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# Modelling Land Use in the Gold Belt Territories of Iron Age Southern Zambezia

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**Abstract:** Throughout the world, the entanglement of humans and landscapes varies from area to area depending on the time scale. In southern Africa, the impact of humanity on the physical environment is largely discussed in the context of modern rural and urban societies, and, usually, most contributions come from human geography, agriculture, and earth sciences. Very limited research is usually extended into the deep past, yet the archaeological record is replete with valuable information that gives a long-time depth of past human land use practices. Consequently, the contribution of the physical environment to the development of complexity over time remains poorly understood in most parts of Iron Age (CE 200–1900) southern Zambezia, particularly in Mberengwa and other gold-belt territories that have often received cursory research attention. What remains obscured is how did inhabitants of these gold-belt territories transform their landscapes in the long and short-term and how did these transformations intersect with their everyday lives? In this study, we combined archaeological, historical, and anthropological data of the Zimbabwe tradition societies that lived in ancient Mberengwa to probe these issues. The preliminary outcome suggests that despite vulnerability to high temperatures, tsetse-flies, and low rainfall, Later Iron Age societies that inhabited this gold belt territory were innovative risk-takers who successfully adapted a mix of land use practices to achieve longevity in settlement and prosperity in agropastoralism, mining, crafting, and much more. This proffers useful lessons on sustainable land use. Hopefully, with modification to suit the present, such solutions may help policy makers and modern societies living in similar environments to combat current global challenges related to environmental change.

**Keywords:** Mberengwa; Iron Age; land use practices; gold-belt territories; landscape archaeology; Zimbabwe tradition; Chumnungwa



**Citation:** Nyamushosho, R.T.; Chirikure, S.; Sitas, A.; Mathoho, E.N. Modelling Land Use in the Gold Belt Territories of Iron Age Southern Zambezia. *Land* **2022**, *11*, 1425. https://doi.org/10.3390/land11091425

Academic Editor: Deodato Tapete

Received: 26 July 2022
Accepted: 16 August 2022
Published: 29 August 2022



## 1. Introduction

> "It is generally accepted that the development of preindustrial societies is inextricably linked to the land and its resources and, thus, cannot be wholly understood outside the context of relationships between societies and the territory they occupied". [1] (p. 68)

Worldwide land use studies have awakened interest among archaeologists, historians, and anthropologists investigating the entanglements between landscapes and humanity in the ancient past. In this era of the Anthropocene, such inquiry has even become more topical in unravelling how food-producing societies modify nature to enhance their everyday life and the consequences of such alterations to the physical environment and culture through the *longue durée* (i.e., [1–9]). Thus, it is increasingly becoming clear that understanding the dynamics of past land use practices can help us to confront the current global challenges related to environmental change (i.e., food insecurity, overgrazing, deforestation, and

overpopulation) through sustainable management of the earth systems and to predict the scale of the human imprint on the physical environment on both spatial and temporal scales [10–12].

Whilst researchers working in southern Africa have made huge strides towards developing models of how Iron Age societies related to nature during the last two thousand years (i.e., [3,8,11,13–27]), some challenges remain regarding the imbalance in research coverage and unavailability of well-resolved datasets. Usually, much of the scholarship on land use in the region is discussed in the context of human geography, agriculture, or earth sciences along with modern rural and urban societies (i.e., [28–30]). More importantly, there is a limited appreciation among archaeologists of the potential of archaeology in contributing meaningfully to these conversations despite the archaeological record being replete with valuable information that gives a long-time depth of past human land use practices. Rather, most of the scholarly effort has been invested in building culture-historical sequences of various Iron Age societies that populated the region (see [31–34] for critique). Whilst there is no doubt that scholarly coverage of these issues has enriched our understanding of the expansion of the Bantu, the contribution of the physical environment towards the development of complexity over time remains poorly understood, especially in gold belt territories dotted across southern Zambezia (Figure 1) that were previously relegated as provincial districts of the Zimbabwe culture (CE 1000–1900) civilizations such as Mapungubwe (CE 1055–1400), Great Zimbabwe (CE 1300–1660), Khami (CE 1250–1685), Mutapa (CE 1450–1900), and Danamombe (CE 1685–1900) [35–43]. Consequently, we do not know much about the Zimbabwe culture societies that inhabited these gold belt territories, particularly how they adapted their everyday lives to achieve sustainability in the long and short-term perspectives. Such an inquiry enables us to explore how these Iron Age societies exploited the local resources, particularly those that had gold and other mineral deposits at their disposal.

Mberengwa (Figure 1), one of the under-researched gold-belt territories acclaimed for hosting some of the gold and other key resources that made the Zimbabwe culture civilizations prosperous (i.e., [35–43]), proves to be a fertile ground on which we can fruitfully explore these issues. Drawing from landscape archaeology—the study of how ancient societies shaped and were shaped by their physical environments [1,44–46]—we conceptualized Mberengwa as a fluid and interwoven anthropogenic landscape that embodied all the land use behaviors of its inhabitants, which can be detected by examining their material residues. In this way, a landscape approach becomes useful in revealing how Zimbabwe tradition societies that occupied this gold-belt territory were entangled with the local environment during the Later Iron Age (CE 1200–1700).

