Identifying Intrinsic, Instrumental, and Relational Values in Kumpula, Helsinki
A Participatory Mapping Study

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Tiivistelmä - Referat - Abstract

Urban densification is resulting in the rapid loss of urban green spaces and their associated values. Moreover, the remaining urban green spaces are under increasing pressure to meet diverse resident needs and preferences. While past studies have investigated the intrinsic, instrumental, and relational values associated with such spaces, little attention has been paid to the sub-sets of relational values referred to a fundamental-relational (i.e., contributions toward enhanced social resilience) and eudemonic-relational values (i.e., actions, experiences, and habits linked to a "good life"). This study used public participation geographic information systems (PPGIS) surveys in a residential neighborhood of Helsinki, Finland to spatially explore and examine the differences between intrinsic, instrumental, fundamental-relational, and eudemonic-relational values in urban green spaces. I analyzed responses from residents and stakeholders (n = 1089) using Chi-square tests for significant associations and density-based clustering. Mapped values indicated that green spaces were primarily valued for their relational value, with an emphasis on eudemonic-relational values. Moreover, there were differences in the spatial distribution of instrumental, intrinsic, and relational values between green space types and values were spatially clustered by land use. Notably, there were few differences in how these values were assigned by different sociodemographic groups. I discuss the implications of these findings for local- and city-scale planning and the use of value typologies in PPGIS surveys. Further research in this field will benefit from the use of further value sub-categories, increased geographic scale, and additional study of the influence of sociodemographic factors.

Avainsanat – Nyckelord - Keywords
Urban green spaces, PPGIS, urban planning, urban densification, climate change, mapped values, land use conflict

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Muita tietoja - Övriga uppgifter - Additional information

1 Abbreviations

EU	European Union
GIS	Geographic information systems
ha	Hectare
IPBES	Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
km	Kilometer
m	Meter
PPGIS	Public participation geographic information system
RAMS	Rakennetut viheralueet, avoimet viheralueet, metsät, suojelualueet (built green spaces, open green spaces, forests, protected areas)
TEEB	Economics of Ecosystems and Biodiversity
UNEP	United Nations Environment Programme

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1 Introduction

We are facing unprecedented urban population growth rates, with 68% of the world's population expected to live in urban areas by 2050 (UN, 2019). The resulting negative effects associated with urban sprawl and inefficient land use have turned urban planners toward more sustainable designs, such as compact and dense city forms. Nonetheless, given the limited space in cities, this also entails the loss of urban green spaces for new development (Haaland and van den Bosch 2015). This is especially concerning in light of the well-acknowledged benefits of urban green spaces to human health and wellbeing (Hartig et al. 2014; Kabisch et al. 2015; Gascon et al. 2016; WHO 2017; van den Bosch and Ode Sang 2017), including numerous environmental and ecological services (e.g., air and water purification, microclimate stabilization), positive effects on psychological and mental health, and social benefits (Chiesura 2004). Furthermore, urban green spaces have been presented as potential key components in both climate change mitigation and adaptation strategies for urban systems (Kabisch et al. 2016; McPhearson et al. 2021).

While discussions of these benefits have existed for centuries, the language and concepts have evolved over time. In the late 1970s, in an attempt to bolster public interest in biodiversity conservation, the benefits of ecosystem functions were framed as "ecosystem services" (Gómez-Baggethun et al. 2010). Subsequently, the 1990s saw the mainstreaming of ecosystem services in the literature (Costanza and Daly 1992; Perrings et al. 1992; Daily 1997), including a focus on estimating their economic value (Costanza et al. 1998). The ecosystem services model was subsequently further integrated into policy via the *Millennium Ecosystem Assessment* (2005), which assessed the impact of ecosystem change on human well-being. Ecosystem services include, for example, fresh water, food, medicinal substances, natural hazard mitigation, recreation, and tourism (Hales et al. 2005; Ten Brink 2012; Arias-Arévalo et al. 2018).

Generally, the ecosystem services model focuses on the intrinsic and instrumental value of nature. Intrinsic values are those which exist independent of humans (O'Neill 1992; Lockwood 1997), including their needs, meanings, interests, and preferences (Chan et al. 2016; Arias-Arévalo et al. 2017; Himes and Muraca 2018). In other words, the object being valued is an end in and of itself (O'Neill 1992). Notably, Piccolo (2017, p. 11) writes that "humans coexist with all life *within* the sphere of intrinsic value." On the other hand, instrumental (also called hedonic) values are those attached to (living and non-living) objects that are a means to an external end (Himes and Muraca 2018), including pleasure and superficial satisfaction (Chan et al. 2016; van den Born et al. 2018). For these reason, instrumental values are in theory substitutable (Himes and Muraca 2018). In order to distinguish between intrinsic and instrumental values, Arias-Arévalo and colleagues (2018) introduced the metaphors of “living for nature” (intrinsic value) and “gaining from nature” (instrumental value).

The ecosystem services model emphasizes instrumental value because it relies on the conceptual metaphor of economic production, which focuses on maximizing human benefits and measures environmental costs as externalities (Raymond et al. 2013). Further, ecosystem services are most often quantified in monetary terms in order to increase their consideration in policy making and management strategies (Scholte et al. 2015; Chan et al. 2016; Arias-Arévalo et al. 2018). Even so, it has been empirically shown that efficiency-based economic and environmental analyses have not been effective in influencing policy decisions (Turnpenny et al. 2014; Waite et al. 2015; Arias-Arévalo et al. 2018).

Accordingly, in order to better understand the economic costs of ecosystem degradation and biodiversity loss, the G8+5 Potsdam Meeting of Environment Ministers called for analysis of the global economic significance of biodiversity, including the costs of biodiversity loss versus the costs of effective conservation. The resulting report, the TEEB in National and International Policy Making (Ring et al., 2010), thus introduced the Total Economic Value framework. Unlike previous work on ecosystem services, this framework strove to account for the intangible benefits from nature; this included both use values (i.e., direct, indirect, and option use values) and non-use values (i.e., value of nature because it brings pleasure or as a bequest to future generations) (Ring et al. 2010).

At the same time, scholars began to call for the involvement of local communities in the “identification and valuation of natural capital assets and ecosystem services at place-specific and regional scales” (Raymond et al. 2010, p. 1302). By the same token, there was an increasing focus on the importance of cultural and social ecosystem services and their role in socially acceptable planning and management (Chan et al.

2012). Accordingly, many scholars turned to PPGIS for the identification and exploration of place-based socio-cultural values (e.g., Fagerholm et al. 2016, 2019; Raymond et al. 2010).

Beginning in the 1990s, PPGIS focuses on ways of using geospatial technologies to facilitate public participation in decision-making processes (Brown et al. 2020). While the language of PPGIS has evolved over time, it is important to note that place-based values have nonetheless been at the core of the field since its inception. Notably, after the publication of the *Millennium Ecosystem Assessment* it became clear that these mapped values could also be described as ecosystem services (Brown et al. 2020). Importantly, mapped place-based values can also serve as an alternative to economic valuation (Raymond et al. 2009; Brown 2013). For example, PPGIS has been used to study cross-cultural differences in values and management preferences (Brown 2013), effects of land tenure on mapped ecosystem values (Hausner et al. 2015), the cultural ecosystem services spatial value transfer (Brown et al. 2016), and cultural ecosystem values in coastal areas (Brown and Hausner 2017).

Nonetheless, the ecosystem services literature continued to emphasize intrinsic and instrumental values. In 2016 Chan and colleagues argued for the inclusion of relational values in the ecosystem services literature, as they argued people do not typically make decisions based solely on inherent worth or their preferences, but they are also influenced by “the appropriateness of how they relate with nature and with others, including the actions and habits conductive to a good life, both meaningful and satisfying” (Chan et al. 2016, p. 1462). Unlike intrinsic and instrumental values, relational values are those which emerge out of relationships with nature and among people (Chan et al. 2016; van den Born et al. 2018; Himes and Muraca 2018). Because the relationship itself takes on meaning, relational values are not substitutable (Himes and Muraca 2018). In continuation of the metaphors presented by Arias-Arévalo and colleagues (2018), relational values can be seen as “living with nature.” Importantly, relational values have also been further sub-divided into fundamental-relational eudemonic-relational values; further discussion of these (including definitions) is provided in the Literature Review below.

