1.00$ ), and the correlation between the latter and the cost of housing is moderate ( $r = 0.64$ ), but statistically insignificant ( $p$ -level more than 0.1).

On the other hand, it is not surprising that the spatial pattern of IDP distribution in Kyiv does not directly depend on the cost of housing, and only slightly on the comfort of districts' residential environment ( $r = 0.62$ ): the capital status of the city forms its specific conditions for integration and adaptation of IDPs in urban district host communities, which is due to a large segment of luxury housing in the central parts of the city and a fairly high level of landscaping, good transport links, etc., which is not common and not so significant in other regional centres of Ukraine. In the last major city of Lviv, most distanced from the conflict zone, there is a moderate inverse correlation between the level of localisation/concentration of IDPs and the level of residential environment comfort of the districts ( $r = -0.55$ ), but this relationship is statistically insignificant, which is obviously due to the low polarisation of the comfort of urban districts in Lviv, rather than the desire of IDPs to live in districts with worse residential environment conditions. In addition, in Lviv, it was not possible to find a significant correlation between the spatial distribution of IDPs and the cost of housing in the intra-urban dimension.

Thus, the positive correlation between the localisation/concentration of IDPs and the level of residential environment comfort of the district is confirmed only in Kharkiv, Dnipro, and Odesa and with a less statistically significant and weaker level of correlation in Kyiv. Lviv is an exception to this socio-spatial pattern: firstly, due to the small number of registered IDPs through its remoteness from the conflict zone; secondly, due to the relatively low polarisation of the comfort of district residential environments within the city (see Appendix 2). Furthermore, a positive correlation between the localisation/concentration of IDPs and the cost of housing is observed only in Kharkiv and Dnipro. In the case of the other major cities, there is either a statistically insignificant relationship, or its complete absence due to the peculiarities of the housing markets of these cities.

Considering the above empirical results, hypothesis 1 and hypothesis 2 were not confirmed in the major cities of Ukraine; on the contrary, the 'poor neighbourhood effect' and 'high housing cost effect' had a reverse relationship with the localisation/concentration of IDPs in Kharkiv and Dnipro, and according to the first effect in Odesa and Kyiv. Moreover, there is a high possibility that the farther away from the conflict zone, the less the probability of significant correlations with the localisation/concentration of IDPs from the above indicators – as a result of a decrease in the number of registered IDPs with remoteness from the conflict zone, or as a result of the impact set of specific factors (features of the housing market, the specifics of the administrative-territorial division of the city, capital status, etc.).

### 4.2 Spatial differentiation of IDPs in major Ukrainian cities

According to cluster analysis results, nine clusters are distinguished (see Fig. 3), which have their own features in the spatial differentiation of IDPs, but which can be generalised into the following four types (see Fig. 4).

| Variables                          | 1        | 2        | 3        | 4        | 5        | 6        |
|------------------------------------|----------|----------|----------|----------|----------|----------|
| <b>KYIV</b>                        |          |          |          |          |          |          |
| Share of registered number of IDPs | X        | 0.860*** | 0.860*** | 0.667**  | 0.620*   | - 0.494  |
| Index of IDP concentration         | 0.860*** | X        | X        | 0.234    | 0.615*   | - 0.250  |
| Index of IDP localisation          | 0.860*** | X        | X        | 0.234    | 0.615*   | - 0.250  |
| <b>KHARKIV</b>                     |          |          |          |          |          |          |
| Share of registered number of IDPs | X        | 0.823*** | 0.823*** | 0.925*** | 0.857*** | 0.678**  |
| Index of IDP concentration         | 0.823*** | X        | X        | 0.562    | 0.848*** | 0.810*** |
| Index of IDP localisation          | 0.823*** | X        | X        | 0.562    | 0.848*** | 0.810*** |
| <b>ODESA</b>                       |          |          |          |          |          |          |
| Share of registered number of IDPs | X        | 0.983**  | 0.983**  | 0.597    | 0.984**  | 0.728    |
| Index of IDP concentration         | 0.983**  | X        | X        | 0.439    | 0.998*** | 0.644    |
| Index of IDP localisation          | 0.983**  | X        | X        | 0.439    | 0.998*** | 0.644    |
| <b>DNIPRO</b>                      |          |          |          |          |          |          |
| Share of registered number of IDPs | X        | 0.593    | 0.593    | 0.818**  | 0.555    | 0.634*   |
| Index of IDP concentration         | 0.593    | X        | X        | 0.078    | 0.942*** | 0.759**  |
| Index of IDP localisation          | 0.593    | X        | X        | 0.078    | 0.942*** | 0.759**  |
| <b>LVIV</b>                        |          |          |          |          |          |          |
| Share of registered number of IDPs | X        | 0.494    | 0.494    | 0.711    | 0.380    | - 0.409  |
| Index of IDP concentration         | 0.494    | X        | X        | - 0.257  | - 0.551  | 0.371    |
| Index of IDP localisation          | 0.494    | X        | X        | - 0.257  | - 0.551  | 0.371    |

Tab. 1: Concentration-localisation of IDPs: Relationships between IDP distribution and residential environments of the major Ukrainian cities.

Notes: 1. Correlations are significant \*\*\* $p \leq 0.01$ ; \*\* $p \leq 0.05$ ; \* $p \leq 0.10$ ; 2. Variables: (1) Share of registered number of IDPs (%), as of June 13, 2019); (2) Index of IDP concentration (number of IDPs per 1,000 urban residents); (3) Index of IDP localisation; (4) Average annual population in urban districts (persons, 2018); (5) The level of residential environment comfort in urban districts (OLX survey in January 2019); (6) Average annual cost of housing – the cost of apartments – in urban districts (USD/m<sup>2</sup>, 2018)

Source: author's elaboration

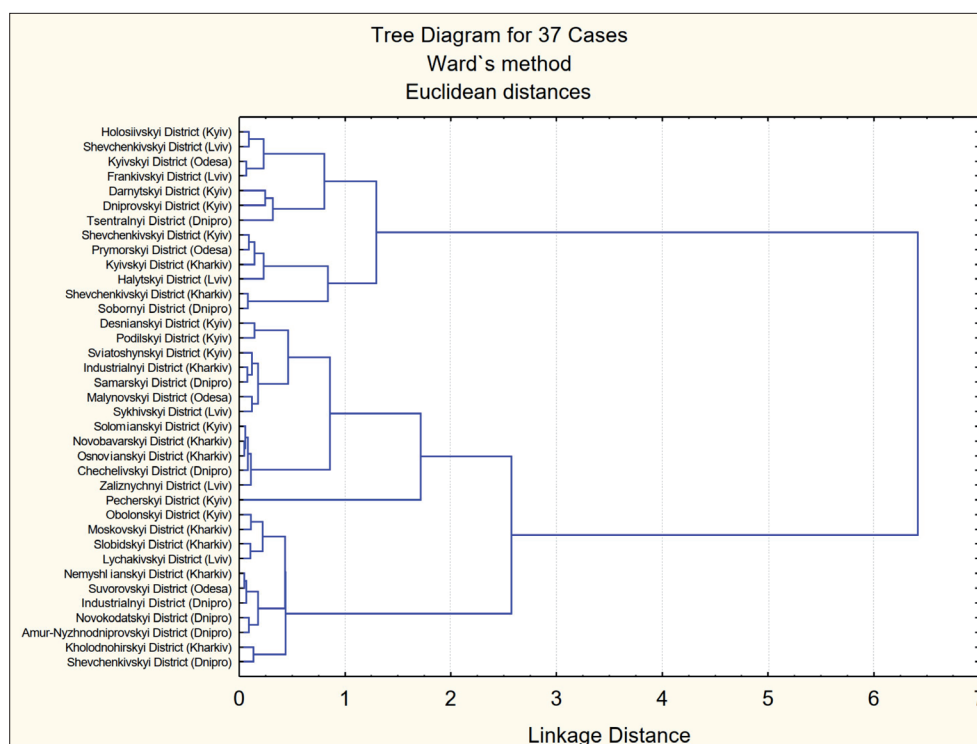


Fig. 3: Cluster analysis results

Source: author's elaboration

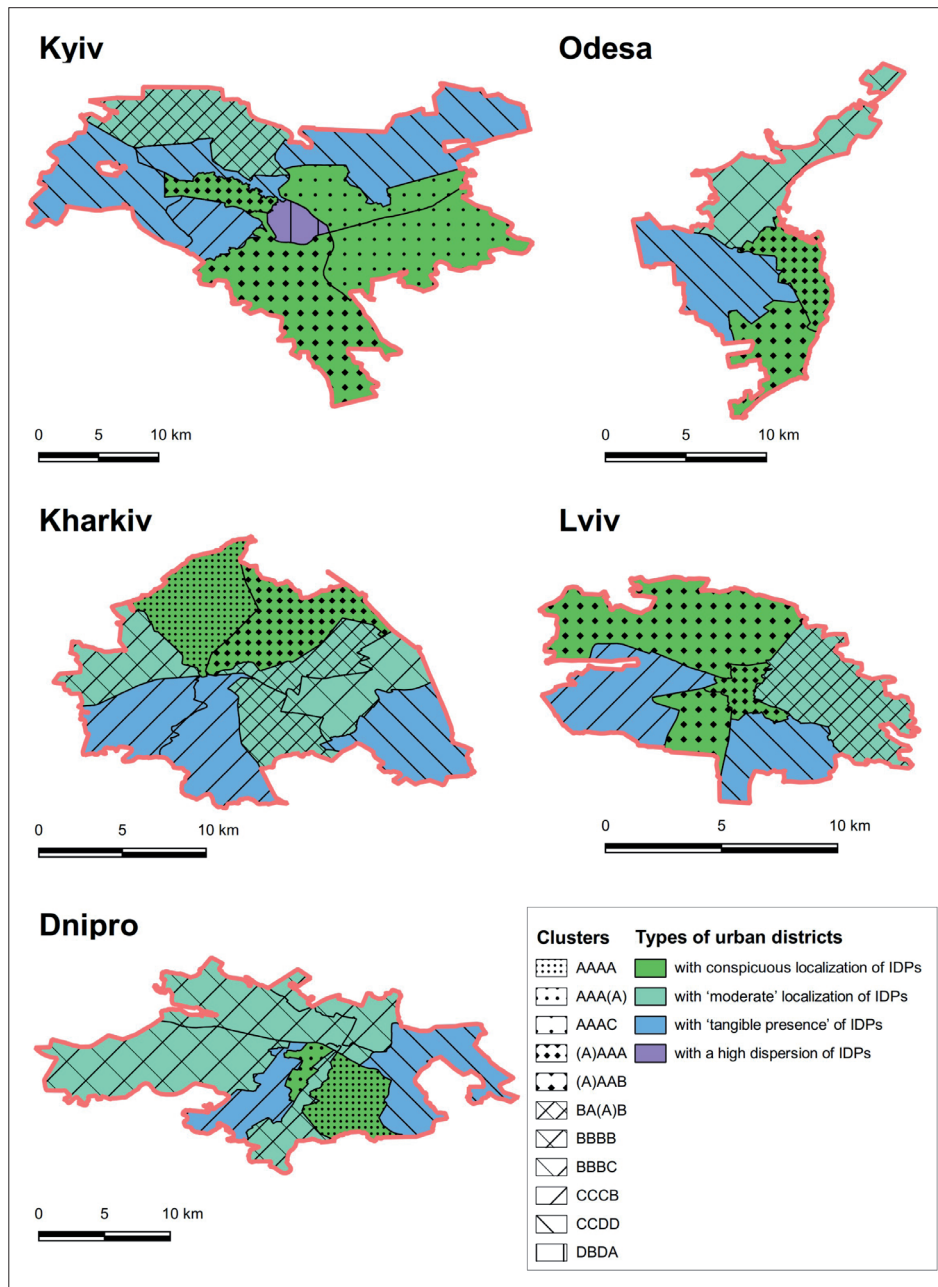


Fig. 4: Classification of urban districts of major Ukrainian cities by features of spatial differentiation of IDPs  
 Note: See Appendix 3 with a more detailed description of the clusters  
 Source: author's elaboration

**Type 1: urban districts with conspicuous localisation of IDPs**

The first type includes 13 urban districts, characterised by a conspicuous localisation of IDPs and a very high spatial concentration of IDPs. Type 1 consists of two subtypes. Most urban districts of this type have a comfortable and quite expensive and prestigious residential environment – Subtype 1.1 (see Appendix 3). Almost every tenth IDP in Lviv and Kyiv, every third IDP in the Dnipro and Odesa, and ca. 40% of IDPs in Kharkiv live in the urban districts of Subtype 1.1.

Although another six districts of the major Ukrainian cities, members of Subtype 1.2, have a high level of residential environment comfort, they are not very expensive within their cities, and therefore more accessible to middle-income IDP households. It was very important

for IDPs who sought to settle in Kyiv, where the capital's labour market has a good conjuncture, and housing prices in almost all urban districts are high compared to the central and prestigious districts of other major Ukrainian cities. In Kyiv about half of IDPs live in districts of Subtype 1.2. In Odesa, every fourth IDP, in Lviv, every second IDP, lives in an urban district that is part of Subtype 1.2.

**Type 2: urban districts with 'moderate' localisation of IDPs**

Type 2 consists of two subtypes, which combine 11 urban districts with 'moderate' IDP localisation and mostly middle-level concentration of IDPs. As a rule, urban districts of this type have a comfortable residential environment, but the affordability of these residential and housing conditions differs from district to district. For example, Subtype 2.1 includes urban districts with a satisfactory comfortable

residential environment and relatively expensive housing. These districts are residential places for 11%, 13%, and 16% of IDPs in Kyiv, Dnipro, and Lviv, respectively, as well as every third IDP in Kharkiv. Subtype 2.2 consists of five urban districts, most of which have second-rate comfort of the residential environment and a more affordable and cheaper housing market than other districts in the previous subtype. In these districts, where an average spatial concentration of IDPs prevails, 41% of all IDPs in Dnipro live there, i.e. almost every second IDP in Dnipro, one quarter of IDPs in Odesa, and 9% of IDPs in Kharkiv. In general, IDP households with middle and lower middle income levels can afford to live in urban districts with 'moderate' localisation of IDPs.

### **Type 3: urban districts with 'tangible presence' of IDPs**

Type 3 consists of 12 urban districts where there is a rather weak but 'tangible presence' of IDPs. This type is formed by Subtype 3.1 and Subtype 3.2, which combine urban districts with a predominance of poorly comfortable residential environments, and the difference between the two subtypes is the different degrees of spatial concentration of IDPs and housing affordability. Subtype 3.1 consists of districts with a low level of spatial IDP concentration and a supply of housing in the mid-price category (in their cities). Roughly speaking, every tenth IDP in the Dnipro, Kyiv and Kharkiv lives in these districts, as well as every seventh IDP in Lviv. In contrast, Subtype 3.2 integrates urban districts that generally have very low IDP concentration and housing supply in a relatively cheap and inexpensively price category (within their cities). Living in such urban districts is the most acceptable option for the lower strata of Ukrainian IDPs. Almost a quarter of IDPs in Kyiv, 16% of IDPs in Odesa, 13% of IDPs in Lviv, 7% of IDPs in Kharkiv, and only 4% of IDPs in Dnipro live in such districts.

### **Type 4: urban district with a high dispersion of IDPs**

Type 4 includes only one Pecherskyi District (Kyiv), which has a high dispersion of IDPs. This district is positioned as a luxury district for wealthy people with prohibitively expensive housing, so ordinary IDPs cannot afford housing here. Therefore, only the upper echelons of Ukrainian IDPs can afford to live in Pecherskyi District. Contrary to the luxury status of this district, it has a relatively comfortable residential environment because it is 'central city' with all the positive and negative effects in its territory, such as total commercialisation and other neoliberal urban transformations. This district has the lowest level of IDP localisation and concentration, and only about 3% of IDPs in Kyiv live there.

In summing up, the general intra-urban pattern of IDP distribution within the identified types of urban districts is as follows. The majority of urban IDPs live in comfortable urban districts in terms of security, cleanness, and infrastructure provision, but with different housing prices. The minority lives in either uncomfortable or luxurious urban districts.

## **4.3 Social situation of urban IDPs in Ukraine: Still internally displaced persons or already local citizens?**

We now turn to the more qualitative results of the research.

### **4.3.1 The impact of ongoing armed conflict on IDPs' psychological well-being. Adaptation to new realities and barriers to integration into host urban communities**

Most informants say that what they experienced because of the armed conflict is: "a new stage of life" (IDP1); "really a tragedy" (IDP2); "It is completely tragic, I will not say.

There were a million difficulties" (IDP3); "a vital event for me. It changed me a lot" (IDP4); "it was a difficult period" (IDP5), and the like. About other displaced people, it is stated that "For many, such a transformation, a phase change, was a tough way of changing life" (IDP3), confirmed by the following responses:

"I would like to decide for myself – where is our place, where to stay. The most was the tragedy – everything was quit..." (IDP2)

"My life has changed. I was a successful entrepreneur. An apartment in the city centre. [...] We did not think that the war would continue so long. We thought that everything would be resolved faster. Here, life changed from an entrepreneur to a displaced person on social benefit..." (IDP6)

"Of course [life trauma – author's remark]. Leaving home for two weeks and not returning there" (IDP7)

Moreover, the armed conflict in Ukraine has affected the 'usual' lifestyle of the participants: some of them note that in addition to changing living conditions, their social circle has narrowed, as an example:

"We do not allow [people] into [our] personal space. [...] After I displaced, we are nowhere to be found on the social network. We deleted all profiles. It's just dangerous" (IDP2).

The IDPs note that volunteers (including local activists), charitable local/international foundations, and organisations have helped them a lot to survive the stress of the military-political conflict and adapt to the new geopolitical and life realities in GCAs. Local authorities provided much less assistance to IDPs, while assistance and support from the state were 'invisible'. Participants from Crimea/Donbas noted:

"I shall say the help was from people. Not from the state. Activists came and arranged it. I am grateful. The stress that the child went through in [one of Crimean cities], thanks to the help of Dnipropetrovsk's residents, quickly passed. [...] If it were not for the volunteers, I do not know where we would be. We would become real homeless people. Only thanks to the volunteers, thanks to the organisation, we were able to live out" (IDP4);

"At first, [volunteers] helped everyone – household items, clothes, spoons, mugs. [We] took dishes, winter clothes. Products. This was the first year. Now everything has stopped. There was also the Akhmetov Foundation. For seven months [the fund was providing humanitarian aid], but then it didn't work out" (IDP8).

Presently, IDPs say that compared to the first years of the armed conflict, the aid of volunteers and various charitable organisations has become smaller, which is apparently due to the reduction of urgent needs among IDPs in terms of clothing, food, shoes, blankets, etc. As well, some IDPs deliberately refused social assistance for different individual reasons. The most important current financial support for urban IDPs is governmental targeted social benefits: realistically speaking, their size is so small that it cannot even cover utility bills for an apartment, let alone the cost of a rented apartment. Furthermore, those IDPs who have housing in NGCAs must pay utility bills to the occupation authorities, because otherwise their houses and apartments are confiscated. This has a serious impact on the socio-economic situation of IDP households. In legal terms, to get governmental social benefits, IDPs must be registered and periodically confirm and extend their status. Most

informants emphasised that they did not have appreciable legal problems with obtaining IDP status, but often had bureaucratic problems with prolongation or re-registration, especially due to long queues and the arrival of social workers at IDPs' places of registration (i.e. place of residence) when they were at work.

Such experiences in GCAs, however, differs from city to city because the more IDPs are registered in a city or urban district, the longer queues in which IDPs need to stand. IDPs also report that bureaucratic problems have disappeared with the start of quarantine in Ukraine due to the global pandemic of coronavirus. Regarding the above, it is interesting that one of the urban IDPs said the following: "We have [the IDP] certificate. Perpetual. It hurts me. This kills the last hope that someday we will return" (IDP5). In addition, employment problems are another barrier to the integration of IDPs in the major cities. Describing the opportunities in the labour market of their cities, IDPs mentioned that:

"Labour market in Kharkiv – the level of income and wages is lower than it was in Donetsk..." (IDP1);

"At first it was difficult. Especially to my husband. [...] The wage is lower; the conditions are different [than in a typical mid-city of Donetsk oblast]. Not entirely pleasant, [the employers] have been a lot of scams, framing" (IDP5);

"[It] is possible to find [a job]. Not always by education. Now, there are more marketing professions" (IDP7).

Moreover, through the coronavirus pandemic, the financial situation of some IDPs has been seriously deteriorating, as evidenced by the following responses:

"It is difficult for him [her husband] with work. He is in the construction industry. Quarantine is difficult. Construction has stopped, [the employers] are not paying..." (IDP6);

"How do our [IDPs] solve the problem with [a job]? Trade sphere. Although the coronavirus has created a problem [in this] too" (IDP3).

Also, in selected major Ukrainian cities, the social stigmatisation of IDPs is observed and the associated further discrimination leads to marginalisation of IDPs and prevents them from adapting to new realities and creates many barriers for them to integrate into the host communities. Most urban IDPs report that either they, their family members, or IDP acquaintances have faced social stigmatisation or discrimination in rent, employment opportunities, medical and educational services, housing conditions, etc. As examples:

"You know, in [20]14, it was hard. Numerous displaced persons were deceiving. I had to cope. It was more difficult to rent an accommodation. But you never know, they [IDPs] will leave an apartment, take something away, leave, then you will not find them there [NGCAs]" (IDP7);

"What amazes me is that the nurse calls the chief doctor and says: what are we doing with such people? The stigma of a special person. In Kharkiv, 'displaced person' is written in red on the medical card. As the stars [the Star of David] used to be for the Jews. They sculpt to us with the red colour 'displaced person'" (IDP8).

Participants do point out, however, that the peak of these negative phenomena occurred in the first years of the armed conflict, and in the following years they note a certain decline and normalisation. A representative quote, for example, would be:

"Now people have become more enlightened. The war has affected more than half of the people in Ukraine" (IDP6).

Speaking of the residents' attitudes to displaced people, it varies from city to city, but in general, there is a tendency that the farther from the conflict zone and the smaller the city, the more negative the attitude to IDPs. This is mainly since, as a rule, the labour markets of the small and medium-sized cities of Ukraine, especially provincial ones, are highly depressed: therefore, the rapid flow of IDPs to these categories of cities exacerbated the already deeply depressed labour market, which led to the spread of various manifestations of social stigmatisation and created in the early years of the conflict, many barriers to the adaptation of IDPs to new realities and hindered integration. In contrast, in the major cities of Ukraine, people are accustomed to competition and constant staff turnover in the labour market, and frequent changes in market conjuncture. For example, IDPs from Kharkiv, referring to the local attitudes to them, reported that:

"The attitude is the same as to Kharkiv citizens" (IDP1);

"In Kharkiv, [the attitude of residents to IDPs] is simpler. There are many displaced persons here. Show themselves adequately. In Uman, [local residents] do not [treat displaced persons] very well. In Zaporizhzhia, too, with prejudices. Luhansk? What for? Why?" (IDP8).

In the case of Odesa, informants note that there are some conflicts related to the burden on the city's social infrastructure, but

"mostly people have a very good [attitude to IDPs]. But all the same Odesa [consists of migrants]. We [locals] are indigenous – but also grandchildren-great-grandchildren of those who came in large numbers" (IDP3).

Finally, in Greater Dnipro, the responses of the informants differ only slightly from each other, apparently depending on the presence or absence of experience of living in an IDP camp. For example, those who have no experience of living in an IDP camp emphasise that:

"In general, the attitude [of the locals to the IDPs] is benevolent. [...] At the moment it has improved. Everyone has adapted. People have arrived and have lived for more than one year" (IDP7);

"How are relationships different [local to IDPs in different host communities]? The same. Smooth. There are no more any [incidents]. I drove around in a car with Donetsk license plates. But there were no threats or provocations" (IDP2);

and those who previously lived in an IDP camp or live there now point out that

"Now a fence has been set up around it [IDP camp in Kamianske]. They [IDPs] have no friendship with the locals. [...] In Dnipro, before arriving at the IDP camp [in Kamianske], I was shocked that the locals made a fuss of us" (IDP4);

"Majority [of the locals] dealt with the displaced people peacefully" (IDP5);

"Nobody treats me badly. Some say that the displaced people have become insolent. In my case, I don't feel any [dislike]. [...] And now it's more calm. The media are working. Even if someone did not understand, who the displaced persons are, they now understand" (IDP6).

Summing up, female IDPs were faster to adapt to new geopolitical and life realities related to the Russo-Ukrainian armed conflict than male IDPs in such aspects as finding a job, making new social ties, and recovering quickly from the psychological consequences of the military crisis. Thus, female IDPs (especially in married couples) integrate more rapidly and more fully into host urban communities than male IDPs. As a rule, female IDPs, faced with the difficulties associated with forced displacement, are looking for new opportunities and to solve them. On the contrary, male IDPs are stuck in their past stage of life – before the military crisis, when they had stable jobs and housing, long-term family, friendship, professional and other social ties, and were the main breadwinners of the family – and for a long time cannot find their place in the new host community. There were no striking differences in adaptation to new realities and the integration of IDPs into local communities based on age and educational levels, because most of the participants at the time of the study were of working age with higher education (see Appendix 1). Obviously, more detailed, and broader research is needed to identify the impact of these IDP characteristics. The only thing we can assume is that IDPs with high skills find jobs in the highly differentiated and flexible labour markets of large cities more quickly than IDPs with low and narrowly specialised skills (perhaps because of the industrial specialisation of Donbas).

