

ISTANBUL TECHNICAL UNIVERSITY ★ GRADUATE SCHOOL

**LIVE WITH NATURE TO LIVE IN NATURE: A PUBLIC PARTICIPATORY
MAPPING OF PLACE VALUES OF ATATÜRK URBAN FOREST**



M.Sc. THESIS

Kosar AZARMIKHOSROSHAHI

Department of Landscape Architecture

Landscape Architecture Programme

JUNE 2024

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**Kosar AZARMIKHOSROSHAHI
(502201609)**

Department of Landscape Architecture

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Thesis Advisor: Assoc. Prof. Dr. Elif KISAR KORAMAZ

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**DOĞADA YAŞAMAK İÇİN DOĞA İLE YAŞA: ATATÜRK KENT ORMANI
YER DEĞERLERİNİN KAMU KATILIMLI HARİTALANMASI**

YÜKSEK LİSANS TEZİ

**Kosar AZARMIKHOSROSHAHI
(502201609)**

Peyzaj Mimarlığı Anabilim Dalı

Peyzaj Mimarlığı Programı

Tez Danışmanı: Doç. Dr. Elif KISAR KORAMAZ

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Kosar Azarmikhosroshahi, a M.Sc. student of İTÜ Graduate School student ID 502201609, successfully defended the thesis entitled “LIVE WITH NATURE TO LIVE IN NATURE: A PUBLIC PARTICIPATORY MAPPING OF PLACE VALUES OF ATATÜRK URBAN FOREST”, which she prepared after fulfilling the requirements specified in the associated legislations, before the jury whose signatures are below.

Thesis Advisor : **Assoc. Prof. Dr. Elif KISAR KORAMAZ**
İstanbul Technical University

Jury Members : **Prof. Dr. Fatih TERZİ**
İstanbul Technical University

Assoc. Prof. Dr. Özlem ÖZER
Gebze Technical University

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To the good earth and all the things green and growing,



FOREWORD

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June 2024

Kosar AZARMIKHOSROSHAHI
(Architect)

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ABBREVIATIONS

AUF	: Atatürk Urban Forest
CSR	: Complete Spatial Randomness
ES	: Ecosystem Services
IMM	: Istanbul Metropolitan Municipality
IPBES	: Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services
NN	: Nearest Neighbor
PPGIS	: Public Participation Geographic Information Systems
RII	: Relational-Intrinsic-Instrumental
SES	: Social-Ecological System(s)



SYMBOLS

ρ : Cell Size





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LIVE WITH NATURE TO LIVE IN NATURE: A PUBLIC PARTICIPATORY MAPPING OF PLACE VALUES OF ATATÜRK URBAN FOREST

SUMMARY

Environmental management and decision-making fields face dualistic complexities of balancing societal progress and developments by addressing their needs and values while sustaining the capacity of ecosystem functioning. This pertains to the need to recognize the interconnectedness and dependencies of human and nature systems and the democratic and participatory approaches to ensure environmental sustainability. Despite this, the role of resource users and their underlying values in understanding coupled social-ecological systems (SES) has yet to be developed both in research and actual management and decision-making frameworks. This research, with a focus on human-nature relationships, aims to elicit and measure the place values of Atatürk Urban Forest (AUF) in Istanbul, Turkey. Place values are the diverse importance individuals attribute to the elements in the surrounding landscapes. Through adopting a plural valuation and public participatory value mapping approach, this research examines the AUF visitors' relational, intrinsic, and instrumental values to capture the many ways people facilitate relationships with nature and perceive its importance for their subjective well-being.

Using the public participation geographic information systems (PPGIS) technique, a web-based questionnaire on ESRI's Survey123 was conducted on-site during the spring-summer of 2023. A total of 112 random site visitors participated resulting in a 29.3% survey participation rate. The survey collected the visitors' place value data points assigned for the AUF's physical landscape along with their non-spatial data on socio-demographics, pattern of use, and familiarity with the site. Accordingly, the collected place value points data were investigated by pattern and density spatial analysis, and the non-spatial data were analyzed by descriptive statistics and non-parametric one-way ANOVA and T-tests.

The descriptive analysis of public-anchored place values signified the importance of the AUF landscape for its aesthetic values. A contextual hierarchy of anchored place values, additionally revealed the aesthetic value as the visitors' highest priority ranked value, biodiversity value as the second priority, and recreation value as the third priority place value of AUF. In addition to these, in descending order, place values including therapeutic, future, social relations, intrinsic, cultural heritage, economic, learning, and spiritual values contextualize AUF as a multifunctional SES. The overall density analysis of all the mapped place values demonstrated the most distinguishable landscape elements where simultaneously concentrate diverse and intensified place values, in areas such as the natural pond areas, festival area, café area and the children's playground. Density analysis of the mapped place values corresponding to relational, intrinsic, and instrumental values revealed the spatial convergence of relational and intrinsic values. The co-existence of these values across the AUF

landscape reflected the dependencies of ‘live in nature’ and ‘live with nature’ human-nature relationships in the urban forest, strengthening our comprehension of AUF as an interconnected SES. The statistical analysis did not yield in significant association for participants’ familiarity with the site and pattern of use in conjunction with their identified place values. Only education indicator of participants’ socio-demographics revealed a positive association with the mean assignment of relational and intrinsic values. Accordingly, the visitors with university-level education assigned more intrinsic values to the urban forest denoting their understanding of nature’s importance for its own sake. Under-university level graduates, on the other hand, assigned more relational values reflecting the value concept’s appeal to a broader audience.

Overall, the results of the research equip landscape management and design with a visual and evaluative tool to inform the experts about the most important areas of value across the AUF landscape according to the public’s perception. Furthermore, future research directions and insights for the landscape architecture field adopting PPGIS to study place values in the landscape scales are extensively discussed. Finally, this research advocates for managing lands in line with people’s values and for their further integration into adaptive management and decision-making frameworks in light of ensuring social-ecological sustainability and well-being.

DOĞADA YAŞAMAK İÇİN DOĞA İLE YAŞA: ATATÜRK KENT ORMANI YER DEĞERLERİNİN KAMU KATILIMLI HARİTALANMASI

ÖZET

Günümüzün çevre sorunlarının aciliyetini kabul ederek, bu tez doğa ve toplum arasındaki karmaşık etkileşimlerle başa çıkan bütünleşik yaklaşımlara odaklanmaktadır. Doğal ve sosyal sistemler karmaşık sistemlerdir ve çevre yönetimi alanı, insanların doğa-toplum sisteminin dışında duramaması nedeniyle ek bir karmaşıklıkla karşı karşıyadır. Bu durum, iki sistem arasındaki karşılıklı etkileşimlerin doğal olarak var olmasından kaynaklanmaktadır. Bu tez, insanların çevreleriyle olan bağlılığını vurgular ve sosyal-ekolojik sistemler (SES) perspektifinden insan-doğa ilişkilerini ana kavramsal çerçeve olarak ele alır. SES, insanların doğadaki yeri kavramını temsil eder; burada sosyal sistemler ve ekolojik sistemler ayrılmaz bir şekilde bağlantılıdır ve bu ilişkiler tanınır. Dolayısıyla, çevresel sürdürülebilirlik ve toplumsal refah, karmaşık yaşam destek sistemlerinin dinamiklerinin uzmanlar kadar toplumun geneli tarafından da anlaşılmasını gerektirir. Bu gereklilik, çevrenin karmaşık yapısını çözümlenmek üzere uzman görüşleri temelli karar verme süreçlerini desteklemek üzere insan deneyimini ve kullanım değerlerinin yerini önemli kılar.

Sürdürülebilir yönetim için ekosistemlere atfedilen çeşitli değerlerin tanınması zorunludur. İnsanlar, çevreleriyle etkileşimleri sonucunda, diğer unsurlarla karşılaştırıldığında peyzaj öğelerine kalıcı kişisel tercihlerine göre göreceli bir önem atfederler. Çevre ile insan ilişkilerini temsil eden yer değerleri, sürdürülebilirlik söyleminde önemli bir rol oynar. Ancak, SES'deki insan değerleri üzerine yapılan araştırmalar sınırlıdır ve değer çoğulculuğu ve ölçülemezliğinin literatürde son zamanlarda kabul edilmesine rağmen, pratik karar verme ve yönetim çerçevelerinde daha az tanınmaktadır. Yer değerleri araştırmasının genel amacı, doğanın insanlar için çeşitli değerlerini gelecekte sürdürülebilir kılmak, peyzaj yönetimi, peyzaj değerlendirmesi, peyzaj mimarisi ve tasarımına yardımcı olmak ve karar verme süreçlerine katılımcı bir yaklaşımla elde edilen çok boyutlu değerleri dahil etmektir.

Bilimin post-pozitivist perspektifi, uzmanlar ve vatandaşlar arasında karşılıklı öğrenme yoluyla çevre korumasını sağlamak için katılımcı süreçlerin ve demokratik uygulamaların önemini vurgular. Halk katılımlı coğrafi bilgi sistemleri (PPGIS) gibi katılımcı yaklaşımlar benimseyerek, mekansal olarak belirgin değerler karar verme süreçlerine dahil edilebilir. Peyzaj kaynaklarının kullanıcılarının haritalanmış yer değerleri, peyzajdaki kullanıcı deneyimleriyle ilişkilidir. Disiplinlerarası bir alan olarak peyzaj mimarlığı, PPGIS ve SES yaklaşımıyla, peyzajın biyofiziksel yapısının yere dayalı sosyal-kültürel değerlerini ve anlamlarını tasarım yaklaşım ve kararlarına dönüştürebilir.

Bu tez, halk katılımlı değer haritalama yaklaşımını benimseyerek Atatürk Kent Ormanı'ndaki (AKO) mevcut insan-doğa ilişkilerini anlamayı amaçlamaktadır. İstanbul'un kuzeyinde yer alan bir kent ormanı olan AKO, sahip olduğu zengin biyolojik çeşitliliği ile ekosistem hizmetleri sağlama potansiyeli yüksek olan bir

alandır. Halkın erişimine açık ve ulaşılabilir olanaklarıyla bu kent ormanı, insanların ve ormanın birbirine bağlı olduğu ve değerlerin ekosistem işleyişi ve sayısız sosyal eylemlerle ilişkilendirilebileceği bir SES peyzajının önemli bir örneğidir.

Bu tez, amacına ulaşmak üzere, araştırmanın metodolojik çerçevesini de yönlendiren üç ana araştırma sorusuyla hareket etmektedir: (1) Kullanıcılar Atatürk Kent Ormanı'na hangi yer değerlerini atfetmektedir? (2) En yüksek düzeyde çeşitlenen ve yoğunlaşan değerler AKO peyzajının neresindedir? (3) Belirlenen yer değerleri kullanıcıların sosyo-demografik özellikleri, siteye aşinalıkları ve kullanım kalıpları ile nasıl ilişkilendirilebilir?

Araştırma sorularına göre, tezin hedefleri şu şekilde detaylandırılmıştır: (1) Kullanıcıların algılarına dayalı olarak AKO'na atfettikleri yer değerlerini mekânsal olarak ve önem sıralamasına göre belirlemek. (2) AKO peyzajında yer değerlerinin mekânsal dağılımını ortaya koymak. (3) Kullanıcı profilleri ile belirlenen değerler arasındaki ilişkiyi araştırmak.

AKO'nun birbiriyle bağlantılı bir SES olarak araştırılması, arazi kullanımı değişikliği tehditlerle karşı karşıya kaldığında SES dayanıklılığını sağlamak için çeşitli yer değerlerinin tanınması ve korunması süreçlerine katkı sağlar. SES'lerde, uyarlanabilir tepkilerin çeşitliliği azaldığında sistem kırılma hale gelir. Bu araştırma, ziyaretçiler tarafından belirlenen yer değerlerini mekânsal olarak araştırarak, kullanıcılarca benimsenen değerler ve peyzajın bir bölümünde arazi kullanımı değişikliğiyle otel inşaatını mümkün kılacak planlama kararları arasındaki çatışmayı belirlemeye yardımcı olacak bir mekânsal araç da ortaya koymaktadır. Ayrıca, AKO'nun vaka çalışması olarak seçilmesinin bir diğer nedeni, kamuya açık yeşil alanların çoğunda olduğu gibi, profesyoneller ve uzmanlar tarafından özel olarak yönetilip tasarlanmasıdır. Oysa peyzajın kaynak kullanıcılarının çoğunluğu halktır. Peyzaj mimarları, planlılar ve yöneticiler, insan sağlığı ve refahını destekleyen açık hava etkinliklerine olan sürekli artan talep karşısında, ziyaretçilerine kaliteli bir deneyim sunma ve peyzajın ekolojik bütünlüğünü koruma zorluğuyla karşı karşıyadır. Bu zorlukla başa çıkmak için peyzaj planlamacıları ve uzmanları, kendi bilgilerini kaynak kullanıcılarının bilgisiyle tamamlamalı ve insanların peyzajla ilişkilerinde atfettikleri değerleri dikkate almalıdır. Soyut ve uzman odaklı yöntemler, peyzajların toplumun temel değerlerini yansıtacak şekilde tasarlanmasını sağlamak için kaynak kullanıcılarının karmaşık sistemlerdeki rolünü tanımalıdır.

Bu çalışmanın metodolojisi, yer değerlerinin katılımcı mekânsal haritalaması için PPGIS tekniği etrafında inşa edilmiştir ve çalışma alanındaki insan-doğa ilişkilerini incelemeye olanak tanır. Araştırmanın hem mekânsal hem de mekânsal olmayan bileşenlerini içeren bir anket, ESRI Survey123 tarafından hazırlanmıştır. Web tabanlı halk katılımlı haritalama anketi aracılığıyla, AKO ziyaretçilerinin rastgele bir seçimi, sosyo-demografik bilgiler, parkla ilgili sorular ve yer değerlerini içeren üç bölümde anketi yanıtlamıştır. Anket, yer değerleri üzerine mekânsal nokta verilerini ve katılımcı profilleri üzerine mekânsal olmayan verileri sağlamıştır. Ortalama en yakın komşu (NN) istatistikleri kullanılarak, peyzaj üzerindeki değer yoğunluğu kümelerinin mekânsal deseni analiz edilmiştir. Değer noktalarının mekânsal yoğunluğunu ve yoğunluk ağırlıklarını dikkate almak için, ArcGIS pro 3.0'da sıcak nokta analizi (hotspot analysis) ve yoğunluk analizi (kernel density analysis) yapılmıştır. Katılımcı profilleriyle ilgili mekânsal olmayan veriler, katılımcıların yer değeri atamalarıyla ilişkilendirilerek analiz edilmiştir. Buna göre, tez kapsamında AKO'nun yer değerleri belirlenmiş ve niceliksel olarak ölçmüş, kullanıcıların öznel refahı için kent ormanının

neden önemli algılandığına dair temel bulgular ortaya koyulmuştur. Diğer iki araştırma amacı, bu yer değerlerinin fiziki peyzajla nasıl mekansal olarak ilişkili olduğunu ve katılımcı profilleri ile nasıl ilişkilendirildiğini incelemiştir.

Web tabanlı PPGIS anketi, 2023 yılının ilkbahar-yaz döneminde, 112 site ziyaretçisinin katılımıyla ve %29.3 yanıt oranıyla gerçekleştirilmiştir. Betimleyici analizlere göre, AKO peyzajının ziyaretçileri büyük ölçüde estetik değerleri önemli olarak algılamaktadır. Ardışık olarak en sık atanan yer değerleri, sırasıyla rekreasyon değeri, biyolojik çeşitlilik değeri, terapötik değer, gelecek değeri, sosyal ilişkiler değeri, yaşamı sürdüren değer, içsel değer, kültürel miras değeri, ekonomik değer, öğrenme değeri ve manevi değerdir. Bu yer değerleri, AKO'yu çok işlevli bir SES olarak karakterize etmektedir. PPGIS katılımcıları tarafından atanan yer değerlerinin üç öncelik sıralaması, AKO için estetik değeri en yüksek, biyolojik çeşitlilik değeri ikinci en yüksek ve rekreasyon değeri üçüncü öncelikli yer değeri olarak belirleyerek bağlamsal bir önem hiyerarşisi oluşturur.

Tüm değer noktalarının bir arada haritalanmasıyla gerçekleştirilen mekansal analiz ve kullanıcılarca atfedilen öneme bağlı olarak belirlenen ağırlıklar, çeşitlenen ve yoğunlaşan yer değerlerinin tanımlanabilir peyzaj alanları etrafında mekansal olarak kümelenildiğini ortaya koymuştur. Yer değerlerinin yoğunlaştığı sıcak noktalar, belirgin bir şekilde büyük gölet alanı, festival alanı ve küçük gölet alanı ile ilişkilidir. Daha az yoğun yer değeri yoğunluğu ise Beltur kafe alanı ve Kuzey kapısına yakın çocuk oyun alanında gözlemlenmiştir. İlginç bir şekilde, bu çok işlevli peyzaj öğeleri, su yolu ve Çıtkuşu yolunun bir kısmı ile bağlantılıdır ve peyzajın merkezi eksenı boyunca sürekli bir yoğunluk yüzeyi oluşturarak başarılı bir tasarım unsuru haline gelmiştir. Ayrıca, bu araştırma, AKO'nun 12 kategorik değer yoğunluğunu görselleştirerek, peyzaj yönetimi ve tasarımcılarına ziyaretçilerin algılarına dayalı olarak önemli yerel bilgileri sağlamaktadır. Bu bulgular, kent ormanındaki farklı alanların insanların doğa deneyimlerine ve insan-doğa ilişkilerine nasıl katkıda bulunduğunu anlamaya yardımcı olmaktadır.

Bu araştırmaya göre, AKO'nun yer değerleri büyük ölçüde ilişkisel değerlerle karakterize edilirken, içsel değerler ikinci sıradadır. Öte yandan, araçsal değerler, AKO'nun yer değerlerini son derece az temsil etmektedir. Önemli bir bulgu, orman peyzajındaki ilişkisel ve içsel değerlerin mekansal birlikte varlığının görselleştirilmesidir. İlişkisel değerlerin merkezi eksen boyunca kümelenmesi, ziyaretçilerin doğa ile çeşitli ilişkilerini kolaylaştıran bu alanın önemini gösterir. İçsel değerlerin yoğunluğu ise merkezi eksen boyunca gözlemlenmiş olup, insan erişiminin yasaklandığı korunmuş orman alanlarına doğru yayılmaktadır. Kavramsal açıdan, ilişkisel ve içsel değerlerin birlikte varlığı, insanların iyi ve anlamlı bir yaşamı oluşturan orman ile veya orman içindeki ilişkilerin bu ormanın varlığına bağlı olduğunu ima eder. Bu, 'doğada yaşamak' için 'doğa ile yaşamak' ilişkilerinin doğanın kendi varlık hakları için değer verilmesi gerektiğini ve bu değerlerin vurgulanması gerektiğini belirtebilir.

Araştırma sonuçları, kullanıcıların yer değerleri ile Atatürk Kent Ormanına ilişkin planlama kararları arasındaki açık bir çatışmayı belirlemek üzere peyzaj yönetimine görsel bir araç sağlamaktadır. Yakın zaman içerisinde kent ormanının festival alanı yakınındaki alan için plan kararı değişikliği ile bir otel inşaatının gündeme gelmesi, yerel topluluğun önerilen peyzaj değişikliğine güçlü protestoları, yerel halkın kent ormanına olan sahiplenme duygusunu yansıtmıştır. Bu gelişmeler SES etkileşimlerinin bir işlevi olan insan-doğa ilişkisinin farklı yönlerine işaret etmektedir. Zube'nin (1987)

kavramlarına göre, kamu arazileri, insanların peyzaj için taşıdığı değerlere uygun olarak yönetilmelidir. Bu araştırma, bu değerlerin dikkate alınmasını ve planlama çerçevelerine entegrasyonlarının vurgulanmasını sağlamak için uyarlanabilir bir yaklaşımın gerekliliğini vurgulamakta, böylece sosyal-ekolojik dayanıklılığı artırarak karşılıklı kabul edilebilir ve sürdürülebilir sonuçlar ortaya koymaktadır.

Son olarak, araştırma sonuçları PPGIS katılımcılarının araştırma alanına ilişkin farkındalık ve bilgi düzeyleri ile kullanım kalıplarıyla belirlenen yer değerleri arasında istatistiksel olarak anlamlı bir ilişki olmadığını göstermiştir. Aynı durum, genel olarak sosyo-demografik özellikler için de geçerlidir; ancak, katılımcıların eğitim seviyelerinin ilişkisel ve içsel değerlerle olumlu ilişkiler gösterdiği belirlenmiştir. Üniversite düzeyinde eğitim alan AKO ziyaretçileri, kent ormanına daha fazla içsel değer atfederken, üniversite düzeyinin altında olan mezunlar daha fazla ilişkisel değer atamışlardır. Bu bulgu, yüksek düzeyde eğitimin, bireylerin insan olmayan varlıklar için ahlaki değerleri ve varlık önemini tanımada bilişlerini artırmadaki etkisine işaret etmektedir.

Bu tez araştırması, insan ve doğa arasındaki bağlılığı vurgulamayı ve çevresel sürdürülebilirlik ve toplumsal refahı sağlamak için kamu katılımlı haritalamanın önemini yansıtmayı amaçlamıştır. Araştırmanın genel sonuçları, uzman temelli karar verme ve tasarımı desteklemek için yararlı görsel araçlar sunmaktadır. PPGIS ve çoğul değerlemenin, peyzaj mimarisi ve tasarım alanları için bir değerlendirme aracı olarak rolü de gösterilmiştir. Peyzaj mimarlığı için PPGIS çalışmalarının başlangıç noktası olarak, bu tez yer merkezli ve kamu katılımlı yaklaşımları benimseyen gelecekteki çalışmalar için özel öneriler sunar. Yerel peyzaj ölçeğinde bağlamsal yer değerlerinin nasıl gerçekleştirildiğinin daha yakından incelenmesi, SES etkileşimlerini anlamayı artıracak ve yenilikçi ve uyarlanabilir peyzaj tasarımları, planlama ve karar alma süreçleri aracılığıyla doğanın değerlerinin geleceğe taşınmasını sürdürebilecektir.

1. INTRODUCTION

Recognizing the urgency of addressing today's environmental challenges, this research focuses on integrative approaches that deal with the complex interactions between nature and society. Nature and social systems are both complex systems and the environmental management fields face an additional complexity given that humans cannot stand outside of the nature-society system. That is due to the inherent reciprocal interactions existing between the two systems. The connectedness between humans and nature is recognized to solve current sustainability crisis, yet it is simultaneously influenced by this very crisis. This research emphasizes the connectedness of humans and their environment and focuses on human-nature relationships as its main conceptual framework. The human-nature relationships are investigated with the transactional model and the social-ecological systems (SES) perspective. The purpose of this investigation is to draw on the importance of human experience in the landscape and the use of place values to appreciate environmental complexity and aid expert-based decision-making. The concept of place value operationalizes human-nature relationships in this research. The focus on values stems from discussions on environmental issues as they are assumed to have an impact on our behavior and decision-making regarding nature and its protection.

The transactional model is based on the concept that humans are active participants in the landscape and as a function of their relationship they both are affected. The model draws on the various values and perceptions that humans develop through their experiences in the landscape. In line with this, SES represent the concept of people in nature where social systems and ecological systems are inextricably linked and their interrelations are recognized (Berkes et al., 2003). People as the resource users through landscape observation and experience hold context-specific knowledge which play a significant role in the ecosystem approach to resource and environmental management.

As a result of interaction with their surrounding landscapes, humans assign relative importance to landscape elements in relation to other elements based on their enduring personal preferences. This perceived importance of the landscape or the place values;

represent the range of human associations with the environment, and play a crucial role in the sustainability discourse. However, research on human values in SES has been limited and even less recognized in practical decision-making and management frameworks, despite the recent acknowledgment of value pluralism and incommensurability in the literature. The overarching aim of the place values research is to sustain nature's diverse values for the future, help landscape management and assessment, landscape architecture and planning, and include multi-dimensional values elicited with a participatory approach in decision-makings.

The post-positivist perspective of science draws on the importance of participatory processes and democratic practices to achieve environmental protection through mutual learning between experts and citizens (F. Fischer, 2000). Public participatory research that represents insights from lay audiences including local community members and landscape visitors has great potential to inform urban and landscape planning. By adopting participatory approaches like public participatory geographic information systems (PPGIS), local knowledge and spatially explicit values can be incorporated into planning and decision-making processes.

Additionally, the mapped spatially explicit place values of resource users relate to their experience in the landscape. Therefore, landscape architecture as an interdisciplinary field, with an SES approach to the landscape, can translate the place-based social-cultural value and meanings of the biophysical structure of the landscape and provide design insights. The profession can enhance the interaction between science and society by providing common grounds on which people can participate, debate, and visualize ideas for a future landscape that embraces local knowledge and respects the diversity of values in the complex human-nature system to ensure sustainability. Although the study of place values has been a focus of regional and other large-scale studies in the developed countries context, landscape architecture is increasingly using the integrative approach to provide detailed and local-scale management and design strategies.

This research through PPGIS empowers marginalized stakeholders in anchoring diverse values of nature at a landscape scale. It investigates place values in an urban forest to understand the existing human-nature relationships, aiming to support adaptive landscape management and landscape design for the well-being of the urban forest SES.

1.1 Aim and Objectives

This research by adopting a public participatory value mapping approach, aims to understand the human-nature relationships that exist in the Atatürk Urban Forest (AUF). The diverse and plural place values anchored by the landscape visitors allow for comprehending AUF as a multifunctional and coupled SES. AUF is a longstanding mixed forest in the north of Istanbul, Turkey. The urban forest boasts a rich and biodiverse ecosystem with high potential for providing ecosystem services (ES). With its open and accessible amenities for the public, this park stands as a prime example of SES landscape in which people and the forest are interconnected and values can relate to its ecosystem functioning and the myriad social actions. This research, through PPGIS, studies the spatially explicit place values of the Atatürk Urban Forest (AUF) and provides a basic understanding of why and how the landscape is important to people to inform sustainable landscape management and decision-making. While the spatial distribution of values is also an evaluative tool of the forest's landscape design, this research also investigates how independent variables such as socio-demographics, pattern of use, and familiarity with the site influence individuals' perceptions of place values.

This research, to reach its aim, investigates three main research questions that guide its methodological framework. They are defined as follows:

- (1) Which place values are collectively held by the public for the urban forest?
- (2) Where does the AUF landscape hold the most diverse and intensified place values?
- (3) How can the identified place values be understood according to associations with the participants' characteristics including socio-demographics, familiarity with the site, and pattern of use?