This is not to say relational values should replace intrinsic and/or instrumental values, but rather that holistic understandings of the importance of natural spaces is achieved through plural valuation (Kenter et al. 2019; Zafra-Calvo et al. 2020; Raymond et al. 2022). As Chan and colleagues (2016) argue, accounting for and valuing human-nature relationships is key for both genuinely inclusive environmental stewardship and fulfilling socio-ecological relationships for present and future generations. This is because the inclusion of relational values enables articulation of values related, for example, to aesthetics, spirituality, wellbeing, "living a good life," connectedness, and place attachment (Himes and Muraca 2018). Importantly, these values are also among the reasons individuals are motivated to care about conservation and biodiversity (Chan et al. 2016; Himes and Muraca 2018). Moreover, relational values are also necessary for understanding and including non-Western valuation languages. For example, many Indigenous peoples do not view themselves as separate from nature, but rather as a part of nature and the environment (e.g., Inoue & Moreira 2016; Joks et al. 2020). Within the policy realm, this means that only once valuation approaches and techniques account for diverse stakeholder value systems (i.e., though consideration of intrinsic, instrumental, and relational values) is it possible to minimize value conflicts and account for trade-offs in the allocation of nature's benefits (Díaz et al. 2015). Nonetheless, little of the PPGIS literature has studied the spatial distribution and intensity of relational values. This knowledge gap is important to address in order to better account for the diverse values of nature in green space planning and management, as further discussed in the following section.

2 Literature Review

In the 1990s, the term "green infrastructure" was introduced as a way to emphasize the importance of urban green spaces as a part of state and national infrastructure plans. Further, by identifying these spaces as "infrastructure," the term implied that maintenance activities were needed and emphasized their interconnected nature (Benedict and McMahon 2002). This term was quickly incorporated into the academic literature and adopted by cities, national bodies, and intergovernmental agencies. The UNEP provides a succinct definition: "the natural or semi-natural systems that provide services for water resources management with equivalent or similar benefits to conventional (built) 'grey' water infrastructure" (Bertule et al. 2014, p. 5). Then, expanding the concept outside of water infrastructure, in the late 2000s the term "nature-based solutions" was introduced to highlight the role of green spaces in climate change mitigation/adaptation and biodiversity conservation (Pauleit et al. 2017), as well as the co-benefits of nature for biodiversity, human well-being, and climate resilience (Raymond et al. 2017). Overall, nature-based solutions can be treated as "an umbrella concept that integrates almost all sustainability frameworks that purport to engage with natural features including ecosystem services, green infrastructure, eco-engineering, and ecosystem-based adaptation" (Sekulova et al. 2021, p. 2).

Nature-based solutions are directly connected to a number of urban policy agendas, including the EU Biodiversity Strategy, EU Green Infrastructure Strategy, and the EU Thematic Strategy on the Urban Environment. At a more local scale, the City of Helsinki names nature-based solutions as key components in both its climate adaptation policy (City of Helsinki 2019a) and the City of Helsinki Biodiversity Action Plan (City of Helsinki 2021a). Moreover, the Helsinki City Plan (City of Helsinki 2013), which outlines the City's vision for 2050, details the City's aims to create a green network that will allow residents to easily access parks, exercise and recreational services, large green spaces, regional hiking and camping areas, recreational trails, and seaside recreational zones. However, the City Plan also centers around densification, including that resulting from the development of urban green spaces. It is estimated that between 2016 and 2018 34% of new construction sites in Helsinki were located within forests or other natural areas (Tiitu 2021). Given nature is considered the second-most important factor in Finns' living environment after location and transport connections (Strandell 2017, as cited by Tiitu 2021), this has led to numerous conflicts in recent years. For example, in February 2022 protestors temporarily prevented logging in Honkasuo forest in the north of Helsinki over concerns that the planned housing was at odds with nature conservation and would entail the removal of spaces important for outdoor activities and recreation (Aalto 2022). Similar concerns were also raised in July 2021, when protestors opposed the plans to increase transit connections and densify the Meri-Rastila neighborhood in eastern Helsinki; residents worried that the construction would result in decreased use of nearby outdoor areas (Valtanen 2021). At the heart of these conflicts is the rapid loss of green spaces and, thus, their values. In order to better reflect the different types of human-nature relationships and to inform a more inclusive approach to green space management, this thesis takes a wider perspective on values and considers intrinsic, instrumental, and relational values.

Such an approach is not new – the values and co-benefits associated with green spaces (both human-engineered and naturally occurring) have been considered by PPGIS scholars for decades. In 2000, Brown and Reed created a typology of forest landscape values that elicited the relationship between values and preferences for forest use. A few years later, Brown (2004) presented a research framework that would allow for the use of values and spatial data in GIS planning. Subsequently, Raymond and colleagues (2009) introduced PPGIS to the ecosystem services literature in order to integrate community values into environmental management.

At the same time, researchers were developing the use of PPGIS to predict and resolve land use conflicts. With the introduction of values compatibility analysis (first called values suitability analysis), Reed and Brown (2003) proposed a method for examining the consistency between social values and current or proposed land uses (see also Brown & Reed 2012). By systematically identifying place-based value trade-offs, values compatibility analysis can help green space planners and managers identify the social acceptability of different planning outcomes. Nonetheless, while values compatibility analysis has been applied in various cases, including elaboration of reasons for conflict (Plieninger et al. 2018) and compatibility of different value types (Ives et al. 2018), it has not been used to examine the subsets of relational values or potential loss of values resulting from urban densification. That is, while PPGIS continues to represent “a more holistic conception of people’s benefits from landscapes” (Fagerholm et al. 2016, p. 30) and enables discussion of the role of local perspectives in the development of socially acceptable policies (e.g., Fagerholm et al. 2019), relational values are not fully explored in the literature. Importantly, this means that such studies may not reflect the full diversity of values that humans assign to nature and in turn fail to represent a genuinely inclusive valuation approach. This point has since been raised by Himes and Muraca (2018), who argued for the unpacking of relational values in ecosystem management.

As mentioned in the Introduction, relational values can further be divided into two categories. The first, fundamental-relational values, are those that contribute toward conditions for enhancing social resilience (i.e., the ability of a social group to respond to external stress) (Arias-Arévalo et al. 2018). This includes relations and processes that protect the life supporting system (including ecological resilience) and “allow people to define themselves and provide sense to their existence" (Muraca 2011; Arias-Arévalo et al. 2018, p. 12). The second, eudemonic-relational values, on the other hand, include actions, experiences, and habits linked to the "good life" (i.e., an ethically responsible, meaningful, and overall satisfying life) (Arias-Arévalo et al. 2018; Himes and Muraca 2018). This includes, for example, recreation and leisure, environmental justice, altruism, aesthetic values, and cognitive development (Arias-Arévalo et al. 2018). Further, Muraca (2011, p. 384) writes that eudemonic values include "all those entities and collectives, which are necessary condition for flourishing and leading a good human life in the sense of Martha Nussbaum's capabilities approach."

Moreover, values compatibility analysis tends to center around land use management decisions for existing green spaces (e.g., Brown & Reed 2012). Yet, within the context of urban densification, planners must also consider conflicts that may arise out of the *removal* of such green spaces. For example, while the construction of residential or commercial areas may result in increased housing stock and employment opportunities, it may also entail the loss of intrinsic, instrumental, and relational value. Similar to the ways in which no net biodiversity loss has been integrated into policymaking (Bull et al. 2013), this paper emphasizes the importance of seeking policies and development plans that look to prevent the loss of intrinsic, instrumental, and relational values.

3 Research Questions

The overarching aim of this thesis is to spatially explore and examine differences in instrumental, intrinsic, and relational values assigned by residents and stakeholders to green spaces in the Kumpula neighborhood of Helsinki. Accordingly, I will address the following research questions:

1. What are the spatial and aspatial differences between relational (including fundamental- and eudemonic-relational), instrumental, and intrinsic values as mapped by Kumpula residents and stakeholders?
2. How are these four value types spatially clustered?
3. What associations are there between spatial clusters of values and both land uses and proposed developments in the Kumpula neighborhood?

For the purposes of this thesis, I define green spaces as those which are partly or fully covered with vegetation (e.g., grass, trees, shrubs, etc.); examples include parks, forests, community gardens, and cemeteries.

4 Methods

4.1 Study Area

The city district of Kumpula (approximately 150 ha) is located in the Vanhakaupunki neighborhood in central Helsinki (Finland). Approximately 4397 individuals live in Kumpula (Helsingin kaupunki 2020), resulting in a population density of 28.3 people/ha; the population density of Helsinki as a whole is 30.2 people/ha (City of Helsinki 2021b). Land use in Kumpula is primarily residential; the majority of housing units (90%) are flats (Helsingin kaupunki 2020), though the neighborhood is also characterized by terraced and detached houses from the 1920s and 1940s. Notable non-residential land uses in Kumpula include the University of Helsinki Kumpula Campus, the Kumpula Botanic Garden, the Kumpula allotment gardens, and a Helsinki City Transport depot (Figure 1).

