sustainability

MDPI

Article

Lost Gardens: From Knowledge to Revitalization and Cultural Valorization of Natural Elements

Zohreh Hosseini * and Giulia Caneva

Department of Science, University of Roma Tre, 00146 Roma, Italy; giulia.caneva@uniroma3.it
* Correspondence: seyedhzohreh.hosseini@uniroma3.it; Tel.: +39-0657336374

Abstract: Gardens constantly change during their lifetime due to the growth and death of plants and to the effects (or lack) of management activities. The loss of garden areas, as well as the building's collapse, can drastically impact the view and understanding of archaeological areas. The study and reconstruction of ancient lost gardens is a complex topic, and it seems that there is a lack of a general methodological approach for assessing the revitalization and valorization activities of these gardens, especially when considering the floristic features. Here, we discuss the required steps for developing the various intervention components for achieving a deep knowledge and understanding of natural, historical, and philosophical features of the place and its culture, from the past to the current conditions. Considering this knowledge, we propose a revitalization and a cultural valorization approach of the natural elements, and we discuss the limitations and issues arising in lost garden studies.

Keywords: ancient gardens; archaeological management; garden flora; garden reconstruction; virtual reality

Citation: Hosseini, Z.; Caneva, G. Lost Gardens: From Knowledge to Revitalization and Cultural Valorization of Natural Elements. *Sustainability* **2022**, *14*, 2956. https://doi.org/10.3390/su14052956

Academic Editor: Ivo Machar

Received: 24 January 2022
Accepted: 22 February 2022
Published: 3 March 2022

1. Introduction

Gardens are dynamic socio-ecological systems, always in a state of change during their lifetime, as plants grow and age. The garden structure is strongly dependent on the maintenance, use, and management methods adopted over time [1–3]. Extensive changes can be linked to the gardens' abandonment and the consequent lack of the required management that determines the natural evolution of plant communities [4–6]. Many ancient gardens have been subject to devastating transformation throughout history, and sometimes only limited physical traces of ancient gardens are still detectable, such as watercourses, fountains, pools, structural remains of the garden design, buried plant remains [1,7–9].

Archaeological sites often contain traces of ancient gardens, even if their structure and the floristic patterns are not more evident [5,10–14]. Relevant cases of lost gardens, i.e., sites where only few remains of a garden survive, come from the Egyptian area (e.g., Karnak [15–17]), and the Near East and Persian context, such as the Royal Garden of Cyrus the Great in Iran [18,19]. The gardens (*Horti*), which adorned the villas of Roman Emperors [20], the private houses of *Pompeii* and *Herculaneum* in Italy [21–24], or across the European and Mediterranean area (e.g., *Thuburbo Maius* in Tunisia [21,22], and Ramat Rahel in Israel [25]), are well-known. There is a wide literature on lost gardens, from the Middle Ages to modern times, including the Monumental Timurid Garden in Afghanistan [26], the Wah Garden in Pakistan [27], the Babur's Lotus Garden in India [28], and the Ancient Lotus Pond Garden in China [29]. Recent examples include the lost gardens of Sydney in Australia [30], Ohio's English garden [31], and New Jersey's Stockton gardens in the USA [32].

Gardens that are neglected and left unmanaged slowly disappear, as well as losing their originality and intrinsic values [33]. In ancient lost gardens, the main issue is the

disconnection and lack of understanding of their significant historical and cultural values that need to be protected, promoted, actualized, and made available and clear to the broad public [24,33]. Although the study of ancient lost gardens has become a more popular discipline in recent decades [4,13,34–36], most studies analyze architectural, archaeological, or archaeobotanical data separately [19,26,28,37,38]. These studies are fundamental, but they should also be addressed for their revitalization (renewal of the garden's characteristics) and valorization (enhancement of the garden's value). Since the Florence Charter [39], with the growing interest in historical garden conservation, many scholars have stressed the importance of preserving historical gardens for future generations, with a high level of authenticity [35,38,40–42].

However, the renewal of completely disappeared gardens is among the most controversial concerns in cultural heritage studies [4,23,43]; the limited understanding of the considerable changes that have occurred over time makes it a highly complex task [44]. In light of the complexity of assessing ancient gardens, despite some positive examples, we highlight the lack of a general methodological approach for assessing historical, structural (i.e., composition), and botanical features simultaneously, as well as a revalorization approach. Therefore, the main goal of this research is to illustrate each step necessary for studying and defining a comprehensive methodological approach for valorizing the natural components of the lost gardens dating to antiquity. Our research will consider their physical–natural, historical, and ideological aspects in their changes during history.

2. Methodological Proposal for the Study of Ancient Lost Gardens and a Revitalization/Valorization Approach

2.1. Knowledge: A Multidisciplinary and Diachronic Approach

For better understanding ancient lost gardens, we emphasize the importance of a comparative, diachronic, and multidisciplinary approach. A garden is not merely a combination of natural elements, it also illustrates the cultural aspects of society in which gardens are located. For comprehensive knowledge, it is essential to consider both natural features (climate, land, and plants) and cultural aspects (historical period, ideology behind the garden construction and functional design). Through a multidisciplinary approach, we will enhance each component of the study, as a "tile" in a complex "mosaic of knowledge". The methods of building up these single tiles are often consolidated among the different disciplines and, for the question of space, we only reference the most relevant literature.

Moreover, it is also necessary to provide data relating both to the past and the current situation (Figure 1). As a result, the acquired information can be used to draft plans for their revitalization and valorization, preventing the risk of a wrong garden interpretation [12,45,46].

2.1.1. The Past: DATA from Ancient Gardens and Related Cultures

Historical Archives: Written histories from reliable sources, historical cartography, bibliographic resources, ancient manuscripts, as well as travelogues, paintings, reliefs, inscriptions, literary and religious texts can describe garden characteristics, persistence, and transformations [6,8,12,47–50]. In particular, the analysis of the available maps from different periods is fundamental to highlight the historical significance of the gardens. The architectural, sculptural, floristic, and perceptive elements should also be considered [36]. As an example of the significance of written old texts, we can cite Xenophon, a Greek essayist and historian, who visited Persia in 401 BC and described the garden of Cyrus the Great, providing an understanding of the original garden composition [19,51]. Similarly, extensive information on Pompeian gardens comes from the Natural History of Pliny the Elder (1st century AD) and we have learned from the Latin poet *Propertius* that the *Porticus* of *Pompeii* was planted with plane trees [20,52].

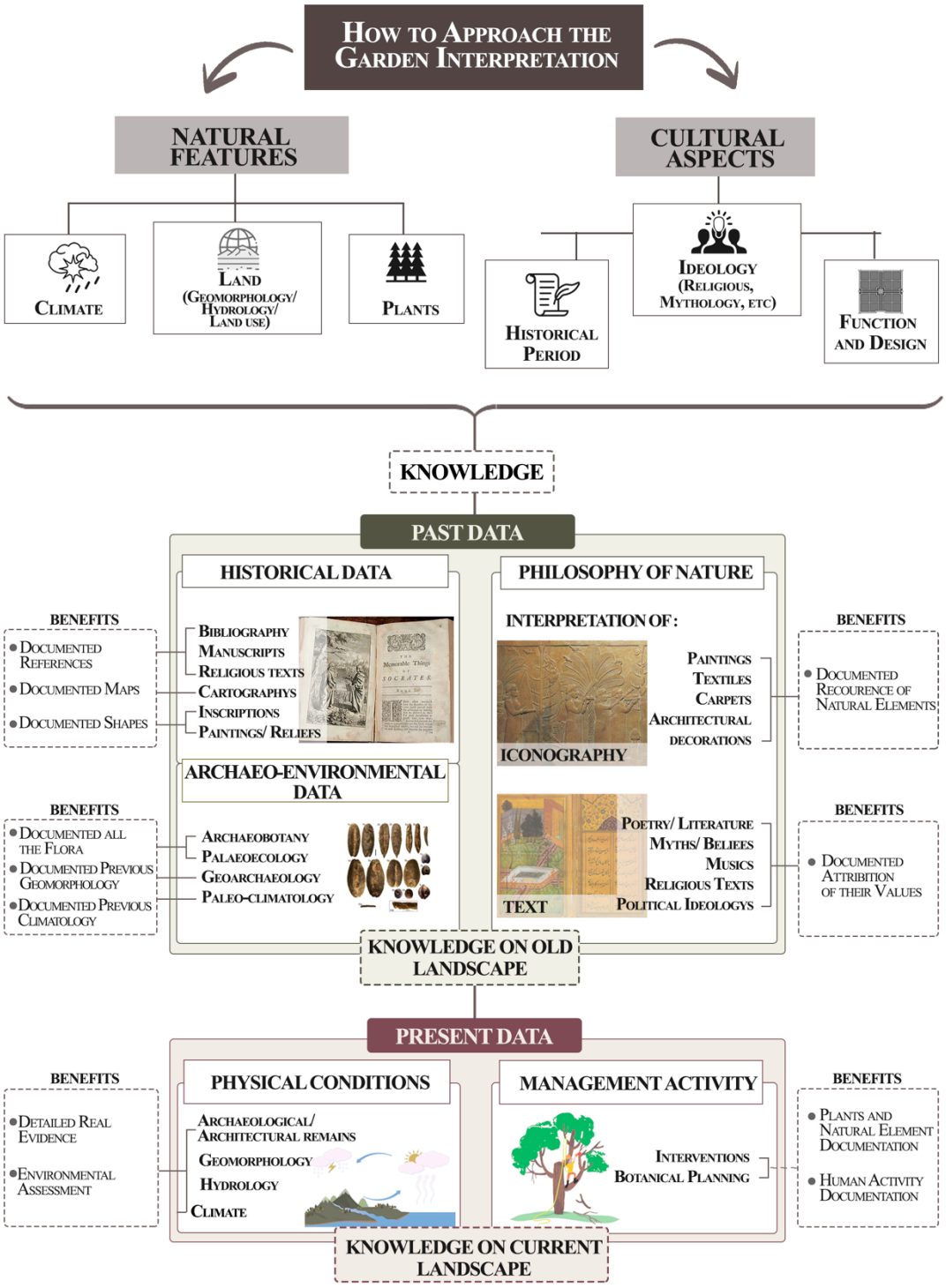

Figure 1. Schematic representation of the steps to undertake natural and cultural aspects of gardens, considering both their past and present conditions.

From the Middle Ages through the Modern era, the number of documents greatly increased, and the descriptions of plants and gardens became richer and more interpretable. Several documentary sources come from books and documents describing the flora of Renaissance or more modern gardens that were lost, as in the case of the outstanding *viridiari* of many noble families in Rome [53].