According to the research questions, the research's objectives are elaborated as such:

- (1) To capture the place values spatially and their importance ranking based on the visitors' perceptions.
- (2) To demonstrate the spatial distribution of place values in the AUF landscape.
- (3) To investigate the association between the users' profiles and their identified values.

The intention behind investigating AUF as an interconnected SES relates to recognizing and preserving a diversity of place values to ensure SES resilience when it is faced with disturbances such as the threat of landscape change. In SES, the system becomes vulnerable when the diversity of values and adaptive responses is reduced. This research by spatially investigating the place values anchored by the visitors introduces a spatial tool to help identify a clear conflict between public values and management plans for privatization and the construction of a hotel in a part of the landscape. This landscape change would effectively hamper the many human-nature relationships and the values arising from them.

Moreover, AUF as with most of the public green spaces is exclusively designed and managed by professionals and experts. This is the case when the majority of the resource users of the landscape are the general public. Landscape planners and managers with the ever-increasing demand for the outdoors that are supportive of human health and well-being face the challenge of providing a quality experience for their visitors as well as maintaining the ecological integrity of landscapes. To face this challenge, landscape planners and experts need to complement their knowledge with that of the resource users and take account of the values people associate with the landscape. The abstract and expert-oriented methods need to recognize the resource users' role in the complex systems to design landscapes that are reflective of society's underlying values to ensure SES sustainability and resilience (Plieninger et al., 2015).

1.2 Scope of the Study

The research process of the research is explained in five main chapters. The first chapter takes a holistic outlook on the overall context of the study and provides the readers with short introduction of the research problems, research's conceptual framework, methodological approach, and outlines the research aim and objectives defined for the case study of Atatürk Urban Forest (AUF). A short explanation on the significance of the study in contributing to the advancement of the theories in the current literature, as well as the practice of landscape management and architecture is given.

The second chapter, reviews the literature on human-nature relationships by first introducing the transactional model which prepares the readers with the SES perspective in environmental sustainability and resilience discourse. As both these

perspectives focus on the role of the resource users, the research dives into concepts of local knowledge, and especially values as the most important operational component of this study. Then the values are defined within the SES framework to establish this study's exact approach to the concept of value. In light of the assessment and measurement of the values, the environmental valuation and plural valuation approaches are reviewed. The value paradigm that contextualizes human-nature relationships is then defined according to the literature. Finally, the participatory mapping of values as a method of plural environmental valuation is discussed with narrowing focus on the PPGIS technique. According to the discussed literature the research aim and objectives are put in perspective for the research case study.

The third chapter, introduces the readers with details on the case study, and elaborates on the opted methodology of the research from operationalizing PPGIS technique by Survey123 up to analysis of the collected spatial and non-spatial data. The analytical workflow that guides this research to reach its three objectives are clarified by a diagram.

The fourth chapter indicates the results for the three research objectives and can be divided into spatial outputs of place value maps and descriptive and statistical tables regarding the PPGIS participants, their assigned place values, and the association between individuals and their anchored values. This chapter then discusses the research findings according to literature and then gives insights on plural valuation and PPGIS for future studies especially within landscape architecture and local-scale along with delineating the methodological limits. The research is concluded in chapter five by reminding the readers with the context of the study and gives a summary of the most important findings regarding the research aim and the human-nature relationships in AUF SES.

1.3 Methodology

The methodology of this study is built around participatory spatial mapping of place values that allows for the study of the human-nature relationships that exist in the study area. The participatory place value mapping is a step in democratic environmental sustainability as the general public are encouraged to contribute their knowledge and aid experts decision-making. Through the literature review on ecosystem valuation, SES, value paradigm, value articulation, participatory mapping, and PPGIS, the

quantitative methodology to investigate place values was determined. A questionnaire was prepared by Survey123, one of the most effective and license-based PPGIS platforms, to comprise both spatial and non-spatial components of this research. Through the web-based public participatory mapping survey, a random selection of AUF visitors participated in answering the survey questionnaire in three sections including place values, park-related questions, and socio-demographics. The survey results provided the spatial point data on place values and participant profiles. The place values are descriptively and spatially investigated to represent the diverse place values of AUF and their importance rankings (research objective 1) and demonstrate their spatial distribution in the landscape (research objective 2). Then for the third objective of the research, the participant profiles as independent variables were statistically investigated by their association with the frequencies of various mapped place values. The research design of this thesis is depicted in Figure 1.1.

1.4 Significance of the Study

This research adopts an ecosystem valuation approach that moves beyond the instrumental-intrinsic valuations in the ecosystem services (ES) assessment framework and takes account of relational values to comprehensively understand human-nature relationships. While the concept of relational values in most recent literature is booming, due to the variety of approaches to the concept (e.g. in environmental ethics and environmental psychology) an inherent ambiguity in its position in different institutions exists. The majority of methods around its assessment have focused on qualitative approaches. Recent literature however, is increasingly encouraging the quantitative assessment of the relational values and their associations with different variables (Schulz & Martin-Ortega, 2018). This research aims to contribute to this body of literature by investigating a holistic representation of human-nature relationships through value pluralism including intrinsic, instrumental, and relational values in a quantitative manner.

Secondly, the place values mapping approach is extremely advanced in land use planning, tourism and nature recreation, environmental planning, and management arenas. However, this approach has not been explored in urban or landscape design, especially considering that the place values given a local scale are potent in relating to the everyday realities of resource users.

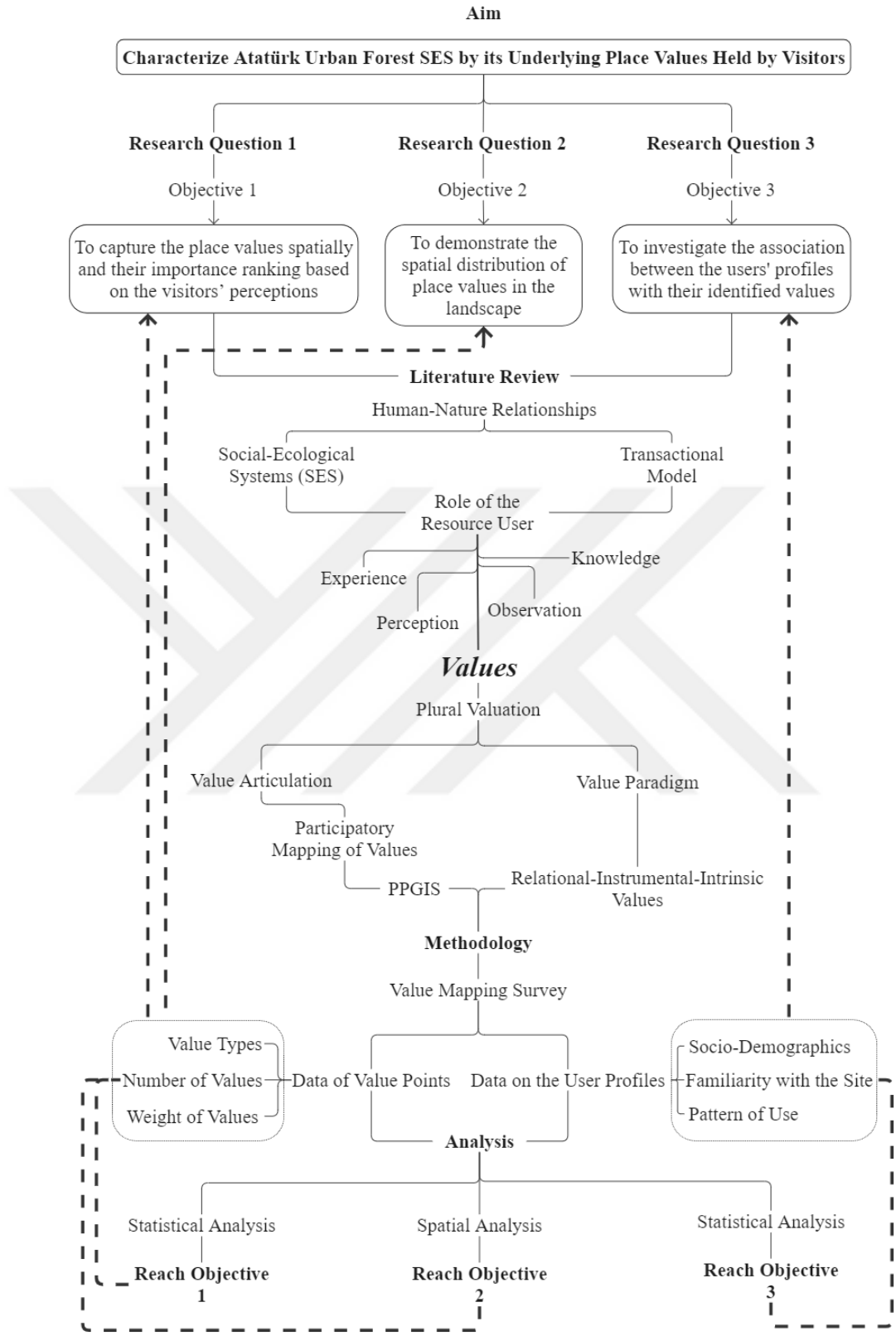


Figure 1.1 : Research design roadmap of the thesis.

This research investigates place values to inform management and decision-making of the urban forest, and also endeavors to progress place values and SES perspective in landscape architecture. By analyzing the spatial distribution of place values it is aimed to evaluate the landscape design of the urban forest in terms of its multifunctionality and importance in visitors's experience of the landscape.

The methodological approach of this study provide landscape management with visual tools as a new way of recognizing and integrating values into decision-making frameworks. The results can then be discussed with the landscape management or local actors and stakeholders as a starting point to better manage public lands in a ecologically sound manner while being inclusive of public values and needs, enhancing well-being. Studies on urban green spaces can benefit from a similar approach to introduce diversity into their landscape assessments, as well as in decision-making and design implications.

2. THEORETICAL FRAMEWORK: KEY CONCEPTS OF THE THESIS

In this chapter, a comprehensive literature review on human-nature relationships, lays the foundation for explaining other related concepts of this research and prepares the setting to dive into the place value concept. Place values as a way to operationalize human-nature relationships, will be defined and reviewed in ecosystem valuation, value articulation and the adopted value paradigm of this research. In the last subsection of this chapter, the place values are put in perspective in terms of aim and objectives for the case study of this research.

2.1 Human-Nature Relationships

With the ever-increasing pressures on the natural environment and resources deduced from the anthropogenic pressures, various scientific fields including landscape planning and management have been concerned with preserving the ecological qualities of the urban ecosystems as well as ensuring supportive landscapes for human well-being. An integrative framework that acknowledges the relationship between humans and the environment is necessary to understand the meaning and values individuals or groups hold for the physical landscape, which in turn contribute to their subjective well-being.

In this research, human-nature relationships framework is discussed with two connected concepts; the transactional model and social-ecological systems (SES). While these two concepts are not discussed in relation to each other in ecosystem valuation research, this research does not draw a distinction between them. The transactional model by Zube (1987) is primitive to SES concept and provides a forward-thinking about the human-nature relationships and helps this research to better define values in SES framework.

2.1.1 Transactional model

Human and nature relationships have been differently conceptualized based on the human roles in the relationship. Zube (1987), describes the relationship in three modes.

The first concept characterized the human as a generator of impacts that induces varying changes in different scales on the physical landscape. This model rejects the human's positive character in the human-landscape interaction. The second conceptualization depicts humans as mere information receivers who observe and respond emotionally to the landscape. The transactional model is the third concept, in which humans are the participants in the ongoing processes in the landscape. The model derived from the field of environmental psychology denotes "that the relationship is a complex one and that both the human and the landscape change as a function of the transactions." (Zube, 1987, p. 38). The transactional model by defining the human as a participant implies an interesting take on the concept of landscape as well. Rather than defining landscape as mere static representations to be observed, it is reformed as a highly informative and surrounding environment that allows exploration and participation for humans. As participants observe and experience the landscape, leading to the development of perception, this perception is subsequently mediated by the sociocultural context that distinctively characterizes the landscape, along with participants' individual utility functions within it. The differing experience of each participant leads to the attribution of various values to the landscape. Landscape planning needs to be responsive to landscape values while minimizing the human interventions on the ecosystems' structure and functions. Zube (1987) states a lack of a conceptual framework to systematically link social science data with data obtained from landscape ecology which investigates the physical and biological landscape, the interplay, and the changes induced by both human and natural components.

2.1.2 Social-ecological systems

Social-ecological systems (SES), or coupled human-nature systems, study the entirety of a system in which not only the social and ecological components are considered, but also their interactions and interdependencies across scales are recognized (Liu et al., 2007; Berkes et al., 2003; J. Fischer et al., 2015). In SES, people are an integral part of the system as they use, modify, and care for the environment while they heavily rely on the material and immaterial life supports of nature for well-being (J. Fischer et al., 2015). As both humans and nature are dynamic components, their interactions, and connectedness imply that changes in one will influence the other. Consequently, these feedbacks affect their mutual development. In the search for sustainability, the

management of such a complex system should secure the capacity of ecosystems to sustain societal development and progress (Berkes et al., 2003). According to Berkes & Folke (1994), a framework of five elements describes SES characteristics and linkages. The first element is the ecological system or ecosystem in which we gain an ecological understanding of the natural environment by focusing on its structures and functions. The functional performance of the ecosystems can be traced to the biotic and abiotic variables and their physical processes, which are crucial to ensuring the system's resilience (Berkes & Folke, 1994).

The four remaining elements that comprise the social systems pertain to social and economic dimensions. The starting point of the social systems is the people in the communities as the resource users. Understanding how people use natural resources can inform us about the sustainability of their practices to maintain productivity and resilience in their environment. The third element is the local knowledge of the resource users. Post-positivist science is supportive of the diverse environmental knowledge systems and world views to face complex systems filled with uncertainties. The fourth element is the property rights with which certain individuals or groups have the rights, responsibilities, and power to use a resource. The fifth element is institutions that accommodate both local knowledge and property rights. Institutions can be defined as formal (e.g., rules and laws) and informal (e.g., behavior norms) constraints that shape human interactions. The health of institutions such as environmental and resource management is highly related to the performance of natural resource systems (Berkes & Folke, 1994). While it is essential to acknowledge the interdependencies in the participants of the social system and the elements of the ecological systems, the interactions between the two systems are the most crucial part of the framework that lead to adaptations of the social system to the local ecosystem and maintain environmental resilience in facing ecological uncertainties.

Berkes & Folke provide an example illustrating the interdependencies of the components within SES and how their linkages can lead to sustainability and the well-being of both the ecosystem and the social system: "...the herders in a hypothetical grazing commons may see that the range is deteriorating, decide on collective action to limit the number of cattle, and decide on enforcement and sanctions, thus replacing the impending 'tragedy of the commons' with a cooperative strategy." (Berkes & Folke, 1994, p. 10). The most critical point about this scenario is that the functioning of SES

is greatly related to the interactions between the two systems and not merely focusing on the components. In the provided example, the social system including the local community and management institution through feedback from the natural processes, are in tune with the ecosystem in which the social and ecological systems' interaction leads to their mutual modification and adaptations. According to Berkes and Folke, the components of SES should not be seen as separated, and in return, the integrated concept of humans in nature should be the central focus.

As shown in Figure 2.1, SES provides an analytical framework for human-nature interactions and the interconnected processes of environmental and societal transformation ranging from a landscape scale to global (J. Fischer et al., 2015).

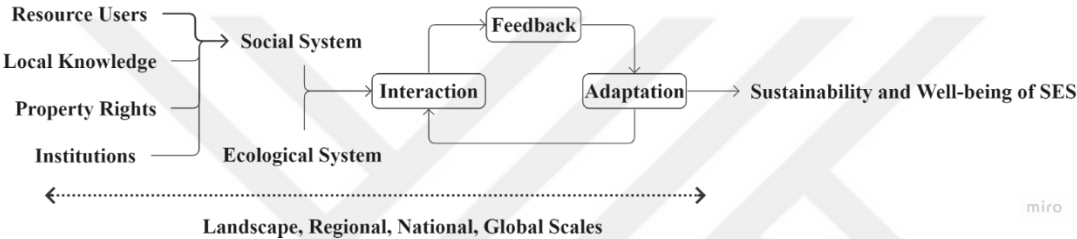


Figure 2.1 : SES framework by Berkes & Folke (1994). Adopted by the Author.

2.1.3 On the role of the resource users

Berkes et al. (2003), define SES as a complex adaptive system that deals with change, uncertainty, and instability, and cannot be understood from a single viewpoint. In their book, they state that positivist resource and environmental management focuses on narrow scientific practices by reducing variabilities in the system and try to quantify, control, and predict ecosystem sustainability. Such conventional practices overlook the interconnectedness, context, and feedback in SES. They can also appear disconnected from the local context that is to be applied (F. Fischer, 2000). On the other hand, adaptive management is based on social and institutional learning, and their integrative approach to systematic experimenting and learning by doing suits the SES characteristics. As such, they can respond to iterative feedback from complex system interactions (Berkes et al., 2003).

One of the schools for an integrative approach that bridges social and natural systems for resource management is ecological economics (Berkes et al., 2003). Ecological economics, with the notion of economics within the ecosystem, is concerned with human-made capital (i.e., capital generated through economic human activity), natural

capital (i.e., non-renewable and renewable resources extracted from ecosystems and their processes and ecosystem services), and cultural capital. Cultural capital indicates the elements with which human societies can actively adapt to the natural environment. Among these adaptation elements, local knowledge and institutions are signified (Berkes & Folke, 1994). Local knowledge in various forms (e.g., indigenous knowledge, traditional ecological knowledge) designates the ecological understanding of the people who use and live by the resources of a place (Warren et al., 1995). Local knowledge is generated through observation and experience of the local environment (Berkes et al., 2003). As complementary to formal scientific knowledge, local knowledge adds diversity and conceptual pluralism to reinforce environmental and resource management. In other words, it provides a bridge between ecosystem and management.

Resource users play a crucial role in adaptive environmental management by providing site-specific and contextualized knowledge (Berkes et al., 2003). Individuals by feelings, sensitivities, and orientations learn and develop their own perceptions and knowledge about the biophysical and social environment (Ingold, 2000). Adaptive management specifically requires local knowledge because of the difficulty of planned and systematic experimenting across scales in SES. Local knowledge incorporates “historical observations of ‘natural experiments’ and their dynamics” about a specific landscape (Gadgil et al., 2003, p. 205). Traditional ecological knowledge as a form of local knowledge evolves through adaptive processes as it is culturally transmitted through generations about the living human and non-human organisms and their environment. The knowledge about the local ecosystems can also be generated through more recent human-nature interactions (C. M. Raymond et al., 2010). Indigenous knowledge, on the other hand, refers to knowledge held by a society or a culture (Berkes et al., 2003). In this context, local knowledge is the adaptive response that perceives and responds to environmental feedback in SES interactions.

By means of practical experimentation and adaptations to changes in the environmental and socioeconomic conditions, local knowledge has been discussed to include insights, ideas, and perceptions that relate to the ecological, geographical, sociocultural norms, and physical characteristics of the local ecosystem (F. Fischer, 2000). Hence, local knowledge held by non-experts, as the direct resource users affected by the system interactions, is increasingly required in the field of

environmental management, landscape planning, and landscape architecture (F. Fischer, 2000). Moreover, Fischer states that the public knowledge of the environment and community life who have an intimate relationship with their surrounding ecosystems should inform experts of the basic meanings and underlying values of the existing structures and physical forms. Utilizing the knowledge and perceptions of the general public can promote participatory processes and pluralistic methodologies, encourage mutual learning between the owners of formal and informal knowledge, and thus connect resource users and professionals (Gadgil et al., 2003).

2.2 Values in SES Framework

In the SES framework, values and knowledge extracted from the human experience of the landscape are embedded in the interaction of the social and ecological systems (Ostrom, 2009). Sustainable management of SES identifies the importance that people place on ecosystems (Ostrom, 2009). In the Oxford English Dictionary the term ‘value’ is defined as the importance, worth, and usefulness of a thing or the personal or collective judgment on something valuable and important (Dietz et al., 2005). In this research ‘value’ will be outlined according to the work of T. C. Brown (1984) to refer to value in SES framework.

The value concept cognitively bridges what is important to an individual (held values) to what the person identifies as important about an object (assigned value) (T. C. Brown, 1984). In this sense, values are stable and sustained over time in the valuation process (G. Brown et al., 2020; Himes & Muraca, 2018). As discussed earlier, the transactional model of the human-nature relationship by Zube (1987), depicts individuals as active participants in the landscape that attribute value to their surrounding environments, which resonates and explains the operation from held values to assigned values (G. Brown et al., 2020). While our perception is tied to what we see and understand, the way we value landscape is largely related to our functions and what we do in them.

This insight underscores that values are clearly tied to our experiences in them and can vary in multiple and incomparable ways, as emphasized by Zube (1987). To facilitate a holistic approach, this research defines values within SES as the diverse significance, meaning (Antrop, 2000), and importance attributed by individuals to elements, considering the context and relation to the other elements in the landscape. Following

the work of Brown et al. (2020), this research will use the 'place values' terminology to refer to the described value framework.

2.2.1 Valuation

Valuation is defined as the act of analyzing, assessing, and measuring values (Gómez-Baggethun & Martín-López, 2015). It is the process that elicits and describes values. An ethical debate has been a central problem in environmental valuation when considering the relationship between the importance of an object and our assessment of its importance (Dietz et al., 2005). While some argue that natural life-sustaining ecosystems or beautiful and scenery landscapes have intrinsic value independent of human preference, and should be valued merely based on their existence, it has been widely acknowledged that there is a limitation in systematically measuring their intrinsic value, aside from asking people's assessments of the importance they attribute to a landscape and its elements (Dietz et al., 2005). While this discussion is beyond the scope of this research, following Muraca (2011), it is delineated that through the relationship between the subject and objects, individuals reflect and recognize the importance of nature and explicitly articulate values in the valuation process (Arias-Arévalo et al., 2018). Therefore, valuation is not subjective or objective but rather involves a combination of both aspects (Himes & Muraca, 2018). The valuation process can comprise a variety of value providers and scales such as individuals, social groups, or larger communities (Kenter et al., 2015). In the valuation process, the determination of which values to elicit, the choice of social actors to be involved, and the selection of methodological tools play an important role in the formation of values and the assessment outcomes (Vatn, 2009).

2.2.2 Plural valuation

As the relationship between the resource users and the landscape can be different in complex SES, the perceptions, values, and knowledge attributed to the landscape can therefore vary (Fagerholm et al., 2013). In order to implement SES thinking in adaptive management with an integrative approach, the diverse perspectives on nature, both in terms of its intrinsic and perceived worth, held by a range of stakeholders must be recognized to inform decision-making (Jacobs et al., 2018; Zafra-Calvo et al., 2020). The approach known as plural valuation (alternatively referred to as integrated or

inclusive valuation) can serve as a tool for harmonizing diverse cognitive models regarding the relationships between humans and nature (Zafra-Calvo et al., 2020).

Plural valuation improves understanding of the interlinked SES by offering novel points of intervention, frames values as the influential factors of change, integrates public values and knowledge to adaptive management, and recognizes conflicts in values related to landscape management (Arias-Arévalo et al., 2017). Many significant contributions to environmental valuation are based on principles from ecological economics (Millennium Ecosystem Assessment (MA), 2005). Ecological economics approaches value pluralism and incommensurability to inform adaptive and sustainable resource management (Munda, 1997). The direction toward value pluralism is a shift from unidimensional monetary valuation which captures a single metric and an incomplete picture of the human-nature relationship (Zafra-Calvo et al., 2020). The ecosystem services (ES) concept defined as the benefits obtained by people from nature (Millennium Ecosystem Assessment (MA), 2005), has been criticized for its inflexibility to view the spectrum of human-nature relationship and focusing on instrumental values as the one-way benefits to the resource users (Reyers et al., 2012). While instrumental values refer to the value of an entity as the means to an end; it suggests that as long as two different entities provide the same impact or benefit on human well-being or welfare they can be substituted (Arias-Arévalo et al., 2018). Hence, the ES framework has been dominated by commodification. These monistic methods resulted in the transformation of previously open-access public resources into fee-based assets (Gómez-Baggethun & Ruiz-Pérez, 2011). This issue pertains to ethical worries that hide non-instrumental values like ecological and socio-cultural values, promote unequal resource accessibility, and diminish intrinsic motivations for conservation (Arias-Arévalo et al., 2018). Neoclassical economists, following classical utilitarianism, define value as pleasure (or utility) and propose measuring it based on people's willingness to pay (i.e., contingent valuation) (Gómez-Baggethun & Martín-López, 2015). However, when applying a utilitarian perspective and assuming that values primarily serve to satisfy human needs, monetary approaches to value (i.e., monetary and biophysical metrics) are considered reductionist (Gómez-Baggethun & Martín-López, 2015). While value monism asserts that there's only one inherently valuable good, value pluralism posits the existence of multiple distinct valuable goods, such as “autonomy, knowledge, justice, equality, and beauty”, none of which can be

reduced to each other, or to any other fundamental value (O'Neill et al., 2008). Therefore, value pluralism enhances our understanding of the multi-functionality of landscape (G. Brown, 2013). Equitable and sustainable outcomes are fostered by plural valuation when it is based on participatory value elicitation approaches, especially including the marginalized to articulate their values and serves as a tool for identifying different cognitive models of the human-nature relationship (Zafra-Calvo et al., 2020).

