Operationalizing Sense of Place Concepts and Cultural Ecosystem Services to Explore Urban Ecosystem Rehabilitation Performance from A Socio-Cultural Lens: The Case of Wadi Hanifah—*Riyadh, Saudi Arabia*

by

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Author's Declaration

This thesis consists of material all of which I authored or co-authored: see Statement of Contributions included in the thesis. This is a true copy of the thesis, including any required final revisions, as accepted by my examiners. I understand that my thesis may be made electronically available to the public.

Statement of Contributions

This thesis dissertation follows the manuscript option for master's students in the School of Planning at the University of Waterloo. As such, this thesis consists of a single manuscript with the intention to submit to a peer-reviewed journal (e.g., *Urban Design* International). For all aspects of this thesis, I (Shahad Kashmiri) am the primary author of this manuscript, while Dr. Luna Khirfan, my supervisor, is the second author. Moreover, I have produced all of the figures and maps shown herein, except when indicated otherwise in citation. I alone led the data collection, and individually performed the data analysis and interpretation. Dr. Khirfan oversaw the work, provided guidance, and also reviewed the manuscript along with Dr. Michael Drescher who provided editorial comments for the manuscript.

Abstract

Urban ecosystems (UE), and urban wetlands specifically, are considered coupled human-natural systems; meaning, they rely on the complex interdependencies of human and ecological components. As such, any intervention procedure (i.e., rehabilitation or restoration) and their evaluations would require an integrated socio-cultural approach to better understand their impacts and promote congruent design and development. The importance of integrating the human dimension in the rehabilitation of UE has been highlighted recurringly in the literature. There have been several calls within the ecosystem services (ES) management and socio-ecological systems (SES) scholarship to operationalize sense of place (SoP) concepts in the evaluation of rehabilitated UE performance, particularly from the socio-cultural lens. Despite that, practice has been slower to follow suite with application.

The following research study presents a framework that links the socio-cultural dimension into the assessments of UE interventions. Primarily, it examines rehabilitated UE performance from a social lens and tracks the changes to their SoP, more specifically their place-image, as a result of the intervention. To achieve these aims, it operationalizes SoP components, as proposed by the literature. The framework essentially relies on the components of place triad (physical attributes, activity, and meanings and conceptions) as variables; to be examined by the visitation and popularity of the ecosystem, the uses and activities, the conditions of the physical environment, and the perceptions and associations of end-users to the rehabilitated UE (the indicators).

To demonstrate the proposed framework, I examined a recently rehabilitated urban wetland in the arid context of Saudi Arabia, namely that of Wadi Hanifah. Wadi Hanifah is a historic valley wetland, teaming with heritage and natural sites that cuts through the capital City of Riyadh. This renders the valley a rarity both for its ecological (i.e., milder micro-climate, and provision of blue and green spaces) and its socio-cultural contributions (i.e., recreational and leisure activities). Seeing as the rehabilitation was never examined from a social lens, this research aimed to fill that gap and provide the first iteration of a socio-cultural study of the rehabilitation.

Data for this study was gathered primarily using online social surveys and one-on-one semi-structured interviews. The results rendered several overlapping dimensions intrinsic to Wadi Hanifah's identity: Nature and natural landscapes; activities; utility; history and heritage; personal experiences; and the rehabilitation itself. The analysis results highlight the factors responsible for the changes in Wadi Hanifah's place-image, such as the introduction of the socio-cultural programs, including but not limited to outdoor and physical activities and the provision of picnic areas. The most noticeable trend was the transition of the perceptions of the Wadi from primarily provisional ES to one that is focused on CES. Furthermore, in terms of performance, the Wadi has reflected positively against the socio-cultural themes adapted from Bin Sulaiman and Almahmood (2022) (safety and security, sociability, accessibility, physical environment cues, attachment, and distinctiveness). It garnered a predominantly positive reception from the participants, where it was viewed as safer, more sociable, accessible, and unique, compared to before the rehabilitation.

The value of this research lies in its contributions to theory, methodology, and practice. Where in theory and methodology, this framework links between the ES scholarship and urban design's SoP. It can also be adapted for other similar UE interventions, especially ones that introduce an intentional socio-cultural agenda. Furthermore, in terms of practice this study sheds light on some of the current issues; provides a baseline for future studies of the Wadi; and provides a pragmatic approach to the improvement of its design and development guidelines.

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List of Abbreviations

UE	Urban Ecosystems
UES	Urban Ecosystem Services
ES	Ecosystem Services
CES	Cultural Ecosystem Services *or* Socio-cultural Ecosystem Services
MA	Millenium Ecosystem Assessment
SES	Socio-Ecological Systems
SoP	Sense of Place
RCRC	Royal Commission of Riyadh City
ADA	Arriyadh Development Authority
WHCDP	Wadi Hanifah Comprehensive Development Plan
FBC	Form-Based Codes

1 Introduction

1.1 General Introduction

The following thesis includes a manuscript intended for publication in a peer-reviewed journal (e.g., *Urban Design International Journal*). The manuscript is based on an exploratory research study that operationalized sense of place (SoP) (i.e., place-image and identity), and cultural ecosystem service indicators (CES) (i.e., activities, uses, and perceptions) to examine the performance of rehabilitated urban ecosystem (UE) from a socio-cultural lens; and explore the impacts of the UE rehabilitation on its SoP, specifically place-image.

1.1.1 Framing the Research

Across the globe, UE, and particularly wetlands, suffered tremendous impacts as a result of human activities. The degradation of UE and ecosystems in general gave rise to ecological interventions, such as rehabilitation, restoration, and reclamation (Costanza et al., 1997; Bolund & Hunhammar, 1999; Everard & Moggridge, 2012; Meli et al., 2014; Palmer et al., 2014; Holt et al., 2015; Al-Obaid et al., 2017; Kibler et al., 2018; Moosavi et al., 2020; de Bell et al., 2020). Despite these interventions' primary ecological agenda that aimed to restore the ecosystems' balance, these interventions often came hand-in-hand with impacts on social and cultural services, or CES (Everard & Moggridge, 2012; Kudryavtsev et al., 2012; Stylidis et al., 2014; Hausmann et al., 2016; Stedman, 2016; Masterson et al., 2017a; Kibler et al., 2018; Halajova et al., 2019; Verbrugge et al., 2019; Duggan et al., 2023). Because some of the impacts of these interventions were assumed to benefit people automatically by providing recreational opportunities, performance monitoring measures for CES were rarely implemented if at all (Verbrugge et al., 2019, p. 670). Hitherto, the impacts of these interventions on human (e.g., sense of place) and natural (e.g., biodiversity) dimensions have often been addressed separately, or rarely examined altogether (Plieninger et al., 2015).

Urban wetlands are considered socio-ecological systems (SES) or coupled human-natural systems. SES describe ecosystems that demonstrate complex interdependencies between ecological and human elements (Hauge, 2007; Niemelä et al., 2010; Boulton et al., 2016; Murphy et al., 2017; Masterson et al., 2017b; Kibler et al., 2018; Verbrugge et al., 2019; Khirfan et al., 2021; Duggan et al., 2023). Nevertheless, integrating the human element as part of the ecosystem remains to be one of the most challenging aspects of ecosystem management and is still in its infancy (Kudryavtsev et al., 2012; Stedman, 2016; Verbrugge et al., 2019; de Bell et al., 2020; Duggan et al., 2023). Because SES approach link the social and ecological dimensions within a single framework (Everard & Moggridge, 2012; Milcu et al., 2013; Lin & Lockwood, 2014; Hausmann et al., 2016), there have been several calls within the SES scholarship for the operationalization of SoP concepts as a means to examine the subjective cultural and personal perceptions of rehabilitated or restored ecosystems (Kudryavtsev et al., 2012; M. Potschin & Haines-Young, 2013; Hausmann et al., 2016; Stedman, 2016; Masterson et al., 2017a; Kibler et al., 2018; Verbrugge et al., 2019; Duggan et al., 2023).

Dubbed as a service under the umbrella of CES in the ecosystem services (ES) literature (Farnum et al., 2005), SoP can be understood as the experiential quality of a place often given its tangible and intangible components (Relph, 1976; Tuan, 1977; Norberg-Schulz, 1980; Steele, 1981; Agnew, 1987; Williams & Stewart, 1998; Stedman, 2003; Farnum et al., 2005; Silva, 2009; Lin & Lockwood, 2014; Qazimi, 2014; Kibler et al., 2018; Peng et al., 2020). Canter (1977) identified the components of place into a triad: the physical attributes (built and natural); activities (use and utility); and meanings and conceptions (beliefs, perceptions, values, etc.). The relationships and interactions of these components then determine SoP. Essentially, SoP is based on the interactions between the environmental, biological components, and human processes (i.e., individual and social experiences) (Hausmann et al., 2016; Kibler et al., 2018). Recent literature highlights that there are two points of departure to integrating SoP in ecosystem management: The first considers SoP as an outcome or product that is to be measured in or of itself; the other views SoP as an evaluative tool that can be used to gauge the performance of an intervention (Masterson et al., 2017a; Kibler et al., 2018; Verbrugge et al., 2019; Duggan et al., 2023). For the purpose of this study, I primarily engage with the second approach.

1.1.2 The Research Objective

The overarching theoretical (and methodological) objective of this research was to develop a framework that examines UE rehabilitation from a social lens and to track changes in their SoP that resulted from the intervention. Based on this objective, the proposed framework operationalizes several SoP concepts, specifically that of place-image; and utilizes aspects of CES as indicators to examine rehabilitated UE.

1.1.3 The Case-Study

This author selected Wadi Hanifah, located in Riyadh Saudi Arabia, as a case-study to demonstrate the proposed framework. I selected the Wadi, first, for its ecological and historic significance; second, because it is a unique case of a historic wetland in an arid urban region that has been examined only a handful of times; third, it has recently experienced a large-scale rehabilitation project that changed intrinsic aspects of its physical environment and activities; and last, the Wadi and its rehabilitation have not yet been examined from a socio-cultural perspective despite numerous ecological assessments.

1.1.4 The Research Aims and Questions

Although several studies were conducted to follow up the environmental and ecological performance of Wadi Hanifah, there is still a gap in knowledge of the impacts of the rehabilitation on the socio-cultural front, and on the Wadi's place-image and identity (Yavuz & Al-Asad, 2007; High Commission for the Development of Arriyadh, 2010a; Samhouri, 2010). To fill the knowledge gap in the examination of UE rehabilitation projects from a social lens, and particularly that of Wadi Hanifah, this author operationalizes the proposed framework to explore the impacts of the recent ecological rehabilitation interventions on the historic wetland's identity and image evolution; and provide a preliminary exploration of the Wadi's performance from a socio-cultural dimension.

Thus, the aims of this study are threefold: (1) To develop and operationalize a framework that integrates the human dimension in the performance evaluation of rehabilitated UE; (2) To explore the performance of rehabilitated UE from a social lens; and (3) to explore the impacts of rehabilitation on UE's SoP.

More specifically to the selected case-study of Wadi Hanifah, this research will provide the first iteration of a socio-cultural performance evaluation of the Wadi's Rehabilitation Project; explore the impacts of introducing a CES agenda to the Wadi; and provide insights on the rehabilitation's impacts on the Wadi's SoP (place-image). The objectives and aims of this research are to be achieved by the following research questions:

- How can SoP be operationalized to examine the performance of rehabilitated UE from a social lens?
- How does the introduction of CES in the UE rehabilitation impact their SoP (i.e., image and identity), and what are their implications on its performance?
- How did Wadi Hanifah's Rehabilitation Project impact its SoP (image and identity), and what are the implications on its performance?

1.1.5 The Research Framework Overview

The framework ensues with the following steps: (1) a thorough background study of the selected UE to identify the preliminary pillars contributing to its identity. Following that, (2) develop a questionnaire based on the identity pillars in combination with the goals and objectives of the intervention, that inquires about the UE both before and after the intervention. This serves three purposes, to track the changes in SoP and possibly the factors that contributed to these changes; to provide a window to the contemporary place-image; and gather socio-cultural feedback for the intervention. The questionnaire would inquire about the physical environment, activities, and meanings and conceptions associated with the rehabilitated UE (SoP components), through inquiring about participants' personal experiences, uses, visitations, and perceptions and associations (CES-related indicators). (3) Analyse the SoP changes and examine where changes occurred and what aspects of the interventions contributed to it. (4) Finally, examine the intervention's performance. For the performance evaluation I adapted Bin Sulaiman and Almahmood's (2022) proposed socio-cultural themes for exploring Wadi's Hanifah's performance from a social lens (safety and security, sociability, accessibility, physical environment cues, attachment, and distinctiveness). My adaptation modified certain criteria and added two more: physical environment cues; safety and security; accessibility; sociability; distinctiveness; and attachment, which were examined through CES as indicators.

1.1.6 The Research Methodology

To conduct the study, I used mixed methods to acquire data. I began the research with a background study of the Wadi through planning documents and reports related to it, such as Wadi Hanifah's Comprehensive Development Plan (WHCDP). The outcomes of the background study formed the blueprint of Wadi Hanifah's identity dimensions. Namely: nature and natural landscapes; activities and utility; history and heritage; personal experiences and memories (attachment); and the rehabilitation itself. The information gathered from this stage was then combined with elements from the SoP literature review to build the questionnaires of the other two methods used in this study. Specifically, the online survey, which examined the Wadi's place-image and identity; and the semi-structured interviews, that explored user experiences of the Wadi and reported on the Wadi's performance. The research aims were then realized by a thematic analysis of the survey and interview results based on the indicated identity dimensions of the Wadi. Accordingly, I was able to draw a comparison of the Wadi's place-image before and after the rehabilitation to track the changes in SoP and the public's perception of the Wadi; and note the elements that propagated those changes. To examine the performance from a social lens, the interview findings were evaluated against the aforementioned socio-cultural themes, which demonstrates the congruence between the Wadi's Rehabilitation Project compared to its initial goals and vision. Thus, indicating the noticeable impacts of the rehabilitation on the Wadi.

1.1.7 The Research Significance and Contributions

The value of this research lies within its contributions to theory, methodology, and practice. In theory and methodology, this study links between the realms of social-ecology, ES, and urban design's SoP. The framework presented therein demonstrates one way of obtaining socio-cultural feedback and performance evaluations for rehabilitated UE, specifically by operationalizing SoP concepts. The framework can be used to track changes in place-image and identity and shed light on the factors that potentially propagated them. Thus, the findings act as performance indicators, ones that demonstrate the impacts of the rehabilitation on UE and their delivery and reception by end-users or residents. Furthermore, in terms of practice, this research presents the first iteration of a socio-cultural study for Wadi Hanifah, on which future socio-cultural evaluations of the Wadi could build on. The study presents a pragmatic approach to obtain feedback which contributes to the improvement of design and development guidelines, and in some cases enhance the current performance and conditions.

1.1.8 The Research Structure

The following sections will introduce the manuscript, which is composed of the manuscript introduction, followed by the literature review on urban ecosystem services (UES) and sense of place. Followed by a description of the methodology, theoretical and conceptual framework, and the case-study. After that, I delve into the data reporting, findings, and the research outcomes; succeeded by the manuscript conclusion, and the dataset that covers the raw data from the surveys. Finally, the conclusion of this study.

1.2 The Manuscript Introduction

UE, such as urban rivers, provide a plethora of benefits, including the mitigation of urban runoffs and provision of CES (Bolund & Hunhammar, 1999; Everard & Moggridge, 2012; Kati & Jari, 2016; Al-Obaid et al., 2017; Verbrugge et al., 2019; de Bell et al., 2020). Evidence abounds that UE, and particularly rivers, have been subjected to severe damage due to population growth and the overextraction of resources that often accompany urbanization, which rendered them among the most vulnerable UE (Bolund & Hunhammar, 1999; Everard & Moggridge, 2012; Meli et al., 2014; Palmer et al., 2014; Al-Obaid et al., 2017; Moosavi et al., 2020; de Haas & Schepers, 2022; Duggan et al., 2023). Responding to this phenomenon, for wetlands as well as other ecosystems, is the rise of restoration and rehabilitation initiatives that attempt to mitigate that damage and restore and enhance some of these ecosystems' vital ecological functions, such as the biodiversity of ecosystems and the provision of their ES (Costanza et al., 1997; Bolund & Hunhammar, 1999; Everard & Moggridge, 2012; Meli et al., 2014; Palmer et al., 2014; Holt et al., 2015; Al-Obaid et al., 2017; Kibler et al., 2018; Moosavi et al., 2020; de Bell et al., 2020). Some interventions, such as reclamation, transform "severely degraded land useable by humans" (Gerwing et al., 2022, p. 2). While restorations attempt to return a system to a previously known pre-disturbance state, rehabilitation acknowledges the impossibility of going back to a previous condition, hence, takes the changes in stride and makes the best out of the situation (Klaus & Kiehl, 2021). Regardless, these interventions lead to a better understanding of the types of UE and their provided services (Costanza et al., 1997; Bolund & Hunhammar, 1999). Although the primary motives of these interventions serve an environmental agenda, they often come hand-in-hand with socio-cultural (i.e., CES) and economic dimensions (Costanza et al., 1997; Bolund & Hunhammar, 1999; Everard & Moggridge, 2012; Braat & de Groot, 2012; Meli et al., 2014; Palmer et al., 2014; Holt et al., 2015; Plieninger et al., 2015; Al-Obaid et al., 2017; Kibler et al., 2018; Verbrugge et al., 2019; Moosavi et al., 2020).These interventions have had tremendous impacts on the ecological, formal (built environment), and socio-cultural fronts (Duggan et al., 2023).

Several scholars propose an SES approach in ecosystem and ES management to bridge between these human and ecological components (Niemelä et al., 2010; Kudryavtsev et al., 2012; Stylidis et al., 2014; Hausmann et al., 2016; Stedman, 2016; Boulton et al., 2016; Masterson et al., 2017a; Murphy et al., 2017; Masterson et al., 2017b; Kibler et al., 2018; Halajova et al., 2019; Verbrugge et al., 2019; de Bell et al., 2020; Duggan et al., 2023). Often, the conceptual and theoretical frameworks proposed by these scholars relied on concepts within the theories of place literature, particularly SoP, to integrate the human element as part of the ecosystem management agenda (Lynch, 1960, 1981; Canter, 1977; Tuan, 1977; Norberg-Schulz, 1980; Steele, 1981; Stokols & Shumaker, 1981; Montgomery, 1998; Kaltenborn, 1998; Silva, 2009; Duggan et al., 2023). Such integration would provide the necessary means to identify opportunities and mitigate threats in SES; provide insights on the synergies and trade-offs in ecosystem management (Chapin et al., 2011; Daniel et al., 2012; Hausmann et al., 2016; Duggan et al., 2023); and acquire insights on people's perceptions, preferences, and experiences of these places (Everard & Moggridge, 2012; Milcu et al., 2013; Lin & Lockwood, 2014; Hausmann et al., 2016). However, the approach faces several challenges similar to those discussed within the CES literature, such as the difficulty in quantifying biophysical variables and difficulty in valuating these services in monetary terms (Daniel et al., 2012; Chan et al., 2012a; Tengberg et al., 2012; Satz et al., 2013; Plieninger et al., 2015; Hølleland et al., 2017; Ko & Son, 2018).

Wadi Hanifah is an important historical wetland in Saudi Arabia that crosses its capital –the City of Riyadh. Because of the novelty of such a large-scale rehabilitation project that is all-inclusive of a socio-cultural agenda not previously present in the region, feedback on rehabilitation from a socio-cultural lens has not been fully explored. The Wadi's rehabilitation also adopted a form-based code (FBC) planning approach, where the primary focus of development would be on a three-dimensional physical or built-environment , rather than the two-dimensional land-use zoning typically used in the region (Bin Sulaiman & Almahmood, 2022). FBC is a method of "regulating development to achieve a specific urban form" (Parolek et al., 2008, p. 4). An FBC-based plan usually includes "a regulating plan, building form standards, public space standards, administration, and a glossary" as opposed to the land-use zoning approach that "control plans through fragmented parameters, e.g., FAR, density, and parking ratios" that do not necessarily consider the urban form development (Talen, 2013; Bin Sulaiman & Almahmood, 2022). This is a paradigm shift in planning in the region, considering it was not part of the planning culture in Saudi Arabia, which often followed a top-down approach (Bin Sulaiman & Almahmood, 2022). Although the Wadi's Rehabilitation and its Building Codes still followed a top-down approach, the introduction of the FBC in the case of Wadi Hanifah, contributes to its urban form development and the potential impacts on the physical attributes associated with the Wadi.

Although several studies were conducted to follow up the environmental and ecological performance of the Wadi, there is still a gap in knowledge of the impacts of the rehabilitation on the socio-cultural front (Yavuz & Al-Asad, 2007; High Commission for the Development of Arriyadh, 2010a; Samhouri, 2010). To fill this knowledge gap in the evaluation of UE rehabilitation projects from a social lens, particularly that of Wadi Hanifah, I operationalize concepts from the SoP literature, specifically, place-image; -identity; and -attachment, to explore the impacts of the recent ecological rehabilitation interventions on the historic wetland's identity and image evolution; and its performance from a social lens, particularly using CES-related indicators (Chon, 1990; Stylidis et al., 2014; Kibler et al., 2018).