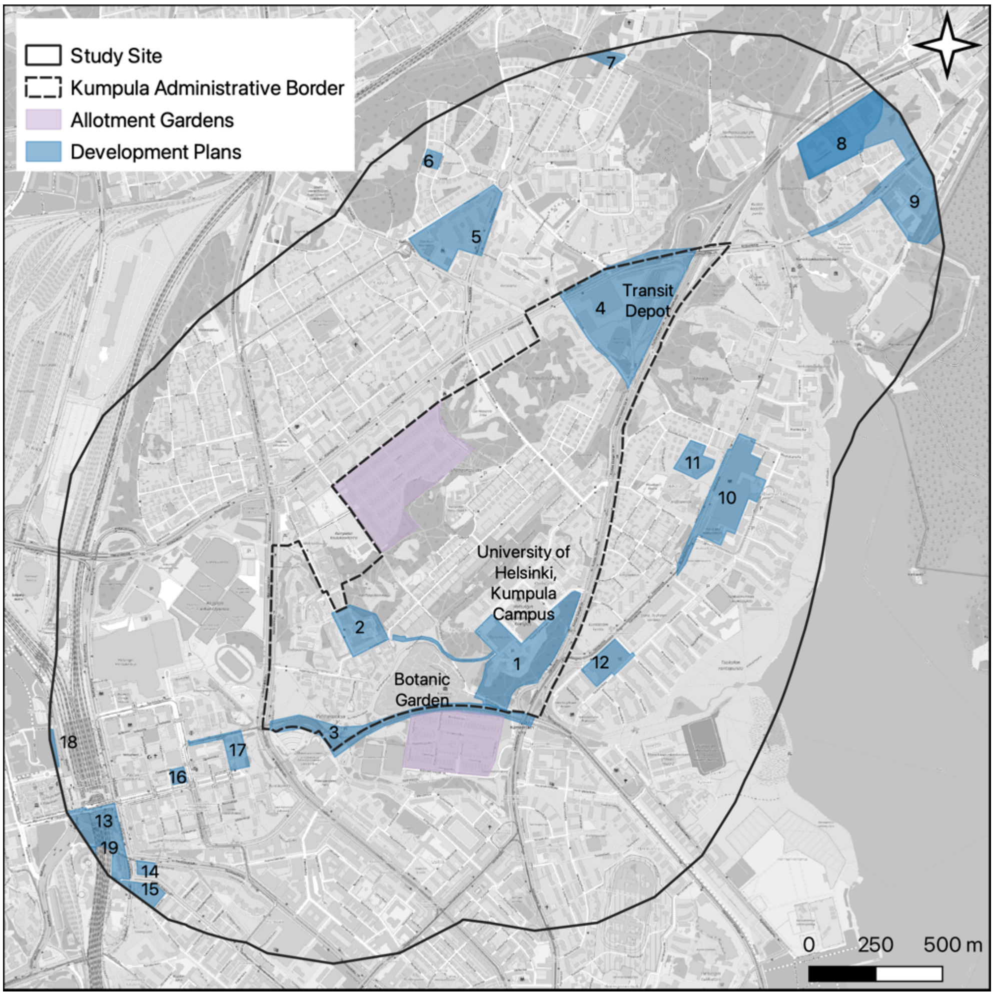

Figure 1. Map of Kumpula and the surrounding areas. See Table 3 for a description of the development plans.

The City of Helsinki uses the RAMS green space classification system (Viherympäristöliitto 2020), which divides public and private green spaces into five primary green space categories based on maintenance factors such as appearance, quality, and use. Based on the RAMS classification system, the majority of the green spaces in Kumpula are forests, followed by built green spaces, open green spaces, and protected green spaces (see Table 1). Each of the RAMS categories are further divided into sub-categories; Kumpula contains all five forest sub-types, though the majority of Kumpula's forests are protective forests (see Table 2).

Table 1. Types and proportion of green spaces in the study site, as classified through the RAMS system (Viherympäristöliitto 2020).

Category	Proportion of Study Area	Short Description
Built green spaces (R)	18.54%	Parks, squares, cemeteries, roof and deck gardens, traffic green areas, and green areas for exercise, play, and other special activities within urban areas.
Open green spaces (A)	2.63%	Natural or manmade meadows and cultivated fields within urban areas or peripheral areas.
Forests (M)	77.46%	Forest cover within urban areas, in peripheral areas, or further afield. Characterized by wild shrubs and undergrowth.
Protected areas (S)	1.37%	Designated by law, decree or governmental decision as containing a protected natural site.

Table 2. Types and proportion of forests in the study site, as classified through the RAMS system (Viherympäristöliitto 2020).

Category	Proportion of Study Area	Short Description
Valuable forests (M1)	7.61%	Forests of particular value for landscape, cultural heritage, biodiversity, or other special features.
Near forests (M2)	22.12%	Forests in the immediate vicinity of residential areas that are used for daily activities, including play, transit, outdoor activities, sports, and social interactions.
Recreational forests (M3)	0.58%	Forests in the vicinity or slightly further away from residential areas; reserved for outdoor activities, hiking, exercise, foraging, and recreation.
Protective forests (M4)	67.56%	Forests located between residential areas and other built environments, including transport corridors and industrial facilities. These forests are reserved for protection, health, and safety.
Economic forests (M5)	2.13%	Forests in commercial use (may also be used for recreational purposes).

Numerous city development plans have been submitted for Kumpula and the surrounding areas. Notable development plans impacting green spaces in the area include the removal of the Kumpulanmäki forest near the University of Helsinki Kumpula Campus and construction of a tram line through Vallilanlaakso park along the southern Kumpula administrative boundary. See Figure 1 and Table 3 for further details on development plans in the area.

Table 3. Description of development plans (Helsingin kaupunki 2021). See Figure 1 for locations of each development plan.

ID	Name	Stage†	Description
1	Kumpulanmäki	Proposal	The undeveloped portion of the University of Helsinki Kumpula Campus will be rezoned for housing. The plan includes approximately 60000 m^2 of housing, 10000 m^2 for businesses, a school, and a daycare center.
2	Kätilöopiston sairaala	Start	Potential redevelopment of the Kätilöopisto hospital into housing. This may also include the transfer of parking spaces for neighboring blocks to a new parking facility.
3	Vallilanlaakson raitiotie	Approval	Construction of a grass tram track through Vallilanlaakso park. Some existing track bottoms in the southern edge of the park will be used. The baana bike path will be located with the tramway.
4	Koskelan varikkokortteli	Start	Construction of a new tram depot. Also includes spaces for businesses, as well housing (including a park as playground) in the western part of the block.
5	Pohjolankatu 45 ja 47	Proposal	The existing school building at Pohjolankatu 45 will be replaced with a larger school building. The residences at Pohjolankatu 47 will be protected as historically valuable buildings.
6	Onnentie 18	Proposal	Conversion of educational building into housing.
7	Oulunkyläntien ympäristö	Start	Construction of new apartment buildings.
8	Viikinrannan energiakortteli	Start	Construction of a new street connection for the public utility maintenance block.
9	Viikinranta	Preparation	Creation of development objectives for the area, including a study of business locations and housing in the area.
10	Arabian tehdaskortteli	Proposal	Construction of new education, work, services, housing, and trade buildings.
11	Damaskuksentie 4	Proposal	Replacement of a commercial building with a residential building, as well as the construction of a new residential building in the existing courtyard.
12	Arabian kauppakeskus	Start	Construction of an apartment building attached to the existing Arabia shopping center.
13	Keski-Pasilan tornialue	Preparation	Construction of a dense residential and office area consisting of 10 tower blocks.
14	Aleksis Kiven katu 49	Entry into force	Redevelopment of office space int commercial budlings.
15	Savonkatu	Start	Construction of business space and housing. Green connections are noted to be considering in the process.
16	Opastinsilta 8	Approval	Replacement of existing office buildings with combined retail, office, and residential buildings.
17	Opastinsilta 1 ja 2	Start	Replacement of existing residential, office, and nursing home buildings with residential buildings; replacement of existing student dormitories with new residential buildings.
18	Firdonkatu 1	Start	Partial replacement of parking space with office buildings.
19	Veturitallinpiha	Start	Study of the area as a possible location for leisure activities, housing, jobs, and services alongside existing train maintenance activities.

†Stages of development as indicated on the Helsinki Map Service are 1) start, 2) preparation, 3) proposal, 4) approval, and 5) entry into force.