#### **4.3.2 The spatial distribution of IDPs in selected major cities: IDP housing and mobility**

An analysis of the interview materials and the empirical results described above indicate that the spatial distribution of IDPs shows several features. Firstly, when IDPs with good economic opportunities come to a major city, they tend to look primarily for districts with their ‘normal’ residential environment, with a special focus on the district’s infrastructure provision. Secondly, when IDPs with poor economic situation come to a major city, they look for budget housing (or, as one informant said: “least a little bit of living conditions” (IDP8)), close to work, but then gradually improve their housing conditions. IDPs with a poor economic situation are mainly concentrated on the periphery of major cities or in the budget housing segment of other city’s parts. Thirdly, one of the budget housing options for IDPs is an IDP camp, but it is very difficult to get there due to the long queue, but some IDPs deliberately refuse to live in IDP camps through poor living conditions or other individual reasons. Moreover, informants who live or have lived in IDP camps report that certain elements of IDP marginalisation are observed in these camps. Confirmation of this can be found in such comments of IDPs:

“A few families are normal. Mostly drunkards. Some people told that in Donetsk Oblast earned 10 thousand [Ukrainian Hryvnia (UAH)], and here we earned 3 thousand [UAH] as loaders in ATB [supermarket]. Refused to work. Continued to drink” (IDP4);

“Our IDP camp is prestigious. There are local showdowns. But mostly [residents] are normal. There was one, she was jailed” (IDP5);

“Someone has died from an overdose. We have a separate block for 4 families. All our families are not bad. [...] Prosperous families. But there in the dorms. Around 10%. Former neighbour, she is now in prison” (IDP6)”.

Lastly, there is no distinct enclavisation of IDPs or ghettoisation in poor districts of the studied cities. When the informants described the spatial distribution of IDPs

within the selected major cities, they noted the following: in Dnipro – “Donetsk highway. From the side of Donetsk. And housing estates are relatively cheaper than any housing on the right bank [of the Dnipro River]. Most are here or on the right bank – Petrovsky Avenue [Novokodatskyi District]” (IDP2); “scattered throughout the city” (IDP4); “There are [IDPs] living in the suburbs. Found housing in the suburbs. Probably, [IDPs] are everywhere in the city” (IDP5); in Kharkiv – “Mainly [IDPs live] on the outskirts, of course” (IDP8); and in Odesa – “The displaced people are “smeared with a thin layer” [over the city]” (IDP3).

According to the participants, the most common barrier to the successful integration of IDPs into host urban communities is the lack of their own or stable housing. Most informants live in rented housing, a minority either in IDP camps or in their own housing. Based on the above results and a literature review of Ukrainian IDP studies, we can say that the case of Ukraine differs qualitatively and quantitatively from the case of other post-Soviet countries with ‘frozen’ conflicts. For example, in Ukraine there is no mass construction of ‘mushroom villages’ near large cities, as was the case in Georgia near Tbilisi (Tserovani settlement and others) in 2008, or as before in the same Georgia, the Shevardnadze regime cynically kept forced internally displaced persons (because of wars in the 1990s) in poverty to profit from their plight through the finances of international aid (see more in Bruckner, 2009, pp. 172–173; Kabachnik et al., 2015; Tarkhan-Mouravi, 2009). The salient features of ‘mushroom villages’ are firstly: poor quality of structures due to the accelerated pace of mass construction; secondly, the lack of employment opportunities; thirdly, isolation from basic services, towns and infrastructure; and finally, lots of these settlements are spatially isolated (Kabachnik et al., 2014, p. 9). A parallel situation with newly constructed settlements for IDPs is observed in Azerbaijan, as the spatial and social isolation in these settlements is dictated by the remoteness of the settlements from the regional centres, cities and towns populated by non-IDPs, thus weakening ties and interactions between IDPs and non-IDPs (Gureyeva-Aliyeva and Huseynov, 2011, p. 43).

Also, for example, comparing the experience of Georgia and Ukraine, it should be noted that in the urban dimension of Ukraine there is no significant socio-spatial isolation of IDPs, as can be seen in the urban dimension of Georgia (see more in Gogishvili, 2015; Gogishvili and Harris-Brandts, 2019; Salukvadze et al., 2014), and Ukrainian IDPs are largely scattered across the city among urban residents and districts. Simultaneously, the urban dimension of internal displacement of both Ukrainian and Georgian IDPs is characterised by a concentration in the respective country’s major cities: namely for Ukraine – in Kyiv, Kharkiv, Odesa, Dnipro, Lviv, and other large cities; and for Georgia – in Tbilisi and the other major cities: Zugdidi (the closest to the Abkhazian territory), Kutaisi, and Gori (close to the administrative boundary line with South Ossetia) (Elizbarashvili et al., 2020; Luciani, 2018; Mitchneck et al., 2009).

Hence, based on the quantitative and qualitative empirical results, it can be argued that the spatial isolation of IDPs within major Ukrainian cities is weak, which refutes the previously stated Hypothesis 3 (segregation effect). Nevertheless, the spatial distribution of urban IDPs needs to be understood with caution, as there is some fragmentation. Although most IDPs live in comfortable city districts, notwithstanding, they can localise/concentrate

in low-cost housing segments of these districts, which are usually on the outskirts of comfortable districts and have poorer housing conditions, but these conditions are not always poorer than for the ordinary citizens in these parts of the city. In other words, in major Ukrainian cities, there is no “enclavisation/islandisation” of internally displaced persons, but rather a certain intra-district ‘outskirtisation’ of urban IDPs. This is not related to the status of IDPs, however, but simply reflects the usual realities of most internal economic migrants in Ukrainian urban areas, due to the spatial heterogeneity of price proposals in the housing markets of large cities.

As evidenced by the materials of the in-depth interviews, the majority of urban IDPs plan to continue to live in the cities of their current residence, even after the end of the armed conflict. Such a situation requires from the government of Ukraine and the authorities of host communities not short-term, but long-term solutions to the urgent problems of urban IDPs: in particular social housing and adequate housing conditions, social protection, etc.

Summarising the interview materials, we can identify several possible general behavioural strategies of urban IDPs:

1. Behavioural strategy: ‘ordinary citizen’ – a strategy of further rooting in the host community urban IDPs who perceive the city of their current residence as their home and do not want to return to NGCAs even if peace arrives in the conflict zone. This strategy consists of the following two types (sub-strategies). Type 1, ‘local ordinary citizen’, is characteristic of IDPs who already consider the current city as their home and do not want to leave it even after the end of the conflict, in addition, they have stable housing or their own housing. Type 2, ‘relative ordinary citizen’, includes those IDPs who plan to stay in the current city even after the end of the conflict and perceive it completely/mainly as their city(home), but cannot yet afford adequate stable housing. The strategy ‘ordinary citizen’ can be called long-term, given that, under the optimistic scenario, IDPs from the type 2 (‘relative ordinary citizen’) will gradually move to the type 1 (‘local ordinary citizen’). An example of Type 1 is a participant from Kharkiv:

“I say that the home is Kharkiv. My home is where my family is. My daughter grew up here. I am not going to return there [NGCA]. Even if the situation returns to its normal course. [...] I like Kharkiv... I see my family only in Kharkiv. To live and build the future. We have been here for 6 years – the foundation has been laid” (IDP1).

An example of Type 2 is an IDP from Dnipro:

“Our house was dismantled there [NGCA]. There is nowhere to return. [...] Even if Donbas will flourish, it will take 20-30 years. Even if the war is over, I do not want to waste time on it. [...] I was happy when I became an entrepreneur and pay taxes. I was glad that as a full-fledged citizen I pay [taxes], and honestly, I would have housing... [...] I fell in love with Dnipro, this is my big city” (IDP5);

2. Behavioural strategy: ‘transit’ IDP – a strategy of the further search for more favourable living conditions for IDPs in or near other Ukrainian large cities and an unwillingness to return to the conflict zone, even if the conflict ends, as well as complete/partial unwillingness to integrate into the host community. In particular this strategy can be of two types. Type 3, ‘capable transit’

IDPs, unites those IDPs who have a good economic situation and opportunities for displacement to a new large city or its suburb in the short-term perspective. Type 4, ‘trapped transit’ IDPs, is typical for those IDPs who would like to leave their current city and displacement to another large city or its suburb, but such displacement is not possible due to a poor economic situation, thus there is a postponement of displacement for the period of accumulation of necessary financial resources for its realisation. An example of Type 3 is a participant from Donbas:

“There is no desire to return there [Donbas]. I cannot imagine if I stayed. It has been like this for 7 years. I would like to decide for yourself – where is our place, where to stay. [...] The most attractive [for displacement] is the suburb of Kyiv. If there will be a vacancy. I am considering Kyiv. [...] There is a house [in Donbas] that I built myself. If transferred to the territory of Ukraine [GCA], I would be happy. [...] Home is my hearth. A place where not only physically, but also mentally” (IDP2).

An example of Type 4 is an IDP from the Crimea:

“There [Kamianske (ex-Dniprodzerzhynsk)] are big problems with unemployment. Not just for the displaced people. [...] I dream of leaving here. But there is no money, no specific goal. I can find a job by my profession. [...] Considering that the child will soon graduate from school, this is a big city. The worst option is Odesa. In order of priority – Odesa, Dnipropetrovsk [now Dnipro], Lviv, Kyiv. Kyiv is in the first place. Also Ternopil. There are universities there. [...] I am here almost assimilated. But I don't consider myself a Dniprodzerzhynets” (IDP4);

3. Behavioural strategy: ‘ambivalent’ IDP: a strategy that assumes that IDPs are in a state of uncertainty about further displacement and integration in the host community. Similar to previous strategies, this strategy has two types. Type 5, ‘ambivalent’ IDPs with negative skew, is characteristic of IDPs that are sufficiently or partially integrated into the host communities, but in case of deterioration of their socio-economic situation, intend to return to NGCAs. Type 6, ‘ambivalent’ IDPs with positive skew, includes IDPs who are sufficiently/partially integrated into the host community but would like to return to their former places of residence in NGCAs after the end of the armed conflict. An example of Type 5 is an IDP from Donetsk:

“If I had housing, I would say, I'm from the Dnipro. But we live in limbo. We may be expelled [from the IDP camp], and we will have to go to Donetsk. [...] If they say in the summer, leave [the IDP camp], I will not be able to pay 7–10 thousand [UAH] for [renting] a room. I will not have a choice. I shall have to go to Donetsk to my apartment” (IDP6).

An example of Type 6 is a participant from Luhansk:

“I would like [to return to Donbas]. If everything returned as it was before [20]14. Judging by what is happening, I do not expect anything good. They [people in NGCA] consider us [IDPs in GCA] traitors. We did not defend our land. Those who stayed believe that we took out their intellectual potential, abandoned them with nothing. [...] Probably, even before Kharkiv, [home] was definitely Luhansk. Now it is not 100%, but more Kharkiv. Fifty-fifty. [...] I would love to go [to Donbas], especially if there was peace. So that [people] perceive us as peacekeepers, and not invaders, as it is now. Life there stopped in [20]14



and is degrading. I would take part in the restoration of [Donbas]" (IDP8).

The most socially vulnerable categories of IDPs usually have the 4<sup>th</sup> or 5<sup>th</sup> behavioural sub-strategies. Regarding the 4<sup>th</sup> sub-strategy, an important element of further internal displacement and successful integration into the host community is an essential improvement in the economic situation. The deplorable situation is further aggravated by the fact that 'trapped transit' IDPs' property could have been confiscated by illegal military formations in NGCAs; consequently, they can no longer sell their property and thereby improve their financial situation. The 5<sup>th</sup> behavioural sub-strategy is usually inherent in IDPs who cannot find adequate housing in GCAs, but they still have housing in NGCAs, to which they can return at any time, if it is not confiscated by the occupation armed groups.

## 5. Conclusions

This paper expands the understanding of the IDPs' accommodation in large cities and describes several reasons why IDPs choose large cities as the destination of internal displacement. Additionally, the study indicates that the late implementation of the "Guiding Principles on Internal Displacement" (UN, 1998), which sets out the principles relevant to the protection of IDPs in all phases of displacement, and institutional chaos in the country can, on the one hand, exacerbate the socio-economic situation of IDPs and lead to marginalisation. On the other hand, it can narrow the opportunities for adequate adaptation to new geopolitical realities and successful integration into host communities and society. The hidden urban geographies of internal displacement consist of several problems: ignoring the needs (not only humanitarian) of urban IDPs which they face every day (e.g. stigmatisation, inequality in the rights of non-IDPs and IDPs, discrimination in the labour and housing markets, poor socio-economic situation and unstable housing, etc.); and in the case of conflict-induced IDPs, some are forced, at their own risk, to return to the conflict zone to meet their basic needs, as their basic needs have been ignored in government-controlled areas.

The results of the author's in-depth interviews, combined with the above-mentioned empirical results, shed light on patterns of the IDPs' adaptation and integration in large Ukrainian cities and help to understand more deeply the hidden urban geographies of internal displacement in large cities. The results of the statistical analysis indicated that in the major Ukrainian cities, most IDPs live in urban districts with comfortable residential conditions in terms of basic urban infrastructure, security, and cleanliness; however, only IDP households with lower-middle- and upper-incomes can afford to live in such districts. The minority of urban IDPs live in urban districts with uncomfortable or poor comfortable residential conditions in terms of the characteristics listed above, where most of these IDPs have low household incomes. As an exception, a critical minority of urban IDPs live in the luxurious central city district of Kyiv, where housing prices are the most expensive in the capital, but, simultaneously, the district has a second-rate comfortable residential environment.

The interviews in selected major cities of Ukraine pointed to the lack of spatial enclaves in the intra-urban distribution of IDPs, excluding individual IDP camps and other collective centres, even though the residents of such collective centres are less numerous compared to the total number of

IDPs throughout the city. There are no enclaves of forced displacement people in its traditional sense or as observed in large cities of other the Former Soviet Union (FSU) countries with 'frozen' conflicts (Georgia, Azerbaijan); in comparison, there is a soft islandisation of IDPs among Ukrainian large cities in IDP camps and other collective centres (e.g. Kharkiv, Dnipro, Zaporizhzhia, etc.). Nevertheless, in the major Ukrainian cities, the process of intra-district 'outskirtisation' of urban IDPs is observed with further gradual improvement of living conditions, but the COVID-19 pandemic has slowed down these positive changes.

Importantly, a further research area may be to study the socio-economic situation of Crimea IDPs, as, on the one hand, most studies have related to either the general situation of Ukrainian IDPs, or focused on IDPs from Donbas. On the other hand, we need an understanding of the current situation of IDPs from Crimea, as Crimean IDPs, according to Austin Charron (2020), are "Overshadowed by their far more numerous counterparts from Donbas", especially Crimean Tatars as one of the most socially vulnerable and discriminated groups among Ukrainian IDPs (UNHCR, 2019). Also, further studies should be concerned with the IDP-Roma and IDPs living in IDP camps. In addition, studies of Ukrainian IDPs in major cities need to deepen the analysis in each city and understand in more detail the situation of IDPs on issues such as sense of home and "double" displacement (e.g. Kabachnik et al., 2010), the experience of secondary and multiple displacements, etc.

Besides, since 2014, Ukraine has been reforming the decentralisation of local self-government and the territorial organisation of authority. As part of this reform, a good institutional environment is being formed at the local level for the rapid (non-centralised) realisation of various local initiatives by both the authority and the community. This is a very important step for Ukraine and its citizens, as local authorities have new opportunities to solve problems and improve the integration of Ukrainian IDPs into host communities. Therefore, one of the promising areas of research on Ukrainian IDPs at the local level may be a study of successful practices of support and integration of IDPs into different host communities.

Finally, the government and local authorities need to decide what to do with the morally and physically obsolete IDP camps where IDPs still live, as the lifetime of these camps expired in 2018. It is important to ensure that prudence exists in solving the IDPs' housing problems in Ukraine, so that policymakers do not (re-)adopt the experience of the mass construction of spatially and socially isolated 'mushroom villages' on the outskirts of cities or urban areas and remote from urban centres for the majority of non-IDPs (e.g. Azerbaijan and Georgia), because this will exacerbate the already fragile social and economic integration of IDPs. Although such actions nominally solve the housing issue for IDPs, they will have negative consequences for the IDPs' living conditions. This results from the construction of new isolated settlements/IDP camps which is not a long-term solution to the problem, but rather a trigger for new displacements within the city or to other urban areas, which ultimately creating a downward spiral of insecurity, informality, and vulnerability. Moreover, a differentiated approach to IDP assistance should be implemented, given the above-identified types of IDP behavioural sub-strategies (although there may be many more) that will create flexibility in the gradual process of successful IDP integration into urban host communities.

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## Appendices

| Code | Gender | Age | Education | Interview period | Region of origin |
|------|--------|-----|-----------|------------------|------------------|
| IDP1 | F      | 40  | tertiary  | November 2020    | Donbas           |
| IDP2 | M      | 50  | tertiary  | December 2020    | Donbas           |
| IDP3 | M      | 76  | tertiary  | December 2020    | Donbas           |
| IDP4 | M      | 45  | secondary | March 2021       | Crimea           |
| IDP5 | F      | 38  | secondary | April 2021       | Donbas           |
| IDP6 | F      | 44  | tertiary  | April 2021       | Donbas           |
| IDP7 | F      | 30  | tertiary  | May 2021         | Donbas           |
| IDP8 | F      | 34  | tertiary  | May 2021         | Donbas           |

*Appendix 1: Characteristics of IDP-informants who participated in in-depth interviews*

*Source: author's elaboration*

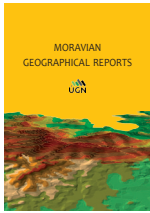
|  | Clusters  | Index of IDP localisation  | The level of residential environment comfort  | Index of IDP concentration   | Average annual cost of housing (the cost of apartments) |
|--|---|--|---|--|---|
| <b>Type 1: urban districts with conspicuous localisation of IDPs</b> |   |  |   |  |   |
| <i>Subtype 1.1</i>   | AAAA  | A  | A   | A  | A   |
|  | AAA(A)  | A  | A   | A  | (A)   |
|  | (A)AAA  | (A)  | A   | A  | A   |
| <i>Subtype 1.2</i>   | AAAC  | A  | A   | A  | C   |
|  | (A)AAB  | (A)  | A   | A  | B   |
| <b>Type 2: urban districts with 'moderate' localisation of IDPs</b>  |   |  |   |  |   |
| <i>Subtype 2.1</i>   | BA(A)B  | B  | A   | (A)  | B   |
|  | BBBB  | B  | B   | B  | B   |
| <i>Subtype 2.2</i>   | BBBC  | B  | B   | B  | C   |
| <b>Type 3: urban districts with 'tangible presence' of IDPs</b>      |   |  |   |  |   |
| <i>Subtype 3.1</i>   | CCCB  | C  | C   | C  | B   |
| <i>Subtype 3.2</i>   | CCDD  | C  | C   | D  | D   |
| <b>Type 4: urban district with a high dispersion of IDPs</b>         |   |  |   |  |   |
|  | DBDA  | D  | B   | D  | A   |
| Description of encoded values:                                       | A = very high level:<br>IL > 1.300<br>(A) = high level:<br>1.100 < IL ≤ 1.300<br>B = medium level:<br>0.850 < IL ≤ 1.100<br>C = low level:<br>0.600 < IL ≤ 0.850<br>D = very low level:<br>IL ≤ 0.600 | A = high level:<br>RE > 1.000<br>B = medium level:<br>0.975 < RE ≤ 1.000<br>C = low level:<br>RE ≤ 0.975 | A = very high level:<br>IC > 1.100<br>(A) = high level:<br>1.000 < IC ≤ 1.100<br>B = medium level:<br>0.900 < IC ≤ 1.000<br>C = low level:<br>0.750 < IC ≤ 0.900<br>D = very low level:<br>IC ≤ 0.750 | A = very high level:<br>IHP > 1.200<br>(A) = high level:<br>1.115 < IHP ≤ 1.200<br>B = medium level:<br>0.915 < IHP ≤ 1.115<br>C = low level:<br>0.800 < IHP ≤ 0.915<br>D = very low level:<br>IHP ≤ 0.800 |   |

*Appendix 3: Description of nine clusters of major Ukrainian cities' districts*

*Note: Variables: (IL) Index of IDP localisation and Normalised indicators: (RE) The level of residential environment comfort in urban districts (OLX survey in January 2019); (IC) Index of IDP concentration (number of IDPs per 1,000 urban residents); (IHP) Average annual cost of housing – the cost of apartments – in urban districts (USD/m<sup>2</sup>, 2018)*

*Source: author's elaboration*





# Adoption of renewable energy innovations in the Portuguese rural tourist accommodation sector

Luís SILVA<sup>a\*</sup>

## Abstract

*The imperative of decarbonisation represents a great challenge for the tourist accommodation sector. This article examines the adoption of renewable energy innovations in the tourist accommodation sector of Portugal. The analysis focuses on one of the most known tourist accommodation products in the Portuguese countryside: Tourism in Rural Areas (TER). Drawing from two complementary e-mail-based surveys conducted with TER owners/managers, the results of the study show that there is a substantial gap between their positive perceptions of renewables and levels of renewable energy innovations adoption. The reasons pinpointed relate to unfavourable market factors and to institutional, legal, regulatory, or administrative hurdles. In addition, except for geographical location, the characteristics of the units and respondents had no significant influence on adoption.*

**Keywords:** renewable energy innovation, tourist accommodation, drivers, barriers, rural areas, Portugal

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## 1. Introduction

To achieve the Paris Agreement goals, the global economy must fully decarbonise by 2050 (IPCC, 2018). This imperative represents a great challenge for the tourist accommodation sector. Based on 2005 data, it has been estimated that accommodation contributes 21% to tourism's global CO<sub>2</sub> emissions (Scott et al., 2008, pp. 132–133). Furthermore, emissions from tourist accommodations are forecasted to increase significantly in the coming decades in the “business as usual” scenario, notably “from 1,101 Mt CO<sub>2</sub> in 2010 to 2,957 Mt CO<sub>2</sub> by 2050” (Gössling and Peeters, 2015, p. 651).

Nevertheless, there is a great potential for the accommodation sector to reduce its CO<sub>2</sub> emissions by improving energy efficiency and using renewable energy sources (Scott et al., 2008, pp. 10–11; Dalton, Lockington and Baldock, 2007, p. 568), including solar, wind, hydro, geothermal and biomass energy. Accordingly, and in line with the European Union's objective of achieving carbon neutrality within 30 years (European Commission, 2019a), the European Travel Commission has encouraged “all countries to accelerate the deployment of ‘best practice’ energy-efficiency retrofits and renewable energy investment in the accommodation sector” (Scott and Gössling, 2018, p. 32).

A considerable body of research about the adoption of energy efficiency measures in tourist accommodations has already been produced (e.g. Becken, 2013; Becken and Dolnicar, 2016; He, Zha and Loo, 2020; Pace, 2016; Warren and Becken, 2017), including in Portugal (e.g. Mendes and Santos, 2014; Moutinho, Costa and Bento, 2015). Far less attention has been devoted to the uptake of renewable energy in tourist accommodation facilities. Most of the few existing studies on this subject focus on the feasibility and on the economic and environmental benefits of renewable energy supply in hotels (Dalton, Lockington and Baldock, 2008; 2009; Karagiorgas et al., 2006; Zografakis et al., 2011), or else, on the drivers and/or barriers to the adoption of renewable energy technologies in hotels (Dhirasasna, Becken and Sahin, 2020; Mahachi, Mokgalo and Pansiri, 2015; Sardanou and Kostakis, 2020). Other types of tourist accommodation remain underexplored. Moreover, there is a paucity of research on the uptake of other renewable energy innovations in tourist accommodations.

This article addresses these gaps by studying a Portuguese case. Four research questions are posed:

1. What are the levels of adoption of renewable energy innovations in tourist accommodations?;

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2. What types of renewable energy innovation are the businesses investing in?;
3. What are the main reasons for adopting, or not, such innovations?; and
4. Do the characteristics of the establishments and/or their owners/managers influence adoption?

The focus of this study is on one of the best known tourist accommodation products in rural Portugal: TER – Tourism in Rural Areas.

Rationale for this study adds knowledge to a research topic that merits further attention for several reasons. First, the supply of and the demand for rural tourist accommodations have been growing in Portugal and in other developed countries since the 1980s due to the rise of a lifestyle-led and leisure-oriented society, and the widespread mobilisation of tourism as a strategy for rural development and revitalisation (Silva and Prista, 2016; Walmsley, 2003). Second, recent research has shown that a considerable number of Portuguese emigrants and their descendants (especially those aged between 29 and 39) who own a house in a rural municipality would like to return to their place of origin to invest in tourism activities (Santos, 2021). Third, this topic remains understudied in the scholarly literatures on “rural energy transitions” (Naumann and Rudolph, 2020) and “energy tourism” (Frantál and Urbánková, 2017). Finally, climate change demands a faster transition towards more sustainable energy systems in all sectors of economic activity at the global level (IPCC, 2021).

## 2. Theoretical background

The concept of social acceptance of renewable energy innovation is useful for the arguments presented in this article. The most influential definition of that concept is Wüstenhagen, Wolsink and Bürer’s (2007) framework, distinguishing three dimensions of social acceptance: socio-political acceptance, community acceptance and market acceptance. The first dimension combines the acceptance of policies and technologies by policymakers, by key stakeholders and by the general public (often measured through opinion polls). The second refers to the local responses to the siting of renewable energy projects and associated infrastructures. The third relates to the consumers (in the case of decentralised generation of energy and green power marketing), investors and intra-firm acceptance. This article focuses on the adoption of renewable energy innovations by consumers, notably by the owners/managers of tourist accommodation establishments.<sup>1</sup>

Research carried out in Europe and beyond has shown that the adoption of renewable energy innovations or renewable energy technologies in hotels and other types of tourist accommodation is low, namely between 6% and 25%, and the highest rate is for solar thermal panels (Coles, Dinan and Warren, 2015; Dalton, Lockington and Baldock, 2007; Karagiorgas et al., 2006; Knezevic and Vicic, 2008; Knowles et al., 1999). A review of the literature identifies several factors that influence the uptake of renewable energy in hotels. For instance, Mahachi, Mokgalo and Pansiri (2015) identify political leadership, financial benefits, the availability of environmental sustainability programs, and strong environmental values as the driving forces for the

adoption of renewable energy technologies in Botswanan hotels. Likewise, Sardianou and Kostakis (2020) concluded that economic, informational, organisational, and human-related factors obstruct the uptake of those technologies in Cretan hotels.