Thus, the aims of this study are threefold: (1) To develop and operationalize a framework that integrates the human dimension in the performance evaluation of rehabilitated UE; (2) To explore the performance of rehabilitated UE from a social lens; and (3) explore the impacts of rehabilitation on UE's SoP. More specifically to the selected case-study of Wadi Hanifah, this research will provide the first iteration of a socio-cultural performance evaluation of the Wadi's Rehabilitation Project; explore the impacts of introducing a CES agenda to the Wadi; and provide insights on the rehabilitation's impacts on the Wadi's SoP (place-image). The objectives and aims of this research are to be achieved by the following research questions:

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- How did Wadi Hanifah's Rehabilitation Project impact its SoP (image and identity), and what are the implications on its performance?

The following sections will present the literature review where we discuss urban ES or UES and set a context for SoP. This is followed by the case study, methodology, and theoretical and conceptual framework. After that, I delve into the data. findings, and finally the research outcomes.

2 Literature Review

2.1 Urban Ecosystem Services

Urban ecosystem services (UES) are often referred to as “green infrastructure” (Gómez-Baggethun & Barton, 2013); however, they also include wetlands (marshes, grasslands, and swamps), open waters (lakes, sea), and flowing waters (rivers, streams) (Bolund & Hunhammar, 1999). These natural features provide an array of tangible and intangible goods, services, and benefits—ES (Costanza et al., 1997; Bolund & Hunhammar, 1999; Millennium Ecosystem Assessments, 2005; M. B. Potschin & Haines-Young, 2016). UE display complex interdependencies between human and natural systems. Accordingly, they are considered SES or coupled human-natural systems (Redman et al., 2004; Kibler et al., 2018).

To facilitate “identification, quantification and valuations of [ES]” (Hølleland et al., 2017, p. 11), the Millennium Ecosystem Assessments (MA) (2005) identified four ecosystem functions: provisional, regulatory, supporting, and cultural. Provisional ES entail the provision of food and water (e.g., agriculture); regulatory ES modulate essential ecological and natural processes that maintain the ecosystem’s health and well-being (e.g., flooding, temperature); supporting ES, also known as habitat services, support the functioning of natural cycles (e.g., photosynthesis, cycling of nutrients, and oxygen production) (Costanza et al., 1997; De Groot et al., 2002, p. 3; Everard & Moggridge, 2012, pp. 296–297). Lastly, CES, the intangible services that benefit human well-being by surpassing basic survival needs (e.g., SoP and eco-tourism), also referred to as “nature’s informational functions” (De Groot et al., 2002, p. 13; Farnum et al., 2005; Everard & Moggridge, 2012, pp. 296–297).

The literature identified approximately ten CES: SoP, ecotourism, recreation, spiritual values, cultural heritage, social relations, knowledge systems, aesthetic values, inspiration, and educational values (Tengberg et al., 2012; Hølleland et al., 2017). Recent studies revealed the irreplaceability of cultural values and the increase of dependence on CES compared to other ES (Plieninger et al., 2015). However, ecosystems do not necessarily exhibit a one-to-one relationship with the services they provide (double counting issues); hence, it becomes difficult to quantify how much of each service was provided by which part of the ecosystem (Bolund & Hunhammar, 1999; Gustafson, 2001; De Groot et al., 2002; Tengberg et al., 2012; Hernández-Morcillo et al., 2013; Satz et al., 2013). Subsequently, accurate monetary valuations, among other evaluations, become increasingly challenging to conduct, (Millennium Ecosystem Assessments, 2003; Daniel et al., 2012; Hernández-Morcillo et al., 2013; Milcu et al., 2013; Satz et al., 2013; Haines-Young & Potschin, 2014; Plieninger et al., 2015; Hausmann et al., 2016; Hølleland et al., 2017; Ko & Son, 2018). When they’re not completely overlooked because of their “intangibility and non-use values which often renders them difficult to classify and measure” (Tengberg et al., 2012, p. 17)—such as their subjective aesthetic and experiential qualities –CES evaluations have been rare and commonly limited to recreation and tourism (Daniel et al., 2012; Plieninger et al., 2013; Hølleland et al., 2017).This gave rise to non-monetary, socio-cultural valuation methods, including but not limited to: “‘psycho-cultural valuation’, ‘social valuation’, ‘deliberative valuation’, ‘qualitative valuation’, and ‘subjective assessment’” that seek “to uncover individual and collective values and perceptions of ES without relying on market logic and monetary metrics” (Burkhard & Maes, 2017, p. 104).

One critique of the existing CES framework is that it is “largely separationist” treating the human and natural dimensions separately, potentially hindering necessary transformations that some of these ecosystems might need (Plieninger et al., 2015). This highlights the importance of an integrative approach in ES management that balances between the social, cultural, urban, and ecological components (Stedman, 2016; Verbrugge et al., 2019). One such example is the evaluation of these ES through SoP concepts (Hauge, 2007; Niemelä et al., 2010; Stedman, 2016; Boulton et al., 2016; Masterson et al., 2017b; Verbrugge et al., 2019; Khirfan et al., 2021). By acquiring feedback on people’s experiences and their relationships with these places (ecosystems), better management systems may be developed, leading to better decisions; reduced unintended conflicts; and garnering the public’s support (Daniel et al., 2012; Hausmann et al., 2016).

2.2 A Context for Sense of Place

Sense can be interpreted as the extent to which a place is differentiated and experienced, and place is a space endowed with value (Tuan, 1977; Lynch, 1981; Kaltenborn, 1998). Taken together, ‘*sense of place’* is seen as "the join between the form of the environment and the human processes of perception and cognition" (Lynch, 1981, p. 131). Since Yi-fu Tuan introduced the notion of *topophilia* – “the affective bond between people and place” (Tuan, 1990, p. 93), studies abounded on the reciprocal and transactional nature of people-place bonds (Canter, 1977; Lynch, 1981; Stokols & Shumaker, 1981; Silva, 2009; Carmona et al., 2012; Khirfan & Momani, 2013; Qazimi, 2014; Ujang & Zakariya, 2015; Parsaee et al., 2015; Campbell, 2018; Wartmann & Purves, 2018). Similarly, theoretical and empirical studies abounded to identify the factors that render a place unique, possessing a ‘*Genius Loci’* (spirit of place), and by consequence, how it relates to human experiences (Norberg-Schulz, 1980; Rossi, 1982; Khirfan, 2014).

Relating people to place is generally divided into four bodies of literature that are often discussed in tandem: SoP, place-attachment, place-dependence, and place-identity (Shamai, 1991; Farnum et al., 2005; Hausmann et al., 2016; Wartmann & Purves, 2018; Peng et al., 2020). Each body of literature identifies a type of people-place relation. While each term is different, some scholars address them under the same umbrella meaning or use them interchangeably as “sub-components of the wider concept”, namely that of SoP (Lin & Lockwood, 2014, p. 1141).

First, SoP refers to the experiential quality that results from the interaction of tangible (physical environment) and intangible elements (beliefs, attitudes, values, behaviors, rites and rituals) of a place that distinguish it from others; it is the subjective perspectives, or feelings elicited by and towards a place (Relph, 1976; Tuan, 1977; Norberg-Schulz, 1980; Steele, 1981; Agnew, 1987; Williams & Stewart, 1998; Stedman, 2003; Farnum et al., 2005; Silva, 2009; Lin & Lockwood, 2014; Qazimi, 2014; Kibler et al., 2018; Peng et al., 2020). Second, Place-attachment, is defined by Tuan to be the “affective bond between an individual or a group and a particular spatial setting” that often ensues from “a long-term emersion and acceptance of an area’s values, beliefs, and cultural systems” (Nanzer, 2004, p. 364). Such people-place bonds are structured by preferences, personal memories, and needs (Shamai, 1991; Nanzer, 2004; Wartmann & Purves, 2018; Peng et al., 2020). Which brings forth the third body of literature, place-dependence, or the attachment to place due to the necessities, functions, and services it provides (Stokols & Shumaker, 1981; Wartmann & Purves, 2018; Rajala et al., 2020). Lastly, there is a body of literature that covers place-identity, or the degree to which a place can be recognized and distinguished compared to others (Lynch, 1981, p. 131).

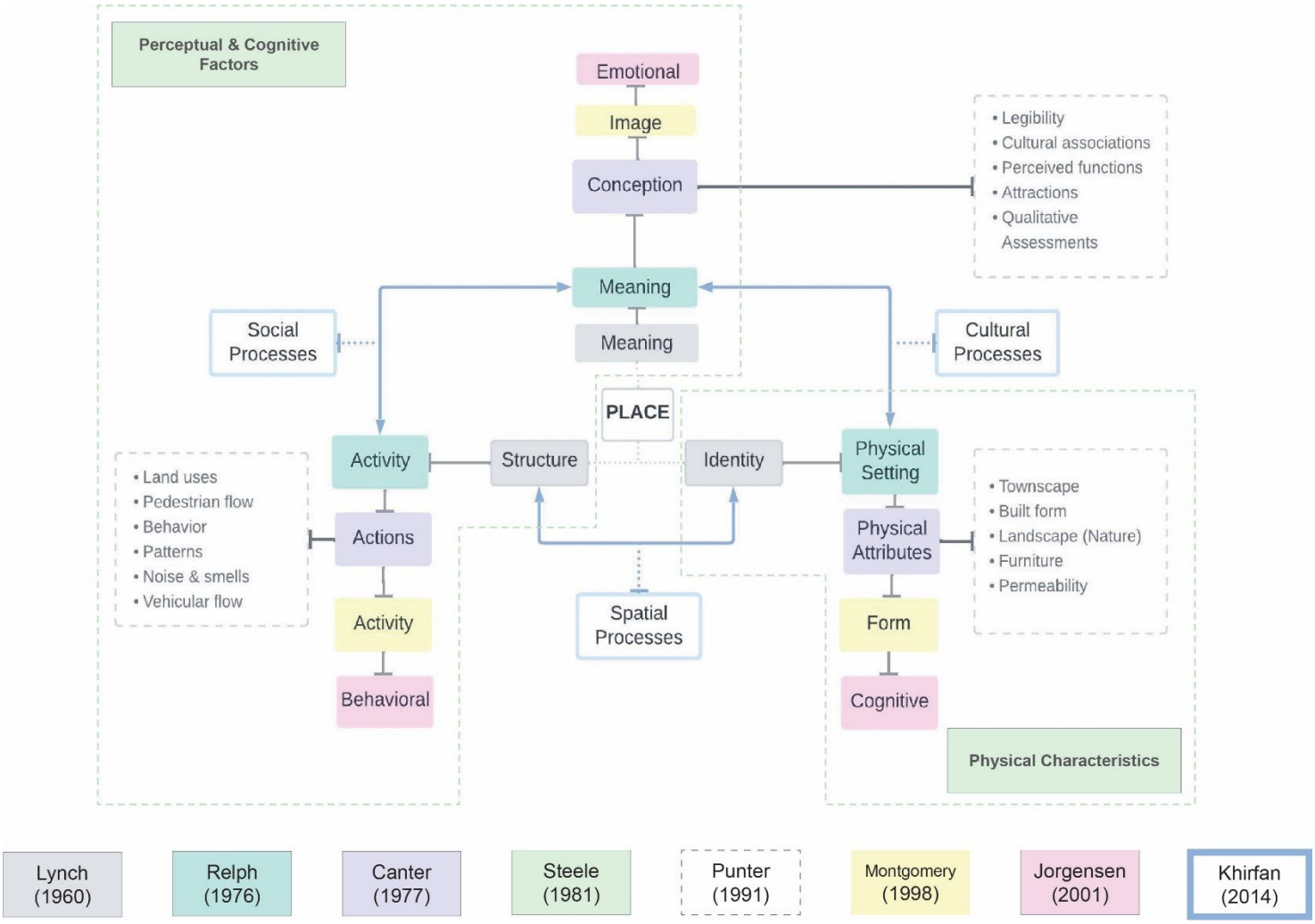


Figure 1 *The development of the theoretical and conceptual frameworks of Distinctive Place.*

Paasi in his book and several articles (1986, 1991, 2002, 2003, 2009a, 2009b), as discussed by Peng at al. (2020), distinguishes between two place-identity understandings that are often conflated in the literature : *people's place-identity* and *place's place-identity*. The former refers to the extent to which a place becomes part of the personal identity or embodied in the definition of the self (Shamai, 1991; Nanzer, 2004; Farnum et al., 2005; Kudryavtsev et al., 2012; Peng et al., 2020). The latter refers to the unique set of qualities or identifiers that distinguish one place from another (Peng et al., 2020, p. 4). While place-identity is based on constructs of past events and intrinsic qualities devoid of individual perceptions (e.g., nature), place-image tends to reveal a reflection of the present, a moment in its identity (Lynch, 1960; Montgomery, 1998; Silva, 2009). Sometimes referred to as 'destination-image', place-image is the mental construct that a place evokes in one's mind based on second-hand information (i.e., history, literature, general media, and the experiences of others). However, the term 'destination-image' is typically used in the context of tourism, where it is often based on a superficial exploitation of a place's identity, intended to influence choices, experiences, and behaviours associated with place (Echtner & Ritchie, 2003; Stylidis et al., 2014).

There was consensus in the literature that the SoP can be found at the junction of three elements (Figure 1): the physical attributes, both built and natural; the activities, functions, and events therein; and meanings and conceptions. These elements are also reminiscent of Lynch's (1960) components of *imageability* or place-image (identity, structure, and meaning) (Echtner & Ritchie, 2003). However, places exhibit different ranges of meanings that can vary significantly depending on the observer (Stedman, 2016; Masterson et al., 2017a). Silva (2009)

explained that place-image is composed of two experiential dimensions: the perceptual or physical external world (i.e., characteristics and attributes) and the symbolic or internal world of the observer (cognitive and symbolic factors). Where the former includes the formal structure, the environment or ambience, and the activities that are available, and the latter is based on the historical memory of people and events, personal meanings, which pertains to memories, preferences, experiences, and attachment to place (Steele, 1981; Silva, 2009).

Scholars such as Punter (1991), Montgomery (1998), and Khirfan (2014), have since expanded-on and operationalized Canter's place-components triad (Figure 1). Punter's (1991) theoretical work, for instance, detailed Canter's, offering specific indicators of each of the components of place. Khirfan (2014) operationalized SoP by developing a framework based on Canter's (1977) components of place triad –revealing what happens at their intersections based on Lynch's performance dimensions, specifically the dimension of *sense* (1981, p. 131), to examine what composes distinctive place-experiences and how they might be measured. These operationalizations also align with some explorations of the SoP as the combination of the physical environment (e.g., landscape and wildlife), social elements (e.g., personal values, interaction and activities, family), and cultural factors (i.e., history, heritage, and traditions) (Lin & Lockwood, 2014). While some have examined SoP by exploring people's experiences and preferences (Chon, 1990), others attempted to measure it based on these people-place relationships, especially place-attachment (Shamai, 1991). Because of the reciprocal relationship between the components of place, what Stokols and Shumaker (1981) described as the "transactional view of settings", alterations to one of the components are bound to impact the other two, and ultimately the overall sense of place over time, if only marginally (Kaplan, 1995; Stedman, 2003; Kim & Kaplan, 2016; Masterson et al., 2017a).

3 The Case Study

The Case of Wadi Hanifah's Rehabilitation Project

Situated at the heart of the Najd plateau, Wadi Hanifah stretches approximately 120 kilometers from northwest to the south of the Province of Riyadh, constituting a geographic boundary west of Riyadh City (Figure 2). Saudi Arabia's arid climate renders freshwater resources like the Wadi rare; hence it became one of the most important natural wetlands in the region, both for ecological and historical reasons (Environmental Management & Protection Department, 2002a; Al-Samhouri & Al-Naim, 2007; Yavuz & Al-Asad, 2007; Samhouri, 2010). The Wadi's catchment area consists of its main basin and nearly 40 tributary valleys (e.g., Wadi Laban, Wadi Namar, Lake Hair) that play a considerable role in natural stormwater management, flood mitigation, and groundwater management (Environmental Management & Protection Department, 2002a; Samhouri, 2010; Koudounas, 2015). The Wadi also acts as a temporary habitat for migrating birds and is home to several species of butterflies, frogs, and dragonflies, which further highlights its ecological importance (Environmental Management & Protection Department, 2002a, p. 71; Yavuz & Al-Asad, 2007).

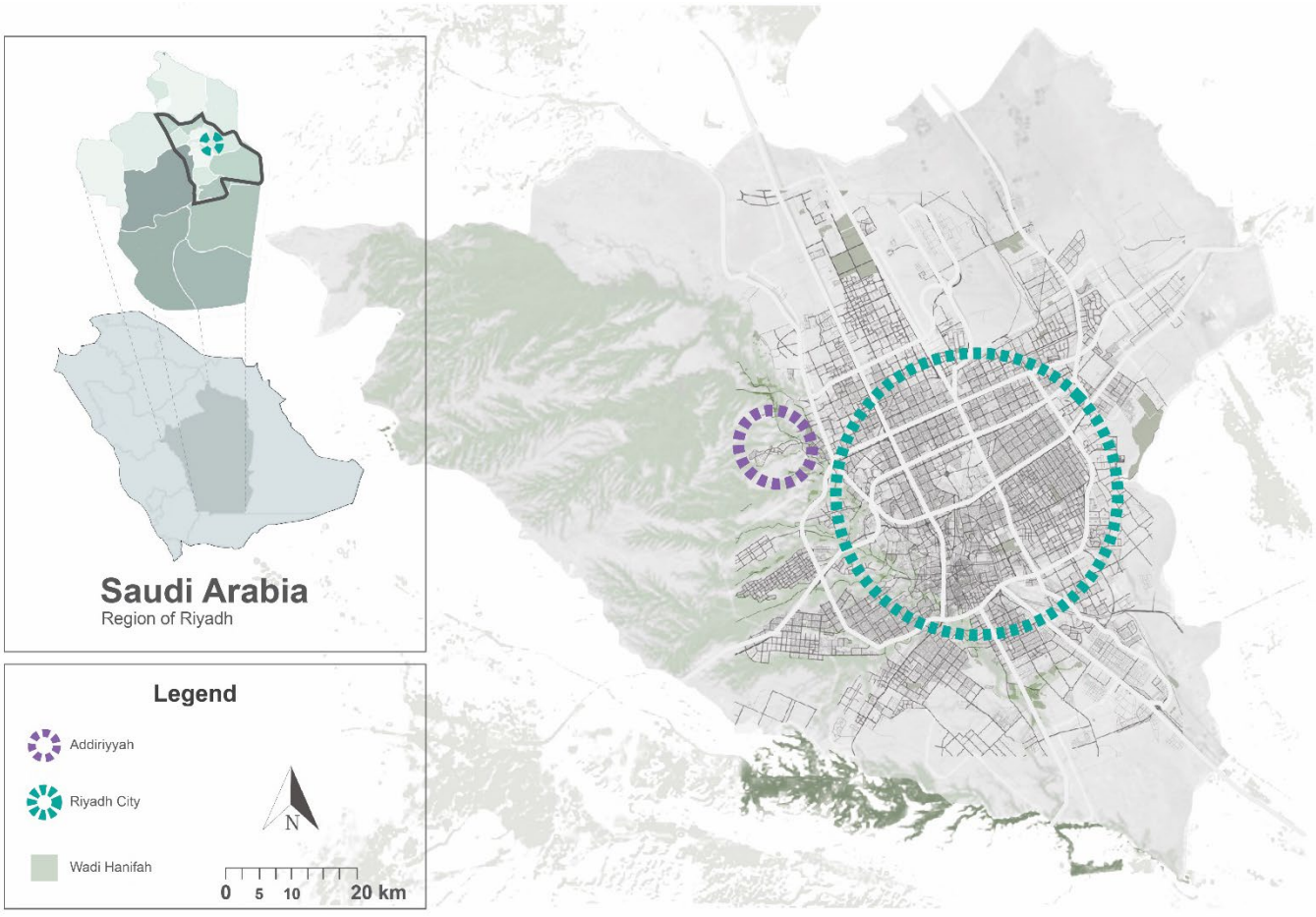


Figure 2 *Wadi Hanifah's Regional Map*

Historically, the wetland has been a source of sustenance for the central region of Saudi Arabia. Archeological evidence, especially in the northern sections of the Wadi closer to the *Thumamah Reserve*, suggests that human activity was present in the area as far back as 15,000 years (Harrigan, 2013; High Commission for the Development of Arriyadh, 2015a). The Wadi provided arable lands and building materials that led to the development of several communities along its length that date back to the periods preceding the Islamic era (circa 610 AD). As such, many historical villages dot Wadi Hanifah's banks, including but not limited to Al Uyaynah, Manfuhah, and Turaif (Environmental Management & Protection Department, 2002b; Yavuz & Al-Asad, 2007; High Commission for the Development of Arriyadh, 2010a). Wadi Hanifah's significance is also tied to the foundation story of the Kingdom of Saudi Arabia, for along its banks lay the village of Addiriyyah, the Kingdom's first capital founded in 1744 AD before Riyadh replaced it in 1824 AD (Al-Samhouri & Al-Naim, 2007; Samhouri, 2010; Harrigan, 2013). Addiriyyah today is a heritage village teaming with cultural activities and events that celebrate the Saudi national identity. Despite Riyadh's economic importance as a major historical trade route for the peninsula, it was only after King Abdulaziz reclaimed it in 1902 that it began to flourish, growing both in its population and urban fabric (High Commission for the Development of Arriyadh, 2015c, 2015a).

