

# Testing urban dwellers' sense of place towards leisure and recreational peri-urban green open spaces in two European cities

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January 2020, Cities 98

*Please cite this article as:*

Žlender, V., & Gemin, S. (2020). Testing urban dwellers' sense of place towards leisure and recreational peri-urban green open spaces in two European cities. *Cities*, 98, 102579.

**DOI: 10.1016/j.cities.2019.102579**

## Abstract

This study uses sense of place to empirically compare, in two case study cities, how people connect with the peri-urban green space which they visit most often for their leisure activities. Based on a literature review and identified gaps in previous research, we developed a conceptual model which explains the factors that contribute to how people form a sense of place. We hypothesize that involvement with and appreciation of peri-urban green spaces, used by urban dwellers for leisure activities, are reflected in people's sense of (peri-urban) place. Furthermore, we hypothesize that sense of place affects people's place-concerning behaviour towards peri-urban green spaces, fact which can contribute to the planning and management of peri-urban areas.

Principal components analysis and structural equation modelling (SEM) were used to test the study hypotheses using data collected from 328 inner-city dwellers in Ljubljana and Edinburgh. Results indicate positive and significant effects of place involvement and appreciation on sense of place, and positive and significant effects of sense of place on place-concerning behaviour. Findings demonstrate that understanding people's sense of place towards peri-urban green spaces is crucial for promoting place-concerning behaviour and, consequently, prioritizing effective policy responses to ensure the sustainable future of these areas.

## Keywords

Comparison of European cities

Place appreciation

Place-concerning behaviour

Place involvement

Structural equation modelling (SEM)

Urban fringe

## Highlights

- Place involvement and appreciation increase sense of place.
- Sense of place positively and significantly influences place-concerning behaviour.
- Most of an individual's background variables do not influence sense of place.
- Sense of place has an important role in enhancing peri-urban areas' sustainability.

## 1. Introduction

Peri-urban open spaces are areas between urban and rural settings, which have, until recently, gained some attention in academia but less in planning practice and policy. This is largely due to these spaces being viewed as transient areas that will be developed in the future. However, the neglect of peri-urban spaces, in combination with weak land-use planning, may have negative

impacts on their long-term development, such as: the depreciation of their intrinsic value and, consequently, people losing attachment to these places; a decrease in ecological value and physical accessibility for leisure purposes; and, perhaps, unwanted patterns of development, such as urban sprawl.

On the other hand, peri-urban open spaces have been recognised as important settings for a variety of purposes: outdoor recreation, people feeling close to nature, relaxation from stress, and aesthetic experiences (see Bonaiuto, Fornara, & Bonnes, 2003; Neuvonen, Sievänen, Tönnies, & Koskela, 2007; Tyrväinen, Mäkinen, & Schipperijn, 2007).

These contradicting academic findings indicate that the knowledge of people's attitudes, feelings, and behaviours towards peri-urban open spaces is still lacking, although it is important for developing peri-urban areas in a way which best suits their users. Sense of place (SOP) is one of the place concepts which offers opportunities to understand the types of spaces people would prefer and frequent, which is crucial for inclusive planning and policy-making. We define SOP as a unidimensional concept, comprising the emotional, functional, and cognitive responses to a particular place.

The present research derives from the question: how intense is the level of involvement of urban dwellers with peri-urban recreation places? Although they may not visit these spaces on a daily basis, they might have lived in the area since childhood and traditionally visit such open spaces. Furthermore, do they appreciate these places, and how does that influence their sense of place? We assume that people who are firmly rooted in a place appreciate peri-urban open spaces and have a strong sense of place towards them. Furthermore, urban dwellers who have a strong sense of place will be more supportive of environmentally sustainable future behaviours than dwellers whose sense of place is weaker.

Accordingly, this study has three primary aims: 1. To conceptualize a model for sense of place for peri-urban open spaces. More specifically, we aim to understand how sense of place can help explain the behaviour of visitors towards peri-urban green open spaces, which they use for leisure and recreational activities; 2. To empirically test the proposed conceptual model (see Fig. 1) in peri-urban green open spaces in selected cities in Europe; 3. To provide planners and policy-makers with practical guidelines for integrating sense of place into policy formation.

We explore peri-urban open spaces within the European context of medium-sized cities, where most of the population lives (Giffinger, Fertner, Kramar, & Meijers, 2007). The peri-urban open spaces under focus are the large-sized open spaces at the edge of the city (e.g., hills, fields, semi-natural areas, green corridors, beaches/lakes/bodies of water, country parks, and protected areas—national reserves, regional parks). The study group comprises inner-city dwellers, chosen because peri-urban open spaces are not located close to their homes. Moreover, several studies have explored sense of place in people who live nearby or own open spaces (Jorgensen & Stedman, 2001; Soini, Vaarala, & Pouta, 2012; Stedman, 2003), but no study was found which focused on the sense of place of inner-city dwellers.

We also attempt to understand how people's backgrounds are associated with the development of place-based meanings. Among several aspects, the socio-demographic characteristics of individuals and their interaction, familiarity, and connection with the place were included. The proposed conceptual model and hypotheses are tested with structural models. The tested research model of the components and relationships among them, based on the survey of inner-city dwellers in two European cities, provides both theoretical and practical evidence for which variables directly or indirectly influence SOP. We hope that this will enable a better understanding of the key factors that can enhance the SOP and beneficial future behaviour of visitors towards peri-urban green open

spaces. This may provide empirical evidence for urban planners and policy-makers to motivate residents to be more involved in the leisure and recreational opportunities that peri-urban green open spaces offer.

The findings described in this article are part of a larger research project (Žlender, 2014), which explores the role of people's perception and usage of peri-urban open spaces in their management, using Ljubljana and Edinburgh as case studies. In the present paper, we focus on exploring the relationship between the sense of place of urban dwellers and their behaviour towards these areas. The investigation was done in selected peri-urban open spaces in Ljubljana and Edinburgh.

## **2. Theoretical framework**

### *2.1 Sense of place: defining the concept*

The concept of sense of place addresses the emotional, symbolic, and spiritual aspects of places. It implies a relational place concept, where undifferentiated space becomes place when we endow it with value (Y. Tuan, 1977). Similarly, Relph (1976) argued that the sense of place is about a person's understanding of a place; it involves experience and a subjective dimension. By contrast, Stedman (2003), Twigger-Ross and Uzzell (1996), and Hidalgo and Hernández (2001), among others, argued, on the basis of their empirical examinations, that the construction of place meaning is not only social, and that the composition and characteristics of the environment's physical components also affect how people perceive and interpret sense of place. We propose that the sense of place is a complex affective bond between people and a specific location.

Sense of place has been explored in a number of disciplines, resulting in the development of a plethora of approaches, concepts, and methods. In the field of urban planning and landscape research, sense of place has been extensively used to explore aspects such as place preference (de la Barrera, Reyes-Paecke, Harris, Bascuñán, & Farías, 2016), landscape valuation (Brown, 2004; Brown & Raymond, 2007), care for a place (Hull, Lam, & Vigo, 1994; Jorgensen & Stedman, 2001; Soini et al., 2012), natural resources and landscape management, including access to and control over the land (Farnum, Hall, & Kruger, 2005; Larson, De Freitas, & Hicks, 2013; Sakurai, Ota, & Uehara, 2017), and aesthetic quality of the landscape (Rudolph, Kirkegaard, Lyhne, Clausen, & Kørnøv, 2017). Furthermore, different factors which influence SOP have been researched, such as gender, age (Cuba & Hummon, 1993; Rollero & De Piccoli, 2010), familiarity with a place, reflected in length of residence (Fleury-Bahi, Félonneau, & Marchand, 2008; Gu & Ryan, 2008) and frequency of visits (Bricker & Kerstetter, 2000; Moore & Scott, 2003; Shamai, 1991), physical attributes of places (Stedman, 2003), property ownership (Jorgensen & Stedman, 2001). A variety of places differing both in spatial levels (Cuba & Hummon, 1993; Hidalgo & Hernández, 2001; Shamai, 1991) and types of green spaces (Smaldone, 2006; Stedman, 2003) have also been examined. It should be noted that most of the studies explore urban open spaces, whilst considerably less studies can be found which focus on rural and peri-urban green spaces; specifically, the empirical use of the sense of place concept in the peri-urban milieu is still far from substantial (Soini et al., 2012). Moreover, the relationships between SOP and different psychological concepts have been tested, such as place involvement (Hwang, Lee, & Chen, 2005; Lee, 2011; Rogan, O'Connor, & Horwitz, 2005), appreciation and attractiveness (Cheng, C. Wu, & Huang, 2013; Soini et al., 2012), environmental knowledge (Cheng & Wu, 2015), and visiting satisfaction (E. Halpenny, 2010; Ramkissoon & Mavondo, 2015; Ramkissoon, Smith, & Weiler, 2013). However, there is no consensus whether SOP is the causative or explanatory factor of the others (E. Halpenny, 2010; Ramkissoon & Mavondo, 2015).