2.2.3 Value paradigm

The term 'value' is commonly brought up in conversations about environmental issues as it is assumed to have an impact on our individual and collective behaviors and decisions concerning the biophysical environment, as well as our commitment to its protection (Dietz et al., 2005; Jones et al., 2016). Debates in nature conservation and environmental ethics have classified values associated with nature into intrinsic and instrumental value dichotomies (Chan et al., 2016; Himes & Muraca, 2018). Traditional conservationists uphold conserving nature for its own sake and its intrinsic value (Klain et al., 2017). Intrinsic values correspond to valuing an object's existence (in relation to other non-human entities), independent of human preference, needs, and interests (O'Neill et al., 2008). In contrast, new conservationists promote instrumental values that prioritize utilitarian conservation based on the benefits nature provides to society (Klain et al., 2017). In parallel with this, the Millennium Ecosystem Assessment reinforced the dichotomy within the ES framework asserting a Kantian logic that an entity has either a price or dignity (Himes & Muraca, 2018). While there is proof that individuals embrace both instrumental and intrinsic values, reducing the significance of nature to these values fails to capture the many intuitive ways that people make decisions and perceive their well-being involving the environment (Chan et al., 2016; Klain et al., 2017). As a result, researchers began to develop methods to include intangible social-cultural values in the ES assessment up to the point that the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES) adopted the relational values as a third value category, into its conceptual framework (Pascual et al., 2017). Relational values are intended to better capture how people and collectives facilitate relations with the environment (Klain et al., 2017), signifying the complex and multidirectional interactions between humans and their environment. Beyond personal preference, relational values encompass the virtues and principles in relationships but also can be shaped by external factors such as policies

and societal norms (Chan et al., 2016). Relational values do not exist inherently in entities; instead, they arise from the connections and responsibilities to landscapes, humans, and non-human entities (Chan et al., 2016). To an extent, the instrumental values overlap with the relational values as they both refer to the relationship between human and nature, however since relational values are more complex and deeper than instrumental values, Himes & Muraca (2018) refer to them as ‘non-instrumental anthropocentric’ values (Himes & Muraca, 2018, p. 2).

Following O’Neill et al. (2008), the relational-intrinsic-instrumental (RII) value paradigm can be discussed in three cognitive models or metaphors of human-nature relationships. The metaphor ‘living from nature’ represents instrumental values in which human welfare, life, and economic productivity rely on ecosystems’ preconditions and benefits. ‘Living with nature’ is the metaphorical embodiment of intrinsic values, emphasizing humanity’s concern for nature and non-human entities and recognizing their inherent moral values (Himes & Muraca, 2018). In this research, intrinsic values are not construed as inherent to objects and divorced from human preferences, as outlined in the IPBES framework (Pascual et al., 2017). Instead, they are viewed as emerging through a valuation process, wherein moral value is attributed to an entity if someone deems it valuable for its own sake (Stålhammar & Thorén, 2019). ‘Living in nature’ points to a mode of interaction where humans are in a relationship with the environment they dwell in (Arias-Arévalo et al., 2018). This metaphor represents context-specific relationships between people and nature that in a relational way make an ‘ordinary place’ socially and culturally significant for local inhabitants (O’Neill et al., 2008). For this reason, the values arising out of this relationship are irreplaceable (Himes & Muraca, 2018). Corresponding to relational values, this metaphor can include more articulated values than the two previous cognitive models (Arias-Arévalo et al., 2018). Muraca (2011) recognizes this metaphor to encompass both eudaimonistic and fundamental values. Eudaimonic values are a non-hedonist concept of well-being (Muraca, 2011) associated with one’s actions, struggles, and experiences to pursue a meaningful, ethical, and overall ‘good life’ (Himes & Muraca, 2018). These values, such as aesthetics, kinship, recreation, altruism, cognitive development, and spiritual values, have been demonstrated as stronger drivers of motivation for nature and biodiversity conservation compared to the intrinsic-instrumental paradigm (Himes & Muraca, 2018). Fundamental values

relate to systems of relations that protect life-support systems while allowing people to make sense of themselves and their existence (Muraca, 2011). The fundamental value domain can be articulated as life-supporting systems, physical and mental health, cultural heritage, and social cohesion (Arias-Arévalo et al., 2018).

The described classification of the RII value paradigm is depicted in Figure 2.2 developed by Arias-Arévalo et al. (2018). The diagram illustrates the ecological, social, and economic dimensions of SES as it implies the dependence of economic flourishing in the context of social systems and both of their embedment within the boundaries of ecological systems, presenting a system as a whole. The diagram is not intended to draw a clear distinction between the value domains, instead represents the possibility of their co-existence (Arias-Arévalo et al., 2018).

For example, a farmer is likely to assign instrumental value to his farmland because he is economically dependent on the land's crop production, while he also assigns fundamental value as the land gives him a sense of identity as his family and ancestors long before he taught him husbandry way of life and traditions, and that the land itself is intrinsically valuable to him merely for existing.

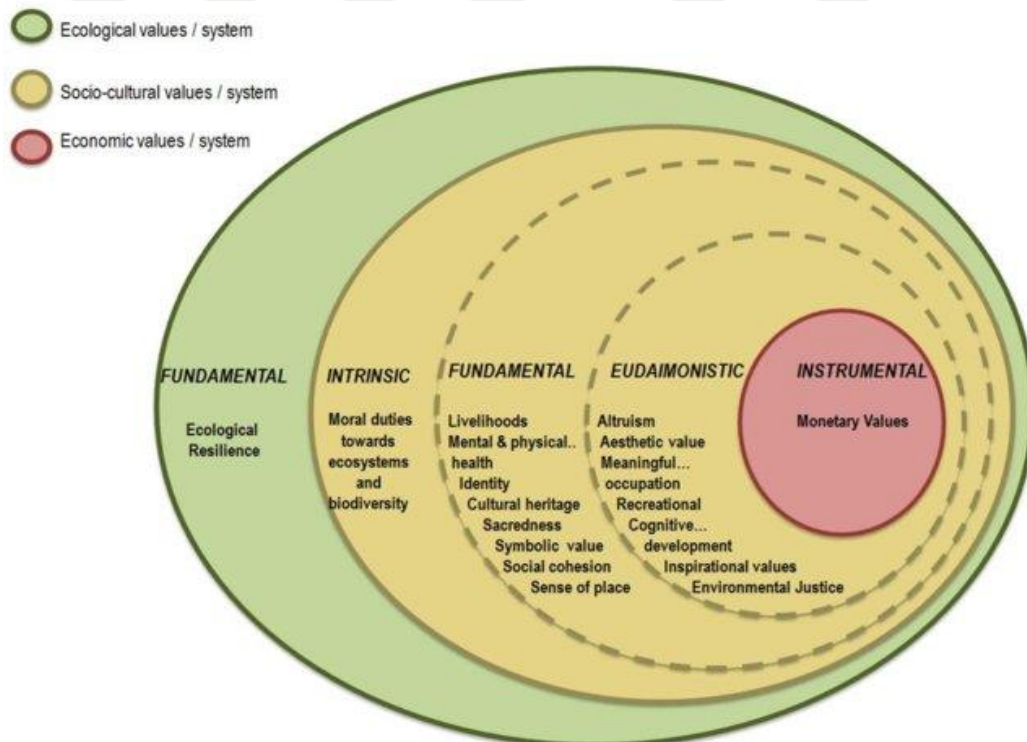


Figure 2.2 : Classification of the relational, intrinsic, and instrumental values in SES. Image source: (Arias-Arévalo et al., 2018).

2.3 Participatory Mapping of Place Values

The incommensurability of values in a pluralistic valuation approach necessitates the establishment of deliberative and participatory processes to inform multidimensionality in environmental decision-making and reach mutually acceptable outcomes (Kenter et al., 2015; O'Neill, 2017). Participation can be described as the process of active involvement of individuals, groups, and communities in the decisions that directly or indirectly impact them (Reed, 2008). Fischer (2000) states that there are three important goals that citizen participation contributes to. Firstly, through its normative rationale, participation gives meaning to democracy. Secondly, legitimizes the development and implementation of policies. And thirdly, through providing resource users' local knowledge, perceptions and values informs the professional inquiry, which can sometimes seem disembodied from their applied local contexts. As argued by Paehlke (1995), achieving environmental sustainability and protection will come true only through democratic approaches.

Participatory mapping integrates cartographic techniques with participatory methods to represent the experiences and knowledge of individuals on a map (Fagerholm et al., 2022). The mapped relational attributes of the natural landscape inform SES research through participatory mapping (G. Brown & Kyttä, 2014). The two main questions that participatory mapping research is interested in relate to asking the participants: "What are the perceived qualities in the landscape, and where are they located?" (F. Fischer, 2000). Under the umbrella concept of participatory mapping, information communication technology (ICT) tools such as public participation geographical information systems (PPGIS) refer to the use of geospatial technologies to engage non-experts to identify spatially explicit information facilitating the participation of the general public especially in urban and regional planning (G. Brown, 2013; G. Brown & Fagerholm, 2015; G. Brown & Kyttä, 2014; Fagerholm et al., 2022). Alongside the location-based data, PPGIS surveys often include non-spatial data regarding socio-demographic profile (e.g. age, gender, education), personal satisfaction level, perceived well-being, etc. (Fagerholm et al., 2021). PPGIS surveys gather data from individuals, which is combined to create a collective and shared pool of information at the survey population level, which is then utilized in environmental decision-making (Fagerholm et al., 2022). PPGIS applications range extensively from neighborhood planning, development of urban green spaces to coastal zone management or

environmental resource management (G. Brown, 2013). Objectives for PPGIS applications commonly involve the identification of perceived qualities of landscapes, everyday spatial activities of people, land use preferences, and attitudes toward landscape management (Fagerholm et al., 2021). In addition, PPGIS has been used in value pluralism approaches assessing place values (Zaman et al., 2022).

Following Zube (1987), the guiding principle driving place value mapping is that landscapes should be managed consistently with the values held by resource users of the landscape. Participatory mapping and PPGIS approaches are capable of integrating the place value concept quantitatively allowing landscape managers to make sustainable decisions regarding multifunctional use of the landscapes that are favored by the community (G. Brown, 2012). Research in PPGIS has delineated that the identification of place values demands an intermediate level of cognitive challenge and knowledge levels whereas the identification of regulating or supporting ES requires minimum knowledge of the natural system and their functions which is more challenging for non-experts and the general public (G. Brown et al., 2012). Identification of place values requires the individual to relate their personal preferences to the landscape features (G. Brown, 2012). The participatory mapping of place values then operates as a bridge that links the psychology of the place to the geography and physical landscape (G. Brown, 2013). Accordingly, human perception plays a key role in PPGIS that enables individuals with experience and local knowledge to assess the place values of the landscape and augment expert and formal knowledge employed in planning processes. The combination of place values and participatory mapping as a plural valuation method offers an alternative to unidimensional monetary valuation, contributing to the place-based understanding of the natural landscape and its multifunctionality (G. Brown, 2013).

In PPGIS research, a wide array of predefined typologies for understanding place values has been employed, followed by the utilization of diverse value terminologies throughout its evolutionary development. The values have been alternatively referred to as forest values (G. Brown & Reed, 2000), community values (C. M. Raymond et al., 2009), ES categories from the MA framework (Fagerholm et al., 2016), landscape services (Fagerholm, Eilola, et al., 2019), landscape values (Alessa et al., 2008; G. Brown, 2005) or social values of ES (Sherrouse et al., 2011; Van Riper et al., 2012). The quantity and mixture of place values are delineated to vary across different

environments; however, there is a core set of place values that can be applied to most landscapes. The differing component, in this case, is the relative weight and importance of held place values (G. Brown, 2012). While in the monetary valuation, the importance is assessed in the dollar worth of the ecosystem, the importance in the place value approach is assessed by the analysis of the spatial distribution of different values across the landscape (G. Brown, 2013). Place value mapping is useful because it enables the articulation of values at the local landscape scale relating to the everyday realities of people in the landscape (Fagerholm et al., 2012) compared to the identification of ES which operates at the larger scales of regional and national. Local-scale mapping of values is especially important since the approach is sensitive to space and participants' subjective experiences of the place (Fagerholm et al., 2012). Participatory mapping and PPGIS are known as efficient means for data collection, especially in the developing world contexts facing data scarcity. Through a random and representative sampling of the general public, PPGIS can target the inclusion of the underrepresented silent majority (G. Brown, 2005) and empower them in the development of future land use decisions and spatial planning (G. Brown & Kyttä, 2014). This process also raises discussions involving conflict, power dynamics, and equity (Kenter et al., 2019).

2.4 Chapter Evaluation

In this section, each of the research questions (RQ) will be explained concerning the conceptual framework of this research. Accordingly, it will be demonstrated how these research questions are set to address novel research gaps. It is aimed for the first question to answer the “why” and the two other questions to answer the “how” Atatürk urban forest is valued.

The main research questions guiding the framework of the research are as follows:

RQ1- Which place values are collectively held by the public for the urban forest?

As discussed earlier in the literature review, there is still a pressing need to address values within the SES framework and also improve environmental management in adaptive capacities. The first step for this would be to elicit and identify these place values. Based on the resource users' experience of the urban forest, this research enforces value pluralism through the RII value paradigm to understand various human-

nature relationships in the Atatürk urban forest (AUF) SES. With a value mapping approach, this study combines a value typology and the PPGIS technique to spatially elicit diverse values of AUF anchored by visitors while also capturing their importance ranking to each individual. The importance rankings are later used as intensity weights while also setting a contextual hierarchy of place values. Understanding values will improve our understanding of AUF as a multifunctional SES. By multifunctionality, this research refers to the capacity of the urban forest to receive multiple and diverse significance and place values simultaneously (De Groot, 2006).

RQ2- Where does the landscape hold the most diverse and intensified place values?

In contrast to monetary valuation, this research assesses the collective importance of different place values of AUF by their spatial distribution across the landscape. According to G. Brown et al. (2020), the mapped place values appear in spatial clusters that are linked to the underlying physical landscape that is significant in social or biophysical features (C. M. Raymond & Brown, 2011). The spatially explicit nature of the mapped values can serve as an evaluative tool in landscape architecture as well as providing visual tool for landscape management to recognize various areas of importance. This implies a progression of landscape architecture in the SES framework by enhancing expert designs, while particularly advancing the planning and management of public spaces such as AUF. The spatial density clusters of various values in the RII value paradigm can reflect both intensified and diverse human-nature relationships that exist in the urban forest. The results of this research question can indicate a potential conflict in the future development and management plans of the urban forest if any objective area is designated.

RQ3- How can the identified place values be understood according to associations with the participants' characteristics including socio-demographics, familiarity with the site, and pattern of use?

Research on PPGIS has postulated that the mapped place values can be influenced by the participant profiles. In particular, the respondents' socio-demographics such as age, gender and level of formal education can affect the number and type of values (G. Brown & Weber, 2012). In addition to these Fagerholm et al. (2016) studied the socio-demographics in their PPGIS study by asking about respondents' professional

relevance in the field of forestry or agriculture or in the study of Schmitt et al. (2022), a profession related to nature.

Studies have further statistically investigated other potential factors associated with values including knowledge of the study area, and pattern of use. For example, the findings of G. Brown, (2005) state that people with good or high levels of knowledge about the site assign more and diverse values. This research investigates this factor by assessing knowledge of the study area combined with relation to the site following the work of C. Raymond & Brown (2007) under the term 'familiarity with the site'. It is hypothesized that a person's high familiarity and experience with the study area can provide more information on place values. The factor of relation to the site was investigated by Fagerholm et al. (2016) by asking the respondents if they live or work around/on the study site. Investigating if people are the nearby residents of the study area relates to the theory of spatial discounting, denoting that people attribute more values to areas close to where they live (G. Brown et al., 2020). For example, Fagerholm et al. (2016) found that people assigned more recreation and social gathering values close to their place of residence.

Furthermore, based on the hypothesis of Zube (1987) stating that our functions in the landscape affect our values, the pattern of use variable is also studied regarding its association with the mapped values. To study the pattern of use, this research defines a set of variables such as preferred activities, and frequency of site visits.

Motivated by the recent literature that is increasingly encouraging the quantitative assessment of place values, this research considers the above-mentioned variables as independent variables that have the potential to influence place values as outlined by Schulz & Martin-Ortega (2018).

3. RESEARCH METHODOLOGY

A thorough literature review on SES, environmental valuation, value pluralism, participatory mapping, and PPGIS guided the conceptual framework and the methodological approach of this research. The methodology of this research is based on other PPGIS scientific research studying place values such as Alessa et al. (2008), G. Brown & Donovan (2014), Fagerholm & Käyhkö (2009), Riper et al. (2020), and more. While the study site scales of the mentioned articles are various (e.g., from 1:5000 to nearly 1:500,000), this research focuses on a landscape scale, as PPGIS studies of place values are valid in a variety of geographic scales ranging from states to urban areas (G. Brown et al., 2020). A web-based PPGIS survey is conducted within the research for the Atatürk urban forest to study the place values held and assigned by its visitors. The participatory spatial mapping of place values will allow to study the human-nature relationships that exist in the study area. In this section, the detailed process of methodology including, study site, survey sample, survey design, and administration will be explained.

3.1 Study Site; Atatürk Urban Forest (AUF)

Atatürk Urban Forest (AUF), previously known as Hacıosman Grove, is located in Sarıyer district, Çamlıtepe neighborhood of Istanbul, and is administered by the Istanbul Metropolitan Municipality (IMM). The urban forest is distinguishable for its preserved and intact natural structure compared to other large parks in Istanbul. While the urban forest is the result of afforestation activities in the 1950s, it has turned into a rich and biodiverse ecosystem for wildlife, and endemic species of flora, and fauna after more than half a century. This urban forest plays an important role in balancing the city's climate with preventing air pollution and greenhouse gases.

AUF covering an area of over one square kilometer, provides a rich environment for bird species with its extensive and varied vegetation and ponds. The forest, situated on a bird migration route in the western Palearctic region, serves as a significant habitat for the nesting and breeding of numerous bird species. In contrast to the average of 15

bird species in other parks, AUF hosts around 30 species (Spor İstanbul, 2020). The lookout points for the birds' breeding, resting, feeding, and wintering areas around ponds are marked on the park maps for interested users to learn more about the park.

The urban forest is a continuation of the Belgrade forest from the west and is surrounded by residential areas from the other side. The forest is located on the city's business center axis and provides a connection between rural and urban areas. Due to its central location, the urban forest is equipped with several transportation facilities, including two stations of the M2 metro line and the Hacıosman main bus stop, providing convenient accessibility for the public. After its recent renovation, the park includes three natural ponds that originate from Belgrade forest, two conserved forest areas, hiking trails, facilities such as a festival area, viewing areas, cafeterias, sports field, children's playground, an open parking lot, toilets, elevator, and bridge for the accessibility of the disabled (Figure 3.1). The urban forest is especially popular for bird-watching activities and the walking track named Çıtkuşu is designed in a way to cover these lookout points in the length of 1.8 km. The walking tracks are also oriented along the natural ponds in 2.8 km length and around the forest to make up a total of 12 km round trip. (Yeşil İstanbul, n.d.). The walking tracks provide people with the freshest air while being able to do activities such as hiking, running, and biking. While many of the hiking trails are mildly steep, some of them are continued with staircases that connect the highs and lows of the forest's topography. The staircase that connects the natural ponds at the low elevations to the Çıtkuşu track accompanies aesthetic views of the conserved forest and the water (Figure 3.2). On the other hand, the festival area hosts many cultural, sports, and artistic activities and events and for this reason, it is usually the busiest spot in the forest. The area also provides a gathering place for people to have a seat or picnic with their friends and families (Figure 3.3). The children's playgrounds and sports fields are equipped with recreational facilities for people to exercise or spend time with their children. The urban forest is a highly maintained landscape to provide capacity for the various socio-cultural activities and demand although it is aimed to preserve the natural qualities of the conserved forest area that derive particular attraction to this outdoor greenery.

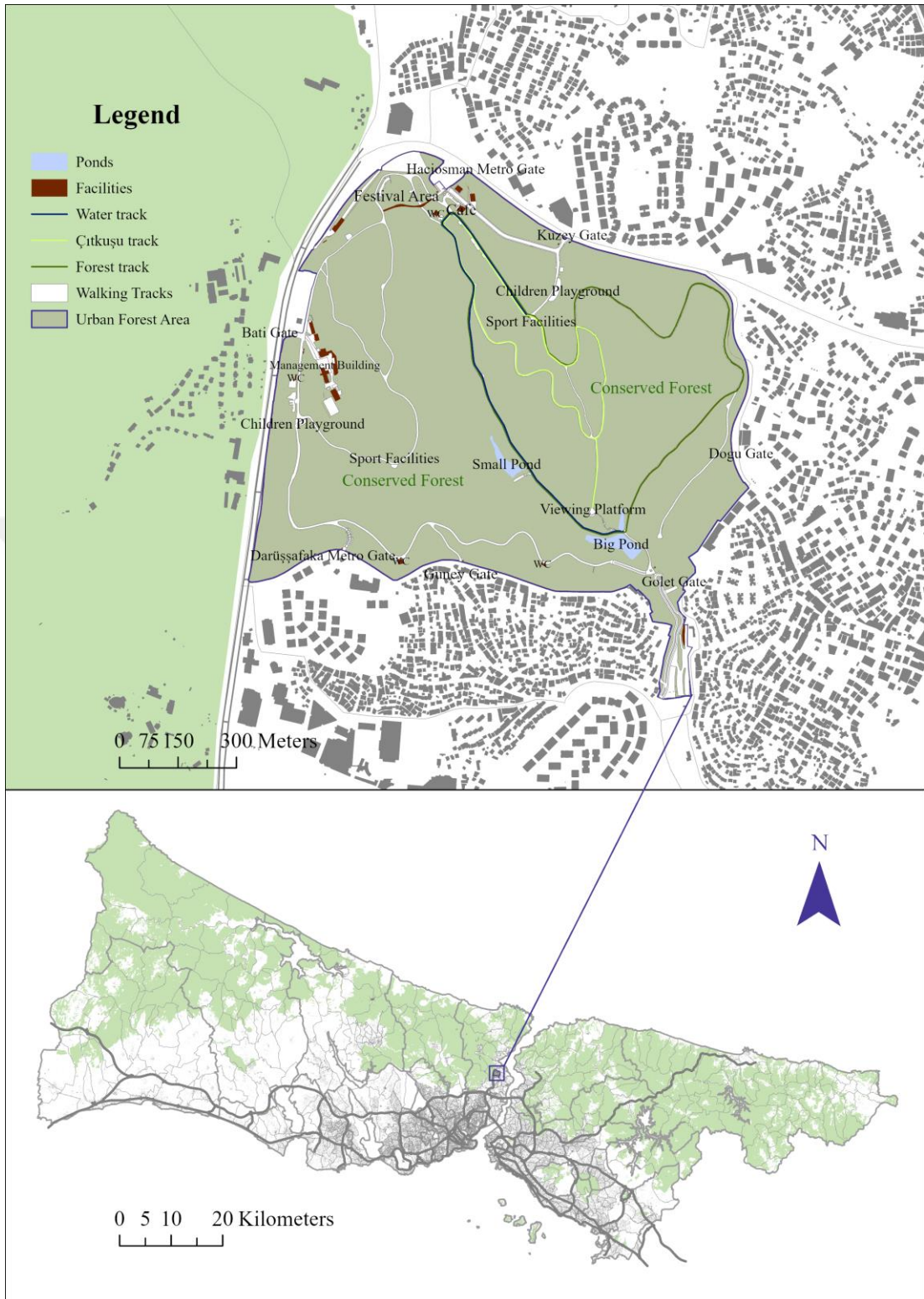


Figure 3.1 : Atatürk urban forest map & its position within its surroundings (created by the author).



Figure 3.2 : Staircase platform with aesthetic vista to the big pond and the conserved forest. Source: (İBB Park Bahçe ve Yeşil Alanlar Daire Başkanlığı, 2021).



Figure 3.3 : Cultural event in the Commemoration of Atatürk day in the festival area. Source: (Yeşil İstanbul, 2021).

To deepen understanding of the planning and design processes of AUF, an interview was conducted with a representative of Kuzey Ormanları Savunması (Northern Forests Defense), a group of environmental activists dedicated to critically examining environmental issues behind political-economic changes and processes. They prioritize academic research and community outreach to raise awareness and advocate for environmental preservation.

As urbanization grew in Istanbul, the forested northern parts of the city with rural characterizations underwent socio-economic changes by becoming integrated with the city center through implementing Sarıyer Büyükdere caddesi and Yenikapı-Hacıosman (M2) metro line. According to this representative, this was the process that separated AUF from the Belgrade forests. These northern forests, were differently envisioned by the current government in charge and the former local administration. Specifically while the former local administration had proposed a millet bahçesi (people's garden) for AUF, the current local government envisioned the area to remain as an intact forest with minimum public accessibility. Later to protect the area from economic and privatization tensions, the area was identified with urban forest land use under the ownership and administration of IMM. In 2020, the current local government opened the urban forest to the public for recreational use.

Furthermore, since Kuzey Ormanları Savunması, acting in its role as a civil initiative, participated in the design processes of AUF, this representative was asked to share insights on the matter. According to their account, preserving the central forested areas was a key priority in the design. They explained how walking tracks were strategically positioned along the forest perimeters to deter human intrusion into the forests in the center. To further limit encroachment, landscaping efforts included planting thorny shrubs alongside these tracks. The absence of benches along the water track serves to discourage visitors from sitting and picnicking near the natural ponds, ensuring their cleanliness and the undisturbed habitat of aquatic and aerial inhabitants. Commercial activities, apart from the Beltur cafe at the northern metro gate, are also restricted to minimize human disturbances. Overall, except for the festival area located in the north, the majority of landscaping elements promote active mobility as the primary recreational activity within the site.

Despite being side by side with the bustling Hacıosman transportation node, AUF stands out as a high-quality urban green space. Thanks to these measures, AUF offers

citizens opportunities for well-being, promotes healthy lifestyles, and supports a functioning natural ecosystem.

Recently the urban forest has gone under development pressures for a landscape change. In the summer of 2023, as per an announcement from the Istanbul Regional Directorate of Foundations, a parcel at the northern tip of the urban forest was recently auctioned for a 21-year lease for the construction of a hotel through a tender. While the parcel was initially subject to the "Sarıyer Bosphorus Back View and Impact Area Protection Development Plan" in 1999, alterations in the 1/5000 master development plans of 2003 shifted the zoning plans to "Tourism Facility Areas" (Odatv, 2023). It has been stated that the threat of hotel construction in this area can potentially cut off the underground water that feeds the urban forest. This initiative has faced numerous protests from the locals against the announced landscape change. The locals have protested the threat of landscape change on-site with slogans such as “ We need the forest, not a hotel”, “ Do not invade the Atatürk urban forest”, “ Building a hotel means the death of the forest” and, “ the forest is ours and will remain ours” showing their strong bond with the forest (Figure 3.4). Many more social actions about this initiative have been posted on the X platform with the hashtag #AtatürkKentOrmanı.



Figure 3.4 : Locals protest the hotel construction tender. Source: (PEHLİVANOĞLU, 2023).