Similarly, Dhirasasna, Becken and Sahin (2020) showed that the interplay between incentive policy, owner/manager perceptions, tourists’ behaviours, technology advancement and electricity grid prices may either enable or hinder the adoption of renewable energy technologies in Queensland hotels. In turn, Dhirasasna and Sahin (2021) ascertain that the adoption rate of renewable energy technologies in Queensland hotels follows an S-curve growth only when market conditions are favourable, that technology performance increases adoption more than the government incentives, and that the perceptions of hoteliers and tourist behaviours act as market accelerators.

These factors are similar to those that affect the adoption of other environmental technologies and practices in hotels. Chan, Okumus and Chan (2020), for example, identify seven barriers to the adoption of environmental technologies in Hong Kong hotels, of which the first three are the most important: 1) environmental feasibility; 2) lack of green knowledge and a green network; 3) monopolised after-sales service; 4) government and initial support; 5) customer experience; 6) human resource limitations; and 7) financial performance. Equally, Wang, Font and Liu (2020) showed that market needs, managers’ attitudes towards the environment and the demand from stakeholders are antecedents of willingness to adopt eco-innovation practice in Chinese hotels.

Given that these drivers and barriers were identified in studies investigating the adoption of renewable energy technologies and/or other environmental measures in medium- and large-sized urban hotels, the uptake of renewable energy innovations in tourist accommodations located in rural areas – which tend to be small-scale and family-based businesses – may well be influenced by other factors. For example, there is evidence that the business’ location and success, as well as the managers’ experience, education level and place of residence, influence the adoption of local development practices in rural tourist accommodations in Central Portugal (Dinis et al., 2019).

## 3. Geographical context

### 3.1 Tourism and carbon emissions from tourism in Portugal

Portugal is one of the European countries most dependent on the tourism industry, especially inbound tourism, whose importance in the national economy has been increasing over the past decade (cf. OECD, 2020). According to the Tourism Satellite Account produced by the National Statistics Institute (INE, 2020a), in 2018, tourism accounted for 8.0% of Portugal’s gross added value and 11.5% of the gross domestic product, contributing to 9.4% of employment and 22.3% of total exports. In addition, the accommodation sector contributed 26.0% to the total expenditure of international tourists, representing the second largest single contributor after food and beverages (26.9%). It also amounted to 32.9% of the total expenditure of domestic tourists, being the largest single contributor.

<sup>1</sup> On the acceptance of renewable energy innovations by other consumers, see, for example, Sauter and Watson (2007) and Wolsink (2012).

Until the emergence of the COVID-19 pandemic in Portugal and in other European countries in March 2020, the tourism industry was still growing in the country, with 24.6 million international tourists – coming mainly from Spain (25.5%), the United Kingdom (15.4%), France (12.6%), Germany (7.9%) and Brazil (5.5%) – and an additional 5.4 million domestic tourists in 2019 (INE, 2020b). The pandemic had a huge impact on tourism worldwide as well as in Portugal, with consequences for the flow of tourists and the weight of the sector in the country's economy (cf. INE, 2021).

According to Eurostat (2020), in 2018, Portugal's greenhouse gas (GHG) emissions (including international aviation, but excluding land use, land-use change and forestry, or LULUCF) reached 71.6 million metric tonnes of CO<sub>2</sub> equivalents – representing a 1.8% share of GHG emissions in the 27 European Union (EU) Member States – down from the 88.0 million tonnes in 2005 but up from the 60.2 million tonnes in 1990. Based on 2010 data, the most recent available data on the subject, the accommodation sector accounts for about 5% of CO<sub>2</sub> emissions from tourism activities in Portugal which, in turn, contributes about 10% to national CO<sub>2</sub> emissions (Moutinho, Costa and Bento, 2015, p. 218). In brief, the accommodation sector is a key element of the tourism industry in Portugal and will play a central role in achieving carbon neutrality by 2050.

### 3.2 Portugal's renewable energy policy

Since the mid-2000s, Portugal has made extensive investments in renewable energy sources, in line with its international commitments. The country met the ambitious target of sourcing 39% of electricity from renewable sources in 2010 and reached 59.6% in 2020, slightly below the target of 60%. It also met the 2020 target of 31% share of its gross final energy consumption from renewable sources. In 2020, the main renewable energy sources of electricity were hydropower (43.6%) (whose inclusion as a renewable energy source is debatable) and wind power (38.5%), followed at some distance by biomass (10.1%) and solar power (5.3%). Most (97.9%) of this electricity came from large-scale, centralised projects (DGEG, 2021).<sup>2</sup>

This pattern of development can be explained by the policy framework and the uptake of renewable energy by the private sector. Portugal's governments have been promoting renewable energy generation through feed-in tariffs, fiscal incentives, green certificates, targets, and funding for research and development projects, as well as tenders and auctions for granting rights to connect wind and solar energy to the electricity grid (see Delicado et al., 2014; Silva and Sareen, 2021, for details). Combined with a system of planning decisions taken at the national level, such energy policy measures have mostly privileged large-scale renewable energy generation projects and favoured large utility companies, rather than small-scale projects and collective or individual prosumers (cf. Delicado et al., 2014, for wind energy; Sareen and Nordholm, 2021; Silva and Sareen, 2021,

for solar energy). The outcome is hindering the adoption of renewable energy innovations by smaller actors, such as those involved in rural tourism businesses, of which TER is an example.

Although the Portuguese governments have been promoting small-scale renewable energy generation by individuals and companies since 2002 (Decree-Law No. 68/2002), several economic and legal factors have hindered its development. First, initially attractive feed-in tariffs (e.g. €650/MWh in the case of solar energy) running for 15 years have declined since 2010 (cf. DGEG, 2018) and were eliminated in 2015. Second, the grid connection limits for decentralised generation set by the governments are low (see Silva and Sareen, 2021; European Commission, 2019b, regarding solar energy). Third, a legislation of the Production Units for Self-Consumption – referred to as UPACs (“Unidades de Produção para Autoconsumo”) – imposed the limitation that the electricity generated had either to be consumed by a single user entity or injected into the national grid in exchange for a nominal tariff set at 90% of the market price (Decree-Law No. 153/2014). Fourth, the remuneration regime for projects (of up to 0.25 MW) that generate electricity exclusively to be injected into the grid – referred to as UPPs (“Unidades de Pequena Produção”) – is not particularly attractive, because it is set by a bidding scheme in which producers offer discounts to the reference tariff annually established by the government (Decree-Law No. 153/2014).<sup>4</sup> Fifth, since 2012, the income earned by producers from the sale of electricity is taxed under the Personal Income Tax regime, whereas, before, producers did not have to pay Personal Income Tax when the annual income earned was less than €5,000.

Nevertheless, in recent years, Portugal's government brought out legislation and implemented some measures to promote the adoption of renewable energy innovations at the household, small company, and community-scale. In 2019, the government passed new legislation that enables the existence of community and collective self-consumption of renewable energy (Decree-Law No. 162/2019), which came into force in January 2020. The government also reintroduced some incentives schemes for self-consumption – a deduction of up to €1,000 in the Personal Income Tax in 2020 for the installation of solar PV panels (and heat pumps) in households (Law No. 2/2020) and, in 2021, created a subsidy of up to €2,500 (grant rate of 70% of the eligible costs) for the installation of solar PV panels (and energy efficiency measures) in buildings constructed before 2006 (Administrative Order No. 8745/2020).<sup>3</sup> Additionally, the government created a credit line for decarbonisation and the circular economy with an allocation of €100 million to support projects of micro-, small- and medium-size industrial and tourism companies aiming to reduce energy consumption, to generate renewable energies for self-consumption, and to change to a circular economy.<sup>5</sup> The fact that peer-to-peer delivery is not included reflects the rigid energy market

<sup>2</sup> As of December 2020, registered small-scale projects totalled 480.7 MW of installed capacity, including solar power (466.5 MW), wind power (4.0 MW), hydropower (0.2 MW) and other renewable energy sources (biomass, biogas) (9.9 MW) (DGEG, 2021).

<sup>3</sup> Tax incentives for micro-generation were introduced in 2007 – the date on which taxpayers could deduct up to €796 (grant rate of 30% of the eligible costs) in the Personal Income Tax – but were eliminated in 2010. The amount allocated to that subsidy was €1,750,000 in 2020 and €2,750,000 in 2021.

<sup>4</sup> In 2019, the government increased the maximum installed capacity of the UPPs to up to 1 MW, but maintained the remuneration regime (Decree-Law No. 76/2019).

<sup>5</sup> This credit line has a term of 12 months, with a maximum amount of €2 million per company and a grace period of up to two years. To be eligible, projects must consume at least 10% of energy produced through renewable energy sources.

structure and the restrictive regulatory framework in Portugal (Klein et al., 2020). The impact of such legislation and measures is still not noticeable.

Aside from setting a target of sourcing 80% of electricity from renewable sources in 2030, Portugal's National Energy and Climate Plan 2021–2030 (European Commission, 2019b) sets a target of 45% to 55% of CO<sub>2</sub> emissions reduction (excluding LULUCF) compared to 2005 by 2030. Although there are no specific targets for tourism activities, this Plan envisages a CO<sub>2</sub> emissions reduction of 70% in services and of 40% in transport by 2030, sectors which are closely linked to tourism. Meanwhile, the Tourism Strategy 2027 sets as a target that over 90% of tourism businesses adopt energy efficiency measures by 2027 (Resolution of the Council of Ministers No. 134/2017). Regarding solar energy, in 2019, 43% of tourist accommodations had installed solar thermal panels and only 14% had solar PV panels (Turismo de Portugal, 2020). In part, this is a consequence of the 23% VAT rate applied to renewable energy devices since 2012 in mainland Portugal.

### 3.3 Tourism in Rural Areas (TER)

Created in 1986, TER is a set of “commercial homes” (Lynch, McIntosh and Tucker, 2009) consisting of small-scale and family-based tourism businesses offering accommodation in a household environment, as well as additional facilities permitting outdoor activities in rural areas, such as swimming, tennis and horse riding. TER differs from all other types of tourist accommodation available in Portugal because it is regulated by specific legislation regarding the characteristics of the units and businesses.

According to Silva (2009), considering the characteristics of the buildings, their furniture and interior decoration in general, TER establishments offer two types of rural dwelling, in reference to a “noble” or to a “peasant” rural past, for touristic consumption. The noble past corresponds to accommodation in manor houses and other residential houses with recognised architectural value. They are furnished and decorated with antiques and exquisite objects, from crystal tableware and silverware to 18<sup>th</sup> century Portuguese furniture, obtained through family heirlooms or purchased at antique shops. In turn, the peasant type corresponds to accommodation in adapted rustic houses or outbuildings on a farm, offering interiors to match. They are decorated with artisanal and vernacular objects, from farming tools to handicrafts, either collected or purchased at arts and crafts shops. These businesses are usually run by their owners, in most cases involving the family unit, or individuals aged between 45 and 60 years old, most of whom hold a university degree, have a complementary occupation, and started the activity to recover and monetise properties obtained through family inheritances.

According to the INE (2021), in 2020, there were 1,374 TER establishments offering 23,430 beds, representing 26.5% of the national tourist accommodation sector – the second most prevalent type of tourist accommodation after local accommodation, units often located in large cities such as Lisbon and Oporto – but only 6.8% of the national tourist accommodation capacity.<sup>6</sup> As shown in Table 1 (see also Fig. 1), the regions with the highest number of TER units

and beds were the North (38.9% and 35.5%, respectively), the Centre (24.2% and 23.1%) and the Alentejo (23.1% and 25.4%). In addition, this segment registered 596,239 guests and 1,293,828 overnight stays, representing 5.7% of the guests and 5.0% of the overnight stays in the tourist accommodation sector of Portugal.

Country Houses were the most prevalent type of accommodation in this segment with 796 establishments and 11,234 beds, and they also ranked first in overnight stays with a market share of 45.9%. Agritourism units were second in number of both establishments (237) and beds (3,960),

| Portuguese region        | No. of establishments | No. of beds   |
|--------------------------|-----------------------|---------------|
| North                    | 535                   | 8,314         |
| Centre                   | 332                   | 5,411         |
| Lisbon Metropolitan Area | 19                    | 369           |
| Alentejo                 | 317                   | 5,952         |
| Algarve                  | 85                    | 1,718         |
| Azores                   | 49                    | *             |
| Madeira                  | 37                    | *             |
| <b>Total</b>             | <b>1,374</b>          | <b>23,430</b> |

Tab. 1: TER establishments and accommodation capacity by region in 2020 (\* Confidential data)

Source: INE (2021 and <https://www.ine.pt/>)



Fig. 1: Regions of Portugal  
Source: author's elaboration

<sup>6</sup> Although Lodging Tourism is considered as distinct from TER since 2008 because it can be situated in both urban and rural areas, in this study it is aggregated in TER, since most establishments (about 92%) are situated in the countryside. Lodging Tourism and TER units are also aggregated in the statistics produced by the INE.

and third in overnight stays (16.1%). Lodging Tourism units were third in number of establishments (182) and fourth in both beds (2,803) and overnight stays (8.7%). Rural Hotels were fourth in number of establishments (97) and second in beds (4,444) and overnight stays (26.4%). Fifth in number of establishments (62), beds (989) and overnight stays (2.8%) were “Other” types of tourist accommodation.<sup>7</sup>

#### 4. Study methods

This article draws upon two complementary e-mail-based surveys conducted by the author with TER owners/managers in 2020 and 2021. This methodological tool was chosen because it allows reaching a greater number

of recipients in a short period of time (cf. Levefer, Dal and Matthíasdóttir, 2006). The study focussed on these respondents because they run the most abundant rural tourist accommodation products and because their perceptions and attitudes towards the adoption of renewable energy innovations also reflect, albeit indirectly, those of other actors involved in businesses operating in the Portuguese countryside. The first survey was carried out in the second half of 2020. The e-mail request was sent to all TER owners/managers in Portugal using the addresses available in the “Registo Nacional de Turismo” (National Tourism Register) online portal. A total of 365 TER owners/managers responded, corresponding to a response rate of 26.6%. This was complemented by another survey

| Category        | Frequency (1 <sup>st</sup> survey) | Frequency (2 <sup>nd</sup> survey) | No. of units in Portugal | Sampled businesses 1 <sup>st</sup> survey (%) | Sampled businesses 2 <sup>nd</sup> survey (%) |
|-----------------|------------------------------------|------------------------------------|--------------------------|---|---|
| Agritourism     | 71                                 | 43                                 | 238                      | 29.8  | 18.1  |
| Country Houses  | 178                                | 124                                | 796                      | 22.4  | 15.6  |
| Lodging Tourism | 46                                 | 26                                 | 182                      | 25.3  | 14.3  |
| Rural Hotels    | 22                                 | 15                                 | 99                       | 22.2  | 15.2  |
| Others          | 48                                 | 5                                  | 62                       | 77.4  | 8.1   |
| <b>Total</b>    | <b>365</b>                         | <b>213</b>                         | <b>1,374</b>             |   |   |

Tab. 2: Sampled businesses by TER accommodation type  
Source: INE (2021) and author’s surveys

| Category     | Frequency (1 <sup>st</sup> survey) | Frequency (2 <sup>nd</sup> survey) | No. of units in Portugal | Sampled businesses 1 <sup>st</sup> survey (%) | Sampled businesses 2 <sup>nd</sup> survey (%) |
|--------------|------------------------------------|------------------------------------|--------------------------|---|---|
| North        | 116                                | 65                                 | 535                      | 21.7  | 12.1  |
| Centre       | 104                                | 66                                 | 332                      | 31.3  | 19.9  |
| LMA          | 15                                 | 8                                  | 19                       | 78.9  | 42.1  |
| Alentejo     | 83                                 | 52                                 | 317                      | 26.2  | 16.4  |
| Algarve      | 20                                 | 9                                  | 85                       | 23.5  | 10.6  |
| Azores       | 18                                 | 10                                 | 49                       | 36.7  | 20.4  |
| Madeira      | 9                                  | 3                                  | 37                       | 24.3  | 8.1   |
| <b>Total</b> | <b>365</b>                         | <b>213</b>                         | <b>1,374</b>             |   |   |

Tab. 3: Sampled businesses by region  
Source: INE (2021 and <https://www.ine.pt/>) and author’s surveys

| No. of rooms | Frequency | % of all respondents | No. of beds | Frequency | % of all respondents |
|--------------|-----------|----------------------|-------------|-----------|----------------------|
| ≤ 3          | 51        | 14.0                 | ≤ 3         | 24        | 6.6                  |
| 4–5          | 92        | 25.2                 | 4–5         | 53        | 14.5                 |
| 6–9          | 137       | 37.5                 | 6–9         | 102       | 27.9                 |
| 10–14        | 56        | 15.3                 | 10–19       | 126       | 34.5                 |
| 15–20        | 21        | 5.8                  | 20–29       | 30        | 8.2                  |
| ≥ 21         | 8         | 2.2                  | ≥ 30        | 30        | 8.2                  |

Tab. 4: Number of rooms and beds offered by the establishments sampled in 2020  
Source: author’s survey

<sup>7</sup> The category “Others” refers to a type of accommodation – Rural Tourism – that was eliminated in 2008. The maximum number of rooms, suites, or apartments for guests in all accommodation types associated with TER except Rural Hotels is 15 (Decree-Law No. 39/2008).

conducted from October 24 to November 15, 2021, with respondents to the first survey. This survey was responded by 213 recipients, resulting in a response rate of 15.5%.

In both cases, the e-mail contained a link to the survey, which was available in Portuguese and English. On average, respondents took 20 minutes to answer the first survey and 3 minutes to answer the second one. In addition to the name, location, size, ownership, number of employees and category of facilities, the first survey focused on the respondents' perceptions and attitudes towards the uptake of renewable energy in tourist accommodations. Topics related to the latter subject included: opinions about the need to reduce GHG emissions from tourist facilities; opinions about renewable energy generation and utilisation in tourist accommodations; technologies to generate electricity in which the businesses invested; prosumer systems (individual and collective); and motivation for and barriers to invest in such innovations. The complementary survey focused on the adoption of other renewable energy innovations that were not included in the first survey, namely, energy management systems, demand response management systems, energy storage technologies, participation in energy cooperatives/communities and electric vehicles chargers. Microgrid assets and other elements that integrate Distributed Energy Systems were not included because they are still scarcely available in the country.

Considering the types of accommodation within TER, "Others" had the highest response rate in the 2020 survey, while Agritourism had the highest response rate in the 2021 survey (see Tab. 2). Regarding the geographical location of the TER units, the Lisbon Metropolitan Area (LMA) achieved the highest response rate in both surveys (see Tab. 3). As can be seen in Table 4, over three-quarters of the businesses in the 2020 sample offered less than 10 rooms and over four-fifths offered less than 20 beds. Part of these rooms and beds (33.2% [919/2770] and 34.5% [1573/4556] of the sample, respectively) were situated in outbuildings. Additionally, 33.7% (123/365) of the units' main houses were built in the 21<sup>st</sup> century, 27.9% (102/365) were constructed in the 20<sup>th</sup> century and 35.9% (131/365) date back to previous centuries, spanning from the 13<sup>th</sup> (1260) to the 19<sup>th</sup> centuries, while 2.5% (9/365) were erected in an unknown date.

Aside from providing accommodation, 33.2% (121/365) of TER establishments had a restaurant and 36.2% (132/365) hosted events such as weddings and christening receptions. Most, 63.8% (233/365), units were situated in farms, of which 44.2% (103/233) exceeded six hectares and 45.1% (105/233) carried on agricultural production activities, mainly viticulture and livestock husbandry. The majority, 91.2% (333/365), of units were run by their owners, of whom 47.1% (172/365) were family businesses and 41.9% (153/365) were an individual. Also, most TER managers were Portuguese and females, held a university degree and had between 45 and 65 years old (see Tab. 5).

## 5. Results

### 5.1 Perceptions and attitudes towards the adoption of renewable energy innovations

Most, 97.0% (354/365), TER owners/managers who responded to the 2020 survey expressed their agreement with the idea that tourist accommodations should reduce their GHG emissions to mitigate global warming and its impacts, whereas the remainder stated that they had no opinion on this matter. Additionally, 95.3% (348/365) of respondents stated

that they were in favour of renewable energy generation and utilisation in tourist establishments, while the remaining ones declared that they had no opinion.

Despite the significant number of favourable responses, only 24.9% (91/365) of respondents reported having installed renewable energy innovations in their establishments and properties. As can be seen in Table 6, most of those innovations were electricity generation technologies and, above all, solar PV technologies. Furthermore, 52.6% (60/114) of such innovations were associated with the UPPs regime. There were no peer-to-peer or collective prosumer schemes. There was also no collective self-consumption. This can be explained by three factors. First, collective and community self-consumption of renewable energies are only permitted since 2020. Second, there is still no specific legal framework (Campos et al., 2020, pp. 5, 7). Third, potential upscaling for sectoral transformation is likely to be preceded by a period of pilot schemes and, therefore, near-future developments may well be characterised by some inertia (Sareen and Nordholm, 2021, p. 1059).

In all cases, the electricity generation units were owned and controlled by respondents. UPAC units tended to be sited on rooftops, while UPP units tended to be sited on land. In contrast to utility-scale solar PV power plants (e.g. Silva and Sareen, 2021; Mulvaney, 2019), the installation of solar PV UPP units entailed no significant land use changes (see Figs. 2 and 3). All units were also funded by their owners, except one case in which the solar PV UPP unit (with 7.1 KW of installed capacity) was crowdfunded by Coopérnico, Portugal's first solar energy cooperative, created in 2013.

Considering the information collected in the 2021 survey, the adoption of energy management systems, demand response management system, energy storage systems and electric vehicles chargers in TER was even lower than the adoption of electricity generation technologies (see Tab. 6). Moreover, respondents' participation in energy cooperatives or communities was barely existent, as only one respondent declared to be a renewable energy cooperative member.

### 5.2 Factors influencing the adoption of renewable energy innovations

As shown in Figure 4, most respondents to the 2020 survey, when asked about the reasons for investing in electricity generation technologies, chose options associated with economic factors, notably "reduces energy cost". A significant number of respondents, however, also chose

| Characteristics | Number                     |
|-----------------|----------------------------|
| Nationality     | Portuguese: 347            |
|                 | Other: 18                  |
| Age             | ≤ 44 years: 93             |
|                 | 45–65 years: 203           |
|                 | > 65 years: 69             |
| Education level | 4 <sup>th</sup> grade: 8   |
|                 | 9 <sup>th</sup> grade: 25  |
|                 | 12 <sup>th</sup> grade: 60 |
|                 | University degree: 272     |
| Gender          | 184 females; 181 males     |

Tab. 5: The profile of the respondents to the 2020 survey  
Source: author's survey

| Renewable energy innovations      | Agritourism | Country houses | Lodging tourism | Rural hotels | Others | % of all respondents |
|-----------------------------------|-------------|----------------|-----------------|--------------|--------|----------------------|
| Solar PV UPP                      | 20          | 21             | 6               | 3            | 10     | 16.4*                |
| Solar PV UPAC                     | 7           | 10             | 3               | 3            | 6      | 7.9*                 |
| Solar powered water pump          | 7           | 6              | 3               | 1            | 4      | 5.8*                 |
| Biomass/biogas UPAC               | 0           | 1              | 1               | 0            | 1      | 0.8*                 |
| Micro/mini hydropower plant       | 1           | 0              | 0               | 0            | 0      | 0.3*                 |
| Wind UPP                          | 0           | 0              | 0               | 0            | 0      | 0*                   |
| Wind UPAC                         | 0           | 0              | 0               | 0            | 0      | 0*                   |
| Digital energy management systems | 4           | 8              | 1               | 1            | 0      | 6.6**                |
| Demand response management system | 0           | 3              | 0               | 0            | 0      | 1.4**                |
| Energy storage technologies       | 3           | 3              | 0               | 1            | 0      | 3.3**                |
| Electric vehicles chargers        | 7           | 11             | 2               | 3            | 2      | 11.7**               |

Tab. 6: Renewable energy innovations adopted by accommodation type  
 Source: \* author's 2020 survey; \*\* author's 2021 survey



Fig. 2: Ground-mounted solar PV UPP in the Algarve region (Photo: L. Silva)



Fig. 3: Ground-mounted solar PV UPP in the Centre region (Photo: L. Silva)

options related to environmental factors, chiefly “helps mitigate climate change”. In turn, as can be seen in Figure 5, when asked about the reasons for not investing in such technologies, most respondents chose options concerning market factors, principally “high equipment cost” and “lack of state subsidies”. Yet, an expressive number of respondents also mentioned other factors, including “lack of grid connection infrastructure” and “legal, regulatory, or administrative barriers”.

Regarding the 2021 survey, when asked what are the main reasons for adopting, or not, other renewable energy innovations, adopters mentioned “energy cost savings” (88% = 22/25), “environmental concerns” (76% = 19/25) and the “creation of a competitive advantage” (48% = 12/25), while non-adopters mentioned “high equipment costs” (64.9% = 122/188), “lack of money” (43.1% = 81/188) and “lack of quality information about technologies and systems” (33.5% = 63/188).

To identify other factors that could influence the adoption of renewable energy innovations in TER, we related the characteristics of the accommodation units and their owners/managers to adoption. The following variables were

tested: 1) type of accommodation; 2) geographical location; 3) establishments’ number of rooms; 4) building age; 5) age of owners/managers; 6) education level; 7) gender; and 8) nationality. Of these variables, only the second proved to be significant for the adoption of renewable energy innovations, as demonstrated below.