It is noteworthy that landscape archaeology in most regions of the world is as old as mainstream archaeology [20,44–46]. In recent years, its transdisciplinary nature has allowed the interlacing of multiple datasets in reconstructing how ancient societies transformed global landscapes (i.e., grasslands, drylands, and woodlands) into settlements, farming lands, and pasturage (i.e., [4,6,11,25,26,47–49]). One notable study germane to this research is that of Kay and Kaplan [8]. Using published datasets drawn from archaeology and the other cognate disciplines, the duo developed a circle diagram with concentric rings that quantitatively modelled the land uses and subsistence categories of forager and agropastoral societies that inhabited sub-Saharan Africa during BCE 1000 and CE 1500. These varied in intensity and ranged from settlement, crop cultivation, and pasturage (arboriculture and woodlot) to hunting and gathering; see [8] (p. 17). More recently, Hughes et al. [9] comprehensively published the theoretical framework and computational processes behind the circle diagram model, whereas Kay et al. [12] updated the land use categories to make them universally applicable to other parts of the world. Whilst these classification schemes can be useful to this study, the challenge that comes up with such global categories of land use is undermining the fact that human land interaction varies in time and space, and it is determined by many interlinked variables, including the local conception of land, livelihoods, and level of complexity. Consequently, because of the

interplay between culture and agency, it is sometimes difficult to detect past human land use relations without inference from the local epistemologies and traditions; hence, Shona knowledge systems and history became handy in this study.

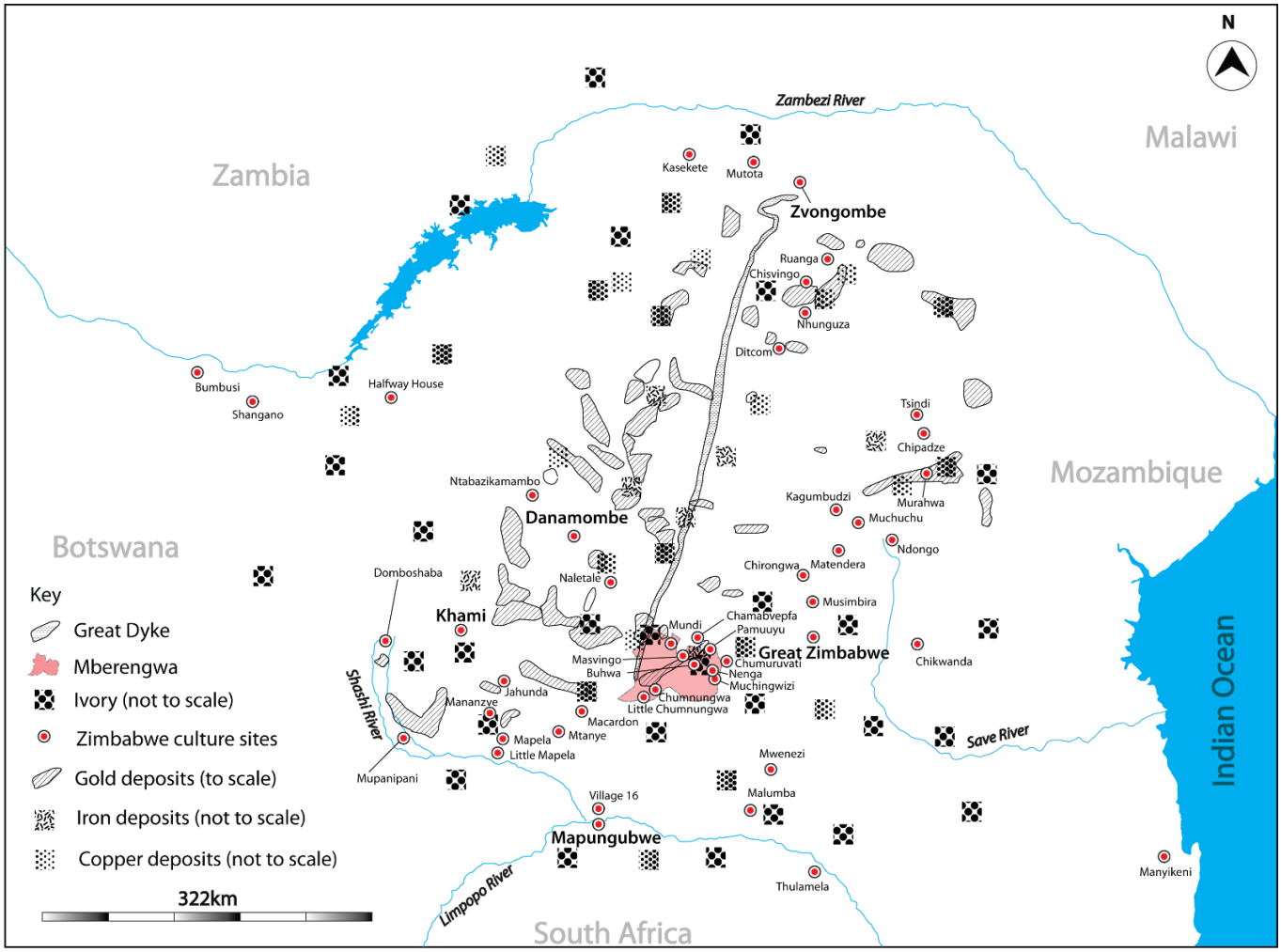



**Figure 1.** A portion of southern Zambezia—the landscape drained by the Zambezi and Limpopo Rivers. Highlighted is Mberengwa and the other gold-belt territories where gold and other key resources were alluded to have been procured by elites who resided in the Zimbabwe culture capitals.