Like many of its neighbours in the Middle East, the rapid urban development phenomenon that Riyadh experienced between the 1930's and 1970's led to the transformation and expansion of the urban fabric. This transition led to incongruent development and in some cases the loss of the cultural or regional identity (Bin Sulaiman & Almahmood, 2022). Moreover, Riyadh's population growth boomed after the oil revolution, from just around 110,000 residents in the 1950's to 1,000,000 in the 1980's, to today's 7.5 million (High Commission for the Development of Arriyadh, 2015c; World Population Review, 2022). Accompanying the population growth was an increasing demand for natural resources that the Wadi continued to provide. Consequently, under the pressures of urbanization, Wadi Hanifah's ecosystem severely deteriorated due to resource extraction and the contamination of its waters that impacted its ecological balance (Environmental Management & Protection Department, 2002a).

In an attempt to reverse this deterioration, several environmental studies were conducted in the 1980's, followed by the "*1994 Wadi Hanifah Development Strategy*" plan, and finally, in 2001, when Arriyadh's Development Authority (ADA), also known as the High Commission for the Development of Arriyadh and known more contemporarily as the Royal Commission of Riyadh's City (RCRC), commissioned[1] the development of the *Wadi Hanifah Comprehensive Development Plan* (WHCDP), as part of the Wadi's rehabilitation project. The WHCDP is a ten-year plan that sought to restore the Wadi's ecological functions and address a potential socio-cultural agenda (Environmental Management & Protection Department, 2002a; Al-Samhouri & Al-Naim, 2007; Yavuz & Al-Asad, 2007; Al-Obaid et al., 2017). The Plan was divided into two segments: *The Wadi's Restoration Project* that focused on the construction works necessary to improve the Wadi's flood performance and the restoration of the Wadi's bed and water quality and ecosystem; and the *Wadi Hanifah Development Programme* that aimed to address, along side private sector investment projects, the public landscape and the necessary infrastructure for the socio-cultural agenda(i.e., recreation and tourism) (Samhouri, 2010).

[1] British -Buro Happold as engineering consultants along with landscape architect firm Moriyama & Tishima Limited, based in Canada.

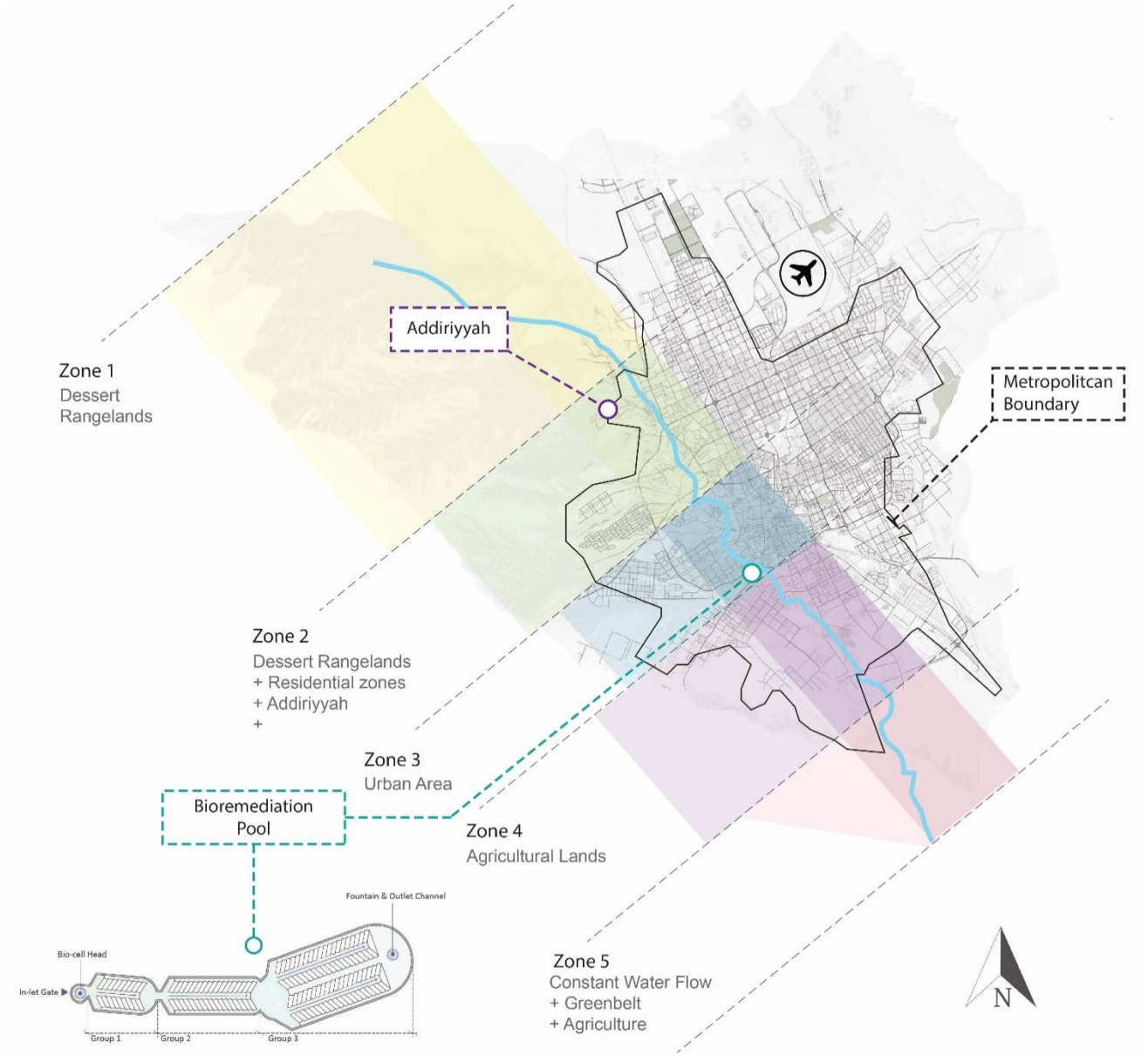


Figure 3 *The development zones designated by Wadi Hanifah's Rehabilitation Project.*

This Rehabilitation Project, the first of its kind and scale in Saudi Arabia at the time, led to drastic changes to the Wadi's ecosystem and urban context (Al-Samhouri & Al-Naim, 2007; Koudounas, 2015). Essentially, the Wadi's Rehabilitation Project divided the wetland into five developmental zones (Figure 3). All five zones have in common that they needed to improve water quality, remove dumping, and check the dams and the micro-catchments (Environmental Management & Protection Department, 2002b). The WHCDP, particularly the *Environmental Restoration and Conservation Program,* explains the works to be done for these zones (Environmental Management & Protection Department, 2002b). Notably, zone 1 had barely suffered the disturbances of human activities, compared to zones 2 and 3 that were subjected to severe dumping, as such, they were the core areas addressed in the earlier phases of the rehabilitation (Environmental Management & Protection Department, 2002b).

The project included the development and adaptation of Wadi Hanifah's Urban Code that aimed to "revive the local identity" and preserve the Najdi architectural aesthetic, provide and improve public spaces, and restore and conserve the Wadi's natural environment (Bin Sulaiman & Almahmood, 2022, p. 183). Collectively, these changes yielded a linear park for Riyadh, whose spaces provided opportunities for socio-cultural and recreational activities – a novel experience in a country with a dearth of such public spaces (Environmental Management & Protection Department, 2002b). Publicly available performance evaluations of Wadi Hanifah's Rehabilitation Project focused on the developmental objectives and the environmental performance, such as the water treatment and bioremediation facilities (Environmental Management & Protection Department, 2002a; Yavuz & Al-Asad, 2007; Samhouri, 2010). Realizing the importance of incorporating the social dimension in this kind of intervention, two charrettes were conducted to integrate the socio-cultural perspective in the Wadi's building and design codes. However, these were incorporated in the final phase of the Code's development and were primarily attended by experts in the field and local and international consultants representing the 'general public'. Therefore, there is still need for post-implementation studies that assess the Wadi through the general public's socio-cultural lens (Bin Sulaiman & Almahmood, 2022, pp. 193–194).

4 The Methodology

4.1 Theoretical & Conceptual Frameworks

Traditionally, the impacts of ecosystem interventions on the human (e.g., place-experience) and natural (e.g., biodiversity and biological health) systems have been addressed separately (Plieninger et al., 2015). However, urban rivers are coupled human-natural systems – in other words, they are intrinsically based on social and ecological interactions (Redman et al., 2004; Hauge, 2007; Niemelä et al., 2010; Boulton et al., 2016; Masterson et al., 2017b; Kibler et al., 2018; Verbrugge et al., 2019; Khirfan et al., 2021). Because these interventions' impacts are subjectively perceived and acted upon by social actors, it is essential to account for these perceptions along with the ecological dimensions in UE rehabilitations or restorations and their management (Chan et al., 2012a; Chan et al., 2012b; Stedman, 2016; Kibler et al., 2018), such an integrated approach facilitates congruent development and optimal outcomes for restoration and rehabilitation efforts and ES management (Chan et al., 2012b; Everard & Moggridge, 2012; Kudryavtsev et al., 2012; Chan et al., 2012a; Stedman, 2016; Masterson et al., 2017b; Kibler et al., 2018; Verbrugge et al., 2019). According to Verbrugge et al. (2019), ES management needs to consider new indicators in the assessment of these SES.

To bridge the gap in the socio-ecological evaluations and ES management, and because it "shares the ontology of an interconnected social and natural world" (Masterson et al., 2017a), there have been several calls for the operationalization of SoP concepts as a means to examine the subjective cultural and personal perceptions of ecosystem rehabilitation and restorations (Figure 4) (Kudryavtsev et al., 2012; M. Potschin & Haines-Young, 2013; Hausmann et al., 2016; Stedman, 2016; Masterson et al., 2017a; Kibler et al., 2018; Verbrugge et al., 2019).

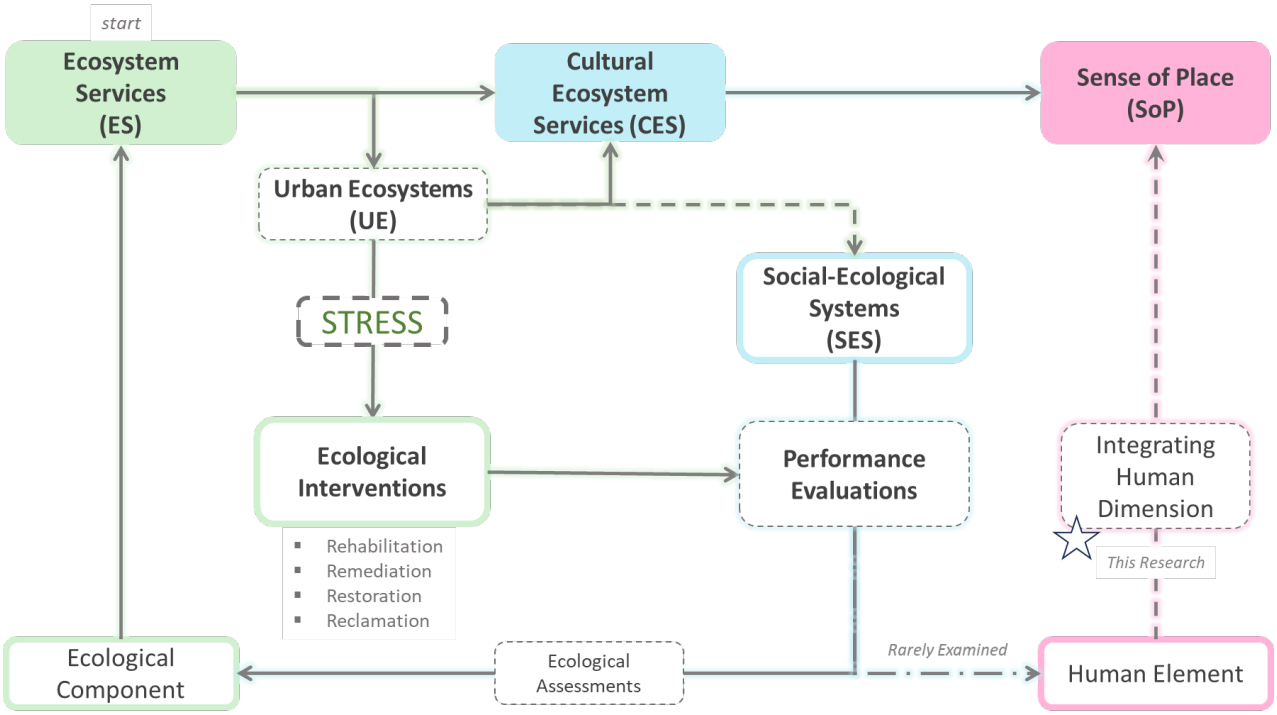


Figure 4 *Literature review roadmap.*

Kibler et al. (2018), for instance, suggested utilizing people-place relationships to gauge the inevitable impacts of ecosystem restoration on humans, particularly with regards to enhanced resilience (capacity of a system to maintain stability) and reduced vulnerability (susceptibility to harm). They highlight that including the broader community in the design, implementation, and monitoring of restorations are key factors for the potential of SoP in improving restoration processes. Moreover, they observed SoP to be a process rather than an attribute (Kibler et al., 2018), one that is based on the interaction between the environmental, biological, and human processes (i.e., individual experiences and social processes) (Hausmann et al., 2016, p. 118). This human dimension, or people's activities-in, perceptions-of, and attachments-to places, according to Stedman (2016), is the product of patterned behaviors resulting from sensory and emotional perceptions that are often based on social constructions. Therefore, as the social structures evolve, so does SoP. That is why these patterns can be examined by exploring people's perceptions (Stedman, 2016). Hausmann et al. highlight that SoP "embeds all dimensions of peoples' perceptions and interpretations of the environment" (2016, p. 117). Although these perceptions are generally subjective (Farnum et al., 2005), their experience among individuals and groups tends to overlap due to constants such as the biological basis of perception and cognition or cultural norms that are often shared among the inhabitants of a particular place (Lynch, 1981; Farnum et al., 2005). When acquired through an ecosystem, such as an urban river (or a forest, etc.), SoP is then identified as one of its CES (Farnum et al., 2005). As such, it has the potential to link the social and ecological dimensions within a single framework; thus, providing the necessary means for identifying opportunities and mitigating threats in coupled human-natural systems, as well as acquiring insights on the perceptions, preferences, and experiences associated with these places (Everard & Moggridge, 2012; Milcu et al., 2013; Lin & Lockwood, 2014; Hausmann et al., 2016).

The framework (Figure 5) demonstrates this research's contributions to theory, methodology, and practice, where CES acts as the bridge between SoP changes and UE intervention performance from a social lens. Accordingly, the presented framework expands on and operationalizes notions introduced by researchers such as Daniel et al., (2012); Khirfan (2014); Hausmann et al., (2016); Masterson et al., (2017a); Kibler et al., (2018); and Verbrugge et al., (2019). Essentially, I investigate place-image and conduct performance evaluations based on CES-related indicators and SoP variables.

To examine changes in place-image, I explore the perceptions of the selected rehabilitated UE (Wadi Hanifah in this case) before and after the rehabilitation through the indicators of reputation and popularity; visitation; uses and activities; perceptions and associations; distinctiveness; and attachment. These indicators report on SoP (or place-image) variables, which are: the physical attributes (built and natural); the activities and uses; and meanings and conceptions (both the physical and cognitive dimensions). Once the findings are obtained, a thematic analysis of the responses will be conducted based on the SoP dimensions identified through the case-study document reviews to track changes in SoP, specifically place-image.

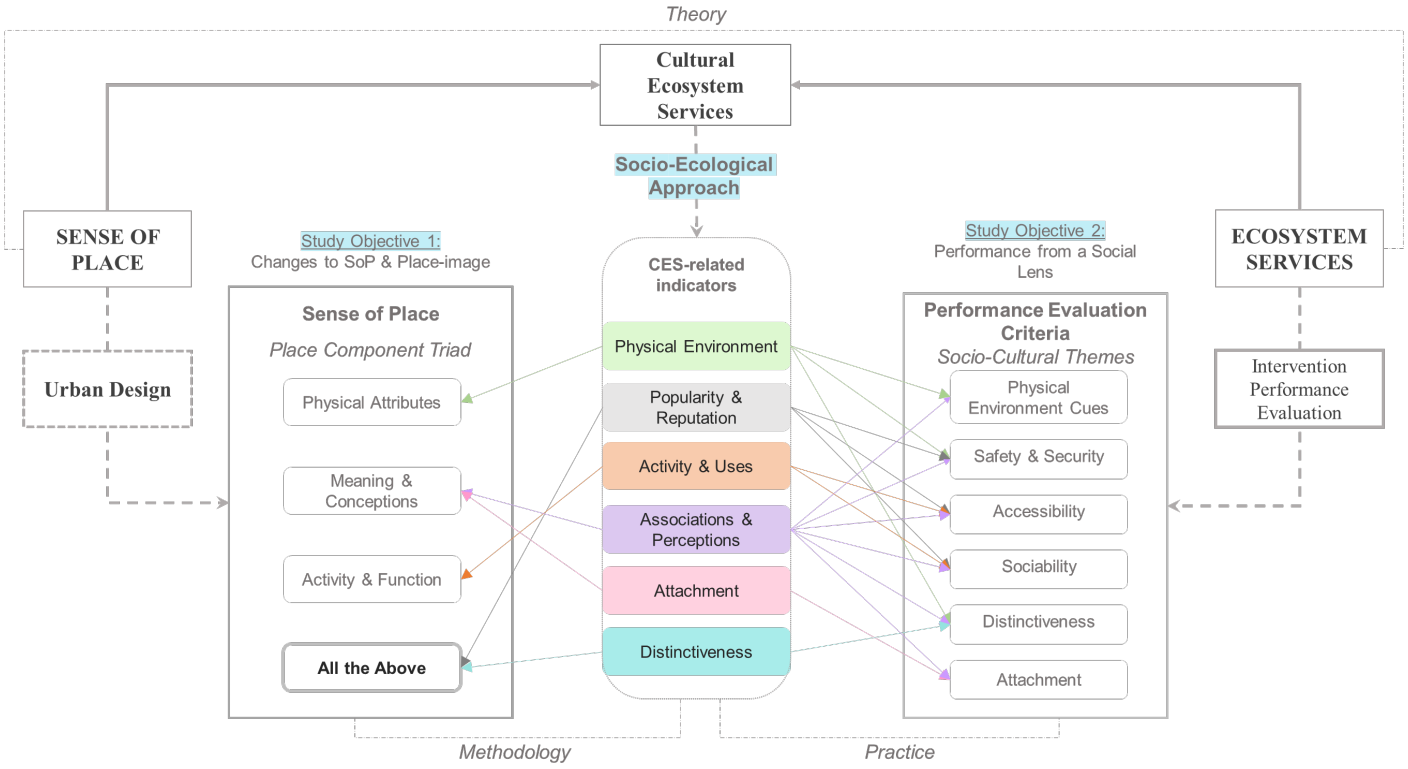


Figure 5 *The theoretical and conceptual framework (the proposed framework).*

To provide a more comprehensive examination of the destination- or place-image, the sample for this portion is divided into two categories, one with all participants included, and the other includes only the participants who knew the UE before and after the intervention. The former would provide a preliminary view into the Wadi's contemporary place-image, and the latter would demonstrate the changes to place-image post-rehabilitation.

In terms of performance, I adapted Bin Sulaiman and Almahmood's (2022) "*socio-cultural themes*" (safety and security, privacy, sociability, accessibility, and architectural cues), which is reminiscent of Lynch's (1981) performance dimensions (vitality, sense, fit, access, control, efficiency, and justice), as the evaluative criteria. However, some of these themes were modified and reiterated to better serve the purpose of this research (Figure 5). Hence, the performance of the rehabilitated UE would be examined by comparing participant feedback against the aforementioned performance criteria.