AUF was selected as the study area of this research for several reasons. Firstly, its biodiverse forest structure which is under conservation allows its users to experience a rather natural environment in an urbanized area which can significantly influence people's health and well-being. Secondly, this longstanding forest, with publicly accessible amenities, serves as a multifunctional SES in which people through interrelationships with the forest assign a myriad of values that can relate to its ecosystem functioning and various socio-cultural actions. Thirdly, the recent protests from the local community against the landscape change plans, reflect and advocate the many human-nature relationships that exist as a function of SES interactions. This draws attention to the urgency of understanding these anchored feedbacks in the current socio-environmental change process. Through studying place values from these human-nature relationships, this study promotes an adaptive approach for the management and decision-making of the urban forest to take account of these values and minimize the conflict for securing the urban forest ecosystem and the progress of societal developments. Lastly, following similar studies (e.g., Sun et al., 2019), the size of the study area is suitable to investigate place values at a landscape scale.

A primary aim of this study to describe the urban forest as SES was to understand its highly interconnected dynamics in case of environmental or social change. The threat of landscape change would not only disturb the forest ecosystem integrity but would also increase inequality in nature access, affecting human-nature relationships and the myriad associated values. More importantly, the powerful protests from locals advocate the principle of managing lands in line with the values held by the public and emphasize their integration into planning frameworks to ensure mutually acceptable and sustainable outcomes, thus enhancing socio-ecological resilience.

3.2 Survey Design

The survey design of this study drew on a web-based questionnaire comprising 3 sections including; self-reporting questions about personal information, park-related information, and the value mapping exercise. The survey was conducted on ESRI Survey123, one of the most effective PPGIS and license-based platforms (Fagerholm et al., 2022). All of this process was conducted on the ArcGIS Survey123 Connect which allows the user to implement questions and codes through an Excel sheet which then appear with their determined format in the Survey123 app. Firstly the survey

thanked the participants for their time and effort and stated the survey aim to inform the participants about this research. The survey was provided in both Turkish and English languages to increase participation (see Appendix B for Turkish version). The user interface of the designed Survey123 in English is shown below in Figure 3.5.

Atatürk Kent Ormanı

Third important social value

Please select your third priority value of the park. *

Please select a different choice than the ones you selected in the previous questions.

We require that you show your selected value on the map in the next question.

- I value this place because I enjoy the scenery, sights, sounds, smells, etc. (Aesthetic value)
- I value this place because it provides various animal and plant life, etc. (Biodiversity value)
- I value this place because it helps to pass down the local wisdom, knowledge, tradition and a way of life. (Cultural heritage value)
- I value this place because it provides economic opportunities; tourism, fiber, etc. (Economic value)
- I value this place because it provides opportunities for future generations to experience nature as it is now. (Future value)
- I value this place because of their important historic natural or human assets. (Historic value)
- I value this place because of its mere existence. (Intrinsic value)
- I value this place because we can learn about the environment through scientific observation or experimentation. (Learning value)
- I value this place because it helps to produce, preserve, clean, and renew air, soil, and water. (Life sustaining value)
- I value this place because I can practice my favorite outdoor activities; watch birds, exercise, etc. (Recreation value)
- I value this place because it is a sacred, religious or spiritually special. (Spiritual value)
- I value this place because it improves my mental or physical health. (Therapeutic value)
- I value this place because I can spend time with other people. (Social relations value)

← Please locate your third selected value on the park's map. You can repeat a location for designating a different value. ↗

(Note: The park's map is defined by the red line boundary. Place the blue pin on your desired location on the park's map.
The icons on the map are only for your guidance and should not affect your point allocation. Clicking on the house icon will take you to the location of the park.)

🔍 Search location or map coordinate

41°8'6.917"N 29°1'47.868"E

Atatürk Kent Ormanı

Residency Information

Do you live in Istanbul? *

Yes No

1 of 1

Personal Information

How old are you? *

18-29 years old 30-59 years old 60 and higher

What is your gender? *

Female Male Non-binary

What is your education level? *

No formal schooling Primary or secondary schooling College Lower university degree Higher university degree

Is your current profession or field of expertise directly related to environmental issues? *

Yes No

Figure 3.5 : The designed Survey123 user-interface.

Guided by the literature, this research identified the independent variables of socio-demographics comprising of age, gender, education level, relevant profession, and

citizenship status following the works of G. Brown (2012), G. Brown & Weber (2011), and C. Raymond & Brown (2007). The personal questions collected information about the age of the participants ranging from young adults (18-29 years), adults (30-59 years), to seniors (60 and higher). Gender questions asked them to identify themselves as either female, male, or non-binary. The education level asked the participants to select if they have no formal schooling, primary or secondary schooling, college degree, lower university degree, or higher university degree. The last questions with a 'yes' or 'no' asked them if their profession or field of expertise is related to environmental subjects and if they are a citizen of the Istanbul metropolitan area.

The park-related information section contained questions about how often the participant visits the park on a Likert scale ranging from first-time visits, once a year, a few times a year, a few times a month, and once a week at least. It was then asked with a multiple-answer selection manner what activities they usually do in the forest including hiking, exercises such as biking, running, etc., bird watching, using recreational facilities, and others which if selected contained an open-ended question asking to disclose that activity. The activities and frequency of visits investigate the pattern of use following other research examples (e.g., G. Brown, 2005; C. Raymond & Brown, 2007; Scaini et al., 2022). To study the visitors' familiarity with the site (e.g., Arslan & Kaymaz, 2020; Hermes et al., 2018; Zube, 1987), the participant's relationship to the site as a visitor, someone who lives around the site or works, was asked with a single selection question. In addition to this, the self-estimating knowledge level of the site was asked with a 5-point Likert scale from 'very good' to 'very poor'. The categorization of the survey items as independent variables of socio-demographics, familiarity with the site and pattern of use and their measurement levels can be seen in Table 3.1.

For the value mapping exercise a list of 13 place values was provided for the respondents to choose and then they were asked to show their selected value on the map of the urban forest with a point icon. The urban forest map used in the survey was generated using ArcGIS web maps and incorporated informative icons, routes, and place names in a manner that closely resembles the guidance map implemented within the forest site to ease the participants' mapping experience. The value point mapping was chosen over the value polygon technique since it has been outlined as less cognitively challenging (G. Brown & Fagerholm, 2015). The value mapping exercise

was repeated three times to collect a total of three different value points for each respondent.

Table 3.1 : Variables and questionnaire items for personal and park-related information.

Variables	Questionnaire items	Responses
Socio-demographics	1- Age 2- Gender 3- Education 4- Relevant profession 5- Citizenship	1- (18-29) (30-59) (>60) 2- Woman, Man, Nonbinary 3- No formal schooling, Primary-secondary, College, Low university, High university 4- Yes, No 5- Yes, No
Familiarity with the site	1- Relation to the site 2- Knowledge of the park	1- Live around the site, Work around the site, Visitor 2- Very poor, Poor, Moderate, Good, Very Good
Pattern of use	1- Preferred activities in the park 2- Visiting frequency	1- Hike, Run, bike or other exercises, Watch birds, Use recreational facilities, Other 2- Once a week, Few times a month, Few times a year, Once a year, First time

This study adopted a value typology based on the ‘landscape value’ typology by G. Brown & Reed (2000), also known as the ‘forest value’ typology as it is the most common value typology used in the PPGIS literature. However following the recent studies (e.g., Fagerholm et al., 2016), the ‘social relations value’ was also added to the typology as it was deemed appropriate according to the urban forest characteristics. Each value was presented with an operational definition while also personalizing their sentence structures in terms of why a person values the urban forest landscape, for example, “I value this place because...”. This way the values can be considered epistemologically as well as in an ecosystem valuation framework and so the place values denote dynamic and special experiences for each person (Stålhammar & Thorén, 2019). Based on the classified taxonomy of plural values defined by Arias-Arévalo et al. (2018), this research categorizes the place values included the aforementioned value typology by G. Brown & Reed (2000), into into the relational-intrinsic-instrumental (RII) value paradigm (Table 3.2).

Table 3.2 : Place value typology guiding the research and the questionnaire design.

Value category Adopted from G.Brown & Reed (2000)	Descriptions and questionnaire items By G.Brown & Reed (2000)	RII paradigm categorization Based on Arias- Arévalo et al. (2018)	Human-nature cognitive model Based on O’Neill et al. (2008)
Biodiversity	I value this place because it provides various animal and plant life, etc.	Intrinsic	Live with nature
Intrinsic	I value this place because of its mere existence.		
Economic	I value this place because it provides economic opportunities; tourism, fiber, etc.	Instrumental	Live from nature
Aesthetic	I value this place because I enjoy the scenery, sights, sounds, smells, etc.	Relational	Live in nature
Cultural heritage	I value this place because it helps to pass down the local wisdom, knowledge, tradition and a way of life.		
Future	I value this place because it provides opportunities for future generations to experience nature as it is now.		
Historic	I value this place because of their important historic natural or human assets.		
Learning	I value this place because we can learn about the environment through scientific observation or experimentation.		
Life-Sustaining	I value this place because it helps to produce, preserve, clean, and renew air, soil, and water.		
Recreation	I value this place because I can practice my favorite outdoor activities; walking, biking, etc.		
Spiritual	I value this place because it is a sacred, religious or spiritually special.		
Therapeutic	I value this place because it improves my mental or physical health.		
Social relations	I value this place because I can spend time with other people.		

The specific metaphors of human-nature relationships corresponding to the RII paradigm was accordingly based on O’Neill et al. (2008) according to the literature

review. This process helps to analyze the articulated values in the RII value paradigm and better interpret the results of the analysis.

Finally, given that the mix and weight of place values can differ based on the individual (G. Brown & Brabyn, 2012), the three value mapping questions were oriented based on their importance ranking as the first question asked for the respondents' first priority value and the third question their third priority. The ranks were used as point weights for the density analysis purpose.

3.3 Survey Sample and Procedure

The survey sample of PPGIS studies has been focused on the 'general public' rather than other stakeholders or experts to elicit values for a geographic area based on their local knowledge. PPGIS research draws on the importance of crowd wisdom to harness collective values that have the potential to solve societal challenges (G. Brown & Fagerholm, 2015). Following the works of other studies (e.g., Riper et al., 2020; Sun et al., 2019), a random sample of site visitors was adopted for this research. As discussed earlier in the literature review, local knowledge can be generated from more recent human-nature relationships. According to this, limiting the survey sample solely to the local population could potentially exclude the diverse values held by users of the urban forest and introduce bias, especially considering that the park attracts numerous national and international visitors. This research complied with the Human Research ethics requirements at the Istanbul Technical University to conduct the survey during May first and July second 2023. The survey administration was initially supposed to be done with an online approach utilizing QR codes provided in the survey pamphlet. However, subsequent experimentation revealed minimal participation among respondents when provided with the QR code. The survey was consequently self-administered on-site with a tablet to increase participants' engagement with the survey. This also helped improve participants' mapping efforts as they could ask questions if they were not well-acquainted with the site map. The survey was conducted at different locations on the site such as the area in front of the Beltur cafe, the festival area, the bridge, the walking paths, and around the big and small ponds. During weekdays and weekends in June and July at different times of the day, a total of 382 people were reached on-site, resulting in 112 participants and a 29.3% participation rate. This participation rate, implies that around one person out of 3.4

people encountered in the AUF site participated in answering the survey. Assuming a 95% confidence level, the true participation rate of the entire population lies between 20.9% and 37.7% (Agresti & Finlay, 2008); as this survey sample is reflective of.

3.4 Analysis

The analysis started by getting the raw PPGIS data collected through Survey123 by downloading the shapefile of the survey data from the ArcGIS Online account. The result shapefile consisted of point data layers that showed the respondents' value points and the non-spatial data which were stored as standalone tables. All the feature services created by Survey123 are stored in the WGS 1984 Web Mercator Auxiliary Sphere, which means that the spatial data should be projected into a local projection to ensure a correct draw of the maps and measurements. Accordingly, the spatial data were projected to the ITRF_96_UTM_Zone_35N coordinate system in ArcGIS Pro. To create a comprehensive geodatabase of all the mapped value points, the process of data organizing and cleaning began by merging all value points related to the three importance rankings, as they were collected in separate survey components and subsequently stored in three different layers. The place values were then coded into corresponding RII classification according to the study's value typology (Table 3.2) to investigate the identified objectives. There were evident errors in value mapping by some respondents as the value points were misplaced outside of the designated study area. These outliers were cleared by using the clipping tool to prepare for the spatial analysis. However, the assigned place values and demographic and park-related data of these respondents were still used in the statistical analysis. The standalone tables included the demographic data and park-related information which were exported as Excel files to be stored for the subsequent statistical analysis in IBM SPSS. All of the statistical analysis processes were conducted in SPSS and the spatial analysis in ArcGIS Pro. A summarizing diagram of the research design, showing the link between specific research objectives, methods, tools, and data analysis and the result formats is provided below (Figure 3.6).

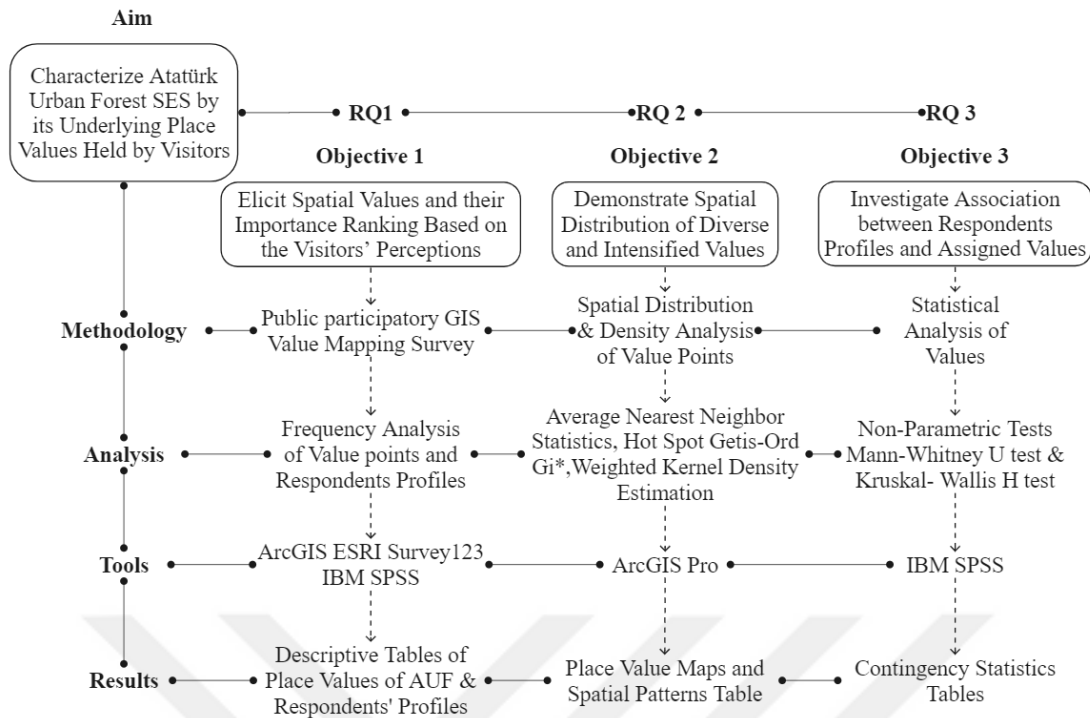


Figure 3.6 : Detailed analytical workflow of the thesis according to its three research objectives.

In the following subsections, the details of the three research objectives, ordered by the first research objective and corresponding descriptive analysis, secondly the spatial analysis of the second research objective, and finally the statistical analysis of the third research objective will be explained.

3.4.1 Descriptive analysis of place values & respondent profiles

To describe the survey results, the mapped place values with their importance ranking and in the categorized RII paradigm were analyzed through descriptive statistics in SPSS. Similarly, the information on the respondent profiles was broken down by their socio-demographics, pattern of use, and familiarity with the site to represent the participant sample. This step is in regard to the first objective of this study to understand the most anchored and prioritized place values for AUF by the participants' sample.

3.4.2 Spatial analysis of place values

The spatially explicit place values were analyzed by their spatial distribution to examine their spatial patterns across the study site. The analysis of spatial pattern of place values was conducted by average nearest neighbor (NN) statistics to test the

complete spatial randomness (CSR) hypothesis (G. G. Brown et al., 2002). This step evaluates if the spatial pattern of value samples is dispersed, clustered, or randomly distributed in the landscape. The statistically aggregated (clustered) point data allows for higher reliability of the value density surface results. This means that the mapped values appearing in spatial clusters in specific areas can be meaningfully linked to the underlying physical landscape (G. Brown et al., 2020; Plieninger et al., 2013). The spatial distribution of place values were also investigated by hotspot Getis-Ord G_i^* analysis. While the NN statistics take account of the point values distributed across the area (without a required minimum sample size), the hotspot analysis is respectful of the importance ranking of the value points and also spatially demonstrates the value points of high or low importance ranking clustered by other high or low value points on the landscape. Conducting Getis-Ord G_i^* hotspot analysis was in line with other studies of spatial value analysis (e.g., G. Brown & Raymond, 2014; Schmitt et al., 2022). The spatial relationships' conceptualization for the hotspot analysis was based on K nearest neighbor as the distribution of place values varies across the study area. This approach ensures that each data point will be analyzed with a defined number of neighbors despite a point having far away or nearby neighbors. It is useful especially when the scale of the analysis is consistent but the number of point values differs in each sample (ArcGIS Pro, n.d.). The Z-scores and p-values were calculated by running the Getis-Ord G_i^* hotspot analysis and were available in the layer attribute table. The positive and large Z-scores indicate statistically significant clusters of highly ranked place values whereas the negative and small Z-scores indicate a statistically significant cluster of low weighted values.

The density of the place values was investigated by weighted kernel density estimation with the importance rankings of assigned place values serving as point intensity weights. Kernel density estimation produces a smoothly curved surface fit over each point with certain search radii or bandwidth (G. Brown & Donovan, 2014). This technique calculates the density of each grid cell in the study area. It is a widely applied method in place value assessments to study the point values' distribution (e.g., Alessa et al., 2008; G. Brown & Weber, 2011; Fagerholm & Käyhkö, 2009; Sherrouse et al., 2011).

There is no agreed identification of grid cell size measurement or distance threshold for the kernel density analysis and each study has adopted a variety of methods (e.g.,

based on analysis scale, or mapping accuracy) to determine this threshold and so this parameter has some levels of subjectivity to it. In this study, while each value category and classified RII values contained a different number of value points, the cell size parameter of kernel density analysis differed as well for each value sample. This implies that each value point layer is transformed into density layers at different grid resolutions and corresponding search radii, promoting a better spatial analysis for specific samples. The search radius of each kernel density analysis was automatically estimated by Silverman's Rule of Thumb bandwidth in ArcGIS Pro. The cell sizes (ρ) were determined by an equation developed by Hengl (2006) which accounts for the number of values in each sample (N) and the area of the study site (A) shown below (3.1).

$$\rho = 0.0791 * \sqrt{A \div N} \quad (3.1)$$

However, since the kernel density surfaces of place value maps were different due to their grid resolution, the categorization of their symbology into qualitative high or low labels was intentionally avoided. The values in the kernel density surfaces refer to point densities per unit area and they are meant to allow for comparison to other value density maps with different grid cell sizes. For this reason, the kernel density layers were all normalized from 0 to 1 by raster calculations to exhibit the intensity of place values and allow for their better comparison by visually inspecting the saturation of density surfaces. All of the spatial analyses were done in ArcGIS Pro at a scale of 1:9000 for the second objective of the research which set to demonstrate the spatial distributions of place values in AUF landscape.

3.4.3 Statistical analysis of independent variables and place values

The effect of independent variables on the frequency of the dependent place value assignments by individuals was investigated by non-parametric counterparts of one-way ANOVA and the T-tests in IBM SPSS statistics 27. This was due to the violation of normality and homogeneity of variances assumptions through Shapiro-Wilk and Levene's tests, mainly due to the small sample sizes of the independent variables. The non-parametric tests allow to conduct the statistical test given the skewness of data distribution and the low sample sizes.

The statistical associations were examined only for the independent variables and the relational-intrinsic-instrumental (RII) value typology. According to Table 3.2, the three place values (collected as thirteen categorical values) assigned by each respondent were coded into RII classification to aggregate the data on values and increase the statistical strength of the analysis as much as possible. This classification was also irrespective of the importance rankings for the same reason. This categorization implied that there was a probability that each respondent could have assigned all of the relational, intrinsic, and instrumental values at least once in the three value mapping questions. On the other hand, although it was asked in the survey for the respondents to identify different values for AUF, the respondents were still able to identify the same categorical values within different locations on the site corresponding to a single RII classification.

The count number of RII values was calculated for each respondent, however since the non-parametric ANOVA and T tests require that the dependent variable be on a continuous scale or ordinal, the count data was converted into mean RII value assignment for this purpose. For example, if the respondent has assigned aesthetic value for the first importance ranking question, biodiversity value for the second, and economic value for the third question, the frequency of this person's RII value assignment is one relational value, one intrinsic value, and one instrumental value. The mean number of values assigned by this individual per RII category would be 0.33, 0.33, 0.33 calculated by dividing the count number of values in each category by three as the total number of values that each respondent could assign.

Socio-demographic independent variables included indicators such as age, gender, education level, and whether or not the respondents are Istanbul citizens and have a relevant profession or expertise in environmental subjects (Table 3.1). The independent categorical binary variables of citizenship and relevant profession were analyzed in conjunction with RII dependent variables by Mann-Whitney U tests to test if there are any statistically significant differences in the mean values assignments by respondents across the independent variable levels. The three remaining independent variables were tested by the Kruskal-Wallis H test as they have more than two nominal categories. The familiarity with the site variable included items of relation to the site with three nominal levels and knowledge level of the urban forest with 5 ordinal levels. These items were also analyzed by the Kruskal-Wallis H test.

The pattern of use independent variable was investigated by the respondents' frequency of visits with 5 ordinal levels using the Kruskal-Wallis H test. For the preferred activities, since it was a multiple choice question, the 5 nominal levels were converted into binary levels of 'yes' or 'no' corresponding to each activity for the purpose of analysis in SPSS. These variables were analyzed through Mann-Whitney U tests.



4. ATATÜRK URBAN FOREST PLACE VALUES

In this chapter, the results of the analysis corresponding to the research objectives which first investigate the visitors' anchored place values, secondly the spatial distribution of place values in the Atatürk urban forest (AUF) landscape, and finally the statistical association of place values and respondent profiles are discussed. Prior to the discussion of these three research objective results, the PPGIS respondent sample that identified the place values of AUF is elaborated in the first subsection of this chapter. Accordingly, after discussing the results, this chapter continues to delve deeper into their comprehension by discussing them according to the current literature. The place values and their application in local landscape scale and the methodological choices regarding place values are additionally elaborated to shed light on the significance of this study and provide future research with insights regarding place values and PPGIS in the similar context to this research.

4.1 Respondents Profiles

The survey was completed by 112 site visitors reflecting a diverse demographic composition during the June and July of 2023 during weekdays and weekends. The frequency of respondents' socio-demographics and their site-related characteristics is provided in Table 4.1. Gender distribution showed a predominance of women (65%), followed by men (34%) with only one non-binary individual. Age demographics revealed that a significant portion of respondents fall within the 18-29 and 30-59 age brackets with a marginal representation of individuals above 60 years. In terms of occupation relevance, a minority of respondents report having a relative occupation associated with environmental sustainability issues, while the majority (84%) do not. Citizenship status indicates the majority of respondents live in Istanbul (95%). A substantial proportion (60%) have a low university education degree. In terms of their relationship to the site, nearly half of the respondents identify as visitors to the site, while the other half indicate that they reside in close proximity to the site, with only three people working nearby (Table 4.1).

Most of the respondents self-reported their knowledge of the study area as very good and good. Finally, the frequency of site visits varies among respondents, with the majority visiting once at least a week (35%), followed by visiting a few times a month (27%), visiting a few times a year (17%), while only a minor proportion visit once a year (3%), with first-time visitors accounting for 20% of the sample.

Table 4.1 : Descriptive table of the participants sample.

			Frequency	Percent (%)
Socio-demographics	Age	18-29	59	52.7
		30-59	52	46.4
		>60	1	0.9
	Gender	Woman	73	65.2
		Man	38	33.9
		Non binary	1	0.9
	Education	Primary or secondary	6	5.4
		College	16	14.3
		Low university	67	59.8
		high university	23	20.5
Citizenship	Yes	106	94.6	
	No	6	5.4	
Relevant profession	Yes	18	16.1	
	No	94	83.9	
Familiarity with the site	Relation to the site	Lives around	55	49.1
		Works around	3	2.7
		Visitor	54	48.2
	Site knowledge	Poor	8	7.1
		Moderate	18	16.1
Pattern of use	Visiting frequency	Once at least a week	39	34.8
		Few times a month	30	26.8
		Few times a year	19	17.0
		Once a year	3	2.7
		First time visiting	21	18.8
	Hiking	Yes	99	88.4
		No	13	11.6
	Biking, & exercises	Yes	25	22.3
		No	87	77.7
	Preferred activities	Watching Birds	Yes	14
No			98	87.5
Use recreational facilities		Yes	14	12.5
		No	98	87.5
Other activities	Yes	14	12.5	
	No	98	87.5	

The majority of the respondents (88.4%) prefer hiking in AUF. Secondly, biking and other exercises and then watching birds and using recreational facilities were identified as the preferred activities of the site respectfully. Half of the respondents who chose other activities disclosed that they picnic in the urban forest. The remaining respondents replied they enjoy just sitting, resting and breathing, or reading a book and some mentioned they spend time with their children in the children's playgrounds (Table 4.1).

4.2 The Most Anchored Place Values

In this section, in line with the first objective to delineate the place values of AUF anchored by the site visitors, the place values and their importance ranking are described by their frequencies. The place values corresponding to relational-intrinsic-instrumental (RII) typology are also descriptively organized for the three value ranking questions.

All of the three assigned values per participant accounted for a total amount of 336 place value points for this PPGIS research. The frequency of the 336 assigned values revealed interesting results related to the diversity of perceived values for each priority ranking (Table 4.2). The first priority ranking corresponding to the highest important values revealed that participants perceived a limited number of 10 place values for this rank among the 13 values in the provided typology in comparison to the other two ranks. The second rank comprised 11 values and the third 12. The smaller amount of number of place values for the first importance ranking category compared to the two lower ranks can point out that the participants have a rather clear view of the most important place values of the forest. The historic value was not assigned by any of the participants for the study area. The aesthetic value was by far the most assigned value for the first priority rank. While aesthetic value was also the most perceived for the second importance ranking, the biodiversity value came in second place with not much difference in count number. Surprisingly the third importance ranking showed participants prioritized recreation value the most compared to other values.