## 2. Situating the Mberengwa Gold-Belt Territory

Mberengwa is positioned within a biophysical landscape that merges parts of the south-central Zimbabwean Middleveld and Lowveld regions (Figure 2). This gold-belt territory is geographically bordered by a network of ephemeral and intermittent rivers. Runde is the largest, followed by Ngezi River, which flows south-eastwards. The southern escarpment of Mberengwa is dissected by the Mwenezi River, which rises from eastern parts of Insiza and flows south-eastwards into the Chegato area before it merges with the Limpopo, one of the major tributary rivers flowing into the Indian Ocean. The slopes on the western edges of the Doro Range give rise to the Bubi and Bembezi Rivers, and these respectively flow southwards into the Limpopo and Umzingwane Rivers. Generally, it is during the wet season when the landscape of Mberengwa is well watered. However, as the dry season escalates, most of the rivers cease to flow [50–56].

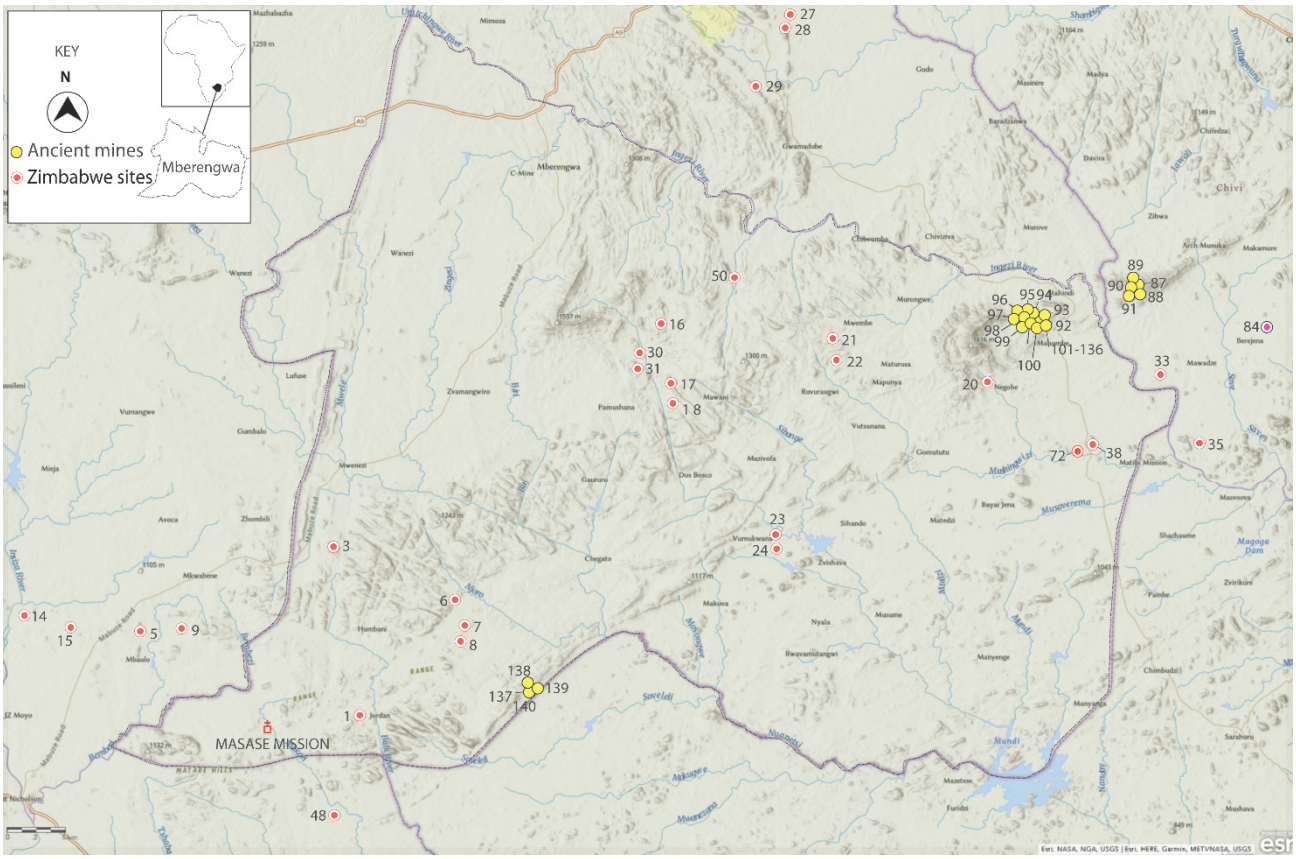



**Figure 2.** Distribution of some Zimbabwe tradition sites and ancient mines in and around Mberengwa.

The geology of the greater part of the Mberengwa landscape is made up of granitic and gneiss undulating surfaces that are intercepted by isolated batholiths and kopjes (Figure 3). These granite and gneiss rocks surround most of the schist belts, such as the Mweza, Doro, Buhwa, and Mberengwa ranges, and, in some instances, they have minor intrusions of dolerites and gabbro outcrops that are rich in copper, nickel, and titanium [50–52]. The landscape is also made up of the Mberengwa, Buhwa, and Mweza greenstone