4.2 Methods

Several methods, such as surveys, interviews, and field observations are typically used for explorations and assessments similar to the one in this study (Chan et al., 2012b; Hernández-Morcillo et al., 2013; Paracchini et al., 2014; Tilliger et al., 2015; Tratalos et al., 2016; Ajwang' Ondiek et al., 2016; Zwierzchowska et al., 2018; Ko & Son, 2018; van Heel & van den Born, 2020; Khirfan et al., 2021). As is typical in similar studies, to achieve the research aims, we combined several methods to gather the data (Duggan et al., 2023): reviewing planning documents and reports related to Wadi Hanifah, online social surveys among past and current users, followed by semi-structured one-on-one interviews. In the interviews, I also included several experts involved in projects related to rehabilitation in its early stages to provide insights into the Wadi's condition and perception prior to the intervention.

To begin, I reviewed some of Wadi Hanifah's planning documents and reports provided by the RCRC, both in print and electronically through their website. The documents reviewed (Appendix E), led to an understanding of the Wadi's condition, significance, and history. They also shed light on what the goals and vision the rehabilitation was expected to deliver. This phase helped determine some of key dimensions to the Wadi's identity (i.e., history and heritage, or natural resource), which was later refined for the analysis of the Wadi's place-image. Next, based on the literature and secondary documents reviews, I designed and pre-tested an online survey in a pilot released in April 2021, through which I refined the survey's language and its Arabic translations. The survey was then officially launched through *Qualtrics* –an online survey platform for surveys, from May 2021 to December 2022. The target sample for this study included both residents and visitors of Riyadh over the age of 18. Participants were recruited through various social media platforms (including *Instagram*[2]*)* and activity groups associated with Wadi Hanifah (e.g., *Riyadh Urban Runners),* along with word of mouth.

This was followed by semi-structured one-on-one interviews where I inquired into deeper insights on participants' experiences and perceptions of the Wadi. Interview participants were recruited via a poll at the end of the survey that sought their interest in volunteering for a follow-up interview. To ensure participants' anonymity, those who volunteered (n=115) were redirected to a separate questionnaire that sought their contact information along with preliminary consent to be contacted for the purposes of the interview. However, many respondents withdrew thereafter, rendering 56 volunteers, of whom only 42 were eligible. Accordingly, these volunteers were invited in their preferred language (Arabic or English) via an e-mail invitation (Appendix C). Unfortunately, only 16 of those contacted attended the interviews. Six additional participants were recruited via direct e-mail invitations for either their experience in Architecture, Environmental Engineering, and Urban Design; involvement in parts of Wadi Hanifah's development project; or their residency near and involvement in activities within the Wadi. Thus, a total of 22 interviews were conducted and recorded via an online virtual platform (*Zoom*) throughout June 2021 to October 2022. For participants who preferred not to be recorded (four participants), a copy of the interview questions was sent to them via e-mail to respond to in writing. I then transcribed and translated the interviews from Arabic into English when necessary. Once completed, I shared with each interviewee their finalized transcript in their preferred language and offered all interviewees a chance to confirm their responses. This ensured a more accurate translation, and that intent of participant responses was captured (Appendix D).

[2] @hanifahresearchstudy

5 Findings

5.1 Survey Instrument Findings

Through exploring its physical attributes, uses and functions (activity), and meanings and conception (attachment and distinctiveness), both before and after the rehabilitation, which capture the changes in Wadi Hanifah's place-image. The following presents the survey instrument findings.

In the survey, I began with inquiries on basic demographic information, such as age, gender, nationality, and residency. The survey was accessed by a total of 195 respondents, some of whom withdrew or were disqualified for being below 18 years of age. Of the remaining 153 eligible respondents, 73% fell between the ages of 25 and 44, and just under 2% were over 65. Moreover, 78% of respondents were Saudi nationals (n=152), and 82% were residents of the region of Riyadh (n=147).

Second, I investigated popularity and reputation by asking how and when (pre- or post-rehabilitation) participants came to learn about Wadi Hanifah. The results demonstrated that only 3% have not heard of the Wadi at all (n=153). To investigate the popularity before the rehabilitation specifically, I inquired if participants knew the Wadi before 2010. This received 145 responses of whom 54% (78 respondents) knew the Wadi before its rehabilitation. The mediums contributing to the popularity and reputation of the Wadi, as indicated by the respondents (n=143), were family and friends, or word of mouth with the highest response rate (75%), education (31%), general media and 'other' means (both 11%), and the internet (10%). The remaining mediums: advertisements, travel, and tourism applications, and living in proximity to the Wadi, each rated between 3-5%; as such, they were considered secondary.

Third, I inquired about the purpose of people's visits to the Wadi (uses and activities). Of the 140 participants who responded to when they visited the Wadi, 80% had indeed visited the Wadi, while the remaining 20% have not visited at all. Of the visitors (n=122), 8% did not know when they had visited, 22% visited only before the rehabilitation; 27% visited both before and after; and 43% visited only after the rehabilitation. As for the purpose of visits (n=101), 62% selected relaxation and leisure, 50% selected family trips; 47% selected physical and outdoor activities; 37% selected visiting heritage and historic sites; 28% selected tourism; 11% indicated educational purposes; and finally, 6% indicated that work was the purpose of their visit.

Fourth, I investigated Wadi Hanifah's place-image and destination-image through inquiring about participants' perceptions of the Wadi both before (Figure 6) and after the rehabilitation (Figure 7). Which received 73 and 131 responses, respectively. I also asked respondents to rank their selected associations after the rehabilitation, where only 123 participants carried through from the selection to the ranking portion of the question (Figure 5).

Fifth, I examined the distinctiveness or uniqueness of the Wadi through a Likert scale system. Of those who responded to the related statement (n=119), 79% agreed that the Wadi is a unique and distinctive feature or place in the region; under 5% disagreed, while 16% were neutral. As part of its distinctiveness inquiry, I also asked participants if they considered the Wadi as a natural landmark both before and after the rehabilitation; each received 120 and 119 responses, respectively. Before the rehabilitation, 52% of respondents generally agreed that the Wadi is a landmark, 38% were neutral, and 11% disagreed (n=120). After the rehabilitation however, 75% of respondents agreed, while 18% were neutral, and only 7% disagreed (n=119).

Finally, I examined participants' perceived place-attachment by asking about their association of the Wadi to personal memories and experiences and if they considered the Wadi as part of their heritage. The purpose of this inquiry was to determine how participants perceive their relationship with the Wadi, and their perceived attachment to it. I asked about personal memories and experiences in two instances in the survey, wherein the first instance, the association question (n=131) where only 23% of respondents selected "personal experiences and memories". In the second instance, in the Likert scale section (n=120), 41% of respondents generally agreed to have many personal memories with family and friends in the Wadi, 29% were neutral, and 30% generally disagreed. In terms of considering the Wadi a part of their heritage (n=95), 67% of respondents generally agreed, 26% were neutral, and 6% generally disagreed.

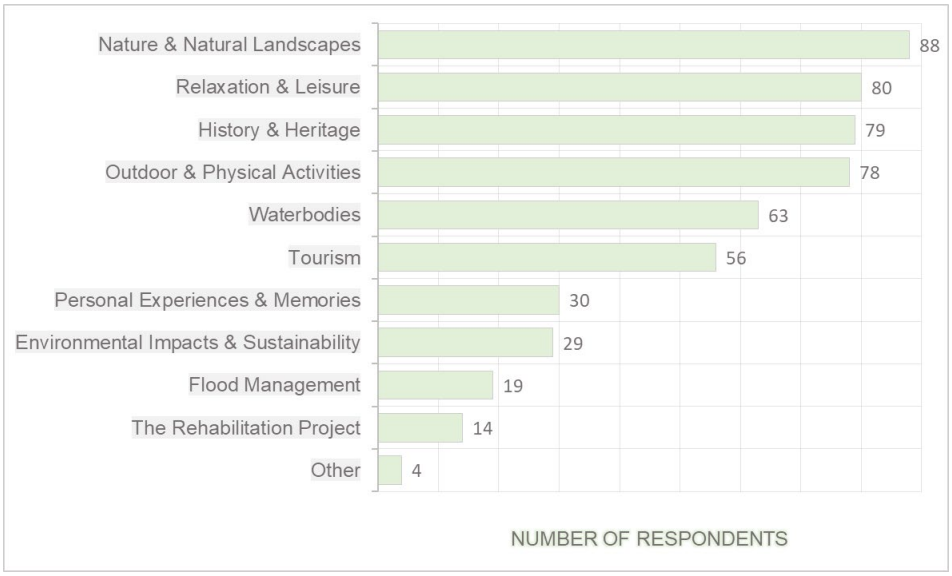


Figure 6 *Association with the Wadi before the Rehabilitation.*

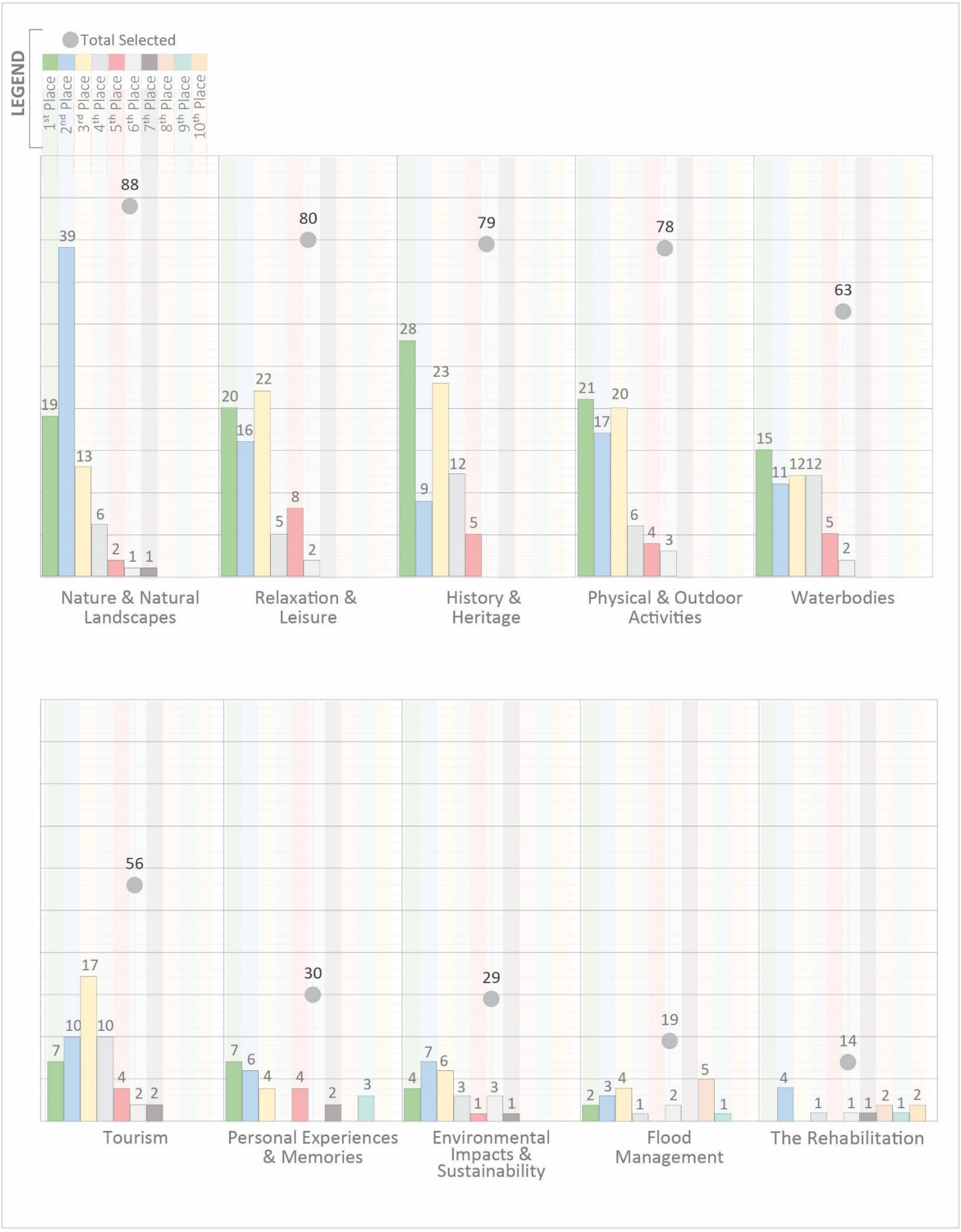


Figure 7 *Associations with the Wadi and their rankings after the Rehabilitation.*

5.2 Interview Instrument Findings

In the interviews, I explored deeper insights into participant perceptions of the Wadi and examined the rehabilitation's performance. To achieve the research aims, similar to the surveys, I used the same CES-based indicators: popularity, reputation, and visitation; physical environment; functions and uses; associations and perceptions; distinctiveness and uniqueness; and attachment, before and after the rehabilitation when possible.

In this section, I discuss first the reputation and popularity, followed by reporting on the descriptions and experiences of the Wadi before the rehabilitation first, then after. In both instances, I inquired about the physical environment first and its condition, followed by accessibility, sense of safety and security, activities and uses, distinctiveness, and at the very end, the sense of attachment or sentimentality towards the Wadi.

I began the inquiry with participant demographic information. Similar to the surveys, most participants' ages ranged between 25 and 35 years (19); and although the majority of participants were residents of the region (14), some were visitors (8). In terms of its reputation and popularity, all interview participants knew the Wadi, where 19 knew of the Wadi both before and after the rehabilitation, and three heard of it only after the rehabilitation. In terms of visitation, a total of 16 participants visited the Wadi, where two visited before the rehabilitation, eight visited post-rehabilitation, six both pre- and post-rehabilitation; and the other six never visited. It is important to highlight that some participants have indicated that they had not visited the main Wadi basin, but rather associated locations, such as Addiriyyah, Al-Bujairi, or some of the residential areas near the Wadi (2). For participants who had visited the Wadi, I provided an opportunity to expand on and relay individual experiences of and within Wadi Hanifah. Moreover, I also recruited participants who had not visited the Wadi at all, to study how the Wadi was perceived (destination-image) through indirect means or secondary sources (i.e., social media, travel applications, history books, etc.).

Overall, there were several themes and components associated with the Wadi regardless of the rehabilitation. These include the association to heritage and history (20), and the association of nature and natural landscape to the Wadi (21). For instance, when I inquired about the Wadi's physical environment (both built and natural), most participants regardless of the rehabilitation, associated the Wadi with elements of nature (21). Many also underscored the Wadi's climate being temperate and relatively cooler by at least a few degrees than the city which made it more inviting in Riyadh's hot and arid context (12).

5.2.1 Before the Rehabilitation

Before the rehabilitation, the Wadi was viewed as an abandoned area (10), a deteriorated place filled with trash and debris (6). According to a few participants (3), the Wadi before the rehabilitation "felt like a huge, disregarded opportunity" (Participant 10). The Wadi was described to have had little to no built environment (9). The little built environment that did exist was inorganized and indistinctive (4), with no "real architectural cues" (Participant 15). Most of the built structures were described as rundown old farms (7), "very old farms that were in a very bad condition." (Participant 12). Some indicated that that "there was no care or value placed on [historic and heritage structures and buildings]" (Participant 1), suggesting that the area was neglected and uncared for prior to the rehabilitation (6). This led some participants to believe that the Wadi lacked an identity (4).

In terms of safety, the Wadi was perceived to be a “relatively secluded area […] that can be dangerous” (Participant 2). There was consensus among the participants who visited the Wadi before the rehabilitation that the Wadi was an unsafe place (5). regarding accessibility, “The Wadi’s reputation was not welcoming to visitors, particularly women” (Participant 21). In general, the Wadi was perceived as “not human-friendly” or “suitable for public use” (6), and overall, not accessible before the rehabilitation (8).

Furthermore, social activities within the Wadi were limited. The association and availability of socio-cultural services with the Wadi are relatively new (11). The little activities that took place there before the rehabilitation were “inorganized or impromptu use of the open areas” (Participant 16) and limited to a specific user group (9). This was highlighted by eight participants who claimed that most visitors tended to be young males, and that “social gatherings (especially for activities like picnics) are a rarity—particularly for women” (Participant 9).

5.2.1 After the Rehabilitation

After the rehabilitation, however, the majority of participants seemed to experience and relay overall positive feedback (16): “It is safe to say that I felt welcomed, excited, calm, and joyful looking at the Wadi” (Participant 9). The Wadi and its surrounding areas have developed (14) and became organized and well-maintained (12). In its built environment, the Wadi’s rehabilitation maintained and reflected “the traditional and heritage style of Saudi” (Participant 20) and seems “to be playing into the Najdi traditional style” (Participant 15), notable for its geometric ornamentation (11). The rehabilitation, thereby its design and development guidelines, aimed to “maintain the identity through codes and regulations” (Participant 2).

According to one participant who was involved in the Wadi’s development more recently: “among the most important sections of the Wadi’s Building Codes, is to protect and maintain the Wadi’s identity and heritage in their design and development, especially in terms of materials and overall aesthetic […] around the Wadi” (Participant 1). That being said, only four participants were explicitly aware of Wadi Hanifah’s Building Codes and Development Guidelines. However, many participants experienced the results of these regulations (15).

The rehabilitation project “cleaned [the Wadi] and made it human-friendly” (Participant 10), making it suitable for public use (14). It introduced outdoor public spaces and green and blue areas in the middle of Riyadh City, which was noted as a rarity in the region (17). The increase in the sense of safety and security (6), alongside the improvement of its physical conditions transformed the Wadi, making it more accessible compared to before (19).This transformation converted the Wadi to a “social hub” or a “place for gathering” (15), and expanded the Wadi’s user-group to include people of all backgrounds, regardless of age and gender, making it more socially open (8).

Notably, there was an increase in the association of the Wadi with activities (22), where the primary purposes of visiting the Wadi were linked to recreational, physical, and outdoor activities, such as picnics, cycling, and running (15). A significant portion of the participants associated the Wadi with cycling specifically (15). The socio-cultural agenda of the rehabilitation also included a touristic programme (Environmental Management & Protection Department, 2002b). Participants concurred that the Wadi is associated with tourism or touristic activity (18); yet some suggested that the Wadi was still far from being a global touristic destination and would require more development for that scope (9). Nevertheless, the Wadi was viewed as an inviting area that catered more towards the resident population rather than a global tourist audience (9). A place for residents to change scenery: “Many people [locals and residents] are going to the Wadi as a breather” (Participant 2). Despite the varying feedback regarding the Wadi as a touristic site, only two respondents said that they did not consider the Wadi touristic at

all. Despite the varying feedback regarding the Wadi as a touristic site, the Wadi was described as place to bring visitors to, especially visitors from abroad (7): “the Wadi is an excellent place to bring visitors from abroad. It is among the most heritage-rich areas here that have been developed and its identity preserved instead of removed” (Participant 21). Interestingly, participants have also described the Wadi as a “destination” (16), a place to relax in the city (14): “This is what Wadi Hanifah represents to me, it’s a break, it’s a nice break.” (Participant 6).

There was agreement among participants regarding the uniqueness of the Wadi (20): where it was viewed as “really unique in the context of Riyadh” (Participant 4). Some also suggested that it is a pivotal feature in Riyadh, “you don’t expect it in the middle of the desert, and suddenly there’s this river of water” (Participant 5). Many also considered the Wadi a regional natural landmark (11): “I would definitely say that it is a historic/natural landmark which should be directly associated with the Kingdom’s identity” (Participant 14). The remaining three respondents that have indicated otherwise highlight that the Wadi has not yet achieved a noticeable presence for its aesthetics or nature like its equivalents abroad (e.g., Central Park in New York): “For me it does not have that iconic identity” (Participant 5). This distinctiveness is attributed to the natural landscape, activities available, or the Wadi’s heritage and history that tie it back to Saudi Arabia’s national identity.

Despite having limited knowledge of the Wadi’s history and heritage (12), the historic ties nevertheless led respondents to associate the Wadi with history and heritage (20). This sense of history has created a sense of bonding with the place as a regional feature, a form of place-attachment. When I asked participants if they felt attached or connected to the Wadi because of a sense of history or heritage, 13 responded positively: “as an Arab, I personally feel attached to the history and heritage of the Wadi” (Participant 16). Interestingly, three of those 13 have not visited the Wadi but still felt a sense of connection to what the Wadi represents in the region. Additionally, several participants expressed a sense of sentimentality towards the Wadi (8), while others conveyed a sense of nostalgia (11). This same impression was also described by five of the six participants that have not visited the Wadi, further highlighting the influence of the Wadi’s destination-image on the end-user or observer.

6 Analysis

6.1 Survey Analysis: The Wadi's Place-image and Identity

Wadi Hanifah has long provided the City of Riyadh with many ES; hence why awareness of the Wadi's roles and contributions, before the rehabilitation, were limited to just the residents of the region. As expected, there was a notable inclination of residents to have known and visited the Wadi before the rehabilitation, compared to non-residents. Seemingly, visitation has increased post-rehabilitation, regardless of residency, indicating an overall increase in popularity. Although non-resident visitors have also increased post-rehabilitation, the difference is marginal due to the limited non-resident sample. Moreover, the Wadi's popularity seemed to increase primarily through word of mouth (family and friends), and prior knowledge of the Wadi through education.