As in Chinese or Japanese cultures, garden elements are deeply embedded in poems and paintings, and the garden's theme became the artistic conception in ancient poems

and landscape paintings [54,55]. Many famous poets and painters, in ancient China, were also outstanding landscape gardeners. It could be said that Chinese poetry and painting are examples of the poet's empathy with the natural landscape, while the gardens are the poet's manifestation of their perception of nature [56].

Outstanding examples of written texts and documents on gardens come from the princess Gul-Badan, who wrote the Humayun-Nama, providing relevant references on the Mughal and Timurid gardens (Wah Garden, XVI century, Pakistan) [28], and from Abdi Beig Shirazi, who, with his poems, gave information on the imperial garden complex of Sa'adat Abad in Qazvin (XVI Century, Iran). Today, this complex has been rebuilt based on his writings and by comparison with other texts and historical documents [57].

Moreover, the numerous comments and gravures made by voyagers who have passed through the area provide insight into the garden excavation and its knowledge [27]. In the seventeenth century, Jean Chardin described the Safavid gardens in Isfahan and the plant species used in Persian gardens, providing relevant data to show the existence and importance of some plant species as the vital characteristics of the Chahar Bagh (the four-part garden, see later). As well, the Neshat Garden (XVI century, Iran) was revitalized using historical inventories, documents and books, old pictures, memories and field observations [58].

On the other hand, many examples of historical documentation on lost or ideal gardens arise from the plant iconography in drawing or engravings, which can be found in archaeological paintings (e.g., in the "villa di Livia" at Prima Porta (Rome), for the Roman gardens, or in the Tombs in the Valley of the Kings, for the Egyptian context). In this regard, portraits of natural motifs in paintings, textiles, carpets, and archaeological decorations are valuable tools in interpreting and investigating the shapes of gardens (Figure 2), as well as horticultural and technological practices, also crop history which includes evolution under domestication, crop dispersal, lost and new traits, and genetic and taxonomic information [59]. For example, in Figure 2a, the Paradise Garden which is divided into four rivers (see section: the ancient philosophy of nature and symbolism of plants and garden), is illustrated in a carpet design, or in Figure 2d, the design of villa d'Este in Italy can be recognized through a map engraved in 1537.

In addition to clarifying the various objective aspects of architecture, landscape, and gardening, these historical sources can reveal the subjective–semantic aspects and the aesthetic principles of the construction period [57,60]. In general, a documentary approach is well considered in the literature, and archival sources and old representations have been widely used to obtain historical data [10,12,13,31].

Archaeo-botanical and Archaeo-environmental data: Paleobotany is the study of plant life in the geological past, while archaeobotany focuses on the study of preserved plant remains from archaeological sites and the reconstruction and interpretation of past human–plant relationships [61]. This term emphasizes the archaeological nature of the evidence, with its recognition of site formation processes and sampling issues. Archaeobotanical data are usually gathered by identifying the micro-remains (materials beyond the human visual range, mounted on slides and examined under magnification, such as phytoliths, pollen, and starch grains), and macro-remains (plant remains that are visible to the naked eye, but which still require microscopy to identify, including crops, chaff, and weeds) collected on a site and interpreting their significance [62]. Pollen analysis is commonly used as a tool in past vegetation and paleoclimate reconstructions [63,64], and garden history investigations [37,65]. Paleoecology, palynology, and palaeoclimatology may provide an overall picture of the former garden, including the plants that were cultivated, the weeds, and other plants that grew in-situ or in the surrounding landscapes [66–70]. For example, in the reconstruction of the green spaces of the housing units and its landscape in ancient Pompeii, pollens, charcoals, seeds, or other plant remains, and roots chalks, which were buried under the eruptions, were widely sampled, analyzed and they resulted in great utility for the garden analysis and plant identification [8,52,71]. Similarly, archaeobotanical data were helpful for the reconstruction of the Medieval "Duchesses' Garden", which was

built during the XV century by *Ercole d'Este* in Ferrara (Italy). In that site, pollen spectra showed about 200 taxa of shade-giving trees, woody plants used in topiary art, hedge plants, and many cultivated fruit trees, as well as ornamental herbaceous flowers [72].

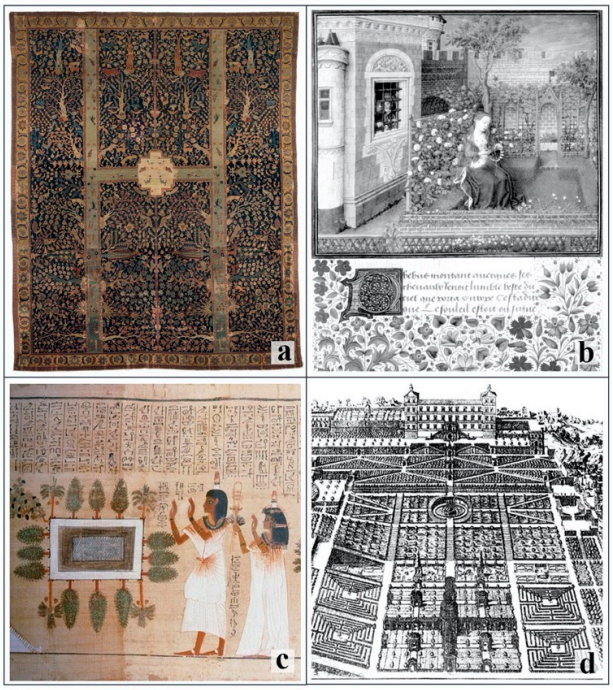

Figure 2. Different sources of images, which could be used for the reconstruction of lost gardens, (**a**) from carpets: the "Wagner" Garden Carpet, 17th century, Kerman, Iran (the Burrell Collection, Glasgow Museums, CSG CIC Glasgow Museum Collection); (**b**) from manuscripts: Emilia in her garden, from 'La Teseida', 1465 (Österreichische Nationalbibliothek, Vienna, Cod. 2617 Han, 53r); (**c**) From the paintings, papyrus from the Book of the Dead of Nakht, 18th dynasty of ancient Egypt, (the trustees of the British Museum, collection no. EA10471,21); (**d**) from maps: the map of Villa d'Este, Tivoli, Italy, engraving by E. Duperac, 1537.

Geoarchaeological data are another important source of understanding human impacts on the landscape through the examination of ancient soils, occupation deposits and stratigraphy. These investigations provide details on human endeavor up to the present day [73]. Geoarchaeological study of the past hydrological dynamics, water infrastructures, dams, and canals should also be conducted. These data can be generated based on the topographic analysis of hydraulic infrastructures, through accurate mapping and their contextualization within the regional hydrology [74]. Such archaeo-environmental materials may reveal information about various aspects of life in the past, including gardening and agro-silvopastoral practices at the landscape scale [63,75].

In gardens, the topsoil often provides poor environmental conditions for preserving remains in the form of pollen, seeds, and leaves, and they often contain materials from the latest phase of gardening [76]. Better conservation of this organic layer occurs when gardens are buried by volcanic eruptions, such as in *Pompeii* (Italy) or Joya de Ceren (El Salvador), or when the layer ends with anaerobic conditions. As an example, the wooden remains of the fossil forest at Dunarobba (Italy) have remained underground for a million years, without a significant loss of integrity [77].

Due to the sensitivity of pollen grains and other plant remains to degradation in oxygen-rich environments, and the fact that garden soils are often aerated by ploughing and other gardening activities, it is also recommended to collect macrofossils [37,63]. These samples (seeds, fruits, plant tissues, etc.) should be taken at the same level as the pollen samples since they can provide other complementary information regarding the vegetation in the garden [63,74,78].

Furthermore, palaeobotanical studies can significantly benefit from geobotanical research. The understanding of the species' autecology, synecology, and dynamism in a given geomorphological and hydrological context can be used to reconstruct past vegetational conditions, as was done for the Mohenjo-Daro archaeological area in Pakistan [79]. In the central archaeological area of Rome, such data on the dynamic series of plant communities, combined with the information on the past climatic conditions allowed the reconstruction of the ancient vegetation of the Palatine hill [80], and also the interpretation of the floristic changes that occurred at the Colosseum archaeological site over the last four centuries [81,82].

The ancient philosophy of nature and symbolism of plants and gardens: Gardens and gardening have been directly associated with human perception of nature, their surrounding environment, and their tangible connection to events, traditions, ideologies, and beliefs, that are reflected in ancient literature, poetry, myths, music, religious texts, and political ideologies [33,78,83]. The "invention" of the garden itself has a great philosophical, religious, and symbolic value, and it has a meaning that transcends from the actual representation, but it is aimed at incarnating spiritual values, as documented in the sacred scriptures of most religions.

The Hebraic Old Testament describes the meaning of the creation of the cosmos (from *kosmeo*, that is, "putting in order", "making beautiful"), from the "horrendous abyss" of the <shapeless void>, which is brought into order by impressing on it the "species" (i.e., beauty) (Genesis 1,1–2; 1, 4). It also explains the sacred value of the Eden Garden: "*And the LORD God planted a garden eastward, in Eden; and there He put the man whom He had formed. And out of the ground made the LORD God grow every tree that is pleasant to the sight, and good for food; the tree of life also in the midst of the garden, and the tree of the knowledge of good and evil. And a river went out of Eden to water the garden; and from thence it was parted and became four heads*" (Genesis, 2, 8–10).

Similarly, Zoroastrianism, the ancient religion of the Iranians, attached great importance to agriculture, giving a sacred value to gardens. According to Zoroaster, the first couple of humans lived in a magnificent garden created by Ahura Mazda, God of light. Four rivers divided this garden, many channels irrigated it and fertile fruit trees were planted. The Persian Garden and its sacred plants are praised in the Avesta, the ancient holy book of the Zoroastrians, as one of the four natural elements (water, wind, soil, and fire), indicating the four directions in the universe and the four seasons (later incorporated into *Chahar-Bagh* Garden design, Figure 3) [84]. It has constantly been emphasized insomuch as Ahura Mazda is living in the *Minavi* (Heavenly Garden) [84]. On a more practical level, such a four-part cross-axial plan was also adopted for easier distribution of the irrigation channels into various directions. In these gardens, a single axial pattern reveals the worldview of a human elevation, from darkness to light, and the division of the world into three parts of origin (lower, middle, and upper). The garden shows such symbolic division from the entrance, which represents darkness, i.e., evil and oppression, to the destination, light, peace, and virtue [85].