Considering the information collected in both surveys, there was no statistically significant variation related to type of accommodation in the adoption of renewable energy innovations (see Fig. 6). However, as shown in Table 6, the types of accommodation with the highest number of renewable energy innovations were Country Houses and Agritourism. We cannot assess the existence of possible regional variations in the adoption of renewable energy innovations for each accommodation type because these are unevenly distributed across the country. For example, Lodging Tourism units prevail in the North. But the highest percentage of respondents with renewable energy innovations were situated in the Lisbon Metropolitan Area region, followed closely by the Autonomous Region of Madeira, while those with the lowest percentage were situated in the North and the Azores regions (see Fig. 7).

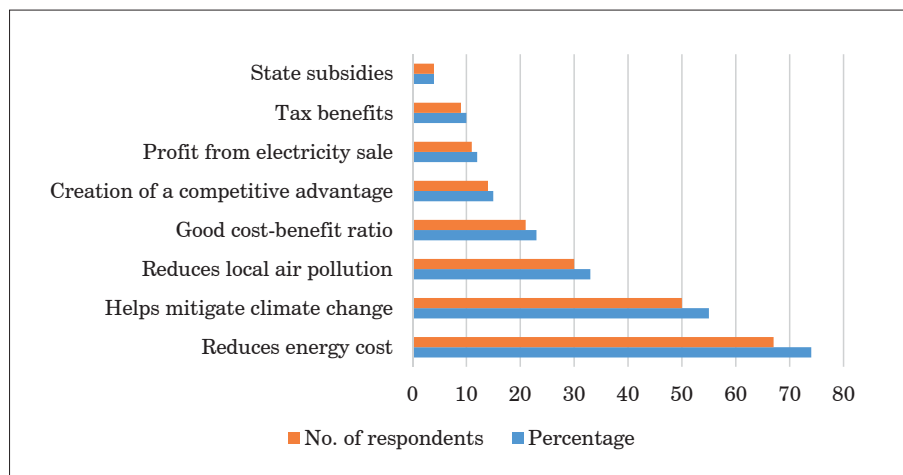


Fig. 4: Motivations for adopting renewable energy innovations

Source: author’s 2020 survey

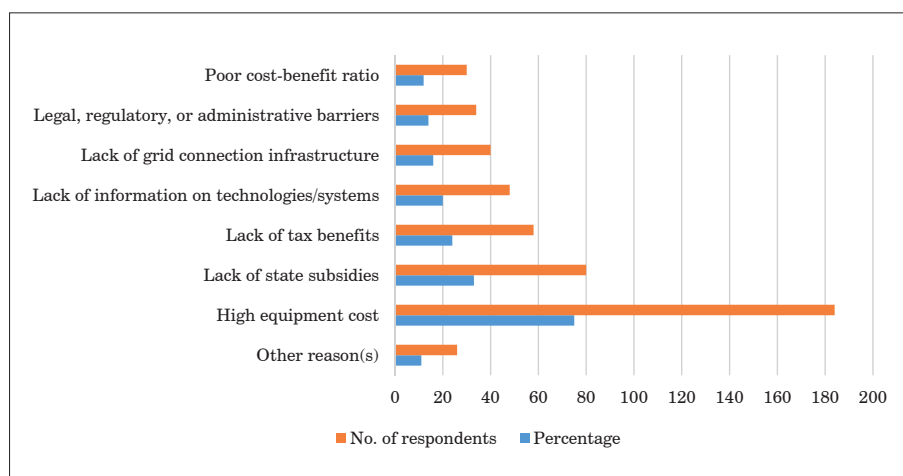


Fig. 5: Barriers to the adoption of renewable energy innovations<sup>8</sup>

Source: author’s 2020 survey

<sup>8</sup> “Other reason(s)” included: lack of money; long payback period due to the small-scale of the businesses and the seasonality of the demand; bureaucratic hurdles in accessing state support; the prohibition of installing “modern” elements in the roofs of buildings located in protected sites; and the high cost and low efficiency of batteries for energy storage. On the cost of batteries for energy storage in Portugal, see Camilo et al. (2017).

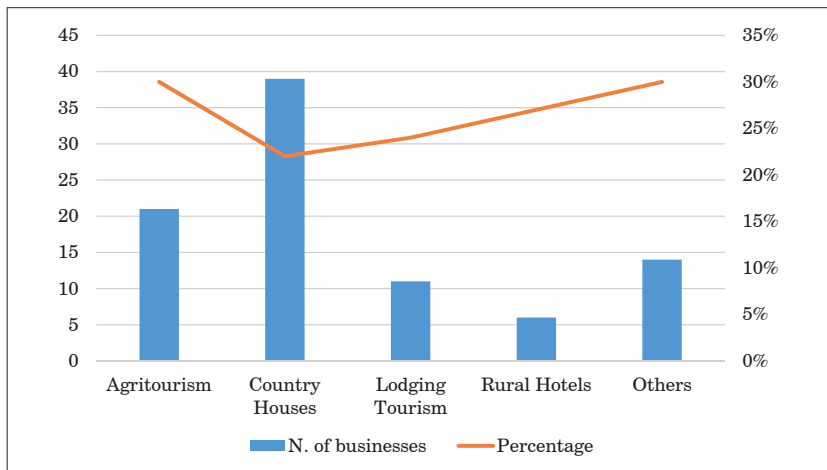


Fig. 6: Adoption of renewable energy innovations by accommodation type  
Source: author's surveys

Additionally, there were no relevant statistical differences in innovation adoption when we consider the establishments' number of rooms – the highest number of TER establishments with renewable energy innovations offered between 6 and 9 rooms (29 units), followed by establishments offering between 4 and 5 rooms (20 units) and between 10 and 14 rooms (20 units), and these were the most prevalent TER sizes in the 2020 sample, as shown above (see Tab. 4).

There were also no significant differences if we consider the date of original construction of the main buildings associated with TER in renewable energy innovations adoption – both establishments with newer buildings and establishments with older buildings use such innovations (see Fig. 8). The same occurred with the sociodemographic characteristics of the owners/managers. Most adopters held a university degree, were between 45 and 65 years old and were Portuguese and females (see Tab. 7), in line with the characteristics of most respondents to the 2020 survey (see Tab. 5).

### 6. Discussion and conclusion

This article set out to examine the adoption of renewable energy innovations in the tourist accommodation sector of Portugal, with reference to TER. The above analysis has shown that the adoption of renewable energy innovations by the consumers at stake in this study is limited. Indeed, despite their positive perceptions of renewables, only one-

quarter of respondents to our surveys have invested in renewable energy innovations, most of which were electricity generation technologies.

As to the factors influencing the uptake of these innovations, most respondents included economic benefits and environmental concerns in the reasons given for adoption. These research findings are consistent with the findings of other studies on the motivations for the uptake of renewable energy technologies and other environmental practices in hotels (Dhirasasna, Becken and Sahin, 2020; Dhirasasna and Sahin, 2021; Mahachi, Mokgalo and Pansiri, 2015; Wang, Font and Liu, 2020). Significantly, unfavourable market factors – high initial costs, lack of government incentives and lack of quality information about technologies and systems – were also highlighted as the main impediments to the adoption of renewable energy innovations by respondents. The case of TER thus parallels the findings of studies on the barriers to the uptake of renewable energy and environmental technologies in the hotel sector (Chan, Okumus and Chan, 2020; Dhirasasna, Becken and Sahin, 2020; Karagiorgas et al., 2006; Sardianou and Kostakis, 2020). Yet, several respondents also mentioned other barriers to adoption, including institutional, legal, regulatory, or administrative hurdles, which are related to the socio-political acceptance of renewable energy innovations or renewable energy technologies (cf. Sovacool and Ratan, 2012).

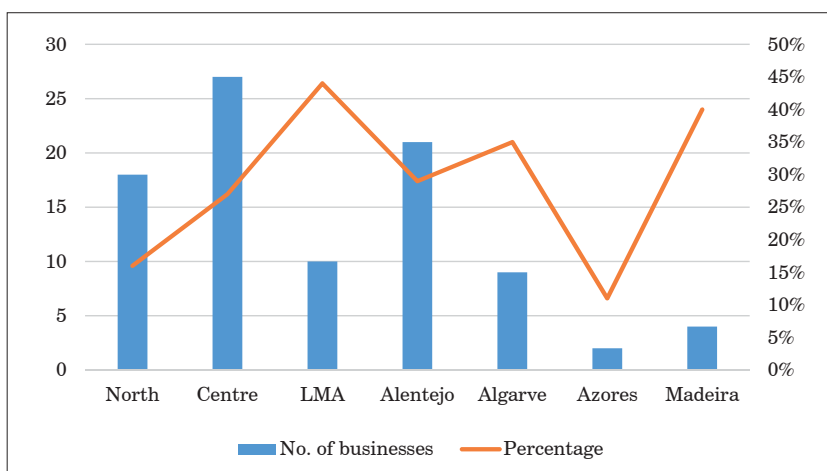


Fig. 7: Geographical location of the units with renewable energy innovations  
Source: author's surveys



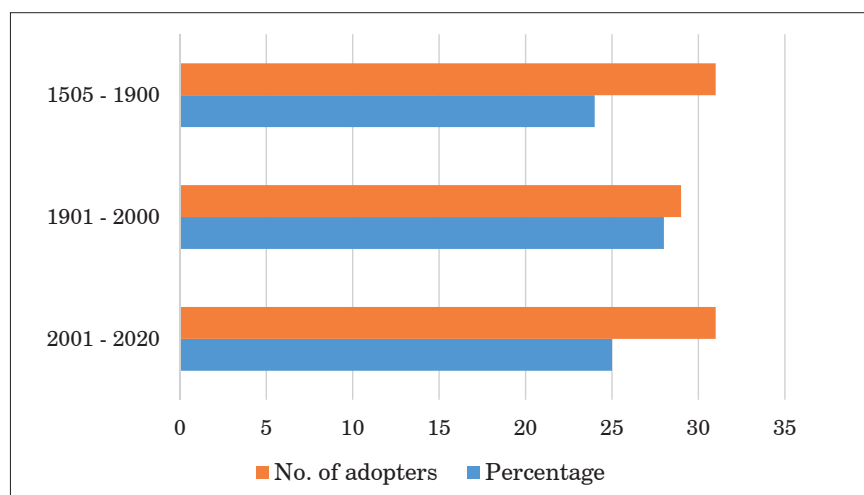


Fig. 8: Building age of the units with renewable energy innovations

Source: author's surveys

| Characteristics | Number  |
|-----------------|---|
| Nationality     | Portuguese: 87 (95.6%)<br>Other: 4 (4.4%)   |
| Age             | ≤ 44 years: 26 (28.6%)<br>45–65 years: 51 (56.0%)<br>> 65 years: 14 (15.4%)   |
| Education level | 4 <sup>th</sup> grade: 0 (0%)<br>9 <sup>th</sup> grade: 6 (6.6%)<br>12 <sup>th</sup> grade: 15 (16.5%)<br>University degree: 70 (76.9%) |
| Gender          | Females: 50 (54.9%); Males: 41 (45.1%)  |

Tab. 7: The profile of the adopters

Source: author's surveys

Additionally, the analysis shows that the characteristics of the establishments and their owners/managers had no significant influence on the uptake of renewable energy innovations in TER, with the exception of geographical location. Establishments located in regions with high solar irradiation and where there is easier access to information about technologies and systems, such as the Lisbon Metropolitan Area region and the Autonomous Region of Madeira, are more likely to use renewable energy innovations. These results are partly similar to and partly different from the results of other studies. For instance, Coles, Dinan and Warren (2015) concluded that property age is not significant for the adoption of renewable energy technologies in tourist accommodations in England. Similarly, Mahachi, Mokgalo and Pansiri (2015) note that size is an important determinant of renewable energy uptake in hotels in Botswana. Likewise, Dinis et al. (2019) found that tourist accommodation managers with a university degree operating in the interior of Portugal are more likely to adopt local development practices.

This study has some limitations. First, its results do not fully reflect the adoption of renewable energy innovations in the whole tourist accommodation sector of Portugal because the study is centred on TER establishments and, hence, other types of tourist accommodation in the Portuguese countryside as well as accommodations in urban areas were not considered. Second, the study focused on the perspectives of TER owners/managers, leaving out those of other actors influencing the

adoption (or non-adoption) of renewable energy innovations in tourist accommodations, such as national and local government representatives, electricity companies, electricity distribution system operators, tourists, and installers. Third, the other dimensions of social acceptance of renewable energy innovations included in Wüstenhagen, Wolsink and Bürer's (2007) theoretical framework, were not investigated.

Despite these limitations, this article enriches our understanding of a research topic that merits further investigation and offers information that can be used to design future strategies to promote the development of low-carbon tourism in Portugal. In particular, we strongly recommend the establishment of specific targets for the adoption of renewable energy innovations in tourist facilities, as well as measures to achieve them, such as higher government incentives, the provision of good quality information about technologies and systems to tourism entrepreneurs/managers, and the removal of remaining legal, regulatory, and administrative barriers. We further recommend the creation of a specific legal framework to support collective renewable energy prosumers, including peer-to-peer schemes. Future research could also examine the determinants of the uptake of renewable energy innovations in accommodations and other tourist facilities in both rural and urban areas in different countries.

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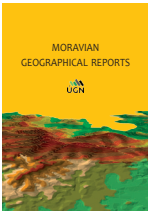
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# How to find a suitable location for a cemetery? Application of multi-criteria evaluation for identifying potential sites for cemeteries in Białystok, Poland

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## Abstract:

*Valorisation of land is an important tool for countries around the world to help regulate land use planning and ensure sustainable development. Cemeteries are multifaceted spaces, providing a keystone community infrastructure. Poorly located cemeteries can generate adverse environmental, landscape and community outcomes. Identifying optimal sites for cemeteries will become an increasing concern for land use planners as population numbers and consequent death rates increase while the amount of available land decreases. This study was conducted with the aim of proposing multi-criteria analysis for identifying some optimal sites for cemeteries. This analysis was implemented in Białystok (297,585 inhabitants, in Podlaskie Voivodeship, Poland), where 11 potential areas for the location of a new cemetery were assessed. Through a comprehensive process of investigation, engagement, and analysis, four options in different locations were identified as suitable for further consideration. Two sites (options 7 and 11) had fatal flaws – high risk and effects associated with development and were not recommended to be taken forward.*

**Keywords:** cemetery; site selection; suitability levels; multi-criteria analysis; feasibility study; localisation; Poland

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## 1. Introduction

Cemetery land is becoming an important issue in many localities all over the world (Lehrer, 1974): in East Asia (Dian, 2004; Lotfi, Habibi and Javad Kooshari, 2009; Al-Anbari, Thameer, Al-Ansari and Knutsson, 2016; Doi, Chai, Xu, and Wang, 2021); in North America (Salisbury, 2002; Basmajian and Coutts, 2010; Larkin, 2011); in New Zealand (Judge, 2012) and Australia (Dent, 2002; Purdon, 2009); in South Africa (Croucamp and Richards, 2002; Dippenaar, 2014); and in Europe (Environment Agency, 2002; Cemetery Development Services, 2017). Urbanisation along with the growth of population, has led to new challenges for humanity (WHO, 1998; World Urbanisation Prospects, 2018).

The number of deaths is currently increasing whilst the amount of available land has decreased due to growing population, urban sprawl, and the ongoing battle between various types of land-uses (Capels and Senville, 2006; Coutts, Basmijan and Chapin, 2011; Bennett and Davies, 2015). As WHO (1998, p. 5) stated: “today, sufficient land area for cemeteries is difficult to find in populated areas, and in

the near future sufficient space for cemeteries may not be found at all in cities in most parts of the world”. A cemetery is a multi-faceted space (Francaviglia, 1971; Rugg, 2000; Długozima and Kosiacka-Beck, 2020) and can be considered an essential public service that plays an important role in social infrastructure (Shaker Ardekani, Akhgar and Zabihi, 2015; Nordh and Swensen, 2018; Długozima, 2020a).

A cemetery’s primary function is to provide a physical space for commemoration and a final resting place of the deceased (Rugg, 2000; Dian, 2004; Larkin, 2011). Nevertheless, the multi-layered character of cemeteries results in many factors impacting decision-making processes, and undoubtedly makes planning procedures more time-consuming. Finding the optimal location for a cemetery is a difficult task even when experienced planning professionals are involved (Lehrer, 1974; Bennet and Davies, 2015; Nguyen, Chou, Van Hoang, Fang and Nguyen, 2019). It is the lack of clearly articulated and consistent land use planning policy that often hampers the development of new cemeteries. Clearly in many cases, the

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inappropriately placed infrastructures have decreased the efficiency and sustainability of the settlement units. The consequence of wrong cemetery location is waste of land and environmental pollution (Pacheco, Mendes, Martins, Hassuda and Kimmelmann, 1991; WHO, 1998; Uslu, Baris and Erdogan, 2009; Zychowski and Bryndal, 2015; Neckel, Costa, Nunes Mario, Saggin Sabadin and Bodah, 2017).

The unsuitable location of graveyards also generates numerous social problems (e.g. the NIMBY syndrome) which prevents this type of investment from gaining public support, and strengthens the taboos related to the phenomenon of death and burial sites (Thomas, 1980; Iserson, 1994; Larkin, 2011). Very often, contemporary cemeteries exist as separate entities far removed from daily life (Dian, 2004; Larkin, 2011; Sheppard-Simms, 2012; Reza, 2012; Reza, 2019), which also contradicts the objectives of their establishment: the cemetery as public green spaces for special purposes (Quinton and Duinker, 2018; Nordh and Swensen, 2018; Rae, 2021). The lack of systematised tools that could support the selection of an optimal site for a new cemetery is the reason why historical cemeteries must remain active and face the threat of being redeveloped. It leads to the degradation of trees and old cemeteries composition (Reza, 2012; SAO, 2016; Pilarczyk and Nowak, 2019; Długozima and Kosiacka-Beck, 2020). It is difficult to establish the best location for a new cemetery: hence the need for an optimal location selection procedure supporting the process of cemetery land use planning is essential (Lehrer, 1974; Capels and Senville, 2006; Basmajian and Coutts, 2010; Bennett and Davies, 2015).

The objective of this research is to develop a multi-criteria evaluation tool that can be used to rapidly and accurately assess a given area, ultimately facilitating the identification of several potential cemetery sites that are sustainable. To achieve such an aim, several criteria to identify appropriate locations for new cemeteries were developed and the multi-criteria evaluation procedure was applied, scrutinising the town of Białystok in Poland as a case study. The aim of the study is an attempt to create an analysis for assessing

the location of cemeteries, considering the multi-faceted character of cemeteries. The proposed analysis can be used as a supportive tool in spatial planning processes for officials, planners, and investors. Therefore, it can reduce the potential environmental and social hazards posed by incorrectly sited cemeteries.

## 2. Theoretical background: Conditions relating to the location of cemeteries

A cemetery, as a specific spatial structure, requires a well-thought space for proper implementation of its functions (Sheppard-Simms, 2012; Black, Dubyna and Rapke, 2016; Rocque, 2017; Reza, 2019). Considering a wide range of designations (green area, construction object, buildings serving religious purposes, venue, site of therapy, regeneration, open air museum, thanatourist object) a cemetery is distinguished from other land use categories, and as such requires an individual approach during the research or planning phase (considering developing criteria to identify appropriate sites for new cemeteries: see Tab. 1). A cemetery determines the development and character of its surrounding. Therefore, it is important to locate it properly – with respect for natural conditions (Cottle, 1997; Dent and Knight, 1998; Rocque, 2017), using available infrastructure and building conditions (Ismali, Omar and Majeed, 2007; Długozima, 2020b), at the same time with adjustments to its social context (Salisbury, 2002; Dian, 2004; Shaker Ardekani, Akhgar and Zagihi, 2015): see Figure 1.

In terms of natural conditions, the most important are geotechnical and hydrological aspects (Fisher, 1992; Dent, 2002; Purdon, 2009; Maloy and Nelson, 2020). Researchers recommend not to locate cemeteries near water bodies, geologically unstable areas, ecologically sensitive areas, or in areas with steep gradients. The site should be located at least 100 m from the 50-year flood line. Moreover, soils of an intermediate range of properties, such as a clayey sand or sandy clay, are ideal for cemetery sites (Fisher, 1992; Dippenaar, Olivier, Lorentz, Ubomba-Jaswa,

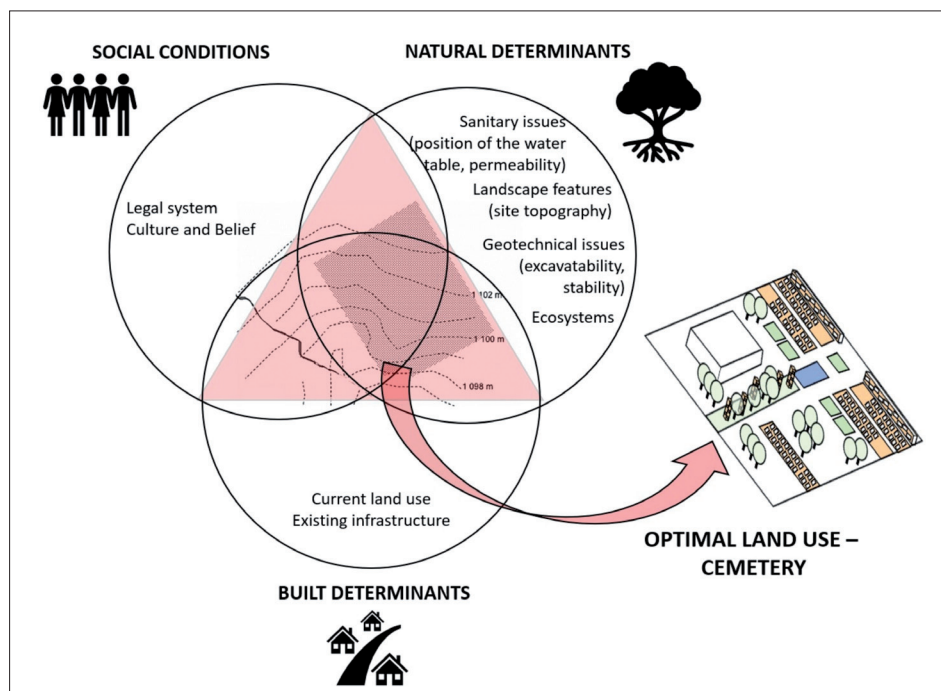


Fig. 1: Diagram showing the main groups of conditions determining a cemetery's location  
Source: author's conceptualisation

| References (chronological)  |                                     |
|---|-------------------------------------|
|   | Fisher, 1992                        |
|   | Environment Agency, 2002            |
|   | Croucamp and Richards, 2002         |
|   | Salisbury, 2002                     |
|   | Dian, 2004                          |
|   | Capels and Senville, 2006           |
|   | Ismail et al., 2007                 |
|   | Coutts et al., 2011                 |
|   | Larkin, 2011                        |
|   | Judge, 2012                         |
|   | Shepard-Stimms, 2012                |
|   | Shaker Ardekani, 2015               |
|   | Black et al., 2016                  |
|   | Al-Anbari et al., 2016              |
|   | NEPA, 2007; PURDON, 2009; CDS, 2010 |
|   | Rocque, 2017                        |
|   | Dippenaar et al., 2018              |
|   | Nguyen et al., 2019                 |
| <b>Conditions (aspects taking into account in cemetery site selection)</b>  |                                     |
| <b>Natural conditions</b>   |                                     |
| Geotechnical and hydrological (sanitary) aspects: stability, workability, excavatability, position of the water table, subsoil permeability | X                                   |
| Landscape features (site topography)  | X                                   |
| Valuable vegetation with unique features, important to construct a local cemetery integrated with landscape (biodiversity)                  | X                                   |
| Landscape coherence – location in relation to the natural system  | X                                   |
| Landscape features – variety of natural landscape (presence of hills, slopes, wooded areas)   | X                                   |
| Visual assessment   | X                                   |
| <b>Socio-cultural conditions</b>  |                                     |
| Social accessibility (location in relation to settlement unit, centre, community)   | X                                   |
| Size (estimate cemetery acreage need)   | X                                   |
| Land ownership  | X                                   |
| Relevant policy (consistency with relevant legislation)   | X                                   |
| Death rate, the rate of various interment methods   | X                                   |
| Cultural heritage   | X                                   |
| <b>Built conditions</b>   |                                     |
| Engineering services (powerlines, telecommunications lines)   | X                                   |
| Access, transport   | X                                   |
| Context (Land use)  | X                                   |

Tab. 1. List of criteria important for the study of cemeteries location in the literature review  
Source: author's elaboration

Abia and Diamond, 2018). In terms of building conditions researchers consider location in relation to the transportation system (transport accessibility) (Cemetery Development Services, 2017) and current land use (Dian, 2004; Ismaili, 2007; Nguyen, 2019). Equipment and access to engineering services (availability of services) is also considered. Social factors for cemetery location are related to accessibility (connections with the local community). Cemeteries were once part of community structure; they now exist as separate entities far removed from daily life (Thomas, 1980; Iserson, 1994; Larkin, 2011; Shaker Ardekani, Akhgar and Zabihi, 2015). Deemed essential to the social infrastructure of communities, cemeteries need to be established in accessible locations to meet the needs of the populations they serve (Larkin, 2011). Alexander (1977) recommends not to build vast cemeteries, but to allocate pieces of land throughout the local community to them instead.

