ISBN 978-82-326-8218-8 (printed ver.)
ISBN 978-82-326-8217-1 (electronic ver.)
ISSN 1503-8181 (printed ver.)
ISSN 2703-8084 (electronic ver.)

NTNU
Norwegian University of
Science and Technology

Doctoral theses at NTNU, 2024:313

Bintang Noor Prabowo

Urban Heritage Facility Management

Case Study: Norwegian World Heritage Sites

Doctoral thesis
Bintang Noor Prabowo

Doctoral theses at NTNU, 2024:313

NTNU

NTNU
Norwegian University of
Science and Technology
Thesis for the degree of
Philosophiae Doctor
Faculty of Engineering
Department of Civil and Environmental
Engineering

NTNU
Norwegian University of
Science and Technology

Bintang Noor Prabowo

Urban Heritage Facility Management

Case Study: Norwegian World Heritage Sites

Thesis for the degree of Philosophiae Doctor

Trondheim, August 2024

Norwegian University of Science and Technology
Faculty of Engineering
Department of Civil and Environmental Engineering

NTNU
Norwegian University of
Science and Technology

NTNU
Norwegian University of Science and Technology

Thesis for the degree of Philosophiae Doctor

Faculty of Engineering
Department of Civil and Environmental Engineering

ISBN 978-82-326-8218-8 (printed ver.)
ISBN 978-82-326-8217-1 (electronic ver.)
ISSN 1503-8181 (printed ver.)
ISSN 2703-8084 (electronic ver.)

Doctoral theses at NTNU, 2024:313

PRINTED IN NORWAY
NO - 1598

NORDIC SWAN ECOLABEL
Printed matter
2041 0731

Printed by Skipnes Kommunikasjon AS

Abstract

This dissertation explores and introduces the novel term Urban Heritage Facility Management (UHFM), which is defined as an urban-scale function that integrates the management of all the supporting services to the people, places, processes, and technologies necessary for the preservation of the heritage value, significance, authenticity, and the visual quality of the urban heritage area. In a brief manner, UHFM's scope is to take care of everything else outside of the routine tasks of conservators and heritage authorities. Through case studies of three Norwegian World Heritage sites, Røros, Rjukan, and Notodden, the doctoral thesis seeks to validate the theoretical keypoints of UHFM and create a framework for managing facilities in urban heritage areas, particularly World Heritage sites.

The first phase of this doctoral research explores the existing body of literature through a rigorous scoping literature review process, extracting 33 theoretical keypoints in the field of UHFM. This part of the doctoral study examines the intersection between urban-scale heritage conservation and the Urban FM as an expansion of the facility management discipline. This research phase clarifies the subtle details of the context, identifies areas where current frameworks are lacking, and emphasizes the importance of UHFM in the complex structure of sustainable urban environment dynamics. This doctoral study then identifies the scope of UHFM using a narrative methodology, closely examining urban-scale support services in World Heritage sites. This part of the dissertation concludes by emphasizing comparisons between facility management at the building level and on an urban scale. World Heritage (WH) sites were included in the comparison table to provide a specific context of the urban built environment. The doctoral thesis examines the rationale behind the comparison of urban environments and buildings, using a narrative approach to justify the examination of the core business of urban environments, including WH sites, emphasizing the importance of urban-scale support services in maintaining the daily functioning and well-being of the people as the main stakeholders, outside the tasks of conservators and heritage authorities.

The UHFM framework, as the novelty of this doctoral thesis, is obtained from cross-sectioning the 33 UHFM theoretical keypoints, the possible urban-scale support services to be provided, and the validation process by conducting interviews, correspondence, and data collection in the three Norwegian case studies. The framework is a detailed matrix that aligns the tasks of technical department clusters with UHFM steps, including the novel last step, "monitoring and evaluation," providing a clear understanding of how to manage urban-scale support services in order to find the balance between urban heritage preservation and the demand for modern development.

This Ph.D. dissertation serves as a valuable resource for scholars and professionals by providing guidance on the complex, yet fragile, field of UHFM. It contributes to the development of sustainable urban environments by managing urban-scale facilities that preserve the urban heritage's outstanding universal value, significance, authenticity, and visual quality.

Sammendrag

Denne avhandlingen utforsker og introduserer det nye begrepet Urban Heritage Facility Management (UHFM), som er definert som en funksjon i urban skala som integrerer forvaltningen av alle støttetjenester til menneskene, stedene, prosessene og teknologiene som er nødvendige for å bevare arveverdi, betydning, autentisitet og den visuelle kvaliteten til det urbane kulturarvområdet. UHFMs virkeområde er i korte trekk å ivareta alt annet utenfor de rutinemessige oppgavene til konservatorer og kulturminnemyndigheter. Gjennom casestudier av tre norske verdensarvsteder, Røros, Rjukan og Notodden, søker doktoravhandlingen å validere de teoretiske hovedpunktene til UHFM og skape et rammeverk for forvaltning av anlegg i urbane kulturarvområder, spesielt verdensarvsteder.

Den første fasen av denne doktorgradsforskningen utforsker den eksisterende litteraturen gjennom en streng litteraturgjennomgangsprosess, og trekker ut 33 teoretiske nøkkelpunkter innen UHFM. Denne delen av doktorgradsstudiet undersøker skjæringspunktet mellom kulturarvbevaring i urban skala og Urban FM som en utvidelse av anleggsforvaltningsdisiplinen. Denne forskningsfasen klargjør de subtile detaljene i konteksten, identifiserer områder der gjeldende rammer mangler, og understreker viktigheten av UHFM i den komplekse strukturen av bærekraftig bymiljødynamikk. Denne doktorgradsstudien identifiserer deretter omfanget av UHFM ved å bruke en narrativ metodikk, og undersøker tett støttetjenester i byskala på verdensarvsteder. Denne delen av avhandlingen avsluttes med å legge vekt på sammenligninger mellom anleggsledelse på bygningsnivå og i urban skala. Verdensarvsteder (World Heritage) ble inkludert i sammenligningstabellen for å gi en spesifikk kontekst av bymiljøet. Doktorgradsavhandlingen undersøker begrunnelsen bak sammenligningen av urbane miljøer og bygninger, ved å bruke en narrativ tilnærming for å rettferdiggjøre undersøkelsen av kjernevirksomheten til bymiljøer, inkludert Verdensarvsteder, og understreker viktigheten av by-skala støttetjenester for å opprettholde den daglige funksjonen og folkets ve og vel som hovedinteressenter, utenfor oppgavene til konservatorer og kulturminnemyndigheter.

UHFM-rammeverket, som nyheten i denne doktoravhandlingen, er hentet fra tverrsnitt av de 33 UHFM-teoretiske nøkkelpunktene, mulige støttetjenester i byskala som skal tilbys, og valideringsprosessen ved å gjennomføre intervjuer, korrespondanse og datainnsamling i tre norske casestudier. Rammeverket er en detaljert matrise som justerer oppgavene til tekniske avdelingsklynger med UHFM-trinn, inkludert det nye siste trinnet, "overvåking og evaluering", som gir en klar forståelse av hvordan man administrerer støttetjenester i byskala for å finne balansen mellom bevaring av byarv og etterspørselen etter moderne utvikling.

Denne Ph.D. avhandlingen fungerer som en verdifull ressurs for forskere og fagfolk ved å gi veiledning om det komplekse, men likevel skjøre feltet UHFM. Det bidrar til utviklingen av bærekraftige bymiljøer ved å forvalte anlegg i urban skala som bevarer byarvens enestående universelle verdi, betydning, autentisitet og visuelle kvalitet.

Preface

My interest and enthusiasm for historic buildings and cultural heritage areas, especially in urban settings, inspired me to pursue a Ph.D. in UHFM. My first academic encounter with heritage occurred when I was writing a final project for my bachelor's degree in architecture titled *"Development of Solo-Balapan train station with supporting facilities of shopping mall and three-star hotels in Surakarta"* at the time. That's when I realized for the first time how complex it is to maintain the significance, value, and authenticity of the protected train station building, designed by Thomas Karsten, as a cultural heritage building while simultaneously planning, developing, and building new modern and sophisticated facilities in the same area.

When I earned my master's degree with a concentration in urban design, my interest in heritage grew into preservation on an urban scale. I chose two Dutch colonial city areas in Oud Batavia (*Kota Tua Jakarta*) and Semarang Old Town (*Kota Lama Semarang*) in my hometown, which, back at that time, was not even on UNESCO's tentative list of World Heritage sites yet. *"Study of the urban design characteristics of the train station area as part of the Old Town configuration"* was the title of my master thesis. During these studies, my conservation horizon and knowledge expanded from single heritage buildings to urban-scale heritage conservation. I began to recognize the significance of preserving historic areas holistically rather than limiting cultural heritage preservation to the preservation, restoration, reconstruction, and adaptation of physical historical buildings only. As a professional architect who has pursued additional studies in urban design, I am well aware that historic buildings, including urban heritage districts, are living monuments and urban ecosystems with human elements that are frequently neglected and often not involved in preserving the neighborhood they live in. As living monuments and living areas, the non-stop provision of support services orchestration occurs while inhabitants carry out daily activities within the urban heritage site at the same time. On the other hand, anything that compromises heritage value, authenticity, significance, and visual quality poses serious threats to the protected buildings' and district's sustainability in terms of preserving cultural heritage areas.

As a result, when I was given the opportunity to continue my doctoral studies under the supervision of Professor Alenka Temeljotov Salaj, a facility management and refurbishment expert who is currently working to expand FM into Urban FM, I saw a very promising common-thread connected to my expertise and interests. My Ph.D. topic is urban heritage facility management (UHFM), which is a specific niche for urban-scale FM. I am determined to make a small but significant contribution to science and the body of knowledge by developing the UHFM framework, which serves as an omnibus package for urban-scale facility management focused on urban heritage areas. Instead of continuing case studies on the two World Heritage tentative lists from my master's study in Indonesia, I selected three World Heritages in Norway as case studies to validate my doctoral research theoretical findings. This was due to a number of practical considerations, including distance, budget, and the global COVID-19 pandemic situation that occurred at the start of my study, necessitating me to re-evaluate and re-direct the research design, which initially required me to travel to Indonesia and Norway, back and forth. On the other hand, my decision allowed this doctoral study to be more focused and introduced me more deeply into the Norwegian World Heritage management realm, from which I can later take lessons and wisdom in managing, hopefully in the future, Indonesia's tentative list of World Heritage sites, particularly those in the form of urban areas or historic districts. One ambitious mission is to include Indonesia's two assets currently on the tentative list of

World Heritage sites in the official list of UNESCO's World Heritage sites. I hope this attempt will, at least, be partially inspired by the UHFM framework, which was developed as part of my doctoral research.

Suppose I am being asked in a casual manner by a fifth-grader student (which is not too often); in that case, I usually explain my dissertation topic, UHFM, as *"a complex task that takes care of everything else, outside of the routine tasks of conservators and heritage authorities, to ensure the preservation of heritage value, authenticity, significance, and visual quality of urban-scale heritage assets."* I am hopeful that the UHFM framework proposed by this Ph.D. research might enhance the balance and dynamics between "*efficiency*" and "*the core business of urban heritage*," which is to maintain its outstanding (universal) value. This research will thus benefit the people, including residents, visitors, municipality staff, heritage authorities, academia, business owners, investors, and other stakeholders in urban heritage conservation. Facility management is and has always been a people-oriented profession, and so are Urban FM and UHFM.

Trondheim, 2024

Bintang Noor Prabowo

Acknowledgements

I am profoundly thankful to my mother, Soelaimah, and my late father, A.R. Gaffar, who constantly encourage(d) me to pursue the highest level of education I could get. Furthermore, I would like to express my gratitude to my supervisor, Alenka Temeljotov-Salaj, and my co-supervisor, Eilif Hjelseth. Alenka has been (and I believe will always be) incredibly supportive and understanding throughout my Ph.D. episode. She is an exceptionally beautiful human being. It is true that half of our Ph.D. journey is indeed determined by having the right supervisors. Special thanks should be given to my family who stayed strong with me through this journey; Irene Indriasari and Faylasufa Avatarisa Sashikirana.

Along the way, this Ph.D. journey is made possible through the support of my colleagues and friends, whom I now call family. Jardar Lohne, the methodology guru and mentor; Agnar Johansen, the Godfather of project management; (Magic) Mara Gabriela Diaconu, the Superhub who fascinated me with her daily fashion show; Alla Marchenko, the multi-talented researcher who used to knock my door every 45 minutes; Bradley Loewen, the smart-sharp-well-dressed colleague; Tahmineh Akbarinejad, the one who stayed calm in any crisis situation; Mina Jowkar, the first colleague of mine who gave me goosebumps every time she called my name from her desk; Elham Andalib, the only one working on health, happiness, and well-being who always prefers building-technology solution over stairs, yet committed to exercise for hours at the gym; Aashish Adhikari the (still) shy one; Dave Collins, the Innovation and Green-Leasing expert whom everyone hears from other parts of the corridors; and Coline Marie Senior, the founder of ByMaker and the most helpful person living on the Northern hemisphere. Coline is the longest to have endured years of my dad's jokes, the extraordinary sense of humor, awkward moments, countless cups of coffee, fruitful (and, of course, non-fruitful) discussions, traveling, and conferences worldwide. Last, but not least, I should thank one special dearest person whom I admire, but I am unable to disclose her name due to technicalities. Many thanks also to Marit Støre-Valen, Olav Torp, Carmel Lindkvist, Rolee Aranya, Mahgol Afshari, Wahyu Wijanarko, Mohammed Hamdy, Oskar Fahlstedt, Omar Sabri, Gema Respati, all my fellow Indonesian friends in Trondheim and Semarang, and countless more of you that would take dozens of pages to mention.

Please keep in mind that you are all in my heart. You all have positive attitudes, lots of lovely energy, and generous hearts.

Trondheim, 2024

Bintang Noor Prabowo

This study is supported by the Directorate General of Resources for Science, Technology, and Higher Education, The Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia, Diponegoro University, and the Department of Civil and Environmental Engineering, Faculty of Engineering, The Norwegian University of Science and Technology (NTNU).

(This page is intentionally left blank)

Authorship Statement of the Appended Research Papers

This dissertation, as a paper-based thesis, consists of a compilation of nine research papers that have been published during the Ph.D. period. Among these papers, three are peer-reviewed journal articles that have been accepted and published by reputable publishers acknowledged by the Norwegian Register for Scientific Journals, Series, and Publishers *(Register over vitenskapelige publiseringskanaler)*. These three research papers serve as the backbone of this doctoral dissertation. The remaining six published research papers have also undergone a comprehensive peer-review process. They have been presented at international conferences and published as proceeding articles and book chapters. It is worth noting that most of these papers have been indexed by Scopus.

The main and corresponding author of all appended papers included in this dissertation is the author of this doctoral thesis. The author was highly involved and contributed to the conceptualization, validation, formal analysis, investigation, resources, draft preparation, visualization, writing, and editing of all papers. Professor Alenka Temeljotov-Salaj from the Norwegian University of Science and Technology supervised, co-developed, and co-authored all the publications. Professor Alenka Temeljotov-Salaj, the supervisor of this Ph.D. study, holds the position of Professor in Sustainable Refurbishment and Facility Management at the Department of Civil and Environmental Engineering *(Institutt for bygg- og miljøteknikk)*, Faculty of Engineering Science *(Fakultet for ingeniørvitenskap)* of NTNU (*Norges teknisk-naturvitenskapelige universitet)*.

Dr. Jardar Lohne, a research scientist at IBM-IV-NTNU, co-authored Papers I, II, and III. He facilitated the methodology, validation, and internal review of these published articles. The co-supervisor of this doctoral study and co-author of Paper VI is Professor Eilif Hjelseth, who holds a position at NTNU specializing in BIM/Digitalization + VDC within the AEC/FM industry. Professor Eilif Hjelseth made significant contributions to the conceptualization, purpose definition, and guidance in the domain of Building Information Modelling (BIM) and digitalization within the context of Urban Heritage Facility Management, as outlined in Paper VI. The final paper included in this dissertation was co-authored by Professor Agnar Johansen, an expert in project management at NTNU, who played a role in developing and defining the concept and objectives of Paper IX.

Throughout the Ph.D. period, the author of this dissertation published three additional scientific articles as co-authors. However, the author of this dissertation chose not to include those articles in the doctoral thesis due to technical considerations.

The nine appended papers listed below are arranged in order of importance and/or publication date. The declaration of co-authorship can be found in the appendix section.

Paper I **Urban Heritage Facility Management: A scoping review.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj, Jardar Lohne. *Applied Sciences, Volume 11, no. 7, Special Issue on Sustainable Urban Facilities,* 2021. Published. DOI: https://doi.org/10.3390/app11209443

Paper II **Identifying UHFM Support Services Considering World Heritage Context.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj, Jardar Lohne. *Urban Science, Volume 7, no. 2,* 2023. Published. DOI: https://doi.org/10.3390/urbansci7020052

Paper III **Urban Heritage Facility Management: A Conceptual Framework for the Provision of Urban-scale Support Services in Norwegian World Heritage Sites.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj, Jardar Lohne. *Heritage, Volume 7, no. 3,* 2024. Published.
DOI: https://doi.org/10.3390/heritage7030066

Paper IV **Systemic Approaches in Revitalization of Semarang Old City Heritage Site: From Neglected Area to Tourism Destination.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj. *The 7th International Academic Conference Places and Technologies, Belgrade*, 2020.
DOI: 10.18485/arh_pt.2020.7.ch38

Paper V **Identifying Overtourism Impacts on the Informal Sector's Livelihoods in Urban Heritage Area.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj. *International Conference on Sustainable Environment and Architecture (SENVAR) 2021, Bandung. IOP Conference Series: Earth and Environmental Science,* vol. 738, no. 1, 2021. Published.
DOI 10.1088/1755-1315/738/1/012044

Paper VI **HBIM Application in Historic Town: A Scoping Literature Review.** Bintang Noor Prabowo, Eilif Hjelseth, Alenka Temeljotov-Salaj. *The 14th European Conference on Product and Process Modelling (ECPPM) 2022, Trondheim. eWork and eBusiness in Architecture, Engineering and Construction 2022, Routledge, Taylor & Francis,* 2022. Published.
DOI: https://doi.org/10.1201/9781003354222-36277

Paper VII **Urban Heritage and the Four Pillars of Sustainability: Urban-scale Facility Management in the World Heritage Sites.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj. *The International Conference on Sustainable Built Environment (SBE) 2023, Thessaloniki. IOP Conference Series: Earth and Environmental Science, Volume 1196, no.1,* 2023, Published. DOI 10.1088/1755-1315/1196/1/012105

Paper VIII **The Older Adults in the Smart Urban Heritage Area: A mini-scoping Review of Inclusivity in the World Heritage Sites.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj. *The 22nd International Federation of Automatic Control (IFAC) 2023, Yokohama. IFAC-PapersOnLine Volume 56, no. 2,* 2023. Published. DOI: https://doi.org/10.1016/j.ifacol.2023.10.259

Paper IX **From Classical Management Theory to Urban Heritage Facility Management: Mobility and Accessibility in Urban Heritage Areas.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj, Agnar Johansen. *The 8th Conference of Interdisciplinary Research on Real Estate (CIRRE), Belgrade,* 2023. Published. DOI: https://doi.org/10.18485/arh_pt.2024.8.ch77

Table of Contents

List of Figures

List of Tables

List of Abbreviations (or Symbols)

BIM	Building Information Modelling
CbFM	Community-based Facility Management
CIM	City Information Modelling
FM	Facility Management
HBIM	Historic Building Information Modelling
HUL	Historic Urban Landscape
ICCROM	International Center for the Study of the Preservation and Restoration of Cultural Property
ICOMOS	International Council on Monuments and Sites
IUCN	International Union for the Conservation of Nature
NSD	*Norsk senter for forskningsdata*
NTNU	The Norwegian University of Science and Technology
OUV	Outstanding Universal Value
PDF	Portable Document Format
QDAS	Qualitative Data Analysis Software
SFM	Sustainable Facility Management
UFM	Urban Facility Management
UHFM	Urban Heritage Facility Management
UIM	Urban Information Modelling
UNESCO	United Nations Educational, Scientific, and Cultural Organization
VTFK	*Vestfold og Telemark Fylkeskommune*
WH	World Heritage
WHC	World Heritage Centre

1 Introduction

"You know that the beginning is the most important part of any work…"

Plato – The Republic

This chapter is intended to provide a brief introduction to the big picture of the urban heritage facility management realm. Several parts of the published publications inspired this chapter. Those publications are (Paper I) Urban Heritage Facility Management: A Scoping Review, (Paper II) Identifying UHFM Support Services: Considering World Heritage Context, (Paper III) Urban Heritage Facility Management: A Conceptual Framework for the Provision of Urban-scale Support Services in Norwegian World Heritage Sites, (Paper VII) Urban Heritage and the Four Pillars of Sustainability: Urban-scale Facility Management in the World Heritage Sites, and (Paper IX) From Classical Management Theory to Urban Heritage Facility Management: Mobility and Accessibility in Urban Heritage Areas.

1.1 Background

During the 20th century, over 30 normative manuals and guidelines for preserving and maintaining cultural heritage have been provided by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) [1]. Since the expansion of its spectrum, after simply concentrating on monuments and historic centers, to a more cultural heritage orientation in the early 21st century, the horizon of cultural heritage was applied to urban areas as living heritages [1–3].

Broadening the term "heritage" has contributed to a comprehensive qualitative view of urban heritage that incorporates the values of the urban landscape [3,4]. A landscape is described as a living territory, a sociocultural concept, and a subjective mental picture of the changing environment in space and time [1,5–8]. The Historic Urban Landscape (HUL) approach, which gives an extensive perspective of urban heritage, provides a framework for the implementation of an integrated value-based landscape strategy for cultural heritage management that is similar to the notion of community-based facility management (CbFM), a predecessor to the urban facility management discipline [1,9]. Therefore, UNESCO's latest approach to carefully managing urban heritage areas has finally intertwined with facility management (FM) and urban facility management (urban FM) principles to achieve sustainable development of historical sites [9].

The national, regional, and local authorities should appropriately handle the maintenance of urban heritage facilities and infrastructure [10,11] and provide urban-scale support services that align with the complex nature of urban-scale heritage conservation. The implementation strategy must carefully consider what needs to be preserved, why, and how to implement it to maintain authenticity and the visual quality of the cultural heritage area [11]. The protection of historical areas can be viewed as a complex form of adaptation, maintenance, and conservation of cultural significance [12].

Currently, urban FM is expanding community-based facilities management (CbFM) by providing a forum for authorities, organizations, and businesses in new and creative

environments to support local stakeholders [13]. The fundamental concept of urban FM is to improve the influence of FM on the urban environment and to ensure the implementation of sustainable development goals through a service-oriented perspective that supports livability requirements and social values, community inclusiveness, and well-being approaches [14] that are more than just the operation and management of the city infrastructures. The urban FM strategy tackles the issues by functioning as a bridge between various stakeholder interests in the urban areas and ensuring that social value is integrated with environmental and financial considerations [14]. Lindkvist et al. [15] highlighted the need for FM to develop further within urban areas. It is supported by Nielsen [16], who referred to urban development as being among the nine categories in which sustainable facilities management (SFM) is considered. SFM is a growing concept within the FM discipline that intends to promote high standards of building performance and safety, minimum resource consumption, and reduced greenhouse gas emissions production, as well as other climate change adaptive responses, which include energy conservation, waste and recycling management, safety, and health management, and minimalization of water and carbon footprints [17].

Furthermore, Salaj et al. [13] extended the prospects of the urban FM field to become a dynamic sponsor in enhancing sustainable living spaces, focusing on healthiness and well-being. FM could incorporate diverse mechanisms for managing heritage protection by resolving changes in utilization, changes in the environment, multiple participants, and overlapping requests for sustainable necessities [10]. Managing historic urban areas has evolved from a tangible method to a holistic one within almost the same period. In the urban context, the historic urban landscape (HUL) approach supports this landscape-based approach [3,18].

Several urban areas of Norway, especially historical ones, have strong and unique characteristics that have enabled them to be acknowledged by UNESCO as World Heritage sites. The historic footprints of those heritage sites are evident. Characteristics of the image of the urban heritage area of Røros, Rjukan, and Notodden were considered to exhibit an important interchange of human values on developments in architecture or technology, monumental arts, town-planning or landscape design (criterion ii), bear a unique testimony to a cultural tradition or to a civilization which is living or which has disappeared (criterion iii), and to be an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates significant stages in human history (criterion iv) [19]. The first inscription of Røros as a world heritage site was in 1980, while Rjukan and Notodden in 2015.

The long experience in managing historic towns in Norway gives the opportunity for this doctoral study to fully observe the practices of urban-scale facility management within urban heritage areas in accordance with the Historic Urban Landscape approach. However, both urban FM and the HUL approach have remained under-researched aspects of FM and conservation. Therefore, a study to bridge the urban heritage conservation and urban FM is urgently required. The combined field between those two in this doctoral thesis is being introduced as urban heritage facility management (UHFM). UHFM is a new term being proposed as part of the results of this doctoral thesis and is not currently used in the domain.

This doctoral thesis would potentially be beneficial for academics, authorities, and professionals in expanding the discipline of FM within an urban scale as an intermediator between public, private, and people to create an effective, collaborative, and interactive governance for co-creation, co-finance, and co-ownership of urban heritage sites to

improve citizens' sense of attachment, commitment, trust, inclusion, and integration. This doctoral study would also be useful for the municipalities, heritage authorities, and the caretaker bodies of the World Heritage sites to understand better the concept of Urban Heritage Facility Management to increase the ability to create values for the citizens, businesses, and society within the protected heritage site or the city as a whole while maintaining the authenticity (and outstanding universal values, if any) in accordance with international, national, regional, and local heritage conservation guidance.

1.2 Problem Statement

The Historic Urban Landscape (HUL) approach, as the latest holistic approach towards preserving historic areas recommended by UNESCO in 2011, is facing several challenges, especially in interpreting it to be applied in real-world conservation practice. Many municipalities and heritage authorities at the strategical, tactical, and operational levels found the approach challenging to be operationalized within urban heritage management, including the World Heritages in the urban context.

On the other hand, facility management (FM) is in the process of being expanded into an urban-scale facility management domain known as Urban FM or UFM. Unlike FM, which has already been relatively established as a discipline, with so many professional organizations and models/ frameworks, both in practical and academic contexts, no comprehensive framework is available yet to explain the realm and scope of Urban FM. One thing for sure is that Urban FM is also people-oriented and seeks the most efficient way of achieving the well-being of all urban stakeholders.

The diversity of urban environments and ecosystems from place to place makes it challenging to determine the components within the Urban FM scope. This might be the cause of the lack of a specific model or framework in this field. Currently, several components within the scope of Urban FM have already been discussed and debated sporadically in the academic literature. Still, not much research has put them together within a comprehensive Urban FM model or framework. This condition gives a chance for protected urban heritage areas to be studied from the perspective of urban-scale facility management due to the relatively consistent characteristics of heritage conservation management aspects and the availability of international frameworks for managing historic areas. Urban heritages, especially those listed as World Heritage sites by UNESCO, possess similarities in terms of characteristics and conservation management, especially those located in the same region or country. The World Heritage sites, which are also obliged to follow international (and supranational) guidance, allow the FM discipline to observe and identify the urban-scale facility management components with a higher degree of consistency than other types of urban environments. Simultaneously, the observable components of UHFM could potentially be used to build a more operable framework that explains the general realm of UHFM practices, which can be utilized by the heritage district's stakeholders, including the municipalities, lawmakers and heritage authorities as "decision-makers," and the dwellers as the "people" aspects within FM field, to achieve the common goals of heritage conservation: maintaining the authenticity, significance, visual quality, and values (universal outstanding values, if any) of the protected urban heritage sites.

This doctoral thesis is intended to further contribute to establishing Urban FM as the expansion of facility management discipline and simplify the challenging tasks of applying the HUL approach in a more operable manner. The doctoral thesis proposed a framework that could potentially serve as a foundation for future research in facility management and

urban conservation. This framework has the potential to be further developed and improved by other researchers in both World Heritage (WH) sites and non-WH urban heritage areas.

1.3 Doctoral Research Design and Research Questions

This doctoral thesis identifies a gap in research regarding the identification of the scope of urban-scale facility management of a heritage district or area. This doctoral thesis aims to provide a reasonable and systematic method to understand urban-scale heritage conservation (with the study case of three Norwegian World Heritage sites) from the perspective of the urban facility management field. In order to achieve the objective, the following tasks have been conducted:

- Performing a literature review on the scope of Urban FM and the HUL approach within an urban heritage context (macro-level).
- Building a narrative and justification to justify that an urban built environment is comparable to buildings, therefore necessitating the provision of urban-scale support services.
- Validating the theoretical keypoints obtained from the scoping literature review process based on the urban-scale support services required in urban heritage areas using three Norwegian World Heritage sites as case studies to develop a framework that bridges urban-scale heritage conservation and urban scale facility management.

The research questions of this doctoral thesis are:

- (RQ1) *What are the fundamental elements, principles, and practices that fall under the urban heritage facility management domain as indicated by the existing body of literature and academic discussion?*
- (RQ2) *How can the expansion from building-level facility management to urban-scale FM be effectively addressed within the context of World Heritage sites, particularly in terms of expanding soft-FM and hard-FM support services to tackle the unique challenges and complexities of managing the urban environment while preserving the heritage value, significance, and visual quality of the sites?*
- (RQ3) *What framework best describes the provision of urban-scale support services by validating the urban heritage facility management theoretical keypoints obtained from the literature review in the three Norwegian world heritage sites?*

Research output is to be achieved by producing a systematic series of peer-reviewed journal articles to answer the research questions and meet the objective of the doctoral thesis by encompassing the following aspects (Figure 1.1):

- A comprehensive scoping literature review is needed to understand the current discussions on urban heritage conservation and urban facility management and find gaps in academic discussion of the urban heritage management field. The scoping review would answer the RQ1 by providing UHFM theoretical keypoints.
- A narrative to justify the comparability of urban settings to be considered as urban-scale built environments. This narrative is important to identify the main goals and urban-scale support services required to achieve the goals. The World Heritage context was put as context. The narrative and identification would answer RQ2 by providing the list of possible urban-scale support services.

- Study Case of World Heritage sites of Norway (Røros, Rjukan, and Notodden) from the Historic Urban Landscape (HUL) approach and Urban FM perspectives to validate the theoretical keypoints obtained from the scoping literature review.
- An attempt to propose a new, or modified, framework of urban facility management on urban heritage areas through the utilization of the previous literature review's results and their validation of the study cases. The framework would answer the RQ3 by providing a cross-sectional matrix of UHFM.

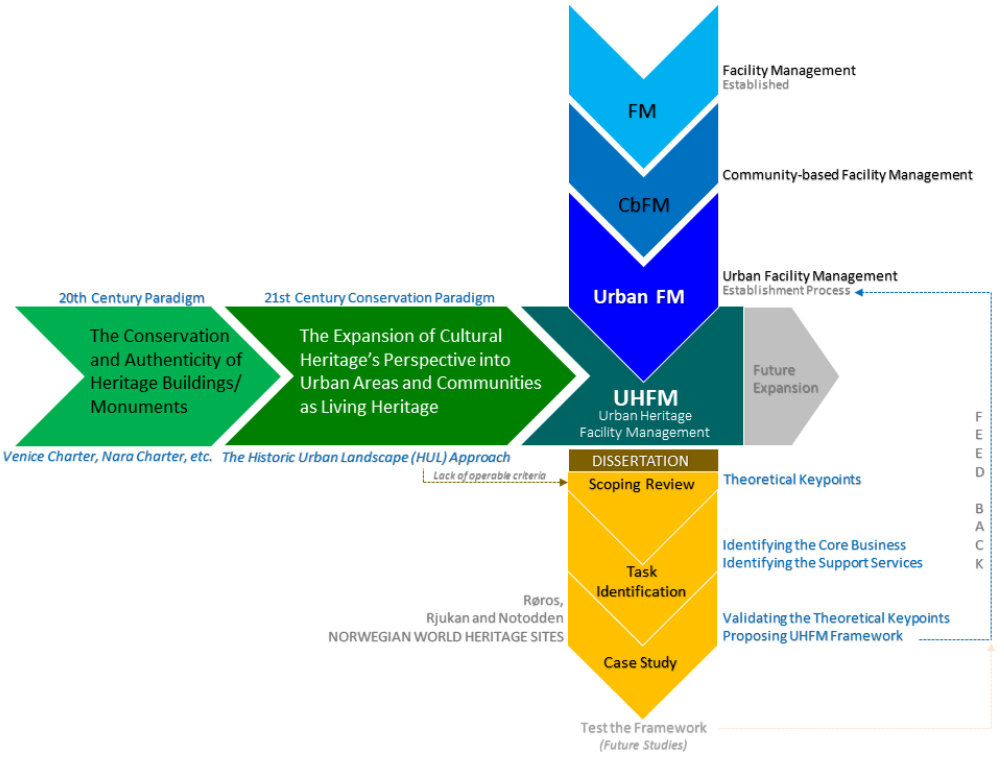


Figure 1.1 Illustration of the doctoral research design

The preceding illustration (Figure 1.1) is further elaborated upon in Figure 1.2, located on the subsequent page. This subsequent figure offers a more comprehensive depiction of the entire research process undertaken for this doctoral study.

Narrative approach and case studies play a crucial role in answering the research questions in this thesis. Narrative research allows for the collection of detailed, context-rich data that provides deep insights into the lived experiences and perspectives of individuals involved in Urban Heritage Facility Management (UHFM). By exploring narrations and experiences, narrative approach helps understand the cultural, social, and historical contexts that influence UHFM practices. This method captures the complexities and nuances of managing urban heritage sites, which are often missed by quantitative methods. Furthermore, the narratives collected can aid in developing and refining theories related to UHFM by providing empirical evidence that supports or challenges existing theoretical frameworks. Case studies, on the other hand, offer an in-depth examination of specific instances of UHFM in real-world settings.

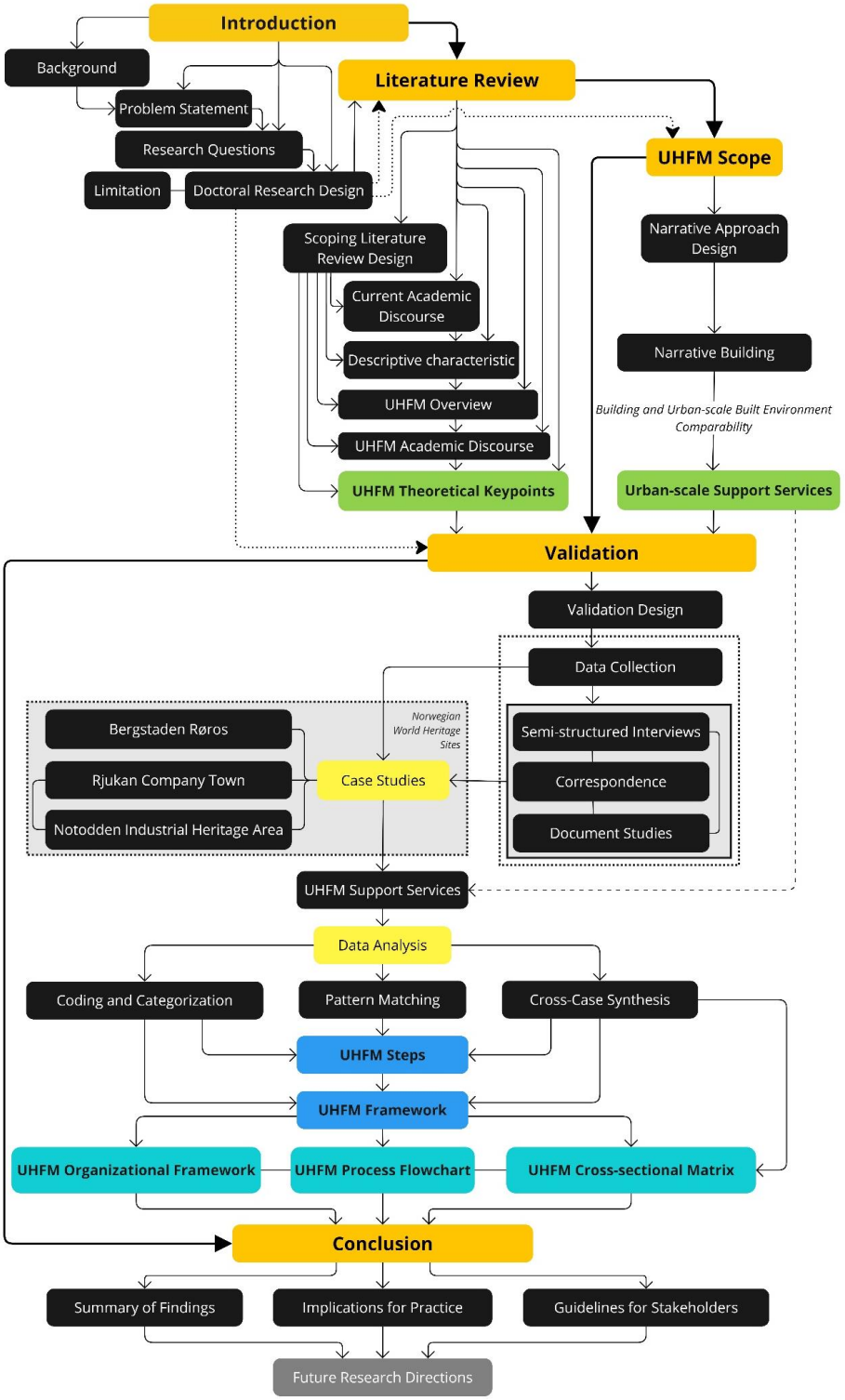


Figure 1.2 Illustration of the entire doctoral research process

This method allows for a comprehensive analysis of the processes, practices, and outcomes in the context of Norwegian World (Urban) Heritage sites. Through comparative analysis of the three case studies, Røros Bergstaden, Rjukan, and Notodden, common themes and patterns can be identified, facilitating the generalization of findings across similar contexts. Additionally, case studies provide practical insights and lessons that can be applied to other urban heritage contexts, offering valuable guidance for practitioners and policymakers.

Reflecting on the discussion of validity, reliability, and generalization, the use of narrative approach ensures internal validity through the detailed and authentic interpretations of participants. These narratives provide a truthful and accurate representation of their experiences, while triangulation of data sources within the case studies helps confirm the consistency and accuracy of the findings. Construct validity is strengthened by using established theoretical frameworks to guide the narrative and case study analyses, ensuring that the concepts being studied are accurately captured and measured. Reliability is enhanced by maintaining a consistent and systematic approach to data collection and analysis across all three case studies. Detailed documentation of the research process, including the methodologies used for narrative collection and case study analysis, ensures that the study can be replicated by other researchers. Using well-defined protocols and procedures for conducting interviews, analyzing narratives, and performing case studies ensures methodological rigor and reliability. While statistical generalization may not be possible due to the qualitative nature of the study, analytical generalization is achieved by linking the findings to broader theories and frameworks in UHFM. By identifying common patterns and themes across multiple case studies, the research findings can be generalized to similar urban heritage contexts. The detailed descriptions and contextual information provided by narrative research and case studies enhance the transferability of the findings. Other researchers and practitioners can apply the insights and lessons learned to their own contexts, considering cultural and contextual differences. By leveraging narrative approach and case studies, the thesis can answer the research questions more comprehensively and provide a robust discussion on validity, reliability, and generalization. These methodologies not only enrich the understanding of UHFM practices but also ensure that the findings are credible, reliable, and applicable to other urban heritage contexts.

This doctoral research adopts a constructivist epistemology, which suggests that knowledge is constructed through social interactions and experiences. This epistemological stance emphasizes the subjective nature of knowledge and recognizes that understanding is developed through the interpretation of human experiences within specific contexts. The constructivist approach aligns well with narrative approach, as it focuses on understanding the meanings and interpretations of individuals within their specific contexts (Figure 1.3). This approach allows the researcher to capture the complexity and richness of human experiences, which is crucial for studying Urban Heritage Facility Management (UHFM). Through narrative approach, the study explores the lived experiences of stakeholders involved in the management of urban heritage sites, providing a comprehensive understanding of their perspectives and actions. The ontological perspective of this research is interpretivist, which holds that reality is socially constructed and multiple realities exist based on individual experiences and contexts (Figure 1.3). This perspective contrasts with positivism, which views reality as objective and singular. The interpretivist ontology supports the use of narrative approach, as it allows for the exploration of diverse perspectives and experiences. It acknowledges that the management of urban heritage sites involves various stakeholders with different views and experiences, making narrative

approach an ideal methodology. This approach enabled this study to understand the multiple realities of stakeholders involved in UHFM, such as municipal staff, heritage authorities, residents, and visitors, and how these realities influence heritage management practices.

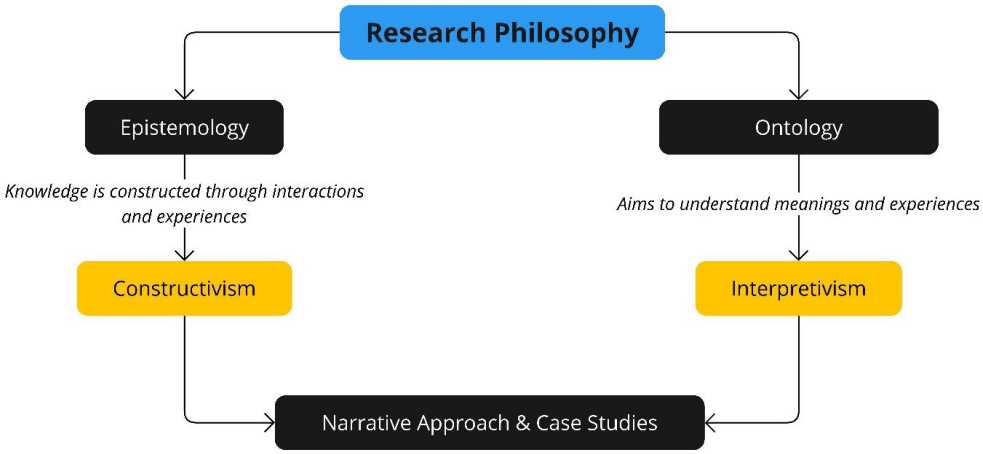


Figure 1.3 Research philosophy underpinning the methodological choices

The use of narrative approach and case studies in this doctoral thesis is deeply connected to this study's constructivist epistemology and interpretivist ontology. By adopting these research philosophies, the research approach allows for a comprehensive understanding of the complex, multifaceted nature of urban heritage management. Narrative approach provides a method to gather rich and detailed data from various stakeholders, facilitating the exploration of different realities and constructing a nuanced understanding of UHFM practices.

1.4 List of Publications

This dissertation consists of a compilation of nine research papers that have been published during the Ph.D. period. Among these papers, three are peer-reviewed journal articles accepted and published by reputable publishers acknowledged by the Norwegian Register for Scientific Journals, Series, and Publishers *(Register over vitenskapelige publiseringskanaler)*. These three research papers serve as the backbone of this doctoral dissertation. The remaining six published research papers have also undergone a comprehensive peer-review process. Those scientific papers have been presented at international conferences and published as proceeding articles and book chapters. Notably, most of these papers are indexed by Scopus.

Throughout the Ph.D. period, the author of this dissertation authored three additional scientific articles as co-authors. However, the author of this dissertation chose not to include those articles in the doctoral thesis due to technical considerations.

The nine appended papers listed below are arranged in order of importance and/or publication date.

Paper I **Urban Heritage Facility Management: A Scoping Review.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj, Jardar Lohne. *Applied Sciences, Volume*

11, no. 7, Special Issue on Sustainable Urban Facilities, 2021. Published. DOI: https://doi.org/10.3390/app11209443 [20]

Paper II **Identifying UHFM Support Services Considering World Heritage Context.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj, Jardar Lohne. *Urban Science, Volume 7, no. 2,* 2023. Published. DOI: https://doi.org/10.3390/urbansci7020052 [21]

Paper III **Urban Heritage Facility Management: A Conceptual Framework for the Provision of Urban-scale Support Services in Norwegian World Heritage Sites.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj, Jardar Lohne. *Heritage, Volume 7, no. 3,* 2024. Published. DOI: https://doi.org/10.3390/heritage7030066 [22]

Paper IV **Systemic Approaches in Revitalization of Semarang Old City Heritage Site: From Neglected Area to Tourism Destination.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj. *The 7th International Academic Conference Places and Technologies, Belgrade*, 2020. DOI: 10.18485/arh_pt.2020.7.ch38 [23]

Paper V **Identifying Overtourism Impacts on the Informal Sector's Livelihoods in Urban Heritage Area.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj. *International Conference on Sustainable Environment and Architecture (SENVAR) 2021, Bandung. IOP Conference Series: Earth and Environmental Science,* vol. 738, no. 1, 2021. Published. DOI 10.1088/1755-1315/738/1/012044 [24]

Paper VI **HBIM Application in Historic Town: A Scoping Literature Review.** Bintang Noor Prabowo, Eilif Hjelseth, Alenka Temeljotov-Salaj. *The 14th European Conference on Product and Process Modelling (ECPPM) 2022, Trondheim. eWork and eBusiness in Architecture, Engineering and Construction 2022, Routledge, Taylor & Francis,* 2022. Published. DOI 10.1201/9781003354222-36277 [25]

Paper VII **Urban Heritage and the Four Pillars of Sustainability: Urban-scale Facility Management in the World Heritage Sites.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj. *The International Conference on Sustainable Built Environment (SBE) 2023, Thessaloniki. IOP Conference Series: Earth and Environmental Science, Volume 1196, no.1,* 2023, Published. DOI 10.1088/1755-1315/1196/1/012105 [25]

Paper VIII **The Older Adults in the Smart Urban Heritage Area: A Mini-scoping Review of Inclusivity in the World Heritage Sites.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj. *The 22nd International Federation of Automatic Control (IFAC) 2023, Yokohama. IFAC-PapersOnLine Volume 56, no. 2,* 2023. Published. DOI: https://doi.org/10.1016/j.ifacol.2023.10.259 [26]

Paper IX **From Classical Management Theory to Urban Heritage Facility Management: Mobility and Accessibility in Urban Heritage Areas.** Bintang Noor Prabowo, Alenka Temeljotov-Salaj, Agnar Johansen. *The 8th Conference of Interdisciplinary Research on Real Estate (CIRRE), Belgrade,* 2023. Published. DOI: https://doi.org/10.18485/arh_pt.2024.8.ch77

1.5 Doctoral Thesis Limitations

This doctoral study is subject to the following limitations:

- The case study would only cover, and be limited to, Norwegian urban heritages listed in the World Heritage sites: Røros Mining Town, Rjukan Company Town, and Notodden Industrial Heritage Site.
- The dissertation's point of view is limited to (and from) the perspective of urban-scale facility management.
- Some of the terminology in this dissertation was interchangeably used in English and Norwegian for practical reasons.

In 2020, *Telemark* County merged with *Vestfold* to form the new *Vestfold og Telemark Fylkeskommune (VTFK)*. However, in 2024, when this dissertation writing process was finalized, Telemark was reinstated back as a county. Given the timeframe of data collection, this study utilized the term *"Vestfold og Telemark Fylkeskommune (VTFK)"* in conjunction with both Vestfold County and Telemark County.

1.6 Significance

The scoping literature review of urban heritage facility management (UHFM) showed that the holistic discussion on conducting urban-scale facility management using UNESCO's recommended approach within urban heritage districts, especially in World Heritage sites, is infrequently emerging, as the HUL approach and Urban FM are relatively new in the field of heritage conservation and facility management. The narrative of justifying urban settings as ultra-large forms of buildings provides insight into expanding building-level FM to urban-scale facility management. World Heritage sites were put as context to further identify, in detailed manners, possible urban-scale support services in urban heritage areas. Finally, this dissertation aims to develop a framework that bridges urban-scale heritage conservation and urban facility management (Urban FM) by validating the previously studied UHFM theoretical keypoints utilizing the three World Heritage sites in Norway as the case study. This UHFM framework is expected to provide operable criteria for facility managers, heritage authorities, and municipalities in managing and preserving urban heritage districts in accordance with UNESCO's recommendation. The framework also provides a new perspective and will likely start new academic debates in FM and the heritage conservation field while closing the gaps in urban heritage facility management thinking.

This doctoral study would potentially be beneficial for academics, authorities, and professionals in expanding the discipline of FM and Urban FM as an intermediator between public, private, and people to create an effective, collaborative, and interactive governance for co-creation, co-finance, and co-ownership of urban heritage sites to improve citizens' sense of attachment, commitment, trust, inclusion, and integration. The research would also be helpful for the municipality and the caretaker bodies of the World Heritage sites to understand better the concept of Urban Heritage Facility Management to increase the ability to create value for the citizens, businesses, and society within the protected heritage site or the city as a whole.

1.7 Approval From the Norwegian Center for Research Data

The data needed for this doctoral study were collected from the bodies of literature, semi-structured interviews, exchanging correspondences, and document studies. The interviews and correspondences were conducted from 2022-01-21 to 2023-12-30 and were registered to and approved by the Norwegian Center for Research Data/ *Norsk senter for forskningsdata* (NSD) with reference number 602497, which later merged with two other Norwegian organizations to establish the new Norwegian Agency for Shared Services in Education and Research (SIKT). Detailed information regarding the registration and approval are included in the appendix section of this dissertation.

1.8 Ethical consideration

The ethical considerations concerning this doctoral thesis are extremely important. The study involves human participants as a part of the interviews and correspondence during the validation stage. This study strictly complies with ethical principles by prioritizing all parties' well-being, privacy, and rights.

The ethical principle of ensuring informed consent was a fundamental aspect of this research. Following the guidance of the Norwegian Center for Research Data/ *Norsk senter for forskningsdata* (NSD), this doctoral research provided extensive details regarding the objectives, methodologies, and potential outcomes of the study to the interviewees and correspondence participants, including key individuals, officials from the technical departments, and heritage authorities. The research emphasized the voluntary aspect of participation, guaranteeing that participants were fully aware of their entitlement to withdraw from the study at any point without consequences. Ensuring the privacy and anonymity of participants was a crucial ethical consideration. Maintaining anonymity was vital due to the sensitive nature of the conversations, especially during interviews and correspondence. The reporting of results ensured the privacy of individuals and organizations by thoroughly anonymizing all personal and organizational identifiers.

The study's ethical framework placed a high priority on ensuring transparency in both data collection and reporting. Clear and effective communication was maintained throughout the research process, ensuring clarity on the research goals, methodologies, and potential implications. The research's transparency extends to how the findings are presented, giving both participants and readers confidence in the accuracy and integrity of the research results. The ethical considerations in this doctoral thesis are thorough and follow established ethical guidelines from NSD/SIKT based on principles of transparency, informed consent, confidentiality, cultural sensitivity, and minimizing harm.

(This page is intentionally left blank)

2 Literature Review

"If I have seen further than others, it is by standing upon the shoulders of giants..."

Isaac Newton

The literature review chapter of this dissertation examines a specific niche of managing the facilities of urban heritage areas, which involves the integration of urban heritage conservation, the Historic Urban Landscape (HUL) approach, and urban-scale facility management. Several parts of the previously published journal articles and proceedings were used to develop this chapter. Those publications are (Paper I) Urban Heritage Facility Management: A Scoping Review, (Paper II) Identifying UHFM Support Services Considering World Heritage Context, (Paper VI) HBIM Application in Historic Town: A Scoping Literature Review, and (Paper VIII) The Older Adults in the Smart Urban Heritage Area: A Mini-scoping Review of Inclusivity in the World Heritage sites. Paper I [20] is the backbone of this chapter.

The decision to utilize a scoping literature review methodology is motivated by the necessity of mapping out the unexplored domain of UHFM, which scholars and academics have not explicitly addressed. Within the extensive field of heritage conservation studies, there is a noticeable lack of discussions regarding the provision of support services at an urban level, particularly in relation to the management of World Heritage sites. The complex tasks of managing all aspects beyond the routine tasks of conservators and heritage authorities in order to protect the Outstanding Universal Value (OUV), historical importance, genuineness, and visual excellence of these sites are frequently overlooked in scholarly discussions. The implementation of the HUL approach signifies a fundamental switch of paradigm in understanding and safeguarding urban heritage areas, highlighting a comprehensive and holistic approach that emphasizes the inhabitants and layers of urban history.

This scoping literature review aims to provide an overview of existing literature and actively explore the subtle and complex aspects of UHFM within the larger framework of the HUL approach. In this context, the scoping review seeks to comprehend the ongoing discussions about UHFM and also to pinpoint any deficiencies and unexplored aspects in the academic discourse, thus highlighting the importance of building upon previous knowledge. This chapter aims to address the fragmented and disparate discussions on UHFM by conducting a scoping literature review. It would gather insights from different disciplines and identify areas where academic discourse is still in its early stages. The literature review is crucial in developing UHFM's theoretical understanding and keypoints, contributing to the broader field of heritage studies and facility management.

2.1 Scoping Literature Review

The intersection between urban facility management (Urban FM) and the Historic Urban Landscape (HUL) approach represents a critical but relatively unexplored domain within the FM discipline and conservation field. The lack of extensive research in this area

necessitates a thorough investigation that connects the fields of urban-scale heritage conservation and FM, providing a comprehensive understanding of their complex relationship. This doctoral thesis presents the innovative concept of Urban Heritage Facility Management (UHFM), which combines the principles of urban heritage management and urban FM. UHFM, a term introduced in this study, has not yet gained widespread recognition in the academic field.

In order to fill the identified gap, this chapter focuses on three pivotal research inquiries.

(RQ1.1) *How is urban heritage conservation related to urban FM?*
(RQ1.2) *What are the dimensions of UHFM in the body of literature?*
(RQ1.3) *How can HUL supporting tools related to urban FM be placed within the critical steps of the HUL approach?*

This dissertation seeks to contribute significantly to understanding the complex dynamics at the intersection of urban heritage management and urban facility management by exploring these research questions.

This literature review chapter thoroughly examines ongoing discussions, established knowledge, and uncharted areas within the intersectional study of urban heritage management and urban facility management. This chapter mainly utilized a scoping review methodology from *Paper I* to examine the academic discussions between 2011 and 2020, revealing the fundamental components of UHFM. This chapter aims to examine the existing academic discussion on facility management practices in urban heritage areas. Additionally, it seeks to uncover the difficulties and possibilities that arise from combining these two fields. Moreover, the study seeks to offer a clear viewpoint and practical standards for overseeing the infrastructure of historical areas by examining the essential stages of the HUL approach in addition to the recommended tools endorsed by UNESCO. This literature review chapter serves as the basis for a thorough comprehension of UHFM, preparing for the subsequent empirical investigation and conceptual advancement in this innovative field.

2.1.1 The Design of the Scoping Literature Review

This chapter implemented a scoping review as the primary method for understanding and identifying the urban FM principles and the urban heritage conservation value [20]. Levac [27] explained that a scoping literature review is a small-scale, detailed description of studies on a subject previously studied. A scoping review aims to remind readers of the essential information and ideas that have been created on the topic to compare, contrast, and relate the results found while evaluating the work of researchers [28]. This method helps both authors and readers gain a sense of academic discussion. Within a research study, a scoping review is frequently utilized as a groundwork for a fresh understanding to recapitulate and extract others' opinions [27–29].

The scoping review seeks to quickly understand the key ideas, especially the complex topics [30]. This qualitative study is suitable for addressing the relationship between urban heritage management and urban FM principles. There have not been many works of literature that comprehensively discuss both fields simultaneously in such a manner. An urban heritage conservation viewpoint could potentially enrich and sharpen the urban FM perspective of managing historic towns or urban heritage precincts.

As proposed by Grant and Booth [31] and then by Arksey and O'Malley [30], a scoping review is an "assessment of potential size and scope of available research literature,"

aiming to identify the nature and the extent of research carried out within a field. As such, it bears no formal quality assessment of the research mapped.

This is in contrast with, for instance, systematic reviews, which *"seek to systematically search for, appraise and synthesize research evidence, often adhering to guidelines on the conduct of a review."* Correspondingly, Grant and Booth [31] stated that *"such systematic reviews can use quality assessments as inclusion or exclusion criteria. Systematic reviews typically come up with recommendations for practice, while scoping reviews map the knowledge within a field, in order to be able to propose research agendas".*

A scoping literature review is usually conducted according to a specific protocol to safeguard reliability and replicability. The procedures used in this analysis were (1) describing the research problems; (2) searching for appropriate works of literature; (3) collecting articles; (4) charting the data; and (5) compiling, summarizing, and presenting the results [30].

The study aims to describe to what extent and how the cross-section of the urban FM and the HUL approach were operationalized through the literature and to propose key elements of urban heritage facility management (UHFM) extracted from the examined papers [20].

2.1.2 Searching Procedure

Following the protocol of the scoping review [30], the steps taken were (Figure 2.1) [20]:

1) Three research questions were defined.
2) After several trials and errors, an initial search of relevant studies was conducted using available scientific databases (Google Scholar, Science Direct, Web of Science, Scopus, and Oria) with the following search strings:
   - ("Facility management" OR "facilities management") AND ("urban heritage" OR "urban conservation")
   - ("Urban facility management" OR "urban facilities management") OR ("urban FM") AND (heritage OR conservation)
   - ("Historic urban landscape") AND ("facility management" OR "facilities management")
3) At first, no limitations were put on the initial search. From the preliminary investigation, it was evident that the number of results using Google Scholar within the keywords "urban facility management" (316) and "urban facilities management" (175) was manageable. It showed that 64.36% of the body of literature on urban FM used the American term for FM (facility management) instead of the British (facilities management).
4) When an OR operator was added ("urban facility management" OR "urban facilities management"), the search resulted in 364 references, indicating that 48 references were using both the US and UK's terms of urban FM.
5) "Urban FM" provided 581 hits, but ("urban FM"–radio) showed 460 results, meaning that 20.83% of the result was a radio-related term of FMs.
6) The search string ("urban facility management" OR "urban facilities management" OR "urban FM") yielded 996 references, while ("urban facility management" OR "urban facilities management" OR "urban FM"-radio) hit 809 references.
7) After the search was limited only to journals and to those between 2011 and 2020, the number of results decreased significantly. The year 2011 was chosen because UNESCO started the recommendation of the HUL approach in that year.

8) After all PDF files of examined papers were collected and their attributes checked by reference manager software (Mendeley), they were exported into qualitative data analysis software under a folder named "examined papers" for further analysis.
9) The publications were then saved and loaded into the QDAS, NVivo12 Pro, to perform the necessary investigation.

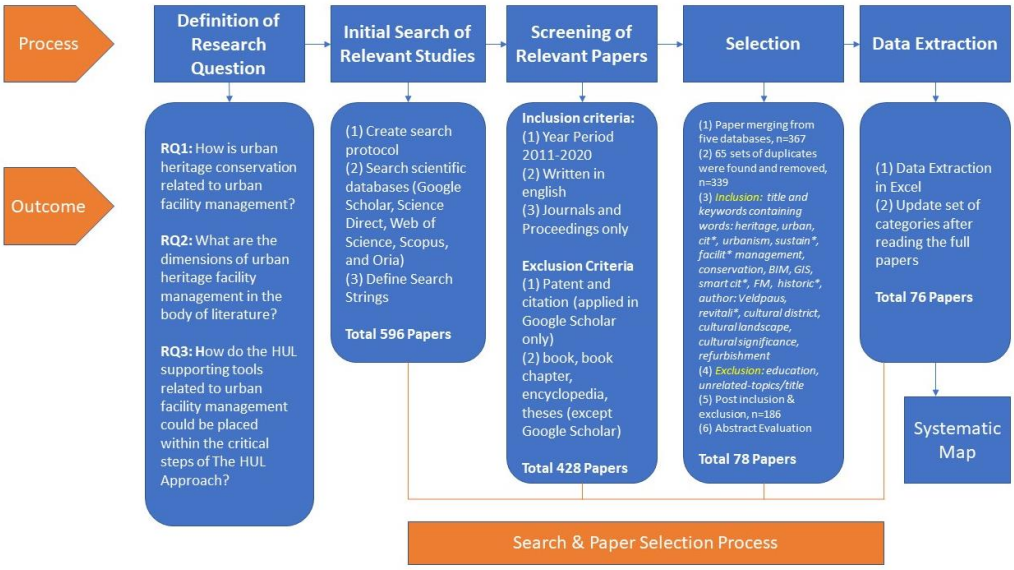


Figure 2.1 Scoping review process (source: Prabowo et al., 2021)

2.1.3 Categorization

Based on the HUL's six critical steps (mapping resources, reaching consensus, assessing vulnerabilities, integrating values and vulnerabilities, prioritizing actions, and establishing local partnerships and frameworks), the body of literature was then coded into categorization [20]. For each critical step, a further categorization was then implemented by assessing the 76 examined papers based on the four supporting tools of the HUL approach: civic engagement tools, financial tools, regulatory systems, and knowledge and planning tools. These four HUL supporting tools are the acknowledged tools in the conservation field recommended by UNESCO to adapt this new international instrument to local contexts and to facilitate its implementation [1]. National and local authorities are stimulated to (re)develop these tools to meet local values and needs [11].

2.1.4 Limitation of the scoping review

The examined papers were based only on English-written literature, without including grey literature such as theses, publicly accessed documents, reports, etc., between 2011 and 2020 [20].

2.2 Current Academic Discourse

2.2.1 The Historic Urban Landscape (HUL) approach: The new paradigm in conserving urban heritage area

The UNESCO Recommendation on the Historic Urban Landscape (HUL) was adopted by the 36th Session of the UNESCO General Conference in 2011. This was six years after the General Assembly of States Parties to the World Heritage Convention adopted Resolution 15GA/7 (in October 2005), which called for the preparation of a new international standard-setting instrument that would be based on the recognition and guidance of investment in the development of historic cities, while at the same time respecting the inherited values embedded in their spatial and social structure [20].

HUL addresses the need to better integrate and frame urban heritage conservation strategies within the larger goals of overall sustainable development. It states that a historic urban landscape is *"the urban area understood as the result of a historical layering of cultural and natural values and attributes, extending beyond the notion of historic center or ensemble to include the broader urban context and its geographical setting"* [32]. It provides the basis for a comprehensive and integrated approach to identifying, assessing, conserving, and managing historic urban landscapes within an overall sustainable development framework [20].

The latest UNESCO guideline on the HUL approach [18,19] promotes a landscape-based strategy at the international level. National and local governments must enact, disseminate, promote, and track its implementations. Authorities are urged to redevelop instruments and tools responsive to local principles and needs related to the HUL critical steps, which are (1) mapping resources, (2) reaching consensus, (3) assessing the vulnerabilities, (4) integrating urban heritage values and vulnerabilities, (5) prioritizing actions, and (6) establishing partnership and local management frameworks [12]. The new philosophy on managing heritage areas describes urban heritage management as "managing the thoughtful transition"; thus, it proposes a holistic strategy for managing historic sites [12,33,34]. The concept of heritage management has developed from a tangible method towards a more holistic framework that incorporates intangible values, attributes, and sustainable urban gentrifications, followed by a more critical analysis of urban historic social and economic roles. The strategy is referred to as the urban landscape method [11]. There are also four supporting tools for the HUL approach: (1) civic engagement tools, (2) financial tools, (3) regulatory systems, and (4) knowledge and planning tools [12]. For every critical step of the HUL approach, these four tools are involved in various forms to support it in diverse proportions according to each specific case [20].

There are many challenges in implementing the HUL framework, but a key practical challenge related to Step 4, which is "integrating urban heritage values." Step 4 is critical to what happens on the ground in the built environment areas [20]. How is new development managed to protect heritage values? How closely does one control the design and details of new interventions in the built environment, and what are the key factors in doing so? Certainly, when poorly designed, insensitive new development is inserted into heritage townscapes, the place's heritage values become quickly eroded. Yet architects, with their developer clients, can be the first to complain when constraints (i.e., via conservation guidelines or height controls) are imposed. Design guidance is critical to the development process, but so often, this is not in place. Indeed, new aggressive

architectural styles are supported by proponents as being honest contemporary expressions with a relationship to a context that is not considered important.

The previous study [20] indicated a lack of an operable value-based approach within urban heritage facility management. Local heritage authorities often found implementing UNESCO's recommendation on HUL problematic due to a lack of detailed local guidance. Urban FM could potentially bridge the gap in operationalizing a value-based approach concerning local policy and stakeholders by facilitating the shift from international standards to contextualized municipal initiatives and strategies in managing historic districts.

2.2.2 Urban Facility Management (Urban FM)

The main concept of urban FM is to increase the efficiency of the tangible infrastructure, build employment openings, and safeguard neighborhood inclusiveness in the operation of facilities of the urban environment [14]. However, in urban heritage areas, the balance between inclusivity and heritage authenticity needs to be maintained [26]. The deterioration of physical space is linked to the lack of local inhabitants' self-organization, leading to conflicts between social classes (among people), between people and governments, or between dwellers and other institutions [20,35].

Integrating FM with community facilities might solve the escalating operational costs and negligence from facility service providers [20]. Since non-technical elements, such as public participation, neighborhood self-organization, well-being, etc., are more disruptive in the built environment, projects that fulfilled technical criteria, such as building codes, heritage conservation codes, city planning, and master planning etc., but did not meet livability requirements were more prevalent [36]. Therefore, Salaj [37] argued that engaging with communities using a value-driven strategy may result in a shared motivation to find solutions that fulfill the community's needs and a link to long-term objectives and commercial possibilities. Although the public-private-people partnership (PPPP) is still under-researched, it is a potential new business model that seeks comprehensive connections with all stakeholders [38] to enhance the public-private partnership (PPP) approach [20].

The discipline of FM is developing into a more complicated subject of urban FM by responding to communities' needs and creating a coordinating body between people, public, and private sectors [20]. Urban FM provides integrated deliveries, e.g., customizable solutions, flexible and well-maintained structures, outdoor activities and services, and various socio-technical solutions [14]. The focus of urban FM is to increase well-being, especially looking at how to deal with an extensive array of challenges, such as environmental hazards [39], social safety [40], resilience [41], and health [42], particularly for women, older adults, and youth. From a design and accessibility point of view, spatial interventions are essential to improve citizens' health and well-being [43]. Still, the approaches primarily focus on a local level context, limiting their broader impact on society. In particular, exploring the possibilities of stimulating a healthy environment as an opportunity to mitigate the effects of people needing care through changing circumstances has been considered in the workplace context [44]. Through urban FM, it is possible for this learning to be transferred to the neighborhood level [20].

2.2.3 Interaction between Urban FM and the HUL Approach

The role of FM in historical urban development is infrequently studied, and its contribution to sustaining the operation of heritage buildings is sometimes problematic [20]. Most

studies stated that FM was mainly related to supporting core activities within a single-owned building(s) [9,45–52]. In fact, FM could be understood from a broader perspective [53], for example, understanding FM from urban scale viewpoints. FM is a branch of the management discipline that addresses the tools and services that support the functionality, safety, and sustainability of buildings, grounds, infrastructures, and real estate [54]. The International Facility Management Association (IFMA) also proposes a new definition of FM: "Facility Management is a profession/discipline that encompasses multiple disciplines to ensure the functionality of the built environment by integrating people, place, process, and technology." This new definition allowed urban FM to legitimately become an expansion of the FM discipline since urban FM is a manifestation of an urban scale facility management. This doctoral study pinpointed the prospect of urban FM to perform in a more expansive setting, especially urban heritage, as argued by Salaj [13] in terms of extending the possibility of the role of urban FM to develop itself as an involving collaborator in promoting living areas and emphasizing health and well-being [20].

In terms of cultural heritage management, FM is known to be a discipline focusing on property [20]. FM can be described as having originated from the convergence of three key fields of practice, including land management, property maintenance, and office administration [55]. This notion should be applied to a broader viewpoint, both tangible and intangible, following the 2011 HUL Recommendation by UNESCO in managing urban heritage sites [10,20].

Similar to the HUL approach, Salaj et al. [36] explained that through establishing solid relationships with residents, urban FM would be able to develop inclusive governing, efficiency, co-financing, co-ownership, and co-creation of urban public spaces to enhance people's participation, engagement, confidence, equality, and cohesion [20]. Enhancement of citizens' participation in governing and development processes is important for the higher achievement of SDGs [56]. From that perspective, co-financing is in line with the public-private-people-partnership (PPPP) model [38], co-owning with the personal perception of responsibility and attachment to the public domain [57,58], and co-creation with the collaborative governance approach resulting in the creation of quality public spaces that contribute to people's well-being [59]. Urban FM stayed as an under-studied FM feature due to the multiple overlapping elements, including urban planning, urban gentrification, urban management, and urban sustainability [9,13,41,47].

Redevelopment in the built environment, particularly the urban historical area, frequently concentrates on technical elements compared to its non-technical features [20,61]. Due to numerous social advancements, gentrification in urban areas must be closely monitored to grasp sustainable growth. Strengthening people's awareness and demands of the environment is critical to increasing their desire for technological possibilities [14,61], an important component of FM [20].

2.2.4 Knowledge Gap in the UHFM Works of Literature

The previous subsections are theoretical explanations of FM and urban FM, the HUL approach, and the interaction between the two fields, and represented the phase-zero and initial rapid analysis of the 76 examined papers using queries, text search, and word frequency tools provided by the qualitative analysis software to identify the potential knowledge gap [20]. The preliminary scoping review process [20] indicated a lack of an operable value-based approach within urban heritage facility management. Local authorities often found implementing UNESCO's recommendation on HUL problematic due to a lack of detailed local guidance. Urban FM could potentially bridge the gap in

operationalizing a value-based approach concerning local policy and stakeholders by facilitating the shift from international standards to contextualized municipal initiatives and strategies in managing historic districts.

Two systematic reviews [1,31] were also acknowledged as phase-zero works of literature before the scoping review process, enriching the chapter. Although considered valuable sources, neither article was listed as an examined paper in this scoping review due to the rigorous protocol of the scoping process. While the two articles, from Rey-Pérez [34] and Ginzarly [1], were conducting a systematic review solely from a historic urban landscape (HUL) approach point of view, this scoping review was more (urban) FM-oriented, aimed at providing vital elements of urban heritage facility management by identifying the current academic discussions on FM practices within the urban heritage area from 2011–2020 to reveal the challenges and opportunities within the combined fields [20].

2.3 Descriptive characteristics of the UHFM scoping review

2.3.1 Number of Examined Publications

In general, the number of publications related to UHFM using a scoping review protocol from 2011–2020 increased throughout the year (Figure 2.2) [20]. Between 2011, when the HUL approach was introduced, and 2017, the number of publications was stable, between four to eight articles each year, with a minor drop in 2012 and 2017, which were compensated for in 2013 and 2016. A significant increase of 100% in 2018, compared to 2016, was identified from the examined papers. The trend continued to steady within the next two years, with 15 articles in 2019 and 2020, when the COVID-19 pandemic started and reached its peak worldwide.

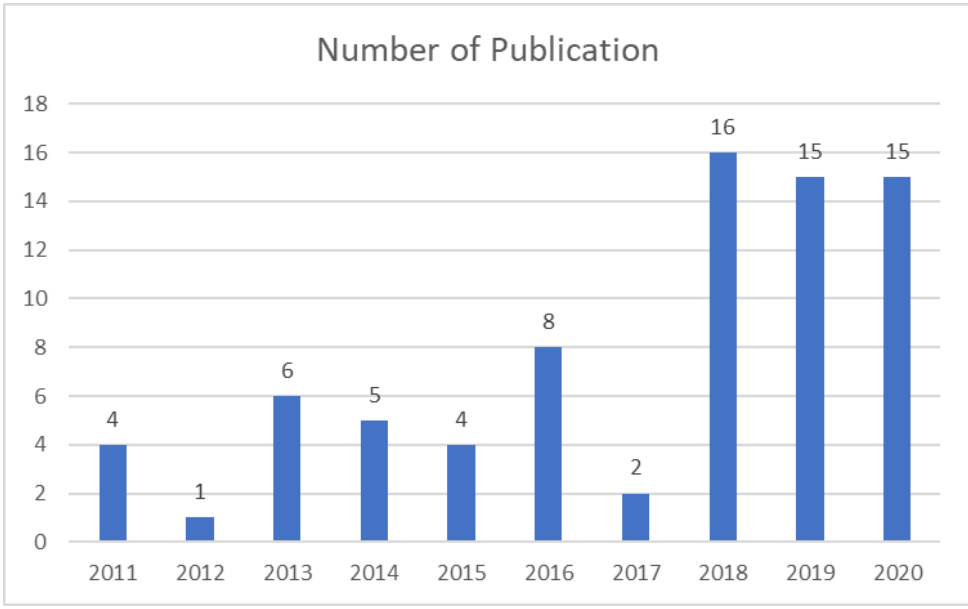


Figure 2.2: The number of publication trends of the examined papers from 2011-2020

The relatively small number of articles per year indicated that the discussion of the combined field of urban heritage conservation and urban FM was not widely examined, therefore becoming an opportunity to be studied further.

2.3.2 Top Authors in the Examined Papers

Among the list of authors of the 76 examined papers, a simple analysis was conducted to figure out the most active authors in the field. The analysis extracted two names from the heritage conservation discipline (Loes Veldpaus and Ana Pereira Roders) and one name from the urban FM field (Alenka Temeljotov Salaj). The latter accounted for nearly 7% of the articles with five publications, both as corresponding author and co-author. Veldpaus and Roders' articles combined accounted for almost 15% of the selected articles. Other authors were identified with less than three articles than the main author from the list (Figure 2.3) [20].

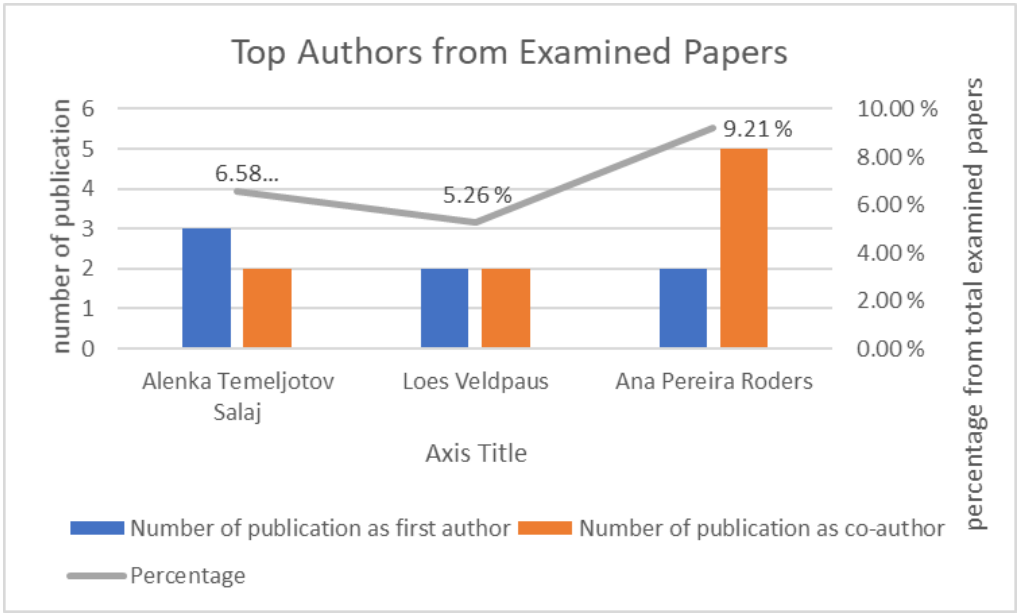


Figure 2.3: Top authors in the UHFM Examined Papers

2.3.3 Top Journals and Publishers of UHFM

Ten journals were repeatedly used to publish articles regarding UHFM, with a total publication of 32 articles (42.11%). *Facilities* was the most active journal in publishing the desired articles for this scoping review, with nine publications (11.84%), mostly with articles concerning FM and urban FM (Figure 2.4) [20]. Writings on the heritage conservation field were primarily published in the *Journal of Cultural Heritage Management and Sustainable Development* (JCHMSD) with four articles, the same number as *Sustainability*, an open-access journal from MDPI. *Environment-Behaviour Proceeding Journal* contributed three articles to the examined papers within the nine years from 2011–2020. *Places and Technologies, Copernicus Publication, The Journal of the Malaysian Institute of Planners* (Journal of MIP), *Automation in Construction, Institute of Physics Publishing (IOP) Conference Series*, and the *Journal of Cultural Heritage* together represented 15.79% of the works of literature. The remaining 44 articles were published in other journals and conference proceedings with only one article each.

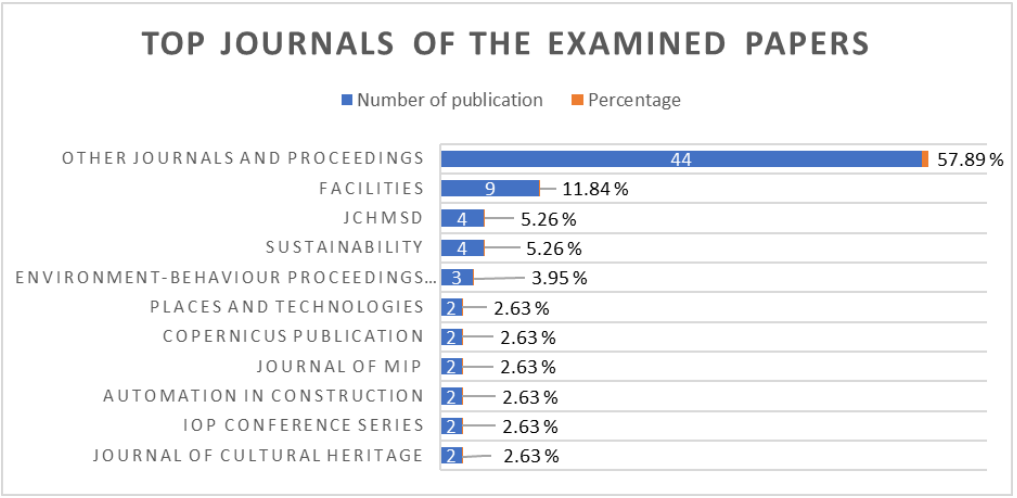


Figure 2.4: Top journals of UHFM-related publications

Emerald Group Ltd. published almost a quarter of the examined papers, while Elsevier Group (18.42%) and Multidisciplinary Digital Publishing Institute (MDPI) (6.58%) published another quarter. Springer contributed three papers, while e-IPH contributed four papers. Besides the aforementioned publishers and Taylor and Francis Group, IOP Publisher, Copernicus Publication, MIP, and the University of Belgrade, all publishers only published one article within UHFM from 2011–2020 (Figure 2.5) [20].

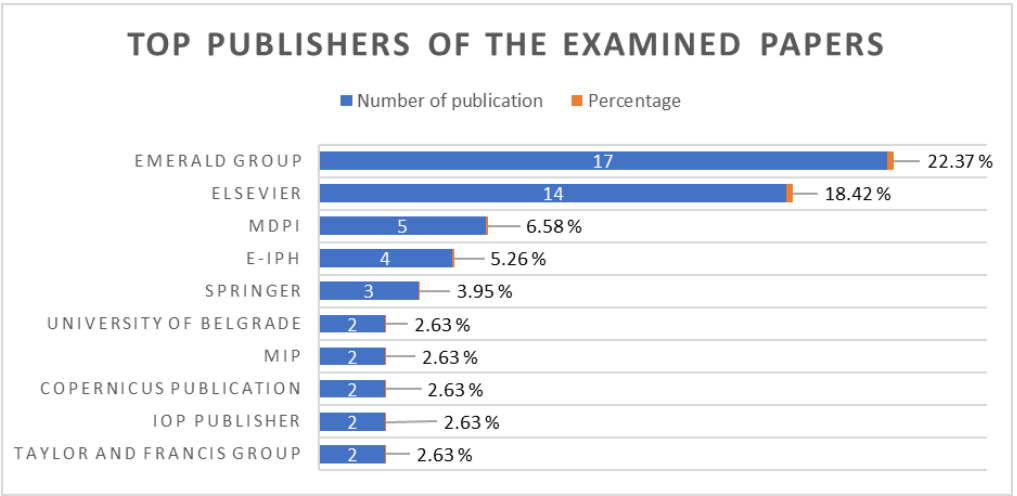


Figure 2.5: Top publishers of UHFM-related publications

2.3.4 Subject Areas of Publications

From the examined papers, this chapter found that 71.05% of the works of literature were from the heritage management or conservation field, while 28.95% were FM-oriented (Figure 2.6) [20].

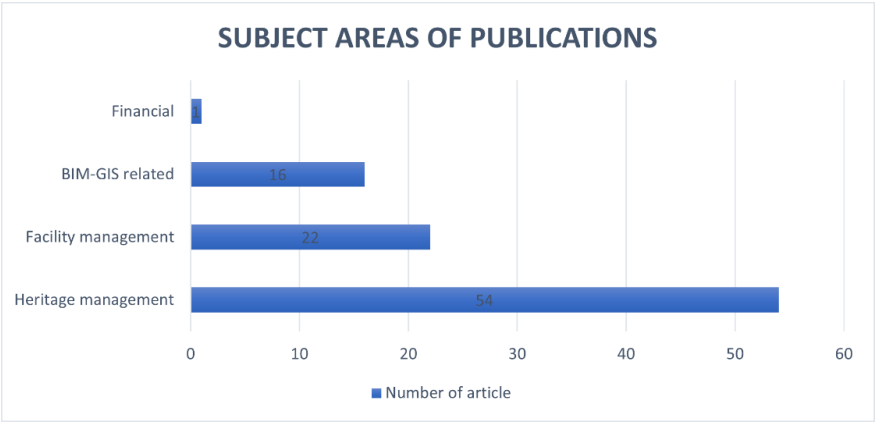


Figure 2.6: Subject Areas of Publications

From the combined field of works of literature, it was discovered that BIM-GIS-related topics were discussed the most [46,47,49–52,62–71] and represented 21.05% of the examined papers. Only one article (1.32%) directly addressed a financial issue of urban heritage facility management [72]. The potential of BIM and its wide application possibilities in UHFM were acknowledged broadly due to its capability to provide heritage assets information management, modelling, and real-time assessment regarding components of both heritage management and urban FM within an urban heritage area [20].

2.4 Overview of the realm of Urban Heritage Facility Management (UHFM)

2.4.1 Mapping Resources

The discussion around the first step of the HUL approach [20], mapping resources, was dominated by the usage of building information modelling (BIM, H-BIM, ACTIVe3D, BIM4FM) as an information management tool within the "civic engagement", "knowledge and planning," and "regulatory systems" [49,50,62,70,71,73]. The usage of BIM technology was not stated by any author regarding the financial aspect of the HUL supporting tools within the mapping resources step, although it is important for efficiency [66] and cost-saving in the long run. As argued by Salaj et al. [74], the discussion around financial instruments showed the potential of expanding the PPP model into PPPP (Table 2.1) [20]. At the same time, another author discussed more about the characteristics that might affect heritage property prices and values [75].

The potential of big data, social media, the Internet of Things (IoT), and artificial intelligence [55,76] in facilitating people to engage in the mapping resources step voluntarily within the UHFM context was also discussed among the authors [20,25]. The effort to integrate the interoperability of BIM and geographic information systems (GIS) could be a breakthrough for urban information modelling (UIM) [50,62,64,70], or even further, urban heritage information modelling (UHIM). Implementation of the 3D modelling through HBIM (historic-BIM) in heritage buildings' interventions made it possible for stakeholders to understand the significance and necessary actions required in the process [49,62,64,71] and made it easier for the facility managers to project and plan ahead for the future maintenance needs [25,49,71,77,78]. The authorities could create new

requirements on permit applications for renovating protected buildings by obligating the stakeholder to provide BIM-friendly data of the building to be added to the heritage database as a part of regulatory systems to accelerate the usage of BIMs [25,62].

HUL Critical Steps	HUL Supporting Tools			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
1. Mapping Resources	Bello, 2019	Andersen, 2014	Bello, 2019	Salaj et al., 2020b
	Ginzarly, 2018	Cecchini, 2019	Charlton, 2020	Zin, 2019
	Khoo, 2018	Charlton, 2020	Jordan-Palomar, 2018	
	McDonald, 2011	Devetakovic, 2018		
	Salaj et al., 2020	García, 2018		
	Salaj et al., 2020b	Marzouk, 2020		
		McDonald, 2011		
		Salaj et al., 2020b		
		Valese, 2020		
		Veldpaus, 2013		

Table 2.1: List of authors discussing the mapping resources supporting tools of the HUL approach within the UHFM field

The review showed a lack of discussion on natural and cultural mapping and identification. Most authors only addressed the mapping of human resources and the processes involved in FM and conservation. This is understandable because the rigid scoping review process produced a very concentrated topic within the UHFM field [20].

2.4.2 Reaching Consensus

"Reaching consensus" as the second step of the HUL approach was the least discussed point within the examined papers compared to the other five steps, with the "civic engagement" aspect becoming the most discussed topic within this step. Consensus building was achieved by raising awareness of citizens' disparities. The way neighborhoods act as collaborative communities could improve livability issues through cooperation between themselves and the municipality [74,79] by increasing people's willingness to change their behavior through motivational and socio-psychological theory [36] (Table 2.2) [20].

HUL Critical Steps	HUL Supporting Tools			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
2. Reaching Consensus	García, 2018	García, 2018	Bello, 2019	Salaj et al., 2020b
	McDonald, 2011	McDonald, 2011	Hussain, 2014	
	Salaj et al., 2020	Salaj et al., 2020b		
	Salaj et al., 2020b			
	Tobi, 2013			
	Zawawi, 2011			

Table 2.2: List of authors discussing the reaching consensus supporting tools of the HUL approach within the UHFM field

Although reaching consensus amongst scholars, experts, and heritage-related practitioners on how heritage should be adequately "consumed" by the people has become an ongoing, never-ending process [71], reaching consensus on what to preserve could be achieved through community involvement, citizen engagement, or citizens' participation [20,73,74]. It was argued that increasing knowledge and education amongst the stakeholders could improve the interest in protecting and preserving important cultural heritage (tangible or intangible) once people were personally related [73,74]. Therefore, technical information about heritage should be interpreted or adapted in layman's terms for the public interest [71]. Extending FM's current knowledge at the strategical, tactical, and operational levels of urban planning, data modeling, multi-criterion, modelling optimization, predictive modelling, demographic method, communication method, and 3D modelling technique might be the answer to "reaching consensus" within "knowledge and planning tools." Meanwhile, developing FM knowledge areas on new business models, such as PPPP and financial aspects [74], would act as financial supporting tools for this second step of the HUL approach. Urban FM or social enterprises were introduced to better manage the community facilities operations due to the risk of a "conflict of interest" in implementing outsourcing, privatization, and joint ventures [20,80].

2.4.3 Assessing the Vulnerabilities

Considering the HUL approach recommended by UNESCO, the "assessing vulnerabilities" step aimed to deal with global warming, climate change, and other environmental issues. Therefore, vulnerability assessment and adaptation to climate change to develop local strategies (i.e., local regulations and laws) are urgently needed [81,82] (Table 2.3) [20]. It is also considered essential to monitor the impact of urban development and various change factors in cultural heritage settings [11]. However, the discussion among authors in the examined paper showed that assessment of the heritage management policy [83], the presence (and the absence) of self-organization of neighborhood residents [36], and the possibilities of using BIM to create a virtual digital environment of the construction project [84] are also critical [20].

Some authors addressed the necessity of assessing the urban heritage assets' architectural aesthetic, artistic, social, economic, and historical aspects [11,85–89]. Firzan [86], Ho [84], Umar [90], and Samodra [91] highlighted the significance of utility and maintenance assessment in improving people's health and well-being. Citizen satisfaction would also improve the participation of local communities [92]; therefore, it also needs to be assessed [20].

The municipality and heritage authority must monitor the evaluation of conformity with current technical requirements as well as preserve its cultural history [20] by adhering to heritage conservation codes [86,89,93,94]. However, the authority should be aware of the audit-style evaluation method that results in "creative compliance," which undermines initial goals and leads to dysfunctional behavior [81].

HUL Critical Steps	**HUL Supporting Tools**			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
3. Assessing Vulnerabilities	Bello, 2019	Attia, 2020	Bello, 2019	Stendebakken, 2015
	Firzan, 2017	Boyle, 2018	Boyle, 2018	
	Ho, 2018	Dastgerdi, 2019	Dastgerdi, 2019	
	Khoo, 2018	Dyson, 2016	Firzan, 2017	

Salaj et al., 2020b	Firzan, 2017	Ho, 2018
	Hanafi, 2018	Khoo, 2019
	Ho, 2018	Sanjbod, 2016
	Huids, 2013	Umar, 2018
	Hussein, 2014	Veldpaus, 2014
	Kristl, 2019	
	Medici, 2020	
	Mignard, 2014	
	Nielsen, 2016	
	Roders, 2013	
	Sadeghi, 2018	
	Samodra, 2019	
	Torre, 2020	
	Veldpaus, 2013	

Table 2.3: List of authors discussing the assessing-vulnerabilities supporting tools of the HUL approach within the UHFM field

This scoping review [20] indicated that the financial aspect of UHFM was not being extensively addressed as a vulnerability as the third critical step of the HUL approach. Assessing the cost analysis of the alternatives available in historic building conservation projects [94] is the only financial aspect of the "assessing vulnerabilities" step. However, Dastgerdi [95] also argued that budget availability would directly affect priorities.

2.4.4 Integrating Values and Vulnerabilities

UHFM creates a strong, mutually supportive, and non-exploitative community by improving human performance, public participation, health, and well-being [43,96], coping with the demand of the citizen who wishes to live close to the city center (but with a community atmosphere) [15] and allowing local communities the chance to participate in the co-design process [74] (Table 2.4) [20].

Incorporating value and vulnerability (in terms of HUL's knowledge and planning tools) emphasized the BIM's ability to enhance proficiency in instances where various designs are implemented, making advanced maintenance tasks possible by delivering simulation, computation, and analysis to support planning [25,52,97]. Integration of BIM and diagnosis-aided HBIM with artificial intelligence for automation might be the instrument to assess the computation and structural vulnerabilities and to survey unsatisfactory conditions, and grades within the platform of BIM acting as a decision-making support system [25,47]. On an urban scale, 3D city models could be considered as a conservation strategy by expanding BIM into city information modelling (CIM) [68].

HUL Critical Steps	**HUL Supporting Tools**			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
4. Integrating Values and Vulnerabilities	Hu, 2016	Almeida, 2016	Dong, 2011	Kristl, 2019
	Kristl, 2019	Andersen, 2014	Kristl, 2019	Nijkamp, 2020
	Lindkvist, 2019	Atta, 2020	Torre, 2020	Torre, 2020
	Nijkamp, 2020	Aziz, 2016		

Salaj et al., 2020b	Bruno, 2017
Shehata, 2015	Colucci, 2020
Talamo, 2019	Dong, 2011
	Gao, 2019
	Hu, 2016
	Kristl, 2019
	Lindkvist, 2019
	Maltese, 2016
	Marzouk, 2020
	Mignard, 2014
	Moioli, 2018
	Nijkamp, 2020
	Talamo, 2019
	Terryn, 2012
	Torre, 2020
	Vukmirovic, 2020

Table 2.4: List of authors discussing the integrating values and vulnerabilities supporting tools of the HUL approach within the UHFM field

Discussion on the regulatory systems [20] indicated that law and regulation improvement are needed to enable heritage management to have a legal basis and enhance the promotion and awareness of heritage protection, thus improving urban sustainability according to the three basic pillars of social, environment, and economy [96,98]. In order to achieve a sustainable UHFM, it is argued that improvement of the heritage laws that enabled restoration financing, supporting private investors, and creating a diverse, vital, and innovative economy should be integrated comprehensively [43,96,99]. Integrating economic, educational, health, and cultural activities could potentially catalyze the community's development [26], not only to attract tourists [100,101].

2.4.5 Prioritizing Actions

The main goal of urban heritage conservation is to preserve the authenticity, unique characteristics, and cultural identity of the urban heritage area [45,102] in order to improve the dwellers' well-being, reinforce neighborhood, enhance physical and social public wellness, increase citizen participation, and create more equitable and satisfying places by sustainably transforming the physical environment [43,100,103], for example, the creation (or re-creation) of urban (heritage) attractive public space by redesigning and programming existing active public plaza [43,100]. One thing to consider is that heritage assets should be protected through preventive maintenance and monitoring rather than executing significant repairs, restoration, or reconstruction to better preserve the assets' authenticity [20,104].

Sustainability could be achieved by enhancing the promotion and place branding to increase heritage tourism [105] and increase local commercial activities, property, and land value of nearby buildings by improving environmental services, employment opportunities, and revenue from tourism due to the prospective new use of the protected assets [45,106]. At the same time, emphasizing ethical land use patterns reduces extreme economic disparities [100]. The effectively converted building would be able to produce enough revenue to fund its future self-sufficiency. Adaptive reuse projects' practical and intangible advantages far surpassed the entire cost, including maintenance costs [45] (Table 2.5) [20].

HUL Critical Steps	HUL Supporting Tools			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
5. Prioritizing Actions	Bello, 2019	Aigwi, 2020	Aigwi, 2020	Aigwi, 2020
	Hu, 2016	Bello, 2019	Andersen, 2014	Hu, 2016
	Li, 2019	Biagini, 2016	Gao, 2019	Valese, 2020
		Colucci, 2020	Hu, 2016	
		Sodangi, 2013	Khoo, 2019	
		Gao, 2019	Nijkamp, 2020	
		Hassan, 2015	Torre, 2020	
		Hu, 2016		
		Li, 2019		
		Mignard, 2014		
		Nijkamp, 2020		
		Rosa, 2020		
		Saccucci, 2018		
		Torre, 2020		
		Vukmirovic, 2020		

Table 2.5: List of authors discussing the prioritizing actions supporting tools of the HUL approach within the UHFM field

The three-dimensional modelling of cities from the integration of BIM and GIS provided an efficient way to share information and knowledge about architectural heritage for professional users, stakeholders, and experts engaged in the policy-making process and the management of the territory [66]. The BIM-enabled approach supported access control management by intuitively creating physical access control policies, conveniently managing physical access control systems, and effectively auditing physical access control logs [52]. Historic BIM (HBIM) implementation might enhance conservation practices [25], improve data maintenance and friendly 3D interface, and enable hazard recognition and risk assessment [25,46,64,99]. It led to efficient service delivery by widening its coverage and improving the quality using the latest technology [92]. Embracing modern information technology's application appropriately in FM and Urban FM promoted efficient and successful historic building maintenance and day-to-day operations [20,21,25,55].

2.4.6 Establishing Partnership and Local Management Framework

Urban FM established an interactive, effective, collaborative governance that enabled co-creation, co-finance, and co-ownership within urban public spaces to increase people's trust, attachment, commitment, inclusion, and integration. Therefore, it enhanced massive public participation in the urban heritage conservation process through urban collaborative decisions using evaluation-based techniques [45,74,84] by putting persons and organizations at the center of urban planning and revitalization through a variety of creative approaches, optimizing social and natural capital, and creating more fair and enjoyable places through community facilities [80,103].

Urban FM can be implemented to provide an integrated array of services supporting the operation, fruition, and valorization of urban goods by optimizing BIMs and enhancing information management for urban FM as a critical enabler for a more sustainable built environment [65,67]. In the service of cultural heritage protection, social media gave new information on regular contact with the historic urban landscape and heritage locations. On the other hand, asset management provided a holistic way to combine data from many

approaches to support particular applications and assist decision-making [107] (Table 2.6) [20].

HUL Critical Steps	HUL Supporting Tools			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
6. Establishing Framework and Partnership	Aigwi, 2020	Almeida, 2016	Aigwi, 2020	Afiqah, 2018
	Hasbollah, 2015	Colucci, 2020	Colucci, 2020	Ho, 2018
	Ho, 2018	Gao, 2019	Khoo, 2018	Hu, 2016
	Li, 2019	García, 2018	Li, 2019	Li, 2019
	Salaj et al., 2020	Ginzarly, 2018	Moretti, 2018	Salaj et al., 2020
	Salaj et al., 2020b	Hasbollah, 2015	Shehata, 2015	
	Tobi, 2013	Langston, 2013	Veldpaus, 2013	
	Vukmirovic, 2020	Li, 2019		
		Sadeghi, 2018		
		Vukmirovic, 2020		

Table 2.6: List of authors discussing the establishing framework and partnership supporting tools of the HUL approach within the UHFM field

The government's stimulus creation through planning laws would encourage adaptive reuse initiatives [45]. Revitalizing historic buildings through a partnership scheme adopting the PPP and PPPP model would create a local economic generator in urban heritage districts [74,84,100]. It is suggested that a partnership of stakeholders be included in the urban planning policy using an adaptive reuse strategy for urban regeneration [45,101]. Using adaptive reuse potential (ARP) modeling, the government would be able to establish the most efficient approach to carry out adaptive reuse interventions on heritage buildings, maximizing financial returns and enhancing productivity while decreasing environmental impact [55,108].