The therapeutic and social relations values were equally the second most assigned values in this rank. Classifying the value categories into the RII value paradigm revealed that relational values shared the highest amount of assigned values by participants across all of the three ranks ranging from 86% to 79%. While the first and third RII ranks contained all of the three relational-intrinsic-instrumental values, the second rank did not. Second to relational values, the intrinsic values were perceived the most for the urban forest.

Table 4.2 : The frequency of all quantified place values of AUF.

Frequency		Percent		Frequency		Percent		Frequency		Percent	
First Rank Values (N=10)				Second Rank Values (N=11)				Third Rank Values (N=12)			
Aesthetic value	53	47.3	Aesthetic value	27	24.1	Aesthetic value	13	11.6			
Biodiversity value	11	9.8	Biodiversity value	20	17.9	Biodiversity value	11	9.8			
Cultural heritage value	1	0.9	Cultural heritage value	6	5.4	Cultural heritage value	2	1.8			
Future value	9	8	Future value	11	9.8	Future value	14	12.5			
Intrinsic value	4	3.6	Intrinsic value	4	3.6	Intrinsic value	7	6.3			
Life Sustaining value	5	4.5	Learning value	1	0.9	Learning value	2	1.8			
Recreation value	12	10.7	Life sustaining value	8	7.1	Life sustaining value	9	8			
Therapeutic value	12	10.7	Recreation value	17	15.2	Recreation value	18	16.1			
Social relations value	4	3.6	Spiritual value	1	0.9	Spiritual value	2	1.8			
Economic value	1	0.9	Therapeutic value	13	11.6	Therapeutic value	15	13.4			
			Social relations value	4	3.6	Social relations value	15	13.4			
						Economic value	4	3.6			
Total	112	100	Total	112		Total	112	100			
First Rank RII			Second Rank RII			Third Rank RII					
Relational	96	85.7	Relational	88		Relational	90	80.4			
Intrinsic	15	13.4	Intrinsic	24		Intrinsic	18	16.1			
Instrumental	1	0.9				Instrumental	4	3.6			
Total	112	100	Total	112		Total	112	100			

4.3 Spatial Distribution of Place Values Across AUF Landscape

Given that there were evident mapping errors as some value points were misplaced outside the designated study site area, a clipping operation was necessary to discard these points for the purpose of the spatial analysis for the second research objective. It is important to note that although these misplaced value points were discarded in the spatial analysis, these misplaced place values were accounted for in the descriptive analysis in the first objective and statistical analysis in the third research objectives. This choice was due to the fact that apart from the placement errors, these place values represented the value categories and the rankings that the respondents had assigned to AUF. Accordingly, after the clipping operation of the misplaced points outside the AUF area, the number of all the mapped place values rounded up to 328 value points. The 8 misplaced values belong to one recreation value point in the first priority rank, one aesthetic value point in the second priority rank, and 6 misplaced values in the third priority rank. These 6 values include one therapeutic value, one intrinsic value, two cultural heritage value points and two aesthetic value points. The number of assigned place values after the clipping operation revealed that aesthetic value is the highest perceived value by the visitors for AUF ($N = 91$). The next three highest assigned categorical value points are recreation value, biodiversity value, and therapeutic value respectively (Table 4.3).

The spatial distribution of all mapped place values of AUF, the RII values and the categorical values were first examined by the average nearest neighbor statistics (NN) taking account of the point values placed on the landscape within the area of 1,075,385 sq.m irrespective of their importance ranking. In this analysis, the R-ratio close to zero is defined as clustered spatial distribution and the R-ratio close to one pertains to the randomness of distribution. The NN statistics (Table 4.3) revealed that all the mapped place values assigned for AUF by the participants are spatially clustered significantly across the urban forest ($N=328$, R index 0.6, Z-score -13.95, $p > 0.01$). Furthermore, the NN statistics indicate value categories and RII value paradigms have different spatial patterns. Among the value categories, the aesthetic value, biodiversity value, future value, life sustaining value, recreation value, social relations value and therapeutic value are spatially clustered while in the RII value paradigm, the relational

and intrinsic values are significantly clustered. Only the spiritual value sample is significantly dispersed across the landscape.

The rest of the value samples do not exhibit any specific spatial pattern and have random spatial patterns including cultural heritage value, economic value, categorical intrinsic value, learning value, and instrumental value in the RII paradigm. This research investigated kernel density surfaces for the clustered value samples since the random or dispersed values cannot be meaningfully linked to the underlying physical landscape (Table 4.3).

Table 4.3 : NN statistics results for 12 categorical values and RII values (C=spatial clustering, R= random pattern, D= dispersed pattern).

	N	R- ratio	Z- score	p-value	Spatial Pattern
Aesthetic value	91	0.560	-8.027	0.000***	C
Biodiversity value	41	0.748	-3.091	0.002***	C
Cultural heritage value	8	0.789	-1.142	0.253	R
Economic value	5	1.238	1.018	0.309	R
Future value	33	0.532	-5.145	0.000***	C
Intrinsic value	14	0.823	-1.267	0.205	R
Learning value	3	1.261	0.866	0.387	R
Life-sustaining value	22	0.811	-1.692	0.091*	C
Recreation value	46	0.507	-6.393	0.000***	C
Social relations value	23	0.640	-3.305	0.001***	C
Spiritual value	3	1.650	2.153	0.031**	D
Therapeutic value	39	0.691	-3.692	0.000***	C
Relational	268	0.600	-12.529	0.000***	C
Intrinsic	55	0.681	-4.532	0.000***	C
Instrumental	5	1.238	1.018	0.309	R
All values	328	0.597	-13.952	0.000***	C

*** significant at 0.01

** significant at 0.05

* significant at 0.1

The NN statistics indicated the spatial distribution of value points despite their importance rankings. However, they do not indicate where on the physical landscape the place values are clustered. For this reason, to ensure a meaningful interpretation of value density maps, the hotspot analysis was conducted to enable a visual inspection of clusterization of highly weighted values (hotspots) or low weighted values (coldspots) in each sample. This analysis requires that the value categories contain at least 30 point features (ArcGIS Pro, n.d.). Accordingly, the aesthetic, biodiversity,

future, recreation, and therapeutic value categories and relational and intrinsic RII values as well as all place value points were investigated by this analysis. The resulting hotspots and coldspots calculated by the G_i^* statistics for each value point revealed a range of different Z-scores in each place values dataset (Table 4.4). This points out the highly different place values and weights each individual holds and assigns to AUF.

Table 4.4 : Z-scores of the hotspot analysis for the place values; Gi-Bin of ± 3 indicate confidence level of 99% and p -value <0.01 , Gi-Bin of ± 2 indicates confidence level of 95% and p -value <0.05 ; Gi-Bin of ± 1 indicate confidence level of 90% and p -value <0.1 .

	KNN	Maximum Z-score (Hottest spots)	p -value	Gi-Bin	Minimum Z-score (Coldest spots)	p -value	Gi-Bin
Aesthetic value	3	-	-	-	-2.59	0.009	-3
Biodiversity value	3	-	-	-	-2.13	0.033	-2
Future value	3	-	-	-	-2.29	0.022	-2
Recreation value	3	2.92	0.004	3	-1.69	0.091	-1
Therapeutic value	3	-	-	-	-1.67	0.096	-1
Relational values	8	2.40	0.016	2	-2.54	0.011	-2
Intrinsic values	3	-	-	-	-2.51	0.012	-2
All place values	8	2.09	0.036	2	-2.05	0.041	-2

The hotspot analysis indicates statistically significant clusters of highly ranked place values with positive and high Z-scores whereas the negative and small Z-scores indicate a statistically significant cluster of low weighted values. The Gi-Bins in this analysis refer to the statistical confidence intervals, and KNN is number of neighboring point values indicated for each value sample. Table 4.4 demonstrates that all the value samples have a clusterization of low importance ranking value points with only aesthetic value samples representing the highest confidence level of significant clustering of coldspots. Recreation value, relational, and all the mapped place values samples on the other hand exhibit clusterization of both hotspots and coldspots. The recreational value sample exhibits the highest clusterization of intensity weights with a high confidence level. Relational values sample has the highest range of Z-scores (4.94) which implies the high difference between the coldspots and hotspots of these

values across AUF. The number of nearest neighbors for each value sample (KNN) was defined through experimentation of hotspot analysis. Hotspot analysis with KNN conceptualization of spatial relationships in ArcGIS is automatically executed with 8 numbers of nearest neighbors which is set by the rule of thumb. However, this amount of neighbors for the samples with a lower amount of value points resulted in a misrepresentation of high/low ranked values' clustering. This analysis identifies high or low ranked value points clustering by other high or low value ranked points as hotspots or coldspots. However, given that the distribution of mapped value points across AUF landscape is extremely varied and skewed, with the smaller-sized value samples, the highly ranked importance place values were identified as hotspots despite being surrounded by low ranked values in scattered surroundings. This is because KNN investigates any defined number of neighbors despite the scale of analysis leading to its increase of search radius to find the closest neighboring mapped points. For this reason, except for the sample of all place values (N=328) and relational values (N=268), the number of three neighbors (K=3) was found to be more appropriate in correctly representing the spatial densities and clusters (Table 4.4).

The following discussions relate to the visual results or the maps of place values of AUF in line with the second research objective of this study. The weighted kernel density map of all the mapped place values assigned by all of the PPGIS participants for AUF revealed extremely varied intensities (Figure 4.1). The central axis of AUF connecting the festival area and the ponds shows a distinctive intensity of the mapped place values. A clear densification of place values is observable in the big pond area and the festival area. This is also evident from the many hotspots of high confidence level especially in the big pond area and then the festival area as well as the small pond. Observable coldspots of high confidence are clustered in the Beltur cafe area and the children's playground near Kuzey gate and also in the eastern conserved forest area.

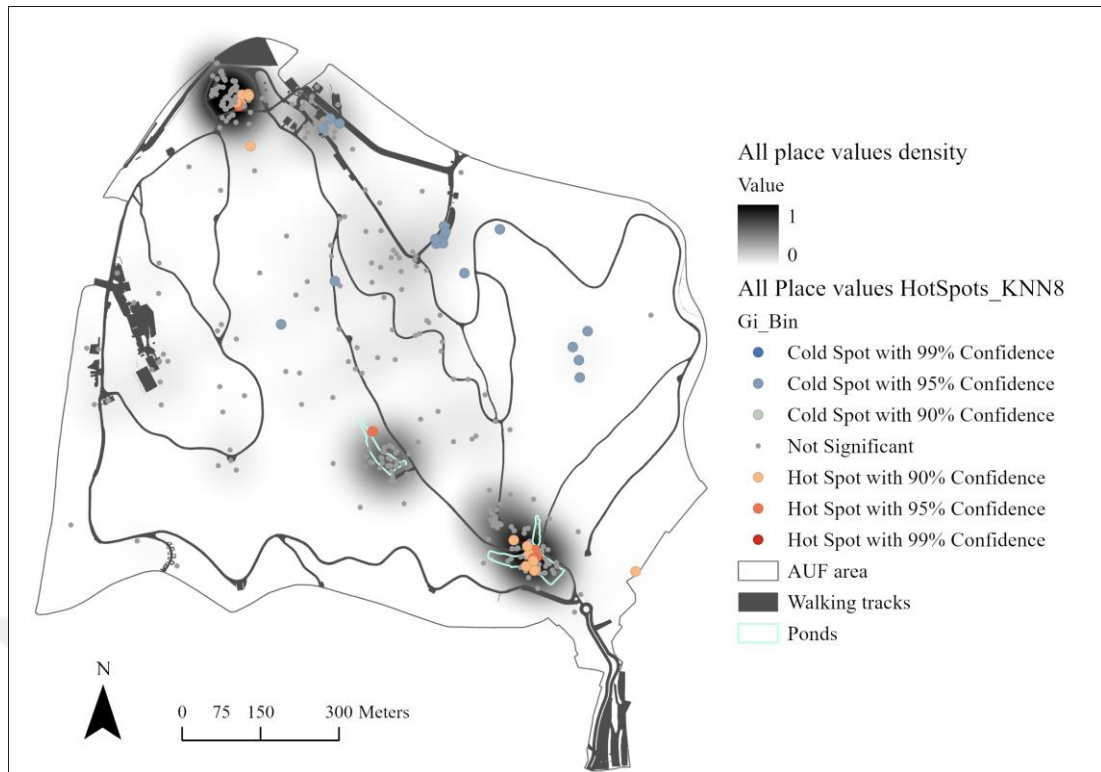


Figure 4.1 : Weighted Kernel density and hotspot- coldspots of all the mapped place values across the AUF landscape. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell.

The overlay of the weighted kernel density surface with the hotspot-coldspots reveals important findings about how people perceive and assign place values for AUF. There are many scattered statistically insignificant mapped place values distributed all over the forest likely because people perceive importance for the urban forest in general. However, this overlaid map exhibits that the most distinctive elements of importance and value for the urban forest are the festival area, the big pond, and the small pond, and then the areas not located in the central axis such as the Beltur cafe and the children's playground. This is as if the intention of the survey for mapping three important prioritized values was to ask people to identify the most distinctive elements of this landscape. Statistically, the mapped places for the first question which related to the highest priority then would be the big pond, small pond, and the festival area. On the other hand, the third question of least priority would statistically reveal areas including the Beltur cafe, the children's playground, and the easter conserved forest area. This is all due to the potential of overlaying densities and hotspot-coldspots that can enable a meaningful interpretation of the landscape design of the forest. This map shows the most successful landscape design elements of AUF and the importance of the central axis that immediately connects these elements. By central axis, this research

specifically refers to the water track and parts of the Çıtkuşu track that link the festival area with the water bodies in the shortest traveling distances (Figure 4.1). All of these specific locales have different landscape characteristics in which people engage with different activities and perceive their significance and meaning. In the subsequent value maps, the importance of each of these locales for people’s experience of the urban forest will be explained to contextualize them in facilitating various human-nature relationships.

The overlay of density surface and hotspot-coldspots of relational values under the RII typology appears similar to that of all the mapped place values since relational values encompass the largest share of the place values for AUF (Figure 4.2).

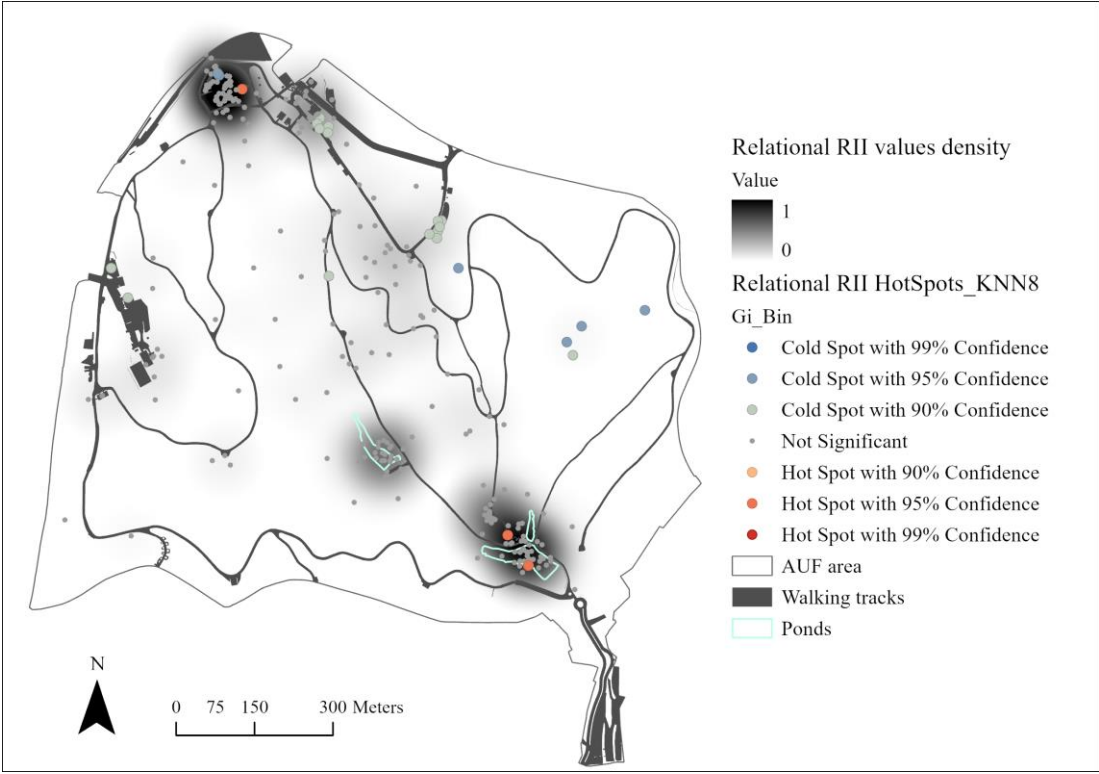


Figure 4.2 : Weighted Kernel density and hotspot- coldspots of relational values across the AUF landscape. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell.

As can be seen in Figure 4.2, hotspots of relational values appear in the big pond area and in the festival area. Many coldpots of 90% confidence appear in the Beltur cafe area and the children’s playground while some also can be seen on the northern part of the management building and one on the water track. Coldposts of higher confidence appear in the eastern forested area as well as in the festival area. This pertains to an understanding that the relational values of the highest importance rank

statistically are linked to the festival area and the big pond area while on the other hand, the lowest importance ranks for relational values are statistically related to the festival area, and the Beltur cafe area and the children’s playground and the conserved forest area. The kernel density surface of relational values appears place-specific and shows densification along the central axis of AUF that connects water bodies to the festival area. The intense density of mapped relational value points can be linked to the festival area and the big pond followed by the small pond and Beltur cafe area with comparatively lower density saturations. Accordingly, this map exhibits that the big pond and the festival area are the specific locales that have been assigned with highest number of relational value points while also receiving the highest importance weighting by the AUF visitors (Figure 4.2).

In contrast to the relational values density surface, the intrinsic values under the RII paradigm exhibit an outwards densification pattern from the central axis towards the conserved forested area (Figure 4.3).

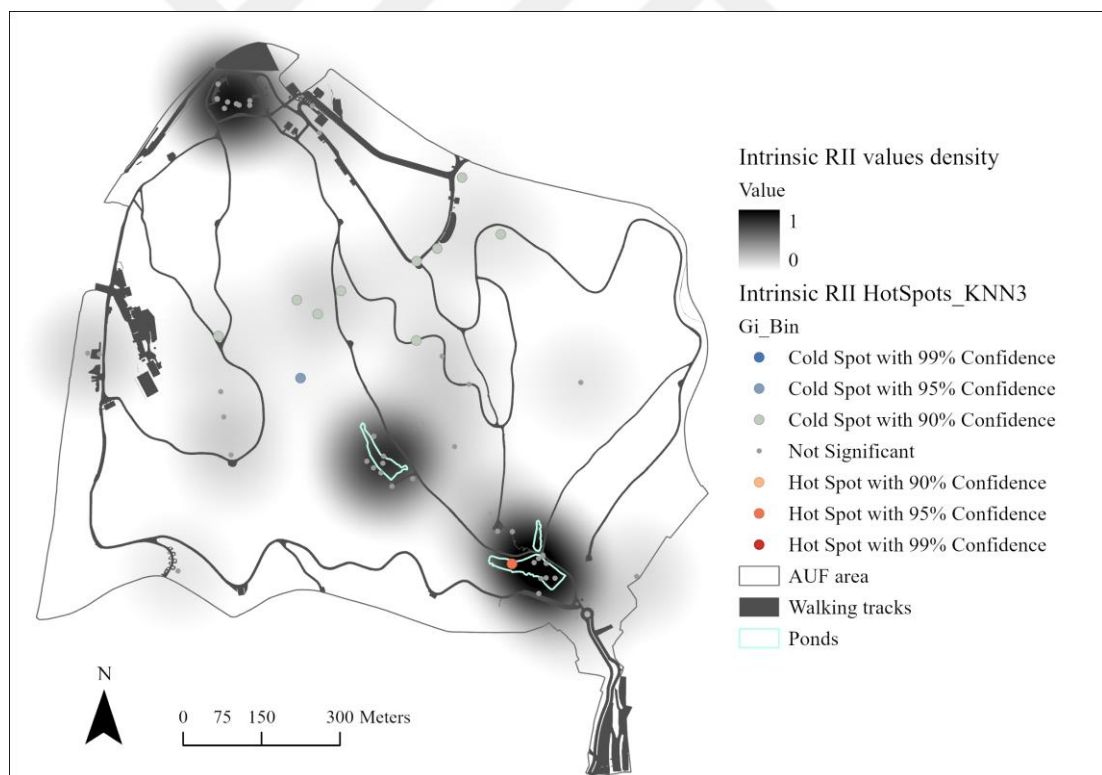


Figure 4.3 : Weighted Kernel density and hotspot- coldspots of intrinsic values across the AUF landscape. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell.

While the density surface of relational values exhibits cohesive and uninterrupted distribution along the central axis, the intrinsic values surface comparatively shows

patches of larger density extents. However, the kernel density surface of intrinsic values demonstrates that the highest number of mapped intrinsic values fall in the big pond, festival area, and small pond area respectively which is similar to the densification of relational values in these areas. The NN statistics revealed that both of these categories under the RII paradigm, are statistically clustered across the landscape and so ensure that this similarity of densification in these specific locales can be meaningfully interpreted. This means that while intrinsic and relational values relate to different constructs of human-nature relationships and are mapped differently, they co-exist simultaneously within similar spatial extents and receive value and significance for both of these value categories. There are also similarities with regards to the importance weighting of relational and intrinsic values. The highest importance ranked value points also appear clustered in the big pond area for intrinsic values while the coldspots of lower importance values appear perpendicular to the central axis.

The instrumental value density map is provided in Figure 4.4 to demonstrate the effect of a low sample size of value points on the coarseness of grid resolution. While the low sample size of this value category (N=5) prohibits discussing its spatial distribution intuitively, it also points out that this value category was by far the least perceived importance for the AUF by the survey participants.

The aesthetic value density resembles similarity to the kernel density surface of relational values (Figure 4.5) as it comprises the highest amount of mapped values for this category. However, this map clearly demonstrates that the most mapped aesthetic values are located in the big pond area and the festival area. The small pond shows a relatively lower intensity of mapped aesthetic values. The aesthetic values however do not show clustering of highly ranked importance values despite exhibiting many clustering of low ranked values with varying and high confidence levels, in both the festival area and the big pond area. The vista deck that connects the Çitkuşu track and the water track by stairs also has a coldspot of aesthetic values. Contrary to expectation, the aesthetic values are not mapped within the conserved forest parts of the landscape however the density surface moves towards the management building and its nearby children's playground (Figure 4.5).

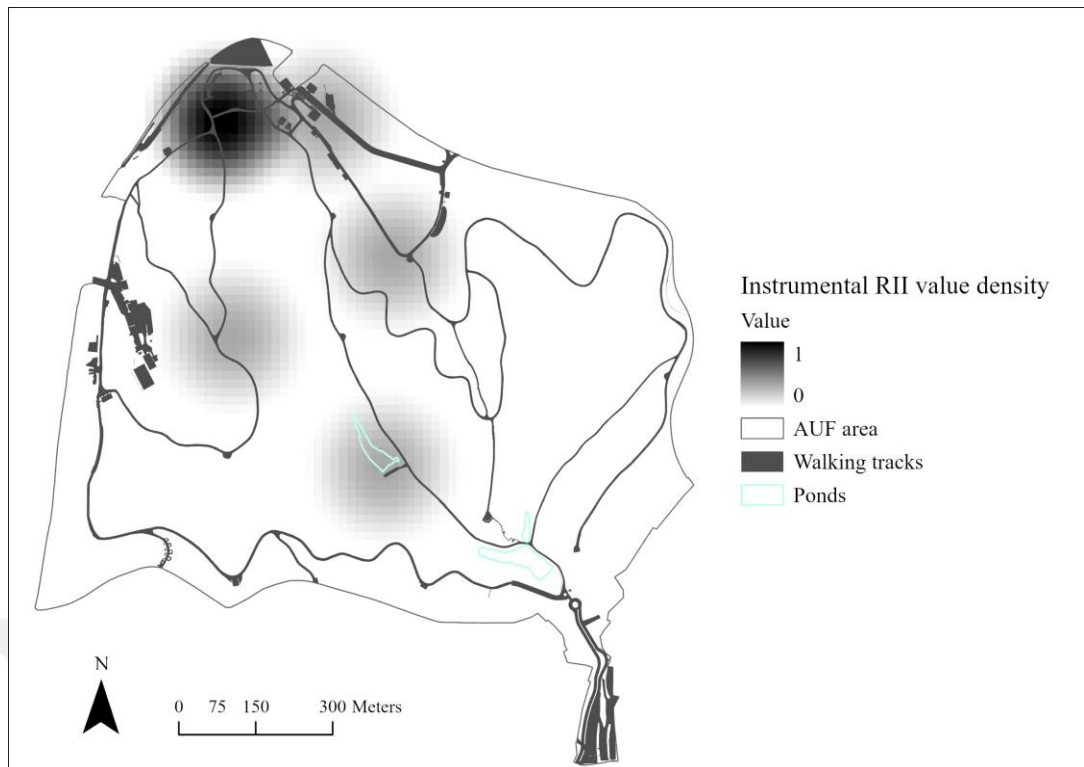


Figure 4.4 : Weighted Kernel density of instrumental values in RII paradigm across AUF landscape. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell. Hotspots were not performed on instrumental values due to the small sample size.