Consequently, location in relation to settlement unit centre (Shaker Ardekani, Akhgar, and Zabihi, 2015), distance to build-up areas and to residential areas (Niță, Iojă, Rozyłowicz, Onose and Tudor, 2014) is considered. As Black, Dubyna and Rapke (2016) stated: a cemetery proposal should demonstrate a community's demand for cemetery space that has not been met yet. Cemetery acreage depends on mortality trend and burial practices (cremation rates) (Croucamp and Richards, 2002; Dian, 2004; Coutts, Basmajian and Chaplin, 2011). A reasonable estimate of space needed for burials with cremation rates at the level of 70–80%, would be the size of 2 to 4 hectares for 50 years (Future Numbers of Death and Cemetery Site Requirements). When the cremation rate is lower, the demand for burial space is higher – at least 5 ha (in Poland the estimated cremation rate is approximately 30%) (Długozima, 2020c).

### 3. Data and methods

The research process encompassed three stages to answer the question: “How does one find suitable locations for new cemeteries?”. In order they were:

- To develop criteria to identify suitable locations for cemeteries (Section 3.1) and fatal flaws (criteria that would immediately render a site unsuitable for the development of a cemetery) (Section 3.2);
- To develop a multi-criteria evaluation process for identifying some optimal positions for cemeteries (Section 3.2); and
- To apply multi-criteria evaluation in Białystok, Poland, where from 2018 a public debate on the location of a new cemetery began (Section 3.3).

#### 3.1 Phase 1: Develop criteria to identify appropriate locations for cemeteries

Research of the literature enabled the development of criteria – features of the optimally located cemetery. The indicators were assigned to five groups of criteria, including spatial criteria (4 indicators), legal criteria (3 indicators), environmental criteria (3 indicators), socio-cultural criteria (3 indicators), and landscape and aesthetic criteria (3 indicators): in total 16 indicators (see Tab. 2).

The developed method of land sustainability analysis for burial functions is consistent with the research assumption that the cemetery should be planned in accordance with the idea of sustainable development. Therefore, the assessment considered spatial, legal, environmental, socio-cultural, landscape and aesthetic criteria:

- Environmental criteria: Due to the necessity to ensure epidemiological safety, a cemetery must fulfil a number of location indicators standardised in provisions relating to geotechnical aspects (ground conditions, quality of soil, land relief) and hydrological aspects;
- Landscape and aesthetics criteria: Aesthetics are a very important consideration when choosing a cemetery site (Sheppard-Simms, 2012; Black, Dubyna and Rapke, 2016; Rocque, 2017). The landscape character will be affected in a number of ways by development of a new cemetery. Neat and clean sites that look natural and peaceful with desirable viewscapes seem to be preferred by most cemetery consumers (Al-Akl, Nasser Karaan, Al-Zein and Assaad, 2018). The literature review shows that the research rarely considers the landscape and aesthetics criteria, while from the social point of view, they should be important in the final location decision (Rocque, 2017);
- Legal criteria: According to the literature review, it is important to verify the legal status of the land and consider the presence and location of protected natural and cultural resources on and adjacent to the property;
- Socio-cultural criteria: According to the Polish Classification of Building Facilities (1999) “Buildings intended for religious worship and religious activities” (class 1272) include cemeteries. For this reason, burial facilities should be incorporated in social infrastructure; and
- Spatial criteria: Due to high costs of investments related to the construction of cemeteries, the availability of services (access to infrastructure) is one of the key location factors. The location should exclude the possibility of harmful impact of the cemetery on its vicinity.

#### 3.2 Phase 2: Develop fatal flaws and multi-criteria evaluation for identifying some optimal positions for cemeteries

A staged approach to cemetery site selection process is proposed: identification the fatal flaws (Phase I: preliminary site assessment) and multi-criteria assessment (Phase II) when selecting a cemetery site (Fig. 2).

The main research phase is the evaluation based on five groups of criteria. Since the multi-criteria analysis relies on weights and these, according to Xu and Zhang (2013) are an element of uncertainty, Phase I was added: the identification of fatal flaws associated with cemeteries. The fatal flaws are criteria that would immediately render a site unsuitable for the cemetery development and therefore are important criteria to consider (Judge, 2012, p. 44). The fatal flaw analysis removes areas with inherent fatal flaws and thus reduces the search area and saves on time as well as resources spent on an area that would prove unacceptable for cemetery establishment. The determination of fatal flaws was based on the following sources: interviews with experts (including, the manager of the South Municipal Cemetery in Antoninów – one of the newest and the largest of Warsaw's cemeteries, members of the Polish Funeral Association, and the Polish Chamber of Funeral Industry); the literature review (Tab. 1); and legislation (applicable provisions of law and judicial decisions – available online at <https://isap.sejm.gov.pl/>, <http://orzeczenia.ms.gov.pl/>). The issues regarding the selection of a proper area for a cemetery are governed by the Regulation of the Minister of Municipal Economy of August 25, 1959 on Determining which

Areas in Terms of Sanitation are Suitable for Cemeteries, Act of January 31, 1959 on Cemeteries and Burial of the Deceased, Regulation of the Minister of Infrastructure of March 7, 2008 on Requirements for Cemeteries, Graves and other Places of Burial of Corpses and Remains, Spatial Planning and Land Development Act of March 27, 2003 (Pilarczyk and Nowak, 2019; Długozima, 2020b). The above-mentioned Regulation (1959) indicates that before establishing a cemetery one should analyse the features and conditions of the area considered as a place where burials are located. The following factors are analysed: water system of the area, type of land, minimum distance from potable water source (e.g. well, spring, borehole), housing development and other facilities on which a cemetery may have a negative impact.

The following exclusion criteria have been defined as the so-called fatal flaws (Phase I):

- Site laying on slope  $> 10^\circ$  (30% or more of the site has slopes exceeding  $10^\circ$ ) or site located in a depression, below the surrounding area;
- Site lying within flood risk (cemetery should not be located below the 1 in 50 year flood line of a river, in close proximity to water bodies such as wetlands);
- National park, nature reserve, strict conservation protection zone extends on the site (cemetery should not be situated in or near sensitive ecological, historical areas);
- Level of underground water is less than 2.5 meters (shallow groundwater);
- Distance from potable water source is less than 150 metres;
- Distance from housing development and other facilities on which a cemetery may have a negative impact is less than 150 metres (or 50 metres if the area is connected to a water supply system);
- The site has only highly permeable soils;
- There are no possibilities to develop adequate buffer zones separations between the site boundary and other land-uses (at least 50 m around the site).

| Idem | Indicator<br>(criteria description)  | Criteria significance   | Data collection  |
|------|--|---|--|
| K1   | Spatial criteria   |   |  |
| K1.1 | Land use character of surrounding area (current land use)  | Cemetery should be located far from national highways, railways, production facilities emitting excessive noise, odours. The greater the distance from incompatible land uses, the lower the risk of nuisance problems and hence resistance to facility.  | Cartographic data: aerial photographs, digital maps<br><br>Open Geoportal Geospatial Data<br><a href="https://polska.e-mapa.net/">https://polska.e-mapa.net/</a><br><br>Spatial analysis using QGIS: boundary analysis, buffer analysis, calculate area and distance   |
| K1.2 | Existing infrastructure (availability of engineering services: powerlines, waterworks)                             | Reduction of investment cost by linking cemetery to existing infrastructure.  |  |
| K1.3 | Accessibility  | The bereavement process is made easier for relatives by visiting a cemetery well laid out. This is associated with cost, convenience and environmental implications, especially if a new road is to be constructed. The shorter the distance to the site through residential areas, the more acceptable the site. |  |
| K1.4 | Land available   | Larger sites tend to be more economically attractive.   |  |
| K2   | Legal criteria   |   |  |
| K2.1 | Legal status of land   | Status of land (public/private; regulated/unregulated) affects cost and duration of the investment.   | Cartographic data: land and building register, cadastral map<br><br>Spatial Information System of the Białystok Poviát – <a href="https://bialostocki.e-mapa.net/">https://bialostocki.e-mapa.net/</a>   |
| K2.2 | Constraints resulting from protected areas (natural and cultural forms of protection)                              | Maximise the distance to natural, historical, cultural relics.  | Cartographic data: digital map<br><br>Geospatial data from: The General Directorate for Environmental Protection – <a href="http://geoserwis.gdos.gov.pl/mapy/">http://geoserwis.gdos.gov.pl/mapy/</a> (natural environment), the National Institute of Cultural Heritage (cultural environment) – <a href="https://mapy.zabytek.gov.pl/">https://mapy.zabytek.gov.pl/</a> |
| K2.3 | Compliance with local policy (Spatial Development Conditions and Directions Study, local spatial development plan) | Including areas predestined for cemeteries in spatial policy document allows to shorten the time of completing documentation of planned cemetery.   | Non-cartographic data: spatial policy documents (spatial development conditions and directions study and local land use plans) [63–65]<br><br>Spatial Information System of the Białystok Poviát – <a href="https://bialostocki.e-mapa.net/">https://bialostocki.e-mapa.net/</a>   |

... Tab. 2: continuing on the next page ...



| Idem  | Indicator (criteria description)   | Criteria significance  | Data collection  |
|---|--|--|--|
| <b>K3 Environmental criteria</b>            |  |  |  |
| K3.1  | Hydrological aspects: flood area, the distance to ground or surface water, presence of hydrographic objects      | The greater this distance, the more suitable the site is in terms of lower potential for water pollution; maximise the distance to sources of surface water.   | Cartographic data: ground water level, hydrogeological maps<br>the National Water Management “Wody Polskie” <a href="https://wody.isok.gov.pl/">https://wody.isok.gov.pl/</a>  |
| K3.2  | Land relief, topography  | The steeper the terrain, the more levelling costs will be. Cemeteries should be located on elevated ground, above the surrounding area, in order to protect the groundwater.   | Cartographic data: digital maps, physical map<br>Elevation profile, slope analysis using Open Geoportal Geospatial Data <a href="https://polska.e-mapa.net/">https://polska.e-mapa.net/</a>  |
| K3.3  | Geotechnical aspects: ground conditions (the quality of on-site soil)  | Low permeability soils reduce pollution migration and are therefore favoured.  | Cartographic data: soil type, geological maps<br>the Polish Geological Institute, the Central Geological Database <a href="https://geologia.pgi.gov.pl/">https://geologia.pgi.gov.pl/</a><br>“Explanations to the geological map of Poland”  |
| <b>K4 Socio-cultural criteria</b>           |  |  |  |
| K4.1  | Acceptance of investment/ community’s attitude to cemetery   | If construction of cemetery is initiative of local community (community-friendly investment), the risk of NIMBY syndrome is reduced.   | Public Information Bulletin, website of the local government unit, local community (Internet forum of residents)   |
| K4.2  | Social accessibility (location in relation to centre and residential areas)                                      | It is ideal to find a balance between close proximity to communities while not limiting urban development.   | Cartographic data:<br>Open Geoportal Geospatial Data <a href="https://polska.e-mapa.net/">https://polska.e-mapa.net/</a><br>Determining distance of site from residential areas and settlement unit centre   |
| K4.3  | Social accessibility (location in relation to important places in community, in particular religious facilities) | Essential to social infrastructure of communities, need to be established in accessible locations to meet the expectations of the populations they serve.  | Field visit (identification of landmarks, nodes, community’s important places)   |
| <b>K5 Landscape and aesthetics criteria</b> |  |  |  |
| K5.1  | Location in relation to natural system   | Cemetery can often enhance natural heritage and provide opportunities for enhanced biodiversity and connectivity of the natural heritage system. Cemeteries can have positive impacts on natural and hydrological features, and contribute to enhanced natural features as well as preservation of open space. | Cartographic data: digital maps<br>Non-cartographic data: documents of spatial planning policy (analysis of local development plans and spatial development conditions and directions study)<br>Geospatial data from: The General Directorate for Environmental Protection <a href="http://geoserwis.gdos.gov.pl/mapy/">http://geoserwis.gdos.gov.pl/mapy/</a><br>Open Geoportal Geospatial Data <a href="https://polska.e-mapa.net/">https://polska.e-mapa.net/</a> |
| K5.2  | Landscape features/character   | New cemeteries should be located to be compatible with natural, cultural, visual and open landscape character of the area.   | Field research<br>Landscape identity assessment including: visual perception characterisation and dominating landscape elements characterisation (Landscape Character Assessment, 2002; Ode, Tveit and Fry, 2008; Nitavska, 2011)  |
| K5.3  | Visual assessment (views from site, views into site)   | The landscape character will be affected in a number of ways by development of a new cemetery. Highly visible sites will result in additional costs to be incurred for screening. Exposed sites with high visibility (these are less desirable than sites that are secluded or naturally screened).            | Field research<br>Views’ sequence analysis (Cullen, 1995; Królikowski, 2016)<br>Analysis of panoramas (Wejchert, 1974)   |

Tab. 2: List of criteria and indicators (required data) that are relevant for the research  
Source: author’s conceptualisation

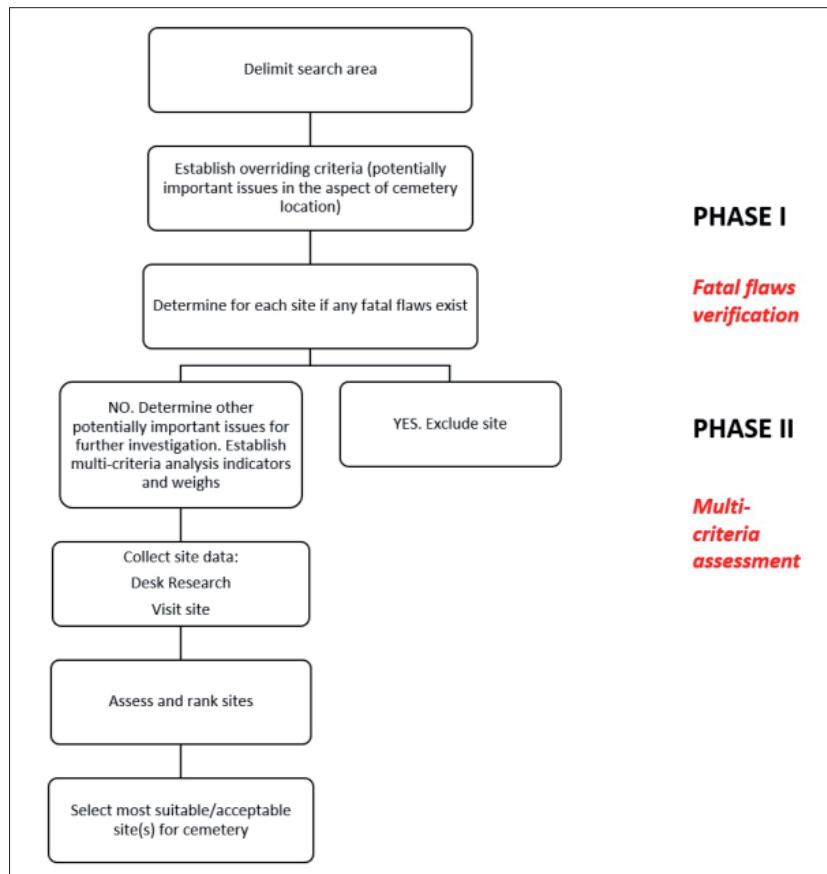


Fig. 2: Cemetery site selection flow chart

Source: author's conceptualisation

Sites which do not have fatal flaws are qualified to enter Phase II of the research. So far, a multi-criteria ranking matrix has been developed, allowing for an objective method of assessing individual sites and thus indicating which sites are more suited for the establishment of a cemetery.

The multi-criteria assessment (MCA) is applied to support a decision-making process when several or more than criteria are at hand (WSP Opus, 2019). The proposed method contains elements of the AHP (Analytical Hierarchy Process) method. The AHP method is hierarchically structured. Therefore, in using it, the weights of the main criteria (five groups) were determined. The first step, in this phase, was to determine the criteria which lead to the achievement of the set aim (Yoon and Hwang, 1995; Šelih, Kne, Srdić and Žura, 2008; Figueira, Greco and Ehrgott, 2016). The criteria were adapted to the assessment purpose. Therefore, they were precisely formulated. Some criteria refer to measurable phenomena, hence they can easily be defined. Others, however, need to be described with linguistic methods and require an adequate scale as well as identification methods (see Tab. 3). After selecting the influencing criteria (Section 3.1), the next step and one of the most important ones was to calculate the importance of each criterion. As mentioned above, weights are an element of uncertainty (Xu and Zhang, 2013): hence, the calculation of weights was determined by 30 experts from the fields of cemetery management, funeral services, landscape design and land use planning. Experts have determined which criteria, in their opinion, are the most important and which are less important in the decision-making process of identifying suitable options for cemeteries (the sum of the weights of a criterion is 1) (Tab. 3). All sites qualified for

Phase II were assessed by scoring 0–2, with scores of 2 being most favoured. Scores of 0 fulfil the criterion to the least extent and involve the necessity of undertaking specific activities generating additional costs and environmental, technical and spatial consequences (Tab. 3).

The suitability was calculated from the formula:

$$s_i = \sum_{j=1}^m (z_{ij} \cdot v_j)$$

where  $s$  = output (suitability),  $z_{ij}$  = value of a parameter,  $v_j$  = weight of a criterion,  $i$  = a criterion, and  $m$  = number of criteria.

The output was divided into four main categories to facilitate the determination of a suitable cemetery: I. High suitable level; II. Moderate suitable level; III. Less suitable level; and IV. Unsuitable level.

### 3.1 Phase 3: Application of multi-criteria analysis in Białystok

Elimination of sites with fatal flaws and the application of a multi-criteria analysis was carried out to select an appropriate site for burials. The implementation was carried out for Białystok, a city with 297,585 inhabitants (2020), which is the capital of Podlaskie Voivodeship. The choice of research area was determined by the city's spatial policy aimed at providing local burial facilities. Despite the shortage of space at the only municipal cemetery, the local authorities of Białystok have been pressurised since 1999 to find cemetery space within the city's borders. Finally, a cemetery was built on the grounds of the Supraśl

| Idem              | Criterion  | Value of a parameter (z)  | Scores | Criteria weight (v) | Final weight |
|-------------------|--|---|--------|---------------------|--------------|
| <b>K1 Spatial</b> |  |   |        |                     |              |
| K1.1              | Land use character of surrounding area (current land use)  | Industrial areas with facilities where noise level exceeds the recommended noise limit; other nuisance in the buffer zone (railway, waste water treatment plant, waste recycling site) (the need for isolating by greenery planting)  | 0      | <b>0.253</b>        | 0            |
|                   |  | Built-up areas: residential, service facilities   | 1      |                     | 0.021        |
|                   |  | Vacant land/clear land/undeveloped area (wastelands, agricultural land)   | 2      |                     | 0.042        |
| K1.2              | Existing infrastructure, availability of services (access to infrastructure)                                       | Overhead power lines 110 kV, 220 kV (the need to establish safety/technical zone)   | 0      |                     | 0            |
|                   |  | Lack of infrastructure, in the proximity access to services (water, electricity)  | 1      |                     | 0.021        |
|                   |  | Existing infrastructure on the site, overhead power lines not in collision with the planned investment  | 2      |                     | 0.042        |
| K1.3              | Accessibility  | Out of town, no public transport access and no direct entrance to major roads of streets (the need to build transport infrastructure that improves site accessibility)  | 0      |                     | 0            |
|                   |  | <ul style="list-style-type: none"> <li>• In town but with no ease of access for public transport or</li> <li>• out of town with public transport access (including cycle paths) near to site (&lt; 500 m) or</li> <li>• out of town with direct entrance to major roads of streets</li> </ul> | 1      |                     | 0.021        |
|                   |  | In town with access to public transport (< 500 m)   | 2      |                     | 0.042        |
| K1.4              | Land available [ha]  | 3–5 ha (no space for future expansion; the need for arrangement the site with columbaria domination; the need to purchase surrounding land)   | 0      |                     | 0            |
|                   |  | 5–10 ha   | 1      |                     | 0.021        |
|                   |  | > 10 ha, space for adequate future expansion  | 2      |                     | 0.042        |
| <b>K2 Legal</b>   |  |   |        |                     |              |
| K2.1              | Legal status of land   | Land divided into smaller plots with unknown owner or several owners (the land is private property and must be purchased)   | 0      | <b>0.230</b>        | 0            |
|                   |  | Land is owned by local government unit other than the one that is planning the investment (the need to establish an inter-municipal cooperative); property of Church or religious associations (one established owner)  | 1      |                     | 0.026        |
|                   |  | Land is owned by local government unit or the Treasury  | 2      |                     | 0.051        |
| K2.2              | Constraints resulting from protected areas (natural and cultural forms of protection)                              | There are less restrictive forms, zones of natural, cultural protection on the site (need to prepare of environmental impact assessment)  | 0      |                     | 0            |
|                   |  | Site is adjacent to natural, cultural forms of protection   | 1      |                     | 0.026        |
|                   |  | Site has no protection or conservation restrictions; site has elements of natural or cultural system, but without protection  | 2      |                     | 0.051        |
| K2.3              | Compliance with local policy (spatial development conditions and directions study, local spatial development plan) | No entries regarding the cemetery in planning documents (spatial development conditions and directions study, local spatial development plan) (the need to change provisions)   | 0      |                     | 0            |
|                   |  | Cemetery included in spatial development conditions and directions study as a public aim investment   | 1      |                     | 0.026        |
|                   |  | Cemetery or public greenery is included in planning documents, no need to change the documents provisions   | 2      |                     | 0.051        |

... Tab. 3: continuing on the next page ...

| Idem | Criterion  | Value of a parameter (z)  | Scores | Criteria weight (v) | Final weight |
|------|--|---|--------|---------------------|--------------|
| K3   | Environmental  |   |        |                     |              |
| K3.1 | Hydrological aspects: flood area, the distance to ground or surface water, presence of hydrographic objects      | The whole site outside flood risk, but site slopes down towards the line of watercourse or water reservoir (possibility of negative water impact on this area and paying special attention to proper protection of newly-designed cemetery) | 0      | <b>0.184</b>        | 0            |
|      |  | The whole site outside flood risk, but, the site adjoins wetlands   | 1      |                     | 0.020        |
|      |  | The whole site outside flood risk, no water issues  | 2      |                     | 0.041        |
| K3.2 | Land relief, topography  | Very steep (slope angle more than 5°) or very flat (less than 1°) topography (the need for earthworks, implementation of drainage systems or hydrophilic plant species)   | 0      |                     | 0            |
|      |  | Flat land (slope angle between 1° and 2°)   | 1      |                     | 0.02         |
|      |  | Gently sloping lands (slope angle between 2° and 5°)  | 2      |                     | 0.041        |
| K3.3 | Geotechnical aspects: ground conditions (the quality of on-site soil)  | Domination of unsuitable soils, high permeability (sand, gravel) (zones with poor to medium water permeability are also present); at least 30% of the site has unfavourable ground conditions (need for earthworks)                         | 0      |                     | 0            |
|      |  | Locally unsuitable soils; at most 30% of the site has unfavourable ground conditions  | 1      |                     | 0.02         |
|      |  | Domination of suitable soils; low and moderate permeability but low water-holding capacity and low soil absorbing capacity (silty sand, clayey sand, silt, peat); favourable ground conditions  | 2      |                     | 0.041        |
| K4   | Socio-cultural   |   |        |                     |              |
| K4.1 | Acceptance of investment/community's attitude to cemetery  | Lack of information (need for social consultation)  | 0      | <b>0.172</b>        | 0            |
|      |  | Popularisation of burial needs in local media   | 1      |                     | 0.019        |
|      |  | Community-based project (community submits applications for cemetery construction to local government council)  | 2      |                     | 0.038        |
| K4.2 | Social accessibility (location in relation to centre and residential areas)                                      | Isolated, away from human settlements (need for social consultation)  | 0      |                     | 0            |
|      |  | Close to settlement unit centre, cemetery's buffer zone includes single plots of land with residential buildings  | 1      |                     | 0.019        |
|      |  | Between settlement units, designed cemetery as integrating space  | 2      |                     | 0.038        |
| K4.3 | Social accessibility (location in relation to important places in community, in particular religious facilities) | Not related to socially important places (need for social consultation)   | 0      |                     | 0            |
|      |  | Visually connected with temple and (or) existing cemetery   | 1      |                     | 0.019        |
|      |  | Located in direct vicinity of temple, cemetery or important for local community objects of small religious architecture   | 2      |                     | 0.038        |
| K5   | Landscape and aesthetics   |   |        |                     |              |
| K5.1 | Location in relation to natural system   | No relationships identified (need for link with natural system by greenery)   | 0      | <b>0.161</b>        | 0            |
|      |  | Cemetery will complement existing ecological corridor   | 1      |                     | 0.018        |
|      |  | Cemetery will support the basic natural system  | 2      |                     | 0.036        |

... Tab. 3: continuing on the next page ...

| Idem | Criterion                        | Value of a parameter (z)  | Scores | Criteria weight (v) | Final weight |
|------|----------------------------------|---|--------|---------------------|--------------|
| K5.2 | Landscape features/<br>character | Monotonous, uniform (need to create, diverse layout of cemetery by greenery)  | 0      |                     | 0            |
|      |                                  | Moderate number of elements, plans  | 1      |                     | 0.018        |
|      |                                  | Great variety of elements, plans  | 2      |                     | 0.036        |
| K5.3 | Visibility in the landscape      | Due to the human scale development in cemetery's buffer zone, cemetery on this site will be a spatial dominant (the object may have a negative impact on site landscape values) (need to create an earthen berm or a perimeter buffer zone with greenery) | 0      |                     | 0            |
|      |                                  | Cemetery will be exposed in open landscape  | 1      |                     | 0.018        |
|      |                                  | Cemetery will be integrated with local landscape  | 2      |                     | 0.036        |

Tab. 3: Assessment criteria with the parameter values and the weights (in the rows "0": the necessity of undertaking specific activities is highlighted). Source: author's conceptualisation

community, in the village of Karakule. The new facility, established in 2010, is located to the north-east of city borders, and therefore, it is difficult to access for residents of the southern and western districts of the Białystok. In 2018–2019, a public debate on a new cemetery was initiated. The proposals to establish a new cemetery in Las Turczyński (the Choroszcz community) provoked opposition from the residents, expressing concerns about the prospect of a decrease of the natural and social values of the area (deforestation of the area of 29 ha). It was decided to verify whether an alternative location could be proposed in the suburban area of Białystok, allowing protection of areas with high natural and social values. Eleven objects were covered by the study. The sites were proposed by the Association of Polish Architects Białystok branch (Polish: SARP). According to Polish law, a cemetery may be established on the local government unit's land. The law also allows for the possibility of establishing an inter-municipal cooperative in the event of problems with obtaining an appropriate site. Establishing inter-municipal cooperation takes place to jointly perform public tasks in the field of cemeteries. Among the proposed locations there are both some areas within the

city boundaries (sites 1, 2), as well as in the neighbouring communities of Choroszcz (sites 3, 4, 5, 6, 7, 8, 9, and 10) and Turośń Kościelna (site 11) (see Tab. 4, Fig. 3). The search for areas suitable for a cemetery was carried out in the suburban area of Białystok. As Dent and Knight (1998, p. 451) have stated:

"There is little room for expansion of existing sites and most included space is either full or being rapidly consumed. Most of our capital cities are now seeking land for cemetery dedication in the urban fringe areas, which to some extent goes with expanding populations and urban sprawl".