Regarding terminology, 'sense of place' has been used predominantly in human geography, whilst environmental psychologists most commonly use the term 'place attachment' (Kyle, Mowen, &

Tarrant, 2004; Williams & Vaske, 2003). As such, the concept encompasses a whole array of place-related phenomena, such as place dependence, identity, satisfaction, rootedness, social bonding, etc. Among these, three components of sense of place—place attachment, identity, and dependence—consistently appear in the environmental psychology literature. Place attachment is defined as a positive emotional bond that develops between a person and their environment (Jorgensen & Stedman, 2001). Although Anton and Lawrence (2014) criticized this definition as vague, and how to define it more precisely has been the subject of debate (Maria Lewicka, 2011), it remains the most commonly used definition in environmental psychology. Next, place identity is a person's sense of identity, constituted by the physical and symbolic properties of locations (Proshansky, Fabian, & Kaminoff, 1983), while an individual's functional attachment to a place is termed 'place dependence' (Stokols & Shumaker, 1981)—it relates to the activities that take place in a setting, and it indicates its capacity for the intended use. It is not necessarily positive, involving a comparison of one setting to a range of alternatives for what a person likes to do.

The above-mentioned confusion regarding the definition and composition of SOP contributed to a variety of ways in which SOP has been measured in the environmental literature. Most studies have treated SOP as a multidimensional concept which includes place attachment, identity, and dependence; social bonding; satisfaction; rootedness; and others (e.g., Halpenny, 2010; Kyle et al., 2004; Ramkissoon et al., 2013; Swaffield & Primdahl, 2006; Williams & Vaske, 2003). However, structural relations between the dimensions of place attachment, identity, dependence, and other related concepts are discordant. For example, a stream of researchers (Brown & Raymond, 2007; Gross & Brown, 2008; Hwang et al., 2005; Qian, Zhu, & Liu, 2011; Williams, Patterson, Roggenbuck, & Watson, 1992) consider place attachment as an overarching dimension, with place identity and dependence being sub-dimensions. By contrast, Stedman (2003) views place attachment and identity as identical concepts, and Jorgensen and Stedman (2001) consider place attachment, identity, and dependence as parallel dimensions under the overarching concept of SOP. We employ the unidimensional concept (Lewicka, 2010; see Jorgensen & Stedman, 2001, for a discussion) in which the emotional, functional, and cognitive links to a place are not split into components.

## *2.2 Place involvement*

In the present study, place involvement is understood as a cognition—a type of knowledge and understanding which one has developed after integrating various acquired information (Folkes, 1988). Specifically, place involvement is a combination of: first, the extent to which an individual is involved in environment-related activities, such as leisure involvement (Lee & Shen, 2013) and place knowledge (Kyle et al., 2004); and second, an individual's deep familiarity with a place—place belongingness or place rootedness (Y. F. Tuan, 1980). People usually have a stronger connection with their place of birth, due to the positive bond which already forms during childhood (Hay, 1998; Hernández, Hidalgo, Salazar-Laplace, & Hess, 2007; Morgan, 2010). Moreover, according to Stegner (1992, cited in Hammitt, Backlund & Bixler, 2006) people develop extreme rootedness when they have experienced and shaped a certain place, by being born to a place, growing up, living, and dying there. Research on outdoor recreation indicates that feelings of place involvement, such as a deep connection with the environment and/or other people through place-people interactions (Manning, 1986), are important for recreation experiences. This applies especially to the long-term use of recreational places, for example, by a family for a number of generations (Milligan, 1998).

## *2.3 Place appreciation*

We consider place appreciation closely related to environmental sensitivity, which emphasizes an individual's affection and concern for the environment (Bagozzi, Gopinath, & Nyer, 1999;

Peterson, 1982, cited in Cheng & Wu, 2015). Furthermore, place appreciation includes characteristic experiences, triggered by specific attributes of the environment (Stedman, 2003), and have been found to form the foundations of attachment and satisfaction (Sack, 1997, cited in Stedman, 2003). Therefore, characteristic experiences are considered an important reason for place appreciation in the present study as well.

Place appreciation, sensitivity, and also involvement have been frequently studied in leisure, tourism, and recreation research; however, only a limited number of studies have explored the relationship between place appreciation and sense of place (or other place constructs). A study by Cheng & Wu (2015), for example, has shown that when tourists have emotional concerns and are sensitive to their travel environments, they will easily develop higher place attachment to a tourism destination.

#### *2.4 Sense of place and place-concerning behaviour*

It has been suggested that sense of place is a favourable concept to research an individual's behaviour towards a place (E. Halpenny, 2010; Raymond, Brown, & Robinson, 2011). A great array of studies consider sense of place as a determinant of positive behavioural intentions towards a place (Cheng & Wu, 2015; Halpenny, 2010; Kaltenborn, 1998; Stedman, 2002; Stewart, Bell, Sanesi, De Vreese, & Arnberger, 2011; Walker & Chapman, 2003, see Halpenny, 2010, for a review). Whilst earlier studies focused on the long-term relationship with and commitment to a place, which determines people to develop attachment and enhanced place-concerning behaviour (Hines, Hungerford, & Tomera, 1987; Relph, 1976), recent studies have been researching whether attachment to a place is associated with low or high pro-environmental behaviour (e.g. E. Halpenny, 2010; Ramkissoon et al., 2013), and whether greater satisfaction with a place is a reason for a greater engagement in pro-environmental intentions (e.g. Davis, Le, & Coy, 2011; Jabarin & Damhoureyeh, 2006; Oguz, 2000). Annerstedt van den Bosch and Depledge (2015) also suggested that pro-environmental behaviour can be induced by external triggers, particularly by experiencing the natural environments.

#### *2.5 Sense of place and peri-urban open spaces*

To understand the association between peri-urban landscapes and sense of place, first, the relationship between sense of place, landscape, and place should be clarified. From the phenomenological perspective, landscape refers to the physical setting and is a mixture of natural and cultural elements to be analysed (Soini et al., 2012), whilst a place does not always have to be a physical location. It means human and physical environments combined (Shamai, 1991; Y. Tuan, 1977). In the discipline of environmental psychology, concepts related to the study of place are mainly multi-faceted. Canter (1977) understands 'place' as a compound of three categories: activities that people may be involved in; the physical attributes of the environment; and the conceptions which people hold of the behaviour in that physical environment. In order to examine the meaning of landscape, Thayer (2002) built a three-dimensional model of perceptual, functional, and symbolic dimensions, which are reflected in human relationships to landscape—technophilia (affection for and dependence upon technology); topophilia (love of land and nature); and technophobia (fear of the negative side effects of technology). His model is primarily related to the landscapes which have changed considerably through the development of new (technological) uses. To some extent, such landscapes could be linked to peri-urban areas, generally viewed as landscapes with a lost sense of place (Gallent & Andersson, 2007). Spirn (1998) argued that the term 'land' denotes both the place and the people living in it, and 'scape' means 'to form'; therefore, 'landscape' could mean a land or place shaped by somebody. Halpenny (2010) defined a place as a spatial location that is given meaning and value by society and individuals. Hence, landscape and place are interlinked and considered as such in this study.

Sense of place has been used to explore different spatial settings, but very rarely for the investigation of peri-urban open spaces and future behaviour towards them. The reason may be, on one hand, the elusiveness of the sense-of-place concept, which derives from the diversity of its definitions (Kaltenborn, 1998; Tapsuwan, Leviston, & Tucker, 2011) and on the other hand, the indefinite character of peri-urban landscapes and a lack of interest in peri-urban issues (Žlender & Ward Thompson, 2017); these are discussed in more detail as follows.