2.5 UHFM Academic Discourse

In order to have a deeper understanding of the UHFM, the research questions of this chapter were required to be answered. The first research question (RQ1.1) was how urban heritage conservation is related to urban *FM* throughout the examined papers. This scoping review [20] indicated that the urban heritage conservation field is closely related to urban FM. Urban heritage conservation and urban FM are required to conduct similar technical tasks such as urban infrastructures, facilities, and scheduled maintenance [20,21]. The latest landscape-based approach to managing the historical area, the HUL approach, recommended by UNESCO in 2011, also gave special attention to the people as an essential component, comparable with FM and urban FM, which are people-oriented disciplines. Implementing FM in urban heritage areas was considered unique in that it should be conducted according to the international, national, and regional heritage codes and laws. With the exception of urban FM implementation in non-heritage regions, which focuses on improving people's well-being, efficiency, and effectiveness, the UHFM is obligated to make every effort to preserve the district's authenticity and historical significance, regardless of cost. The key was finding the balance between efficiency, people's well-being, and preserving authenticity [20].

To address the second research question (RQ1.2) on the dimensions of UHFM in the body of literature, this scoping review structured the discussion by clustering the critical points from the combined field works of literature according to six critical steps and the HUL approach's supporting tools [20]. The overview of all dimensions showed that the frequency of authors or articles on each critical step directly indicated the intensity of discussion within examined papers. Around 71% of the articles in the literature addressed the UHFM dimensions from the heritage management point of view, while the rest were from the FM perspective. However, BIM's dimension was discussed repeatedly from both fields, indicating that a mutual entanglement could be addressed from the technological aspect of managing the heritage district [20].

The second step, "reaching consensus," using participatory planning and stakeholder consultation, became the least discussed step compared to the other five critical steps [20]. This lack of debate was surprising. From the phase-zero of the preliminary review, many case study publications considered the "reaching consensus" step to be one of the most crucial parts of a landscape-based approach in the urban heritage context. On the contrary, the "civic engagement" tool was the second-largest aspect discussed within the examined papers, thus consistent with phase-zero. On the second critical step of HUL, the "reaching consensus" step, the "civic engagement" aspect was the most extensive topic being discussed (Table 2.2) [20]. It even exceeded the number of authors discussing "knowledge and planning" tools, which consistently dominated the discussion in the other five critical steps.

The last research question (RQ1.3) on how the HUL supporting tools, related to urban FM, were placed within the critical steps of the HUL approach was responded to by creating a cross-sectional matrix between the six critical steps and the supporting tools of the HUL approach [20]. From the scoping review, it was seen that all four supporting tools support each critical step, but not each of them was equally balanced. As the first step, the "mapping resources" step was mainly supported by all three supporting tools but was lacking in the "financial tool" discussions, with only two authors discussing it. This step was also lacking discussion regarding the natural and cultural mapping process. The second step, "reaching consensus, " indicated that citizen participation was crucial. To enhance civic engagement, technical information concerning urban heritage management should be tailored to the interest of non-expert stakeholders. Within the third step, "assessing vulnerabilities," the intended purpose was to deal with socioeconomic pressure, global warming, climate change, and environmental issues. However, the supporting tools discussed among authors tended to give more attention to the assessment of compliance with current technical standards while at the same time maintaining its cultural heritage by following the heritage building codes needed. The "civic engagement" tools in the fourth step, "integrating values and vulnerabilities," mainly discussed the role of UHFM in creating a resilient community [20].

In contrast, the "knowledge and planning" tool discussed the potential of expanding BIMs into CIMs [20]. Adjustments to heritage legislation that allows for restoration funding, private investor support, and the creation of a diversified, dynamic, and creative economy should be incorporated fully through regulatory systems and financial tools. The fifth step, "prioritizing actions," was primarily supported by all four tools to fulfill the fundamental purpose of urban heritage conservation: to preserve the authenticity and historical value of the urban heritage area. The last critical step, "establishing partnerships and local management frameworks," focused on creating collaborative and interactive governance to improve citizens' sense of engagement. The government's stimulus creation through

planning regulations would support adaptive reuse projects as the best sustainable method for maintaining historic places. Historic building revitalization through a partnership scheme based on the PPP and PPPP models would establish a local economic generator in urban heritage areas [20].

Due to the limitation of this scoping review chapter [20], it is interesting to see the results of similar research, which include grey literature within the study, such as reports from the caretakers of historical districts and world heritage sites, standards from the professional associations, and thesis or dissertation works within the combined field of heritage management and urban FM within the examined papers. The language limitation has also limited the publication search, excluding the works of literature in heritage management and FM from other leading countries such as Japan, People Republic of China, and other non-English speaking European countries. The potential for a more comprehensive understanding could be achieved by addressing this research from another perspective limited to this chapter. The financial aspect, which was the least discussed topic in this study, would probably be addressed more intensively in some of the grey literature excluded from this scoping review [20].

2.6 UHFM Theoretical Keypoints

To summarize the overall result, a summary table was developed to give a broader perspective on this doctoral study. Findings from the previous subsections were simplified into a list of keypoints for each HUL step (Table 2.7) [20]. The total number of studies from every tool and step was added to give a side-to-side notion of this scoping review. It was evident that the "reaching consensus" and "mapping resources" steps were not as intensively studied as the other four critical steps of the HUL approach. The potential application of BIMs in the urban heritage facility management context is often discussed in every critical step of HUL, along with adaptive reuse, PPP/PPPP, and citizen awareness and participation [20,25].

HUL Critical Steps	HUL Supporting Tools				∑	Keypoints
	CE	KP	RS	F		
1. Mapping resources	6	10	2	2	20	Mapping resources using BIM/H-BIM, Mapping the existing PPP/PPPP, Mapping the heritage property price and value.
2. Reaching consensus	6	3	2	1	12	Citizen awareness, Consensus building, Collaborative community, Citizen engagement/participation, Education/developing knowledge, Interpretation of technical information.
3. Assessing vulnerabilities	5	18	9	1	33	Coping with climate change, Monitoring the impact of urban development, Utility and maintenance assessment, Citizen satisfaction assessment, Urban heritage policy assessment, Digital assessment using BIMs.

4. Integrating values & vulnerabilities	7	20	3	3	33	Improving human resources, Improving public participation, Improving health and well-being, BIM and AI to enhance efficiency, Heritage law and regulation improvement.
5. Prioritizing actions	3	15	7	3	28	Maintaining the authenticity, Preserving cultural identity, Efficient service delivery from the authorities, Enhance physical and social well-being, Preventive maintenance, Adaptive reuse, Enabled BIM integration approach, Increasing citizen participation.
6. Establishing framework & partnership	8	10	7	5	30	Collaborative governance, Urban collaborative decisions, Digital information optimation, Adaptive reuse approach, PPP/PPPP schemes.

**CE: Civic engagement tools; KP: Knowledge and planning tools; RS: Regulatory system; F: Financial tools.*

Table 2.7: Overall representation showing cross-cutting themes and concepts between urban FM and the HUL approach within the examined papers of scoping review, keypoints, and the number of studies on each of the HUL step

2.7 Contribution of the UHFM Scoping Literature Review to the Body of Knowledge

The scoping literature review of Urban Heritage Facility Management (UHFM) conducted in this dissertation significantly enhances the current understanding of various crucial areas of knowledge. A notable contribution is the identification and extraction of 33 theoretical UHFM keypoints. These keypoints are essential for validating urban-scale support services in the context of three Norwegian World Heritage Sites: Bergstaden Røros, Rjukan Company Town, and Notodden Industrial Heritage Area. They potentially serve as a foundational tool and play a crucial role in the validation process. The scoping review systematically examines a wide range of literature, articles, and publications from 2011 to 2020. A comprehensive collection of theoretical focal points is derived through a thorough analysis, which effectively captures the complex dynamics of UHFM. Every keypoint represents a subtle element of managing urban heritage facilities, which contributes to the development of a comprehensive framework that can be used as a standard for assessing the quality of support services.

The 33 theoretical UHFM keypoints [20] are not randomly chosen principles. Instead, they encapsulate the core ideas discussed in academic conversations about merging urban heritage conservation and facility management. Their importance lies in their usefulness as a diagnostic tool for evaluating the effectiveness, credibility, and alignment with heritage preservation objectives in the delivery of urban-scale support services. By relying on these keypoints, this dissertation establishes a methodologically rigorous foundation for the subsequent empirical investigation, ensuring that the validation process is anchored in a well-defined and theoretically informed framework. The recognition of these crucial points enhances our understanding of the complex connections among heritage preservation,

urban administration, and facility maintenance, thus enriching the overall theoretical framework. Consolidating these keypoints improves the conceptual comprehension of UHFM and offers a valuable asset for future research efforts in this emerging field. The comprehensive compilation of theoretical UHFM keypoints is a significant and fundamental contribution to the ongoing discussion on urban heritage management and facility operations.

(This page is intentionally left blank)

3 UHFM Scope: Urban-scale Support Services of World Heritage Sites

"There may have been a time when preservation was about saving an old building here or there, but those days are gone.. Preservation is in the business of saving communities and the values they embody…"

Richard Moe

This chapter focuses on the detailed aspects of managing facilities on an urban scale in the context of World Heritage sites as part of exploring Urban Heritage Facility Management (UHFM). The need to construct a coherent storyline and offer a strong rationale stems from the necessity to extend and compare facility management at the building level to urban-scale FM within urban heritage areas, which ultimately leads to the specialized domain of UHFM. This chapter utilized a narrative methodology, acknowledging the influence of narration-building in understanding the complexities of managing urban-scale heritage conservation.

The main objective of this chapter is to address the importance of understanding the essential support services needed to be provided in a particular urban setting. According to the Cambridge Dictionary, "core business" is the most important or most significant part of a company's business activity. Therefore, aligned with the definition of FM as an organizational function that integrates people, place, and process within the built environment with the purpose of improving the quality of life of people and the productivity of the core business [109], the FM support service refers to the key activities that provide support and improvement to the core business of both building level and urban-scale built environment. Within the realm of World Heritage sites, the primary objective is undeniably safeguarding the Outstanding Universal Value (OUV) [10,88,110], which serves as the fundamental basis for their inclusion in the World Heritage list.

World Heritage sites are excellent subjects for this exploration because they provide a vast amount of data and a comprehensive set of international, national, and local regulations, laws, and guidelines that govern their conservation efforts. This chapter examines the urban-scale support services required to support the preservation of Outstanding Universal Value (OUV) as the core business of WH sites. This chapter provides a foundation for understanding the complexities and challenges of UHFM, specifically in the context of managing facilities in the World Heritage sites.

The backbone of this chapter is Paper II (Identifying UHFM Support Services: Considering World Heritage Context) [21]. However, several parts of the other previously published publications such as (Paper I) Urban Heritage Facility Management: A Scoping Review, (Paper IV) Systemic Approaches in Revitalization of Semarang Old City Heritage Site: From Neglected Area to Tourism Destination, and (Paper V) Identifying Overtourism Impacts on the Informal Sector's Livelihoods in Urban Heritage Area also inspiring this chapter.

3.1 Introduction

The city as an artificial habitat is an intriguing phenomenon since it provides a location for human civilization to reside [21]. Cities are dynamic, complex, and multifaceted entities that are constantly evolving. The scientific study of cities has emerged as an essential area of research in recent years. One specific aspect of this field is examining urban heritage conservation, which is a system and process within urban development. Urban heritage refers to the cultural and historical value of cities. It encompasses both tangible and intangible aspects, including architectural heritage, historic landscapes, traditional practices, social customs, and cultural expressions. Urban heritage, which can also be addressed using the systems theory of urbanism, is essential in understanding the evolution of cities, as it reflects the cultural, economic, and social history of the communities that reside within them [111]. Therefore, urban development, as a complex and ongoing process that is shaped by various factors, needs to consider urban heritage as one of its key components [21].

Some cities are brand-new and purposely built, while others are hundreds or thousands of years old with a volatile past. There are other cities that eventually perished and are abandoned for a variety of reasons. The evolutionary history of cities around the globe demonstrates that a city is also a complex megastructure [112–116] comparable to a large institution [117–122] that occupies a massively built environment and must be managed effectively to function. Nevertheless, one must always remember that a city is not only a tangible structure but also a complex system comprising various subsystems, including the social, economic, political, environmental, and physical subsystems [111,123]. Over time, the proto-cities that initially arose from a group of humans who worked in a simple hierarchy evolved into a hub for vast numbers of individuals with diverse characteristics, interests, and needs, which the early founders may not have anticipated. As the complexity grew, it became unavoidable to employ stakeholders who were appointed as regulating authorities, as well as to manage the complicated daily tasks of a city [21]. Today's urban areas must be managed with exceptional discipline and precision to avoid chaos and long-term urban problems in the foreseeable future [20,21].

Cities also require enormous infrastructure and facilities, which must be designed, constructed, monitored, and maintained on an ongoing basis to ensure the citizens' well-being and quality of life [21]. City facilities management must be implemented systematically and effectively to decrease unnecessary costs and environmental impact. The International Facility Management Association (IFMA) defines facility management (FM) as a field dedicated to supporting people by assuring the functioning, well-being, efficiency, productivity, and sustainability of the built environment, which includes the buildings, the neighborhood, the city, and the infrastructures surrounding them [124–126]. FM is readily justifiable at the urban scale given that the city is intrinsically a physically built environment, consists of people with diverse interests and aims, and is arguable, to some extent, as a form of mega-organization or institution [21].

As a function responsible for ensuring that all supporting services are appropriately delivered, FM requires the institution's primary objectives or "core business" to be specified early in the strategic planning process [21]. Within a building level, it is apparent that recognizing the core business of the institution that operates and dwells in the building is not problematic. Moreover, without neglecting demographic, social, cultural, geographical, and other factors, the clarity of the core business will significantly influence the nature and type of supporting services that must be provided to achieve the organization's primary

goal effectively [54]. Knowledge of the "core business" in which the FM operates is necessary to forecast expenses, maximize service levels, and provide the requisite proactivity so that the organization's goals are aligned with those who are in charge of the facility management in strategical, tactical, and operational level [21,54]. One problematic issue is a lack of consensus on the fundamental question of what constitutes a city's "core business." Consequently, if the primary objective of developing a massive and complex community called a city has not been determined, it will become uncertain in deciding what support services are essential for achieving a successful and efficient urban-scale FM, especially in managing the World Heritage (WH) site as a real case of urban-scale heritage preservation [21]. Furthermore, managing urban-scale WH sites presents numerous challenges and dilemmas, such as balancing conservation and urban development, tourism and visitor management, lack of resources, and climate change.

This chapter contributes to developing urban-scale FM (Urban FM) as a field within the scope of FM discipline that is still in the establishment process [127]. This chapter also attempts to consolidate pieces of the puzzle of urban-scale FM, scattered in various journals, into a single chapter to spark academic debate and argument regarding Urban FM by using WH context as the best practice example of urban heritage facility management (UHFM) [20,21]. The heritage authorities and the WH caretakers will also reap the benefit of understanding the possible support services that could be provided to ensure the well-being of the people and the preservation of authenticity, visual quality, significance, and the outstanding universal value (OUV) of the protected sites from the FM point of view. The concept of UHFM, urban-scale support services, and Urban FM within historic towns and world heritage sites can benefit a wide range of other stakeholders, including local communities, tourists, and property owners. UHFM can also potentially improve administration by providing a framework for efficiently managing facilities within historic towns and WH sites. This can help to overcome silos and ensure that various technical departments and agencies collaborate to achieve common objectives. In addition, these services can contribute to improving training and capacity building for urban managers at the strategical, tactical, and operational levels by providing specialized training programs and resources tailored to the specific requirements of historic towns and world heritage sites [21].

Academics and urban observers have examined the connection and comparison between the city and the building for a considerable amount of time [21]. One of the earliest academic sources that discussed the subject matter defined a city in its comparison as a "building" in a book titled *The Elusive City: Five Centuries of Design, Ambition, and Miscalculation* [128]. Several other researchers describe a city as a megacomplex of structures [43,112,114–116,129]. Furthermore, one of the authors [43] concurred with the notion that cities and buildings can be compared directly by proposing a comparison between urban design and building facility design. The author investigated whether various design approaches in building and urban facilities are related and whether there is a relevant intersection of research areas of interest for developing the urban-scale FM. Moreover, the urban-scale FM principles should be engaged in the beginning phase of urban design to capitalize on the crossovers and new research [43], such as how facility managers with architectural backgrounds should be involved in the designing phase of a building. Therefore, the strategic and tactical planning of urban heritage facility management within WH sites should also be incorporated into the urban planning at the municipality and county levels. Given that this chapter is addressing urban heritage areas, with WH sites as the context, the implications for urban planning are immense. In contrast to a protected single building, which is also considered in urban planning, its impact is not

as significant as that of urban-scale WH sites, which are required both from a conservation management perspective and a city-scale facility management perspective that oversees everything outside the scope of the cultural heritage caretakers tasks [21,130].

To fully comprehend urban-scale facility management, this chapter observes the city as a structure comparable to a building [21]. This enables us to identify the support services of an urban area that must be prepared by directly associating them with the practice at the building-level facility management. The management of energy, water, sanitation, transportation, and communication are easily comparable between a city and a building. However, it is expected that there will be several variations and differences between facility management at the building level and facility management at the urban scale, particularly at WH sites with embedded local, national, and international heritage regulations [21]. However, every attempt to bring this subject up in academic discourse will contribute to establishing the Urban FM field. This chapter is more of an experimentation designed to address the technical issues and components of urban-scale FM within a protected heritage area such as WH sites. The United Nations Educational, Scientific and Cultural Organization (UNESCO) acknowledges WH sites as places of outstanding universal value, and as such, they must be preserved for future generations. Proper urban-scale FM support services are essential to preserving these sites, as the services take care of everything besides the daily tasks of heritage conservators [130]. FM services can help ensure that the sites are well-maintained, that their cultural and historical significance is preserved, and that they remain accessible to visitors. In addition, the fact that WH sites are regulated by binding local, national, and international regulations makes the identification of the potential support services of WH sites more consistent and less biased [21].

The World Heritage Convention, which was adopted by UNESCO in 1972, aims to protect and preserve significant cultural and natural heritage sites of universal value [19]. The Convention recognizes the importance of these sites for present and future generations and emphasizes the need for effective management and conservation. Furthermore, the UNESCO recommendation on the Historic Urban Landscape (HUL) approach emphasizes the need for a holistic and integrated approach to the management of historic urban environments [19,20,131]. Consequently, urban-scale FM and the World Heritage Convention are conceptually connected due to the role of Urban FM in achieving the goals of the World Heritage Convention by providing a framework for the effective management of facilities and services within historic cities and towns [20,21]. This includes the management of buildings, infrastructure, public spaces, and other urban amenities that contribute to the site's cultural and historical significance. Moreover, urban-scale facility management contributes to preserving and protecting these sites' cultural heritage for future generations [21].

To strengthen the argument that a city acts as an entity that should be managed, Dickerson [132] argued that the city, to some extent, is an organization. This argument is also confirmed by a number of other scholars [133–135]. Organization refers to a systematically organized group of individuals having a shared objective and identity associated with an external environment. It is frequently confused with the institution, which refers to an entity with a high level of sustainability that can be viewed as an integral part of a big society or community. Nevertheless, a city is also associated with an institution [117–122].

The fact that a city is an institution that grows within the built environment can be related to the definition of FM in ISO 41011:2017, which is also adopted by IFMA, as an organizational function that integrates people, place, and process within the built

environment intending to improve the quality of life of people and the productivity of the core business of the institution [21,126]. In other words, the fundamental purpose of FM is to support an organization's primary business activities and facilitate the creation of an environment suitable for achieving its goals. Consequently, the absence of studies about a city's "core business" from an FM perspective has led to a lack of clarity regarding the support services that an urban-scale FM may provide to meet a city's primary objective [21].

This chapter formulated two research questions [21] that will be discussed in the discussion:

(RQ2.1) *What is the primary goal or "core business" of a city?*
(RQ2.2) *What are the possible support services that could be identified to enable a city, including the urban heritage area such as WH sites, to serve its purposes?*

These research questions were addressed by comparing a city and urban-scale WH sites to a building in terms of its capacity to support the daily life of its inhabitants from the FM point of view [21].

The "core business" of a city is one of the most crucial unaddressed topics from an urban-scale facility management perspective [21]. This chapter functioned as preliminary research that simplifies the more significant challenge of urban facility management, which aims to identify features that might be suggested as the "core business" and possible support services of a city that are acceptable for different types of cities, including the urban areas that are listed as WH sites.

3.2 Methods and Research Design to Build the Narrative

This chapter attempted to create a narration of what a "core business" of a city actually is, in order to be able to propose urban scale supporting services needed to be delivered, especially within the WH sites, to ensure the preservation of outstanding universal values (OUV), authenticity and visual quality as heritage assets [21]. The term "city" is used extensively in this chapter since it is considered to be a universal terminology in expressing other terms, such as urban and town, in a more contextualized manner when describing urban-scale facility management. In order to do that, a literature review and a narrative approach were conducted. A desk review was conducted by reviewing literature related to the purpose of a city, the city as an organization, and the city as an institution to determine the general concept of the core business of a city (RQ2.1) [21].

A narrative approach was needed to be carried out due to the lack of intensive academic discussion regarding urban-scale support services and the unclear definition of the core business of a city [21]. Several opinions from urban experts, historians, scholars, etc., are summarized in a narrative to simplify and justify the concept of the "core business" of a city, which will later provide a way to answer what support services are needed to achieve the primary goal of establishing the city. Using a literature review and narrative research approach from the experts and available journal articles and books, this chapter seeks to shed light on potential explanations for a city's "core business." [21]

A narrative is a method of writing that depicts an event sequence that has significance for the narrator or the audience [136,137]. Moen [136] argued that the narrative method is a "frame of reference," which is a form of presenting the research work. The narrative approach is situated within the qualitative or interpretive research method (Gudmundsdottir in [136]). Such a qualitative methodology to the subject of study entails

that scholars examine subjects in their normal daily contexts, aiming to understand some things based on the interpretations that the narrative speakers described [136,138].

While a narrative approach has the strength to (1) provide a deeper understanding of the experiences and perspectives of different respective narrators that might not be possible to accomplish using other methods, (2) provide valuable context to help explain certain unformulated concepts, (3) recognize the individuality of narrators and allow them to share their unique perspective on the subject matter in their own words, (4) identify patterns, themes, and meanings that interacted across narrators, and (5) identify patterns, themes, and meanings that may not be apparent through other research methods, the selected approach also has several weaknesses, such as the subjective nature of interpreting the narrators' statements and the limited generalizability of the results [136]. Furthermore, this chapter acknowledge that some degree of simplification is necessary within this study to make the comparison feasible and understandable while avoiding oversimplification by using IFMA's parameters as the basis argument to construct the comparison table [21].

Defining a city's "core business" and describing its support services required such approaches to enhance a broader audience's comprehension across many disciplines, thus stimulating more in-depth interdisciplinary discussions [21]. In addressing the second research question (RQ2.2), several sets of side-by-side comparison matrixes are created between building-level FM and urban-scale FM support services to make it easier for the audience to understand the context and to facilitate a more structured discussion of potential urban-scale supporting services. Another category is being added to elaborate on the possible supporting services within the WH site's context. Utilizing prior knowledge [20] and data obtained from the Norwegian WH sites' caretakers, this chapter attempts to minimize bias and interpretation of the possible support services within the urban level and WH sites' frame of reference in comparison with the building level FM [21]. However, the comparison carried out in this chapter is not intended to be regarded as a definitive and established framework for urban-scale support services. Instead, it serves as a preliminary study that necessitates further refinement and will be subject to further development.

3.3 Theory and Background to Build the Narrative

This subchapter is needed to establish a coherent narrative that justifies the comparability between a building and an urban environment, such as a city or town. A theoretical foundation is crucial for creating a conceptual framework that connects building-level facility management with the challenges of managing an entire urban environment. By comparing the two scales, this chapter attempted to identify similarities in how they operate, their complex structures, and the services needed for them to work effectively.

In short, both buildings and urban-scale built environments possess fundamental similarities, with the latter essentially functioning as an enlarged version of the former with different levels of complexities and challenges [21]. This analogy is not simply figurative but arises from a recognition that the principles governing the maintenance, functioning, and endurance of buildings are inherently interconnected with those of urban-scale built environments, such as neighborhoods, districts, historic towns, or even cities. Buildings, being the essential components, contribute to the overall composition of a city or town.

The primary objective of a city or town can be compared to the primary objective or function of a building and is vital for determining the support services needed to be provided for its ongoing operation [21]. Within the framework of an urban area, the activities extend beyond the tangible buildings to encompass the holistic welfare of its

residents and population. This dissertation explores the complex field of urban-scale facility management in urban heritage areas by analyzing the various components that make up the fundamental operations of urban environments, including World Heritage sites as protected heritage assets. The subsequent identification of urban-scale support services is crucial for maintaining the daily operational efficiency of the urban environment and, ultimately, the overall well-being of its diverse population while at the same time maintaining the heritage values, significance, authenticity, and visual quality [21].

3.3.1 The Definition and Origin of Cities

Essentially, a city is a sufficiently large town with its own governance. The expression was derived from the French word "cité," which originated from the Latin word "civitatum," which means "citizenship" [139]. In the context of ancient Greece, citizenship refers to the involvement of individuals in the social and political life of small-scale communities [122]. According to the Degree of Urbanization approved by the United Nations Statistical Commission, a city is proportionately more prominent than a town [140,141]. The expansion of agriculture is intimately related to the emergence of the earliest cities. Later, the greater the population of the community, the safer it was from attack by other tribes. Through time, villages developed in size and eventually transformed into towns and cities [142]. The food surplus from the successful agricultural productions enabled both the specialization of work and the formation of a class structure that can provide the leadership and workforce to build and operate even more complex agricultural systems, which in turn makes possible further increases in the food supply [142,143]. Numerous craftspeople who were not working as farmers, such as masons, carpenters, jewelers, potters, etc., lived and worked at a considerable distance from the urban center. Through time, the division of labor and professions grew to be more specialized due to the increasing complexity of society [143]. The concentration of a large number of specialists in a small area stimulated creativity, not only in technology but also in religious, philosophical, and scientific ideas [142]. Moreover, some representatives among the citizens and certain specialists were appointed to manage the city's routine tasks in order to prevent social disorder. These citizens might have acted as the predecessors of the current support service providers or even facility managers [21].

However, a city is not merely a structure. A city is also a complex system with multiple layers of subsystems [21]. The theory of what a city is and its subsystems has been the subject of much debate and discussion among urban theorists and scholars. One influential theory is the systems theory of urbanism, a theoretical approach that views cities as complex and dynamic systems of interconnected and interdependent parts [111,123]. According to this theory, a city is not just a physical structure but also a system that consists of different interconnected subsystems [111] that interact with each other in a complex and dynamic way, creating a web of relationships that shape the urban environment [123]. As a structure, a city refers to the physical form and built environment, such as buildings, streets, and public spaces. As a system, a city refers to the processes and activities that take place within the urban environment, such as economic activities, social interactions, and political decision-making. The system theory of urbanism highlights the importance of understanding the complexity and interdependence of different subsystems within a city to effectively manage urban development, one of which is through urban-scale facility management [21].

3.3.2 Urban-Scale FM

Virtually everything must be managed, from simple tasks to complex tasks such as daily city operations [21]. Management is the act or art of managing, planning, developing, directing, or supervising anything to attain a particular objective [144,145]. The management discipline has evolved into many branches, each of which has its character and specialization field, one of which is facility management. Salaj and Lindkvist [127] recommended expanding the FM discipline into an urban-scale practice after Alexander and Brown [146] had earlier proposed a similar concept for community-based facility management (CbFM) [21].

FM services at the building level are exemplified by users' experience when entering the main entrance, feeling comfortable in the lobby, using a luxurious escalator, meeting in a well-equipped meeting room, and having excellent toilet facilities [21]. The satisfaction due to the pleasant and productive experience is the work of the facility managers operating behind the scenes. It is identical to how the dwellers perceived the city as a lively and productive environment due to the excellent work of the urban facility managers. Arguably, FM support services act as the avant-garde to ensure the efficiency and daily operation of the facilities of built environments, including cities and the infrastructures needed for the dynamic and productive urban environment to be achieved to maintain citizens' fulfillment. Urban FM, or UFM, as an expansion of building-level FM, has been discussed by multidisciplinary scholars globally from various perspectives and vantage points. Nevertheless, the FM stakeholders and academics have not yet agreed on a solid Urban FM framework. The idea of enhancing public participation [147], PPPP [38], sustainable neighborhood refurbishment [74], health-directed design interventions in cities [43], urban heritage facility management [20], and place-making [103], among others, are contributing to the development and establishment of Urban FM as an emerging discipline branch of FM. These pieces of knowledge are scattered throughout the intellectual discourses and academic debates [20]. While most urban caretakers have performed urban-scale facility management as part of their day-to-day tasks, the research community has not seemed to structure it in one comprehensive model or framework. This situation, to some extent, resembles the same phenomenon that occurred in the early development of the building-scale FM discipline. However, many institutions and businesses specialize in the FM industry to improve the organization's efficiency, cost savings, and flawless operation. Thus, incorporating FM is becoming a common practice in society. The same shift is expected to happen with Urban FM in managing urban-scale facilities in the near future. Contextualizing urban-scale FM within WH sites will contribute to establishing Urban FM as a discipline and provide a distinctly new perspective and management approach for WH site preservation through the provision of urban-scale support services tailored for heritage districts and historic towns [21].

3.3.3 World Heritage Sites as A Protected Urban Area

The concept of "World Heritage" was innovative when it was introduced for the first time. Traditionally, inherited cultural assets were restricted to specific people or communities [148]. With the relatively new terminology of "World Heritage," a cultural item is deemed universal, has a broader reach, and is incorporated into global human history. During the completion of the Aswan Dam in Egypt in 1959, the Ramses II temple at Abu Simbel was in danger of being demolished. This resulted in the establishment of the WH movement [149,150]. UNESCO launched an international campaign to salvage critical heritage assets, which sparked a debate about the necessity of a worldwide treaty to protect the most significant cultural and natural heritage sites all over the globe. In 1972, UNESCO came

up with an agreement that included natural and cultural assets worldwide. The agreement's purpose is to protect areas of worldwide significance that also contain outstanding universal values and belong to all of humanity [151]. Therefore, the permanent protection of this asset is of the utmost importance to the global society and is becoming the defined terminology of WH that we know today.

The concept of WH also represents a shift in thinking about cultural heritage from a narrow focus on individual buildings or monuments to a broader understanding of cultural landscapes and the complex relationships between people and their environment. The notion of WH has helped encourage a more holistic approach to heritage management, which seeks to balance conservation with sustainable development and community involvement [20].

To be listed as an urban-scale WH, a site must meet at least one of the following criteria: (1) exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning, or landscape design; (2) bear a unique or exceptional testimony to a cultural tradition or to a civilization that is living or that has disappeared; (3) be an outstanding example of a type of building, architectural, or technological ensemble or landscape, which illustrates a significant stage(s) in human history; (4) be an outstanding example of a traditional human settlement, land-use, or sea-use, which is representative of a culture (or cultures), especially when it has become vulnerable under the impact of irreversible change; and (5) be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance [19]. Sites must also meet the conditions of integrity and authenticity, meaning they must be intact and genuine representations of their cultural heritage values. Additionally, they should be well-preserved and have adequate management and protection systems in place. Furthermore, failure to maintain the outstanding universal value(s) will result in the delisting of the sites from WH status, such as the Arabian Oryx Sanctuary, Oman (2007), Elbe Valley in Dresden, Germany (2009), and the Liverpool Maritime Mercantile City in Liverpool, United Kingdom (2021).

Heritage has extended to include groups of structures, historical urban centers, parks, and nonphysical heritage such as surroundings, social characteristics, and, more recently, intangible attributes [152–154]. The phrase "tangible" describes the physical objects that have been developed, conserved, and handed down through the generations of a community. It consists of creative accomplishments, built legacies such as structures and monuments, and other artifacts of human innovation instilled with cultural significance. In contrast, the "intangible" terminology refers to the expressions, rituals, symbols, knowledge, and abilities that individuals, groups, and communities acknowledge as representative of their collective memory [131,155]. However, most tangible heritage can only be interpreted and comprehended through reference to the intangible. Consequently, society and values in the WH site context are intricately interconnected [155], progressively becoming relevant for urban-scale FM as a people-oriented discipline [20,21].

Heritage can be both an asset and an incumbrance to urban development, depending on how it is managed and valued. Heritage can be a significant asset to urban development because it provides a city with a distinct and valuable sense of identity, history, and culture. Heritage sites can attract tourists, stimulate economic growth, and increase property values [23,24]. Additionally, preserving and supporting heritage can foster a sense of

community pride and cohesion and contribute to a city's social and cultural fabric. Managing an urban-scale WH site requires finding the right balance between the need for preservation and the necessity for urban development to meet modern living standards and urban facility management services [21]. This can be challenging to achieve, as urban development and the preservation of cultural and historical values can sometimes be in conflict [20,156]. Historic preservation may limit the ability of developers to build new buildings or make alterations to existing protected buildings, resulting in conflicts between preservationists and developers. Urban WH sites, which frequently attract large numbers of visitors, can also potentially introduce management challenges for the site and its surrounding communities. Managing WH visitors is further complicated by overtourism, inappropriate visitor behavior, and damage to heritage sites [23,24]. Many urban WH sites are located in developing nations or areas with limited resources, which can present additional challenges in terms of conservation funding and management resources [157,158]. This does not even take into account the existence of facts regarding climate change and natural disasters, which can pose significant threats to WH sites, which are sometimes located in areas prone to earthquakes, flooding, and other natural disasters [159,160]. In Røros, Rjukan, and Notodden, three WH-preserved towns of Norway, climate change has resulted in unusually wet winters over the past several decades, which has increased the difficulty of preserving the wooden materials on the facades and structures of the protected buildings. Providing heritage-oriented urban facility management support services could also be a potential approach for achieving the optimal balance in the management of WH sites [21].

Heritage preservation and urban development are closely related to urban-scale facility management (Urban FM) because they aim to improve urban residents' quality of life [20,21]. Urban FM plays a crucial role in ensuring the preservation of historic buildings and sites and fostering urban development through efficient and sustainable management of urban-scale support services. In this way, Urban FM acts as a link between the past and the present, preserving the history of cities while ensuring their continued growth and development. Effective urban facilities management can ensure that historic structures and sites are maintained to the highest standards and can be utilized for a variety of purposes. This requires close collaboration between different technical departments of the governing authorities and stakeholders to ensure that urban facilities are efficiently maintained and managed and that any necessary repairs and upgrades are performed promptly [21]. Urban FM can also play a significant role in promoting sustainable urban development by ensuring that urban-scale support services are managed to reach optimum efficiency while retaining historical significance. Heritage preservation, urban development, and Urban FM have a complex and multifaceted relationship. By collaborating, these distinct disciplines can contribute to the development of thriving urban areas rich in heritage and history while meeting the needs of a growing and changing population [21].

3.3.4 Urban-scale Support Services within the World Heritage Sites

There has been no extensive research to date that defines and describes urban-scale support services at WH sites [21]. Urban FM is in the midst of establishing itself, and the research on support services in the context of WH sites has the potential to contribute to the intensification of discussions aimed at strengthening Urban FM as the expansion of building-level FM. The research on support services in the context of WH as a gap in knowledge also highlights the need for further research in developing effective strategies for the sustainable management of WH sites as protected urban areas. Therefore, filling this knowledge gap will help enhance our understanding of urban-scale FM and its critical

role in preserving and promoting WH sites' cultural and historical significance. Urban heritage facility management integrated both public (government-owned) and private (individual and corporate-owned) heritage assets within the core and buffer zone of the World Heritage site, with different levels of flexibility and authority in managing such assets [21].

By elaborating on the scope and description of hard-FM and soft-FM provided by RICS and IFMA [109], a set of comparison tables was made to foresee possible comparable support services between building-level and urban-level facility management [21]. Hard FM mainly includes maintaining and supervising the built environment's physical assets, whereas soft FM mostly encompasses managing additional services. The infrastructures, air quality, structural aspects, plumbing, water supply, electricity, lighting, and telecommunication systems fall under the hard FM domain. The second category, soft FM, comprises services such as catering, cleaning, waste management, gardening, security, and so on [161]. Managing a WH site requires a more specific approach because the provided urban-scale support services affect both private and public heritage assets while at the same time being oriented toward preserving authenticity, visual quality, and, most importantly, the outstanding universal values that distinguish WH sites from other urban heritages and historical cities [21].

3.4 The Narratives

3.4.1 Comparability between Building and Urban-scale Built Environment

This chapter indicated that a city is, to some extent, comparable to a single building or complex of buildings in terms of managing its facilities (Table 3.1) [21].

Narration	Author(s)	Reference(s)
City as a building or megastructure	Barnet (1986), Caffaroni (2016), Chizzoniti (2018), Koehler (2019), Bettman (2019), Vermeulen (2020)	[112,114–116,128,129]
A city is not a building, although it is acknowledged that the minimalist design of urban plazas has its origins in the architectural interior design of buildings	Lenzholzer (2008)	[152]
City as an organization	Lang (2000), Dickerson (2003), Knox (2010), Shade (2020)	[132–135]
City as an institution	Richard (2011), Canniffe (2016), Ruwet (2017), Ismard (2018), Kornberger (2021), Duplouy (2022)	[117–122]
The analogy between urban design and (building-level) facility design	Nijkamp (2020)	[43]

Table 3.1 Justification of the comparability between a building and a city

It is evident that a city is indeed a physically built environment that requires an organizational function that integrates people, places, and processes within its boundary. The core business of a city should then be placed at the central point of the realm of urban-scale facility management. To achieve the city's primary goal, the in-house teams and the outsourced task forces should deliver excellent hard-FM and soft-FM services. The users

and the stakeholders simultaneously act as the "owners" of the facility within the domain of co-governance, co-ownership, and civic engagement [21].

The quality of the individuals that a city intends to attract is considered crucial because the positive qualities such as skills, assets, and values of the people who will become the new citizens will be directly linked to the improvement of the society. The city is implicitly not interested in attracting "low-quality" newcomers, which will burden the municipality and taxpayers. This chapter suggests that a city's primary objective is to maintain and possibly attract new "desirable" citizens by providing excellent services, a quality-built environment, a sense of well-being, health, safety, security, and economic growth (Table 3.2) [21]. Therefore, the integration of urban-scale support services must be aligned with the "core business" of the city. For example, the "core business" of a historical city or urban heritage area would be to maintain its inhabitants to dwell, and probably attract new dwellers who are interested in living in, and thus contributing to, the heritage conservation by providing support services that ensure the preservation of the heritage significance, value, and authenticity [130]. Meanwhile, the "core business" of an industrial city would probably be in maintaining the existence of laborers, workforces, business owners, and investors as the stakeholders by providing support services such as integrated infrastructures, power, access to capital, transport, and market to enhance efficiency [21].

3.4.2 Purpose of a City

Kemmis [162] highlighted how essential it was for cities to generate a few responsibility-seeking citizens. Regarding the existence of citizens in connection to the sustainability of the city and the need for the city to be organized and governed, Otis White, an urban expert, shares a similar viewpoint (Table 3.2) [21].

Purpose of a City	Author(s)	Reference(s)
A city should be in the business of caring for and nurturing human beings.	Gilliam (1967)	[163]
A city is a place for humans to dwell, with primary functions to provide housing and boost productivity by actively providing citizens with food, clean water, sanitation, and other essentials.	Davis (1973), Harper (1992)	[164,165]
How important it is for a city to produce responsibility-seeking citizens.	Kemmis (1995)	[162]
The purpose of why a city exists is to create citizens.	White (2010)	[166]
A city is a community/social structure with distinctive social qualities and uniqueness that promotes work and occupations by enabling labor, production, and commodity circulation and consumption.	Morshed (2019)	[167]

Table 3.2: Collection of narratives to emphasize the common purpose of a city

It appears that the urbanist was influenced by Peter Drucker's views on the fundamental concept of the corporation, in which Drucker argued that the only valid definition of corporate business purpose is customer creation [166,168]. Other things, such as profit, employment, etc., are the byproducts of creating customers, not the objectives. Customers are the reason for the existence of a business because, without them, there would be no profits, jobs, or social value. Therefore, the primary focus of every business entity should

be on generating customers [168]. Otis White then proposed that the purpose of why cities exist is to create, and thus maintain, citizens [166]. Because without citizens, there would be no economic growth, arts, entertainment, or educational facilities. It is argued that the actual purpose of cities is to generate a group of individuals who will bear responsibility for their community, whether through direct participation in city management or other means [162,166]. In other words, citizenship is described as a form of "participation" rather than "membership" [122]. The citizens' primary characteristics are the commitment to participate and take on responsibility [21].

In the past, when cities were surrounded by vast amounts of unmanaged territory and where predators were prevalent, life was dangerous and frequently brief. Once they established urban settlements, they frequently discovered that the predators had followed, and life continued being threatened like before. The possibility of invasions and wars from other outsider parties was also enormous. At this point, the creation of actual citizens emerged. The people sacrificed some individuals' freedoms in exchange for greater freedom from threats. The inhabitants then collaborated to establish a sense of community safety and security. Cities are governed by explicit regulations, which are agreed to by their citizens. Economic benefits are the result of collective action. Still, such activity is only achievable with the collaboration and a sense of safety and security provided by themselves toward common goals for the benefit of all [21].

Lewis Mumford (in [163]) proposed that a city should be in the business of caring and nurturing human beings. This statement is strongly aligned with urban-scale facility management, which is a people-oriented discipline [20,21]. This condition becomes unique when the protected urban heritage area is considered a living artifact, with living people and activities inside, not merely lifeless monuments or archaeological artifacts. Historic cities, urban heritage areas, and WH sites such as Røros, Rjukan, and Notodden, in Norway, for example, must continue to operate and function for caring and nurturing the citizens in their daily lives while continuously maintaining the significance, visual qualities, authenticity, and OUV, with the technological advancements, and physical development to ensure the highest quality of life for the citizens [21]. Therefore, Gilliam [163] also argued that a city consensus needed to be established to enable the citizens of a particular community to manage their public affairs, conduct their corporate business, and develop their well-being.

Harper [165] makes an additional critical point on the real purpose of a city, namely as a place for humans to dwell. Otis White has denied that the purpose of the city is to provide a location for people to be organized, educated, and entertained [166]. Still, Harper [165] did not rule out this possibility. Additionally, Morshed [167] attempts to distinguish a city as a community through its distinctive social qualities and uniqueness. The definition of a city as a "concentration of numerous people positioned near together for residential and productive purposes" includes several objective characteristics, such as population density and number of residents [164]. However, more importantly, Davis [164] emphasized that the primary function of a city is to provide housing and boost the productivity of its citizens. The city then employs resources and generates outputs to achieve its goals. Thus, consequently required to be appropriately managed [21].

3.5 Urban-Scale FM and Its Supporting Services

The variety of support services for facilities is so extensive that they are frequently split into soft-FM and hard-FM services [21]. Some services, such as cleanliness and trash management, are conducted daily, while others, such as maintenance services, may be

performed less frequently. Other types of services can be planned based on the urgency of the situation. The key role of urban-scale FM in public sectors is to support the core business activities of the institution in accomplishing its objectives by reassuring end-user expectations, optimizing budgets and expenses, providing business continuity, ensuring legal and regulatory compliance, and so on [127]. The definition of FM as an integrated management of all non-core business services for buildings, space, and people, to operate and maintain the built environment introduced the emphasis on non-core activities, which refers to all the additional characteristics required to achieve an institution's core business [169]. The non-core services, although often not seen on the surface, serve a supporting role in achieving the institution's objectives [21].

The non-core services can be categorized as (1) utility services, (2) technical services, (3) application services, (4) financial services, (5) property or real estate services, and (6) auxiliary services [170]. All of them belong to the spectrums of hard-FM and soft-FM. However, depending on the organizational structure and building needs, not all FM services might be relevant to the core activities of the organization or city as the subject of this study [21,171].

FM is an essential aspect of building operations, and cities and municipalities have increasingly adopted its principles and practices as they seek to manage and maintain their urban infrastructure and services [21]. The transformation of FM to the urban level, known as Urban FM, involves applying FM principles and practices to manage and maintain urban-scale assets, such as public buildings, transportation systems, public spaces, and utilities. Urban FM requires a holistic approach to urban management that considers the interdependencies between different systems and services and the need to manage these assets in a coordinated and integrated manner. Urban FM is closely related to urban governance, which refers to the structures, processes, and actors involved in the management of urban areas. Effective urban governance requires collaboration and coordination between different departments and stakeholders and a shared vision and goals for urban development. Urban FM can contribute to effective urban governance by providing a framework for managing and maintaining urban infrastructure and services and promoting collaboration and coordination between different departments and stakeholders [21].

Within Urban FM's scope, the urban scale support services, which are dispersed within various in-housed technical departments and outsourced third parties, were then defined after the domain of the core business of a city was determined [21]. Urban-scale facility managers will organize the various services within different technical departments/bodies using a comprehensive and coordinated approach. This chapter argues that the main purpose of the existence of a city is to maintain the existing citizens and attract newcomers who possess positive traits such as skills, assets, and values to contribute further to the collective well-being of the overall dwellers of the city. In other words, a city prefers to attract new citizens with "desirable" characteristics. This terminology is unrelated to concepts of exclusion and discrimination. Rather, it refers to the fact that every city and country expects "high-quality," non-violent, and non-criminal citizens who bring resources and exhibit good behavior [172,173]. This study did not suggest excluding refugees, the elderly, the poor, or potential new citizens with other non-inadmissible characteristics, which are the "undesirable" type of newcomers with criminal records, insufficient funds, and security concerns [174]. However, despite a city's desire to attract "desirable" citizens, it is difficult to prevent the arrival and urbanization of people who wish to enter and reside

in a city, as opposed to the crossing of a nation's border, where security measures are in place to prevent "undesirable" newcomers [21].

The "byproducts" of maintaining responsibility-seekers citizens and other "desirable" types of inhabitants are providing housing, food, water, electricity, and all other basic needs and luxurious things that can only be found in an urban area for the citizens [21]. They are becoming consequences and necessities for the city to keep the citizens satisfied. Several crucial factors in maintaining the population to stay, such as economic, social, environmental, and cultural factors, can be planned, executed, evaluated, and improved. However, other factors, such as natural disasters, can only be mitigated and not eliminated. The negative effects of global warming are also a unique phenomenon since they cannot be resolved at the municipal level alone; instead, they require global action. However, cities that fail to retain the existence of their residents as significant actors in the urban ecosystem will inevitably be abandoned and cease to exist [21].

The preference for urban living can be linked to the concept of basic needs generally provided by cities. Maslow's hierarchy of needs theory suggests that individuals have a hierarchy of needs, starting with basic physiological needs such as food and shelter and progressing to higher-level needs such as self-actualization [175]. Urban areas often provide greater access to these basic level needs, making them attractive to individuals seeking to fulfill their basic needs. Additionally, cities' social and cultural amenities can help individuals fulfill their higher-level needs for social interaction, creativity, and personal growth. Furthermore, cities offer greater access to job opportunities, a wider range of social and cultural activities, and better infrastructure and public services. Cities also attract people due to their diversity and vibrancy of urban life, which can provide a sense of excitement and energy that is not easily found in rural areas [21].

Several established theories support the idea that people prefer to live in cities compared to rural areas. One of the most well-known theories is the "pull" theory of urbanization, which suggests that people are attracted to urban areas due to the economic opportunities and higher standard of living that cities offer [176]. According to this theory, people are drawn to cities because of the availability of jobs, higher wages, better healthcare, education, and cultural amenities. Another theory is the "human ecology" theory, which emphasizes the role of environmental factors in shaping human behavior and social organization. According to this theory, cities provide a more favorable environment for human habitation than rural areas, as they offer greater access to resources, services, and social networks [177]. Furthermore, the "social exchange" theory suggests that people are attracted to cities because of the social and cultural benefits that cities offer. Cities provide a diverse range of social opportunities, such as access to a wider range of leisure activities, cultural events, and social networks [178]. These factors can contribute to a higher quality of life and a sense of belonging for city dwellers [21].

The provision of these basic needs is important for cities to retain their residents and maintain a sustainable urban ecosystem [21]. This is because individuals are more likely to stay and thrive in cities that provide for their basic needs. However, what is considered basic needs may vary based on different contexts and communities. For example, in some regions, access to electricity or the internet may be considered a basic need, whereas, in others, it may not be as essential. It is crucial for urban planners and policymakers to consider the specific needs and priorities of different communities when defining what is considered basic needs [21].

3.5.1 Possible support services

Although RICS and IFMA emphasized that the distinction between soft FM and hard FM services is arbitrary and often generates confusion and the risk of impeding good practice in the integration of services and the formation of a customer-focused FM delivery team, both "hard" and "soft" services are necessary for effective asset management outcomes, which is not the least of the problems with this division [21,109,171].

3.5.2 Hard FM Support Services

The hard-FM supporting services within building-level FM provide insight into recognizing similar services within urban-scale FM (Table 3.3) [21]. The plumbing system within a building, including the clean, grey, and black water management, for example, resembles similar urban infrastructure such as a clean water distribution system, sewage system, and urban industrial and black water management. The municipality will almost certainly have its in-house team to manage some particular aspects, but the other municipalities would likely outsource such infrastructures' design, construction, and maintenance. Similar services such as lighting, electricity, energy management, and telecommunication infrastructures are comparable in building-level and urban-scale FM. Heating, ventilation, and air conditioning (HVAC) as important hard-FM supporting services were rather difficult to find in the urban-level comparison, but it is argued that urban heat management could be suitable to be considered [179–181]. Several WH sites outsourced the district heating, electricity, energy management, and telecommunication infrastructures to private companies, while their technical departments managed most of the other hard-FM support services. However, the provided support services' design, construction, and maintenance must comply with the heritage regulations and UNESCO's World Heritage guidelines [21].

Building Level	**Urban Level**	**World Heritage Sites ***
HVAC systems	Urban heat management	District heating and cooling, district heat management
Electrical power supply	Power provider/plantation	Power provider
Energy management	Energy management	Energy management
Water supply	Raw water/clean water production	Water supply
Plumbing system—clean water	Clean water/drinking water system	Clean water/drinking water system
Plumbing system—grey water and sewage disposal	Urban sewerage system	District sewerage system
Plumbing system—black water and septic tank	Industrial waste and black water system	Black water system
Drainage system	City drainage and flood control system	Neighborhood/district drainage and flood control system
Building structures	Urban structures	Urban heritage structures
Building partitioning	Urban partition/division	Core zone (the Property) and buffer zone
Building fabric	Urban fabrics	Urban heritage visual quality
Fixtures and fittings	Urban furniture and street furniture	Urban heritage furniture and street furniture

Lighting	Public lighting	Indoor, outdoor, and public lighting
Telecommunication and data cabling	Telecommunication infrastructures	Telecommunication infrastructures

Table 3.3 The possible hard-FM support services

3.5.3 Soft FM Support Services

Soft-FM encompasses service aspects that promptly affect customers and other service users. This vast scope typically covers the services mentioned in Table 3.4 [21]. These building-level support services are then expanded to the urban level to open up new possibilities and start an academic discussion. Meanwhile, managing soft-FM support services in urban-scale WH sites involves several unique challenges, including maintaining the authenticity of the heritage site, meeting the needs of visitors and residents, ensuring sustainability, and managing the resources effectively. Unlike FM and Urban FM, the urban heritage facility management (UHFM) practices at WH sites tend to prioritize authenticity over efficiency [21].

Building Level	**Urban Level**	**World Heritage Sites ***
Building cleaning and janitorial services	Urban/city cleaning	Neighborhood/district cleaning/hidden trash containers
Catering and retail services	[Traditional] market and urban scale retailer	The traditional seasonal market, tourist-oriented shop/retailer
Guarding and security	Police department	Conservation law, enforcement task force, municipal police, public-order enforcers, enforcement agent
Mail room, courier service, and logistics	Post office and city logistic management	Post office (optional)
Receptionist, lobby	City hall	The main square
Conference services and command center	City command center	District command center
Switchboard (electrical distribution system)	Electricity distribution system/power-grid	Hidden electrical panel/equipment, underground electricity distribution
Facilities helpdesk/service desk	City hotline/helpdesk	Conservation helpdesk
Internal horticulture, garden, yard, pot, vase	Park, garden, city forest, urban farming	Protected heritage park, garden, void, cemetery
Vehicle fleet management	Transportation system	Connection with the general transportation system
In-building transport (elevator, escalator, etc.)	Inner city transportation	District sustainable transportation system, in-building transport
Inter-building transportation	Intercity/inter-regional transportation	Heritage funicular, travelator, shuttle/site transportation

Garage and parking	Public parking	Preservation-oriented parking lot

Table 3.4: The possible soft-FM support services

3.5.4 The "Other" Possible Support Services

Furthermore, RICS and IFMA [109] pointed out that several other characteristics of FM, nevertheless, do not fall into this dichotomy between "hard"-FM and "soft"-FM services (Table 3.5) [21]. These characteristics are particularly relevant in the context of managing urban-scale WH sites, especially concerning strategic planning, sustainability, health and safety, and smart urban heritage concepts. FM's "other" support services are essential to consider when managing urban-scale WH sites. By considering these characteristics [21], urban-scale facility managers can ensure that the heritage site is managed to support its cultural and historical significance, promote sustainability, protect the health and safety of visitors and employees, and embrace the smart city concept in managing historic districts.

Building Level	**Urban Level**	**World Heritage Sites ***
Environmental management	Urban environmental management	Heritage environmental management
Health and Safety	Urban health and safety	Urban heritage health and safety
Document archiving	Municipality/regional archiving	Heritage documentation, archiving, digitization, digitalization
New construction and maintenance	Urban development and maintenance	Preservation, Restoration, Reconstruction, Adaptation
Moves, relocation, and renovation	Urban regeneration	Urban heritage refurbishment
Workplace design	City planning (general/detail city-spatial/layout plan)	Urban heritage design/development guidelines comply to the historic urban landscape (HUL) approach
Real estate management	Land use and public asset management	Strategic heritage plan (SHP)
Small works project management	Urban project management	Heritage project management
Grounds maintenance/landscaping	Urban-scale ground maintenance/urban landscaping	Heritage landscaping
Pest control	Urban-scale pest control	Pest control
Waste management and recycling	Urban-scale waste management and recycling	Heritage-friendly (and tourist-friendly) waste management system
IT, information system (BIM) application software, license, service provider	IT, urban information system (UIM/CIM) service provider	HBIM, UHIM, HCIM
Smart building	Smart city	Smart Urban Heritage

Table 3.5: The "other" possible support services

There are more categories and possible services to ponder that might trigger discussion among the professionals and academics in the facility management field regarding the possible support service that could be provided to safeguard the "core business" of a city

to maintain its citizens [21]. In the context of urban-scale WH sites, communication and stakeholder engagement are essential to ensure that visitors, residents, and local authorities are engaged in managing the protected heritage sites. UHFM also involves managing the financial resources associated with managing urban heritage facilities, such as budgeting, forecasting, and monitoring financial performance to ensure the protection of the WH status of the sites [21].

Instead of making an issue out of the "hard"-FM or "soft"-FM dichotomy, urban-scale facility managers should put more effort into combining supporting services based on the specific situations they confront [21]. The most important factors to explore are the capacity to integrate the outsourcing service providers, professional positions, and specialists, increase employee and equipment utilization, and lower management overhead expenses. The WH coordinator will have to work closely to make sure that all of the possible support services in the WH sites are conducted in compliance with the heritage preservation regulations to maintain the outstanding universal values (OUV) embedded within the sites [21].

3.6 Contribution of This Chapter to the Development of UHFM Framework

In conclusion, a city that is, to some extent, comparable to a single or complex building in terms of managing its facilities belongs to the scope of urban-scale FM. The integration of the urban-scale support services must then be aligned with the "core business" of the city, which is to maintain and attract "desirable" citizens by providing a livable and functional environment for its inhabitants, visitors, and businesses. The urban-scale facility management of WH sites is crucial in achieving this purpose. Effective management FM requires all hard-FM, soft-FM, and other possible support services concerning strategic planning, sustainability, health and safety, stakeholder engagement, and financial management. Hard-FM support services, including building maintenance, utility management, and technical support, are required to maintain the WH site's physical infrastructure to a high standard. Soft-FM support services, such as cleaning, security, waste management, and landscaping, are necessary for the site to be safe, clean, and appealing to visitors. Soft-FM support services, such as cleaning, security, waste management, and landscaping, are necessary for the site to be safe, clean, and appealing to visitors.

By considering all of the aforementioned factors, urban-scale facility managers can ensure that the WH sites are being managed in a manner that safeguards the preservation of the authenticity, visual quality, outstanding universal values (OUV), and cultural and historical significance while also meeting the needs and demands of the stakeholders. Effective management of WH sites can contribute to the success and livability of a city while also providing future generations with unique and valuable cultural resources. The findings suggest that cities act as governmental, economic, social, and cultural centers for their larger neighboring territories, with the primary goal of ensuring the well-being of their citizens; a group of individuals who are taking responsibility for making their community inhabitable. In the WH context, the users and all of the stakeholders simultaneously act as the "owners" of the facility within the domain of co-governance, co-ownership, and civic engagement. However, different levels of interventions should be applied carefully when managing private and public heritage assets within WH sites.

The suggested answer to the question of what the "core business of a city" is, which led to the description of the possible urban-scale support services to be provided, is expected to trigger further academic discussion on this topic since this study did not claim that the results, findings, and conclusions presented in this chapter are irrefutable. In order to obtain a more comprehensive understanding, this chapter invites stakeholders and academics to critique, develop, revise, and amend the definition of the city's "core business" and its possible supporting services mentioned in this chapter from different points of view or by going into the detailed aspects of the discussed possible support services. The urban heritage conservations and urban-scale FM practitioners, experts, and academics will potentially benefit from this study by understanding the importance of maintaining and attracting citizens, thus integrating and delivering excellent urban-scale support services tailor-made for the specified type of urban areas, especially the World Heritage sites.

This chapter provides the types and ranges of urban-scale support services in the urban heritage area, especially WH sites. This information provides the "what" and possibly "who" is in charge of providing and delivering the services, therefore, made possible to be one of the bases to validate the UHFM theoretical keypoints from the scoping literature review, using the three Norwegian World Heritage sites as context.

4 Urban-scale FM in the Norwegian World Heritage Sites: Validating the Theoretical Keypoints

"In theory, theory and practice are the same. In practice, they are not…"

Albert Einstein

This chapter validated the theoretical keypoints obtained from the published scoping literature review within the context of three Norwegian World Heritage sites: Røros, Rjukan, and Notodden. The cross-sectional table of the urban heritage facility management (UHFM) framework, which is based on interviews and correspondence, demonstrates the connection between the tasks of the six clusters of technical departments responsible for the provision of urban-scale support services and the modified critical steps of the Historic Urban Landscape approach, in which an additional step for "monitoring and evaluation" was included. UHFM operates at the intersection of heritage preservation, urban-scale facility management, and stakeholder coordination, which requires a careful balance between urban heritage conservation and sustainable urban management practices, thus enabling the preservation of World Heritage status that, among others, fosters sustainable tourism. The three case studies highlighted the significance of UHFM in preserving heritage value, authenticity, visual quality, and significance. Besides providing comprehensive support services that extend beyond the daily tasks of conservators and World Heritage managers, UHFM also allows feedback mechanisms for continuous improvement. This chapter highlighted the complex relationship between the provision of urban-scale support services and the preservation of Outstanding Universal Value as the core business of World Heritage sites. Several parts of the previously published journal articles and proceedings were used to develop this chapter. Those publications are (Paper I) Urban Heritage Facility Management: A Scoping Review, (Paper II) Identifying UHFM Support Services Considering World Heritage Context, Paper III (Urban Heritage Facility Management: A Conceptual Framework for the Provision of Urban-scale Support Services in Norwegian World Heritage Sites), (Paper IV) Systemic Approaches in Revitalization of Semarang Old City Heritage Site: From Neglected Area to Tourism Destination, (Paper V) Identifying Overtourism Impacts on the Informal Sector's Livelihoods in Urban Heritage Area, and (Paper VI) HBIM Application in Historic Town: A Scoping Literature Review. Paper III [22] is the backbone of this chapter.

4.1 Introduction to the UHFM Validation

World Heritage (WH) sites are highly valuable assets to humanity because they represent universal value that goes beyond national boundaries [22]. To maintain the Outstanding Universal Value (OUV) as the prerequisite of preserving the WH status of protected sites [182,183], complementary to the daily tasks of conservators, archeologists, academics, and heritage authorities [21], various technical departments in the municipality, county,

and national level need to work together in a coordinated manner to achieve the common goals [20–22]. The conservators and heritage authorities emphasized maintaining the historic buildings, monuments, and sites' OUV more than addressing the urban-scale support services, which gives the impression of indirectly contributing to the conservation efforts. However, in order to determine the support services that are required to be provided, it is still crucial to have a comprehensive understanding of the "core business" of the WH site [21].

In the previous study, the scoping literature review of urban heritage facility management (UHFM) highlighted a few discussions and debates amongst academics and practitioners around urban-scale facility management within urban heritage areas [20]. The previously examined literature mainly discussed facility management (FM) practices of single heritage buildings or a complex of buildings instead of urban-scale facility management (Urban FM). Meanwhile, works of literature in the Urban FM field did not explicitly address historic districts or urban heritage areas, nor did they relate to urban-scale conservation practices [20,21]. The phenomenon is understandable since Urban FM itself is still a relatively new field in its establishment phase as an expansion of FM discipline within the urban context [184,185]. Most of the heritage-related articles from the examined papers refer to the Historic Urban Landscape (HUL) approach as the latest holistic approach to managing urban heritage [20]. Although widely recognized as an avant-garde approach, many uncertainties exist in interpreting the HUL approach's operable criteria at the regional and local governance levels [20,186,187]. Many aspects of such an approach could be explained and clarified better using FM and Urban FM as more technical disciplines for the technical departments in charge of providing and delivering urban-scale support services [20].

FM is a branch of management discipline that addresses the tools and services that support the functionality, safety, and sustainability of buildings, grounds, infrastructures, and real estate [20,109,188]. International Facility Management Association (IFMA) also proposed a new definition of FM *as a profession, or discipline, that encompasses multiple disciplines to ensure the functionality of the built environment by integrating people, place, process, and technology* [109,126]. This new definition allowed Urban FM to legitimately become an expansion of the FM discipline since Urban FM is a manifestation of urban-scale facility management [22]. As the definition is applied to a single building, an urban area is also considered a built environment [21,43]. The new definition of FM by IFMA also made it possible for the HUL approach, as the latest conservation paradigm, to be incorporated into the Urban FM field since this holistic approach put the people, its main stakeholder, as an important part of the sustainable urban conservation process, especially in reaching consensus on what and how to preserve heritage assets, within a bottom-up heritage policy decision-making [20,21].

UHFM emerged from the expansion of the facility management (FM) discipline into urban-scale facility management (Urban FM) within the context of urban-scale heritage areas [20,21,188]. This development coincided with the emergence of a new paradigm in managing urban heritage areas and historic towns, known as the HUL approach, recommended by UNESCO in 2011 [187,189]. This approach advocates for a more holistic and inclusive strategy in managing heritage, aiming to balance the preservation of historical buildings and monuments with the evolving demands of urban development. Inclusivity and equality can be achieved by ensuring that urban designers, planners, conservators, and facility managers balance the needs and aspirations of the entire population while maintaining the heritage values, visual quality, and authenticity of the urban heritage areas [22,26].

UHFM also addresses the complex task of managing urban-scale support services in World Heritage sites as the representation of such unique types of heritage areas. The justification for UHFM establishment is supported by the dual requirement of safeguarding the WH sites' outstanding universal values (OUV) while ensuring their sustainable development and stakeholders' wellbeing [20,21]. The HUL approach is a comprehensive framework highlighting the coexistence of heritage preservation and sustainable urban development. The HUL approach acknowledged the significance of the historic town as a living environment and dynamic entity. In contrast, the UHFM framework expands on this philosophy by integrating it into the management of urban-scale facilities. WH sites, especially those with urban characteristics, require an advanced approach that goes beyond conventional heritage conservation, as they preserve exceptional cultural heritage values and attributes. UHFM, as an integration of the HUL approach and Urban FM, provides the opportunity to support the preservation of OUV through the excellent delivery of urban heritage-friendly support services [22].

UHFM focuses specifically on examining the complex aspects of managing facilities in the context of urban heritage. It acknowledges that the preservation of OUV is not an isolated task but one that requires a coordinated effort in managing various support services crucial for the daily operation of these areas [22]. Thus, UHFM bridges the gap between preserving cultural heritage, ensuring urban functionality, and promoting collaboration among stakeholders. It offers a detailed and practical framework for effectively organizing support services on a large scale in urban areas. Implementing UHFM into the management of historic towns has the potential to complement the conventional conservation measures undertaken by conservators and heritage authorities at various levels, nationally, regionally, and locally. This integration may deliver urban-scale support services that comply with the preservation of OUV as part of the holistic approach recommended by UNESCO through the HUL approach [20,189].

The UNESCO recommendation proposed a paradigm shift in the preservation of historic buildings [20,22]. Instead of solely focusing on the physical preservation of buildings and monuments, it suggests a broader approach that considers the entire human environment, including both tangible and intangible aspects, including increased attention to the wellbeing of the dwellers in urban heritage areas. This shift in paradigm, together with the emerging concepts of Urban FM as a people-oriented discipline, resulted in an adjustment of the provision of urban-scale support services in establishing a balance between the efficiency and effectiveness of service delivery while simultaneously preserving the heritage integrity and OUV of WH sites. Therefore, there is a necessity for a framework to implement urban heritage facility management that is capable of adapting to the dynamic characteristics of urban environments [22]. This framework is essential for achieving a balance between preserving heritage values and meeting the demands and standards of modern society. By considering into account the roles and responsibilities of various stakeholders, technical departments, and governance structures, the UHFM framework serves as a potential tool that allows the involvement of urban-scale support services to contribute and align with the protection of the WH status of the areas under study [22].

Urban heritage facility managers' tasks extend beyond the routine tasks of conservators and heritage authorities. Support services that may not appear directly connected to historical aspects, in practical terms, might significantly impact the visual aesthetics, cultural value, and the OUV of protected heritage sites [21,22]. Tasks such as placing waste containers, choosing between cobblestone or asphalt for road construction, conducting excavation work for underground infrastructure, and installing street furniture

in the protected core area of WH sites can present significant complexities. These challenges necessitate both heritage and technical skilled and knowledgeable human resources, which can be managed within the proposed UHFM framework in this doctoral study. The UHFM provides clear guidance for support service providers and technical departments, overcoming the difficulty of interpreting the HUL approach, which was often confusing at the tactical and operational levels. UHFM operates at the intersection of heritage conservation, urban-scale facility management, and collaboration among stakeholders [22].

This chapter examines the complexities of UHFM by analyzing information gathered from three Norwegian World Heritage sites: Røros, Rjukan, and Notodden. The study takes a comprehensive approach, integrating insights obtained from interviews and correspondence with key individuals responsible for managing certain aspects of the studied World Heritage sites, including officials from technical departments, heritage authorities, and governmental bodies at the local, regional, and national levels [22]. The information collected provides valuable qualitative data, insights into challenges, achievements, and collaborative efforts related to managing urban-scale support services in urban heritage areas.

The primary objective of this chapter is to propose a conceptual framework for UHFM that effectively addresses the complexities of organizing urban-scale support services in World Heritage sites. In order to achieve this, this study aimed to address two research questions:

(RQ3.1) *"How can urban-scale support services be efficiently organized in an urban heritage area or World Heritage site by technical departments and other stakeholders, without compromising the Outstanding Universal Value (OUV), visual quality, authenticity, and significance of the protected heritage site?"*
(RQ3.2) *"How do the processes and coordination functions of urban-scale facility management support services contribute to preserving the World Heritage status of a protected urban heritage area, considering the roles of multiple layers of governance, technical departments, stakeholders, and feedback mechanisms for continuous improvement?"*

This doctoral study investigated the urban heritage facility management practices in the three Norwegian world heritage sites as the case study to validate the theoretical keypoints on how to conduct urban-scale facility management within urban heritage areas.

4.2 Methods

4.2.1 Research Design

This research undertakes three case studies in the Norwegian World Heritage sites: Bergstaden Røros, Rjukan Company Town, and Notodden Industrial Heritage area [22]. The selection of case studies has gone through a long process by taking into account many factors, including representing urban heritage areas or historic towns and aspects of comparability, which makes them relevant to be studied to validate the theoretical keypoints obtained from the urban heritage facility management's scoping review process [20]. Urban heritage areas with World Heritage status were selected due to their compliance with international standards in conservation management and the implementation of a comprehensive periodic reporting system at the local, national, and international levels, thus ensuring the availability of standardized and structured data and

documented information. Norway was selected as a nation to be studied based on its unique architectural characteristics, extensive experience in managing World Heritage sites, close proximity to the home base of this study research laboratory, well-established network, ease of access, and budget limitations. The main approach chosen was based on (1) semi-structured interviewing, (2) detailed correspondence with technical departments, and (3) document studies of the investigated cases. The results were organized according to (1) a clustering of technical departments and (2) the validation of the 33 UHFM theoretical keypoints [20,22].

The urban-scale support services that form the UHFM foundation in the World Heritage context [21] have been incorporated into corresponding technical departments at the municipality *(kommune)* level [22]. Furthermore, interviews were conducted, and correspondences were exchanged with technical departments at the county *(fylkeskommune)* level regarding urban-scale service delivery at WH sites. As an illustration, the WH coordinator *(verdensarvkoordinator)* for Bergstaden Røros and its surrounding areas operates under the jurisdiction of the local municipality *(Røros kommune)* with some coordination function between counties *(verdensarvrådet)* where the circumference of Røros is situated, whereas the WH coordinators for Rjukan and Notodden operate under the organizational structure of the county level *(Vestfold og Telemark fylkeskommune)*. This study is aware that in 2020, Telemark County underwent a merger with Vestfold County to establish the new *Vestfold og Telemark Fylkeskommune* (VTFK). Nevertheless, in 2024, Telemark was again restored as a county. This study will use VTFK in conjunction with both Vestfold County and Telemark County, considering the specific timeframe of its data collection. In this study, it is noteworthy that all coordinators of WH sites in the Norwegian context collaborate closely with *Riksantikvaren*, the Directorate for Cultural Heritage of Norway. The support services were categorized into six clusters: planning and zoning, public works and infrastructure, tourism, conservation and cultural heritage, environment and sustainability, and urban safety and security. The data for this research was collected and analyzed employing the three selected Norwegian World Heritage sites as case studies and the six categories mentioned earlier. The 33 theoretical keypoints of UHFM, obtained from the UHFM scoping literature review [20], were utilized in this study to provide guidance for the development of interview protocols, correspondences, coding for qualitative analysis, and cross-sectional tables [22].

4.2.2 Data Collection

The data needed for this doctoral study were collected from semi-structured interviews, exchanging correspondences, and document studies. The interviews and correspondences were conducted from 2022-01-21 to 2023-12-30 and were registered to and approved by the Norwegian Center for Research Data (NSD), which later merged with two other Norwegian organizations to establish the new Norwegian Agency for Shared Services in Education and Research (SIKT) [22].

4.2.2.1 Semi-structured Interviews

This chapter used in-depth semi-structured interviews to address the research questions adequately [22,190]. A predetermined interview protocol was created to ensure the alignment with the research questions, and it has undergone pre-testing and peer review by an academic who also works as a researcher and has a particular interest in one of the World Heritage sites in Norway. The feedback was then integrated into the final interview protocol.

The interviewees were chosen based on their roles and/or administration function in the protected urban heritage sites [22]. The main interviewees comprised eight individuals who have specialized knowledge in conservation and World Heritage site management in the Norwegian context, such as city antiquarians *(byantikvar)*, WH coordinators *(verdensarvkoordinator)*, academics, and staff members of the Directorate for Cultural Heritage *(Riksantikvar)* of Norway. The *byantikvar* and *verdensarvkoordinator*, part of the technical department cluster responsible for cultural heritage and conservation in the municipality and county, were given special interviews. There are several challenges during the data collection, such as conflicted schedules, language barriers, and impracticalities due to the COVID-19 pandemic. It was then decided to conduct some of the interviews via online platforms (i.e., Zoom meetings, Google Meet, and MS Teams) to overcome most of the challenges. Two interviews were conducted in person, while the remaining six interviews were conducted through one-on-one meetings through live video conferences. Minutes of the meetings were taken, and voice notes and/ or video conferences were recorded with the interviewees' consent. Automatic transcription was generated and used to transcribe the interviews roughly, but further careful audio rechecks were conducted manually to guarantee the accuracy of the transcription. All interviews were recorded in both video and audio formats, except for the two physical interviews, which were recorded solely in audio format [22].

4.2.2.2 Correspondence with Technical Departments

Nevertheless, a written correspondence method [191,192] was adopted to increase participation and data collection from the technical departments, especially regarding specific tasks and support services [22]. The correspondence technique was employed in this study due to the disinclination of the technical departments' resources to accept interview requests, resulting in low response rates during the initial data collection stage. One possible explanation for the low response rate is that the semi-structured interview material included with the interview request application was too broad for certain specific technical departments. This assumption can be drawn based on the frequent comments made during email correspondence, later, where they expressed their reluctance to address questions that belong to the responsibilities and expertise of other technical departments. However, questions related to the responsibilities, authorities, and duties of the respective departments and sections were addressed comprehensively by the contact persons during the follow-up email correspondence. Another possible cause is that language barriers, cultural differences, and the hectic work schedules of the interviewees in various technical departments at the municipality and county levels posed challenges, making conducting lengthy or repeated interviews impractical. As a result, the electronic correspondence method via email was adopted as a more effective and efficient substitute for the interviews. Questions that remained unresolved or those that generated intellectual curiosity needed by this study were investigated further through a series of exchanged emails. The follow-up inquiries were typically answered in written form with explanations or by providing URL links to relevant documents, reports, or official websites [22].

A more focused set of questions, specifically tailored to each technical department, was developed from the initial semi-structured interview questions [22]. These inquiries were subsequently sent to the relevant technical department responsible for addressing the specific inquiry. Out of the 72 emails in total sent to the academics, Riksantikvaren, and various levels of technical staff in the municipality and county of the studied area, 28 emails were responded to and utilized for further communication and data collection for this study. Among those 28 replies, only 21 of them should be considered as correspondence since 7

of the other email responses agreed to participate in the interviews. Another interviewee was being contacted by phone (Tables 4.1 and Table 4.2) [22]. The correspondence data and archives were saved in PDF format and categorized based on the different labels and locations of the study case.

Institution/ Background	n	Knowledge		
		General	Heritage	Technical
Municipality (Kommune)	18	Yes	Some	Yes
County (Fylkeskommune)	7	Yes	Some	Yes
Academic/ University	3	Yes	Yes	Some
National Authority (Riksantikvaren)	1	Yes	Yes	Some

Table 4.1: Distribution of interviewees and correspondences

WH Sites	Interviewees/ correspondences	Codes					
		PLZ	PWI	TOU	CCH	ESU	USS
Røros (RO)	Røros kommune	RO-PLZ	RO-PWI	RO-TOU	RO-CCH	RO-ESU	RO-USS
	Trøndelag fylkeskommune	TR-PLZ	TR-PWI	-	TR-CCH	TR-ESU	-
	Academics	AC1, AC2	AC1, AC2	AC1, AC2	AC1, AC2	AC1, AC2	AC1, AC2
	Riksantikvaren	RI	RI	RI	RI	RI	RI
Rjukan (RJ)	Tinn kommune	RJ-PLZ	RJ-PWI	RJ-TOU	RJ-CCH	RJ-ESU	RJ-USS
	Vestfold og Telemark fylkeskommune	VT-PLZ	VT-PWI	-	VT-CCH	-	-
	Academics	AC3	AC3	AC3	AC3	AC3	AC3
	Riksantikvaren	RI	RI	RI	RI	RI	RI
Notodden (NO)	Notodden kommune	NO-PLZ	NO-PWI	NO-TOU	NO-CCH	NO-ESU	NO-USS
	Vestfold og Telemark fylkeskommune	VT-PLZ	VT-PWI	-	VT-CCH	-	-
	Academics	AC3	AC3	AC3	AC3	AC3	AC3
	Riksantikvaren	RI	RI	RI	RI	RI	RI

** RO=Røros, RJ=Rjukan, NO=Notodden, AC=Academics, RI=Riksantikvaren/Directorate for Cultural Heritage, PLZ=Planning and zoning, PWI=Public works and infrastructure, TOU=Tourism, CCH=Conservation and cultural heritage, ESU=Environment and Sustainability, USS= Urban safety and security*

Table 4.2: Interviewees and correspondence coding

The complete responses of the interviewees and correspondences were transcribed and utilized for analysis and coding in NVivo 12 Pro [22].

4.2.2.3 Document Studies

During the process of conducting interviews, some interviewees and correspondents occasionally supplied tools, data, information, files, and URL links to provide supplementary information pertinent to this chapter. Publicly available data was acquired from official websites through the Internet, online databases, and libraries (Table 4.3) [22]. The documents consist of nomination dossiers, periodic reporting, Planning and Building Acts, Cultural Heritage Acts, evaluation by advisory bodies, etc. The documents were examined for their capacity to comprehensively analyze existing records, plans, and reports related to World Heritage sites. Through careful examination of nomination dossiers, periodic reports, management plans, and other documents, researchers can discover valuable insights regarding the historical development, conservation strategies, and difficulties encountered by these sites. These documents serve as a basis for understanding the context, objectives, and recommended management practices for protecting the WH

properties. Furthermore, conducting document studies allows for the detection of challenges, inconsistencies, or successes in implemented strategies, providing insights for future improvements [22,193]. The document studies also enabled this doctoral study to understand institutional knowledge, policy frameworks, and the interactions between stakeholders.

Properties	Documents	Year/ date	Institution
Røros Mining Town	Justification for inclusions in the World Heritage list	1978-05-16	Government of Norway
	Advisory body evaluation	1978-11-15	ICOMOS
	Cultural Heritage Act	1978	Government of Norway
	Decision from World Heritage Committee	1980-09-29	WHC - UNESCO
	Planning and Building Act	1985	Government of Norway
	State of Conservation - Bureau of the World Heritage Committee 18th session	1994-05-26	WHC - UNESCO
	Decision's context	2006-05-26	Presentation of the periodic report for section I and II of Europe
	Decisions adopted at the 30th session of the World Heritage Committee (Vilnius, 2006)	2006-08-23	WHC - UNESCO
	Periodic Reporting - State of Conservation of World Heritage Properties in Europe	2006	WHC - UNESCO
	Advisory Body Evaluation	2010-03-17	ICOMOS
	Advisory Body Evaluation	2010-05	IUCN
	Report of the decisions adopted by the World Heritage Committee at its 34th Session	2010-09-03	WHC - UNESCO
	Decision's context - Evaluations of Cultural Properties - 34th ordinary session(25 July - 03 August 2010), Brasilia (Brazil)	2010	WHC - UNESCO
	Decision's context - Establishment of the World Heritage List and of the List of World Heritage in Danger	2010-05-31	WHC - UNESCO
	Periodic Report - Second Cycle	2014-05-19	Government of Norway
Rjukan-Notodden Industrial Heritage Sites	Cultural Heritage Act	1978	Government of Norway
	Planning & Building Act	2008	Government of Norway
	Cultural Heritage Act (Amended)	2009	Government of Norway
	Rjukan – Notodden Industrial Heritage Site – Nomination Dossier	2015	Government of Norway
	Advisory body evaluation	2015-03-12	ICOMOS
	Decisions adopted by the World Heritage Committee at its 39th session (Bonn)	2015-07-08	WHC - UNESCO
	Decisions context - Establishment of the World Heritage List and of the List of World Heritage in Danger (Bonn, Germany, 28 June - 8 July 2015)	2015-05-15	WHC - UNESCO
	Decision context - Establishment of the World Heritage List and of the List of World Heritage in Danger (Corrigendum)	2015-05-22	WHC - UNESCO
	Decision context – Evaluation of nominations of cultural and mixed properties to the World Heritage list (ICOMOS report for the World Heritage Committee)	2015-04	ICOMOS

Table 4.3: List of studied documents

4.2.3 Data Analysis

The empirical analysis primarily relies on an iterative and inductive process [190,194] that involves reading, coding, interpreting, and re-evaluating the transcribed interview notes from the three case studies and their six technical departments [22]. Additionally, it includes input from the national authority *(riksantikvaren)* and academics who have previously been involved or are currently working on the studied and specified World Heritage sites in Norway. The analysis of each case study involved the utilization of open and axial coding techniques in the NVivo 12 Pro environment. The author manually allocated codes, categories, or clusters to each interview during this stage. The coding

process utilized the six crucial steps established by the HUL approach, including its additional last UHFM step, and the 33 theoretical keypoints of UHFM as guidance indicators [20–22]. Furthermore, certain categories were employed in accordance with the research framework. The author and co-authors of this study internally reviewed each case study's coding and transcript. Last, the data were employed for cross-case analysis, pattern matching, grouping, and frequency analysis. In general, there was a strong confidence level in the accuracy of the spoken words during the interviews and the written responses in electronic correspondence [22].

In order to ensure a high degree of reliability, this study distinguished between construct, internal, and external validity [190,195]. Multiple sources are used for cross-case analysis to ensure construct validity, and a chain of evidence is established through transcripts, visual data, and documents presented during the interviews. In addition, the interview and correspondence protocol includes both open-ended and closed questions to ensure the accuracy and reliability of the answers. Internal validity is established by employing pattern matching and constructing explanations based on each individual case. In order to ensure external validity, this study employed a multi-case approach across three Norwegian WH sites, incorporating replication logic within each case. This study utilized a comprehensive database containing all interviews, correspondences, interview protocols, and audio and video recordings to ensure reliability [22].

4.2.4 Limitations

This chapter does not intend to make broad generalizations that can be applicable to all types of technical departments, support services, and different types of World Heritage sites outside of Norway [22]. This study was designed to be an initial umbrella study of urban-scale heritage facility management using Norwegian WH sites as a context, which provides the basis for further research in the realm of Urban FM, urban heritage conservation, and detailed parts of UHFM. Various terms in this study are used interchangeably in English and the Norwegian version due to technical and practical reasons [22].

4.3 Case Studies

Norway was selected as the primary focus for the case study based on several significant factors that render it suitable for comprehensive analysis [22]. Norway exhibits a distinctive architectural heritage distinguished by a diverse combination of historical significance and architectural innovation. The nation has extensive experience managing World Heritage sites, dating back to 1980. These years of experience provide valuable insights into heritage preservation and management practices. The Norwegian study cases' proximity to this study's research laboratory at the Department of Civil and Environmental Engineering of NTNU enables convenient access and fosters collaboration. Budget considerations also played a role in selecting Norway due to the short distance and ease of travelling to the case study locations. This chapter examines three Norwegian World Heritage sites, namely Bergstaden Røros in Trøndelag County, Rjukan in Tinn Municipality in Telemark County, and Notodden in Telemark County (Figure 4.1) [22]. These sites were chosen for their representation of protected urban settings among Norway's eight listed World Heritage assets due to their alignment with the research objectives and their potential to offer valuable insights into practices related to managing facilities at an urban scale. The World Heritage of Bryggen, situated in Bergen, Norway, has been excluded from the study due to its incompatible characteristics, which prevents a focused and coherent analysis of the type of urban heritage sites being examined in this doctoral study.

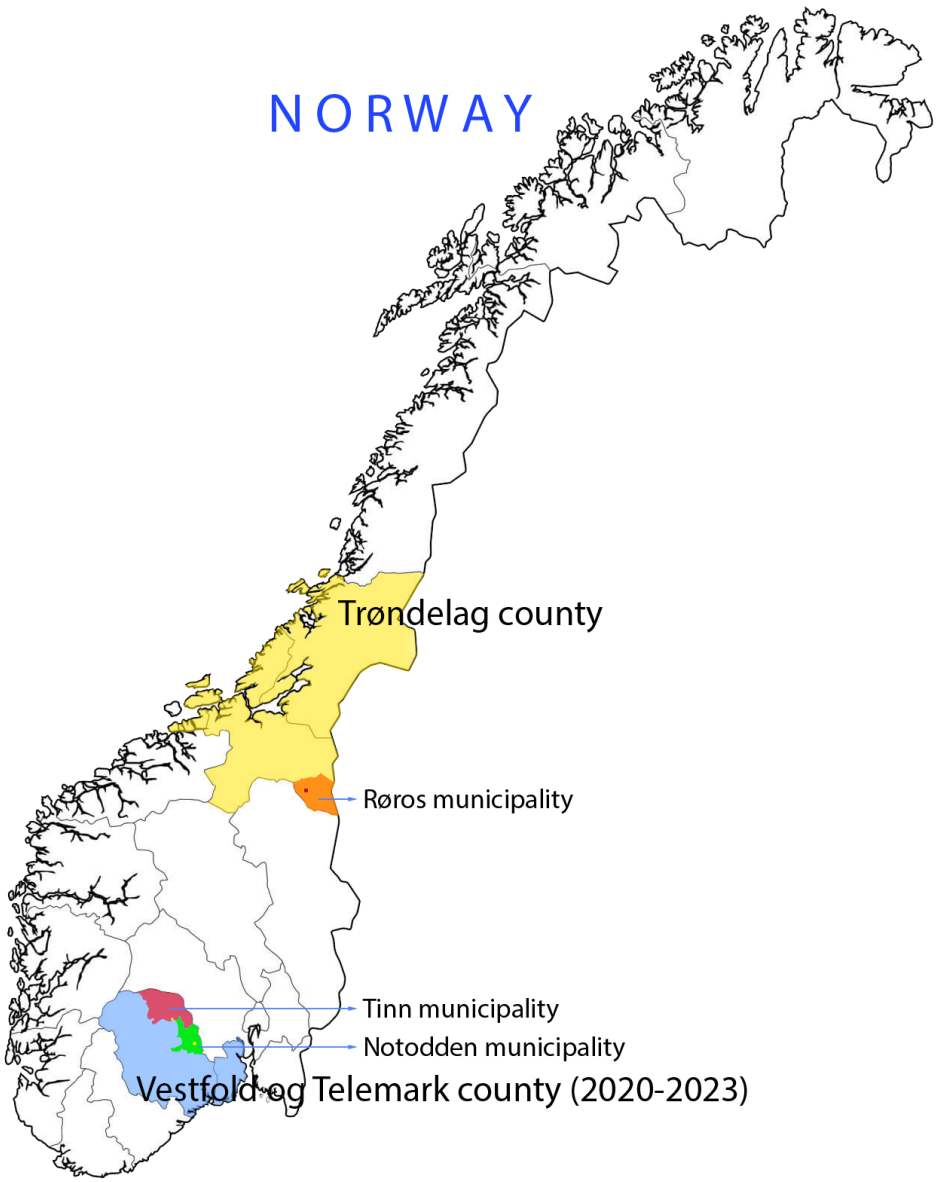


Figure 4.1 Location of Røros, Tinn, and Notodden Municipality.

To provide a pre-understanding of the case studies and interconnection between cases, an integrative description of the case studies has been developed in Table 4.4 below.

Category	Bergstaden Røros	Rjukan	Notodden
Location	Røros Municipality, Trøndelag County, Norway	Tinn Municipality, Telemark County (was Vestfold og Telemark County), Norway	Notodden Municipality, Telemark County (was Vestfold og Telemark County), Norway
Coordinates	62°34′29″N 11°23′03″E	59°52′44″N 8°35′39″E	59°37′46″N 9°11′29″E
UNESCO Designation	1980	2015	2015
WH Criteria of Selection	(iii), (iv), (v)	(ii), (iv)	(ii), (iv)
Outstanding Universal Value	Example of an early industrial town based on copper mining	Exceptional example of industrial development based on hydroelectric power	Exceptional example of industrial development based on hydroelectric power
Significance	Historic mining town known for its wooden buildings and copper mine	Industrial town known for hydroelectric power development	Industrial town known for hydroelectric power development
Key Historical Period	Established in 1644	Early 20th century (Hydroelectric development started in 1905)	Early 20th century (Hydroelectric development started in 1905)
Major Industries	Copper mining (Røros Copper Works)	Hydroelectric power (Norsk Hydro)	Hydroelectric power (Norsk Hydro)
Reason for Declining Main Industry	Decline in copper prices and exhaustion of resources	Technological advances and changes in industry demand	Technological advances and changes in industry demand
Nowadays Replacement Industry	Tourism and cultural heritage	Tourism and industrial heritage	Tourism and industrial heritage
Notable Structures	Røros Church (1784), Smelthytta, Olavsgruva	Vemork power plant, Company Town	Tinfos I and II power plants, Industrial Heritage Area
Cultural Heritage	Rich mining history, traditional wooden houses, museums	Site of heavy water sabotage during WWII, industrial architecture, preserved company town	Early industrial architecture, significant for hydroelectric power, preserved industrial heritage area
Uniqueness	Well-preserved wooden buildings and mining landscape.	Innovative industrial town layout and architecture.	Integration of industrial heritage into modern urban development.
Natural Surroundings	Two national parks: Femundsmarka and Forollhogna	Vestfjorddalen valley, Gaustatoppen mountain	Heddalsvatnet lake, surrounding hills and forests
Tourism Activities	Museums, guided mine tours, historical town walks, Christmas market	Museum of Industrial Workers, tours of Vemork power plant	Industrial heritage museum, hiking, cultural festivals, annual Blues festival
Challenges	Maintaining historical authenticity while adapting to modern needs.	Balancing industrial heritage with modern economic development.	Preserving industrial heritage amid urbanization.

Community Involvement	High level of local engagement in conservation and tourism.	Active participation in heritage conservation and tourism.	Strong community involvement in heritage preservation and tourism development.
Future Prospects	Continued focus on sustainable tourism and heritage preservation.	Developing eco-friendly tourism and further industrial heritage conservation.	Expanding cultural tourism and promoting sustainable urban development.

Table 4.4 The three Norwegian World Heritage study cases descriptive comparison

4.3.1 Bergstaden Røros

Røros history is linked to the copper mining activities in the 17th century, located in an extreme mountainous environment and was exploited for more than three centuries until 1977 when the mining activities were finally ended. The town was completely rebuilt after being destroyed by the Swedish troops in 1679, consisting of eighty wooden houses, some of which still retain dark pitch log facades. Most of these buildings are grouped around courtyards. Røros has also been called "Bergstaden Røros" or just "Bergstaden"; the Mountain City. In the past, Røros also being called "*Røraas Hytteplads*" or "*Røraas Bergplads*." Røros Mining Town, located in Trøndelag County (Figure 4.1), was designated as a UNESCO World Heritage site in 1980 and extended to its circumference in 2010 (Figure 4.2) due to its exceptional universal value under criteria (iii) for bearing unique witness to the adaptation of technology to the requirements of the natural environment and the remoteness of the situation, (iv) for illustrating in an outstanding manner how people adapted to the extreme circumstances in which they had to live and how they used the available indigenous resources to provide shelter, produce food for their sustenance, and contribute to the national wealth of the country, and (v) for constituting a totality that is an outstanding example of traditional settlement and land use [196,197].

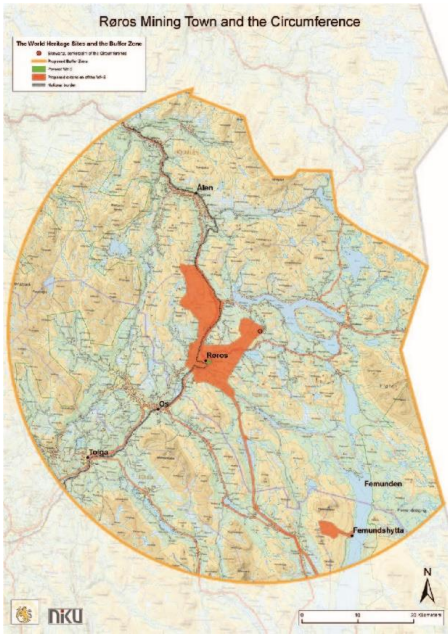


Figure 4.2 Røros mining town and the circumference
(source: https://whc.unesco.org/en/list/55/maps/, accessed: 2024-01-12)

The historic center of Røros was built around the Hyttelva River, which originates in the neighboring Hittersjøen Lake and has powered the copperworks since 1644. Kjerkgata, Bergmannsgata, and Lorentz Lossiusgata are the three main streets that run parallel to and west of the river. In 1650, Røros built its first church, which was made of wood. It stayed there until 1784 when the current church was finished. A museum proposal was put forth in 1900, but it failed to spark much interest. A few enthusiasts attempted in 1910 to stop the demolition of "*Aspaasgården,*" one of the finest buildings in Røros, but were unsuccessful. The building was rebuilt at Trondheim's Folk Museum. Three years after the legislation on the preservation of buildings in 1920, 80 buildings in Røros were protected by Norwegian heritage law. A temporary museum exhibition was organized in 1930, but it was not until 1938 that serious discussion existed about preserving the actual Røros on the site. A proposal for the creation of a buffer zone and an expansion of the WH area was made by the Norwegian government in 2009. The proposal was accepted by UNESCO in 2010, and the Property was then referred to as "Røros Mining Town and the Circumference." However, this study was only focused on the downtown area of Bergstaden Røros (Figure 4.3) due to the lack of compatibility between the Røros Circumference and the UHFM keypoints.

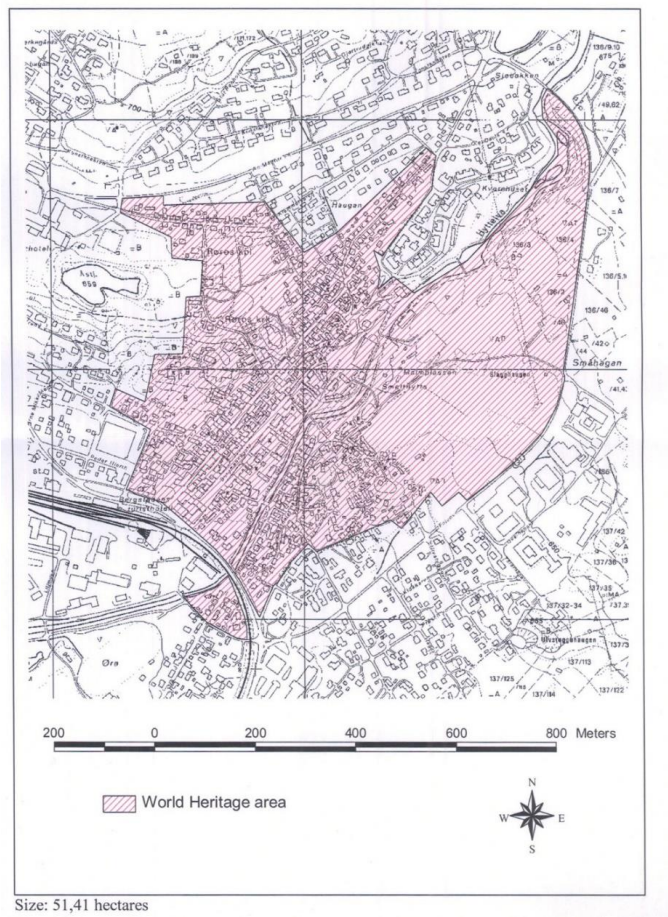


Figure 4.3 Downtown area of Bergstaden Røros
(source: https://whc.unesco.org/en/list/55/maps/, accessed: 2024-01-12)

One of Norway's most well-known painters, Harald Sohlberg, encountered Rondane for the first time in 1899. His future development as an artist was greatly influenced by his wintertime experiences in the mountains. Although he painted many motifs from Rondane, *Vinternatt i Rondane* (Winter Night in the Mountains) was his masterpiece and has been referred to as Norway's "national painting." The motifs from Rondane and Røros by Harald Sohlberg have made Norway's "national painting" and enabled Røros to be inscribed into the UNESCO World Heritage List. In the early 1900s, Sohlberg and his spouse, Lilli Hennum, resided in Røros. In his paintings, the streets and church of Røros are frequently appears. The restoration of Røros Mining Town to its original state was partly inspired by Solberg's paintings of Røros (Figure 4.4).