Initially, a list of key criteria was developed to verify whether they were present at the 11 sites. Later, a multi-criteria analysis was applied using the criteria in accordance with Table 3. The assessment was undertaken using GIS analysis software (QGIS), utilising data layers containing information on the site selection criteria, by investigating existing literature, legislation or reports relating to the relevant area, or through field research. Data for the multi-criteria analysis for identifying potential sites for cemeteries were collected from the following

| Site number | Localisation (community/geodesic precinct) | Area [ha] | Development direction in the planning document | Land use, elements of development in buffer zone                       |
|-------------|--|-----------|--|--|
| 1.          | Białystok city/ Klepacze                   | 18.0      | Agricultural land                              | Railway, residential areas   |
| 2.          | Białystok city/ Ścianka                    | 6.6       | Industrial area, service facilities            | Heating plant, railway   |
| 3.          | Choroszcz/ Ogrodniki                       | 22.0      | Agricultural land                              | Railway, residential areas   |
| 4.          | Choroszcz/ Czaplino                        | 12.0      | Agricultural land                              | Forest   |
| 5.          | Choroszcz/ Czaplino                        | 18.7      | Agricultural land                              | Forest, wasteland  |
| 6.          | Choroszcz/ Barszczewo                      | 20.0      | Agricultural land                              | Homesteads, the East of Poland Cycling Trail GreenVelo, wayside shrine |
| 7.          | Choroszcz/ Barszczewo                      | 9.7       | Agricultural land                              | Agricultural land, wasteland   |
| 8.          | Choroszcz/ Sienkiewiczze                   | 16.7      | Agricultural land                              | Wasteland, homesteads, service facilities                              |
| 9.          | Choroszcz city                             | 18.0      | Church area                                    | Agricultural land, wasteland, wayside shrine                           |
| 10.         | Choroszcz city                             | 27.0      | Church area                                    | Agricultural land, wasteland   |
|             | Turośń Kościelna/Niewodnica Kościelna      | 22.0      | Church area                                    | Sacral complex: church, cemetery, homesteads                           |

Tab. 4: List of potential areas for the location of the new cemetery in Białystok  
Source: author's elaboration

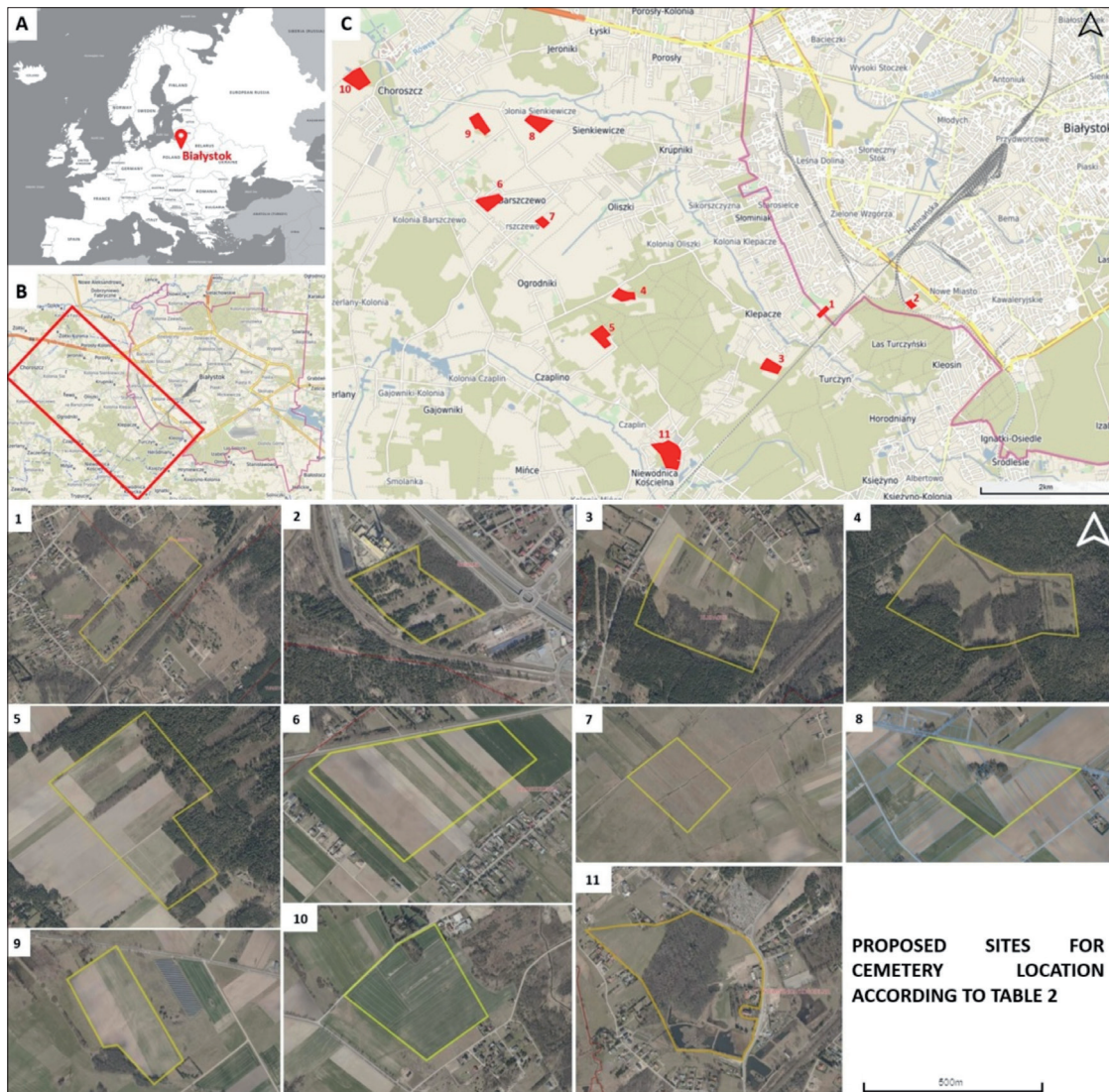


Fig. 3: Research area: Białystok in the map of Europe (A); the spatial distribution of selected sites in relation to the city boundaries (B, C); and their landscape setting (see below)  
 Source: author's elaboration based on <https://polska.e-mapa.net/>

institutions: the General Directorate for Environmental Protection, the National Institute of Cultural Heritage, the Białystok Poviát, the National Water Management “Wody Polskie”, the Polish Geological Institute, the Central Geological Database, the Municipal and Communal Offices of Białystok, Choroszcz and Turośń Kościelna. A number of criteria and their corresponding indicators, which concern legal (local policy), landscape and aesthetic characters were elaborated based on local spatial policy documents (Spatial Development Conditions and Directions Studies of Białystok, Choroszcz and Turośń Kościelna and the local spatial development plans). To assess and evaluate proposed sites for cemeteries, an evidence card in the form of a table consisting of a descriptive part as well as a graphic one were created (see Tab. 5 and Fig. 6 as samples). The data were divided into the categories that directly relate to the scope of the assessment criteria.

#### 4. Results and discussion

Eleven potential cemetery areas were analysed according to the defined criteria (5 groups, 16 indicators). Within the 11 options considered potentially suitable for cemetery development, seven areas were identified as potential

development options (highly and moderately suitable) (sites 2, 4, 5, 6, 8, 9, and 10). Having verified the overriding criteria (the so-called fatal flaws) the following table summarises the non-qualifying sites based on legal, environmental and spatial considerations as listed below in Table 6.

Sites for which no overriding criteria apply were selected for further assessment. Nine of the 11 sites qualified for multi-criteria analysis. Exclusionary conditions for site selection purposes were identified on the sites 7 and 11 (Fig. 4). Burials must not cause pollution and therefore should not take place below the water table, according to defined fatal flaws. Sites 7 and 11 are situated below the surrounding areas, in close proximity to water bodies (shallow groundwater). Sites evaluated in the reports prepared by WRC (1994) and WSP Opus (2019) were excluded from further study for the same reasons. As Dover District Council stated (2010) environmental issues, especially groundwater is a major part of land assessment for cemeteries. This approach is consistent with the recommendation that “There is a need of building appropriate cemeteries to adequately receive dead bodies and minimise the effects of juxtaposition between residential and cemeterial areas” (Neckel et al., 2017, p. 218).

|   |  |  |   |
|---|--|--|---|
| <b>Map of the location of site</b><br><i>Location of the site in relation to settlement units – especially to Białystok, and communes Choroszcz, Turośń Kościelna</i> | <b>Environmental criteria (K3)</b>                   |  | <b>Legal criteria (K2)</b><br><br><i>Local land use plan with land register data and buffer zone (150 m)</i>                    |
|   | <b>K3,3</b><br><i>Geological map with soil types</i> | <b>K3,1</b><br><i>Hydrological map (with flood risk)</i> |   |
| <b>Spatial criteria (K1)</b><br><i>Map with spatial data (land use, existing infrastructure, accessibility)</i>   | <b>K3,2</b><br><i>Hypsometric map</i>                | <i>Elevation profile 1</i>                               |   |
|   |  | <i>Elevation profile 2</i>                               |   |
| <b>Socio-cultural criteria (K4)</b><br><i>Orthophoto map with identification of community's important places</i>  |  | <b>Graphic card</b><br><br>.....<br><b>(site number)</b> | <b>K5,1</b><br><i>Location in relation to natural system (extract from Spatial Development Conditions and Directions Study)</i> |
| <b>Landscape and aesthetic criteria (K5,2; K5,3)</b><br><i>Photos showing landscape character and views from site</i>   |  |  |   |

Tab. 5: Graphic card template  
 Source: author's elaboration

| Site number | Fatal flaw (- No) (+ Yes) | Specification   |
|-------------|---------------------------|---|
| 1           | -                         | Qualified to phase II   |
| 2           | -                         | Qualified to phase II   |
| 3           | -                         | Qualified to phase II   |
| 4           | -                         | Qualified to phase II   |
| 5           | -                         | Qualified to phase II   |
| 6           | -                         | Qualified to phase II   |
| 7           | +                         | Site in depression, below the surrounding area<br>Site lying in close proximity to water bodies such as wetlands  |
| 8           | -                         | Qualified to phase II   |
| 9           | -                         | Qualified to phase II   |
| 10          | -                         | Qualified to phase II   |
| 11          | +                         | Site in depression, below the surrounding area<br>Site lying in close proximity to water bodies such as wetlands<br>Site has soils with high permeability; the vast majority of the area covered by the investment project slopes down to the adjacent wetland; hydrographic objects on the site; on the lowest parts of the site local waterlogging appeared |

Tab. 6: The list of non-qualifying sites  
 Source: author's elaboration

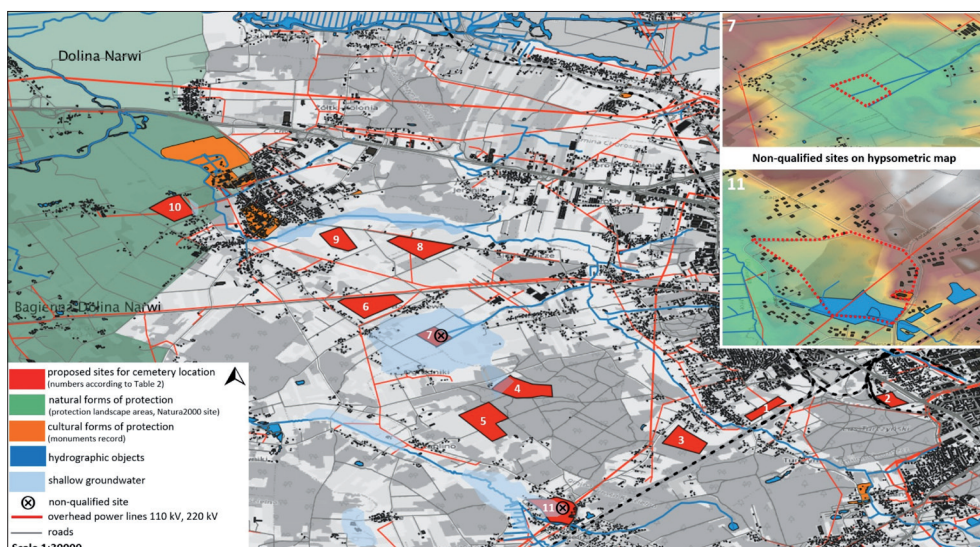


Fig. 4: Spatial, environmental and legal conditions for the analysed sites  
 Source: author's elaboration

The top four highest ranked sites were as follows: 5, 6, 8, 9 and these sites may require further detailed investigation (Fig. 5, Tab. 7).

One highly suitable candidate for a cemetery is site 9 (the highest score and the highest number of fulfilled indicators). Currently, the structure of this site is dominated by agricultural land. This site (Fig. 6) is regarded as the best as it is directly adjacent to the Choroszcz city centre (700 m),

the road from Choroszcz to Białystok (Białostocka Street: along this road there is the Green Velo bicycle way and the Zygmunt Gloger walking trail); the housing area (nearest buildings 200 m from the site boundary); as well as religious objects (church and wayside shrine).

Similarly, a perfect location is a flat, diverse, and attractive area in terms of landscape values. Having scrutinised a range of assessments of the proposed sites, option No. 9 would

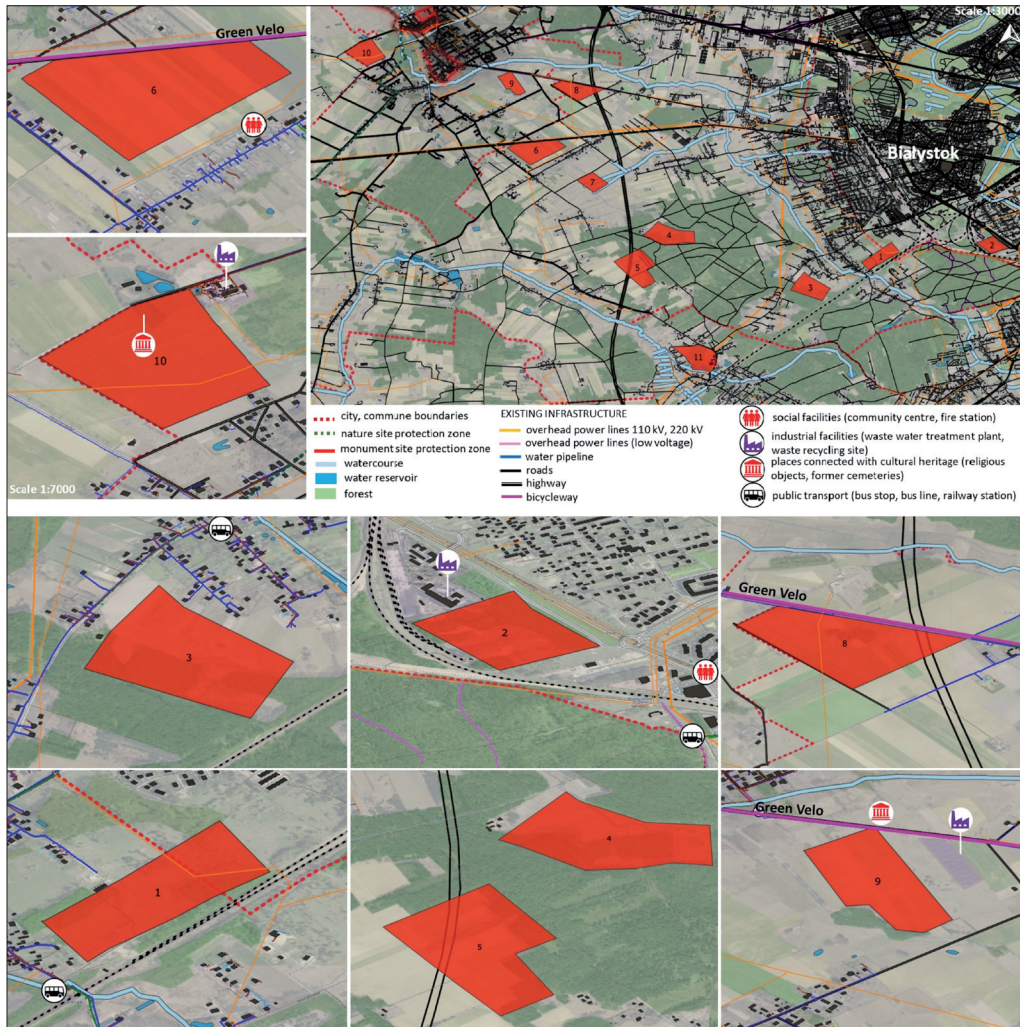


Fig. 5: Spatial analysis presenting the characteristics of qualified sites for a cemetery (including context) Source: author's elaboration



Fig. 6: Sites 5,6,8,9 as the highest rated options showing on representative photographs (A) and on QGIS map (B) Source: author's elaboration



serve best the public interests with its size, location access and social, landscape considerations. The site would have to be developed with minimum impact on current visual aspects and vistas. It can be proposed and discussed with the local authorities and community.

Moreover, site 6 is classified as moderately suitable and ranked in second place in terms of the number of fulfilled indicators. The main features of this area are accessibility (location near social facilities and the tertiary road – Kruszevska Street, with Green Velo bicycle way), land structure (agricultural land and wastelands), distance to

human settlements (circa 50 m), varied landscape and existing infrastructure (water pipeline, electricity).

Both sites were highly rated for their accessibility, which corresponds with the Cemetery Development Services (2010) site assessment report. Many visitors to cemeteries are the elderly and infirm that may, for whatever reason, not have access to private transport. Therefore, the cemetery site location should be within easy access of local bus stops with short taxi routes from the town centre, as well as being close to the proximity of the settlement unit for pedestrian and cycle ways.

| Criterion          | Indicator | Proposed sites for cemetery location (according to Tab. 2) |              |              |              |              |              |   |              |              |              |    |
|--------------------|-----------|--|--------------|--------------|--------------|--------------|--------------|---|--------------|--------------|--------------|----|
|                    |           | 1  | 2            | 3            | 4            | 5            | 6            | 7 | 8            | 9            | 10           | 11 |
| K1                 | K1.1      | 0  | 0            | 1            | 2            | 2            | 1            |   | 2            | 2            | 2            |    |
|                    | K1.2      | 2  | 2            | 1            | 1            | 1            | 2            |   | 0            | 2            | 0            |    |
|                    | K1.       | 2  | 2            | 0            | 0            | 1            | 1            |   | 1            | 1            | 1            |    |
|                    | K1.4      | 2  | 1            | 2            | 2            | 2            | 2            |   | 2            | 2            | 2            |    |
|                    | X         | 0.253  | 0.253        | 0.253        | 0.253        | 0.253        | 0.253        |   | 0.253        | 0.253        | 0.253        |    |
|                    | Σ         | 1.518  | 1.265        | 1.012        | 1.265        | 1.518        | 1.518        |   | 1.265        | 1.771        | 1.265        |    |
| K2                 | K2.1      | 0  | 2            | 0            | 0            | 0            | 0            |   | 0            | 2            | 2            |    |
|                    | K2.2      | 2  | 2            | 1            | 2            | 2            | 2            |   | 2            | 2            | 0            |    |
|                    | K2.3      | 0  | 0            | 1            | 1            | 1            | 1            |   | 1            | 1            | 1            |    |
|                    | X         | 0.23   | 0.23         | 0.23         | 0.23         | 0.23         | 0.23         |   | 0.23         | 0.23         | 0.23         |    |
|                    | Σ         | 0.46   | 0.92         | 0.46         | 0.69         | 0.69         | 0.69         |   | 0.69         | 1.15         | 0.69         |    |
| K3                 | K3.1      | 2  | 2            | 2            | 2            | 2            | 2            |   | 1            | 0            | 0            |    |
|                    | K3.2      | 1  | 1            | 1            | 2            | 1            | 2            |   | 1            | 2            | 1            |    |
|                    | K3.3      | 0  | 0            | 1            | 2            | 2            | 2            |   | 1            | 1            | 1            |    |
|                    | X         | 0.184  | 0.184        | 0.184        | 0.184        | 0.184        | 0.184        |   | 0.184        | 0.184        | 0.184        |    |
|                    | Σ         | 0.552  | 0.552        | 0.736        | 1.104        | 0.92         | 1.104        |   | 0.552        | 0.552        | 0.368        |    |
| K4                 | K4.1      | 0  | 0            | 1            | 1            | 1            | 1            |   | 1            | 1            | 1            |    |
|                    | K4.2      | 1  | 1            | 1            | 0            | 1            | 2            |   | 2            | 2            | 1            |    |
|                    | K4.3      | 2  | 2            | 0            | 0            | 1            | 2            |   | 2            | 2            | 2            |    |
|                    | X         | 0.172  | 0.172        | 0.172        | 0.172        | 0.172        | 0.172        |   | 0.172        | 0.172        | 0.172        |    |
|                    | Σ         | 0.516  | 0.516        | 0.344        | 0.172        | 0.516        | 0.86         |   | 0.86         | 0.86         | 0.688        |    |
| K5                 | K5.1      | 0  | 2            | 1            | 2            | 1            | 2            |   | 2            | 2            | 2            |    |
|                    | K5.2      | 1  | 2            | 1            | 2            | 1            | 2            |   | 2            | 2            | 2            |    |
|                    | K5.3      | 0  | 2            | 1            | 2            | 2            | 1            |   | 2            | 2            | 2            |    |
|                    | X         | 0.161  | 0.161        | 0.161        | 0.161        | 0.161        | 0.161        |   | 0.161        | 0.161        | 0.161        |    |
|                    | Σ         | 0.161  | 0.966        | 0.483        | 0.966        | 0.644        | 0.805        |   | 0.966        | 0.966        | 0.966        |    |
| <b>Total score</b> |           | <b>3.207</b>   | <b>4.219</b> | <b>3.035</b> | <b>4.197</b> | <b>4.288</b> | <b>4.977</b> |   | <b>4.333</b> | <b>5.299</b> | <b>3.977</b> |    |

Tab. 7: The results of multi-criteria evaluation for nine sites, where suitability levels (Tab. 8) are marked in colour and fulfil criteria in grey (Tab. 9)

Source: author's elaboration

| %                    | Scores                              | Suitability levels  | Site number                 |
|----------------------|-------------------------------------|---------------------|-----------------------------|
| $0 \leq x < 25$      | $0 \leq x < 1.626$ (0–25%)          | Unsuitable          | 7,11 (non-qualifying sites) |
| $25 \leq x < 50$     | $1.626 \leq x < 3.253$ (25–50%)     | Marginally suitable | 1,3                         |
| $50 \leq x < 75$     | $3.253 \leq x < 4.880$ (50–75%)     | Moderately suitable | 2,4,5,8,10                  |
| $75 \leq x \leq 100$ | $4.880 \leq x \leq 6.506$ (75–100%) | Highly suitable     | 6,9                         |

Tab. 8: The results – the site suitability levels

Source: author's elaboration

| Site number | Fulfilment of: |                   | Score |
|-------------|----------------|-------------------|-------|
|             | criteria (x/5) | indicators (y/16) |       |
| 1           | 0/5            | 9/16              | 3.207 |
| 2           | 1/5            | 12/16             | 4.219 |
| 3           | 2/5            | 13/16             | 3.035 |
| 4           | 2/5            | 12/16             | 4.197 |
| 5           | 4/5            | 15/16             | 4.288 |
| 6           | 4/5            | 15/16             | 4.977 |
| 8           | 3/5            | 14/16             | 4.333 |
| 9           | 4/5            | 15/16             | 5.299 |
| 10          | 2/5            | 13/16             | 3.977 |

Tab. 9: The results. Fulfilment of criteria, indicators, and final output. The sites that fulfil criteria to the largest extent are marked in grey  
 Source: author's elaboration

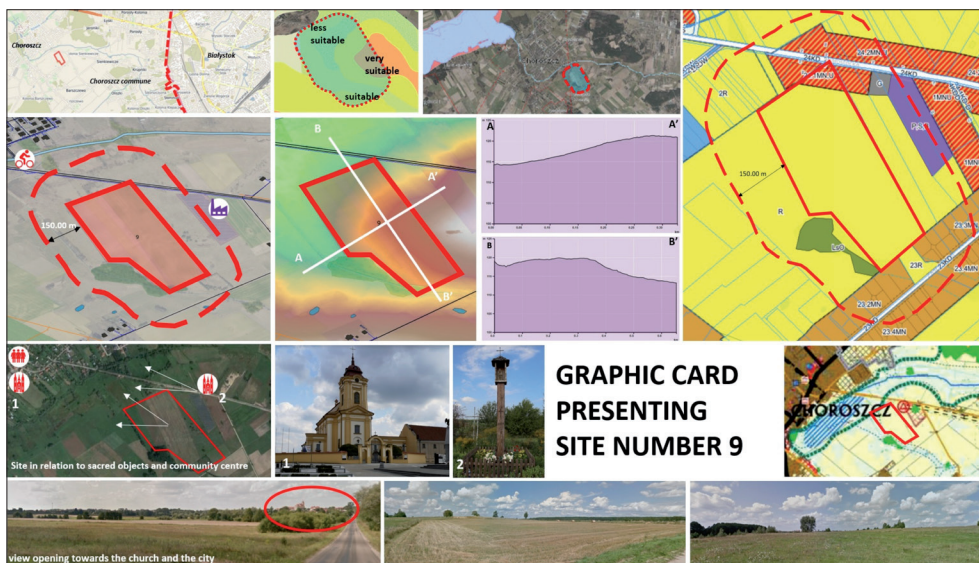


Fig. 7: Site No. 9 as highly suitable for new cemetery  
 Source: author's elaboration

There is no proper landfill site that fulfils all criteria/indicators, especially with respect to the legal requirements (local policy). For the highest rated sites, where the criteria are met less – some recommendations were developed on possible modifications that could be undertaken (Tab. 10).