The data also indicated an increase in use and activity post-rehabilitation. It demonstrated a notable increase in recreational uses post-rehabilitation, such as physical and outdoor activities and relaxation and leisure (Figure 8), compared to the purposes of visits before the rehabilitation that were minimal and mostly focused on family trips.

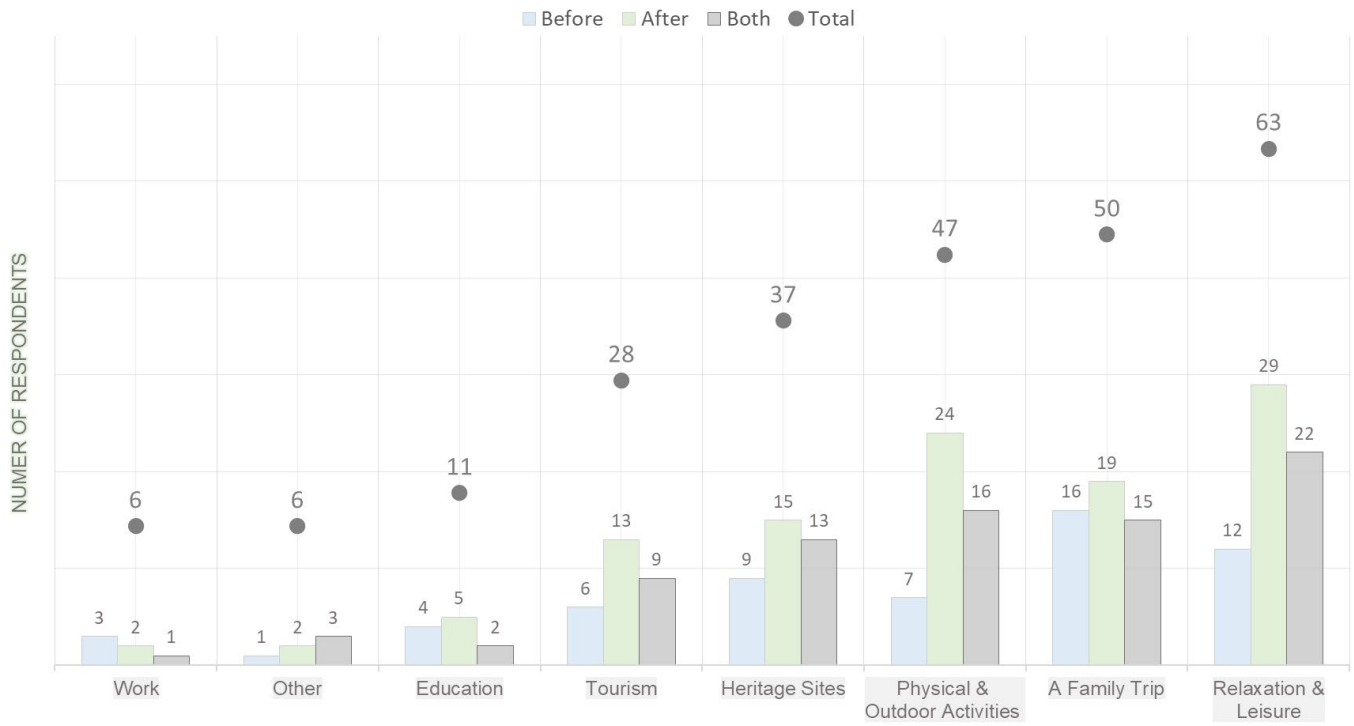


Figure 8 *Purpose of visiting the Wadi, depending on when the Wadi was visited (before or after rehabilitation).*

6.1.1The Wadi's Identity Dimensions

The case-study document reviews revealed some of the foundations of Wadi Hanifah's identity (Figure 9), which were used as a basis for the thematic analysis of the survey responses. The results rendered several overlapping dimensions that are intrinsic to Wadi Hanifah's identity: Nature, natural landscapes, and ecosystems (Nature); utility and functions (Utility); history and heritage; activities and events (Activity), personal experiences and attachment; distinctiveness; and the Rehabilitation Project itself. Moreover, the dimensions of personal experiences and distinctiveness are not dimensions of the Wadi's identity per se, but rather experiential qualities that I sought to examine as part of the performance evaluation. The Wadi's Rehabilitation Project was introduced as a dimension or component here given that the intervention itself has become an aspect of the Wadi's identity and image. Nevertheless, these are the dimensions through which I tracked the changes in the Wadi's place-image that I will expand on in the discussion section.

To extract a more accurate representation of the changes in place-image, I filtered the respondents to only include participants who knew the Wadi both before and after the rehabilitation, which rendered a total of 67 respondents (Table 1). The filtered participants' sample allowed for a more accurate comparison between the image of the Wadi before and after the rehabilitation. The unfiltered sample, however, is indicative of the contemporary place-image of the Wadi, which represents the current place- or destination-image of the Wadi.

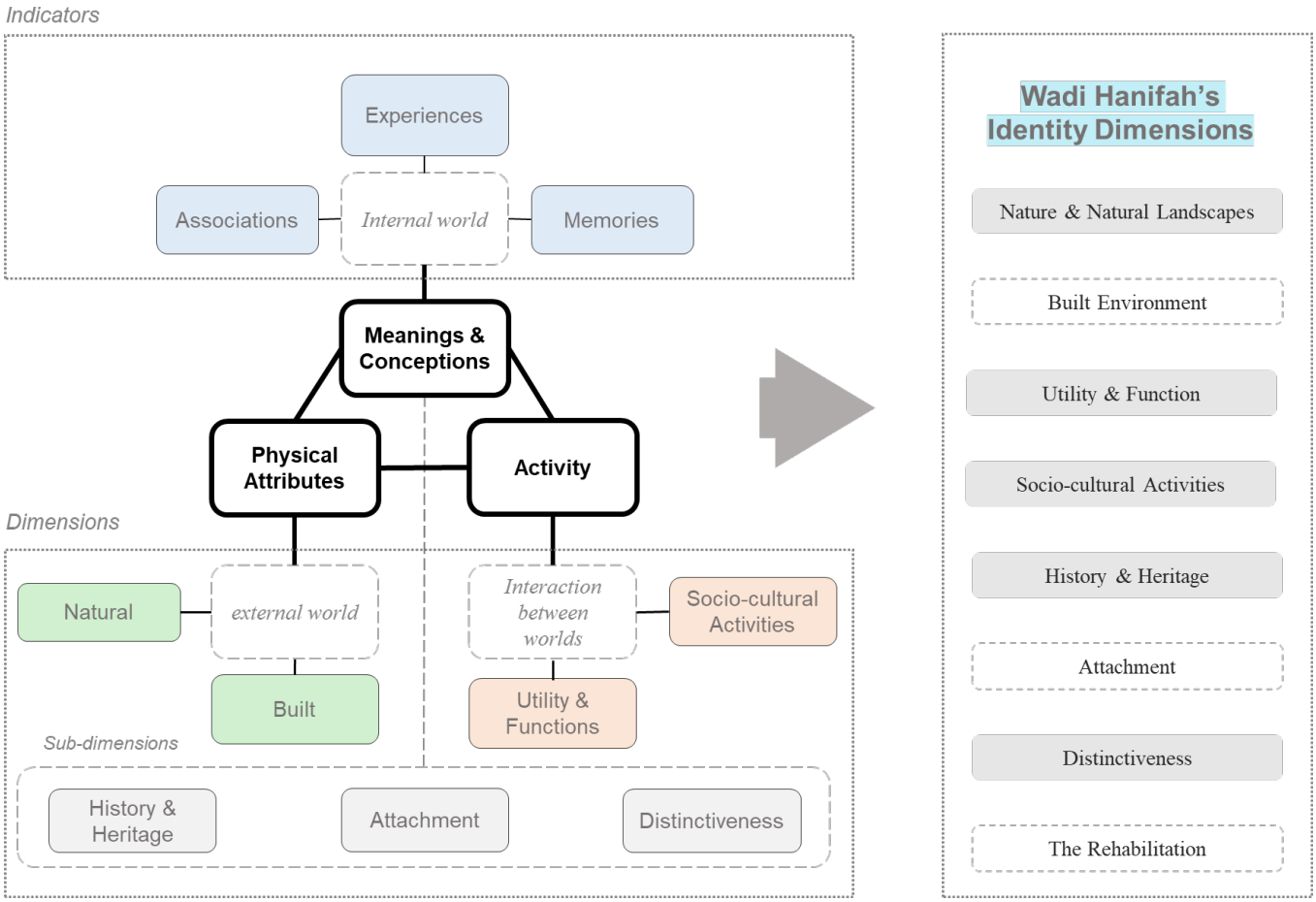


Figure 9 *The analysis of the document reviews and surveys that identify the Wadi's identity dimensions.*

6.1.2 Summary of Analysis Outcomes

The survey instrument revealed that: (1) the Wadi's popularity has increased post-rehabilitation, as tracked by the increase in the number of participants who knew of and/or visited the Wadi post- rehabilitation compared to before; (2) the Wadi's popularity and reputation has expanded primarily through the word of mouth as seen in the survey and interviews results; (3) the majority of visits today are based on recreational, physical, and outdoor activities, all of which are part of the CES the rehabilitation has introduced. These activities also happen to be among the primary associations with the Wadi today. Finally, (4) the Wadi is considered a unique regional feature in Saudi Arabia that contributes natural, historical, and heritage features.

Table 1 Wadi Hanifah's identity dimensions derived from the thematic analysis.

		Unfiltered Data		**Filtered Data**	
Place Component	**Identity Dimension**	**n=149**	**(%)**	**n=67**	**(%)**
Activity & function	Activities	133	89%	65	97%
Physical Attributes	Nature	131	88%	65	97%
All*	History & Heritage	119	80%	59	88%
All*	The Rehabilitation	125	84%	55	82%
Meanings & Conceptions	Personal Experiences & Attachment	84	56%	55	82%
Lynch's 'Sense' + All*	Distinctiveness	110	74%	54	81%
Activity & Function	Utility	107	72%	51	76%
	Arranged from most to least in the Filtered Data column.				

6.2 Interview Analysis: The Wadi's Performance from a Social Lens

In terms of performance, the findings generally reflected positively against the evaluation criteria (Table 2). The six socio-cultural themes of the evaluation all showed an increase post-rehabilitation. That being said, some themes experienced a greater increase than others. For instance, noting the increase of safety and security at the Wadi was limited to participants who had prior knowledge of the Wadi before the rehabilitation.

Overall, perceptions of the Wadi before the rehabilitation leaned towards a negative overview of the wetland (6), which changed for many participants post-rehabilitation, where they described the Wadi positively (11). After the rehabilitation, the Wadi was identified as a safe, sociable, accessible, and unique place by many participants, particularly those who could compare it to before the rehabilitation (Table 2).

The sense of safety and security that has increased post-rehabilitation also encouraged visitation and increased the Wadi's popularity as a local destination. Furthermore, it was noted that there was care towards the built environment where their design and aesthetic reflected the local traditional style. This was especially reflective of the notable impacts of Wadi Hanifah's Building Codes. All together, these observations respond to the goals set by the Wadi's Building Codes, indicating a degree of congruence between the intention or theory and practice of these codes. It also demonstrates congruence with the plans and socio-cultural ES (i.e., public green spaces) that the WHCDP had intended.

The results suggest that the rehabilitation was successful in many ways in terms of delivering its objectives. However, as per the participants' feedback, the Wadi has room for improvement. Some participants relayed comments and constructive feedback to consider in the continued development and improvement of Wadi Hanifah, particularly for its CES delivery. For instance, several participants described the Wadi as crowded (7), which suggest the need for more areas like the Wadi in the region. Another notable comment pertained to the lack of safe bike lanes (4), where some participants describe biking on the main street at the Wadi to be a highly dangerous endeavor (Participant 15). Although many facilities and services (i.e., restrooms and prayer areas) were introduced post-rehabilitation (11), a few described these facilities to be "limited" and hard to find if one did not know them (3), suggesting that they would require improvement in their legibility and access. Moreover, for its touristic agenda, the majority of respondents indicated that the Wadi has touristic potential (18), but it would still require some refinement to match that scope (9).

Despite these comments and concerns, the rehabilitation has indeed improved the Wadi's conditions and introduced public green spaces, something that was in dearth up to that point. Even though the Wadi was not particularly viewed as a traditional park, it was referred to as a natural site with waterbodies that tended to be inviting for residents.

Table 2 Wadi Hanifah's performance from a social lens against the identified socio-cultural themes.

Evaluation Criteria	Respondents n= 22	(%)	Graphic scale
Access			
Safe & Secure	6	27%	
Accessible	18	82%	
Sociable	15	68%	
Built Environment			
Traditional Architectural Aesthetics	12	55%	
Personal Experiences			
Attachment	10	45%	
Distinctiveness	21	95%	
The Rehabilitation			
Wadi is Cared-for	11	50%	

7 Discussion

Exploring the Impacts of the Rehabilitation on Wadi Hanifah

One of the purposes of this study was to identify the foundations of Wadi Hanifah's identity, then explore the changes to its place-image specifically post-rehabilitation—as it would be indicative of its performance and congruence with its development plans (the WHCDP). The distinction between place-image and identity, as indicated in the literature review, suggests that an image is a subjective instance or perception of identity, while identity is the objective reality of the components that define a place, regardless of whether or not those aspects are typically perceived (Alexander, 1979; Montgomery, 1998). In a sense, the Wadi's image is the experience of aspects of the Wadi's identity that can be influenced by socio-cultural and economic aspects (Bolund & Hunhammar, 1999; Everard & Moggridge, 2012; Kati & Jari, 2016; Al-Obaid et al., 2017; Verbrugge et al., 2019; Duggan et al., 2023). To understand the change in the perceptions of the Wadi (its place- or destination-image), it is important to deconstruct the Wadi's identity to its constituents: the physical environment, activity, and meanings and conceptions (components of place triad) (Figure 10).

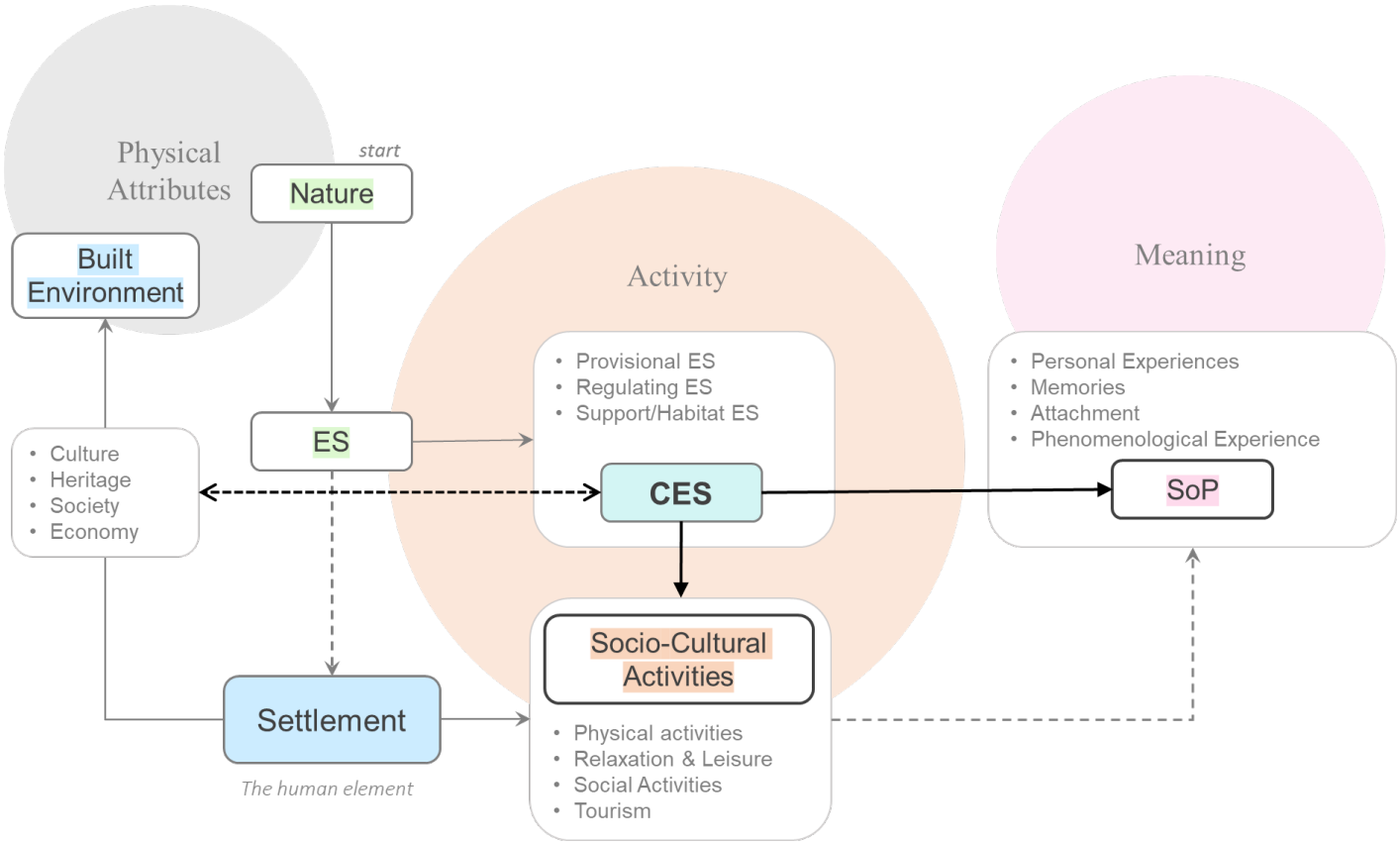


Figure 10 *The structure and Chronological Development of the Wadi's Identity*

The Wadi in a physical sense, before it became anything else, was an ecosystem (nature). It provided many vital ecological functions (i.e., habitat for flora and fauna) and resources for human sustenance (i.e., water source, agriculture, flood management)—utility that led to the development of settlements along its banks. The human element introduced by settlements entailed socio-cultural activity, a built environment (urban form and architecture), and an economy (activity). Collectively, these aspects give the Wadi a sense of heritage and history and contribute to its cultural value that contribute to individuals' meanings and conceptions of the Wadi, including personal experiences and attachment. This analysis illustrates a simplified representation of the Wadi's identity development chronologically (Figure 10). However, the relationship between these elements is more complex and interdependent than indicated here. For instance, as the physical attributes are refined and activities are introduced or changed, the meanings and perceptions are also impacted, thus impacting the overall SoP. This is also the case of the Wadi, where the Rehabilitation Project transformed the Wadi in its activities and physical environment, thus altering its place-image and identity.

The data analysis also demonstrated that the image of the Wadi transitioned from its initial and primarily utilitarian (provisioning) ES before the rehabilitation, to one that provided the opportunity for social and cultural activities (CES) (Figure 11, A). As demonstrated in Figure 11, the dimension of utility was recognized more noticeably by participants who visited the Wadi before the rehabilitation. This is because the Wadi, before the rehabilitation, delivered primarily provisional and regulating ES functions. Although some activities existed prior to the rehabilitation, personal visits to the Wadi, such as with family or friends, were impromptu and not designed as part of the Wadi's services (Participant 16). Consequently, activities were barely recognized prior to the rehabilitation.



Figure 11 *Place-Image before and after the Rehabilitation.*

After the rehabilitation, the data revealed a spike in the association of activities to the Wadi, conversely, utility was not recognized as frequently. This transformation is predominantly attributed to the socio-cultural agenda introduced by the Rehabilitation Project that invited visitors, some of whom did not know the Wadi prior to its rehabilitation. Since visitation increased post-rehabilitation, the perceptions of many of the respondents reflected the image of the Wadi then. Hence why utility and functions are not as noticeably reflected in its contemporary place-image. This is not to say that the Wadi lost its provisional capacity, only that they are not always experienced by end-users. Despite its marginal perception in the Wadi's place-image, as long as the Wadi continues to provide certain functions (i.e., water filtration, flood management, or agriculture), utility and function will continue to be a primary pillar of its being, whether or not people acknowledge it as such. Furthermore, the rehabilitation and its contributions (i.e., activities, parks, trails etc.) were not intrinsic aspects of the Wadi's initial identity, however, they became intrinsic through their impacts on the perception and experience of the Wadi, and the inevitable impacts on its identity.

However, utility and activities are not the only dimensions to experience changes, though they express the most drastic alterations. The perception of the Wadi as an ecosystem, a natural landscape, or a natural resource (all under the umbrella of Nature) has increased post-rehabilitation as a direct influence of the rehabilitation. Because the filtered sample is constituted by participants who knew the Wadi in both instances (before and after the rehabilitation), the increase the association of nature to the Wadi demonstrate the changes in the respondents' before and after the rehabilitation. In other words, it is demonstrative of the impacts of the rehabilitation on the physical and natural environment. As such, it is also as an indicator for the rehabilitation's performance.