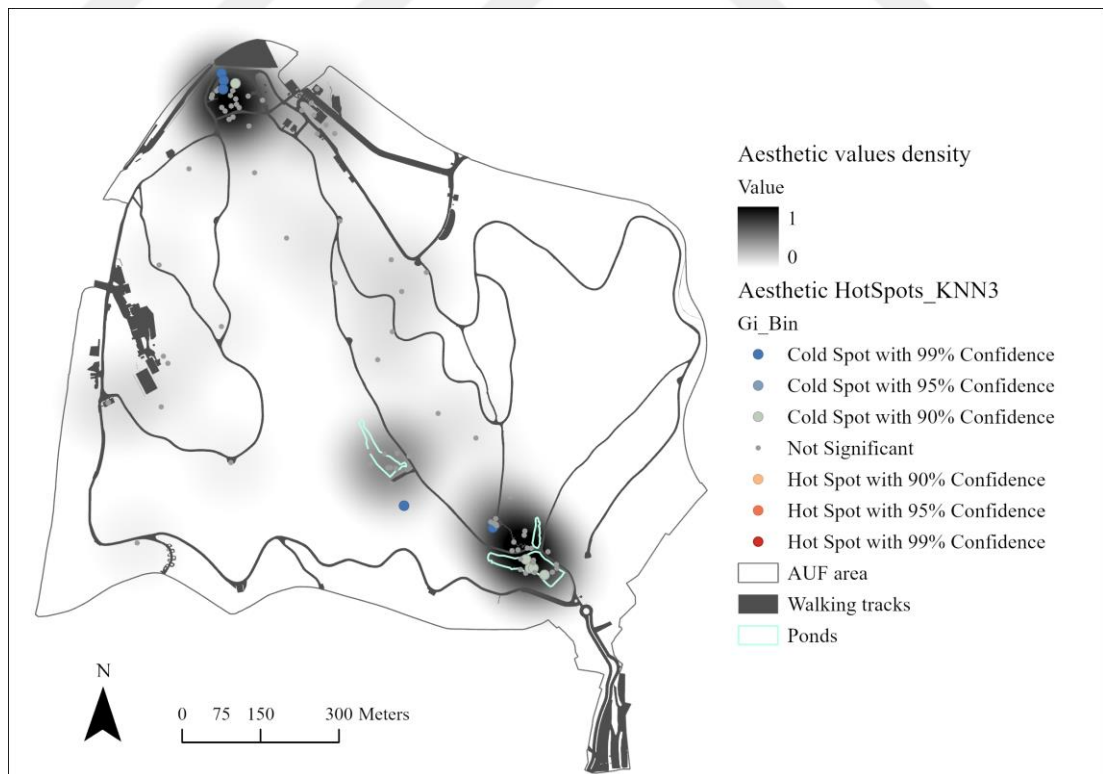


Figure 4.5 : Weighted Kernel density of aesthetic values overlaid hotspot-coldspots across AUF. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell.

The recreation value density demonstrates a highly place-specific clusterization of mapped recreation value points especially in the big pond area towards the vista deck staircase (Figure 4.6). This value sample is the only sample that exhibits clustering of hotspots among other value categories. Many hotspots of high confidence levels can be seen in the big pond area meaning that the respondents who identified recreation values for AUF statistically indicated the big pond in the first importance ranking question for this value. Lower intensities of mapped recreational values can be observed in the festival area and around the children’s playground near Kuzey gate.

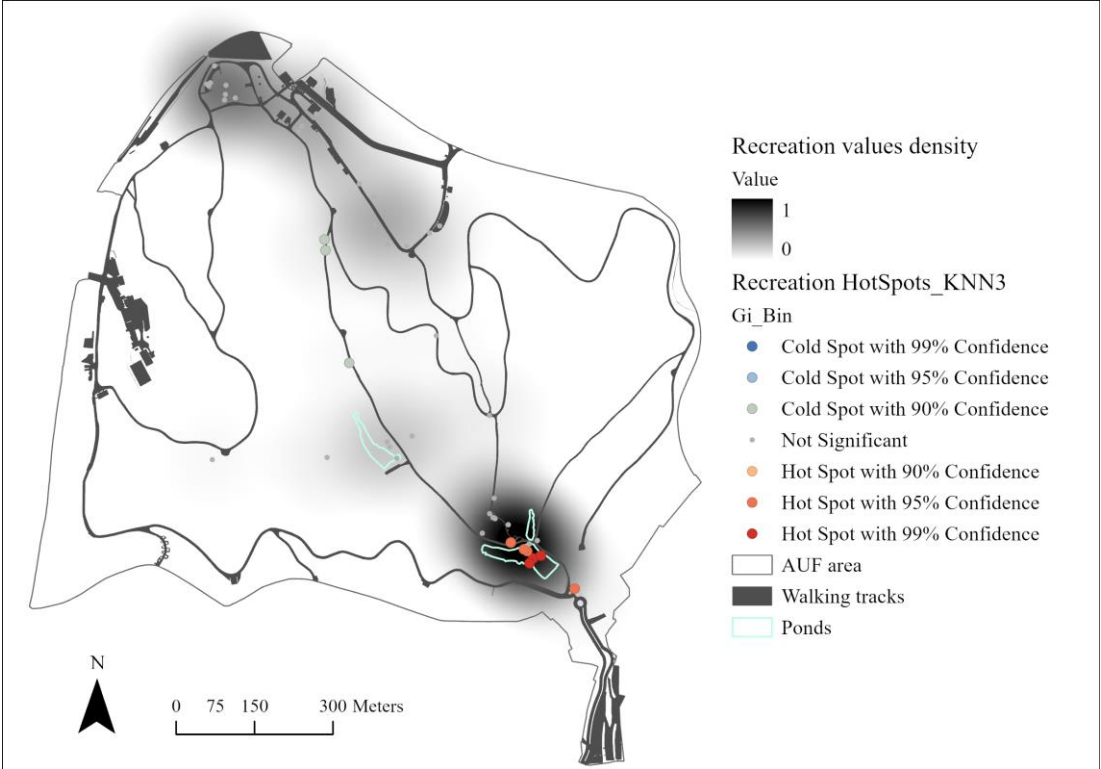


Figure 4.6 : Weighted Kernel density of recreation values overlaid hotspot-coldspots across AUF. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell.

The kernel density surface of biological diversity values shows scatteredness of density patches all across the AUF landscape, especially in its lower half which pertain to conserved forest areas that are also prohibited to human accessibility (Figure 4.7). The high intensity of mapped biodiversity values can especially be seen in the small and the big pond areas. Coldspots of biodiversity values are located in the western conserved forest. Interestingly, the festival area also shows a relatively intense distribution of biodiversity values. The kernel density raster of biodiversity value is similar to that of the intrinsic RII value as biodiversity values are the highest number of mapped values in this category by the survey participants.

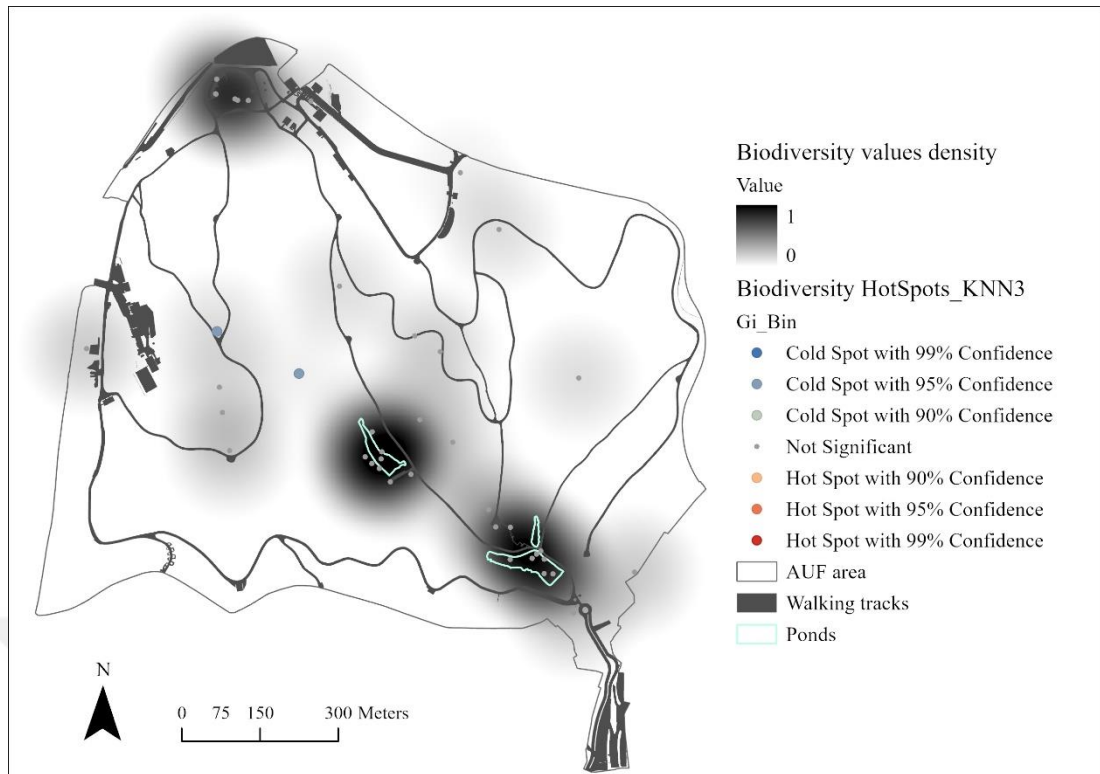


Figure 4.7 : Weighted Kernel density of biodiversity values overlaid hotspot-coldspots across AUF. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell.

The kernel density raster of therapeutic values (Figure 4.8) delineates the intensification of these values especially in the big pond and festival area and in comparatively lower intensities in the forested area around the Çitkuşu track and in the small pond area. Coldspots of low-ranked therapeutic values are statistically related to the area around the Çitkuşu track around the eastern conserved forest and the festival area. The density surface of therapeutic values is positioned in large spatial extents and spreads towards the conserved forest areas.

The mapped future values as the 5th most assigned value category for AUF, exhibit clustering of coldspots only in the big pond area (Figure 4.9). However, the weighted Kernel density surface of this value resembles similarities to the therapeutic density surface. Although mapped in a lower number of value points, the future value density shows the most intense mapping of its value points in the big pond and festival area and relatively lower intensities around Çitkuşu track and in the small pond area much like the therapeutic values density. Future value density however is in much concentrated spatial extent compared to therapeutic value density (Figure 4.9).

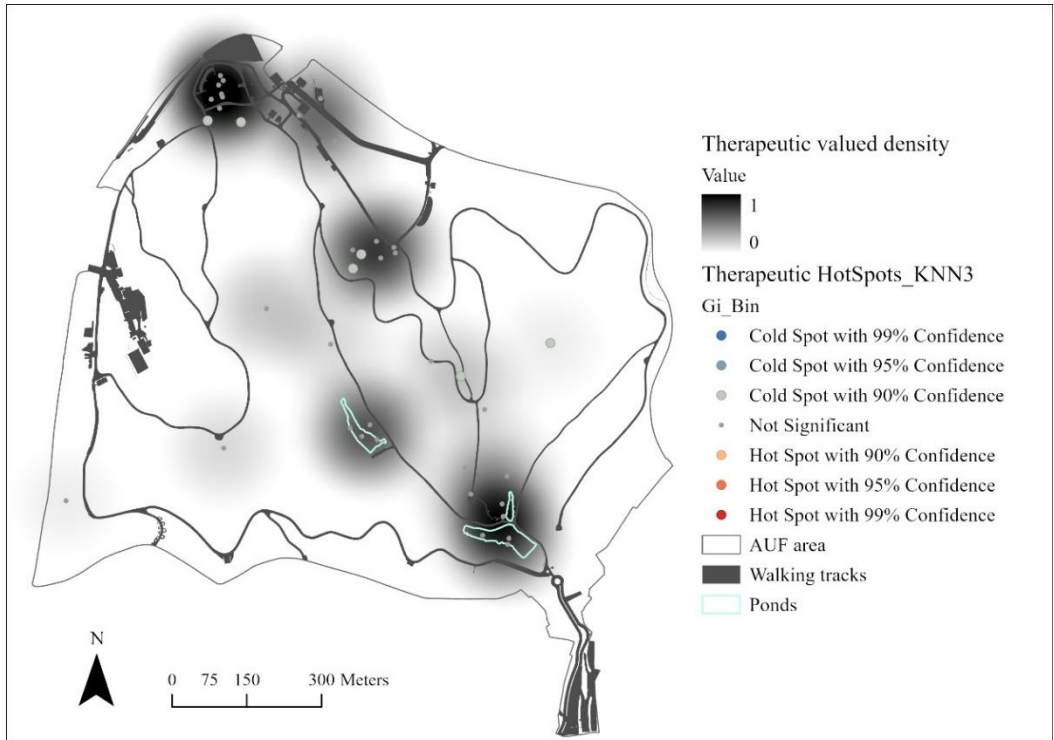


Figure 4.8 : Weighted Kernel density of therapeutic values overlaid hotspot-coldspots across AUF. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell.

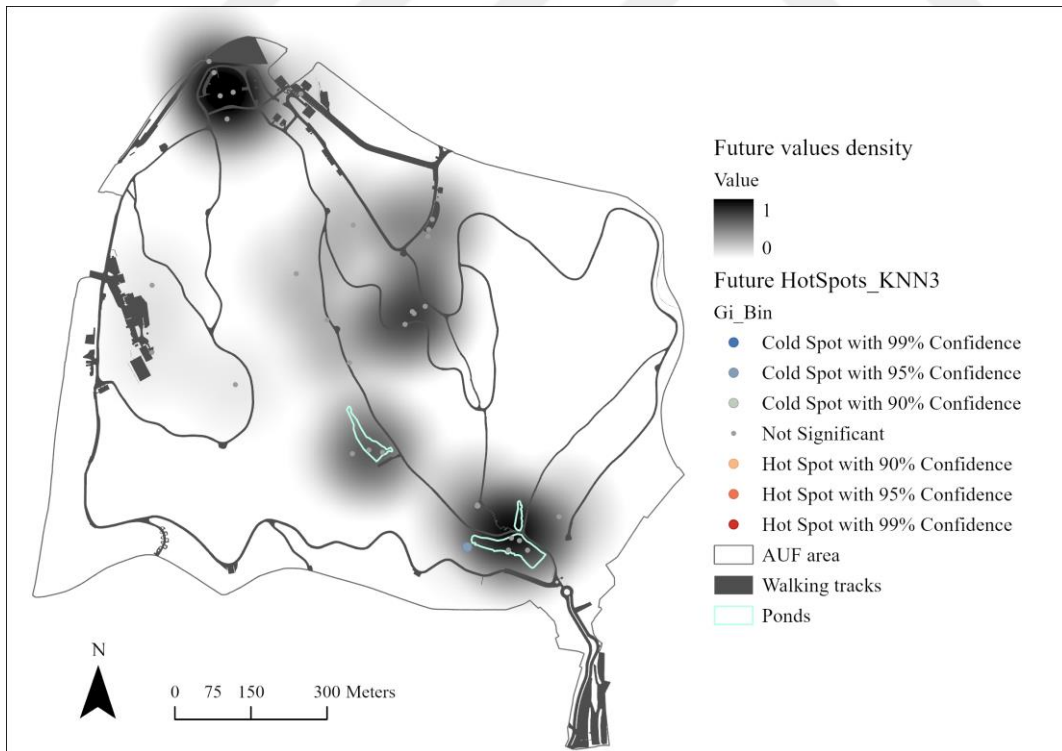


Figure 4.9 : Weighted Kernel density of future values overlaid hotspot-coldspots across AUF. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell.

The high intensification of future values in the therapeutic values surfaces in these specific locales might be helpful for understanding the perception of future values by the visitors in regard to their connection to therapeutic values.

The weighted density raster of social relations values is the most distinctly recognizable value density compared to the other value categories' densities. According to this map (Figure 4.10), the festival area can be simply delineated as the most valued area of AUF for its social relations value and its significance for social networking. This value can be meaningfully linked to this area as the festival area is the only area within the landscape with characteristics of social cohesion.

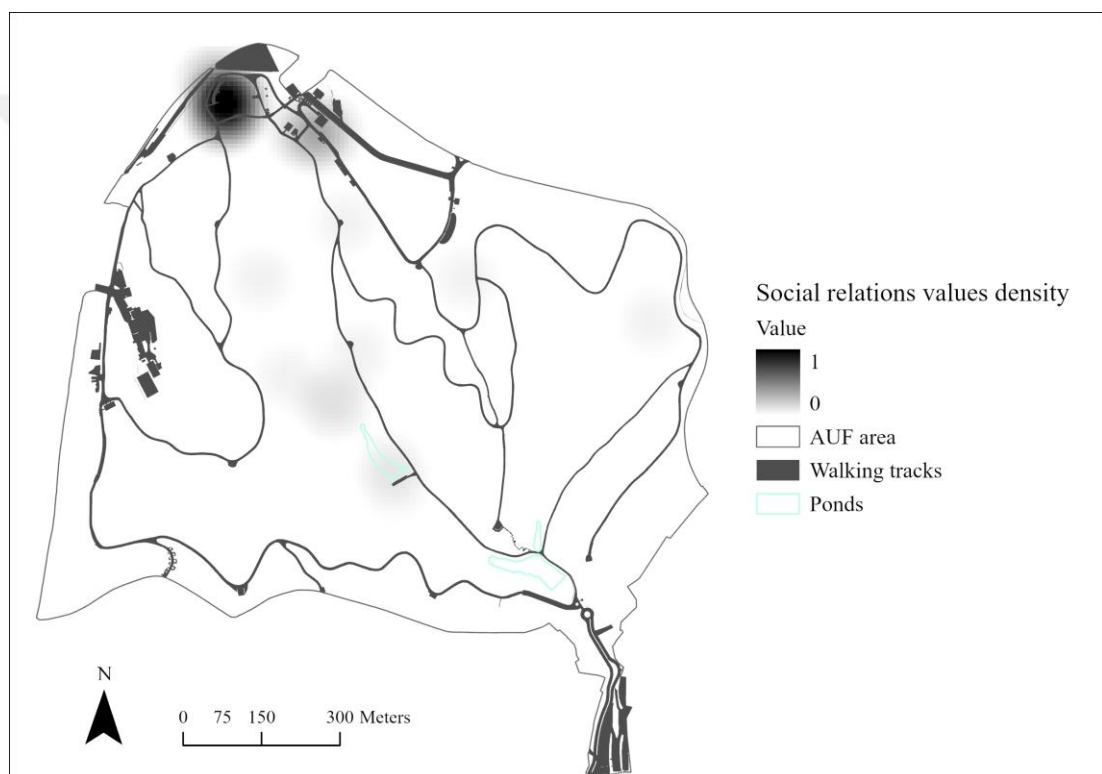


Figure 4.10 : Weighted Kernel density of social relations values across AUF. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell. Hotspots were not performed due to the small sample size.

The Kernel Density of life-sustaining values (Figure 4.11) demonstrates the high intensity of mapped value points, especially in the small pond area and then in the big pond area. The density raster is spread out beyond the central axis but this distribution does not indicate the forested areas of AUF.

The value density can resemble the biodiversity value density since they are intensified in the same three locales however, this density surfaces also extend towards the children's playground and the management building. Life-sustaining values according

to this spatial investigation can reveal the fuzzy boundary between intrinsic and relational RII values in the sense that while they exhibit similarities, life-sustaining value perception moves beyond valuing nature for its own sake and reflects anthropocentric dimensions. This might relate to this value’s complex position in relational values which reflects social and ecological systems are interlinked (Figure 4.11).

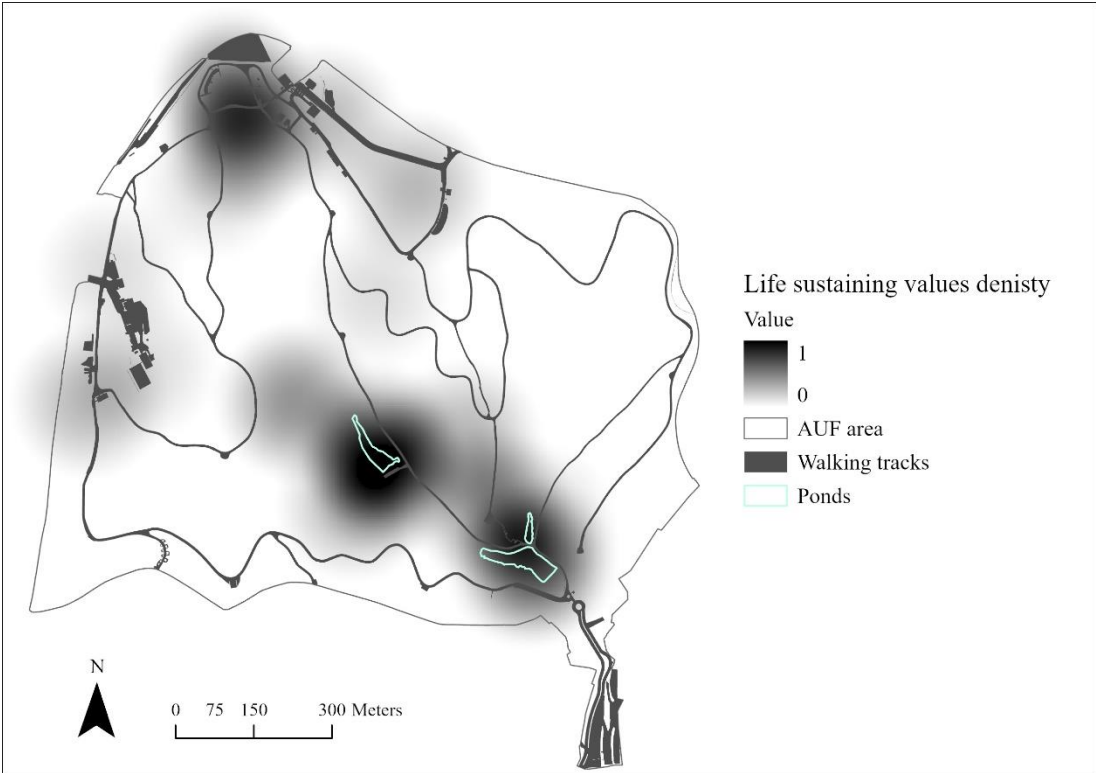


Figure 4.11 : Weighted Kernel density of life-sustaining values across AUF. The density surface is normalized (0-1) exhibiting the amount of value points falling in each grid cell. Hotspots were not performed due to the small sample size.

The results of spatial analysis of mapped place values for AUF investigated the NN statistics and Getis-Ord G_i^* statistics to examine the spatial patterns of mapped values and also with regards to their importance ranking. This step provided the information to enable a meaningful interpretation of the weighted kernel density surfaces. The kernel density surfaces allowed for visual inspection of similarities and differences between various value densities, to make sense of their conceptual understanding by the visitors of the site, their connection to the physical landscape and landscape design, and most importantly can reveal straightforward conflict between the place values and future development plans for AUF. These results will be extensively discussed by the existing literature of landscape values in the subsection 4.5 to interpret the findings more deeply.

4.4 Place Values and Respondent Profiles

In line with the third research objective, the statistical association of respondents profiles and their assigned place values were examined to indicate if the respondent characteristics such as socio-demographics, pattern of use and familiarity with the site had an effect on perceiving specific place values for the case of AUF. The non-parametric counterparts for ANOVA and T tests were used for this objective in which the participant profiles were set as the independent variables and the place values grouped into the relational-intrinsic-instrumental (RII) value typology comprised the dependent variables.

Based on Mann-Whitney U tests of PPGIS participants' socio-demographic profiles and pattern of use, no statistically significant difference in mean RII value assignment was found in conjunction with citizenship status, relevant profession, and preferred activities of hiking, running- biking and other exercises, watching birds, using recreational facilities or other activities (Table 4.5). On the other hand, Kruskal-Wallis H tests of mean place value assignments across multi-level nominal independent variables including age, gender, education under socio-demographics, relations to the site and self-reported site knowledge under familiarity with the site, and visiting frequency item of the pattern of use, similarly did not indicate significant differences (Table A.1).

As can be seen in the Kruskal-Wallis test results, the original categorization of education including primary-secondary schooling, college graduate, low university graduate, and high-university graduate while, did not yield significant difference for mean relational and intrinsic value assignments, the asymptotic significance indicated 0.119 and 0.169 respectively for the both value types. This led to the decision to aggregate the four education variables to investigate broader patterns within the data that were possibly hindered due to the high variety between these levels of the independent variable. From a conceptual standpoint, the distinction between low university and high university education, while academically significant, may not necessarily reflect the difference in place value assignment compared to disparities between individuals with university-level education and individuals with non-university education.

Table 4.5 : Mann-Whitney U test of socio-demographics and pattern of use variables in conjunction with mean place value assignment for AUF.

			Mean Relational Value Assignment			Mean Intrinsic Value Assignment			Mean Instrumental Value Assignment		
			Mean Rank	Asymp. Sig. ^a	U statistics	Mean Rank	Asymp. Sig. ^a	U statistics	Mean Rank	Asymp. Sig. ^a	U statistics
Socio-demographics	Citizenship	Yes	56.9	0.513	273	55.9	0.386	259	56.6	0.588	303
		No	49.0			66.3			54.0		
	Relevant profession	Yes	62.1	0.373	746	50.1	0.298	730.5	57.1	0.808	835
		No	55.4			57.7			56.4		
	Education (aggregated)	University graduate (n=90)	53.9	0.050*	752.5	59.2	0.043**	747	56.5	0.984	989
		Under-uni graduate (n=22)	67.3			45.5			56.5		
Pattern of use-preferred activities	Hiking- running	Yes	56.3	0.878	628.5	56.4	0.901	631.5	56.8	0.409	611
		No	57.7			57.4			54.0		
	Biking	Yes	54.5	0.694	1037.5	58.5	0.694	1038	56.2	0.899	1081
		No	57.1			55.9			56.6		
	Watching birds	Yes	61.5	0.488	616	49.9	0.357	594	58.0	0.606	665
		No	55.8			57.4			56.3		
	Use recreational facilities	Yes	59.5	0.674	643.5	55.5	0.893	672.5	54.0	0.389	651
		No	56.1			56.6			56.9		
	Other activities	Yes	61.3	0.504	618.5	53.6	0.682	645	54.0	0.389	651
		No	55.8			56.9			56.9		

** The significance level is .05.

* The significance level is .10

While original education categories provide details of educational profiles of the survey participants, the aggregation of individuals to categories of ‘university graduates’ and ‘under-university level graduates’ captures a fundamental division in educational attainment. This aggregated version of the education variable was then analyzed by Mann-Whitney U tests and the results revealed a significant difference in mean intrinsic value assignments between university graduates and under-university graduate individuals ($p < 0.05$) (Table 4.5). Accordingly, individuals with university education significantly assigned more intrinsic values for AUF than those who had not attained university-level education (Asymp. sig. = .043, $U = 747$). On the other hand, with less significance level, relational values were more assigned for AUF by the under-university graduates (Asymp. sig. = .050, $U = 752.5$). Alternative categorization of education levels was considered; however, only the chosen aggregation yielded a significant result, representing its practicality in revealing the underlying patterns and its appropriate conceptual categorization.