belts, which form the southern limit of the Zimbabwean Archean craton (Figure 3). These interlayered greenstone belts comprise a succession of ultramafic schists and sedimentary rocks, whose lithostratigraphic sequences date to the Sebakwian (2.35 Ga), Shamvaian (2.65 Ga), and Bulawayan (Upper section = 2.7 Ga/Lower section = 2.9 Ga) eras of the Early Precambrian [52,53,55]. Ultramafic rocks dominate the geology of the greenstone belts, and these metamorphosed rocks, which comprise emerald, pollucite, uranium, thorium, and feldspar, are locally classified under the Sebakwian and Bulawayan groups [52,55]. Similarly, the Mberengwa, Buhwa, and Mweza greenstone belts have segments of metavolcanic rocks with intercalated metasediments—namely molybdenum, beryl, tantalite, columbite, and lithium, which date to the Shamvaian, Sebakwian, and Bulawayan eras [52,53,55]. These are followed by metasediments that are richly embedded with a range of minerals such as gold, silver, iron ore, copper, lead, zinc, and magnesite. These are prevalent on Mt Mberengwa, Mt Buhwa, the Mweza Range, and the Musume area, but they are also readily available in the nearby Gwanda (Vubachikwe, Colleen Bawn) and Insiza (Filabusi) Districts (Figure 3).

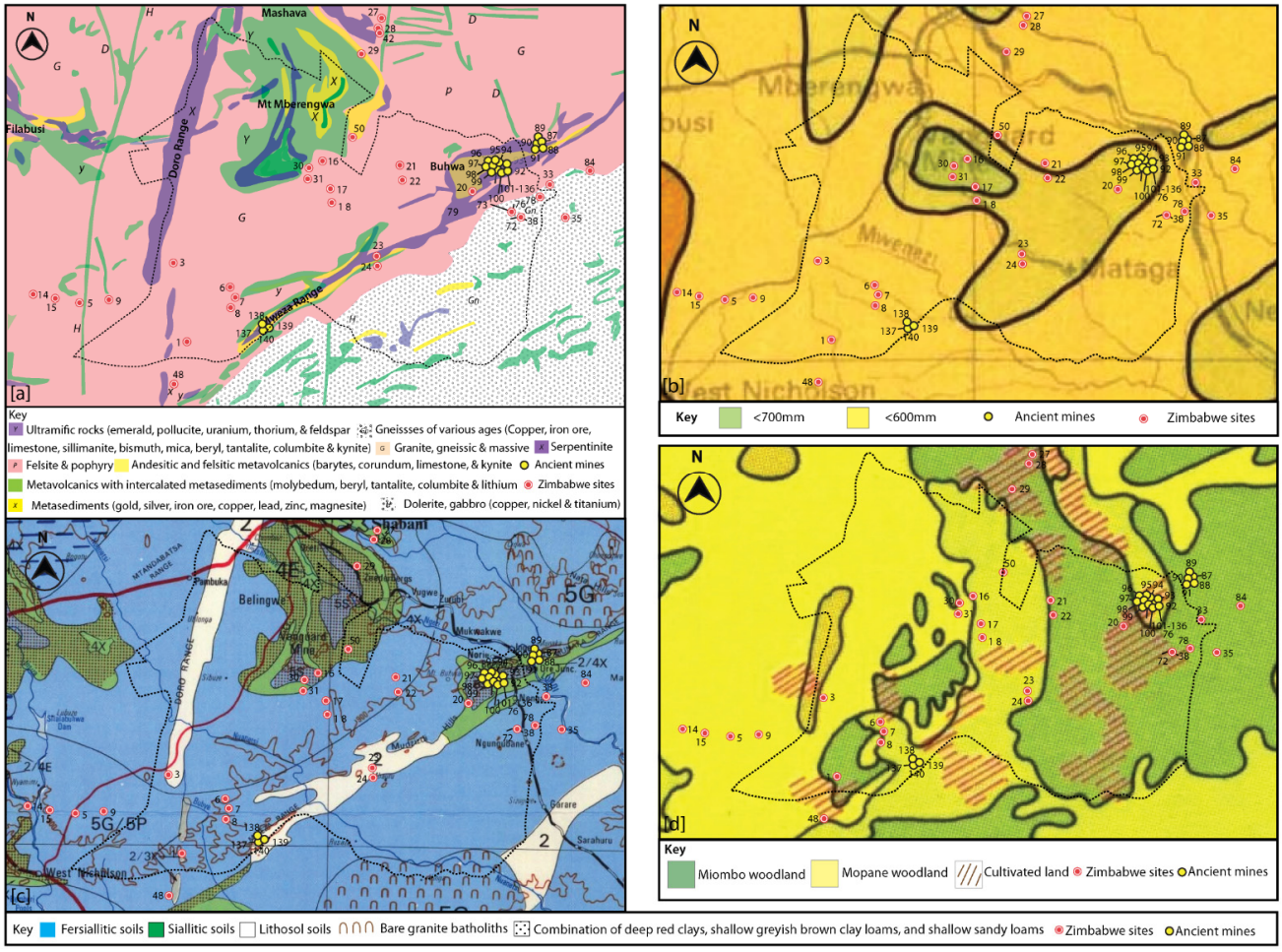



**Figure 3.** Bio-physiographic maps of the landscape in and around Mberengwa showing the distribution of Zimbabwe tradition sites and ancient mines in relation to the (**a**) geology (adapted from [55]); (**b**) mean annual rainfall patterns (adapted from [56]); (**c**) soil classes (adapted from [57]); and (**d**) vegetation types (adapted from [58]).