Similar to Nature, the perception of history and heritage has increased post-rehabilitation. This can be attributed to two factors: the Wadi's built environment that aimed to restore and emulate the traditional Najdi architectural style vis-à-vis the Wadi's Building Codes (Bin Sulaiman & Almahmood, 2022), and the transformation of heritage zones and old villages, such as Addiriyyah to a heritage site that's teaming with events and activities vis-à-vis the '*Diriyah Gate'* Project (High Commission for the Development of Arriyadh, 2015b). Although many respondents did not have deeper knowledge to the historic value of the Wadi, they nevertheless, associate it with the Wadi. This is indicative of the Wadi's performance, particularly its built environment and architectural cues.

Finally, distinctiveness. Interestingly, the Wadi was perceived to be distinctive both before and after the rehabilitation, suggesting that the Wadi is a unique and distinctive feature regardless of the rehabilitation. The Wadi's contemporary place-image demonstrates a strong focus on activities, followed by nature, history and heritage, then utility. Unanimously between the interviews and survey results, the data indicated that participants who had never visited the Wadi seemed to reflect similar place-image associations, namely the association with recreational activities, to nature, and to the historical components. Collectively, these changes are indicative of the influence of the Rehabilitation on the Wadi's place-image.

8 Manuscript Conclusion

8.1 Study Constraints

Typical of many countries in the Middle East, the documentation of the Wadi's ecological conditions and historical functions is limited, if not lacking (Samhouri, 2010). Additionally, many existing documents related to the Wadi followed an advertisement format that focuses on a very specific agenda. Previous studies also faced similar obstacles (Moosavi, 2016, p. 58). Another notable limitation pertained to the respondents. Most of the respondents were between 25 and 44 years of age, this could mean that that specific age-group are the primary users of the Wadi; or that this age group is the one more likely to have access to the online survey compared to an older cohort. Finally, during the data-collection phase of this study, COVID-19 mandates limited physical access to the Wadi and direct contact with our interview participants. Consequently, this study was carried out on online platforms instead of the initial plan to conduct activity maps and on-site observations. Finally, this study was limited by the absence of historic records and data regarding the Wadi's identity and image before the rehabilitation, as such, the data relied heavily on participant recollection of the Wadi prior to the intervention to build the image of the Wadi before the rehabilitation.

8.2 Conclusion

The quality, resilience, and performance of rehabilitated UE rely on the complex interdependencies between the ecological and the human dimensions. As such, it is essential to integrate the human dimension in UE rehabilitation performance evaluations. The proposed framework is one that incorporates the human dimension through operationalizing SoP concepts, as suggested by several scholars, and demonstrated in Wadi Hanifah's case-study. The research rendered several outcomes, it: (1) identified the primary pillars of Wadi Hanifah's identity and, thereby, its place-image; (2) tracked the changes in the Wadi's place-image pre- and post-rehabilitation; and finally, (3) examined the Wadi's rehabilitation performance from a socio-cultural lens through socio-cultural themes indicated previously. Altogether, the findings contribute the first iteration of Wadi Hanifah's Rehabilitation performance evaluation from a social lens.

As seen in Wadi Hanifah, when a disturbance occurs to an ecosystem (e.g., urban river), whether natural (i.e., flooding or storm) or human (i.e., demolition), it affects its physical form (i.e., removing trees or flooding), the symbolic meanings associated with it, and the potential activities therein. These changes inevitably impact how people perceive and interact with these places, thus affecting their SoP. This "transactional view of settings" emphasizes the interdependence between people and places where people create, modify, and attribute meanings to places as well as derive meanings from them (Stokols & Shumaker, 1981; Hauge, 2007; Kudryavtsev et al., 2012; Lin & Lockwood, 2014). People-place bonds are essential for congruent design. Congruence here refers to the relationship between the spatial structures (i.e., physical attributes) and their non-spatial concepts (i.e., meanings, conceptions, and experiences) (Lynch, 1981). As such, congruence is a primary component in the continuity of place and the development of place-attachment (Alexander, 1979; Lin & Lockwood, 2014; Verbrugge et al., 2019). Therefore, approaching ecosystem assessments from a place-based perspective can help clarify local contexts, preferences, values, and priorities, leading to more congruent outcomes (Lin & Lockwood, 2014; Masterson et al., 2017a).

The analysis determined several overlapping dimensions that constitute the foundations of the Wadi's identity and place-image (Nature, activities, utility, history and heritage, personal experiences and attachment, and the rehabilitation itself). The most notable shift in the Wadi's place-image is seen in the transition from a function-focused perception of the Wadi before the rehabilitation, to one based on its CES after. Where after the rehabilitation, the Wadi provided a plethora of social and cultural services and activities, including the provision of green and blue spaces that encouraged socio-cultural activities (i.e., recreation, leisure, physical activities, tourism etc.). This shift highlighted the impacts of the rehabilitation on the Wadi's SoP. The rehabilitation had influenced most of the Wadi's identity dimensions through changes in its physical environment, activities and functions, and the meanings and conceptions of the general public, thus leading to the transformations seen in its contemporary place-image.

Not surprisingly, the majority of the Wadi's visitors were residents of the region, indicating a more local audience rather than a touristic one. Despite some of the concerns and comments raised by some of the participants, (e.g., bike lanes), the rehabilitation's overall performance garnered positive feedback from the respondents and reflected positively against the evaluation criteria. The predominant impression was that the rehabilitation has improved the Wadi and allowed it to be used by a larger audience than before, making it safer, more accessible, and sociable. Unanimously, both interviews and survey underscore that the Wadi is a unique and distinctive feature in Riyadh, one that provides rare commodities to the region, and is generally unexpected in the region.

This study, the first of its kind in the context of Saudi Arabia, represents the first iteration of a socio-cultural feedback for Wadi Hanifah's rehabilitation. All things considered, the results suggest that current design and development guidelines are slowly achieving their goals. To maintain this progress and further improve congruence between the goals, intentions, and vision of the WHCDP, regular socio-cultural assessments should be conducted for performance monitoring. Such evaluations could then be used as part of an iterative pragmatic process to improve the Wadi's performance and the development and refinement of its current design and development guidelines (Inam, 2014). Future iterations of this study could consider different methods, such as community charrettes, focus groups, on-site interviews, and field observations, to study how people interact and operate in the Wadi. Regarding theory and methodology, the value of this study lies in the proposed conceptual framework operationalizing SoP and CES as tools to examine changes in SoP and the performance of rehabilitated UE. On the practical front, the study contributed to the evaluation of Wadi Hanifah's performance, whereby any knowledge collected here can be used for future iterations of this study, but also other similar projects or interventions.

9 The Survey Dataset

The following dataset concerns the study's online survey, released May 2021- October 2022. The survey was accessed by 195 respondents, of whom 29 abandoned, three did not consent to participate, and eight withdrew. This left a total of 155 consenting and continuing participants. To be eligible to participate, respondents had to be over 18 years of age and needed to have at least heard about Wadi Hanifah. Two participants indicated they were below 18 years of age, as such, they were disqualified from participation. Moreover, four indicated they have not heard of Wadi Hanifah, rendering the remainder 149 eligible participants.

Age & Gender (Questions 1 & 2)

As previously indicated, two participants were below 18 years of age (1%). Furthermore, 18 participants (11%) were below 24 years of age. The majority of participants, however, mainly ranged between 25 and 44 years of age, constituting 73% of all the respondents. The data also indicated that 25 participants were over 45 years, of whom only three were aged 65 and over (2%) (Figure 12). Out of the 153 continuing respondents, only 61 answered Question 2, indicating their gender, with 31 males and 30 females.

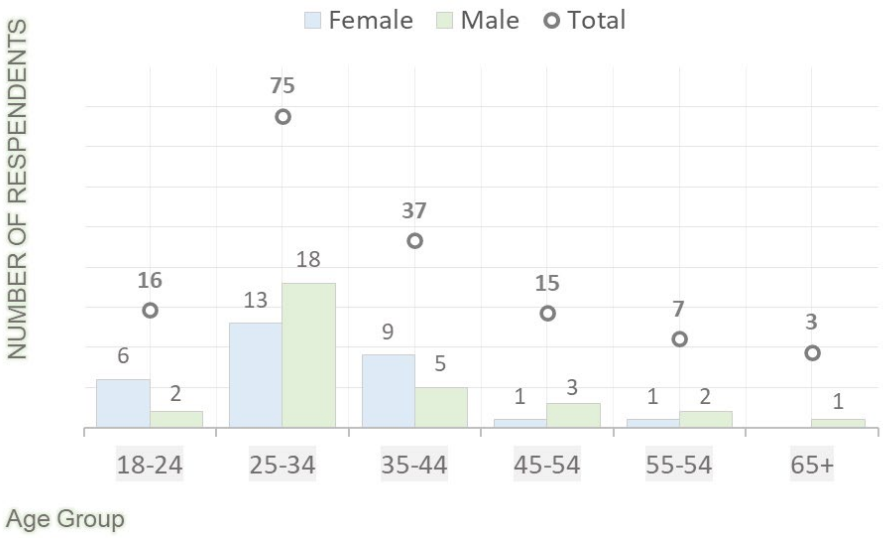


Figure 12 *Age and gender distribution.*

Nationality, Residency, and Riyadh Visitors (Questions 3,5,6, & 7)

Of the 153 eligible respondents, 152 answered the nationality question (Question 3). The majority of participants were Saudi Arabian (78%). Only 33 indicated all other nationalities, 24 of whom indicated their specific nationalities (Figure 13). Of the 147 participants who responded to the question of residency (Question 5), 121 (82%) indicated they were residents and 26 (18%) non-residents (Figure 14). Of the non-residents, 20 were visitors, and four had not visited the region of Riyadh. Of those 20 non-residents who visited the region (Question 6), 23 have indicated the reasons for their visits to the region (Question 7). Where 11 (48%) indicated their reason for visiting the region to be for family; seven (30%) indicated visiting the region temporarily for work; six (26%) for tourism and leisure; three (13%) for employment; and two (9%) for education. Furthermore, four respondents indicated 'other' reasons, and another two preferred not to answer (Figure 15).

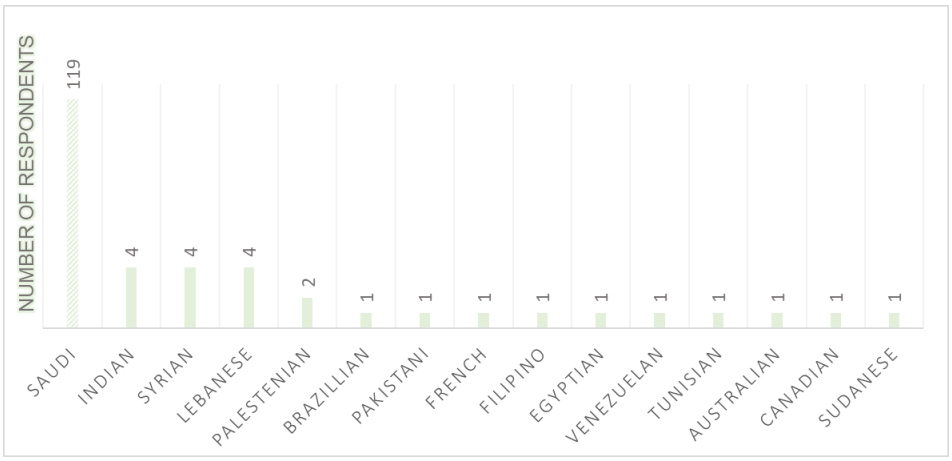


Figure 13 *Nationality distribution.*

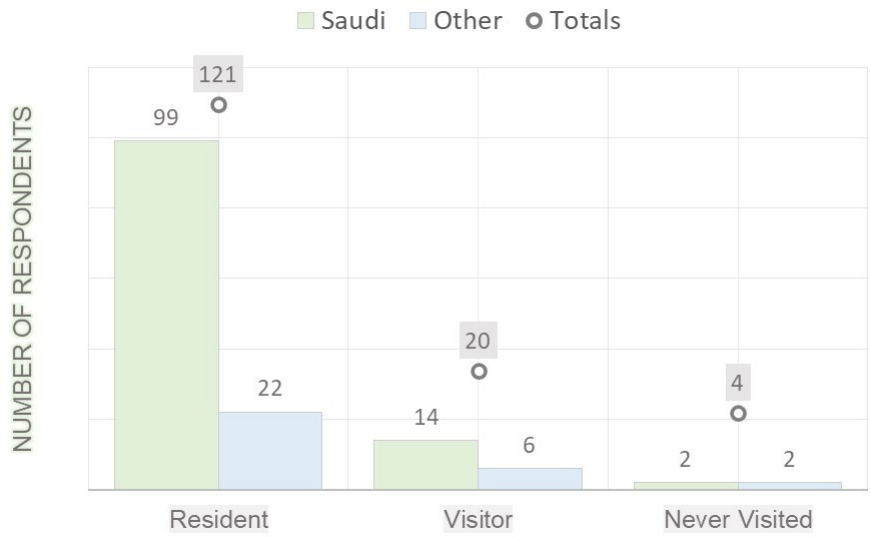


Figure 14 *Nationality distribution among residents and visitors of the Region of Riyadh.*

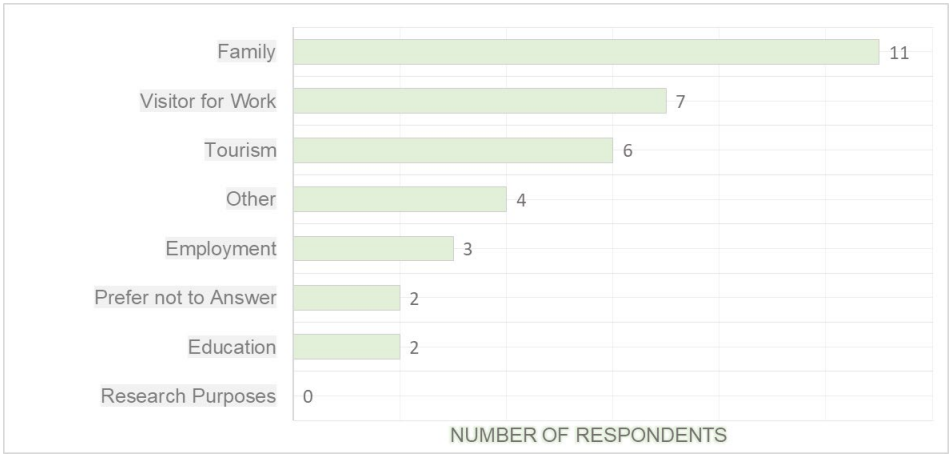


Figure 15 *Reasons of visiting the Region of Riyadh (for non-residents).*

The Wadi's Reputation & Popularity (Questions 4,8,9, &11)

Of the 149 participants that heard of the Wadi (Question 4), 143 indicated how they heard of it (Question 8). Word of mouth was the primary mode to hear of the Wadi (family & friends) for 75% of respondents, and 31% heard about the Wadi through school and education. Other modes and the media each were selected by 11% of participants10% learned about the Wadi through the internet, 5% lived near the Wadi, 4% learned of it through travel and tourism applications, such as TripAdvisor, and 3% learned about the Wadi through advertising means such pamphlets, flyers, and posters (Figure 16).

Moreover, 145 respondents responded to the question inquiring about the Wadi's reputation and popularity before the rehabilitation (Question 9). Of these respondents, 78 (54%) said they had heard of the Wadi before rehabilitation, and 67 (46%) indicated otherwise. When asked when they visited the Wadi (Question 11), a total of 140 participants responded, 25 of whom (22%) indicated they had visited only before the rehabilitation; 48 (43%) said they visited after the rehabilitation only; 30 (27%) visited both before and after the rehabilitation; and 28 (25%) said they had never visited; while 9 (8%) did not know when they visited (Figure 17).

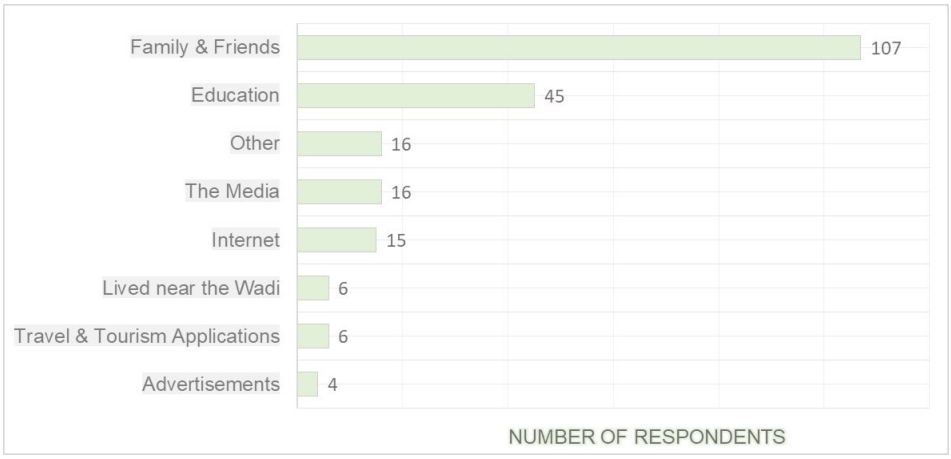


Figure 16 *The modes and mediums through which participants became aware of Wadi Hanifah.*

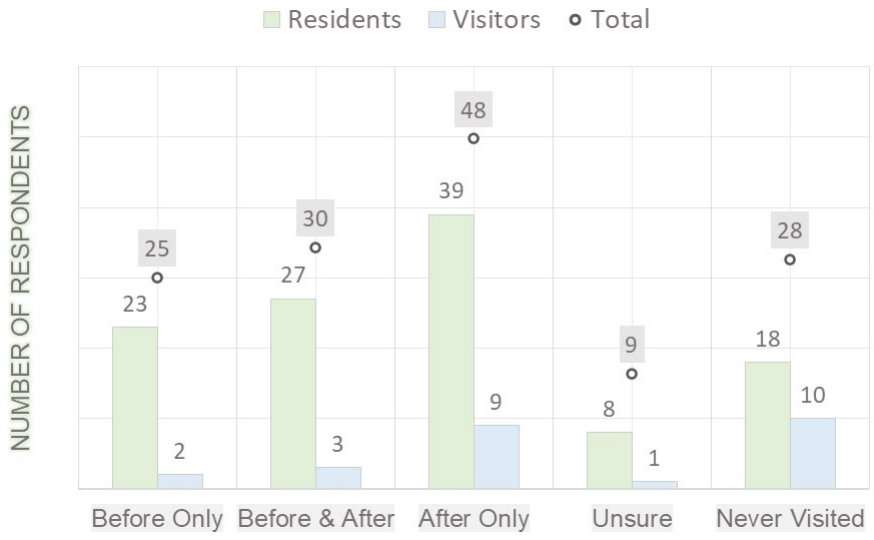


Figure 17 Data distribution of when participants had visited the Wadi (before or after the Rehabilitation).

Uses and Activities (Question 12 & 13)

When asked about the purpose of their visits (Question 12), of the 112 who visited the Wadi, 101 responded to the question, where 62% selected relaxation and leisure; 50% selected family trips, 47% physical activities; 37% visiting heritage and history sites; 28% tourism; 11% educational and research purposes, and 6% for work (Figure 18). Question 13 was aimed towards participants who had not visited the Wadi at all, inquiring what could be the potential reason for their visit; however, Question 13 received no responses.