4.5 Evaluation of AUF Place Values in Comparison to Literature

Through a plural valuation of existing human-nature relationships of AUF SES, this research revealed that AUF visitors as its resource users hold and assign diverse place values with varying importance weights. The results of the first research objective indicated that under the RII paradigm, the forest stands out by its anchored relational values. The relational values pertain to the ‘live in nature’ human-nature relationships (O’Neill et al., 2008). This cognitive model of human-nature relationships depicts humans as the dwellers of the environment (Arias-Arévalo et al., 2018) or according to Zube (1987), as the participants in the ongoing processes of the landscape. This value depicts multidirectional and deeply connected human-nature relationships where people perceive environmental values beyond nature’s supply of benefits to humans or nature as a separate entity of importance. Among this study, a bundle of other PPGIS studies adopting a plural valuation approach confirm the prevalence of anchored relational values by the general public for their case studies. For example, Arias-Arévalo et al. (2017), report that all of their respondents articulated relational values the most frequently, followed by intrinsic values and then instrumental values for the Otún River watershed in Colombia. A similar result is reported by Schmitt et al. (2022) about grasslands in Germany. Klain et al. (2017), examined a set of social-ecological

value statements related to individuals' connection to nature as their own realm of care that resonated with individuals as relational values. Similarly, this study's second most anchored value under the RII paradigm for AUF is intrinsic values which pertain to the 'live with nature' cognitive model or humans as a static observer of the landscape as defined by Zube. Instrumental RII values however highly underrepresented the place values of AUF and it can be stated that there is little to no evidence of 'live from nature' relationships for the forest. Despite AUF's potential to contribute to the local economy as a tourist attraction green space, visitors perceive the study area valueless in terms of its economic values.

The widespread report on relational values indicates that the concept resonates with a broad audience and can better depict how individuals facilitate relations with the environment and perceive well-being regarding nature. Accordingly, a plural valuation that moves beyond the dichotomy of intrinsic-instrumental ES framework is necessary for environmental planning and decision-making frameworks and should be reinforced by public participatory approaches.

An expected result of this study was the identification of aesthetic values followed by recreation values as the most perceived values of AUF following similar PPGIS studies of outdoor greeneries (i.e., G. Brown & Brabyn, 2012; Fagerholm, Torralba, et al., 2019; Riper et al., 2020; Sun et al., 2019). The following five most perceived place values of AUF pertain to biodiversity value, therapeutic value, future value, social relations value, and life-sustaining value, respectively. These place values strengthen our understanding of AUF as a multifunctional SES in which the landscape offers a variety of experiences that affect the subjective well-being of the visitors. While many outdoor greeneries are designed to provide publicly accessible recreation with aesthetic landscape qualities, landscape architecture, and urban design professions need to enhance the heterogeneity of their designs by understanding these underlying contextual values arising from resource users' immediate landscape experiences. AUF's multifunctionality in relation to its most anchored place values is the result of including relational values in the plural valuation that could elicit significance and meanings of the landscape beyond the ES framework.

The importance rankings of place values demonstrated a hierarchy of perceived relative importance between these identified values (Table 4.2). Aesthetic value is perceived more frequently and with higher importance weights in both the first and

second ranks. Given the fact that aesthetic value has obtained the first priority rank, biodiversity can be respectively considered as the highest mapped place value for the second importance rank. Subsequently, recreation value emerges as the predominant third priority ranking for the urban forest.

The spatial analysis of mapped place values served the second research objective to link the perceived importance of the AUF landscape by its resource users to its biophysical context. The density surface of all the mapped place values overlaid with hotspot-coldspots signified the most successful landscape elements of AUF as multifunctional areas perceived for a diversity of place values. Specific locales of multifunctionality can be identified in the big pond, festival area, small pond, Beltur cafe area, and children's playground area near Kuzey gate. Kernel density demonstrated that these areas are connected by a corridor-like density surface, running along the central axis of the landscape. This density surface relates to the water track and parts of the Çitkuşu track that connect the Hacıosman gate at the northern part of the landscape to the Gölet gate at the southern part of the landscape within the shortest traveling distance. This finding highlights the importance of resource accessibility enabling the practice of everyday activities as a prerequisite for perceiving place values of SES as emphasized by Fagerholm et al. (2016).

Furthermore, the kernel density surface of relational and intrinsic values under the RII paradigm also adds to the understanding of the human-nature relationships in SES landscape. While this study revealed that 'live in nature' cognitive model majorly characterizes AUF SES, 'live with nature' simultaneously contributes to understanding the interlinkedness of humans and nature in this landscape. As noted by Plieninger et al. (2019), it is likely for different models of human-nature relationships to co-exist in a tightly coupled SES. This means that while the majority of visitors of AUF perceive its significance in enabling them to lead a 'good life' and finding purpose in their existence, they also appreciate the natural ecosystem of AUF for its inherent right to exist or its moral values. This is further supported by the spatial density surface of relational values and intrinsic values. Although with observable differences, relational and intrinsic value densities collate and converge within the highest spatial extents. At the same time, both are statistically clustered around the big pond and the festival area, contributing to their meaningful coexistence among participant's perceptions and experiences. The higher tendency for relational and intrinsic values'

spatial overlap has been outlined in the results of other studies as well as corresponding to the overlapping conceptual understanding of the two values by individuals (Schmitt et al., 2022). This result can lead to an interpretation that the relationships with or within the forest that constitute a good and meaningful life for the people are reliant upon the existence of this forest.

The density surfaces of relational and intrinsic values denote how both values are perceived for the physical landscape as they relate to different landscape experiences although with respect to their convergence in some areas. The density surface of relational values can be seen in a cohesive cluster in space (i.e., central axis) however the intrinsic value density is spread outwards from the central axis towards the conserved forest areas where human accessibility is prohibited, covering a larger spatial extent. This phenomenon is explainable in regards to epistemologies of both these value concepts from environmental valuation literature. Relational values refer to values that arise ‘in relation’ to nature and closely represent notions of sense of place. This is not to infer that intrinsic values arise regardless of human-nature relationships and experiences as discussed in this research literature review. However, an intricate boundary that differentiates relational values is that the concept relates to a mode of human-nature relationships in which nature becomes an individual’s realm of care and constitutes conditions for human flourishing. This mode of interaction involves human-human, human- non human relationships that occur with or within nature. Accordingly, this highly context-dependent relationship links to relational values that make an ‘ordinary place’ socio-culturally significant in the sense that they become irreplaceable (Himes & Muraca, 2018). Many studies have reported that the spatial context of relational values such as recreation value, aesthetic values, or social relations values are significantly clustered around road systems or places of residency which by nature are locale-specific (i.e., Alessa et al., 2008; G. G. Brown et al., 2002; Schmitt et al., 2022; Sun et al., 2019; Van Riper et al., 2012). On the other hand, intrinsic values have been identified in larger spatial extents where relate to vegetation coverage, wilderness areas, or conserved natural areas that are also not accessible to public use (G. Brown & Alessa, 2005). The anthropocentric traces of relational values and their rather explicit expressions accordingly can be understood from their prevalence in these spatial contexts as also found by this research.

Yet again, this is not to draw a rigid distinction between the two values as discussed in the results, this research showed the spatial co-existence of these values for the case of AUF. Berta Martín-López (n.d.), discusses how through the repetitive acts of visiting the forest, senses of place and identity could be nourished and this relation between the forest and the individual by time can lead to endorsing moral values and values related to the forest's right to existence. It is likely that for this reason, relational values have been found to be closely related to stewardship towards landscape protection (Chan et al., 2016; Himes et al., 2023).

Analyzing the spatial densities of categorical values included in the research value typology was an endeavor to focus on specific locales in the AUF landscape to reveal visitors' contextual connection to the physical landscape as these values vary in spatial distribution due to geographical, biophysical, accessibility, or social settings (Fagerholm, Torralba, et al., 2019). This step is important for informing landscape management and landscape design of the forest about the locales of considerable importance and meaning in the AUF landscape. Only seven value categories were found to be clustered in the AUF landscape while the remaining five anchored value types for AUF were identified in random or dispersed spatial distribution. These random or dispersed value densities cannot be rigorously and intuitively discussed by their linkage to the physical landscape and so require future research to focus on these values with higher sample sizes as an effort to sustain these values of the forest and retain AUF SES multifunctionality.

An important component of human-nature relationships has long been related to the beauty of nature (Ulrich, 1983). Understanding landscape beauty is especially important as the perception of this value is an identification of humans as intuitive and caring beings towards nature (Zube et al., 1982). Aesthetic values have been discussed to be related to landscapes of natural and unmodified ecosystems with high ecological functioning values both in theory and practical research (Zube et al., 1982). For example, Plieninger et al. (2018), in their results discuss that biological diversity values found in wildlife or landforms were interlinked with perceived aesthetic values as well as recreational values. On the contrary, this research revealed that aesthetic values cluster in the central axis of the site and especially intensified in the festival area and big pond area which simultaneously exhibited hotspots of recreation values for AUF much like the results of G. G. Brown et al. (2002). A partial explanation of

aesthetic values' distribution in this area can be in regards to its close proximity to water bodies. While socio-cultural contexts also affect an individual's perception of waterscapes, research has shown that affinity with waterscapes is linked to their potential to enhance the naturalness of the sceneries (Kaplan & Kaplan, 1989). On the other hand, the intensification of mapped aesthetic values in the festival area is rather difficult to interpret. As mentioned earlier, the festival area is the busiest place in the landscape where people can have a seat on the round benches or picnic in the grass area. Compared to the rest of the forest, the area has fewer trees and vegetation. The area is also connected to the walking tracks and Haciosman gate through a bridge over the landscape. The populated landscape filled with people spending time and enjoying nature, playing games, or the elevated perspective that crossing over the bridge provides can all be related to this PPGIS population's perception of aesthetics. In their book, Kaplan & Kaplan (1989) denote that through a preference testing an area just by providing sights of a few trees in an urban context can be perceived as satisfactory to the senses. However, this study is limited to discussing systematically why a landscape is perceived for a certain place value and did not aim to delve in the epistemology of the place. This approach requires extensive testing of a variety of landscape characteristics, e.g., the natural setting, the composition of elements, the effect of elevation and proximity to landscape elements, its social setting and crowdedness, etc. with a considerably large sample size of participants. And even then the study can only provide information about certain socio-demographics for specific geographical contexts, while also considering the fact that on a longitudinal level, perceptions are prone to change as significant changes in socio-economic conditions occur. Accordingly, questions of why a place is valued or more valued remain largely unanswered (Zube et al., 1982).

The spatial distribution of biodiversity value points appeared scattered all across the conserved forest area however the density surface was by far intensified in the natural ponds areas. The biodiversity of the landscape can be objectively measured through terrestrial/marine vegetation coverage, animal distribution, species diversity and richness, normalized vegetation indices (NDVI), or net primary productivity (NPP) mapping (Alessa et al., 2008). While the operational definition of biodiversity value in this research described the value as the provision of diverse animal and plant lives (Table 3.2), it can be assumed that AUF visitors perceive the natural ponds' area with

biodiversity values for its various aquatic and aerial livings. However, the comparatively low intensity of biodiversity value in the conserved forest area and higher intensity of this value in the festival area can question the intuitiveness of mapping this value for AUF by the survey participants. Past research has delineated that often people do not appear attuned to the areas of objectively measured high biological diversity (Van Riper et al., 2017). While this study does not delve into the measurement of AUF's ecological system, by visually comparing the density surface of biodiversity value to other value types' densities, it can confirm that the density surface of this value shows higher mapped value points for the conserved forest area than any other value densities. As suggested by Alessa et al. (2008), coldspots of biodiversity (i.e., the areas of high biological productivity that have received lower perceived importance by the general public) should be spatially prioritized by decision-makers to educate and improve ecological literacy of the visitors to sustain these areas and their values. Schebella et al. (2019) emphasize the role of urban designers and landscape architects to nurture this knowledge by implementing interpretive signs throughout the landscape that catch the visitors' attention with information regarding ecological attributes of the greenery that improve the visitor's pro-environmental behaviors.

Moreover, this study endeavored to identify place values and confirms the prevalence of aesthetic, recreation, and biodiversity values for the case of AUF following many similar PPGIS studies of place values. However therapeutic and future values, as the subsequent most assigned place values, deepen our understanding of the multifunctionality of AUF SES. The restorative qualities of nature within an urban context and its influence on psychological and physical health have been widely acknowledged (G. Brown et al., 2014; Kaplan & Kaplan, 1989). Specifically, a study by Francis et al. (2012) suggested that people's mental health is highly related to the presence of quality green space in their neighborhoods. The visitors' perception of AUF as therapeutically significant can be attributed to its success as a high-quality green space, effective in contributing to individuals' well-being. An interesting observation was the similarity of the spatial distribution of mapped therapeutic and future values around the water track and Çitkuşu track. The two place values have been discussed as having intangible characteristics; meaning that they cannot be explicitly directed to physical elements, activities, or landscape settings (Alessa et al., 2008; G.

Brown, 2005). However since for the case of AUF these values spatially aggregated in the big pond, festival area, and the forested area near Çıtkuşu track, it can be suggested that the presence of birdlife, water scenery, and social areas enabling parent-child activities and bonding can influence the perceptions of well-being and importance of sustaining nature for future generations. It is worthwhile noting that future value or the concept of altruism (i.e., caring for nature for communities and a future larger than one's self) is a novel component to deepen our understanding of relational values as this value's perception relates to the influence of social norms and responsibilities to others that shape human-nature relationships.

A highly spatially explicit anchor of social relations values in the festival area, on the other hand, demonstrates its tangible characteristics and marks the festival area's importance for social cohesion in AUF. Life-sustaining values density is the only cluster with lower statistical significance and with an R-ratio of 0.81 (Table 4.3) shows distribution towards randomness due to low sample size. However, this value's density is worth discussing since much like the biodiversity value points distribution, it is intensified around the small pond area possibly owing to the perception of ecological space and productivity. While this study has identified life-sustaining value in the relational value category since it refers to the fundamental values related to the protection of the life-support system and enabling individuals to make sense of themselves, future research needs to explore this value's fuzzy boundary as relational values or intrinsic values with regards to the local context of the study as suggested by Himes et al. (2023).

The remaining assigned place values of AUF including cultural heritage value, intrinsic value, learning value, economic value, instrumental RII value due to randomness of spatial distribution, and spiritual value exhibiting dispersed spatial pattern were not discussed by this study. Their extremely low sample size of mapped points for the study area disables the NN analysis to indicate a statistical difference between the observed and expected mean Euclidean distances to other point features in the area and consequently their spatial distribution cannot be meaningfully interpreted by the physical landscape of AUF. Despite this, these values still contribute to the perception of AUF as a multifunctional SES. Future studies with higher PPGIS population samples could investigate these anchored values in a deeper and spatial manner. Furthermore, future studies when including the historic value in their value

typology should consider the value in relation to the public experience of the landscape rather than merely considering the time period for the study area. The PPGIS population in this study did not assign historic value to AUF, even though the forest dates back to the 1950s, it was opened to the public only in 2020. This also highlights historic value as a relational value.

Contrary to expectations, learning values were one of the least assigned place values for AUF (N=3), given that throughout the AUF site, visitors can encounter multiple signs with QR codes with information on flora, fauna, and also the habitats of the birdlife across the landscape. This is the case while AUF is specially advertised by IMM for its diversity and abundance of bird species. The low assignment of learning values for AUF can be proof of these signs' ineffectiveness in attracting the public's attention to the ecological space of AUF or at least making a difference in one's landscape experience. From this point of view, AUF is not distinguished for its special birdlife characteristics compared to other outdoor greeneries in Istanbul. Landscape architects can address this by implementing interactive or more place-specific signs that catch one's attention about a single plant or bird species and their specific characteristics, instead of implementing the same signs all across the landscape with only providing the names of the flora and fauna. More creative approaches can also be considered such as designing nature-based activities, especially in the Çıtkuşu track (which is designated to inhabit Eurasian bird families); for example by implementing nature goggles asking visitors to take notice of three birds in that area (Pocock et al., 2023). Such practices can increase participants' time spent in nature which has been discussed to be effective in stress reduction, and restoration. This can ultimately increase visitors' appreciation of landscape biodiversity for intrinsic reasons (Mikkelsen, 2022).

The study of existing human-nature relationships through place value mapping was intended to portray AUF as a tightly interconnected SES. According to Berkes et al. (2003), SES will face vulnerability when system diversity is reduced leading to the decrease in adaptive capacities that are necessary for SES sustainability and resilience. Through spatially investigating the place values of AUF with the designated area for tourism zone and hotel construction, this study objectively reveals a conflict between the values of the general public and landscape management by overlaying the density surface of all the place values assigned by PPGIS participants and the area designated

for the tourism zone on the landscape (Figure 4.12). The data for this plan was retrieved from the official Sariyer municipality website (Sariyer Belediyesi, n.d.). As can be seen in this map, the mapped place values surface is spatially converged with the hotel development plan area right at the top of the urban forest where it holds the most intensified and diverse place values. This is a clear indication of a potent conflict between the values held by the public and the management and development plans of the urban forest. The conflict is spatially explicit in the festival area where simultaneously holds diverse hotspots of place values. The festival area is also the surface for the underground water that fills the natural ponds that feed the forest. This potential landscape change threatens the various human-nature relationships and place values that exist within the forest which would effectively result in resource degradation and lower valuation (Alessa et al., 2008).

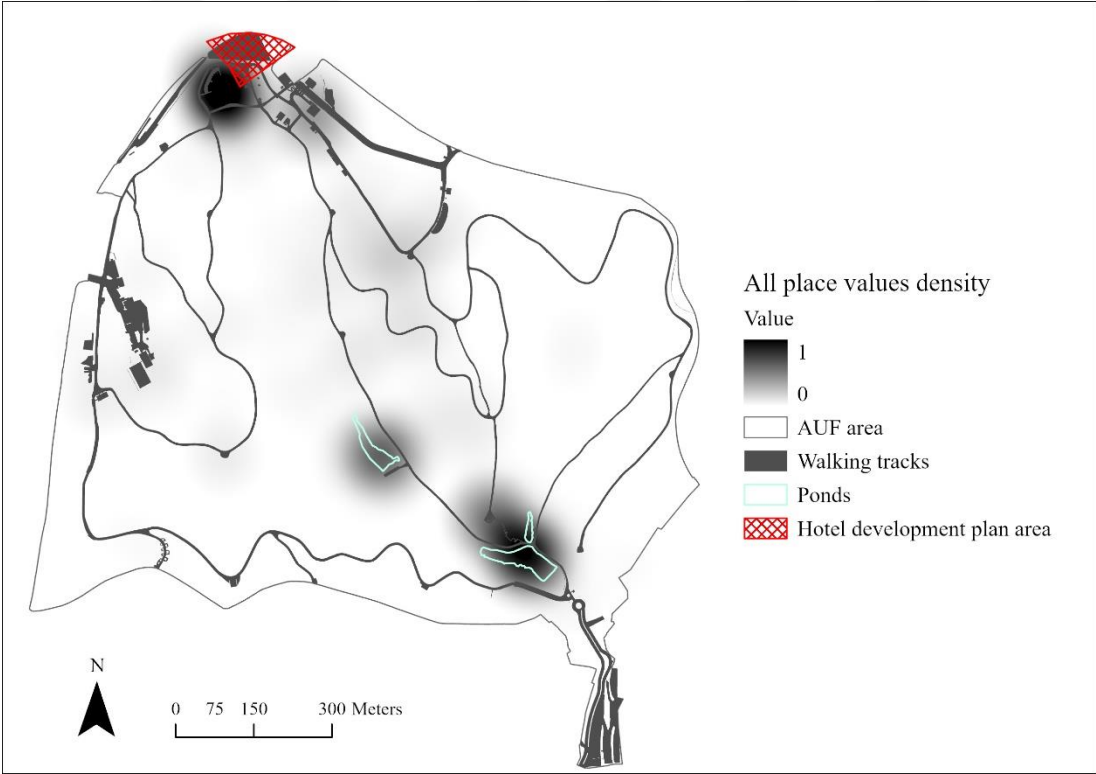


Figure 4.12 : Weighted Kernel density of all the mapped place values overlaid with designated hotel construction area in the AUF landscape.

As discussed earlier in the literature review, the accumulated local knowledge of the resource users should inform managers and decision-makers of the underlying values of SES to secure the capacity of natural ecosystems to sustain societal development and progress. This research’s results indicated that the majority of the anchored place values of AUF essential for human flourishing and well-being are reliant upon the

existence of the urban forest itself. Once again this reflects the SES interconnection by the dependence of economic prosperity in the context of social systems and both of their embedment within the boundaries of healthy and functioning ecological systems (Arias-Arévalo et al., 2018). This study advocates the importance of adaptive management that takes account of these place values and ensures their sustenance and diversity to combat a potent ‘tragedy of commons’ (Berkes & Folke, 1994). From the SES view, while this study focused on the role of resource users and their anchored values of SES, the role of institutions and property rights as other parts of the social system must not be undermined as the sustainable performance of natural resource systems is highly dependent on the health of institutions. This study although adopting a plural valuation approach to take account of the marginalized stakeholders’ values, was conducted with an exploratory purpose to inform landscape management and decision-makers of the multiple place values of AUF. However, to foster equitable and sustainable outcomes more studies on the plural valuation of nature should be conducted with the purpose of incorporating these values into actual planning and decision-making frameworks.

The third research objective of the research, contrary to the initial hypotheses, the determined independent variables of socio-demographics, pattern of use, and familiarity with the site did not exhibit any significant impact on the perception of AUF place values by its visitors. This finding differs from the many PPGIS studies that have shown these indicators’ prediction of perceiving place value for their case studies (e.g., Arslan & Kaymaz, 2020; G. Brown et al., 2012; G. Brown & Weber, 2012; Fagerholm et al., 2016; Hermes et al., 2018; Scaini et al., 2022). Accordingly, this research posits that the perception of diverse place values of AUF is shared uniformly across the site visitors, regardless of the determined independent variables.

Among all of the defined independent variables however, only the education profile of the PPGIS participants as a factor of socio-demographics variable, influenced the frequency of RII value assignments. The higher assignment of intrinsic values for AUF was indicated by the university graduates while individuals with under-university level education indicated more relational values assignment. The influence of education on perceiving intrinsic values of nature has also been reported by the results of Schmitt et al., (2022). This can point out the importance of higher education attainment in improving people’s cognitive understanding of natural systems and other non-human

entities within their own existence rights. On the other hand, the higher assignment of relational values by less academically educated visitors can indicate the value concepts' comprehensiveness in resonating with a broad audience and the general public who perceive the significance and meaningfulness of the natural landscape solely through experiencing it. The high variability in levels of independent variables related to the visitor profiles limited this study to recognizing more patterns that could possibly predict the place value assignment. Future studies need to consider a larger participant sample when investigating a diverse socio-demography.

4.5.1 PPGIS, plural valuation and landscape architecture

This research adopts a post-positivist approach to ecosystem valuation in which the general public is empowered to anchor the basic values and meanings they perceive for AUF primarily based on their landscape experience. Through operationalizing PPGIS, this research realized the participation of marginalized stakeholders to provide diversity to the expert-oriented frameworks of landscape management, planning, and design. This research accordingly introduces an approach for landscape architecture to consider participatory design approaches inclusive to the resource users that experience and facilitate a first-hand relationship with the landscape.

Plural valuations, on the other hand, have been discussed by their importance in management and decision-making scenarios by enabling integration of values into adaptive management or realizing conflict of values between stakeholders. However, the plurality of place values must also be considered in urban and landscape design fields. The integration of PPGIS with plural valuation provided this research with a visual tool for revealing spatially explicit landscape multifunctionality, uncovering the extent to which specific areas in the landscape can simultaneously enhance user experience and subjective well-being.

Investigating the place values of AUF at the landscape scale with the PPGIS-based plural valuation methodology, drew this study to speculate the potentials of the methodology with a focus on landscape architecture discourse. The research results indicated that while the spatially clustered values are related to distinguishable spatial extents, there is still ambiguity that limits similar studies to fully explain the association of place values with specific areas. It is important to again note that the research objectives of the research was to elicit and measure the place values of AUF

and not to focus on the epistemology of the place per se. This limitation will be explained with several reasons.

Firstly, according to the existing literature, the majority of studies adopting a participatory value mapping approach aim to provide primary information on areas of special importance for consideration in future development plans, land use planning, conservation strategies, landscape management, and identifying conflicts. These studies have provided prime practical examples of why the participatory mapping approaches are useful in the first place and reflected the application of democratic approaches in the environmental sustainability discourse. Despite this novel contribution, little to none of these studies were conducted with the goal of explaining the environmental or social factors that cause the specific values' peculiar spatial densities. Secondly, many studies among these, have noted the specific characteristics of some values that could be explained by association to their case study landscape. However, there are no studies that systematically focus on this cause-effect relationship. For example, Alessa et al. (2008), explain their study's public-anchored place values based on tangible and intangible characteristics of some values. They mention that tangible values can be directly related to physical features or settings or activities such as recreation or biodiversity values and on the other hand, intangible values are not explicit in these factors such as spiritual value. They also denote that some values occupy an intermediate level of both these factors such as aesthetic values, life-sustaining value, intrinsic value, or economic values. Another example can be discussed by the study of G. Brown (2005) who pioneered landscape value mapping and applied the method in various geographies and case studies. He explains that some values can be easily attributed to the physical landscape by individuals such as aesthetic, biodiversity, and recreation values. Other values such as intrinsic, future, and spiritual values are not grounded in human experience in the landscape or they have an abstract appeal. This pertains to the inherent ambiguity of place values that still persists and reflects that the study of plural values of human-nature relationships is still in its infancy (Schmitt et al., 2022). Thirdly, this research argues that this issue is highly likely to be a result of the focus on large urban, regional, and national scales and the scarcity of urban design and landscape architecture studies adopting PPGIS methods. As discussed earlier, the fine local scale is considered to reflect the everyday realities and landscape experiences of individuals (Fagerholm et al., 2012),

emphasizing the suitability of this scale for examining human-nature relationships. With this in mind, studies of large scales cannot meaningfully link the values to specific landscape characteristics since there is no representation of “place” anymore. This points out the need for place-based methods that capture the sensitivity of how values are realized at the local scale (Fagerholm et al., 2012). This sensitivity can potentially reflect the hidden dimensions of landscape experience.