The andesitic and felsitic metavolcanics rocks, which comprised barytes, pyrite, corundum, limestone, and kyanite, are more prevalent on the Mberengwa greenstone belt, while the banded ironstone with alternating stratigraphical layers of hematite and quartz are more pronounced on Mt Buhwa [51]. Locally, Mberengwa is the largest greenstone belt; it has an approximate width of 30 km and a length of 70 km, and, so far, it is the most well-studied and best-preserved greenstone belt of the late Archaean era [50–54]. The Mweza-greenstone belt—mostly renowned for its Sandawana emerald deposit—is situated on the southern end of the Mweza range (Figure 3). The Doro Range on the western end of the Mberengwa landscape is largely made up of serpentinites, dolerites, and pyroxenites, which are silicified to different degrees (Figure 3). These rocks, which form a linear geological intrusion that dissects the Mberengwa landscape in a north to south orientation, are rich in chromite, asbestos, and magnesite. The Doro Range is part of the Wedza chamber that forms the southern limit of the renowned Great Dyke of Zimbabwe—the world's longest narrow strip of ultramafic and mafic rocks [52–55]. The age of the Great Dyke is approximated by geologists to be 2.5 billion years [53]; it was first reported to the international community in 1867 by Karl Mauch, one of the earliest German geologists who explored the landscape of southern Africa in the 19th century [59].

The major parts of the Mberengwa Middleveld and Lowveld landscapes have a mixture of sandy loams and sandy clay loams whose color ranges from brown to reddish-brown (Figure 3). Elevated places such as Mt Mberengwa and Mt Buhwa have a layering

of moderately shallow to moderately deep reddish-brown and greyish brown soils, which were formed out of the metasediments and some metavolcanic rocks that make up the geology of these two mountains; however, Mt Mberengwa is dominated by shallow to moderately shallow brown, reddish-brown clays formed from mafic rocks [60–62]. The soils on the Mweza and Doro Ranges are predominantly shallow, and their depth is less than 25 cm (Figure 3).

The climate of Mberengwa is mainly regulated by seasonal movements of the Intertropical Convergence Zone (ICTZ), which influences the landscape to be predominantly characterized by warm wet summers and cold dry winters [62–67]. Maximum temperatures are usually experienced during the summer, particularly in the Lowveld section of Mberengwa, where the highest readings can reach up to 30 °C. Rainfall is relatively seasonal; the bulk of it is received during November and April; this period marks the fluorescence of the wet season when most of the domesticated crops are cultivated [65]. The Middleveld portions of Mberengwa receive much of the rainfall, and recorded totals range between 450 and 600 mm, while those from the Lowveld areas do not exceed 400 mm (Figure 3). However, in some instances, the Mberengwa landscape experiences acute dry spells during the driest months and periodic droughts every five or two years [63,65,66,68].

The vegetation of Mberengwa is dominated by indigenous savanna grasses, shrubs, and tree species widely known as Miombo and Mopane woodlands. The Miombo woodlands are made up of drought-deciduous, semi-evergreen, and semi-deciduous miombo species, (Figure 3), which are largely distributed within the elevated parts of Mberengwa where the bulk of the rainfall is received [67,69,70]. The Mopane woodlands populate most parts of the Mberengwa Lowveld, where most mopane species have successfully adapted to the dry conditions; however, these are usually infested with tsetse flies (*Glossina* spp.) [13–15,69,71]. As elsewhere, the local vegetation has had a bearing on the animal species that inhabit the Mberengwa landscape. Before the advent of commercial farming, mining, the creation of the Tribal Trust Lands (TTLs), and other colonial projects that deforested the area and pushed away most of the animal species in the late 19th and early 20th centuries, historical records of early European travelers, hunters, and prospectors that roamed the Mberengwa during the pre-colonial era show that the landscape was rich in wildlife [35,36,59,63,72]. Nevertheless, most of these species still inhabit the Mberengwa landscape, particularly in the neighboring wildlife ranches such as the Nuanetsi Game Ranch, Bubye Valley Conservancy, and the Bubiana Wildlife Area [20,73–76].

As demonstrated by the bio-physiographical data, Mberengwa is exceptionally endowed with huge deposits of minerals. Aside from mineral wealth, the landscape hosts rich biodiversity and a network of rivers that intersects the southern Zambezian Middleveld and Lowveld regions into the Indian Ocean. Such diversity of natural resources makes the landscape an ecological niche optimal for cattle production, mining, craft production, trading, and much more. Therefore, it is possible that the Iron Age societies who inhabited this gold-belt territory used the local resources to enhance their livelihoods, perhaps in a different way than we currently envision. This raises the need to revisit their material residues.

## 3. Materials and Methods

Datasets informing this study were largely drawn from the archaeology of Zimbabwe tradition societies that lived in ancient Mberengwa, including the history and anthropology of their Shona descendants who largely occupy most parts of southern Zambezia. Published and unpublished reports of surveys and excavations undertaken in the last century by both professional and amateur archaeologists largely informed the archaeology. However, for ground truthing purposes and augmenting the irregularities in the existing spatial and material culture datasets, we also carried out our own fieldwork. This included inter and intra-site surveys, which we executed instantaneously using a combination of satellite imagery (Google Earth Pro and Esri's web-based ArcGIS Online), and pedestrian and vehicular surveys to map the sites (and their surface deposits) and plot their distribution and catchment areas in relation to the geology, climate, soils, and vegetation cover of