Figure 18 *Purpose of Wadi visits, depending on when participants visited the Wadi.*

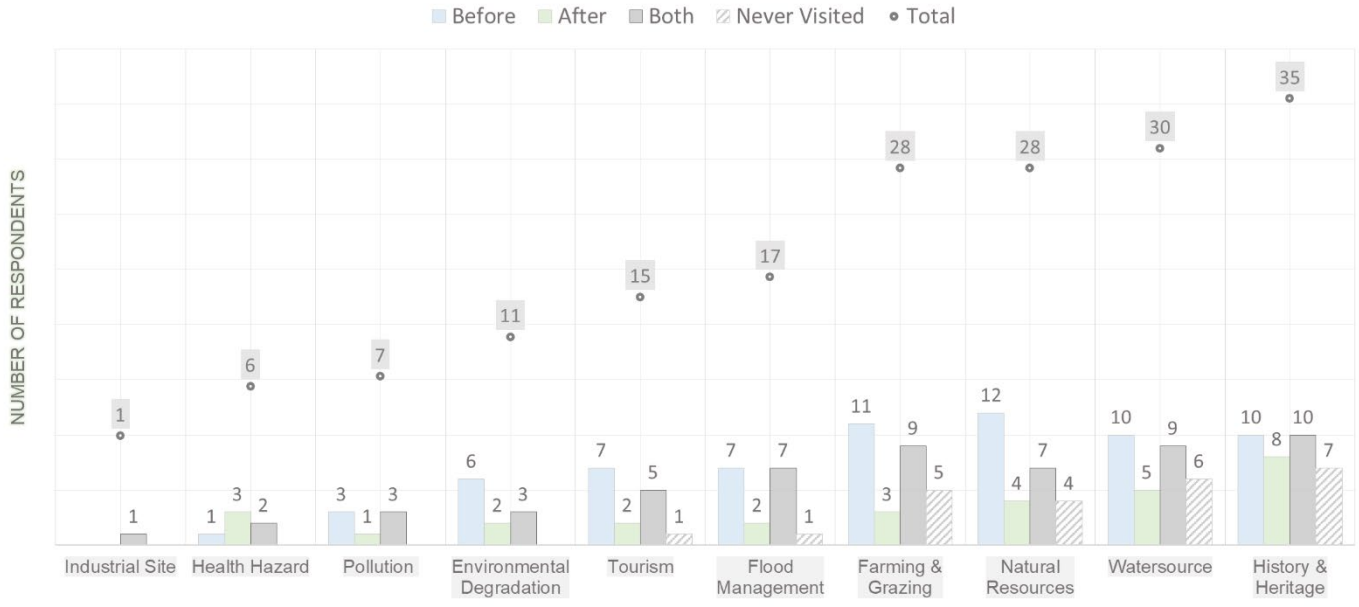


Figure 19 *Terms/Statements associated with the Wadi before the Rehabilitation, depending on when participants visited.*

Association Before the Rehabilitation (Question 10)

When asked about what they associated with the Wadi before its rehabilitation (Question 10), only 73 participants responded (Table 3A, Figure 19). Some of these respondents have not visited the Wadi before the rehabilitation at all, which would demonstrate the perceptions and destination-image of the Wadi (Figure 19). The results from these responses illustrate how associations before the rehabilitation were not always built on direct or personal experiences.

Association After the Rehabilitation (Question 14)

When asked about what they associated with the Wadi after its rehabilitation, 131 participants responded (Figure 20, Table 3B), and 123 continued to rank their selections (Table 4).

Table 3 Statements and terms associated with Wadi Hanifah before and after the Rehabilitation.

	Respondents	
(A) Associations Before the Rehabilitation	**n = 73**	**(%)**
History & Heritage	35	48%
Water source	30	41%
Farming & Grazing	28	38%
Natural Resources	28	38%
Flood Management	17	23%
Tourism	15	21%
Environmental Degradation	11	15%
Pollution (water, air, sound, etc.)	7	10%
Health Hazard	6	8%
Industrial Site	1	1%
Other	3	4%
(B) Associations After the Rehabilitation	**n = 131**	**(%)**
Nature & Natural Landscapes	88	67%
Relaxation & Leisure	80	61%
History & Heritage	79	60%
Physical & Outdoor Activities	78	59%
Waterbodies (lakes, streams, & dams)	63	48%
Tourism	56	43%
Personal Experiences & Memories of the Wadi	30	23%
Environmental Impacts & Sustainability	29	22%
Flood Management	19	15%
Bioremediation & the Wadi's Rehabilitation Project	14	11%
Other	4	5%

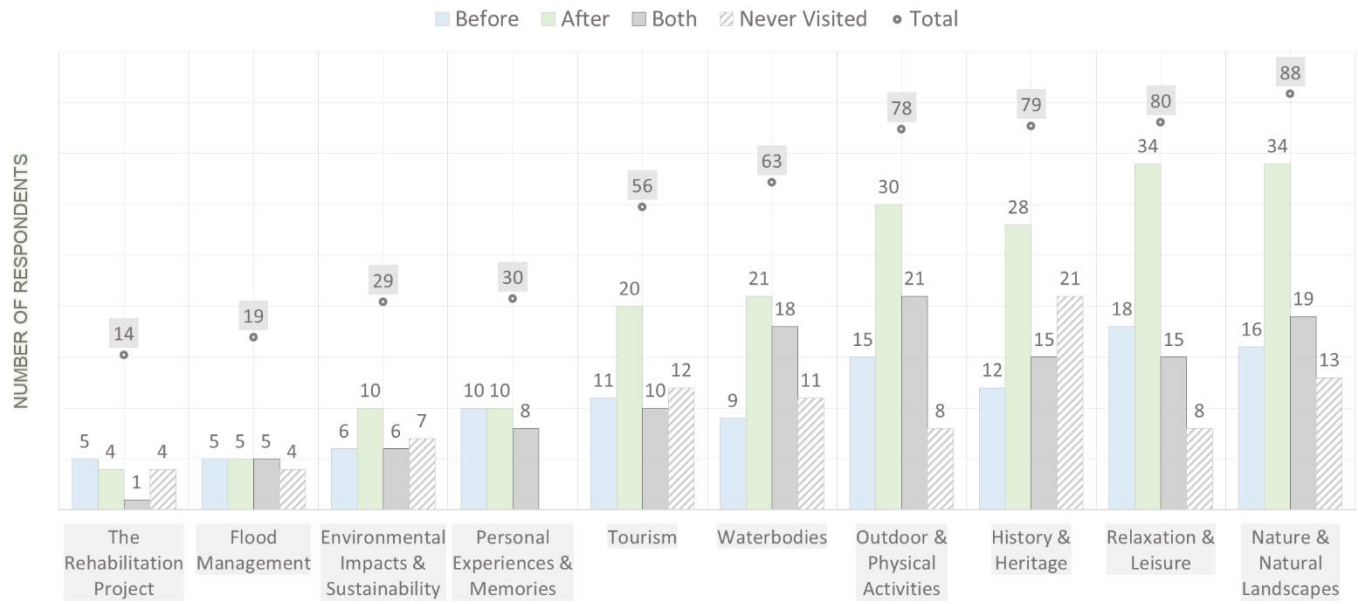


Figure 20 *Statements and terms associated with the Wadi after the Rehabilitation, depending on when participants visited the Wadi (before or after the Rehabilitation).*

Table 4 The rankings of the statements associated with Wadi Hanifah after the Rehabilitation

	Ranking									
Association	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th
Nature & Natural Landscapes	19	39	13	6	2	1	1	0	0	0
History & Heritage	28	9	23	12	5	0	0	0	0	0
Physical & Outdoor Activities	21	17	20	6	4	3	0	0	0	0
Relaxation & Leisure	20	16	22	5	8	2	0	0	0	0
Tourism	7	10	17	10	4	2	2	0	0	0
Waterbodies (lakes, streams, & dams)	15	11	12	12	5	2	3	0	0	0
Environmental impacts & Sustainability	4	7	6	3	1	3	1	0	0	0
My Personal experiences & Memories	7	6	4	0	4	0	2	0	3	0
Flood Management	2	3	4	1	0	2	0	5	1	0
Bioremediation and the Wadi's Rehabilitation Project	0	4	0	1	0	1	1	2	1	2
Other	0	1	2	0	0	0	0	0	0	0

The following table demonstrates the ranks (1st place, 2nd, etc.) of each of the associated statements, where the numbers represent the number of participants selecting each statement-rank.

Likert Scale (Question 15)

Finally, the last portion of the survey is a Likert Scale section that inquired about associations, use, attachment, and the Wadi's uniqueness. Below is the list of statements (Table 5), followed by the results (Figure 21).

Table 5 *Statements of the Likert Scale Section (Question 15)*

#	Statements
1	I consider the Wadi to be a part of my heritage.
2	I consider the Wadi today as a unique and distinctive place in the region.
3	The Wadi, after its rehabilitation, provided many opportunities for social, touristic, and recreational activities that were not available before.
4	The Wadi generally has significant heritage and historic values in the region.
5	The rehabilitation strengthened the image and association of heritage and history to the Wadi.
6	I have many personal memories with family and/or friends in the Wadi.
7	I relate the Wadi, after the rehabilitation, to positive environmental impacts.
8	I relate the Wadi's rehabilitation to the improvement of the Region of Riyadh's development approach.
9	I consider the Wadi now to be a major natural landmark for the region.
10	The architecture and built structures in the Wadi (gates, walls, etc.) to be reflective of the region's traditional architectural style.
11	The architecture in the Wadi is reflective of the Wadi's heritage and cultural style.
12	The rehabilitation strengthened the image and association of grazing, agriculture, and farming to the Wadi.
13	The Wadi provides an opportunity to explore and connect with nature.
14	I relate the Wadi, before its rehabilitation, to negative environmental impacts.
15	I consider the Wadi, before its rehabilitation, as a major natural landmark for the region.
16	I think that the Wadi, before its rehabilitation, provided limited social, touristic, and recreational activities.
17	I think that the Wadi, before its rehabilitation, was a health hazard.

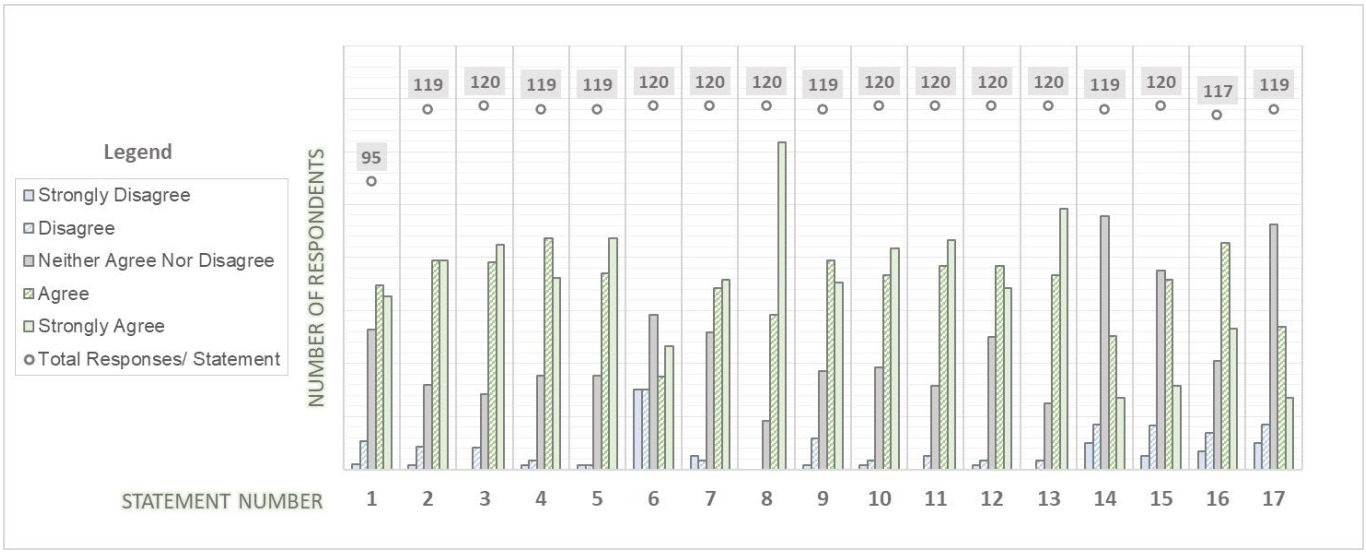


Figure 21 Likert Scale results (Question 15).

10 Synthesis

One of the prominent challenges of contemporary rehabilitation and ES management is to integrate the human element as part of its performance evaluation. The current study attempted to reduce that gap and provide a framework that integrates aspects of the human element in the performance of rehabilitated UE and ES management, namely through SoP concepts and CES-related indicators, as demonstrated through Wadi Hanifah's case-study.

The study revealed that Wadi Hanifah's identity is based on several foundations or pillars: nature and natural landscapes; activities and uses; utility and functions; history and heritage; personal attachment and experiences; and finally, the rehabilitation itself as a new addition. The analysis indicated a clear shift from a function-focused perception of the Wadi before the rehabilitation to one that is based on socio-cultural activities (CES). This suggests that the rehabilitation has indeed impacted the Wadi on the socio-cultural front. The introduction of green and blue spaces that residents and visitors can enjoy for recreational and touristic purposes, personal leisure, and physical activities were lacking in the region prior to the rehabilitation. Participants have consistently associated many outdoor and physical activities with the Wadi and, in some cases, cultural or heritage-related activities demonstrative of the local Islamic culture, like a Ramadan tent, or Eid celebration areas. This transition demonstrates how the rehabilitation's socio-cultural programs have indeed reached the general public and Wadi's visitors so much that they became the primary components unanimously described and associated with the Wadi.

Additionally, the overall impression of the Wadi today is inclined towards positive experiences and feedback, where both survey and interview data displayed an increase in the popularity of the Wadi, and an eagerness to visit. Moreover, participants report an increased sense of security and a sense of care towards the Wadi and its surrounding heritage sites. Although there was some association of tourism to the Wadi, many participants, particularly those interviewed, have emphasized that the Wadi still needed to develop more to be suitable for tourism, with several participants indicating that the Wadi is more a local destination than a global tourist site. Interestingly, and despite its wide array of visitors, the Wadi's history is not clearly defined for many participants. Many participants demonstrated knowledge of connecting the Wadi to history and heritage, but few had more profound knowledge.

Nevertheless, some participants raised concerns and proposed improvement suggestions. Such as concerns about bike lanes, parking areas, and washroom facilities. Because there are no designated bike lanes, cyclists are often forced to share the road with other vehicles. Despite the speed limitations and speedbumps, cyclists do not feel safe driving along vehicles without their own designated lanes. Finally, the facilities, which include restrooms and prayer areas, have been noted by many of the interview participants. However, they were described as hard to find and relatively limited given the scale and size of the Wadi and the volume of its visitors. That being said, the predominant impression was that the rehabilitation had improved the Wadi and allowed it to be used by a larger audience than before, making it more accessible.

To summarize, the current research achieved its overarching objective to provide a framework that integrates the human element in UE intervention performance. Moreover, the application of the proposed framework accomplished its aims to (1) shed light on the foundations of Wadi Hanifah's identity; (2) track the changes to SoP, more accurately place-image, before and after the rehabilitation, and the potential contributions to those shifts through the place-component triad discussed in the literature review (physical attributes, meanings and conceptions, and activities). The two major contributions to those shifts in SoP were identified to be the introduction of a socio-cultural agenda and the improvement of the physical environment, both natural and man-made. (3) Finally, it provided socio-cultural performance feedback on a rehabilitated UE (Wadi Hanifah) through a comparison between the end-user experiences (i.e., the interview participants) to the goals and vision of WHCDP. Despite some of the concerns and comments raised by the participants, the Wadi overall received positive feedback post-rehabilitation, where it was perceived to be safer, sociable, more accessible, and a green area for social and physical activities that was limited in the region. The Wadi was also considered a unique natural landmark, rich with history and heritage.

The value of this research lies within its contributions to theory, methodology, and practice. In terms theory and methodology, the proposed framework embodies a socio-ecological approach linking urban design and ecosystem services. Essentially, it integrates aspects of the human element in examining the performance of rehabilitated UE from a social lens. This work also has potential implications in practice, whereby any knowledge collected through the current study may be helpful for future similar projects in Saudi Arabia. This study provides the first iteration of this kind of feedback for Wadi Hanifah. Future iterations of this study could focus more on particular solutions for public concerns. These could be acquired through on-site interviews or focus groups. Moreover, field observations could also be considered to study how people interact and operate in the Wadi, compared to how they perceive to behave. Future studies could also continue to monitor the rehabilitation performance from a social lens to refine the design and development guidelines, plans, and strategies to allow for more congruent development compatible with the ecosystem and the residents' needs.

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APPENDICES

Appendix A: The Survey Instrument Recruitment

Appendix A.1: Survey Recruitment Letter

Dear Potential Participant,

I would like to introduce myself ;my name is Shahad Kashmiri ,and I am a master's student working under the supervision of Professor Luna Khirfan in the School of Planning at the University of Waterloo ,in Canada .As part of my master's degree, I am conducting a research study to understand the impacts on place-identity and image of introducing a social and cultural agenda to the environmental rehabilitation of Wadi Hanifah, Riyadh ,Saudi Arabia.

You are being invited to participate in an online survey that will inquire about your experiences and perceptions of Wadi Hanifah and its image and identity .The survey, extending from May 2021 to October 2022, will consist of approximately 25 30-short multiple-choice and ranking questions that should take no more than 10 minutes of your time to answer.

If you decide to volunteer in this study, I would like to remind you that your participation is voluntary ,you can skip any question you do not wish to answer ,and you can also withdraw at any point should you feel uncomfortable with completing the questionnaire, this can be done simply by abandoning the survey. The final decision about participation is yours.

This study has been reviewed and received ethics clearance through the University of Waterloo Research Ethics Board. For more details about the study ,you can consult the "About the Study" link available at the beginning of the survey (Appendix A.3). For an informed decision about participation, please read the provided "Informational Letter" also available through a link at the start of the survey (Appendix A.2). If you require additional information to assist you in reaching a decision about participation, please do not hesitate to contact me at sekashmi@uwaterloo.ca, or contact my supervisor Professor Luna Khirfan at Luna.Khirfan@uwaterloo.ca .

Below is the link to the survey :

https://uwaterloo.ca1.qualtrics.com/jfe/form/SV_8HUGN5bqtK9YryK

Sincerely,

Shahad Kashmiri.

Appendix A.2: Survey Informational Letter

About The Survey

The survey extends from May 2021 to October 2022. If you decide to participate, you will be completing the study on an online survey platform operated by *Qualtrics.* You will be asked to complete an online social survey consisting of 25-30 multiple choice and ranking questions that would take approximately 10 minutes to answer. Participation in this study is voluntary. You may skip any question you do not wish to answer. You may also at any point decide to withdraw from this study without any negative consequences by advising the researcher or simply leaving the survey browser. You may also choose to withdraw at a later date; however, this withdrawal period extends only to the end of the data-collection period, anticipated to be December 2022.

The Data (*Your Responses*)

Data collected from this study will first be saved on *Qualtrics's* protected server. Upon the completion of the survey period, the data will be transferred and retained in a password protected hard-drive for the duration of the research study and until its related peer reviewed papers are published, approximated to be around 4 years. Only researchers associated with this project will be granted access to the data.

Interview Recruitment & Anonymity

At the end of the survey, you will be presented with an opportunity to participate in a one-on-one semi-structured interview. Should you choose to participate, you will be redirected to a page and required to provide your full name and contact information. However, rest assured that this information will not be linked to your survey responses. Your survey responses will remain anonymous. Your name and personal information will not appear in any thesis or report resulting from this study.

Security & Privacy

Qualtrics has implemented technical, administrative, and physical safeguards to protect the information provided via the Services from loss, misuse, and unauthorized access, disclosure, alteration, or destruction. However, no Internet transmission is ever fully secure or error free. Furthermore, we do not collect or use internet protocol (IP) addresses or other information which could link your participation to your computer or electronic device. All data will be summarized, and no individual will be identified from these summarized results. Your identity will be completely confidential.

Research Ethics

This study has been reviewed and received ethics clearance through the University of Waterloo Research Ethics Board (ORE #43261). If you have questions for the Board, contact the Office of Research Ethics, at 1-519-888-4567 ext. 36005 or reb@uwaterloo.ca.

For all other questions or if you would like additional information to assist you in reaching a decision about participation, please contact me at by email at **sekashmi@uwaterloo.ca.** You can also contact my supervisor, **Professor Luna Khirfan** at **Luna.Khirfan@uwaterloo.ca**.

Thank you,
Yours Sincerely,
Shahad Kashmiri.

Appendix A.3: About the Study

Wadi Hanifah is an important natural and historic landmark in the region of Riyadh. The Rehabilitation Project of the Wadi has been designed to include the rehabilitation of the Wadi's ecosystem. This entailed improving its water and flood systems, the introduction of a water treatment facility, and the revegetation of large sections of the Wadi. However, a large portion of the development program included the introduction of public spaces and parks, as well as the development of a touristic agenda based on the Wadi's natural scenic landscapes and its rich history and heritage components. Because of the novelty of this project in the region at the time of its conception, the Wadi's monitoring and evaluations have been focused on the ecological or environmental feedback. This study aims to explore the socio-cultural feedback regarding the Wadi's performance, especially in terms of the activities available in the Wadi, its overall built environment, and the image or identity it reflects. This will reveal how the rehabilitation has impacted the Wadi's perceived image and overall identity.

Through inquiring about the aspects of place, namely the physical environment, both built and natural; the meanings and conceptions associated with place; and the activities and functions available therein, an overall idea of the Wadi's identity could be traced. Thus, revealing the degrees to which each component impacted the identity and image of Wadi Hanifah today and how it is perceived by the general public.
This study will focus on personal experiences and perceptions of place (Wadi Hanifah in this case). Since the introduction of the new programs and services that catered to the social and cultural agendas such as tourism, recreational activities, and the provision of public open spaces with vegetation and waterbodies that are not common in the region, emphasis is placed on the importance of acquiring users' and residents' feedback, such as yourself. This will provide the first step in a feedback loop process that will improve the future development plans and performance of the Wadi and other similar projects, as well as refining their design and development approaches in the future.

Appendix B: The Survey Instrument Questions

Appendix B.1: Survey Introductory Note & Participant Consent

Welcome!