Peri-urban landscapes are characterised by the variety of its activities, land uses, and processes. They entail areas that vary from those which are completely natural, such as natural parks and wilderness areas, those with more rural characteristics—agricultural areas, allotments, woodlands, and country parks—and those with very urban land uses: industrial hubs, wastelands, and shopping malls. A considerable amount of literature describes the peri-urban landscape as an area with low identity and recognisability (in comparison with the urban or rural landscapes), and an undefined but complex space in terms of usage and typology (Gallent, Andersson, & Bianconi, 2006; Qviström & Saltzman, 2006; Shoard, 2002). Other expressions that are used among authors when defining the character of the peri-urban landscape are, for instance, ‘ambiguous’, ‘fuzzy’, and ‘transitional’, suggesting that there is no clear-cut dividing line between urban and rural, or city and countryside, respectively. These designations point to the complexity of the peri-urban areas, which is a considerable challenge to the city authorities, practitioners, and theorists.

The relevance of place theory to attitudes towards peri-urban landscapes becomes apparent when considering the relationship between SOP and the way peri-urban open spaces are perceived by different groups of people. Sense of place is connected with meanings and values people hold for certain areas, hence, it encompasses beliefs on how places should be managed and developed in the future (Yung, Freimund, & Belsky, 2003). Accordingly, understanding people’s sense of place is important in effectively managing and maintaining the quality of environment (Andkjær & Arvidsen, 2015; Derr, 2002). Moreover, sense of place can be used to promote pro-environmental behaviour by imposing upon an individual’s willingness to protect meaningful places (Lehman & Geller, 2004; Ramkissoon et al., 2013; Relph, 1993; Y. Tuan, 1977), and, potentially, raise environmentally-responsible behaviour in other facets of an individual’s life (Vaske & Kobrin, 2001). However, this connection is less clear than the relationship between sense of place and place-specific pro-environmental behaviour (E. Halpenny, 2010) and, therefore, is not central to this study.

## *2.6 Hypothesized model*

The conceptual frame of this study stems from attitude-behaviour correspondence research, which has demonstrated that attitudes can be strong predictors of specific behaviours (Eagly & Chaiken, 1993; Fishbein & Manfredo, 1992; Williams & Vaske, 2003). We use a conceptual framework, based on the relationships between ‘cognition’, ‘affection’, ‘attitude’, and ‘behaviour’ (Cheng & Wu, 2015), to consider how personal involvement with a place and appreciation of peri-urban green spaces potentially affect the attitude of visitors towards the place. Attitude encompasses an individual’s evaluation regarding specific behaviour (Ajzen & Fishbein, 2000). In this view, sense of place can be considered a type of evaluation of subjective cognition and affection. On the other hand, behaviour refers to the concrete actions of an individual (Ajzen, 1985), whereas the place-concerning behaviour is the adopted action. Hence, cognition and affection influence attitude, and attitude influences behavioural intention (López-Mosquera & Sánchez, 2013). However, we suspect that the sequence is not always linear, and that direct and/or indirect effects between these factors exist. Therefore, in the present study, we hypothesize that deep place involvement and a high degree of place appreciation will reinforce urban dwellers’ SOP towards peri-urban open spaces they visit

and, finally, they will exhibit place-concerning behaviour towards this place. We also suspect that there exists an indirect effect of place involvement and place appreciation on place-concerning behaviour. Using this framework to measure attitudes towards peri-urban green spaces should provide an accurate estimate whether visitors will behave in a place-concerning manner. The findings of this study should help authorities to learn how to develop place-concerning behaviour in visitors of peri-urban areas.

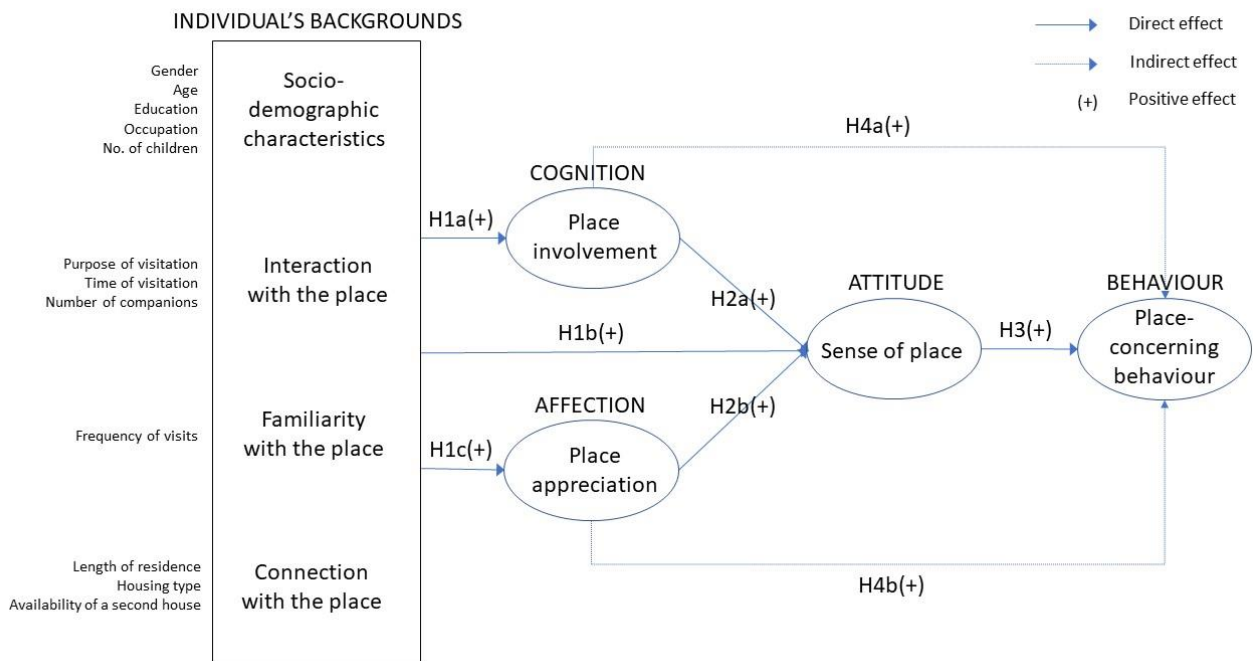
Based on the literature review (see sections 2.1–2.4 for details), we set the following hypotheses (Figure 1):

H1(a, b, c): An individual’s background (socio-demographic characteristics, the individual’s interaction, familiarity, and connection with the place) influences place involvement (H1a), place appreciation (H1c), and sense of place (H1b).

H2(a, b): Both place involvement (H2a) and place appreciation (H2b) have significant and direct impact on sense of place.

H3: Sense of place has a significant and direct impact on place-concerning behaviour.

H4(a, b): Both place involvement (H4a) and place appreciation (H4b) have significant and indirect impact on place-concerning behaviour.