4.2 Phase I Sampling and Survey Technique

In order to elicit geospatially referenced values associated with green spaces, two surveys were administered in Kumpula. The first targeted Kumpula residents (the "Kumpula survey") and was advertised through postal invitations to a random sample of 1500 Kumpula residents, a local print news outlet, and numerous local-interest Facebook groups. Three hundred and fifteen individuals responded to this form of the survey (65% of whom submitted complete surveys).

Further, to increase the response rate from young adults, a second survey (the "student survey") was administered to students ages 15 and older through workshops at two high schools near Kumpula: Mäkelänrinteen lukio and Kumpulan luonnontiedelukio. One hundred and eighty-seven students responded to the student survey (79% of whom submitted complete surveys). Permission to distribute the survey among students during the workshops was granted by the City of Helsinki in March 2021 (permit number HEL 2021-002634). Data collection for both surveys was carried out between March and May 2021 through web-based PPGIS surveys (Maptionnaire) in Finnish and English.[1]

While the contents of the surveys differed, both included the following prompt: *In this section, we would like to know about the green spaces in your city district that are most important to you. Please place as many dots on the adjacent map a as you want, and shortly describe what you value about these spaces.* The survey also asked about socio-demographic information, including age, gender, education, and approximate location of home. Though details of this survey were clarified with the Ethical Review Board of the Humanities and Social and Behavioural Sciences of the University of Helsinki, no ethical review for the study was required per the Finnish National Board on Research Integrity TENK's ethical principles (Kohonen et al. 2019).

4.3 Formation of the Preliminary Typology

In order to account for the diversity of responses, categories of values associated with important green spaces were created inductively for all responses by the research

[1] Students from Kumpulan luonnontiedelukio participated in the workshops through advanced English classes focusing on sustainability. Accordingly, the coordinating teacher requested that the survey was provided in these students only in English. Students participating through Mäkelänrinteen lukio were able to choose between the Finnish and English versions of the survey.

team comprising of Kayleigh C. Kavanagh, Oriol García Antúnez, and Jussi Lampinen; each team member cross-checked each other's work during the course of coding to ensure inter-rater reliability. To begin, each researcher read through 150 responses (75 Kumpula survey responses and 75 student survey responses) and independently created a list of categories using phrases as the unit of analysis (Cho and Lee 2014). We then reduced these categories into 11 mutually exclusive categories (Crowley and Delfico 1996) that KCK and OGA independently applied to the dataset (each researcher analyzed approximately half of the responses). Throughout analysis category definitions were adapted to reflect the dataset. While not all mapped points fell within the administrative boundaries of Kumpula, all open-ended responses related to important green spaces were included in this analysis. Nonetheless, some responses could not be categorized (e.g., due to unclear text or the use of emoji) and were thus removed from further analysis. Responses in Finnish were initially translated into English using Google Translate; in cases where translations were unclear JL assisted with translation into English. We then related the resulting categories to existing theoretical understandings of intrinsic, instrumental, and relational values to abductively create the typology seen in Table 4.

4.4 Phase II Sampling and Survey Technique

Initial data analysis revealed that the number of responses were insufficient for meaningful comparison of proportional differences between value types and sociodemographic variables. Consequently, data collected during phase I were combined with the result of a survey run in September and October 2021 (the "Helsinki survey"). Similar to the Kumpula survey, the Helsinki survey was a web-based PPGIS survey (Maptionnaire) in Finnish, Swedish, and English. The survey was advertised via postal invitations to 1500 Helsinki residents, several newsletters and publications, and numerous Facebook groups. Three thousand two hundred and thirty-seven individuals responded to this form of the survey (37% of whom submitted complete surveys).

Table 4. Value sub-category descriptions and supporting references.

Value Type	Description	Supporting References
	Intrinsic	
Nature[†]	References to protected spaces, the non-human world and biodiversity (without references to comfort or aesthetics).	(O'Neill 1992; Piccolo 2017; IPBES 2019)
Natural Value[‡]	This place has urban wildlife and biodiversity.	(O'Neill 1992; Lockwood 1997; Piccolo 2017)
Wilderness[‡]	This place has a wild feeling to it.	(O'Neill 1992; Piccolo 2017)
	Instrumental	
Environmental Quality[†]	References to physical comfort (e.g., shelter, temperature, air quality, sunlight, lack of noise).	(Lockwood 1997; Arias-Arévalo et al. 2018)
	Fundamental-Relational	
Personal Narratives[†]	References to memories/experiences and repeated use.	(Muraca 2011; Chan et al. 2016; Arias-Arévalo et al. 2018)
Personal Identity[‡]	I have a special bond with this place.	(Raymond et al. 2010; Muraca 2011; Chan et al. 2016; Arias-Arévalo et al. 2018)
Community Narratives[†]	References to spaces with historical, cultural, or community importance.	(Muraca 2011; Arias-Arévalo et al. 2018) [17]
Community Identity[‡]	This place is of community importance.	(Muraca 2011; Arias-Arévalo et al. 2018)
Heritage Value[‡]	This place is relevant for local history.	(Fredheim and Khalaf 2016; Arias-Arévalo et al. 2018)
Socializing[†]	References to meeting spaces, friends, and social activities.	(Muraca 2011; Arias-Arévalo et al. 2018)
Social Interaction[‡]	This place is good for meeting other people and socializing.	(Raymond et al. 2009; Muraca 2011; Arias-Arévalo et al. 2018)
Relaxation[†]	References to mental health benefits (e.g., relaxation, calm, peace), solitude, and oases. Does not include references to lack of noise.	(Korpela and Hartig 1996; Arias-Arévalo et al. 2018)
Relaxation & Restoration[‡]	This place has a relaxing, calm and pleasant atmosphere.	(Korpela and Hartig 1996; Arias-Arévalo et al. 2018)
Spiritual[‡]	This place is spiritually important to me.	(Arias-Arévalo et al. 2018)
	Eudemonic-Relational	
Learning[‡]	This place is good for or enables learning.	(Arias-Arévalo et al. 2018)
Walking[‡]	This place is good for taking a walk.	(Clough 2013; Arias-Arévalo et al. 2018)
Sports[‡]	This place is good for doing sports or exercise.	(Clough 2013; Arias-Arévalo et al. 2018)
Recreation[†]	References to exercises and activity, including play areas, allotment gardens, sports infrastructure, and birdwatching.	(Clough 2013; Arias-Arévalo et al. 2018)
Accessibility[†]	References to distributional justice and physical accessibility (including references to well-maintained paths and routes).	(Arias-Arévalo et al. 2018)
Aesthetics[†]	References to beautiful/visually pleasing spaces (including views) and cues to care.	(Ode et al. 2008; Arias-Arévalo et al. 2018; Himes and Muraca 2018)
Aesthetic Value[‡]	This place is beautiful and appealing.	(Ode et al. 2008; Arias-Arévalo et al. 2018; Himes and Muraca 2018)

[†] Category developed inductively based on all open-ended responses from the Kumpula and student surveys.
[‡] Category selected by respondents from a list provided to Helsinki survey respondents.

As with the Kumpula and student surveys, respondents were prompted to map important green spaces: *In this section, we would like to know about the green spaces in Helsinki that are most important to you personally. Please place as many dots to the adjacent map as you want and indicate why these places are important for you.* Once the points were mapped, respondents were asked to indicate which of the following value categories best described the mapped point: relaxation and restoration, natural value, wilderness, aesthetic value, sports, other outdoor activities, social interaction, heritage value, learning, spiritual, personal identity, community identity, and other (with an option to elaborate).

Though based on the preliminary typology developed from responses to the Kumpula and student surveys, these categories differed slightly in order to account for the more varied green spaces (and their uses) found in Helsinki. Responses listed under "other outdoor activities" and "other" were not included in further analysis. The survey also asked about socio-demographic information, including age, gender, education, and approximate location of home. Per the Finnish National Board on Research Integrity TENK's ethical principles (Kohonen et al. 2019), no ethical review for the study was required.

4.5 Spatial and Aspatial Data Analysis

4.5.1 Spatial Data Processing

In my analysis, I focused on the frequency and distribution of mapped values related to important green spaces within and nearby Kumpula. To begin, I examined the distribution of mapped points within and outside of Kumpula to determine if a buffer was needed. Of the points mapped outside the administrative boundaries of Kumpula, the plurality of values were principally mapped within 800 m of the border. Thus, the study area was extended to include points within 800 m of the Kumpula border; all points outside of this area were excluded from further analysis. Given that the Phase II survey was conducted across the City of Helsinki, only points within the 800 m buffer were included in further analysis.