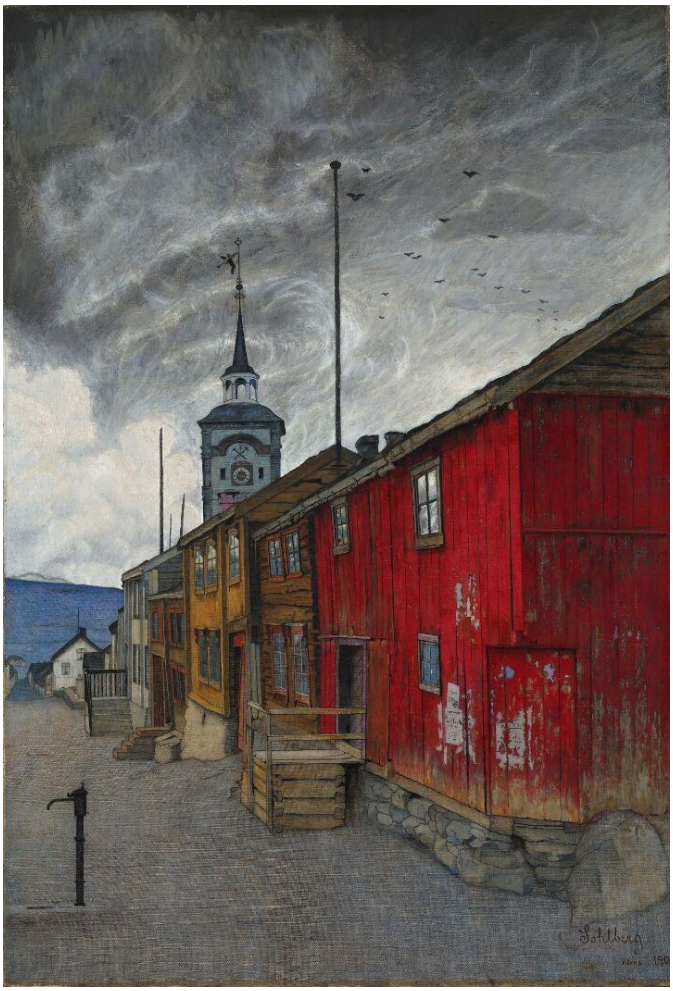


Figure 4.4 Harald Sohlberg's painting (Street in Røros/ Gate i Røros)
(source: https://www.nasjonalmuseet.no/samlingen/objekt/NG.M.00883, accessed: 2024-01-12)

Røros is a remarkable reminder of a lost cultural tradition and an important period in Norwegian history. This picturesque mountainous mining town has been recognized for its well-preserved architectural ensemble, which reflects the socio-economic systems and mining practices of the 17th and 18th centuries, earning it a place on the World Heritage List. Røros, which is distinguished by wooden houses painted in traditional colors (Figures

4.5), is a remarkable example of how people have adapted to a harsh environment. It plays a crucial role in the Røros Municipality because the town is a thriving hub for community life, cultural traditions, and heritage preservation [197]. Røros is important to Trøndelag County, even outside of its immediate vicinity. It adds to the area's cultural diversity and draws tourists eager to experience the distinctive mining history and charming architecture that characterize this remarkable World Heritage site.

Figure 4.5 Viewpoint from Kjerkgata (Church Street) in Bergstaden Røros
(source: Author's collection)

The inscription of Røros as a World Heritage site has brought multifaceted benefits across social, economic, environmental, and cultural domains, significantly shaping the landscape of the historic town. In a social context, the attainment of World Heritage status has stimulated a collective sentiment of pride and identity among inhabitants of Røros, thereby cultivating a mutual dedication to the safeguarding of their cultural heritage, which enhanced Røros' global reputation, drawing tourists from various locations who desire to fully engage with its rich historical background and unique atmosphere.

From an economic standpoint, the World Heritage designation has proven to be advantageous for Røros, as it has sustained tourism-related business and fostered employment opportunities in the hospitality, retail, and service industries. The increased number of tourists has stimulated investment in both infrastructure and facilities, thereby strengthening the town's attractiveness as a tourist destination. In Røros municipality, heritage tourism serves as a source of income that actively contributes to the local economy by providing support for the conservation and safeguarding of historical structures and cultural resources. The World Heritage status in Røros also highlights the significance of sustainable development and environmental management. The preservation of the natural surroundings and the minimization of the environmental impact of tourism activities are of utmost importance in upholding the integrity of the site. The

implementation of sustainable practices, including waste management, energy efficiency measures, and green infrastructure initiatives, is heavily reliant on the provision of urban-scale support services of facility management that allows Røros to effectively reduce the ecological impact of overtourism and protect its natural resources for future generations. The World Heritage designation in Røros plays a crucial role in stimulating heritage preservation and revitalization endeavors from a cultural perspective by highlighting the importance of the town's mining heritage, architectural legacy, and traditional crafts, thereby promoting efforts to preserve and enhance these cultural assets.

The challenges of managing urban-scale facilities in Røros become evident, necessitating a careful balance between conservation efforts and modern functionality. The scope of support services provided in this context goes beyond regular maintenance and encompasses a comprehensive approach that protects cultural heritage values while also addressing the requirements of residents, businesses, and tourists. The FM practices in Røros exemplify the complex relationship between heritage preservation and sustainable urban development, encompassing infrastructure maintenance and heritage interpretation.

4.3.2 Rjukan-Notodden Industrial Heritage Sites (Rjukan-Notoden Industriarv)

Rjukan-Notodden Industrial Heritage site is an outstanding example of how humankind has shaped and utilized the landscape while also developing architecture, technology, art, and urban planning. The narrative of how the water from Møsvatn and waterfalls in the modern Tinn and Notodden municipality was converted into electrical energy is presented in the Rjukan-Notodden World Heritage site. The largest hydroelectric power plants in Europe were constructed on the sites, which served as one of the impetuses for the Second Industrial Revolution. A severe worldwide food scarcity existed at the turn of the 19th and 20th centuries, necessitating the use of artificial fertilizers in agriculture. Kristian Birkeland succeeded in deciphering the formula for manufacturing synthetic fertilizer on a large industrial scale. Although the production required a lot of energy, hydropower was available to solve the challenges. Simultaneously, Notodden and Rjukan emerged as cities that were created solely to produce artificial fertilizers, with factories, residential areas, and infrastructure supported by international capital, as a result of Sam Eyde's ingenuity. A large number of people went to work in Notodden and Rjukan, and the labor movement grew, winning the fight for an eight-hour workday. This is recognized as the beginning of modern Norway and the so-called Norwegian welfare model. Innovation in the fertilizer production industry also became significant for humanity as it helped resolve the global food crisis.

This industrial innovation marked an important period in Norway’s industrial history, represented by the Rjukan and Notodden Industrial Heritage area, which was inscribed as a UNESCO World Heritage site in 2015. Rjukan and Notodden were listed as outstanding representatives of the Second Industrial Revolution, and the nomination consists of four components: industry, hydropower, transport systems, and factory towns. This cultural landscape in Telemark County was essential to the early 20th-century production of fertilizers through the use of hydroelectric power and nitrogen extraction [198,199]. The two towns, Rjukan and Notodden (Figure 4.6), show how human activity shaped the landscape and are prime examples of inventive industrial urban planning and architecture. This site is inscribed under UNESCO criteria (ii) for demonstrating an exceptional combination of industrial themes and assets tied to the landscape, which exhibit an important exchange on technological development in the early 20th century, and (iv) for

its outstanding industrial ensemble comprising dams, tunnels, pipes, power plants, power lines, factory areas and equipment, the company towns, railway lines, and ferry service, located in a landscape where the natural topography enabled hydroelectricity to be generated in the necessary large amounts, stands out as an example of a new global industry in the early 20th century [198,199]. This site serves as a testament to the economic and social changes brought about by the development of hydroelectric power and industrialization. The Rjukan and Notodden Industrial Heritage area in Telemark is a living heritage site today, contributing to the identity of the area and drawing tourists eager to learn more about the industrial and architectural legacy of this distinctive cultural landscape.

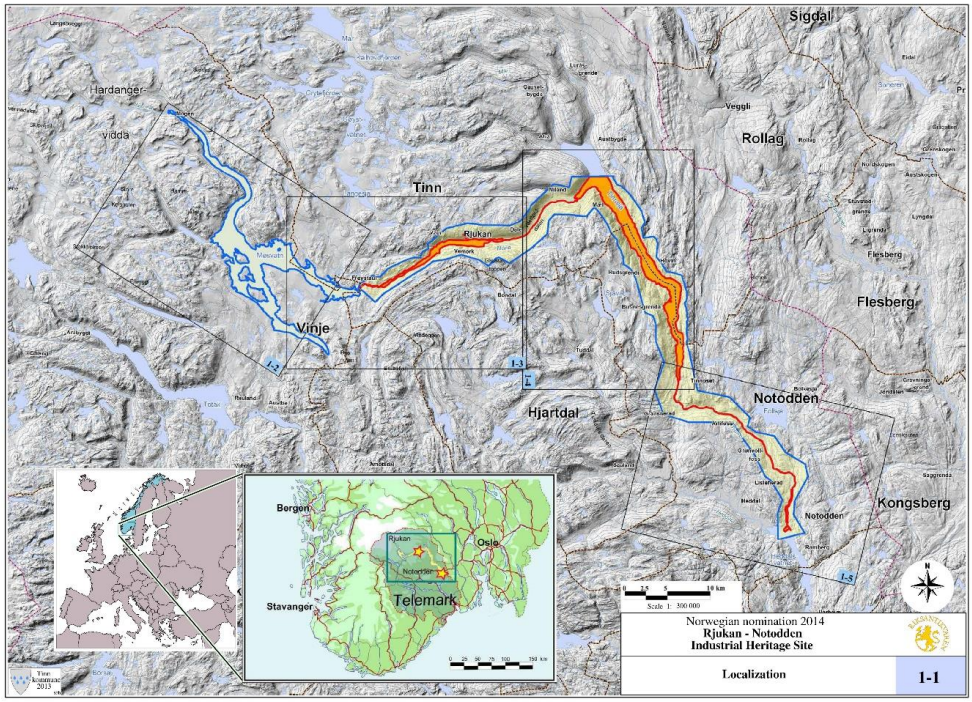


Figure 4.6 The core area and buffer zone of Rjukan and Notodden World Heritage sites (source: https://whc.unesco.org/en/list/1486/documents/, accessed: 2024-01-12)

4.3.2.1 Rjukan Company Town

Located in the Vestfjorddalen, west of Tinnsjøen in Telemark, Rjukan is a small, elongated town in the Tinn municipality (Figure 4.7). It is gathered between steep mountainsides along the river Måna. Constructed around Norsk Hydro's establishment of the "Rjukan saltpeter factories" in the early 20th century, Rjukan was once a significant industrial center at the county and national level. Following an internal naming competition, Rjukanfossen became the inspiration for the town's official name. Såheim was the original name of the location. The main reason for the establishment of Norsk Hydro was easy access to abundant electrical power through the regulation of the Måna River and its primary source, Møsvatn. Sam Eyde, an industrialist and engineer, is credited as founding Rjukan and is commemorated with a bronze statue in Rjukan Square. Based on Kristian Birkeland's method, he established the Norwegian nitrogen industry and fertilizer production, built out the waterfalls Rjukan and Svelgfoss, and consequently established

the urban communities of Rjukan and Notodden. The groundwork was done for one of the world's most technologically sophisticated electrochemical companies, as well as a large-scale hydropower development.

The Vestfjorddalen region experienced a significant transformation in its industry. The valley was inhabited by 50 families in 1907. Less than ten years later, it had transformed into a thriving industrial hub with over 10,000 residents. Rjukan was Norway's earliest large-scale industrial facility. The world's first commercial heavy water plant was constructed by Norsk Hydro in 1934 at Vemork in Rjukan. During the Second World War, the Germans and Norsk Hydro jointly operated the plant. Later, the Allied forces subjected it to multiple instances of sabotage.

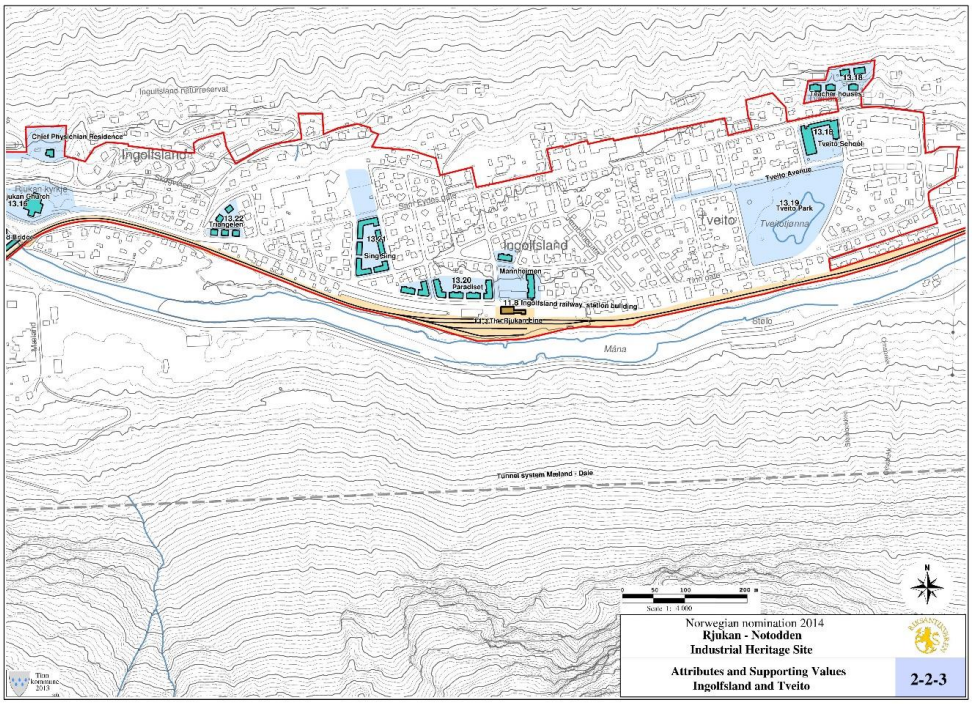


Figure 4.7 Rjukan World Heritage core zone
(source: https://whc.unesco.org/en/list/1486/documents/, accessed: 2024-01-12)

Norsk Hydro provided comprehensive services, including the provision of milk to households, businesses, medical facilities, fire departments, and even agricultural barns. Rjukan was endowed with a high architectural standard, owing to the town's founder, Sam Eyde. Rjukan, being a company town (Figure 4.8), showed an urban structure that reflects the industrial values that previously dominated its surroundings. This is evident through the presence of purpose-built residential units, factory complexes, and infrastructure specifically designed to facilitate the activities of Norsk Hydro.

The town exhibited distinct social stratification (Figure 4.9). Residences for the directors and engineers are situated on the higher ground, where the sun showed the earliest in the spring and the latest in the autumn. Between the mountain area and the bottom of the valley was dedicated to the officials and staff of Norsk Hydro. The common laborers resided

in the lowermost section of the valley. The distinction became less clear after the sale of a significant portion of Norsk Hydro's housing stock in Rjukan.

Figure 4.8 Rjukan Company Town
(source: https://whc.unesco.org/en/list/1486/documents/, accessed: 2024-01-12)

After 1960, most of the saltpeter and fertilizer production at Rjukan was transferred to Hydro's factory at Herøya in Porsgrunn. Today, the power station that energized the fertilizer industry has been converted into the Norwegian Industrial Workers' Museum, where the history of Rjukan and the industrial workers is told, in addition to the war and sabotage history associated with the site.

Figure 4.9 Rjukan Company Town with Såheim Kraftverk building as background
(source: Author's collection)

4.3.2.2 Notodden Industrial Heritage Site

Notodden is a municipality located in Telemark County (Figure 4.10), situated approximately 120 km southwest of Oslo. Heddalsvannet and the eastern course of the Telemark canal are the municipality's locations. Rjukan and Kongsberg are the neighboring towns.

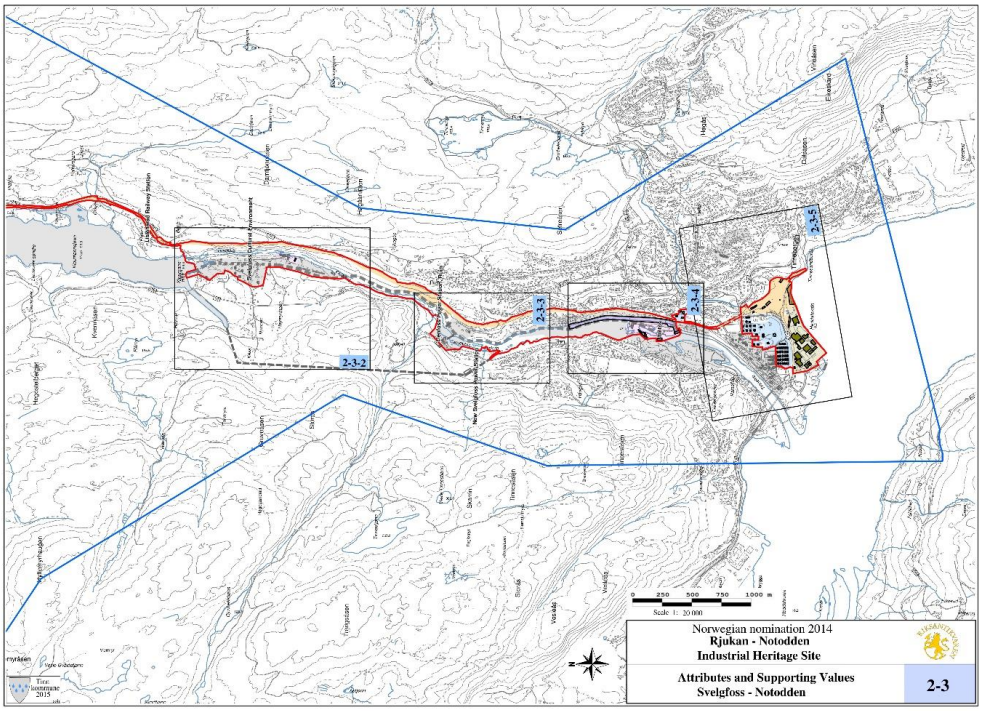


Figure 4.10 Notodden World Heritage core area and buffer zone
(source: https://whc.unesco.org/en/list/1486/documents/, accessed: 2024-01-12)

Notodden is primarily recognized for hosting the Notodden Blues Festival, one of the largest blues festivals in Europe. The history of the name "Notodden" can be traced back to the farmhouse known as Notodden, which was owned by Tinne gård, situated at the estuary of the Tinnelva River in Heddalsvatnet. As of 1 January 2023, the town of Notodden (Figure 4.11), serving as the administrative hub of the municipality, is home to a population of 9,071 individuals. Someone originating from Notodden is referred to as a Notodding.

As of the year 1865, the population of the present-day town of Notodden was estimated to be approximately 350 individuals. At that time, the region was a part of the agricultural settlement of Heddal. However, at the Notodden location, there were only a few large farms accompanied by numerous smaller farmhouses situated near them. The construction of the new road to Kongsberg in 1839 and the inauguration of the Norsjù–Skienkanalen in 1861 were significant milestones for Notodden. The introduction of train service between Kongsberg and Oslo in 1871 resulted in a relatively short distance between Notodden and the capital city.

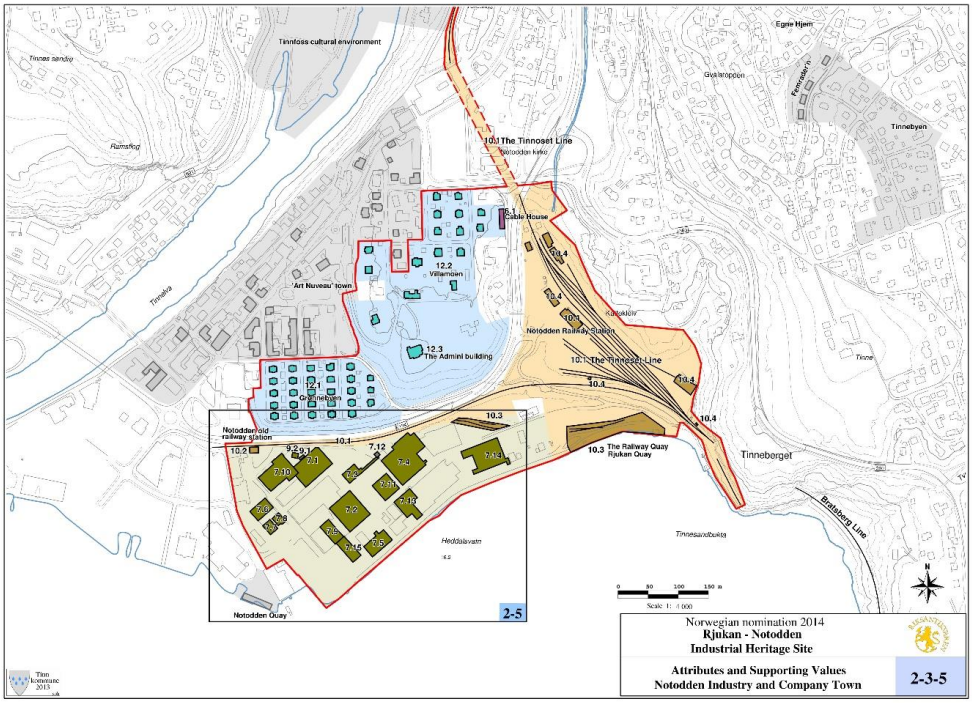


Figure 4.11 Notodden Industrial Heritage area core zone
(source: https://whc.unesco.org/en/list/1486/documents/, accessed: 2024-01-12)

Notodden also observed the emergence of tourist traffic in the latter half of the 19th century. Rjukanfossen attracted many visitors, while Notodden served as an intermediary hub, offering convenient access to both Oslo and Skien through a brief journey. The sawmill established by Tinfos, which subsequently transformed into Tinfos Group, was established in 1873. By 1900, Notodden had emerged as the primary center of Heddal, and through the advancements in industry, trade, and communication, the municipality's population had reached nearly 1,000 residents.

Before establishing Norsk Hydro, Sam Eyde, for quite some time, had bought several waterfalls in Notodden and subsequently looked for novel approaches to harness the potential energy of the waterfall resources. The utilization of electricity for the synthesis of nitrogen compounds resulted in the acquisition of a patent following consultation and cooperation with Professor Kristian Birkeland. In simple terms, Birkeland developed a technique known as the Birkeland-Eyde process to produce synthetic fertilizer. In 1905, *Norsk Hydro-Elektrisk Kvaelstofaktieselskab* was established with the collaboration of Sam Eyde, Eyde's French banking connections, and the Swedish major investor Marcus Wallenberg. Norsk Hydro and Tinfos initiated a rapid and extensive industrial development at Notodden. The urban population experienced a significant increase from approximately 1000 to approximately 5,000 residents within a span of ten years. Notodden finally received its city status on 1 January 1913.

Following the initial industrialization and the Second World War, the city underwent a period of economic stagnation and subsequent decline. A significant portion of the production has been relocated in proximity to the vast waterfalls in Rjukan or the market. Furthermore, the Haber-Bosch process replaced the Birkeland-Eyde process, which

emerged in 1913 as a more energy-efficient alternative to artificial fertilizers. Following the conclusion of the war, there was a notable amelioration in the situation, primarily attributed to the favorable conditions prevailing in global markets and the strategic reallocation of Norsk Hydro's building stock. In addition, a distinct sack manufacturing facility was established, thereby generating numerous employment opportunities within the local community. During the height of 1960, the workforce of Tinfos and Norsk Hydro accounted for 38 percent of the population in Notodden. Tinfos Jernverk, a prominent company with a history spanning 77 years, ceased its operations in 1987. Norsk Hydro had already relocated its workplaces from the city several decades ago. This event signified the conclusion of Notodden's status as a conventional industrial town (Figure 4.12). Nowadays, Rjukan has solidified its position as a commercial hub for Aust-Telemark and its neighboring regions. In recent years, new industrial enterprises have emerged, specifically in the domains of high technology, offshore operations, and defense.

The unique industrial history of Notodden has gathered increased attention, particularly in relation to tourism and the preservation of cultural heritage. The industrial heritage area of Notodden (Figure 4.13) bears a resemblance to the historical significance of hydroelectric power generation and chemical manufacturing, which experienced significant growth during the late 19th and early 20th centuries. Notodden was listed on Norway's tentative list for UNESCO's World Heritage List together with Rjukan, Odda, and Tyssedal in 2009. The submission of the World Heritage application for Rjukan and Notodden to UNESCO took place in January 2014. The application underwent processing and received approval from ICOMOS, the advisory body of UNESCO, on May 15, 2015. Afterwards, on July 5, 2015, it was considered for final inclusion on the UNESCO World Heritage List.

Figure 4.12 Notodden Industrial Heritage area and Hydro Town
(source: https://whc.unesco.org/en/list/1486/documents/, accessed: 2024-01-12)

Figure 4.13 Notodden Industrial Heritage area
(source: Author's collection)

The figure below illustrates the cross-cutting themes and interconnections between the three case studies, highlighting how each studied site's unique characteristics and heritage significance contribute to the overarching UHFM framework (Figure 4.14).

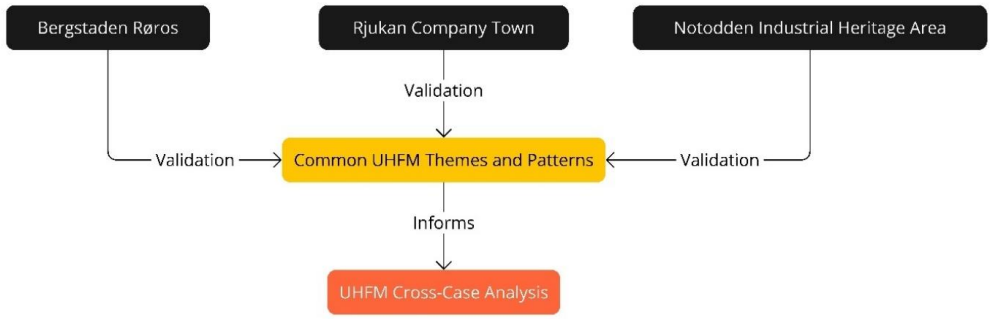


Figure 4.14 Interconnections between the three case studies

4.3.3 UHFM Support Services

The provision of urban-scale hard FM support services plays a crucial role in preserving and sustaining protected heritage areas within urban heritage facility management (UHFM) [22]. These urban-scale support services, proposed as hard-UHFM, play a crucial role in preserving the heritage value, authenticity, significance, and visual quality of world heritage sites. In these urban settings, which possess a rich historical and cultural background, the dwellers depend on a diverse range of infrastructure and utilities to support their livelihood and preserve the historic integrity of their environment [22].

The responsibility for providing hard-UHFM support services, which encompass a complex network of urban scale drainage systems, plumbing and sanitation systems, as well as reliable energy distribution, public lighting, and telecommunication infrastructures, are

conducted by technical departments, institutions, and organizations that have been entrusted with the maintenance and management of these valuable protected sites [22]. As caretakers and service providers of urban heritage, these entities carefully manage the intricate balance between contemporary functionality and the preservation of heritage values, ensuring that each service provided complies with complex heritage regulations and UNESCO guidelines.

When examining the complexities of hard-UHFM support services [21], it becomes obvious that their effective provision is crucial not only for the current well-being of dwellers but also for preserving the heritage of these renowned urban environments for future generations. This research undertakes three case studies in the Norwegian World Heritage sites: Bergstaden Røros, Rjukan Company Town, and Notodden Industrial Heritage area. Based on the previous study regarding the possible urban-scale hard FM in the World Heritage sites (Table 3.3) [21], a comparison table was developed to showcase and define the tasks required and stakeholders in charge within the three aforementioned study cases (Table 4.5) [22].

Tasks/ urban scale support services	**Department/ institution/ organization in charge**		
	Røros	**Rjukan**	**Notodden**
District heating and cooling, district/neighbourhood heat management (*fjernvarme*) (1,2,5)	Ren Røros Strøm AS, Norsk varme	Statkraft AS, Norsk Varme, Green Mountain (data center excess heat)	Thermokraft AS, Norsk Varme, (owned by Notodden Energi)
Power provider (*strømleverandøren*) (2,5)	REN Røros Strøm AS	Tinn Energi AS Hydro Energi AS Telemark	Notodden Energi Kraft AS
Energy management (*strømnettet/* power grid) (2,5)	Røros E-Verk Nett	Stannum	Everket AS
Water supply (2,5)	Røros kommune, Norsk Vann	Tinn kommune (Rjukan vannverks), Norsk Vann	Notodden kommune (Notodden vannverks), Norsk Vann
Clean/drinking water system (1,2,5)	Røros kommune, Norsk Vann	Tinn kommune, Norsk Vann	Notodden kommune, Norsk Vann
District sewerage system (1, 2, 5)	Røros kommune	Tinn kommune	Notodden kommune
Black water system (1, 2, 5, 6)	Røros kommune, Norsk Vann	Tinn kommune, Norsk Vann	Notodden kommune, Norsk Vann
Neighborhood/district drainage and flood control system (1,2,5, 6)	Røros kommune	Tinn kommune	Notodden kommune
Heritage buildings and structures (4)	*Byantikvar, Verdensarvkoordinator*, Department of cultural heritage	*Byantikvar, Verdensarvkoordinator*, Department of cultural heritage	*Byantikvar, Verdensarvkoordinator*, Department of cultural heritage
Core zone and buffer zone (World Heritage sites) (1, 4)	*Verdensarvkoordinator, Riksantikvaren* (supervised by WHC/ UNESCO), *Verdensarvrådet*	*Verdensarvkoordinator, Riksantikvaren* (supervised by WHC/ UNESCO)	*Verdensarvkoordinator, Riksantikvaren* (supervised by WHC/ UNESCO)
Urban heritage visual quality (3, 4)	*Byantikvar, Verdensarvkoordinator*, Department of cultural heritage	*Byantikvar, Verdensarvkoordinator*, Department of cultural heritage	*Byantikvar, Verdensarvkoordinator*, Department of cultural heritage
Urban heritage street furniture (2,3,4)	Røros kommune	Tinn kommune	Notodden kommune

Outdoor and public lighting (1,2,6)	Røros kommune, *Statens vegvesen* (The Norwegian Public Roads Administration)	Tinn kommune, *Statens vegvesen* (The Norwegian Public Roads Administration)	Notodden kommune, *Statens vegvesen* (The Norwegian Public Roads Administration)
Street and road infrastructures and maintenance (1,2,6)	Røros kommune, Trøndelag fylkeskommune, *Statens vegvesen* (The Norwegian Public Roads Administration)	Tinn kommune, Vestfold og Telemark fylkeskommune, *Statens vegvesen* (The Norwegian Public Roads Administration)	Notodden kommune, Vestfold og Telemark fylkeskommune, *Statens vegvesen* (The Norwegian Public Roads Administration)
Telecommunication infrastructures (1,2)	Infonett Røros AS (cable-based telecommunication), Telenor, Telia	Telenor, Telia and ICE	Telenor, Telia and ICE

**Clusters of departments: (1) PLZ=Planning and zoning, (2) PWI=Public works and infrastructure, (3) TOU=Tourism, (4) CCH=Conservation and cultural heritage, (5) ESU=Environment and Sustainability, (6) USS=Urban safety and security.*

Table 4.5: Hard UHFM Support Services

Besides the hard UHFM, the soft FM support services are also crucial in maintaining the integrity and authenticity of protected heritage areas. These urban-scale support services, proposed as soft-UHFM, play an important part in fostering the well-being of communities within world heritage sites [21,22]. In their role as caretakers of these protected urban environments, technical departments, institutions, and organizations are responsible for delivering a diverse range of soft support services specifically designed to cater to the distinct requirements and dynamics of the residents. Soft UHFM also promotes a sense of belonging, pride, and ownership among residents and visitors [21].

A comparison table between the three Norwegian World Heritage cases was developed based on the previous chapter (Table 3.4) [21] to showcase and define the "What" (the tasks required) and the "Who" (stakeholders in charge) within the three aforementioned study cases (Table 4.6) [22].

Tasks/ urban scale support services	**Department/ institution/ organization in charge**		
	Røros	**Rjukan**	**Notodden**
Neighborhood/district cleaning/hidden trash containers (1,2)	Røros kommune	Tinn kommune	Notodden kommune
The traditional seasonal market, tourist-oriented shop/retailer, town events (3)	*Rørosmartnan* (Christmas market), *Destinasjon Røros*	*Høstmarked/Bygdas dag* (Autumn market), Rjukan Matfestival, *Solfesten* (Sun festival), Rjukan Turistkontor, visitRjukan AS	*Høstmarked*, Notodden Vårmarked, Notodden Bluesfestival, Tinfosløpet, *Kjentmannsmerket*
Conservation law enforcer, municipal police (4,6)	Røros kommune	Tinn kommune	Notodden kommune
Post office (2)	Posten Bring AS	Posten Bring AS	Posten Bring AS
The main square (1,2,3)	Røros kommune	Tinn kommune	Notodden kommune
District command center (6)	-	-	-
Electrical panel, underground electricity distribution (2)	Røros E-Verk Nett, Røros kommune	Stannum, Tinn kommune	Everket AS, Notodden kommune
Conservation helpdesk (3)	The Røros Museum Call Centre, Røros kommune, *Servicetorget*	Vestfold og Telemark fylkeskommune, Tinn kommune, *Servicetorget*	Vestfold og Telemark fylkeskommune, Notodden kommune, *Servicetorget*

Protected heritage park, garden, void, cemetery (1,2,3,4,5)	*Kjerkgata* (Harald Sohlberg corridor), *Røros Kirke*, *Slegghaugan* (the slag heaps of Røros)	*Rjukan kirke, Rjukan torg*	*Notodden kirke, Notodden torv*, Admini Notodden
Connection with the general transportation system (1,2)	Røros Airport, Røros Station/ *Jernbanedirektoratet* (Norwegian Railway Directorate), Røros bus terminal	Rjukan station/Norwegian Railway Directorate, Rjukan bus stop	Notodden station/ Norwegian Railway Directorate, Notodden *skysstasjon* (public transport terminal)
Heritage funicular, travelator, shuttle/site transportation (1,2,3,4)	-	Krossobanen, Gaustabanen	-
Preservation-oriented parking lot (1,2)	Røros kommune	Tinn kommune	Notodden kommune

**Clusters of departments: (1) PLZ=Planning and zoning, (2) PWI=Public works and infrastructure, (3) TOU=Tourism, (4) CCH=Conservation and cultural heritage, (5) ESU=Environment and Sustainability, (6) USS=Urban safety and security.*

Table 4.6: Soft UHFM Support Services

In accordance with RICS and IFMA [109] that highlighted several other characteristics of FM that do not fit into the categorization of "hard"-FM and "soft"-FM services [21], the following comparison table (Table 4.7) [22], based on the previous chapter (Table 3.5) [21]compared UHFM practices in the studied areas. Through careful consideration of these aforementioned characteristics, facility managers at the urban scale can effectively ensure the management of heritage sites in a manner that upholds their cultural and historical significance, fosters sustainability, safeguards the well-being and safety of both visitors and employees and embraces the principles of the technological advancement in the management of historic districts [22].

Tasks/ urban scale support services	**Department/ institution/ organization in charge**		
	Røros	**Rjukan**	**Notodden**
Heritage environmental management (4,5)	*KLD, Trøndelag fylkeskommune*, Røros kommune	*KLD,* Vestfold og Telemark fylkeskommune, Tinn kommune	*KLD*, Vestfold og Telemark fylkeskommune, Notodden kommune
Urban heritage health and safety (5,6)	Department for culture and public health (*Avdeling for kultur og folkehelse), Sosial og helsedirektoratet*, fylkeskommune, Røros kommune	Department for culture and public health, *Helse og omsorgsdepartementet, Sosial og helsedirektoratet*, fylkeskommune, Tinn kommune	Department for culture and public health, *Helse og omsorgsdepartement et, Sosial og helsedirektoratet*, fylkeskommune, Notodden kommune
Heritage documentation, archiving, digitization, digitalization (4)	The Røros Museum, Røros kommune (*arkiv/*archive)	Norsk Industri-Arbeidermuseum (NIA), Tinn kommune	Norsk Industri-Arbeidermuseum (NIA), Notodden kommune
Urban heritage preservation, restoration, reconstruction, adaptation (2,4)	Department of cultural heritage (*Avdeling for kulturminner), Byantikvar, Verdensarvkoordinator, Riksantikvaren*	Department of cultural heritage, *Byantikvar, Verdensarv-koordinator, Riksantikvaren*	Department of cultural heritage, *Byantikvar, Verdensarv-koordinator, Riksantikvaren*
Urban heritage design guidelines comply with the HUL approach (4)	Department of cultural heritage, *Byantikvar,*	Department of cultural heritage, *Byantikvar, Verdensarv-koordinator, Riksantikvaren*	Department of cultural heritage, *Byantikvar, Verdensarv-*

	Verdensarvkoordinator, Riksantikvaren		*koordinator, Riksantikvaren*
Strategic heritage plan (SHP) (4)	Department of cultural heritage, *Byantikvar, Verdensarvkoordinator, Riksantikvaren*	Department of cultural heritage, *Byantikvar, Verdensarv-koordinator, Riksantikvaren*	Department of cultural heritage, *Byantikvar, Verdensarv-koordinator, Riksantikvaren*
Heritage/tourist-friendly waste management system (2,5)	Røros kommune	Tinn kommune	Notodden kommune
HBIM, UHIM, HCIM (1,2)	-	-	-
Heritage-friendly public facilities (2)	Røros kommune	Tinn kommune	Notodden kommune
Customized universal design and accessibilities (2)	Røros kommune	Tinn kommune	Notodden kommune
Urban heritage-related CSR, PPP, and PPPP *(N/A)*	Trøndelag fylkeskommune, Røros kommune	Vestfold og Telemark fylkeskommune, Rjukan Næringsutvikling AS, Tinn kommune	Vestfold og Telemark fylkeskommune, Notodden kommune
Search and Rescue (6)	The Norwegian SAR/ The Rescue and Emergency Planning Department, Directorate for Civil Protection and Emergency Planning *(Direktoratet for samfunnssikkerhet og beredskap/ DSB)*	The Norwegian SAR/ The Rescue and Emergency Planning Department, DSB	The Norwegian SAR/ The Rescue and Emergency Planning Department, DSB
Emergency preparedness (6)	The Norwegian SAR/ The Rescue and Emergency Planning Department, DSB, Trøndelag fylkeskommune, Notodden kommune	The Norwegian SAR/ The Rescue and Emergency Planning Department, DSB, Vestfold og Telemark fylkeskommune, Notodden kommune	The Norwegian SAR/ The Rescue and Emergency Planning Department, DSB, Vestfold og Telemark fylkeskommune, Notodden kommune
Tourism (3)	*Destinasjon Røros*, Trøndelag fylkeskommune, Røros kommune	VisitRjukan, Vestfold og Telemark fylkeskommune, Tinn kommune	Vestfold og Telemark fylkeskommune, Notodden kommune
Heritage Education (4)	The Røros Museum, Røros kommune	Norsk Industri-Arbeidermuseum (NIA), Tinn kommune	Norsk Industri-Arbeidermuseum (NIA), Notodden kommune
Interpretation of heritage for public/general audience (4)	The Røros Museum, Røros kommune, Røros World Heritage Foundation (*Røros Verdensarv*)	Norsk Industri-Arbeidermuseum (NIA), Tinn kommune, Norwegian Industrial Heritage Foundation (*Stiftelsen Norsk Industriarbeidermuseum*)	Norsk Industri-Arbeidermuseum (NIA), Notodden kommune, Norwegian Industrial Heritage Foundation (*Stiftelsen Norsk Industriarbeidermuseum)*

**Clusters of departments: (1) PLZ=Planning and zoning, (2) PWI=Public works and infrastructure, (3) TOU=Tourism, (4) CCH=Conservation and cultural heritage, (5) ESU=Environment and Sustainability, (6) USS=Urban safety and security.*

Table 4.7: Other UHFM Support Services

4.4 Discussion

The ambition of the discussion chapter was to elaborate the findings from the results chapter by addressing the research questions regarding the efficient organization of urban-scale support services in an urban heritage area, as well as the processes and coordination functions of the six clusters of UHFM technical departments in preserving the World Heritage status of the studied sites following the proposed UHFM steps as the structure (Figure 4.15) [22].

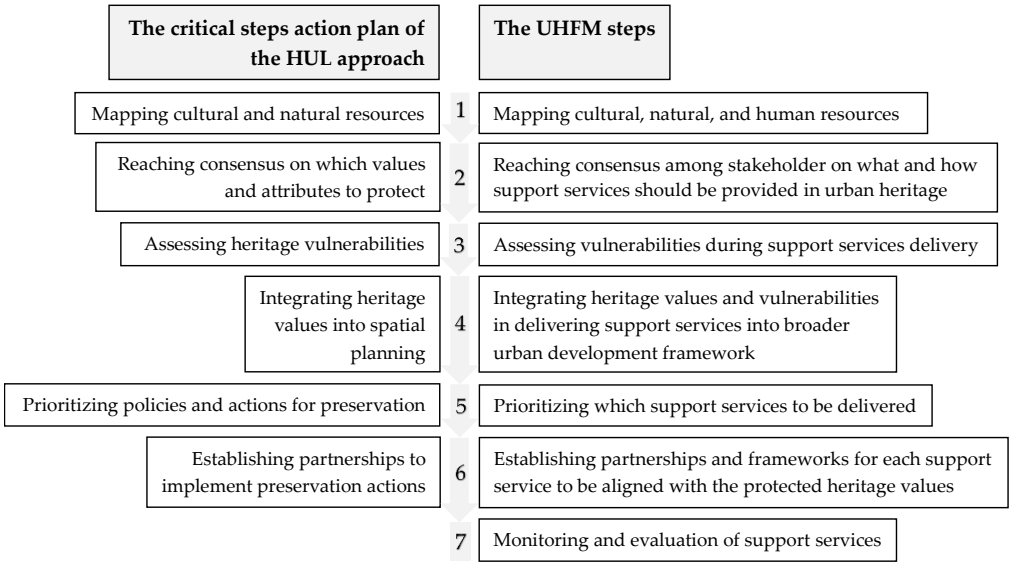


Figure 4.15: From the six-critical steps action plan of the HUL approach to the UHFM steps

This chapter, based on Paper III [22]as its backbone, explores various aspects and components of urban heritage facility management (UHFM) using the HUL approach's six critical steps, as reviewed and theoretically studied previously [20], which resulted in 33 UHFM keypoints. Adapting these steps allows for the recognition, identification, and formulation of urban-scale support services in the urban heritage area, which is the focus of this research study. The chapter is divided into seven main sections to ensure a systematic discussion, according to the UHFM steps (Figure 4.15) [22]. Based on the research interviews and the model developed for potential urban-scale support services [21], a comparison is made among three Norwegian World Heritage (WH) sites with urban characteristics, which are Bergstaden Røros; the core city in Røros mining town and its surroundings, The Company Town in Rjukan, and the Notodden Industrial Heritage area in Notodden (Table 4.5, Table 4.6, and Table 4.7) [22]. This comparison provides an overall illustration of the UHFM process and its management within the context of good governance in Norway in terms of providing people-oriented urban-scale support services within urban-scale heritage areas without compromising the protected sites' OUV.

As discussed through interviews and correspondence, the conditions shed light on the daily practice of providing urban-scale support services at the three Norwegian World Heritage (WH) sites [22]. Criticisms and potential improvements regarding the provision and delivery of services, as well as coordination between agencies and technical departments,

were also explored. Notably, the dynamics and mechanisms of the relationship between public authorities (public), dwellers, citizens, inhabitants, visitors (people), and the private sector (private) emerged as significant aspects in the realm of UHFM [22].

4.4.1 Mapping resources for UHFM

Mapping resources, as the first step in the UHFM steps, serves as a critical foundation for informed decision-making and coordinated efforts across various technical departments [22]. This step involves the accurate mapping of topographical features and heritage assets to create comprehensive base maps for all departments involved in urban management. The cluster of planning and zoning departments ensures precision in mapping land use, development zones, population density, and building types, laying the groundwork for comprehensive urban development. The public works and infrastructure department cluster focuses on mapping vital infrastructure elements such as roads, bridges, utility networks, and other urban facilities. This type of mapping is crucial for the daily practice of infrastructure development and maintenance. The Tourism department's cluster mainly mapped the visitor facilities, public spaces, and the tourism movement to ensure sustainable tourism planning and to avoid overtourism [24], thus safeguarding a balance between visitor experience and heritage preservation [23,24]. The conservation and cultural heritage department's cluster provides detailed maps of the WH sites' core and buffer zones, which is essential for heritage conservation, future adaptive reuse strategies, and general conservation initiatives. The environment and sustainability department cluster contributed to mapping green spaces, energy consumption patterns, waste management facilities, and other environment-related tasks. This mapping integrated sustainable practices into urban planning, promoting environmental health and the dweller's well-being. Based on the raw maps provided by the planning and zoning departments, the cluster of urban safety and security departments mapped the vital infrastructure, emergency services locations, and potential natural disaster zones such as flooding, landslides, and fire hazards. This type of mapping is crucial for enhancing public safety measures, emergency response planning, and safeguarding heritage assets from potential threats. The interconnection between these technical departments ensures a holistic approach to managing the studied WH sites [22].

The unavailability of utilization of the BIM-based tools to map existing resources and mapping partnerships in the urban-scale support services of the three studied Norwegian World Heritage sites, Røros, Rjukan, and Notodden, during the data collection process, can be attributed to various factors, such as the limited technological adoption within the technical departments [22,25]. Moreover, an inadequate level of awareness regarding the potential advantages of utilizing BIM-based tools to map current resources and partnerships could be a contributing factor. The studied WH sites were also a part of national regulatory and policy frameworks that do not explicitly require or incentivize integrating BIM technologies in managing historic towns in Norway [22].

4.4.2 Reaching consensus on what and how the urban-scale support services should be provided

Throughout the reaching-consensus step, each cluster of technical departments adjusted their specific tasks in providing urban-scale support services to be aligned with the WH mission in maintaining OUV as the prerequisite of the WH status [22]. Collaborative decision-making in the cluster of planning and zoning departments relies on the incorporation of citizen awareness, participatory planning, and consensus-building, which highlighted the significance of integrating the citizens' opinions into the city planning and

master plan to guarantee their compatibility with the preference of the WH site's inhabitants [22].

The cluster of planning and zoning departments together with public works and infrastructure departments, actively sought public input and collaborated with private developers to establish the land use, planning, and zoning decisions that should be aligned with community goals and preservation of OUV. Meanwhile, the tourism departments' cluster involves stakeholders in the tourism planning process by acknowledging the importance of including local communities and businesses during the reaching-consensus step [22,24]. By adopting such a collaborative approach, tourism initiatives can be aligned with local interests and positively contribute to the community, thus increasing the sustainability of the WH sites economically, socially, and environmentally [23,24]. The conservation and cultural heritage department cluster engaged in collaborative efforts with heritage experts, academics, and local communities to develop a strategic heritage management plan, focusing on historical education and the advancement of heritage knowledge, which showed a long-term strategy towards conserving heritage. The environment and sustainability department cluster works with environmental advocates and citizens who are interested in promoting sustainable practices in the WH sites. The urban safety and security department cluster prioritizes cooperation with law enforcement and the dwellers to identify potential risks and improve safety and security protocols to protect the integrity of WH assets as a collective duty to guarantee a safe and protected urban heritage setting [22].

The presence of all necessary theoretical keypoints obtained from the scoping literature review process [20] in the reaching consensus step within the three studied cases of Røros, Rjukan, and Notodden indicated that these sites have effectively implemented comprehensive strategies for engaging the community and building consensus in the delivery of urban-scale support services [22]. As mandated by the Nordic model, the three sites' authorities have placed citizen awareness as their primary concern, actively engaging in efforts to proactively inform the public about current and future development and urban-scale support services. Consensus-building is a commonly accepted practice in Nordic countries, including Norway, that involves collaborative efforts in planning and decision-making processes. The municipalities in charge of managing these studied WH sites have adopted a participatory planning approach, enabling local communities, developers, and other relevant stakeholders to be involved. Furthermore, the emphasis on developing heritage technical knowledge and heritage interpretation indicated a commitment to open and transparent communication among the stakeholders [22].

The absence of missing theoretical keypoints in the reaching-consensus step suggests successfully integrated community-centric approaches in managing urban-scale support services within the studied Norwegian WH sites in Røros, Rjukan, and Notodden. The Nordic model, characterized by a trusting community and a commitment to equality, serves a significant role in this step [22]. However, a further study of community involvement approaches and decision-making processes would be required to validate these interpretations.

4.4.3 Assessing the Vulnerabilities of the WH Sites and Their Relationships with UHFM

An assessment step is necessary to address the potential risks and challenges of delivering urban-scale support services within the context of the studied WH sites in Norway [22]. The assessment of vulnerabilities of the WH sites necessitates a comprehensive

assessment of various vulnerabilities tailored to the specific functions of each technical department in providing the required urban-scale support services. This is particularly important for addressing the socio-economic pressures and impacts of climate change, besides the strict compliance to the conservation regulations [22].

Vulnerability assessment in the cluster of planning and zoning focuses on land use, zoning decisions, and socio-economic factors, which suggests acknowledging the commitment to mitigating potential vulnerabilities that may arise from these decisions. The municipal and county authorities must work together to harmonize zoning regulations in broader urban development initiatives. In the meantime, the assessment of infrastructure vulnerabilities has become an important task performed by the cluster of public works and infrastructure departments [22]. Urban-scale utility and maintenance assessments are conducted to identify vulnerabilities and potential hazards in the urban infrastructure, necessitating the cooperation of various technical departments in the local government to work together within more extensive urban development strategies and ensure the infrastructure's long-term functionality. The cluster of tourism departments assessed the impact of tourism to identify particular vulnerabilities in tourist destinations. This approach acknowledges the importance of tourism in World Heritage sites while aiming to minimize any possible adverse effects on the WH assets [22–24]. Heritage Impact Assessments (HIA) are essential in assessing the vulnerabilities of heritage sites for the conservation and cultural heritage department cluster. This action shows a commitment to protecting WH sites' cultural and historical significance. Collaboration with heritage experts, academics, and national heritage authorities is important to ensure the precision and efficacy of these assessments. The environment and sustainability department cluster assessed the vulnerabilities related to climate change in the studied WH sites by carrying out Environmental Impact Assessments (EIA). Effective vulnerability assessment requires collaboration with environmental advocacy groups and national environmental authorities. Last, the urban safety and security department cluster emphasized the importance of conducting comprehensive risk assessments to identify any vulnerabilities related to the safety and security of residents and visitors, which includes cooperating with law enforcement agencies, emergency services, and community groups. Working with local, regional, and national authorities helps ensure that urban safety and security measures align with broader urban development and heritage preservation objectives [22].

The missing theoretical keypoint found in this step during the data collection is the lack of a mechanism to assess citizen satisfaction and stakeholder feedback. Including citizen feedback in vulnerability assessments could provide valuable insights regarding the effectiveness of urban-scale support services from the end-users' perspective. The operational level of the UHFM team may also provide useful inputs for improving support service delivery in this step. Implementing digital assessment tools and information modeling tools has the potential to bridge this gap [22,25], thus improving the overall vulnerability assessment step.

4.4.4 Integrating Values and Vulnerabilities

Heritage authorities and technical departments, represented by the *Verdensarvkoordinator* and *Riksantikvar*, who are responsible for heritage preservation, for example, can effectively collaborate with the technical departments overseeing road and bridge construction at the local, regional, and national levels [22]. The UHFM organizational framework, obtained from the interview and exchanging correspondence, includes a complex strategy that integrates heritage preservation and urban development. Each technical department serves a distinctive function in this integration, showcasing an

awareness of the complex interrelationship between outstanding universal values and vulnerabilities in WH site management [22].

The primary responsibility of the cluster of planning and zoning departments is to align land use and zoning regulations with preserving the protected heritage area [22]. This integration acknowledges the importance of land use and zoning decisions in shaping the physical and cultural environment within the core area, buffer zone, and broader urban development. Therefore, the governing stakeholders must work together to ensure that zoning regulations align with the heritage conservation objectives. The cluster of public works and infrastructure departments contributes to urban heritage areas' functional, visual, and historical aspects by integrating infrastructure and physical development vulnerabilities to align with the WH sites' cultural and historical value. The cluster of tourism departments acknowledges that involving the community in tourism planning improves the relationship between tourism initiatives and broader heritage conservation goals to ensure that heritage tourism policies have beneficial impacts on the stakeholders' and citizens' well-being [22–24]. The cluster of conservation and cultural heritage departments has the role of integrating cultural heritage into development plans and implementing adaptive reuse strategies, thus requiring certain degrees of flexibility in the decision-making process. The flexible approach emphasizes the dynamic nature of conserving cultural heritage, with adaptive reuse being an important strategy. These strategies may ensure alignment with national and international conservation objectives by working closely with heritage experts, academics, and national heritage authorities. Incorporating sustainable practices and green infrastructure into urban planning by the cluster of environment and sustainability departments is essential for promoting the dwellers' health and wellbeing [22]. This step illustrates an acknowledgment of the mutual reliance between preserving the environment and safeguarding cultural heritage. Coordination with environmental advocacy groups and relevant authorities guarantees the successful incorporation of sustainable practices. The cluster of urban safety and security departments integrates safety and security measures with heritage conservation to protect cultural and historical resources while simultaneously ensuring the well-being, safety, and security of inhabitants and tourists. Coordination with national law enforcement and emergency services is essential to ensure that the safety and security measures align with urban development and heritage preservation strategies [22].

The keypoint lacking in this step is the systematic integration of information modeling tools or other digital asset management tools to improve efficiency in the integration process. Utilizing digital tools may improve the process of integrating values and identifying vulnerabilities, leading to a more organized and data-driven approach. Incorporating information modeling tools at this step can optimize the overall integration process [22,25].

4.4.5 Prioritizing UHFM Actions

Through the data collection, the respondents were asked about the important factors that need to be taken into account when providing urban-scale support services [22]. Furthermore, they have been requested to determine the urban-scale support services that should be prioritized to maintain the WH sites' OUV, heritage significance, authenticity, and visual quality. The respondents from various clusters, in general, emphasized prioritizing maintaining the urban infrastructure, physical urban fabric, accessibility and mobility, and environmental sustainability when planning and implementing urban scale support services within the realm of UHFM. Several other respondents raised other issues

to be prioritized, including matters related to interpretation and education, cleanliness, and waste management [22].

During the prioritizing actions step, each technical department cluster strategically targets specific aspects that align with their domain as the cluster's priority [22]. The planning and zoning department cluster prioritizes ensuring adherence to zoning regulations and providing guidance for development. This necessitates a robust focus on guaranteeing that development complies with the established regulations and contributes to preserving the urban heritage areas. Effective implementation of zoning regulations requires intensive coordination with other municipal and county sections and bodies [22].

The public works and infrastructure department cluster prioritizes routine maintenance, development, and preventive infrastructure maintenance [22]. Collaborating with other relevant departments guarantees that infrastructure developments align with the overarching goals of urban-scale heritage preservation. The cluster of tourism departments' priorities are establishing sustainable tourism, enhancing visitor experiences, interpreting cultural heritage, preserving cultural identity, and promoting citizen participation [22–24]. This comprehensive strategy acknowledges the impact of tourism in shaping the perception and experience of visitors and dwellers of WH sites. The conservation and cultural heritage department cluster prioritizes heritage conservation, adaptive reuse, preventive maintenance, preservation of cultural value, and promoting citizen participation. This comprehensive approach acknowledges the dynamic nature of conserving cultural heritage, integrating preventative measures and strategies for adaptive reuse. Working in collaboration with heritage experts and actively involving the local community in the decision-making related to WH sites ensures a comprehensive approach to preserving urban heritage areas. The priority of the environment and sustainability department cluster is to protect the urban environment within the vicinity of WH sites, improve physical and social well-being, and promote citizen engagement in participating in sustainable heritage practices. The cluster of urban safety and security departments responded with the statement that their priorities are to ensure public safety, security, emergency response, preventive maintenance, and the protection of heritage sites from potential threats. This approach also highlights the commitment to ensuring residents' and visitors' safety and security while protecting valuable heritage assets. Collaboration with national law enforcement and emergency services is necessary for integrating safety measures with broader urban development and heritage preservation strategies [22].

The keypoint lacking in this step is the intentional incorporation of information modeling tools (such as BIM/HBIM/CIM) integration approach in improving efficiency and prioritizing actions [22,25]. Utilizing digital tools could optimize the decision-making and prioritization process, ensuring a more systematic and data-driven approach. Integrating information modeling [22,25] at this step has the potential to enhance the overall efficiency of prioritizing actions by improving coordination and communication among technical departments and other stakeholders.

4.4.6 Establishing Partnerships and Frameworks for Each Support Service and Technical Department's Cluster

Throughout the step of establishing partnerships, the majority of respondents from each technical department cluster acknowledged the significance of collaborative governance and established strategic partnerships to improve the provision of urban-scale support services in urban heritage areas [22].

The planning and zoning departments cluster plays a crucial role in establishing partnerships with stakeholders, specialists, local businesses, and community groups [22]. This collaborative approach ensures that zoning decisions and urban planning are in accordance with the diverse needs and viewpoints of the community and other stakeholders. The public works and infrastructure departments cluster establishes partnerships with urban planners, community stakeholders, and private developers. This collaborative effort ensures that the construction of infrastructure is aligned with the visual quality of urban heritage areas, historical context, and the preservation of OUV as the core business of WH sites. The cluster of tourism departments establishes partnerships with contractors, utility providers, and community groups through the implementation of the PPP scheme. The necessary framework for each partnership was developed accordingly to promote sustainable tourism. Effective communication with a wide range of stakeholders, including local communities and businesses, is crucial for successfully implementing tourism initiatives [22–24]. The conservation and cultural heritage department cluster establishes PPP specifically focused on preserving heritage through collaboration with heritage organizations, local businesses, and tourism boards. However, the respondents did not mention any form of Public-Private-People Partnership (PPPP) practices in the studied WH sites, Røros, Rjukan, and Notodden [22]. This collaborative activity ensures that conservation strategies, adaptive reuse programs, and preventive maintenance are in harmony with the objectives of safeguarding cultural heritage. Coordination with heritage organizations enhances the specialized knowledge contributed to conservation initiatives. The environment and sustainability department cluster forms partnerships with environmental organizations and sustainable businesses, participating in PPP to advocate for sustainable practices. The collaborative approach integrates ecological infrastructure into urban heritage development. The urban safety and security departments cluster establish partnerships and coordination with law enforcement, emergency services, and community groups to improve safety measures. The collective endeavor guarantees incorporating safety and security factors into urban design and historic preservation guidelines [22].

The crucial aspect not found throughout the interviews and correspondence process in this step is the intentional incorporation of digital information modeling optimization and automation to improve the effectiveness of forming partnerships [22]. Incorporating information modeling tools at this step could improve the overall efficiency of collaborative governance, ensuring a more systematic approach to establishing partnerships and developing a framework with a broader city management plan [22,25].

4.4.7 Monitoring and Evaluation: The New UHFM Step

Within the monitoring and evaluation step, as the proposed additional step differs from the HUL approach, each cluster of technical departments has a crucial role in monitoring and evaluating the efficiency of their specific tasks in providing urban-scale support services to ensure continuous improvement and compliance with heritage preservation goals [22].

The responsibility of the planning and zoning department cluster is to monitor and evaluate the impact of urban development surrounding WH sites and ensure compliance with zoning and land use regulations, especially in the protected sites' core area and buffer zone, which includes evaluating the impacts of zoning decisions on the broader urban development, including their impact on the urban heritage area [22]. The public works and infrastructure department cluster primarily monitors and evaluates urban infrastructure's performance, maintenance, and functionality, including roads, streets, bridges, and other infrastructures.

Through real-time monitoring, these departments might identify specific areas and objects requiring maintenance or improvement, ensuring that the infrastructure development complies with the WH sites' heritage conservation regulations and guidelines [22,25]. The cluster of tourism departments monitors and evaluates tourism patterns, providing visitor satisfaction and preventing overtourism that might compromise the preservation of WH sites [22–24]. The cluster of conservation and cultural heritage departments primarily conducts the monitoring and evaluation of the maintenance of WH status and the preservation, reconstruction, restoration, and adaptive reuse of cultural heritage. The environment and sustainability departments monitor and evaluate energy consumption, air and water quality, environmental conditions, and waste management strategies. The urban safety and security departments monitor and evaluate the efficacy of emergency preparedness and surveillance measures. However, none of the respondents mentioned using an urban command center to conduct surveillance and real-time monitoring to improve the safety of the dwellers and visitors, not to mention the security of the protected assets from vandalism and irresponsible tourist activity. The urban safety and security department cluster monitors and evaluates the effectiveness of emergency preparedness and surveillance measures. This comprehensive approach ensures continuous improvement in managing urban heritage areas and WH sites.

The absence of theoretical keypoints in the UHFM scoping literature review process, specifically regarding the "monitoring and evaluation" step in the management practices of Norwegian World Heritage sites, although being mentioned repeatedly by the respondents during data collection, suggests three possible circumstances during the conception of UHFM keypoints . Firstly, it is possible that academic discussions on the "monitoring and evaluation" step were not identified during the scoping literature review process. Secondly, the absence of this important step in the discussion may be attributed to its unintentional oversight during the scoping literature review, which follows a rigorous protocol incorporating the HUL approach as one of the search criteria for filtering relevant literature. Lastly, the process of conducting a scoping literature review might include adding and classifying "monitoring and evaluation" in academic discussions within the category of "assessment," the third critical step of the HUL approach. Subsequently, during the data collection phase, the respondents, through interviews and correspondences, placed particular emphasis on "monitoring and evaluation" in providing urban-scale support services to ensure continuous improvement in service delivery. Assessments are typically conducted at the beginning to determine the type and manner in which support services will be provided. Meanwhile, "monitoring and evaluation" is usually carried out during the operational phase, where inputs, problems, difficulties, and challenges in the provision of urban-scale support services begin to be discovered. Monitoring occurs at the tactical and operational levels, whereas evaluation is carried out at the tactical and strategic levels of UHFM. The majority of respondents' understanding of the differences between assessment, monitoring, and evaluation suggests that they are highly aware of and committed to flexible and adaptive urban heritage facility management practices. It is presumed that these respondents and their institutions have included monitoring and evaluation in their daily practices, thereby improving the general efficiency of urban-scale support services in preserving the OUV and integrity of the WH sites from time to time.

4.5 Proposing UHFM Framework: The Results

4.5.1 UHFM cross-sectional matrix

The process leading to developing the conceptual framework for urban heritage facility management exposed the complex interconnections and relationships essential for providing urban-scale support services within WH sites [21,22]. The cross-sectional table visualized the seven steps of UHFM with the six clusters of technical departments that are responsible for managing the strategic, tactical, and operational levels of urban-scale support services (Table 4.8) [22]. The table contains a narrative representing the simplified and summarized results of interviews and correspondence with the key stakeholders involved. This comprehensive matrix acts as the primary framework of the study, facilitating the broad spectrum of insights gathered during interviews and correspondence from the stakeholders involved in managing three Norwegian World Heritage Sites: Røros, Rjukan, and Notodden. The table simplifies complex interactions, tasks, and responsibilities into a visually understandable format through data and narratives, with each element symbolizing an important role in providing urban-scale support services [22].

The UHFM conceptual framework also revealed several missing theoretical keypoints, indicating the unavailability of actions, tasks, or information during the data collection process [22]. The lack of UHFM keypoints revealed considerable facts and information regarding the complexity and challenges involved in providing support services. This framework made it possible to see the big picture and comprehend the narrative of complexities, gaps, and strategic alignments that characterize the UHFM framework in the context of urban-scale Norwegian WH sites. The empirical outcomes of interviews and correspondence were translated and brought concretely to allow for a comprehensive interpretation and discussion in the subsequent chapters [22].

Department / UHFM Steps	**Planning, Zoning, and Land Use**	**Public Works and Infrastructure**	**Tourism**	**Conservation and Cultural Heritage**	**Environment and Sustainability**	**Urban Safety and Security**
	Accurate mapping of the topographical features & heritage assets as base maps for all departments					
Mapping Resources	Mapping of land use, values, development zones, building types/patterns, population density	Mapping of infrastructure (roads, bridges, utility networks, urban facilities, etc.)	Mapping of visitor facilities, public space, tourism flow management, interpretation points	Detailed mapping of core and buffer zone of WH sites, archaeological sites, cultural routes	Mapping of green spaces, energy consumption patterns, waste management facilities	Mapping of vital infrastructure, emergency services locations, potential natural disasters, surveillance
Missing keypoint(s)	*Mapping of the existing partnership and mapping resources using information modelling/ BIM-based tools*					
	Citizen awareness and engagement, participatory planning, and consensus building for effective decision-making					
Reaching Consensus	Facilitate public input; work with developers for zoning decisions in privately	Facilitate public input; collaborate with community groups, academics, and planners to align	Engage stakeholders in tourism planning; involving local communities	Collaborate with heritage experts, academics, and communities in heritage management	Collaborate with environmental advocates and the public for sustainable practices in WH management;	Collaborate with law enforcement and communities to identify potential

	owned development and property	infrastructure needs	and businesses	planning; education/ developing heritage knowledge; heritage interpretation	education/ developing knowledge	hazards; enhance safety and security measures
Missing keypoint(s)	*N/A*					
Assessing vulnerabilities	Assess the vulnerabilities specific to the technical department's interaction with heritage assets					
	Assessing vulnerabilities in zoning decisions; social economic assessment	Assess infrastructure vulnerabilities, utility, and maintenance assessment	Identify vulnerabilities in tourist areas; tourism impact assessment	Assess vulnerability of heritage sites; Heritage Impact Assessment (HIA); heritage policy assessment	Assess vulnerability to climate change; Environment Impact Assessment (EIA)	Assess safety and security vulnerabilities; Risk assessment
Missing keypoint(s)	*Citizen satisfaction assessment and digital assessment utilizing BIMs (HBIM, UIM/CIM)*					
Integrating values and vulnerabilities	Balancing preservation with development and modern needs					
	Ensure zoning regulations align with urban character and heritage preservation	Integrate infrastructure development into urban aesthetics and heritage context	Balance heritage preservation with modern urban development needs; improving public participation	Integrate cultural heritage into development plans; adaptive reuse strategies; improving human resources and public participation; improve heritage regulation	Integrate sustainable practices and green infrastructure into urban planning; improving health and wellbeing	Integrate safety and security measures into urban design; historic preservation guidelines; improving health, safety, and wellbeing
Missing keypoint(s)	*Enhancing efficiency using information modelling (BIM, HBIM, UIM/CIM), IoT, AI, and sensors*					
Prioritizing actions	Preserving the OUV of the WH sites through the implementation of sustainable cultural heritage management through the efficient delivery of support service(s)					
	Zoning regulations enforcement; provide development guidance	Infrastructure maintenance and development; preventive maintenance	Sustainable tourism; visitor experience enhancement; cultural heritage interpretation; preserving cultural identity; increasing citizen participation	Heritage conservation; adaptive reuse; preventive maintenance; cultural value preservation; increasing citizen participation	Environmental protection; sustainable heritage practices; enhance physical and social wellbeing; increasing citizen participation	Public safety and security; emergency response; preventive maintenance; heritage protection from threats
Missing keypoint(s)	*Enabling information modelling (BIM, HBIM, UIM/CIM) integration approach*					

Establishing Partnerships	Forming partnerships with stakeholders, experts, local businesses, and community groups aligned with the specific goals of each department (collaborative governance and decisions-making)					
	Partners with urban planners, community stakeholders, developers	Work with contractors, utility providers, and community groups for infrastructure and maintenance	Collaborate with heritage organizations, local businesses, tourism boards; Public-private partnership in tourism	Collaborate with cultural experts, historians, conservationists for preservation, adaptive reuse approach; Public-private partnership in heritage preservation	Partners with environmental organizations and sustainable businesses for initiatives; Public-private partnership in sustainability	Collaborate with law enforcement, emergency services, and community groups for safety
Missing keypoint(s)	*Digital information and information modelling optimation (optimization and automation)*					
Monitoring & Evaluation of support service provision	Monitoring and evaluation of support services provided by each technical department					
	Monitoring and evaluation of urban development impact and zoning/land use compliance	Monitoring and evaluation of urban infrastructure performance, maintenance, and effectiveness	Monitoring and evaluation of tourism flows, visitor satisfaction, tourism support services, and impact of tourism on heritage preservation	Monitoring and evaluation of conservation and WH status, and cultural heritage preservation (reconstruction, restoration, and adaptive reuse)	Monitoring and evaluation of energy consumption, carbon footprint, air quality, environment, and waste management practices	Monitoring and evaluation of emergency preparedness and surveillance effectiveness
Missing keypoint(s)	*N/A*					

Table 4.8 UHFM Cross-sectional Matrix

4.5.2 UHFM Organizational Framework

The organizational framework for UHFM illustrates the complexities involved in managing urban heritage facilities [22]. Due to the complex nature of these organizations, especially in the context of WH sites, it is important to simplify the illustrated interaction to prevent overwhelming the general audience in understanding the framework (Figure 4.16) [21,22].

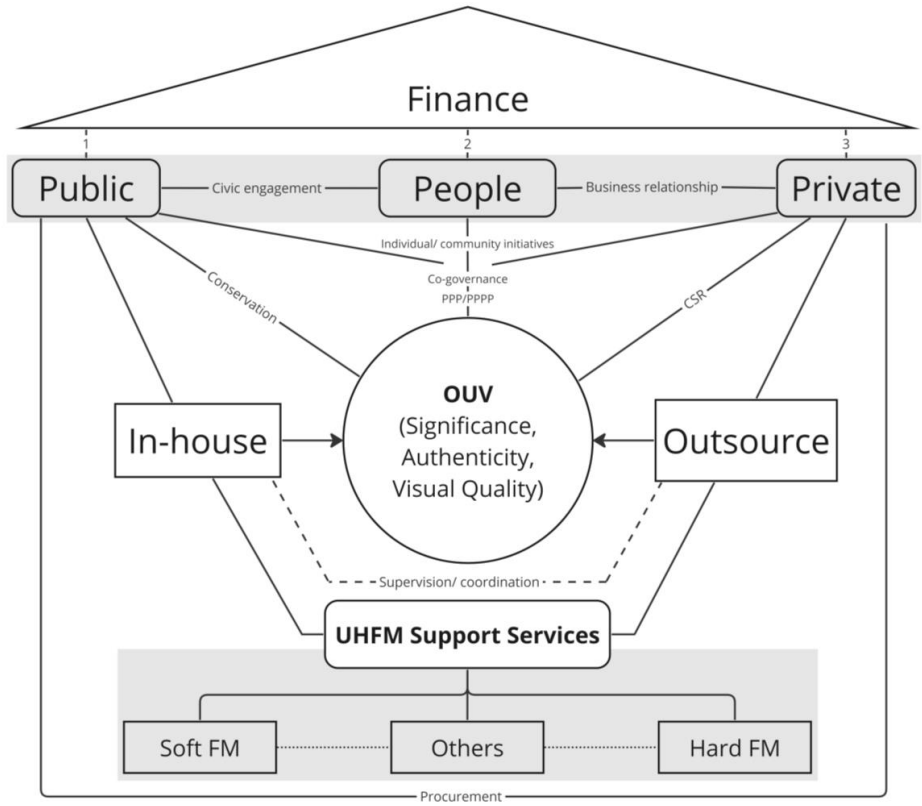


Figure 4.16: UHFM organizational framework

**(1) International, national, regional, and local government funding; private to public funding; sovereign bonds/ government paper, etc., (2) Government grant; incentive funds; special taxation; private loan/banking; community funding; self-funding, (3) Private loan/banking; international, national, regional, and local government funding; public to private funding; crowdfunding (people to private funding); public-private partnership (PPP), public-private-people partnership (PPPP).*

The UHFM organizational framework prioritizes heritage values as the central focus of urban heritage area conservation [22]. Within the context of WH sites, the OUV serves as the foundation for inscribing cultural heritage on the WH list, making its preservation and care of utmost importance. The OUV, as the "core business" of the WH site, should not be compromised for the sake of efficiency, budget, or effectiveness as traditionally understood in facility management, including Urban FM. Urban-scale support services must be dedicated to ensuring that urban heritage areas, as a component of the built environment in FM defined by ISO41001 [126], continue to uphold their heritage significance, authenticity, and aesthetic quality. The delivery of support services, both in terms of soft FM and hard FM, by in-house teams and outsourced service providers should be rooted in heritage values and attributes that carry those values [21,22].

The key stakeholders in UHFM are categorized into three clusters: the public, people, and private sectors (Figure 4.16) [22]. Generally, technical departments under the municipality *(kommune)* and, to a lesser extent, the county *(fylkeskommune)* administration are responsible for providing urban-scale support services. In the UHFM organizational framework, the public sector includes local, regional, national, and international governing authorities, particularly those with direct responsibilities for cultural heritage preservation

[22]. The community plays a role in heritage preservation through various initiatives, both at the individual and collective levels [22,200,201]. Individuals can support cultural heritage preservation efforts in general or take direct action in caring for cultural heritage, particularly if they own or occupy heritage buildings. Individuals' involvement in support services often entails providing feedback or participating in public hearings on support services related to heritage assets and properties [22,202]. The private sector is also a significant stakeholder, actively utilizing cultural heritage properties and engaging in corporate social responsibility (CSR) within the cultural heritage context [22,203].

Civic engagement plays a central role in the interaction of public sector interactions with individuals [22,201]. The level of community involvement in the conservation of urban heritage areas often determines the success of cultural heritage preservation. While the relationship between the private sector and individuals is usually centered around customer-business interactions, there are instances where the private sector directly supports heritage communities. The partnership between the public and private sectors, known as Public-Private Partnership (PPP), can be expanded to include elements of people through the Public-Private-People Partnership (PPPP) model [204], which involves crowdfunding and co-governance mechanisms for funding and managing urban heritage areas [22].

Funding is crucial for both general conservation efforts and the provision of urban-scale support services [205]. National, regional, and local policies strictly regulate funding sources for managing urban heritage [22]. Government budgets can be allocated to fund private sector service providers and technical departments. Government grants and subsidies may also be provided to individuals and communities to support the preservation of tangible and intangible cultural assets. However, funding for individuals and communities typically does not directly address urban-scale support services. On the other hand, the private sector is directly involved in providing various types of urban heritage support services through outsourcing mechanisms supervised and/or coordinated by the relevant technical department. Establishing a UHFM organization responsible for coordinating and orchestrating all urban-scale support services in the urban heritage district is one of the recommendations proposed in this study [22]. UHFM professionals hold positions similar to facility managers in the context of large-scale building complexes [20–22].

4.5.3 UHFM Process Flowchart

A process flowchart serves as a simplified representation of a specific process within the realm of urban heritage facility management [22]. It provides a model that depicts the sequential steps and decision points involved in delivering support services on an urban scale within an urban heritage area. Such areas are characterized by specific heritage regulations that differentiate them from other types of urban environments. The flowchart offers a graphical representation of the workflow, interactions among stakeholders, and the sequence of activities (Figure 4.17) [22]. By illustrating and facilitating the comprehension of stages and procedures in urban heritage facility management, the process flowchart becomes a valuable tool for analysis, communication, and process improvement [22].

The provision of urban-scale support services for urban heritage areas, particularly World Heritage (WH) sites in urban contexts, typically commences with identifying and planning potential support services at the strategic and tactical levels (Figure 4.17) [22]. The responsibility for this initial identification generally lies with governing authorities, such as

municipalities and counties, adhering to principles of effective urban governance. Engaging multiple stakeholders, especially through participatory planning processes and public hearings, plays a crucial role in this procedure. Public participation can occur early in the process or be reintroduced through hierarchical consultation involving the cultural heritage department and the WH coordinator, particularly when planned support services may impact the heritage values and characteristics of a World Heritage Site. The identification and planning of support services may undergo a continuous loop based on monitoring and evaluation results, indicating the need for improvement, correction, adjustment, or modification, thereby requiring re-identification or re-planning of these support services [22]. For instance, in the case of Røros, Rjukan, and Notodden, the provision of cobblestone as a substitute for asphalt to enhance visual quality led to complaints from wheelchair and bicycle users, necessitating the re-identification and re-planning of road infrastructure provision to meet the needs of residents through a combination of flat surfaces and cobblestone [22,26].

WH coordinators maintain communication forums with their colleagues at other sites and have extensive interactions with Riksantikvar, an agency under the Ministry of Climate and Environment (KLD) [22]. If the identification and planning of support services have national significance, the WH coordinator will engage in national-level consultations. KLD serves as a communication and coordination channel with UNESCO, the World Heritage Centre (WHC), and their advisory bodies, such as the International Council on Monuments and Sites (ICOMOS), the International Union for the Conservation of Nature (IUCN), and the International Center for the Study of the Preservation and Restoration of Cultural Property (ICCROM), should intervention and consultation from international institutions be required [22].

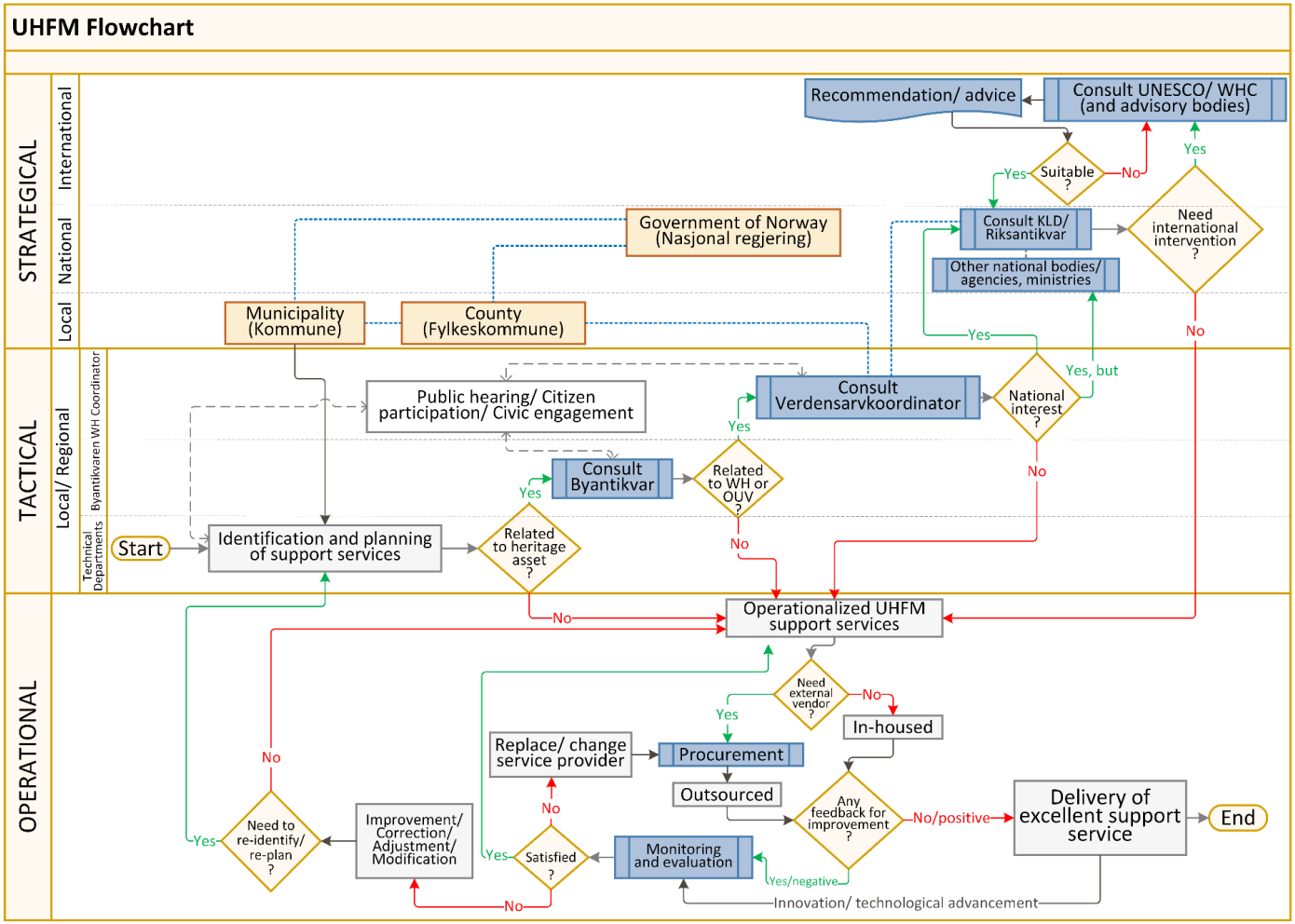


Figure 4.17: UHFM Process Flowchart

While the identification and planning of urban-scale support services originate at the municipal level, the strategic level in Norwegian WH practice also involves coordination functions with the county level *(fylkeskommune)* and the national level through KLD and Riksantikvar [22]. Additionally, several national bodies, agencies, and ministries outside of KLD, including those responsible for railways, education, energy, health, and more, may participate in the coordination hierarchy. Once agreements on the provision of urban-scale support services are reached at the strategic and tactical levels, UHFM support services operationalize at the operational level, considering available resources and potential obstacles. Some support services are performed in-house, while others are outsourced through a procurement process to businesses, professionals, contractors, vendors, and private service providers. During the operationalization of support services, feedback for improvement is typically received from the operational level task forces as the avant-garde team and citizens as end users. This feedback mechanism involves various formal and informal procedures. The absence of feedback may indicate inadequacies in the delivery of support services. Enhancing the process of delivering urban-scale support services in an urban heritage area, particularly within the context of World Heritage Sites, requires continuous stakeholder engagement [22].

4.6 Contribution

The urban heritage facility management (UHFM) conceptual framework reveals a deep comprehension of the complex dynamics that govern the delivery of support services on a large scale in WH sites. The exploration, driven by the two research questions (RQ3.1 and RQ3.2) on the efficient organization of these services and the role of coordination functions in maintaining the WH status, has resulted in detailed observations from three Norwegian World Heritage Sites: Røros, Rjukan, and Notodden. The UHFM conceptual framework contains the primary information obtained from interviews and correspondence exchanges with key stakeholders. The cross-sectional table between the seven UHFM steps and the six technical department clusters serves as a navigational tool, streamlining the intricate interactions and responsibilities in managing urban-scale support services. This matrix functions both as a visual representation and a condensed narrative, revealing the complexities of stakeholder engagements and the coordination of support services. The detection of crucial elements which is missing in the UHFM conceptual framework reflected the difficulties and gaps in the delivery of support services within the management of World Heritage sites. The gaps between the theoretical keypoints from the scoping literature review process and the conceptual framework obtained from the studied cases reflect the challenges encountered when trying to balance heritage preservation, authenticity, and modern development. The lack of information modeling tools integration throughout several UHFM steps is particularly interesting, emphasizing the need for improvement and efficiency in future implementations.

The additional step, "monitoring and evaluation," allowed the UHFM conceptual framework to become a powerful and flexible tool adaptable to all possible social, economic, and environmental changes. The ability of this asset to capture the complex connections among technical departments, governance structures, and stakeholders in providing urban-scale support services while maintaining the OUV, visual quality, authenticity, and significance of the studied WH sites makes it a valuable tool in heritage management, alongside the original HUL approach and other existing heritage conservation framework addressing the core business of WH sites. The importance of a collaborative and unified strategy, which involves the integration of heritage preservation, management of urban-scale facilities, and collaboration with stakeholders, is emphasized by this study. The UHFM conceptual

framework tackles both present challenges and serves as a basis for ongoing enhancement and adaptable strategies in the constantly changing field of urban heritage preservation.

This chapter provides valuable insights into the complexity of managing facilities within urban heritage management, specifically focusing on the Norwegian WH sites. Furthermore, this study offers a conceptual framework that can be applied to various contexts worldwide. This study serves as an invitation for further academic discussion, research, and implementation of the UHFM conceptual framework in order to shape sustainable, resilient, and culturally vibrant urban heritage environments for future generations. The results and findings of this study pave the way for future research to replicate similar studies in other non-WH historic towns and urban heritage districts in Norway, as well as in urban heritage areas and WH sites outside of Norway. This will contribute to a more comprehensive understanding of facility management at an urban scale in urban heritage areas.

5 Conclusions

"What we call the beginning is often the end. And to make an end is to make a beginning. The end is where we start from…"

T.S. Eliot

This dissertation has explored the domain of Urban Heritage Facility Management (UHFM), which is a novel and previously-unexplored field of urban-scale facility management (Urban FM), providing a foundation for a thorough comprehension of how to manage support services on an urban scale in the context of World Heritage sites; a specific niche of urban heritage areas. This doctoral thesis has developed the UHFM conceptual framework that comprehensively explains the complex tasks and challenges of preserving the heritage values, authenticity, significance, and visual quality of protected urban heritage areas. It does so by adopting a multidisciplinary approach and incorporating insights from urban facility management, heritage conservation, and stakeholder collaboration.

The scoping literature review results, the identification of urban-scale support services, and the cross-sectional study of the three Norwegian World Heritage sites, Bergstaden Røros, Rjukan Company Town, and Notodden Industrial Heritage area, have provided valuable insights regarding the complexities and intricacies involved in managing facilities within urban heritage areas (Figure 5.1).

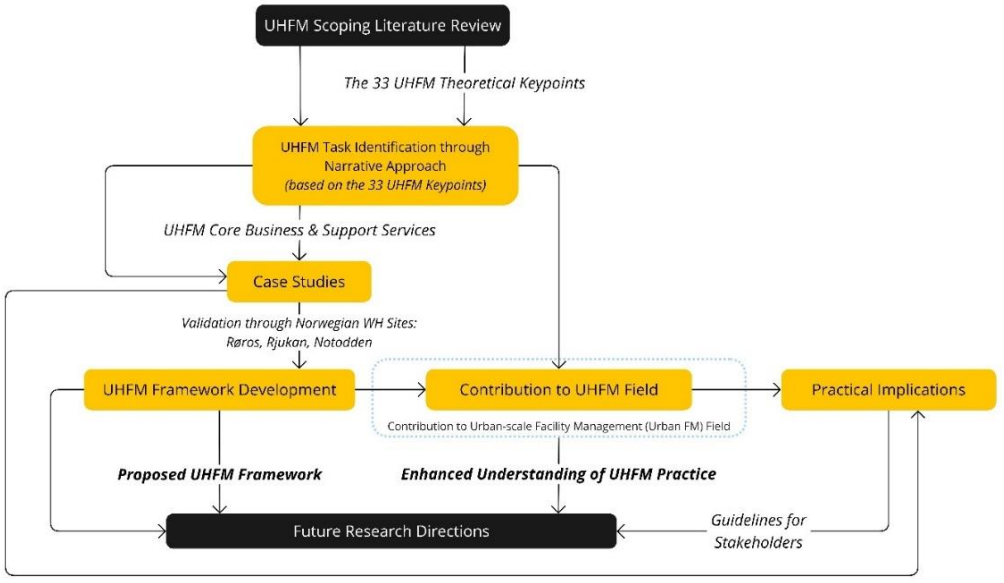


Figure 5.1 Reflection on the doctoral research design and its contributions to the UHFM field

The 33 theoretical keypoints of UHFM encapsulated the key principles that have been discussed in academic literature regarding the integration of urban heritage

conservation and urban-scale facility management (Figure 5.1). Theoretical keypoints are utilized as a diagnostic instrument for evaluating the effectiveness, credibility, and alignment with heritage preservation objectives in the provision of urban-scale support services. This doctoral study established a methodologically reliable foundation for the validation of these keypoints in real-life practice. This ensures that the validation process is based on a well-defined and theoretically informed framework (Figure 5.1). The narrative of the core business of an urban setting and identification of the provision of services to support its main goals led to the identification of types and ranges of urban-scale support services in the urban heritage area, especially WH sites. This part of the study provided the "what" and "who" is in charge of providing and delivering the services, therefore, made possible to be one of the bases to validate the UHFM theoretical keypoints from the scoping literature review, using the three Norwegian World Heritage sites as context.

The cross-sectional study of Bergstaden Røros, Rjukan, and Notodden World Heritages validated the theoretical UHFM keypoints by utilizing the Soft FM, Hard FM, and other possible urban-scale support services through a series of interviews and correspondences with the stakeholders on the delivery of urban-scale facility management support services within the corresponding urban heritage areas. The cross-sectional table between the seven UHFM steps and the six technical department clusters serves as a navigational tool, streamlining the intricate interactions and responsibilities in managing urban-scale support services.

The framework for managing urban heritage facilities displayed an in-depth understanding of the complex dynamics that govern the provision of urban-scale support services in WH sites. The framework highlighted the intricacies of stakeholder engagements and the coordination of support services by functioning as both a visual representation and a condensed narrative. The study suggests adding a step called "monitoring and evaluation" to the UHFM framework, making it more adaptable and capable of managing any social, economic, or environmental change.

It is important to emphasize that although the theoretical UHFM keypoints have been validated on the three Norwegian World Heritage sites through series of semi-structured interviews and correspondence to develop the conceptual UHFM framework, it requires further testing in the same sites and, even better, at other World Heritage sites in other contexts, countries, and continents.

The UHFM conceptual framework, along with the original HUL approach and other existing heritage conservation frameworks, can be developed to become a potential tool in urban-scale heritage management practice because it can capture the intricate relationships between technical departments, governance structures, and stakeholders in providing urban-scale support services while maintaining the OUV, visual quality, authenticity, and significance of the studied WH sites. This doctoral research has highlighted the significance of an integrated and cooperative approach that incorporates stakeholder collaboration, management of urban-scale facilities, and heritage preservation. The UHFM conceptual framework provides a useful approach in addressing current issues and providing a foundation for future development and flexible approaches in the dynamic field of urban heritage conservation. It is worth noting that since the OUV is the fundamental basis for inscribing cultural heritage within the context of the World Heritage, its preservation cannot be compromised for the sake of efficiency, financial constraints, or conventional views of effective facility management practices.

The suggested UHFM conceptual framework promotes a collaborative and informed approach that potentially benefits users and engages stakeholders by facilitating effective

decision-making, resource allocation, and strategic planning. The UHFM framework emphasizes the importance of heritage values, authenticity, and visual quality to foster a sense of responsibility for the sustainable management of urban heritage areas.

5.1 Practical Implications, Guidelines, and Recommendations

The findings of this thesis have significant implications for various stakeholders involved in Urban Heritage Facility Management (UHFM), including UNESCO, local municipalities, funding partners, heritage managers, and community groups. The practical relevance of the research is highlighted through the following lessons learned and step-by-step recommendations.

For UNESCO, the integration of UHFM practices is shown to enhance the preservation and sustainability of heritage sites. UNESCO should promote the adoption of the UHFM framework in World Heritage sites globally, providing guidelines and resources for implementation. Developing training programs and workshops for heritage managers to familiarize them with the UHFM framework is a crucial step. For local municipalities, the research underscores the importance of local involvement and tailored UHFM practices for effective management. Municipalities should collaborate with heritage managers and local communities to co-create and implement UHFM strategies. Establishing local heritage committees to oversee the application of the UHFM framework and ensure community engagement is recommended. For heritage managers and UHFM-ers, a holistic approach to heritage management that considers both conservation and urban-scale support services is effective. Heritage managers should adopt the UHFM framework to balance conservation efforts with the daily needs of urban heritage sites. Conducting regular training and capacity-building sessions for staff on UHFM practices will be beneficial. For local dwellers and community groups, the research highlights the importance of community involvement in heritage management. Community groups should be actively involved in the decision-making process and the implementation of UHFM strategies. Organizing community forums and feedback sessions to gather input and ensure local perspectives are integrated into UHFM plans is essential.

5.2 Sustainability Aspect in UHFM

The concept of sustainability is inherently complex and often controversial, particularly in the context of urban heritage facility management (UHFM). From this doctoral thesis' perspective, sustainability in UHFM is viewed through a multidimensional lens, encompassing environmental, economic, and social aspects. The primary objective is to balance the preservation of heritage values with the needs of contemporary urban life, ensuring that heritage sites remain vibrant, functional, and relevant for future generations. This approach recognizes that sustainability is not a static end-state but an ongoing process that requires adaptive management and continuous engagement with various stakeholders.

Achieving sustainable development in UHFM presents several challenges. Balancing conservation and modern needs are a persistent issue. Heritage sites often face pressure to modernize and accommodate new functions, which can conflict with conservation goals. Striking a balance between preserving historical integrity and meeting the needs of current and future urban populations is complex. Financial and human resources dedicated to heritage conservation and management are often limited. Securing sustainable funding and expertise for ongoing maintenance and adaptive reuse projects is critical but challenging. Effective UHFM requires the involvement of diverse stakeholders, including

government agencies, local communities, private sector partners, and international organizations like UNESCO. Ensuring meaningful participation and collaboration among these groups can be complex and time-consuming. Heritage sites are vulnerable to environmental changes and natural disasters. Implementing sustainable practices that mitigate environmental impacts while enhancing the resilience of heritage sites is essential but often difficult.

Despite these challenges, UHFM offers significant contributions to resolving sustainability dilemmas. It promotes an integrated approach that combines conservation efforts with urban-scale support services, ensuring that heritage sites are not only preserved but also remain functional and beneficial to the community. By adapting historical buildings for modern use through adaptive reuse approach, for example, UHFM supports the sustainable revitalization of urban areas, reducing the need for new construction, conserving resources, and breathing new life into heritage sites. Engaging local communities in heritage management fosters a sense of ownership and responsibility, ensuring that heritage conservation efforts are aligned with the needs and aspirations of local residents, promoting social sustainability. Furthermore, UHFM can generate economic benefits through heritage tourism, creating jobs and stimulating local economies. Sustainable tourism practices, guided by UHFM principles, help preserve heritage sites while providing economic opportunities. UHFM frameworks advocate for robust policy and governance structures that support sustainable development goals, ensuring that heritage management practices are transparent, accountable, and inclusive.

5.3 Disclaimer

This doctoral thesis does not intend to make broad generalizations that can be applicable to all types of technical departments, support services, and different types of World Heritage sites outside of Norway. This doctoral study was designed to be an initial umbrella study of urban-scale heritage facility management using Norwegian World Heritage sites as contexts, which provides the basis for further research in the realm of Urban FM, urban heritage conservation, and detailed parts of UHFM. Various terms in this study are used interchangeably in English and the Norwegian version due to technical and practical reasons. This study represented a progression in the domain of urban heritage management and Urban FM by introducing a framework that addresses the complexity associated with managing urban heritage facilities, specifically focusing on the Norwegian WH sites, which is in contrast to previous studies that typically examined specific aspects of heritage conservation or facility management of protected buildings only.

5.4 Future Research

This dissertation suggests multiple paths for researchers and practitioners to explore further in the field of urban heritage facility management (UHFM), thereby facilitating future research. One promising area for future research involves the integration of Information Modeling Tools at various stages of UHFM. These tools, which are currently not being used to their full potential, have the ability to improve the efficiency and effectiveness of UHFM processes without compromising the heritage values, significance, authenticity, and visual quality. This would give a technological advantage to the caretakers in providing urban-scale support services in heritage areas. Examining the implementation and modification of these tools has the potential to completely transform the approach to UHFM, promoting a more efficient and data-oriented management framework. Nevertheless, this conceptual framework needs to be further tested in the

initial case studies. The UHFM conceptual framework could also be tested and validated in other types of urban settings and World Heritage sites outside Norway. Different sociocultural settings will provide interesting, and maybe unpredictable, results that could enrich the understanding and development of both UHFM and Urban FM.

Another area of research with potential is the examination of the socio-economic impacts of UHFM, particularly its influence on heritage tourism in World Heritage sites as a specific niche of tourism. Acquiring a thorough comprehension of the intricate connections between UHFM practices and the visitor experience can provide valuable insights for formulating policies that effectively strike a balance between the imperative for conservation and the economic benefits linked to heritage tourism. This type of prospective investigation has the capacity to offer valuable understanding regarding the role of UHFM in preserving cultural heritage and fostering sustainable development in local communities through tourism. Further research, by other researchers, could explore the potential alignment between UHFM and sustainable urban development goals through considering how UHFM can be integrated into the broader framework of urban sustainability. An analysis of the correlation between UHFM and the United Nations Sustainable Development Goals can offer a comprehensive understanding of its contribution to the advancement of resilient and inclusive urban environments. Moreover, the integration of community perspectives and engagement strategies in the UHFM conceptual framework presents a promising area for research. Gaining insight into the perceptions, engagement, and advantages that local communities derive from UHFM initiatives can enhance the adoption of community-centered and culturally attuned strategies. Further investigation could explore techniques for augmenting community participation in decision-making processes pertaining to urban heritage management.

The future research directions mentioned above seek to expand the scope of UHFM and Urban FM, transforming it from a theoretical framework into a practical and adaptable tool for managing support services at an urban scale in heritage districts. This future research offers promising opportunities for academics and professionals to contribute to the ongoing development of UHFM and its vital role in preserving the cultural value of urban heritage sites outside the common tasks of conservators and heritage authorities.