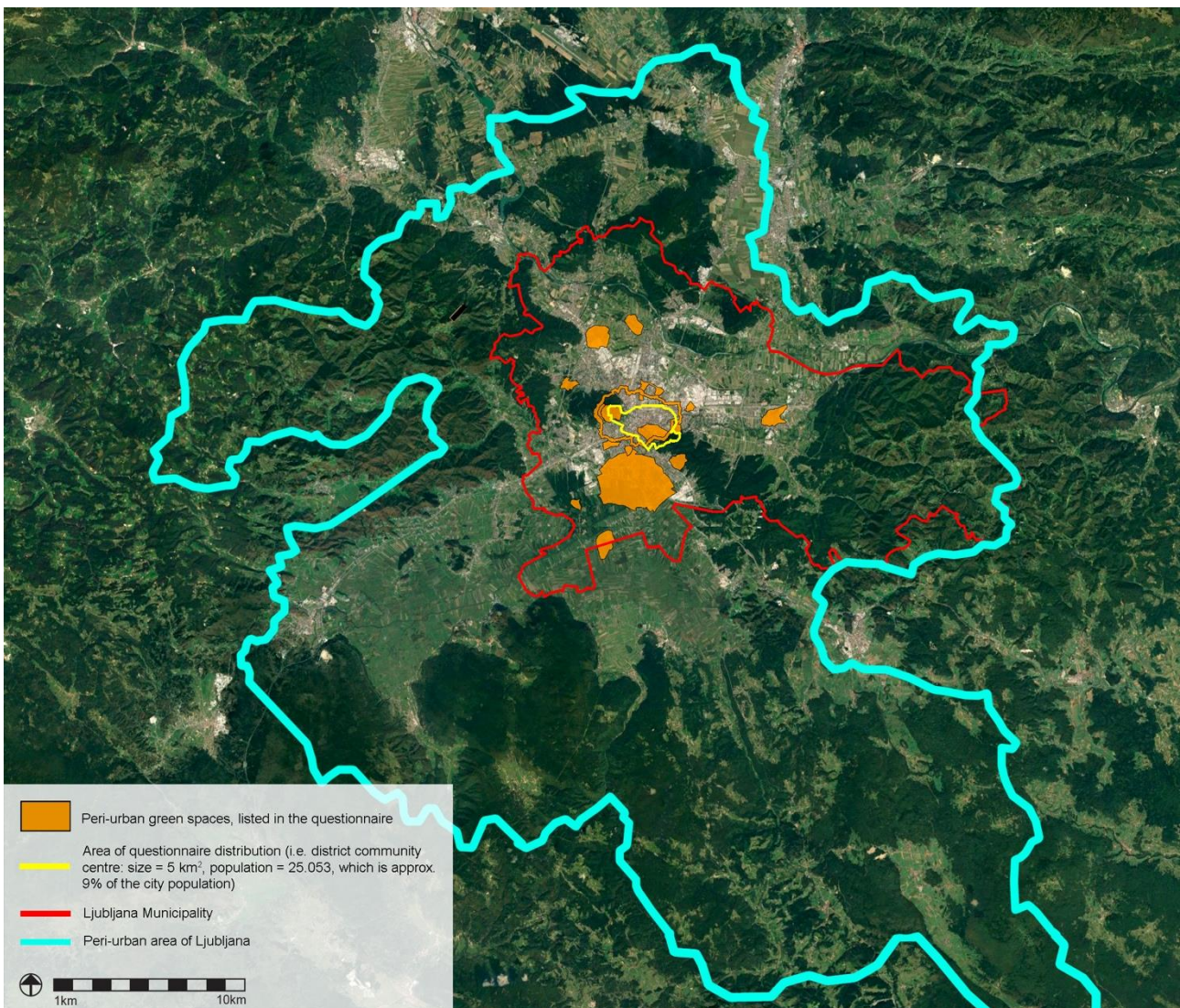
**Fig.1.** The conceptual model

### 3. Methods

#### 3.1 Study context

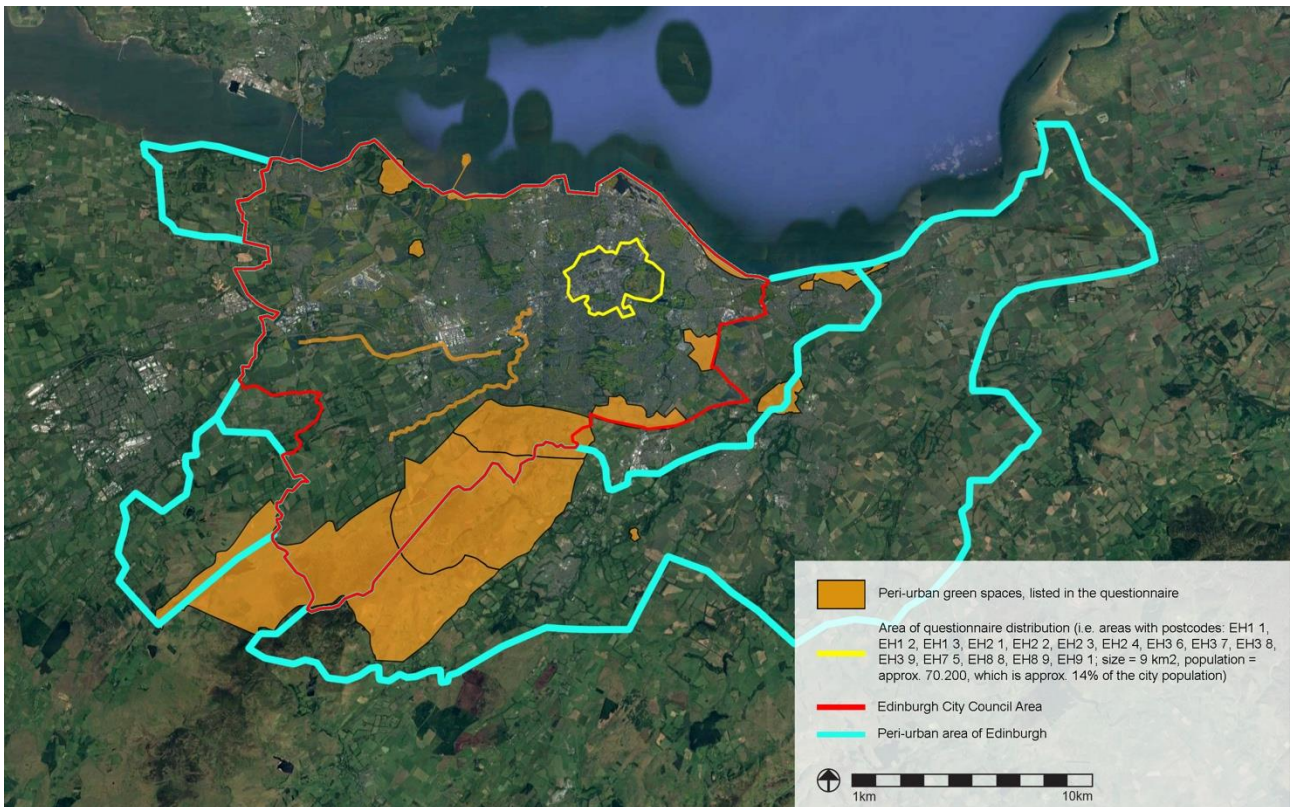
Two European cities, of similar sizes and population levels, Ljubljana and Edinburgh, were selected as case study cities for data collection. Ljubljana and Edinburgh are both growing cities, which significantly affects the development and change of open spaces at their edges. With populations of approx. 482,000 (Edinburgh) and 280,000 (Ljubljana), they are both considered medium-sized European cities (populations between 100,000 and 500,000), which are the types of cities where most of the European population lives (Giffinger et al., 2007). Cities of this size have an important role in Europe’s economic development, and have been affected by peri-urbanisation in the last decades, but they tend to be overlooked in urban research studies, which favour focusing on larger cities and metropolises (Giffinger et al., 2007).

The peri-urban landscape of Edinburgh mostly pertains to the green belt area. This area was designated 50 years ago with the main objective to limit further expansion of the city and to prevent the agglomeration of urban areas. Apart from putting a greater focus on the preservation of land for recreational purposes over the protection of land for agricultural use, the initial objective has not changed much since it was first laid down in the green belt plan. The green belt has remained well preserved until now, with the exception of minor adjustments that have been made to some parts of Edinburgh's inner and outer boundaries. Contrastingly, Ljubljana has developed in a star-like form, which has enabled the preservation of relatively extensive natural areas, especially forests, which reach from the city-centre to its outskirts and beyond. These so-called 'green wedges' form the urban and peri-urban open spaces of Ljubljana. They encompass ecologically important sites and forest areas with recreational character. Details of the study areas (with emphasis on the structures and peri-urban areas of both cities) and data collection process are discussed in Žlender and Ward Thompson (2017).



**Fig.2.** Various boundaries of the Ljubljana case study: peri-urban area of Ljubljana, as defined in this study, Ljubljana municipality border, area of questionnaire distribution and peri-urban green open spaces, listed in the questionnaire.





**Fig.3.** Various boundaries of the Edinburgh case study: peri-urban area of Edinburgh, as defined in this study, Edinburgh city council area, area of questionnaire distribution and peri-urban green open spaces, listed in the questionnaire.

### 3.2 Data collection

To collect data, we used self-administered questionnaires developed to collect views of urban dwellers in both cities on the: (1) General use of, and access to, green spaces in and around the city; (2) The leisure and recreational behaviours of respondents, and their access to specific peri-urban green spaces; (3) The perceptions of and attitudes towards their most often visited green, peri-urban open space; (4) Socio-demographic information for the respondents, such as age, education, gender, current occupation, whether they have children, type of housing, length of residence, and whether they have a second house or not. In this paper, we focused on part (3). In part (2), respondents were given a list of various peri-urban green open spaces (for example, hills, fields, semi-natural areas, beaches, lakes, green corridors, country parks, protected areas, etc.; see Figures 2 and 3) and were asked to select, from the list, their most visited green space. In part (3), respondents' answers were related to their preferred green space, as selected in part (2).

Since this study focused on the views of urban dwellers, the questionnaire, in Slovenian and English as appropriate, was distributed among residents of each city's centre area. In Ljubljana, all distributed questionnaires were paper-based: 900 samples were administered to randomly chosen household post boxes in the assigned area. Respondents were asked to return the completed samples, within 14 days from their distribution, to collection boxes provided in the foyer area of each building. The returned samples were checked to verify whether the respondents' age corresponded to the distribution area census data. There was a shortage of older respondents (aged 60 years or more) in the data collected by this method, and so additional responses were collected via a snowball approach. In total, 163 (an 18% response rate) of valid questionnaires were collected. In Edinburgh, questionnaires were initially collected via an online survey and convenience sampling. The total number of valid questionnaires, collected via the online survey, was 77.