As seen in Table 4, the phase I and phase II surveys used different value categories. Thus, data was aggregated at the level of intrinsic, instrumental, fundamental-relational, and eudemonic-relational values. While this provided less detail on the values, combining these datasets allowed for statistically meaningful comparison of proportional differences between value types and sociodemographic variables in the Kumpula neighborhood.

4.5.2 Relationship Between Demographic Variables & Value Types

Descriptive statistics and Chi-square tests for significant associations were run to examine the relationship between value type and gender, highest level of education, and age. For each statistically significant Chi-square finding, I used standardized residuals to identify the sources of significant association. A residual quantifies the difference between the observed frequency and expected frequency; in this case the difference between the expected and observed point count for each value category. Residuals greater than 1.95 or less than -1.95 indicate significant representation, while residuals between -1.95 and 1.95 are not statistically meaningful (Sharpe 2015).

In order to determine if respondents tended to map different types of values nearer or farther from their homes, I calculated the Euclidian distance between each mapped point and the respondent's approximate home location (where indicated). Subsequently, a one-way ANOVA was run to determine the relationship between the distance from home and the value type. Responses from each survey were analyzed independently, as the average distance between home and mapped value points varied widely across the three surveys.

4.5.3 Spatial Distribution of Value Points

The spatial distribution of the mapped value points was examined visually in order to identify spatial patterns in the distribution and density of mapped value points.

4.5.4 Relationship Between Value & Green Space Types

In order to explore the potential influence of green space type on the mapped values, the proportion of each value type (intrinsic, instrumental, fundamental-relational, and eudemonic-relational) within green spaces in the study area was compared to the relative cover of each green space in Kumpula. Accordingly, the RAMS classification was extracted from the carbon sink map of the Helsinki Metropolitan Area (Helsingin seudun ympäristöpalvelut HSY 2021). Then, using the Count Points in Polygon function, the total number of points in each RAMS green space polygon was calculated for each of the four value types.

4.5.5 Density-Based Spatial Clustering

In order to identify areas with high densities of mapped values (i.e., clusters), I implemented the Density-Based Spatial Clustering of Applications with Noise (DBSCAN) algorithm (Ester et al. 1996). First, I began by calculating the distance between each point and its nearest neighbor (k-nearest neighbor distance) independent of value type. Based on the plot of these values, I selected a threshold value (65 m) below which the majority of datapoints fell as the search radius distance for the clusters. Then, I used the DBSCAN algorithm to identify areas with a minimum of 10 clusters within said search radius (Muñoz et al. 2019). Of the resulting clusters, only those with 100 or more points were included in further analysis. Descriptive statistics and Chi-square tests for significant associations were also run to examine the relationship between the clusters and value types. In order to account for points mapped directly alongside development areas, polygons were buffered by 10 m when comparing the clusters to City of Helsinki development plans.

All spatial analyses were performed in QGIS (versions 3.14 and 3.22). All statistical analysis was performed in IBM SPSS Statistics 28.

5 Results

5.1 Relationship Between Demographic Variables and Value Type

A combined total of 4445 people responded the three surveys. Of these, only the 1089 respondents who mapped points in the study area were included in further analysis. Respondents mapped a total of 2278 value points within the study area; 3.2% were mapped by student survey respondents, 49.0% were mapped by Kumpula survey respondents, and 47.8% were mapped by Helsinki survey respondents. More survey respondents were female (72.7%) than male (25.7%); females also make up the majority of Helsinki residents (52%) (Henkikirjat et al. 2021). The majority of respondents were 25-44 years old (56.8%), similar to the median age of 39 in Kumpula and the City of Helsinki (City Facts, 2021). The remainder of the respondents were 45-64 years old (28.3%), 65 years and older (10.3%), and 15-24 years old (4.6%). Overall, respondents were more educated than the those in the City of Helsinki, where 52% of residents ages 25-64 have completed higher education programs (City of Helsinki, 2020); the majority of respondents completed a master's degree (58.6%), followed by a bachelor's degree (26.5%), primary or upper secondary school (8.3%), and a doctoral degree (6.6%).

There were no proportional differences in the number of value points in each category as mapped by gender ($X^2(6, N= 2160) = 4.62$, $p > .05$) nor by highest level of education attained ($X^2(12, N= 1840) = 5.08$, $p > .05$). However, the percentage of participants who mapped each value type differed by age, $X^2(9, N= 2139) = 29.11$, $p = .001$ (see Table 5). Young adults (ages 15-24) were less likely to map fundamental-relational values (6.1%) than instrumental (13.0%) and intrinsic values (10.6%). Adults ages 45 and older were more likely to map fundamental relational values than all other value types (13.0%). While not statistically significant, adults ages 25-44 mapped fewer fundamental-relational values (48.0%) and adults ages 45 and older mapped fewer eudemonic-relational values (8.1%) than the average respondent.

On average, student survey respondents mapped important green spaces farthest from home (average of 6883 m), while Kumpula survey respondents mapped important green spaces closest to home (average of 715 m). A one-way ANOVA revealed that there was not a statistically significant difference in the distance between home and different value types for respondents to the Helsinki survey ($F(2,955) = .450$, $p > 0.05$) or the Kumpula survey ($F(3,804) = .742$, $p > 0.05$). There were not enough data points ($n = 26$) to analyze the relationship between the distance to home and different value types for respondents to the student survey.

Table 5. Proportional differences (X^2) *across value and age categories*. Statistically significant results indicated in dark green (proportionately more value points) and red (proportionately fewer value points) within a given age class. Notable, non-statistically significant results indicated in orange.

Age Group		Number and Proportion of Value Points: Intrinsic	Instrumental	Fundamental-Relational	Eudemonic-Relational
15-24 (n = 208)	Count	50	6	28	124
	Percent	10.6%	13.0%	6.1%	10.7%
	√E	0.6	0.7	-2.5	1.0
25-44 (n = 1147)	Count	260	23	221	643
	Percent	55.2%	50.0%	48.0%	55.3%
	√E	0.5	-0.3	-1.6	0.8
45-64 (n = 576)	Count	111	13	151	301
	Percent	23.6%	28.3%	32.8%	25.9%
	√E	-1.4	0.2	2.4	-0.7
65+ (n = 208)	Count	50	4	60	94
	Percent	10.6%	8.7%	13.0%	8.1%
	√E	0.6	-0.2	2.3	-1.8
Total (n = 2139)	Count	471	46	460	1162
	Percent	100.0%	100.0%	100.0%	100.0%

5.2 Spatial Distribution of Value Points

Once all of the mapped important green spaces had been categorized by value type, the majority of mapped points were eudemonic-relational (53.6%), followed by fundamental-relational (22.6%), intrinsic (21.9%), and instrumental (2.0%) (Table 6). Further, intrinsic, instrumental, eudemonic-relational, and fundamental-relational values were spatially distributed differently across the study site (Figure 2). For example, intrinsic value points were concentrated in forested areas, particularly those directly southeast of the Kumpula Allotment Garden and southwest of the University of Helsinki Kumpula Campus. The highest densities of instrumental values were located in the Kumpulanmäki forest southeast of the University of Helsinki Kumpula Campus. Fundamental-relational values were most highly concentrated in the Kumpula Botanical Gardens and the surrounding forests to the north and east. High densities of fundamental-relational values were also found in the Kumpula Allotment Garden and forest immediately to the southeast. Finally, eudemonic-relational values were highly concentrated in forest along the northwest side of the University of Helsinki Campus, as well as in the forest directly southeast of the Kumpula Allotment Garden.