The conducted multi-criteria analysis and four selected sites indicate that many sites suffer from constraints related to topography (land relief), groundwater levels, and soil permeability. As a result, these constraints in effect define a restricted development of ground suitable for burial use (interment of ashes, caskets). The results allow stakeholders to initiate in-depth studies in relation to the highest ranked sites. Currently, no investment activities are carried out in their vicinity, so they can be assigned in spatial policy documents as cemeteries for the local community. The peripheral location of the site in the settlement structure determines the need for expansion of its transportation infrastructure. On the other hand, too much exposition of the site in the landscape relates to a recommendation of visual intrusion managed by creating an earthen berm or a perimeter buffer zone with greenery. An overhead power line runs through the site No. 8 and is a barrier in cemetery planning processes (the need to establish safety/technical zone).

The multi-criteria analysis provided a comparative feasibility study for a new cemetery. The analysis of proposed sites in accordance to multifaceted criteria showed the most suitable options to provide burial facilities once the current Białystok cemeteries have become full. The ‘essential elements’ of the analysis are to: verify the fatal flaws, exclude sites with fatal flaws (a number of potential sites should be identified from the areas determined as not exhibiting a fatal flaw); review the current cemetery provision within the city and adjacent municipalities; undertake the research study to identify new sites that conform to the basic requirements for new cemetery space and the associated pre-defined analysis criteria; the site data collection; the evaluation of sites in line with the development criteria for a future cemetery development and classification into the suitability levels.

Further detailed investigation is undertaken on the highest-ranking sites. The areas considered potentially suitable for cemetery development should be subject to consultation to canvass the views of the community and key stakeholders. This stage also involves a detailed geotechnical investigation. As time and resources are limited, this stage should be realised only on a limited number of sites and, on the other hand, one must bear in mind an alternative option if the one selected first turns out to be flawed (Fig. 8).

| Site number | Not fully met criteria   | Type of costs  | Recommendations  |
|-------------|--|--|--|
| 5           | K2.1 Land divided into smaller plots with unknown owner or several owners; the land is private property and must be purchased  | Economic, legal (extended investment time)                               | Because of peripheral location - the need to develop the communication infrastructure connecting the site with the vicinity          |
| 6           | K2.1 Land divided into smaller plots with unknown owner or several owners; the land is private property and must be purchased  | Economic, legal (extended investment time)                               | Because of high visibility of site - Visual intrusion can be managed by creating earthen berm or perimeter buffer zone with greenery |
| 8           | K2.1 Land divided into smaller plots with unknown owner or several owners; the land is private property and must be purchased<br><br>K1.2 Overhead power lines 220 kV (the need to establish safety/technical zone)  | Economic, legal (extended investment time)                               | Because of high permeability of soils in southern part of site - arrangement with columbaria are recommended*                        |
| 9           | K3.1 The whole site outside exposed to flood risk, but site slopes down towards the line of a watercourse or a water reservoir (possibility of negative water impact on this area and pay special attention to proper protection of newly-designed cemetery) | Environmental, economic (drainage works, bunds, drains may be necessary) | Increasing the number of columbaria in the part of the cemetery located closer to the hydrographic facilities                        |

Tab. 10: List of the highest ranked sites for burial purposes with recommendations

Source: author's elaboration based on NEPA (2007), PURDON (2009), CDS (2010)

\* Cremation burials usually pose a lesser risk to the water environment than conventional burials (SEPA, 2017)

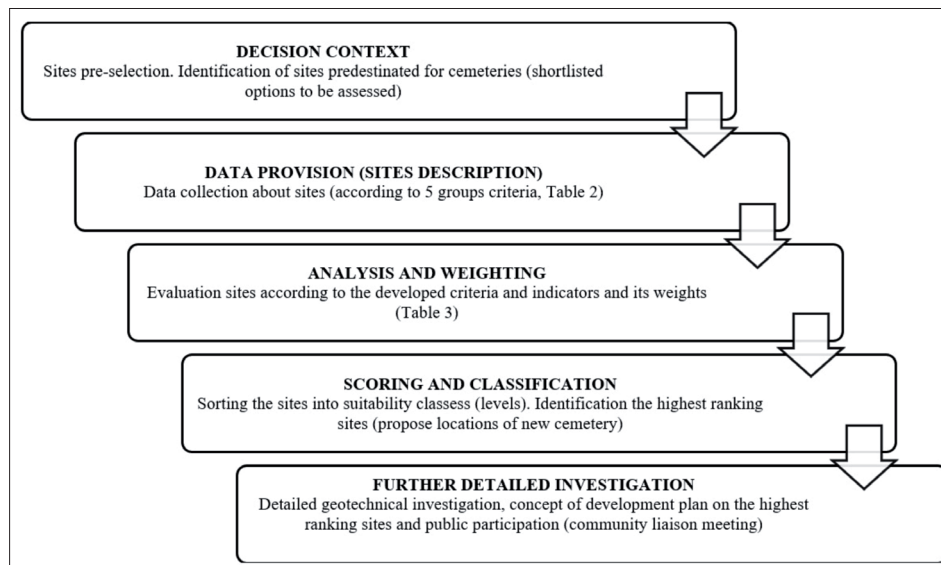


Fig. 8: Methodology diagram – multicriteria analysis of shortlisted options

Source: author's conceptualisation

Based on the conducted research, and with reference to world practice (CDS, 2010; Judge, 2012), it is recommended that a minimum of four sites should be identified and carried forward for further investigation (in case fatal flaws appear in the next phases: geotechnical investigations and community consultations are required). Due to the N-I-M-B-Y (Not-In-My-Back-Yard) syndrome, it is very important to include public participation in the cemetery site selection process. Community consultation should take place whereby a meeting is held to present the highest ranked sites and so that the affected communities are given the opportunity to voice their opinions and feelings about the proposed sites.

The methodology presented here aims at identifying areas that are most appropriate for the establishment of a cemetery and eliminating those areas that are most

unsuitable. In this way, the financial burden associated with detailed site investigations is avoided by assessing only the most suitable sites. The multi-criteria analysis assists in the final decision made by aggregating a wide range of data to present recommendations which can be used to assist in the design phase.

The proposed procedure is partly based on the assessment procedures developed by the WRC (1994), WHO (1998), CDS (2010), and Judge (2012), using the fatal flaws and multi-criteria assessment approach. What distinguishes the developed method from the above-mentioned ones is its multifaceted nature: considering not only environmental, legal and spatial criteria, but also socio-cultural, landscape and aesthetics criteria – in accordance with the idea of sustainable development. The literature review shows that

previous research rarely considers landscape and aesthetics criteria, whereas from a social point of view, they should be important in the final location decision (Rocque, 2017).

As a cemetery is a landscape element, a vital element of natural and cultural heritage, it should be subjected to principles of landscape integrated design. Landscape design is focused on holistic, durable and sustainable development. As a result, a new burial site in line with landscape design aims at preservation of human environmental quality because of its efficient use and is based on rules of durable and sustainable development (spatial, legal, environmental, socio-cultural and landscape requirements). This research shows that several important factors are required for a new cemetery site. Any new facility should be located at an adequate distance from the current city to allow for cemetery development unimpeded by urban growth, as well as ensuring proximity to affordable transport options for mourners.

## 5. Conclusions

The proposed multi-criteria analysis can be used as a supportive tool in the spatial planning process for officials, planners, urban geographers, landscape architects, social activists and other experts. Therefore, it can reduce the potential spatial and socio-cultural problems posed by incorrectly sited burial grounds. As Capels and Senville stated (2006, p. 1): “Cemeteries deserve the same attention and should be incorporated into the planning processes that cities and towns undertake for other types of infrastructure, community facilities, and services”. In this research, several considerations and recommendations were provided to address the main issues in choosing a burial ground. Cemeteries are challenged with the pressures of urban development. Planners, designers, local officials, and the public should be equipped with such methods that allow an evaluation of sites with respect to of suitability for burials. Cemeteries, as the inevitable form of land use, should be planned, designed, and maintained in order to protect landscape, spatial values and to create liveable spaces.

It should be noted that regulations regarding cemeteries, as much as funeral services, vary between countries, but the phenomenon of cemetery is common. The general nature of this research should be of universal character and applicable to all jurisdictions across the field of land planning (Fig. 6). One important consideration in the location of cemeteries is its relative universality and permanence. That is why the issue of planning location and cemetery design should be in the special interest of the general public.

As population and mortality rates increase in Europe, the need arises to develop new cemeteries. This method allows for the selection of several suitable cemetery sites as soon as possible, at lowest possible cost and taking into consideration geotechnical and environmental constraints. The level of accuracy in the process, however, is largely dependent on the availability and accuracy of the data used, any specialist investigations undertaken and finances available to undertake such investigations. This methodology should be supplemented with education, educating both authorities and the general public of the risks associated with poorly sited cemeteries.

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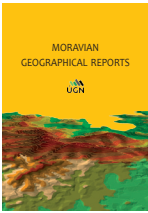
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# Perception of safety and passage of time as factors influencing mode choice: The case of the Prague-Munich high-speed route

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## Abstract

*Behavioural factors of risk perception and time perception influencing the mode choice on the Prague-Munich route in relation to railway as a reference mode, are subject to evaluation in this article. Semi-structured interviews are qualitatively analysed using the Grounded Theory method and ATLAS.ti software, giving specific sets of meanings and understandings of selected factors, which in turn affect the travel behaviours and the mode choice. Defining these factors creates space for estimating and proposing perspectives for the development of expected travel behaviours in the context of the planned high-speed rail (HSR) system on the Prague-Munich route. The significance of this research lies in creating new meaning fields of selected factors in the specific transport infrastructure with four existing transport modes between Prague and Munich. The results based on the formulated concepts show two different meaning fields of risk – the concept of perceived risk of an accident and the concept of personal safety. Empirical results of time perception show four different meaning fields of time perception based on a preferred transport mode. Finally, the results are used for creating contextual perspectives for HSR planning across Czech – German borders.*

**Key words:** *high-speed rail, risk perception, passenger-perceived time cognition, mode choice, grounded theory, theory of planned behaviours, Czech Republic, Germany*

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## 1. Introduction

For many years, researchers have been trying to decipher complicated patterns of transport behaviours, with particular emphasis on understanding the reasons for preferring certain modes of transport over others. Socio-psychological factors, such as perceptions of identity, habits and norms, are increasingly being explored in order to better understand mode of transport choice (e.g. Bamberg and Schmidt, 2001; Forward, 1998; Galdames et al., 2011; Kaewklungklom, et al., 2017; Steg et al., 2001; Tertoolen et al., 1998; Verplanken et al., 1994). Many other studies (Anable, 2005; Bamberg et al., 2003; Rothengatter and Vaya, 1997) use psychological theories of attitudes to predict transport mode choice. Theories generally agree in the conclusion that the mode choice is to some extent influenced by decisions, personal attitudes, habits or, for example, various external and internal obstacles (Bamberg and Schmidt, 1998; Forward, 1998; Hunecke et al., 2007).

While increasingly sophisticated research and analysis of transport behaviours enables researchers to better

understand the process of choosing a mode of transport, sets of ideas and a deeper understanding of unperceived and hidden socio-psychological behavioural factors are seldom analysed. Especially in geographical research that is traffic related, qualitative approaches are still infrequent – yet such approaches can shed more light on the above-mentioned psychological factors. This study is based on the analysis of two hitherto little studied factors of transport mode choice, namely the perception of safety and the passage of time during the journey. We use a Grounded Theory method (hereinafter GTM; Glaser et al., 1968; Strauss and Corbin, 1994), where the analytical process consists of data coding, development, control, and integration of new theoretical categories (Řiháček and Hytych, 2013).

This study is based on interviews with passengers on the Prague–Munich route (see Fig. 1), to define the content of selected safety factors and the passage of time, and to estimate perspectives in the preference for transport modes in relation to future High-speed rail (hereinafter HSR) development, with emphasis on these factors. The results of

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semi-structured interviews with a total of 30 informants – passengers by bus, car and plane in comparison with a train journey in the autumn of 2019 – are evaluated.

A discussion of the existing literature studying the factor of perceived safety and the factor of the passage of time is first presented in detail. Subsequently, methodological approaches are discussed, in which the form and construction of questionnaires, data collection and the method of their evaluation using the Atlas. TI software for the analysis of qualitative data are described. The methodological part is followed by the empirical part with the presentation of the results for the mentioned factors. The role of gender in connection with the concept of both factors is also evaluated in more detail here. In the end, recommendations, and implications for the perspective construction of HSR on the Prague–Munich route are proposed.

## 2. Theoretical background: Conceptualisation of travel safety and passage of time

### 2.1 Perception of safety

One of the key socio-psychological factors in the mode of transport choice is fear, or rather perceived safety, which can significantly influence human behaviours in the form of ideas about the safety of individual transport modes. Maslow (1970) ranked the feeling of safety and security as a biological need second only to the basic physical and physiological needs of humans. Thus, in his view, the feeling of safety is the imaginary second cornerstone of human needs. Perceived safety as a part of perceived behavioural self-control plays an important role in the patterns of resulting behaviours, found also in the fundamental theory of planned behaviours of Ajzen and Fishbein (1980). There have been several studies on perception of safety in the literature outside of East Central Europe, but no research on this specific socio-psychological factor of mode choice in the context of HSR has been done in any academic environment of the Czech Republic and neighbouring regions.

In this paper we present a hypothesis that the cognition of transport safety can be conceptualised into two areas:

- i. Fear for one's own health or life due to the risk of a traffic accident; and
- ii. Fear of assault and harassment, which is associated with theft, inappropriate behaviours, transgression in an unknown environment, etc.

#### 2.1.1 Safety as a perceived risk of a traffic accident

The connection between the human perception of fear and the possibility of a traffic accident is a relatively frequently examined relation in the literature. The human perception of safety is often differentiated according to the type of transport mode (e.g. Backer-Grøndahl et al., 2009; Roche-Cerasi et al., 2013; Rundmo et al., 2011). Specific differences in the perception of safety across different transport modes have been demonstrated in relation to travel behaviours (Backer-Grøndahl et al., 2009). The transport behaviours of people are not fully rational, however, because statistically the most dangerous transport mode – the car – is the most used means.

Previous research on the general perception of transport risks has found that transport risk falls into two main categories: public and private transport mode (Moen and Rundmo, 2006). Backer-Grøndahl et al. (2009) take this division into two categories and enrich it by finding that the probable interpretation of the difference between these factors is related to whether one must communicate with other people in a given transport mode. In private transport, as opposed to public transport, there is no need to interact with other people, which in turn can mean a potential risk for passengers using public transport. Within public transport, the threat of unpleasant events, violence, robbery, etc., are more relevant than the threat of an accident. In the case of air transport, on the other hand, many people are afraid to fly, despite favourable accident statistics.

In private transport, which most often consists of individual car transport, psychological studies have found that car drivers generally rate themselves as more qualified

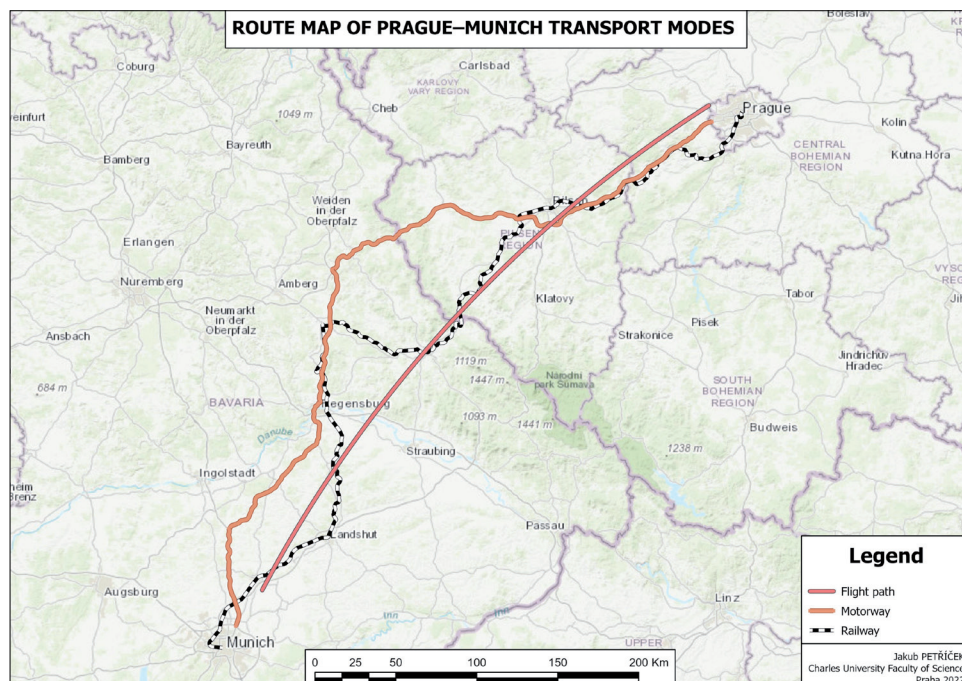


Fig. 1: Route map of Prague–Munich transport modes  
Source: authors' elaboration

than the average driver (Delhomme, 1991; Goszczynska and Roslan, 1989; McCormick et al., 1986; Svenson, 1981;). This means that drivers perceive it as safer when driving themselves, compared to driving with another driver or using public transport. The idea of self-control over the vehicle is therefore important in this concept. The feeling of self-control does not appear psychologically when using public transport, and trust in public transport drivers may be less compared to self-control in driving a private car.

The perception of safety related to the risk of travelling by transport mode is therefore directly linked to the mode of transport used and its nature in terms of public vs. private transport. Perceived control over private modes of transport, knowledge of safety and trust in institutions differs significantly for passengers who frequently use individual car transport compared to those who prefer public transport. Nordfjærn and Rundmo (2011) conclude that greater concerns about accidents are expressed by passengers in private transport. Rundmo et al. (2011) further elaborate that the perception of safety in individual and public transport is also something that most passengers have personally come to terms with and do not consider them to be a key factor in their transport decisions. Passengers are generally able to think reasonably and calmly about the mode of transport choice, as they are aware of the risks and perceive their decision without fear of the risks arising from the use of specific modes of transport.

Backer-Grøndahl et al. (2009) conclude that fears of accidents affect changes in the transport behaviours of private vehicles, while concerns about unpleasant events cause changes in behaviours in public transport. The results of a study by Nordfjærn and Rundmo (2011) highlighted a significant increase in vehicle safety priorities related to transport safety. From these examples, the mode of transport choice is a complex process where the objective danger is reduced or modified by factors of a subjective nature.

An exception to thinking about the risk of an accident is air transport. If an air accident occurs, the consequences are usually serious. People try to suppress thinking about a traffic accident as part of their transport behaviours, however, even though these consequences can be serious (Rundmo et al., 2011). Passenger self-control is more influenced by the generally accepted truth about the very low probability of an air accident in the context of accidents of other modes of transport. Major air disasters or global pandemics (e.g. the events of September 11, 2001, or the COVID-19 pandemic) lower the motivation to use air travel. These events can evoke an increased fear of air travel in humans (Gigerenzer, 2004; Lamb et al., 2020).

On the contrary, passengers think about rail transport differently. The study by Nordfjærn et al. (2014) shows that rail transport is most chosen by passengers who fear an accident, while it is not sought after by passengers who fear theft or harassment, for example.

### 2.1.2 Personal safety

Perceived self-control as a factor in the mode of transport choice is not only affected by the perception of the risk of an accident. The second component of perceived safety in transport is the feeling of personal safety. Safety is generally considered by Gilovich et al. (2001) to be a subjective feeling that pertains to our rapid, instinctive, and intuitive responses to danger. Loewenstein et al. (2001) talk about risk as a feeling, hypothesising that those responses to

danger and risk situations are due in part to direct emotions such as fear and anxiety. Similarly, Zajonc (1980) mentions a sense of security in relation to emotions, arguing that emotions may be primarily cognitive and may also precede cognitive action.

In the case of concerns about harassment or assault, there is probably a fundamental difference in the means of individual transport versus public transport. A private transport mode provides its own environment, controlled by the owner, who decides who will be allowed into the transport mode, etc. Although public transport modes place greater emphasis on respecting societal norms that should ensure safety, however, in subjective human perception, public transport, with its risks to personal safety, can at the same time limit the user's comfort and evoke feelings of discomfort, anxiety, etc. Compared to individual transport, the risk of terrorism, harassment and violence is generally perceived more in public transport. Due to these concerns, passengers who perceive a high risk of such events may tend to avoid public transport, even if it is in some cases the most timewise and economically advantageous option for a given route (Nordfjærn et al., 2014).

Various concerns about personal safety are also noted from the perspective of gender research. Several studies such as Delbosc and Currie (2012), Hsu et al. (2019), Levy (2013), Yavuz and Welch (2010) examined the gender factor influencing the perception of risk in transport (such as crime, harassment). The gender factor plays a role in the perception of the environment in a transport mode, which is risky, especially for women, and less so for men. Gender-based concerns about personal safety may subsequently discourage the use of a certain transport mode, especially public ones with shared public space. The feeling of safety in connection with gender, however, tends to have generally a smaller effect on passengers' willingness to use public transport and its frequency.

The Health Belief Model (Rosenstock, 1974) and The Protection Motivation Theory (Rogers, 1975) shed light on the background of the safety factor for individual behaviours. Theories agree that an individual's perception of safety is important in his or her behavioural intentions. This is especially in cases where decisions involve a high degree of uncertainty. Based on these theories, it can be assumed that passengers who are concerned about their personal safety when travelling by public transport will prefer to drive more often to reduce this risk due to their protection. Conversely, people who perceive safety from the point of view of a car accident will tend to gravitate toward using public transport. In the area of perceived transport behaviours, it is therefore crucial to divide and identify both levels of perceived safety.

### 2.2 Perceived passage of time

The second factor examined, the passage of time, is mentioned by many as important for understanding the relationship to society's travel behaviours (e.g. Algers et al., 1996; Wittmer and Laesser, 2010). The perceived journey time on the road directly affects passenger satisfaction and is therefore a crucial factor for passenger travel behaviours (Meng et al., 2018). In this paper, examining perceived passage of time on a specific route, where possible types of delays are well documented by passengers in four travel modes, brings a considerably novel methodology in the context of the perceived passage of time, especially in the post-socialist Central East European region.

Previous studies have examined the perception of time spent by passengers waiting (Fan et al., 2016; Hess et al., 2004; Lagune-Reutler et al., 2016; Millonig et al., 2012; Watkins et al., 2011). Studies generally agree that passengers generally perceive real-time waiting for public transport as longer, especially when no real-time traffic information is provided (e.g. departure information boards).

The common factors of this perceived “extension” of time are most often a lack of comfort, travelling in rush hour traffic, an emotionally longer time when transferring or walking to a stop in the case of public transport. The general definition of the value of travel time is always based on the highest benefit, which depends on the choice of a specific alternative (in our case, the mode of transport), considering key variables such as income, price, and other characteristics. In general, there is ambiguity among authors in the research literature in specific definitions and specifications of travel time, depending on the examined mode of transport, type of trip, etc. Hensher (2001) defines travel time as the willingness of a passenger to financially compensate for a certain amount of time saved. Becker (1965) operates with the concept of direct benefit from travel time, where the passenger clearly prefers the way of spending time in the transport mode over the total absolute value of travel time. Wardman (2001) highlights the role of possible complications in total travel time, such as rail delays, traffic congestion, accidents, cancellations, vehicle failures, and others. Givonni and Banister (2012) speak of travel speed itself as a less important element in the context of HSR than the total perceived travel time.

Existing literature (Cheng and Tsai, 2014; Meng et al., 2018; Wittmer and Laesser, 2010) explains the longer perception of time in consciously perceived slow situations (e.g. traffic congestion, train delays) and unpleasant situations (e.g. bad weather, overcrowding). On the contrary, pleasant, and fast situations increase the speed of subjective time due to the concentration on a given pleasant event (e.g. refreshments on the train, conversation with friends, etc.).

Usually, research on estimates of perceived time focuses on only one mode of transport, most often only on public transport. In public transport in particular, journey times are one of the basic elements that strongly influence passengers’ views on the quality of transport services (Krygsman et al., 2004). For example, during the time spent waiting at a station, passengers generally expect to board the bus as soon as possible. Another reason for the longer perception of time is registered for passengers who are exposed to a lack of comfort, overcrowding and bad weather. This time is perceived by passengers longer than they spend in the context of the whole journey (Beirão and Cabral, 2007).