However, the respondents' age profiles lay primarily in the 18–29 years old age group. Therefore, additional paper-based questionnaires were distributed in public parks, children's playgrounds, community centre interest groups, voluntary organisations, etc., to try to achieve a balance of ages among respondents. The number of questionnaires collected in this way was 88.

### 3.3 Measures and analysis

We developed multi-item scales to operationalise and empirically examine hypotheses concerning the relationships between place constructs. Scales were pre-tested through administering a questionnaire to a network of colleagues, using a snowball approach. Based on the feedback of 30 respondents and two peer-reviewers, part (3) of the questionnaire was shortened, and the clarity of the survey items was enhanced.

Sense of place, place involvement, and place appreciation were measured by 13, 3 and 3 items, respectively, on a five-point Likert scale type, ranging from 'Not at all' (1) to 'Completely' (5), and an additional 'Don't know' option. The items were adapted from Jorgensen and Stedman (2001), Deutsch et al. (2010), Soini et al. (2012), and Semken et al. (2009). Aligned with the hypothesis in this paper, each item was adjusted and the scale to measure SOP drew in the emotional, functional, and cognitive response to a place.

Since there is no generally agreed scale for measuring behavioural intentions (E. Halpenny, 2010), scales were specifically developed for this study, in line with its aims. Place-concerning behaviour too, was measured on a five-point Likert scale, with four statements, making the final number of statements equal to 23.

Because the statements '*As far as I am concerned, there are better places to be than at this place*' and '*These areas could be used for further housing or office expansion*', are negative in their nature when compared to all other statements, their scale has been reversed, assigning (5) to the 'Not at all' answers, and (1) to the 'Completely' ones.

Collected data were analysed by statistical methods, for both cities together and separately, where relevant. Descriptive analysis was used to understand the characteristics of the visitors. To investigate the presence of components in our set of variables, we used exploratory factor analysis (EFA). Structural equation modelling (SEM) was used to verify the hypotheses and test additional indicators which may explain differences in sense-of-place attitudes among individuals (i.e., their backgrounds). SEM is a statistical method which consists of two components, the measurement model and the structural model, and it shows a causal relationship among variables in a non-experimental situation. SEM allows researchers to investigate the statistical correlations between place dimensions by introducing latent variables, and it illustrates ways in which the variables are operationalised through their fitness indicators. This enables the comparison between different models and the search of alternative model structures. The R programming language, in combination with Lavaan package, was utilised for data processing and assessing the overall fit of the model.

## 4. Results

### 4.1 General characteristics of the respondents

The respondent pool was of average age of 44,6 in Ljubljana and 37,3 in Edinburgh (SD = 16.5, age range: 13–86). In Ljubljana, 31% of respondents were male and 69% were female. In Edinburgh, 28% were male and 72% were female respondents. The proportion of respondents with a university degree was comparable in both cities (about 30% of all respondents), with the difference being that

in Edinburgh, there were more respondents with a postgraduate and PhD/MPhil degree. Most of the respondents, in both cities, were full- or part-time employed (51% in Ljubljana and 42% in Edinburgh), followed by retired (21% in Ljubljana, 7% in Edinburgh), and students (16% in Ljubljana and 35% in Edinburgh). Most of them lived in an apartment, with a difference being that in Edinburgh, half of the respondents lived in an apartment that had access to a communal garden. In both cities, working-age people and older people (above 60 years old) tended to stay in the same place longer (at least two years) than the other demographic groups. Overall, the respondents had lived in their city for more than two years. About 62% of the respondents in Ljubljana and 76% in Edinburgh had visited some peri-urban green open space in the past three years, mainly for walking and enjoying peace and relaxation.

#### 4.2 Scale testing

As an initial step in the analysis, a Kaiser-Meyer-Olkin (KMO) test for sample adequacy has been calculated separately for the two partitions of data related to the two cities, returning an overall KMO score of 0.69 for Ljubljana and 0.74 for Edinburgh. Scores above 0.5 or 0.6 indicate an acceptable level of adequacy (Kaiser, 1970). Single variable scores for each of the two cities have also been computed. For the sample of data collected in Ljubljana, the KMO score for the two variables '*I care about the future of this place*' and '*I'm not moving away from this part of Ljubljana/Edinburgh in the near future*' turned out to be lower than 0.5. Accordingly, these two variables were not considered in the further joint analysis. However, the sampling of these two variables for the Edinburgh sample was adequate, and so they were considered in the analysis of the Edinburgh case study. Similarly, the variable '*Priority green spaces should be identified and required to be well maintained*' was only used in the sample of data collected in Ljubljana. A Bartlett's test of sphericity (Bartlett, 1954) has also been performed for each of the two data samples, showing significant results in both cases ( $X^2 = 1137.38$ ,  $p = 0.0000$  for Ljubljana and  $X^2 = 1129.07$ ,  $p = 0.0000$  for Edinburgh).

To investigate the presence of a common model, we performed an EFA. Principal component analysis and Varimax with Kaiser normalization rotation gave the best result for the joint dataset, obtained from the responses to the twenty aforementioned statements (twenty-three initially considered and without the three that failed the adequacy test). After discarding factors with eigenvalues less than 1.5 and items with loading less than 0.4 on at least one factor, the resulting four factors were named: sense of place, place appreciation, place involvement, and place-concerning behaviour (Table 1). Fifteen out of the sixteen retained items had significant loading ( $> 0.4$ ) onto only one factor. The statement '*I feel relaxed when I am there*' cross-loaded onto two factors, sense of place (0.465) and place appreciation (0.440); therefore, it was discarded.

The internal reliability of each construct was confirmed by the value of the Cronbach's alpha, which resulted being greater than 0.69 for every factor (Cortina, 1993). As it can be seen from the grand means for each of the four factors, visitors in both cities relatively appreciate their visited peri-urban open spaces and have rather strong SOP towards their most visited peri-urban green open space. In both cities, they also nurture place-concerning behaviour towards their preferred place. However, they do not feel very much involved, with the difference between the respondents of the two cities being significant ( $t = 2.7327$ ,  $p = 0.0027$ ).

Table 1: Factor loadings of items in the exploratory factor analysis. Items are ordered by factor affiliation.

\*Statements to measure place attachment (PA), place identity (PI) and place dependence (PD) on the original scales adapted from Jorgensen and Stedman (2001), Deutsch et al. (2010), Soini et al. (2012), and Semken et al. (2009).

\*\*These items were not included in the SEM analysis due to low sampling adequacy.

\*\*\*These items either have loading lower than 0.4 on any of the resulting factor, or cross-loading on multiple factors.

\*\*\*These items have been reversed, since they are negatively stated.

Code	Factor	LJ		EDI		Whole dataset					
		Mean	Std	Mean	Std	Mean	Std	Component loading	% of variance	Cumulative % of variance	Cronbach's $\alpha$
	<b>Sense of place*</b>	3.06		3.19		3.21			17.8%	17.8%	0.81
SOP1	I feel happiest when I am there. (PA)	4.08	0.85	3.70	0.89	3.88	0.89	0.592			
SOP2	This place is my favourite place to be. (PA)	3.42	0.93	3.24	0.95	3.33	0.95	0.711			
SOP3	This place makes me feel as if I can be myself. (PI)	2.53	1.10	3.23	1.06	3.37	1.09	0.679			
SOP4	I really miss this place when I am away. (PA)	2.53	1.05	2.85	1.05	2.70	1.07	0.612			
SOP5	This place is the best place for doing the things that I enjoy the most. (PD)	3.34	1.08	3.14	1.04	3.23	1.06	0.729			
SOP6	As far as I am concerned, there are better places to be than at this place. (PD)****	2.45	1.15	2.99	1.09	2.75	1.15	0.434			
	<b>Place involvement</b>	2.72		2.16		2.43			12.0%	29.8%	0.77
INV1	I know this place inside out.	3.52	0.93	3.20	1.02	3.35	1.00	0.412			
INV2	My roots are here.	2.37	1.48	1.81	1.04	2.08	1.30	0.851			
INV3	I have spent the majority of my childhood here.	2.27	1.49	1.46	0.94	1.85	1.31	0.914			
	<b>Place appreciation</b>	3.47		3.64		3.57			10.3%	40.1%	0.69
APP1	This place and its surroundings are good just the way they are.	3.68	0.96	3.71	0.84	3.70	0.90	0.533			
APP2	There aren't any features of this place that annoy me.	2.99	1.07	3.40	0.98	3.21	1.04	0.736			
APP3	I feel as if I'm able to move freely in this place.	3.74	0.99	3.83	0.86	3.79	0.92	0.671			
	<b>Place-concerning behaviour</b>	4.47		4.34		4.38			9.5%	49.6%	0.74
PCB 1	These areas should be kept green and sparsely built.	4.62	0.72	4.33	0.82	4.43	0.84	0.768			
PCB 2	These areas should be kept in a natural state.	4.46	0.75	4.17	0.93	4.31	0.84	0.744			
PCB 3	These areas could be used for further housing or office expansion. ****	4.32	0.90	4.53	0.81	4.40	0.86	0.551			
	<b>Discarded items</b>										
	I feel relaxed when I am there. ***	4.36	0.76	4.21	0.63	4.29	0.70				
	I like this place because there are friendly people around. ***	3.36	0.91	2.64	1.14	2.97	1.10				
	I'm not moving away from this part of Ljubljana/Edinburgh in the near future. **	3.74	1.52	3.12	1.28	3.41	1.43				
	I care about the future of this place. **	3.38	1.62	3.82	0.88	3.61	1.29				