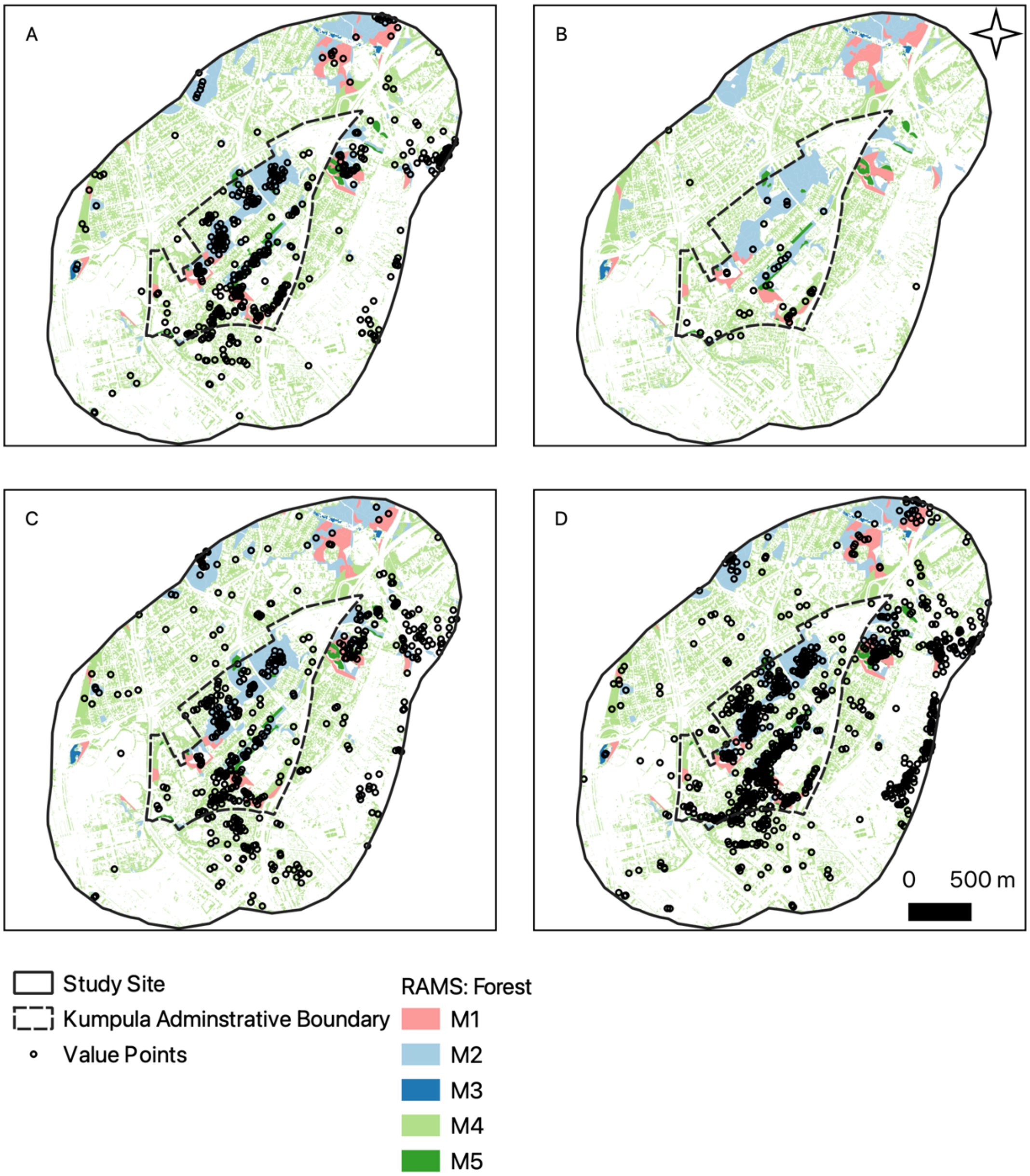

Figure 2. Distribution of A) intrinsic, B) instrumental, C) fundamental-relational, and D) eudemonic-relational value points as mapped by all survey respondents. The RAMS forest sub-categories are valuable forests (M1), near forests (M2), recreational forests (M3), protective forests (M4), and economic forests (M5); see Table 2 for a more detailed description of the RAMS forest sub-categories.

Table 6. Frequency and proportion of value points by value category.

Value Category	Frequency	Proportion
Intrinsic	498	21.9%
Instrumental	46	2.0%
Fundamental-Relational	514	22.6%
Eudemonic-Relational	1220	53.6%
Total	2278	100.0%

5.3 Relationship Between Value and Green Space Types

Of all mapped points in the study area, 1784 points (78.31%) fell within the pre-defined RAMS green space polygons. Of these, 14.91% were within build green spaces, 4.20% were within open green spaces, 77.24% were within forests, and 3.64% were within protected green spaces. As seen in Table 6, this distribution is similar to the distribution of these green spaces across Kumpula. Nonetheless, when looking more closely at the forest sub-categories (see Table 2 for descriptions), differences appear. Specifically, compared to the distribution of forest types within Kumpula, value points were mapped less frequently in protective forests and more frequently in valuable and near forests (Table 7).

Table 6. Proportion of value points that fell within each of the four green space types (built green spaces, open green spaces, forests, and protected green spaces). Highlighted cells indicate a deviation from the expected proportion by -5 percentage points (orange), +5 percentage points (light green), and +10 percentage points (dark green).

	Built	**Open**	**Forest**	**Protected**
Proportion of Kumpula	**18.54%**	**2.63%**	**77.46%**	**1.37%**
Intrinsic	8.47%	2.42%	82.32%	6.78%
Instrumental	12.50%	--	87.50%	--
Fundamental-Relational	17.07%	5.33%	74.67%	2.93%
Eudemonic-Relational	16.95%	4.71%	75.63%	2.72%
Total	**14.91%**	**4.20%**	**77.24%**	**3.64%**

Table 7. Proportion of value points that fell within each of the forest types (valuable forests, near forests, recreational forests, protective forests, and economic forests). Highlighted cells indicate a deviation from the expected proportion by -10 percentage points (red), +5 percentage points (light green), and +10 percentage points (dark green).

	Valuable	Near	Recreational	Protective	Economic
Proportion of Kumpula	**7.61%**	**22.12%**	**0.58%**	**67.56%**	**2.13%**
Intrinsic	17.94%	49.41%	0.29%	26.76%	5.59%
Instrumental	14.29%	34.29%	0.00%	45.71%	5.71%
Fundamental-Relational	11.79%	42.14%	0.00%	41.79%	4.29%
Eudemonic-Relational	13.69%	54.22%	0.28%	27.80%	4.01%
Total	**14.37%**	**50.07%**	**0.22%**	**30.84%**	**4.50%**

5.4 Density-Based Spatial Clustering

The DBSCAN algorithm identified 21 clusters (Figure 3) with a minimum number of search-radius-points of 10 and a search distance of 65 m. Following Muñoz and colleagues (2019), the search radius of 65 m was selected through visual observation of the density plot of nearest neighbor distances. Of these clusters, 15 clusters contained less than 100 points, four clusters contained between 100 and 200 points, and two clusters contained more than 200 points. Given the number of clusters generated, only clusters of 100 or more points were included for further analysis.

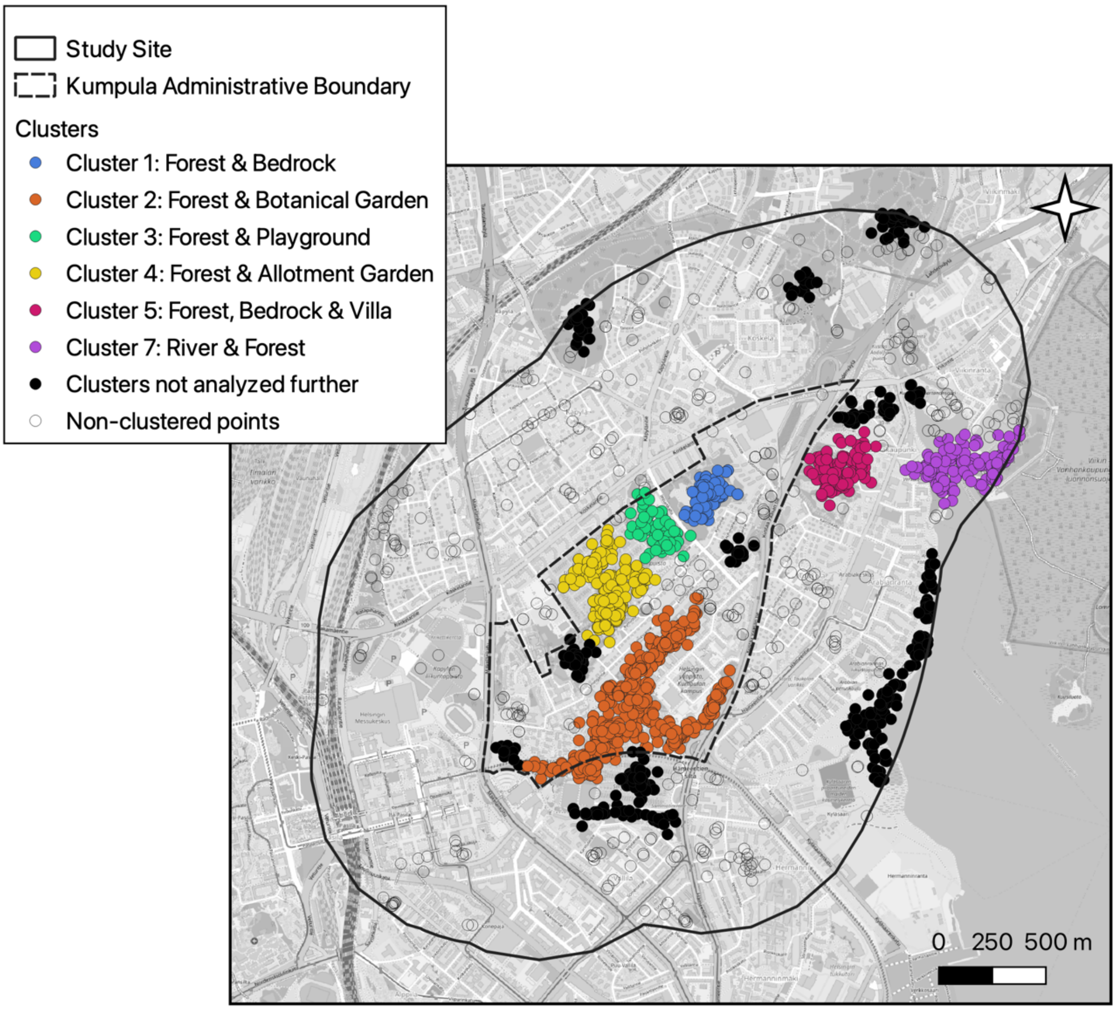

Figure 3. Clusters identified by the DBSCAN algorithm.