In the Holy Quran of Islam, the role of the garden as a Paradisiac place (from *Paradeiza*, e.g., Persian walled gardens) is found in 78 verses with the term of garden. Like other sacred books, the Holy Quran has described Heaven as a garden. Allah created such gardens for the well-doers as a place of eternity, serenity, and salvation (verse 72, Al-Tawbah). This description of the water flow in brooks, the springs bubbling from the middle of the river *Kowsar*, the fruit trees, and their shades are all clear examples of inspirations from the Persian Garden [51]. Illustration of the fourfold garden from the first millennium BC to the Islamic era shows its persistence and its influence over different ideologies through time (Figure 3). In general, the garden is undoubtedly also a place of delights, dispensing the radiant colors and scents of flowers, fruits from "*pomiferous*" trees, and harmonic sounds, such as the birdsongs and fountains, capable of satisfying people's various senses, but among all these values there is the essence of life itself. In its origin and for a long time, the garden has also been a symbolic element representing the place of innocence and justice

and regaining a lost dimension; it is the place where nature bends to human will until it becomes "perfect" [86].

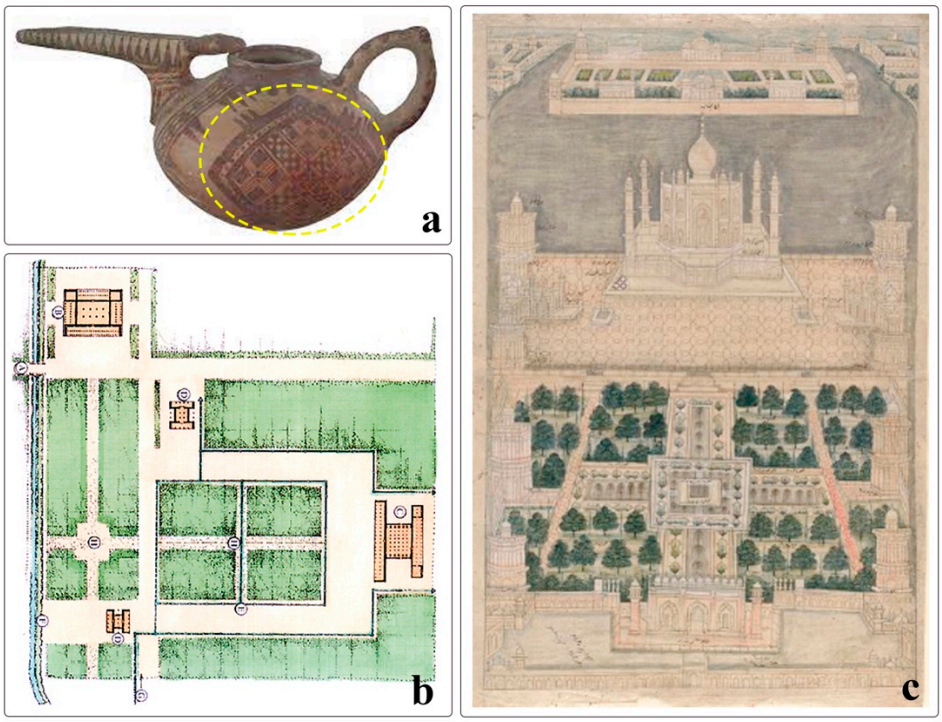

Figure 3. The different four-fold pattern in ancient Persian garden representations: (**a**) pottery vessel (dated 1st millennium BC) discovered in Tepe Sialk (National Museum of Iran, photo by Fabian Dany); (**b**) plan of the Royal Garden of Pasargadae (530 BC) as the first formal designed garden and earliest archetype of the four-fold layout (Archive of Pasargadae research center, Stronach section); (**c**) the bird's eye view of the Taj Mahal at Agra (India) (1790–1810), derived from Persian culture, showing the effect of four-fold layout in Islamic gardens (Arthur M. Sackler Gallery, Smithsonian Institution, Washington, D.C.: S2001.6).

Also, in the Egyptian context, like in all other aspects of ancient Egyptian society, the gardens were full of religious symbols, especially those in the temple gardens. This evidence starts with the orientation of the garden, the choice of the plants, which were selected as sacred to particular deities or as the expressions of ideas, the animal's presence or representation, and the waters with channels and pools. These values have not significantly changed with the changes of the dynasties, being a well-consolidated tradition [15]. Since those times and through the Middle Ages and Renaissance, the "theory of signature" created associations, which explained the meaning of plants, based on the similarity of the shapes between plants and human organs, guiding the symbolic view of plants [87]. In the gardens, many plants were chosen for their augural messages of love, beauty, prosperity, fertility, new life, and rebirth [59,88].

Symbolic and religious values played an important role in planting gardens [88]. Political ideology was another factor in ancient garden construction, and kings and political figures frequently used religious or cultural symbols in their propaganda [78,89]. In Egyptian gardens, the sacred roles of the plants are described in the Old Kingdom, where texts and the divinities were anthropomorphized in the plants themselves [15,90]. For instance, *Phoenix dactylifera* symbolised Rha (the god of the Sun) and Min (the god of fertility); *Hyphaene thebaica* represented Thoth (the god of the moon, wisdom, writing, science, magic, and art). *Tamarix* and *Salix* species, such as *Vitis vinifera*, represented Osiris (the god of fertility, vegetation, death, and afterlife); *Nymphaea* and *Papyrus* symbolized Horus (the god of the hawk), and Hathor (the goddess of the sky, fertility, women, and love), *Ficus sycomorus* symbolized Isis (like Hathor powerful goddess) [17,91].

In the Greek–Roman contexts, the selection of species in gardens according to their symbolic value was well-documented by Pliny the Elder and *Vitruvius*. Both in architectural decorations and garden structures, the choice of subjects or plants was purposeful and not simply ornamental, and symbolism was a constant presence, used to convey a message, to serve as a warning, or as an augural element [87,91,92]. Here, the symbolic message of plants could be explained through mythology*: Laurus nobilis* referred to Phoebus-Apollo (homologous to the Egyptian Rha); *Vitis vinifera* to Dionysus/Bacchus (homologous of Osiris); *Rosa sp*. to Aphrodite/Venus (homologous to Hathor); *Cydonia oblonga* to Heracles/Hercules (the mythical hero with extraordinary strength); *Lilium candidum* to Hera/Juno (as Great mother symbols and of purity).

A similar correlation between plants and gods can be found in all ancient cultures, and it is well underlined in the earliest texts. The symbolic values are reflected in the shapes of the gardens, having a defined symmetry, which is often bilateral or quadripartite, concerning the symbolic function of the garden as a whole [93] (Figure 3). In ancient times, the symmetry of the garden was meant to visualize the divine order embedded in nature [18,85,93].

Because of the relevant changes that took place in all the cultures during the last centuries, and especially in the contemporary era, Phyto-iconographic representations have lost their value. For example, the garden representation of the Villa di Livia at Prima Porta (I century BC) is not a mere description of an idyllic and beautiful landscape. The careful and symmetrical sequence of trees, which also have a clear hierarchical disposition, and all the plants and birds, hide a key of interpretation. This garden is an "ideal place", communicating through the plants (each one referring to different goddesses and myths) the fundamental values of life, always able to regenerate itself and where death is not a final event [53,88].

Interpretation of old landscapes: Finally, we stress that gardens are manmade landscapes that transform the natural environment to meet both cultural values and expectations of the customer and the aesthetic experience of the garden designer [89,94,95]. Garden interpretations should be situated at the intersection of aesthetics of art and nature since a garden reflects its ideology and aesthetic values [94]. The geographic space of the landscape and the environment contain the physical records of historical transformations, settlements, cultural practices, and changes in lifestyles [96].

Therefore, when interpreting gardens, it is essential to evaluate their relationship and complex system of connections with the environment and society as well [5]. The aesthetic value of the past landscape must be cautiously evaluated, along with a thorough examination of their physical appearance, and an analysis of the emotions and atmosphere evoked by the surrounding landscape [13,97]. As a tool for assessing landscape complexity, the "landscape and community map" represents both tangible (artefacts, works, and spatial organization), and intangible (meaning attributions, customs, and traditions) aspects of landscape heritage to illustrate the way that landscape components relate to residents' identities [96].

Natural or manmade elements can change their cultural values over time [13], and sometimes the visual connections that ensure their display may be difficult to recognize; they may even convey different messages to different segments of society at other times [98]. As a result, landscape structures are the result of continuous processes of design, building, sedimentation, and transformation. Furthermore, in addition to recognizing its components, it is important to comprehend its historical significance, as well as its visual, spatial, functional, and symbolic associations, the intentions that led to its production, as well as its "functioning" both historically and contemporarily [96].

2.1.2. The Present: Data from the Site

Data on physical conditions: The existing conditions and physical remains (e.g., planting beds, paths, pools, watercourses, drains, internal fences, hedges walls, pavilions, and terraces) can shed light on the garden design, main axes, entrance, and water circulation,

which should be documented on a topographic survey [31]. The findings of archaeological excavations and surveys provide the basis for reconstructing lost gardens, and for a long time, maps, and aerial images [99] have been used as a tool for investigating the garden form and design, through careful observation of changes and patterns in the soil [100].

In fact, aerial photography (from aircraft, balloons, and now overall through UAV or drones) and satellite images based on the remnant structures both above ground and underground, can highlight forms that sometimes are barely visible on the ground, thanks to the formed marks (Figure 4a) [101–105]. Given the scale of many gardens and field systems, it is the best method of observing the land surface allowing us to see their overall order, and it was applied to explore the positions and forms of forty destroyed urban Persian gardens in Kerman (Iran) [106]. Furthermore, aerial photography was also widely used to identify damp marks (as a result of temporary changes in humidity) and crop and wild marks (variation in plant coverage and heights) as indicators of building structures or remains of lost gardens (Figure 4b) [101].

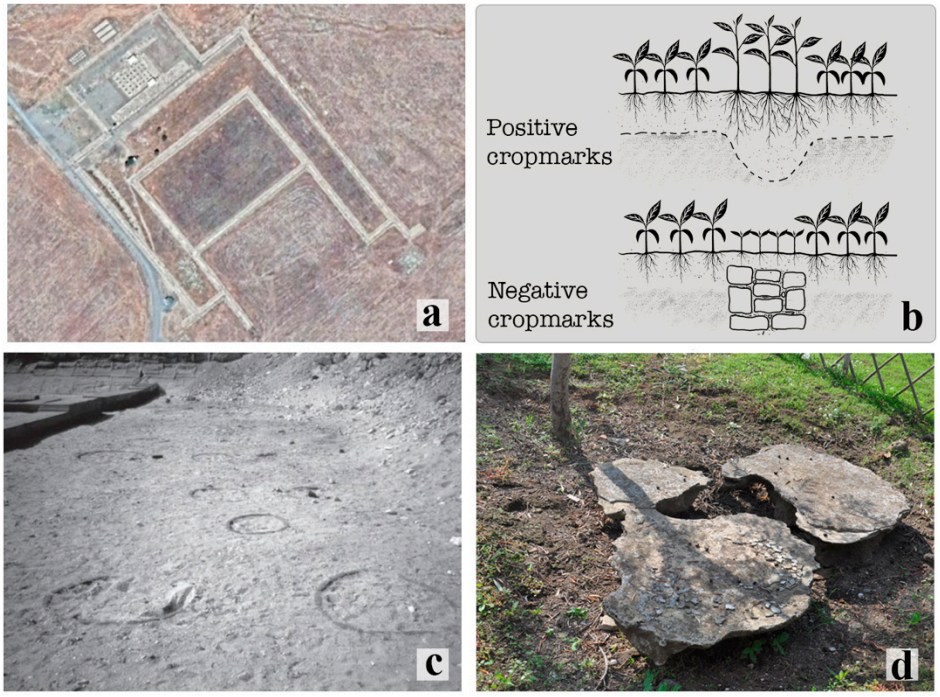

Figure 4. Signs of the presence of gardens and trees: (**a**) Aerial photo enhancing the garden design of the Royal Garden of Pasargadae (from Google Earth); (**b**) Crop marks induced by differences in underground soils [101]; (**c**) signs of pits due to ancient tree presences around the Dahshur temple (Egypt) (Reprinted with permission from ref. [90]. Copyright 2016 Casemate Group); (**d**) pits of trees enhanced by cement casting in Oplontis (photo by G. Caneva).