(This page is intentionally left blank)

References

1. Ginzarly, M.; Houbart, C.; Teller, J. The Historic Urban Landscape approach to urban management: a systematic review. *Int. J. Herit. Stud.* **2019**, *25*, 999–1019, doi:10.1080/13527258.2018.1552615.
2. Taylor, T.; Landorf, C. Subject-object perceptions of heritage: A framework for the study of contrasting railway heritage regeneration strategies. *Int. J. Herit. Stud.* **2015**, *21*, 1050–1067, doi:10.1080/13527258.2015.1061582.
3. Bandarin, F.; van Oers, R. *The Historic Urban Landscape: Managing Heritage in an Urban Century*; 2012; ISBN 9780470655740.
4. Roders, A.P.; Bandarin, F. *Reshaping Urban Conservation: The Historic Urban Landscape Approach in Action*; Springer, 2019; Vol. 2; ISBN 981108887X.
5. Stephenson, J. The Cultural Values Model: An integrated approach to values in landscapes. *Landsc. Urban Plan.* **2008**, *84*, 127–139.
6. Thompson, C.W. Landscape perception and environmental psychology. In *The Routledge companion to landscape studies*; Routledge, 2018; pp. 19–38 ISBN 1315195062.
7. Gobster, P.H.; Nassauer, J.I.; Daniel, T.C.; Fry, G. The shared landscape: what does aesthetics have to do with ecology? *Landsc. Ecol.* **2007**, *22*, 959–972.
8. Tress, B.; Tress, G. Capitalising on multiplicity: a transdisciplinary systems approach to landscape research. *Landsc. Urban Plan.* **2001**, *57*, 143–157.
9. Hou, H.; Wu, H. A case study of facilities management for heritage building revitalisation. *Facilities* **2020**, *38*, 201–217.
10. Roders, A.P.; Van Oers, R. World Heritage cities management. *Facilities* **2011**, *29*, 276–285.
11. Veldpaus, L.; Roders, A.P. Historic urban landscapes : an assessment framework part II. In Proceedings of the 29th Conference of sustainable architecture for a renewable future (PLEA 2013); Munich, Germany, 2013; pp. 1–5.
12. Veldpaus, L. Historic urban landscapes: framing the integration of urban and heritage planning in multilevel governance, Technische Universiteit Eindhoven, 2015.
13. Salaj, A.T.; Bjørberg, S.; Støre-Valen, M.; Lindkvist, C. Urban Facility Management Role. In Proceedings of the 5th International Academic Conference Places and Technologies; 2018; pp. 24–27.
14. Salaj, A.T.; Lindkvist, C.M. Urban facility management. *Facilities* **2020**, *39*, 525–537, doi:10.1108/F-06-2020-0078.
15. Lindkvist, C.; Temeljotov-Salaj, A.; Collins, D.; Bjorberg, S. Defining a niche for Facilities Management in Smart Cities. In Proceedings of the IOP Conference Series: Earth and Environmental Science; 2019; Vol. 352.
16. Nielsen, S.B.; Sarasoja, A.L.; Galamba, K.R. Sustainability in facilities management: an overview of current research. *Facilities* 2016, *34*, 535–563.
17. Aceves-Avila, C.D.; Berger-García, M.A. Sustainable Facilities Management in Higher Education Institutions. *Encycl. Sustain. High. Educ.* **2019**, 1802–1809.
18. UNESCO *Recommendation on the Historic Urban Landscape*; UNESCO: Paris, 2011;
19. UNESCO *Operational Guidelines for the Implementation of the World Heritage Convention*; UNESCO: Paris, 2019; pp. 1–177;.
20. Prabowo, B.N.; Salaj, A.T.; Lohne, J. Urban Heritage Facility Management: A Scoping Review. *Appl. Sci.* **2021**, *11*, 9443.
21. Prabowo, B.N.; Temeljotov Salaj, A.; Lohne, J. Identifying Urban Heritage Facility Management Support Services Considering World Heritage Sites. *Urban Sci.* **2023**, *7*, 52.
22. Prabowo, B.N.; Temeljotov Salaj, A.; Lohne, J. Urban Heritage Facility Management: A Conceptual Framework for the Provision of Urban-Scale Support Services in Norwegian World Heritage Sites. *Heritage* **2024**, *7*, 1372–1399.
23. Prabowo, B.N.; Salaj, A.T. Systemic Approaches In Revitalization Of Semarang Old City Heritage Site: From Neglected Area To Tourism Destination. In Proceedings of the 7th International Academic Conference Places and Technologies; 2020; pp. 322–329.
24. Prabowo, B.; Salaj, A. Identifying Overtourism Impacts on the Informal Sector's Livelihoods in Urban Heritage Area. In Proceedings of the IOP Conference Series: Earth and Environmental Science PAPER; 2021; Vol. 738, p. 012044.
25. Prabowo, B.N.; Hjelseth, E.; Temeljotov-Salaj, A. HBIM application in historic town: A scoping literature review. In Proceedings of the Proceedings of the 14th European Conference on Product and Process Modelling (ECPPM 2022); Eilif Hjelseth, S.F.S.& R.S., Ed.; CRC Press:

Trondheim, 2023.
26. Prabowo, B.N.; Temeljotov-Salaj, A.; Prabowo, Bintang Noor; Salaj, A.T. The Older Adults in the Smart Urban Heritage Area: A Mini Scoping Review of Inclusivity in the World Heritage Sites. In Proceedings of the The 22nd World Congress of the International Federation of Automatic Control (IFAC) 2023; Elsevier: Yokohama, 2023; Vol. 56, pp. 9570–9575.
27. Levac, D.; Colquhoun, H.; O'Brien, K.K. Scoping studies: advancing the methodology. *Implement. Sci.* **2010**, *5*, 69.
28. Colquhoun, H.L.; Levac, D.; O'Brien, K.K.; Straus, S.; Tricco, A.C.; Perrier, L.; Kastner, M.; Moher, D. Scoping reviews: time for clarity in definition, methods, and reporting. *J. Clin. Epidemiol.* **2014**, *67*, 1291–1294.
29. Tricco, A.C.; Lillie, E.; Zarin, W.; O'Brien, K.; Colquhoun, H.; Kastner, M.; Levac, D.; Ng, C.; Sharpe, J.P.; Wilson, K. A scoping review on the conduct and reporting of scoping reviews. *BMC Med. Res. Methodol.* **2016**, *16*, 1–10.
30. Arksey, H.; O'Malley, L. Scoping studies: towards a methodological framework. *Int. J. Soc. Res. Methodol.* **2005**, *8*, 19–32.
31. Grant, M.J.; Booth, A. A typology of reviews: an analysis of 14 review types and associated methodologies. *Heal. Inf. Libr. J.* **2009**, *26*, 91–108.
32. Bandarin, F.; van Oers, R. *The Historic Urban Landscape*; 2012; ISBN 9780470655740.
33. Prabowo, B.N.; Pramesti, P.U.; Ramandhika, M.; Sukawi, S. Historic urban landscape (HUL) approach in Kota Lama Semarang: mapping the layer of physical development through the chronological history. In Proceedings of the IOP Conference Series: Earth and Environmental Science; IOP Publishing, 2020; Vol. 402, p. 12020.
34. Rey-Pérez, J.; Roders, A.P. Historic urban landscape: A systematic review, eight years after the adoption of the HUL approach. *J. Cult. Herit. Manag. Sustain. Dev.* **2020**, *10*, 233–258, doi:10.1108/JCHMSD-05-2018-0036.
35. Kuijlenburg, R. Teaching urban facility management, global citizenship and livability. *Facilities* **2020**, *38*, 849–857, doi:10.1108/F-11-2019-0119.
36. Salaj, A.T.; Lindkvist, C.; Jowkar, M. Social needs for sustainable refurbishment in Trondheim. In Proceedings of the 19th EuroFM Research Symposium 2020; 2020; pp. 51–61.
37. Salaj, A.T.; Bjoerberg, S.; Boge, K.; Larssen, A.K. Increasing attractiveness by LCC facility management orientation. In Proceedings of the IFAC-PapersOnLine; 2015; Vol. 28, pp. 149–154.
38. Xue, Y.; Temeljotov-Salaj, A.; Engebø, A.; Lohne, J. Multi-sector partnerships in the urban development context: A scoping review. *J. Clean. Prod.* **2020**, *268*, 122291, doi:10.1016/j.jclepro.2020.122291.
39. Depietri, Y.; McPhearson, T. Integrating the grey, green, and blue in cities: nature-based solutions for climate change adaptation and risk reduction. In *Nature-based solutions to climate change Adaptation in urban areas*; Springer, Cham, 2017; pp. 91–109.
40. Haase, D.; Kabisch, S.; Haase, A.; Andersson, E.; Banzhaf, E.; Baró, F.; Brenck, M.; Fischer, L.K.; Frantzeskaki, N.; Kabisch, N. Greening cities–To be socially inclusive? About the alleged paradox of society and ecology in cities. *Habitat Int.* **2017**, *64*, 41–48.
41. Kardan, O.; Gozdyra, P.; Misic, B.; Moola, F.; Palmer, L.J.; Paus, T.; Berman, M.G. Neighborhood greenspace and health in a large urban center. *Sci. Rep.* **2015**, *5*, 1–14.
42. Jennings, V.; Gaither, C.J. Approaching environmental health disparities and green spaces: an ecosystem services perspective. *Int. J. Environ. Res. Public Health* **2015**, *12*, 1952–1968.
43. Nijkamp, J.E.; Mobach, M.P. Developing healthy cities with urban facility management. *Facilities* **2020**, doi:10.1108/F-11-2019-0128.
44. Avčin, B.A.; Šarotar, B.N.; Salaj, A.T. More proactive facility management role for resilience at the workplace. In Proceedings of the Joint CIB W099 and TG59 International Safety, Health, and People in Construction Conference; p. 130.
45. Aigwi, I.E.; Ingham, J.; Phipps, R.; Filippova, O. Identifying parameters for a performance-based framework: Towards prioritising underutilised historical buildings for adaptive reuse in New Zealand. *Cities* **2020**, *102*, 102756, doi:10.1016/j.cities.2020.102756.
46. Biagini, C.; Capone, P.; Donato, V.; Facchini, N. Towards the BIM implementation for historical building restoration sites. *Autom. Constr.* **2016**, *71*, 74–86, doi:10.1016/j.autcon.2016.03.003.
47. Bruno, S.; De Fino, M.; Fatiguso, F. Historic Building Information Modelling: performance assessment for diagnosis-aided information modelling and management. *Autom. Constr.* **2018**, *86*, 256–276, doi:10.1016/j.autcon.2017.11.009.
48. Ciocia, C.; Napolitano, T.; Viola, S. Diagnostic Monitoring for Historic Urban Landscape Case Study: Building in Via Caracciolo Napoli. *Eur. Sci. J.* **2013**, *9*, 1857–7881.
49. Charlton, J.; Kelly, K.; Greenwood, D. The complexities of managing historic buildings with BIM. *Eng. Constr. Archit. Manag.* **2020**.
50. Devetaković, M.; Radojević, M. Application of BIM technology in the processes of documenting

heritage buildings. In Proceedings of the 5th international Academic Conference on Places and Technologies, 2018; 2018.
51. Ewart, I.J.; Zuecco, V. Heritage Building Information Modelling (HBIM): A Review of Published Case Studies. In Proceedings of the 35th CIB W78 2018 International Conference: IT in Design, Construction, and Management; Springer International Publishing: Chicago, 2019; pp. 35–41.
52. Gao, X.; Pishdad-Bozorgi, P. BIM-enabled facilities operation and maintenance: A review. *Adv. Eng. Informatics* **2019**, *39*, 227–247, doi:10.1016/j.aei.2019.01.005.
53. Alexander, K. Facilities management: A strategic framework. *Facil. Manag. Theory Pract.* **2013**, 1–13, doi:10.4324/9780203475966.
54. Atkin, B.; Brooks, A. *Total facility management*; John Wiley & Sons, 2021; ISBN 1118655389.
55. Li, Y.; Zhang, Y.; Wei, J.; Han, Y. Status quo and future directions of facility management: a bibliometric-qualitative analysis. *Int. J. Strateg. Prop. Manag.* **2019**, *23*, 354–365.
56. Senior, C.; Jowkar, M.; Temeljotov-Salaj, A.; Johansen, A. Empowering Citizens in a Smart City Project One Step at a Time: a Norwegian Case Study. In Proceedings of the 2021 IEEE European Technology and Engineering Management Summit (E-TEMS); IEEE, 2021; pp. 10–15.
57. Grum, D.K. Interactions between human behaviour and the built environment in terms of facility management. *Facilities* **2018**.
58. Hauge, Å.L.; Hanssen, G.S.; Flyen, C. Multilevel networks for climate change adaptation–what works? *Int. J. Clim. Chang. Strateg. Manag.* **2019**.
59. Gohari, S.; Larssæther, S. Sustainable energy planning as a co-creative governance challenge. Lessons from the Zero Village Bergen. *Int. J. Sustain. Energy Plan. Manag.* **2019**, *24*, 147–154, doi:10.5278/ijsepm.3353.
60. Michell, K. FM as a social enterprise. *Manag. Organ. Ecol. Space, Manag. Organ.* **2013**, 167–177, doi:10.4324/9780203117231.
61. Bröchner, J.; Haugen, T.; Lindkvist, C. Shaping tomorrow's facilities management. *Facilities* **2019**, *37*, 366–380, doi:10.1108/F-10-2018-0126 Abstract.
62. Jordan-Palomar, I.; Tzortzopoulos, P.; García-Valldecabres, J.; Pellicer, E. Protocol to manage heritage-building interventions using heritage building information modelling (HBIM). *Sustain.* **2018**, *10*, doi:10.3390/su10040908.
63. Maltese, S.; Fradegrada, G.; Moretti, N.; Dejaco, M.C.; Re Cecconi, F. GIS application in urban district maintenance. *41st IAHS World Congr. Sustain. Innov. Futur. 13-16th Sept. 2016 Albufeira, Algarve, Port.* **2016**.
64. Mignard, C.; Nicolle, C. Merging BIM and GIS using ontologies application to urban facility management in ACTIVe3D. *Comput. Ind.* **2014**, *65*, 1276–1290.
65. Moretti, N.; Dejaco, M.C.; Maltese, S.; Cecconi, F.R. An information management framework for optimised urban facility management. In Proceedings of the 35th International Symposium on Automation and Robotics in Construction (ISARC 2018) An; 2018.
66. Saccucci, Marco; Pelliccio, A. Integrated BIM-GIS system for the enhancement of urban heritage. In Proceedings of the Metrology for Archaeology and Cultural Heritage (MetroArchaeo), IEEE; 2018; pp. 222–226.
67. Sadeghi, M.; Hashem, M.S.; Mehany, M.; Strong, K.; Mehany, M. Integrating Building Information Models and Building Operation Information Exchange Systems in a Decision Support Framework for Facilities Management. In Proceedings of the Construction Research Congress 2018; 2018.
68. Almeida, A.; Gonçalves, L.; Falcao, A.; Ildefonso, S. 3D-GIS Heritage city model: Case study of the historical city of Leiria. In Proceedings of the 19th AGILE International; Helsinki, 2016.
69. Aziz, N.D.; Nawawi, A.H.; Ariff, N.R.M. ICT Evolution in Facilities Management (FM): Building Information Modelling (BIM) as the Latest Technology. *Procedia - Soc. Behav. Sci.* **2016**, *234*, 363–371, doi:10.1016/j.sbspro.2016.10.253.
70. Cecchini, C. From data to 3D digital archive: A GIS-BIM spatial database for the historical centre of Pavia (Italy). *J. Inf. Technol. Constr.* **2019**, *24*, 459–471, doi:10.36680/j.itcon.2019.024.
71. García, E.S.; García-Valldecabres, J.; Blasco, M.J.V. The use of HBIM models as a tool for dissemination and public use management of historical architecture: A review. *Int. J. Sustain. Dev. Plan.* **2018**, *13*, 96–107, doi:10.2495/SDP-V13-N1-96-107.
72. Zin, N.M.; Ismail, S.; Md. Azmi, F.A. Ascertaining the Economic Sustainability of Heritage Property Market based on Sales Transaction Analysis. In Proceedings of the Environment-Behaviour Proceedings Journal; 2018; Vol. 3.
73. Mcdonald, H. Understanding the antecedents to public interest and engagement with heritage. *Eur. J. Mark.* **2011**, *45*, 780–804, doi:10.1108/03090561111120037.
74. Salaj, A.; Gohari, S.; Senior, C.; Xue, Y.; Lindkvist, C. An interactive tool for citizens' involvement in the sustainable regeneration. *Facilities* **2020**.

75. Zin, N.M.; Ismail, S.; Mohamad, J.; Hana, N.; Maimun, A.; Afiqah, F.; Azmi, M. Critical determinants of heritage property value: A conceptual framework. *J. Malaysian Inst. Planners* **2019**, *17*, 219–231.
76. Ginzarly, M.; Roders, A.P.; Teller, J. Mapping historic urban landscape values through social media. *J. Cult. Herit.* **2019**, *36*, 1–11.
77. Andersen, P.D.; Andersen, A.D.; Jensen, P.A.; Rasmussen, B. Sectoral innovation system foresight in practice: Nordic facilities management foresight. *Futures* **2014**, *61*, 33–44, doi:10.1016/j.futures.2014.04.012.
78. Marzouk, M.; ElSharkawy, M.; Elsayed, P.; Eissa, A. Resolving deterioration of heritage building elements using an expert system. *Int. J. Build. Pathol. Adapt.* **2020**, *38*, 721–735, doi:10.1108/IJBPA-12-2019-0106.
79. Wan Abdullah Zawawi, N. A., & Abdullah, A. Evaluating stakeholders' preferences: Reconciling heritage and sustainability in Kuala Lumpur traditional areas. *J. Malaysian Inst. Planners* **2011**, *IX*, 37–50.
80. Tobi, S.U.M.; Amaratunga, D.; Noor, N.M. Social enterprise applications in an urban facilities management setting. *Facilities* **2013**, *31*, 238–254, doi:10.1108/02632771311307106.
81. Boyle, L.; Michell, K.; Viruly, F. A Critique of the Application of Neighborhood Sustainability Assessment Tools in Urban Regeneration. *Sustainability* **2018**, doi:10.3390/su10041005.
82. Dastgerdi, A.S.; Sargolini, M.; Pierantoni, I. Climate Change Challenges to Existing Cultural Heritage Policy. *Sustainability* **2019**, doi:10.3390/su11195227.
83. Veldpaus, L.; Roders, A.P. Learning from a legacy: Venice to Valletta. *Chang. Over Time* **2014**, *4*, 244–263, doi:10.1353/cot.2014.0022.
84. Ho, D.; Hou, H. Enabling sustainable built heritage revitalisation from a social and technical perspective: A case study. *Facilities* **2019**, *37*, 704–722, doi:10.1108/F-05-2017-0055.
85. Attia, D.; Maarouf, I.; Taha, D.; Nassar, D. Detecting failures in conservation practice in relation to cultural significance: the case of heritage buildings in Khartoum. *Build. Res. Inf.* **2020**, *48*, 124–139.
86. Firzan, M.; Keumala, N.; Zawawi, R. Gaps pertaining evaluation on built heritage conservation with special annotation on the Malaysian context. *Pertanika J. Soc. Sci. Humanit.* **2017**, *25*, 21–38.
87. Hanafi, M.H.; Umar, M.U.; Razak, A.A.; Rashid, Z.Z.A. Essential entities towards developing an adaptive reuse model for organization management in conservation of heritage buildings in Malaysia. In Proceedings of the Environment-Behaviour Proceedings Journal; 2018; Vol. 3, pp. 265–276.
88. Sanjbod, H.S.; Hermans, L.; Reijnders, D.; Veldpaus, L. Captain, where can we find the attributes? *Hist. Environ. Policy Pract.* **2016**, *7*, 177–188, doi:10.1080/17567505.2016.1172786.
89. Umar, S.B.; Said, I. A review on Decision-making Models and Tools in Developed Countries towards Enhancing Sustainable Built Heritage Assets in Developing Countries. In Proceedings of the Environment-Behaviour Proceedings Journal; 2018; Vol. 3.
90. Umar, S.B.; Said, I. Conservation Challenges of Heritage Building Reuse in Nigeria: A review of decision-making models. *Asian J. Environ. Stud.* **2018**, *4*, 16–36, doi:10.21834/aje-bs.v4i12.336.
91. Samodra, F.T.B.; Sudarma, E. Review on environmental and building services performance of urban heritage hospital. *MATEC Web Conf.* **2019**, *280*, 04005, doi:10.1051/matecconf/201928004005.
92. Bello, M.U.; Martin, D.; Kasim, R. The Position of Facility Management Services on Customer Loyalty on Malaysian Municipal Council Service Delivery. *Spec. J. Urban Plan. Dev.* **2019**, *4*, 17–27.
93. Dyson, K.; Matthews, J.; Love, P. Critical success factors of adapting heritage buildings: an exploratory study. *Built Environ. Proj. Asset Manag.* **2016**, *6*, 44–57.
94. Stendebakken, M.O.G.; Grytli, E.R.; Olsson, N.O.E. Proposed Aspects for Evaluation of the Value of Spaces in Historic Buildings. *Procedia Econ. Financ.* **2015**, *21*, 23–31, doi:10.1016/s2212-5671(15)00146-x.
95. Dastgerdi, A.S.; Sargolini, M. Vulnerability Assessment and Conservation of Heritage Sites in A Changing Climate. *Int. J. Landsc. Archit. Res. E-ISSN 2602-4322* **2019**, *3*, 121–129.
96. Kristl, Ž.; Temeljotov Salaj, A.; Roumboutsos, A. Sustainability and universal design aspects in heritage building refurbishment. *Facilities* 2019.
97. Colucci, E.; Kokkla, M.; Mostafavi, M.A.; Noardo, F.; Spano, A. Semantically Describing Urban Historical Buildings Across Different Levels of Granularity. In Proceedings of the The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, XXIV ISPRS Congress; 2020.
98. Dong, H.X. A Tentative Study on the World Heritage Tourism management in China. In Proceedings of the 2nd International Conference on Artificial Intelligence, Management

Science and Electronic Commerce (AIMSEC); 2011; pp. 6532–6537.
99. Della Torre, S. Italian perspective on the planned preventive conservation of architectural heritage. *Front. Archit. Res.* **2020**, doi:10.1016/j.foar.2020.07.008.
100. Hu, C.; Gong, C. Creating an ecological historic district: Rethinking a Chinese challenge through the case of Oakland District, Pittsburgh. In Proceedings of the International Conference on Sustainable Design, Engineering and Construction; Elsevier Ltd, 2016; pp. 1572–1579.
101. Shehata, W.T.A.; Moustafa, Y.; Sherif, L.; Botros, A. Towards the comprehensive and systematic assessment of the adaptive reuse of Islamic architectural heritage in Cairo: A conceptual framework. *J. Cult. Herit. Manag. Sustain. Dev.* **2015**, *5*, 14–29, doi:10.1108/JCHMSD-02-2014-0003.
102. Khoo, S.L.; Lim, Y.M. Dissecting George Town's human capital challenges in built heritage: Voices from the stakeholders. *J. Cult. Herit. Manag. Sustain. Dev.* **2019**, *9*, 376–393, doi:10.1108/JCHMSD-10-2017-0072.
103. Vukmirovic, M.; Gavrilović, S. Placemaking as an approach of sustainable urban facilities management. *Facilities* **2020**, doi:10.1108/F-04-2020-0055.
104. Sodangi, M.; Khamdi, M.F.; Idrus, A.; Hammad, D.B.; Ahmedumar, A. Best practice criteria for sustainable maintenance management of heritage buildings in Malaysia. In Proceedings of the Procedia Engineering Fourth International Symposium on Infrastructure Engineering in Developing Countries, IEDC 2013; 2014; Vol. 77, pp. 11–19.
105. Hassan, A.; Rahman, M. World Heritage site as a label in branding a place. *J. Cult. Herit. Manag.* **2015**.
106. Valese, M; Noardo, F; Roders, A.P. World Heritage mapping in a standard-based structured Geographical Information System. In Proceedings of the The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences,; 2020; Vol. XLIII, pp. 81–89.
107. Ginzarly, M.; Teller, J. Eliciting cultural heritage values: landscape preferences vs representative images of the city. *J. Cult. Herit. Manag. Sustain. Dev.* **2018**, *8*, 257–275, doi:10.1108/JCHMSD-06-2017-0031.
108. Langston, C.; Yung, E.H.-K.; Chan, E.H.-W. The application of ARP modelling to adaptive reuse projects in Hong Kong. *Habitat Int.* **2013**, *40*, 233–243, doi:https://doi.org/10.1016/j.habitatint.2013.05.002.
109. Wilson, D. *Strategic Facility Management Framework*; 1st editio.; the Royal Institution of Chartered Surveyors (RICS) and International Facility Management Association (IFMA), 2018; ISBN 978 1 78321 235 4.
110. Hendro, E.P. Study of the Outstanding Universal Values (OUV) to Achieve the Semarang Old Town as the World Heritage City. *Adv. Sci. Lett.* **2017**, *23*, 10002–10004.
111. Taylor, N. Urban planning theory since 1945. *Urban Plan. Theory since 1945* **1998**, 1–192.
112. Caffaroni, S.; Busnelli, C. A city as a building: new thoughts and new possibilities for Harvard, Politecnico di Milano, 2016.
113. Barnett, J. Redesigning the metropolis the case for a new approach. *J. Am. Plan. Assoc.* **1989**, *55*, 131–135.
114. Koehler, D. Mereological Thinking: Figuring Realities within Urban Form. *Archit. Des.* **2019**, *89*, 30–37.
115. Chizzoniti, D. The nature of cities. In *Cities' Identity Through Architecture and Arts*; Routledge, 2018; pp. 297–308 ISBN 1315166550.
116. Vermeulen, K. City Building. In *Conceptualizing Biblical Cities*; Springer, 2020; pp. 143–158.
117. Richard, J. In the Elites' Toolkit: Decoding the Initiative and Reference System behind the Investment in the Architecture and Decoration of Roman Nymphaea. *Elit. Toolkit Decod. Initiat. Ref. Syst. Behind Invest. Archit. Decor. Rom. Nymphaea* **2011**, 65–100.
118. Canniffe, E. *The politics of the piazza: the history and meaning of the Italian square*; Routledge, 2016; ISBN 1315554194.
119. Ruwet, C. The cities of Robert Ezra Park: Toward a periodization of his conception. *Anthem Companion to Robert Park* **2017**, 201–223.
120. Ismard, P. Associations and Citizenship in. *Defin. Citizsh. Archaic Greece* **2018**, 145.
121. Kornberger, M.; Meyer, R.E.; Höllerer, M.A. Exploring the long-term effect of strategy work: The case of Sustainable Sydney 2030. *Urban Stud.* **2021**, *58*, 3316–3334.
122. Duplouy, A. Hippotrophia as Citizen Behaviour in Archaic Greece. In *From Homer to Solon*; Brill, 2022; pp. 139–161 ISBN 9004513639.
123. Coelho, D.; Ruth, M. Seeking a unified urban systems theory. *WIT Trans. Ecol. Environ.* **2006**, *93*, 179–188.
124. Bröchner, J. Measuring the productivity of facilities management. *J. Facil. Manag.* **2017**.
125. Lindkvist, C.; Salaj, A.T.; Collins, D.; Bjørberg, S.; Haugen, T.B. Exploring urban facilities management approaches to increase connectivity in smart cities. *Facilities* **2020**.

126. ISO ISO 41011: 2017, Facility management–Vocabulary 2017.
127. Salaj, A.T.; Lindkvist, C.M. Urban facility management. *Facilities* **2021**, *39*, 525–537.
128. Barnett, J. *The elusive city: five centuries of design, ambition and miscalculation*; HarperCollins Publishers, 1986; ISBN 0064303772.
129. Bettman, M. Substantiate Structuralism: Give reason for preservation or transformation. **2019**.
130. Prabowo, B.N. Urban Heritage Facility Management. *Sch. Community Encycl.* 2022.
131. Blake, J. UNESCO's 2003 Convention on Intangible Cultural Heritage: the implications of community involvement in 'safeguarding.' In *Intangible heritage*; Routledge, 2008; pp. 59–87 ISBN 0203884973.
132. Dickerson, C.M. Corporations as Cities: Targeting the Nodes in Overlapping Networks. *J. Corp. L.* **2003**, *29*, 533.
133. Knox, H. Cities and organisation: The information city and urban form. *Cult. Organ.* **2010**, *16*, 185–195.
134. Shade, J.; Wuertz, H. The City as Organization: Ethnography for Alternative Futures. In Proceedings of the Ethnographic Praxis in Industry Conference Proceedings; Wiley Online Library, 2020; Vol. 2020, pp. 129–148.
135. Lang, J. Learning from twentieth century urban design paradigms: lessons for the early twenty-first century. In *Urban Planning in a Changing World*; Routledge, 2000; pp. 78–97 ISBN 0429235747.
136. Moen, T. Reflections on the narrative research approach. *Int. J. Qual. Methods* **2006**, *5*, 56–69.
137. Bell, A. A narrative approach to research. *Can. J. Environ. Educ.* **2003**, *8*, 95–110.
138. Dean, R.G. A narrative approach to groups. *Clin. Soc. Work J.* **1998**, *26*, 23–37.
139. Foster, M. Urban education in North America: Section editor's introduction. In *International handbook of urban education*; Springer, 2007; pp. 765–778.
140. Dijkstra, L.; Florczyk, A.J.; Freire, S.; Kemper, T.; Melchiorri, M.; Pesaresi, M.; Schiavina, M. Applying the degree of urbanisation to the globe: A new harmonised definition reveals a different picture of global urbanisation. *J. Urban Econ.* **2021**, *125*, 103312.
141. Dijkstra, L.; Hamilton, E.; Lall, S.; Wahba, S. How do we define cities, towns, and rural areas Available online: https://blogs.worldbank.org/sustainablecities/how-do-we-define-cities-towns-and-rural-areas (accessed on Dec 12, 2022).
142. Sjoberg, G. The origin and evolution of cities. *Sci. Am.* **1965**, *213*, 54–62.
143. Adams, R.M. The origin of cities. *Sci. Am.* **1960**, *203*, 153–172.
144. Badawy, M.K. *Developing managerial skills in engineers and scientists: Succeeding as a technical manager*; John Wiley & Sons, 1995; ISBN 0471286346.
145. Rao, V.S.P.; Krishna, V.H. *Management: Text and cases*; Excel Books India, 2009; ISBN 8174463178.
146. Alexander, K.; Brown, M. Community-based facilities management. *Facilities* **2006**, *24*, 250–268, doi:10.1108/02632770610666116.
147. Senior, C.; Salaj, A.T.; Vukmirovic, M.; Jowkar, M.; Kristl, Ž.; Palella, B.I.; Alonso, R.; Lezcano, G. The Spirit of Time-The Art of Self-Renovation to Improve Indoor Environment in Cultural Heritage Buildings. **2021**, doi:10.3390/en14134056.
148. Jokilehto, J. Considerations on authenticity and integrity in world heritage context. *City time* **2006**, *2*, 1.
149. Wienberg, J. The past is everywhere. In *Heritopia*; Lund University Press, 2021; pp. 1–34 ISBN 9198469940.
150. Smith, N. Classic projects: Relocation of Abu Simbel. *Eng. Technol.* **2011**, *6*, 112–113.
151. Logan, W. Cultural diversity, cultural heritage and human rights: Towards heritage management as human rights-based cultural practice. *Int. J. Herit. Stud.* **2012**, *18*, 231–244, doi:10.1080/13527258.2011.637573.
152. Lenzholzer, S. A city is not a building–architectural concepts for public square design in Dutch urban climate contexts. *J. Landsc. Archit.* **2008**, *3*, 44–55.
153. Ryan, J. Intangible cultural heritage: the new frontier of destination branding. In *Ideas in marketing: Finding the new and polishing the old*; Springer, 2015; pp. 388–390.
154. Idris, M.Z.; Mustaffa, N.B.; Yusoff, S.O.S. Preservation of intangible cultural heritage using advance digital technology: Issues and challenges. *Harmon. J. Arts Res. Educ.* **2016**, *16*, 1–13.
155. Munjeri, D. Tangible and intangible heritage: From difference to convergence. *Museum Int.* **2004**, *56*, 12–20.
156. Ripp, M.; Rodwell, D. The geography of urban heritage. *Hist. Environ. Policy Pract.* **2015**, *6*, 240–276.
157. Steinberg, F. Conservation and rehabilitation of urban heritage in developing countries. *Habitat Int.* **1996**, *20*, 463–475.

158. Timothy, D.J.; Nyaupane, G.P. Protecting the past: Challenges and opportunities. *Cult. Herit. Tour. Dev. world* **2009**, 34–55.
159. Gallina, V.; Torresan, S.; Critto, A.; Sperotto, A.; Glade, T.; Marcomini, A. A review of multi-risk methodologies for natural hazards: Consequences and challenges for a climate change impact assessment. *J. Environ. Manage.* **2016**, *168*, 123–132.
160. Bosher, L.; Kim, D.; Okubo, T.; Chmutina, K.; Jigyasu, R. Dealing with multiple hazards and threats on cultural heritage sites: an assessment of 80 case studies. *Disaster Prev. Manag. An Int. J.* **2020**, *29*, 109–128.
161. Kulatunga, U.; Liyanage, C.; Amaratunga, D. Performance measurement and management in facilities management. *Facilities* **2010**.
162. Kemmis, D. *The good city and the good life*; Houghton Mifflin, 1995; ISBN 039568630X.
163. Gilliam, H. The fallacy of single-purpose planning. *Daedalus* **1967**, 1142–1157.
164. Davis, R.H.C. *The ford, the river and the city*; RHC Davis, 1973;
165. Harper, M. The city as a home for enterprise: has anything changed for the informal sector? *Habitat Int.* **1992**, *16*, 143–148.
166. White, O. The Purpose of a City Available online: http://otiswhite.com/the-purpose-of-a-city/ (accessed on Sep 12, 2022).
167. Morshed, A.Z. Debunking the smart-city myth. In; The Daily Star, 2019.
168. Drucker, P. *Concept of the Corporation*; Routledge, 2017; ISBN 1315080737.
169. De Toni, A.F.; Nonino, F. The facility management: non core services definitions and taxonomy. *Open Facil. Manag. A Success. Implement. a public Adm.* **2009**, 3–28.
170. Nur, N.M.; Musa, Z.N. Defining the current practice of facilities management service delivery in klang valley (KV) shopping centres. *J. Surv. Constr. Prop.* **2017**, *8*, 44–58.
171. Arampatzi, E.; Burger, M. Facility management services and employee well-being. *J. Facil. Manag.* **2020**, *18*, 109–130.
172. Lebuhn, H. Local border practices and urban citizenship in Europe: Exploring urban borderlands. *City* **2013**, *17*, 37–51.
173. Rome, S.H. Promoting family integrity: The Child Citizen Protection Act and its implications for public child welfare. *J. Public Child Welf.* **2010**, *4*, 245–262.
174. Satzewich, V. Visa officers as gatekeepers of a state's borders: the social determinants of discretion in spousal sponsorship cases in Canada. *J. Ethn. Migr. Stud.* **2014**, *40*, 1450–1469.
175. Kopackova, H. Reflexion of citizens' needs in city strategies: The case study of selected cities of Visegrad group countries. *Cities* **2019**, *84*, 159–171.
176. Jedwab, R.; Christiaensen, L.; Gindelsky, M. Demography, urbanization and development: Rural push, urban pull and… urban push? *J. Urban Econ.* **2017**, *98*, 6–16.
177. Steiner, F. Urban human ecology. *Urban Ecosyst.* **2004**, *7*, 179–197.
178. Zhang, R.; Zhang, Y.; Liu, X.; Yin, Q.; Yang, L. Analysis of the population displacement phenomenon under tourism economy development in Chinese historical areas: Based on Social Exchange Theory. *Int. Rev. Spat. Plan. Sustain. Dev.* **2017**, *5*, 86–103.
179. He, B.-J.; Wang, J.; Liu, H.; Ulpiani, G. Localized synergies between heat waves and urban heat islands: Implications on human thermal comfort and urban heat management. *Environ. Res.* **2021**, *193*, 110584.
180. Kleerekoper, L.; Van Esch, M.; Salcedo, T.B. How to make a city climate-proof, addressing the urban heat island effect. *Resour. Conserv. Recycl.* **2012**, *64*, 30–38.
181. Lanza, K.; Stone Jr, B. Climate adaptation in cities: What trees are suitable for urban heat management? *Landsc. Urban Plan.* **2016**, *153*, 74–82.
182. Labadi, S. The World Heritage Convention at 50: Management, credibility and sustainable development. *J. Cult. Herit. Manag. Sustain. Dev.* **2022**.
183. Khalaf, R.W. Integrity: Enabling a future-oriented approach to cultural heritage. *Hist. Environ. Policy Pract.* **2022**, *13*, 5–27.
184. Salaj, Alenka Temeljotov; Bjørberg, Svein; Støre-Valen, Marit; Lindkvist, Carmel Margaret; Lohne, J. Urban Facility Management Role. In Proceedings of the Facilities; 2020.
185. Temeljotov Salaj, A.; Lindkvist, C.M.; Salaj, A.T.; Lindkvist, C.M. Urban facility management. *Facilities* **2021**, *39*, 525–537, doi:10.1108/F-06-2020-0078.
186. Van Oers, R.; Pereira Roders, A. Road map for application of the HUL approach in China. *J. Cult. Herit. Manag. Sustain. Dev.* **2013**, *3*, 4–17.
187. Rey-Pérez, J.; Pereira Roders, A. Historic urban landscape: A systematic review, eight years after the adoption of the HUL approach. *J. Cult. Herit. Manag. Sustain. Dev.* **2020**, *10*, 233–258, doi:10.1108/JCHMSD-05-2018-0036.
188. Prabowo, B.N.; Salaj, A.T. Urban heritage and the four pillars of sustainability: Urban-scale facility management in the World Heritage sites. In Proceedings of the IOP Conference Series: Earth and Environmental Science; IOP Publishing, 2023; Vol. 1196, p. 12105.
189. UNESCO, W.H.C. *UNESCO Recommendation on HUL*; UNESCO Paris, 2011; Vol. 25;.
190. Yin, R.K. Case study research 2014.

191. Harris, J. The correspondence method as a data-gathering technique in qualitative enquiry. *Int. J. Qual. Methods* **2002**, *1*, 1–9.
192. Parris, M. Email correspondence: A qualitative data collection tool for organisational researchers. **2008**.
193. Van Raemdonck, B.; Vanhoutte, E. Editorial theory and practice in Flanders and the Centre for Scholarly Editing and Document Studies. *Lit. Linguist. Comput.* **2004**, *19*, 119–127.
194. Miles, M.B.; Huberman, A.M. *Qualitative data analysis: An expanded sourcebook*; sage, 1994; ISBN 0803955405.
195. Franklin, C.; Ballan, M. Reliability and validity in qualitative research. *Handb. Soc. Work Res. methods* **2001**, *4*.
196. Borgos, M. Managing the World Heritage Site Røros Mining Town and the Circumference. *Adapt. Hist. places to Clim. Chang.* 41.
197. Guttormsen, T.S.; Fageraas, K. The social production of "attractive authenticity" at the World Heritage Site of Røros, Norway. *Int. J. Herit. Stud.* **2011**, *17*, 442–462, doi:10.1080/13527258.2011.571270.
198. Sesana, E.; Gagnon, A.S.; Bonazza, A.; Hughes, J.J. An integrated approach for assessing the vulnerability of World Heritage Sites to climate change impacts. *J. Cult. Herit.* **2020**, *41*, 211–224.
199. Taugbøl, T.; Andersen, E.M.; Grønn, U.; Moen, B.F. Rjukan-Notodden Industrial Heritage Site. Nomination to the UNESCO World Heritage List. Norway. **2014**.
200. Firmansyah, F.; Fadlilah, K.U. Improvement of involvement society in the context of smart community for cultural heritage preservation in Singosari. *Procedia-Social Behav. Sci.* **2016**, *227*, 503–506.
201. Li, Y.; Hunter, C. Community involvement for sustainable heritage tourism: a conceptual model. *J. Cult. Herit. Manag. Sustain. Dev.* **2015**, *5*, 248–262.
202. Senior, C.; Temeljotov Salaj, A.; Johansen, A.; Lohne, J. Evaluating the Impact of Public Participation Processes on Participants in Smart City Development: A Scoping Review. *Buildings* **2023**, *13*, 1484.
203. Chi, C.G.; Zhang, C.; Liu, Y. Determinants of corporate social responsibility (CSR) attitudes: Perspective of travel and tourism managers at world heritage sites. *Int. J. Contemp. Hosp. Manag.* **2019**, *31*, 2253–2269.
204. Xue, Y.; Lindkvist, C.M.; Temeljotov-Salaj, A. Barriers and potential solutions to the diffusion of solar photovoltaics from the public-private-people partnership perspective–Case study of Norway. *Renew. Sustain. Energy Rev.* **2021**, *137*, 110636.
205. Della Torre, S.; Boniotti, C. Innovative funding and management models for the conservation and valorization of public built cultural heritage. In *Eresia ed ortodossia nel restauro. Progetti e realizzazioni*; Arcadia Ricerche, 2016; pp. 105–114.

Appendices

Appendix 1 : (Paper I) Urban Heritage Facility Management: A Scoping Review *(Published)*

Appendix 2 : (Paper II) Identifying Urban Heritage Facility Management Support Services Considering World Heritage Sites *(Published)*

Appendix 3 : (Paper III) Urban Heritage Facility Management: A Conceptual Framework for the Provision of Urban-scale Support Services in Norwegian World Heritage Sites *(Published)*

Appendix 4 : (Paper IV) Systemic Approaches in Revitalization of Semarang Old City Heritage Site: From Neglected Area to Tourism Destination *(Published)*

Appendix 5 : (Paper V) Identifying Overtourism Impacts on the Informal Sector's Livelihoods in Urban Heritage Area *(Published)*

Appendix 6 : (Paper VI) HBIM Application in Historic Town: A Scoping Literature Review *(Published)*

Appendix 7 : (Paper VII) Urban Heritage and the Four Pillars of Sustainability: Urban-Scale Facility Management in the World Heritage Sites *(Published)*

Appendix 8 : (Paper VIII) The Older Adults in the Smart Urban Heritage Area: A Mini-Scoping Review of Inclusivity in the World Heritage Sites *(Published)*

Appendix 9 : (Paper IX) From Classical Management Theory to Urban Heritage Facility Management: Mobility and Accessibility in Urban Heritage Areas *(Published)*

Appendix 10 : NSD/SIKT registration, assessment, and completed notification.

Appendix 11 : Declaration of Co-Authorship

(This page is intentionally left blank)

Appendix 1

applied sciences

MDPI

Review

Urban Heritage Facility Management: A Scoping Review

Bintang Noor Prabowo *, Alenka Temeljotov Salaj and Jardar Lohne

Department of Civil and Environmental Engineering, Faculty of Engineering, Norwegian University of Science and Technology (NTNU), 7491 Trondheim, Norway; alenka.temeljotov-salaj@ntnu.no (A.T.S.); jardar.lohne@ntnu.no (J.L.)

* Correspondence: bintang.n.prabowo@ntnu.no; Tel.: +47-48689764

Abstract: This review examines current discussions from the cross-section study between urban heritage conservation and urban facility management fields in the academic literature from 2011–2020. The purpose is to identify the gaps within the examined papers to reveal the challenges and opportunities in the combined fields using the United Nations Educational, Scientific, and Cultural Organization (UNESCO)'s recommendation of the historic urban landscape (HUL) approach. The scoping review procedure was followed. The six critical steps and four supporting tools of the HUL approach were used to analyze the examined papers. Most aspects of urban heritage management within the body of literature were directly related to urban-scale facility management. The potential usage of building information modelling became one of the most discussed technological aspects. The expansion of the public–private partnership model into the public–private–people partnership is considered as a new potential business model. At the same time, the adaptive reuse approach is deemed to be the most sustainable method of managing heritage areas. This scoping review identified the financial tools as the most under-researched urban heritage facility management component. Therefore, it needs to be endorsed among the scientific communities to improve the knowledge and provide operable guidelines for the authorities and practitioners in the urban heritage field.

Keywords: facility management (FM); urban FM; urban heritage; conservation; the HUL approach

Citation: Prabowo, B.N.; Salaj, A.T.; Lohne, J. Urban Heritage Facility Management: A Scoping Review. *Appl. Sci.* **2021**, *11*, 9443. https://doi.org/10.3390/app11209443

Academic Editor: Athanasios Sfetsos

Received: 31 August 2021
Accepted: 7 October 2021
Published: 12 October 2021

1. Introduction

During the 20th century, over 30 normative manuals and guidelines for preserving and maintaining cultural heritage have been provided by the United Nations Educational, Scientific, and Cultural Organization (UNESCO) [1]. Since the expansion of its spectrum, after simply concentrating on monuments and historic centers to a more cultural heritage orientation in the early 21st century, the horizon of cultural heritage was applied to urban areas and communities as living heritages [1–3]. Broadening the term "heritage" has contributed to a comprehensive qualitative view of urban heritage that incorporates the values of the urban landscape [3,4]. A landscape is being described as a living territory, a socio-cultural concept, and a subjective mental picture of the changing environment in space and time [5–8], as cited in [1]. The HUL, which gives an extensive perspective of urban heritage, provides a framework for the implementation of an integrated value-based landscape strategy for cultural heritage management that is similar to the notion of community-based facility management, a predecessor to the urban facility management discipline [1,9]. Therefore, UNESCO's latest approach to carefully managing urban heritage areas has finally married facility management (FM) and urban facility management (urban FM) principles to achieve sustainable development of historical sites [9]. The heritage authority should handle the maintenance of urban heritage facilities and infrastructure appropriately [10,11]. The implementation strategy must carefully consider what needs to be preserved, why, and how to implement it to maintain authenticity and the visual quality of the cultural heritage area [11]. The protection of historical areas can be viewed as a complex form of adaptation, maintenance, and conservation of cultural significance [12].

Currently, urban FM is expanding community-based facilities management by providing a forum for authorities, organizations, and businesses in new and creative environments to support local stakeholders [13]. The fundamental concept of urban FM is to improve the influence of FM on the urban environment and to ensure the implementation of sustainable development goals through a service-oriented perspective that supports livability requirements and social values, community inclusiveness, and well-being approaches [14] that are more than just the operation and management of the city infrastructures. The urban FM strategy tackles the issues by functioning as a bridge between various stakeholder interests in the urban areas and ensuring that social value is integrated with environmental and financial consideration [14]. Lindkvist et al. [15] highlighted the need for FM to develop further within urban areas. It is supported by Nielsen [16] who referred to urban development as being among the nine categories where sustainable facilities management (SFM) is considered. SFM is a growing concept within the FM discipline that intends to promote high building-performance and safety, minimal resource consumption, and reduced greenhouse gas emissions production, as well as other climate change adaptive responses which includes energy conservation, waste and recycling management, safety and health management, and minimalization of water and carbon footprints [17].

Furthermore, Salaj et al. [13] extended the prospects of the urban FM field in becoming a dynamic sponsor in enhancing sustainable living spaces, focusing on healthiness and well-being. FM could incorporate diverse mechanisms for managing heritage protection by resolving changes in utilization, changes in the environment, multiple participants, and overlapping requests for sustainable necessities [10]. Managing historic urban areas has evolved from a tangible method to a holistic one within almost the same period. In the urban context, the historic urban landscape (HUL) approach supports this landscape-based approach [3,18].

However, both urban FM and the HUL approach have remained under-researched aspects of FM and conservation. Therefore, a study to bridge the urban scale heritage conservation and urban FM to gain a holistic understanding is urgently required. The combined field between urban heritage management and urban FM in this article is being introduced as urban heritage facility management (UHFM). UHFM is a new term being proposed as part of the results and not currently used in the domain. This study addresses the problem by assessing these three research questions:

(RQ1) How is urban heritage conservation related to urban FM?
(RQ2) What are the dimensions of UHFM in the body of literature?
(RQ3) How can HUL supporting tools related to urban FM be placed within the critical steps of the HUL approach?

This article examines the current discussions, what is already known, and what is not from the cross-section study between urban heritage management and urban FM fields in the academic works of literature using a scoping review process. This scoping review aims to provide key elements of UHFM by identifying the current academic discussions on FM practices within the urban heritage area from 2011–2020 to reveal the challenges and opportunities within the combined fields. This study also attempts to provide a clearer view and operable criteria to managing the facilities of historic districts by analyzing the HUL critical steps and supporting tools recommended by UNESCO.

2. Theoretical Framework

The main ambition of this chapter is to outline key features of the two theoretical fields, urban heritage management and urban FM, in order to establish a vocabulary necessary to grasp the challenges involved. This vocabulary will in turn serve as the basis for the scoping literature review, and will structure the presentation of the results.

2.1. Urban Facility Management (Urban FM)

The main concept of urban FM is to increase the efficiency of the tangible infrastructure, build employment openings, and safeguard neighborhood inclusiveness in the operation

of facilities of the city [14]. The deterioration of physical space is linked to the lack of local inhabitants' self-organization, leading to conflicts between social classes (among people) and between people and governments or between dwellers and other institutions [19]. Integrating FM with community facilities might solve the escalating operational costs and negligence from facilities services providers. Since non-technical elements, such as public participation, neighborhood self-organization, well-being, etc., are more disruptive in the built environment, projects that fulfilled technical criteria, such as building codes, heritage conservation codes, city planning and masterplanning etc., but did not meet livability requirements were more prevalent [20]. Therefore, Salaj [21] argued that engaging with communities using a value-driven strategy may result in a shared motivation to find solutions that fulfill the community's needs, as well as a link to long-term objectives and commercial possibilities. Although public–private–people partnership (PPPP) is still under-researched, it is a potential new business model that seeks comprehensive connections with all stakeholders [22] to enhance public–private partnership (PPP) approach. The discipline of FM is developing into a more complicated subject of urban FM by responding to communities' needs and creating a coordinating body between people, public, and private sectors. Urban FM provides integrated deliveries, e.g., customizable solutions, flexible and well-maintained structures, outdoor activities and services, and various socio-technical solutions [14]. The focus of urban FM is to increase well-being, especially looking at how to deal with an extensive array of challenges, such as environmental hazards [23], social safety [24], resilience [25], and health [26], particularly for women, older adults, and youth. From a design and accessibility point of view, spatial interventions are essential to improve citizens' health and well-being [27]. Still, the approaches primarily focus on a local level context, limiting their broader impact on society. In particular, exploring the possibilities of stimulating a healthy environment as an opportunity to mitigate the effects of people needing care through changing circumstances has been considered in the workplace context [28]. Through urban FM, it is possible for this learning to be transferred to the neighborhood level.

2.2. *The Historic Urban Landscape (HUL) Approach*

The latest UNESCO guideline on the HUL approach [18,29] promotes a landscape-based strategy at the international level. National and local governments must enact, disseminate, promote, and track its implementations. Authorities are urged to redevelop instruments and tools responsive to local principles and needs related to the HUL critical steps which are (1) mapping resources; (2) reaching consensus; (3) assessing the vulnerabilities; (4) integrating urban heritage values and vulnerabilities, (5) prioritizing actions, and (6) establishing partnership and local management frameworks [12]. The new philosophy on managing heritage areas describes urban heritage management as "managing the thoughtful transition", thus it proposes a holistic strategy to managing historic sites [12,30,31]. The concept of heritage management has developed from a tangible method towards a more holistic framework that incorporates intangible values, attributes, and sustainable urban gentrifications, followed by a more critical analysis of urban historic social and economic roles. The strategy is referred to as the urban landscape method [11]. There are also four supporting tools for the HUL approach, which are (1) civic engagement tools; (2) financial tools; (3) regulatory systems, and (4) knowledge and planning tools [12]. For every critical step of the HUL approach, these four tools are involved in various forms to support it in diverse proportions according to each specific case.

2.3. *Interaction between Urban FM and the HUL Approach*

The role of FM in historical urban development is infrequently studied, and its contribution to sustaining the operation of heritage buildings is sometimes problematic. Most studies stated that FM was mainly related to supporting core activities within a single-owned building(s) [9,32–39]. In fact, FM could be understood from a broader perspective [40], for example, understanding FM from urban scale viewpoints. FM is a branch of

the management discipline that addresses the tools and services that support the functionality, safety, and sustainability of buildings, grounds, infrastructures, and real estate [41]. The International Facility Management Association (IFMA) also proposes a new definition of FM: "Facility Management is a profession/discipline that encompasses multiple disciplines to ensure the functionality of the built environment, by integrating people, place, process, and technology". This new definition allowed urban FM to legitimately become an expansion of the FM discipline since urban FM is a manifestation of an urban scale facility management. This study pinpointed the prospect of urban FM to perform in a more expansive setting, especially urban heritage, as argued by Salaj [13] in terms of extending the possibility of the role of urban FM to develop itself as an involving collaborator in promoting living areas and emphasizing health and well-being.

In terms of cultural heritage management, FM is known to be a discipline focusing on property. FM can be described to have originated from the convergence of three key fields of practice, including land management, property maintenance, and office administration [42]. This notion should be applied to a broader viewpoint, both tangible and intangible, following the 2011 HUL Recommendation by UNESCO in managing urban heritage sites [10].

Similar to the HUL approach, Salaj et al. [20] explained that through establishing solid relationships with residents, urban FM would be able to develop inclusive governing, efficiency, co-financing, co-ownership, and co-creation of urban public spaces to enhance people's participation, engagement, confidence, equality, and cohesion. Enhancement of citizens' participation in governing and development processes is important for the higher achievement of SDGs [43]. From that perspective, co-financing is in line with the public-private-people-partnership (PPPP) model [22], co-owning with the personal perception of responsibility and attachment to the public domain [44,45], and co-creation with the collaborative governance approach resulting in the creation of quality public spaces that contribute to people's well-being [46]. Urban FM stayed as an under-studied FM feature due to the multiple overlapping elements, including urban planning, urban gentrification, urban management, and urban sustainability [9,13,41,47].

Redevelopment in the built environment, particularly the urban historical area, is frequently concentrated on technical elements compared to its non-technical features [48]. Gentrification in urban areas must be closely monitored to grasp sustainable growth because of numerous social advancements. Strengthening people's awareness and demands of the environment is critical to increasing their desire for technological possibilities [14,48], an important component of FM.

2.4. Knowledge Gap

The previous subsections are theoretical explanations of FM and urban FM, the HUL approach, and interaction between the two fields, and represented the phase-zero and initial rapid analysis of the 76 examined papers using queries, text search, and word frequency tools provided by the qualitative analysis software to identify the potential knowledge gap. The preliminary scoping review process indicated a lack of an operable value-based approach within urban heritage facility management. Regional discourses on preservation and the complexities of managing heritage assets were not entirely contextualized. Local authorities often found it problematic to implement UNESCO's recommendation on HUL due to a lack of detailed local guidance. Urban FM could potentially bridge the gap in operationalizing a value-based approach concerning local policy and stakeholders by facilitating the shift from international standards to the contextualized municipal initiatives and strategies in managing historic districts.

Two systematic reviews [1,31] were also acknowledged as phase-zero works of literature, prior to the scoping review process, that enriched the study. Although considered valuable sources, both articles were not listed as examined papers in this scoping review due to the rigorous protocol of the scoping process. While the two articles, from Rey-Pérez [31] and Ginzarly [1] were conducting a systematic review solely from an historic

urban landscape (HUL) approach point of view, this scoping review was more (urban) FM oriented, aimed at providing vital elements of urban heritage facility management by identifying the current academic discussions on FM practices within the urban heritage area from 2011–2020 to reveal the challenges and opportunities within the combined fields.

3. Materials and Methods

3.1. Research Design

This study implemented a scoping review as the primary method for understanding and identifying the urban FM principles and the urban heritage conservation value. Levac [49] explained that a scoping literature review is a small-scale, detailed description of studies on a subject previously studied. A scoping review aims to remind readers of the essential information and ideas that have been created on the topic to compare, contrast, and relate the results found while evaluating the work of researchers [50]. This method helps both authors and readers to gain a sense of academic discussions. Within a study, a scoping review is frequently utilized as a groundwork aimed at a fresh understanding to recapitulate and extract others' opinions [49–51].

The scoping review seeks to quickly understand the key ideas, especially the complex topics [52]. This qualitative study is suitable for addressing the relationship between urban heritage management and urban FM principles. There have not been many works of literature that comprehensively discuss both fields simultaneously in such a manner. An urban heritage conservation viewpoint could potentially enrich and sharpen the urban FM perspective of managing historic towns or urban heritage precincts.

As proposed by Grant and Booth [53], and then by Arksey and O'Malley [52], a scoping review is an "assessment of potential size and scope of available research literature", aiming to identify the nature and the extent of research carried out within a field. As such, it bears no formal quality assessment of the research mapped.

This is in contrast with, for instance, systematic reviews, which "seek to systematically search for, appraise and synthesis research evidence, often adhering to guidelines on the conduct of a review." Correspondingly, still according to Grant and Booth [53], "such systematic reviews can use quality assessments as inclusion or exclusion criteria. Systematic reviews typically come up with recommendations for practice, while scoping reviews map the knowledge within a field, in order to be able to propose research agendas".

A scoping literature review is usually conducted according to a specific protocol to safeguard its reliability and replicability. The procedures used in this analysis were (1) describing the research problems; (2) searching for appropriate works of literature; (3) collecting articles; (4) charting the data, and (5) compiling, summarizing, and presenting the results [52].

The study aims to describe to what extent and how the cross-section of the urban FM and the HUL approach were operationalized through the literature and to propose key elements of urban heritage facility management (UHFM) extracted from the examined papers.

3.2. Searching Procedure

Following the protocol of the scoping review [52], the steps taken were (Figure 1):

1. Three research questions were defined.
2. After several trials and errors, an initial search of relevant studies was conducted using available scientific databases (Google Scholar, Science Direct, Web of Science, Scopus, and Oria) with the following search strings:
   - ("Facility management" OR "facilities management") AND ("urban heritage" OR "urban conservation");
   - ("Urban facility management" OR "urban facilities management") OR ("urban FM") AND (heritage OR conservation);
   - ("Historic urban landscape") AND ("facility management" OR "facilities management").

3. At first, no limitations were put on the initial search. From the preliminary investigation, it was evident that the number of results using Google Scholar within the keyword of "urban facility management" (316) and "urban facilities management" (175) was manageable. It showed that 64.36% of the body of literature on urban FM used the American term of FM (facility management) instead of the British (facilities management).
4. When an OR operator was added ("urban facility management" OR "urban facilities management"), the search resulted in 364 references, indicating that 48 references were using both the US and UK's terms of urban FM.
5. "Urban FM" provided 581 hits, but ("urban FM"–radio) showed 460 results, meaning that 20.83% of the result was a radio-related term of FMs.
6. The search-string ("urban facility management" OR "urban facilities management" OR "urban FM") yielded 996 references, while ("urban facility management" OR "urban facilities management" OR "urban FM"-radio) hit 809 references.
7. After the search was limited only to journals and to those between 2011 and 2020, the number of results decreased significantly. The year 2011 was chosen because UNESCO started the recommendation of the HUL approach in that year.
8. After all PDF files of examined papers were collected and their attributes checked by reference manager software (Mendeley), they were exported into a qualitative data analysis software under a folder named "examined papers" for further analysis.
9. The publications were then saved and loaded into the QDAS, NVivo12 Pro, to perform the necessary investigation.

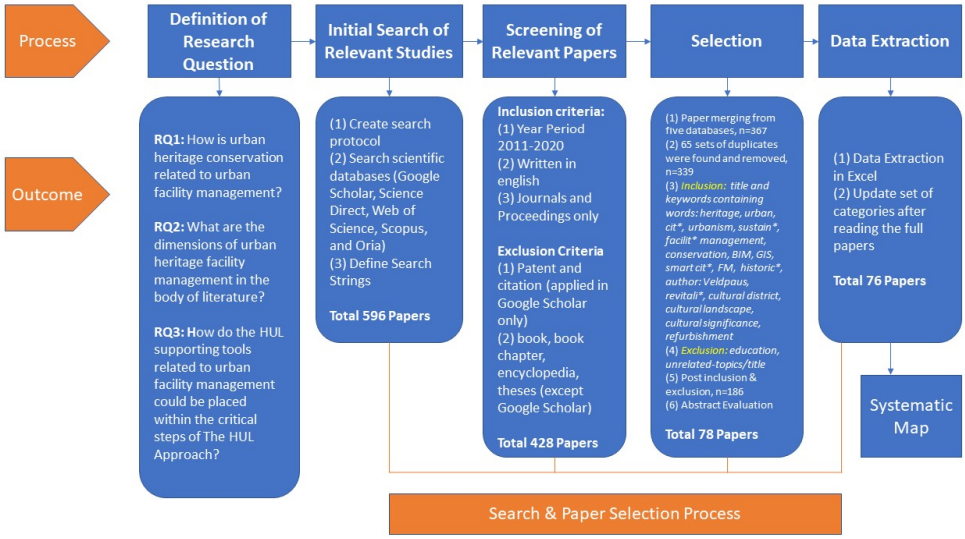


Figure 1. Scoping review process; source: author analysis.

3.3. Categorization

Based on the HUL's six critical steps (mapping resources, reaching consensus, assessing vulnerabilities, integrating values and vulnerabilities, prioritizing actions, and establishing local partnerships and frameworks), the body of literature was then coded into categorization. For each critical step, a further categorization was then implemented by

assessing the 76 examined papers based on the four supporting tools of the HUL approach: civic engagement tools, financial tools, regulatory systems, and knowledge and planning tools. These four HUL supporting tools are the acknowledged tools in the conservation field recommended by the UNESCO, to adapt this new international instrument to local contexts and to facilitate its implementation [1]. National and local authorities are stimulated to (re)develop these tools to meet the local values and needs [11].

3.4. Limitation

The examined papers were based only on English-written literature without including grey literature such as thesis, publicly accessed documents, reports, etc., between 2011 and 2020.

4. Results

4.1. Descriptive Result

4.1.1. Number of Publications

In general, the number of publications related to UHFM using a scoping review protocol from 2011–2020 increased through the year (Figure 2). Between 2011, when the HUL approach was introduced, up to 2017, the number of publications was stable, between four to eight articles each year, with a minor drop in 2012 and 2017, which were compensated for in 2013 and 2016. A significant increase of 100% in 2018, compared to 2016, was identified from the examined papers. The trend continued to steady within the next two years by 15 articles in 2019 and 2020 when the COVID-19 pandemic started and reached its peak worldwide.

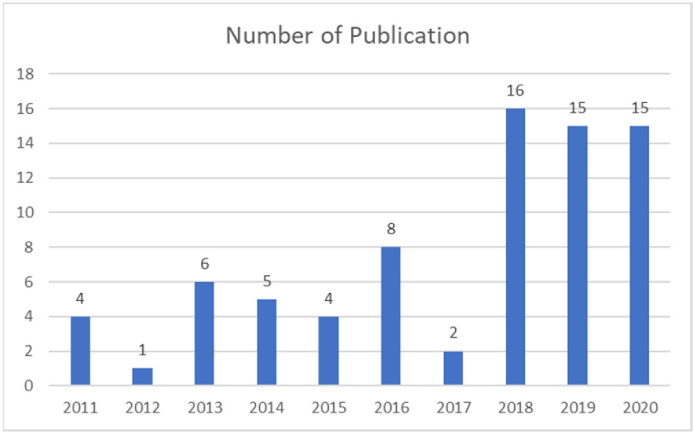


Figure 2. The number of publication trends from 2011–2020.

The relatively small number of articles per year indicated that the discussion of the combined field between urban heritage conservation and urban FM was not widely examined, therefore becoming an opportunity to study further.

4.1.2. Top Authors in the Field

Among the list of authors of the 76 examined papers, a simple analysis was conducted to figure out the most active authors in the field. The analysis extracted two names from the heritage conservation discipline (Loes Veldpaus and Ana Pereira Roders) and one name from the urban FM field (Alenka Temeljotov Salaj). The latter accounted for nearly 7% of the articles with five publications, both as corresponding author and co-author. Veldpaus

and Roders' articles combined accounted for almost 15% of the selected articles. Other authors were identified with less than three articles than the main author from the list (Figure 3).

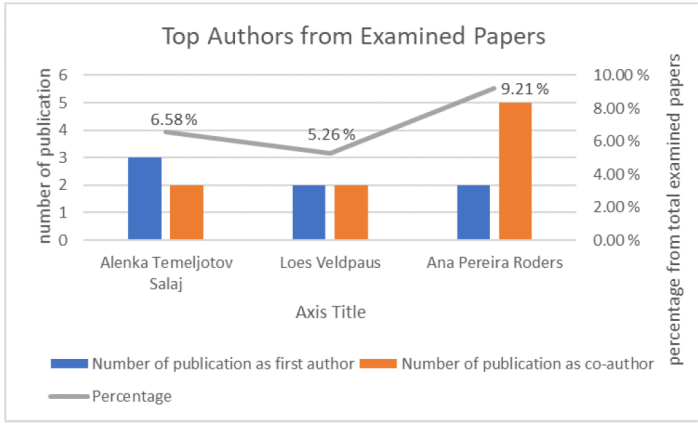


Figure 3. Top authors on urban heritage facility management (UHFM) field.

4.1.3. Top Journals of Urban Heritage Facility Management Articles

Ten journals were repeatedly used to publish articles regarding UHFM, with a total publication of 32 articles (42.11%). *Facilities* was the most active journal to publish the desired articles for this scoping review with nine publications (11.84%), mostly with articles concerning FM and urban FM (Figure 4). Writings on the heritage conservation field were primarily published in the *Journal of Cultural Heritage Management and Sustainable Development* (JCHMSD) with four articles, the same number as *Sustainability*, an open access journal from MDPI. *Environment-Behaviour Proceeding Journal* contributed three articles to the examined papers within the nine years from 2011–2020. *Places and Technologies*, *Copernicus Publication*, *The Journal of the Malaysian Institute of Planners* (Journal of MIP), *Automation in Construction*, *Institute of Physics Publishing (IOP) Conference Series*, and the *Journal of Cultural Heritage* together represented 15.79% of the works of literature. The remaining 44 articles were published in other journals and conference proceedings with only one article each.

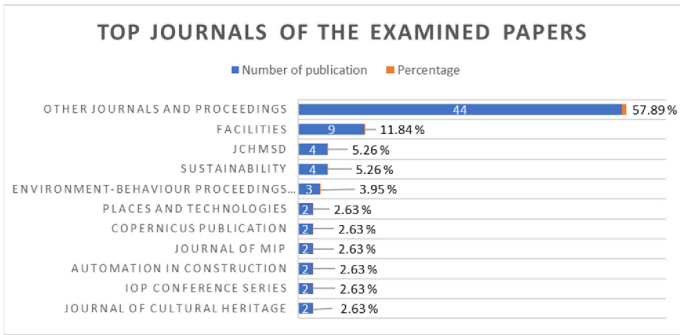


Figure 4. Top journals of UHFM-related articles.

Emerald Group Ltd. published almost a quarter of the examined papers, while Elsevier Group (18.42%) and Multidisciplinary Digital Publishing Institute (MDPI) (6.58%) published another quarter. Springer contributed three papers, while e-IPH contributed four papers. Besides the aforementioned publishers and Taylor and Francis Group, IOP Publisher, Copernicus Publication, MIP, and the University of Belgrade, all publishers only published one article within UHFM from 2011–2020 (Figure 5).

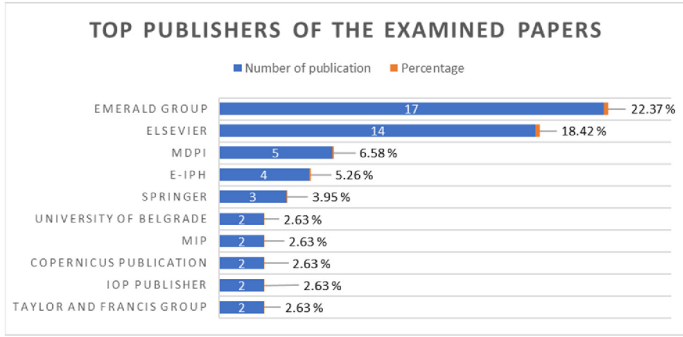


Figure 5. Top publishers of UHFM-related articles.

4.1.4. Subject Areas of Publications

From the examined papers, this study found out that 71.05% of the literatures were from the heritage management or conservation field, while 28.95% of them were FM oriented (Figure 6).

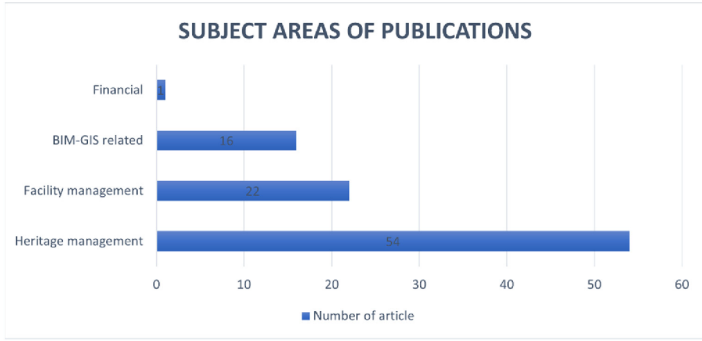


Figure 6. Subject areas of publications.

From the combined field of works of literature, it was discovered that BIM-GIS related topics were discussed the most [33,34,36–39,54–63] and represented 21.05% of the examined papers. Only one article (1.32%) directly addressed a financial issue of urban heritage facility management [64]. The potential of BIM and its wide application possibilities in UHFM were acknowledged broadly due to its capability in providing heritage assets information management, modelling, and real-time assessment regarding components of both heritage management and urban FM within an urban heritage area.

4.2. Overview of the Results

4.2.1. Mapping Resources

The discussion around the first step of the HUL approach, mapping resources, was dominated by the usage of building information modelling (BIM, H-BIM, ACTIVe3D, BIM4FM) as an information management tool within the "civic engagement", "knowledge and planning", and "regulatory systems" [36,37,54,62,63,65]. The usage of BIM technology was not stated by any author regarding the financial aspect of the HUL supporting tools within the mapping resources step, although it is important for efficiency [58] and cost-saving in the long run. As argued by Salaj et al. [66], the discussion around financial instruments showed the potential of expanding the PPP model into PPPP (Table 1). At the same time, another author discussed more on the characteristics that might affect the heritage property price and value [67].

The potential of big data, social media, the Internet of Things (IoT), and artificial intelligence [42,68] in facilitating people to engage in the mapping resources step voluntarily within the UHFM context was also discussed among authors. The effort to integrate the interoperability of BIM and geographic information systems (GIS) could be a breakthrough for urban information modelling (UIM) [37,54,56,62], or even further, urban heritage information modelling (UHIM). Implementation of the 3D modelling through HBIM (historic-BIM) in heritage buildings' interventions made it possible for stakeholders to understand the significance and necessary actions required in the process [36,54,56,63] and made it easier for the facility managers to project and plan ahead for the future maintenance needs [36,63,69,70]. The authorities could create new requirements on permit application of renovating protected buildings by obligating the stakeholder to provide BIM-friendly data of the building to be added to the heritage database as a part of regulatory systems to accelerate the usage of BIMs [54].

Table 1. List of authors discussing the mapping-resources supporting tools of the HUL approach within the urban heritage facility management field.

HUL Critical Steps	HUL Supporting Tools			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
1. Mapping Resources	Bello, 2019 Ginzarly, 2018 Khoo, 2018 McDonald, 2011 Salaj et al., 2020 Salaj et al., 2020b	Andersen, 2014 Cecchini, 2019 Charlton, 2020 Devetakovic, 2018 García, 2018 Marzouk, 2020 McDonald, 2011 Salaj et al., 2020b Valese, 2020 Veldpaus, 2013	Bello, 2019 Charlton, 2020 Jordan-Palomar, 2018	Salaj et al., 2020b Zin, 2019

The review showed the lack of discussion on natural and cultural mapping and identification. Most authors only addressed the mapping of human resources and the processes involved in FM and conservation. It is understandable because the rigid scoping review process produced a very concentrated topic within the UHFM field.

4.2.2. Reaching Consensus

"Reaching consensus" as the second step of the HUL approach was the least discussed point within the examined papers compared to the other five steps, with the "civic engagement" aspect becoming the most discussed topic within this step. Consensus building was achieved by raising awareness of citizens' disparities. The way neighborhoods acted as a collaborative community could improve livability issues through cooperation amongst themselves and the municipality [66,71] by increasing people's willingness to change their behavior through motivational and socio-psychological theory [20] (Table 2).

Table 2. List of authors discussing the reaching-consensus supporting tools of the HUL approach within the urban heritage facility management field.

HUL Critical Steps	HUL Supporting Tools			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
2. Reaching Consensus	García, 2018 McDonald, 2011 Salaj et al., 2020 Salaj et al., 2020b Tobi, 2013 Zawawi, 2011	García, 2018 McDonald, 2011 Salaj et al., 2020b	Bello, 2019 Hussain, 2014	Salaj et al., 2020b

Although reaching consensus amongst scholars, experts, and heritage-related practitioners on how heritage should be adequately "consumed" by the people has become an ongoing never-ending process [63], reaching consensus on what to preserve could be achieved through community involvement, citizen engagement, or citizens' participation [65,66]. It was argued that increasing knowledge and education amongst the stakeholders could improve the interest in protecting and preserving important cultural heritage (tangible or intangible) once people were personally related [65,66]. Therefore, technical information about heritage should be interpreted or adapted in layman's terms for the public interest [63]. Extending FM's current knowledge at the strategical, tactical, and operational levels of urban planning, data modeling, multi-criterion, modelling optimization, predictive modelling, demographic method, communication method, and 3D modelling technique might be the answer to "reaching consensus" within "knowledge and planning tools". Meanwhile, developing FM knowledge areas on new business models such as PPPP and financial aspects [66] would act as financial supporting tools for this second step of the HUL approach. Urban FM or social enterprises were introduced to manage the community facilities operations better due to the risk of a "conflict of interest" in implementing outsourcing, privatization, and joint ventures [72].

4.2.3. Assessing the Vulnerabilities

Considering the HUL approach recommended by UNESCO, the "assessing vulnerabilities" step aimed to deal with global warming, climate change, and other environmental issues. Therefore, vulnerabilities assessment and adaptation to climate change to develop local strategies (i.e., local regulations and laws) are urgently needed [73,74] (Table 3). It is also considered essential to monitor the impact of urban development and various change factors in cultural heritage settings [11]. However, the discussion amongst authors in the examined paper show that assessment on the heritage management policy [75], the presence (and the absence) of self-organization of neighborhood residents [20], and the possibilities of using BIM to create a virtual digital environment of the construction project [76] are also critical.

Some authors addressed the necessity to assess the urban heritage assets' architectural aesthetic, artistic aspects, social, economic, and historical aspects [11,77–81]. Firzan [78], Ho [76], Umar [82], and Samodra [83] highlighted the significance of utility and maintenance assessment in improving people's health and well-being. Citizen satisfaction would also improve the participation of local communities [84], therefore, also needs to be assessed.

The municipality and heritage authority must monitor the evaluation of conformity with current technical requirements as well as preserving its cultural history by adhering to heritage conservation codes [78,81,85,86]. However, the authority should be aware of the audit-style evaluation method that results in "creative compliance", which undermines initial goals and leads to dysfunctional behavior [73].

Table 3. List of authors discussing the assessing-vulnerabilities supporting tools of the HUL approach within the urban heritage facility management field.

HUL Critical Steps	HUL Supporting Tools			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
3. Assessing Vulnerabilities	Bello, 2019 Firzan, 2017 Ho, 2018 Khoo, 2018 Salaj et al., 2020b	Attia, 2020 Boyle, 2018 Dastgerdi, 2019 Dyson, 2016 Firzan, 2017 Hanafi, 2018 Ho, 2018 Huids, 2013 Hussein, 2014 Kristl, 2019 Medici, 2020 Mignard, 2014 Nielsen, 2016 Roders, 2013 Sadeghi, 2018 Samodra, 2019 Torre, 2020 Veldpaus, 2013	Bello, 2019 Boyle, 2018 Dastgerdi, 2019 Firzan, 2017 Ho, 2018 Khoo, 2019 Sanjbod, 2016 Umar, 2018 Veldpaus, 2014	Stendebakken, 2015

This scoping review indicated that the financial aspect of UHFM as the third critical step of the HUL approach is not being extensively addressed as a vulnerability. Assessing the cost analysis of the alternatives available in historic building conservation projects [86] is the only financial aspect in "assessing vulnerabilities" step. However, Dastgerdi [87] also argued that budget availability would directly affect priorities.

4.2.4. Integrating Values and Vulnerabilities

UHFM creates a strong, mutually supportive, and non-exploitative community by improving human performance, public participation, health, and well-being [27,88], coping with the demand of the citizen who wishes to live close to the city center (but with a community atmosphere) [15] and allowing local communities the chance to participate in the co-design process [66] (Table 4).

Incorporating value and vulnerability (in terms of HUL's knowledge and planning tools) emphasized the BIM's ability to enhance proficiency in instances where various designs are implemented, making advanced maintenance tasks possible by delivering simulation, computation, and analysis to support planning [39,89]. Integration of BIM and diagnosis-aided HBIMM with artificial intelligence for automation might be the instrument to assess the computation, structural vulnerabilities, and surveying unsatisfactory condition grades within the platform of BIM acting as a decision-making support system [34]. On an urban scale, 3D city models could be considered a conservation strategy by expanding BIM into city information modelling (CIM) [60].

Discussion on the regulatory systems indicated that the law and regulation improvement are needed to enable heritage management to have a legal basis and enhanced the promotion and awareness of heritage protection, thus improving urban sustainability accordingly to the three basic pillars of society, environment, and economy [88,90]. In order to achieve a sustainable UHFM, it is argued that improvement of the heritage laws that enabled restorations' financing, supporting private investors, and creating a diverse, vital and innovative economy should be integrated comprehensively [27,88,91]. Integrating economic, educational, health, and cultural activities could potentially be a catalyst for the development of the community, not only to attract tourists [92,93].

Table 4. List of authors discussing the integrating values and vulnerabilities supporting tools of the HUL approach within the urban heritage facility management field.

HUL Critical Steps	HUL Supporting Tools			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
4. Integrating Values and Vulnerabilities	Hu, 2016 Kristl, 2019 Lindkvist, 2019 Nijkamp, 2020 Salaj et al., 2020b Shehata, 2015 Talamo, 2019	Almeida, 2016 Andersen, 2014 Atta, 2020 Aziz, 2016 Bruno, 2017 Colucci, 2020 Dong, 2011 Gao, 2019 Hu, 2016 Kristl, 2019 Lindkvist, 2019 Maltese, 2016 Marzouk, 2020 Mignard, 2014 Moioli, 2018 Nijkamp, 2020 Talamo, 2019 Terryn, 2012 Torre, 2020 Vukmirovic, 2020	Dong, 2011 Kristl, 2019 Torre, 2020	Kristl, 2019 Nijkamp, 2020 Torre, 2020

4.2.5. Prioritizing Action

The main goal of urban heritage conservation is to preserve the authenticity, unique characteristics, and cultural identity of the urban heritage area [32,94] in order to improve the dwellers' well-being, reinforce neighborhood, enhance physical and social public wellness, increase citizen participation, and create more equitable and satisfying places by sustainably transforming the physical environment [27,92,95], for example, the creation (or re-creation) of urban (heritage) attractive public space by redesigning and programming existing active public plaza [27,92]. One thing to be considered, heritage assets should be protected through the application of preventive maintenance and monitoring rather than executing significant repairs, restoration, or reconstruction to preserve better the authenticity of the assets [96].

The sustainability could be achieved by enhancing the promotion and place branding to increase heritage tourism [97] and increase local commercial activities, property, and land value of nearby buildings by improving environmental services, employment opportunities, and revenue from tourism due to the prospective new use of the protected assets [32,98]. At the same time, emphasizing ethical land use patterns reduces extreme economic disparities [92]. The effectively converted building would be able to produce enough revenue to fund its future self-sufficiency. The practical and intangible advantages of adaptive reuse projects far surpassed the entire cost, including maintenance costs [32] (Table 5).

The three-dimensional modelling of cities from the integration of BIM and GIS provided an efficient way to share information and knowledge about architectural heritage for professional users, stakeholders, and experts engaged in the policy-making process and the management of the territory [58]. The BIM-enabled approach supported access control management by intuitively creating physical access control policies, conveniently managing physical access control systems, and effectively auditing physical access control logs [39]. Historic BIM (HBIM) implementation might enhance conservation practices, improve data maintenance and friendly 3D interface, and enable hazard recognition and risk assessment [33,56,91]. It led to efficient authority's service delivery by widening its coverage and improving the quality using the latest technology [84]. Embracing modern information technology's appropriate application in (urban) FM promoted efficient and

successful historic building maintenance and day-to-day operations through the use of information technology [42].

Table 5. List of authors discussing the prioritizing actions supporting tools of the HUL approach within the urban heritage facility management field.

HUL Critical Steps	HUL Supporting Tools			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
5. Prioritizing Actions	Bello, 2019 Hu, 2016 Li, 2019	Aigwi, 2020 Bello, 2019 Biagini, 2016 Colucci, 2020 Sodangi, 2013 Gao, 2019 Hassan, 2015 Hu, 2016 Li, 2019 Mignard, 2014 Nijkamp, 2020 Rosa, 2020 Saccucci, 2018 Torre, 2020 Vukmirovic, 2020	Aigwi, 2020 Andersen, 2014 Gao, 2019 Hu, 2016 Khoo, 2019 Nijkamp, 2020 Torre, 2020	Aigwi, 2020 Hu, 2016 Valese, 2020

4.2.6. Establishing Framework and Partnership

Urban FM established an interactive, effective, collaborative governance that enabled co-creation, co-finance, and co-ownership within urban public spaces to increase people's trust, attachment, commitment, inclusion, and integration. Therefore, it enhanced massive public participation in the urban heritage conservation process through urban collaborative decisions using evaluation-based techniques [32,66,76] by putting persons and organizations at the center of urban planning and revitalization through a variety of creative techniques, optimizing social and natural capital, and creating more fair and enjoyable places through community facilities [72,95].

Urban FM can be implemented to provide an integrated array of services supporting the operation, fruition, and valorization of urban goods by optimizing BIMs and enhancing information management for urban FM as a critical enabler for a more sustainable built environment [57,59]. In the service of cultural heritage protection, social media gave new information on regular contacts with the historic urban landscape and heritage locations. On the other hand, assets management provided a holistic way to combine data from many approaches to support particular applications and assist decision-making [99] (Table 6).

Table 6. List of authors discussing the establishing framework and partnership supporting tools of the HUL approach within the urban heritage facility management field.

HUL Critical Steps	HUL Supporting Tools			
	Civic Engagement	**Knowledge and Planning**	**Regulatory Systems**	**Financial**
6. Establishing Framework and Partnership	Aigwi, 2020 Hasbollah, 2015 Ho, 2018 Li, 2019 Salaj et al., 2020 Salaj et al., 2020b Tobi, 2013 Vukmirovic, 2020	Almeida, 2016 Colucci, 2020 Gao, 2019 García, 2018 Ginzarly, 2018 Hasbollah, 2015 Langston, 2013 Li, 2019 Sadeghi, 2018 Vukmirovic, 2020	Aigwi, 2020 Colucci, 2020 Khoo, 2018 Li, 2019 Moretti, 2018 Shehata, 2015 Veldpaus, 2013	Afiqah, 2018 Ho, 2018 Hu, 2016 Li, 2019 Salaj et al., 2020

The government's stimulus creation through planning laws would encourage adaptive reuse initiatives [32]. Revitalizing historic buildings through a partnership scheme adopting the PPP and PPPP model would create a local economic generator in urban heritage districts [66,76,92]. It is suggested to include a partnership of stakeholders using an adaptive reuse strategy for urban regeneration in the urban planning policy [32,93]. Using adaptive reuse potential (ARP) modeling, the government would be able to establish the most efficient approach to carry out adaptive reuse interventions on heritage buildings, maximizing financial returns and enhancing productivity while decreasing environmental impact [42,100].

4.2.7. Overall Outlook

To summarize the overall result, a summary table was being developed to give a wider perspective on this study. Findings from the previous subsections were simplified into list of key points for each HUL step (Table 7). The total number of studies from every tool and step were added to give a side-to-side notion of this scoping review. It was evident that the "reaching consensus" and "mapping resources" steps were not as intensively studied as the other four critical steps of the HUL approach. The potential application of BIMs in the urban heritage facility management context is often discussed in every critical step of HUL, along with adaptive reuse, PPP/PPPP, and citizen awareness and participation.

Table 7. Overall representation showing cross-cutting themes and concepts between urban FM and the HUL approach within the examined papers of scoping review, key points, and the number of studies on each HUL step.

HUL Critical Steps	HUL Supporting Tools				Σ	Key Points
	CE	KP	RS	F		
1. Mapping resources	6	10	2	2	20	Mapping resources using BIM/H-BIM, Mapping the existing PPP/PPPP, Mapping the heritage property price and value.
2. Reaching consensus	6	3	2	1	12	Citizen awareness, Consensus building, Collaborative community, Citizen engagement/participation, Education/developing knowledge, Interpretation of technical information.
3. Assessing vulnerabilities	5	18	9	1	33	Coping with climate change, Monitoring the impact of urban development, Utility and maintenance assessment, Citizen satisfaction assessment, Urban heritage policy assessment, Digital assessment using BIMs.
4. Integrating values & vulnerabilities	7	20	3	3	33	Improving human resources, Improving public participation, Improving health and well-being, BIM and AI to enhance efficiency, Heritage law and regulation improvement.
5. Prioritizing actions	3	15	7	3	28	Maintaining the authenticity, Preserving cultural identity, Efficient service delivery from the authorities, Enhance physical and social well-being, Preventive maintenance, Adaptive reuse, Enabled BIM integration approach, Increasing citizen participation.
6. Establishing framework & partnership	8	10	7	5	30	Collaborative governance, Urban collaborative decisions, Digital information optimation, Adaptive reuse approach, PPP/PPPP schemes.

CE: Civic engagement tools; KP: Knowledge and planning tools; RS: Regulatory system; F: Financial tools.

5. Discussion

In order to have a deeper understanding of the UHFM, the research questions were required to be answered. The first research question was how urban heritage conservation is related to urban FM throughout the examined papers. This scoping review indicated that the urban heritage conservation field is closely related to urban FM. Urban heritage conservation and urban FM are required to conduct similar technical tasks such as urban infrastructures, facilities, and scheduled maintenance. The latest landscape-based approach in managing the historical area, the HUL approach, recommended by UNESCO in 2011, also gave special attention to the people as an essential component, comparable with FM and urban FM, which are people-oriented disciplines. Implementation of FM in urban heritage areas was considered unique in a manner that it is supposed to be conducted accordingly to the international, national, and regional heritage codes and laws. With the exception of urban FM implementation in non-heritage regions, which focuses on improving people's well-being, efficiency, and effectiveness, the UHFM is obligated to make every effort to preserve the district's authenticity and historical significance, regardless of cost. The key was finding the balance between efficiency, people's well-being, and preserving authenticity.

To address the second research question on what are the dimensions of UHFM in the body of literature, this scoping review structured the discussion by clustering the critical points from the combined field works of literature according to six critical steps and the HUL approach's supporting tools. The overview of all dimensions showed that the frequency of authors or articles on each critical step directly indicated the intensity of discussion within examined papers. Around 71% of the articles in the literature addressed the UHFM dimensions from the heritage management point of view, while the rest were from the FM perspective. However, BIM's dimension was being discussed repeatedly from both fields, indicating that a mutual entanglement could be addressed from the technological aspect of managing the heritage district.

The second step, "reaching consensus", using participatory planning and stakeholder consultation, became the step that was least discussed compared to the other five critical steps. This lack of debate was surprising. From phase-zero of the preliminary review, many case study publications considered the "reaching consensus" step as one of the most crucial parts of a landscape-based approach in the urban heritage context. On the contrary, the "civic engagement" tool was the second-largest aspect discussed within the examined papers, thus consistent with phase-zero. On the second critical step of HUL, the "reaching consensus" step, the "civic engagement" aspect was the most extensive topic being discoursed (Table 2). It even exceeded the number of authors discussing "knowledge and planning" tools, which consistently dominated the discussion in the other five critical steps.

The last research question on how the HUL supporting tools (related to urban FM) were placed within the critical steps of the HUL approach was responded to by creating a cross-sectional matrix between the six critical steps and the supporting tools of the HUL approach. From the scoping review, it was seen that all four supporting tools support each critical step, but not each of them was equally balanced. The "mapping resources step" as the first step was mainly supported by all three supporting tools but was lacking in the "financial tool" discussions, with only two authors discussing it. This step was also lacking discussion regarding the natural and cultural mapping process. The second step, "reaching consensus", indicated that citizen participation was a crucial aspect. To enhance civic engagement, technical information concerning urban heritage management should be tailored for the non-expert stakeholder interest. Within the third step, "assessing vulnerabilities", the intended purpose was to deal with socio-economic pressure, global warming, climate change, and environmental issues. However, the supporting tools discussed among authors tended to give more attention to the assessment of the compliance with current technical standards while at the same time maintaining its cultural heritage by following the heritage building codes needed. The "civic engagement" tools in the

fourth step, "integrating values and vulnerabilities", mainly discussed the role of UHFM in creating a resilient community.

In contrast, the "knowledge and planning" tool discussed the potential of expanding BIMs into CIMs. Adjustments to heritage legislation that allow for restoration funding, private investor support, and the creation of a diversified, dynamic, and creative economy should be incorporated fully through regulatory systems and financial tools. The fifth step, "prioritizing actions", was primarily supported by all four tools to fulfill the fundamental purpose of urban heritage conservation: to preserve the authenticity and historical value of the urban heritage area. The last critical step, "establishing partnerships and local management frameworks", focused on creating collaborative and interactive governance to improve citizens' sense of engagement. The government's stimulus creation through planning regulations would support adaptive reuse projects as the best sustainable method to maintaining historic places. Historic building revitalization through a partnership scheme based on the PPP and PPPP models would establish a local economic generator in urban heritage areas.

Due to the limitation of this scoping review, it is interesting to see the results of similar research, which include grey literature within the study such as reports from the caretaker of historical districts and world heritage sites, standards from the professional associations, and thesis or dissertation works within the combined field of heritage management and urban FM within the examined papers. The language limitation has also limited the publication search, excluding the works of literature in heritage management and FM from other leading countries such as Japan, China, and other European non-English speaking countries. The potential of having a more comprehensive understanding could be achieved by addressing this research from another perspective limited in this study. The financial aspect that was the least discussed topic in this study would probably be addressed more intensively in some of the grey literature excluded from this scoping review.

6. Conclusions

The purpose of this paper was to achieve a comprehensive understanding of operable criteria within the cross-section discipline (urban heritage management and urban FM) with the aim to provide key elements of UHFM. The study indicated a close relation between urban FM and the urban conservation field, as both required similar technical tasks to be conducted such as urban infrastructures, facilities, and scheduled maintenance. However, UHFM emphasized more on maintaining the authenticity of the protected heritage area than cost-benefit outcomes. Since urban FM was in its establishment process as the expansion of FM, and the HUL approach were understudied components of the conservation field, this study that linked the urban scale heritage conservation and facility management was urgently needed to achieve a comprehensive understanding.

This scoping review introduced UHFM, which could potentially enrich the fields of urban FM and urban heritage management. This study is—filling the gaps—in understanding both fields with the way the UHFM was being shaped to some extent in complying with higher-level heritage codes and regulations. It also made it easier to identify the supporting factors in achieving the main goals of urban heritage conservation, which are maintaining the authenticity and preserving the historical values of the heritage assets. Looking from the perspective of urban FM, it could be found from this scoping literature review that not all the four supporting tools were equally balanced. Although lacking in financial discussions, by providing cross-sectional key elements such as adaptive reuse, PPPP, the potential of BIM, and collaborative government and community within concise steps and tools, UHFM could promote a more operable value-based approach that made it possible for the local heritage authorities to better implement UNESCO's recommendation on the historic urban landscape approach.

The urban FM field as an expansion of FM in an urban scale could also benefit from this UHFM study since many existing regulations concerning historic buildings, and urban heritage areas were established earlier and acknowledged internationally, nationally, and

locally. From that perspective, this study could help in defining heritage attributes and values, which the urban FM could support. By addressing each critical step deeper and through the supporting tools of the HUL approach, further research is necessary to be conducted in understanding how FM could be better integrated into the urban heritage management field. Moreover, additional operable tools to address the technical scope of UHFM still need to be explored. Study cases within the standardized urban heritage area, such as world heritage sites, are essential to formulate and validate within the UHFM framework due to their strong bonds with the international heritage conservation criteria. This study also made it possible for further research on the topic of resiliency or disaster recovery within the urban heritage area from the FM and urban FM point of view.

Author Contributions: Conceptualization, B.N.P. and A.T.S.; methodology, J.L.; software, B.N.P.; validation, B.N.P., A.T.S. and J.L.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing—original draft preparation, B.N.P. and A.T.S.; writing—review and editing, B.N.P., A.T.S. and J.L.; visualization, B.N.P.; supervision, A.T.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Acknowledgments: This study is supported by the Directorate General of Resources for Science, Technology, and Higher Education, The Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia, Diponegoro University, and the Department of Civil and Environmental Engineering (IBM), Faculty of Engineering (IV), Norwegian University of Science and Technology (NTNU).

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Ginzarly, M.; Houbart, C.; Teller, J. The historic urban landscape approach to urban management: A systematic review. *Int. J. Herit. Stud.* **2019**, *25*, 999–1019. [CrossRef]
2. Taylor, T.; Landorf, C. Subject-object perceptions of heritage: A framework for the study of contrasting railway heritage regeneration strategies. *Int. J. Herit. Stud.* **2015**, *21*, 1050–1067. [CrossRef]
3. Bandarin, F.; van Oers, R. *The Historic Urban Landscape: Managing Heritage in an Urban Century*; Wiley: Hoboken, NJ, USA, 2012; ISBN 9780470655740.
4. Roders, A.P.; Bandarin, F. *Reshaping Urban Conservation: The Historic Urban Landscape Approach in Action*; Springer: Berlin/Heidelberg, Germany, 2019; Volume 2, ISBN 981108887X.
5. Stephenson, J. The cultural values model: An integrated approach to values in landscapes. *Landsc. Urban Plan.* **2008**, *84*, 127–139. [CrossRef]
6. Thompson, C.W. Landscape perception and environmental psychology. In *The Routledge Companion to Landscape Studies*; Routledge: Milton Park, UK, 2018; pp. 19–38, ISBN 1315195062.
7. Gobster, P.H.; Nassauer, J.I.; Daniel, T.C.; Fry, G. The shared landscape: What does aesthetics have to do with ecology? *Landsc. Ecol.* **2007**, *22*, 959–972. [CrossRef]
8. Tress, B.; Tress, G. Capitalising on multiplicity: A transdisciplinary systems approach to landscape research. *Landsc. Urban Plan.* **2001**, *57*, 143–157. [CrossRef]
9. Hou, H.; Wu, H. A case study of facilities management for heritage building revitalisation. *Facilities* **2020**, *38*, 201–217. [CrossRef]
10. Roders, A.P.; Van Oers, R. World Heritage cities management. *Facilities* **2011**, *29*, 276–285. [CrossRef]
11. Veldpaus, L.; Roders, A.P. Historic urban landscapes: An assessment framework part II. In Proceedings of the 29th Conference of Sustainable Architecture for a Renewable Future (PLEA 2013), Munich, Germany, 10–12 September 2013; pp. 1–5.
12. Veldpaus, L. *Historic Urban Landscapes: Framing the Integration of Urban and Heritage Planning in Multilevel Governance*; Technische Universiteit Eindhoven: Eindhoven, The Netherlands, 2015.
13. Salaj, A.T.; Bjørberg, S.; Støre-Valen, M.; Lindkvist, C. Urban facility management role. In Proceedings of the 5th International Academic Conference Places and Technologies, Belgrade, Serbia, 26–27 April 2018; pp. 24–27.
14. Salaj, A.T.; Lindkvist, C.M. Urban facility management. *Facilities* **2020**, *39*, 525–537. [CrossRef]
15. Lindkvist, C.; Temeljotov-Salaj, A.; Collins, D.; Bjorberg, S. Defining a niche for facilities management in smart cities. In Proceedings of the 1st Nordic Conference on Zero Emission and Plus Energy Buildings, Trondheim, Norway, 6–7 November 2019; Volume 352.
16. Nielsen, S.B.; Sarasoja, A.L.; Galamba, K.R. Sustainability in facilities management: An overview of current research. *Facilities* **2016**, *34*, 535–563. [CrossRef]
17. Aceves-Avila, C.D.; Berger-García, M.A. Sustainable facilities management in higher education institutions. *Encycl. Sustain. High. Educ.* **2019**, 1802–1809.