Of the clusters containing more than 100 points (clusters 1-5 and 7), the percentage points in each of the four value categories differed by cluster, $X^2(15, N= 1433) = 42.86$, $p < .001$ (Table 8).[2] Compared to the average, Cluster 2 was more likely to contain instrumental value points (87.2%). Cluster 5 was less likely to contain fundamental-relational value points. While not statistically significant, Cluster 3 contained fewer fundamental-relational value points.

Table 8. Proportional differences (X^2) across value categories and clusters. Statistically significant results indicated in dark green (proportionately more value points) and red (proportionately fewer value points) within a given cluster.

		Number and Proportion of Value Points			
		Intrinsic	Instrumental	Fundamental-Relational	Eudemonic-Relational
Cluster 1 (n = 124)	Count	30	0	23	71
	Percent	8.8%	0.0%	8.1%	9.2%
	√E	0.1	-1.8	-0.3	0.5
Cluster 2 (n = 670)	Count	157	34	118	361
	Percent	46.0%	87.2%	41.5%	46.9%
	√E	-0.2	3.7	-1.3	0.1
Cluster 3 (n = 102)	Count	23	3	13	63
	Percent	6.7%	7.7%	4.6%	8.2%
	√E	-0.3	0.1	-1.6	1.1
Cluster 4 (n = 270)	Count	63	2	63	142
	Percent	18.5%	5.1%	22.2%	18.5%
	√E	-0.2	-2.0	1.3	-0.2
Cluster 5 (n = 123)	Count	27	0	34	62
	Percent	7.9%	0.0%	12.0%	8.1%
	√E	-0.4	-1.8	1.9	-0.5
Cluster 7 (n = 144)	Count	41	0	33	70
	Percent	12.0%	0.0%	11.6%	9.1%
	√E	1.2	-2.0	0.8	-0.8
Total (n = 1433)	Count	341	39	284	769
	Percent	100.0%	100.0%	100.0%	100.0%

Note: counts <5 defy the assumptions of Chi-square and differences are not reported on.

Given the abundance of points in Cluster 2, this cluster was selected for further analysis. Of the points in this cluster, the majority are eudemonic-relational (53.9%), followed by intrinsic (23.4%), fundamental-relational (17.6%), and instrumental (5.1%). This cluster overlapped with both the Kumpulanmaki and Vallilanlaakon raitiotie development areas. (Figure 4); 135 points fell within the Kumpulanmaki development area and 31 fell within the Vallilanlaakon raitiotie development area. The percentage of different

[2] While included in Table 8, proportional differences were not considered for counts of less than 5.

value types did not differ by development area, $X^2(3, N= 166) = 5.356$, $p > .05$ (see Table 9).

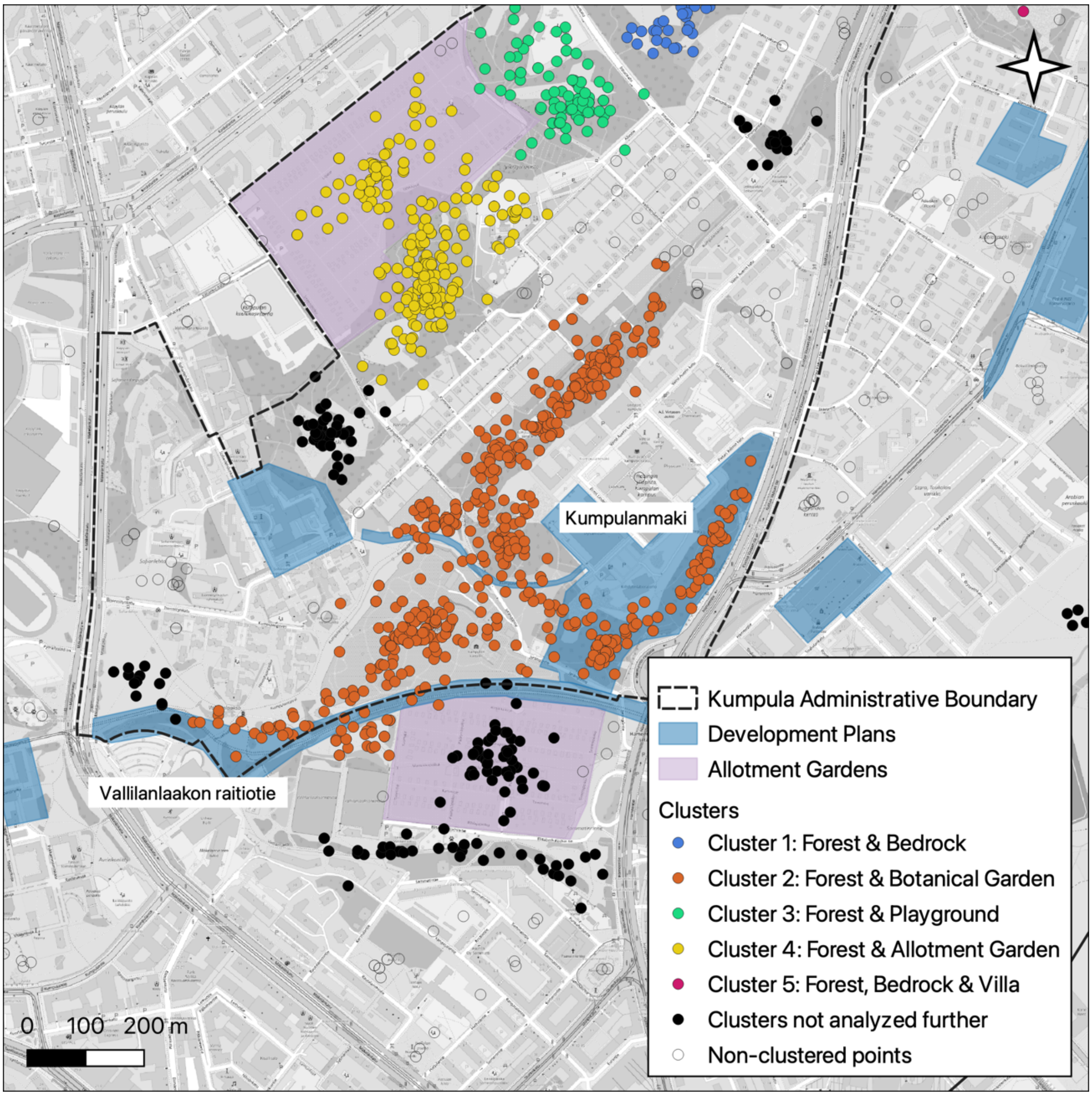

Figure 4. Distribution of points in Cluster 2.

Table 9. Proportion of value points within Cluster 2 across the two development areas.

		Number and Proportion of Value Points			
Development Area		Intrinsic	Instrumental	Fundamental-Relational	Eudemonic-Relational
Kumpulanmaki	Count	39	15	18	63
	Percent	28.9%	11.1%	13.3	46.7%
Vallilanlaakon raitiotie	Count	6	3	1	21
	Percent	19.4%	9.7%	3.2%	67.7%
Total	Count	45	18	19	84
	Percent	100.0%	100.0%	100.0%	100.0%

6 Discussion

This thesis spatially explored and examined differences in instrumental, intrinsic, and relational values assigned by residents and stakeholders to green spaces in the Kumpula neighborhood. I moved beyond the state-of-the-art by showing spatial variations in different sub-types of relational values, which has not been done in such ways in previous PPGIS studies. Data collected via these surveys indicated that green spaces in Kumpula were primarily valued relationally, with an emphasis on eudemonic-relational values. Moreover, instrumental, intrinsic, and relational values were distributed differently across green space types and values were spatially clustered by land use. Notably, there were few differences in how these values were assigned by different sociodemographic groups. The abductive typology presented in Table 4 is aligned with that presented by Arias-Arévalo and colleagues (2018), further reinforcing Brown and colleagues' (2020) conclusion that the typology approach in mapping place values is an appropriate alternative to grounded theory and qualitative approaches.