Additionally, significant differences in the composition of the wild plants have been detected in the field of archaeological areas, which allowed a better understanding of the underground structures, as was demonstrated in the *Maxentius* villa or the Domitian stadium of Rome [107,108]. In ancient archaeological sites, the interpretation of signs that arise from the remnant of pits resulted in great relevance and provided interesting information for establishing the old tree settlements. In the case of temple gardens and funerary gardens in Egypt, such as on the northern side of the pyramid of *Dahshur*, the hollows in a row indicated pits that had been dug to plant trees (Figure 4c) [90,109]. In the case of *Pompeii*, wide pits arising from the decomposition of tree roots were used for making castings, using cement to fill the empty spaces; later the shapes of roots' casts were used for the identification of the pre-existing trees (Figure 4d) [52].

In the interpretation of lost gardens, it is important to consider that the remnant channels, drains and other structures could have had additions and alterations to the original structure from time to time. For example, the variation of dimensions and width of tanks and surrounding walls, as well as their damages in Wah Garden, indicated that the original construction was of bricks, which were dressed by stone in a later stage of restoration [27].

Furthermore, the study of the geomorphological characteristics in the present times, such as the hydrological features, is the basis for carrying out geoarchaeological studies [79]. Finally, the bioclimatic conditions should also be evaluated by climatic stations in order to determine the sustainability of the garden reconstruction and the management needs [110].

The present landscape: All structural landscape elements, such as patches, corridors, networks, and matrices should be analyzed to clarify the current condition of the studied landscape [111]. The landscape assessment considers ecological, socio-cultural, and visual assessments, which require evaluations of landscape elements, including biotic (wild vegetation), abiotic (hydrology, topography, geology, climate, and soil types), cultural, and social resources, and then further analysis of their current values (e.g., natural reserves or monuments, cultural and vernacular monuments) [111]. Online surveys, combined with GIS tools and statistical software allow their assessment and participatory planning [112].

Concerning the plant landscape, we emphasize the importance of defining the characteristics and ecological significance of wild and cultivated plants [79,110,113]. A floristic survey, i.e., identification of the occurring species (both wild and cultivated) is needed with particular attention to the ecological behavior of the wild species as bioindicators [107,108]. Furthermore, great information is obtained from vegetation surveys, i.e., identification and classification of the wild plant communities found in the area, using the phytosociological methods of the Zurigo-Montpellier school [114], which allows a better definition of the ecological features. The phytosociological syntax could also support the understanding of ancient (cereal and pulse) crop husbandry regimes [31,115]. Finally, natural, and potential vegetation maps seem very useful since they provide information on species diversity and the occurrence of rare plants, as well as vegetation structure, dynamics, and anthropogenic impact [110].

The plant management activities: For the management of the wild flora, the analysis of the interrelationships between plants and monuments should be carried out, considering both the negative interaction of the root's growths, as well as the positive values on the microclimate and environment [77,116]. Furthermore, several studies underlined the relevance of archaeological sites for the conservation of biodiversity, due to the high richness of plant communities, and to the presence of protected, endangered, or rare species for the region [117]. A botanical investigation should be carried out to balance interventions of plant management, and to favor the reconstruction of natural landscapes [110,113]. As a part of such an analysis, the effects of human activities, such as cutting, trampling, and sometimes even grazing on flora and vegetation should be considered [118]. In such plans, the previously suggested vegetation maps can be useful for identifying areas and habitats with different management strategies (e.g., habitat protected against trampling or mowing, those that do not require specific protection but only mechanical mowing, or those hosting species that need to be eradicated etc.). A Geographic Information System (GIS) is very useful in such plans [119] since information can be accessed easily [120]. In terms of analysis, documentation, conservation, and recovery of cultural sites, 3D mapping enhances the usability and versatility of geodatabases [119].

Research, knowledge, conservation, education, communication, planning, and tourism are the proposed strategic vision for an integrated management plan [121]. It is essential to develop and evaluate efficient management tools and strategies for future planning of valorization or revitalization.

2.2. The Proposal of Revitalization and Cultural Valorization

The term revitalization is used when the garden is renovated with a distinct application of the stylistic and natural elements of the period, which were most relevant in the site, adding functions to meet the actual demands [5,9,13]. Revitalization aims to enhance its readability, authenticity, and identity [13,122,123], since gardens should reflect the period of their existence, the values and skills of those who have owned and cultivated them [1]. Revitalization of lost gardens always includes reconstruction, restoring as closely as possible to the original form, considering the original spatial structure and mass proportions, and establishing a long-term management plan [5,13]. As previously underlined, the reconstruction model needs a multifactorial assessment (e.g., cultural, historical, architectural, educational, functional, spatial, and ecological), which is essential for setting criteria of interventions and renewal [1,2,5,11].

Indeed, the traditional approach to botanical planning at the archaeological sites was often limited to aesthetic considerations, and plants were often introduced quite casually or reflected the subjective preferences of those responsible for the site [110]. Therefore, sometimes, invasive or exotic species which have no historical or cultural significance to the territory have been introduced to the garden [124]. For the selection of plants, the historical suitability (coherence of the choice concerning the original plant landscape) is the first element, and a careful pattern of plant distribution should be considered [110]. A consideration of bioclimatic and edaphic suitability as well as phytosociological knowledge is required to design green spaces in harmony with the natural vegetation and the local landscape. The extensive analysis of the ancient, cultivated plants at *Pompeii*, based also on plant iconography (Figure 5a) allowed for replanting in the house's gardens (Figure 5b), giving a new perception of the past in the present times [24]. Indeed, this approach was sometimes primarily aesthetic since gardeners did not pay sufficient attention to maintain authenticity, selecting plants for colors and shapes, or their management facility (e.g., the American *Begonia* or *Tagetes*, which were not present at Roman times) (Figure 5c), disregarding the ancient values of natural elements and the possibility to explain them to the visitors.

Figure 5. Revitalization of lost gardens in Pompeii: (**a**) detailed from moral paintings of the house of the Golden Bracelets which describes the garden flora; (**b**) careful intervention in *Octavius Quartio's* house's garden; (**c**) introduction of American plants (Begonia and red flowers) on the ancient garden (Photo G. Caneva).

The term "valorization" is derived from the concept of "value", and it is the process of giving, adding, or increasing value to something. Therefore, valorization should enhance cultural, historical, aesthetic, artistic, spiritual, symbolic, social, technical, and economic values, to increase readability, authenticity, and identity of the place [122,123]. As a result, all functions, and regulations should be exercised in order to promote knowledge, to ensure the best conditions for its use and the enjoyment by the public [123].

Historically, it has also been the case that ancient gardens have been replaced by other historical buildings, which cannot be ignored. For example, the garden of the *Domus Tiberiana* (I Century BC) at the top of the Palatine hill (Rome), was occupied, after the burial, by the *Horti Farnesiani* (XVI Century), who built historical gardens there for themselves [80].

Furthermore, when data are missing, or when the occurred transformations give rise to an impossible revitalization, modern tools are applied to evoke the atmosphere of the former garden. Geo-based redistribution of ancient perspective views can help people in correlating them to the current scenario [36]. A cultural valorization should be carried out not only through a visual reconstruction of the site, but overall, through the communication of the ancient cultural values, as stressed in the paragraph on the philosophy of nature. Indeed, when considering a plant in an ancient garden, it is not only important to define which plant was used, but also why it was selected, i.e., what message was behind the selection. Efficient communication of such a message, as well as its proposal, is critical. In Figure 6, we summarize the suggested methodological approach in a revitalization and valorization approach of lost gardens.

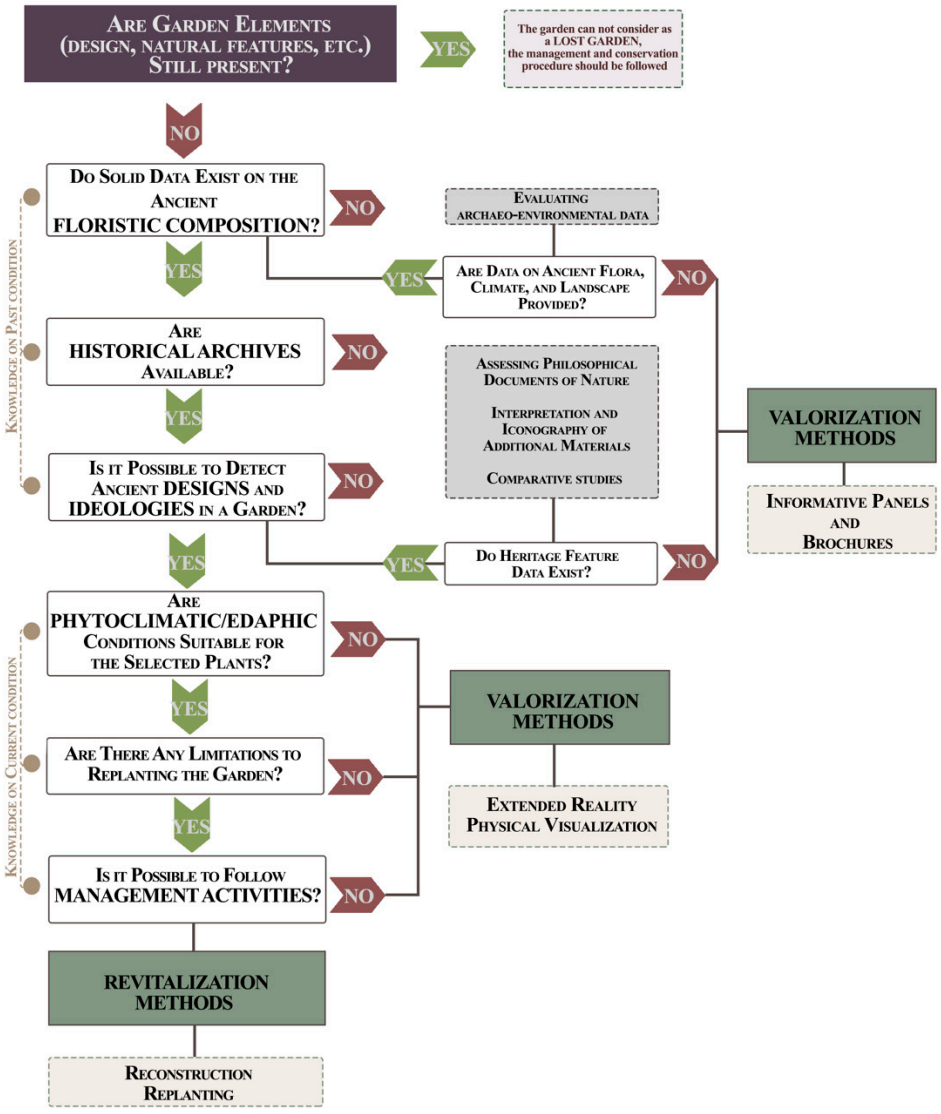

Figure 6. Scheme of suggested garden revitalization and valorization approach.