	This place and its surroundings have many local history and cultural features. ***	3.67	0.94	3.42	1.05	3.54	1.00				
	This place and its surroundings are important most of all for their forests and water features. ***	4.06	1.05	3.49	1.21	3.76	1.16				
	This place and its surroundings are important most of all for their open fields. ***	3.42	1.25	3.33	1.17	3.38	1.21				
	Priority green spaces should be identified and required to be well maintained (e.g. accessible walking routes, cycle paths, clearing away undergrowth and vegetation, good lighting at parking areas, etc.). **	4.24	0.73	4.27	0.93	4.25	0.88				

### 4.3 Structural equation model

The H2a, H2b, and H3 relationships (Figure 1) between the four factors, resulted from the EFA, have been tested using SEM with maximum likelihood estimation. We conducted a path analysis to simultaneously test hypotheses and determine the direction and significance of relationships. Fitting results are presented in Figure 4. When fitting the model on the whole dataset, the resulting overall fit indices for the SEM were: chi square ( $X^2$ ) = 149.317 ( $p = 0.000$ ), degrees of freedom (DF) = 86, comparative fit index (CFI) = 0.946, Tucker-Lewis index (TLI) = 0.934, root mean square error of approximation (RMSEA) = 0.048, and (standardized) root mean square residual (SRMR) = 0.056. On the grounds of the assessment guidelines from Hu and Bentler (1999), the achieved fit statistics indicate good basis to accept the proposed model to explain the relationship between sense of place and other constructs.

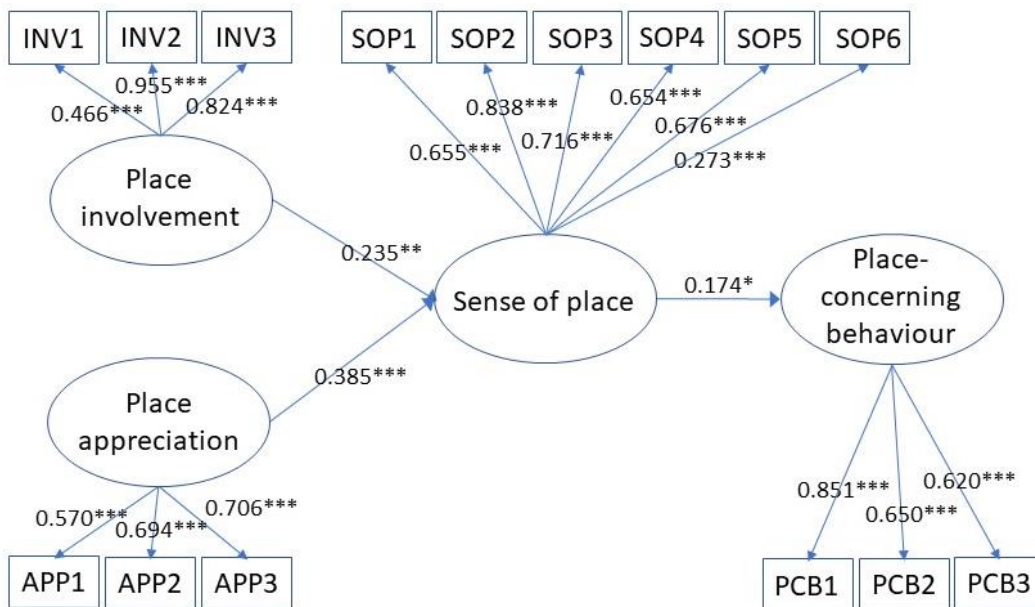


Fig. 4. The best-fitting model for the entire dataset. Note: \*\*\* indicates  $p < 0.001$ ; \*\* indicates  $p < 0.01$ ; \* indicates  $p < 0.05$  (comprehensive data is reported in Appendix).

Furthermore, we examined the strengths and fits of the hypothesised relationships for the whole dataset and, additionally, for each of the two cities separately (Table 2). In all three cases, the positive effect of place appreciation on SOP was confirmed, which indicates that the level of visitors' general appreciation of a place was significantly related to their emotional reaction and experience with a place. Similarly, the hypothesis of a positive effect of place involvement on SOP was confirmed. This indicates that visitors who are involved in a place, also have a stronger bond with their peri-urban green open space for leisure and recreation. It should be noticed that the effect of appreciation on SOP appears to be consistently more than 50% higher than the one given by place involvement. The hypothesis of a positive effect of SOP on place-concerning behaviour was confirmed for the whole dataset, suggesting that users who develop a bond with peri-urban open spaces will also exhibit greater concern for the sustainable future of these spaces. The performed path analysis for the whole dataset also confirmed that the indirect effects of place appreciation and place involvement on place-concerning behaviour are significant. To determine whether the role of SOP is mediator or moderator, we tested the significance of additional direct paths: place involvement  $\rightarrow$  place-concerning behaviour, and place appreciation  $\rightarrow$  place-concerning behaviour. Having obtained  $p = 0.685$  and  $p = 0.653$ , respectively, for these additional relationships, we concluded that their effects are not significant, and that SOP has a mediating role in the effects of place appreciation and place involvement on place-concerning behaviour. Therefore, we also confirmed the H4a and H4b hypotheses.

The SOP  $\rightarrow$  place-concerning behaviour direct effect, although significant, is weaker in comparison with the other two tested direct relationships, and a low amount of variability of the place-concerning behaviour variable can be explained by the model (R-square = 0.040 in comparison with R-square = 0.203 for SOP). This indicates that other variables should be taken into account as possible antecedents for place-concerning behaviour; what is more, reducing our data set by analysing only one city is likely to be the reason for the low significance of the relationships involving place-concerning behaviour, when tested on separate datasets.

Table 2. Estimated standard coefficients for the model relationships (comprehensive data is reported in Appendix).

Relationship	Whole dataset			Ljubljana subset			Edinburgh subset			Hypotheses
	$\beta$	z	p-value	$\beta$	z	p-value	$\beta$	z	p-value	
Place involvement $\rightarrow$ SOP	0.235	3.357	0.001	0.231	2.174	0.030	0.210	2.340	0.019	H2a: Accepted
Place appreciation $\rightarrow$ SOP	0.365	4.058	0.000	0.399	2.885	0.004	0.323	2.636	0.008	H2b: Accepted
SOP $\rightarrow$ Place-concerning behaviour	0.174	2.299	0.022	0.085	0.795	0.426	0.240	2.322	0.020	H3: Accepted overall and for Edinburgh subset
Place involvement $\approx \rightarrow$ Place-concerning behaviour	0.052	2.005	0.045	0.030	0.915	0.360	0.056	1.678	0.087	H4a: Accepted for the whole dataset
Place appreciation $\approx \rightarrow$ Place-concerning behaviour	0.080	2.130	0.033	0.052	0.950	0.342	0.093	1.886	0.062	H4b: Accepted for the whole dataset

To investigate hypothesis H1, we tested one by one, on the whole dataset and individually for each case study, the effect of each variable of an individual's background on the three previously identified latent variables. The estimated parameters are listed in Table 3.