Mberengwa (Figure 3). We also inventoried relevant archaeological finds that were recovered by the previous excavators. This included excavation data from recent fieldwork at Chumnungwa (see [77]), which provided additional insights into the settlement history and technological aspects. Generally, the archaeological data were useful in the reconstruction of the land use behaviors of the Zimbabwe people across the sites and the broader surrounding landscapes. However, because of the legacy of colonial and postcolonial vandalism that resulted in the partial and complete destruction of some sites by mining corporations, land developers, local villagers, artisanal miners, treasure hunters, and antiquarians who unscientifically dug sections of these places in search of gold and other valuable finds (see [36,38,77,78]) (as well as massive post-depositional processes mainly characterized by soil erosion and the intrusion of modern settlements and crop farming into some of the archaeological landscapes), it was difficult to achieve this. Therefore, recourse was made to Shona anthropology (i.e., [79–90]) and history [31,91–95] to make meaningful inferences that are conversant with the local epistemologies, ontologies, and practices of land use. As such, the next section explores the archaeology of Zimbabwe tradition societies that inhabited ancient Mberengwa.

## 4. Results: Traces of the Archaeological Imprint of the Zimbabwe Tradition Societies on the Mberengwa Landscape

A review of the existing archaeological data on surveys and excavations undertaken in Mberengwa exposed numerous Zimbabwe tradition sites with hordes of material residues (Figure 2). These included dry-stone walling, *dhaka* (adobe/clay) house floors, grain bin foundations, livestock kraals with vitrified dung, burials, furnace precincts, ashy middens with dense scatters of pottery, bone fragments, metals, slag residues, dolly holes, and many other traces of human modifications that were imprinted on the broader landscape (see Tables 1 and 2).

### *4.1. Dry-Stone Architecture*

As demonstrated in Table 1, more than 30 Zimbabwe tradition sites were recorded with drystone architecture that comprised occasional revetment platforms and free-standing walled enclosures. Based on the spatial data we gathered so far, Chumnungwa stands out as the largest of them all.

As highlighted in Table 1, it is evident that the bulk of the stone walls were constructed using a combination of undressed and dressed stone blocks sourced from granite and dolerite. However, granite seems to have been the predominant raw material. A combination of architectural styles equivalent to Whitty's [104] were recorded at multiple sites (Table 1). These ranged from P and R-type walls, which are mainly characterized by stone blocks with irregular shapes and sizes, to Q-type coursed walling built with dressed stone blocks, which are more regular and cube-shaped. In some cases, it was evident that the architects used small wedges to buttress the walls, but, in most cases, most walls were abutted to natural rock boulders (Figure 4). Thus, the picture portrayed at most sites was more of an architectural trajectory that combined most of the walling styles even in one wall rather than separately employing them. In addition, most of the Zimbabwe sites in Mberengwa have residues of both rounded and squared entrances, some with dolerite lintel stone slabs (Figure 4). More importantly, sites such as Chumnungwa have remnants of a conical buttress with steps that give a good commanding view of the surrounding area (Figure 4). A basic analysis of the contemporaneity of the dry stonewalling at Chumnungwa shows that most of the sections, particularly those encircling the summit of the hill might have been sequentially constructed together first, followed by the inner walls that divided the open space on the summit into various enclosures and platforms (Figure 4). As highlighted in Table 1, the walling at most sites was decorated with herringbone designs, followed by check motifs, cords, chevron, and chessboard patterns. Kongezi stands out as the only site with all the designs (Figure 4).

**Table 1.** Inventory of archaeological finds that were recorded at Zimbabwe tradition sites in Mberengwa.

| Site | *Dhaka* Floors and Walls | Dry Stone Walling | | | | | | | Grain Bins | Livestock Kraals | Dolly Holes | Burials | Furnaces, Middens, and Other 'Everyday' Objects | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Cs | H | Cv | Ck | Cc | Fs | Re | | | | | Sl | T | Ch | Df | Wf | Cl | So | L | F | Cr | B | G | C | I | S | P | Sp | Wb |
| Chumnungwa | X | | | X | | | X | | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X | X |
| Little Buhwa | | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | |
| 2030:CB18 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| 2030:CB20 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| 2030:CB21 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| 2030:CB26 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| Pamuuyu | | | | | | | X | | | | | | | | | | | | | | | | | | | | | X | | |
| Mundi/ Mupandashango | X | | | | X | | X | | | | | X | X | X | X | | | X | X | X | X | X | | X | X | X | | X | | X |
| Nenga | X | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | |
| 2030:CB55 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| 2030:CB56 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| 2030:CB57 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| Mutabvuri Homestead | X | | | | | | X | X | | | X | | | | | | | | | | | | | | | | | X | | |
| Kongezi | X | X | X | X | X | X | X | | X | | | | | | | | | | | | | | | X | X | | | X | | |
| 2030:CB52 | X | | | | | | | | | | | | | | | | | | | | | | | | | | | X | | |
| Gorongwe | | | | | | X | X | X | | | | | X | | | | | | | | X | X | | X | X | | | X | | |
| Little Gorongwe | | | | | | | | | | | | | X | | | | | | | | | | | X | | | | | | |
| Biri | X | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | |
| Chipukuswi | X | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | |
| Tokwe River | X | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | |
| Mpopoti | X | | X | | X | | X | | | | | X | X | | | | | | | | | X | | X | X | | | X | | |
| Ensindi 2/Hollins Block 2 | X | | X | | | | X | X | | | | | | | | | | | | | | | | | | | | | | |
| Sabafu | X | | | | X | | X | X | | | | | | | | | | | | | | | | | | | | | | |
| Zumnungwe | X | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | |
| Watoba | X | | | | | | X | | | | | | | | | | | | | | | | | X | X | | | X | | |
| Isinknombo | X | | | | | | X | | X | X | X | X | | X | X | X | | | | | | X | | X | X | | | X | | |
| Gombo's 1 | X | | | | | | X | | | | | | X | | | | | | | | | | | X | | | | X | | |
| Gombo's 2 | X | | | | | | X | | | | | | X | X | X | | | | | | | | | X | X | | | X | | |
| Molindula | X | | | | | | X | | | | | | | | X | | | | | | | | | X | | | | X | | |
| Ruins [1] (Unnamed) | X | | X | | | | X | | | | | X | | | | | | | | | | | | X | X | X | | | | |
| Ruins [2] (Unnamed) | X | | X | | | | X | | | | | | | | | | | | | | | | | X | | | | X | | |
| Ruins [3] (Unnamed) | X | | X | | | | X | | | | | | | | | | | | | | | | | X | | | | X | | |
| Ihurzi | X | | X | | | | X | | | | | | | | | | | | | | | | | X | X | | | X | | |
| Sesinga | X | | | | | | X | | | | | | | | | | | | | | | | | X | | | | X | | |
| Mwenezi | X | | | | X | | X | | | | | | | | | | | | | | | | | X | X | | | X | | |
| Little Mwenezi | X | | | | | | X | | | | | | | | | | | | | | | | | | | | | | | |
| Escep(g)we | X | | | | | | X | | X | X | X | | | | | | | | | | X | | | X | X | X | | X | | |
| Little Escep(g)we | X | | | | X | | X | | | | | | X | X | | | | | | | | | | | | X | | | | |