Informative panels and brochures: Informative panels and brochures, which provide information on garden history and a general description of its floral and architectural characteristics, are the basic elements of lost garden valorization [36]. Such tools cannot

reflect the artistic conception and steric space of the ancient garden and adding information on philosophical ideas in garden design, as well as current flora and its changes over time could support a better understanding [29]. Here, an informative panel with transparent reconstruction [121,125], or graphic drawings with texts of garden design can be used as a tool for their valorization [29]. For improving the panel representation of the garden, a holographic stand based on 3D visualization, as stressed below, was suggested to give a greater sense of immersion [126].

The extended reality (XR) of relevant features: Modern techniques, such as mixed reality, have recently been utilized for the representation of architectural and archaeological heritage, providing a new way of expression for the restoration design of ancient gardens, and facilitating the comprehension of the ruins but also as a spur to tourist development [127]. These techniques are diverse and refer to all forms of combined real and virtual environments including augmented reality (AR), virtual reality (VR), mixed reality (MR), 3D restitution models, and digital video sequences [121,125,128]. These techniques have gradually become the mainstream idea of garden representation and landscape expression [129]. They involve stimulating the three-dimensional space of the garden and its natural environment, generating multiple motion senses via visual (3D visualization), hearing (nature soundscape along with information), touch sensors, and observing garden works from certain angles [29,130], then generating an immersive interactive scene simulation effect [129]. The human–computer interaction technique allows modern people to experience virtual wonderings and scene reappearances in ancient gardens and the evolution during the time and feel the unique spatial artistic conception of ancient gardens (Figure 7) [29,131].

Figure 7. Advanced multimedia presentation techniques. (**a**) TimeScope at the archaeological site of Ename (Reprinted with permission from ref. [127]. Copyright 2008 Provinciale Erfgoedsite Ename) (**b**) Virtual view in the Etruscan city of Tarquinia (Italy) near the temple Ara della Regina to reconstruct the original shapes (photo and tools by M. Legni).

Physical visualization of the garden pattern: To increase the readability of garden pattern or design, *planted hedges* have been suggested or used for recovering garden patterns, such as using the evergreen planting, low-growing, and brightly colored varieties of bedding plants as well as stone ornaments in Witley Court East Garden (Worcester, UK), where the original decorative scheme was accurately reconstructed from the surviving traces [132].

In recent years, *lighting technologies* have become very important tools in virtual modification, restoration, and presentation of cultural heritage [133] and they could be considered as a tool for enhancement of garden elements, its axis and landscape, since the projection of light on an object allows alteration of an object's appearance virtually and reversibly [134].

We could also discuss the role of "eye-catchers" that attract attention even from a distance, such as natural elements, artificial structures, or outstanding visual elements [98]. There is one aspect of "creative preservation", introduced by Morin [135] at Ramat Rahel archaeological sites, which attempts to establish a contemporary dialogue with the site and the public while addressing cultural and ethical issues associated with the preservation

of historical memory. Besides exploring the 'authentic' qualities of the site, this method also explores the philosophical implications of this activity in a contemporary context as a living memory [135,136]. In addition, they can also function as focal points of a visual axis or define a specific visual link to determine the structural layout of landscaped gardens and to determine the strategic points of the garden [98].

3. Discussion

A garden is a complex combination of visual and aesthetic values (through geometry, color and texture), as well as natural and cultural values, which are expressed through different living materials (plants), representing different historical eras, philosophical ideologies, arts, and architectural landscapes [36,45].

Garden study is always a challenge, since it encompasses several fields and involves diverse disciplinary perspectives [45]. The multidisciplinary approach requires a team of experts from multiple fields, and the botanical aspects must be analyzed in relation to the past and present wild and cultivated flora, such as natural vegetation [78,102]. Despite such (multiple) demands, the study of gardens is often approached independently by architects, archaeologists, and historians, less commonly by scientists, and rarely with a truly multidisciplinary approach. Considering the different expertise, the different skills should work together to produce integrated documentation and a valorization project. These documents and projects should consider materials, shapes, and natural elements, without ignoring any one of them. Tools, such as GIS systems, and software like AutoCAD, which are commonly used by architects and archaeologists, assist in the analysis and rendering of such documentation [112,119,120].

There is a weak point in many gardens' renewal projects, where plants are documented for their skylines, colors and shapes, without taking into account the plants' ecology, phenology during the seasons, and cultural significance [1,6]. Interpreting the values of the single natural elements requires a comprehensive botanical assessment, first for precise recognition, followed by an evaluation of their cultural significance, which is too often considered only for aesthetic reasons [87,90].

The analysis of ancient gardens, and especially of lost gardens, has greater complexity, due to the need of interpreting and managing the values of ancient cultures by a contemporary culture [137]. As part of such an aim, interpretation is needed not only of traditions, old beliefs, and religions belonging to the humanistic backgrounds but also of social perceptions of nature. In the case of lost gardens, several critical issues should be considered for the understanding of the physical features. In fact, although excavation may reveal details of garden construction, the exact design may be impossible to discover without adequate historical documentation [1,9,36]. When historical references for the analyzed cases are insufficient, critical comparative research can support its general understanding and the proposal of valorization [138–140].

Furthermore, the evidence of natural remains is sometimes not easy to access. For example, there are inherent risks when using pollen analysis to reconstruct the history of cultivated crops in gardens. The risk can arise from a variety of factors e.g., differential preservation, as well as differential pollen production and dispersal by different species [74,141].

Furthermore, a recreation of an ambience that provides a sense of historical authenticity and returns the aesthetical and historical values of lost gardens to the wider public is also essential for their valorization/revitalization [36]. In this regard, understanding specific connections between landscape architecture, architecture, natural and human-made landscape, and other areas of arts and literature, can add rich layers to a garden visit [36]. In providing the original sense of the place, modern technologies are becoming very useful, and have resulted in an increasing topic of research and application.

4. Conclusions

The study showed the different information, from the past to current conditions, that is needed for achieving deep knowledge of the natural, historical, and philosophical features

of the places where lost gardens were settled. This study has the added value of bringing together a multidisciplinary network of experts in a multidisciplinary approach, able to enhance the value of each component of the study, in a complex mosaic of knowledge. Although the tiles are constructed using a standardized methodology, there is no general approach to the whole process.

In an integrated approach to revitalization/valuation strategies of lost gardens, neglecting the role of natural elements may lead to a change in future outlooks. This perspective can contribute to a more objective enhancement of this complex cultural heritage, where nature and culture are combined.

Author Contributions: This research article is provided by both authors' equal contribution. All authors have read and agreed to the published version of the manuscript.

Funding: This research was conducted as part of a PhD study and funded as a PhD scholarship by the University Roma Tre, Science Department. The Grant of Excellence Departments, MIUR, Italy (Art. 1, commi 314–337 legge 232/2016), is gratefully acknowledged.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: The study did not report any data.

Acknowledgments: This research is a part of a PhD project. We thank Valentina Savo for her kind review of the paper. We would like to mention that any errors are our own and should not tarnish the reputations of these esteemed persons.

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

References

1. Sales, J. Conserving Historic Gardens. *J. Archit. Conserv.* **2000**, *6*, 72–84. [CrossRef]
2. Bourke, M. How Will My Garden Grow? A Philosophy for the Restoration of Historic Gardens. *J. Gard. Hist.* **2012**, *3*, 49–54. [CrossRef]
3. Harney, M. *Gardens and Landscapes in Historic Building Conservation*; Wiley Blackwell: West Sussex, UK, 2014; ISBN 978-1-118-50814-5.
4. Bakke, J. The Vanished Gardens of Byzantium. In *Byzantine Gardens and Beyond*; Bodin, H., Hedlund, R., Eds.; Acta Universitatis Upsaliensis: Uppsala, Sweden, 2013; pp. 149–249, ISBN 978-91-554-8627-3.
5. Obad Šćitaroci, M.; Marić, M.; Vahtar-Jurković, K.; Knežević, K.R. Revitalisation of Historic Gardens—Sustainable Models of Renewal. In *Cultural Urban Heritage*; Urban Book Series; Obad Šćitaroci, M., Bojanić Obad Šćitaroci, B., Mrđa, A., Eds.; Springer: Cham, Switzerland, 2019; pp. 423–441. [CrossRef]
6. Gullino, P.; Pomatto, E.; Gaino, W.; Devecchi, M.; Larcher, F. New Challenges for Historic Gardens' Restoration: A Holistic Approach for the Royal Park of Moncalieri Castle (Turin Metropolitan Area, Italy). *Sustainability* **2020**, *12*, 10067. [CrossRef]
7. Watkins, J.; Wright, T.W.J. *The Management and Maintenance of Historic Parks, Gardens and Landscapes: The English Heritage Handbook*; Frances Lincoln: London, UK, 2007; ISBN 0-7112-2439-0.
8. Bors-Oprisa, S.; Tanasescu, I. Restoration and conservation of gardens, parks and historic landscapes in terms of multidisciplinary guidelines. *Agricultura* **2013**, *85*, 133–136. [CrossRef]
9. Walerzak, M.T.; Swierk, D.; Krzyzaniak, M.; Urbanski, P. A Method of Analysis and Valorization of Historic Green Space Arrangements in Rural Areas in Poland. *Bulg. J. Agric. Sci.* **2015**, *21*, 507–516.
10. Sales, J. Garden Restoration Past and Present. *Gard. Hist.* **1995**, *23*, 1–9. [CrossRef]
11. Jacques, D. The Treatment of Historic Parks and Gardens. *J. Archit. Conserv.* **1995**, *1*, 21–35. [CrossRef]
12. Craăciun, C. The Natural, Anthropogenic, and Cultural Landscape between Space and Time. Case Study: The Lost Gardens of Bucharest. In *Space and Time Visualization*; Springer: Cham, Switzerland, 2016; pp. 19–34.
13. Fekete, A.; Kollányi, L. Research-Based Design Approaches in Historic Garden Renovation. *Land* **2019**, *8*, 192. [CrossRef]
14. Slotten, V.; Lentz, D.; Sheets, P. Landscape Management and Polyculture in the Ancient Gardens and Fields at Joya de Cerén, El Salvador. *J. Anthropol. Archaeol.* **2020**, *59*, 101191. [CrossRef]
15. Wilkinson, A. Symbolism and Design in Ancient Egyptian Gardens. *Gard. Hist.* **1994**, *22*, 1–17. [CrossRef]
16. Laboury, D. Archaeological and Textual Evidence for the Function of the 'botanical Garden' of Karnak in the Initiation Ritual. In *Sacred Spaces and Sacred Function in Ancient Thebes; Occasional Proceedings of the Theban Workshop*; University of Chicago Press: Chicago, IL, USA, 2007; pp. 27–34.
17. Daines, A. Egyptian Gardens. *Studia Antiq.* **2008**, *6*, 15–25.