18. UNESCO. *Recommendation on the Historic Urban Landscape*; UNESCO: Paris, France, 2011.
19. Kuijlenburg, R. Teaching urban facility management, global citizenship and livability. *Facilities* **2020**, *38*, 849–857. [CrossRef]
20. Salaj, A.T.; Lindkvist, C.; Jowkar, M. Social needs for sustainable refurbishment in Trondheim. In Proceedings of the 19th EuroFM Research Symposium (EFMIC 2020), Online Conference, 3–4 June 2020; pp. 51–61.
21. Salaj, A.T.; Bjoerberg, S.; Boge, K.; Larssen, A.K. Increasing attractiveness by LCC facility management orientation. *IFAC-PapersOnLine* **2015**, *48*, 149–154.
22. Xue, Y.; Temeljotov-Salaj, A.; Engebø, A.; Lohne, J. Multi-sector partnerships in the urban development context: A scoping review. *J. Clean. Prod.* **2020**, *268*, 122291. [CrossRef]
23. Depietri, Y.; McPhearson, T. Integrating the grey, green, and blue in cities: Nature-based solutions for climate change adaptation and risk reduction. In *Nature-Based Solutions to Climate Change Adaptation in Urban Areas*; Springer: Cham, Switzerland, 2017; pp. 91–109.
24. Haase, D.; Kabisch, S.; Haase, A.; Andersson, E.; Banzhaf, E.; Baró, F.; Brenck, M.; Fischer, L.K.; Frantzeskaki, N.; Kabisch, N. Greening cities—To be socially inclusive? About the alleged paradox of society and ecology in cities. *Habitat Int.* **2017**, *64*, 41–48. [CrossRef]
25. Kardan, O.; Gozdyra, P.; Misic, B.; Moola, F.; Palmer, L.J.; Paus, T.; Berman, M.G. Neighborhood greenspace and health in a large urban center. *Sci. Rep.* **2015**, *5*, 1–14. [CrossRef] [PubMed]
26. Jennings, V.; Gaither, C.J. Approaching environmental health disparities and green spaces: An ecosystem services perspective. *Int. J. Environ. Res. Public Health* **2015**, *12*, 1952. [CrossRef]
27. Nijkamp, J.E.; Mobach, M.P. Developing healthy cities with urban facility management. *Facilities* **2020**, *38*, 819–833. [CrossRef]
28. Avčin, B.A.; Šarotar, B.N.; Salaj, A.T. More proactive facility management role for resilience at the workplace. In Proceedings of the Joint CIB W099 and TG59 International Safety, Health, and People in Construction Conference, Salvador, Brazil, 1–3 August 2018; p. 130.
29. UNESCO. *Operational Guidelines for the Implementation of the World Heritage Convention*; UNESCO: Paris, France, 2019; pp. 1–177.
30. Prabowo, B.N.; Pramesti, P.U.; Ramandhika, M.; Sukawi, S. Historic urban landscape (HUL) approach in Kota Lama Semarang: Mapping the layer of physical development through the chronological history. In Proceedings of the 3rd International Conference on Sustainability in Architectural Design and Urbanism, Surakarta, Indonesia, 29–30 August 2019; Volume 402, p. 12020.
31. Rey-Pérez, J.; Roders, A.P. Historic urban landscape: A systematic review, eight years after the adoption of the HUL approach. *J. Cult. Herit. Manag. Sustain. Dev.* **2020**, *10*, 233–258. [CrossRef]
32. Aigwi, I.E.; Ingham, J.; Phipps, R.; Filippova, O. Identifying parameters for a performance-based framework: Towards prioritising underutilised historical buildings for adaptive reuse in New Zealand. *Cities* **2020**, *102*, 102756. [CrossRef]
33. Biagini, C.; Capone, P.; Donato, V.; Facchini, N. Towards the BIM implementation for historical building restoration sites. *Autom. Constr.* **2016**, *71*, 74–86. [CrossRef]
34. Bruno, S.; De Fino, M.; Fatiguso, F. Historic building information modelling: Performance assessment for diagnosis-aided information modelling and management. *Autom. Constr.* **2018**, *86*, 256–276. [CrossRef]
35. Ciocia, C.; Napolitano, T.; Viola, S. Diagnostic monitoring for historic urban landscape case study: Building in Via Caracciolo Napoli. *Eur. Sci. J.* **2013**, *9*, 1857–7881.
36. Charlton, J.; Kelly, K.; Greenwood, D. The complexities of managing historic buildings with BIM. *Eng. Constr. Archit. Manag.* **2020**, *28*, 570–583. [CrossRef]
37. Devetaković, M.; Radojević, M. Application of BIM technology in the processes of documenting heritage buildings. In Proceedings of the 5th international Academic Conference on Places and Technologies, Belgrade, Serbia, 26–27 April 2018.
38. Ewart, I.J.; Zuecco, V. Heritage building information modelling (HBIM): A review of published case studies. In Proceedings of the 35th CIB W78 2018 International Conference: IT in Design, Construction, and Management, Chicago, IL, USA, 1–3 October 2018; Springer International Publishing: New York, NY, USA, 2019; pp. 35–41.
39. Gao, X.; Pishdad-Bozorgi, P. BIM-enabled facilities operation and maintenance: A review. *Adv. Eng. Inform.* **2019**, *39*, 227–247. [CrossRef]
40. Alexander, K. Facilities management: A strategic framework. *Facil. Manag. Theory Pract.* **2013**, 1–13. [CrossRef]
41. Atkin, B.; Brooks, A. *Total Facility Management*; John Wiley & Sons: Hoboken, NJ, USA, 2021; ISBN 1118655389.
42. Li, Y.; Zhang, Y.; Wei, J.; Han, Y. Status quo and future directions of facility management: A bibliometric-qualitative analysis. *Int. J. Strateg. Prop. Manag.* **2019**, *23*, 354–365. [CrossRef]
43. Senior, C.; Jowkar, M.; Temeljotov-Salaj, A.; Johansen, A. Empowering citizens in a smart city project one step at a time: A Norwegian case study. In Proceedings of the 2021 IEEE European Technology and Engineering Management Summit (E-TEMS), Dortmund, Germany, 18–20 March 2021; IEEE: Manhattan, NY, USA, 2021; pp. 10–15.
44. Grum, D.K. Interactions between human behaviour and the built environment in terms of facility management. *Facilities* **2018**, *36*, 2–12. [CrossRef]
45. Hauge, Å.L.; Hanssen, G.S.; Flyen, C. Multilevel networks for climate change adaptation–what works? *Int. J. Clim. Chang. Strateg. Manag.* **2019**, *11*, 215–234. [CrossRef]
46. Gohari, S.; Larssæther, S. Sustainable energy planning as a co-creative governance challenge. Lessons from the Zero Village Bergen. *Int. J. Sustain. Energy Plan. Manag.* **2019**, *24*, 147–154. [CrossRef]

47. Michell, K. FM as a social enterprise. In *Managing Organizational Ecologies*; Routledge: Milton Park, UK, 2013; pp. 167–177. [CrossRef]
48. Bröchner, J.; Haugen, T.; Lindkvist, C. Shaping tomorrow's facilities management. *Facilities* **2019**, *37*, 366–380. [CrossRef]
49. Levac, D.; Colquhoun, H.; O'Brien, K.K. Scoping studies: Advancing the methodology. *Implement. Sci.* **2010**, *5*, 69. [CrossRef]
50. Colquhoun, H.L.; Levac, D.; O'Brien, K.K.; Straus, S.; Tricco, A.C.; Perrier, L.; Kastner, M.; Moher, D. Scoping reviews: Time for clarity in definition, methods, and reporting. *J. Clin. Epidemiol.* **2014**, *67*, 1291–1294. [CrossRef]
51. Tricco, A.C.; Lillie, E.; Zarin, W.; O'Brien, K.; Colquhoun, H.; Kastner, M.; Levac, D.; Ng, C.; Sharpe, J.P.; Wilson, K. A scoping review on the conduct and reporting of scoping reviews. *BMC Med. Res. Methodol.* **2016**, *16*, 1–10. [CrossRef] [PubMed]
52. Arksey, H.; O'Malley, L. Scoping studies: Towards a methodological framework. *Int. J. Soc. Res. Methodol.* **2005**, *8*, 19–32. [CrossRef]
53. Grant, M.J.; Booth, A. A typology of reviews: An analysis of 14 review types and associated methodologies. *Health Inf. Libr. J.* **2009**, *26*, 91–108. [CrossRef] [PubMed]
54. Almeida, A.; Gonçalves, L.; Falcao, A.; Ildefonso, S. 3D-GIS Heritage city model: Case study of the historical city of Leiria. In Proceedings of the 19th AGILE International Conference on Geographic Information Science, Helsinki, Finland, 14–17 June 2016.
55. Aziz, N.D.; Nawawi, A.H.; Ariff, N.R.M. ICT evolution in facilities management (FM): Building information modelling (BIM) as the latest technology. *Procedia-Soc. Behav. Sci.* **2016**, *234*, 363–371. [CrossRef]
56. Cecchini, C. From data to 3D digital archive: A GIS-BIM spatial database for the historical centre of Pavia (Italy). *J. Inf. Technol. Constr.* **2019**, *24*, 459–471. [CrossRef]
57. García, E.S.; García-Valldecabres, J.; Blasco, M.J.V. The use of HBIM models as a tool for dissemination and public use management of historical architecture: A review. *Int. J. Sustain. Dev. Plan.* **2018**, *13*, 96–107. [CrossRef]
58. Jordan-Palomar, I.; Tzortzopoulos, P.; García-Valldecabres, J.; Pellicer, E. Protocol to manage heritage-building interventions using heritage building information modelling (HBIM). *Sustainability* **2018**, *10*, 908. [CrossRef]
59. Maltese, S.; Fradegrada, G.; Moretti, N.; Dejaco, M.C.; Re Cecconi, F. GIS application in urban district maintenance. In Proceedings of the 41st IAHS World Congress on Housing, Sustainability and Innovation for the Future, Albufeira, Portugal, 13–16 September 2016.
60. Mignard, C.; Nicolle, C. Merging BIM and GIS using ontologies application to urban facility management in ACTIVe3D. *Comput. Ind.* **2014**, *65*, 1276–1290. [CrossRef]
61. Moretti, N.; Dejaco, M.C.; Maltese, S.; Cecconi, F.R. An information management framework for optimised urban facility management. In Proceedings of the 35th International Symposium on Automation and Robotics in Construction (ISARC 2018), Berlin, Germany, 20–25 July 2018.
62. Saccucci, M.; Pelliccio, A. Integrated BIM-GIS system for the enhancement of urban heritage. In Proceedings of the Metrology for Archaeology and Cultural Heritage (MetroArchaeo), Cassino, Italy, 22–24 October 2018; IEEE: Manhattan, NY, USA, 2018; pp. 222–226.
63. Sadeghi, M.; Hashem, M.S.; Mehany, M.; Strong, K.; Mehany, M. Integrating building information models and building operation information exchange systems in a decision support framework for facilities management. In Proceedings of the Construction Research Congress, New Orleans, LA, USA, 2–4 April 2018.
64. Zin, N.M.; Ismail, S.; Azmi, F.A. Ascertaining the Economic Sustainability of Heritage Property Market based on Sales Transaction Analysis. *Environ. Behav. Proc. J.* **2018**, *3*, 247–254.
65. Mcdonald, H. Understanding the antecedents to public interest and engagement with heritage. *Eur. J. Mark.* **2011**, *45*, 780–804. [CrossRef]
66. Salaj, A.; Gohari, S.; Senior, C.; Xue, Y.; Lindkvist, C. An interactive tool for citizens' involvement in the sustainable regeneration. *Facilities* **2020**, *38*, 859–870. [CrossRef]
67. Zin, N.M.; Ismail, S.; Mohamad, J.; Hana, N.; Maimun, A.; Afiqah, F.; Azmi, M. Critical determinants of heritage property value: A conceptual framework. *J. Malays. Inst. Plan.* **2019**, *17*, 219–231.
68. Ginzarly, M.; Roders, A.P.; Teller, J. Mapping historic urban landscape values through social media. *J. Cult. Herit.* **2019**, *36*, 1–11. [CrossRef]
69. Andersen, P.D.; Andersen, A.D.; Jensen, P.A.; Rasmussen, B. Sectoral innovation system foresight in practice: Nordic facilities management foresight. *Futures* **2014**, *61*, 33–44. [CrossRef]
70. Marzouk, M.; El Sharkawy, M.; Elsayed, P.; Eissa, A. Resolving deterioration of heritage building elements using an expert system. *Int. J. Build. Pathol. Adapt.* **2020**, *38*, 721–735. [CrossRef]
71. Wan Abdullah Zawawi, N.A.; Abdullah, A. Evaluating stakeholders' preferences: Reconciling heritage and sustainability in Kuala Lumpur traditional areas. *J. Malays. Inst. Plan.* **2011**, *IX*, 37–50. [CrossRef]
72. Tobi, S.U.M.; Amaratunga, D.; Noor, N.M. Social enterprise applications in an urban facilities management setting. *Facilities* **2013**, *31*, 238–254. [CrossRef]
73. Boyle, L.; Michell, K.; Viruly, F. A critique of the application of neighborhood sustainability assessment tools in urban regeneration. *Sustainability* **2018**, *10*, 1005. [CrossRef]
74. Dastgerdi, A.S.; Sargolini, M.; Pierantoni, I. Climate change challenges to existing cultural heritage policy. *Sustainability* **2019**, *11*, 5227. [CrossRef]
75. Veldpaus, L.; Roders, A.P. Learning from a legacy: Venice to Valletta. *Chang. Over Time* **2014**, *4*, 244–263. [CrossRef]

76. Ho, D.; Hou, H. Enabling sustainable built heritage revitalisation from a social and technical perspective: A case study. *Facilities* **2019**, *37*, 704–722. [CrossRef]
77. Attia, D.; Maarouf, I.; Taha, D.; Nassar, D. Detecting failures in conservation practice in relation to cultural significance: The case of heritage buildings in Khartoum. *Build. Res. Inf.* **2020**, *48*, 124–139. [CrossRef]
78. Firzan, M.; Keumala, N.; Zawawi, R. Gaps pertaining evaluation on built heritage conservation with special annotation on the Malaysian context. *Pertanika J. Soc. Sci. Humanit.* **2017**, *25*, 21–38.
79. Hanafi, M.H.; Umar, M.U.; Razak, A.A.; Rashid, Z.Z.A. Essential entities towards developing an adaptive reuse model for organization management in conservation of heritage buildings in Malaysia. *Environ. Behav. Proc. J.* **2018**, *3*, 265–276. [CrossRef]
80. Sanjbod, H.S.; Hermans, L.; Reijnders, D.; Veldpaus, L. Captain, where can we find the attributes? *Hist. Environ. Policy Pract.* **2016**, *7*, 177–188. [CrossRef]
81. Umar, S.B.; Said, I. A review on decision-making models and tools in developed countries towards enhancing sustainable built heritage assets in developing countries. *Environ. Behav. Proc. J.* **2018**, *3*, 237–246. [CrossRef]
82. Umar, S.B.; Said, I. Conservation challenges of heritage building reuse in Nigeria: A review of decision-making models. *Asian J. Environ. Stud.* **2018**, *4*, 16–36. [CrossRef]
83. Samodra, F.T.B.; Sudarma, E. Review on environmental and building services performance of urban heritage hospital. In *MATEC Web Conferences*; EDP Sciences: Ulis, France, 2019; Volume 280, p. 04005. [CrossRef]
84. Bello, M.U.; Martin, D.; Kasim, R. The position of facility management services on customer loyalty on malaysian municipal council service delivery. *Spec. J. Urban Plan. Dev.* **2019**, *4*, 17–27.
85. Dyson, K.; Matthews, J.; Love, P. Critical success factors of adapting heritage buildings: An exploratory study. *Built Environ. Proj. Asset Manag.* **2016**, *6*, 44–57. [CrossRef]
86. Stendebakken, M.O.G.; Grytli, E.R.; Olsson, N.O.E. Proposed aspects for evaluation of the value of spaces in historic buildings. *Procedia Econ. Financ.* **2015**, *21*, 23–31. [CrossRef]
87. Dastgerdi, A.S.; Sargolini, M. Vulnerability assessment and conservation of heritage sites in a changing climate. *Int. J. Landsc. Archit. Res.* **2019**, *3*, 121–129.
88. Kristl, Ž.; Temeljotov Salaj, A.; Roumboutsos, A. Sustainability and universal design aspects in heritage building refurbishment. *Facilities* **2019**, *38*, 599–623. [CrossRef]
89. Colucci, E.; Kokkla, M.; Mostafavi, M.A.; Noardo, F.; Spano, A. Semantically describing urban historical buildings across different levels of granularity. *Int. Arch. Photogramm. Remote Sens. Spatial Inf. Sci.* **2020**, 33–40. [CrossRef]
90. Dong, H.X. A tentative study on the world heritage tourism management in China. In Proceedings of the 2nd International Conference on Artificial Intelligence, Management Science and Electronic Commerce (AIMSEC), Zhengzhou, China, 8–10 August 2011; pp. 6532–6537.
91. Della Torre, S. Italian perspective on the planned preventive conservation of architectural heritage. *Front. Archit. Res.* **2020**, *10*, 108–116. [CrossRef]
92. Hu, C.; Gong, C. Creating an ecological historic district: Rethinking a Chinese challenge through the case of Oakland District, Pittsburgh. In Proceedings of the International Conference on Sustainable Design, Engineering and Construction 2016 (ICSDEC 2016): Integrating Data Science, Construction and Sustainability, Tempe, AZ, USA, 18–20 May 2016; pp. 1572–1579.
93. Shehata, W.T.A.; Moustafa, Y.; Sherif, L.; Botros, A. Towards the comprehensive and systematic assessment of the adaptive reuse of Islamic architectural heritage in Cairo: A conceptual framework. *J. Cult. Herit. Manag. Sustain. Dev.* **2015**, *5*, 14–29. [CrossRef]
94. Khoo, S.L.; Lim, Y.M. Dissecting George Town's human capital challenges in built heritage: Voices from the stakeholders. *J. Cult. Herit. Manag. Sustain. Dev.* **2019**, *9*, 376–393. [CrossRef]
95. Vukmirovic, M.; Gavrilović, S. Placemaking as an approach of sustainable urban facilities management. *Facilities* **2020**. [CrossRef]
96. Sodangi, M.; Khamdi, M.F.; Idrus, A.; Hammad, D.B.; Ahmedumar, A. Best practice criteria for sustainable maintenance management of heritage buildings in Malaysia. *Procedia Eng.* **2014**, *77*, 11–19. [CrossRef]
97. Hassan, A.; Rahman, M. World Heritage site as a label in branding a place. *J. Cult. Herit. Manag.* **2015**, *5*, 210–223. [CrossRef]
98. Valese, M.; Noardo, F.; Roders, A.P. World Heritage mapping in a standard-based structured Geographical Information System. *Int. Arch. Photogramm. Remote. Sens. Spat. Inf. Sci.* **2020**, *43*, 81–89. [CrossRef]
99. Ginzarly, M.; Teller, J. Eliciting cultural heritage values: Landscape preferences vs representative images of the city. *J. Cult. Herit. Manag. Sustain. Dev.* **2018**, *8*, 257–275. [CrossRef]
100. Langston, C.; Yung, E.H.-K.; Chan, E.H.-W. The application of ARP modelling to adaptive reuse projects in Hong Kong. *Habitat Int.* **2013**, *40*, 233–243. [CrossRef]

(This page is intentionally left blank)

Appendix 2

urban science

MDPI

Article

Identifying Urban Heritage Facility Management Support Services Considering World Heritage Sites

Bintang Noor Prabowo [1,2,*], Alenka Temeljotov Salaj [1] and Jardar Lohne [1]

[1] Department of Civil and Environmental Engineering, Faculty of Engineering, Norwegian University of Science and Technology (NTNU), 7491 Trondheim, Norway
[2] Department of Civil Infrastructure Engineering and Architectural Design, Diponegoro University, Semarang 50275, Indonesia
* Correspondence: bintang.n.prabowo@ntnu.no or bintangprabowo@lecturer.undip.ac.id; Tel.: +47-4868-9764

Abstract: Whether public sectors or private institutions, in-house or outsourced, building-level or urban-scale, the critical role of facility management (FM) is to support the core business activities of an organization in accomplishing its objectives. Through the services it manages and provides, FM impacts people's health, well-being, and quality of life. While there is no difficulty in defining a corporation, organization, or institution's core business, defining the core business of a city as an institution is not widely discussed in the urban-scale facility management literature. By using a narrative research approach from the available literature, this study seeks to shed light on potential justifications for a city's "core business" and its possible support services. The context of the World Heritage site is used to provide a sharper perspective on the possible urban-scale support services customized for urban heritage areas. This study suggests that a city's primary objective is to maintain and possibly attract new "desirable" citizens through the provision of excellent services, a quality-built environment, a sense of well-being, health, safety and security, and economic growth. Consequently, the integration of urban-scale support services must be aligned with the purpose of the city, or the World Heritage site, to be specific.

Keywords: urban FM; facility management; world heritage; support services; conservation

Citation: Prabowo, B.N.; Temeljotov Salaj, A.; Lohne, J. Identifying Urban Heritage Facility Management Support Services Considering World Heritage Sites. *Urban Sci.* **2023**, *7*, 52. https://doi.org/10.3390/urbansci7020052

Academic Editor: Tigran Haas

Received: 1 March 2023
Revised: 28 April 2023
Accepted: 7 May 2023
Published: 10 May 2023

1. Introduction

The city as an artificial habitat is an intriguing phenomenon since it provides a location for human civilization to reside. Cities are dynamic, complex, and multifaceted entities that are constantly evolving. The scientific study of cities has emerged as an essential area of research in recent years. One specific aspect of this field is examining urban heritage conservation, which is a system and process within urban development. Urban heritage refers to the cultural and historical value of cities. It encompasses both tangible and intangible aspects, including architectural heritage, historic landscapes, traditional practices, social customs, and cultural expressions. Urban heritage, which can also be addressed using the systems theory of urbanism, is essential in understanding the evolution of cities, as it reflects the cultural, economic, and social history of the communities that reside within them [1]. Therefore, urban development, as a complex and on-going process that is shaped by various factors, needs to consider urban heritage as one of its key components.

Some cities are brand-new and purposely built, while others are hundreds or thousands of years old with a volatile past. There are other cities that eventually perish and are abandoned for a variety of reasons. The evolutionary history of cities around the globe demonstrates that a city is also a complex megastructure [2–6] comparable to a large institution [7–12] that occupies a massively built environment and must be managed effectively to function. Nevertheless, we must always remember that a city is not only a tangible structure but also a complex system comprising various subsystems, including the social, economic, political, environmental, and physical subsystems [1,13]. Over time, the

proto cities that initially arose from a group of humans who worked in a simple hierarchy evolved into a hub for vast numbers of individuals with diverse characteristics, interests, and needs, which the early founders may not have anticipated. As the complexity grew, it became unavoidable to employ stakeholders who were appointed as regulating authorities, as well as to manage the complicated daily tasks of a city. Today's urban areas must be managed with exceptional discipline and precision to avoid chaos and long-term urban problems in the foreseeable future.

Cities also require enormous infrastructure and facilities, which must be designed, constructed, monitored, and maintained on an on-going basis to ensure the well-being and quality of life of the citizens. To decrease unnecessary costs and environmental impact, city facilities management must be implemented systematically and effectively. The International Facility Management Association (IFMA) defines facility management (FM) as a field dedicated to supporting people by assuring the functioning, well-being, efficiency, productivity, and sustainability of the built environment, which includes the buildings, the neighborhood, the city, and the infrastructures surrounding them [14–16]. FM is readily justifiable at the urban scale given that the city is intrinsically a physically built environment, consists of people with diverse interests and aims, and is arguable, to some extent, as a form of mega-organization or institution.

As a function responsible for ensuring that all supporting services run properly, FM requires the institution's primary objectives or "core business" to be specified early in the strategic planning process. Within a building level, it is apparent that recognizing the core business of the institution which operates and dwells in the building is not problematic. Moreover, without neglecting demographic, social, cultural, geographical, and other factors, the clarity of the core business will significantly influence the nature and type of supporting services that must be provided to achieve the organization's primary goal effectively [17]. Knowledge of the "core business" in which the FM operates is necessary to forecast expenses, maximize service levels, and provide the requisite proactivity so that the organization's goals are aligned with those who are in charge of the facility management in strategical, tactical, and operational level [17]. One of the problematic issues is that there is a lack of consensus on the fundamental question of what constitutes a city's "core business". Consequently, if the primary objective of developing a massive and complex community called a city has not been determined, it will become uncertain to decide what support services are essential for achieving a successful and efficient urban-scale FM, especially in managing the World Heritage (WH) site as a real case of urban-scale heritage preservation. Furthermore, managing urban-scale WH sites presents numerous challenges and dilemmas, such as balancing conservation and urban development, tourism and visitor management, lack of resources, and climate change.

This study contributes to developing urban-scale FM (Urban FM) as a field within the scope of FM discipline that is still in the establishment process [18]. This article also attempts to consolidate pieces of the puzzle of urban-scale FM, scattered in various journals, into a single article to spark academic debate and argument regarding Urban FM by using WH context as the best practice example of urban heritage facility management (UHFM) [19]. The heritage authorities and the WH caretakers will also reap the benefit of understanding the possible support services that could be provided to ensure the well-being of the people and the preservation of authenticity, visual quality, significance, and the outstanding universal value (OUV) of the protected sites from the FM point of view. The concept of UHFM, urban-scale support services, and Urban FM within historic towns and world heritage sites can benefit a wide range of other stakeholders, including local communities, tourists, and property owners. UHFM can also potentially improve administration by providing a framework for the efficient management of facilities within historic towns and WH sites. This can help to overcome silos and ensure that various technical departments and agencies collaborate to achieve common objectives. In addition, these services can contribute to the improvement of training and capacity building for urban managers at the strategical, tactical, and operational levels by providing specialized training programs

and resources that are tailored to the specific requirements of historic towns and world heritage sites.

Academics and urban observers have examined the connection and comparison between the city and the building for a considerable amount of time. One of the earliest academic sources which discussed the subject matter defined a city in its comparison as a "building" in a book titled *The Elusive City: Five Centuries of Design, Ambition, and Miscalculation* [20]. Several other researchers describe a city as a megacomplex of structures [2,4–6,21,22]. Furthermore, one of the authors [22] concurred with the notion that cities and buildings can be compared directly by proposing a comparison between urban design and building facility design. The author investigated whether various design approaches in building and urban facilities are related and whether there is a relevant intersection of research areas of interest for developing the urban-scale FM. Moreover, the urban-scale FM principles should be engaged in the beginning phase of urban design to capitalize on the crossovers and new research [22], such as how facility managers with architectural backgrounds should be involved in the designing phase of a building. Therefore, the strategical and tactical planning of urban heritage facility management within WH sites should also be incorporated into the urban planning within municipality and county levels. Given that this paper is addressing urban heritage areas, with WH sites as the context, the implications for urban planning are immense. In contrast to a protected single building, which is also considered in urban planning, its impact is not as significant as that of urban-scale WH sites, which are required both from a conservation management perspective and a city-scale facility management perspective that oversees everything outside the scope of the cultural heritage caretakers tasks [23].

To fully comprehend urban-scale facility management, we should also view the city as a structure comparable to a building. This enables us to identify the support services of an urban area that must be prepared by directly associating them with the practice at the building-level facility management. The management of energy, water, sanitation, transportation, and communication are easily comparable between a city and a building. However, it is expected that there will be several variations and differences between facility management at the building level and facility management at the urban scale, particularly at WH sites with embedded local, national, and international heritage regulation. However, every attempt to bring this subject up in academic discourse will contribute to establishing the Urban FM field. This study is more of an experimentation designed to address the technical issues and components of urban-scale FM within a protected heritage area such as WH sites. The United Nations Educational, Scientific and Cultural Organization (UNESCO) acknowledges WH sites as places of outstanding universal value, and as such, they must be preserved for future generations. Proper urban-scale FM support services are essential to preserving these sites, as the services take care of everything besides the daily tasks of heritage conservators [23]. FM services can help ensure that the sites are well-maintained, that their cultural and historical significance is preserved, and that they remain accessible to visitors. In addition, the fact that WH sites are regulated by binding local, national, and international regulations makes the identification of the potential support services of WH sites more consistent and less biased.

The World Heritage Convention, which was adopted by the UNESCO in 1972, aims to protect and preserve significant cultural and natural heritage sites of universal value [24]. The Convention recognizes the importance of these sites for present and future generations and emphasizes the need for effective management and conservation. Furthermore, the UNESCO recommendation on the Historic Urban Landscape (HUL) approach emphasizes the need for a holistic and integrated approach to the management of historic urban environments [19,24,25]. Consequently, urban-scale FM and the World Heritage Convention are conceptually connected due to the role of Urban FM in achieving the goals of the World Heritage Convention by providing a framework for the effective management of facilities and services within historic cities and towns. This includes the management of buildings, infrastructure, public spaces, and other urban amenities that contribute to the site's cultural

and historical significance. Moreover, urban-scale facility management contributes to the preservation and protection of these sites' cultural heritage for future generations.

To strengthen the argument that a city acts as an entity that should be managed, Dickerson [26] argued that the city, to some extent, is an organization. This argument is also confirmed by a number of other scholars [27–29]. Organization refers to a systematically organized group of individuals having a shared objective and identity associated with an external environment. It is frequently confused with the institution, which refers to an entity with a high level of sustainability that can be viewed as an integral part of a big society or community. Nevertheless, a city is also associated with an institution [7–12].

The fact that a city is an institution that grows within the built environment can be related to the definition of FM in ISO 41011:2017, which is also adopted by IFMA, as an organizational function that integrates people, place, and process within the built environment intending to improve the quality of life of people and the productivity of the core business of the institution [16]. In other words, the fundamental purpose of FM is to support an organization's primary business activities and facilitate the creation of an environment suitable for achieving its goals. Consequently, the absence of studies about the "core business" of a city from an FM perspective has led to a lack of clarity regarding the support services that an urban-scale FM may provide to meet a city's primary objective.

This study formulated two research questions that will be discussed in the discussion: (RQ1) what is the primary goal or "core business" of a city, and (RQ2) what are the possible support services that could be observed to enable a city, therefore including the urban heritage area such as WH sites, to serve its purposes. These research questions were addressed by comparing a city and urban-scale WH sites to a building in terms of its capacity to support the daily life of its inhabitants from the FM point of view.

The "core business" of a city is one of the most crucial unaddressed topics from an urban-scale facility management perspective. This study functioned as preliminary research that simplifies the more significant challenge of urban facility management, which aims to identify features that might be suggested as the "core business" and possible support services of a city that are acceptable for different types of cities, including the urban areas that are listed as WH sites.

2. Theory and Background

2.1. The Definition and Origin of Cities

Essentially, a city is a sufficiently large town with its own governance. The expression is derived from the French word "cité," which is derived from the Latin word "civitatum," which means "citizenship" [30]. In the context of ancient Greece, citizenship refers to the involvement of individuals in the social and political life of small-scale communities [12]. According to the Degree of Urbanization approved by the United Nations Statistical Commission, a city is proportionately more prominent than a town [31,32]. The expansion of agriculture is intimately related to the emergence of the earliest cities. Later, the greater the population of the community, the safer it was from attack by other tribes. Through time, villages developed in size and eventually transformed into towns and cities [33]. The food surplus from the successful agricultural productions enabled both the specialization of work and the formation of a class structure that can provide the leadership and workforce to build and operate even more complex agricultural systems, which in turn makes possible further increases in the food supply [33,34]. Numerous craftspeople, who were not working as farmers, such as masons, carpenters, jewelers, potters, etc., lived and worked at a considerable distance from the urban center. Through time, the division of labor and professions grew to be more specialized due to the increasing complexity of society [34]. The concentration of a large number of specialists in a small area stimulated creativity, not only in technology but also in religious, philosophical, and scientific ideas [33]. Moreover, some representatives among the citizens and certain specialists were appointed to manage the city's routine tasks in order to prevent social disorder. These citizens might have acted as the predecessors of the current support service providers or even facility managers.

However, a city is not merely a structure. A city is also a complex system with multiple layers of subsystems. The theory of what a city is, and its subsystems, has been the subject of much debate and discussion among urban theorists and scholars. One influential theory is the systems theory of urbanism, which is a theoretical approach that views cities as complex and dynamic systems made up of interconnected and interdependent parts [1,13]. According to this theory, a city is not just a physical structure but also a system that consists of different interconnected subsystems [1] that interact with each other in a complex and dynamic way creating a web of relationships that shape the urban environment [13]. As a structure, a city refers to the physical form and built environment, such as buildings, streets, and public spaces. As a system, a city refers to the processes and activities that take place within the urban environment, such as economic activities, social interactions, and political decision-making. The system theory of urbanism highlights the importance of understanding the complexity and interdependence of different subsystems within a city to effectively manage urban development, one of which is through urban-scale facility management.

2.2. *Urban-Scale FM*

Virtually everything must be managed, from simple tasks to complex tasks such as daily city operations. Management is the act or art of managing, planning, developing, directing, or supervising anything to attain a particular objective [35,36]. The management discipline has evolved into many branches, each of which has its character and specialization field, one of which is facility management. Salaj and Lindkvist [18] recommended expanding the FM discipline into an urban-scale practice after Alexander and Brown [37] had earlier proposed a similar concept for community-based facility management (CbFM).

FM services in the building level are exemplified by users' experience when entering the main entrance, feeling comfortable in the lobby, using a luxurious escalator, meeting in a well-equipped meeting room, and having excellent toilet facilities. The satisfaction due to the pleasant and productive experience is the work of the facility managers operating behind the scenes. It is identical to how the dwellers perceived the city as a lively and productive environment due to the excellent work of the urban facility managers. Arguably, FM support services act as the avant-garde to ensure the efficiency and daily operation of the facilities of built environments, including cities and the infrastructures needed for the dynamic and productive urban environment to be achieved to maintain citizens' fulfillment. Urban FM, or UFM, as an expansion of building level's FM, has been discussed by multidisciplinary scholars globally from various perspectives and vantage points. Nevertheless, the FM stakeholders and academics have not yet agreed on a solid Urban FM framework. The idea of enhancing public participation [38], PPPP [39], sustainable neighborhood refurbishment [40], health-directed design interventions in cities [22], urban heritage facility management [19], and place-making [41], among others, are contributing to the development and establishment of Urban FM as an emerging discipline branch of FM. These pieces of knowledge are scattered throughout the intellectual discourses and academic debates. While most urban caretakers have performed urban-scale facility management as part of their day-to-day tasks, the research community has not seemed to structure it in one comprehensive model or framework. This situation, to some extent, resembles the same phenomenon that has occurred in the building-scale FM discipline in its early development. However, nowadays, many institutions and businesses are specializing in the FM industry to improve the organization's efficiency, cost savings, and flawless operation. Thus, incorporating FM is becoming common practice in society. The same shift is expected to happen with Urban FM in managing urban-scale facilities in the near future. Contextualizing urban-scale FM within WH sites will contribute to establishing Urban FM as a discipline and provide a distinctly new perspective and management approach for WH site preservation through the provision of urban-scale support services tailored for heritage districts and historic towns.

2.3. World Heritage Sites as A Protected Urban Area

The concept of "World Heritage" is innovative when it was introduced for the first time. Traditionally, inherited cultural assets were restricted to specific people or communities [42]. With the relatively new terminology of "World Heritage," a cultural item is deemed universal, has a broader reach, and is incorporated into global human history. During the completion of the Aswan Dam in Egypt in 1959, the Ramses II temple at Abu Simbel was in danger of being demolished. This resulted in the establishment of the WH movement [43,44]. The UNESCO launched an international campaign to salvage the critical heritage asset, which sparked a debate about the necessity of a worldwide treaty to protect the most significant cultural and natural heritage sites all over the globe. In 1972, UNESCO came up with an agreement that included natural and cultural assets worldwide. The agreement's purpose is to protect areas of worldwide significance that also contain outstanding universal values and belong to all of humanity [45]. Therefore, the permanent protection of this asset is of the utmost importance to the global society and is becoming the defined terminology of WH that we know today.

The concept of WH also represents a shift in thinking about cultural heritage from a narrow focus on individual buildings or monuments to a broader understanding of cultural landscapes and the complex relationships between people and their environment. The notion of WH has helped to encourage a more holistic approach to heritage management, one that seeks to balance conservation with sustainable development and community involvement [19].

To be listed as an urban-scale WH, a site must meet at least one of the following criteria: (1) exhibit an important interchange of human values, over a span of time or within a cultural area of the world, on developments in architecture or technology, monumental arts, town-planning, or landscape design; (2) bear a unique or exceptional testimony to a cultural tradition or to a civilization that is living or that has disappeared; (3) be an outstanding example of a type of building, architectural, or technological ensemble or landscape, which illustrates a significant stage(s) in human history; (4) be an outstanding example of a traditional human settlement, land-use, or sea-use, which is representative of a culture (or cultures), especially when it has become vulnerable under the impact of irreversible change; and (5) be directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance [24]. Sites must also meet the conditions of integrity and authenticity, meaning they must be intact and genuine representations of their cultural heritage values. Additionally, they should be well-preserved and have adequate management and protection systems in place. Furthermore, failure to maintain the outstanding universal value(s) will result in the delisting of the sites from WH status, such as the Arabian Oryx Sanctuary, Oman (2007), Elbe Valley in Dresden, Germany (2009), and the Liverpool Maritime Mercantile City in Liverpool, United Kingdom (2021).

Heritage has extended to include groups of structures, historical urban centers, parks, and nonphysical heritage such as surroundings, social characteristics, and, more recently, intangible attributes [46–48]. The phrase "tangible" describes the physical objects that have been developed, conserved, and handed down through the generations of a community. It consists of creative accomplishments, built legacies such as structures and monuments, and other artifacts of human innovation instilled with cultural significance. In contrast, the "intangible" terminology refers to the expressions, rituals, symbols, knowledge, and abilities that individuals, groups, and communities acknowledge as being representative of their collective memory [25,49]. However, most tangible heritage can only be interpreted and comprehended through reference to the intangible. Consequently, society and values in the WH site context are intricately interconnected [49] and progressively becoming relevant for urban-scale FM as a people-oriented discipline.

Depending on how it is managed and valued, heritage can be both an asset and an incumbrance to urban development. Heritage can be a significant asset to urban development because it provides a city with a distinct and valuable sense of identity,

history, and culture. Heritage sites can attract tourists, stimulate economic growth, and increase property values. Additionally, preserving and supporting heritage can foster a sense of community pride and cohesion and contribute to a city's social and cultural fabric. Managing an urban-scale WH site requires finding the right balance between the need for preservation and the necessity for urban development to meet contemporary living standards and urban facility management services. This can be challenging to achieve, as urban development and the preservation of cultural and historical values can sometimes be in conflict [19,50]. Historic preservation may limit the ability of developers to build new buildings or make alterations to existing protected building, resulting in conflicts between preservationists and developers. Urban WH sites, which frequently attract large numbers of visitors, can also potentially introduce management challenges for the site and its surrounding communities. Managing WH visitors is being further complicated by overtourism, inappropriate visitor behavior, and the damage of heritage sites [51]. Many urban WH sites are located in developing nations or areas with limited resources, which can present additional challenges in terms of conservation funding and management resources [52,53]. This does not even take into account the existence of facts regarding climate change and natural disasters, which can pose significant threats to WH sites, which are sometimes located in areas prone to earthquakes, flooding, and other natural disasters [54,55]. In Røros, Rjukan, and Notodden, three WH preserved towns of Norway, climate change has resulted in unusually wet winters over the past several decades, which has increased the difficulty of preserving the wooden materials on the facades and structures of the protected buildings. Providing heritage-oriented urban facility management support services could also be a potential approach for achieving the optimal balance in the management of WH sites.

Heritage preservation and urban development are closely related to urban-scale facility management (Urban FM) because they both aim to improve the quality of life for urban residents. Urban FM plays a crucial role in ensuring the preservation of historic buildings and sites, as well as fostering urban development through the efficient and sustainable management of urban-scale support services. In this way, Urban FM acts as a link between the past and the present, preserving the history of cities while ensuring their continued growth and development. Effective urban facilities management can ensure that historic structures and sites are maintained to the highest standards and can be utilized for a variety of purposes. This requires close collaboration between different technical departments of the governing authorities and stakeholders to ensure that urban facilities are efficiently maintained and managed, and that any necessary repairs and upgrades are performed promptly. Urban FM can also play a significant role in promoting sustainable urban development by ensuring that urban-scale support services are managed to reach optimum efficiency while retaining historical significance. Heritage preservation, urban development, and Urban FM have a complex and multifaceted relationship. By collaborating, these distinct disciplines can contribute to the development of thriving urban areas that are rich in heritage and history while also meeting the needs of a growing and changing population.

2.4. The Dynamics between Urban Heritage Protection and Urban Planning

Urban heritage and WH sites play crucial roles in urban planning, as they can make better informed decisions regarding the preservation and development of urban historic and cultural resources [56,57]. Urban heritage sites are areas or locations within a city that have historical or cultural significance, such as old neighborhoods, historic buildings, monuments, and public spaces. These locations can contribute to the identity and unique character of a city and are commonly major tourist attractions. Integrating the preservation of urban heritage sites in urban planning can help maintain a sense of continuity with the past, increase the cultural value of the city, and attract visitors and investment. When making decisions about zoning, land use, and development regulations, urban planners should consider the historic significance and outstanding universal values of these WH sites, as they are typically accorded special protection and conservation status in urban

planning. As a result, urban planners may impose stricter restrictions on development near WH sites, or work to establish buffer zones that protect the site from undesirable and uncontrolled development [58,59]. Thus, the preservation and management of WH sites can contribute to the protection of a city's cultural and historic identity and to the promotion of sustainable development that respects and enhances the value of these vital resources.

The inscription and listing of a site as a UNESCO WH site can bring various social and economic benefits while also imposing certain urban planning restrictions for future development. WH sites attract a large number of tourists, who can contribute to the local economy by creating jobs, generating revenue from ticket sales, and increasing demand for local goods. The increased attention and visitation can also heighten awareness of the cultural and natural significance of the site. UNESCO promotes sustainable tourism practices that prioritize responsible and eco-friendly tourism [51]. This can lead to a more balanced economic development that considers the site's conservation requirements and local communities. WH sites are also eligible for funding and technical assistance from the World Heritage Fund, which can support conservation efforts and promote sustainable development. Furthermore, the process of the inscription as a world heritage includes a rigorous evaluation of the site's value, authenticity, and integrity, as well as ongoing monitoring to ensure the site's outstanding universal value is maintained. This may result in increased oversight and scrutiny of planning and development decisions in the area.

2.5. *Projected Nature of Heritage Values*

The projected nature of heritage values refers to how the values attributed to a particular heritage site or object are projected onto the surrounding community. In other words, how people in a community view a particular heritage site or object can significantly impact its preservation and conservation. One key factor influencing the projected nature of heritage values is the community's values and beliefs [60,61]. Various factors can shape these values and beliefs, including cultural traditions, historical events, and socio-economic factors. For example, a community that places a high value on the preservation of historic buildings may be more likely to support the conservation of an old, dilapidated structure than a community that places a lower value on historic preservation.

Another factor influencing the projected nature of heritage values is how heritage sites and objects are managed and promoted by city officials and other stakeholders [60]. Effective management and promotion can help enhance the perceived value of a heritage site or object, increasing community support for its conservation and preservation. For example, suppose a city invests in restoring and promoting a historic neighborhood; in that case, residents and visitors may view the area as a valuable cultural asset, which can help sustain community support for its preservation [61].

In addition to these factors, the projected nature of heritage values can also be influenced by the actions of individual community members. For example, a local historian who writes a book or talks about the history of a particular heritage site may help increase awareness and appreciation of its value among community members. The famous Norwegian artist and painter Harald Sohlberg played a significant role in creating awareness of Røros, a remote area in Norway, which is now a protected WH site.

Shifting baselines can impact the reliability of heritage studies, as personal knowledge and value-driven observer bias can lead to the incorrect exclusion of properties [62]. To minimize observer bias, Spennemann (2022) [62] argued that community heritage studies should involve local professionals, a representative sample of community members, and a formal community-wide survey, which should include questions designed to elicit memories of locations cherished by previous generations. Once a property is listed, its values remain fixed, whereas the projected values are subject to change. This means that listed properties may lose or gain significance and value over time. The planning regulations associated with listing can limit the freedom of action of property owners, and development actions may no longer be directly proportionate with the increased significance [62].

Therefore, the projected nature of heritage values is a complex and dynamic phenomenon shaped by various factors, including community values, management strategies, and individual actions. To successfully conserve and preserve urban heritage, it is essential for city officials and other stakeholders to understand and work with the projected nature of heritage values to build and sustain community support for heritage conservation and preservation efforts.

2.6. Motivations of Managing Urban Heritage and Being Listed as World Heritage Sites

Diverse motivations exist for designating and inscribing a site as a WH site and for managing urban heritage areas, which can influence the priorities for urban-scale facility management. In the typical heritage planning trajectory of identification, nomination, evaluation, listing, and preservation, the epistemological basis of nominations and evaluations is infrequently examined; therefore, understanding this theory of knowledge, along with the motivations behind nominations and listings, enables us to evaluate whether the heritage-listed properties are representative of the cultural, social, and economic realities of a community as revealed by their historic trajectories [63].

Furthermore, preserving and managing urban heritage areas can contribute to sustainable development by encouraging the reuse of existing buildings and infrastructure, decreasing the need for new construction, and preserving the embodied energy and cultural value of existing resources. Nevertheless, the management and acknowledgment of cultural heritage are subject to both moral and physical ownership, which extends not only to the physical manifestation of a heritage asset but also to its intangible characteristics [63].

The motivations mentioned above can influence the priorities of urban-scale facility management, which may include maintenance, repair, and the preservation of historic buildings, public spaces, and other cultural and historic resources. In addition, facility management priorities may include promoting sustainable development, improving the tourist experience, and preserving cultural and historical resources for future generations. Urban planners and facility managers can develop effective management strategies for these important resources by providing heritage-oriented urban planning and support services by understanding the motivations for inscription as WH list assets and managing urban heritage areas.

2.7. The Authority of the Municipality in Managing Urban-Scale Heritage Assets

The authority and power of a city administration to manage heritage assets can vary depending on the laws and regulations in a particular jurisdiction. City administrations generally have a certain degree of authority to manage heritage assets within their boundaries, but legal and practical constraints often limit this authority.

The municipalities usually exercise their authority to manage heritage assets by using land use planning and zoning [57], heritage designation and protection [64], and building codes and standards [65]. City administrations have the power to regulate land use and zoning within their boundaries. This can include the designation of heritage districts or zones, which can provide some degree of protection for heritage assets located within those areas. In many jurisdictions, municipalities have the authority to designate heritage properties and structures, which can provide a degree of protection against demolition, alteration, or other forms of damage or destruction. Municipalities also may impose and establish building codes and standards that apply to all structures within their jurisdiction, including heritage assets. These codes and standards may require that owners of heritage properties adhere to certain preservation standards or obtain permits before making any changes to the property [65].

However, many heritage assets are in private hands, and owners of these assets generally have a great deal of control over how they are managed and maintained [66]. Municipalities often have limited authority over the actions of private owners and may need to rely on education, incentives, and partnerships with heritage organizations and advocacy groups to encourage owners to preserve and protect heritage assets. In some

cases, city administrations may be able to use legal tools such as heritage easements, expropriation, or financial incentives such as tax credits to encourage owners to preserve heritage assets. However, these tools can be challenging to use and may not always be practical. While city administrations have some power and authority to manage heritage assets within their jurisdiction, they must often work within legal and practical constraints and rely on a range of partnerships and incentives to encourage private owners to preserve and protect these critical resources [66].

2.8. Knowledge Gap: Support Services within the World Heritage Sites

There has been no extensive research to date that defines and describes urban-scale support services at WH sites. Urban FM is in the midst of establishing itself, and the research on support services in the context of WH sites has the potential to contribute to the intensification of discussions aimed at strengthening Urban FM as the expansion of building-level FM. The research on support services in the context of WH as a gap in knowledge also highlights the need for further research in developing effective strategies for the sustainable management of WH sites as protected urban areas. Therefore, filling this knowledge gap will help to enhance our understanding of urban-scale FM and its critical role in preserving and promoting the cultural and historical significance of WH sites. Urban heritage facility management integrated both public (government-owned) and private (individual and corporate-owned) heritage assets within the core and buffer zone of the World Heritage site, with different level of flexibility and authority in managing such assets.

By elaborating on the scope and description of hard-FM and soft-FM provided by RICS and IFMA [67], a set of comparison tables was made to foresee possible comparable support services between building-level and urban-level facility management. Hard-FM mainly includes the maintenance and supervision of the built environment's physical assets, whereas soft-FM mostly encompasses the management of additional services. The infrastructures, air quality, structural aspects, plumbing, water supply, electricity, lighting, and telecommunication systems, fall under the hard-FM domain. The second category, soft-FM, comprises services such as catering, cleaning, waste management, gardening, security, and so on [68]. Managing a WH site requires a more specific approach because the provided urban-scale support services affect both private and public heritage assets, while at the same time must be oriented toward preserving authenticity, visual quality, and, most importantly, the outstanding universal values that distinguish WH sites from other urban heritages and historical cities.

3. Methods and Research Design

This study attempted to create a narration of what a "core business" of a city actually is in order to be able to propose urban scale supporting services needed to be delivered, especially within the WH sites, to ensure the preservation of outstanding universal values (OUV), authenticity and visual quality as a heritage asset. The term "city" is used extensively in this study since it is considered to be a universal terminology in expressing other terms, such as urban and town, in a more contextualized manner when describing urban-scale facility management. In order to do that, a literature review and a narrative approach were conducted. A desk review was conducted by reviewing literature related to the purpose of a city, the city as an organization, and the city as an institution to determine the general concept of the core business of a city. A narrative approach is needed to be carried out due to the lack of intensive academic discussion regarding urban-scale support services due to the unclear core business of what a city should achieve. Several opinions from urban experts, historians, scholars, etc., are summarized in a narrative to simplify and justify the concept of the "core business" of a city, which will later provide a way to answer what support services are needed to achieve the primary goal of establishing the city. Using a literature review and narrative research approach from the experts and available journal articles and books, this study seeks to shed light on potential explanations for a city's "core business". A narrative is a method of writing that depicts an event sequence

that has significance for the narrator or the audience [69,70]. Moen [69] argued that the narrative method is a "frame of reference," which is a form of presenting the research work. The narrative approach is situated within the qualitative or interpretive research method (Gudmundsdottir in [69]). Such a qualitative methodology to the subject of study entails that scholars examine subjects in their normal daily contexts, aiming to understand some things based on the interpretations that the narrative speakers described [69,71].

While a narrative approach has the strength to (1) provide a deeper understanding of the experiences and perspectives of different respective narrators that might not be possible to accomplish using other methods, (2) provide valuable context to help explain certain unformulated concepts, (3) recognize the individuality of narrators and allow them to share their unique perspective on the subject matter in their own words, (4) identify patterns, themes, and meanings that interacted across narrators, and (5) identify patterns, themes, and meanings that may not be apparent through other research methods, the selected approach also has several weaknesses, such as the subjective nature of interpreting the narrators' statements and the limited generalizability of the results [69]. Furthermore, we acknowledge that some degree of simplification is considered necessary within this study in order to make the comparison feasible and understandable, while avoiding oversimplification by using IFMA's parameters as the basis argument to construct the comparison table.

Defining the "core business" of a city, thereby describing its support services, required such approaches to enhance a broader audience's comprehension across many disciplines, thus stimulating more in-depth inter-disciplinary discussions. In addressing the second research question, several sets of side-by-side comparison matrixes are created between building-level FM and urban-scale FM support services to make it easier for the audience to understand the context and to facilitate a more structured discussion of potential urban-scale supporting services. Another category is being added to elaborate the possible supporting services within the WH sites context. Utilizing prior knowledge and data obtained from the Norwegian WH sites' caretakers, this study attempts to minimize bias and interpretation of the possible support services within the urban level and WH sites' frame of reference in comparison with the building level FM. However, the comparison conducted is not claimed to represent established support services framework in the field; rather, it acts as a preliminary study that requires and will undergo additional development.

4. Results

This study indicated that a city is, to some extent, comparable to a single building or complex of buildings in terms of managing its facilities (Table 1).

Table 1. Justification of the comparability between a building and a city.

Narration	Author(s)	Reference(s)
City as a building or megastructure	Barnet (1986), Caffaroni (2016), Chizzoniti (2018), Koehler (2019), Bettman (2019), Vermeulen (2020)	[2,4–6,20,21]
A city is not a building, although it is acknowledged that the minimalist design of urban plazas has its origins in the architectural interior design of buildings	Lenzholzer (2008)	[46]
City as an organization	Lang (2000), Dickerson (2003), Knox (2010), Shade (2020)	[26–29]
City as an institution	Richard (2011), Canniffe (2016), Ruwet (2017), Ismard (2018), Komberger (2021), Duplouy (2022)	[7–12]
The analogy between urban design and (building-level) facility design	Nijkamp (2020)	[22]

It is evident that a city is indeed a physically built environment that requires organizational function that integrates people, places, and processes within its boundary. The core business of a city should then be placed at the central point of the realm of urban-scale facility management. To achieve the city's primary goal, the in-house teams and the outsourced task forces should deliver excellent hard-FM and soft-FM services. The users and the stakeholders simultaneously act as the "owner" of the facility within the domain of co-governance, co-ownership, and civic engagement (Figure 1).

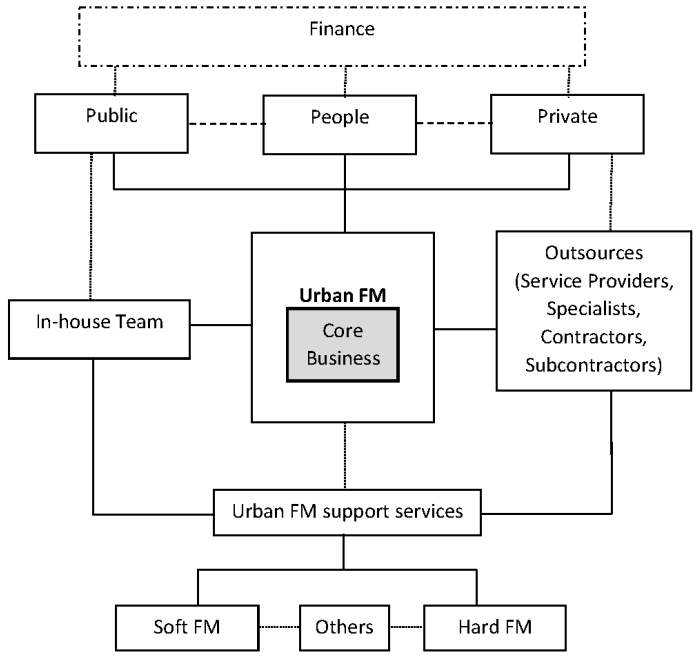


Figure 1. The position of the city's core business and the support services of Urban FM. Source: Adapted from the UFM organization model [72].

The term "public" refers to the governing and heritage authorities, whereas "private" refers to business entities, corporations, businesses, and private sectors. Meanwhile, "people" refers to the inhabitants, residents, citizens, and other stakeholders outside of the "public" and "private" stakeholder categories. The financing system for urban development may involve public, private, and community partners, among others. Public–private partnership (PPP) and public–private–people partnership (PPPP) are means of bringing these partners together to share the costs and benefits of urban development projects. In a PPPP, the public, private, and community sectors work together to develop and finance projects that serve the public interest. This may include the development of infrastructure, social housing, public transportation, and other urban amenities. Typically, the public sector finances PPPPs through direct financing or by providing incentives to private sector partners. Private sector partners, such as developers and investors, contribute capital and expertise to the undertaking. Community groups can also play an important role by providing local expertise and support, as well as by contributing financially. The specific financing arrangements for a PPPP will vary based on the project and participating partners. In some instances, the public sector may provide the majority of funding, whereas private

sector partners may contribute more to other aspects. PPPPs can be an effective method of financing urban development projects because they combine the resources and expertise of multiple partners to create community-beneficial public goods. However, it is essential to ensure that PPPPs are transparent, accountable, and serve the public interest, not just the private sector partners' interests.

The quality of the individuals that a city intends to attract is considered crucial because the positive qualities such as skills, assets, and values of the people who will become the new citizens will be directly linked to the improvement of the society. The city is implicitly not interested in attracting "low-quality" newcomers, which will burden the municipality and taxpayers. This study then suggests that a city's primary objective is to maintain and possibly attract new "desirable" citizens through the provision of excellent services, a quality-built environment, a sense of well-being, health, safety, security, and economic growth (Table 2). Therefore, the integration of urban-scale support services must be aligned with the "core business" of the city.

Table 2. Collection of narratives to emphasize the common purpose of a city.

Purpose of a City	Author(s)	Reference(s)
A city should be in the business of caring for and nurturing human beings	Gilliam (1967)	[73]
A city is a place for humans to dwell, with primary functions to provide housing and boost productivity by actively providing citizens with food, clean water, sanitation, and other essentials	Davis (1973), Harper (1992)	[74,75]
How important it is for a city to produce responsibility-seeking citizens	Kemmis (1995)	[76]
The purpose of why a city exists is to create citizens	White (2010)	[77]
A city is a community/social structure with distinctive social qualities and uniqueness that promotes work and occupations by enabling labor, production, and commodity circulation and consumption	Morshed (2019)	[78]

For example, the "core business" of a historical city or urban heritage area would be to maintain its inhabitant to dwell, and probably attract new dwellers who are interested in living in, and thus contributing to, the heritage conservation by providing support services that ensure the preservation of the heritage significance, value, and authenticity [23]. Meanwhile, the "core business" of an industrial city would probably be in maintaining the existence of laborers, workforces, business owners, and investors as the stakeholders by providing support services such as integrated infrastructures, power, access to capital, transport, and market to enhance efficiency.

5. Discussion

5.1. Purpose of a City

Kemmis [76] highlighted how essential it was for cities to generate a few responsibility-seeking citizens. Regarding the existence of citizens in connection to the sustainability of the city and the need for the city to be organized and governed, Otis White, an urban expert, shares a similar viewpoint. It appears that the urbanist was influenced by Peter Drucker's views on the fundamental concept of the corporation, in which Drucker argued that the only valid definition of corporate business purpose is customer creation [77,79]. Other things, such as profit, employment, etc., are the byproducts of creating customers, not the objectives. Customers are the reason for the existence of a business because, without them, there would be no profits, jobs, or social value. Therefore, the primary focus of every business entity should be on generating customers [79]. Otis White then proposed that the purpose of why cities exist is to create, and thus maintain, citizens [77]. Because without

citizens, there would be no economic growth, arts, entertainment, or educational facilities. It is argued that the actual purpose of cities is to generate a group of individuals who will bear responsibility for their community, whether through direct participation in city management or other means [76,77]. In other words, citizenship is described as a form of "participation" rather than "membership" [12]. The citizens' primary characteristics are the commitment to participate and take on responsibility.

In the past, when cities were surrounded by vast amounts of unmanaged territory and where predators were prevalent, life was dangerous and frequently brief. Once they established urban settlements, they frequently discovered that the predators had followed, and life continued being threatened like before. The possibility of invasions and wars from other outsider parties was also enormous. At this point, the creation of actual citizens emerged. The people sacrificed some individuals' freedoms in exchange for greater freedom from threats. The inhabitants then collaborated to establish a sense of community safety and security. Cities are governed by explicit regulations, which are agreed to by their citizens. Economic benefits are the result of collective action. Still, such activity is only achievable with the collaboration and a sense of safety and security provided by themselves toward common goals for the benefit of all.

Lewis Mumford (in [73]) proposed that a city should be in the business of caring and nurturing human beings. This statement is strongly aligned with urban-scale facility management, which is a people-oriented discipline. This condition becomes unique when the protected urban heritage area is considered a living artifact, with living people and activities inside, not merely lifeless monuments or archaeological artifacts. Historic cities, urban heritage areas, and WH sites such as Røros, Rjukan, and Notodden, in Norway, for example, must continue to operate and function for caring and nurturing the citizens in their daily lives while continuously maintaining the significance, visual qualities, authenticity, and OUV, with the technological advancements, and physical development to ensure the highest quality of life for the citizens. Therefore, Gilliam [73] also argued that a city charter needed to be established to enable the citizens of a particular community to manage their public affairs, conduct their corporate business, and develop their well-being.

Harper [75] makes an additional critical point on the real purpose of a city, namely as a place for humans to dwell. Otis White has denied that the purpose of the city is to provide a location for people to be organized, educated, and entertained [77]. Still, Harper [75] did not rule out this possibility. Additionally, Morshed [78] attempts to distinguish a city as a community through its distinctive social qualities and uniqueness. The definition of a city as a "concentration of numerous people positioned near together for residential and productive purposes" includes several objective characteristics, such as population density and number of residents [74]. However, more importantly, Davis [74] emphasized that the primary function of a city is to provide housing and boost the productivity of its citizens. The city then employs resources and generates outputs to achieve its goals. Thus, consequently required to be appropriately managed.

5.2. Tackling the Challenges in Urban-Scale World Heritage Sites Conservation

In order to preserve urban-scale heritage assets while at the same time developing cities to meet current living standards and urban facility management services, it is essential to adopt a comprehensive and integrated approach involving multiple stakeholders, such as government agencies, urban planners, heritage professionals, local communities, and private sector actors [39]. Based on the Historic Urban Landscape (HUL) approach, recommended by UNESCO, several strategies can be used to preserve urban-scale WH in the face of development pressures, such as integrating WH conservation management into the urban planning, engaging the local communities in the preservation, implementing the sustainable tourism strategy, using the technology to monitor and manage WH sites and develop partnerships among the stakeholders.

Heritage conservation should be integrated into urban planning, so that heritage sites are not viewed as isolated entities but as part of the urban fabric. This approach

can help balance preservation with development. Local communities should be involved in heritage management, decision-making, and planning to ensure that their values and needs are taken into account [23]. Empowering local communities can also help build support for conservation efforts [38]. Sustainable tourism strategies should be developed to manage visitor numbers and mitigate the impact of tourism on heritage sites and local communities [38]. Technology such as sensors and the Heritage Building Information Modelling (HBIM) can be used to monitor and manage heritage sites and to identify potential risks or threats [80].

5.3. Urban-Scale FM and Its Supporting Services

The variety of support services for facilities is so extensive that it is frequently split into soft-FM and hard-FM services. Some services, such as cleanliness and trash management, are conducted daily, while others, such as maintenance services, may be performed less frequently. Other types of services can be planned based on the urgency of the situation. The key role of urban-scale FM in public sectors is to support the core business activities of the institution in accomplishing its objectives by reassuring end-user expectations, optimizing budgets and expenses, providing business continuity, ensuring legal and regulatory compliance, and so on [18]. The definition of FM as an integrated management of all non-core business services for buildings, space, and people, to operate and maintain the built environment introduced the emphasis on non-core activities, which refers to all the additional characteristics required to achieve an institution's core business [81]. The non-core services, although often not seen on the surface, serve a supporting role in achieving the institution's objectives.

The non-core services can be categorized as (1) utility services, (2) technical services, (3) application services, (4) financial services, (5) property or real estate services, and (6) auxiliary services [82]. All of them belong to the spectrums of hard-FM and soft-FM. However, depending on the organizational structure and building needs, not all FM services might be relevant to the core activities of the organization or city as the subject of this study [83].

FM is an essential aspect of building operations, and its principles and practices have been increasingly adopted by cities and municipalities as they seek to manage and maintain their urban infrastructure and services. The transformation of FM to the urban level, known as Urban FM, involves applying FM principles and practices to the management and maintenance of urban-scale assets, such as public buildings, transportation systems, public spaces, and utilities. Urban FM requires a holistic approach to urban management that takes into account the interdependencies between different systems and services, and the need to manage these assets in a coordinated and integrated manner. Urban FM is closely related to urban governance, which refers to the structures, processes, and actors involved in the management of urban areas. Effective urban governance requires collaboration and coordination between different departments and stakeholders, as well as a shared vision and goals for urban development. Urban FM can contribute to effective urban governance by providing a framework for the management and maintenance of urban infrastructure and services, and by promoting collaboration and coordination between different departments and stakeholders.

Within Urban FM's scope, the urban scale support services, which are dispersed within various in-housed technical departments and outsourced third parties, were then defined after the domain of the core business of a city was determined. Urban-scale facility managers will organize the various services within different technical departments/bodies using a comprehensive and coordinated approach. This study argues that the main purpose of the existence of a city is to maintain the existing citizens and attract newcomers who possess positive traits such as skills, assets, and values to contribute further to the collective well-being of the overall dwellers of the city. In other words, a city prefers to attract new citizens with "desirable" characteristics. This terminology is unrelated to concepts of exclusion and discrimination. Rather, it refers to the fact that every city and country

expects "high-quality" citizens who are non-violent and non-criminal, bring resources, and exhibit good behavior [84,85]. This study did not suggest excluding refugees, the elderly, the poor, or potential new citizens with other non-inadmissible characteristics, which are the "undesirable" type of newcomers with criminal records, insufficient funds, and security concerns [86]. However, despite a city's desire to attract "desirable" citizens, it is difficult to prevent the arrival and urbanization of people who wish to enter and reside in a city, as opposed to the crossing of a nation's border, where security measures are in place to prevent "undesirable" newcomers.

The "byproducts" of maintaining responsibility-seekers citizens and other "desirable" type of inhabitants are providing housing, food, water, electricity, and all other basic need and luxurious things only found in an urban area for the citizens. They are becoming consequences and necessities for the city to keep the citizens satisfied. Several crucial factors in maintaining the population to stay, such as economic, social, environmental, and cultural factors, can be planned, executed, evaluated, and improved. However, there are other factors, such as natural disasters, that can only be mitigated and not eliminated. The negative effects of global warming are also a unique phenomenon since they cannot be resolved at the municipal level alone; rather, they require global action. However, cities that fail to retain the existence of their residents as significant actors in the urban ecosystem will inevitably be abandoned and cease to exist.

The preference for urban living can be linked to the concept of basic needs, which generally are provided by cities. Maslow's hierarchy of needs theory suggests that individuals have a hierarchy of needs, starting with basic physiological needs such as food and shelter and progressing to higher-level needs such as self-actualization [87]. Urban areas often provide greater access to these basic level needs, making them attractive to individuals seeking to fulfill their basic needs. Additionally, cities' social and cultural amenities can help individuals fulfill their higher-level needs for social interaction, creativity, and personal growth. Furthermore, cities offer greater access to job opportunities, a wider range of social and cultural activities, and better infrastructure and public services. Cities also attract people due to their diversity and vibrancy of urban life, which can provide a sense of excitement and energy that is not easily found in rural areas.

Several established theories support the idea that people prefer to live in cities compared to rural areas. One of the most well-known theories is the "pull" theory of urbanization, which suggests that people are attracted to urban areas due to the economic opportunities and higher standard of living that cities offer [88]. According to this theory, people are drawn to cities because of the availability of jobs, higher wages, better healthcare, education, and cultural amenities. Another theory is the "human ecology" theory, which emphasizes the role of environmental factors in shaping human behavior and social organization. According to this theory, cities provide a more favorable environment for human habitation than rural areas, as they offer greater access to resources, services, and social networks [89]. Furthermore, the "social exchange" theory suggests that people are attracted to cities because of the social and cultural benefits that cities offer. Cities provide a diverse range of social opportunities, such as access to a wider range of leisure activities, cultural events, and social networks [90]. These factors can contribute to a higher quality of life and a sense of belonging for city dwellers.

The provision of these basic needs is important for cities to retain their residents and maintain a sustainable urban ecosystem. The reason for this is that individuals are more likely to stay and thrive in cities that provide for their basic needs. However, what is considered as basic needs may vary based on different contexts and communities. For example, in some regions, access to electricity or the internet may be considered a basic need, whereas, in others, it may not be as essential. It is crucial for urban planners and policymakers to consider the specific needs and priorities of different communities when defining what is considered as basic needs.

5.4. Possible Support Services

Although RICS and IFMA emphasized that the distinction between soft-FM and hard-FM services is arbitrary and often generates confusion and the risk of impeding good practice in the integration of services and the formation of a customer-focused FM delivery team, both "hard" and "soft" services are necessary for effective asset management outcomes, which is not the least of the problems with this division [67,83].

The hard-FM supporting services within building-level FM provide insight into recognizing similar services within urban-scale FM (Table 3). The plumbing system within a building, including the clean, grey, and black water management, for example, resembles similar urban infrastructure such as a clean water distribution system, sewage system, and the management of urban industrial and black water. The municipality will almost certainly have its inhouse-team to manage some particular aspects, but the other municipalities would likely outsource the design, construction, and maintenance of such infrastructures. Similar services such as lighting, electricity and energy management, and telecommunication infrastructures are comparable in building-level and urban-scale FM. Heating, ventilation, and air conditioning (HVAC) as one of the important hard-FM supporting services were rather difficult to find the urban-level comparison, but it is argued that urban heat management could be suitable to be considered [91–93]. Several WH sites outsourced the district heating, electricity, energy management, and telecommunication infrastructures to private companies, while their technical departments managed most of the other hard-FM support services. However, the design, construction, and maintenance of the provided support services must comply with the heritage regulation and UNESCO's World Heritage guidelines.

Table 3. The possible hard-FM support services.

Building Level	Urban Level	World Heritage Sites *
HVAC systems	Urban heat management	District heating and cooling, district heat management
Electrical power supply	Power provider/plantation	Power provider
Energy management	Energy management	Energy management
Water supply	Raw water/clean water production	Water supply
Plumbing system—clean water	Clean water/drinking water system	Clean water/drinking water system
Plumbing system—grey water and sewage disposal	Urban sewerage system	District sewerage system
Plumbing system—black water and septic tank	Industrial waste and black water system	Black water system
Drainage system	City drainage and flood control system	Neighborhood/district drainage and flood control system
Building structures	Urban structures	Urban heritage structures
Building partitioning	Urban partition/division	Core zone and buffer zone
Building fabric	Urban fabrics	Urban heritage visual quality
Fixtures and fittings	Urban furniture and street furniture	Urban heritage furniture and street furniture
Lighting	Public lighting	Indoor, outdoor, and public lighting
Telecommunication and data cabling	Telecommunication infrastructures	Telecommunication infrastructures

* Comply with the conservation regulations.

Soft-FM encompasses service aspects that promptly affect customers and other service users. This vast scope typically covers the services mentioned in Table 4. These building-level support services are then expanded to the urban level to open up new possibilities and start an academic discussion. Meanwhile, managing soft-FM support services in urban-

scale WH sites involves several unique challenges, including maintaining the authenticity of the heritage site, meeting the needs of visitors and residents, ensuring sustainability, and managing the resources effectively. Unlike FM and Urban FM, the urban heritage facility management (UHFM) practices at WH sites tend to prioritize authenticity over efficiency.

Table 4. The possible soft-FM support services.

Building Level	Urban Level	World Heritage Sites *
Building cleaning and janitorial services	Urban/city cleaning	Neighborhood/district cleaning/hidden trash containers
Catering and retail services	[Traditional] market and urban scale retailer	The traditional seasonal market, tourist-oriented shop/retailer
Guarding and security	Police department	Conservation law, enforcement task force, municipal police, public-order enforcers, enforcement agent
Mail room, courier service, and logistics	Post office and city logistic management	Post office (optional)
Receptionist, lobby	City hall	The main square
Conference services and command center	City command center	District command center
Switchboard (electrical distribution system)	Electricity distribution system/power-grid	Hidden electrical panel/equipment, underground electricity distribution
Facilities helpdesk/service desk	City hotline/helpdesk	Conservation helpdesk
Internal horticulture, garden, yard, pot, vase	Park, garden, city forest, urban farming	Protected heritage park, garden, void, cemetery
Vehicle fleet management	Transportation system	Connection with the general transportation system
In-building transport (elevator, escalator, etc.)	Inner city transportation	District sustainable transportation system, in-building transport
Inter-building transportation	Intercity/inter-regional transportation	Heritage funicular, travelator, shuttle/site transportation
Garage and parking	Public parking	Preservation-oriented parking lot

* Comply with the conservation regulations.

Furthermore, RICS and IFMA [67] pointed out that several other characteristics of FM, nevertheless, do not fall into this dichotomy between "hard"-FM and "soft"-FM services (Table 5). These characteristics are particularly relevant in the context of managing urban-scale WH sites, especially concerning strategic planning, sustainability, health and safety, and smart urban heritage concepts. FM's "other" support services are essential to consider in managing urban-scale WH sites. By considering these characteristics, urban-scale facility managers can ensure that the heritage site is managed in a way that supports its cultural and historical significance, promotes sustainability, protects the health and safety of visitors and employees, and embraces the smart city concept in managing historic districts.

Table 5. The "other" possible support services.

Building Level	Urban Level	World Heritage Sites *
Environmental management	Urban environmental management	Heritage environmental management
Health and Safety	Urban health and safety	Urban heritage health and safety
Document archiving	Municipality/regional archiving	Heritage documentation, archiving, digitization, digitalization
New construction and maintenance	Urban development and maintenance	Preservation, Restoration, Reconstruction, Adaptation
Moves, relocation, and renovation	Urban regeneration	Urban heritage refurbishment

Table 5. *Cont.*

Building Level	Urban Level	World Heritage Sites *
Workplace design	City planning (general/detail city-spatial/layout plan)	Urban heritage design/development guidelines comply to the historic urban landscape (HUL) approach
Real estate management	Land use and public asset management	Strategic heritage plan (SHP)
Small works project management	Urban project management	Heritage project management
Grounds maintenance/landscaping	Urban-scale ground maintenance/ urban landscaping	Heritage landscaping
Pest control	Urban-scale pest control	Pest control
Waste management and recycling	Urban-scale waste management and recycling	Heritage-friendly (and tourist-friendly) waste management system
IT, information system (BIM) application software, license, service provider	IT, urban information system (UIM/CIM) service provider	HBIM, UHIM, HCIM
Smart building	Smart city	Smart Urban Heritage

* Comply with the conservation regulations.

There are more categories and possible services to ponder (Table 6) that might trigger discussion among the professionals and academics in the facility management field regarding the possible support service that could be provided to safeguard the "core business" of a city to maintain its citizens. In the context of urban-scale WH sites, communication and stakeholder engagement are essential to ensure that visitors, residents, and local authorities are engaged in managing the protected heritage sites. UHFM also involves managing the financial resources associated with managing urban heritage facilities, such as budgeting, forecasting, and monitoring financial performance to ensure the protection of the WH status of the sites.

Table 6. The extended possible support services to consider.

Building Level	Urban Level	World Heritage Sites *
Procurement	Public procurement	Public procurement
Finance and budgets	Urban-level finance and budgets	Heritage cost management
Public facility (restroom, nursing room, praying room, smoking area, etc.)	Public facilities	Heritage-friendly public facilities
Universal design and accessibilities	Universal design and accessibilities	Customized universal design and accessibilities
Corporate social responsibility (CSR) and public–private partnership (PPP)	Urban-scale CSR, PPP, and public–private–people partnership (PPPP)	Urban heritage-related CSR, PPP, and PPPP

* Comply with the conservation regulations.

Instead of making an issue out of the "hard"-FM or "soft"-FM dichotomy, urban-scale facility managers should put more effort into combining supporting services based on the specific situations they confront. The most important factors to explore are the capacity to integrate the outsourcing service providers, professional positions, and specialists, increase employee and equipment utilization, and lower management overhead expenses. The WH coordinator will have to work closely to make sure that all of the possible support services in the WH sites are conducted in compliance with the heritage preservation regulations to maintain the outstanding universal values (OUV) embedded within the sites.

6. Conclusions

In conclusion, a city, which is to some extent comparable to a single or complex building in terms of managing its facilities, belongs to the scope of urban-scale FM. The integration of the urban-scale support services must then be aligned with the "core business" of the city, which is to maintain and attract "desirable" citizens, by providing a livable and functional environment for its inhabitants, visitors, and businesses. The urban-scale facility management of WH sites is crucial in achieving this purpose. Effective management FM requires all hard-FM, soft-FM, and other possible support services concerning strategic planning, sustainability, health and safety, stakeholder engagement, and financial management. Hard-FM support services, including building maintenance, utility management, and technical support, are required to maintain the WH site's physical infrastructure to a high standard. Soft-FM support services, such as cleaning, security, waste management, and landscaping, are necessary for the site to be safe, clean, and appealing to visitors. Soft-FM support services, such as cleaning, security, waste management, and landscaping, are necessary for the site to be safe, clean, and appealing to visitors.

By considering all of the aforementioned factors, urban-scale facility managers can ensure that the WH sites are being managed in a manner that safeguards the preservation of the authenticity, visual quality, outstanding universal values (OUV), and cultural and historical significance while also meeting the needs and demands of the stakeholders. Effective management of WH sites can contribute to the success and livability of a city while also providing future generations with unique and valuable cultural resources.

The findings suggest that cities act as governmental, economic, social, and cultural centers for their larger neighboring territories, with the primary goal of ensuring the well-being of their citizens; a group of individuals who are taking responsibility for making their community inhabitable. In WH context, the users and all of the stakeholders simultaneously act as the "owner" of the facility within the domain of co-governance, co-ownership, and civic engagement. However, different level of interventions should be applied carefully in managing private and public heritage assets within WH sites.

The suggested answer to the question of what is the "core business of a city," which led to the description of the possible urban-scale possible support services to be provided, is expected to trigger further academic discussion on this topic, since this study does not claim that the results, findings, and conclusions presented in this article are irrefutable. In order to obtain a more comprehensive understanding, this article invites stakeholders and academics to critique, develop, revise, and amend the definition of the city's "core business" and its possible supporting services mentioned in this study from different points of view or by going into the detailed aspects of the discussed possible support services.

The urban heritage conservations and urban-scale FM practitioners, experts, and academics will benefit from this study by understanding the importance of maintaining and attracting citizens, thus integrating and delivering excellent urban-scale support services tailor-made for the specified type of urban areas, especially the World Heritage sites.

Author Contributions: Conceptualization, B.N.P. and A.T.S.; methodology, J.L.; software, B.N.P.; validation, B.N.P., A.T.S. and J.L.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing—original draft preparation, B.N.P. and A.T.S.; writing—review and editing, B.N.P., A.T.S. and J.L.; visualization, B.N.P.; supervision, A.T.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Data sharing is not applicable.

Acknowledgments: This study is supported by the Department of Civil and Environmental Engineering, Faculty of Engineering, Norwegian University of Science and Technology (NTNU), the Directorate General of Resources for Science, Technology, and Higher Education, The Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia, and Diponegoro University.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Taylor, N. *Urban Planning Theory Since 1945*; Sage: London, UK, 1998; p. 192.
2. Caffaroni, S.; Busnelli, C. A City as a Building: New Thoughts and New Possibilities for Harvard. Master's Thesis, Politecnico di Milano, Milan, Italy, 2016.
3. Barnett, J. Redesigning the metropolis the case for a new approach. *J. Am. Plan. Assoc.* **1989**, *55*, 131–135. [CrossRef]
4. Koehler, D. Mereological Thinking: Figuring Realities within Urban Form. *Archit. Des.* **2019**, *89*, 30–37. [CrossRef]
5. Chizzoniti, D. The nature of cities. In *Cities' Identity through Architecture and Arts*; Routledge: London, UK, 2018; pp. 297–308, ISBN 1315166550.
6. Vermeulen, K. City Building. In *Conceptualizing Biblical Cities*; Springer: Berlin/Heidelberg, Germany, 2020; pp. 143–158.
7. Richard, J. In the Elites' Toolkit: Decoding the Initiative and Reference System behind the Investment in the Architecture and Decoration of Roman Nymphaea. *Facta A J. Rom. Mater. Cult. Stud.* **2011**, *5*, 65–100.
8. Canniffe, E. *The Politics of the Piazza: The History and Meaning of the Italian Square*; Routledge: London, UK, 2016; ISBN 1315554194.
9. Ruwet, C. The cities of Robert Ezra Park: Toward a periodization of his conception. In *The Anthem Companion to Robert Park*; Anthem Press: London, UK, 2017; pp. 201–223.
10. Ismard, P. Associations and Citizenship in. In *Defining Citizenship in Archaic Greece*; Oxford University Press: Oxford, UK, 2018; p. 145.
11. Kornberger, M.; Meyer, R.E.; Höllerer, M.A. Exploring the long-term effect of strategy work: The case of Sustainable Sydney 2030. *Urban Stud.* **2021**, *58*, 3316–3334. [CrossRef]
12. Duplouy, A. Hippotrophia as Citizen Behaviour in Archaic Greece. In *From Homer to Solon*; Brill: Leiden, The Netherlands, 2022; pp. 139–161. ISBN 9004513639.
13. Coelho, D.; Ruth, M. Seeking a unified urban systems theory. *WIT Trans. Ecol. Environ.* **2006**, *93*, 179–188.
14. Bröchner, J. Measuring the productivity of facilities management. *J. Facil. Manag.* **2017**, *15*, 285–301. [CrossRef]
15. Lindkvist, C.; Salaj, A.T.; Collins, D.; Bjørberg, S.; Haugen, T.B. Exploring urban facilities management approaches to increase connectivity in smart cities. *Facilities* **2021**, *39*, 96–112. [CrossRef]
16. *ISO 41011: 2017*; Facility Management–Vocabulary 2017. ISO: Geneva, Switzerland, 2017.
17. Atkin, B.; Brooks, A. *Total Facility Management*; John Wiley & Sons: Hoboken, NJ, USA, 2021; ISBN 1118655389.
18. Salaj, A.T.; Lindkvist, C.M. Urban facility management. *Facilities* **2021**, *39*, 525–537. [CrossRef]
19. Prabowo, B.N.; Salaj, A.T.; Lohne, J. Urban Heritage Facility Management: A Scoping Review. *Appl. Sci.* **2021**, *11*, 9443. [CrossRef]
20. Barnett, J. *The Elusive City: Five Centuries of Design, Ambition and Miscalculation*; HarperCollins Publishers: New York, NY, USA, 1986; ISBN 0064303772.
21. Bettman, M. Substantiate Structuralism: Give reason for preservation or transformation. Master's Thesis, Delft University of Technology, Delft, The Netherlands, 2019.
22. Nijkamp, J.E.; Mobach, M.P. Developing healthy cities with urban facility management. *Facilities* **2020**, *38*, 819–833. [CrossRef]
23. Prabowo, B.N. Urban Heritage Facility Management. Scholarly Community Encyclopedia. Available online: https://encyclopedia.pub/entry/15217 (accessed on 12 December 2022).
24. UNESCO. *Operational Guidelines for the Implementation of the World Heritage Convention*; UNESCO: Paris, France, 2019; pp. 1–177.
25. Blake, J. UNESCO's 2003 Convention on Intangible Cultural Heritage: The implications of community involvement in 'safeguarding'. In *Intangible Heritage*; Routledge: London, UK, 2008; pp. 59–87, ISBN 0203884973.
26. Dickerson, C.M. Corporations as Cities: Targeting the Nodes in Overlapping Networks. *J. Corp. Law* **2003**, *29*, 533.
27. Knox, H. Cities and organisation: The information city and urban form. *Cult. Organ.* **2010**, *16*, 185–195. [CrossRef]
28. Shade, J.; Wuertz, H. The City as Organization: Ethnography for Alternative Futures. In Proceedings of the Ethnographic Praxis in Industry Conference Proceedings, Melbourne, Australia, 19–24 October 2020; Volume 2020, pp. 129–148.
29. Lang, J. Learning from twentieth century urban design paradigms: Lessons for the early twenty-first century. In *Urban Planning in a Changing World*; Routledge: London, UK, 2000; pp. 78–97, ISBN 0429235747.
30. Foster, M. Urban education in North America: Section editor's introduction. In *International Handbook of Urban Education*; Springer: Berlin/Heidelberg, Germany, 2007; pp. 765–778.
31. Dijkstra, L.; Florczyk, A.J.; Freire, S.; Kemper, T.; Melchiorri, M.; Pesaresi, M.; Schiavina, M. Applying the degree of urbanisation to the globe: A new harmonised definition reveals a different picture of global urbanisation. *J. Urban Econ.* **2021**, *125*, 103312. [CrossRef]
32. Dijkstra, L.; Hamilton, E.; Lall, S.; Wahba, S. How Do We Define Cities, Towns, and Rural Areas. Available online: https://blogs.worldbank.org/sustainablecities/how-do-we-define-cities-towns-and-rural-areas (accessed on 12 December 2020).
33. Sjoberg, G. The origin and evolution of cities. *Sci. Am.* **1965**, *213*, 54–62. [CrossRef]
34. Adams, R.M. The origin of cities. *Sci. Am.* **1960**, *203*, 153–172. [CrossRef]
35. Badawy, M.K. *Developing Managerial Skills in Engineers and Scientists: Succeeding as a Technical Manager*; John Wiley & Sons: Hoboken, NJ, USA, 1995; ISBN 0471286346.
36. Rao, V.S.P.; Krishna, V.H. *Management: Text and Cases*; Excel Books: Delhi, India, 2009; ISBN 8174463178.
37. Alexander, K.; Brown, M. Community-based facilities management. *Facilities* **2006**, *24*, 250–268. [CrossRef]
38. Senior, C.; Salaj, A.T.; Vukmirovic, M.; Jowkar, M.; Kristl, Ž. The Spirit of Time-The Art of Self-Renovation to Improve Indoor Environment in Cultural Heritage Buildings. *Energies* **2021**, *14*, 4056. [CrossRef]

39. Xue, Y.; Temeljotov-Salaj, A.; Engebø, A.; Lohne, J. Multi-sector partnerships in the urban development context: A scoping review. *J. Clean. Prod.* **2020**, *268*, 122291. [CrossRef]
40. Salaj, A.; Gohari, S.; Senior, C.; Xue, Y.; Lindkvist, C. An interactive tool for citizens' involvement in the sustainable regeneration. *Facilities* **2020**, *38*, 859–870. [CrossRef]
41. Vukmirovic, M.; Gavrilović, S. Placemaking as an approach of sustainable urban facilities management. *Facilities* **2020**, *38*, 801–818. [CrossRef]
42. Jokilehto, J. Considerations on authenticity and integrity in world heritage context. *City Time* **2006**, *2*, 1.
43. Wienberg, J. The past is everywhere. In *Heritopia*; Lund University Press: Lund, Sweden, 2021; p. 336, ISBN 9198469940.
44. Smith, N. Classic projects: Relocation of Abu Simbel. *Eng. Technol.* **2011**, *6*, 112–113. [CrossRef]
45. Logan, W. Cultural diversity, cultural heritage and human rights: Towards heritage management as human rights-based cultural practice. *Int. J. Herit. Stud.* **2012**, *18*, 231–244. [CrossRef]
46. Lenzholzer, S. A city is not a building–architectural concepts for public square design in Dutch urban climate contexts. *J. Landsc. Archit.* **2008**, *3*, 44–55. [CrossRef]
47. Ryan, J. Intangible cultural heritage: The new frontier of destination branding. In *Ideas in Marketing: Finding the New and Polishing the Old*; Springer: Berlin/Heidelberg, Germany, 2015; pp. 388–390.
48. Idris, M.Z.; Mustaffa, N.B.; Yusoff, S.O.S. Preservation of intangible cultural heritage using advance digital technology: Issues and challenges. *Harmon. J. Arts Res. Educ.* **2016**, *16*, 1–13. [CrossRef]
49. Munjeri, D. Tangible and intangible heritage: From difference to convergence. *Museum Int.* **2004**, *56*, 12–20. [CrossRef]
50. Ripp, M.; Rodwell, D. The geography of urban heritage. *Hist. Environ. Policy Pract.* **2015**, *6*, 240–276. [CrossRef]
51. Prabowo, B.; Salaj, A. Identifying Overtourism Impacts on the Informal Sector's Livelihoods in Urban Heritage Area. In Proceedings of the IOP Conference Series: Earth and Environmental Science PAPER, Surakarta, Indonesia, 24–25 August 2021; Volume 738, p. 012044.
52. Steinberg, F. Conservation and rehabilitation of urban heritage in developing countries. *Habitat Int.* **1996**, *20*, 463–475. [CrossRef]
53. Timothy, D.J.; Nyaupane, G.P. Protecting the past: Challenges and opportunities. In *Cultural Heritage and Tourism in the Developing World*; Routledge: London, UK, 2009; p. 22.
54. Gallina, V.; Torresan, S.; Critto, A.; Sperotto, A.; Glade, T.; Marcomini, A. A review of multi-risk methodologies for natural hazards: Consequences and challenges for a climate change impact assessment. *J. Environ. Manag.* **2016**, *168*, 123–132. [CrossRef]
55. Bosher, L.; Kim, D.; Okubo, T.; Chmutina, K.; Jigyasu, R. Dealing with multiple hazards and threats on cultural heritage sites: An assessment of 80 case studies. *Disaster Prev. Manag. An Int. J.* **2020**, *29*, 109–128. [CrossRef]
56. Nasser, N. Planning for urban heritage places: Reconciling conservation, tourism, and sustainable development. *J. Plan. Lit.* **2003**, *17*, 467–479. [CrossRef]
57. Van Oers, R.; Pereira Roders, A. Historic cities as model of sustainability. *J. Cult. Herit. Manag. Sustain. Dev.* **2012**, *2*, 4–14. [CrossRef]
58. Wager, J. Environmental planning for a world heritage site: Case study of Angkor, Cambodia. *J. Environ. Plan. Manag.* **1995**, *38*, 419–434. [CrossRef]
59. Schlee, M.B. The role of buffer zones in Rio de Janeiro urban landscape protection. *J. Cult. Herit. Manag. Sustain. Dev.* **2017**, *7*, 381–406. [CrossRef]
60. Díaz-Andreu, M. Heritage values and the public. *J. Community Archaeol. Herit.* **2017**, *4*, 2–6. [CrossRef]
61. Mydland, L.; Grahn, W. Identifying heritage values in local communities. *Int. J. Herit. Stud.* **2012**, *18*, 564–587. [CrossRef]
62. Spennemann, D.H.R. The Shifting Baseline Syndrome and Generational Amnesia in Heritage Studies. *Heritage* **2022**, *5*, 2007–2027. [CrossRef]
63. Spennemann, D.H.R. The usefulness of the Johari Window for the Cultural Heritage Planning Process. *Heritage* **2023**, *6*, 724–741. [CrossRef]
64. Ringbeck, B. *Management Plans for World Heritage Sites: A Practical Guide*; German Commission for UNESCO: Bonn, Germany, 2008.
65. Little, W.E. Façade to street to façade: Negotiating public spatial legality in a World Heritage City. *City Soc.* **2014**, *26*, 196–216. [CrossRef]
66. Prott, L.V.; O'Keefe, P.J. 'Cultural heritage'or 'cultural property'? *Int. J. Cult. Prop.* **1992**, *1*, 307–320. [CrossRef]
67. Wilson, D. *Strategic Facility Management Framework*, 1st ed.; The Royal Institution of Chartered Surveyors (RICS) and International Facility Management Association (IFMA): Houston, TX, USA, 2018; ISBN 978 1 78321 235 4.
68. Kulatunga, U.; Liyanage, C.; Amaratunga, D. Performance measurement and management in facilities management. *Facilities* **2010**, *28*. [CrossRef]
69. Moen, T. Reflections on the narrative research approach. *Int. J. Qual. Methods* **2006**, *5*, 56–69. [CrossRef]
70. Bell, A. A narrative approach to research. *Can. J. Environ. Educ.* **2003**, *8*, 95–110.
71. Dean, R.G. A narrative approach to groups. *Clin. Soc. Work J.* **1998**, *26*, 23–37. [CrossRef]
72. Larato, F.; Bjørberg, S.; Amin, H. Urban facility management—Study on practices in regenerated urban. In Proceedings of the 4th Conference of Interdiciplinary Reserach on Real Estate, Trondheim, Norway, 12–13 September 2019; Bojan, G., Darja, K.G., Temeljotov Salaj, A., Eds.; Institute of Real Estate Studies: Trondheim, Norway, 2018; pp. 151–160.
73. Kemmis, D. *The Good City and the Good Life*; Houghton Mifflin: Boston, MA, USA, 1995; ISBN 039568630X.
74. Drucker, P. *Concept of the Corporation*; Routledge: London, UK, 2017; ISBN 1315080737.

75. White, O. The Purpose of a City. Available online: http://otiswhite.com/the-purpose-of-a-city/ (accessed on 12 September 2022).
76. Gilliam, H. The fallacy of single-purpose planning. *Daedalus* **1967**, *96*, S1142–S1157.
77. Harper, M. The city as a home for enterprise: Has anything changed for the informal sector? *Habitat Int.* **1992**, *16*, 143–148. [CrossRef]
78. Morshed, A.Z. *Debunking the Smart-City Myth*; The Daily Star: Dhaka, Bangladesh, 2019.
79. Davis, R.H.C. The Ford, The River and The City; Oxford, UK. 1973. Volume 38. Available online: https://www.oxoniensia.org/volumes/1973/davis.pdf (accessed on 28 February 2023).
80. Prabowo, B.N.; Hjelseth, E.; Temeljotov-Salaj, A. HBIM application in historic town: A scoping literature review. In Proceedings of the 14th European Conference on Product and Process Modelling (ECPPM 2022), Trondheim, Norway, 14–16 September; Eilif Hjelseth, S.F.S., Raimar, S., Eds.; CRC Press: Trondheim, Norway, 2023.
81. De Toni, A.F.; Nonino, F. The facility management: Non core services definitions and taxonomy. In *Open Facility Management: A Successful Implementation in a Public Administration*; Scuola Nazionale Servizi Foundation: Perugia, Italia, 2009; pp. 3–28.
82. Nur, N.M.; Musa, Z.N. Defining the current practice of facilities management service delivery in klang valley (KV) shopping centres. *J. Surv. Constr. Prop.* **2017**, *8*, 44–58.
83. Arampatzi, E.; Burger, M. Facility management services and employee well-being. *J. Facil. Manag.* **2020**, *18*, 109–130. [CrossRef]
84. Lebuhn, H. Local border practices and urban citizenship in Europe: Exploring urban borderlands. *City* **2013**, *17*, 37–51. [CrossRef]
85. Rome, S.H. Promoting family integrity: The Child Citizen Protection Act and its implications for public child welfare. *J. Public Child Welf.* **2010**, *4*, 245–262. [CrossRef]
86. Satzewich, V. Visa officers as gatekeepers of a state's borders: The social determinants of discretion in spousal sponsorship cases in Canada. *J. Ethn. Migr. Stud.* **2014**, *40*, 1450–1469. [CrossRef]
87. Kopackova, H. Reflexion of citizens' needs in city strategies: The case study of selected cities of Visegrad group countries. *Cities* **2019**, *84*, 159–171. [CrossRef]
88. Jedwab, R.; Christiaensen, L.; Gindelsky, M. Demography, urbanization and development: Rural push, urban pull and ... urban push? *J. Urban Econ.* **2017**, *98*, 6–16. [CrossRef]
89. Steiner, F. Urban human ecology. *Urban Ecosyst.* **2004**, *7*, 179–197. [CrossRef]
90. Zhang, R.; Zhang, Y.; Liu, X.; Yin, Q.; Yang, L. Analysis of the population displacement phenomenon under tourism economy development in Chinese historical areas: Based on Social Exchange Theory. *Int. Rev. Spat. Plan. Sustain. Dev.* **2017**, *5*, 86–103. [CrossRef] [PubMed]
91. He, B.-J.; Wang, J.; Liu, H.; Ulpiani, G. Localized synergies between heat waves and urban heat islands: Implications on human thermal comfort and urban heat management. *Environ. Res.* **2021**, *193*, 110584. [CrossRef] [PubMed]
92. Kleerekoper, L.; Van Esch, M.; Salcedo, T.B. How to make a city climate-proof, addressing the urban heat island effect. *Resour. Conserv. Recycl.* **2012**, *64*, 30–38. [CrossRef]
93. Lanza, K.; Stone, B., Jr. Climate adaptation in cities: What trees are suitable for urban heat management? *Landsc. Urban Plan.* **2016**, *153*, 74–82. [CrossRef]

(This page is intentionally left blank)

Appendix 3

heritage

MDPI

Article

Urban Heritage Facility Management: A Conceptual Framework for the Provision of Urban-Scale Support Services in Norwegian World Heritage Sites

Bintang Noor Prabowo [1,2,*], Alenka Temeljotov Salaj [1] and Jardar Lohne [1]

[1] Department of Civil and Environmental Engineering, Faculty of Engineering, Norwegian University of Science and Technology (NTNU), 7034 Trondheim, Norway; alenka.temeljotov-salaj@ntnu.no (A.T.S.); jardar.lohne@ntnu.no (J.L.)
[2] Department of Civil Infrastructure Engineering and Architectural Design, Diponegoro University, Semarang 50275, Indonesia
* Correspondence: bintang.n.prabowo@ntnu.no; Tel.: +47-4868-9764

Abstract: This study validated the theoretical keypoints obtained from a previously published scoping literature review within the context of three Norwegian World Heritage sites: Røros, Rjukan, and Notodden. The cross-sectional table of the urban heritage facility management (UHFM) framework, which is based on interviews and correspondence, demonstrates the connection between the tasks of the six clusters of technical departments responsible for the provision of urban-scale support services and the modified critical steps of the Historic Urban Landscape approach, in which an additional step for "monitoring and evaluation" was included. UHFM operates at the intersection of heritage preservation, urban-scale facility management, and stakeholder coordination, which requires a careful balance between urban heritage conservation and sustainable urban management practices, thus enabling the preservation of World Heritage status that, among others, fosters sustainable tourism. The three case studies highlighted the significance of UHFM in preserving heritage value, authenticity, visual quality, and significance. Besides providing comprehensive support services that extend beyond the daily tasks of conservators and World Heritage managers, UHFM also allows feedback mechanisms for continuous improvement. This study highlighted the complex relationship between the provision of urban-scale support services and the preservation of Outstanding Universal Value as the core business of World Heritage sites.

Keywords: urban facility management; support services; urban heritage; urban scale; conservation; World Heritage

Citation: Prabowo, B.N.; Temeljotov Salaj, A.; Lohne, J. Urban Heritage Facility Management: A Conceptual Framework for the Provision of Urban-Scale Support Services in Norwegian World Heritage Sites. *Heritage* **2024**, *7*, 1372–1399. https://doi.org/10.3390/heritage7030066

Academic Editors: Fátima Matos Silva and Isabel Vaz de Freitas

Received: 16 January 2024
Revised: 29 February 2024
Accepted: 7 March 2024
Published: 9 March 2024

1. Introduction

World Heritage (WH) sites are highly valuable assets to humanity because they represent universal value that goes beyond national boundaries [1–3]. To maintain the Outstanding Universal Value (OUV), as the prerequisite of preserving the WH status of protected sites [4,5] and complementary to the daily tasks of conservators, archeologists, academics, and heritage authorities [6], various technical departments in the municipality, county, and national level need to work together in a coordinated manner to achieve the common goals. In accordance with their primary responsibilities, conservators and cultural heritage authorities tend to prioritize the preservation of historic buildings, monuments, and OUV of heritage sites over providing urban-scale support services [7,8]. The delivery of these services is a crucial task that appears not to support conservation efforts directly. However, in order to determine the support services that are required to be provided, it is still crucial to have a comprehensive understanding of the "core business" of the WH site [6].