This survey is available in two languages: Arabic and English. You can change the language by clicking on the drop-down menu at the top-right side of the page.

Dear Potential Participant,

This is an invitation participate in a study I am conducting as part of my master's degree in the School of Planning, under the supervision of Professor Luna Khirfan, at the University of Waterloo, in Canada. We are interested in understanding the impacts of the rehabilitation of Wadi Hanifah on its sense of place, identity, and image. For this study, you will be asked to answer some questions about your perceptions, associations, knowledge, and experiences of the Wadi. Details about the contents of this study will be available through the "About the Study" link below (Appendix A.3).

More information about this study and what your involvement would entail please read the information provided in the informational letter carefully, found through the following link: Informational Letter (Appendix A.2). For more information about the topic of the research study itself, please click on the following link: About the Study (Appendix A.3)

Survey Participant Consent

Note that by participating in this study, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

By **agreeing to participate in this survey**, you acknowledge that:

- You have read and acknowledged the provided informational letter.
- You are at least 18 years of age.
- Your participation in the study is voluntary.
- You may choose to terminate your participation at any time for any reason.

Answers:

a) Yes, I consent, begin study!
b) No, I do not consent, I will not participate in this study.

Appendix B.2: The Survey Questions

Question 1: Age

If participant is below 18 years of age, they are directed to the end of the survey and presented the following message:

> Thank you for your participation and time!
> Unfortunately, you do not meet the minimum age requirement to partake in this study.
>
> Have a lovely day!

Question 2: Gender

Question 3: Nationality

Question 4: Have you heard of Wadi Hanifah before?

a) Yes.
b) No.

Question 5: Are you a resident of the Region of Riyadh?

a) Yes.
b) No.

Question 6: Have you visited the Region of Riyadh?

Question 7: Select all that apply, what was the reason of your visit/stay in the region of Riyadh?

a) Employment.
b) Education.
c) Family.
d) Visitor (tourism/leisure).
e) Visitor (work).
f) Research purposes.
g) I prefer not to answer.
h) Other: (text box)

Question 8: Select all that apply, how did you first hear of Wadi Hanifah?

a) School/Education.
b) Family/Friends.
c) Internet: World Wide Web.
d) Pamphlets, flyers, posters, and advertisements.
e) Travel and tourism applications such as *TripAdvisor*
f) The Media.
g) Other: (text box)

Question 9: Have you heard of Wadi Hanifah before the rehabilitation project was completed (before 2010)?

a) Yes.
b) No.

Question 10: Select all that apply, which of the following did you associate with Wadi Hanifah before its rehabilitation?

a) Flood management.

b) History and Heritage.
c) Water-source.
d) Pollution (water, ais, sound, etc.).
e) Farming and grazing.
f) Natural resources.
g) Tourism.
h) Environmental degradation.
i) Health hazard.
j) Industrial site.
k) Other: (text box).

Question 11: When did you visit Wadi Hanifah?

a) Before the Wadi's Rehabilitation Project.
b) After the Wadi's Rehabilitation Project.
c) Before and after the Wadi's Rehabilitation Project.
d) I don't know.
e) I never visited the Wadi.

Those who visited proceed to question 12, those who did not skip to question 13.

Question 12: Select all that apply, what was the primary purpose of your visit or visits to Wadi Hanifah?

a) Tourism.
b) Visiting the historic and heritage sites.
c) Educational or research purposes.
d) Work.
e) Relaxation and leisure.
f) Physical activities (walking, jogging, sports, etc.)
g) A family trip.
h) All the above.
i) None of the above.
j) Other: (text box)

Question 13: Select all that apply, if you have not visited the Wadi before, what would most likely be the purpose of your visit in the future?

a) Tourism.
b) Visiting the historic and heritage sites.
c) Educational or research purposes.
d) Work.
e) Relaxation and leisure.
f) Physical activities (walking, jogging, sports, etc.)
g) A family trip.
h) All the above.
i) None of the above.
j) Other: (text box)

Question 14: Select all that apply (at least 3), what is not selected will be considered "completely unrelated to the Wadi" so be sure to select all that you think applies. If none of the choices apply for you, kindly skip the question.

Question 14.A: When I think of Wadi Hanifah, I think of:

a) History and heritage.

b) Tourism.
c) Leisure and relaxation.
d) Outdoor activities.
e) Nature and natural landscapes.
f) Environmental impacts and sustainability.
g) Waterbodies (lakes, streams, and dams).
h) Flood management.
i) My personal experiences and memories in and of the Wadi.
j) Bioremediation and the Wadi's Rehabilitation Project.
k) Other: (text).

Question 14.B: Rank your choices by what you associate with the Wadi from most to least, 1 being most.

Question 15: Indicate your level of agreement (Strongly Agree, Somewhat Agree, Neither Agree not Disagree, Somewhat Disagree, Strongly Disagree) with each of the following statements:

1) I consider the Wadi to be a part of my heritage.
2) I consider the Wadi today as a unique and distinctive place in the region.
3) The Wadi, after its rehabilitation, provided many opportunities for social, touristic, and recreational activities not available before.
4) The Wadi generally has significant heritage and historic values in the region.
5) The rehabilitation strengthened the image and association of heritage and history to the Wadi.
6) I have many personal memories with family and/or friends in the Wadi.
7) I relate the Wadi, after the rehabilitation, to positive environmental impacts.
8) I relate the Wadi's rehabilitation to the improvement of the Region of Riyadh's development approach.
9) I consider the Wadi now to be a major natural landmark for the region.
10) The architecture and built structures in the Wadi (gates, walls, etc.) to be reflective of the region's traditional architectural style.
11) The architecture in the Wadi is reflective of the Wadi's heritage and cultural style.
12) The rehabilitation strengthened the image and association of grazing, agriculture, and farming to the Wadi.
13) The Wadi provides an opportunity to explore and connect with nature.
14) I relate the Wadi, before its rehabilitation, to negative environmental impacts.
15) I consider the Wadi, before its rehabilitation, as a major natural landmark for the region.
16) I think that the Wadi, before its rehabilitation, provided limited social, touristic, and recreational activities.
17) I think that the Wadi, before its rehabilitation, was a health hazard.

Question 16: Withdrawal: **You are approaching the end of this survey.**

If you wish to continue and submit your responses, please select "**Continue**"
Alternatively you can choose to withdraw from this survey by selecting **"Withdraw."**

a) Continue.
b) Withdraw.

Should candidates choose to continue, they are navigated to a separate survey where they can volunteer for a one-on-one semi-structured interview.

Appendix B.3: The Interview Recruitment Survey

Note: your information provided here will not be tied to your responses to the rest of this survey. Your responses will remain anonymous.

Question 1: Would you be willing to participate in a short semi-structured one-on-one interview regarding the Wadi?

a) Yes.
b) No.
c) Maybe.

Question 2: To contact you for this interview, please provide the following:

1) Full name
2) E-mail address
3) Preferred Language (Arabic or English)

At the end the participants received the following message:

Thank you for your participation in this study!
Your contributions are valuable to us.

Wishing you all the best,
Shahad Kashmiri

Appendix C: The Interview Instrument Recruitment

Appendix C.1: Interview Recruitment Letters

C.1.1 Recruitment Letter I (Survey Recruits)

Date: 00/00/202x

Dear *Participant Name*,

I would like to introduce myself; my name is **Shahad Kashmiri*,*** and I am a master's student working under the supervision of **Professor Luna Khirfan** in the School of Planning at the University of Waterloo, in Canada. As part of my master's degree, I am conducting a research study to understand the impacts on place-identity and image of introducing a social and cultural agenda to the environmental rehabilitation of Wadi Hanifah, Riyadh, Saudi Arabia. I am contacting you today based on your response from the "*Wadi Hanifah Identity & Image"* survey to participate in a one-on-one semi-structured interview. This interview is to be conducted via an online/virtual platform (*Zoom),* either video or audio depending on your preference. It will inquire further about your experience of Wadi Hanifah and your perspective regarding its image and identity.

This study is expected to proceed from May 2021 to October 2022, as such, the interview will take place during that period. If you decide to volunteer for this study, participation will take approximately **60 minutes** of your time. With your permission, I would like to audio-record the interview to ensure accurate transcription and analysis. I would like to remind you that your participation is voluntary, and you can withdraw at any point should you feel uncomfortable with completing the questionnaire.

This study has been reviewed and received ethics clearance through the University of Waterloo Research Ethics Board. For more information and for more details regarding what participation will entail, please read the attached Informational Letter. If you require additional information to assist you in reaching a decision about participation, please do not hesitate to contact me at **sekashmi@uwaterloo.ca** You may also contact my supervisor **Professor Luna Khirfan** at **Luna.Khirfan@uwaterloo.ca.**

If you are interested in participating in this research study, kindly respond to this e-mail/message to set up the interview appointment (date/time).

Sincerely,
Shahad Kashmiri.

C.1.2 Recruitment Letter II (Experts & Residents)

Date: 00/00/202x

Dear *Participant Name*,

I would like to introduce myself; my name is **Shahad Kashmiri,** and I am a master's student working under the supervision of **Professor Luna Khirfan** in the School of Planning at the University of Waterloo, in Canada. As part of my master's degree, I am conducting a research study **to understand the impacts on place-identity and image of introducing a social and cultural agenda to the environmental rehabilitation of Wadi Hanifah, Riyadh, Saudi Arabia**.

I am contacting you today to invite you to participate in a one-on-one semi-structured interview via an online/virtual platform (*Zoom),* either video or audio depending on your preference. It will inquire about your experience of Wadi Hanifah and your perspective regarding its image and identity.

This study is expected to proceed from May 2021 to October 2022, as such, the interview will take place during that period. If you decide to volunteer for this study, participation will take approximately **60 minutes** of your time.

With your permission, I would like to audio-record the interview to ensure accurate transcription and analysis. I would like to remind you that your participation is voluntary, and you can withdraw at any point should you feel uncomfortable with completing the questionnaire.

This study has been reviewed and received ethics clearance through the University of Waterloo Research Ethics Board. For more information and for more details regarding what participation will entail, please consult the attached Informational Letter (Appendix C.2). If you require additional information to assist you in reaching a decision about participation, please do not hesitate to contact me at **sekashmi@uwaterloo.ca**, or my supervisor **Professor Luna Khirfan** at **Luna.Khirfan@uwaterloo.ca**.

If you are interested in participating in this research study, kindly respond to this e-mail/message to set up the interview appointment (date/time).

Sincerely,

Shahad Kashmiri.

Appendix C.2: Interview Informational Letter

About The Interview

Participation in this study is voluntary. It will involve a semi-structured, one-on-one interview, conducted between June 2021 and October 2022. The interview is expected to be approximately **40-60 minutes** in length, taking place on a mutually agreed upon date and time through the platform of *Zoom*. This can be done either by audio or video, depending on your comfort and preference. You may decline to answer any of the interview questions if you so wish. Further, you may decide to withdraw from this study at any time without any negative consequences by advising the researcher.

With your permission, the interview will be audio recorded to facilitate the collection of information, and its transcription thereafter for analysis. After the interview has been completed, you are free to request a copy of the transcript to give you an opportunity to confirm the accuracy of our conversation and to add or clarify any points that you wish. excerpts from the interview may be included in the thesis and/or publications to come from this research, however, the quotations will be anonymous. You may choose to withdraw at a later date; however, this withdrawal period extends only to the end of the data-collection period, anticipated to be **December 2022.**

The Data (*Your Responses*)

Data collected from this study will be retained in a password protected hard-drive for the duration of the research study and until its related peer reviewed papers are published, approximated to be around 4 years. Only researchers associated with this project will be granted access to the data.

Security & Privacy

Despite the lack of known or anticipated risks to you as a participant in this study, **your complete privacy cannot be guaranteed.** This is because the interview is to be conducted through an online electronic platform (***Zoom***) and data is transmitted over the internet where there is always a risk that your responses may be intercepted by unknown third parties outside the University's and researchers' controls (e.g., government agencies, hackers, etc.). Furthermore, the University of Waterloo researchers will not collect or use internet protocol (IP) addresses or other information which could link your participation to your computer or electronic device without first informing you. All identity information you provide will be confidential. Your name will not appear in any thesis or report resulting from this study, however, with your permission, anonymous quotations may be used.

Research Ethics

This study has been reviewed and received ethics clearance through a University of Waterloo Research Ethics Board (ORE #43261). If you have questions for the Board, contact the Office of Research Ethics, at 1-519-888-4567 ext. 36005 or reb@uwaterloo.ca.

Participant Verbal Consent

Consent for participation in this interview will be verbal, attached to this letter is a copy of the "**Participant Consent Form"** for your reference. For all other questions or if you would like additional information to assist you in reaching a decision about participation, please contact me at by email at **sekashmi@uwaterloo.ca.** You can also contact my supervisor, **Professor Luna Khirfan** at **Luna.Khirfan@uwaterloo.ca**.

I look forward to speaking with you and thank you in advance for your contribution to this study.

Yours Sincerely,
Shahad Kashmiri

Appendix D: The Interview Instrument Questions

Appendix D.1: Interview Introductory Note & Consent

Acquiring Verbal Consent

After exchanging pleasantries and thanking the participant for their time, the researcher asked the participant if they had read and understood the informational letter, and if any clarifications are required, the researcher responded accordingly and answered any questions. Once the participant was satisfied, the researcher read the "researcher script" and followed it up with the "consent questions" where the researcher documented the participant's responses in the "research log" table below.

Researcher Script

This interview will be audio recorded, excerpts and quotations may be used but all will remain anonymous. I would also like to remind you that your participation is voluntary, you can choose to skip questions you are not comfortable with, and you can also choose to end your participation at any point and for any reason without penalty. Your responses will be stored safely in an external password protected hard-drive to ensure its protection. You can also choose to withdraw at a later time if you wish, just note that this will only be possible before the closing of the data collection period anticipated to be in December 2022, beyond that point it is not possible to withdraw.

Note that by participating in this study, you are not waiving your legal rights or releasing the investigator(s) or involved institution(s) from their legal and professional responsibilities.

RESEARCHER LOG		
Participant Name	WHSOPS-INT00-00000000	
Recruitment	Survey – Expert – Resident & Recorded – Written & Arabic - English	
Interview Date & Time		
Consent Questions		**Agreement**
You confirm that you are at least 18 years of age and have some level of familiarity with Wadi Hanifah?		
You agree to have the interview audio recorded to ensure accurate transcription?		
You agree to have excerpts from the interview included in the thesis and/or publications to come from this research, with the understanding that the quotations will be anonymous?		
Do you confirm that you have read the attached informational letter and that you have had the opportunity to ask any questions related to this study, and to receive satisfactory answers to your questions, as well as any additional details you wanted?		
you are aware that you can withdraw your participation and consent at any time without penalty by advising the researcher.		
With full knowledge of all foregoing, you agree, of your own free will, to participate in this study.		

Appendix D.2: The Interview Questions

PART A: Demographic Information

1. Gender:
2. Age:
3. Nationality:
4. Status in Riyadh (Resident/citizen/ visitor):

PART B: Descriptive Questions

Q.1 Have you heard of Wadi Hanifah before or after the rehabilitation project?

A.1:

Q.2: Have you visited Wadi Hanifah before or after the Rehabilitation Project?

A.2:

Q.3: What was your impression of the Wadi before the Rehabilitation, in terms of the physical environment, activities, and the meanings and narratives associated with the Wadi?

A.3:

Q.4: How would you describe your experience of the Wadi's image and identity (before and/or after the rehabilitation)?

A.4:

Q.5: Did your impression change after the rehabilitation? How would you describe this change?

A.5:

Q.6: Do you think the activities within the Wadi have impacted or will impact the Wadi's character and identity? How so?

A.6:

Q.7: Do you think the Wadi's development has impacted or will impact the local culture (or vice versa) in anyway? How would you describe this impact?

A.7:

Q.8: Do you think the built environment and architecture in the Wadi, after the rehabilitation, are reflective of its identity?

A.8:

Q.9: How would you describe the heritage and history aspects of the Wadi?

A.9:

Q.10: Do you personally feel a sense of belonging or attachment to that heritage or history? Why or why not?

A.10:

Q.11: How would you describe the Wadi to others, or someone who has not been there before?

A.11:

Q.12: Would you describe the Wadi as a unique feature in the region? How would you describe this uniqueness?

A.12:

Q.13: Can you give me a brief description of your experiences in the Wadi and what you saw and did there? Just an overall preview of your experience or experiences. (For visitors)

A.13:

PART C: Likert Scale Rating Questions

Q.14: Please identify your level of agreement (Strongly disagree [1]- disagree [2]- neither agree nor disagree [3] – agree [4]- strongly agree [5]) with each of the following words and phrases and indicate why you believe this describes the Wadi.

1. **Tourism (--)**
2. **Recreational Activities (--)**
3. **Relaxation and Leisure (--)**
4. **Physical and Outdoor Activities (--)**
5. **Park Area / Public Park (--)**
6. **Nature / Natural Landscapes (--)**
7. **Flood and Flood Management (--)**
8. **Sustainability (--)**
9. **Waterbodies (lakes, streams, etc.) (--)**
10. **Natural Landmark (--)**
11. **Heritage and History (--)**

- And with this we have reached the end of the interview. Thank you for your time and participation. I will complete the transcription of our interview and send it to you in the coming two weeks for your approval and review.

Appendix D.3 Ethics Certificate

UNIVERSITY OF WATERLOO

Notification of Ethics Clearance to Conduct Research with Human Participants

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Principal Investigator: Luna Khirfan (School of Planning)

Student investigator: Shahad Kashmiri (School of Planning)

File #: 43261

Title: Examining the impacts of introducing a socio-cultural agenda to the rehabilitation of a historic wetland's (Wadi Hanifah's) place-identity and image.

The Human Research Ethics Committee is pleased to inform you this study has been reviewed and given ethics clearance.

Initial Approval Date: 05/17/21 (m/d/y)

University of Waterloo Research Ethics Committees are composed in accordance with, and carry out their functions and operate in a manner consistent with, the institution's guidelines for research with human participants, the Tri-Council Policy Statement for the Ethical Conduct for Research Involving Humans (TCPS, 2nd edition), International Conference on Harmonization: Good Clinical Practice (ICH-GCP), the Ontario Personal Health Information Protection Act (PHIPA), the applicable laws and regulations of the province of Ontario. Both Committees are registered with the U.S. Department of Health and Human Services under the Federal Wide Assurance, FWA00021410, and IRB registration number IRB00002419 (HREC) and IRB00007409 (CREC).

This study is to be conducted in accordance with the submitted application and the most recently approved versions of all supporting materials.

Expiry Date: 05/18/22 (m/d/y)

Multi-year research must be renewed at least once every 12 months unless a more frequent review has otherwise been specified. Studies will only be renewed if the renewal report is received and approved before the expiry date. Failure to submit renewal reports will result in the investigators being notified ethics clearance has been suspended and Research Finance being notified the ethics clearance is no longer valid.

Level of review: Delegated Review

Signed on behalf of the Human Research Ethics Committee



Karen Pieters, Manager, Research Ethics, karen.pieters@uwaterloo.ca, 519-888-4567, ext. 30495

This above named study is to be conducted in accordance with the submitted application and the most recently approved versions of all supporting materials.

Documents reviewed and received ethics clearance for use in the study and/or received for information:

file: Interview_Recruitment Letter_ Survey Candidate_ English_ Draft 3_ 17.05.2021.pdf

file: Survey_ Recruitment Letter_ English_ Draft 3 _ 17.05.2021.pdf

Appendix E: Document Review List

- *Wadi Improvement Program (1994)*
- several documents from the *Wadi Hanifah Comprehensive Development Plan* (WHCDP) (2002), some of which were already available on their official website, such as:
    - the *Environmental Restoration and Conservation Program,*
    - *Environmental Principles and Guidelines.*
    - *Recreation and Open Space Programme*
- *Wadi Hanifa Development Plan* (Yavuz & Al-Asad, 2007);
- *Wadi Hanifa – Looking ahead* (Salih et al., 2008)*;*
- *Wadi Hanifa Wetlands* (Al-Samhouri & Al-Naim, 2007; Samhouri, 2010)*;*
- *From the Wadi's Memory (High Commission for the Development of Arriyadh, 2010b);*
- *Rehabilitation Report* (High Commission for the Development of Arriyadh, 2010c)*;*
- *Environmental Rehabilitation: Namar, Laban, and Hanifah* (High Commission for the Development of Arriyadh, 2010a)*;*
- *A Wadi Runs Through It* (Teller, 2012)*;*
- *Riyadh: Oasis of Heritage and Vision* (Harrigan, 2013)*;*
- *Journey of development* (High Commission for the Development of Arriyadh, 2015b)*;*
- *Monitoring Water Pollution Levels in Wadi Hanifa, Riyadh, Saudi Arabia and its Public Health Implications* (Al-Hammad & Abd El-Salam, 2017)*;* and
- *Environmental Rehabilitation Program for Wadi Hanifa and its Tributaries* (Royal Commission for Riyadh City, 2019).