18. Stronach, D. The Garden as a Political Statement: Some Case Studies from the Near East in the First Millennium B.C. *Bull. Asia Inst.* **1990**, *4*, 171–180.
19. Stronach, D. Parterres and Stone Watercourses at Pasargadae: Notes on the Achaemenid Contribution to Garden Design. *J. Gard. Hist.* **1994**, *14*, 3–12. [CrossRef]
20. Jashemski, W.; Gleason, K.; Hartswick, K.; Malek, A. *Gardens of the Roman Empire*; Cambridge University Press: Cambridge, UK, 2017.
21. Jashemski, W.F.; Foss, J.E.; Lewis, R.J.; Timpson, M.E.; Lee, S.Y. Roman Gardens in Tunisia: Preliminary Excavations in the House of Bacchus and Ariadne and the East Temple at Thuburbo Maius. *Am. J. Archaeol.* **1995**, *99*, 559–576. [CrossRef]
22. Jashemski, W.F. Ancient Roman Gardens in Campania and Tunisia: A Comparison of the Evidence. *J. Gard. Hist.* **1996**, *16*, 231–243. [CrossRef]
23. Bowe, P. *Gardens of the Roman World*; Frances Lincoln: London, UK, 2004; p. 168, ISBN 0-7112-2387-4.
24. Cirillo, C.; Scarpa, L. The Valorization of Urban Green between Architecture and Archaeobotany: The "Park" of Octavius Quartio's House in Pompeii. In Proceedings of the 19th IPSAPA/ISPALEM International Scientific Conference, Napoli, Italy, 2–3 July 2017; pp. 261–266.
25. Gross, B.; Gadot, Y.; Lipschits, O. The ancient garden and its water installations. In *Ramat Raḥel IV*; Penn State University Press: University Park, PA, USA, 2021; pp. 459–468.
26. Ball, W. The Remains of a Monumental Timurid Garden outside Herat. *Source East West* **1981**, *31*, 79–82.
27. Khan, M. An Introduction to the Historical, Architectural and Hydraulic Studies of the Mughal Garden at Wah, Pakistan. *Source East West* **1996**, *46*, 457–472.
28. Moynihan, E.B. The Lotus Garden Palace of Zahir Al-Din Muhammad Babur. *Muqarnas* **1988**, *5*, 135–152. [CrossRef]
29. Li, J.; Cao, Y. The Application of Virtual Reality Technology in Ancient Garden Restoration. In Proceedings of the 7th International Conference on Education, Management, Computer and Medicine (EMCM 2016), Shenyang, China, 29–31 December 2016; Atlantis Press: Zhengzhou, China, 2017; Volume 59, pp. 172–177.
30. Morris, C. Lost Gardens of Sydney. *Aust. Gard. Hist.* **2008**, *20*, 4–9.
31. Halbrooks, M.C. The English Garden at Stan Hywet Hall and Gardens: Interpretation, Analysis, and Documentation of a Historic Garden Restoration. *HortTechnology* **2005**, *15*, 196–213. [CrossRef]
32. Goodwin, C.M.; Metheny, K.B.; Kratzer, J.M.; Yentsch, A. Recovering the Lost Landscapes of the Stockton Gardens at Morven, Princeton, New Jersey. *Hist. Archaeol.* **1995**, *29*, 35–61. [CrossRef]
33. Abouei, R.; Jayhani, H. Restoration of Persian Gardens. *Soffeh* **2012**, *22*, 107–117.
34. Dix, B. 'Digging of Borders': Reflections on Archaeology and Garden Restoration. *J. Gard. Hist.* **1997**, *17*, 11–17. [CrossRef]
35. Dreija, K. Historic Gardens and Parks: Challenges of Development in the Context of Relevant Regulations, Definitions and Terminology. *Moksl.—Liet. Ateitis/Sci. —Future Lith.* **2012**, *4*, 167–175. [CrossRef]
36. Cazzani, A.; Zerbi, C.M.; Brumana, R. Management plans and WEB-GIS software applications as active and dynamic tools to conserve and valorize historic public gardens. *Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci.—ISPRS Arch.* **2019**, *42*, 291–298. [CrossRef]
37. Moe, D.; Hufthammer, A.K.; Indrelid, S.; Salvesen, P.H. New Approaches to Garden History; Taxonomical, Dendrological, Pollen Analytical and Archaeological Studies in a 17th Century Renaissance Garden at the Milde Estate, Norway. In Proceedings of the 1st Conference on Crop Fields and Gardens Archaeology, Barcelona, Spain, 1–3 June 2006; pp. 221–247.
38. Funsten, C.; Borsellino, V.; Schimmenti, E. A Systematic Literature Review of Historic Garden Management and Its Economic Aspects. *Sustainability* **2020**, *12*, 10679. [CrossRef]
39. ICOMOS-IFLA. *Historic Garden, the Florence Charter*; ICOMOS: Florence, Italy, 1982.
40. Gustavsson, R.; Peterson, A. Authenticity in Landscape Conservation and Management—The Importance of the Local Context. In *Landscape Interface*; Springer: Dordrecht, The Netherlands, 2003; Volume 1, pp. 319–356.
41. Kosmala, M. Brief Historic Outline of the Preservation and Conservation of Historic Gardens. *Ann. Wars. Univ. Life Sci.-SGGW Hortic. Landsc. Archit.* **2007**, *28*, 211–219.
42. Turner, T. *European Gardens: History, Philosophy and Design*; Routledge: London, UK, 2011; ISBN 978-0-415-49684-1.
43. Massoudi, A. *Acquaintance with Iranian Gardens Bagh-e Shazdeh*; Faza Publication: Tehran, Iran, 2009.
44. Mahdizadeh, S.; Rajendran, L.P. A Renewed Approach to Conservation Policy of Historical Gardens in Iran. *Landsc. Res.* **2019**, *44*, 48–61. [CrossRef]
45. Carneiro, A.R.S.; Menezes, J.F.; Mesquita, L. The Conservation of Historical Gardens in a Multidisciplinary Context: The "Cactário Da Madalena," Recife, Brazil. *City Time* **2005**, *1*, 25–35.
46. Ignatieva, M.; Konechnaya, G. Floristic Investigations of Historical Parks in St. Petersburg, Russia. *Urban Habitats* **2004**, *2*, 174–216.
47. van Tonder, G.J. Recovery of Visual Structure in Illustrated Japanese Gardens. *Pattern Recognit. Lett.* **2007**, *28*, 728–739. [CrossRef]
48. Heathcote, R. Gardens Lost and Found. *Aust. Gard. Hist.* **2010**, *22*, 14–21.
49. Irani Behbahani, H.; Shokouhi Dehkordi, Z.; Soltani, R. Identification and Documentation of Iranian Unknown Historical Gardens. *J. Environ. Stud.* **2013**, *39*, 145–156. [CrossRef]
50. Karg, S. Evidence of Garden Plants in Southern Scandinavia from Iron Age to Early Modern Times Based on Archaeological Plant Records. In *Source to History of Gardening*; Andréasson, A., Gräslund Berg, E., Heimdahl, J., Jakobsson, A., Larsson, I., Persson, E., Eds.; Sveriges Lantbruksuniversitet: Alnarp, Sweden, 2014; pp. 241–250.