In the previous study, the scoping literature review of urban heritage facility management (UHFM) highlighted a few discussions and debates amongst academics and

practitioners around urban-scale facility management within urban heritage areas [9]. The previously examined literature mainly discussed facility management (FM) practices of single heritage buildings or a complex of buildings instead of urban-scale facility management (Urban FM). Meanwhile, works of literature in the Urban FM field did not explicitly address historic districts or urban heritage areas nor their relation to urban-scale conservation practices [6,9]. The phenomenon is understandable since Urban FM itself is still a relatively new field in its establishment phase, and it is an expansion of FM discipline within the urban context [10,11]. Most of the heritage-related articles from the examined papers refer to the Historic Urban Landscape (HUL) approach as the latest holistic approach to managing urban heritage [9,12,13]. Although widely recognized as an avant-garde approach, there are many uncertainties in interpreting the HUL approach's operable criteria at the regional and local governance levels [9,13,14]. Many aspects of such an approach could be explained and clarified better using FM and Urban FM as more technical disciplines for the technical departments in charge of providing and delivering urban-scale support services [9].

FM is a branch of management discipline that addresses the tools and services that support the functionality, safety, and sustainability of buildings, grounds, infrastructures, and real estate [9,15,16]. International Facility Management Association (IFMA) also proposed a new definition of FM as a profession, or discipline, that encompasses multiple disciplines to ensure the functionality of the built environment by integrating people, place, process, and technology [15,17,18]. This new definition allowed Urban FM to legitimately become an expansion of the FM discipline since Urban FM is a manifestation of urban-scale facility management. As the definition is applied to a single building, an urban area is also considered a built environment [6,19,20]. The new definition of FM by IFMA also made it possible for the HUL approach, as the latest conservation paradigm, to be incorporated into the Urban FM field since this holistic approach put the people—its main stakeholder—as an important part of the sustainable urban conservation process, especially in reaching consensus on what and how heritage assets should be preserved, within bottom-up heritage policy decision-making [6,9].

UHFM emerged from the expansion of the facility management (FM) discipline into urban-scale facility management (Urban FM) within the context of urban-scale heritage areas [6,9,16]. This development coincided with the emergence of a new paradigm in managing urban heritage areas and historic towns, known as the HUL approach, which was recommended by UNESCO in 2011 [13,21]. This approach advocates for a more holistic and inclusive strategy in managing heritage, aiming to balance the preservation of historical buildings and monuments with the evolving demands of urban development [22–24]. UHFM addresses the complex task of managing urban-scale support services in these unique types of heritage areas. The justification for UHFM establishment is supported by the dual requirement of safeguarding the WH sites' outstanding universal values while ensuring their sustainable development and stakeholders' well-being [6,9]. The HUL approach is a comprehensive framework highlighting the coexistence of heritage preservation and sustainable urban development [22,23]. The HUL approach acknowledged the significance of the historic town as a living environment and dynamic entity. In contrast, the UHFM framework expands on this philosophy by integrating it into the management of urban-scale facilities. WH sites, especially those with urban characteristics, require an advanced approach that goes beyond conventional heritage conservation [25,26], as they preserve exceptional cultural heritage values and attributes. UHFM, as an integration of the HUL approach and Urban FM, provides the opportunity to support the preservation of OUV through the excellent delivery of urban heritage-friendly support services.

UHFM focuses specifically on examining the complex aspects of managing facilities in the context of urban heritage. It acknowledges that the preservation of OUV is not an isolated task but one that requires a coordinated effort in managing various support services crucial for the daily operation of these areas. Thus, UHFM bridges the gap between preserving cultural heritage, ensuring urban functionality, and promoting collaboration among stakeholders. It offers a detailed and practical framework for effectively organizing

support services on a large scale in urban areas. Implementing UHFM into the management of historic towns has the potential to complement the conventional conservation measures undertaken by conservators and heritage authorities at various levels, nationally, regionally, and locally. This integration may deliver urban-scale support services that are in compliance with the preservation of OUV as part of the holistic approach recommended by UNESCO through the HUL approach [9,21].

The UNESCO recommendation proposed a paradigm shift in the preservation of historic buildings. Instead of solely focusing on the physical preservation of buildings and monuments, it suggests a broader approach that considers the entire human environment, including both tangible and intangible aspects, such as increased attention to the well-being of the dwellers in urban heritage areas [12,13,26]. This shift in paradigm, together with the emerging concepts of Urban FM as a people-oriented discipline, resulted in an adjustment of the provision of urban-scale support services in establishing a balance between the efficiency and effectiveness of service delivery while simultaneously preserving the heritage integrity and OUV of WH sites. Therefore, there is a necessity for a framework to implement urban heritage facility management that is capable of adapting to the dynamic characteristics of urban environments. This framework is essential for achieving a balance between preserving heritage values and meeting the demands and standards of modern society. By taking into account the roles and responsibilities of various stakeholders, technical departments, and governance structures, the UHFM framework serves as a tool that allows the involvement of urban-scale support services to contribute and align with the protection of the WH status of the areas under study.

Urban heritage facility managers' tasks extend beyond the routine tasks of conservators and heritage authorities. Support services that may not appear directly connected to historical aspects, in practical terms, might have significant impacts on the visual esthetics, cultural value, and the OUV of protected heritage sites. Tasks such as placing waste containers, choosing between cobblestone or asphalt for road construction, conducting excavation work for underground infrastructure, and installing street furniture in the protected core area of WH sites can present significant complexities. These challenges necessitate both heritage and technical skilled and knowledgeable human resources, which can be managed within the proposed UHFM framework in this study. The UHFM provides clear guidance for support service providers and technical departments, overcoming the difficulty of interpreting the HUL approach, which often showed itself to be confusing at the tactical and operational levels. UHFM operates at the intersection of heritage conservation, urban-scale facility management, and collaboration among stakeholders.

This study examines the complexities of UHFM by analyzing information gathered from three Norwegian World Heritage sites: Røros, Rjukan, and Notodden. The study takes a comprehensive approach, integrating insights obtained from interviews and correspondence with key individuals responsible for managing certain aspects of the studied World Heritage sites, including officials from technical departments, heritage authorities, and governmental bodies at the local, regional, and national levels. Document studies were conducted as an additional source to supplement the interviews and correspondences. The information collected provides valuable qualitative data, insights into challenges, achievements, and collaborative efforts related to managing urban-scale support services in urban heritage areas.

The primary objective of this study is to propose a conceptual framework for UHFM that effectively addresses the complexities of organizing urban-scale support services in World Heritage sites. In order to achieve this, this study aimed to address two research questions: (RQ1) "How can urban-scale support services be efficiently organized in an urban heritage area or World Heritage site by technical departments and other stakeholders, without compromising the Outstanding Universal Value (OUV), visual quality, authenticity, and significance of the protected heritage site?" and (RQ2) "How do the processes and coordination functions of urban-scale facility management support services contribute to preserving the World Heritage status of a protected urban heritage area, considering the

roles of multiple layers of governance, technical departments, stakeholders, and feedback mechanisms for continuous improvement?".

This study investigated the urban heritage facility management practices in the three Norwegian world heritage sites as the case study to validate the theoretical keypoints on how to conduct urban-scale facility management within urban heritage areas.

2. Methods

2.1. Research Design

This research undertakes three case studies in the Norwegian World Heritage sites: Røros Bergstaden, Rjukan Company Town, and Notodden Industrial Heritage area. The selection of case studies has gone through a long process by taking into account many factors, including representing urban heritage areas or historic towns and aspects of comparability, which makes them relevant to be studied to validate the theoretical keypoints obtained from the urban heritage facility management's scoping review process [9]. Urban heritage areas with World Heritage status were selected due to their compliance with international standards in conservation management and the implementation of a comprehensive periodic reporting system at the local, national, and international levels, thus ensuring the availability of standardized and structured data and documented information. Norway was selected as a nation to be studied based on its unique architectural characteristics, extensive experience in managing World Heritage sites, close proximity to the home base of this study research laboratory, well-established network, ease of access, and budget limitations. The main approach chosen was based on (1) semi-structured interviewing, (2) detailed correspondence with technical departments, and (3) document studies of the investigated cases. The results were organized according to (1) a clustering of technical departments and (2) the validation of the 33 UHFM theoretical keypoints.

The urban-scale support services that form the UHFM foundation in the World Heritage context [6] have been incorporated into corresponding technical departments at the municipality *(kommune)* level. Furthermore, interviews were conducted, and correspondences were exchanged with technical departments at the county *(fylkeskommune)* level regarding urban-scale service delivery at WH sites. As an illustration, the WH coordinator *(verdensarvkoordinator)* for Røros Bergstaden and its surrounding areas operates under the jurisdiction of the local municipality *(Røros kommune)* with some coordination function between counties *(verdensarvrådet)* where the circumference of Røros is situated, whereas the WH coordinators for Rjukan and Notodden operate under the organizational structure of the county level *(Vestfold og Telemark fylkeskommune)*. This study is aware that in 2020, Telemark County underwent a merger with Vestfold County to establish the new Vestfold og Telemark Fylkeskommune (VTFK). Nevertheless, in 2024, Telemark was again restored as a county. This study will use VTFK in conjunction with both Vestfold County and Telemark County, considering the specific timeframe of its data collection. In this study, it is noteworthy that all coordinators of WH sites in the Norwegian context collaborate closely with *Riksantikvaren*, the Directorate for Cultural Heritage of Norway. The support services were categorized into six clusters: planning and zoning, public works and infrastructure, tourism, conservation and cultural heritage, environment and sustainability, and urban safety and security. The data for this research were collected and analyzed employing the three selected Norwegian World Heritage sites as case studies and the six categories mentioned earlier. The 33 theoretical keypoints of UHFM, obtained from the UHFM scoping literature review [9], were utilized in this study to provide guidance for the development of interview protocols, correspondences, coding for qualitative analysis, and cross-sectional tables.

Røros Mining Town, located in Trøndelag County (Figure 1), was designated as a UNESCO World Heritage site in 1980 and extended to its circumference in 2010 due to its exceptional universal value under criteria (iii) for bearing unique witness to the adaptation of technology to the requirements of the natural environment and the remoteness of the situation, (iv) for illustrating in an outstanding manner how people adapted to the extreme

circumstances in which they had to live and how they used the available indigenous resources to provide shelter, produce food for their sustenance, and contribute to the national wealth of the country, and (v) for constituting a totality that is an outstanding example of traditional settlement and land use [27,28]. Røros is a remarkable reminder of a lost cultural tradition and an important period in Norwegian history. This picturesque mountainous mining town has been recognized for its well-preserved architectural ensemble, which reflects the socio-economic systems and mining practices of the 17th and 18th centuries, earning it a place on the World Heritage List. Røros, which is distinguished by wooden houses painted in traditional colors, is a remarkable example of how people have adapted to a harsh environment. It plays a crucial role in the Røros Municipality because the town is a thriving hub for community life, cultural traditions, and heritage preservation [28]. Røros is important to Trøndelag County, even outside of its immediate vicinity. It adds to the area's cultural diversity and draws tourists eager to experience the distinctive mining history and charming architecture that characterize this remarkable World Heritage site.

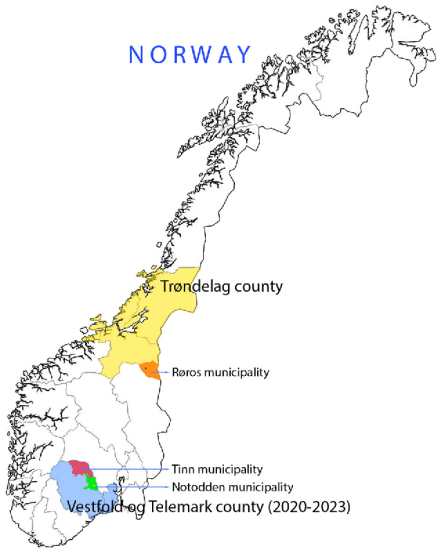


Figure 1. Location of Røros municipality (Trøndelag County) and Tinn and Notodden Municipality (Vestfold og Telemark County).

Meanwhile, an important period in Norway's industrial history is represented by the Rjukan and Notodden Industrial Heritage area, which was inscribed as a UNESCO World Heritage site in 2015. This cultural landscape in Telemark County was essential to the early 20th-century production of fertilizers through the use of hydroelectric power and nitrogen extraction [29,30]. The two towns, Rjukan and Notodden (Figure 1), show how human activity shaped the landscape and are prime examples of inventive industrial urban planning and architecture. This site is inscribed under UNESCO criteria (ii) for demonstrating an exceptional combination of industrial themes and assets tied to the landscape, which exhibit an important exchange on technological development in the early 20th century, and (iv) for its outstanding industrial ensemble comprising dams, tunnels, pipes, power plants, power lines, factory areas and equipment, the company towns, railway lines, and ferry service, located in a landscape where the natural topography enabled hydroelectricity to be generated in the necessary large amounts, stands out as an example of new global industry in the early 20th century [29,30]. This site serves as

a testament to the economic and social changes brought about by the development of hydroelectric power and industrialization. The Rjukan and Notodden Industrial Heritage area in Telemark is a living heritage site today, contributing to the identity of the area and drawing tourists eager to learn more about the industrial and architectural legacy of this distinctive cultural landscape.

2.2. *Data Collection*

The data needed for this study were collected from semi-structured interviews, exchanging correspondences, and document studies. The interviews and correspondences were conducted from 21 January 2022 to 30 December 2023 and were registered to and approved by the Norwegian Center for Research Data (NSD), which later merged with two other Norwegian organizations to establish the new Norwegian Agency for Shared Services in Education and Research (SIKT).

2.2.1. Semi-Structured Interviews

This study used in-depth semi-structured interviews to address the research questions adequately [31]. A predetermined interview protocol was created to ensure alignment with the research questions, and it has undergone pre-testing and peer review by an academic who also works as a researcher and has a particular interest in one of the World Heritage sites in Norway. The feedback was then integrated into the final interview protocol.

The interviewees were chosen based on their roles and/or administration function in the protected urban heritage sites. The main interviewees comprised eight individuals who have specialized knowledge in conservation and World Heritage site management in the Norwegian context, such as city antiquarians *(byantikvar)*, WH coordinators *(verdensarvkoordinator)*, academics, and staff members of the Directorate for Cultural Heritage *(Riksantikvar)* of Norway (Table 1). The *byantikvar* and *verdensarvkoordinator*, part of the technical department cluster responsible for cultural heritage and conservation in the municipality and county, were given special interviews as they agreed to do so. There are several challenges during the data collection, such as conflicted schedules, language barriers, and impracticalities due to the COVID-19 pandemic. It was then decided to conduct some of the interviews via online platforms (i.e., Zoom meetings, Google Meet, and MS Teams) to overcome most of the challenges. Two interviews were conducted in person, while the remaining six interviews were conducted through one-on-one meetings through live video conferences. Minutes of the meetings were taken, and voice notes and/ or video conferences were recorded with the interviewees' consent. Automatic transcription was generated and used to transcribe the interviews roughly, but further careful audio rechecks were conducted manually to guarantee the accuracy of the transcription. All interviews were recorded in both video and audio formats, except for the two physical interviews, which were recorded solely in audio format.

Table 1. Distribution of interviewees and correspondence.

Institution/Background	n	Knowledge		
		General	Heritage	Technical
Municipality (Kommune)	18	Yes	Some	Yes
County (Fylkeskommune)	7	Yes	Some	Yes
Academic/University	3	Yes	Yes	Some
National Authority (Riksantikvaren)	1	Yes	Yes	Some

2.2.2. Correspondence with Technical Departments

Nevertheless, a written correspondence method [32,33] was adopted to increase participation and data collection from the technical departments, especially regarding specific

tasks and support services. The correspondence technique was employed in this study due to the disinclination of the technical departments' resources to accept interview requests, resulting in low response rates during the initial data collection stage. One possible explanation for the low response rate is that the semi-structured interview material included with the interview request application was too broad for certain specific technical departments. This assumption can be drawn based on the frequent comments made during email correspondence, later, where they expressed their reluctance to address questions that belong to the responsibilities and expertise of other technical departments. However, questions related to the responsibilities, authorities, and duties of the respective departments and sections were addressed comprehensively by the contact persons during the follow-up email correspondence. Another possible cause is that language barriers, cultural differences, and the hectic work schedules of the interviewees in various technical departments at the municipality and county levels posed challenges, making conducting lengthy or repeated interviews impractical. As a result, the electronic correspondence method via email was adopted as a more effective and efficient substitute for the interviews. Questions that remained unresolved or those that generated intellectual curiosity needed by this study were investigated further through a series of exchanged emails. The follow-up inquiries were typically answered in written form with explanations or by providing URL links to relevant documents, reports, or official websites.

A more focused set of questions, specifically tailored to each technical department, was developed from the initial semi-structured interview questions. These inquiries were subsequently sent to the relevant technical department responsible for addressing the specific inquiry. Out of the 72 emails in total sent to the academics, *Riksantikvaren*, and various levels of technical staff in the municipality and county of the studied area, 28 emails were responded to and utilized for further communication and data collection for this study. Among those 28 replies, only 21 of them should be considered as correspondence since 7 of the other email responses agreed to participate in the interviews. Another interviewee was being contacted by phone (Tables 1 and 2). The correspondence data and archives were saved in PDF format and categorized based on the different labels and locations of the study case.

Table 2. Interviewees and correspondence coding.

		PLZ	PWI	TOU	CCH	ESU	USS
Røros (RO)	Røros kommune	RO-PLZ	RO-PWI	RO-TOU	RO-CCH	RO-ESU	RO-USS
	Trøndelag fylkeskommune	TR-PLZ	TR-PWI	-	TR-CCH	TR-ESU	-
	Academics	AC1, AC2	AC1, AC2	AC1, AC2	AC1, AC2	AC1, AC2	AC1, AC2
	Riksantikvaren	RI	RI	RI	RI	RI	RI
Rjukan (RJ)	Tinn kommune	RJ-PLZ	RJ-PWI	RJ-TOU	RJ-CCH	RJ-ESU	RJ-USS
	Vestfold og Telemark fylkeskommune	VT-PLZ	VT-PWI	-	VT-CCH	-	-
	Academics	AC3	AC3	AC3	AC3	AC3	AC3
	Riksantikvaren	RI	RI	RI	RI	RI	RI
Notodden (NO)	Notodden kommune	NO-PLZ	NO-PWI	NO-TOU	NO-CCH	NO-ESU	NO-USS
	Vestfold og Telemark fylkeskommune	VT-PLZ	VT-PWI	-	VT-CCH	-	-
	Academics	AC3	AC3	AC3	AC3	AC3	AC3
	Riksantikvaren	RI	RI	RI	RI	RI	RI

RO = Røros, RJ = Rjukan, NO = Notodden, AC = Academics, RI = *Riksantikvaren*/Directorate for Cultural Heritage, PLZ = planning and zoning, PWI = public works and infrastructure, TOU = tourism, CCH = conservation and cultural heritage, ESU = environment and sustainability, USS = urban safety and security.

The complete responses of the interviewees and correspondences were transcribed and utilized for analysis and coding in NVivo 12 Pro.

2.2.3. Document Studies

During the process of conducting interviews, some interviewees and correspondents occasionally supplied tools, data, information, files, and URL links to provide supplementary information pertinent to this study. Publicly available data were acquired from official websites through the Internet, online databases, and libraries (see Appendix B). The documents consist of nomination dossiers, periodic reporting, Planning and Building Acts, Cultural Heritage Acts, evaluation by advisory bodies, etc. The documents were examined for their capacity to provide a comprehensive analysis of existing records, plans, and reports related to World Heritage sites. Through careful examination of nomination dossiers, periodic reports, management plans, and other documents, researchers can discover valuable insights regarding the historical development, conservation strategies, and difficulties encountered by these sites. These documents serve as a basis for understanding the context, objectives, and recommended management practices for protecting the WH properties. Furthermore, conducting document studies allows for the detection of challenges, inconsistencies, or successes in implemented strategies, providing insights for future improvements [34]. The document studies also enabled this study to understand institutional knowledge, policy frameworks, and the interactions between stakeholders.

2.3. Data Analysis

The empirical analysis primarily relies on an iterative and inductive process [31,35] that involves reading, coding, interpreting, and re-evaluating the transcribed interview notes from the three case studies and their six technical departments. Additionally, it includes input from the national authority *(riksantikvaren)* and academics who have previously been involved or are currently working on the studied and specified World Heritage sites in Norway. The analysis of each case study involved the utilization of open and axial coding techniques in the NVivo 12 Pro environment. The author manually allocated codes, categories, or clusters to each interview during this stage. The coding process utilized the six crucial steps established by the HUL approach, including its additional last UHFM step, and the 33 theoretical keypoints of UHFM as guidance indicators. Furthermore, certain categories were employed in accordance with the research framework. The author and co-authors of this study internally reviewed each case study's coding and transcript. Last, the data were employed for cross-case analysis, pattern matching, grouping, and frequency analysis. In general, there was a strong confidence level in the accuracy of the spoken words during the interviews and the written responses in electronic correspondence.

In order to ensure a high degree of reliability, this study distinguished between construct, internal, and external validity [31,36]. Multiple sources are used for cross-case analysis to ensure construct validity, and a chain of evidence is established through transcripts, as well as visual data and documents presented during the interviews. In addition, the interview and correspondence protocol includes both open-ended and closed questions to ensure the accuracy and reliability of the answers. Internal validity is established by employing pattern matching and constructing explanations based on each individual case. In order to ensure external validity, this study employed a multi-case approach across three Norwegian WH sites, incorporating replication logic within each case. To ensure reliability, this study utilized a comprehensive database containing all interviews, correspondences, interview protocols, and audio and video recordings.

3. Results

3.1. UHFM Cross-Sectional Matrix

The process leading to developing the conceptual framework for urban heritage facility management exposed the complex interconnections and relationships essential for providing urban-scale support services within WH sites (see Appendix A). The cross-sectional table visualized the seven steps of UHFM with the six clusters of technical departments that are responsible for managing the strategic, tactical, and operational levels of urban-scale support services. The table contains a narrative representing the simplified and summa-

rized results of interviews and correspondence with the key stakeholders involved. This comprehensive matrix acts as the primary framework of the study, facilitating the broad spectrum of insights gathered during interviews and correspondence from the stakeholders involved in managing three Norwegian World Heritage Sites: Røros, Rjukan, and Notodden. The table simplifies complex interactions, tasks, and responsibilities into a visually understandable format through data and narratives, with each element symbolizing an important role in providing urban-scale support services.

The UHFM conceptual framework also revealed several missing theoretical keypoints, indicating the unavailability of actions, tasks, or information during the data collection process. The lack of UHFM keypoints revealed considerable facts and information regarding the complexity and challenges involved in providing support services. This framework made it possible to see the big picture and comprehend the narrative of complexities, gaps, and strategic alignments that characterize the UHFM framework in the context of urban-scale Norwegian WH sites. The empirical outcomes of interviews and correspondence were translated and brought concretely to allow for a comprehensive interpretation and discussion in the subsequent sections.

3.2. UHFM Organizational Framework

The organizational framework for UHFM illustrates the complexities involved in managing urban heritage facilities. Due to the complex nature of these organizations, especially in the context of WH sites, it is important to simplify the illustrated interaction to prevent overwhelming the general audience in understanding the framework (Figure 2).

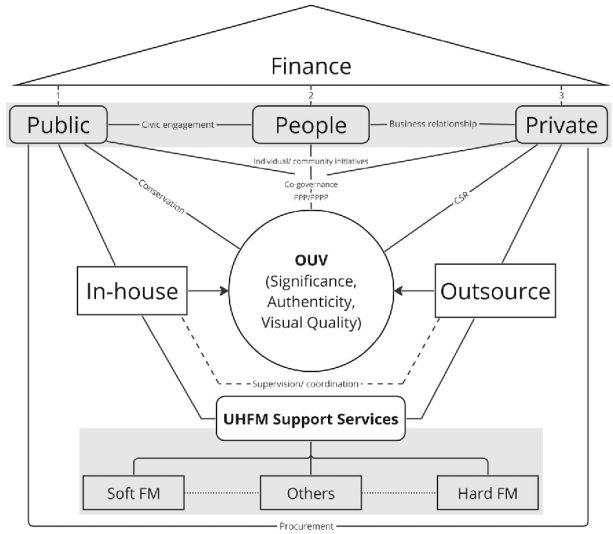


Figure 2. UHFM organizational framework. (1) International, national, regional, and local government funding; private to public funding; sovereign bonds/government paper, etc. (2) Government grant; incentive funds; special taxation; private loan/banking; community funding; self-funding. (3) Private loan/banking; international, national, regional, and local government funding; public to private funding; crowdfunding (people to private funding); public–private partnership (PPP); public–private–people partnership (PPPP).

The UHFM organizational framework prioritizes heritage values as the central focus of urban heritage area conservation. Within the context of WH sites, the OUV serves as

the foundation for inscribing cultural heritage on the WH list, making its preservation and care of utmost importance. The OUV, as the "core business" of the WH site, should not be compromised for the sake of efficiency, budget, or effectiveness as traditionally understood in facility management, including Urban FM. Urban-scale support services must be dedicated to ensuring that urban heritage areas, as a component of the built environment in FM defined by ISO41001 [17], continue to uphold their heritage significance, authenticity, and esthetic quality. The delivery of support services, both in terms of soft FM and hard FM (see Appendix A), by in-house teams and outsourced service providers should be rooted in heritage values and attributes that carry those values.

The key stakeholders in UHFM are categorized into three clusters: the public, people, and private sectors. Generally, technical departments under the municipality *(kommune)* and, to a lesser extent, the county *(fylkeskommune)* administration are responsible for providing urban-scale support services. In the UHFM framework, the public sector includes local, regional, national, and international governing authorities, particularly those with direct responsibilities for cultural heritage preservation. The community plays a role in heritage preservation through various initiatives, both at the individual and collective levels [37,38]. Individuals can support cultural heritage preservation efforts in general or take direct action in caring for cultural heritage, particularly if they own or occupy heritage buildings. Individuals' involvement in support services often entails providing feedback or participating in public hearings on support services related to heritage assets and properties [39]. The private sector is also a significant stakeholder, actively utilizing cultural heritage properties and engaging in corporate social responsibility (CSR) within the cultural heritage context [40].

Civic engagement plays a central role in the interaction of public sector interactions with individuals [38]. The level of community involvement in the conservation of urban heritage areas often determines the success of cultural heritage preservation. While the relationship between the private sector and individuals is usually centered around customer–business interactions, there are instances where the private sector directly supports heritage communities. The partnership between the public and private sectors, known as public–private partnership (PPP), can be expanded to include elements of people through the public–private–people partnership (PPPP) model [41], which involves crowdfunding and co-governance mechanisms for funding and managing urban heritage areas.

Funding is crucial for both general conservation efforts and the provision of urban-scale support services [42]. National, regional, and local policies strictly regulate funding sources for managing urban heritage. Government budgets can be allocated to fund private sector service providers and technical departments. Government grants and subsidies may also be provided to individuals and communities to support the preservation of tangible and intangible cultural assets. However, funding for individuals and communities typically does not directly address urban-scale support services. On the other hand, the private sector is directly involved in providing various types of urban heritage support services through outsourcing mechanisms supervised and/or coordinated by the relevant technical department. Establishing a UHFM organization responsible for coordinating and orchestrating all urban-scale support services in the urban heritage district is one of the recommendations proposed in this study. UHFM professionals hold positions similar to facility managers in the context of large-scale building complexes.

3.3. UHFM Process Flowchart

A process flowchart serves as a simplified representation of a specific process within the realm of urban heritage facility management. It provides a model that depicts the sequential steps and decision points involved in delivering support services on an urban scale within an urban heritage area. Such areas are characterized by specific heritage regulations that differentiate them from other types of urban environments. The flowchart offers a graphical representation of the workflow, interactions among stakeholders, and the sequence of activities (Figure 3). By illustrating and facilitating the comprehension of stages

and procedures in urban heritage facility management, the process flowchart becomes a valuable tool for analysis, communication, and process improvement.

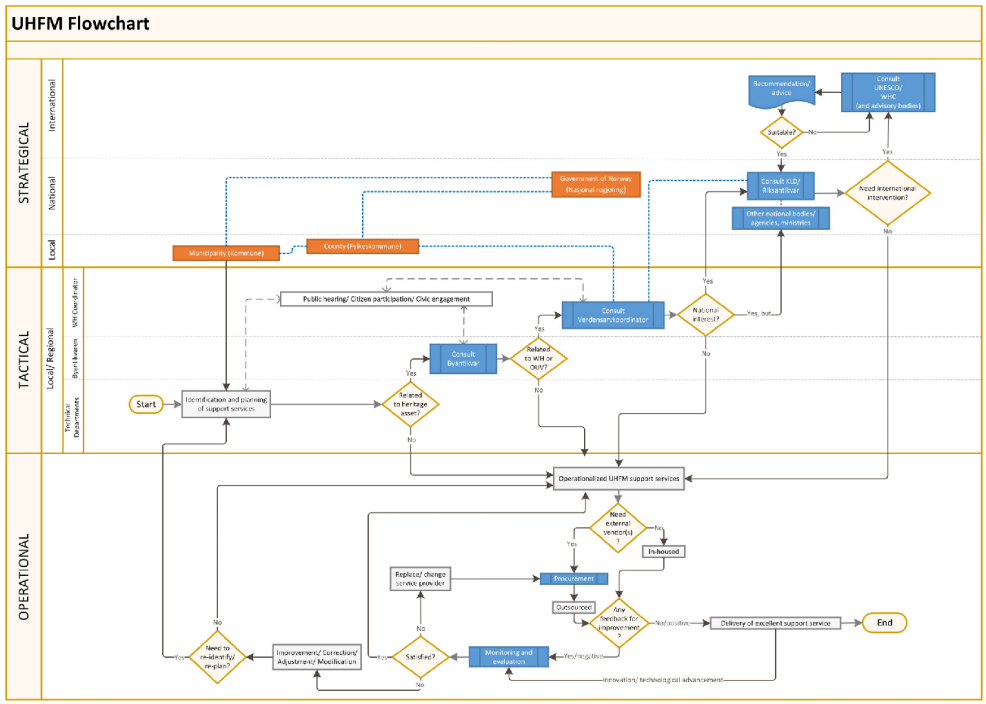


Figure 3. UHFM process flowchart.

The provision of urban-scale support services for urban heritage areas, particularly World Heritage (WH) sites in urban contexts, typically commences with identifying and planning potential support services at the strategic and tactical levels (Figure 3). The responsibility for this initial identification generally lies with governing authorities, such as municipalities and counties, adhering to principles of effective urban governance. Engaging multiple stakeholders, especially through participatory planning processes and public hearings, plays a crucial role in this procedure. Public participation can occur early in the process or be reintroduced through hierarchical consultation involving the cultural heritage department and the WH coordinator, particularly when planned support services may impact the heritage values and characteristics of a World Heritage Site. The identification and planning of support services may undergo a continuous loop based on monitoring and evaluation results, indicating the need for improvement, correction, adjustment, or modification, thereby requiring re-identification or re-planning of these support services. For instance, in the case of Røros, Rjukan, and Notodden, the provision of cobblestone as a substitute for asphalt to enhance visual quality led to complaints from wheelchair and bicycle users, necessitating the re-identification and re-planning of road infrastructure provision to meet the needs of residents through a combination of flat surfaces and cobblestone.

WH coordinators maintain communication forums with their colleagues at other sites and have extensive interactions with *Riksantikvar*, an agency under the Ministry of Climate and Environment (KLD). If the identification and planning of support services have national

significance, the WH coordinator will engage in national-level consultations. KLD serves as a communication and coordination channel with UNESCO, the World Heritage Committee (WHC), and their advisory bodies, such as the International Council on Monuments and Sites (ICOMOS), the International Union for the Conservation of Nature (IUCN), and the International Center for the Study of the Preservation and Restoration of Cultural Property (ICCROM), should intervention and consultation from international institutions be required.

While the identification and planning of urban-scale support services originate at the municipal level, the strategic level in Norwegian WH practice also involves coordination functions with the county level *(fylkeskommune)* and the national level through KLD and *Riksantikvar*. Additionally, several national bodies, agencies, and ministries outside of KLD, including those responsible for railways, education, energy, health, and more, may participate in the coordination hierarchy. Once agreements on the provision of urban-scale support services are reached at the strategic and tactical levels, UHFM support services operationalize at the operational level, considering available resources and potential obstacles. Some support services are performed in-house, while others are outsourced to businesses, professionals, contractors, vendors, and private service providers through a procurement process. During the operationalization of support services, feedback for improvement is typically received from the operational level task forces as the avant-garde team and citizens as end users. This feedback mechanism involves various formal and informal procedures. The absence of feedback may indicate inadequacies in the delivery of support services. Enhancing the process of delivering urban-scale support services in an urban heritage area, particularly within the context of World Heritage Sites, requires continuous stakeholder engagement.

4. Discussion

The ambition of the discussion section was to elaborate the findings from the results section by addressing the research questions regarding the efficient organization of urban-scale support services in an urban heritage area, as well as the processes and coordination functions of the six clusters of UHFM technical departments in preserving the World Heritage status of the studied sites following the proposed UHFM steps as the structure (Table 3 and Figure 4).

Table 3. UHFM cross-sectional matrix.

Department / UHFM Steps	Planning, Zoning, and Land Use	Public Works and Infrastructure	Tourism	Conservation and Cultural Heritage	Environment and Sustainability	Urban Safety and Security
	Accurate mapping of the topographical features and heritage assets as base maps for all departments					
Mapping Resources	Mapping of land use, values, development zones, building types/patterns, population density	Mapping of infrastructure (roads, bridges, utility networks, urban facilities, etc.)	Mapping of visitor facilities, public space, tourism flow management, interpretation points	Detailed mapping of core and buffer zone of WH sites, archeological sites, cultural routes	Mapping of green spaces, energy consumption patterns, waste management facilities	Mapping of vital infrastructure, emergency services locations, potential natural disasters, surveillance
Missing keypoint(s)	Mapping of the existing partnership and mapping resources using information modeling/BIM-based tools					
	Citizen awareness and engagement, participatory planning, and consensus building for effective decision-making					
Reaching Consensus	Facilitate public input; work with developers for zoning decisions in privately owned development and property	Facilitate public input; collaborate with community groups, academics, and planners to align infrastructure needs	Engage stakeholders in tourism planning, involving local communities and businesses	Collaborate with heritage experts, academics, and communities in heritage management planning; education/developing heritage knowledge; heritage interpretation	Collaborate with environmental advocates and the public for sustainable practices in WH management; education/developing knowledge	Collaborate with law enforcement and communities to identify potential hazards; enhance safety and security measures

Table 3. *Cont.*

Department / UHFM Steps	Planning, Zoning, and Land Use	Public Works and Infrastructure	Tourism	Conservation and Cultural Heritage	Environment and Sustainability	Urban Safety and Security
Missing keypoint(s)	N/A					
Assessing vulnerabilities	Assess the vulnerabilities specific to the technical department's interaction with heritage assets					
	Assessing vulnerabilities in zoning decisions; social economic assessment	Assess infrastructure vulnerabilities, utility, and maintenance assessment	Identify vulnerabilities in tourist areas; tourism impact assessment	Assess vulnerability of heritage sites; Heritage Impact Assessment (HIA); heritage policy assessment	Assess vulnerability to climate change; Environment Impact Assessment (EIA)	Assess safety and security vulnerabilities; Risk assessment
Missing keypoint(s)	Citizen satisfaction assessment and digital assessment utilizing BIMs (HBIM, UIM/CIM)					
Integrating values and vulnerabilities	Balancing preservation with development and modern needs					
	Ensure zoning regulations align with urban character and heritage preservation	Integrate infrastructure development into urban esthetics and heritage context	Balance heritage preservation with modern urban development needs; improving public participation	Integrate cultural heritage into development plans; adaptive reuse strategies; improving human resources and public participation; improve heritage regulation	Integrate sustainable practices and green infrastructure into urban planning; improving health and well-being	Integrate safety and security measures into urban design; historic preservation guidelines; improving health, safety, and well-being
Missing keypoint(s)	Enhancing efficiency using information modeling (BIM, HBIM, UIM/CIM), IoT, AI, and sensors					
Prioritizing actions	Preserving the OUV of the WH sites through the implementation of sustainable cultural heritage management through the efficient delivery of support service(s)					
	Zoning regulations enforcement; provide development guidance	Infrastructure maintenance and development; preventive maintenance	Sustainable tourism; visitor experience enhancement; cultural heritage interpretation; preserving cultural identity; increasing citizen participation	Heritage conservation; adaptive reuse; preventive maintenance; cultural value preserving; increasing citizen participation	Environmental protection; sustainable heritage practices; enhance physical and social well-being; increasing citizen participation	Public safety and security; emergency response; preventive maintenance; heritage protection from threats
Missing keypoint(s)	Enabling information modeling (BIM, HBIM, UIM/CIM) integration approach					
Establishing Partnerships	Forming partnerships with stakeholders, experts, local businesses, and community groups aligned with the specific goals of each department (collaborative governance and decision-making)					
	Partners with urban planners, community stakeholders, and developers	Work with contractors, utility providers, and community groups for infrastructure and maintenance	Collaborate with heritage organizations, local businesses, tourism boards; public–private partnership in tourism	Collaborate with cultural experts, historians, and conservationists for preservation, adaptive reuse approach; public–private partnership in heritage preservation	Partners with environmental organizations and sustainable businesses for initiatives; public–private partnership in sustainability	Collaborate with law enforcement, emergency services, and community groups for safety
Missing keypoint(s)	Digital information and information modeling optimization and automation					
Monitoring and Evaluation of support service provision	Monitoring and evaluation of support services provided by each technical department					
	Monitoring and evaluation of urban development impact and zoning/land use compliance	Monitoring and evaluation of urban infrastructure performance, maintenance, and effectiveness	Monitoring and evaluation of tourism flows, visitor satisfaction, tourism support services, and impact of tourism on heritage preservation	Monitoring and evaluation of conservation and WH status, and cultural heritage preservation (reconstruction, restoration, and adaptive reuse)	Monitoring and evaluation of energy consumption, carbon footprint, air quality, environment, and waste management practices	Monitoring and evaluation of emergency preparedness and surveillance effectiveness
Missing keypoint(s)	N/A					

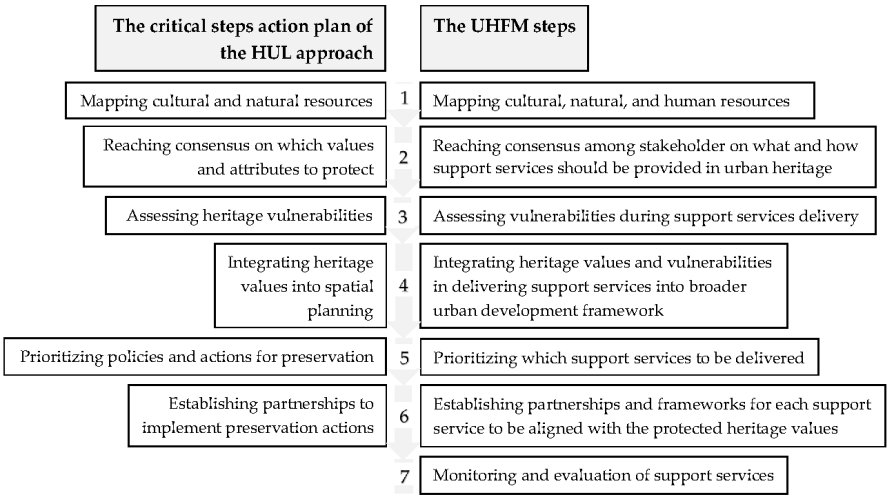


Figure 4. The six critical steps in the action plan of the HUL approach to the UHFM steps.

This section explores various aspects and components of urban heritage facility management (UHFM) using the HUL approach's six critical steps, as reviewed and theoretically studied previously [9], which resulted in 33 UHFM keypoints. Adapting these steps allows for the recognition, identification, and formulation of urban-scale support services in the urban heritage area, which is the focus of this research study. The section is divided into seven main sections to ensure a systematic discussion according to the UHFM steps (Figure 3). Based on the research interviews and the model developed for potential urban-scale support services [6], a comparison is made among three Norwegian World Heritage (WH) sites with urban characteristics, which are Røros Bergstaden—the core city in Røros mining town and its surroundings—The Company Town in Rjukan, and the Notodden Industrial Heritage area in Notodden (see Appendix A). This comparison provides an overall illustration of the UHFM process and its management within the context of good governance in Norway in terms of providing people-oriented urban-scale support services within urban-scale heritage areas without compromising the protected sites' OUV.

As discussed through interviews and correspondence, the conditions shed light on the daily practice of providing urban-scale support services at the three Norwegian World Heritage (WH) sites. Criticisms and potential improvements regarding the provision and delivery of services, as well as coordination between agencies and technical departments, were also explored. Notably, the dynamics and mechanisms of the relationship between public authorities (public), dwellers, citizens, inhabitants, visitors (people), and the private sector (private) emerged as significant aspects in the realm of UHFM.

4.1. Mapping Resources for UHFM

Mapping resources, as the first step in the UHFM steps, serves as a critical foundation for informed decision-making and coordinated efforts across various technical departments. This step involves the accurate mapping of topographical features and heritage assets to create comprehensive base maps for all departments involved in urban management. The cluster of planning and zoning departments ensures precision in mapping land use, development zones, population density, and building types, laying the groundwork for comprehensive urban development. The public works and infrastructure department cluster focuses on mapping vital infrastructure elements such as roads, bridges, utility

networks, and other urban facilities. This type of mapping is crucial for the daily practice of infrastructure development and maintenance. The Tourism department's cluster mainly mapped the visitor facilities, public spaces, and the tourism movement to ensure sustainable tourism planning and to avoid overtourism, thus safeguarding a balance between visitor experience and heritage preservation. The conservation and cultural heritage department's cluster provides detailed maps of the WH sites' core and buffer zones, which is essential for heritage conservation, future adaptive reuse strategies, and general conservation initiatives. The environment and sustainability department cluster contributed to mapping green spaces, energy consumption patterns, waste management facilities, and other environment-related tasks. This mapping integrated sustainable practices into urban planning, promoting environmental health and the dweller's well-being. Based on the raw maps provided by the planning and zoning departments, the cluster of urban safety and security departments mapped the vital infrastructure, emergency services locations, and potential natural disaster zones such as flooding, landslides, and fire hazards. This type of mapping is crucial for enhancing public safety measures, emergency response planning, and safeguarding heritage assets from potential threats. The interconnection between these technical departments ensures a holistic approach to managing the studied WH sites.

The unavailability of utilization of the BIM-based tools to map existing resources and mapping partnerships in the urban-scale support services of the three studied Norwegian World Heritage sites—Røros, Rjukan, and Notodden—during the data collection process can be attributed to various factors, such as the limited technological adoption within the technical departments. Moreover, an inadequate level of awareness regarding the potential advantages of utilizing BIM-based tools to map current resources and partnerships could be a contributing factor. The studied WH sites were also a part of national regulatory and policy frameworks that do not explicitly require or incentivize integrating BIM technologies in managing historic towns in Norway.

4.2. Reaching Consensus on What and How Urban-Scale Support Services Should Be Provided

Throughout the reaching-consensus step, each cluster of technical departments adjusted their specific tasks in providing urban-scale support services to be aligned with the WH mission in maintaining OUV as the prerequisite of the WH status. Collaborative decision-making in the cluster of planning and zoning departments relies on the incorporation of citizen awareness, participatory planning, and consensus-building, which highlighted the significance of integrating the citizens' opinions into the city planning and master plan to guarantee their compatibility with the preference of the WH site's inhabitants.

The cluster of planning and zoning departments, together with public works and infrastructure departments, actively sought public input and collaborated with private developers to establish the land use, planning, and zoning decisions that should be aligned with community goals and preservation of OUV. Meanwhile, the tourism departments' cluster involves stakeholders in the tourism planning process by acknowledging the importance of including local communities and businesses during the reaching-consensus step. By adopting such a collaborative approach, tourism initiatives can be aligned with local interests and positively contribute to the community, thus increasing the sustainability of the WH sites economically, socially, and environmentally. The conservation and cultural heritage department cluster engaged in collaborative efforts with heritage experts, academics, and local communities to develop a strategic heritage management plan, focusing on historical education and the advancement of heritage knowledge, which showed a long-term strategy towards conserving heritage. The environment and sustainability department cluster works with environmental advocates and citizens who are interested in promoting sustainable practices in the WH sites. The urban safety and security department cluster prioritizes cooperation with law enforcement and the dwellers to identify potential risks and improve safety and security protocols to protect the integrity of WH assets as a collective duty to guarantee a safe and protected urban heritage setting.

The presence of all necessary theoretical keypoints obtained from the scoping literature review process in the reaching consensus step within the three studied cases of Røros, Rjukan, and Notodden indicated that these sites have effectively implemented comprehensive strategies for engaging the community and building consensus in the delivery of urban-scale support services. As mandated by the Nordic model, the three sites' authorities have placed citizen awareness as their primary concern, actively engaging in efforts to proactively inform the public about current and future development and urban-scale support services. Consensus-building is a commonly accepted practice in Nordic countries, including Norway, that involves collaborative efforts in planning and decision-making processes. The municipalities in charge of managing these studied WH sites have adopted a participatory planning approach, enabling local communities, developers, and other relevant stakeholders to be involved. Furthermore, the emphasis on developing heritage technical knowledge and heritage interpretation indicates a commitment to open and transparent communication among the stakeholders.

The absence of missing theoretical keypoints in the reaching-consensus step suggests successfully integrated community-centric approaches in managing urban-scale support services within the studied Norwegian WH sites in Røros, Rjukan, and Notodden. The Nordic model, characterized by a trusting community and a commitment to equality, serves a significant role in this step. However, a further study of community involvement approaches and decision-making processes would be required to validate these interpretations.

4.3. Assessing the Vulnerabilities of the WH Sites and Their Relationships with UHFM

An assessment step is necessary to address the potential risks and challenges of delivering urban-scale support services within the context of the studied WH sites in Norway. The assessment of vulnerabilities of the WH sites necessitates a comprehensive assessment of various vulnerabilities tailored to the specific functions of each technical department in providing the required urban-scale support services. This is particularly important for addressing the socio-economic pressures and impacts of climate change, besides the strict compliance to the conservation regulations.

Vulnerability assessment in the cluster of planning and zoning focuses on land use, zoning decisions, and socio-economic factors, which suggests acknowledging the commitment to mitigating potential vulnerabilities that may arise from these decisions. The municipal and county authorities must work together to harmonize zoning regulations in broader urban development initiatives. In the meantime, the assessment of infrastructure vulnerabilities has become an important task performed by the cluster of public works and infrastructure departments. Urban-scale utility and maintenance assessments are conducted to identify vulnerabilities and potential hazards in the urban infrastructure, necessitating the cooperation of various technical departments in the local government to work together within more extensive urban development strategies and ensure the infrastructure's long-term functionality. The cluster of tourism departments assessed the impact of tourism to identify particular vulnerabilities in tourist destinations. This approach acknowledges the importance of tourism in World Heritage sites while aiming to minimize any possible adverse effects on the WH assets. Heritage Impact Assessments (HIAs) are essential in assessing the vulnerabilities of heritage sites for the conservation and cultural heritage department cluster. This action shows a commitment to protecting WH sites' cultural and historical significance. Collaboration with heritage experts, academics, and national heritage authorities is important to ensure the precision and efficacy of these assessments. The environment and sustainability department cluster assessed the vulnerabilities related to climate change in the studied WH sites by carrying out Environmental Impact Assessments (EIAs). Effective vulnerability assessment requires collaboration with environmental advocacy groups and national environmental authorities. Last, the urban safety and security department cluster emphasized the importance of conducting comprehensive risk assessments to identify any vulnerabilities related to the safety and security of residents and visitors, which includes cooperating with law enforcement agencies, emergency ser-

vices, and community groups. Working with local, regional, and national authorities helps ensure that urban safety and security measures align with broader urban development and heritage preservation objectives.

The missing theoretical keypoint found in this step during the data collection is the lack of a mechanism to assess citizen satisfaction and stakeholder feedback. Including citizen feedback in vulnerability assessments could provide valuable insights regarding the effectiveness of urban-scale support services from the end-user's perspective. The operational level of the UHFM team may also provide useful inputs for improving support service delivery in this step. Implementing digital assessment tools and information modeling tools has the potential to bridge this gap, thus improving the overall vulnerability assessment step.

4.4. Integrating Values and Vulnerabilities

Heritage authorities and technical departments employ various measurements to incorporate heritage sites' significance and susceptibilities. One approach involves employing a SWOT analysis, which examines strengths, weaknesses, opportunities, and threats. This analysis allows for the development of strategies by simulating different potential scenarios and determining appropriate solutions. The *Verdensarvkoordinator* and *Riksantikvar*, who are responsible for heritage preservation, can effectively collaborate with the technical departments overseeing road and bridge construction at the local, regional, and national levels. The UHFM organizational framework, obtained from the interview and exchanging correspondence, includes a complex strategy that integrates heritage preservation and urban development. Each technical department serves a distinctive function in this integration, showcasing an awareness of the complex inter-relationship between outstanding universal values and vulnerabilities in WH site management.

The primary responsibility of the cluster of planning and zoning departments is to align land use and zoning regulations with preserving the protected heritage area. This integration acknowledges the importance of land use and zoning decisions in shaping the physical and cultural environment within the core area, buffer zone, and broader urban development. Therefore, the governing stakeholders must work together to ensure that zoning regulations align with the heritage conservation objectives. The cluster of public works and infrastructure departments contributes to urban heritage areas' functional, visual, and historical aspects by integrating infrastructure and physical development vulnerabilities to align with the WH sites' cultural and historical value. The cluster of tourism departments acknowledges that involving the community in tourism planning improves the relationship between tourism initiatives and broader heritage conservation goals to ensure that heritage tourism policies have beneficial impacts on the stakeholders' and citizens' well-being. The cluster of conservation and cultural heritage departments has the role of integrating cultural heritage into development plans and implementing adaptive reuse strategies, thus requiring certain degrees of flexibility in the decision-making process. The flexible approach emphasizes the dynamic nature of conserving cultural heritage, with adaptive reuse being an important strategy. These strategies may ensure alignment with national and international conservation objectives by working closely with heritage experts, academics, and national heritage authorities. Incorporating sustainable practices and green infrastructure into urban planning by the cluster of environment and sustainability departments is essential for promoting the dwellers' health and well-being. This step illustrates an acknowledgment of the mutual reliance between preserving the environment and safeguarding cultural heritage. Coordination with environmental advocacy groups and relevant authorities guarantees the successful incorporation of sustainable practices. The cluster of urban safety and security departments integrates safety and security measures with heritage conservation to protect cultural and historical resources while simultaneously ensuring the well-being, safety, and security of inhabitants and tourists. Coordination with national law enforcement and emergency services is essential to ensure that the safety and security measures align with urban development and heritage preservation strategies.

The keypoint lacking in this step is the systematic integration of information modeling tools or other digital asset management tools to improve efficiency in the integration process. Utilizing digital tools may improve the process of integrating values and identifying vulnerabilities, leading to a more organized and data-driven approach. Incorporating information modeling tools at this step can optimize the overall integration process.

4.5. Prioritizing UHFM Actions

Through the data collection, the respondents were asked about the important factors that need to be taken into account when providing urban-scale support services. Furthermore, they were requested to determine the urban-scale support services that should be prioritized to maintain the WH sites' OUV, heritage significance, authenticity, and visual quality. The respondents from various clusters, in general, emphasized prioritizing maintaining the urban infrastructure, physical urban fabric, accessibility and mobility, and environmental sustainability when planning and implementing urban-scale support services within the realm of UHFM. Several other respondents raised other issues to be prioritized, including matters related to interpretation and education, cleanliness, and waste management.

During the prioritizing actions step, each technical department cluster strategically targets specific aspects that align with their domain as the cluster's priority. The planning and zoning department cluster prioritizes ensuring adherence to zoning regulations and providing guidance for development. This necessitates a robust focus on guaranteeing that development complies with the established regulations and contributes to preserving the urban heritage areas. Effective implementation of zoning regulations requires intensive coordination with other municipal and county sections and bodies.

The public works and infrastructure department cluster prioritizes routine maintenance, development, and preventive infrastructure maintenance. Collaborating with other relevant departments guarantees that infrastructure developments align with the overarching goals of urban-scale heritage preservation. The cluster of tourism departments' priorities are establishing sustainable tourism, enhancing visitor experiences, interpreting cultural heritage, preserving cultural identity, and promoting citizen participation. This comprehensive strategy acknowledges the impact of tourism in shaping the perception and experience of visitors and dwellers of WH sites. The conservation and cultural heritage department cluster prioritizes heritage conservation, adaptive reuse, preventive maintenance, preservation of cultural value, and promoting citizen participation. This comprehensive approach acknowledges the dynamic nature of conserving cultural heritage, integrating preventative measures and strategies for adaptive reuse. Working in collaboration with heritage experts and actively involving the local community in the decision-making related to WH sites ensures a comprehensive approach to preserving urban heritage areas. The priority of the environment and sustainability department cluster is to protect the urban environment within the vicinity of WH sites, improve physical and social well-being, and promote citizen engagement in participating in sustainable heritage practices. The cluster of urban safety and security departments responded with the statement that their priorities are to ensure public safety, security, emergency response, preventive maintenance, and the protection of heritage sites from potential threats. This approach also highlights the commitment to ensuring residents' and visitors' safety and security while protecting valuable heritage assets. Collaboration with national law enforcement and emergency services is necessary for integrating safety measures with broader urban development and heritage preservation strategies.

The keypoint lacking in this step is the intentional incorporation of information modeling tools (such as BIM/HBIM/CIM) into the integration approach to improve efficiency and prioritize actions. Utilizing digital tools could optimize the decision-making and prioritization process, ensuring a more systematic and data-driven approach. Integrating information modeling at this step has the potential to enhance the overall efficiency

of prioritizing actions by improving coordination and communication among technical departments and other stakeholders.

4.6. Establishing Partnerships and Frameworks for Each Support Service and Technical Department's Cluster

Throughout the establishing partnerships step, the majority of respondents from each technical department cluster acknowledges the significance of collaborative governance and establishes strategic partnerships to improve the provision of urban-scale support services in urban heritage areas.

The planning and zoning departments cluster plays a crucial role in establishing partnerships with stakeholders, specialists, local businesses, and community groups. This collaborative approach ensures that zoning decisions and urban planning are in accordance with the diverse needs and viewpoints of the community and other stakeholders. The public works and infrastructure departments cluster establishes partnerships with urban planners, community stakeholders, and private developers. This collaborative effort ensures that the construction of infrastructure is aligned with the visual quality of urban heritage areas, historical context, and the preservation of OUV as the core business of WH sites. The cluster of tourism departments establishes partnerships with contractors, utility providers, and community groups through implementing the PPP scheme. The necessary framework for each partnership was developed accordingly to promote sustainable tourism. Effective communication with a wide range of stakeholders, including local communities and businesses, is crucial for successfully implementing tourism initiatives. The conservation and cultural heritage department cluster establishes PPP specifically focused on preserving heritage through collaboration with heritage organizations, local businesses, and tourism boards. However, the respondents did not mention any form of public–private–people partnership (PPPP) practices in the studied WH sites Røros, Rjukan, and Notodden. This collaborative activity ensures that conservation strategies, adaptive reuse programs, and preventive maintenance are in harmony with the objectives of safeguarding cultural heritage. Coordination with heritage organizations enhances the specialized knowledge contributed to conservation initiatives. The environment and sustainability department cluster forms partnerships with environmental organizations and sustainable businesses, participating in PPP to advocate for sustainable practices. The collaborative approach integrates ecological infrastructure into urban heritage development. The urban safety and security departments cluster establish partnerships and coordination with law enforcement, emergency services, and community groups to improve safety measures. The collective endeavor guarantees incorporating safety and security factors into urban design and historic preservation guidelines.

The crucial aspect not found throughout the interviews and correspondence process in this step is the intentional incorporation of digital information modeling optimization and automation to improve the effectiveness of forming partnerships. Incorporating information modeling tools at this step could improve the overall efficiency of collaborative governance, ensuring a more systematic approach to establishing partnerships and developing a framework with a broader city management plan.

4.7. Monitoring and Evaluation

Within the monitoring and evaluation step, as the proposed additional step differs from the HUL approach, each cluster of technical departments has a crucial role in monitoring and evaluating the efficiency of their specific tasks in providing urban-scale support services to ensure continuous improvement and compliance with heritage preservation goals.

The responsibility of the planning and zoning department cluster is to monitor and evaluate the impact of urban development surrounding WH sites and ensure compliance with zoning and land use regulations, especially in the protected sites' core area and buffer zone, which includes evaluating the impacts of zoning decisions on the broader urban development, including their impact on the urban heritage area. The public works and

infrastructure department cluster primarily monitors and evaluates urban infrastructure's performance, maintenance, and functionality, including roads, streets, bridges, and other infrastructures. Through real-time monitoring, these departments might identify specific areas and objects requiring maintenance or improvement, ensuring that the infrastructure works comply with the WH sites' heritage conservation regulations and guidances. The cluster of tourism departments monitors and evaluates tourism patterns, providing visitor satisfaction and preventing overtourism that might compromise the preservation of WH sites. The cluster of conservation and cultural heritage departments primarily conducts the monitoring and evaluation of the maintenance of WH status and the preservation, reconstruction, restoration, and adaptive reuse of cultural heritage. The environment and sustainability departments monitor and evaluate energy consumption, air and water quality, environmental conditions, and waste management strategies. The urban safety and security departments monitor and evaluate the efficacy of emergency preparedness and surveillance measures. However, none of the respondents mentioned using an urban command center to conduct surveillance and real-time monitoring to improve the safety of the dwellers and visitors, not to mention the security of the protected assets from vandalism and irresponsible tourist activity. The urban safety and security department cluster monitors and evaluates the effectiveness of emergency preparedness and surveillance measures. This comprehensive approach ensures continuous improvement in managing urban heritage areas and WH sites.

The absence of theoretical keypoints in the UHFM scoping literature review process, specifically regarding the "monitoring and evaluation" step in the management practices of Norwegian World Heritage sites, although being mentioned repeatedly by the respondents during data collection, suggests three possible circumstances during the conception of UHFM keypoints. Firstly, it is possible that academic discussions on the "monitoring and evaluation" step were not identified during the scoping literature review process. Secondly, the absence of this important step in the discussion may be attributed to its unintentional oversight during the scoping literature review, which follows a rigorous protocol incorporating the HUL approach as one of the search criteria for filtering relevant literature. Lastly, the process of conducting a scoping literature review might include adding and classifying "monitoring and evaluation" in academic discussions within the category of "assessment", the third critical step of the HUL approach. Subsequently, during the data collection phase, the respondents, through interviews and correspondences, placed particular emphasis on "monitoring and evaluation" in providing urban-scale support services to ensure continuous improvement in service delivery. Assessments are typically conducted at the beginning to determine the type and manner in which support services will be provided. Meanwhile, "monitoring and evaluation" is usually carried out during the operational phase, where inputs, problems, difficulties, and challenges in the provision of urban-scale support services begin to be discovered. Monitoring occurs at the tactical and operational levels, whereas evaluation is carried out at the tactical and strategic levels of UHFM. The majority of respondents' understanding of the differences between assessment, monitoring, and evaluation suggests that they are highly aware of and committed to flexible and adaptive urban heritage facility management practices. It is presumed that these respondents and their institutions have included monitoring and evaluation in their daily practices, thereby improving the general efficiency of urban-scale support services in preserving the OUV and integrity of the WH sites from time to time.

5. Conclusions

The urban heritage facility management (UHFM) framework reveals a deep comprehension of the complex dynamics that govern the delivery of support services on a large scale in WH sites. The exploration, driven by the two research questions on the efficient organization of these services and the role of coordination functions in maintaining the WH status, has resulted in detailed observations from three Norwegian World Heritage Sites: Røros, Rjukan, and Notodden. The UHFM framework contains the primary information

obtained from interviews and exchanging correspondence with key stakeholders. The cross-sectional table between the seven UHFM steps and the six technical department clusters serves as a navigational tool, streamlining the intricate interactions and responsibilities in managing urban-scale support services. This matrix functions both as a visual representation and a condensed narrative, revealing the complexities of stakeholder engagements and the coordination of support services. The detection of crucial elements absent in the UHFM framework serves as a reflection of the difficulties and gaps in the delivery of support services. The gaps between the theoretical keypoints from the scoping literature review process and the conceptual framework obtained from the studied cases reflect the challenges encountered when trying to balance heritage preservation, authenticity, and modern development. The lack of integration of information modeling tools throughout several UHFM steps is particularly interesting, emphasizing the need for improvement and efficiency in future implementations.

The additional step, monitoring and evaluation, allows the UHFM framework to become a powerful and flexible tool adaptable to all possible social, economic, and environmental changes. The ability of this asset to capture the complex connections among technical departments, governance structures, and stakeholders in providing urban-scale support services while maintaining the OUV, visual quality, authenticity, and significance of the studied WH sites makes it a valuable tool in heritage management, alongside the original HUL approach and other existing heritage conservation frameworks addressing the core business of WH sites. The importance of a collaborative and unified strategy, which involves the integration of heritage preservation, management of urban-scale facilities, and collaboration with stakeholders, is emphasized by this study. The UHFM framework effectively tackles both present challenges and serves as a basis for ongoing enhancement and adaptable strategies in the constantly changing field of urban heritage preservation.

The UHFM organizational framework addresses the challenges of managing facilities and how to effectively organize urban-scale support services in an urban heritage area or World Heritage site. The framework highlights the necessity of simplifying stakeholder interactions between UHFM stakeholders by placing heritage values at the center of urban heritage conservation while providing urban-scale service delivery. Within the World Heritage context, the OUV serves as the foundation for inscribing cultural heritage, making its preservation non-negotiable and must not be compromised for the sake of efficiency, budget, or traditional understandings of effectiveness in facility management. The proposed UHFM framework provides insights into coordinating and orchestrating all urban-scale support services in the urban heritage district. In the newly proposed urban heritage facility management field, the UHFM process flowchart provides the workflow steps that must be taken one after another and the decisions that must be made when providing support services on an urban scale inside heritage areas. The perpetual cycle of monitoring and evaluation enables the necessary modifications predicated on input, guaranteeing the continuous improvement of urban-scale service delivery provision.

The proposed UHFM framework plays a role in engaging and benefiting stakeholders and users by fostering a collaborative and informed approach to urban heritage facility management. The framework's capacity to streamline coordination, improve communication channels, and offer a structured comprehension of urban-scale support services will be beneficial to stakeholders, including the public, private sector, and governing authorities. The clarity offered by the framework ensures that stakeholders can actively contribute to the preservation of heritage values while aligning with contemporary needs. Users, including heritage professionals, municipal authorities, and the community, will benefit from a user-friendly and adaptable tool that facilitates efficient decision-making, resource allocation, and strategic planning. The UHFM framework that enables efficient decision-making, resource allocation, and strategic planning will benefit various stakeholders, such as heritage authorities, technical departments, and the community. The UHFM framework promotes a sense of responsibility for the sustainable management of urban heritage areas by highlighting the importance of heritage significance, authenticity, and visual quality.

This study does not intend to make broad generalizations that can be applicable to all types of technical departments, support services, and different types of World Heritage sites outside of Norway. This study was designed to be an initial umbrella study of urban-scale heritage facility management using Norwegian WH sites as a context, which provides the basis for further research in the realm of Urban FM, urban heritage conservation, and detailed parts of UHFM. Various terms in this study are used interchangeably in English and the Norwegian version due to technical and practical reasons. This study represents a progression in the domain of urban heritage management and Urban FM by introducing a framework that addresses the complexity associated with managing urban heritage facilities, specifically focusing on the Norwegian WH sites, which is in contrast to previous studies that typically examined specific aspects of heritage conservation or facility management of protected buildings only. Furthermore, this study offers a conceptual framework that can be applied to various contexts worldwide. This study serves as an invitation for further academic discussion, research, and implementation of the UHFM framework in order to shape sustainable, resilient, and culturally vibrant urban environments for future generations. The results and findings of this study pave the way for future research to replicate similar studies in other non-WH historic towns and urban heritage districts in Norway, as well as in urban heritage areas and WH sites outside of Norway. This will contribute to a more comprehensive understanding of facility management at an urban scale in urban heritage areas.

Author Contributions: Conceptualization, B.N.P. and A.T.S.; methodology, J.L.; software, B.N.P.; validation, B.N.P., A.T.S. and J.L.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing—original draft preparation, B.N.P. and A.T.S.; writing—review and editing, B.N.P., A.T.S. and J.L.; visualization, B.N.P.; supervision, A.T.S. All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Data Availability Statement: Data are contained within the article.

Acknowledgments: This study is supported by the Department of Civil and Environmental Engineering, Faculty of Engineering, Norwegian University of Science and Technology (NTNU), the Directorate General of Resources for Science, Technology, and Higher Education, The Ministry of Education, Culture, Research, and Technology of the Republic of Indonesia, and Diponegoro University.

Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Hard UHFM Support Services.

Tasks/Urban-Scale Support Services	**Department/Institution/Organization in Charge**		
	Røros	**Rjukan**	**Notodden**
District heating and cooling, district/neighborhood heat management (*fjernvarme*) (1, 2, 5)	Ren Røros Strøm AS, Norsk Varme	Statkraft AS, Norsk Varme, Green Mountain (data center excess heat)	Thermokraft AS, Norsk Varme, (owned by Notodden Energi)
Power provider(*strømleverandøren*) (2, 5)	REN Røros Strøm AS	Tinn Energi ASHydro Energi AS Telemark	Notodden Energi Kraft AS
Energy management(*strømnettet*/power grid) (2, 5)	Røros E-Verk Nett	Stannum	Everket AS
Water supply (2, 5)	Røros kommune, Norsk Vann	Tinn kommune (Rjukan vannverks), Norsk Vann	Notodden kommune (Notodden vannverks), Norsk Vann

Table A1. *Cont.*

Tasks/Urban-Scale Support Services	Department/Institution/Organization in Charge		
	Røros	**Rjukan**	**Notodden**
Clean/drinking water system (1, 2, 5)	Røros kommune, Norsk Vann	Tinn kommune, Norsk Vann	Notodden kommune, Norsk Vann
District sewerage system (1, 2, 5)	Røros kommune	Tinn kommune	Notodden kommune
Black water system (1, 2, 5, 6)	Røros kommune, Norsk Vann	Tinn kommune, Norsk Vann	Notodden kommune, Norsk Vann
Neighborhood/district drainage and flood control system (1, 2, 5, 6)	Røros kommune	Tinn kommune	Notodden kommune
Heritage buildings and structures (4)	*Byantikvar*, *Verdensarvkoordinator*, Department of cultural heritage	*Byantikvar*, *Verdensarvkoordinator*, Department of cultural heritage	*Byantikvar*, *Verdensarvkoordinator*, Department of cultural heritage
Core zone and buffer zone (World Heritage sites) (1, 4)	*Verdensarvkoordinator*, *Riksantikvaren* (supervised by WHC/UNESCO), *Verdensarvrådet*	*Verdensarvkoordinator*, *Riksantikvaren* (supervised by WHC/ UNESCO)	*Verdensarvkoordinator*, *Riksantikvaren* (supervised by WHC/ UNESCO)
Urban heritage visual quality (3, 4)	*Byantikvar*, *Verdensarvkoordinator*, Department of cultural heritage	*Byantikvar*, *Verdensarvkoordinator*, Department of cultural heritage	*Byantikvar*, *Verdensarvkoordinator*, Department of cultural heritage
Urban heritage street furniture (2, 3, 4)	Røros kommune	Tinn kommune	Notodden kommune
Outdoor and public lighting (1, 2, 6)	Røros kommune, *Statens vegvesen* (The Norwegian Public Roads Administration)	Tinn kommune, *Statens vegvesen* (The Norwegian Public Roads Administration)	Notodden kommune, *Statens vegvesen* (The Norwegian Public Roads Administration)
Street and road infrastructures and maintenance (1, 2, 6)	Røros kommune, Trøndelag fylkeskommune, *Statens vegvesen* (The Norwegian Public Roads Administration)	Tinn kommune, Vestfold og Telemark fylkeskommune, *Statens vegvesen* (The Norwegian Public Roads Administration)	Notodden kommune, Vestfold og Telemark fylkeskommune, *Statens vegvesen* (The Norwegian Public Roads Administration)
Telecommunication infrastructures (1, 2)	Infonett Røros AS (cable-based telecommunication), Telenor, Telia	Telenor, Telia and ICE	Telenor, Telia and ICE

Clusters of departments: (1) PLZ = planning and zoning, (2) PWI = public works and infrastructure, (3) TOU = tourism, (4) CCH = conservation and cultural heritage, (5) ESU = environment and sustainability, (6) USS = urban safety and security.

Table A2. Soft UHFM Support Services.

Tasks/Urban-Scale Support Services	Department/Institution/Organization in Charge		
	Røros	**Rjukan**	**Notodden**
Neighborhood/district cleaning/hidden trash containers (1, 2)	Røros kommune	Tinn kommune	Notodden kommune
The traditional seasonal market, tourist-oriented shop/retailer, town events (3)	*Rørosmartnan* (Christmas market), *Destinasjon Røros*	*Høstmarked/Bygdas dag* (Autumn market), Rjukan Matfestival, *Solfesten* (Sun Festival), Rjukan Turistkontor, visitRjukan AS	*Høstmarked*, Notodden Vårmarked, Notodden Bluesfestival, Tinfosløpet, *Kjentmannsmerket*

Table A2. *Cont.*

Tasks/Urban-Scale Support Services	**Department/Institution/Organization in Charge**		
	Røros	**Rjukan**	**Notodden**
Conservation law enforcer, municipal police (4, 6)	Røros kommune	Tinn kommune	Notodden kommune
Post office (2)	Posten Bring AS	Posten Bring AS	Posten Bring AS
The main square (1, 2, 3)	Røros kommune	Tinn kommune	Notodden kommune
District command center (6)	-	-	-
Electrical panel, underground electricity distribution (2)	Røros E-Verk Nett, Røros kommune	Stannum, Tinn kommune	Everket AS, Notodden kommune
Conservation helpdesk (3)	The Røros Museum Call Centre, Røros kommune, *Servicetorget*	Vestfold og Telemark fylkeskommune, Tinn kommune, *Servicetorget*	Vestfold og Telemark fylkeskommune, Notodden kommune, *Servicetorget*
Protected heritage park, garden, void, cemetery (1, 2, 3, 4, 5)	*Kjerkgata* (Harald Sohlberg corridor), *Røros Kirke*, *Slegghaugan* (the slag heaps of Røros)	*Rjukan kirke*, *Rjukan torg*	*Notodden kirke*, *Notodden torv*, Admini Notodden
Connection with the general transportation system (1, 2)	Røros Airport, Røros Station/*Jernbanedirektoratet* (Norwegian Railway Directorate), Røros bus terminal	Rjukan station/Norwegian Railway Directorate, Rjukan bus stop	Notodden station/Norwegian Railway Directorate, Notodden *skysstasjon* (public transport terminal)
Heritage funicular, travelator, shuttle/site transportation (1, 2, 3, 4)	-	Krossobanen, Gaustabanen	-
Preservation-oriented parking lot (1, 2)	Røros kommune	Tinn kommune	Notodden kommune

Clusters of departments: (1) PLZ = planning and zoning, (2) PWI = public works and infrastructure, (3) TOU = tourism, (4) CCH = conservation and cultural heritage, (5) ESU = environment and sustainability, (6) USS = urban safety and security.

Table A3. Other UHFM Support Services.

Tasks/Urban-Scale Support Services	**Department/Institution/Organization in Charge**		
	Røros	**Rjukan**	**Notodden**
Heritage environmental management (4, 5)	*KLD, Trøndelag fylkeskommune*, Røros kommune	*KLD*, Vestfold og Telemark fylkeskommune, Tinn kommune	*KLD*, Vestfold og Telemark fylkeskommune, Notodden kommune
Urban heritage health and safety (5, 6)	Department for culture and public health (*Avdeling for kultur og folkehelse*), *Sosial og helsedirektoratet*, fylkeskommune, Røros kommune	Department for culture and public health, *Helse og omsorgsdepartementet, Sosial og helsedirektoratet*, fylkeskommune, Tinn kommune	Department for culture and public health, *Helse og omsorgsdepartementet, Sosial og helsedirektoratet*, fylkeskommune, Notodden kommune
Heritage documentation, archiving, digitization, digitalization (4)	The Røros Museum, Røros kommune (*arkiv*/archive)	Norsk Industri-Arbeidermuseum (NIA), Tinn kommune	Norsk Industri-Arbeidermuseum (NIA), Notodden kommune
Urban heritage preservation, restoration, reconstruction, adaptation (2, 4)	Department of cultural heritage (*Avdeling for kulturminner*), *Byantikvar, Verdensarvkoordinator, Riksantikvaren*	Department of cultural heritage, *Byantikvar, Verdensarv-koordinator, Riksantikvaren*	Department of cultural heritage, *Byantikvar, Verdensarv-koordinator, Riksantikvaren*

Table A3. *Cont.*

Tasks/Urban-Scale Support Services	Department/Institution/Organization in Charge		
	Røros	**Rjukan**	**Notodden**
Urban heritage design guidelines comply with the HUL approach (4)	Department of cultural heritage, *Byantikvar*, *Verdensarvkoordinator*, *Riksantikvaren*	Department of cultural heritage, *Byantikvar*, *Verdensarv-koordinator*, *Riksantikvaren*	Department of cultural heritage, *Byantikvar*, *Verdensarv-koordinator*, *Riksantikvaren*
Strategic heritage plan (SHP) (4)	Department of cultural heritage, *Byantikvar*, *Verdensarvkoordinator*, *Riksantikvaren*	Department of cultural heritage, *Byantikvar*, *Verdensarv-koordinator*, *Riksantikvaren*	Department of cultural heritage, *Byantikvar*, *Verdensarv-koordinator*, *Riksantikvaren*
Heritage/tourist-friendly waste management system (2, 5)	Røros kommune	Tinn kommune	Notodden kommune
HBIM, UHIM, HCIM (1, 2)	-	-	-
Heritage-friendly public facilities (2)	Røros kommune	Tinn kommune	Notodden kommune
Customized universal design and accessibilities (2)	Røros kommune	Tinn kommune	Notodden kommune
Urban heritage-related CSR, PPP, and PPPP (N/A)	Trøndelag fylkeskommune, Røros kommune	Vestfold og Telemark fylkeskommune, Rjukan Næringsutvikling AS, Tinn kommune	Vestfold og Telemark fylkeskommune, Notodden kommune
Search and Rescue (6)	The Norwegian SAR/ The Rescue and Emergency Planning Department, Directorate for Civil Protection and Emergency Planning (*Direktoratet for samfunnssikkerhet og beredskap/DSB*)	The Norwegian SAR/The Rescue and Emergency Planning Department, DSB	The Norwegian SAR/The Rescue and Emergency Planning Department, DSB
Emergency preparedness (6)	The Norwegian SAR/ The Rescue and Emergency Planning Department, DSB, Trøndelag fylkeskommune, Notodden kommune	The Norwegian SAR/The Rescue and Emergency Planning Department, DSB, Vestfold og Telemark fylkeskommune, Notodden kommune	The Norwegian SAR/The Rescue and Emergency Planning Department, DSB, Vestfold og Telemark fylkeskommune, Notodden kommune
Tourism (3)	*Destinasjon Røros*, Trøndelag fylkeskommune, Røros kommune	VisitRjukan, Vestfold og Telemark fylkeskommune, Tinn kommune	Vestfold og Telemark fylkeskommune, Notodden kommune
Heritage Education (4)	The Røros Museum, Røros kommune	Norsk Industri-Arbeidermuseum (NIA), Tinn kommune	Norsk Industri-Arbeidermuseum (NIA), Notodden kommune
Interpretation of heritage for public/general audience (4)	The Røros Museum, Røros kommune, Røros World Heritage Foundation (*Røros Verdensarv*)	Norsk Industri-Arbeidermuseum (NIA), Tinn kommune, Norwegian Industrial Heritage Foundation (*Stiftelsen Norsk Industriarbeidermuseum*)	Norsk Industri-Arbeidermuseum (NIA), Notodden kommune, Norwegian Industrial Heritage Foundation (*Stiftelsen Norsk Industriarbeidermuseum*)

Clusters of departments: (1) PLZ = planning and zoning, (2) PWI = public works and infrastructure, (3) TOU = tourism, (4) CCH = conservation and cultural heritage, (5) ESU = environment and sustainability, (6) USS = urban safety and security.

Appendix B

Table A4. List of Document Studies Resources.

Properties	Documents	Year/Date	Institution
Røros Mining Town	Justification for inclusions in the World Heritage list	16 May 1978	Government of Norway
	Advisory body evaluation	15 November 1978	ICOMOS
	Cultural Heritage Act	1978	Government of Norway
	Decision from World Heritage Committee	29 September 1980	WHC—UNESCO
	Planning and Building Act	1985	Government of Norway
	State of Conservation—Bureau of the World Heritage Committee 18th session	26 May 1994	WHC—UNESCO
	Decision's context	26 May 2006	Presentation of the periodic report for sections I and II of Europe
	Decisions adopted at the 30th session of the World Heritage Committee (Vilnius, 2006)	23 August 2006	WHC—UNESCO
	Periodic Reporting—State of Conservation of World Heritage Properties in Europe	2006	WHC—UNESCO
	Advisory Body Evaluation	17 March 2010	ICOMOS
	Advisory Body Evaluation	May 2010	IUCN
	Report of the decisions adopted by the World Heritage Committee at its 34th Session	3 September 2010	WHC—UNESCO
	Decision's context—Evaluations of Cultural Properties—34th ordinary session(25 July–3 August 2010), Brasilia (Brazil)	2010	WHC—UNESCO
	Decision's context—Establishment of the World Heritage List and of the List of World Heritage in Danger	31 May 2010	WHC—UNESCO
	Periodic Report—Second Cycle	19 May 2014	Government of Norway
Rjukan-Notodden Industrial Heritage Sites	Cultural Heritage Act	1978	Government of Norway
	Planning & Building Act	2008	Government of Norway
	Cultural Heritage Act (Amended)	2009	Government of Norway
	Rjukan—Notodden Industrial Heritage Site—Nomination Dossier	2015	Government of Norway
	Advisory body evaluation	12 March 2015	ICOMOS
	Decisions adopted by the World Heritage Committee at its 39th session (Bonn)	8 July 2015	WHC—UNESCO

Table A4. *Cont.*

Properties	Documents	Year/Date	Institution
Rjukan-Notodden Industrial Heritage Sites	Decisions context—Establishment of the World Heritage List and of the List of World Heritage in Danger (Bonn, Germany, 28 June–8 July 2015)	15 May 2015	WHC—UNESCO
	Decision context—Establishment of the World Heritage List and of the List of World Heritage in Danger (Corrigendum)	22 May 2015	WHC—UNESCO
	Decision context—Evaluation of nominations of cultural and mixed properties to the World Heritage list (ICOMOS report for the World Heritage Committee)	April 2015	ICOMOS

References

1. Elliott, M.A.; Schmutz, V. World heritage: Constructing a universal cultural order. *Poetics* **2012**, *40*, 256–277. [CrossRef]
2. Jokilehto, J.; Cameron, C.; Parent, M.; Petzet, M. *The World Heritage List. What Is OUV? Defining the Outstanding Universal Value of Cultural World Heritage Properties*; Hendrik Bäßler Verlag: Berlin, Germany, 2008; Volume 16, ISBN 3930388510.
3. Tucker, H.; Carnegie, E. World heritage and the contradictions of 'universal value'. *Ann. Tour. Res.* **2014**, *47*, 63–76. [CrossRef]
4. Labadi, S. The World Heritage Convention at 50: Management, credibility and sustainable development. *J. Cult. Herit. Manag. Sustain. Dev.* **2022**. [CrossRef]
5. Khalaf, R.W. Integrity: Enabling a future-oriented approach to cultural heritage. *Hist. Environ. Policy Pract.* **2022**, *13*, 5–27. [CrossRef]
6. Prabowo, B.N.; Temeljotov Salaj, A.; Lohne, J. Identifying Urban Heritage Facility Management Support Services Considering World Heritage Sites. *Urban Sci.* **2023**, *7*, 52. [CrossRef]
7. Shrestha, C.B.; Banskota, B. Strengthening the National Capacity for Conservation of National Heritage Monuments and Sites. *Vikas A J. Dev.* **2021**, *1*, 1–13.
8. Cristina Heras, V.; Wijffels, A.; Cardoso, F.; Vandesande, A.; Santana, M.; Van Orshoven, J.; Steenberghen, T.; Van Balen, K. A value-based monitoring system to support heritage conservation planning. *J. Cult. Herit. Manag. Sustain. Dev.* **2013**, *3*, 130–147. [CrossRef]
9. Prabowo, B.N.; Salaj, A.T.; Lohne, J. Urban Heritage Facility Management: A Scoping Review. *Appl. Sci.* **2021**, *11*, 9443. [CrossRef]
10. Collins, D.; Senior, C.; Jowkar, M.; Salaj, A.; Facilities, A.J. The impact of an urban facilities management summer school on the participants. *Facilities* 2021, *ahead-of-print*. [CrossRef]
11. Temeljotov Salaj, A.; Lindkvist, C.M. Urban facility management. *Facilities* **2021**, *39*, 525–537. [CrossRef]
12. Ginzarly, M.; Houbart, C.; Teller, J. The Historic Urban Landscape approach to urban management: A systematic review. *Int. J. Herit. Stud.* **2019**, *25*, 999–1019. [CrossRef]
13. Rey-Pérez, J.; Pereira Roders, A. Historic urban landscape: A systematic review, eight years after the adoption of the HUL approach. *J. Cult. Herit. Manag. Sustain. Dev.* **2020**, *10*, 233–258. [CrossRef]
14. Van Oers, R.; Pereira Roders, A. Road map for application of the HUL approach in China. *J. Cult. Herit. Manag. Sustain. Dev.* **2013**, *3*, 4–17. [CrossRef]
15. Wilson, D. *Strategic Facility Management Framework*, 1st ed.; The Royal Institution of Chartered Surveyors (RICS): London, UK; International Facility Management Association (IFMA): Houston, TX, USA, 2018; ISBN 978 1 78321 235 4.
16. Prabowo, B.N.; Salaj, A.T. Urban heritage and the four pillars of sustainability: Urban-scale facility management in the World Heritage sites. In *Proceedings of the IOP Conference Series: Earth and Environmental Science*; IOP Publishing: Bristol, UK, 2023; Volume 1196, p. 12105.
17. *ISO 41011: 2017*; Facility Management–Vocabulary. ISO: Geneva, Switzerland, 2017.
18. Modu, M.A.; Sapri, M.; Abd Muin, Z. Towards facilities management practice within a different environment. *J. Infrastruct. Facil. Asset Manag.* **2021**, *3*. [CrossRef]
19. Nijkamp, J.E.; Mobach, M.P. Developing healthy cities with urban facility management. *Facilities* **2020**, *38*, 819–833. [CrossRef]
20. Chizzoniti, D. The nature of cities. In *Cities' Identity Through Architecture and Arts*; Routledge: London, UK, 2018; pp. 297–308. ISBN 1315166550.
21. UNESCO World Heritage Convention. *UNESCO Recommendation on HUL*; UNESCO: Paris, France, 2011; Volume 25.
22. Shah, A.A.; Chanderasekara, D.P.; Naeem, A. Preserving the Past and Shaping the Future: An Articulation of Authenticity of Heritage within Urban Development. *J. Int. Soc. Study Vernac. Settl.* **2023**, *10*. [CrossRef]

23. Erkan, Y. The Way Forward with Historic Urban Landscape Approach towards Sustainable Urban Development. *Built Herit.* **2018**, *2*, 82–89. [CrossRef]
24. González Martínez, P. Built heritage conservation and contemporary urban development: The contribution of architectural practice to the challenges of modernisation. *Built Herit.* **2017**, *1*, 14–25. [CrossRef]
25. Jiang, J.; Zhou, T.; Han, Y.; Ikebe, K. Urban heritage conservation and modern urban development from the perspective of the historic urban landscape approach: A case study of Suzhou. *Land* **2022**, *11*, 1251. [CrossRef]
26. Otero, J. Heritage conservation future: Where we stand, challenges ahead, and a paradigm shift. *Glob. Chall.* **2022**, *6*, 2100084. [CrossRef]
27. Borgos, M. Managing the World Heritage Site Røros Mining Town and the Circumference. *Adapt. Hist. Places Clim. Chang.* 41. Available online: https://whc.unesco.org/en/list/55/ (accessed on 10 February 2024).
28. Guttormsen, T.S.; Fageraas, K. The social production of "attractive authenticity" at the World Heritage Site of Røros, Norway. *Int. J. Herit. Stud.* **2011**, *17*, 442–462. [CrossRef]
29. Sesana, E.; Gagnon, A.S.; Bonazza, A.; Hughes, J.J. An integrated approach for assessing the vulnerability of World Heritage Sites to climate change impacts. *J. Cult. Herit.* **2020**, *41*, 211–224. [CrossRef]
30. Taugbøl, T.; Andersen, E.M.; Grønn, U.; Moen, B.F. *Rjukan-Notodden Industrial Heritage Site*; Nomination to the UNESCO World Heritage List; Riksantikvaren: Oslo, Norway, 2014.
31. Yin, R.K. *Case Study Research*; SAGE Publications: London, UK, 2014.
32. Harris, J. The correspondence method as a data-gathering technique in qualitative enquiry. *Int. J. Qual. Methods* **2002**, *1*, 1–9. [CrossRef]
33. Parris, M. Email Correspondence: A Qualitative Data Collection Tool for Organisational Researchers. 2008. Available online: https://www.anzam.org/wp-content/uploads/pdf-manager/1390_PARRIS_MELISSA-433.PDF (accessed on 10 February 2024).
34. Van Raemdonck, B.; Vanhoutte, E. Editorial theory and practice in Flanders and the Centre for Scholarly Editing and Document Studies. *Lit. Linguist. Comput.* **2004**, *19*, 119–127. [CrossRef]
35. Miles, M.B.; Huberman, A.M. *Qualitative Data Analysis: An Expanded Sourcebook*; Sage: London, UK, 1994; ISBN 0803955405.
36. Franklin, C.; Ballan, M. Reliability and validity in qualitative research. In *The Handbook of Social Work Research Methods*; Sage: London, UK, 2001; Volume 4.
37. Firmansyah, F.; Fadlilah, K.U. Improvement of involvement society in the context of smart community for cultural heritage preservation in Singosari. *Procedia-Soc. Behav. Sci.* **2016**, *227*, 503–506. [CrossRef]
38. Li, Y.; Hunter, C. Community involvement for sustainable heritage tourism: A conceptual model. *J. Cult. Herit. Manag. Sustain. Dev.* **2015**, *5*, 248–262. [CrossRef]
39. Senior, C.; Temeljotov Salaj, A.; Johansen, A.; Lohne, J. Evaluating the Impact of Public Participation Processes on Participants in Smart City Development: A Scoping Review. *Buildings* **2023**, *13*, 1484. [CrossRef]
40. Chi, C.G.; Zhang, C.; Liu, Y. Determinants of corporate social responsibility (CSR) attitudes: Perspective of travel and tourism managers at world heritage sites. *Int. J. Contemp. Hosp. Manag.* **2019**, *31*, 2253–2269. [CrossRef]
41. Xue, Y.; Temeljotov-Salaj, A.; Lindkvist, C.M. Renovating the retrofit process: People-centered business models and co-created partnerships for low-energy buildings in Norway. *Energy Res. Soc. Sci.* **2022**, *85*, 102406. [CrossRef]
42. Della Torre, S.; Boniotti, C. Innovative funding and management models for the conservation and valorization of public built cultural heritage. In *Eresia ed Ortodossia nel Restauro: Progetti e Realizzazioni*; Arcadia Ricerche: Venice, Italy, 2016; pp. 105–114.

Appendix 4

SYSTEMIC APPROACHES IN REVITALIZATION OF SEMARANG OLD CITY HERITAGE SITE: FROM NEGLECTED AREA TO TOURISM DESTINATION

DOI: 10.18485/arh_pt.2020.7.ch38

_ Bintang Noor Prabowo
Department of Civil and Environmental Engineering, Norwegian University of Science and Technology (NTNU), bintang.n.prabowo@ntnu.no

_ Alenka Temeljotov Salaj
Department of Civil and Environmental Engineering, Norwegian University of Science and Technology (NTNU), alenka.temeljotov-salaj@ntnu.no

ABSTRACT

Many heritage areas, with different typologies, problems, and existing levels of decays, in several countries, were left abandoned and causing various economic, social, and urban complications. Some typologies of urban heritage areas often found in previous studies are ex-colonial settlement, industrial cultural-heritage, park, ancient cemetery, etc. The typical problems that repeatedly occurred, such as decays, depreciation of land value, and safety/security issues, show that although located in different places, urban heritage areas might face the same glitches. The existing condition of those places are ranging from relatively well preserved, regular, medium severe, severely damaged, and even totally damaged, thus needed to be taken care of using different conservation approaches; preservation, reconstruction, restoration, and (or) adaptation.

Despite the current conditions, such sites are nowadays considered as an essential part of humans' and cities' history. Some of those heritage sites face challenges in gaining sustainable conservation in cultural, environmental, social, economic, and territorial aspects. They usually have been left behind by their "enablers" that previously led the growth of these areas, not to mention the specific and latent characteristics of the urban heritage area that could be very different from today's urban ecosystem.

One current case worth to be observed is Semarang Old City (Kota Lama Semarang), a previously abandoned ex-Dutch colonial towns located in Java Island, Indonesia, that shows interesting trends of ups and downs throughout this last century. This urban heritage area, being left abandoned for decades, finally emerges as a new tourism destination in Central Java province within the last couple of years. The booming visits of tourists and enthusiasts is a remarkable phenomenon to be studied since numbers of researches on the same cases in other countries show various impacts regarding the sustainability of such urban heritage areas. This article aims to identify the strategic approach in the revitalization of the Semarang Old City urban heritage area using six critical steps from the Historic Urban Landscape Approach and principles of Urban Facility Management.

METHODOLOGY: This qualitative study uses literature research and observational technique to obtain information and conduct a comprehensive analysis of the phenomenon; RESULTS: the matriculation table resulted in this article is a useful resource to understand the strategic approach in the management of urban heritage conservation, so that the stakeholders of any specific urban heritage in general, and Kota Lama Semarang in specific, could benefit from the knowledge, and therefore contribute more according to their individual and collective roles; TYPE OF PAPER: Viewpoint paper.

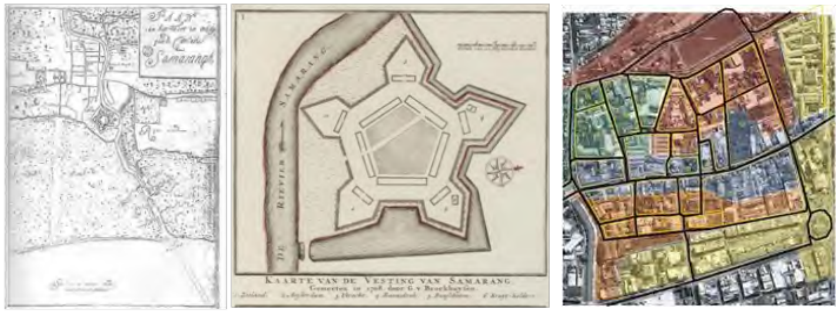
KEYWORDS _ *urban heritage, conservation, revitalization, urban facility management, historic urban landscape*

INTRODUCTION

After the national and local policy started to take a side on the conservation of Semarang Old City (Kota Lama) area by the early 1990s, the district slowly gained attention from its stakeholders, after being abandoned for decades due to several reasons. Besides lack of infrastructures and known as a dangerous area to be visited, this area also often faced a periodic tidal flood, causing damages to the heritage buildings. Some of the buildings even collapsed due to deterioration of their wooden structures, or simply because intentionally left untreated properly by their owners (B. N. Prabowo and Harsritanto 2018).
By the issuance of Mayor Decree No.646/50/1992, as an operational, legal document for National Act. No 5 of 1992 on Heritage Artefact, the municipality of Semarang began to conduct a systemic approach to preserve historical buildings in the city, including the Kota Lama area, by creating a list of protected heritage buildings. On the national level, within the next two decades, the act was renewed with a more comprehensive regulation with the ratification of National Act no. 11 of 2010 on Heritage.

A brief history of Kota Lama Semarang

The Dutch colony history in Central Java began with the relocation of the representative office of the Vereenigde Oost-indische Compagnie (VOC), a large company formed by the government from a merger of a couple of Dutch trading-companies, from Jepara to Semarang in 1708. As a reward for defeating the Trunojoyo rebel in Madura, the kingdom of Mataram granted the VOC the right to operate in the Semarang harbor region by the end of 1677, in compliance with the agreement between VOC and Amangkurat II. Next to the resident's house, on the side of the Kali Semarang, a building permit for the settlement was issued. VOC was then subsequently given the monopoly on duty-free trade in rice and sugar and the right to inhabit most of the territory of Semarang (B. N. et al Prabowo 2019).
The earliest proof of Kota lama Semarang's presence was seen on the map of PAAN van het Fort en Omleggende Cituatie van Samarangh as a fortress, dating back to 1695 (Figure 1). The location was situated on Kali Semarang's east side. VOC had a large number of soldiers and staff, according to Fransçois Valentijn, who was in charge of trade with the locals. In the shape of five edged stars, the colony settlement was reinforced by a wood plank on each edge: Zeeland, Amsterdam, Utrecht, Raamsdonk, and Bunschoten (Hendro 2017). The cluster eventually became known as De Vijfhoek van Samarangh.



_ Figure 1: Evolution of Semarang Old City (Kota Lama) Maps (source: https://www.researchgate.net/publication/339105098_Historic_urban_landscape_HUL_approach_in_Kota_Lama_Semarang_mapping_ the_layer_of_physical_development_through_the_chronological_history, and https://www.connective-cities.net/fileStorage/Veranstaltungen/ Projektwerkstatt_Jakarta/Dokumenten/T1-2_Presentasi_Kota_Lama_UCLG_180717.pdf; access date: 05.05.2020)

There were not many construction activities in this part of town after the Second World War. Following the Republic of Indonesia's Declaration of Independence in 1945, this region started to deteriorate gradually. In 1910, the old bridge named de Zuiderport burg or Gouvernementsburg was rebuilt and added with a new identical bridge in the 1980s, following a new policy of one-way route circling around de Heerenstraat.

Due to the local flood caused by the increase in water surface level during some periods, especially during rainy seasons, the degradation of this area worsened every year. It used to be inconvenient and dangerous to walk through this area at night before the year 2000, as this abandoned section of the city was notorious for its criminal and homeless activities, after the commercial functions progressively left the old town of Semarang to the new center of Semarang (B. N. Prabowo and Harsritanto 2018). Despite those conditions, the Mayor of Semarang released policy of Mayor Decree No.646/50/1992 on conservation of heritage buildings in Semarang, including those which scattered inside the Old City, as a manifestation of higher government regulation (UU No. 5, 1992 on Heritage Artefact)

Between 1999-2000, to address the flood crisis, the Semarang government undertook the construction of Polder Tawang, a pond or water retention system fitted with pumps to control the flood if needed. Used for different purposes earlier, the site of this Tawang polder used to be a 1.3-hectare public space (Wicaksono 2016). The polder architecture was meant to replicate Kota Lama Semarang 's environment as it is situated between Tawang Station and Noorderwalstraat. Many younger generations regarded this Tawang Polder as an old artifact from the Nederlandsch Indische period, after twenty years of its first operational; a misunderstanding with stakeholder mix-response.

UNESCO has already identified the Old City of Semarang in the Tentative List of emerging World Heritage by 2017, a big step towards the complete acceptance of being promoted as a World Heritage by the WHC (B. N. Prabowo and Harsritanto 2018). Since that, a major renovation is being carried out in Kota Lama Semarang, but many experts and scholars are concerned about the originality of the Old City as the gentrification seems to be targeted solely for tourism purposes, with less heritage conservation concern.

Some changing strategic approaches were taken in the effort of preservation, reconstruction, restoration, and adaptation during a relatively long period of time with different leadership. This article aims to identify those strategies applied in the gentrification of the urban Heritage from the Historic Urban Landscape approach and (urban) facility management point of view.

METHODOLOGY

Initially, the study began with a historical data collection to support the first step of the Historic Urban Landscape approach through literature survey, secondary sources, archival study, interviews, and field observation to obtain information and conduct a comprehensive analysis of the phenomenon. A qualitative data analysis software is used to code, classify, and analyze the data descriptively to understand better the strategic approach taken in Semarang Old City revitalization from the HUL approach and (urban) FM perspectives.