Poor-Coursed Walling

i.e., Mundi, Nenga, Chumnungwa, Gorongwe, Biri

Poor-Quality Coursed Walling

i.e., Nenga, Mwenezi, Mutabvuri, homestead, Chumnungwa, Pamuuyu

Quality Coursed Walling

i.e., Kongezi, Chumnungwa, Mundi, Nenga, Sesinga, Mwenezi, Little Gorongwe

Rough Coursed Walling

i.e., Pamuuyu, Chumnungwa, Mutabvuri homestead, Kongezi

Key: I = iron, C = copper, G = gold, B = bronze, Cr = crucibles, So = soapstone, Df = domestic fauna, Wf = wild fauna, Cl = clay figurines, Ch = charcoal, T = tuyeres, Sl = slag, F = furnaces, Cs = chessboard, H = herringbone, Cv = chevron, Ck = check, Cc = cord, L = lithics, S = shell beads, P = pottery, Sp = spindle whorls, Wb = worked bone, Fs = free standing, Re = retaining (adapted from [35,36,38,40,77,93,96–102]).

**Table 2.** The range of domestic and wildlife species represented by faunal remains that were recovered at Chumnungwa. Their feeding habits and habitat preferences are also highlighted (adapted from Ref. [75,76,103]).

| Taxon | Common Name | Type | NISP | MNI | Feeding Habit | Habitat |
|---|---|---|---|---|---|---|
| Domesticated | | | | | | |
| *Ovis/Capra* | Sheep/goat | Mammal | 13 | 7 | Herbivore | Savanna grasslands |
| *Bos taurus* | Cattle | Mammal | 66 | 30 | Herbivore | Savanna grasslands |
| Gathered | | | | | | |
| *Achatina sp.* | Land snail | Mollusca | 25 | 6 | Herbivore | Warm and moist environment |
| *Stigmochelys pardallis* | Leopard tortoise | Reptile | 26 | 7 | Herbivore | Savanna grasslands, kopjes, valleys |
| Snared | | | | | | |
| *Procavia capensis* | Rock hyrax | Mammal | 5 | 4 | Omnivore | Dry savanna grasslands with kopjes for shelter |
| *Heterohyrax* | Yellow-spotted rock hyrax | Mammal | 2 | 1 | Omnivore | Dry savanna grasslands with kopjes for shelter |
| *Aethomys chrysophilus* | *Red veld rat* | Mammal | 16 | 2 | Herbivore/Omnivore | Open dry savanna grasslands and woodland areas |
| Hunted | | | | | | |
| *Connochaetes* | Wildebeest | Mammal | 4 | 4 | Herbivore | Open dry savanna grasslands and woodland areas |
| *Syncerus caffer* | Buffalo | Mammal | 18 | 10 | Herbivore | Open dry savanna grasslands and woodland areas |
| *Hippotragus niger* | Sable | Mammal | 28 | 12 | Herbivore | Open dry savanna grasslands and woodland areas, near water sources |
| *Aespyceros meumpus* | Impala | Mammal | 3 | 3 | Herbivore | Open savanna woodland and grassland areas |
| *Taurotragus oryx* | Eland | Mammal | 3 | 3 | Herbivore | Semi-arid areas with shrub-like bushes/Savanna grasslands |
| *Kobusellipsiprymnus* | Waterbuck | Mammal | 2 | 2 | Herbivore | Open savanna woodland and grassland areas |
| *Tragelaphus strepsiceros* | Kudu | Mammal | 12 | 7 | Browser | Dense bush, light forest, and hilly areas |
| *Orycteropus afer* | Aardvark | Mammal | 1 | 1 | Omnivore | Open savanna woodland and grassland areas |
| *Raphicerus campestris* | Steenbok | Mammal | 1 | 1 | Browser | Open savanna grasslands and all other environments except rainforests and arid landscapes |