51. Rahaei, O. Analyzing the Geometry of Iranian Islamic Gardens Based on the Quran's Characteristics of Paradise. *J. Res. Islamic Archit.* **2015**, *3*, 94–113.
52. Jashemski, W.F. The Gardens of Pompeii, Herculaneum and the Villas Destroyed by Vesuvius. *J. Gard. Hist.* **1992**, *12*, 102–125. [CrossRef]
53. Caneva, G. Ipotesi sul significato simbolico del giardino dipinto della Villa di Livia (Prima Porta, Roma). *Bull. Della Comm. Archeol. Comunale Roma* **1999**, *100*, 63–80.
54. Chen, C.Z. *On Chinese Garden*; Tongji University Press: Shanghai, China, 1984.
55. Minnema, L. Cross-Cultural Comparisons between the Mughal Tomb Garden of Taj Mahal in Agra (India) and the Dry Landscape Garden of the Ryoan-Ji Zen Monastery in Kyoto (Japan). *Worldviews Environ. Cult. Relig.* **2019**, *23*, 197–229. [CrossRef]
56. Wang, X. *A Cluster Analysis Comparison of Garden Activities in Classical Chinese Gardens and American Gardens*; Michigan State University: Lansing, MI, USA, 2019.
57. Yarahmadi, S.; Ansari, M.; Mahdavinejad, M. Re-Commentary of Sa'adat Abad Garden of Qazvin a Comparative Analysis of Abdi Beig Shirazi's Poems and Historical Documents. *Mon. Sci. J. Bagh-E Nazar* **2018**, *15*, 27–52.
58. Khayat Moghadam, M.; Irani Behbahani, H.; Darabi, H. Revitalization of Neshat Garden of Firouzeh City Based on Historical and Environmental Documentations. *Pazhoheshha-Ye Bastan Shenasi Iran* **2018**, *7*, 219–238. [CrossRef]
59. Janick, J. Plant Iconography and Art: Source of Information on Horticultural Technology. *Bull. Univ. Agric. Sci. Vet. Med. Cluj-Napoca—Hortic.* **2010**, *67*, 11–23. [CrossRef]
60. Kuttner, A. Looking Outside inside: Ancient Roman Garden Rooms. *Stud. Hist. Gard. Des. Landsc.* **1999**, *19*, 7–35. [CrossRef]
61. Arnold, C.A. *An Introduction to Palaeobotany*; Read Books Ltd.: New York, NY, USA, 2013.
62. Fuller, D.Q.; Lucas, L. Archaeobotany. In *Encyclopedia of Global Archaeology*; Smith, C., Ed.; Springer: New York, NY, USA, 2014; pp. 305–310.
63. Bryant, V.M., Jr. Botanical Remains in Archaeological Sites. In *Interdisciplinary Workshop on the Physical-Chemical-Biological Processes Affecting Archaeological Sites*; U.S. Army Engineer Waterways Experiment Station: Washington, DC, USA, 1989; pp. 85–115.
64. Bjune, A.E.; Seppä, H.; Birks, H.J.B. Quantitative Summer-Temperature Reconstructions for the Last 2000 Years Based on Pollen-Stratigraphical Data from Northern Fennoscandia. *J. Paleolimnol.* **2009**, *41*, 43–56. [CrossRef]
65. Langgut, D.; Gadot, Y.; Porat, N.; Lipschits, O. Fossil Pollen Reveals the Secrets of the Royal Persian Garden at Ramat Rahel, Jerusalem. *Palynology* **2013**, *37*, 115–129. [CrossRef]
66. Waters, M. An Introduction to Geoarchaeology and the Impacts of Site Burial. In *Interdisciplinary Workshop on the Physical-Chemical-Biological Processes Affecting Archaeological Sites*; U.S. Army Engineer Waterways Experiment Station: Washington, DC, USA, 1989; pp. 116–127.
67. Miller, N.; Gleason, K. *The Archaeology of Garden and Field*; University of Pennsylvania Press: Philadelphia, PA, USA, 1997.
68. Mercuri, A.M.; Allevato, E.; Arobba, D.; Mazzanti, M.B.; Bosi, G.; Caramiello, R.; Castiglioni, E.; Carra, M.L.; Celant, A.; Costantini, L. Pollen and Macro-remains from Holocene Archaeological Sites: A Dataset for the Understanding of the Bio-Cultural Diversity of the Italian Landscape. *Rev. Palaeobot. Palynol.* **2015**, *218*, 250–266. [CrossRef]
69. Lippi, M.M.; Bellini, C.; Secci, M.M. Palaeovegetational Reconstruction Based on Pollen and Seeds/Fruits from a Bronze Age Archaeological Site in Tuscany (Italy). *Plant Biosyst.* **2010**, *144*, 902–908. [CrossRef]
70. Sadori, L.; Mercuri, A.M.; Lippi, M.M. Reconstructing Past Cultural Landscape and Human Impact Using Pollen and Plant Macro-remains. *Plant Biosyst.* **2010**, *144*, 940–951. [CrossRef]
71. Cirillo, C.; Scarpa, L.; Acampora, G.; Bertoli, B.; Esposito, R.; Russo, M. Pompeii-Nature and Architecture. In Proceedings of the 19th IPSAPA/ISPALEM International Scientific Conference, Naples, Italy, 2 July 2015; pp. 719–728.
72. Bosi, G.; Mazzanti, M.; Accorsi, C.; Mercuries, A.M.; Towers, P.; Trevisan Grandi, G.; Guarnieri, C.; Vallini, C. The Duchesses Garden of the Ducal Palace at Ferrara, from Ercole I d'Este (15th Cent. AD) to the Current Time: Archaeobotanical and Historical-Archaeological Reconstruction. *IRIS* **2006**, 103–128. Available online: https://www.semanticscholar.org/paper/The-Duchesses-Garden-of-the-Ducal-Palace-at-from-I-Bosi-Mazzanti/e2d51bc0c7a75919d267be2661a04fefd9f8a2ce (accessed on 24 January 2022).
73. Goldberg, P.; Macphail, R. *Practical and Theoretical Geoarchaeology*; Blackwell Publishing: Oxford, UK, 2008.
74. Gondet, S.; Mohammadkhani, K. Approaching Past Landscape Management on the Field: Pluridisciplinary and Multiscalar Studies in the Pasargadae Region (Fars Province, Iran). 2018, pp. 96–300. Available online: https://halshs.archives-ouvertes.fr/halshs-01973019 (accessed on 24 January 2022).
75. Djamali, M.; Jones, M.D.; Migliore, J.; Balatti, S.; Fader, M.; Contreras, D.; Gondet, S.; Hosseini, Z.; Lahijani, H.; Naderi, A.; et al. Olive Cultivation in the Heart of the Persian Achaemenid Empire: New Insights into Agricultural Practices and Environmental Changes Reflected in a Late Holocene Pollen Record from Lake Parishan, SW Iran. *Veg. Hist. Archaeobotany* **2016**, *25*, 255–269. [CrossRef]
76. Andréasson, A.; Gräslund Berg, E.; Heimdahl, J.; Jakobsson, A.; Larsson, I.; Persson, E. Source to History of Gardening. In *Four Interdisciplinary Seminars, 2010–2013 Arranged By the Nordic Network for the Archaeology and Archaeobotany of Gardening (NTAA)*; Sveriges Lantbruksuniversitet: Alnarp, Sweden, 2010.
77. Caneva, G.; Nugari, M.P.; Salvadori, O. *Plant Biology for Cultural Heritage: Biodeterioration and Conservation*; Getty Conservation Institute: Los Angeles, CA, USA, 2008; ISBN 9780892369393.

78. Djamali, M.; Chaverdi, A.A.; Balatti, S.; Guibal, F.; Santelli, C. On the Chronology and Use of Timber in the Palaces and Palace-like Structures of the Sasanian Empire in "Persis" (SW Iran). *J. Archaeol. Sci. Rep.* **2017**, *12*, 134–141. [CrossRef]
79. De Marco, G.; Dinelli, A.; Caneva, G. Geobotany Applied to the Analysis and Management of Archaeological Sites. *Braun-Blanquetia* **1989**, *3*, 293–297.
80. Caneva, G.; Cutini, M. Palatino: Trasformazioni Ambientali Ed Aspetti Floristico-Vegetazionali Legati Ai Problemi Archeologici. In *Il Palatino, Area Sacra Sud-Ovest e Domus Tiberian*; Giavarini, C., Ed.; L'Erma di Bretschneider: Rome, Italy, 1988; pp. 195–258.
81. Caneva, G.; Pacini, A.; Celesti Grapow, L.; Ceschin, S. The Colosseum's Use and the State of Abandonment as Analysed through Its Flora. *Int. Biodeterior. Biodegrad.* **2003**, *51*, 211–219. [CrossRef]
82. Celesti-Grapow, L.; Caneva, G.; Pacini, A. The Flora of Colosseum (Rome). *Webbia* **2001**, *56*, 321–342. [CrossRef]
83. Yoch, J.J.; Hunt, J.D. The Figure in the Landscape: Poetry, Painting and Gardening during the Eighteenth Century. *MLN* **1977**, *92*, 703–708. [CrossRef]
84. Karimi-Hakkak, A. Iranica Heirloom: Persian Literature. *Iran. Stud.* **1998**, *31*, 527–542. [CrossRef]
85. Barati, N.; Alehashemi, A.; Miniator Sajadi, A. Iranian Worldview and Axial Pattern in Persian Garden. *Manzar Sci. J. Landsc.* **2018**, *9*, 6–15.
86. Cardini, F.; Miglio, M. *Nostalgia Del Paradiso- Il Giardino Medievale*; Laterza: Bari, Italy, 2002.
87. Caneva, G. *The Augustus Botanical Code: Rome, Ara Pacis: Speaking to the People through the Images of Nature*; Gangemi Editore: Rome, Italy, 2010.
88. Caneva, G. Il Giardino Come Espressione Del Divino Nelle Rappresentazioni Dell'antica Roma. In *Le jardin dans l'antiquité. Tome LX. Entretiens sur l'Antiquité classique de la Fondation Hardt*; Coleman, K., Pascale, D., Eds.; Fondation Hardt: Vandœuvres, Switzerland, 2014; pp. 301–361.
89. Branton, N. Landscape Approaches in Historical Archaeology: The Archaeology of Places. In *International Handbook of Historical Archaeology*; Springer: New York, NY, USA, 2009.
90. Farrar, L. *Gardens and Gardeners of the Ancient World: History, Myth and Archaeology*; Windgather Press: London, UK, 2016.
91. Savo, V.; Kumbaric, A.; Caneva, G. Grapevine (*Vitis vinifera L.*) Symbolism in the Ancient Euro-Mediterranean Cultures. *Econ. Bot.* **2016**, *70*, 190–197. [CrossRef]
92. Kumbaric, A.; Caneva, G. Updated Outline of Floristic Richness in Roman Iconography. *Rend. Lincei* **2014**, *25*, 181–193. [CrossRef]
93. Khansari, M.; Yavari, M.; Moghtader, M. *The Persian Garden: Echoes of Paradise*; Cultural Heritage: Tehran, Iran, 1998.
94. Salwa, M. Historic Gardens as Places of Conflicting Values. *Ethics Prog.* **2014**, *5*, 96–112. [CrossRef]
95. Berleant, A. *Aesthetics beyond the Arts: New and Recent Essays*; Routledge: England, UK, 2016; ISBN 978-1-315-56583-5.
96. Branduini, P.; Laviscio, R.; L'Erario, A.; Toso, F.C. Mapping evolving Historical Landscape Systems. In The International Archives of the Photogrammetry, Remote Sensing and Spatial Information Sciences, Volume XLII-2/W11. In Proceedings of the 2019 GEORES 2019—2nd International Conference of Geomatics and Restoration, Milan, Italy, 8–10 May 2019; pp. 277–284. Available online: https://www.int-arch-photogramm-remote-sens-spatial-inf-sci.net/XLII-2-W11/ (accessed on 24 January 2022).
97. Schmidt, E.; Calnan, M. Rooted in History: Studies in Garden Conservation. *Gard. Hist.* **2002**, *30*, 98–99. [CrossRef]
98. Fekete, A.; van den Toorn, M. The Maros River and Its Potential for Landscape Development. In Proceedings of the Fábos Conference on Landscape and Greenway Planning, Budapest, Hungary, 30 June–3 July 2016; Volume 5, pp. 333–341.
99. Dix, B. Garden Archaeology. In *Gardens and Landscapes in Historic Building Conservation*; Harney, M., Ed.; John Wiley and Sons, Ltd.: Hoboken, NJ, USA, 2014; pp. 149–152, ISBN 978-1-118-50810-7.
100. Gleason, K.L. To bound and to Cultivate: An Introduction to the Archaeology of Gardens and Fields. In *The Archaeology of Garden and Field*; Miller, N.F., Gleason, K., Eds.; University of Pennsylvania Press: Philadelphia, PA, USA, 1994; pp. 1–24.
101. Scollar, I. Physical Conditions Tending to Produce Crop Sites in the Rhineland. In Proceedings of the Colloque International, Archéologie Aérienne, Paris, France, 31 August–3 September 1964; pp. 39–47.
102. Ceraudo, G. Aerial Photography in Archaeology. In *Good Practice in Archaeological Diagnostics*; Springer: Cham, Switzerland, 2013; pp. 11–30.
103. Campana, S. Drones in archaeology. State-of-the-art and future perspectives. *Archaeol. Prospect.* **2017**, *24*, 275–296. [CrossRef]
104. Marchetti, N.; Al-Hussainy, A.; Benati, G.; Luglio, G.; Scazzosi, G.; Valeri, M.; Zaina, F. The Rise of Urbanized Landscapes in Mesopotamia: The QADIS Integrated Survey Results and the Interpretation of Multi-Layered Historical Landscapes. *Z. Für Assyriol. Und Vorderasiat. Archäologie* **2019**, *109*, 214–237. [CrossRef]
105. Masini, N.; Marzo, C.; Manzari, P.; Belmonte, A.; Sabia, C.; Lasaponara, R. On the Characterization of Temporal and Spatial Patterns of Archaeological Crop-Marks. *J. Cult. Herit.* **2018**, *32*, 124–132. [CrossRef]
106. Bahrami, F.; Grose, M.J. The Surviving, Partially Destroyed, and Lost Persian Gardens of Kerman, Iran. *Urban For. Urban Green.* **2021**, *65*, 127367. [CrossRef]
107. Ceschin, S.; Caneva, G. Plants as Bioindicators for Archaeological Prospection: A Case of Study from Domitian's Stadium in the Palatine (Rome, Italy). *Environ. Monit. Assess.* **2013**, *185*, 5317–5326. [CrossRef] [PubMed]
108. Ceschin, S.; Kumbaric, A.; Caneva, G.; Zuccarello, V. Testing Flora as Bioindicator of Buried Structures in the Archaeological Area of Maxentius's Villa (Rome, Italy). *J. Archaeol. Sci.* **2012**, *39*, 1288–1295. [CrossRef]
109. Carroll, M. *Earthly Paradises: Ancient Gardens in History and Archaeology*; Getty Publications: Los Angeles, CA, USA, 2003.
110. Caneva, G. A Botanical Approach to the Planning of Archaeological, Parks in Italy. *Conserv. Manag. Archaeol. Sites* **1999**, *3*, 127–134. [CrossRef]