RESULT AND DISCUSSION

The study shows that the strategic approaches taken in managing Semarang Old City heritage area are taken intuitively without addressing the UNESCO Recommendation on the Historic Urban Landscape (HUL) approach. The Historic Urban Landscape assessment framework from the work of Veldpaus and Roders (2013) was used in this study. The participation of people and civic society was seemingly set to minimal, although all elements of (urban) Facility Management and values assessment were already taken into consideration. It will be challenging for Kota Lama Semarang to be promoted as a World Heritage site if the Historic Urban Landscape approach is not addressed

properly (as shown in table 1). However, the dwellers gain benefits from the blooming of tourism after major urban gentrification was taken.

_ Table 1: The Historic Urban Landscape Assessment in Kota Lama Semarang (inherited from the HUL assessment framework by Veldpaus & Roders)

	Traditional Values				Community Values		Process Values	
	Aesthetical	Age	Historic	Scientific	Social	Political	Economic	Ecological
A. Map resources	1	1	1	1	3	0	3	1
B. Reach consensus on what to protect	0	4	3	1	3	0	1	1
C. Asses vulnerability	1	1	1	1	1	0	3	1
D. Integrate A, B, C in urban management	1	1	1	1	3	1	1	1
E. Prioritize action	3	3	1	1	3	1	3	1
F. Define partnership	1	1	1	1	3	0	3	1

As an asset for the city, Kota Lama Semarang is already listed in the tentative list of World Heritage by WHC and UNESCO. A strict requirement should be fulfilled in order to be promoted as a World Heritage due to its uniqueness and outstanding universal value as one of the human civilization traces during the colonial era. Strategic approaches have already been implemented in multiple phases, and as the urban heritage area nourished with tourism, a systematic assessment was taken by this study to identify the strategic approach from the Historic Urban Landscape (HUL) approach and (urban) facility management perspectives.

Cultural Heritage Management of Semarang Old City

Cultural Heritage Management (CHM) is "a heritage protection mechanism that coordinates and integrates the function of a heritage site with the primary aim of preserving the importance of the site as specified by designation requirements, government entities or other stakeholders, experts from different shades and other people with valid interests in the site" (Mason et al., 2003 in Hasbollah, (2015)). The essence of strategic planning in revitalizing Kota Lama Semarang is not a straightforward strategy, but more likely to include multiple facets and stakeholders in the area. In specific, when dealing with cultural Heritage that has visible and intangible elements, a more cyclical process ought to be undertaken, which opens up opportunities for input and appraisal from multiple points of view. The key driver in tackling the ever-changing complexities of urban planning is the establishment of a consistent long-term strategy as a roadmap to taking short-term action (Rafidee Bin Hasbollah 2015). A top-down conservation approach that still governs the serial processes of urban patrimony gentrification in Kota Lama Semarang, while some focus group discussions with academics and specialists still take place in the creation of the master plan. Typical issues in Indonesia are lack of popular interest and political activity. In some cases, the influential position of the consultant as the messenger of the vision of authority was criticized as neglecting the expectations of the dwellers of the Old City. After, such a consultant's lack of conservation expertise resulted in the "Disneyfication" and needless ornamentation across the heritage region.

The definition of Cultural Heritage Management has ramifications for site administrators and heritage practitioners, according to Altenburg (2010). Management initiatives that effectively include site management, a multidisciplinary team with a variety of expertise, realistic and conceptual thought, resilience, and the continued engagement and engagement of the local community are required for successful execution. Through the Mayor Decree No.12 in 2007, a special body, namely BPK2L (Badan Pengelola Kawasan Kota Lama/ Old City Area Management Body) was established as a non-structural institution with responsibilities to manage, develop, and optimize the potential of the Kota Lama Semarang area, including planning, monitoring, supervising, and controlling the development of the protected urban heritage zone. BPK2L, with a multi sectors member, was supposed to become an influential body for the conservation and revitalization conducted in the site, but

most decisions were made at the municipal level.

_ Table 2: Distribution of strategic approach in Kota Lama Semarang

Element	Values	Strategy	Approach	FM Level
People	**Social Political**	Improvement of human resources within the bureaucratic system and the dwellers	Improve a clean and efficient government.	S, T, O
			Friendly officers/ field operators	O
			Improve the security to increase comfort and safety	O
			Regulation of informal sectors	T
		Improvement of Public-Private-People Partnership	Civic engagement/ public participation	S, T, O
			Transparent government/ policy	S, T
			Ease of permit obtaining	S, T, O
			Improve Public-Private Partnership (PPP) & Public-Private-People Partnership (PPPP)	S, T, O
Process	**Ecological**	Improvement of Flood and Drainage Management	Flood Prevention and Drainage Masterplan	S, T
			Water retention polder	T, O
			Scheduled maintenance	O
	Economic	Incentives and ease of investment	Financial management	S, T
			Tax deduction and relieves	S, T, O
			Reduction of building permit cost	T, O
	Political	Management of historic city	Internal stakeholder and bureaucracy	S, T, O
			BPK2L	S, T, O
			Coordination with Provincial and National level	S, T
			Pro heritage policy	S
			World heritage promotion	S, T, O
			Monitoring and Evaluation	S, T
Place	**Aesthetic Historic Age Scientific**	Urban Heritage Development	Improve building regulation	S
			Improve supervision	O
			List of heritage buildings and places	S, T, O
			Masterplan of Kota Lama Semarang	S
			Guideline of renovation & conservation	S, T
		Urban infrastructure	Urban utilities	S, T
			Street ornaments	S, T, O
			Improvement of existing parks	T, O
			Improvement of walkability	S, T, O
Technology	**Social Scientific Ecological**	Usage of technologies	Official website	T, O
			Sensors and CCTV	O
			Command center	T, O
			Application of smart city	S, T, O

Numbers of strategies and approaches were taken along the period of different leadership and a couple of trials and errors in conducting conservation of heritage buildings. The shifting paradigm in Urban Heritage conservation from treating the building as monuments to be preserved into a more holistic approach with the latest UNESCO recommendation on the HUL approach brings consequences in minor and major adjustments within the conservation of Kota Lama Semarang.
Therefore, the importance of cultural value qualities and the role of heritage stakeholders in decision-making processes were included in CHM. However, as mentioned earlier, there is a shortfall in the application of the Cultural Heritage Management process in the conservation of heritage buildings. Because of that, this issue needs to be addressed, and a new conservation paradigm is being proposed. A facility management perspective will, therefore, be proposed due to its familiarity with the practice of building maintenance.

Traditional Values
Assessment criteria towards traditional values (aesthetical, age, historical, scientific) significantly showed that the age of heritage building reach the highest score due to the ease to obtain data

regarding building age and clear guidance from the National Act on Heritage article 5, which stated that one of the criteria to be listed as a heritage, the age of the building has to already reach a minimum 50 years of existence. There is no dispute on this matter amongst the stakeholders. Another value that raised a high consensus, both on tangible and intangible, is the historic value embedded in the buildings or other cultural heritages. It is interesting to find out that aesthetic value is not becoming a leading factor in traditional values, while it is, at the same time, considered important to determine action priority. One of the explanations is that the aesthetic factor could be very subjective from one to another person or group.

Generally, resource mapping, vulnerability assessment, and defining partnerships in the management of Semarang Old City heritage area have not yet been conducted in a comprehensive manner. Physical aspects as tangible attributes contributed to the bigger portion of the short-term development plan. A more interesting Public-Private Partnership (PPP) or Public Private People Partnership (PPPP) scheme, as shown by Salaj et al. (2018), could be applied as new alternative models in defining partnerships inside the conservation area.

The integration of resource mapping, consensus reaching, and vulnerability assessment within a larger urban context also mostly focused on the tangible aspect. Recently, the chief of BPK2L, who is also the Vice Mayor of Semarang City, announced that the area of Old Semarang City had been stated as a National Heritage Site by the Ministry of Education and Culture of the Republic of Indonesia. The usage of the term Old Semarang City (instead of Semarang Old City) indicated that another three historical areas (Kauman, Kampung Melayu, and the China Town) are simultaneously set together with Semarang Old City (Kota Lama) to form an entire Old Semarang City urban heritage site.

Community Values

Social and political values assessment in Kota Lama Semarang resulted in a very contrast output. All assessment checkpoint on social values shows that a large portion of attention is given to both tangible physical aspects and non-physical cultural aspects (intangible). On the contrary, the study reveals that political aspects are not becoming the dominant factor of the community values.

From the interview with several local historians, it is evident that although the acceleration of urban heritage gentrification in Semarang Old City is a political decision taken by the Mayor of Semarang municipality and the President of the Republic of Indonesia (through the Ministry of Public Works), the mapping of resources, consensus achievement, vulnerability assessment, and partnership defining the process, have not been exploited politically. Only the action prioritization and integration of the first three-factor in urban management context being assessed as politic-related values, especially the tangible ones. Political decisions such as tax benefits and incentives towards the property owners on the urban heritage area also have strong relationships with economic values.

Process Values

Within urban facility management discipline, "process" is an important part, along with "people" and "place," to enhance an efficient and sustainable city. Table 1 indicates that economic values are an important aspect in the development of urban heritage areas such as Kota Lama. Without economic activity, an urban heritage area will not be sustainable in the long run. After being stagnant for decades, Semarang Old City gaining its momentum back toward economic balance, following the successful revitalization of the area.

Ecological values seem to be still focusing on the two big issues on the area; flood controlling and emission reduction. The plan of creating "slow traffic" inside the conservation area is often criticized as an ambiguous decision. New parking management by creating multiple parking spots on the district's periphery is considered preferable for the convenience and the wellbeing of the dwellers and tourists in the conservation site.

_ Figure 2: Semarang Old City (Kota Lama) before and after urban heritage gentrification (source: https://bambangpriantono.wordpress.com/2013/02/23/catatan-wisata-banjir-hari-ini/ and https://cjtb.or.id/listing/semarang-old-town-charming-old-time-heritage-atmosphere/; access date: 05.05.2020)

CONCLUSIONS

The conservation of Kota Lama Semarang had a multiple-phase evolution with different approaches. It is evident that the planning and development of the urban heritage area were not entirely following UNESCO Recommendation on the Historic Urban Landscape, which is understandable since the recommendation itself was issued in 2011 and still in its establishment phase. The conservation movement in the Semarang Old City began in 1992, following the ratification of the National Act on heritage protection. More than 50 percent of the heritage buildings in Semarang were listed and clustered in the Kota Lama Semarang heritage area.

Critiques were addressed to the authority due to its exclusivity in the top-down model of decision making, which resulted in a couple dispute and misunderstanding during the gentrification process. A phenomenon of "Disneyfication" by adding too much (and unrelated) accessories was one of clear signs that the authority in charge was not fully aware of the importance of preserving the significance and originality of the heritage area. By not entirely following the guidance of the Historic Urban Landscape Approach and the critical steps of HUL, the prospect of being listed as a World Heritage by the UNESCO is going to be very limited.

However, the Semarang Old City has now gradually back to life and find its new direction, despite the academic and technical debates on the rights or wrongs in the policymaking. It is the duty of bureaucracy, academics, and other stakeholders to enhance and guide this spirit of betterment by systematically involved in the conservation process in accordance with the vision of Kota Lama Semarang to become one of the World Heritage sites in Indonesia.

REFERENCES

_ Altenburg, K. 2010. "Values-Based Management at Cultural Heritage Sites." Amoeda, R. Lira, S. and Pinheiro, C.(Eds.) *Heritage*.

_ Hendro, Eko Punto. 2017. "Study of the Outstanding Universal Values (OUV) to Achieve the Semarang Old Town as the World Heritage City." *Advanced Science Letters* 23(10): 10002–4.

_ Prabowo, Bintang Noor; et al. 2019. "Historic Urban Landscape (HUL) Approach in Kota Lama Semarang: Mapping the Layer of Physical Development through the Chronological History." In *IOP Conf. Series: Earth and Environmental Science*; ICSADU 2019, Semarang: IOP Publishing.

_ Prabowo, Bintang Noor, and Bangun IR Harsritanto. 2018. "KOTA LAMA SEMARANG MENUJU STATUS PUSAKA DUNIA UNESCO: APA ITU STATUS WORLD HERITAGE?" MODUL.

_ Rafidee Bin Hasbollah, Hasif. 2015. "A Conceptual Framework for Conserving Heritage Buildings in Malaysia from the Perspective of Facilities Management." *International Journal of Economics and Financial Issues* (5): 45–51. http:www.econjournals.com (September 1, 2020).

_ Salaj, Alenka Temeljotov, Athena Roumboutsos, Peter Verlič, and Bojan Grum. 2018. "Land Value Capture Strategies in PPP – What Can FM Learn from It?" Facilities.

_ Veldpaus, Loes, and Ana Pereira Roders. 2013. "Historic Urban Landscapes : An Assessment Framework Part II." In *29th Conference of Sustainable Architecture for a Renewable Future (PLEA 2013)*, Munich, Germany, 1–5.

_ Wicaksono, Fajar B. 2016. "Urban Drainage and Options for Urban Polder Development for UNESCO Heritage Kota Lama, Semarang, Central Java, Indonesia."

Appendix 5

The 20th Sustainable, Environment and Architecture IOP Publishing
IOP Conf. Series: Earth and Environmental Science **738** (2021) 012044 doi:10.1088/1755-1315/738/1/012044

Identifying Overtourism Impacts on the Informal Sector's Livelihoods in Urban Heritage Area

Bintang Noor Prabowo, Alenka Temeljotov Salaj
Department of Civil and Environmental Engineering
Norwegian University of Science and Technology (NTNU)

bintang.n.prabowo@ntnu.no

Abstract. Ever since UNESCO discussed the impact of revitalization on the urban environment and its heritage value, a new niche of urban heritage tourism has emerged. This niche of tourism was once a successful phenomenon before it reached a point where overtourism eventually produces volatility issues. The literature review has shown that research on the effect of overtourism on informal economies is inadequate. Many academics seem mostly interested in focusing on the economic aspects and the inhabitants, without addressing whether they are engaging in formal or informal sectors. Therefore, studies of overtourism on the informal sector in urban heritage areas are essential to bridge the knowledge gap. This article will identify the impact of overtourism on informal sectors' livelihoods in the urban heritage area using the Sustainable Livelihoods Framework, with minor adjustments within the urban heritage context, as the primary tool to carefully understand the phenomenon and suggest a more suitable framework for this specific study. A qualitative data analysis software is used to conduct the necessary processes in this article. Informal markets and disadvantaged communities are seen to find ways to develop and merge the resources they already have innovatively to ensure their well-being. A modified framework to discuss the context of urban heritage is being developed by evaluating the informal sectors of urban heritage from the viewpoint of the Sustainable Livelihoods Approach during the overtourism phenomenon. The proposed framework may potentially be used to address other issues relating to urban livelihoods in different contexts.

Keywords: overtourism, urban heritage, livelihoods, informal sector, urban facility management

1. Introduction

Urban form, city-infrastructure, and density are important factors in understanding how the urban system works. The latter factor acts as one of the demographic problems related to urban spaces spread-out throughout the downtown area [1]. As one of the density-contributing factors, tourism has become increasingly prevalent towards cultural sites and urban destinations [2]. Neuts and Nijkamp [3] argued that as the heritage destinations continue to draw a considerable number of visitors, overcrowding is becoming a growing problem. Overtourism's detrimental effects include several issues, such as traffic and parking problems, community frustration from misbehaving visitors, increasing living costs for residents, visitor's disappointment, and significant breakage of the heritage [2]–[4]. As summarized by Butler [5] in his book, overtourism is a new word for an old issue, namely disproportionate numbers of visitors at a destination that can have detrimental impacts on the society concerned of all styles. Although the term is recent, many of the issues involved have a long history, especially in well-visited city areas. John Ruskin, an art expert, wrote about the prevalence and influence of visitors in Venice in

the mid-19th century. The revolutionary impact of high tourism on locations has been recognized very well over decades [5].

Capocchi et al. [6] summarized that the newly introduced word "Overtourism" defines specific destinations where dwellers or visitors, local people, or guests believe in the existence of a disproportionate number of travelers, which caused area's personal-satisfaction or the standard of the experience to be inadequately decreased. However, the statistical uptrend will ultimately be affecting the members of society who currently reside in the urban heritage tourism destination. Community members can be annoyed by a growing number of visitors, especially if the tourism industry's revenue is not fully benefited the local dwellers and businesses. If the dwellers feel that the tourist industry's growth has superior positive effects rather than negative ones, then the local communities are expected to engage with it. It was not surprising that locals and visitors are worried that an adverse effect will occur when the site's carrying capacity is exceeded [7].

The literature showed that work on the implications of overtourism on informal economies is minimal. Many scholars seem mainly interested in concentrating solely on economic aspects and residents without discussing whether they are doing formal or informal business in the region. Aris Anuar et al. [8], citing Seraphin's latest research, only studied other aspects of overtourism and Venice's fall as a destination. A couple of years earlier, Goodwin [9] has been surveying the risk of overtourism without addressing the informal sectors. Thus, studies on identifying the impact of overtourism on the informal sector in urban heritage areas are essential to bridging the knowledge gap. This article will identify the impact of overtourism on informal sectors' livelihood in the urban heritage area. This study used the Sustainable Livelihood framework as the primary tool to carefully understand the phenomenon and suggest a more suitable framework for this specific study.

2. Literature Review

The word "overtourism" is relatively recent, with almost all the mentioning dating back to 2017 and a growing number of publications in the form of thesis and dissertation coming out in 2018. Research articles that explored the tension of tourism on surrounding communities occurred in the 1970s [10], [11], along with conversations about the potential consequences of saturation of tourism destinations [12]. Overtourism is a dynamic trend that significantly influences a place's livability, as well as the interactions of locals, tourists, and multiple actors (including informal sectors) who are either directly or indirectly concerned with (or influenced by) tourism [13], [14]. The successful management strategy cannot be merely a "top-down" strategy since it requires mutual responsibility between stakeholders and tailor-made behavior tailored to a destination's features relevant to the unique situation [15].

2.1. History of Overtourism

Conservation is interdisciplinary practices involving the environment, art, architecture, and archeology, which evolved from spiritual connotations and urban glorification into scientific restoration, a modern theory of restoration, and an approach to district preservation. The World Heritage Center later declared that all heritage items worldwide were valuable globally would be regarded as world assets [16].

Since the tourist industry was among the world's fastest-growing industries, the increasing popularity of cultural tourism has made sustainable tourism even more important. It can attract more investment and foundations by implementing organized, sustainable tourism while improving local community well-being, including the area's formal and informal sectors. Therefore, tourism can play a vital role in sustaining these cultural assets by enhancing the numerous activities related to cultural sites [17]. However, Foo and Krishnapillai [18] suggested that heritage tourism's attractiveness usually attracts capital (re)investments that could cause relocations, displacements, and gentrification. Some analysis has shown that the listing has caused extraordinary capital appreciation, a rise in rentals, and improved existing building transactions. They also eventually caused gentrification in the conservation sector. In several instances, the current dwellers, informal sectors, and traditional businesses were replaced by new inhabitants and companies linked to tourism.

Figure 1. Sudden overcrowding in Kota Lama Semarang after urban gentrification, Source: https://www.liputan6.com/lifestyle/read, accessed: 02/06/2020

Adie et al. [2] argued that since urban heritage sites usually generate many tourists, overcrowding has become a severe problem in this area. Overtourism's adverse consequences include parking and congestion problems in historical centers, inhabitant discomfort as a direct consequence of disrespecting visitors, increasing living costs for local dwellers, tourist disappointment, and crucial breakage and damage of the heritage objects. On the opposite, some formal and informal industries in smaller vacation spots often felt the positive impact of growing tourist activities they were forced to contend with. While it appears to be beneficial in the short term, overtourism throughout the medium to long term might lead to the loss of authenticity and insinuate a substantial risk to a destination's potential attractiveness. Uncontrolled travel and tourism industry can damage cityscapes, heritage buildings, the ecosystem, and inhabitants' living conditions, creating financial injustices and marginalization, particularly for the informal sector as the most vulnerable stakeholder [15].

2.2. Sustainable Livelihood Framework

The Sustainable Livelihoods Approach has been well associated with its political and social context in various respects. In the United Kingdom, the Department for International Development (DFID), currently been replaced by the Foreign, Commonwealth & Development Office (FCDO), accepted the new viewpoint in the 1990s as it endeavored to fundamentally change its position and imprint the 1997 government change with a unique and accurate approach to international development. Therefore, one such initiative succeeded due to a clash between two factors: a large international environment that supported people-centered methods and a need to define a new development practice phase in DFID [19]. The DFID's livelihoods framework (figure 2.) has become an opportunity to look at the sophistication of people's livelihoods. It intends to explain the problematic aspects of an individual's livelihood, the strategies and goals decided to pursue, and the challenges and opportunities associated with it. DFID framework is a useful tool that can be used to examine better livelihoods, especially vulnerable groups' livelihoods, including the informal sectors [20].

More than just a limited range of earnings and productivity measures, the Sustainable Livelihoods Approach framework offers a comprehensive vulnerability approach. Ellis [21] explained: *"a livelihood includes the assets (natural, physical, human, financial, and social capital), the actions, and access to them (through institutions and social relations), all which determine the individual's or household's obtained living."* In specific, the Sustainable Livelihood framework includes a summary of crucial

concerns and explains how these connections connect and, at the same time, highlights critical factors and processes.

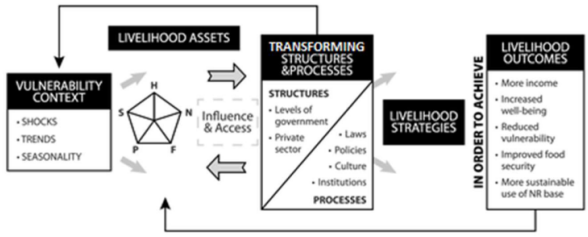


Figure 2. DFID's Sustainable Livelihoods Framework
Source: Department for International Development [20]

The Sustainable Livelihoods Approach is intended to be an instrument that can be used to adjust planning and management. The analysis should be carried out collaboratively, with a firm commitment to eradicating poverty. People in charge who undertake this should be concerned with social and political factors that can skew responses to the wealthy's interests rather than the informal sectors [19], [20].

2.3. Informal Sector

The term "informal economy" often found in works of literature, as summarized by Losby et al. [22], from several authors such as the irregular economy, the subterranean economy, the underground economy, the black economy, the shadow economy, and the informal economy|.

Informal sectors generally refer to "very small units of production" trading with "low capital levels, skills, access to organized markets and technology, low and unstable incomes, and poor working conditions." Several formal organizations, particularly the smallest of micro-enterprises, exhibit these characteristics, but their informal equivalents are not registered officially [23]. This study only discussed the livelihoods of informal sectors operated in urban heritage areas, as mentioned in section 5.1. of the article.

3. Methodology

This study is qualitative descriptive research aiming to retrieve information concerning the impact of overtourism towards informal sectors on urban heritage areas from the livelihoods framework point of view. The article used a qualitative data collection technique with past-observation and literature studies on series of articles, books, proceedings, and journals on tourism, informal sectors, and sustainable livelihoods approach, conducted between March 2019 until February 2020.

This study's data and literature were analyzed by conducting coding and analytical strategy using a Qualitative Data Analysis Software (QDAS) NVivo12 Pro. The electronic literature search made use of Web of Science, SCOPUS, Research Gate, Google Scholar, and other possible electronic literature sources. Search terms were tested and narrowed down to meet the criteria. A matrix is then created as a simplified form of the result by examining vulnerability context, transforming structures & processes, and livelihood strategies from the five livelihoods assets' perspective.

4. Results and Discussion

The qualitative data analysis indicated that the most suitable approach to understand the informal sector's livelihoods phenomenon in an urban heritage context is by describing the issue using the Sustainable Livelihoods Approach framework developed by DFID.

In an urban heritage context, the natural capital was not suitable to be applied as a livelihoods asset, thus needed to be modified by adjusting the term "*natural assets*" into *"built-environmental capital*." On the same exploitation of the water bodies (i.e., sea, river, or lake) for the livelihood of fishermen village, and the fertile soil and humid climate for farmers community living on the valley of mountains

across Java island in Indonesia (as a natural asset category), the urban heritage precinct as a built environment in urban areas were exploited as an existing capital which generates a unique urban ecosystem by bringing in tourists and visitors that creates a higher economic cash flow compared to other urban, suburban, and rural part of the city. Further studies need to be conducted with field observational and in-depth interviews with the informal sectors and policymakers on a specific urban heritage area to understand livelihood strategies' effectiveness to achieve the desired outcomes towards the vulnerable groups.

The livelihoods approach helps to establish a precise and adequate understanding of the informal sector (in the form of limited assets) and how they are trying to convert them into positive livelihood outcomes. Informal and vulnerable groups are seen finding ways to nurture and combine what capitals they already have created to ensure their survival.

Human capital includes the ability to set goals for financial prospects, health and well-being, education and skills, employment opportunities, the opportunity to keep learning, and the development of skills that make it easier for informal sectors to pursue different livelihoods strategies and achieve their livelihoods goals. The only way to accomplish it is by inducing informal sector skills through providing formal and informal education in government-level policies implemented by government bodies, non-governmental organizations, and legal enterprises.

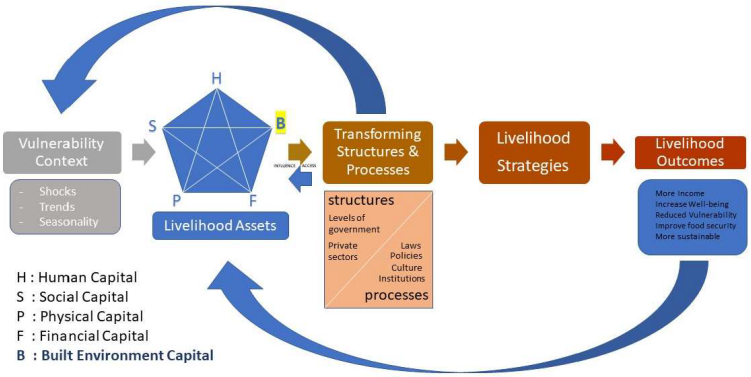


Figure 3. Modified Sustainable Livelihoods Framework
Source: framework modification by the author

Physical capital provides the essential services and resources required to sustain the survival of the informal sector. These physical assets help informal sectors fulfill the basic needs (water, housing, communication, and health services essential for the informal sector's sustainable livelihoods. Access to housing, food, safety, transportation, child/ old care, recreation, information, and computers for vulnerable groups is one way to achieve this. (note that debt can sometimes be contra-productive for vulnerable groups since they must pay back the debts along with the interests).

Social capital could be recognized when individuals have been bound by the widely accepted value, norms, and penalties. Numerous formal and informal businesses have successfully implemented business relationships related to family ties. The DFID framework identifies some examples of social capital such as family support, friends, community support, peer support (network building), work-life balance, leadership skills, and political literacy and action. In most cases, poor households would motivate their family and friends to reduce costs and increase earnings. In the case of arts and antique street vendors in Kota Lama Semarang in Indonesia, for example, a community or vendor association

had been proven to be more effective in communicating their needs and opinions on the area's gentrification, rather than bargaining with government institution as an individual.

In terms of *financial capital*, most informal sectors depend on their cash-reserves and financial assistance from their families, friends, relatives, and neighbors. Such street vendors are not aware of any microcredit facilitation by the government. They are not involved in a structured banking loan due to a lack of information, poor accounting, and complicated banking policies. Whenever informal businesses require fast money to resolve shocks or predict patterns and seasonality, disadvantaged groups continue to pursue a fast-money solution by high-interest-rate loans. These practices will lead to further poverty and lower quality of well-being.

The fifth asset/ capital of the DFID's livelihoods assets interestingly differs between some other sustainable livelihoods frameworks [19]. It opens possibilities to modify or contextualized the original Sustainable Livelihoods Framework by DFID into a new framework on urban heritage context. The DFID's fifth livelihoods asset is *"natural assets,"* such as lake, sea, fertile soil, river, etc., while the "personal assets" can be identified as follows: identity, self-esteem, motivation, spirituality, and independence. This article suggested modifying the fifth asset into "*built-environment asset*" to replace the term "natural/ personal assets" to meet the urban heritage context (figure 3).

Since 2003, the World Heritage Committee has discussed the effect of contemporary revitalization on the local urban environment and its heritage value. The Vienna Memorandum is an integrative method that links architecture, urban design, and cityscape based on historical correlations, building inventory, and existing context. The interest in developing a more appropriate location for visitors, international challenges, and urbanization practices directly affects local authenticity, visual integrity, geographic area, and citizens residing in urban heritage areas [24]. UNESCO's status as a World Heritage Site draws attention to the development of cultural-heritage tourism worldwide. The increasing number of global travelers is searching for various vacation styles that are not packed as a hurried shopping/ sight-seeing trip. Not unexpectedly, many nations that rely on the tourism industry are progressively focusing their tourism strategy to accommodate these "culture-vulture" visitors, who are considered a more beneficiary and sustainable market [25]. As the most vulnerable category, the informal sector has become one of the historic town's stakeholders, which needs to be considered wisely in the context of livelihoods.

The significance of tourism's harmful effects, as the term of overtourism implies, was being related to a few well-established factors. Overtourism affects the local community's lives (including informal sectors) on economic gain, financial, cultural, and environmental degradation. As Goodwin [9] indicated, a radical change in local tourism stakeholders' views, mass tourism has turned into a local political debate. Overtourism has given very controversial beliefs and specific implications for the informal sectors. Some suggest that this is a chance for the region to provide sustainable economic development and social well-being growth. Conversely, several other experts have noted that overtourism can disincentivize local cultures [8].

Changing the feedback mechanism characterizes the connection between the historical area and environmental quality. Historic buildings and landmarks may be used as a catalyst for tourism growth, which acts as a conduit for showcasing the site in terms of efficiency and facilities. Visitors' uncontrolled behavior and density also undermine the environment's nature, damaging the historic location, natural assets, and properties (in some territories, only plants and animals may be permanently damaged) [26]. In this situation, the informal industries will only profit from the tourism industry in a very brief period with no long-term insight into how the impact will affect their potential well-being. This would undoubtedly not be a simple job because the creation or redevelopment of Urban Heritage from its initial origins has gradually been displaced [27]. Furthermore, the problems found are also correlated with informal sectors, despite being banned, with their buying and selling activities around urban heritage areas and the misconduct of tourists around the neighborhood [28].

Similarly, the impact of the development of tourism may also be defined as the stress level of overtourism. Some of them may be related to the frustration of the dwellers who lived in an urban heritage tourism destination that might be caused by (1) increased traffic and crowd congestion, (2) overwhelmed infrastructure development, (3) increased demand for energy, thus creating more carbon-prints, (4) water, air, noise, and soil pollution, (5) unexpected visitors behavior, (6) environment

deprivation, (7) damage to public properties, infrastructures, historic sites and monuments, and (8) loss of identity and authenticity [29].

Table 1. Matrix of analysis, adopted from DFID's framework

	Human capital	**Physical capital**	**Social capital**	**Financial capital**	**Built Environment capital**
VULNERABILITY CONTEXT					
Trends (Overtourism)	Skill/ education to harness the benefit of Overtourism [30] [31]	Proper tools & infrastructure to win the competition [32]	Empowering family and relatives to maximize profit, Adopting the theory of planned behavior [33]	Savings, Loan/ microcredit, Fast money [23], [34]	Urban precinct, park, landscape, street, and pedestrian way [32]
Shocks (natural disaster, law enforcement)	Skill, education, health, language, survival instinct [30]	Standardized tools& infrastructure, Hygiene issues, Lack of access to clean water and sanitation [32]	Good practice, community/ association, family, Ensuring the experience quality for visitors and long-term sustainability for the locals [15]	Savings, Government financial aid, NGO aid [23], [34]	Restoration, Cleaning, etc. [35]
Seasonality (peak/ low season)	Skill, creativity, alternative business	Flexible and mobile stall, proper tools, variation	Family, relatives, community	Savings, loan, microcredit, fast money [23], [34]	Urban environment, urban heritage
STRUCTURES					
Levels of government	Local, regional, national	Local, regional, national	Local, regional, national	Financial Local, regional, national	Local, regional, national, international
Private sectors	CSR, NGO	CSR, NGO	CSR, NGO	Bank, cooperation	CSR, NGO
PROCESSES					
Laws	Education act [30]	Municipality regulation [22]	Pro-poor law, law enforcement [22]	Microbusiness act [34]	Conservation act [35]
Policy	Pro-poor policy [22]	Pro-poor policy [22]	Pro-poor policy [22]	Pro-poor policy [22]	Urban FM Tourism forecasts, city image and branding [35]
Cultures	Local wisdom, traditional crafting/ manufacturing skill	Local value, indigenous tool,	Local tradition, local custom, caste system, social system	Person to person (personal help), community fund	Pride, confidence [35]

	Human capital	**Physical capital**	**Social capital**	**Financial capital**	**Built Environment capital**
STRATEGIES	Induce new skill in sustainable services The governmental approach in educational and skill acquiring policy and law CSR and NGO involvement in the education of informal sectors, health, etc. [30]	Members of the association took part in a food handling course provided by the government and have current food hygiene certificates Cooperation between formal and informal sectors Enforce the labor code accordingly [22] Regulate commercial activities through licensing and outright prohibitions [36], [37]	Less hostile to informal vendors during regulation making and law enforcement, [23] Application of Stricter law enforcement against criminal [32]	Allocation of micro business and individual loans. [23], [34] Unawareness of any microcredit facilitation from the government and are not interested in banking. [38] Gradually enhanced informal sectors to become more formal to gain access to more significant funding [22]	Urban Heritage Facility Management [32], [35]

**Source: author's analysis*

To reduce the impact of such shocks, Urban Facility Management fields, as suggested by Salaj in 2018 [39], propose an innovative model that is proven to be especially beneficial and implementable to create shared values in an urban context, i.e.: (1) transparency in governmental level to make available higher standards of facilities well-being, (2) generating new ways of the ecosystem for citizen engagement on co-design and co-creation of processes and services, (3) the usage of technology to deliver directness of processes and services, (4) safeguarding effect with the leadership as a service tool, (6) structuring a people-centered approach, and (6) empower the people to be the part of the urban-problem solution. An "urban" facility manager, through the integration of multiple disciplines in a human-center approach, can become the enabler and implementer of a sustainable urban ecosystem, i.e., balancing social, economic, and environmental pillars [40].

4.1. Typical Informal Sectors on Urban Heritage Area

From the literature review, the informal sectors found in the urban heritage area can be categorized as mobile, semi-mobile, and immobile (static sellers) mode. Furthermore, although the informal activities mostly happen in the local bazaars and night markets, other informal sectors that could be identified from the works of literature are listed as follows: food vendors, beverage vendors, traditional cuisine, the traditional mode of transport service (trishaw, gondola/ small boat, rickshaw, tricycle, horse cart, etc.), traditional art performance, contemporary performance (dance, magic trick), music performance (street musicians), the street entertainers (dancing dolls, face painters, art tattoos, jugglers, etc.), fruit/juice pressers, fruit vendors, unofficial taxi (both car and motorcycles) drivers, guides, street traders, local and traditional crafts maker and seller, photo-spot/object service (man-like statues; heroes, cartoon, ghosts, etc.), merchandise traders, personal money changer, and informal parking service. Although mentioned in the literature, other services are not considered relevant enough to be regarded as urban

heritage's informal sectors, such as small/ personal vehicle reparations, cleaning service, catering, baby daycare, and underpaid workers for formal sectors.

4.2. Vulnerability Context

In general, informal sectors' living conditions are easily influenced by radical changes such as trends, shocks, and seasonality. Overtourism is certainly a considerable phenomenon occurring in many well-known urban heritage areas. Informal sectors are often left behind by a lack of knowledge, skills, and financial support in anticipating the nourishing tourism activities. Even as they transition to the overtourism, they will be directly influenced by changes in patterns, surprises, and seasonality with such high effects. Competition with structured industries, less participation in decision-making, and unsustainable overtourism would theoretically generate vulnerability. According to the study conducted by Mat Radzuan and Ahmad in 2016 [41], most stakeholders, including informal sectors, will profit from the tourist flood to the area at the beginning of overtourism. But the good trends will soon be losing their momentum when both the residents and the tourists realized the uncomfortable atmosphere of overtourism.

Shocks in the form of natural disasters such as the Indonesian Tsunami and the CoVID-19 pandemic do have a substantial impact on the tourism industry. While larger formal economies can survive somewhat longer, the informal sectors seek government support to reduce the impact. Thailand (and Indonesia) could be an example of how local authorities, formal tourism industries, and humanitarian organizations work together to create a new solution that can be seen as an opportunity for positive change and a reversal of the environmental damage blighting parts of the affected area [23]. The proposal planned landscaping, security steps against flooding, and a decline in the volume of the beach and street stalls. There were rumors that 1000 vendors would be relocated, provoking fierce opposition from many hawkers and small businesses who were stressed and worried that their former workplace would be precluded. Smith and Henderson [23] also explained that the ability to survive and expand indicates the informal sectors' persistence after the shock. In effect, such values are extracted from basic conditions, which means that there are sometimes few, if any, options for people working in the sector to earn money.

Besides the trend and shocks, there are many other vulnerability issues related to overtourism in an urban heritage area, such as:

- **Discomfort, conflict, and traumatic experience of tourists**
  Overtourism has grown increasingly across the world, and protests have taken place in a few locations, and some of them have included incidents of low rates of abuse. It is important to consider an urban heritage tourism destination's existing condition regarding its capacity to attract tourists and how problematic it is for a tourism object to restore its image once it is damaged [8]. The traumatic experience will be an unfavorable promotion for the urban heritage area, leading to a significant reduction in tourist visits and (or) hesitation in buying from informal sectors.
- **Disneyfication – Over-exploitation of tourism destination**
  The physical and natural surroundings in which tourism is built are made up entirely of historical places. More importantly, it consists of those populations that inhabit the zones in question. Their economic and social living conditions and, above all, their customs and habits may be severely affected by the unplanned growth of tourism, with the repercussions perhaps much more severe than the impact of tourism on the physical environment itself [26]. The phenomenon of Overtourism may cause a loss of credibility and create a significant hazard to a destination's potential attractiveness. The unrestrained growth of tourism will destroy dwellers' living situations, causing wealth disparity and social segregation. Tourism can generate social costs, often hard to estimate but are no less severe [42]. While tourism can ensure that some original rituals and informal sectors attract tourists are preserved, it can also pose a challenge to traditional practices and local knowledge practiced by informal sectors.

  Numbers of travelers are continually rising in urban heritage area all over the world. As The town continues to reinvent its own and rebuild itself, the overcrowding of tourists in the historical sites and the seasonality issue demand more significant initiatives to improve tourist's quality experiences and long-term sustainability for the dwellers. There is a higher chance of the urban heritage *Disneyfication*, further strengthening the historic center's tourism, causing the loss of authenticity and local identity [15]. An urban heritage area may take the inspiration from the retail marketing

methodology, where the value of identity is transplanted via urban marketing, into a tourism image where destination identity has a substantial impact on the buying process.

- **Carrying capacity issues**
  Aris [8]summarized the fact that carrying capacity tends to vary based on the form of the visitor, the social status, and the society they originated. The congestion issue is explained in terms of capacity conveyance, subject to interpretation to the tourism industry. Some apparent problems have a direct effect on the number of tourists that can be supported: (1) social carrying capacity; the density that tourists and the residents are willing to tolerate; (2) physical carrying capacity; the number of accommodation options, airplane seats, technical infrastructure; and (3) Environmental carrying capacity; the ability of natural or historical sites to accommodate visitors; Strategic error in capacity management will result in dissatisfaction for both tourists and the informal local sectors. The distribution of basic needs (such as homes, safe drinking water supplies, modern sanitation, drainage systems, and mass transit) was planned and built not only for local-residents and informal sectors but also to support foreign companies and investors. Most dwellers and informal sectors accepted that different activities are easily accessible (in the case of George Town world heritage site), which created opportunities to improve urban communities' quality of life, including the informal sectors [32].
- **Anti-tourism movements**
  Numerous anti-tourism actions express their anxiety at the ever-increasing quantity of visitors coming to Europe. Anti-tourism demonstrators were especially virulent in several countries on the continent to a lesser degree. The motives for this intensification in anti-tourism are diverse and comprise: (1) the vast number of tourists put some UNESCO World Heritage sites in jeopardy, (2) visitors have undesirable effects on the quality of life of the dwellers, (3) the ecological protection of the environment is at risk, and (4) the beneficial role of visitors to the local commercial activity is limited [43], [44].

Figure 4. Anti-tourism movement all over the world,
source: (1) https://www.spottedbylocals.com/wp-content/uploads/tYSrwxkA.jpeg, (2) https://www.citymetric.com/sites/default/files/ styles/node image/public, accessed: 02/06/2020

Furthermore, summarizing multiple sources, Seraphin [44] explained the growth of anti-tourism worldwide, which indicates that it can cause more harm and destruction where tourism is not handled correctly. This movement can be considered as a paradigm shift as well. Local communities now have a greater interest in improving their quality of life than expecting the tourism industry's revenue. Sometimes, these anti-tourism protests created mixed feelings within the household and were often carried out in informal sectors. Besides the visitors themselves, the informal businesses in the urban heritage area struggle the most as the second focus in anti-tourism protests.

- **Criminal activities and vandalism**
  Because of human occupation (vandalism and over industrialization), temples and heritage sites have also become sensitive areas regarding their fragility against the environment (climate and natural disasters). That vulnerability is emphasized by the tourist explosion [26]. Additionally, commercial activities on the grey area of (or outside) the law could result in corruption, extortion, bribery, and other criminal manifestations. Such situations are unsettling, harming the environment and ambiance, and worsen the destinations' images, so most local authorities attempt to regulate commercial activities through licensing and outright prohibitions [36], [37]. While the emergence of criminal

activity has always preferred types of informality in certain urban heritage areas, such as protection/security, illegal parking, or the handling of restricted resources, most informal sectors do not benefit from these operations.

A primary concern over rising crime rates, with 32.5 percent of respondents, indicated the local authorities' need to enforce the legislation strictly [26]. Significantly concerning raising and monitoring the number of crimes that occur, further compliance is required. A healthy climate for urban heritage would ensure the survival of informal sector businesses.

- **The marginalization of informal sectors**

The condition tends to be based on benefit and speculation in the urban sense, while those with financial control decide and determine the urban heritage environment [45]. Local authorities who might also be unfairly seen as representatives of formal businesses are unfriendly to informal sectors they notice to be a nuisance and openly violate regulations. For pitches and customers, there may be fierce rivalry with resulting congestion, pollution, waste, health hazards, and intimidation (or harassment) of visitors [23]. In Indonesia, and supposedly many other developing countries, the informal communities are frequently left behind in the urban heritage redevelopment planning system, owing to the lack of coordination and policy funding from the local authority. And due to the intense rivalry between formal and informal industries, many street vendors and other forms of informalities are eventually forced away from the urban heritage core area. These are related to the notion, specifically suggesting ways of helping the informal sector and vulnerable groups transition from informal to formal status [22].

After being in a period of confrontation and misunderstanding between informal sectors and the Semarang Municipality in Central Java Province, Indonesia, a specific group of informal sectors that sell arts and antiques finally established an association called PERDANI (Paguyuban Pedagang Barang Seni/ Association of Art Vendors). Through this initiative (and the support of local pro-poor NGOs), they could create good communication with the municipality, followed by extensive coordination and targeted funding from the government to the street vendors. Some of them are placed in a new indoor market inside a renovated building owned by the municipality. In contrast, others receive a mobile uniformed stall located in one of the heavily visited streets in the Kota Lama Semarang heritage area. This model will then be a prototype model to handle other informal sector types in Kota Lama Semarang, both with and without any association involved.

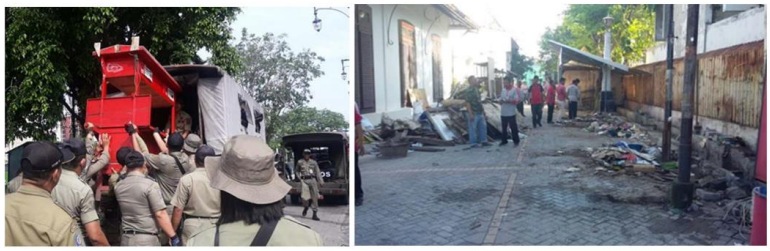


Figure 5. Forced eviction of illegal slum kiosks in Kota Lama Semarang urban heritage area, source: (1) http://dinasperdagangan.semarangkota.go.id/wp-content, (2) https://sigijateng.id/wp-content, accessed 03/06/20200

- **Education and Skill**

The connection between educational background and involvement in the informal sector is apparent in urban environments. Marcelli [30] shows an association between higher education and jobs where the formal sector accounts for a higher employment percentage. Informal sectors would supposedly gain an advantage by testing their goods and services in a small market in an informal environment and could obtain expertise in manufacturing, distribution, client relationships, and other business fields without engaging in registration and other standardization components. But testing skills are not easily accessible to the informal-sectors and vulnerable-groups, even within the informal economy [22].

The vulnerable groups need access to the training (skill) and education (knowledge) provided by the government, NGO, and formal private sector to be effectively retained and increasing their asset, competitiveness, and livability. It is necessary to absorb shocks' impact and harvest positive trends and peak season in urban heritage tourism destinations.

5. Conclusion

By addressing and analyzing the informal sectors in the urban heritage area from the perspective of the Sustainable Livelihoods Approach during the overtourism trend, a modified framework is being developed to address the urban heritage environment's context. Identifying the various impacts of over-tourism on the informal sector has shown that the Sustainable Livelihoods Approach has become a useful evaluation tool for understanding the phenomena.

The modified Sustainable Livelihoods Approach to explain these results makes it easier to identify the impact of informal sectors' livelihoods through a different form of capital, structures, and processes that influence informal sectors' livelihoods through livelihoods strategies to obtain specific livelihoods outcomes. Moreover, the lifestyle itself's outcome needs to be discussed since this article does not contain the effects of the livelihoods attributable to other situations.

Further research by conducting a quantitative survey of individuals involved in informality in an urban heritage area would be useful. However, the present study has shown that a simple modification of the DFID SLA framework can represent better understanding and learning purposes.

6. Acknowledgment

The author would like to thank Prof. Dr. Rolee Aranya, the course coordinator of the Urban Ecological Planning on Diverse Culture at the Department of Architecture and Planning, Faculty of Architecture and Design, Norwegian University of Science and Technology (NTNU).

This work was supported by the Ministry of Research and Technology/National Research and Innovation Agency of the Republic of Indonesia. Grant numbers 458/UN40.D/PT/2020, under LPPM Universitas Pendidikan Indonesia.

The corresponding author is a BPPLN scholarship awardee provided by the Ministry of Education of the Republic of Indonesia.

References

[1] B. Paramita, "The land-use of Bandung, its density, overcrowded area and public facility toward a compact city," in IOP Conference Series: Materials Science and Engineering, 2016, vol. 128, p. 12034.

[2] B. A. Adie, M. Falk, and M. Savioli, "Overtourism as a perceived threat to cultural heritage in Europe," Curr. Issues Tour., pp. 1–5, 2019, doi: 10.1080/13683500.2019.1687661.

[3] B. Neuts and P. Nijkamp, "Tourist crowding perception and acceptability in cities. An Applied Modelling Study on Bruges," Ann. Tour. Res., 2012, doi: 10.1016/j.annals.2012.07.016.

[4] S. M. Rasoolimanesh, B. Taheri, M. Gannon, A. Vafaei-Zadeh, and H. Hanifah, "Does living in the vicinity of heritage tourism sites influence residents' perceptions and attitudes?," J. Sustain. Tour., 2019, doi: 10.1080/09669582.2019.1618863.

[5] R. W. Butler, The Tourism Area Life Cycle: Conceptual and Theoretical Issues. 2006.

[6] A. Capocchi, C. Vallone, M. Pierotti, and A. Amaduzzi, "Overtourism: A Literature Review to Assess Implications and Future Perspectives," Sustainability, vol. 11, no. 12, 2019, doi: 10.3390/su11123303.

[7] J. Van Der Borg, P. Costa, and G. Gotti, "Tourism in European heritage cities," Ann. Tour. Res., 1996, doi: 10.1016/0160-7383(95)00065-8.

[8] A. N. Aris Anuar, F. H. Ridzuan, N. Jaini, F. C. Sulaiman, and N. I. Hashim, "The Impact of Overtourism Towards Local Community in Heritage City," J. Tour. Hosp., vol. 08, no. 03, 2019, doi: 10.35248/2167-0269.19.8.406.

[9] H. Goodwin, "The Challenge of Overtourism," Responsible Tour. Partnersh., 2017, doi: 10.1016/S0140-6736(84)91114-0.

[10] J. Boissevain, "Tourism and development in Malta," Dev. Change, vol. 8, no. 4, pp. 523–538, 1977.

[11] T. A. Williams, "Impact of domestic tourism on host population: The evolution of a model," Tour. Recreat. Res., vol. 4, no. 2, pp. 15–21, 1979.
[12] WTO, "Risks of Saturation of Tourist Carrying Capacity Overload in Holiday Destinations (English version)." UNWTO Madrid, p. 1, 1983, doi: doi:10.18111/9789284407545.
[13] N. Bellini and C. Pasquinelli, Tourism in the city: Towards an integrative agenda on urban tourism. 2016.
[14] C. C. Milano Joseph M.; Novelli, Marina, "Overtourism a growing global problem," The Conversation, 2018.
[15] P. Peeters et al., "Overtourism: Impact and possible policy responses," Res. TRAN Committee. Retrieved Febr., vol. 23, p. 19, 2018.
[16] B. N. et al Prabowo, "Historic urban landscape (HUL) approach in Kota Lama Semarang: mapping the layer of physical development through the chronological history," in IOP Conf. Series: Earth and Environmental Science; ICSADU 2019, 2019, vol. 402, doi: 10.1088/1755-1315/402/1/012020.
[17] B. M. Farahani, G. Abooali, and B. Mohamed, "George Town World Heritage Site: What We Have and What We Sell?," Asian Cult. Hist., vol. 4, no. 2, 2012, doi: 10.5539/ach.v4n2p81.
[18] R. Foo and G. Krishnapillai, "Preserving the intangible living heritage in the George Town World Heritage Site, Malaysia," J. Herit. Tour., vol. 14, no. 4, pp. 358–370, 2018, doi: 10.1080/1743873x.2018.1549054.
[19] W. Solesbury, Sustainable livelihoods: A case study of the evolution of DFID policy. Overseas Development Institute London, 2003.
[20] DFID, "Sustainable livelihoods guidance sheets. The framework," Dep. Int. Dev., 1999, doi: 10.1002/smj.
[21] F. Ellis, "Methods and Livelihoods," in Rural Livelihoods and Diversity in Developing Countries, 2000.
[22] J. L. Losby, J. F. Else, M. E. Kingslow, E. L. Edgcomb, E. T. Malm, and V. Kao, "Informal Economy Literature Review," ISED Aspen Inst., 2002, doi: 10.1002/hast.259.
[23] R. A. Smith and J. C. Henderson, "Integrated beach resorts, informal tourism commerce and the 2004 tsunami: Laguna Phuket in Thailand," Int. J. Tour. Res., 2008, doi: 10.1002/jtr.659.
[24] R. Che Amat, A. B. Sulaiman, and S. Shamsuddin, "Historic Urban Landscape and the Character of George Town, Penang UNESCO World Heritage Site," Asian J. Environ. Stud., vol. 3, no. 9, 2018, doi: 10.21834/aje-bs.v3i9.297.
[25] N. et al Abdulhameed, "Adaptive reuse approaches of Shophouses at Cannon Street in George Town, Penang.," in IOP Conf. Series: Materials Science and Engineering; 3rd International Conference on Architecture and Civil Engineering (ICACE 2019), 2019, vol. 636.
[26] B. Boudiaf, "Innovative approaches in architecture and planning, the future of our past," ICONARP Int. J. Archit. Plan., vol. 3, no. 2, pp. 40–68, 2016.
[27] R. Hidayat, R. Ismariati, and Y. Apriliandini, "Connecting Identity and Image of City Branding in Kota Tua (Old City) Jakarta," IBIMA Bus. Rev., pp. 1–10, 2019, doi: 10.5171/2019.217784.
[28] D. P. A. Utami Mohammad Riduansyah, "Analysis of Urban Heritage Management in the Heritage Area of Jakarta Old-City," in Advances in Social Science, Education and Humanities Research, 2017, vol. 167.
[29] P. Jordan, P. Pastras, and M. Psarros, "Managing Tourism Growth in Europe," ECM Dijon, Fr., 2018.
[30] E. A. Marcelli, M. Pastor, and P. M. Joassart, "Estimating the effects of informal economic activity: Evidence from Los Angeles County," Journal of Economic Issues. 1999, doi: 10.1080/00213624.1999.11506187.
[31] J. H. Gallaway and A. Bernasek, "Gender and informal sector employment in Indonesia," J. Econ. Issues, vol. 36, no. 2, pp. 313–321, 2002.
[32] S. R. S. Dawood, "Sustainability, Quality of Life and Challenges in an Emerging City Region of George Town, Malaysia," J. Sustain. Dev., vol. 12, no. 3, 2019, doi: 10.5539/jsd.v12n3p35.
[33] S. Mohd, A. R. Abdul Latiff, and A. Senadjki, "Travel Behavior of Elderly in George Town and Malacca, Malaysia," Sustainability, vol. 11, no. 19, 2019, doi: 10.3390/su11195251.
[34] K. Meagher, "Unlocking the informal economy: A literature review on linkages between formal and informal economies in developing countries," Work. ePap, vol. 27, 2013.

[35] S. Ismail and N. A. Mohd-Ali, "The Imaging of Heritage Conservation in Historic City of George Town for City Marketing," Procedia Eng., vol. 20, pp. 339–345, 2011, doi: 10.1016/j.proeng.2011.11.175.
[36] L. Trager, "A Re-Examination of the Urban Informal Sector in West Africa," Can. J. African Stud. / Rev. Can. des Études Africaines, 1987, doi: 10.2307/484374.
[37] S. Pena, "Regulating informal markets: Informal commerce in Mexico City," Int. J. Sociol. Soc. Policy, 2000, doi: 10.1108/01443330010789223.
[38] D. P. Utami and M. R. Anza, "Analysis of Urban Heritage Management in the Heritage Area of Jakarta Old-City," vol. 167, pp. 306–314, 2017, doi: 10.2991/icaspgs-icbap-17.2017.40.
[39] A. Salaj, S. Bjorberg, M. Store-Valen, and C. Lindkvist, "Urban Facility Management Role," no. April, 2018.
[40] A. Temeljotov Salaj, S. Gohari, C. Senior, Y. Xue, and C. Lindkvist, "An interactive tool for citizens' involvement in the sustainable regeneration," Facilities. Emerald Group Publishing Ltd., 2020, doi: 10.1108/F-09-2019-0099.
[41] I. S. Mat Radzuan and Y. Ahmad, "Synthesising an Effective Incentives System in Safeguarding the Heritage Village of Melaka and George Town," Plan. Malaysia J., vol. 14, no. 5, 2016, doi: 10.21837/pmjournal.v14.i5.200.
[42] P. K. Peeters Jeroen; Milano, Claudio, "Overtourism: Impact and possible policy responses." 2019.
[43] W. Coldwell, "First Venice and Barcelona: now anti-tourism marches spread across Europe," Guard., vol. 10, p. 2017, 2017.
[44] H. Seraphin, "Overtourism: Excesses, Discontents and Measures in Travel and Tourism," J. Tour. Futur., vol. 5, no. 3, pp. 295–296, 2019, doi: 10.1108/jtf-09-2019-088.
[45] I. Diaz-Parra and J. Jover, "Overtourism, place alienation and the right to the city: insights from the historic centre of Seville, Spain," J. Sustain. Tour., pp. 1–18, 2020, doi: 10.1080/09669582.2020.1717504.

Appendix 6

ECPPM 2022 – eWork and eBusiness in Architecture, Engineering and Construction – Hjelseth, Sujan & Scherer (Eds)

HBIM application in historic town: A scoping literature review

B.N. Prabowo, E. Hjelseth & A. Temeljotov-Salaj
Department of Civil and Environmental Engineering, NTNU, Trondheim, Norway

ABSTRACT: The use of BIM as data management platform for the AEC sectors has been observed primarily in the designing and building phases rather than in post-construction applications such as facilities management and conservation. As the concept of BIM reached maturity, there has been a growing interest in applying the technology to heritage buildings and towns. This paper examines the phenomenon by considering how the HBIM application in managing historic towns might be described and what type of information will give further insights. This study is using a scoping literature review. Finding showed that the HBIM is involved in every critical step of the HUL approach by exploiting the technology to better mapping the heritage resources, interpreting heritage technical knowledge, digital assessment of vulnerabilities, enhancing efficiency, and prioritizing action to be made. The digitization is costly and time spending, but the HBIM output demonstrate a superior potential to manage historic towns.

1 INTRODUCTION

The United Nations Educational, Scientific, and Cultural Organization (UNESCO) classifies cultural heritage into two primary categories: tangible and intangible cultural heritage. This scoping review focuses on applying heritage (or historic) building information modeling (HBIM) to tangible cultural assets in the form of urban heritage areas or historic towns. Lack of documentation and technical understanding of urban-scale heritages (López et al. 2018; Penttilä et al. 2007; Tomaževiè & Lutman 2007), particularly in historic towns, might cause inefficiency in project management, wasted time, and higher costs connected with the preservation of a protected historic location (Gursel et al. 2009). Modern architectural heritage preservation practice nowadays requires a computerized three-dimensional (3D) model. In addition, the digital 3D model must be converted into a crucial reference frame for the comprehension and monitoring of documentation (Johansson et al. 2015; Letellier & Eppich 2015), thereby creating data sources suitable for assisting urban-scale conservation, restoration, and reconstruction projects are essential (Acierno et al. 2017; López et al. 2018).

Specialists currently employ various BIM platforms for the modeling, virtual visualization, and administration of the integral and incremental knowledge of historical assets. It is crucial to remember that the libraries and tools of BIM platforms are intended to design and build new structures with basic, regular, and conventional components (Bryde et al. 2013; Gray et al. 2013). Consequently, the virtual and exhaustive reconstruction of cultural-historical heritage has revealed significant limitations of BIM platforms, such as the absence of historical para-metric object libraries and the absence of tools for managing complex, irregular, and uncertain shapes derived from point clouds. Using point clouds to obtain parametric 3D models of architectural components is likewise time-consuming. Therefore, according to Murphy et al. (2009) and Volk et al. (2014), once parametric objects are modeled using architectural-historical documentation and laser scanning data, libraries of the modeled elements should be created encapsulating the concept of HBIM. These new HBIM libraries, which serve as a BIM plug-in within the broad framework of "smart heritage," make the design, rehabilitation, reconstruction, management, and maintenance of architectural heritage simpler, more transparent, and more efficient for the balance of its life cycle (McArthur, 2015).

Currently, most material regarding historic structures consists of computer-aided design 2D or 3D drawings, models, and a collection of records and reports created by various practitioners utilizing their individual methodologies and standards. The inconsistency and unpredictability of the data regarding cultural heritage assets is a disadvantage. This lack of information often leads to poor decision-making, detrimental to the historic asset's value and significance. Using the BIM process's capabilities permits the successful modeling and recording of heritage assets and historical towns to preserve the heritage site and monument's data and physical, functional, and cultural attributes (Ahmad Baik, 2017). These tools assist the rapid and cost-effective creation of exact models (Aburamadan et al., 2021)

This paper conducted a scoping review of prior publications concerning the implementation of HBIM in historic towns and urban heritage districts. Moreover,

DOI 10.1201/9781003354222-36

the most relevant approaches, tools, and technologies for information capture, administration, and exchange in HBIM are described. Alternately, the scope encompasses collecting information and expertise related to HBIM and other tools used for 3D modeling and information management of the historic urban region. However, construction programming, cost calculation, analysis and simulations, residual management, and demolition are omitted due to varying requirements and the fact that most sources focus primarily on new construction (Akcamete et al., 2010; Cheng & Ma, 2013).

This scoping literature review addressed the phenomenon by assessing these research questions:

(RQ1) what are the dimensions of urban-scale applications of HBIM within urban heritage areas in the body of literature, and (RQ2) what are the characteristics of urban-scale HBIM applications?

This scoping literature review aims to find gaps and highlight HBIM's implementation and functionality in the conservation of historic towns all across the world. In this context, this scoping review will be helpful in understanding the potentialities and difficulties of expanding the usage of HBIM within an urban-scale heritage area.

2 THEORETICAL FRAMEWORK

2.1 *Early heritage information data management*

Suggesting a technique for maintaining heritage structures is vital due to the dispersion of knowledge around historic buildings. Historic assets must be protected for future generations. International, national, and local regulations and master plans currently supervise the preservation of cultural assets (García Valldecabres et al., 2016). Cultural Heritage Management has typically focused on the "identification, interpretation, preservation, and protection of key cultural sites and historical physical assets" while also considering intangible components of legacy such as traditional skills, customs, and languages. Urbanization, large-scale agribusiness, mining, looting, erosion, and unsustainable tourism are potential threats (Hafez, 2019; Hajialikhani, 2007).

The architecture field has long been concerned with conservation. As evidenced by the Charter of Venice (1964), this concern rapidly spread to other areas. The majority of the documentation is made up of analytical and critical research, illustrations, and photographs. These are primarily sketches, except for the metric records collected from topographic and photogrammetric surveys. In such cases, surveys offer a summary of the architect's approaches, subsequent modifications, and degeneration through time. This concept takes on a different meaning in engineering, focusing primarily on capturing and representing spatial information. García Valldecabres et al. (2016) state that, as technology has progressed, it has become feasible to develop database management systems suited to these heritage assets.

2.2 *An urban-scale HBIM*

Much research is on merging relational databases with HBIM-generated 3D models of architectural heritage (Avena et al., 2021; Prabowo et al., 2021). Considerations about data models and organization and format compatibility are undeniably essential in building a city-scale 3D database that integrates existing and freshly generated geographic data.

Biljecki et al. (2015) argued that the majority of 3D city models are built for the aim of visualization, emphasizing its applicability in a variety of academic fields. Meanwhile, Xu et al. (2014) conducted a comprehensive evaluation of the object classes of the IFC standards and determined that at least sixty to seventy of the 900 available classes have a semantic representation that is highly equivalent to the CityGML standard to achieve city information modeling (CIM), which is also applied in the context of historic towns.

2.3 *Knowledge Gap*

There is a shortage of knowledge regarding the automation and adaptation of BIM technology to existing historic buildings. BIM is currently more focused on human productivity than on the development of technical software. After years of studying automated software, it is fair for researchers to shift their attention to improving the social and cultural efficiency of the process. As a result of a comprehensive analysis of the present level of BIM expertise, a preliminary strategy for maintaining historical assets using HBIM has been devised.

3 METHODS

3.1 *Research design*

This study utilized a scoping review as the primary method for grasping and defining the implementation of an urban-scale HBIM in the historic towns acquired from the reviewed literature. According to Levac et al. (2010), a scoping literature review is a concise, comprehensive overview of previously investigated studies on a topic. The objective of a scoping review is to remind readers of the fundamental facts and concepts that have been produced on the topic to compare, contrast, and connect the results uncovered while reviewing the work of researchers (Colquhoun et al., 2014). This method helps both authors and readers comprehend academic talks. A scoping review is often done as preliminary research inside a study to summarize and solicit the opinions of others (Colquhoun et al., 2014; Levac et al., 2010; Tricco et al., 2016).

According to Arksey & O'Malley (2005), the scoping review's purpose is to grasp the key concepts, particularly the complex ones, quickly. This qualitative research is suitable for assessing the current debate around the implementation of HBIM in historic towns. There have not been many literary works that simultaneously and comprehensively cover these subjects. This scoping review could sharpen the urban-scale

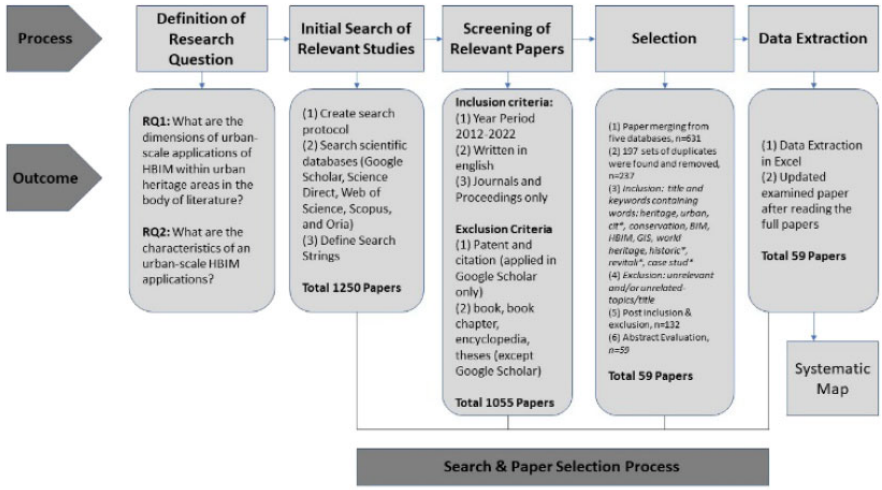


Figure 1. Scoping review process.Source: Author.

FM strategy for managing historic towns and urban heritage districts (Prabowo et al., 2021).

3.2 *Searching procedure*

The step-by-step procedure for obtaining the examined papers for this scoping review is explained in Figure 1.

3.3 *Categorization*

The categorization of this scoping review was based on the division of the modeling process proposed by Megahed (2015) with reverse engineering techniques, which are (1) data collection, (2) data processing, and (3) data management and presentation.

3.4 *Limitation*

The examined papers were based only on open accessed and English-written literature without including the grey literature such as thesis, publicly accessed documents, reports, etc., between 2012 and 2022.

4 RESULTS

4.1 *Descriptive results*

4.1.1 *Geographical distribution*

The examined papers showed that the geographical location of the case study of the application of HBIM within historic districts was equally distributed between Europe and Asia as a continent. However, there are more Asian countries engaged in the topic with nine nationalities involved, while only six countries in European territory became the locus of this scoping review (Figure 2). But this fact also indicated that more studies were conducted on each European country than in Asia (Figure 3).

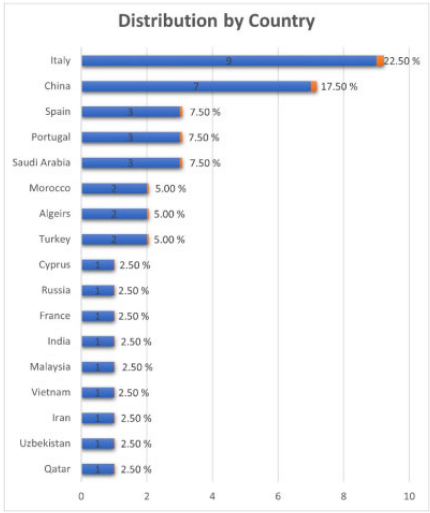


Figure 2. Distribution by country.

Case studies in Turkey were considered Asian, while the case study of the St. Petersburg area in Russia was counted as European following the United Nations (UN) classification.

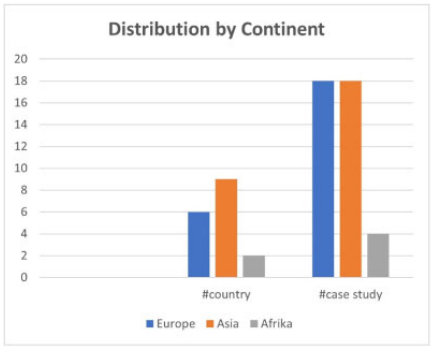


Figure 3. Distribution by continent.

Interestingly, this scoping review revealed that there are not many different approaches, enablers, or challenges between published case studies on different continents.

4.1.2 *Type of the case studies*

Among the 59 examined pap ers from this scoping literature review, 60% of the case was within the most extensive category context, which is urban or heritage district (Figure 4). The other 32.5% of the cases were complex buildings, and merely 7.50% of the works of literature were conducted in a single building as the object. It is evident that the protocols in obtaining the examined paper for this scoping review were aligned with the expectation.

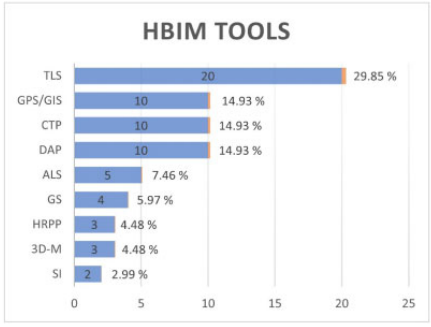


Figure 4. Type of the case study.

Although the processing phase went through similar approaches, the data acquisition at the urban or district level used satellite imagery, digital aerial photogrammetry, aerial laser scanning, terrestrial laser scanning, and GPS/ GIS more often than high-resolution panoramic photos and close-range terrestrial photogrammetry.

4.1.3 *Tools*

Following the list of BIM tools developed by Vileikis & Khabibullaeyev (2021), the examined papers were then analyzed using NVivo 12 Pro to determine which tools were used in each case study. From the ten categories (satellite imagery [SI], digital aerial photogrammetry [DAP], aerial laser scanning [ALS], geophysical survey [GS], 3D-scanning/ terrestrial laser scanning [TLS], GPS/ GIS, panoramic photography, high-resolution panoramic photos [HRPP], close-range terrestrial photogrammetry [CTP], and total station), the findings showed that only two categories (panoramic photography and total station) were not represented within the selected articles.

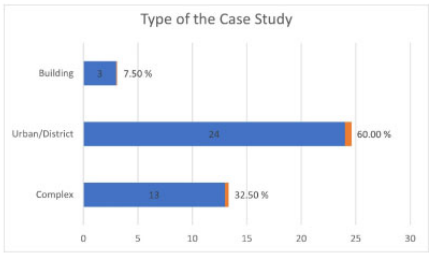


Figure 5. HBIM tools were used in the examined papers.

Another category was then added to the list (Figure 5), which is 3D-modelling [3D-M] from previously available drawings. Three articles (4.48%) discussed the possibility of obtaining the information needed to build the model only by using the existing archived drawings instead of performing a full terrestrial laser (3D) scanning mentioned by Vileikis & Khabibullaeyev (2021).

4.2 *Overview of the results*

Overall, the trend and tendency obtained from the scoping literature review process indicated that most of the studies addressed the data management topics compared to the data collection and data processing phase within the field of HBIM application in historical towns (Figure 6).

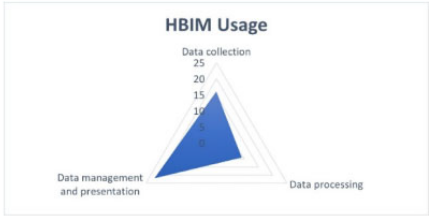


Figure 6. HBIM trend and tendency.

5 DISCUSSION

The desire of the scientific community and governing bodies to implement HBIM in historic towns demonstrate the need for interdisciplinary dialogue to connect the different knowledge that influences the economic development of a city and a territory in symbiosis with the improvement, restoration, and preservation of the historic town and its architecture (Gomih et al., 2021). The complicated process comprising the phases of data collecting, data processing, data management, and data presentation constitutes the earliest crucial steps of studies related to protecting cultural assets (Megahed, 2015).

The examined papers in this scoping review also indicated several similar HBIM enablers, which are (1) support from top management, (2) strategic vision and plan, (3) risk aversion, (4) open communication and information sharing, (5) inter-organizational linkage, (6) setting benchmarking metrics, and (7) BIM maturity assessment tools.

5.1 *Data collection*

Suggesting a technique for maintaining heritage structures is vital due to the dispersion of knowledge around historic buildings and the necessity of protecting the heritage assets for future generations. Clark (2001) in Aksin & Karaş (2021) states that documenting heritage is the first step toward understanding it. The protection of cultural assets begins with collecting data by recording the current state of the building and its environments through drawings, photographs, and written reports (Aksin & Karaş, 2021).

Digitizing heritage documentation, especially the one with important artistic and historical context, through HBIM, which pursues a multidisciplinary approach that connects various disciplines such as geomatics, restoration, history, etc., is the most effective way to manage diverse conservation activities and knowledge. The HBIM model is a complex virtual reconstruction of a structure composed of pieces defined as "semantic objects," with parameters such as dimensions, information on building materials conservation status, and historical information (A Baik et al., 2014; Ma et al., 2015). All of these products can be linked to a platform for data management, such as HBIM, together with all the information necessary to manage conservation projects (Gomih et al., 2021).

Digitization of cultural heritage is a multidisciplinary technique for managing cultural heritage in a technological setting, wherein an object, image, document, or signal is represented by a discrete collection of its points or samples (Lorring, L., & Kajberg, L. (2005) in Themistocleous et al. (2019)). Numerous cultural heritage locations may be inaccessible due to their geographical location and the influence of natural and human causes. Consequently, digitizing cultural heritage sites can aid in restoration and conservation efforts and enable digital access to the site for the general public (Evens, T., & Hauttekette, L. (2011) and Piccialli, F., & Chianese, A. (2017) in (Themistocleous et al., 2019)). Nevertheless, many remaining historic structures lack documentation and technical data (Tomaževiè & Lutman, 2007). The technologies of 3D scanning and photogrammetry are ideally suited for accelerating the collection of spatial data from existing buildings and their surroundings in urban heritage areas (Themistocleous et al., 2019).

The transformation from one-way heritage information transmission to multidimensional information exchanges and improved human-centered interactions on the digital heritage information management platform has occurred (Jia et al., 2022). Technology development has resulted in the introduction of digital systems for collecting heritage data. Addison (2007), cited in Vileikis & Khabibullaeyev (2021), classifies digital sensors into four categories: optical, locational, dimensional, and environmental. Visual sensors provide perceptions of the scene's hue, shape, and movement. Dimensional sensors determine the length, breadth, and height of a place. The location of an object is determined using a geographic coordinate system and location sensors. Environmental sensors can provide information on environmental conditions affecting property as well as the age of an object (Santana and Addison, (2007) Vileikis & Khabibullaeyev (2021)).

Besides the non-HBIM related challenges such as urbanization, globalization, mass tourism, climate change, environmental impact, and financial resources (Kokla et al., 2019; Minh et al., 2021; Soonwald et al., 2019), HBIM data collection in urban heritage areas within the examined papers faces similar technical issues due to the complexity of the preserved object (Alshawabkeh et al., 2021; Godinho et al., 2020; Lin et al., 2021; Soonwald et al., 2019). Curved walls, complicated shapes, architectural details, and non-standard materials complicate the object recognition throughout data acquisition and model generation employed by most BIM software.

Another challenge is the reconstruction of building façades that are located in shaded areas, the interior part of the protected building, or buried underground, during the survey phases; this produces a loss of data in the point cloud (Costantino et al., 2021; Rahal et al., 2020; Vázquez-Molini et al., 2021). Other techniques, tools, methods, and software will be needed to overcome these situations.

5.2 *Data processing*

The data processing enables the heritage authorities and other stakeholders to comprehend the final representation of the digital reconstruction of the heritage assets, including the minus 4D data. At the urban scale, GIS software geocoding is based on historical and current maps. On a smaller scale, a heritage building analysis is created through the systematization of heritage conservation code, architectural rules, and architectural development, allowing the functional organization to understand the entire convent

and how these historic building spaces have evolved. Plans, supplemental profiles, and video production were developed by isolating distinct components from the point cloud on a building level when laser scanning or photogrammetric surveys were performed.

The current use of revolutionary 3D scanning methods and techniques in urban-scale heritage and the field of urban conservation allows significant time savings during the architectural survey and digitization of all architectural, structural, and environmental elements. Through the use of point cloud management software, pure modeling software, and 3D parametric object software, a number of tools facilitate the transformation of a 3D-scanned point cloud (data acquisition) into a BIM model (data processing) that can be utilized in a variety of studies (data fusion) (Zouaoui et al., 2021).

Using cutting-edge technology, the point cloud to BIM modeling generates precise 3D BIM models from the point cloud. Point cloud to BIM modeling is more accurate than traditional surveys utilizing measurement equipment. The 3D BIM model obtained from UAV data was integrated with the building's semantic data, providing information regarding, among other things, construction materials, condition, color, and texture (Themistocleous et al., 2019).

Digital photogrammetry creates photographs that require post-processing software. However, integrating laser scanning and digital photogrammetry is difficult due to the fact that both devices must be calibrated; hence, error propagation is possible (Jia et al., 2022). To reduce computer errors, a manual process was devised. After denoising, the acquired data from numerous scanning stations must be united into a single coordinate system to unify data from various perspectives (Lin et al., 2021).

Total station (TS), terrestrial laser scanning (TLS), and high-resolution cameras for photogrammetric methods allow for speedy and accurate 3D surveying of complex heritage buildings. These digital technologies simplify measurement procedures and enhance the accuracy of the generated data, such as blueprints and 3D models. They require a post-processing phase characterized by registration, cleaning, decimation, and segmentation as essential editing techniques. The result is a point cloud or meshes suitable with CAD and BIM authoring tools, which cannot be automatically converted into HBIM assets used for additional research, including design, restoration, and structural simulation. This issue prevents enterprises and professional organizations from implementing this technology inside their workflow (Zaker et al., 2021).

The processing phase among the selected papers was challenged by the complexity of the sources of information and by the need to integrate them into a holistic tool. The examined papers in this scoping review showed several obstacles such as challenges with fully automating the process for efficiency, data management, sharing and storage, and integration with intangible heritage data.

5.3 *Data management and presentation*

Current digital representation and information management procedures and tools offer new insights. The gathering of high-quality point clouds by TLS or photogrammetric surveys permits the application of BIM into existing heritage structures and historic towns. On this foundation, a realistic digital model of a building's current state can be generated and exploited for collaborative data management on a platform (Jouan et al. (2019) cited by Zaker et al. (2021).

Despite the promising potential for the application of digital technologies to heritage conservation planning, there are still gaps in the existing literature, such as difficulties with fully automating the process for efficiency, data management, sharing, and storage, and integration of intangible heritage data (Aburamadan et al., 2021).

Integrated three-dimensional data management for urban environments, such as urban heritage areas and essential infrastructures, is crucial for various reasons (Becker et al. in Kontic et al. (2019)). As a result of the European Directive 2014/24/EU (in Kontic et al. (2019)), the significance of HBIM has risen inside the legislative and regulatory frameworks of several European countries, where it facilitates decision-making, interdisciplinary collaboration, and information exchange (Gigliarelli et al. in Kontic et al. (2019)).

Historic cities worldwide are complex territorial systems characterized by an invaluable cultural and natural heritage, which can significantly benefit from a holistic approach to sustainable development. The purpose mentioned above can be achieved using digital tools and cutting-edge technology. HBIM was implemented by defining a shared coding and cataloging system for heterogeneous data integration and professional collaboration, developing a relational model for database management, and establishing HBIM-oriented 3D modeling to support architectural heritages, historic towns, and historical analysis (Kontic et al., 2019).

In the context of cultural heritage, virtual elements such as maps and virtual tour guides have been used as an exhibition tool to enhance the visitor's experience. In addition, virtual reality has enabled the exploration of historic towns, allowing for the observation and modification of tangible assets. Virtual museum programs received significant attention during the Covid-19 pandemic and enabled individuals to digitally visit physical museums and educate them about old towns' concrete and hidden wealth. The application provides a gesture-based interface that permits users to interact with virtual representations of tangible and intangible assets using body movements. Barbera et al. (2022) argued that by presenting a system based on two cellphones, one of which is used as the main display and the other as a controller for completing activities such as rotation and scale, the problem of low immersion in virtual reality provided by mobile devices has been handled. Combining HBIM and VR

has permitted the virtual restoration of intangible parts of vanished heritage objects.

6 CONCLUSIONS

Creating an urban-scale 3D heritage database requires addressing issues with data management and interoperability. In 3D geo-information science, geographical data are utilized to construct 3D models of cities. Harmonization of different standards that enable the entire integration of BIM models in GIS environments is the most crucial objective. This scoping review concluded that the management of historic towns could benefit from HBIM implementation.

The HBIM as a management platform was created to go beyond the conventional notion of a "heritage database" by utilizing the digital heritage archives of historic cities. HBIM enables a more active and inventive digital cultural heritage information service. As the driving force of information services, local governments not only provide thorough and scientific heritage information but also continuously examine creative techniques and instruments for information transmission, thereby also playing the function of coordinator. In addition, as recipients of information services, other heritage stakeholders no longer act as passive recipients of heritage information. Still, they are increasingly involved in the heritage information and knowledge generation processes.

The main challenges of HBIM practice in the historic towns found in this scoping review are how to utilize digital technology to obtain data and how to construct systems that enable the management, visualization, and usage of these data within a unique digital ecosystem.

REFERENCES

Aburamadan, R., Trillo, C., Udeaja, C., …A. M.-D. A. & 2021, U. (2021). Heritage Conservation and Digital Technologies in Jordan. *Digital Applications in Archaeology and Cultural Heritage*, 22.

Acierno, M., Cursi, S., Simeone, D., & Fiorani, D. (2017). Architectural Heritage Knowledge Modelling: An Ontology-Based Framework for Conservation Process. *Journal of Cultural Heritage*, 24, 124–133.

Akcamete, A., Akinci, B., & Garrett, J. H. (2010). Potential Utilization of Building Information Models For Planning Maintenance Activities. *Proceedings of the International Conference on Computing in Civil and Building Engineering*, 2010, 151–157.

Aksin, M., & Karaþ, Ý. R. (2021). A Review of The Distinguishing Features of The Historical Buildings in Safranbolu Region For The Purpose of Classification For Semantically Enhanced 3d Building Model. *International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences*, 46.

Alshawabkeh, Y., Baik, A., & Fallatah, A. (2021). As-textured As-built Bim Using Sensor Fusion, Zee Ain Historical Village As A Case Study. *Remote Sensing*, 13(24).

Arksey, H., & O'Malley, L. (2005). Scoping Studies: Towards A Methodological Framework. *International Journal of Social Research Methodology*, 8(1), 19–32.

Avena, M., Colucci, E., Sammartano, G., & Spanò, A. (2021). HBIM Modelling For An Historical Urban Centre. *The International Archives of Photogrammetry, Remote Sensing and Spatial Information Sciences*, 43, 831–838.

Baik, A, Alitany, A., Boehm, J., & Robson, S. (2014). *Jeddah Historical Building Information Modelling* "JHBIM"–Object Library.

Baik, Ahmad. (2017). From Point Cloud To Jeddah Heritage BIM Nasif Historical House–Case Study. *Digital Applications in Archaeology and Cultural Heritage*, 4, 1–18.

Barbera, R., Condorelli, F., Gregorio, G. Di, & Di, G. (2022). A Case Study for the Design and Implementation of Immersive Experiences in support of Sicilian Cultural Heritage. *FAPER 2022: 2nd International Workshop on Fine Art Pattern Extraction and Recognition*.

Biljecki, F., Stoter, J., Ledoux, H., Zlatanova, S., & Çöltekin, A. (2015). Applications of 3D City Models: State of The Art Review. *ISPRS International Journal of Geo-Information*, 4(4), 2842–2889.

Bryde, D., Broquetas, M., & Volm, J. M. (2013). The Project Benefits of Building Information Modelling (BIM). *International Journal of Project Management*, 31(7), 971–980.

Cheng, J. C. P., & Ma, L. Y. H. (2013). A BIM-based system for demolition and renovation waste estimation and planning. *Waste Management*, 33(6), 1539–1551.

Colquhoun, H. L., Levac, D., O'Brien, K. K., Straus, S., Tricco, A. C., Perrier, L., Kastner, M., & Moher, D. (2014). Scoping Reviews: Time For Clarity in Definition, Methods, and Reporting. *Journal of Clinical Epidemiology*, 67(12), 1291–1294.

Costantino, D., Vozza, G., Saverio Alfio, V., Pepe, M., Lo Brutto, M., & Alena Girelli, V. (2021). *Strategies for 3D Modelling of Buildings from Airborne Laser Scanner and Photogrammetric Data Based on Free-Form and Model-Driven Methods*: The Case Study of. Mdpi.Com.

García Valldecabres, J. L., López González, M. C., & Jordán Palomar, I. (2016). *The study of architectural heritage with HBIM methodology. A medieval case study. Congreso Internacional de Expresión Gráfica Arquitectónica*, 945–955.

Godinho, M., Machete, R., Ponte, M., Falcão, A. P., Gonçalves, A. B., & Bento, R. (2020). BIM as a resource in heritage management: An application for the National Palace of Sintra, Portugal. *Journal of Cultural Heritage*, 43.

Gomih, S., Leporelli, E., Martino, M., & Santi, G. (2021). *Sustainable Strategies For The Development Of Unesco Sites*: The Medina Of Marrakech.

Gray, M., Gray, J., Teo, M., Chi, S., & Lamari, F. (2013). *Building information modelling: an international survey. Proceedings of the 19th International CIB World Building Congress, Brisbane 2013: Construction and Society*, 1–14.

Gursel, I., Sariyildiz, S., Akin, Ö., & Stouffs, R. (2009). Modeling and Visualization of Lifecycle Building Performance Assessment. *Advanced Engineering Informatics*, 23(4), 396–417.

Hafez, N. M. E. (2019). Managing Heritage Through Facilities Data Management Heritage Information System. *Resourceedings*, 2(2), 153–166.

Hajialikhani, M. R. (2007). *Risk Management Approach For Cultural Heritage Projects Based On Project Management Body of Knowledge*. ICOMOS Australia, Extreme Heritage, James Cook University, Cairns.

Jia, S., Liao, Y., Xiao, Y., Zhang, B., Meng, X., Sustainability, K. Q.-, & 2022, undefined. (2022). *Methods of Conserving and Managing Cultural Heritage in Classical Chinese Royal Gardens Based on 3D Digitalization*. Mdpi.Com

Johansson, M., Roupé, M., & Bosch-Sijtsema, P. (2015). Real-time Visualization of Building Information Models (BIM). *Automation in Construction*, 54, 69–82.

Kokla, M., Mostafavi, M., …F. N.-I. A. P., & 2019, U. (2019). *Towards Building A Semantic Formalization of (Small) Historical Centres*. Pure.Tudelft.Nl.

Kontic, A., Jadresin-Milic, R., & Mrljes, R. (2019). *Defining The Methodology of Integrated Research in The Process of Digital Documentation of Architectural Heritage*: case study Lizori, Italy.

Letellier, R., & Eppich, R. (2015). Recording, Documentation and Information Management For The Conservation of Heritage Places. Routledge.

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping Studies: Advancing The Methodology. Implementation Science, 5(1), 69.

Lin, G., Giordano, A., Sang, K., Stendardo, L., & Yang, X. (2021). Application of Territorial Laser Scanning in 3d Modeling of Traditional Village: A Case Study of Fenghuang Village in China. *ISPRS International Journal of Geo-Information*, 10(11).

López, F. J., Lerones, P. M., Llamas, J., Gómez-García-Bermejo, J., & Zalama, E. (2018). A Review of Heritage Building Information Modeling (H-BIM). *Multimodal Technologies and Interaction*, 2(2), 21.

Ma, Y.-P., Hsu, C. C., Lin, M.-C., Tsai, Z.-W., & Chen, J.-Y. (2015). Parametric Workflow (Bim) For The Repair Construction Of Traditional Historic Architecture In Taiwan. *International Archives of the Photogrammetry, Remote Sensing & Spatial Information Sciences*, 40.

McArthur, J. J. (2015). A Building Information Management (BIM) Framework and Supporting Case Study For Existing Building Operations, Maintenance and Sustainability. *Procedia Engineering*, 118, 1104–1111.

Megahed, N. A. (2015). Towards A Theoretical Framework For Hbim Approach in Historic Preservation and Management. *ArchNet-IJAR: International Journal of Architectural Research*, 9(3), 130.

Minh, K., Bui, N., of, T. D.-I. J., & 2021, undefined. (2021). *Towards Developing the Smart Cultural Heritage Management of the French Colonial Villas in Hanoi*, Vietnam. Publisher.Uthm.Edu.My, 12(1), 1–4.

Murphy, M., McGovern, E., & Pavia, S. (2009). Historic Building Information Modelling (HBIM). *Structural Survey*, 27(4), 311–327.

Penttilä, H., Rajala, M., & Freese, S. (2007). *Building Information Modelling of Modern Historic Buildings*.

Prabowo, B. N., Salaj, A. T., & Lohne, J. (2021). Urban Heritage Facility Management: A Scoping Review. *Applied Sciences*, 11(20), 9443.

Rahal, W., …M. R.-G. J. of T., & 2020, undefined. (2020). *The Preservation of World Archaeological Sites and Promotion of Tourism*: qala'at bani hammad (M'sila) Algeria.

Soonwald, E. S., Wojnarowski, A. E., Tikhonov, S. G., Artemeva, O. V., & Tyurin, S. V. (2019). *Building Information Modeling Applied To The Industrial Architectural Monuments Case Study of Saint Petersburg*. Pdfs.Semanticscholar.Org.

Themistocleous, K., Mettas, C., Evagorou, E., & Hadjimitsis, D. (2019). The Use of Uavs and Photogrammetry For The Documentation of Cultural Heritage Monuments: The Case Study of The Churches In Cyprus. *Earth Resources and Environmental Remote Sensing/GIS Applications X*, 11156, 85–96.

Tomaževiè, M., & Lutman, M. (2007). Heritage Masonry Buildings In Urban Settlements and The Requirements of Eurocodes: Experience of Slovenia. *International Journal of Architectural Heritage*, 1(1), 108–130.

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K., Colquhoun, H., Kastner, M., Levac, D., Ng, C., Sharpe, J. P., & Wilson, K. (2016). A Scoping Review on The Conduct and Reporting of Scoping Reviews. *BMC Medical Research Methodology*, 16(1), 1–10.

Vázquez-Molini, D., Álvarez Fernández-Balbuena, A., Benítez, A. J., Souto, X. P., Armenteros, M., Stepanian, E. M., Cantos, R., García-Villaraco, M., Solano, J., & Manzanares, Á. G. (2021). *Multi-Camera Workflow Applied to a Cultural Heritage Building: Alhambra's Torre de la Cautiva from the Inside*. Mdpi.Com.

Vileikis, O., & Khabibullaeyev, F. (2021). Application of Digital Heritage Documentation For Condition Assessments And Monitoring Change in Uzbekistan. ISPRS Annals of the Photogrammetry, *Remote Sensing and Spatial Information Sciences*, 8(M-1–2021), 179–186.

Volk, R., Stengel, J., & Schultmann, F. (2014). Building Information Modeling (BIM) For Existing Buildings—Literature Review And Future Needs. *Automation in Construction*, 38, 109–127.

Xu, X., Ding, L., Luo, H., & Ma, L. (2014). From Building Information Modeling To City Information Modeling. *Journal of Information Technology in Construction*, 19, 292–307.

Zaker, R., Eghra, A., & Pahlavan, P. (2021). Documentation and Hbim of Industrial Heritage Using Drone Images: Petroleum Reservoir of Mashhad. I*nternational Archives of The Photogrammetry, Remote Sensing and Spatial Information Sciences - ISPRS Archives*, 46, 917–923.

Zouaoui, M. A., Djebri, B., & Capsoni, A. (2021). From Point Cloud to HBIM to FEA, the Case of a Vernacular Architecture. *Journal on Computing and Cultural Heritage*, 14(1).

Appendix 7

Urban heritage and the four pillars of sustainability: Urban-scale facility management in the World Heritage sites

B N Prabowo[1,2] and A T Salaj[1]
[1] Department of Civil and Environmental Engineering, Norwegian University of Science and Technology (NTNU)
[2] bintang.n.prabowo@ntnu.no

Abstract. The discussion addressing sustainability issues of the World Heritage (WH) as cultural sites that holds outstanding universal values (OUV) has started to surface since the adoption of the "Strategic Action Plan for the Implementation of the World Heritage Convention 2012-2022", specifically in the third goal, which states that "heritage protection and conservation should consider present and future environmental, societal, and economic needs." This goal aligned with the first three pillars of sustainability. After the introduction of "culture" as the fourth pillar of sustainability by UCLG in 2011, the issue of sustainability in the WH sites has drawn global attention. The balance of all four pillars of sustainability within protected sites can potentially be achieved by improving efficiencies through urban-scale facility management (Urban FM). The principles of Urban FM aligned with UNESCO's recommendation on the Historic Urban Landscape (HUL) approach, which is a holistic approach to managing historic sites. This study discusses aspects of managing urban-scale facilities in urban heritage areas and aims to shed light on the knowledge of Urban FM at WH sites by employing a literature review approach. The preliminary findings indicate that culture, the fourth pillar of sustainability, was involved and bound to the other three pillars: economic, social, and environmental. Within WH sites, urban-scale facility management needs to be considered seriously to ensure the protection of OUV that efficiently defines the existence of their status as World Heritage.

1. Introduction

After the 1992 Earth Summit in Rio de Janeiro established the three pillars of sustainable development, namely the economy, social equity, and environmental balance, nearly all aspects of development and society were linked with these three elements [1], [2]. However, later, the United Nations Educational, Scientific and Cultural Organization (UNESCO) and multiple international summits on sustainable development recognized the necessity for the cultural approach to be included as the fourth pillar of sustainable development [3]–[5]. This new approach addresses the relationship between culture and sustainable development through the development of the cultural sector and ensures that cultural aspects are given the appropriate weight and place in public policy, particularly those pertaining to education, the economy, science, communication, the environment, social cohesion, and international cooperation. Since the adoption of the "Strategic Action Plan for the Implementation of the World Heritage Convention 2012 -2022", especially in the third goal, which states that "heritage protection and conservation should consider present and future environmental, societal, and economic conditions," the topic of preserving historic districts, particularly World Heritages (WH) as cultural sites with outstanding universal values (OUV), concerning sustainability has begun to surface. This objective aligns with the first three sustainability pillars.

After the United Cities and Local Governments (UCLG) introduced "culture" as the fourth pillar of sustainability in 2011, the issue of sustainability in WH sites and urban heritage areas has grown much

more complex than simple tourism issues. The balance of all four pillars within the context of WH sites could be achieved by increasing efficiency through urban-scale facility management (Urban FM) as a people-focused discipline. Urban FM principles align with UNESCO's guideline on the Historic Urban Landscapes (HUL) approach, which is a holistic method for maintaining historical monuments, including WH sites [6]–[8]. Urban FM is expanding the discipline of facility management (FM) into urban contexts to respond to the needs of communities by facilitating their shared values [9].

The selection of WH sites in this paper was based on their ability to describe the context of this study and their clearer universal shared criteria. This study aims to shed light on the understanding of urban-scale facility management in WH sites within the context of the sustainable development pillars, including "culture" as the proposed fourth pillar. Within WH sites, urban-scale facility management should be carefully considered to maintain the efficient protection of the OUV that characterizes the status of WH. This study examines the economic, social, environmental, and cultural aspects of the management of WH sites.

2. Background

2.1. Towards the proposal of the fourth pillar of sustainability

Cultural heritage contains tangible and intangible examples of human innovation that have been passed down through generations and are valued by communities, groups, or society. These heritages are preserved in the present and passed on for the benefit of future generations. Cultural heritage is vital because it reminds us of the past and gives us a sense of cultural origins, which contributes to the development of national and local community identity, which is essential for a sense of place and for bringing people together [7]. Examples of tangible cultural heritage include monuments, groups of structures, cultural landscapes, and locations. In contrast, intangible cultural heritage comprises the practices, representations, expressions, knowledge, and abilities of communities, organizations, and occasionally even individuals, together with the instruments, items, artifacts, and cultural spaces accompanying them [10].

As a novel approach, the proposed fourth pillar of sustainability addressed the relationship between culture and sustainable development by fostering the cultural sector's growth and securing culture's place in all public policies [11]. In this instance, we are all aware that our contemporary society faces not only economical, social, and environmental obstacles. Creativity, knowledge, diversity, and beauty are essential values indispensable to human civilization's evolution.

The primary objective of any government is to foster a healthy, safe, tolerant, and creative society, not just economically affluent. This means that local governments must promote a model of development that "meets the needs of the present without compromising the ability of future generations to meet their own needs," as well as ensuring the enjoyment of culture and its components by all, as well as protecting and enhancing the rights of citizens to freedom of expression and access to information and resources by incorporating culture into the pillars of sustainability [12]. This fourth pillar establishes sturdy bridges with the previous three development dimensions and is compatible with each.

The longstanding commitment of local and regional authorities to the promotion of culture as an integral part of the development and as a necessary condition for a diverse and peaceful society has prompted the World Organization to mainstream culture in its current work and to encourage the adoption of Agenda 21 for culture by local and regional governments [6]. Based on UNESCO's Universal Declaration on Cultural Diversity (2001) and Convention on the Diversity of Cultural Expressions (2005), the UCLG decided to develop a proposal to include "Culture" as the fourth pillar of sustainable development [12].

2.2. The origin of the World Heritage: A brief history

The concept of "world heritage" is innovative. Traditionally, inherited cultural assets were restricted to specific people or communities [13]. With the new terminology of "world heritage," a cultural item is deemed universal, has a broader reach, and is incorporated into global human history. In 1959, during the construction of the Aswan Dam in Egypt, the Ramses II temple at Abu Simbel, one of the world's most distinctive cultural landmarks, was at risk of being destroyed. This led to the development of World

Heritage [14], [15]. UNESCO initiated a global campaign to save valuable archaeological remains, which generated a discussion about the necessity of a worldwide treaty to safeguard the world's most significant cultural and natural heritage sites.