Similar to previous PPGIS surveys, mapped values were predominantly relational, and under-emphasized different types of instrumental and intrinsic values. For example, previous work has identified aesthetics, outdoor recreation, and social interaction as those most commonly associated with green spaces (e.g., Fagerholm et al. 2016, 2019; Garcia-Martin et al. 2017). Similarly, Plieninger and colleagues (2018) highlighted the importance of beautiful landscapes/landmarks, recreation, and culture/history/heritage in the landscape. What this study further illustrates, though, is the dominance of *eudemonic*-relational values, which accounted for more than half of the mapped values within the study site. While it is thus important to fully consider relational values, this limited assignment of intrinsic and instrumental values to green spaces in Kumpula also demonstrates the important need to complement PPGIS studies with additional research on the ecological importance of urban green spaces.

Within the study site, mapped values were distributed relatively evenly across different RAMS green space types; this is in contrast to previous studies that have found forested areas are most frequently mapped (e.g., Brown 2013). Given more than three-quarters of the green spaces in the study area were forests, it is difficult to draw conclusions regarding other green space types. However, different forest types are not valued uniformly. Respondents more often mapped important green spaces within forests already designated as valuable (e.g., for landscape, cultural heritage, natural biodiversity values, or other special features) and those near residential areas. Fewer important green spaces were mapped within protective forests (i.e., those between residential areas and other environments). These value differences likely result from differences in the physical characteristics of the study area, a trend highlighted by Brown and colleagues (2020). Though other factors play a role, the extent of the forests may be a large factor – valuable and near forests tend to be larger, contiguous forests, while protective forests are more fragmented and dispersed (see Figure 2).

The finding of significant proportional differences between the distribution of value types across the clusters identified by the DBSCAN algorithm suggests that biophysical factors are likely the driving force behind the spatial clusters. In particular, clusters are centered around forests and spaces with cultural and social significance (i.e., allotment gardens, botanical garden, playground, villa; see Figures 3 and 4). While land use may be a proxy for clusters of values in this case, I caution against generalizing this finding to other areas. Indeed, a previous survey in Helsinki found that stress reduction and relaxation during physical activity were most often experienced within larger (more than 30 ha) and recreational forests (Kajosaari and Pasanen 2021). Notably, certain forested areas were more often mapped, including the Kumpulanmäki forest, Vallilanlaakso park, and the forests running north-east/south-west between the Kumpula Allotment Garden and University of Helsinki Kumpula Campus.

There were relatively few differences in the frequency of the value types mapped by different sociodemographic groups. Out of the variables studied (i.e., gender, level of education, and age), the only significant differences were that younger respondents (ages 15-24) were less likely to map fundamental-relational values while older respondents (ages 45 and older) were more likely to map fundamental-relational values. Such differences may be the result of differing place-based experiences in the neighborhood and distance of domicile from mapped values. Student survey respondents (a large portion of the youngest respondents) lived, on average, farthest from mapped values and conversations with students during workshops revealed that (in large part due to the COVID-19 pandemic) they had spent relatively little time in the green spaces in and around Kumpula. These respondents may not have felt as much personal or community connection as older residents, given previous studies have found both distance from home (Brown et al. 2015) and time spent in an area (Kelly and Hosking 2008) were positively associated with place attachment and the formation of certain values. Similarly, Garcia-Martin and colleagues (2017) found age influences perceptions of values associated with cultural and provisioning ecosystem services and Laatikainen and colleagues (2017) found significant differences in the physical environments of “positive places” mapped between age groups. Unlike previous studies (e.g., Korpilo et al. 2022, under review) this study did not identify significant differences between genders. Given the well-documented gender differences in environmentalism and environmental values (Milfont and Sibley 2016), it is possible that significant differences exist within the value sub-categories. While significant differences were not found between respondents with different levels of education, it is important to note that this may be because the sample was relatively homogenous and more educated than the average Helsinki resident.

While it has been clearly demonstrated that mapped place values are related to attitudes toward land use and predictive of land use conflict and resolution, there is little evidence of PPGIS influencing land use decisions (Brown et al. 2020). Even in Helsinki, where PPGIS has been employed with the express goal of influencing city planning, utilization of PPGIS-generated data (including information on important green spaces) has been low (Kahila-Tani et al. 2016). In part, this is due to technological and knowledge barriers; PPGIS typically involves large datasets and analysis requires a level of GIS-literacy. Importantly, though, the nature of the values themselves also plays a role in how effectively they are incorporated in the planning process. That is, input from laypeople in planning processes is often dismissed as opinions or beliefs (Corburn 2003); the personal, subjective, and nonmaterial nature of relational values may amplify this dynamic. Nonetheless, this study clearly demonstrates that factors such as personal and community identities, socialization, restoration and relaxation, aesthetics, and recreation are at the heart of how residents and stakeholders value Kumpula’s green spaces. Mapped values presented in this thesis may further serve to compliment and expand the City of Helsinki’s wider sustainability initiatives. For example, as the City of Helsinki’s Voluntary Local Review (City of Helsinki 2019b) highlights, the current approach to the Sustainable Development Goals is highly operations- and economy-based; gaining information on relational values is thus an opportunity to shift toward more inclusive initiatives.

This is especially important as Helsinki moves closer to the 2050 vision of a “markedly more dense” city (City of Helsinki 2013, p. 6), as such a goal necessitates the removal of green spaces and will place increased pressure on the remaining “green network.” While methods (including PPGIS) exist for exploring potential conflict resulting from management of these remaining spaces, cities also need to understand the potential conflicts that will arise from the loss of existing green spaces and their associated values. While new construction will provide new homes, jobs, transit connections, and social benefits (e.g., as found by Kyttä et al. 2013), the removal of green spaces will also result in the loss of intrinsic instrumental, and relational values. For example, Cluster 2 (forest and botanical garden) not only contains almost half of all eudemonic-relational values in the clusters subjected to further analysis, it also accounts for 87.2% of instrumental values in these clusters. Thus, not only will future development in Kumpulanmäki forest and Vallilanlaakso park entail the loss of values linked to “the good life,” it will include the removal of the green space most valued in terms of contributions to physical comfort (e.g., shelter, temperature, air quality, sunlight, lack of noise; see Table 4).

6.1 Limitations and Future Directions

There were several limitations to this study. First, as multiple surveys were combined in order to increase the sample size, it was necessary to analyze the mapped important green spaces at the level of intrinsic, instrumental, fundamental-relational, and eudemonic-relational values. For example, as few instrumental values were mapped in phase I, the phase II survey did not include any instrumental values on the list of values (an open-ended “other” option was provided; analysis of these responses was not included in this thesis). While this mirrors previous work showing the dominance of relational values, future work would benefit from more effort to elicit instrumental values. However, the typology presented within this thesis provides a starting point for future studies seeking to create more inclusive understandings of the multiple values of nature, such as the importance of urban forests for eudemonia. Moreover, by expanding the geographic range of future studies, PPGIS surveys would both allow for an understanding of the values of nature at a city-scale and allow for more nuanced understandings of values by type of green space. Finally, study respondents tended to be middle-aged, female, and highly educated. While the use of proportional differences still allowed for meaningful comparison of difference sociodemographic groups, a more complete understanding of the dynamics of age, gender, education, and other sociodemographic factors is necessary for inclusive planning. Especially important are the differences between age groups, as this is a key component in the creation of intergenerationally just planning policies.

7 Conclusions

This thesis aimed to explore and examine how residents and stakeholders value the green spaces in Kumpula, Helsinki. By spatially examining the differences in instrumental, intrinsic, fundamental-relational, and eudemonic-relational values as mapped in PPGIS surveys, this thesis demonstrates that the green spaces in Kumpula are primarily valued for their relational value, with the majority of mapped important green spaces linked to eudemonic-relational values. Furthermore, while the four different value types were distributed differently across green space types, all mapped values were spatially clustered near the larger forests and spaces with particular cultural or social value. Notably, there were few differences in how these values were assigned by different sociodemographic groups. These findings highlight the potential for land use conflict resulting from the loss of values through urban densification projects. Moreover, this study demonstrates the effectiveness of typology approaches in PPGIS and shows spatial variation within the sub-types of relational value.

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