Hall(2001) and Meng et al. (2018) elaborate on the perception of time by claiming that waiting times are perceived differently by passengers based on age. Post-productive age passengers generally perceive waiting time as shorter than productive age passengers.

Research often discusses only the transfer phase and the waiting time, not the entire riding time. The current research contributes to the literature by examining the relationship between actual and perceived value of travel time across all existing modes (aircraft, bus, train, car) on a particular route, considering the specifics of these modes of transport in relation to existing transport infrastructure on the route, the possibilities of activities on the way, the purposes of passenger journeys, frequency and the quality of services.

In the Czech environment, Máca and Braun Kohlová (2019) studied the topic of the passage of time. Their study concludes that the value of time spent in a traffic jam is almost twice the value of the time spent travelling in freely flowing traffic. Máca and Braun Kohlová (2019) highlight the economic benefit of reducing traffic congestion compared to reducing travel time in normal smooth traffic without delay. This evidence confirms the crucial importance of distinguishing between different travel modes in assessing the benefits of transport infrastructure.

### 3. Methodology

For the empirical part of the study, a traffic-sociological survey was conducted, which was carried out among airline users, bus passengers and passengers by car on the Prague–Munich route. The survey, which was part of the research on the OP RDE New Mobility, was carried out with a qualitative research strategy. The aim of the transport-sociological survey was to map independent information about the opinions, preferences, and habits of informants. The results of semi-structured in-depth interviews with a total of 30 informants were evaluated – 12 passengers on the Prague–Munich route by bus, 7 by car and 11 by plane. After the main research, eight travellers by train on the route Prague–Domažlice were interviewed in the Spring of 2020. Due to COVID-19 restrictions causing cancellation of international trains to Germany, these answers were not evaluated in this analysis because of incoherence among the interviews and the non-international route of those travellers. Descriptive data of all participants are presented in Table 1 below.

In the interview, the informants expressed their views on the transport mode used in comparison with the train journey. If they had not used the train, they were informed about the alternative use of the train connection (speed, frequency, price). The conversations took place in the autumn of 2019. The participants were recruited with respect to the diversity of their education, gender, different productive age groups, and income groups.

The construction of the questionnaire resulted from the main goal of the survey – to define selected safety factors and the passage of time that affect the mode of transport choice on the Prague–Munich route in relation to the railway as a reference mode. Qualitative data collection techniques

| Focus groups by preferred transport mode | Number of respondents by gender |        | Average age | Average income [net, thousands of CZK] |
|--|---------------------------------|--------|-------------|--|
|  | Male                            | Female |             |  |
| Car                                      | 5                               | 2      | 38          | 30–39                                  |
| Bus                                      | 6                               | 6      | 40          | 20–29                                  |
| Aircraft                                 | 6                               | 5      | 37          | 40–49                                  |

Tab. 1: Descriptive data of participants in the preferred transport mode groups on the Prague–Munich route  
Source: authors’ survey

were used to achieve this goal. Three group discussions based on preferred transport mode (car, plane, bus) were held – focus groups and several dozen collections of in-depth semi-structured interviews in specific environments of train stations, bus stations and airports. These methods are characterised by a defined purpose, a certain syllabus and great flexibility of the whole process of obtaining information. These are very effective qualitative methods that allow a deep insight into the researched issues with the knowledge of the target group (Hendl, 2005).

The structure of the interview was based on the theoretical concept of the Theory of Planned Behaviours (Ajzen, 1991; Heath and Gifford, 2002). Sets of safety factor questions have been divided into sections to find out the reasons for their choice, with an emphasis on the reasons for their sense of security or danger, to find out how passengers feel about their sense of safety and whether their views differ from their travel behaviours. The individual transport modes on the route were also compared. The sets of questions about the passage of time focused on the feeling of slow or fast passage, travel activities and consciously unpleasant situations. The questions also emphasised determination of the preferences of the selected transport mode in relation to the passage of time. The aim was to identify the different thinking of passengers in the context of their choice of transport connection and the purpose of the trip.

The questions and answers were deepened during the discussion to find out the most precise reasons, preferences, and habits of the passengers on the route. The interviewers emphasised listening to the narratives of the communication partners and the informal conception of the conversations. The interviews were recorded and subsequently transcribed into text documents. The individual questions were structured and transcribed in such a way as to distinguish the intentions and the resulting actions of the passengers in the mode of transport choice.

The results were evaluated by the Grounded Theory Method (GTM) (Glaser et al., 1968; Strauss and Corbin, 1994) and analysed by a software tool for evaluating qualitative data: ATLAS.ti. The basis of GTM is an organised and interactive approach to data collection and analysis using the so-called “constant comparison method”. The analytical process contains four basic steps: data coding, development, control, and integration of theoretical categories (Řiháček and Hytych, 2013). At the beginning of the process, the data were coded and compared

to analyse potential preliminary categories, which were then collected into more general ones. With the help of open code assignment and conceptualisation of data (for example, accidents, accident frequency with statements about the feeling of safety), a gradual essence of analysed factors was created with assigned concepts (e.g. risk of car accident, slow flow waiting in a queue at the airport). In this phase, emphasis was placed on the search for relationships between selected concepts that have hitherto been abstract in nature (e.g. the presence of flight crew vs. personal safety in the aircraft). Based on these relationships, which explained the idea, principle, and experience valid across various statements or situations, content structures were subsequently created that fulfilled the concepts of security and the passage of time.

In the second phase of the evaluation, the declared relationships between the created concepts were sought and the hierarchy and final explanation of the concepts were determined. Subsequently, parts of the informants' statements were assigned to the concepts created on the principle of theoretical axial coding (Glaser, 1978; Strauss and Corbin, 1999). Several variants of the investigated phenomena were found in the statements of informants. In the last part of the GTM process, the created concepts were synthesised within the factor of perceived safety and the passage of time, thus creating the final concept, which is presented in the following section.

## 4. Results and discussion

### 4.1 Perception of safety

The basic research goal was to try to uncover and understand the perception of safety in relation to travel behaviours. The aim is to create a final concept, which is preceded by the search for relationships and connections using inductive methods according to GTM for qualitative data evaluation. When using the GTM-based methods, we tried to avoid just listing the concepts in our research. Attention was paid to the interpretation of a meaningful background and the story of the two formulated concepts. The result is a graphical representation of the thematic structure of statements about perceived safety in transport modes on the Prague–Munich route. The structural analysis of the statements revealed generally two basic units, which stand side by side in the perception of safety as different concepts of safety (see Fig. 2).

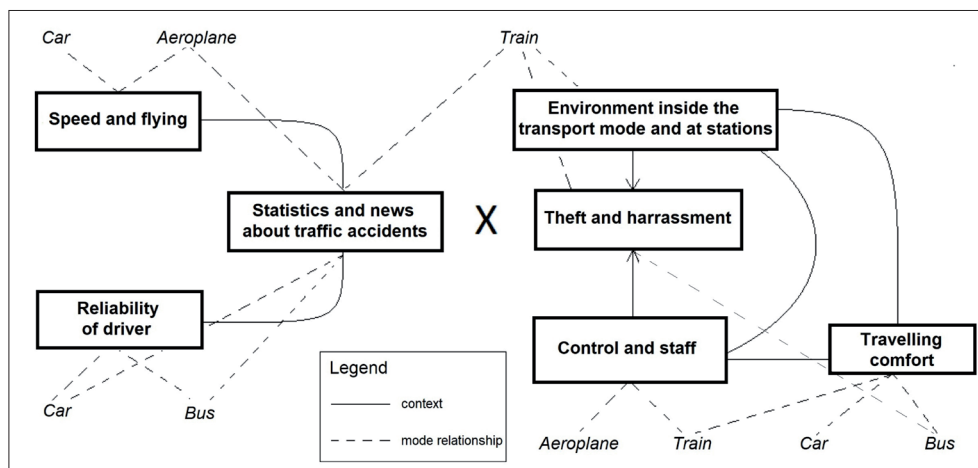


Fig. 2: Thematic structure of safety statements on the Prague–Munich route  
Source: authors' data collection and representation

#### 4.1.1 Accident frequency as an idea of safety

The left part of the thematic structure (Fig. 2) shows passengers' perceptions of safety from the point of view of accident frequency. This level is formed through ideas of safety in the statistical concept of the number of accidents on individual transport modes, which are directly related to factors such as vehicle speed in the case of cars, fear of altitude or flying at altitude in the case of air transport, and for bus and car connections, professionalism, and confidence in the driver. Passengers perceive the ideal safe transport mode in terms of the number of accidents or the chances of an accident differently, based on their experience, information from the media, their own observations, or assumptions about the statistical number of accidents, as evidenced by the following set of statements:

I feel safest on the bus. It's because of statistics that I follow a lot. I know that a car is much more dangerous than a bus... I know that flying is statistically safest, but I am extremely afraid of flying, so I try to fly as little as possible. I don't feel good about it, I usually feel ill... When I can, we always go by car, bus or train... There is nothing I can do about far-away journeys. For example, I had to fly to Malta, of course.

There are definitely fewer accidents on trains. I perceive the train as being safer than a plane or bus. Especially now after having just seen the news about the bus in Nitra.

My husband doesn't drive badly, but he's so distracted in the car, so I have a greater sense of safety and comfort on the train.

I see buses as the most dangerous in terms of accidents. I don't feel comfortable or safe there. It's too big, you don't even know who's driving the bus (if he's tired, if he's a good driver). At least they have an autopilot on the plane if the pilot falls asleep.

... or when I see some suspicious behaviours on the part of the driver, that they are bored, not paying attention to driving or not paying attention to the traffic. It has happened to me several times. From this point of view, I think that the road is not completely safe.

From the statements of these informants, fears about the quality of drivers and their behaviours behind the wheel, which shape the informant's ideas about the safety of traffic modes, are clear. Based on their perceptions and personal experiences, they attach preferences to individual transport modes in terms of safety. In the case of air transport, the perceived safety is determined by the height at which the aircraft moves or the general fear of flying. Some informants explain their fears of flying precisely because of the fear of height, and this fear is in most cases not explained by any rational argument, but informants perceive it so emotionally.

I don't know why, but I'm most afraid of the plane. Surprisingly. It is somehow connected to the fact that a person is in the air. When I'm firmly on the ground, whether by bus or train, I feel much safer. Maybe it's nonsense – it's a feeling.

It's supposed to be safest by air. Of course, everyone has a slight feeling of fear before boarding a plane, they don't think about this before boarding a train or bus.

A common element of all the above-mentioned statements is the perception of safety from the point of view of a traffic accident, although it may be caused by various conditional factors, which may contribute to the resulting traffic

accident to different degrees. These scales do not allow conceptualisation to be more accurate, but their nature is obvious. A higher safety risk is associated with the perceived quality of the driver and confidence in their abilities.

#### 4.1.2 Personal safety as a factor of mode of transport choice

The second half of the thematic structure (Fig. 2) explains the perception of safety at the level of personal safety, which is inextricably linked to travel, especially by public transport (Backer-Grøndahl et al., 2009; Rundmo et al., 2009; Rundmo et al., 2011). The level of personal safety is formed through the ideas and experiences of respondents with theft, harassment, generally different social environments, or personal control, which together more or less make the journey more pleasant for passengers in different modes of transport. As a result, these ideas and experiences generally formulate an opinion on the comfort of travel by the transport mode themselves, which is summarised in the following statements.

By bus – one believes or I don't know how to explain it – the presence of on-board staff also plays a role, it depends on the people around. But I still like to take the bus.

[On the plane] it is also reassuring that no one can have weapons, liquids or anything dangerous there. You never know on a train or bus...

The feeling of safety [on the plane] is probably derived from the fact that I'm just sitting and being taken care of by flight attendants.

There is more control on the plane, they check people several times at the airport, flight attendants are always walking around the plane and checking what you are doing.

Within the framework of personal safety in transport, informants show sensitivity to harassment, the social environment (drunks, rioters, vandals), but also the physical environment (passenger car, station environment, nearby park, etc.).

There are a large number of passengers on the train. The train stops at more places where passengers get on and off, and they can steal your luggage, so I can never sleep on the train.

Theoretically, I'm afraid of rioters and drunks, but that usually doesn't happen on long-distance routes when it's going straight and doesn't stop anywhere. I'm not really afraid. But theoretically, there is a higher risk that someone drunk will come in to harass me.

Then, of course, the danger can come from fellow passengers. It has happened several times that, for example, when someone was drunk, the bus stopped, and the police, for example, had to pull the drunk off the bus and arrest them.

A common feature of personal safety statements is generally the passengers' perceptions of the control of the space of the transport mode. The psychological factor of security checks and the presence of cabin crew has been shown many times in similar research to be an important factor in the mode of transport choice (Backer-Grøndahl et al., 2009). Potentially unpleasant situations and environments when travelling by train or bus are considered by many authors to be a more important safety factor than the risk of an accident (Rundmo and Moen, 2006; Rundmo et al., 2011).

The results of our research also show differences in the perception of safety based on gender. In terms of a qualitative comparison, in our sample of informants,

mostly women talk about personal safety when being asked about the train as a reference mode. In general, women often cite assault and theft, especially at night, as reasons for personal safety concerns. Men, on the other hand, emphasise the experience of car accidents in their answers, or emphasise the presence of aircrew on business trips by plane, which is in line with the professional literature on gender in transport (Dobbs, 2005; Fyhri and Backer-Grøndahl, 2012; Gordon et al., 1989).

An analysis of the narratives of our informants shows that the safety factor has two structural levels (Fig. 2):

1. The level of accident frequency, in which it is primarily a perception of safety in terms of a possible traffic incident. This is conditioned by accident statistics, driver quality and the physical environment of the vehicle's movement (e.g. flying in the air); and
2. Level of personal safety, which is conditioned by factors of comfort, control, physical environment (e.g. coupe, platform), but also the social environment of individual means.

#### 4.2 Perceived passage of time

The aim of the research of this factor was to understand the perception of the passage of time in connection with travel behaviours for selected modes of transport on the Prague–Munich route, based on the search for relationships and connections using inductive methods according to GTM for qualitative data evaluation. In contrast to the previous section on safety, the passage of time is assessed and compared between the transport mode examined for clarity. The purpose of the analysis of the passage of time was to understand the meanings and relationships between individual structures. First, a rough structure was created by dividing the codes based on the relationships of faster and slower passage of time of the selected transport mode in comparison with other investigated means.

From this very extensive rough structure of the comparison, after indirect recoding, four indirectly observed and implicitly expressed meaning fields were subsequently derived and constructed:

- On regular trips to work, time passes the fastest by bus;
- Time passes the fastest on a comfortable train;
- Time passes the fastest by plane because it moves the fastest; and
- Time flows the fastest in one's own means due to independent movement and the possibility of individual mobility.

The first meaning field is a characteristic of statements about regular business trips. For some informants, a certain connection can be observed in the faster passage of time if they are not travelling on the route for the first time, as described by Givonni and Banister (2012). This frequency of connections is then the basis for a rapid perception of travel time, in which the optimal balance of the distribution between distance perceptions and total time perceptions plays a key role, as discussed by Wittmer and Laesser (2010). The journey by bus in this meaning field is perceived based on the statements of informants as the fastest in comparison with all other modes of transport, precisely due to the speed of time in the bus. The meaning field of the "fast" bus, characterised by the ability to spend time with the passenger's favourite activities (sleeping, reading, watching movies) and the emphasis on the slow flow of time

traveling by plane (respondents compared this when asked by the interviewer), waiting at airports, airport checks and in general throughout the airport check-in process:

I sleep, read, look out the window, talk to my friends. It passes by faster.

Subjectively, my journey passed faster by bus because we slept.

The connection between the passage of time in the bus and the purpose of the journey and the regular long-distance mobility is also evidenced by the passenger whose purpose of the journey is business. She rides on the route regularly and does not consider the time spent on the bus to be long. Time passes by quickly, because she is already used to travelling on the Prague–Munich route for work. Habituation, together with regularity, is one of the reasons for the final choice of bus, as confirmed, for example, by the study by Verplanken et al. (1994) or Aarts et al. (1997):

... I must say that, to me, the journey by bus seems faster and more comfortable ... In Munich, I change to a bus to Stuttgart, where I have work responsibilities ... I've travelled six times this year, counting the trip back and forth as one trip."

The second meaning field is characterised by train journeys in connection with travel comfort. Comfort plays an important role for passengers when travelling not only in terms of safety, but also for train passengers. From the statements of the respondents, the connection between the comfort of the train and the fast perception of time on the journey is clear. The time spent on the road thus passes by faster for passengers, if, for example, they can walk in the car, work comfortably, shorten their time with refreshments in the dining car. It is important for parents to entertain children in a compartment with enough space to paint, read and relax:

Speaking for myself, train transport is safer and more comfortable for me, both in terms of the fact that I can use the toilet at any time, or have a snack or enjoy the countryside, or possibly work on a laptop.

Since we have a child, we most often play, sing, talk – in short, we try to keep the little one entertained. If I ride alone, I read or relaxed. This is an advantage of the train. You have fun and the journey goes by faster.

The third meaning field connects statements about the rapid passage of time in an aircraft in connection with its higher cruising speed and the associated faster passage of time. The average speed of a direct flight from Lufthansa on the Prague–Munich route is almost 320 km/h. This speed is strikingly reminiscent of the territory of HSR speeds, which by their very nature should be the largest competitor at medium distances for air transport (Albalate et al., 2015; Dobruszkes, 2011).

The statements regarding the reference train show complaints about unsatisfactory railway connections on the Prague–Munich route with too complicated, slow, and often expensive rail transport. The common feature of this group is the passage of time in the form of the absolute priority of a rapid transfer from Prague to Munich and back, which in 2019 is provided only by Lufthansa by direct flight. For the time being, the current railway connection does not yet allow a one-day return journey.

Well, it takes a long time by train. So there is that Western Express, it takes 8 to 9 hours. I have a feeling, but it doesn't solve the transfer... That would be a matter

for the whole day. So, I have a meeting there tomorrow, so I'll fly there and be back tomorrow night, while the train cannot offer similar conditions. Yes, it's faster and even with the transfer in Munich, if it flew straight, it's the easiest... But unfortunately. That means, in terms of price, I think it would be more expensive – in addition, those international train journeys are certainly more expensive.

I would be motivated to reduce my travel time by train if it was a high-speed train. If we had a choice between 50 minutes by plane and 2 or 3 hours by train, we would choose a train. The hours spent at the airport in advance, check-in, etc. would be eliminated. In the same way, we would choose a train if there were no direct flights between the two destinations, or we would consider another country to fly to.

The main summary of the third meaning field for the passage of time is the definition of a key decisive factor in the passage of time – the speed that passengers potentially demand even for the high-speed transport system on the Prague–Munich route. With the current train connection with an average speed of 78 km/h, however, the railway is uncompetitive with direct air connections, despite the several hours of waiting at an airport that passengers can overlook.

As reasons for the faster passage of time in the fourth meaning field of the car, the informants state the motorway speed resulting from the presence of quality motorways between the cities of Prague and Munich, and the possibility of individual rest while driving, the possibility of refreshments along motorways, and the overall individuality in the process of choosing the route, for example in the case of traffic jams:

Sometimes I go for a smoke, so neither the train nor the bus allows me to do this, so for me the best option is a company car and a gas station stop.

On the contrary, some informants mention the potentially slower passage of time in the car during traffic congestion, which again supports the theoretical discussion (Cheng and Tsai, 2014; Meng et al., 2018; Wittmer and Laesser, 2010) about the slower passage of time in unpleasant situations. On the contrary, pleasant situations, such as riding with friends, can speed up the passage of time in the car.

If the traffic is smooth, then I perceive [passage of time] well. If there is a traffic jam on the road, as in the case of D1, then the road becomes a horror.

Congestion is difficult to avoid in certain sections, although there are various applications, such as Waze, which help drivers, and car navigation is connected to a radio station and looking for detour routes, but in my experience [the Prague–Munich route] it is such a well-conceived route that there are usually no traffic jams. Traffic jams may form in front of Munich at rush hour around 4 pm, but this is nothing dramatic. Passing by this route is usually fine.

I was a little worried about D1, but today you can download various applications, and I've seen that D1 is passable, although there are a lot of restrictions. And then from that Prague, as we went to Pilsen on to Munich, it went fine there.

It depends on whether I'm driving alone or with someone. If I'm driving alone, I learn English or some education. Sometimes even movies, but that would have to be a really long trip. Sometimes I read a book, it really depends. When we drove in a group, I drove. We talked about what we were up to and listened to the radio. The time passed by quickly."

Overall, the effects of habituation due to regular bus use, the effects of individualisation and freedom of movement in independent and flexible car travel, the effects of speed and ability to travel within 24 hours by plane, and the effects of comfort when travelling by train can be considered as crucial.

#### 4.3 Perspectives for HSR

The defined concept of safety should also be considered for the perspective construction of HSRs and their successful use. The analysis of perceived safety in transport modes showed two completely different levels of safety perception: the level of perception of safety in terms of accidents that rail transport does not suffer much from, and the level of personal safety (Tab. 1). In the context of the future construction of high-speed train connections on the Prague–Munich route, the perceived safety of the examined competitive transport mode will play an important role for travel behaviours, or for deciding on the use of transport mode on the route.

In terms of the passage of time, the advantage of rail transport has been clearly demonstrated in the form of a road comfort factor, which guarantees passengers a feeling of fast travel (Tab. 1). The required comfort combined with a fast and smooth journey with the possibility to work on the train could serve in the future as a primary marketing tool and a convincing argument for moving from the plane to HSR on the Prague–Munich route.

Travel time must also be competitive so that passengers can use the rail for a day trip there. The planning strategy should be aimed at changing the mode choice attitude from aircraft to HSR, by emphasising the slow flow of time while waiting at the airport and emphasising the fast flow on HSR. Emphasis should be placed on the prestige associated with high ground cruising speeds and low accident frequency. At the same time, however, HSR travel should retain the hallmark of a safe transport mode with a high degree of control, which must not consciously slow down the feeling of travelling by train, as is the case with waiting at airport checks. HSR must maintain the image of safe travel on the question of safety without the threat of terrorism, just as air transport has done. As can be seen from Table 2, the disadvantages of the railway can be eliminated by frequent inspections by on-board staff or by increasing the culture of the station environment and, of course, by increasing the travel speed thanks to HSR.

Investments in HSR on the Prague–Munich route should be made with a sense for the above-mentioned defined factors, which are often neglected in HSR research strategies.

## 5. Conclusion

Safety and the passage of time in transport are complex topics of interest to many social scientists, which creates space for different perspectives. In our case, the analysis of perceived safety in vehicles made it possible to define two completely different levels of safety perception: (1) the level of accident frequency, in which the perceived general safety of individual modes of transport plays a role; and (2) the level of personal safety, in which, in addition to the identified reasons, the role of gender manifested itself. The results showed a higher sensitivity of women to the level of personal safety in public transport, and for men, on the contrary, "riskier" thinking about safety in terms of accident frequency.

| Choice factor   |                   | Aircraft                       | Train  | Bus                               | Car   |
|-----------------|-------------------|--------------------------------|--|-----------------------------------|---|
| Safety          | Risk of accident  | High, fear of flying           | Neutral  | High, infrastructure              | Marginalised if he/she drives or has an experienced driver  |
|                 | Personal safety   | High, the presence of staff    | Low fear of theft  | Medium, fear of theft             | High, except for car pooling                                |
| Passage of time | Slow time passage | Waiting at the airport, checks | Low travel speed   | The necessity to sit in one place | Traffic congestion, boredom behind the wheel                |
|                 | Fast time passage | Top travel speed               | Comfort, constant passage of time, possibilities to work | Regular travel for work           | Quality highway, independent feeling, using one's own means |

Tab. 2: Summary table of the influence of selected factors on transport modes on the Prague–Munich route (Notes: Red disadvantages of the train against the aircraft, green advantages.)

Source: authors' data collection and representation

The analysis of the passage of the time lapse factor showed four different views on the passage of time, which are derived from the preferred mode of the passenger. Bus users highlight the fast passage of time on the bus since they take the trip with a certain regularity. Aircraft users emphasise the high speed of transport, which gives them a feeling of a fast passage of time. Regular drivers and car passengers explain their quick journey by being able to set off at any time, regardless of the timetable, and highlight high-quality motorways that give them the opportunity to drive fast. The reference train connection is perceived, as pertains to passage of time, in connection with the feeling of comfort and the possibility to have fun on the train with a wide range of activities, including work. In addition to the slow passage of time due to the check-in process at airports, the passage of time on the plane and on the train is perceived equally in the context of distance: the advantage of a faster passage of time on an aircraft only becomes apparent when travelling longer distances, where the time physically spent on the aircraft is longer than the time spent at the airport during the check-in process.

From this understanding of safety and the passage of time, positive perspectives can be drawn for HSR planning on the medium-to-long-term Prague-Munich route. The results of the survey showed where further investments should be made to make the railways more attractive. In addition to the current low speed, the level of personal safety appears to be the biggest weakness of the choice of railways, which does not yet correspond to similar controls in air transport. HSR planning should not only focus on traditional economic and travel time factors, but also on the physical and social environment of vehicles, platforms, and terminals in terms of personal safety perception, as well as quality service in the field of flight crew service.

The resulting concepts are formed and developed by the passengers themselves with their ever-changing dynamic transport behaviours. How strong the driving forces in travel behaviours and mode choice in the factors of safety and the passage of time will be, will be demonstrated by the actual commissioning of the high-speed line on the Prague–Munich route. Due to the long-term planning and implementation of HSR, however, this connection may operate in a completely different transport and social context than it is today.

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*Fig. 9: Piódão, a protected village in the Centre region of Portugal where there are some TER establishments (Photo: L. Silva)*



*Fig. 10: Monsaraz, a protected village in the Alentejo region where and around which there are multiple TER establishments (Photo: L. Silva)*