A direct effect on SOP and on place-concerning behaviour was shown to be given by the frequency of visit. This indicates that a person who frequently visits a peri-urban open space for leisure and recreational activities, tends to develop an emotional attachment to it and be more concerned about the place. Not surprisingly, length of residence and age positively affect place involvement of the respondents in both cities. In Edinburgh, there is a significant inverse correlation between level of education and place involvement, probably due to the fact of being considered a temporary residence by the student population.

In Ljubljana, respondents with children seem to be more involved with, appreciate more, and build stronger sense of place towards peri-urban locations. The latter seems to also characterise active visitors and respondents who visit a place alone, or with a dog. Overall, the availability of a second house seems to reduce the appreciation towards peri-urban spaces, and respondents in Ljubljana living in homes with a private garden seem to show lower environmental concern about these spaces.

Table 3: Impact of an individual's background variables on latent variables. Only attributes with significant impact on at least one variable are reported.

Note: insignificant ( $p > 0.05$ ) total effects are not listed, \*\* indicates  $p < 0.001$ ; \* indicates  $p < 0.01$ .

Note 1: Categorical variables have been transformed into binary variables by grouping their possible values (Occupation: full-time employment, other; Purpose of visitation: active, passive; Time of visitation: a.m., p.m.; Number of companions: alone and/or with a dog, in a company; Housing type: housing with a private and/or common garden, housing without a garden)

Factor	Sense of place ( $\beta$ )			Place appreciation ( $\beta$ )			Place involvement ( $\beta$ )		
	LJ	ED	Whole dataset	LJ	ED	Whole dataset	LJ	ED	Whole dataset
<i>Socio-demographic characteristics</i>									
Gender									
Age	0.292*		0.197	0.366*		0.263	0.207	0.416**	0.314**
Education								-0.445**	-0.290**
Occupation	0.215								
Number of children	0.222			0.328*		0.209	0.204		
<i>Interaction with the place</i>									
Purpose of visitation	0.365*		0.151			0.174			
Time of visitation									
Number of companions	0.260		0.185						
<i>Familiarity with the place</i>									
Frequency of visits	0.368*	0.194	0.266**						
<i>Connection with the place</i>									
Length of residence							0.196	0.337**	0.341**
<i>Housing type</i>									
Availability of a second house						-0.205*			

## 5. Discussion

### 5.1 Implications of major findings

This study examined how sense of place, place appreciation, place involvement and place-concerning behaviour are related. We hypothesised that sense of place is a unidimensional factor, which is affected by place appreciation and place involvement, and has an influence on place-concerning behaviour. As indicated in the Results section, all hypotheses were confirmed, on which

basis several inferences can be made and, consequently, a few peri-urban open space management implications can be drawn as well.

Findings revealed that people do not necessarily value the most the places they visit most often. In both cities, the majority of the respondents were neutral in identifying whether the place they frequented most often was also their favourite one. Nevertheless, in both cities, nearly 40% favoured their most visited place very much or entirely. At the same time, almost half of Ljubljana's respondents thought there are better places to be than at this place. Whilst in Ljubljana, the most visited peri-urban green space provided the respondents enough satisfaction in terms of the things they liked to do most, they did not identify themselves with it to a great degree and they would not miss it much when they were away. In Edinburgh, conversely, people identified themselves more strongly with their most visited place, although they were less dependent on it. Along with a few other answers, these results highlight the differences between the two cities in terms of sense of place and also provide support for the suggestion of Williams and Vaske (2003) that bonding with a place does not generalize from area to area, but that it rather indicates a personal relationship to an area.

The major finding of this study was that sense of place has an important influence on place-concerning behaviour, consistent with several empirical studies (Cheng & Wu, 2015; E. Halpenny, 2010; López-Mosquera & Sánchez, 2013; Ramkissoon et al., 2013): it has been demonstrated that people are more likely to show place-concerning behaviour when they are highly attached to a place. This effect also supports early place theories (Relph, 1976; Y. Tuan, 1977), which suggest that direct experience with a place develops to attachment, which in turn leads to intentions to protect the place. Place involvement and place appreciation were both key antecedent variables of SOP and place-concerning behaviour. Moreover, they had a stronger effect on SOP than, for example, SOP on place-concerning behaviour, which indicates that place appreciation and place involvement can effectively enhance SOP and care for peri-urban green open spaces. Considering the mediating role of SOP on the effect of place appreciation and involvement on place-concerning behaviour, both variables can be considered the strongest and most effective predictors of place-concerning behaviour. Similar results were reported by Chen and Wu (2015) and Sia et al. (1986). Therefore, authorities should pay attention to strengthening visitors' perception of and interest in peri-urban open spaces.

Although people's attitudes towards peri-urban areas are influenced by both affective ties (place appreciation) and cognitive links (place involvement), the former were shown to have a much stronger effect in both case study cities. Still, there are some nuances between the two cities, in particular with regard to people's cognitive links. Ljubljana's respondents appreciate their most visited peri-urban green space, although they are not deeply involved with it: they claim to know it well but do not feel being rooted there. One way to interpret this would be that the majority of the respondents are not indigenous to Ljubljana (weak rootedness; more than 50% of the respondents did not spend their childhood there), but they have been living there for a while (more than two years, and the majority up to 10 years). They use green spaces around the city (good—self-claimed—knowledge of the place) and appreciate their natural features; for this reason, they are likely to identify themselves with these green spaces. However, their childhood (spent someplace else) can evoke embellished memories of some other place which fulfilled their needs much more, which may explain a low place involvement. In addition, more than 40% of the respondents in Ljubljana benefitted from the availability of a homestead, to which they may feel a deeper connection. Similar findings of weak involvement due to the existence of alternative places were reported by Hammit et al. (2004) and Bricker and Kerstetter (2000). Conversely, Edinburgh's respondents do not know their most visited peri-urban green space to the same extent. This could be interpreted by the majority of the respondents being relatively new to the city (more than 80% did not spend their childhood there, and almost 20% have been living in their current residence for less



than 3 months); for this reason, they were curious about and keen to explore new places. They exhibited weaker place involvement than Ljubljana's respondents, whilst they appreciated more their most visited peri-urban green space—perhaps because it reminded them of places they used to go to, so they were better able to relate to it. At the same time, they had not yet built up many expectations of it, and thus, they appreciated it without reservation. However, since scarce information on the respondents' past was collected, this interpretation remains an assumption. More of this type of data would need to be collected to confidently make these statements.

Hence, it appears that place appreciation, based on place attributes and characterised by people's sensitivity and emotional concern for a place, may be more relevant for strengthening people's SOP than their deep involvement with and knowledge of a place. This can be important information for authorities and spatial planners in making planning and management decisions concerning development of different peri-urban green space types.

Among hypothetical effects of personal characteristics, only few of them appeared to be significant, result which is equally important, as it shows similar sense-of-place attitudes among respondents of both cities. For instance, gender is not significant for any of the factors, indicating that similar attitudes can be found across both genders, in both cities. Limited to the Edinburgh case study, we found that age had a significant positive correlation with place involvement, while level of education had a significant negative one. This may be due to the fact that a large number of young and highly educated people in Edinburgh are either students or employees of the university, who think of themselves as temporary residents. Length of residence positively affects place involvement of the respondents of both cities, which was an expected result and in line with those of previous studies (Soini et al., 2012; Stedman, 2006). People who have lived longer in the area, feel more involved and rooted to a place. Most importantly, peri-urban green space visiting frequency was the only critical antecedent of sense of place for all three tested models that was not mediated by place involvement or appreciation, meaning that urban dwellers who frequently visit peri-urban green spaces can develop a bond with a place without necessarily appreciating it in particular, nor being very involved with it. Instead, they tend to highly value a place because it offers them sought-for experiences. In time, they become attached to a site, and if they continue to visit the place for many years, they are more likely to develop stronger levels of identification with a place than first-time visitors. In fact, previous studies indicate that repeated interaction with a place facilitates the development of an emotional bond (Hammit et al., 2004; Zhang, van Dijk, Tang, & Berg, 2015) and protective behaviours towards it (E. A. Halpenny, 2006).

Further, our empirical findings also confirm the unidimensional character of SOP, as all the items that measure it in EFA loaded on one factor. As hypothesized, these items took into account the emotional, functional, and cognitive response to a place. However, it should be noted that not all the loadings of items on one factor were strong, which indicates that the dimensionality of SOP (and the number of facets to measure it) is not always clear—an effect already observed and discussed in previous research. Halpenny (2010), for example, extracted two factors with the EFA; however, they were not clear, and scales did not load on four factors, as initially suggested. Similarly, Hammit et al. (2006) tested a five-dimensional model of place bonding but reported a high correlation between two factors and, due to inconclusive results, proposed the development of new items that better measure place belongingness. Last, Qian et al. (2011) show, in their study, that the dimensionality of SOP is dependent on the geographical scale. Hence, further work is required to investigate the dimensionality of SOP and to develop more robust measurement methods.