111. Ahmadi, F.; Bemanian, M.; Ansari, M. An Introduction to Natural Landscape Restoration Method Based on Landscape Ecology Approach. *Mon. Sci. J. Bagh-E Nazar* **2018**, *14*, 5–16.
112. Roth, M.; Gruehn, D. Visual landscape assessment for large areas visual landscape assessment for large areas-using GIS, internet surveys and statistical methodologies. *Proc. Latv. Acad. Sci. A Humanit Soc. Sci.* **2012**, *66*, 129–142.
113. Cicinelli, E.; Salerno, G.; Caneva, G. An Assessment Methodology to Combine the Preservation of Biodiversity and Cultural Heritage: The San Vincenzo al Volturno Historical Site (Molise, Italy). *Biodivers. Conserv.* **2018**, *27*, 1073–1093. [CrossRef]
114. Westhoff, V.; Maarel, E.V.D. The Braun-Blanquet approach. *Classif. Plant Communities* **1978**, *5*, 287–399. [CrossRef]
115. Jones, G. Weed Phytosociology and Crop Husbandry: Identifying a Contrast between Ancient and Modern Practice. *Rev. Palaeobot. Palynol.* **1992**, *73*, 133–143. [CrossRef]
116. Hosseini, Z.; Caneva, G. Evaluating hazard conditions of plant colonization in Pasargadae World Heritage Site (Iran) as a tool of biodeterioration assessment. *Int. Biodeterior. Biodegrad.* **2021**, *160*, 105216. [CrossRef]
117. Caneva, G.; Benelli, F.; Bartoli, F.; Cicinelli, E. Safeguarding Natural and Cultural Heritage on Etruscan Tombs (La Banditaccia, Cerveteri, Italy). *Rend. Lincei* **2018**, *29*, 891–907. [CrossRef]
118. Caneva, G.; Cutini, M.; Pacini, A.; Vinci, M. Analysis of the Colosseum's Floristic Changes during the Last Four Centuries. *Plant Biosyst.* **2002**, *136*, 291–311. [CrossRef]
119. Apollonio, F.I.; Gaiani, M.; Benedetti, B. 3D Reality-Based Artefact Models for the Management of Archaeological Sites Using 3D GIS: A Framework Starting from the Case Study of the Pompeii Archaeological Area. *J. Archaeol. Sci.* **2012**, *39*, 1271–1287. [CrossRef]
120. Malinverni, E.S.; Chiappini, S.; Pierdicca, R. A Geodatabase for Multisource Data Management Applied to Cultural Heritage: The Case Study of Villa Buonaccorsi's Historical Garden. *Int. Arch. Photogramm. Remote Sens. Spat. Inf. Sci.* **2019**, *42*, 771–776. [CrossRef]
121. Benali Aoudia, L.; Chennaoui, Y. The Archaeological Site of Tipasa, Algeria: What Kind of Management Plan? *Conserv. Manag. Archaeol. Sites* **2017**, *19*, 173–196. [CrossRef]
122. Lorusso, S. Interdisciplinary Studies in Cultural and Environmental Heritage. *Conserv. Sci. Cult. Herit.* **2018**, *18*, 177–199. [CrossRef]
123. Lorusso, S.; Cogo, G.M.; Natali, A. The Protection and Valorization of Cultural and Environmental Heritage in the Development Process of the Territory. *Conserv. Sci. Cult. Herit.* **2016**, *16*, 59–88. [CrossRef]
124. Minissale, P.; Sciandrello, S.; Trigilia, A.; Brogna, F. Plants and Vegetation in the Archaeological Park of Neapolis of Syracuse (Sicily, Italy): A Management Effort and Also an Opportunity for Better Enjoyment of the Site. *Conserv. Manag. Archaeol. Sites* **2015**, *17*, 340–369. [CrossRef]
125. Pioaru, I. Virtual Reality Holography—A New Art Form. In *Technology, Design and the Arts—Opportunities and Challenges*; Earnshaw, R., Liggett, S., Excell, P., Thalmann, D., Eds.; Springer Series on Cultural Computing; Springer International Publishing: Cham, Switzerland, 2020; pp. 317–333, ISBN 978-3-030-42097-0.
126. Duguleana, M.; Postelnicu, C.C. Towards Preserving Transylvanian Fortified Churches in Virtual Reality. In Proceedings of the International Conference on VR Technologies in Cultural Heritage, Brasov, Romania, 29–30 May 2018; Volume 904, pp. 34–45.
127. Van der Donckt, M.C. Innovative Presentation Techniques in the Ename Project: Museum, Archeological Site and Monument (Belgium). *Marq Arqueol. Mus.* **2008**, *3*, 131–136.
128. Fassi, F.; Mandelli, A.; Teruggi, S.; Rechichi, F.; Fiorillo, F.; Achille, C. VR for Cultural Heritage. In Proceedings of the International Conference on Augmented Reality, Virtual Reality and Computer Graphics, Lecce, Italy, 15–18 June 2016; Volume 9769, pp. 139–157. [CrossRef]
129. Chen, M.; Saad, W.; Yin, C. Virtual Reality over Wireless Networks: Quality-of-Service Model and Learning-Based Resource Management. *IEEE Trans. Commun.* **2018**, *66*, 5621–5635. [CrossRef]
130. Frith, J.; Ahern, K. Make a Sound Garden Grow: Exploring the New Media Potential of Social Soundscaping. *Convergence* **2015**, *21*, 496–508. [CrossRef]
131. Toth, A.; Spallazzo, D. Historical-Virtual Reconstruction of an Italian Garden Imagining the Past of Villa Lo Zerbino. *Planum J. Urban.* **2013**, *2*, 1–10.
132. Dix, B. "Barbarous in Its Magnificence": The Archaeological Investigation and Restoration of Wa Nesfield's Parterre Design for the East Garden at Witley Court, Worcestershire. *Gard. Hist.* **2011**, *39*, 51–63.
133. Di Salvo, S. Innovation in Lighting for Enhancing the Appreciation and Preservation of Archaeological Heritage. *J. Cult. Herit.* **2014**, *15*, 209–212. [CrossRef]
134. Manzanares, Á.G.; Benítez, A.J.; Antón, J.C.M. Virtual Restoration and Visualization Changes through Light: A Review. *Heritage* **2020**, *3*, 1371–1384. [CrossRef]
135. Morin, R. Creative Preservation: The Development of an Artistic Approach to the Preservation and Presentation of the Past. *Conserv. Manag. Archaeol. Sites* **1999**, *3*, 191–201. [CrossRef]
136. Morin, R. 'Creative Preservation' in the Recently Opened Archaeological Garden at Ramat Rachel, Jerusalem. *Conserv. Manag. Archaeol. Sites* **2005**, *7*, 56–62. [CrossRef]
137. Muñoz Viñas, S. Contemporary Theory of Conservation. *Stud. Conserv.* **2002**, *47*, 25–34. [CrossRef]

138. Drennan, R.D.; Earle, T.; Feinman, G.M.; Fletcher, R.; Kolb, M.J.; Peregrine, P.; Peterson, C.E.; Sinopoli, C.; Smith, M.E.; Smith, M.L.; et al. Comparative Archaeology: A Commitment to Understanding Variation. In *The Comparative Archaeology of Complex Societies*; Cambridge University Press: Cambridge, UK, 2011; pp. 1–3.
139. Smith, M.E. *The Comparative Archaeology of Complex Societies*; Cambridge University Press: Cambridge, UK, 2011; p. 334, ISBN 978-0-521-19791-5.
140. Smith, M.E.; Peregrine, P. Approaches to Comparative Analysis in Archaeology. In *The Comparative Archaeology of Complex Societies*; Smith, M.E., Ed.; Cambridge University Press: New York, NY, USA, 2012; pp. 4–20.
141. Djamali, M.; Cilleros, K. Statistically Significant Minimum Pollen Count in Quaternary Pollen Analysis; the Case of Pollen-Rich Lake Sediments. *Rev. Palaeobot. Palynol.* **2020**, *275*, 104156. [CrossRef]