To explain this point the spatial density surface of recreational values of AUF by this study’s results can be discussed. The density surface of recreational value appeared to be highly place-specific around the big pond area with many hotspots denoting the intense densification of mapped value points and clustering of high importance ranking in the area. As earlier discussed, the big pond and small pond areas are extensively maintained to prohibit any activities of picnicking, fishing, boat riding, or feeding ducks or fish in the pond to preserve their natural and clean qualities. The festival area to a lesser degree exhibited a density of recreation values. Meanwhile, around 88% of the PPGIS population of this study indicated hiking as their preferred activity on the site much more than other any other identified activities (Table 4.1). Although this study has not investigated the statistical relationship between categorical values and landscape characteristics, the following argument is intended to merely explain a hypothesis. The operational definition of recreation value specifically indicates the place value by individuals’ practice of their favorite outdoor activities on the site such as walking, biking, etc. Arguably, this definition of recreational value straightforwardly enables individuals to relate to their most tangible landscape experiences by pointing out the ‘activities’. Given the potential of value mapping in the landscape scale in reflecting the subjective experiences of individuals in the landscape, it was interesting to observe the clustering of recreational values in distinguishable specific places such as the big pond area and the festival area and not the walking tracks as one might use these areas specifically for hiking or activities of such. This is not to infer that this observation mistakenly depicts the big pond and festival areas with recreational values however, it certainly reveals the need to discuss the qualities of the value mapping method regarding the local scale. Following this observation one might wonder if people in general, map values intuitively or precisely enough, if the walking tracks do not promote walkability to be valued for such, or if the problem is rooted in the way some values are mapped. The literature has

extensively discussed that it is impossible to define the actual areal extent of mapped value points by non-experts. On the other hand, as noted by Fagerholm et al. (2012) the goal is to identify values' broader spatial patterns, and by doing so although with possible mapping errors, the spatial density surfaces can be meaningfully linked to the physical landscape and are proved to be a valid method to defeat the imprecise nature of mapped value points by the public participators. Accordingly, this research's focus was not to study the performance of landscape characteristics in promoting a special activity or behavior, but it is proposed to rely on observations or at least the idea that walking tracks do provide the visitors of AUF with amenities designed for mobile activities. Based on this perspective and assuming a cause-effect relation between walking tracks and recreational values one might ask; how would one assign recreation value to walking tracks by mapping a point to some area that belongs to the walking corridor as a whole? Assuming that this was the case, the expectations to observe corridor-like densities along walking tracks should have been realized to some degree for the whole survey sample contrary to observing nothing in such manner. Following this, this research questions whether the point mapping method discourages the participants from adequately reflecting on the realities of such a transitory landscape experience of hiking. Additionally, if the mapping method included various features, such as a line mapping option that participants could freely choose to assign values with, would the density of recreation values still only be observed in the big pond area or the festival area?

Accordingly, this research hypothesizes that point mapping, by nature, promotes place-specific qualities. While these qualities have proven effective in mapping many place values, they encounter challenges in relating to some subjective landscape experiences when applied on a landscape scale. This research highlights the importance of conducting more PPGIS value mapping approaches on the landscape scale, especially with adopting flexible and innovative mapping methods to study the effect of the way of value mapping on the understudied dimensions of place values. Landscape architects and design experts should explore the variety of these methods to capture how values are realized in the landscape and effectively evaluate the physical landscape and its multifunctionality and in return strengthen conceptual understanding of the place values as well. This research pathway can potentially

strengthen participatory environmental valuation approaches in design and affect the management and planning outcomes.

4.5.2 Methodological limits and future research directions

As with any other PPGIS studies, this study is subject to human errors in mapping place value points to the designated case study area. While the results reflected the potential of PPGIS data in estimating SES multifunctionality and spatial distribution of multiple and diverse place values of AUF, a challenge remains regarding the undefined set of standards to ensure the collected spatial data quality (G. Brown & Fagerholm, 2015). Furthermore, this study used ESRI Survey123 as its PPGIS data acquisition platform which prevented this study from collecting an unlimited number of value points by the survey participants which effectively reduced the sample sizes of value points. This was due to the limitation of Survey123, as the mapping component can record only one point in each question. Since this research had access to the university-provided license of ESRI enterprises, the Survey 123 was opted as the PPGIS tool whereas, other PPGIS studies using platforms such as Maptionnaire can collect as many or as few points for different values in one question. Additionally, the mapping component could not be set to a desired scale and participants can zoom in and out as they want. This also potentially affected the mapping accuracy of the value points.

Another limitation relates to the participants sample of the study' PPGIS survey. With the participation rate of 29.3% this sample excludes around 2 out of three people encountered on the site for participation in the survey. Along this, the respondent sample is majorly represented by women while men's participation is undercovered. These factors lead to sample bias which limit the study to draw universal conclusions about its findings. It is suggested for the future research with similar efforts to apply weighting techniques to compensate for the underrepresented population in the survey sample.

This study used the landscape value typology by G. Brown & Reed (2000) which has been the most widely adopted value typology in the literature. The results of this study showed that the survey respondents perceive and resonate with these values as well, although it is difficult to understand whether all of the landscape's importance and significance have been captured. Given the fact that PPGIS studies are rare in Middle

Eastern contexts, the value typology for these contexts has yet to be defined and conceptualized. This study can be a starting point for other PPGIS studies in the region to reflect on and evaluate their approach to value typologies. This study suggests future studies to workshop the value typologies among various stakeholders as well as the local resource users to contextualize the value typology according to the specific social and geographical characteristics of the study area.

Another limitation of this study's methodology pertains to the classification of value categories in the value typology to the RII paradigm also according to the existing literature. This research used the constructs of relational, intrinsic, and instrumental values defined by Arias-Arévalo et al., (2018) and the corresponding human-nature relationships by the defined cognitive models of O'Neill et al. (2008). This study was motivated to study the human-nature relationships for AUF in a quantitative manner however, as was noted earlier there still persists a research gap regarding the conceptual understanding of the RII paradigm, especially relational values. Himes et al. (2023, p. 8) in their systematic literature review of relational, intrinsic, and instrumental values point out the 'fuzzy boundaries and overlapping meanings' that exist between these values. While they reflect on the healthy nature of these fuzzy boundaries as the starting point of a true plural valuation approach and accept the co-existence of these value constructs in people's minds to anchor nature's importance, they suggest researchers navigate these values' overlapping meanings by facilitating dialogues across different stakeholders to recognize a mutually agreed boundary for values. For example, rather than applying a static classification approach to categorize life-sustaining value into relational values as done by this study, the potential interpretation of the value into intrinsic values category should be considered. The categorization of place values into the RII paradigm can also be explored through statistical analyses and data acquisition methods other than the one applied by this study. The methodological choice of collecting the value data was primarily based on enforcing a choice for the participants to read through the list of place values in the typology and relate to one value in each mapping question as the value they perceive and can easily associate with AUF landscape and then to map the selected value in the study area. This method elicits a meaningful understanding of the most important areas of landscape for various human-nature relationships. However, the collected count data of the mapped values restricts performing statistical analysis such as Cronbach's

alpha to examine the internal consistency of different place values' measurement of relational, intrinsic, or instrumental values. Future studies can focus on understanding the RII paradigm by collecting data on place values by Likert questionnaire asking the respondents' agreement/disagreement level regarding the perception of a certain value for their case study. This way the collected data is readily a continuous data type. Such studies can add to the existing literature by eliciting new meanings and dimensions of the RII paradigm .



5. CONCLUSION

To conclude this research, it is essential to briefly revisit the research and practice gaps that initially motivated the study. According to the ecosystem valuation literature, the role of public-anchored values in social-ecological systems (SES) research has yet to be developed and more importantly realized in the actual environmental decision-making and planning frameworks. This research with a focus on the coupled SES investigated the human-nature relationships within the Atatürk Urban Forest (AUF) landscape, a longstanding and biodiverse forest in the north of Istanbul, Turkey. Using a plural valuation approach integrated with the public participation GIS (PPGIS) survey technique, a set of place values corresponding to relational, intrinsic, and instrumental values were examined by the perceptions of the AUF visitors. Accordingly, this research elicited and quantitatively measured the place values of AUF to provide a basic understanding of why the urban forest is perceived as important for the visitors as its first research objective. The remaining two research objectives examined how these place values spatially relate to the physical landscape and how their association can be understood by the visitors' socio-demographics, familiarity with the site and pattern of use. The participatory mapped value points along with non-spatial data were then analyzed by descriptive analysis, spatial distribution and density analysis, and by statistical non-parametric tests of one-way ANOVA and T-tests.

The web-based PPGIS survey was conducted on-site during the spring-summer of 2023 resulting in the participation of 112 site visitors and a 29.3% response rate. Based on the descriptive analysis, the visitors of AUF landscape majorly perceive its importance for aesthetic values. The subsequent anchored place values of AUF in descending frequencies are recreation value, biodiversity value, therapeutic value, future value, social relations value, life-sustaining value, intrinsic value, cultural heritage value, economic value, learning value, and spiritual value. These place values characterize AUF as a multifunctional SES. The three priority rankings for the assigned place values by the PPGIS participants establish a contextual importance

hierarchy for AUF, with aesthetic value as the highest, biodiversity value as the second highest, and recreation value as the third prioritized place value.

The spatial analysis of all the mapped value points along with their importance weights revealed that diverse and intensified place values are spatially clustered around distinguishable landscape areas. These place value hotspots distinctively relate to the big pond area, the festival area, and the small pond area. Less intensified place values density was observed in the Beltur cafe area and the children's playground near the Kuzey gate. Interestingly these multifunctional landscape elements are connected via the water track and part of the Çıtkuşu track, creating a continuous density surface along the central axis of the landscape, making it a successful design element. Moreover, this research by visualizing the density of the 12 categorical values of AUF provides landscape management and architects with information on specific locales of importance based on visitors' perceptions. This insight helps to understand the diverse ways different areas within the urban forest contribute to people's nature experiences and foster human-nature relationships.

Based on this research, place values corresponding to relational values highly characterize AUF following intrinsic values in the second place. Instrumental values on the other hand extremely underrepresented the place values of AUF. An important finding relates to the visualization of spatial co-existence of the relational and intrinsic values in the forest landscape. The clustering of relational values along the central axis denotes the importance of this area for visitors, facilitating various relationships with and involving nature. Intrinsic values density although observed in the central axis as well, spread outwards the central axis towards the conserved forest areas where human accessibility is prohibited. From a conceptual standpoint, the co-existence of relational and intrinsic values implies that the relationships with or within the forest that constitute a good and meaningful life for the people are reliant upon the existence of this forest. This can lead to an interpretation that to 'live in nature' the 'live with nature' relationships where nature is valued for its own rights of existence should be nurtured and signified.

This research equips landscape management with a visual tool to identify a clear conflict between visitors' anchored place values and the landscape change plans for a hotel construction at the top of the urban forest near the festival area. The powerful protests of the local community to the proposed landscape change reflect locals'

stewardship of the urban forest and advocate the many human-nature relationships that exist as a function of SES interactions. Following the notions of Zube (1987), public lands should be managed in line with the values people hold for the landscape. This research highlights the necessity of an adaptive approach for landscape management and decision-making to take account of these values and emphasize their integration into planning frameworks to ensure mutually acceptable and sustainable outcomes, thus enhancing socio-ecological resilience.

Finally, contrary to expectations, this research did not find any statistically significant association between the PPGIS participants' familiarity with the site and pattern of use by their identified place values, denoting that the perception of diverse place values of AUF is shared uniformly across the site visitors. The same is true for socio-demographics at large however, the aggregated education levels of the participants did demonstrate positive relationships with relational and intrinsic values. AUF visitors with university-level educational attainment assigned more intrinsic values to the urban forest while on the other hand, under-university level graduates assigned more relational values. This finding pertains to the effect of higher-level education in enhancing individuals' cognition in recognizing moral values and existence importance for non-human entities.

This research endeavored to emphasize the connectedness of humans and nature and reflect the importance of public participatory mapping for ensuring environmental sustainability and societal well-being. The overall results of the research provide useful visual tools to aid expert-based decision-making for moving beyond predominant economic ecosystem valuations by recognizing plural and incommensurable place values. The role of PPGIS and plural valuation was also demonstrated for the landscape architecture field to factor in the general public for evaluating the landscape design potentials based on people's landscape experiences and place values. As a starting point for PPGIS studies of landscape architecture, this research gives specific recommendations for future studies adopting value-centered and public participatory approaches at the local landscape scale. A closer investigation of the ways contextual place values are realized at the fine scales would enhance the understanding of SES interactions and allow us to sustain the emergence of nature's values for the future through innovative and adaptive landscape management, designs, and planning.



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APPENDICES

APPENDIX A: Kruskal-Wallis test results tables

APPENDIX B: Survey123 questinnare Turkish interface



APPENDIX A

Table A.1 : Kruskal-Wallis H test of socio-demographics, pattern of use, and familiarity with the site in conjunction with mean place value assignment for AUF.

			Mean Relational Value Assignment			Mean Intrinsic Value Assignment			Mean Instrumental Value Assignment		
			Mean Rank	Asymp. Sig.	H statistics	Mean Rank	Asymp. Sig.	H statistics	Mean Rank	Asymp. Sig.	H statistics
Socio-demographics	Age	18-29	56.8			55.2			57.8		
		30-59	55.7	0.620	0.955	58.5	0.557	1.172	55.1	0.458	1.562
		>60	84.0			31.0			54.0		
	Gender	Woman	55.5			57.5			56.3		
		Man	57.6	0.593	1.046	55.3	0.624	0.943	56.9	0.940	0.124
	Education	Non-binary	84.0			31.0			54.0		
		Primary- Secondary	75.3			39.8			54.0		
College		64.3	0.119	5.849	47.6	0.169	5.035	57.5	0.612	1.815	
Familiarity with the site	Relation to site	Low university	51.8			60.6			57.3		
		High university	60.0			55.2			54.0		
		Lives around	59.6			52.6			57.1		
	Site Knowledge	Works around	49.0	0.517	1.318	66.3	0.345	2.131	54.0	0.845	0.337
		Visitor	53.8			59.9			56.1		
		Poor	64.3			50.9			54.0		
		Moderate	53.3	0.198	4.671	58.9	0.180	4.889	57.1	0.930	0.448
	Good	63.0			49.6			56.8			
	Very good	50.7			62.6			56.4			

Table A.1 (continued) : Kruskal-Wallis H test of socio-demographics, pattern of use, and familiarity with the site in conjunction with mean place value assignment for AUF.

		Mean Relational Value Assignment			Mean Intrinsic Value Assignment			Mean Instrumental Value Assignment			
		Mean Rank	Asymp. Sig.	H statistics	Mean Rank	Asymp. Sig.	H statistics	Mean Rank	Asymp. Sig.	H statistics	
Pattern of use	Visiting Frequency	Once at least a week	55.6			54.7			59.7		
		Few times a month	61.2			53.9			54.0		
		Few times a year	48.1	0.266	5.210	67.3	0.238	5.515	54.0	0.244	5.453
		Once a year	84.0			31.0			54.0		
		First time	55.2			57.5			56.7		

APPENDIX B

Atatürk Kent Ormanı

Değerli katılımcımız, zaman ayırıp bu anketi doldurduğunuz için teşekkür ederiz.

Bu anket, Atatürk Kent Ormanı hakkındaki deneyiminizi ve çevresel bilginizi sosyal değerler şeklinde yakalamayı amaçlamaktadır. Yıldız (*) işareti olan sorular zorunlu sorulardır.

▼ Parkla ilgili sorular

Bu parkı ne sıklıkla ziyaret edersiniz? *

Haftada en az birkaç kez Ayda birkaç kez Yılda birkaç kez Yılda bir kez İlk kez ziyaret ediyorum

Burada genellikle hangi aktiviteleri yapıyorsunuz?
(birden fazla seçenek seçebilirsiniz)

Doğa yürüyüşü
 Bisiklete binme, koşma vb. gibi egzersizler
 Kuş gözlemi
 Rekreasyon alanlarından faydalanma
 Diğer

Bu park ve çevresiyle ilişkiniz nedir? *

Bu parka başka bir bölgeden ziyaretçi olarak geliyorum.
 Bu park çevresinde çalışıyorum.
 Bu park çevresinde yaşıyorum.

Park hakkındaki bilginizi nasıl değerlendiriyorsunuz? *

Çok iyi İyi Orta Kötü Çok kötü

▼ Birinci Derecede Öncelikli Sosyal Değer

Aşağıdaki listeden, bu alanda sizin için en yüksek önceliği olan ilk değeri seçiniz. *

Bir sonraki soruda seçtiğiniz değeri haritada gösteriniz.

- Bu yeri değerli kılan şey, manzarası, görüntüleri, sesleri, havası ve kokularındır. (estetik değer)
- Bu yeri değerli kılan şey, çeşitli hayvan ve bitkiler için yaşam ortamı sağlamasıdır. (biyolojik çeşitlilik değeri)
- Bu yeri değerli kılan şey, yerel bilgeliği, bilgiyi, gelenekleri ve bir yaşam tarzını aktarmaya yardımcı olmasıdır. (kültürel miras değeri)
- Bu yeri değerli kılan şey, turizm gibi ekonomik fırsatlar sağlamasıdır. (ekonomik değer)
- Bu yeri değerli kılan şey, gelecek nesillere şu an olduğu gibi doğayı deneyimleme fırsatı sağlamasıdır. (gelecek değeri)
- Bu yeri değerli kılan şey, önemli tarihi, doğal veya insan varlıklarına sahip olmasıdır. (tarihi değer)
- Bu yeri değerli kılan şey, yalnızca varlığıdır. (içsel değer)
- Bu yeri değerli kılan şey, bilimsel gözlem veya deneyler yoluyla çevre hakkında öğrenebilme imkanı sağlamasıdır. (öğrenme değeri)
- Bu yeri değerli kılan şey, hava, toprak ve su üretmeye, korumaya, temizlemeye ve yenilemeye yardımcı olmasıdır. (sürdürülebilirlik değeri)
- Bu yeri değerli kılan şey, kuşları izleme, yürüyüş yapma, egzersiz yapma vb. gibi favori açık hava etkinliklerimi yapabileme imkanı sağlamasıdır. (rekreasyon değeri)
- Bu yeri değerli kılan şey, kutsal veya manevi açıdan özel olmasıdır. (manevi değer)
- Bu yeri değerli kılan şey, zihinsel veya fiziksel sağlığını iyileştirmesidir. (iyileştirici değer)
- Bu yeri değerli kılan şey, diğer insanlarla zaman geçirebilmemdir. (sosyal ilişkiler değeri)

< Lütfen seçtiğiniz sizin için en yüksek önceliği olan ilk değeri parkın haritasında işaretleyiniz. !

(Not: Parkın haritası, kırmızı çizgi sınırlarıyla belirlenir. Park haritasındaki istediğiniz konuma mavi pini yerleştirin.)

Haritadaki simgeler yalnızca rehberlik için kullanılır ve puan tahsisinizi etkilememelidir. Ev ikonuna tıklamak sizi parkın konumuna götürecektir.)

Konum veya harita koordinatı ara




Figure B.1 : Survey123 questinnare interface (1).

▼ İkinci Derecede Öncelikli Sosyal Değer

Lütfen bu alanda ikinci derecede öncelik verdiğiniz değeri seçiniz. *

Lütfen önceki sorularda seçtiğiniz seçeneklerden farklı bir seçenek seçiniz.

Bir sonraki soruda seçtiğiniz değeri haritada göstermeniz gerekiyor.


- Bu yeri değerli kılan şey, manzarası, görüntüleri, sesleri, havası ve kokularıdır. (estetik değer)
- Bu yeri değerli kılan şey, çeşitli hayvan ve bitkiler için yaşam ortamı sağlamasıdır. (biyolojik çeşitlilik değeri)
- Bu yeri değerli kılan şey, yerel bilgeliği, bilgiyi, gelenekleri ve bir yaşam tarzını aktarmaya yardımcı olmasıdır. (kültürel miras değeri)
- Bu yeri değerli kılan şey, turizm gibi ekonomik fırsatlar sağlamasıdır. (ekonomik değer)
- Bu yeri değerli kılan şey, gelecek nesillere şu an olduğu gibi doğayı deneyimleme fırsatı sağlamasıdır. (gelecek değeri)
- Bu yeri değerli kılan şey, önemli tarihi, doğal veya insan varlıklarına sahip olmasıdır. (tarihi değer)
- Bu yeri değerli kılan şey, yalnızca varlığıdır. (içsel değer)
- Bu yeri değerli kılan şey, bilimsel gözlem veya deneyler yoluyla çevre hakkında öğrenebilme imkanı sağlamasıdır. (öğrenme değeri)
- Bu yeri değerli kılan şey, hava, toprak ve su üretmeye, korumaya, temizlemeye ve yenilemeye yardımcı olmasıdır. (sürdürülebilirlik değeri)
- Bu yeri değerli kılan şey, kuşları izleme, yürüyüş yapma, egzersiz yapma vb. gibi favori açık hava etkinliklerini yapabileme imkanı sağlamasıdır. (rekreasyon değeri)
- Bu yeri değerli kılan şey, kutsal veya manevi açıdan özel olmasıdır. (manevi değer)
- Bu yeri değerli kılan şey, zihinsel veya fiziksel sağlığını iyileştirmesidir. (iyileştirici değer)

← Lütfen seçtiğiniz sizin için ikinci derecede önceliği olan değeri parkin haritasında işaretleyiniz. Farklı bir değer belirtmek için aynı konumu tekrarlayabilirsiniz. ↗

(Not: Parkin haritası, kırmızı çizgi sınırlarıyla belirlenir. Park haritasındaki istediğiniz konuma mavi pini yerleştirin.)

Haritadaki simgeler yalnızca rehberlik için kullanılır ve puan tahsisinizi etkilememelidir. Ev ikonuna tıklamak sizi parkin konumuna götürecektir.)

🔍 Konum veya harita koordinatı ara



41°8'5.882"N 29°1'59.315"E

Figure B.2 : Survey123 questinnare interface (2).

Üçüncü Derecede Öncelikli sosyal değer

Lütfen bu alanda üçüncü derecede öncelik verdiğiniz değeri seçiniz. *

Lütfen önceki sorularda seçtiğiniz seçeneklerden farklı bir seçenek seçiniz.

Bir sonraki soruda seçtiğiniz değeri haritada göstermeniz gerekiyor.

- Bu yeri değerli kılan şey, manzarası, görüntüleri, sesleri, havası ve kokularıdır. (estetik değer)
- Bu yeri değerli kılan şey, çeşitli hayvan ve bitkiler için yaşam ortamı sağlamasıdır. (biyolojik çeşitlilik değeri)
- Bu yeri değerli kılan şey, yerel bilgeliği, bilgiyi, gelenekleri ve bir yaşam tarzını aktarmaya yardımcı olmasıdır. (kültürel miras değeri)
- Bu yeri değerli kılan şey, turizm gibi ekonomik fırsatlar sağlamasıdır. (ekonomik değer)
- Bu yeri değerli kılan şey, gelecek nesillere şu an olduğu gibi doğayı deneyimleme fırsatı sağlamasıdır. (gelecek değeri)
- Bu yeri değerli kılan şey, önemli tarihi, doğal veya insan varlıklarına sahip olmasıdır. (tarihi değer)
- Bu yeri değerli kılan şey, yalnızca varlığıdır. (içsel değer)
- Bu yeri değerli kılan şey, bilimsel gözlem veya deneyler yoluyla çevre hakkında öğrenebilme imkanı sağlamasıdır. (öğrenme değeri)
- Bu yeri değerli kılan şey, hava, toprak ve su üretmeye, korumaya, temizlemeye ve yenilemeye yardımcı olmasıdır. (sürdürülebilirlik değeri)
- Bu yeri değerli kılan şey, kuşları izleme, yürüyüş yapma, egzersiz yapma vb. gibi favori açık hava etkinliklerimi yapabilme imkanı sağlamasıdır. (rekreasyon değeri)
- Bu yeri değerli kılan şey, kutsal veya manevi açıdan özel olmasıdır. (manevi değer)
- Bu yeri değerli kılan şey, zihinsel veya fiziksel sağlığımı iyileştirmesidir. (iyileştirici değer)



İkamet Soruları

İstanbul'da mı yaşıyorsunuz? *

- Evet Hayır

1 / 1

Kişisel Bilgileri

Kaç yaşındasınız? *

- 18-29 yaş arası 30-59 yaş arası 60 yaş ve üstü

Cinsiyetiniz nedir? *

- Kadın Erkek Cinsiyet kimliğim yok / Non-binary

Eğitim seviyeniz nedir? *

- Formal eğitimim yok İlköğretim veya ortaöğretim Lise Üniversite Lisansüstü

Mevcut mesleğiniz veya uzmanlık alanınız yeşil alanlar veya çevreyle ilgili konularla ilişkili mi? *

- Evet Hayır

Figure B.3 : Survey123 questinnare interface (3).

CURRICULUM VITAE

Name Surname : Kosar Azarmikhosroshahi

EDUCATION

- **B.Sc.** : 2019, Tabriz University, Faculty of Civil Engineering, Architectural Engineering Department

PROFESSIONAL EXPERIENCE AND REWARDS:

- Best Paper Prize: Runner-Up Winner of 18th AESOP Young Academics Conference – Full paper “Spatial Assessments of Mapped Plural Values of Visitors for the Urban Forest: Unveiling Conflict between Public’s Values and Management Plans”

PRESENTATIONS ON THE THESIS:

- International Graduate Research Symposium - IGRS'23 – Conference presentation. Title “Operationalizing the PPGIS Methodology for Socio-Cultural Ecosystem Services Assessment: Atatürk Kent Ormanı Case in Istanbul. Online

OTHER PUBLICATIONS, PRESENTATIONS:

- **Azarmikhosroshahi, K.** (2024). Assessing Plural Values Anchored By Public Stakeholders for Safeguarding Social-Ecological System: The Case of Atatürk Urban Forest. In Politecnico di Milano (Ed.), *Bridging Gaps: Urban Planning for Coexistence*, (pp. 13). ISBN 9789464981803.3
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- **Azarmikhosroshahi, K.**, Terzi, F. (January 2024). Assessing the Impact of Urbanization on Ecosystem Services in Istanbul: Limitations and Ecological Considerations. *Environmental Monitoring and Assessment*, 1(1). Under peer review.