## *5.2 Peri-urban areas and sense of place*

An important conclusion that emerges from the present findings, also discussed in the previous section, is that research on sense of place—its origin, composition, and how it may be affected—

can provide authorities, spatial planners, and managers with in-depth information on the context of the peri-urban landscape. This information can serve as a guideline to develop appropriate management objectives and has implications for land-use planning. Place-based values can, for example, provide a basis to predict changes that can occur as a result of new developments (e.g. with scenario-building or similar method), which can be crucial for future decisions such as approving proposals for development in peri-urban areas. Furthermore, a better understanding of the relationship between place involvement, appreciation, and SOP may help authorities, managers, and practitioners to find better ways to address, identify, and engage people in the maintenance, restoration, and development of existing places and sustainable planning of new green open spaces in the peri-urban milieu (e.g. Ramkissoon & Mavondo, 2015). Moreover, place-bonding components can assist managers in selecting key stakeholders for the public participation process, since the people-place relationship is associated with attitudes that can influence how they react to changes and why they resist suggested changes. In addition, since SOP appears to be a good predictor of place-concerning behaviour, fostering positive experiences with a place can be a way of encouraging visitors to take initiatives to protect it, involve sustainable use of natural resources and enhance the biodiversity of a place (e.g. Ramkissoon, Weiler, & Smith, 2012)(e.g. Ramkissoon et al., 2013). This, however, should be addressed more profoundly in future research, since other possible antecedents (e.g. education, environmental awareness, society influence) may have an important influence and should be considered. In addition, existing discrepant findings showing that SOP is associated with less pro-environmental behaviour (Gosling & Williams, 2010; Stedman, 2002; Uzzell, Pol, & Badenas, 2002) should also be addressed.

### *5.3 Limitations*

The value of the present work consists in applying SEM to data from two case studies, which demonstrates how the place-based meanings and man-place bonding that urban dwellers develop are similar across the two geographical spaces, suggesting the generalisability of the model. Despite this contribution, the data collected in this study present several limitations.

In general, sampling a larger number of people, achieving a better balance of demographic characteristics with regard to gender, education, and ethnicity, as well as acquiring questionnaires with less missing values would undoubtedly enhance the validity of the research findings; in particular, this would ensure that the items which measure the constructs are robust with scaling. Since SOP is conceptualised in many different ways, further efforts could also be assigned to improving the content and format of SOP measures (E. Halpenny, 2010; Williams & Vaske, 2003). Whilst multiple conceptualisations of place were incorporated within our model, other important ones, especially related to social bonding, have not been adequately considered. Further research could address these and other dimensions, in a wider range of places and contexts.

Finally, another potential area to explore in future studies would be using not only objective (i.e., a survey) but also perceived measures of people's attitudes and feelings towards peri-urban open spaces—this would add another dimension to researching how knowledge of people's attitudes can help improve the development of such spaces.

## **6. Conclusion**

This study examined the causal relationship between place involvement, appreciation, sense of place, and place-concerning behaviour of urban dwellers in peri-urban open spaces of two middle-sized European cities. Assessing this novel behavioural model contributes to the further development of behavioural models, previously conceptualised by different researchers. Most importantly, this study contributes to better understanding the people-place relationship in the still

much underexamined milieu of peri-urban areas. The exploration of latent variables and the relationships between them suggests that sense of place is a unidimensional factor, affected by place appreciation and involvement, and has a critical influence on the place-concerning behaviour of urban dwellers in peri-urban green open spaces. Hence, by offering empirical support for these latent variables, the present study provides further insight into behavioural models of sense of place.

In addition to its theoretical contributions, the present study derives several important implications concerning the planning and management of peri-urban areas. Spatial planners have the ability to significantly contribute to our spatial and temporal experience of a place, by shaping its physical components. Accounting for how people perceive a place can help define important place-based values and user characteristics, which in turn leads to a better understanding of people's responses to new planning and policy proposals. If sense of place is considered as a mediating variable in the effects of peri-urban development decisions on people, such information can assist management to better appreciate the values of an area, resulting in a more responsible and democratic decision-making process.

Peri-urban areas face many challenges, including an ever-increasing demand for housing and infrastructure development, and recreation use. Some of these areas have low intrinsic value due to the lack of support from authorities and/or inappropriate development, which results in unwanted land uses and an impoverished sense of place. The present research has shown the potential utility of sense of place in addressing these challenges and supporting the future development of peri-urban areas within long-term planning goals, in order to ensure their environmentally-sound and socially-inclusive development.

## Appendix

### Goodness of fit—extended summary (related to Figure 4 and Table 2 in the manuscript, whole dataset)

Relationship	$\beta$	se	z-score	p-value	95% confidence interval
SOP $\approx$ → SOP1	0.655	0.043	15.249	0.000	0.571 – 0.739
SOP $\approx$ → SOP2	0.838	0.030	28.318	0.000	0.780 – 0.895
SOP $\approx$ → SOP3	0.716	0.038	18.645	0.000	0.641 – 0.791
SOP $\approx$ → SOP4	0.654	0.043	15.347	0.000	0.571 – 0.738
SOP $\approx$ → SOP5	0.676	0.041	16.308	0.000	0.595 – 0.757
SOP $\approx$ → SOP6	0.273	0.066	4.143	0.000	0.144 – 0.401
Place involvement $\approx$ → INV1	0.466	0.054	8.687	0.000	0.361 – 0.571
Place involvement $\approx$ → INV2	0.955	0.037	25.548	0.000	0.882 – 1.028
Place involvement $\approx$ → INV3	0.824	0.037	22.527	0.000	0.752 – 0.896
Place appreciation $\approx$ → APP1	0.570	0.058	9.747	0.000	0.455 – 0.684
Place appreciation $\approx$ → APP2	0.694	0.055	12.659	0.000	0.586 – 0.801
Place appreciation $\approx$ → APP3	0.706	0.055	12.808	0.000	0.598 – 0.814
Place-concerning behaviour $\approx$ → PCB1	0.851	0.047	18.029	0.000	0.758 – 0.943
Place-concerning behaviour $\approx$ → PCB2	0.650	0.048	13.406	0.000	0.555 – 0.745
Place-concerning behaviour $\approx$ → PCB3	0.620	0.049	12.521	0.000	0.523 – 0.716
Place appreciation → SOP	0.365	0.072	5.095	0.000	0.224 – 0.505
Place involvement → SOP	0.235	0.065	3.628	0.000	0.108 – 0.362
SOP → Place-concerning behaviour	0.174	0.073	2.397	0.017	0.032 – 0.317

Place involvement → Place-concerning behaviour	0.052	0.025	2.066	0.039	0.003 – 0.101
Place appreciation → Place-concerning behaviour	0.080	0.036	2.244	0.025	0.010 – 0.149

**Goodness of fit—extended summary (related to Table 2 in the manuscript, Ljubljana subset)**

Relationship	$\beta$	se	z-score	p-value	95% confidence interval
Place appreciation → SOP	0.399	0.102	3.917	0.000	0.199 – 0.599
Place involvement → SOP	0.231	0.097	2.393	0.017	0.042 – 0.420
SOP → Place-concerning behaviour	0.085	0.106	0.805	0.421	(-0.122) – 0.293
Place involvement → Place-concerning behaviour	0.030	0.033	0.924	0.356	(-0.034) – 0.094
Place appreciation → Place-concerning behaviour	0.052	0.054	0.967	0.334	(-0.054) – 0.158

**Goodness of fit—extended summary (related to Table 2 in the manuscript, Edinburgh subset)**

Relationship	$\beta$	se	z-score	p-value	95% confidence interval
Place appreciation → SOP	0.323	0.102	3.166	0.002	0.123 – 0.522
Place involvement → SOP	0.210	0.083	2.519	0.012	0.047 – 0.374
SOP → Place-concerning behaviour	0.240	0.096	2.510	0.012	0.053 – 0.427
Place involvement → Place-concerning behaviour	0.056	0.032	1.713	0.087	(-0.008) – 0.119
Place appreciation → Place-concerning behaviour	0.087	0.043	2.016	0.044	0.002 – 0.171

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