In 1972, UNESCO formed an accord covering the world's natural and cultural assets. The agreement aims to preserve globally significant sites of universal significance that belong to all humanity. OUV refers to the cultural and natural significance that transcends national borders and is of interest to all human generations, past, present, and future [16]. Therefore, the permanent protection of this asset is of the utmost importance to the global society and is becoming the defined terminology of "World Heritage" that we know today.

2.3. Tangible, intangible, natural, and man-made cultural asset

Heritage has expanded beyond a concern for physical assets such as historical monuments and buildings to include groups of buildings, historic urban and rural centers, historic gardens, and nonphysical heritage such as surroundings, social aspects, and, more recently, intangible qualities [17], [18]. The term "Tangible Cultural Heritage" refers to the physical items created, preserved, and passed down through a community's generations. It includes creative accomplishments, constructed heritage such as buildings and monuments, and other items of human innovation imbued with cultural significance in society. "Intangible Cultural Heritage" refers to "the practices, representations, expressions, knowledge, skills that communities, groups, and, in some cases, individuals acknowledge as constituting their Cultural Heritage" [19], [20]. Intangible heritage includes oral traditions, performing arts, indigenous knowledge, and traditional skills. However, the tangible can only be comprehended and interpreted through the intangible. Thus, society and values are inextricably interwoven [20].

Tangible and intangible cultural resources require separate preservation and protection techniques, which is one of the key reasons for creating and adopting the UNESCO Convention for the Safeguarding of the Intangible Cultural Heritage in 2003 [19], [21]. The Convention acknowledges the importance of intangible Cultural Heritage as a catalyst for sustainable development and a source of cultural diversity. UNESCO, recognizing the importance of people for the expression and transmission of intangible cultural heritage, pioneered the recognition and promotion of living human treasures, defined as "persons who possess to a very high degree the knowledge and skills necessary for performing or recreating specific elements of intangible Cultural Heritage [22].

3. Methodology

This study examines aspects of urban facility management in historic urban areas. The selection of WH sites was based on their ability to describe the context of this study and their clearer shared criteria. This study aims to shed light on the understanding of urban-scale facility management in WH sites within the context of the pillars of sustainable development, including culture as the proposed fourth pillar, by conducting a non-systematic literature review. Due to the ongoing discussion regarding the cultural aspect of sustainability, a literature review was chosen. Some results of semi-structured interviews with the managers of three Norwegian World Heritage sites are also provided to back up and justify some aspects of urban-scale facility management in the context of Norwegian WH.

4. Results and discussions

4.1. World Heritage sites as cultural assets

Heritage was absent from the widespread academic discussion on sustainable development in the past despite its fundamental importance to societies and widely accepted ability to contribute to social, economic, and environmental goals. In response to a significant call from national and local stakeholders, the 2030 Agenda adopted by the UN General Assembly incorporates the role of culture, through the WH program, as one of the facilitators of sustainable development across the Sustainable Development Goals [23]. WH may serve as a forum for creating and assessing innovative strategies that emphasize the significance of heritage to sustainable development [24].

Safeguarding WH sites may be considered an essential contribution to human wellbeing. It is challenging to imagine our society without the recognizable remnants of our past. In addition to their

intrinsic value for present and future generations, WH sites can significantly contribute to sustainable development in all dimensions [24]. A well-protected WH cultural site can directly contribute to alleviating poverty and social inequality by providing fundamental necessities and services, such as security and health, through shelter and access to clean air, water, and food.

WH, as a cultural asset, is essential to the wellbeing of the dwellers due to its profound visual and symbolic properties. The recognition and conservation of the cultural and natural heritage, in addition to fair access and equitable sharing of the benefits of WH assets, improve a sense of place and belonging and a sense of pride, purpose, and ability to maintain common wellbeing, which contributes to the social bonding of a community and individual. Access to heritage is essential, as it is a fundamental part of human development [24].

The preservation of history is also crucial for avoiding risks linked with natural and man-made disasters. Experience has shown that deteriorated natural resources, neglected rural areas, urban sprawl, and poorly designed new construction increase the disaster risk exposure of populations, especially in emerging nations. Alternatively, a well-preserved natural and historic environment based on traditional knowledge and skills considerably reduces disaster risk factors, improves community resilience, and saves lives.

In times of crisis, access to and care for the heritage can help vulnerable individuals re-establish a sense of continuity, dignity, and autonomy. All the above are potential positive contributions to sustainable development that an effective conservation and management of WH could give [24].

The role of the urban scale facility manager is, therefore, to ensure a balance between the limit of acceptable change (LAC) in conservation practices to maintain the OUV, visual quality, and authenticity of WH sites, as well as the welfare of the stakeholders, including residents, migrants, tourists, investors, business owners, and workers [25], [26]. Culture is maintained by not neglecting the progression of time while presenting culture as the hub for the other three pillars of sustainability. Dresden (2009) and Liverpool (2021) had their World Heritage classification withdrawn when the heritage sites were not adequately preserved and managed in compliance with UNESCO's regulations. The World Heritage Committee (WHC) resolved to remove Dresden (Elbe Valley) and Liverpool (Maritime Mercantile City) from the WH list due to the irreversible loss of qualities conveying the heritage asset's outstanding universal values.

4.2. World Heritage sites as a driving force for the sustainable economy

The presence of WH properties enables the protection and provision of social, cultural, and educational resources. Frequently, irreplaceable WH structures, monuments, and sites contribute to tourism and economic growth, creating jobs and the economic trickle-down effect [27]. International, national, and local heritage authorities and other heritage development practitioners engage with local organizations to safeguard cultural assets and encourage the development and use of conservation skills. Development professionals can also increase future economic possibilities by safeguarding cultural treasures and supporting sustainable tourism [7], [28]. In recent decades, cultural heritage has become a major tourist attraction, especially those urban heritage areas designated as WH sites, resulting in a huge increase in the cultural tourism industry [29], [30]. WH site is also an essential asset for other types of economic growth by attracting investments and producing green, locally based, steady, and high-quality jobs, of which only a fraction of them may be tourism-related [19].

The urban-scale facility managers at WH sites, well-known as tourism attractions, are responsible for ensuring that all supporting services required for comfort, safety, and user experience are supplied effectively. A negative image of inadequate urban facilities and infrastructure will be detrimental to promoting the WH site, resulting in decreased tourism to the area. The severe reduction in tourism at WH sites will precipitate the collapse of the general tourism industry, including the informal sector and the small-to-medium economy, which have relied on tourism as the economic engine. In addition, WH caretakers should provide investor-friendly support services and encourage business, corporate social responsibility (CSR), public-private partnership (PPP), and public-private-people Partnership (PPPP).

4.3. Relationship between World Heritage status and social equity

In this study, the term "equity" is preferred to "equality." "Equality" implies that each person or group receives the same resources or opportunities, whereas "equity" acknowledges that each person has unique circumstances and provides the exact resources and opportunities necessary to achieve an equal result [31].

The heritage authorities maintaining WH sites are often under intense pressure [32]. The WH sites are frequently enormous and vital to the local tourism industry. Large populations may reside in and around them, and overtourism often creates tensions between local dwellers and tourists. The WH sites are both an asset and a severe responsibility for certain countries. The conflicting demands of conservation, economic development, and social equity complicate the management of the WH site. Effective management of this issue demands the ability to observe change and to connect with community perspectives, allowing essential information and community involvement to be included in the management process [32]. To maintain a sustainable, low-cost urban heritage living model, for example, a nonexpert individual or community would benefit from guidance for self-renovation provided by the heritage authorities [33].

Integrating social equity and environmental sustainability could have significant conservation advantages for WH sites [34]. For instance, the entrance fee discussion in the context of WH sites in the literature focuses primarily on whether an entrance ticket should be implemented. Based on the "user pays" approach (Laarman & McGregersen (1996) in [35]), user fees are often promoted for their potential to increase economic efficiency (Walsh (1986) in [35]) and to financially support the preservation of the WH assets [35], [36]. In contrast, based on the principle of social equity, some heritage activists propose free entry to WH sites as assets that are frequently owned and administered on behalf of the public. The entrance fee may also prevent some individuals from accessing public resources to which they are legally allowed (Buckley (2003) and Walsh (1986) in [35]). Raising entrance charges is, initially, intended to increase the site's tourism revenues and reduce visitor numbers to support heritage preservation. It may appear to be a win-win situation for cultural assets. However, legacy tourism is a resource-dependent tourist industry [37]. Due to the uniqueness and irreplaceability of the historical and cultural assets at WH sites, the motivation to visit these locations would not be affected drastically by price changes. In this scenario, increasing the entrance cost will not be sustainable for WH sites, as the number of visitors, particularly international and wealthy tourists, is not decreasing considerably, while at the same time, the increase in ticket prices prevents locals from visiting their own national heritage assets[35]. Utilizing an integrated social sustainability assessment (ISSA) tool to identify the strengths and weaknesses [38] could be used to address these problematic issues. This is an illustration of how to tackle social inequality in the management of WH properties.

However, in general, the increasing profit and number of visitors will attract further new investments in different sectors. Investment of economic resources in cultural and natural heritage may promote social, equitable, and inclusive advantages for all, in addition to the anticipated economic benefits of jobs and income. Regarding WH, inclusive economic development prefers a people-centered economy, reconciling economic growth with social equality through exploiting local resources and fair competitiveness on a global market [39]. By integrating the principles of universal design, accessibility, and social equity into the management of historical assets, urban-scale facility managers at WH sites can promote social justice for all stakeholders, including the poor, the disabled, and the elderly.

4.4. Environmental considerations in the management of World Heritage sites

Activities associated with stewardship of cultural and natural heritage are local by definition and environmentally friendly "by design" because they embody a fundamentally more sustainable pattern of land use, consumption, and production, developed over centuries, if not millennia, of gradual adaptation between communities and the environment. This is true not only for biodiverse protected natural regions but also for cultural landscapes and historic cities [24].

Climate stresses can directly affect cultural heritage structures, monuments, and communities. Rising sea levels threaten coastal assets due to increased erosion and saltwater intrusion. Storms and floods are more frequent and more robust, which can cause damage to structures that were not built to resist prolonged structural pressure, erosion, and immersion [40]. Changing precipitation patterns can cause

rapid deterioration of assets constructed for a different environment. Increases in soil moisture caused by an increase in precipitation can weaken the structural integrity of historic structures and archaeological sites. Warmer temperatures and higher humidity can cause damage to building materials and buildings by fostering decay, insect infestations, and erosion. The relative significance of these and other climate change threats varies, with a range of cost implications, compounding effects, and repercussions on development objectives [28].

These consequences, ramifications, and required resources must be considered by decision-makers to appropriately raise awareness of existing and future threats by building capacity in conserving and maintaining the site [41]. Adaptation options for cultural heritage include giving stakeholders the skills they need, changing management practices and policies about infrastructure maintenance, reinforcement, and development to protect and fortify structures, and making partnerships that include benefits sharing since those who want to preserve a site may be different from those whose actions are needed to protect it. If climatic considerations are incorporated into early planning and design, specific adaptation options may require minimal or no further investment, whereas others may require extensive additional resources [28], [41]. Incorporating adaption strategies into existing cultural heritage management plans and programs can enhance long-term preservation efforts. When restoring, renovating, and monitoring cultural heritage assets, it is essential to examine all significant long-term factors [28].

The evaluation and monitoring can be performed concurrently with other urban and adaptive planning. Even though many adaptation strategies for cultural heritage assets are identical to those for different types of infrastructure, cultural heritage assets also present distinct challenges. For example, cultural heritage objects are often irreplaceable [42]. In addition, many adaptation strategies are specific to heritage assets, such as combining traditional materials and skills with modern engineering when reinforcing, stabilizing, and renovating historic structures to both preserve their historic beauty and increase their endurance. Adaptation options also differ depending on whether the cultural heritage object may be relocated [28], [42].

Cultural WH sites, which are more prominent in the number of sites compared to the protected natural sites [43], are often far smaller than natural WH sites in size and were not designated for their biological values. However, adaptation to climate change and disaster risk reduction concerns both natural and cultural WH sites. Only by preserving healthy ecosystems can natural WH sites continue to provide the many services and benefits they already give to local and global communities. Environmental sustainability as a whole must be prioritized in the expansion of the WH agenda.

Heritage authorities and urban facility managers in WH sites are now expected to conduct a Heritage Impact Assessment (HIA) prior to deciding whether to allow development applications to proceed if the proposed heritage building refurbishment is compromising the authenticity or poses a danger of irreparably harming the cultural significance of heritage assets [44]. As a result, HIA asserts that, due to its preventative nature, it helps statutory authorities identify and prevent the acceptance of aggressive development, defined as development that undermines the cultural significance of heritage properties [44]. HIA structures an examination of the potential harm or advantages that may accrue to the cultural heritage assets' significance.

Urban-scale facility managers who manage WH sites must also consider the environmental aspect as a significant element of the conservation plan. Although it requires global action in fighting climate change, the heritage authorities and urban facility managers might conduct a local strategic plan to mitigate the imminent potential danger of the obstruction of OUV that might cause the deletion of WH status in the near future.

5. Conclusions

Within the management of WH sites, urban-scale facility managers play a significant role in the management of support services that safeguard the authenticity, visual quality, and outstanding universal values (OUV) of the protected assets. Managers of urban-scale facilities are responsible for maintaining a balance between the limit of allowable change in conservation and the interests of stakeholders. They are also responsible for ensuring that all supporting services essential for comfort, safety, and user experience are properly provided in order to prevent a decline in tourism to the area that could result in

the collapse of the tourism industry as a whole. By incorporating the principles of universal design, accessibility, and social equity into the administration of historical assets, the presence of urban-scale facility managers at WH sites acts as an enabler for social justice for all stakeholders by providing equal support services, while also paying close attention to the environmental aspect as significant elements of the conservation plan. Overall, the principles of urban-scale facility management align with UNESCO's recommendation on the Historic Urban Landscape (HUL) approach in managing historic urban assets such as World Heritage sites.

6. References

[1] M. Grubb, M. Koch, K. Thomson, F. Sullivan, and A. Munson, *The'Earth Summit'Agreements: A Guide and Assessment: An Analysis of the Rio'92 UN Conference on Environment and Development*, vol. 9. Routledge, 2019.
[2] B. P. Y. Combes, "The United Nations decade of education for sustainable development (2005–2014): Learning to live together sustainably," *Appl. Environ. Educ. Commun.*, vol. 4, no. 3, 2005.
[3] G. Burford *et al.*, "Bringing the 'missing pillar' into sustainable development goals: Towards intersubjective values-based indicators," *Sustainability*, vol. 5, no. 7, pp. 3035–3059, 2013.
[4] N. Duxbury, C. Cullen, and J. Pascual, "Cities, culture and sustainable development," *H. Anheier, y YA Isar, Cult. Policy Gov. a New Metrop. Age*, pp. 73–86, 2012.
[5] N. Lazar and K. Chithra, "Role of culture in sustainable development and sustainable built environment: a review," *Environ. Dev. Sustain.*, vol. 24, no. 5, pp. 5991–6031, 2022.
[6] K. Boluk, "Going Beyond: Perceptions of Sustainability in Heritage Studies No. 2." Taylor & Francis, 2018.
[7] M.-T. Albert, *Perceptions of sustainability in heritage studies*, vol. 4. Walter de Gruyter GmbH & Co KG, 2015.
[8] B. N. Prabowo, A. T. Salaj, and J. Lohne, "Urban Heritage Facility Management: A Scoping Review," *Appl. Sci.*, vol. 11, no. 20, p. 9443, 2021.
[9] A. T. Salaj and C. M. Lindkvist, "Urban facility management," *Facilities*, vol. 39, no. 7–8, pp. 525–537, Apr. 2021.
[10] A. P. Roders and R. Van Oers, "Bridging cultural heritage and sustainable development," *J. Cult. Herit. Manag. Sustain. Dev.*, vol. 1, no. 1, pp. 5–14, 2011.
[11] Y. G. Kim, "Sustainable Development and Korea's Intangible Cultural Heritage Policy," *MUNHWAJAE Korean J. Cult. Herit. Stud.*, vol. 49, no. 3, pp. 256–269, 2016.
[12] K. Nurse, "Culture as the fourth pillar of sustainable development," *Small states Econ. Rev. basic Stat.*, vol. 11, pp. 28–40, 2006.
[13] J. Jokilehto, "Considerations on authenticity and integrity in world heritage context," *City time*, vol. 2, no. 1, p. 1, 2006.
[14] J. Wienberg, "The past is everywhere," in *Heritopia*, Lund University Press, 2021, pp. 1–34.
[15] N. Smith, "Classic projects: Relocation of Abu Simbel," *Eng. Technol.*, vol. 6, no. 3, 2011.
[16] W. Logan, "Cultural diversity, cultural heritage and human rights: Towards heritage management as human rights-based cultural practice," *Int. J. Herit. Stud.*, vol. 18, no. 3, pp. 231–244, May 2012, doi: 10.1080/13527258.2011.637573.
[17] J. Ryan, "Intangible cultural heritage: the new frontier of destination branding," in *Ideas in marketing: Finding the new and polishing the old*, Springer, 2015, pp. 388–390.
[18] M. Z. Idris, N. B. Mustaffa, and S. O. S. Yusoff, "Preservation of intangible cultural heritage using advance digital technology: Issues and challenges," *Harmon. J. Arts Res. Educ.*, vol. 16, no. 1, pp. 1–13, 2016.
[19] J. Blake, "UNESCO's 2003 Convention on Intangible Cultural Heritage: the implications of community involvement in 'safeguarding,'" in *Intangible heritage*, Routledge, 2008, pp. 59–87.
[20] D. Munjeri, "Tangible and intangible heritage: From difference to convergence," *Museum Int.*, vol. 56, no. 1-2, pp. 12–20, 2004.
[21] C. F. Kreps, "Appropriate museology in theory and practice," *Museum Manag. Curatorsh.*, vol. 23, no. 1, pp. 23–41, Mar. 2008, doi: 10.1080/09647770701865345.
[22] F. Lenzerini, "Intangible cultural heritage: The living culture of peoples," *Eur. J. Int. Law*, vol. 22,

no. 1, pp. 101–120, 2011.
[23] D. Wiktor-Mach, "What role for culture in the age of sustainable development? UNESCO's advocacy in the 2030 Agenda negotiations," *Int. J. Cult. Policy*, vol. 26, no. 3, pp. 312–327, 2020.
[24] W. H. C. UNESCO, "Policy Document for the Integration of a Sustainable Development Perspective into the Processes of the World Heritage Convention," in *Paris: General Assembly of States Parties to the World Heritage Convention at Its 20th Session*, 2015.
[25] G. S. J. Roman, P. Dearden, and R. Rollins, "Application of zoning and 'limits of acceptable change' to manage snorkelling tourism," *Environ. Manage.*, vol. 39, no. 6, pp. 819–830, 2007.
[26] D. F. Rahman, "Re-Evaluating Socio-Cultural Change in World Heritage Sites: A Case Study of the Cultural Landscape of Bali Province." UCL (University College London), 2021.
[27] E. Andalib and Y. Khodadadeh, "The role of innovative design in creating city identity and tourist attraction: Investigating Sheikh-Zahed Monument as a case study," *J. Des. Think.*, vol. 2, no. 2, pp. 123–136, 2021.
[28] D. Harkin *et al.*, "Impacts of climate change on cultural heritage," *MCCIP Sci. Rev*, vol. 16, pp. 24–39, 2020.
[29] R. A. de Oliveira, R. M. A. Baracho, and L. Cantoni, "The perception of UNESCO World Heritage Sites' managers about concepts and elements of cultural sustainability in tourism," *J. Cult. Herit. Manag. Sustain. Dev.*, 2022.
[30] J. Romão, "Tourism, a Place-Based Activity," in *Tourism, Territory and Sustainable Development*, Springer, 2018, pp. 37–64.
[31] M. E. Guy and S. A. McCandless, "Social equity: Its legacy, its promise," *Public Adm. Rev.*, vol. 72, no. s1, pp. S5–S13, 2012.
[32] R. Fletcher, I. Johnson, E. Bruce, and K. Khun-Neay, "Living with heritage: site monitoring and heritage values in Greater Angkor and the Angkor World Heritage Site, Cambodia," *World Archaeol.*, vol. 39, no. 3, pp. 385–405, Sep. 2007, doi: 10.1080/00438240701465001.
[33] C. Senior, A. T. Salaj, M. Vukmirovic, M. Jowkar, and Ż. Kristl, "The spirit of time—The art of self-renovation to improve indoor environment in cultural heritage buildings," *Energies*, vol. 14, no. 13, p. 4056, 2021.
[34] G. Wardell-Johnson *et al.*, "Re-framing values for a World Heritage future: what type of icon will K'gari-Fraser Island become?," *Australas. J. Environ. Manag.*, vol. 22, no. 2, pp. 124–148, 2015.
[35] M. M. Su and G. Wall, "Chinese research on world heritage tourism," *Asia Pacific J. Tour. Res.*, vol. 16, no. 1, pp. 75–88, 2011.
[36] S. S. Kim, K. K. F. Wong, and M. Cho, "Assessing the economic value of a world heritage site and willingness-to-pay determinants: A case of Changdeok Palace," *Tour. Manag.*, vol. 28, no. 1, pp. 317–322, 2007.
[37] C. Wang and H. Xu, "The role of local government and the private sector in China's tourism industry," *Tour. Manag.*, vol. 45, pp. 95–105, 2014.
[38] T. Akbarinejad, A. T. Salaj, and A. Johansen, "A Novel Approach to Develop an Integrated Social Sustainability Assessment Framework: Case Study of Norway," *SSRN Electron. J.*, 2022, doi: 10.2139/ssrn.4279208.
[39] P. B. Larsen, "Human rights, wrongs and sustainable development in World Heritage," in *World Heritage and Sustainable Development*, Routledge, 2018, pp. 120–133.
[40] C. McGuigan, R. Reynolds, and D. Wiedmer, "Poverty and climate change: Assessing impacts in developing countries and the initiatives of the international community," *London Sch. Econ. Consult. Proj. Overseas Dev. Inst.*, pp. 1–40, 2002.
[41] C. N. Cook, M. B. Mascia, M. W. Schwartz, H. P. Possingham, and R. A. Fuller, "Achieving conservation science that bridges the knowledge–action boundary," *Conserv. Biol.*, vol. 27, no. 4, pp. 669–678, 2013.
[42] X. Romão, E. Paupério, and N. Pereira, "A framework for the simplified risk analysis of cultural heritage assets," *J. Cult. Herit.*, vol. 20, pp. 696–708, 2016.
[43] T. Badman and B. Bomhard, "World heritage and protected areas," Quebec City, 2008.
[44] A. P. Roders and R. Van Oers, "Guidance on heritage impact assessments: Learning from its application on World Heritage site management," *J. Cult. Herit. Manag. Sustain. Dev.*, 2012.

Appendix 8

Available online at www.sciencedirect.com

ScienceDirect

IFAC PapersOnLine 56-2 (2023) 9570–9575

IFAC Papers Online CONFERENCE PAPER ARCHIVE

The older adults in the smart urban heritage area: A mini-scoping review of inclusivity in the World Heritage sites

Bintang Noor Prabowo*. Alenka Temeljotov-Salaj*

** Department of Civil and Environmental Engineering, Norwegian University of Science and Technology (NTNU), Norway (e-mail: bintang.n.prabowo@ntnu.no, alenka.temeljotov-salaj@ntnu.no)*

Abstract: This article explores the concept of creating a smart urban heritage area that is livable for all citizens, particularly older adults who are considered valuable stakeholders. The article explains that elderly people, especially in cities, are growing faster and want to age in place instead of moving far away, and thus, cities need to adapt to the needs of this type of residents. The study views old age and elderly accommodation as social design problems that individuals cannot solve, and that ethical and inclusive architecture can solve these issues. The article also addresses how inclusively designed urban heritage areas can improve the quality of life, personal identity, and human interactions throughout citizens' lifespans. The methodology used in the study involved mini-scoping reviews to understand and defining accessibility, inclusivity, and mobility in urban heritage case studies from the reviewed literature. The authors searched various databases for peer-reviewed journal articles that addressed the relationship between older adults and smart urban heritage, particularly UNESCO World Heritage sites, and found 18 relevant papers. The article concludes by discussing the characteristics and needs of older adults and the various design concepts and practices that can improve the sustainable urban experience in smart urban heritage areas.

Keywords: smart heritage, facility management, elderly, inclusivity, mobility, accessibility, UHFM

1. INTRODUCTION

As part of a smart city in general, the smart urban heritage area should be a livable part of the urban area for all the citizens, including the older adults, as one of the respectable stakeholders of the city. Smart urban heritage concept will make possible the usage of technology while ensuring the principle of inclusivity and the right to equality for all.

In the current management of the urban heritage area, the shifting paradigm in urban conservation allowed the authorities to focus more on the dwellers' quality of life (Prabowo et al., 2021). Therefore, urban designers, planners, conservators, and facility managers must keep in their mind the needs and aspirations of the entire population (Salaj, 2020) while maintaining the balance of the development within the heritage district to not compromise the heritage visual quality and authenticity as the main principle of cultural heritage preservation. Concentrating more on the most vulnerable members of society, such as older adults, is important because doing so allows all citizens to achieve a balance of comfort and well-being. However, the situation is not inverted. Suppose the focus is placed on the productive members of society instead of the vulnerable ones. In that case, older adults and the physically disabled will likely have difficulty accessing urban facilities, especially within World Heritage (WH) sites.

Globally, the number of older adults is growing, especially in urban areas (Buffel et al., 2012; Pillay & Maharaj, 2013). The aging population typically increases in most high-income countries, although it might also decrease in several other countries with a higher poverty rate among the citizens (Currie & Schwandt, 2016; Pillay & Maharaj, 2013). Buffel further highlighted that the proportion of the population aged 65 and older to the overall population is highest in Japan, at 23.1 percent, followed by 20.6 percent of the Italian population and 20.3 percent of the German population. (Buffel et al., 2012). Furthermore, the United Nations predicts that by 2025 there will be more than 1 billion people aged 60 or older. (Marshall et al., 2004).

Regarding aging, it is possible to argue that people are acquiring a fresh perspective regarding living conditions. Most of those individuals intend to remain in situ instead of relocating far away from their current environment. This growing population of elderly adults, after the vast urbanization of the last several decades, preferring to reside in urban areas rather than rural areas to access more amenities and products, has altered the city as it was previously known. As the city's population is aging, it presents a new difficulty in how to adapt the city to the needs of various types of residents (Afacan & Demirkan, 2011; Buffel et al., 2012; Vidmar et al., 2022).

Establishing a social and physical environment for the everyday lives of older adults is becoming important in respect of a user-friendly interface embedded in the smart urban heritage area since the quality of the built environment is considerably affecting the productivity, satisfaction, comfort, and health of its users. This paper examines senior care as a social design issue that individuals cannot solve. However, those challenges may be resolved through the provision of urban-scale support services inspired by moral considerations and inclusive design approaches. It is

10.1016/j.ifacol.2023.10.259

essential to enable through design by listening to the opinions and voices of older adults and being aware of their different requirements and wants (Clarkson & Coleman, 2015).

These elderly populations also favor urban living due to several factors, including closeness to health facilities, entertainment facilities, public parks, accessibility, and other public facilities (Takano et al., 2002). The urban heritage districts, usually located in one of the urban centers, are dominated by older citizens (Dobner et al., 2016; Fadda et al., 2010; Wang et al., 2022). This is understandable, given that the elderly's wealth accumulation and pension plans in highly developed countries enable them to control and own property in the center of urban regions (Mitchell & Piggott, 2010). Several exotic urban historical places are also inherited by the elderly from their former owners. This is exacerbated by the fact that the younger generation frequently prefers to reside in more modern properties, even if they are located further from the city core (M. L. Senior et al., 2006). Younger generations who have just begun their jobs and have entry-level incomes would be likely unable to compete against the wealthier senior citizens to obtain property in the city center, especially in historic city centers, with, of course, excluding the business entities. Arguably, different phenomena might occur in the least developed countries (LDCs) worldwide. The result is an imbalance in the composition and proportion of residents in the downtown area, particularly in urban historic districts where older citizens are likely to dominate demographically.

The preliminary literature review revealed that there are substantial arguments between many assisted-living providers, architects, planners, facility managers, and policymakers regarding senior citizens' requirements, desires, and aspirations. There is some understanding regarding the use of the universal design approach for these aged communities, such as residential projects and renovations to meet the needs of aging people in urban areas with easy access to urban-scale facilities and services. Universally designed parks that accommodate older adults and physically disabled individuals are the closest examples of such insight. Inclusiveness also encompasses the establishment of public policies and regulations for sustainable social development and assistive technologies for the targeted groups of citizens (Afacan & Demirkan, 2011; Temeljotov-Salaj & Bogataj, 2021).

Numerous concepts and procedures promote the idea that a senior-friendly setting potentially enhances the individual experience inside the smart urban heritage area. Using current technologies to aid older adults in terms of accessibility and mobility is one of the principles underlying the development of urban historical sites that are inclusive for all (Burton & Mitchell, 2006). This concept is predicated on the provision of urban settings which excite and enrich the standard of living, sense of self, and interpersonal relationships of citizens across their lifetimes (Peace et al., 2007).

This study aimed to respond to the following research question: How does the notion of intelligent urban heritage and the older adult population coexist in terms of inclusivity, mobility, and accessibility to improve the quality of older adults' life?

2. METHODOLOGY

This study employed a mini-scoping review as the primary method for grasping and defining the implementation of accessibility, inclusivity, and mobility within urban heritage case studies acquired from the reviewed literature. According to Levac et al. (2010), a scoping literature review is a concise, comprehensive overview of previously investigated studies on a topic. The objective of a scoping review is to remind readers of the fundamental facts and concepts that have been produced on the topic to compare, contrast, and connect the results uncovered while reviewing the work of researchers (Colquhoun et al., 2014). This method helps both authors and readers comprehend academic talks. A scoping review is often done as preliminary research inside a study to summarize and solicit the opinions of others (Colquhoun et al., 2014; Levac et al., 2010; Tricco et al., 2016).

This study used major databases such as Web of Science, Scopus, Science Direct, and Google Scholar to identify relevant publications published in peer-reviewed journals. Publications were considered if an article's abstract or entire content focused on the dynamics between the older adult population and the smart urban heritage, especially the World Heritage that UNESCO acknowledged. The search contained just articles written in English.

A set of examined papers have been obtained from this mini-scoping review protocol involving a preliminary-founded 491 articles from various databases using only a single search string: *(elderly OR "older adults" OR "older adult" OR "senior citizen") AND "World Heritage" AND ("smart city" OR "smart cities")*. The number of preliminary examined papers was reduced to 18 relevant examined papers using a manual selection based on the title and abstract suitability.

3. RESULTS AND DISCUSSION

3.1 Characteristics of the elderly population

The process of aging causes both mental and physical limits in older adults. The sensory and perceptual deterioration, the degeneration of the cognitive and nervous system's neurological functions, the deterioration of the skeletal and muscular systems, the diminished capacity for thermal adjustment, the susceptibility to illness, and the diminished mobility of older adults define their physical characteristics (Ostir et al., 1999).

Besides the physical characteristics mentioned previously, The psychological characteristics of older adults are associated with frequent disorientation and bewilderment, along with trauma resulting from alterations in their careers, smaller earnings, lesser community programs, and less frequent engagement with social relationships (Dobner et al., 2016). Such factors influence the basic requirements that older

adults have. The senior population has the same self-actualization, economic, social, and safety needs as the rest of the population (H. Goodwin, 2017). Addressing the requirements of older adults, it was argued that they must consume a proper diet, live in safe surroundings, have access to high-quality healthcare services, and also have companions with whom they can communicate and exchange their knowledge and experience (Kavšek et al., 2021; Ramadhani et al., 2020).

The elderly traits are directly related to their primary needs. In terms of providing safe environments, historical buildings, and urban-scale heritage facilities are required to meet the needs of older adults while complying with conservation regulations (Moulaert & Garon, 2016). It is anticipated that the facilities within the urban heritage area and the protected historic buildings will safeguard a high level of safety and security for senior citizens, facilitate the older adults' physiological limitations, and enhance social interaction to create community programs that strengthen their sense of identity and self-worth (Ramadhani et al., 2020). The essential psychological requirements of older adults include the desire to feel at ease with their surroundings (D. L. Goodwin & Compton, 2004; Ostir et al., 1999). With the provision of these inclusive smart urban heritage facilities for the elderly, older adults are able to live more independently.

3.2 Authenticity "versus" inclusivity

Authenticity is considered to be one of the most important aspects of WH preservation since it contains the outstanding universal values (OUV) that made it possible for the sites to be included in UNESCO's WH list (Prabowo et al., 2021). Therefore, it needed to be prioritized, although, to some extent, it should also embrace the presence of the dwellers, especially senior citizens, at the same time. Engaging with the conservation of many WH sites is often challenging (Prabowo et al., 2021; Roders & van Oers, 2011), and many historic buildings preservation continue to present challenges for people with mobility and vision impairments, such as older adults (Pezzo, 2010). In fact, heritage protection regulations can make it difficult for institutions and building owners to provide mobility access in WH sites and highly protected buildings (Pezzo, 2010; Wang et al., 2022).

Among many reservationists, some certain level of disability, considered as one of the elderly characteristics, can be accommodated without compromising the authenticity of a historic site or the environment within which monuments are set (Gissen, 2019; Pezzo, 2010). Excluding older adults, especially those with a physical impairment, from accessing the urban heritage buildings and their historical surroundings to maintain authenticity violates the principle of inclusivity within the WH sites (Silberman, 2012).

In order for all citizens, including older adults, to experience the urban heritage area, it's been deemed necessary to find an acceptable compromise between the moral concern of equality and fairness, the acknowledgment of social diversity, the desire for accessibility, and the moral responsibility of commemoration, which consists of safeguarding and advocating for historic sites (UNESCO, 2013). It is a matter of finding an equilibrium among people who are in favor of restrictive protection of heritage buildings and others in support of unrestricted access for all individuals, with the consequences of compromising the authenticity of the protected urban heritage in order to meet the needs of older adults and the physically impaired people.

Furthermore, the principles of inclusivity in the WH sites for older adults can be enhanced using autonomous and robotic technology such as autonomous vehicles, robotic assistive devices, and interactive robots in multiple languages to allow older adults with a language barrier and visual or hearing impairments to be included in the heritage experience.

3.3 Accessibility issues in the realm of urban conservation

Making the historic built environment more accessible is of the utmost urgency and value of the inclusivity principle. It is arguable that the heritage authorities, which are engaged in interpreting, protecting, and stabilizing historic assets, are experiencing pressures placed on the historic built environment to be more inclusive. We might also need to adjust the current relationship between preservation and certain aspects of limitation experienced by older adults by encouraging institutions and owners of historic property to make the historic assets more accessible for all.

The common aspect of accessibility within the protected building is the fear of compromising the authenticity of the facade and the structural integrity. Accessibility elements required by older adults were often out of the designers' consideration of the historic buildings in the past. Therefore, several incompatibilities occurred whenever the principle of universal design was being applied in the protected building to allow inclusive access for older adults, such as ramps, railings, and automatic doors, which altered the historic visual quality. A carefully installed automatic door sensor in an old entry of a protected building is possible within the limit of acceptable change (LAC) of heritage preservation to allow accessibility for the elderly with the wheelchair. A smart wheelchair can also be set to communicate with smart heritage buildings to recognize the presence of advanced aided tools automatically. Smart wheelchairs and autonomous vehicles also allow older adults to access most parts of the heritage districts and WH sites independently. Historic ramp installations at the Lincoln Cathedral are handled with the utmost care, with precautions made to protect the cathedral's floors and walls. None of the ramps required wall or ground attachments. Slip-resistant rubber tiles were put beneath the feet of each support for the safety aspect and convenience of the elderly and impaired users. The systems can be disassembled anytime if a clean looking of the facade is required. This benefit cannot be accommodated by either a wooden or a concrete ramp.

As an alternative to physical accessibility, the use of technology also enabled virtual access to historical buildings and sites that are inaccessible to the elderly due to, for example, a challenging geographical landscape or technical

difficulties in installing additional lifts or elevators to access specific historical building sections in an urban heritage area. To embrace the notion of inclusivity, even if the heritage experience is not physically accessible, older adults can access it virtually through virtual reality (VR) and augmented reality (AR) supplied and supervised by the heritage authorities (Fig. 1). This type of technology is also useful for those unable to travel to a heritage site due to financial constraints or travel restrictions, such as during the Covid-19 pandemic.

Fig. 1. Existing condition (left) and augmented image (right) of Temple of Hera, Greece, source: Vlahakis et al., 2001

Virtual tourism is, in fact, a safer and better option for the highly protected heritage asset and WH sites. Virtual travel enhanced by VR and AR enables visitors to visit new locations without departing from one's houses (Noh et al., 2009). It surely, to some extent, increases virtual accessibility for older adults. Sophisticated virtual reality technologies employed the 360-degree visibility of WH sites to inspire the impulse to visit the site and experience a pleasant memory. In addition, VR enables older adults to pre-evaluate their abilities prior to actually physically experiencing cultural heritage assets that may be located on difficult terrains. As additional information, augmented reality can also reconstruct the historical building and monuments as if the audience is going back in time (Noh et al., 2009; Vlahakis, 2001). The elderly population might experience childhood memories if the service providers have enough historical data from the specified time.

Municipalities, heritage authorities, facility managers, and urban facility managers need to find a middle ground where the limit of acceptable change (LAC) is still acceptable under the cultural heritage preservation law to enable the principles of universal accessibility.

3.4 Older adults' mobility within the urban heritage area

The 2009 EU Action Plan on Urban Mobility contained a combination of policies and initiatives supporting an integrated mobility system with an emphasis on older adults and aging societies in Europe. A portion of the plan addresses green urban transport, passenger rights, and intelligent transport systems to facilitate older adults' mobility. (Okraszewska et al., 2018). The municipality and heritage authorities will be aided by smart urban heritage in the creation of more inclusive scenarios in terms of mobility, aesthetic effect, and other factors (Bernardo, 2020). The urban planners and all other stakeholders concerned with the preservation of urban historical assets should not disregard the requirements of these urban environments for the accessibility of historic buildings and sites by older adults.

Alternate modes of transportation must also play a significant role in any set of urban preservation plans (Fig. 2). It is essential for older adults to have a positive interaction with the external environment. Thus, urban facility managers should consider ways to encourage older adults to engage in community activities.

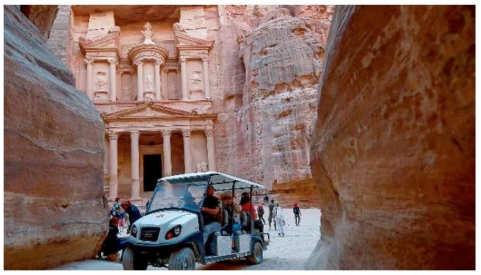


Fig. 2. Electric vehicle at Petra, Jordan, as a green transportation mode, source: www.euronews.com/travel/2021/11/19/ electric-vehicles- replace-horses-in-jordan-s-ancient-city-of-petra

Mobility can be considerable if there are fewer obstacles on the streets and easier access to trains, buses, and other modes of transit. In addition, historic urban districts should have well-designed infrastructure that promotes mobility rather than becoming an obstacle (Fig. 3).

Fig. 3. Cobblestone versus wheelchairs, source: www.funka.com/en/about-funka2/customer-stories/a-win-win-situation-with-funkas-empathy-exercises

With all of their limitations, needs, and traits, senior citizens must be accepted as dignified and independent citizens in accordance with the principles of universal design and inclusion. In the context of preserving historic buildings and regions, several elements associated with retaining authenticity undermine efforts to advance the values of inclusivity, mobility, and accessibility (C. Senior et al., 2021). For instance, cobblestone in urban historical sites frequently impedes wheelchair users' mobility. Steep steps and the absence of ramps impede older adults' ability to enter buildings protected by cultural heritage legislation, while preservation requirements hamper efforts to create ramps and automatic doors. The smart urban heritage area should embrace simple and fluid mobility for all of the citizens, including the elderly population. The Smart Pedestrian

Assistant (SPA) mobile application embedded in smart wheelchairs, for example, will automatically detect and allow elderly or disabled pedestrians who may prefer flat routes without cobblestone walkways because they require less physical effort, using the sensors and AI algorithm provided. The development of robotic exoskeletons (Fig. 4) could also potentially contribute to mobility issues for older adults in the realm of world heritage site conservation.

Fig. 4. Exoskeletons to improve older adult's mobility, Source: https://www.digitalfutures.kth.se/research/demonstrator-projects/real-time-exoskeleton-control-for-human-in-the-loop-optimization

3.5 Integrating information technology and technological aspects in managing historic districts to improve the inclusivity, mobility, and accessibility

Technology and creative ideas were once believed to affect young adults' lives, but they are now affecting the lives of older adults (Bernardo, 2020). The internet, artificial intelligence (AI), big data, and cloud computing may be utilized as platforms to recognize the preferences of older persons and assist them in doing everyday tasks autonomously. Innovation and sustainability must coexist in urban heritage conservation. In this approach, it may be able to improve the city's economic and social successes by creating new infrastructure. Everyone should enjoy the advantages of assisted ambiance living (AAL) environments (Bernardo, 2020; Dikken et al., 2020; Kavšek et al., 2021).

Communication and technology infrastructures are at the core of the examples for constructing smart urban heritage districts. The advancement of information technology embedded in an urban-scale Heritage-BIM (HBIM) made it possible to recognize and identify several specific needs of older adults that dwell in or visit an urban heritage area (Prabowo et al., 2021). Urban scale facility managers can predict and provide those needs by collecting sensors, applications, and manual surveillance data to create an inclusive smart urban heritage area. The obtained data can be used, for instance, to monitor the movement of the elderly and detect their presence and position at heritage sites via the application and to enable a better user experience for other elderly customers by adding a ramp and by identifying what difficulties an older adult encounter when visiting such cultural heritage assets.

4. CONCLUSION

The elderly population is growing faster in cities, and the smart urban heritage area should be livable for all citizens, including older adults, who are considered respectable stakeholders. In conclusion, the growth of the elderly population in cities requires the integration of their needs into urban design. As part of a smart city, a smart urban heritage area should be livable for all citizens, including older adults. Senior citizens have specific needs and demands that can be met through inclusivity, mobility, and accessibility. The shifting paradigm in urban conservation has enabled the management of urban heritage areas to focus more on residents' quality of life. The built environment affects users' health, comfort, satisfaction, and productivity. Excluding older adults, especially those with a physical impairment, from accessing the urban heritage buildings and their historical surroundings to maintain authenticity violates the principle of inclusivity within the WH site management. In order to create an elderly-friendly environment in the smart urban heritage area, inclusively designed urban heritage areas use technology to help older adults with mobility and accessibility. Inclusivity and equality can be achieved by ensuring that urban designers, planners, conservators, and facility managers balance the needs and aspirations of the entire population while maintaining the outstanding universal values (OUV), visual quality, and authenticity of the World Heritage sites. Overall, designing smart urban heritage areas with older adults in mind can improve sustainability and promote citizens' quality of life, personal identity, and human interactions throughout their lives.

ACKNOWLEDGEMENT

This study is part of the ongoing research project "CaPs - Citizens as Pilots of Smart Cities," funded by Nordforsk (project number 95576).

REFERENCES

Afacan, Y., & Demirkan, H. (2011). An ontology-based universal design knowledge support system. *Knowledge-Based Systems*, *24*(4), 530–541.

Bernardo, M. L. (2020). *Ambient Assisted Living: The Case of Porto Historic Centre*. Universidade do Porto (Portugal).

Buffel, T., Phillipson, C., & Scharf, T. (2012). Ageing in urban environments: Developing 'age-friendly'cities. *Critical Social Policy*, *32*(4), 597–617.

Burton, E., & Mitchell, L. (2006). *Inclusive urban design: Streets for life*. routledge.

Clarkson, P. J., & Coleman, R. (2015). History of inclusive design in the UK. *Applied Ergonomics*, *46*, 235–247.

Colquhoun, H. L., Levac, D., O'Brien, K. K., Straus, S., Tricco, A. C., Perrier, L., Kastner, M., & Moher, D. (2014). Scoping reviews: time for clarity in definition, methods, and reporting. *Journal of Clinical Epidemiology*, *67*(12), 1291–1294.

Currie, J., & Schwandt, H. (2016). Inequality in mortality decreased among the young while increasing for older adults, 1990–2010. *Science*, *352*(6286), 708–712.

Dikken, J., van den Hoven, R. F. M., van Staalduinen, W. H., Hulsebosch-Janssen, L. M. T., & van Hoof, J. (2020). How older people experience the age-friendliness of their city: Development of the age-friendly cities and communities questionnaire. *International Journal of Environmental Research and Public Health*, *17*(18), 6867.

Dobner, S., Musterd, S., & Droogleever Fortuijn, J. (2016). 'Ageing in place': experiences of older adults in Amsterdam and Portland. *GeoJournal*, *81*, 197–209.

Fadda, G., Cortés, A., Olivi, A., & Tovar, M. (2010). The perception of the values of urban space by senior citizens of Valparaiso. *Journal of Aging Studies*, *24*(4), 344–357.

Gissen, D. (2019). Disability and preservation. *Future Anterior: Journal of Historic Preservation, History, Theory, and Criticism*, *16*(1), iii–xiii.

Goodwin, D. L., & Compton, S. G. (2004). Physical activity experiences of women aging with disabilities. *Adapted Physical Activity Quarterly*, *21*(2), 122–138.

Goodwin, H. (2017). The Challenge of Overtourism. *Responsible Tourism Partnership*. https://doi.org/10.1016/S0140-6736(84)91114-0

Kavšek, M., Rogelj, V., & Bogataj, D. (2021). Smart Age-Friendly Environments. *IFAC-PapersOnLine*, *54*(13), 768–773. https://doi.org/10.1016/J.IFACOL.2021.10.545

Levac, D., Colquhoun, H., & O'Brien, K. K. (2010). Scoping studies: advancing the methodology. *Implementation Science*, *5*(1), 69.

Marshall, R., Case, K., Porter, J. M., Sims, R., & Gyi, D. E. (2004). Using HADRIAN for eliciting virtual user feedback in 'design for all.' *Proceedings of the Institution of Mechanical Engineers, Part B: Journal of Engineering Manufacture*, *218*(9), 1203–1210.

Mitchell, O. S., & Piggott, J. (2010). Appendix A: Housing Wealth Among the Elderly. *Reverse Mortgages and Linked Securities: The Complete Guide to Risk, Pricing, and Regulation*, 149–160.

Moulaert, T., & Garon, S. (2016). Age-friendly cities and communities in international comparison. *Cham, CHE: Springer International*.

Noh, Z., Sunar, M. S., & Pan, Z. (2009). A review on augmented reality for virtual heritage system. *International Conference on Technologies for E-Learning and Digital Entertainment*, 50–61.

Okraszewska, R., Romanowska, A., Wołek, M., Oskarbski, J., Birr, K., & Jamroz, K. (2018). Integration of a multilevel transport system model into sustainable urban mobility planning. *Sustainability*, *10*(2), 479.

Ostir, G. V, Carlson, J. E., Black, S. A., Rudkin, L., Goodwin, J. S., & Markides, K. S. (1999). Disability in older adults 1: Prevalence, causes, and consequences. *Behavioral Medicine*, *24*(4), 147–156.

Peace, S., Wahl, H.-W., Mollenkopf, H., & Oswald, F. (2007). Environment and ageing. *Ageing in Society*, 209–234.

Pezzo, K. A. (2010). Universal access for universal value: Creating disabled access at heritage sites for those with mobility impairments. *Conservation and Management of Archaeological Sites*, *12*(4), 290–323.

Pillay, N. K., & Maharaj, P. (2013). Population ageing in Africa. *Aging and Health in Africa*, 11–51.

Prabowo, B. N., Salaj, A. T., & Lohne, J. (2021). Urban Heritage Facility Management: A Scoping Review. *Applied Sciences*, *11*(20), 9443.

Ramadhani, A., Luru, M. N., Suharto, B. B., Wartaman, A. S., & Supriatna, Y. (2020). The elderly perceptions and needs for the senior park in Surabaya City. *International Journal Of Scientific & Technology Research*, *9*(1), 1557–1561.

Roders, A. P., & van Oers, R. (2011). World Heritage cities management. In *Facilities* (Vol. 29, Issue 7, pp. 276–285). https://doi.org/10.1108/02632771111130898

Salaj, A. T. (2020). Urban Facility Management. *Facilities, Special Issue*.

Senior, C., Salaj, A. T., Vukmirovic, M., Jowkar, M., Kristl, Ž. (2021). *The Spirit of Time-The Art of Self-Renovation to Improve Indoor Environment in Cultural Heritage Buildings*. https://doi.org/10.3390/en14134056

Senior, M. L., Webster, C. J., & Blank, N. E. (2006). Residential relocation and sustainable urban form: Statistical analyses of owner-occupiers' preferences. *International Planning Studies*, *11*(1), 41–57.

Silberman, N. A. (2012). Heritage interpretation and human rights: documenting diversity, expressing identity, or establishing universal principles? *International Journal of Heritage Studies*, *18*(3), 245–256.

Takano, T., Nakamura, K., & Watanabe, M. (2002). Urban residential environments and senior citizens' longevity in megacity areas: the importance of walkable green spaces. *Journal of Epidemiology & Community Health*, *56*(12), 913–918.

Temeljotov-Salaj, A., & Bogataj, D. (2021). Application of assistive technologies in smart cities. *2021 29th Mediterranean Conference on Control and Automation (MED)*, 657–662.

Tricco, A. C., Lillie, E., Zarin, W., O'Brien, K., Colquhoun, H., Kastner, M., Levac, D., Ng, C., Sharpe, J. P., & Wilson, K. (2016). A scoping review on the conduct and reporting of scoping reviews. *BMC Medical Research Methodology*, *16*(1), 1–10.

UNESCO. (2013). *European Symposium: Heritage and Accessibility*. https://whc.unesco.org/en/events/1005/

Vidmar, B., Bogataj, D., & Rogelj, V. (2022). The Framework for Research of Smart Silver Villages. *IFAC-PapersOnLine*, *55*(39), 382–387. https://doi.org/10.1016/J.IFACOL.2022.12.059

Vlahakis, G. N. (2001). Against French science: Alessandro Volta and Luigi Brugnatelli in early nineteenth-century Greece. *Nuncius*, *16*(1), 191–210.

Wang, S., Yung, E. H. K., & Sun, Y. (2022). Effects of open space accessibility and quality on older adults' visit: planning towards equal right to the city. *Cities*, *125*, 103611.

Appendix 9

FROM CLASSICAL MANAGEMENT TO URBAN HERITAGE FACILITY MANAGEMENT: MOBILITY AND ACCESSIBILITY IN URBAN HERITAGE AREAS

Bintang Noor Prabowo[1]
Department of Civil and Environmental Engineering, Norwegian University of Science and Technology, NTNU, Trondheim, Norway, bintang.n.prabowo@ntnu.no

Alenka Temeljotov Salaj
Department of Civil and Environmental Engineering, Norwegian University of Science and Technology, NTNU, Trondheim, Norway, alenka.temeljotov-salaj@ntnu.no

Agnar Johansen
Department of Civil and Environmental Engineering, Norwegian University of Science and Technology, NTNU, Trondheim, Norway, a.johansen@ntnu.no

ABSTRACT

This study undertakes an academic exploration of the evolution of management theory, examining its progression from Classical Management to the modern principles of Urban Heritage Facility Management (UHFM) in the specific context of mobility and accessibility in urban heritage areas. This paper explores the difficulties presented by urban heritage areas, distinguished by their cultural heritage significance and the varied interests of stakeholders. It examines how management strategies have evolved to tackle these challenges. The findings demonstrated the relevance of inclusive mobility planning, heritage preservation, sustainable urban development, and increased stakeholder engagement as vital foundations for effectively managing mobility and accessibility. This study encompasses a comprehensive literature review exploring the multifaceted realm of mobility and accessibility management. This investigation reveals that the crucial balance between preserving heritage and providing accessibility plays a pivotal role in managing urban heritage areas. Practical strategies that have emerged in this study include innovative solutions such as adaptive reuse of historical buildings, the application of universal design principles, and active community engagement. UHFM has appeared as a potential solution to bridge the gap between the preservation of cultural heritage and the demands of modern accessibility and mobility requirements by incorporating sustainable urban development strategies in the urban heritage areas. Furthermore, it prioritizes implementing inclusive mobility planning strategies and acknowledges the significance of engaging a wide range of stakeholders in decision-making. The article emphasizes the potential of UHFM in maintaining accessibility and mobility concerning the preservation of the distinctive historical importance, outstanding values, authenticity, and visual quality of these areas.

Keywords: Facility Management, urban FM, UHFM, conservation, mobility

[1] Corresponding author

INTRODUCTION

Urban heritage areas and World Heritage (WH) sites are renowned for their rich historical significance, cultural value, and remarkable architectural achievements. These artifacts exhibit the marks left by previous generations, serving as vessels for narratives encompassing our collective human legacy. Nevertheless, these urban heritage areas frequently encounter a complex challenge in finding a way to harmonize their significance, value, visual quality, and authenticity with the requirements of modern urban life (Prabowo et al., 2021). In urban-scale settings, one of the rarely addressed challenges revolves around the crucial matters of mobility and accessibility (Ababneh, 2021; Jiménez-Espada et al., 2022; Sepe, 2021).

This article examines the management of mobility and accessibility in urban heritage areas and World Heritage sites, focusing on their evolutionary development. The purpose of this study is to analyze the progression of management practices from Classical Management to the current urban-scale Facility Management (Urban FM), with a specific emphasis on urban heritage areas. The study explores various methods through which these unique urban areas have adjusted to address the requirements of heritage preservation and modern urban living in terms of mobility and accessibility. Furthermore, this study observes the emergence and development of Facility Management (FM) as an established academic discipline. This study investigates the application of FM principles in addressing mobility and accessibility issues in urban-heritage settings. It attempts to clarify the shift from conventional management practices to more comprehensive and integrated approaches in the new domain of urban heritage facility management (UHFM). This study aimed to stimulate increased awareness and recognition of the significant interaction between management strategies and safeguarding urban heritage areas. The statement functions as a persuasive appeal, compelling individuals to acknowledge the importance of mobility and accessibility as integral components of heritage preservation. By comprehending this process of evolution, the stakeholders gain the necessary knowledge to develop urban heritage environments that are sustainable, inclusive, and culturally dynamic.

The primary objective of this study is to address the research inquiry: *"What are the developments in the incorporation of mobility and accessibility considerations in the management of urban heritage areas, specifically with the introduction of Urban Heritage Facility Management (UHFM), and what are the effective strategies and solutions that have been developed to tackle these concerns?"*. This research question facilitates a comprehensive investigation into the historical development of management strategies related to mobility and accessibility in urban heritage areas.

BACKGROUND THEORY: EVOLUTION OF MANAGEMENT THEORIES IN MOBILITY AND ACCESSIBILITY

The historical context of Classical Management Theory in the urban heritage area

Within the context of urban-scale heritage conservation, it is necessary to examine the historical origins of Classical Management Theory to understand the development of accessibility and mobility. This theory laid the foundation for the fundamental principles that underpin modern management practices. (Dahlgaard-Park et al., 2018; Pindur et al., 1995). The existing approach exhibited a lack of comprehensive attention to issues of accessibility and mobility, particularly in the context of urban-scale heritage preservation and WH sites.

The Classical Management Theory, as demonstrated through the contributions of Frederick Taylor and Henri Fayol, emphasized principles concerning efficiency, hierarchical structures, and formal organizational frameworks (Kitana, 2016; Mahmood et al., 2012). These early management pioneers' primary focus revolved around optimizing industrial processes and labor productivity. The concepts they proposed centered on optimizing tasks, uniformizing work methodologies, and the establishment of straightforward hierarchies (Kitana, 2016; Mahmood et al., 2012; Pindur et al., 1995). Although these principles were revolutionary in industrial settings, their implementation in preserving urban-scale heritage was mainly lacking.

The emergence of urbanization and its subsequent impact on heritage conservation gained significant prominence in the late 19th and early 20th centuries. A substantial and swift progression towards urbanization and industrialization increased pressure on historic urban areas during this period. The conservation of cultural heritage sites has faced obstacles due to the intrusion of urban development within these regions (Ripp & Rodwell, 2016; Sonkoly, 2023). The Classical Management Theory during that period was found inadequate in addressing the considerations associated with preserving heritage values and accommodating accessibility needs.

Classical Management Theory's central focus was primarily on enhancing efficiency and productivity within organizational contexts (Dahlgaard-Park et al., 2018; Kitana, 2016; Mahmood et al., 2012; Pindur et al., 1995). However, this theoretical framework provided relatively little attention to issues related to accessibility and mobility. While revolutionary in their time, the concepts of scientific management and bureaucracy had limited applicability in managing urban-scale heritage conservation due to their complex nature. The theory's apparent lack of emphasis on accessibility and mobility has resulted in an inadequate number of comprehensive strategies for conserving historic urban areas that can effectively address diverse user groups.

One significant drawback of Classical Management Theory was its deficiency in incorporating inclusive planning, evident due to its reliance on a top-down decision-making approach and hierarchical structures, which were not conducive to fostering inclusive planning processes (Kitana, 2016). The viewpoints of local communities, heritage conservationists, and supporters of accessibility were frequently marginalized. The rigidity and bureaucratic characteristics of the theory presented difficulties in incorporating the participatory and community-oriented approaches required for conserving heritage at an urban scale.

Throughout the 20th century, there was an essential evolution in management theories. The Human Relations Theory, for example, introduced the concept of incorporating the human element within organizations, facilitating a more comprehensive approach to the decision-making process (Takahashi, 2022). Nevertheless, it was not until the latter part of the 20th century that modern management principles, such as Total Quality Management (TQM) and Sustainability Management, started to tackle the issues of accessibility and mobility within the realm of heritage preservation (Murugan, 2007).

The Classical Management Theory fundamentally shaped modern management practices (Dahlgaard-Park et al., 2018; Pindur et al., 1995). However, its applicability to issues of accessibility and mobility within the context of urban-scale heritage conservation is somewhat constrained (Ababneh, 2021; Sepe, 2021). The theory's central emphasis on efficiency and hierarchy was incongruent with the complex challenges associated with preserving heritage

values and accommodating diverse mobility and accessibility requirements. These critical considerations were integrated into management approaches in subsequent decades, signifying a notable transformation in heritage conservation and urban development.

Classical Management Theories: Mobility and accessibility in urban heritage areas

The Classical Management Theories, which emerged during the late 19th and early 20th centuries, have significantly influenced modern management practices. These theories, specifically Frederick Taylor's Scientific Management and Henri Fayol's Administrative Theory, have established the fundamental principles of modern management (Mahmood et al., 2012; Pindur et al., 1995). In 1881, Frederick Taylor authored a scholarly article that revolutionized the field of metal cutting by introducing a scientific approach. The individual's contributions to the field of industrial engineering, specifically in the areas of time and motion studies, resulted in significant enhancements in productivity. Henri Fayol, commonly referred to as the "Father of Modern Operational Management Theory," published his notable version of management principles, which have significantly impacted the management field. He elucidated the principles by which managers ought to arrange and engage with their personnel (Mahmood et al., 2012). Nevertheless, the focus of these theories was predominantly on the optimization of industrial processes and the enhancement of labor efficiency. Within the specific framework being discussed, the factors pertaining to mobility and accessibility in urban heritage areas were frequently marginalized, often given lesser importance, or disregarded entirely. The primary goal was to increase productivity and optimize organizational structures (Dahlgaard-Park et al., 2018).

Over time, it became apparent that Classical Management Theories have certain limitations in effectively addressing the issues of mobility and accessibility in urban heritage areas. The classical theories exhibited a notable absence of emphasis on preserving cultural heritage. The encroachment of urbanization upon historic sites often resulted in prioritizing efficiency considerations over the necessity of accessibility and mobility. Furthermore, these theories advocated for a hierarchical decision-making process that was not aligned with the inclusive planning required to tackle issues related to mobility and accessibility effectively. The marginalized position of local communities and heritage conservationists within this hierarchical structure is frequently observed.

The theory of management proposed by Max Weber in 1922, commonly referred to as bureaucratic management theory, draws upon principles delineated by Frederick Taylor in his scientific management theory. Weber and Taylor both emphasized the significance of efficiency (Dahlgaard-Park et al., 2018; Mahmood et al., 2012; Pindur et al., 1995). However, Weber additionally cautioned against the potential negative consequences of prioritizing technology over emotional considerations. Furthermore, the rigid bureaucratic procedures promoted by Classical theories hindered the ability to adapt to the complex challenges presented by urban heritage areas. The demand for mobility and accessibility solutions necessitated a greater emphasis on flexibility and community engagement (Senior et al., 2023), which are frequently absent in traditional Classical Management approaches.

Transition to Modern Management Theories

The shift from Classical to Modern Management Theories significantly changed the perspective on mobility and accessibility in urban heritage areas. The Human Relations Theory, proposed by Elton Mayo, emerged during the 1930s and 1940s and presented a

paradigm shift towards a more people-oriented perspective, which aligned with the facility management (FM) principle as a people-centric discipline. This theory acknowledged the substantial impact of individuals' needs and motivations on their level of productivity (Smith, 2013). In the context of urban heritage areas, this transition entailed the recognition of the significance of addressing accessibility requirements and fostering community involvement as key components of management approaches, which later in the future was acknowledged by UNESCO Recommendation on the Historic Urban Landscape in 2011 (Prabowo, Bintang Noor; Salaj, 2023).

The emergence of Total Quality Management (TQM) in the 1950s and 1960s firmly focused on continuous improvement, customer satisfaction, and the provision of services of superior quality. The concept of TQM emerged during the 1950s and has since become predominantly associated with Japan. This can be understood as a corporate quality management system, enterprise quality management system, or integrated quality management system comparable to similar systems implemented by other countries or organizations (Dahlgaard-Park et al., 2018). In the realm of heritage conservation, this particular approach can facilitate inclusive mobility solutions by prioritizing enhancing visitor experiences and providing accommodations for diverse user groups.

The concept of Sustainability Management emerged during the latter part of the 20th century, and its importance grew due to the growing acknowledgment of the significance of environmental and social sustainability. The field of sustainability management has been influenced by the concept of incorporating environmental, social, and economic viewpoints. As a result, the integration of sustainability management has emerged as an essential element within contemporary management theories (Pásková & Zelenka, 2018). The 17 Goals were officially embraced by all United Nations Member States in 2015 as an integral component of the 2030 Agenda for Sustainable Development. This agenda delineated a comprehensive strategy spanning 15 years to achieve the Sustainable Development Goals. This approach also integrated accessibility and mobility as important components of sustainable development within urban heritage areas. The primary goal was to ensure the conservation of heritage values while also addressing the needs and requirements of the modern era (Guccio & Mignosa, n.d.; Jiménez-Espada et al., 2022; Pásková & Zelenka, 2018). While it is true that Modern Management Theories have helped bring beneficial improvements in mobility and accessibility, it is necessary to recognize that practical challenges have remained unresolved.

The transition from Classical to Modern Management Theories represented a progressive shift towards more comprehensive strategies to improve mobility and accessibility in urban heritage areas. While each theory addressed these concerns to varying degrees, practical challenges persisted. The integration of accessibility and mobility with heritage preservation is driven by recognizing their inherent importance in advancing the sustainability and inclusivity of urban heritage areas. This evolutionary process highlights the significance of implementing comprehensive management strategies that uphold tradition while simultaneously addressing contemporary needs, intending to create environments that hold importance in both historical and modern frameworks. The subsequent table (Table 1) briefly

summarizes the chronological development of management theories and their corresponding effects on mobility and accessibility within urban heritage sites.

Table 1: Key points regarding the transition from Classical Management Theories to Modern Management Theories regarding mobility and accessibility in urban heritage areas

Aspects	Classical Management	Transition to Modern Management
Mobility & accessibility	Secondary consideration	Gradual recognition of the importance
Heritage preservation	Often lacking	Emphasis on heritage preservation
Decision-making approach	Top-down hierarchy	Transition to more inclusive planning
Bureaucratic rigidity	Promoted rigidity	Shift towards flexibility
Emphasis on people	N/A	Human-centric approach introduced
TQM	N/A	Enhanced visitor experiences
Sustainability	N/A	Accessibility & mobility integration

Emergence of Facility Management and Urban FM

During the 1970s, FM emerged as a service primarily focused on janitorial and caretaker responsibilities, encompassing building maintenance and cleaning tasks. However, during the mid-1970s and late 1980s, the business landscape experienced increased dynamism and competitiveness (Bartosova Viera & Valaskova Katarina, 2018; Mohammed, 2014). The organization initiated a cost reduction strategy that delegated non-essential services, such as lighting, heating, and plumbing, to FM companies. Nowadays, FM is a multifaceted field that involves the strategic administration of physical assets, infrastructure, and services within constructed environments to attain operational efficiency and sustainability and enhance user experiences. The discipline of FM has emerged and developed due to various factors, with the key influences of accessibility and mobility shaping its evolution. FM is a comprehensive field encompassing multiple aspects, including strategic planning, architectural design, operational management, and ongoing maintenance of diverse facilities. These facilities can range from individual buildings to entire urban areas (urban FM) (A. Salaj et al., 2018; A. T. Salaj & Lindkvist, 2020), including heritage sites (UHFM) (Prabowo, 2022). FM entails harmonizing human resources, operational procedures, and technological advancements to ensure these facilities' optimal functioning, cost-effectiveness, and environmental sustainability.

Multiple factors contribute to the establishment of FM as a recognized discipline. The complexity of the built environment has experienced a significant increase due to urbanization and technological advancements, thereby demanding a systematic approach to the management of facilities (Wilson, 2018). The significance of urban-scale facility management is highlighted by the necessity to effectively manage various infrastructure components in urban areas, such as transportation networks and historical sites. The subsequent factor pertains to the significant role that economic considerations have played in shaping the evolution of FM. The effective allocation and utilization of resources, encompassing energy, space, and maintenance, plays a pivotal role in attaining financial savings and maximizing the utilization of facilities, particularly in heritage sites that operate within limited financial means. In addition, the increasing awareness of environmental issues has emphasized sustainability in facility management. Incorporating sustainable measures, such as the implementation of energy-efficient lighting and the adoption of mobility solutions that minimize carbon emissions, is crucial in facility management, particularly in areas dedicated to heritage conservation. These regions place significant importance on safeguarding cultural and environmental resources. The acknowledgment that facilities should accommodate the varied requirements of users has had a substantial impact on the

field of facility management. The inclusion of accessibility and mobility is crucial in guaranteeing favorable user experiences, particularly in urban heritage areas where historical and cultural sites must be accessible to individuals of all physical abilities.

The international commitment to sustainability has witnessed a significant shift with adopting the Rio Convention in 1992, recognizing the Historic Urban Landscape (HUL) approach in 2011, and establishing the Paris Agreement in 2015. The transition has not solely affected the administration of structures and cultural landmarks (Jiménez-Espada et al., 2022). Still, it has also influenced how individuals interact with and approach urban heritage zones. The prevalence of sustainable modes of transportation, such as public transit and non-motorized alternatives, has witnessed a notable rise. Facility management experts have collaborated with urban planners and transportation authorities to establish integrated and ecologically sustainable mobility experiences within heritage areas.

Moreover, the advent of the digital era has ushered in substantial technological progress, leading to the emergence of novel mobility solutions in facility management. Mobile applications and virtual reality technology have provided interactive and readily accessible experiences for heritage sites. The utilization of augmented reality technology facilitates the active involvement of individuals in interacting with historical landmarks, thereby enhancing the accessibility of these sites and ensuring the preservation of their genuine characteristics (Prabowo, Bintang Noor; Salaj, 2023).

Transition to urban FM and UHFM

Urban-scale Facility Management (Urban FM) is the logical extension of facility management practices, expanding from managing individual buildings to encompass entire urban environments. The necessity for comprehensive management of facilities within urban areas becomes increasingly apparent as cities continue to expand and develop. Urban FM adopts a comprehensive approach to managing the constructed environment, including individual buildings, transportation systems, public areas, and urban heritage areas.

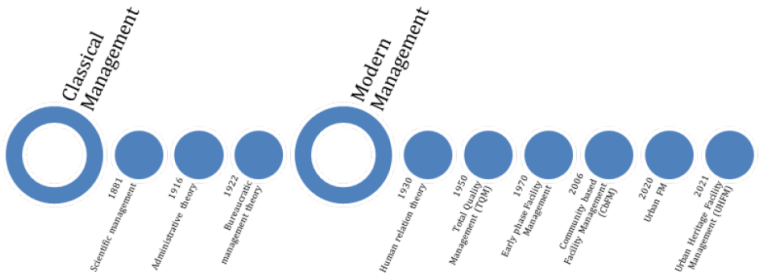


Figure 1: Timeline from Classical Management to Modern Management

Urban Heritage Facility Management (UHFM) represents one specific spectrum of Urban FM (Prabowo, 2022), as it effectively tackles the challenges related to mobility and accessibility within urban heritage zones. The concept of Urban Historic Landscape and Facility Management (UHFM) expands upon the principles of Facility Management (FM) to encompass the effective management and preservation of historically significant urban

landscapes. The timeline in Figure 1. explains the progression from classical management theories to the UHFM. There are numerous advantages associated with adopting UHFM in heritage conservation and promoting enhanced accessibility and mobility (Prabowo et al., 2023), such as inclusive mobility planning, universal design principles, improved visitor experience, community engagement (Senior et al., 2023), and tourism, thus, economic benefit. The UHFM prioritizes heritage conservation as a central aspect of urban development. Preserving historical sites and landmarks is essential to safeguard them from the negative impacts of urbanization and simultaneously improve their accessibility and mobility.

METHODOLOGY

A qualitative research approach has been employed by conducting an extensive review of academic literature, historical documents, management theories, and relevant publications related to the evolution of mobility and accessibility considerations in urban heritage management to analyze and synthesize information from scholarly sources to establish a historical context and identify key milestones, challenges, and trends in the field, to achieve a comprehensive understanding of the evolution of mobility and accessibility in urban heritage management. A subset of outcomes from a semi-structured interview conducted for other research on the three Norwegian World Heritage sites, which were selected for a more comprehensive investigation into urban-scale support services within urban heritage areas, were utilized intrinsically to strengthen the argument in this study. Specifically, the sections related to support services and technical departments responsible for urban-scale mobility and accessibility were emphasized.

This qualitative research provides a foundation for understanding the historical evolution of mobility and accessibility considerations within urban heritage management. By triangulating data from literature and parts of an in-depth semi-structured interview, we seek to uncover the strategies and practices that have been developed over time to address these concerns effectively. The results of this research will contribute to a deeper understanding of the role of UHFM in heritage conservation and inform future strategies for managing mobility and accessibility in urban heritage areas and WH sites.

RESULTS AND FINDINGS

The findings of this study provide information on an important shift in the development of management theory, explicitly concerning the concepts of mobility and accessibility within urban heritage areas. There has been a significant transformation from the foundational principles of Classical Management theory to the modern principles of UHFM. This shift demonstrates a dedication to inclusive mobility planning, preservation of heritage values, sustainable urban development, and improved stakeholder engagement. This study encompasses the complex dynamics that arise from the preservation of cultural heritage, the progress of urbanization, and the multifaceted requirements of different stakeholders involved in urban heritage areas, as shown in Table 2.

Table 2: Key points regarding the transition from Classical Management Theories to Modern Management

Framework	Key Aspects	Objective	Approach
Inclusive mobility planning	Universal design	Integrating universal design principles into urban planning to ensure accessibility	Removal of physical barriers, provision of accessible public transportation

	Pedestrianization	Prioritizing pedestrian zones and creating walkable areas within heritage sites and the mobility experience	Consider the needs of pedestrians with disabilities, including appropriate signage and tactile paths
	Mobility assessment	Continuous enhancement of accessibility	Assessments of mobility infrastructure and pathways
Preservation of Heritage Values	Heritage Conservation	Accessibility modifications should be carried out with sensitivity to the heritage significance of the area	Implementing conservation measures to protect historical buildings, monuments, and cultural landmarks.
	Adaptive Reuse	Adaptive reuse of heritage buildings to make them accessible while maintaining their historical integrity	Installing elevators, ramps, and accessibility features without compromising the building's heritage value
	Heritage Interpretation	Provide context and enrich the visitor experience without disrupting the visual quality	Integrating heritage interpretation features
Sustainable Urban Development	Environmental Considerations	Implementing sustainable mobility solutions, reduces the environmental impact	Electric public transportation, promoting walking and cycling, increasing walkability
	Energy Efficiency	Ensures sustainability while enhancing visitor comfort	Energy-efficient lighting and HVAC system in heritage sites
	Resource Management	Contribute to the sustainability of heritage sites.	Efficient waste management and resource allocation
Enhanced Stakeholder Engagement	Community Involvement	Ensuring that mobility and accessibility solutions align with community needs/values	Involving public-people-private stakeholders in decision-making processes
	Partnerships	Strengthening the impact of UHFM initiatives	Public-private-people partnership in mobility and accessibility
	Visitor Feedback	Fostering continuous improvement of the heritage sites	Actively seeking visitor feedback regarding mobility and accessibility experiences

The results and findings in Table 2. emphasize the urgent requirement for comprehensive approaches to managing mobility and accessibility in urban heritage areas. The complex relationship between the preservation of heritage, the provisions of modern accessibility, and the involvement of stakeholders necessitates the development of creative solutions that effectively reconcile historical significance with contemporary demands.

DISCUSSIONS

The preservation of authenticity presents a significant challenge in the context of historic urban landscapes (Table 3). Urban heritage areas serve as tangible remnants of certain historical periods, sometimes characterized by their narrow cobblestone pathways, uneven topography, and significant architectural structures that evoke a distinct past events era. Nevertheless, the process of modifying these areas to be compliant with current accessibility and mobility standards while at the same time preserving their historical values requires a sophisticated approach. Within the unique realm of historic urban landscapes, the narrative of mobility and accessibility intersects seamlessly with the broader contexts of heritage preservation and urban development. This intersection is not merely a

convergence of concepts but a complex interplay that demands careful consideration and innovative solutions, as shown in Table 3.

Table 3: Challenges and possible solutions for accessibility and mobility in urban heritage areas

Challenges	Descriptions	Possible Solutions
Preservation of Authenticity	Preserving the heritage significance, outstanding values, and authenticity	Ensuring compliance with technical and preservation standards
Heritage Conservation	Accessibility improvements often compromise historical visual quality	Careful planning and execution
Infrastructure Constraints	Limited physical space, making the installation of accessibility features challenging and not easy	Creative engineering solutions that comply with the heritage regulation
Diverse Stakeholder Interests	Balancing stakeholder interests while ensuring accessibility/mobility and authenticity	Necessitates negotiation and inclusive decision-making
Regulatory Compliance	Contradictory regulatory compliance	Harmonizing two often divergent sets of requirements
Tourism Pressures	The tourism sector necessitates the provision of comfort and convenience to sustain the interest of tourists	Enhancing accessibility and mobility while preserving heritage values and visitor experience
Funding and Resources	Retrofitting historic urban areas to meet accessibility requirements is capital-intensive	Reconciling the budget among local governing bodies, funders, and heritage preservation entities
Community Engagement	The contradiction between the desires of stakeholders and the need for accessibility and mobility requirements	Inclusive engagement, collaborative decisions

UHFM encompasses a comprehensive approach to effectively manage historic urban landscapes and culturally significant areas situated within urban settings. The main goal of UHFM is to preserve heritage values while addressing contemporary challenges, with a specific focus, in this study, on prioritizing mobility and accessibility. The UHFM recognizes the significance of guaranteeing equitable accessibility to historical urban areas for individuals with varying physical abilities. UHFM also highlights the importance of ensuring an efficient and inclusive mobility experience within these areas.

CONCLUSIONS

The emergence of UHFM as an alternative catalyst for transformation has supported the urban heritage management field. UHFM has redefined the approach to preserving cultural heritage in urban areas by considering the needs of contemporary mobility and accessibility. This article examined the heritage conservation domain, progressing from classical management theories to current methodologies. The examination has also encompassed the shift from FM at the individual building level to the more expansive field of Urban FM. This study addressed the necessity of integrating mobility and accessibility considerations into UHFM. The previously stated requirement serves as one of the foundations for the implementation of sustainable heritage management.

The development of UHFM has contributed to the establishment of Urban FM as an emerging field, particularly in its role of preserving and protecting cultural heritage in urban settings. The framework outlined in this presentation encompasses a comprehensive set of measures designed to address both the preservation of cultural legacies and the challenges associated

with mobility and accessibility in urban heritage areas. The UHFM places considerable importance on inclusive mobility planning, which includes universal design principles, pedestrianization, and accessible public transportation. These measures are implemented to ensure that heritage areas are easily accessible to individuals with diverse physical abilities, thereby promoting inclusivity and fostering a sense of belonging. The UHFM connects the tangible cultural heritage's multifaceted and complex tapestry with contemporary requirements and future aspirations. The UHFM offers a comprehensive approach to efficiently and sustainably managing urban heritage areas. It focuses on providing support services at the urban scale while ensuring the preservation of these urban heritage areas,

ACKNOWLEDGMENT

This conference paper is supported by the MoST (Mobilitetslab Stor-Trondheim) project (*https://www.mobilitetslabstortrondheim.no/en/);* a collaboration between Miljøpakken, Green2050, Trøndelag County Municipality and the Norwegian University of Science and Technology (NTNU).

REFERENCES

Ababneh, A. (2021). Heritage management and accessibility to world heritage sites in Jordan: A field work analysis study of Petra. *Heritage & Society*, *14*(2–3), 160–183.

Bartosova Viera, & Valaskova Katarina. (2018). Facility Management in the Globalized Society. *Management Studies*, *6*(5), 358–366. https://doi.org/10.17265/2328-2185/2018.05.004

Dahlgaard-Park, S. M., Reyes, L., & Chen, C.-K. (2018). The evolution and convergence of total quality management and management theories. *Total Quality Management & Business Excellence*, *29*(9–10), 1108–1128.

Guccio, C., & Mignosa, A. (n.d.). *Sustainability, management, and conservation of cultural heritage for development: A Euro-Mediterranean perspective*.

Jiménez-Espada, M., Cuartero, A., & Breton, M. Le. (2022). Sustainability Assessment through Urban Accessibility Indicators and GIS in a Middle-Sized World Heritage City: The Case of Cáceres, Spain. *Buildings*, *12*(6), 813.

Kitana, A. (2016). Overview of the managerial thoughts and theories from the history: Classical management theory to modern management theory. *Indian Journal of Management Science*, *6*(1), 16.

Mahmood, Z., Basharat, M., & Bashir, Z. (2012). Review of classical management theories. *International Journal of Social Sciences & Education*, *2*(1).

Mohammed, A. H. (2014). *Facility Management History and Evolution | Azman Noor - Academia.edu*. *5*(1). https://www.academia.edu/9962414/Facility_Management_History_and_Evolution

Murugan, A. (2007). Exploring the potential and usefulness of ecotourism in Puducherry with special reference to tourism and environment. *DSTE, Govt. of Puducherry*.

Pásková, M., & Zelenka, J. (2018). Sustainability management of unesco global geoparks. *Sustain. Geosci. Geotourism*, *2*, 44–64.

Pindur, W., Rogers, S. E., & Suk Kim, P. (1995). The history of management: a global perspective. *Journal of Management History*, *1*(1), 59–77.

Prabowo, Bintang Noor; Salaj, A. T. (2023). The Older Adults in the Smart Urban Heritage Area: A Mini Scoping Review of Inclusivity in the World Heritage Sites. *The 22nd World Congress of the International Federation of Automatic Control (IFAC) 2023*.

Prabowo, B. N. (2022). Urban Heritage Facility Management. In *Scholarly Community Encyclopedia*. https://encyclopedia.pub/entry/15217

Prabowo, B. N., Salaj, A. T., & Lohne, J. (2021). Urban Heritage Facility Management: A Scoping Review. *Applied Sciences*, *11*(20), 9443.

Prabowo, B. N., Temeljotov Salaj, A., & Lohne, J. (2023). Identifying Urban Heritage Facility Management Support Services Considering World Heritage Sites. *Urban Science*, *7*(2), 52.

Ripp, M., & Rodwell, D. (2016). The governance of urban heritage. *The Historic Environment: Policy & Practice*, *7*(1), 81–108.

Salaj, A., Bjorberg, S., Store-Valen, M., & Lindkvist, C. (2018). *Urban Facility Management Role*. *April*. https://www.researchgate.net/publication/328768124_URBAN_FACILITY_MANAGEMENT_ROLE

Salaj, A. T., & Lindkvist, C. M. (2020). Urban facility management. *Facilities*, *39*(No. 7/8, 2021), 525–537. https://doi.org/10.1108/F-06-2020-0078

Senior, C., Temeljotov Salaj, A., Johansen, A., & Lohne, J. (2023). Evaluating the Impact of Public Participation Processes on Participants in Smart City Development: A Scoping Review. *Buildings*, *13*(6), 1484.

Sepe, M. (2021). Accessibility and Mobility in Public Spaces: a sustainable challenge. In *Piani e politiche per una nuova accessibilità* (pp. 41–47). Planum publisher; Società Italiana degli Urbanisti.

Smith, V. (2013). Human Relations Theory. *Sociology of Work: An Encyclopedia*. https://doi.org/10.4135/9781452276199.n146

Sonkoly, G. (2023). *Urban Heritage in Europe: Economic and Social Revival*. Taylor & Francis.

Takahashi, T. (2022). The Acceptance of Human Relations Theory in Japan. In *Translating and Incorporating American Management Thought into Japan: Impacts on Academics and Practices of Business Administration* (pp. 53–70). Springer.

Wilson, D. (2018). *Strategic Facility Management Framework* (1st editio). the Royal Institution of Chartered Surveyors (RICS) and International Facility Management Association (IFMA).

Appendix 10

Sikt

Notification form / Urban Heritage Facility Management (UHFM) / Assessment

Assessment of processing of personal data

Reference number	Assessment type	Date
602497	Standard	23.02.2022

Title
Urban Heritage Facility Management (UHFM)

Institution responsible for the project
Norges teknisk-naturvitenskapelige universitet / Fakultet for ingeniørvitenskap / Institutt for bygg- og miljøteknikk

Project leader
Bintang Noor Prabowo

Project period
21.01.2022 - 30.12.2023

Categories of personal data
General

Legal basis
Consent (General Data Protection Regulation art. 6 nr. 1 a)

The processing of personal data is lawful, so long as it is carried out as stated in the notification form. The legal basis is valid until 30.12.2023.

Notification Form

Comment
Data Protection Services has carried out an assessment of the processing of personal data in this project. Our assessment is that the processing will comply with data protection legislation, so long as it is carried out in accordance with what is documented in the Notification Form and attachments, dated 23.02.2022, as well as in our message correspondence.

TYPE OF DATA AND DURATION
The project will process general categories of personal data until 30.12.2023.

LEGAL BASIS
The project will gain consent from data subjects to process their personal data. We find that consent will meet the necessary requirements under art. 4 (11) and 7, in that it will be a freely given, specific, informed and unambiguous statement or action, which will be documented and can be withdrawn.

The legal basis for processing general categories of personal data is therefore consent given by the data subject, cf. the General Data Protection Regulation art. 6.1 a).

PRINCIPLES RELATING TO PROCESSING PERSONAL DATA
We find that the planned processing of personal data will be in accordance with the principles under the General Data Protection Regulation regarding:
• lawfulness, fairness and transparency (art. 5.1 a), in that data subjects will receive sufficient information about the processing and will give their consent
• purpose limitation (art. 5.1 b), in that personal data will be collected for specified, explicit and legitimate purposes, and will not be processed for new, incompatible purposes
• data minimisation (art. 5.1 c), in that only personal data which are adequate, relevant and necessary for the purpose of the project will be processed
• storage limitation (art. 5.1 e), in that personal data will not be stored for longer than is necessary to fulfil the project's purpose

THE RIGHTS OF DATA SUBJECTS
We find that the information that will be given to data subjects about the processing of their personal data will meet the legal requirements for form and content, cf. art. 12.1 and art. 13.

Data subjects will have the following rights in this project: access (art. 15), rectification (art. 16), erasure (art. 17), restriction of processing

(art. 18), notification (art. 19) and data portability (art. 20). These rights apply so long as the data subject can be identified in the collected data.

We remind you that if a data subject contacts you about their rights, the data controller has a duty to reply within a month.

FOLLOW YOUR INSTITUTION'S GUIDELINES

Our assessment presupposes that the project will meet the requirements of accuracy (art. 5.1 d), integrity and confidentiality (art. 5.1 f) and security (art. 32) when processing personal data.

To ensure that these requirements are met you must follow your institution's internal guidelines and/or consult with your institution (i.e. the institution responsible for the project).

NOTIFY CHANGES

If you intend to make changes to the processing of personal data in this project it may be necessary to notify us. This is done by updating the information registered in the Notification Form. On our website we explain which changes must be notified. Wait until you receive an answer from us before you carry out the changes.

FOLLOW-UP OF THE PROJECT

We will follow up the progress of the project at the planned end date in order to determine whether the processing of personal data has been concluded.

Good luck with the project!
Contact person: Henning Levold

Sikt

Notification form / Urban Heritage Facility Management (UHFM) / Export

Notification Form

Reference number
602497

Which personal data will be processed?

- People in images or video recordings
- Voice on audio recordings

Project information

Title
Urban Heritage Facility Management (UHFM)

Summary
Urban Facility Management (Urban FM) could incorporate diverse mechanisms for managing heritage protection by resolving changes in utilization, changes in the environment, multiple participants, and overlapping requests for sustainable necessities. Since managing historic urban areas has evolved from a tangible method to a holistic one, in the urban context, the historic urban landscape (HUL) approach could be used to supports this landscape-based approach. However, both urban FM and the HUL approach have remained under-researched aspects of FM and conservation. Therefore, a study to bridge the urban scale heritage conservation and urban FM to gain a holistic understanding is urgently required. The combined field between urban heritage management and urban FM in this article is being introduced as urban heritage facility management (UHFM). UHFM is a new term being proposed as part of the results and not currently used in the domain.

If the personal data will be used for other purposes, please describe
The personal data will not be used for other purposes

Provide a justification for the need to process the personal data
The processing of personal data (voice and / or online meeting recording) is necessary to avoid misquoting the result of the interview in written.

External funding
- Public authorities

Type of project
Research/PhD project

Data controller

Institution responsible for the project
Norges teknisk-naturvitenskapelige universitet / Fakultet for ingeniørvitenskap / Institutt for bygg- og miljøteknikk

Project leader
Bintang Noor Prabowo, bintang.n.prabowo@ntnu.no, tlf: 48689764

Do multiple institutions share responsibility (joint data controllers)?
No

Sample 1

Describe the sample
World heritage stakeholders (Heritage authorities, academics, professionals, and business owners) in Røros, Rjukan-Notodden, and (tentatively) Bryggen.

Describe how you will identify or contact the sample
Only 12 stakeholders will be needed to be interviewed. The initial contact will be made via email and/or a visit to the selected world heritage sites.

Age group

25 - 76

Which personal data will be processed for sample {{i}}? 1

- People in images or video recordings
- Voice on audio recordings

How is the data relating to sample 1 collected?

Personal interview

Attachment

Interview.docx

Legal basis for processing general personal data
Consent (General Data Protection Regulation art. 6 nr. 1 a)

Information for sample 1

Does the sample receive information about the processing of personal data?
Yes

How does the sample receive information about the processing?
Written (on paper or electronically)

Information letter

Information_letter_NSD_Bintang_UHFM2.docx

Third persons

Does the project collect information about third parties?
No

Documentation

How will consent be documented?

- Electronically (email, e-form, digital signature)

How can consent be withdrawn?
The consent can be withdrawn with oral notification or written request manually (on paper) or electronically (via email).

How can data subjects get access to their personal data or have their personal data corrected or deleted?
The data subjects may get access to their personal data or have their personal data corrected or deleted by a written request manually (on paper) or electronically (via email).

Total number of data subjects in the project
1-99

Approvals

Will any of the following approvals or permits be obtained?
Ikke utfyllt

Security measures

Will the personal data be stored separately from other data?
Yes

Which technical and practical measures will be used to secure the personal data?

- Continuous anonymisation

Where will the personal data be processed

- Hardware

Who has access to the personal data?

- Project leader

Are personal data transferred to a third country?
No

Closure

Project period
21.01.2022 - 30.12.2023

What happens to the data at the end of the project?
Personal data will be anonymised (deleting or rewriting identifiable data)

Which anonymisation measures will be taken?
- Any sound or video recordings will be deleted

Will the data subjects be identifiable in publications?
No

Additional information

Sikt

Messages

Write message...

Note: The content of the message will be available to your institution as well as other project members.

Send message

Completed
06.01.2024 09:44
We have received confirmation that the processing of personal data in this project is completed, and that the data have either been anonymised, deleted, or archived.

Reminder
06.01.2024 09:00

Status inquiry (project end)
30.12.2023 09:00

Hidden message

Assessed
23.02.2022 13:02

The processing of personal data is assessed.

Read our assessment

Message from Bintang Noor Prabowo
23.02.2022 11:33

Thank you, Henning..

I have just edited the form, uploaded the information letter, and pressed the "confirm send in" button.
Thank you for this helpful and kind reminder.
Have a lovely day..

Med vennlig hilsen,

Bintang Prabowo
UHFM Project Leader

Sent in to be assessed
23.02.2022 11:30

Message
23.02.2022 08:56

NSD har begynt på vurderingen av meldeskjemaet, og vi har noen kommentarer før vi kan ferdigstille den.
Når du har oppdatert meldeskjemaet i tråd med kommentarene, trykk «bekreft innsending» på siden Send inn.
Meldingsdialogen kan benyttes til eventuelle spørsmål, svar og avklaringer.

Hi,

We have now assessed your project. Everything seems to be in order except one thing:

On the page "Sample 1" you have to answer yes to the question "Will you inform the sample about the processing of their personal data?" You then have to upload the information letter you will give to the participants. We recommend that you use our template to make the information letter: nsd.no/en/data-protection-services/notification-form-for-personal-data/information-and-consent

When the information letter has been uploaded I will send our assessment of the project.

Remeber to press "confirm send in" on the last page in the form.

With regards,
Henning Levold
Data Protection Services

Returned
23.02.2022 08:56

Sent in to be assessed
21.01.2022 14:37

(This page is intentionally left blank)

Appendix 11

NTNU

DECLARATION OF CO-AUTHORSHIP

Bintang Noor Prabowo apply for the evaluation of the following thesis:

Urban Heritage Facility Management (Case Study: Norwegian World Heritage Sites)

) The declaration should describe the work process and division of labor, **specifically identifying the candidate's contribution, as well as give consent to the article being included in the thesis.*

Declaration of co-authorship on the following article: *Urban heritage facility management: A scoping review*.

Conceptualization, B.N.P. and A.T.S.; methodology, J.L.; software, B.N.P.; validation, B.N.P., A.T.S. and J.L.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P., A.T.S. and J.L.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj, J.L.: Jardar Lohne*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Alenka Temeljotov Salaj
Signature co-author

Declaration of co-authorship on the following article: *Urban heritage facility management: A scoping review*.

Conceptualization, B.N.P. and A.T.S.; methodology, J.L.; software, B.N.P.; validation, B.N.P., A.T.S. and J.L.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P., A.T.S. and J.L.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj, J.L.: Jardar Lohne*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Jardar Lohne
Signature co-author

Norges teknisk-naturvitenskapelige universitet

Declaration of co-authorship on the following article: *Identifying Urban Heritage Facility Management Support Services Considering World Heritage Sites.*

Conceptualization, B.N.P. and A.T.S.; methodology, J.L.; software, B.N.P.; validation, B.N.P., A.T.S. and J.L.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P., A.T.S. and J.L.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj, J.L.: Jardar Lohne*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Alenka Temeljotov Salaj
Signature co-author

Declaration of co-authorship on the following article: *Identifying Urban Heritage Facility Management Support Services Considering World Heritage Sites.*

Conceptualization, B.N.P. and A.T.S.; methodology, J.L.; software, B.N.P.; validation, B.N.P., A.T.S. and J.L.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P., A.T.S. and J.L.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj, J.L.: Jardar Lohne*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Jardar Lohne
Signature co-author

Declaration of co-authorship on the following article: *Urban Heritage Facility Management: A Conceptual Framework for the Provision of Urban-Scale Support Services in Norwegian World Heritage Sites*.

Conceptualization, B.N.P. and A.T.S.; methodology, J.L.; software, B.N.P.; validation, B.N.P., A.T.S. and J.L.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P., A.T.S. and J.L.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj, J.L.: Jardar Lohne*

All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Alenka Temeljotov Salaj
Signature co-author

Declaration of co-authorship on the following article: *Urban Heritage Facility Management: A Conceptual Framework for the Provision of Urban-Scale Support Services in Norwegian World Heritage Sites*.

Conceptualization, B.N.P. and A.T.S.; methodology, J.L.; software, B.N.P.; validation, B.N.P., A.T.S. and J.L.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P., A.T.S. and J.L.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj, J.L.: Jardar Lohne*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Jardar Lohne
Signature co-author

Declaration of co-authorship on the following article: *Systemic Approaches in Revitalization of Semarang Old City Heritage Site: From Neglected Area to Tourism Destination.*

Conceptualization, B.N.P. and A.T.S.; methodology, B.N.P.; software, B.N.P.; validation, B.N.P. and A.T.S.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P. and A.T.S.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Alenka Temeljotov Salaj
Signature co-author

Declaration of co-authorship on the following article: *Identifying Overtourism Impacts on the Informal Sector's Livelihoods in Urban Heritage Area.*

Conceptualization, B.N.P. and A.T.S.; methodology, B.N.P.; software, B.N.P.; validation, B.N.P. and A.T.S.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P. and A.T.S.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Alenka Temeljotov Salaj
Signature co-author

Declaration of co-authorship on the following article: *HBIM Application in Historic Town: A Scoping Literature Review.*

Conceptualization, B.N.P., E.H., and A.T.S.; methodology, B.N.P.; software, B.N.P.; validation, B.N.P., E.H., and A.T.S.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P., E.H., and A.T.S.; writing (review and editing), B.N.P. and A.T.S.; visualization, B.N.P.; supervision, E.H., and A.T.S.

**B.N.P.: Bintang Noor Prabowo, E.H.: Eilif Hjelseth, A.T.S.: Alenka Temeljotov-Salaj*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Eilif Hjelseth
Signature co-author

Declaration of co-authorship on the following article: *HBIM Application in Historic Town: A Scoping Literature Review.*

Conceptualization, B.N.P., E.H., and A.T.S.; methodology, B.N.P.; software, B.N.P.; validation, B.N.P., E.H., and A.T.S.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P., E.H., and A.T.S.; writing (review and editing), B.N.P. and A.T.S.; visualization, B.N.P.; supervision, E.H., and A.T.S.

**B.N.P.: Bintang Noor Prabowo, E.H.: Eilif Hjelseth, A.T.S.: Alenka Temeljotov-Salaj*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Alenka Temeljotov Salaj
Signature co-author

Declaration of co-authorship on the following article: *Urban heritage and the four pillars of sustainability: Urban-scale facility management in the world heritage sites.*

Conceptualization, B.N.P. and A.T.S.; methodology, B.N.P.; software, B.N.P.; validation, B.N.P. and A.T.S.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P. and A.T.S.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Alenka Temeljotov Salaj
Signature co-author

Declaration of co-authorship on the following article: *The Older Adults in the Smart Urban Heritage Area: A mini-scoping review of inclusivity in the World Heritage sites.*

Conceptualization, B.N.P. and A.T.S.; methodology, B.N.P.; software, B.N.P.; validation, B.N.P. and A.T.S.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P. and A.T.S.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Alenka Temeljotov Salaj
Signature co-author

Declaration of co-authorship on the following article: *From classical management theory to urban heritage facility management: Mobility and accessibility in urban heritage areas.*

Conceptualization, B.N.P., A.T.S., and A.J.; methodology, B.N.P.; validation, B.N.P. and A.T.S.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P., A.T.S., A.J.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj, A.J.: Agnar Johansen*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Alenka Temeljotov Salaj
Signature co-author

*)
Declaration of co-authorship on the following article: *From classical management theory to urban heritage facility management: Mobility and accessibility in urban heritage areas.*

Conceptualization, B.N.P., A.T.S., and A.J.; methodology, B.N.P.; validation, B.N.P. and A.T.S.; formal analysis, B.N.P.; investigation, B.N.P.; resources, B.N.P.; writing (original draft preparation), B.N.P. and A.T.S.; writing (review and editing), B.N.P., A.T.S., A.J.; visualization, B.N.P.; supervision, A.T.S.

**B.N.P.: Bintang Noor Prabowo, A.T.S.: Alenka Temeljotov-Salaj, A.J.: Agnar Johansen*
All authors give consent to the article to be included in the doctoral thesis.

Trondheim, 01.04.2024
Place, date

Agnar Johansen
Signature co-author

(This page is the end of the dissertation)