### *4.2. Ancient Mines, Furnaces, Dolly Holes, Burials, and Middens*

The archaeological footprint of the Zimbabwe people in ancient Mberengwa is further demonstrated by residues of metal-smelting furnaces, oval-shaped *dolly* holes, human burials, refuse middens, and ancient mines that were recorded at several sites dotted across the landscape (Table 1). Summers [39] recorded more than 75 ancient mines that were used for mining iron, copper, and gold (Figure 3). Three of these were alluvial gold panning sites situated at the confluence of Ngezi and Runde Rivers. The remainder were open mines largely characterized by shafts and soil mounds that were heavily eroded. Associated material culture recorded at R2880 and the other mines included human remains, dolly holes, a bowl, and a smoking pipe, both made of soapstone, and pieces of Zimbabwe pottery that were regularly designed with beaded rims and triangle decoration motifs on their shoulders [36,39,77]. Remnants of clay furnaces, including tuyeres, crucibles, ore, charcoal, and numerous slag nodules and pellets, were found scattered in open spaces both in the walled and unwalled spaces of most sites [35,36,39,77]. Hall and Neal [36] chronicled five open-bowl-shaped furnaces they documented in situ in a semi-complete state at Mundi and others consisting of a pit and very low wall above the ground at Gorongwe and Escep(g)we. As denoted by the pair, the furnaces at Mundi were built into two rows, approximately 90 cm from each other, and the depth of their bases and diameters ranged up to 30 cm. Some of the delict fragments of the furnaces had wood impressions, including the air combustion clay-molded tuyeres whose length and diameter roughly spanned 25 cm and 7 cm, respectively [36]. Many of these crucibles were clay-pot shaped, and these were thickly attached with gold flux, including those we recovered at Chumnungwa (Figure 5). Some recorded at Mundi had visible impressions of a tong that was used to take them out of a furnace, and their diameter ranged from 5 to 8 cm [36]. However, at most sites, slag (Figure 5) and other oxide waste products formed bulky of the smelting debris [36,39,77].


**Figure 4.** (**1**) Dry stone walling at Kongezi showing a rounded entrance and designs of herringbone, check, cord, chevron, and chessboard patterns. (**2**) Remnants of a squared entrance with dolerite lintel stone slabs recorded at Chumnungwa. (**3**) Remnants of a conical buttress with steps recorded at Chumnungwa. (**4**) The main free-standing walls encircling the northern end of Chumnungwa hill summit. (**5**) Part of the walling recorded at the Mutabvuri homestead.

**Figure 5.** Some of the crafts and import objects that were recovered from Zimbabwe tradition sites in Mberengwa. 1 = soapstone slab, 2 = soapstone bead, 3–4 = Zimbabwe tradition pottery sherds, 5 = bone whistle, 6 = clay gold bead mold, 7–8 = clay figurines, 9–10 = spindle whorls, 11–16 = lithics, 17 = soapstone bowl (originally from Great Zimbabwe; typical bowls were recovered at Chumnungwa and Mundi), 18–20 = shell beads, 21–24 = glass beads, 25 = bronze wire bangle with hollow bone core, 26, 28 = cuprous wound wire, 27 = *Mbira* iron key, 29–31 = slag, 32 = clay (pot) lid, 33, 38, 39 = iron hoe heads, 34, clay bowl, 35 = copper X-shaped ingot, 36 = double iron gong (originally from Great Zimbabwe; a similar gong was recovered at Chumnungwa), 37 = bronze wound bangle with a fiber core, 40 = iron arrowhead fragment, 41–42 = bronze wound wire bangles, 43 = dice, 44 = bronze bangle fragment with herringbone pattern, 45 = soapstone hammer (adapted from [35,36,38,77,105]).

More than 15 burials, including males and females, were recorded at numerous sites, accompanied by a wide array of grave goods that were mostly made from gold (Table 1). Individuals were mostly buried on either their right or left side, including a juvenile recorded at Chumnungwa [36]. Part of the grave goods included an iron gong, copper X-shaped ingot, soapstone bowls decorated with herringbone designs, pottery, gold wires, gold bangles (some decorated with chevron designs), iron bangles, foiled gold, a gold rosette with a sun image, gold dust, gold tacks, gold nails, gold hammers, and gold beads, which varied in size (Figure 5). The gold beads recorded were either diamond or spherical shaped, while others were decorated with chevron designs. As noted by [36], gold bead necklaces dominated in most burials, and at Mundi, for instance, they recovered 6.52 kg of gold objects (Figure 6). Similar gold objects were recovered from the ashy middens that were excavated and surface collected at these Zimbabwe sites dotted across the Mberengwa landscape (Table 1).

**Figure 6.** Remnants of gold objects that were looted at Mundi by the Rhodesia Ancient Ruins Company [36] (pp. 94–250), and dolly holes that we recorded near the Mutabvuri homestead in Mberengwa.

Other utilitarian and non-utilitarian objects made from a range of raw materials, including glass, shell, animal bone, and stone, were also recovered as garbage remains. Among these included lithics, charcoal, spindle whorl disc fragments, bone whistle, clay bead mould, dice, shell beads, glass beads, soapstone bead, bronze wire bangles, iron arrowheads, iron hoe heads, thumb-piano (*mbira*) key, and cuprous wires (see Figure 5). Domestic and wildlife fauna was also recovered in these middens, which depicted a range of browsers, grazers, herbivore, and omnivores species (Table 2).

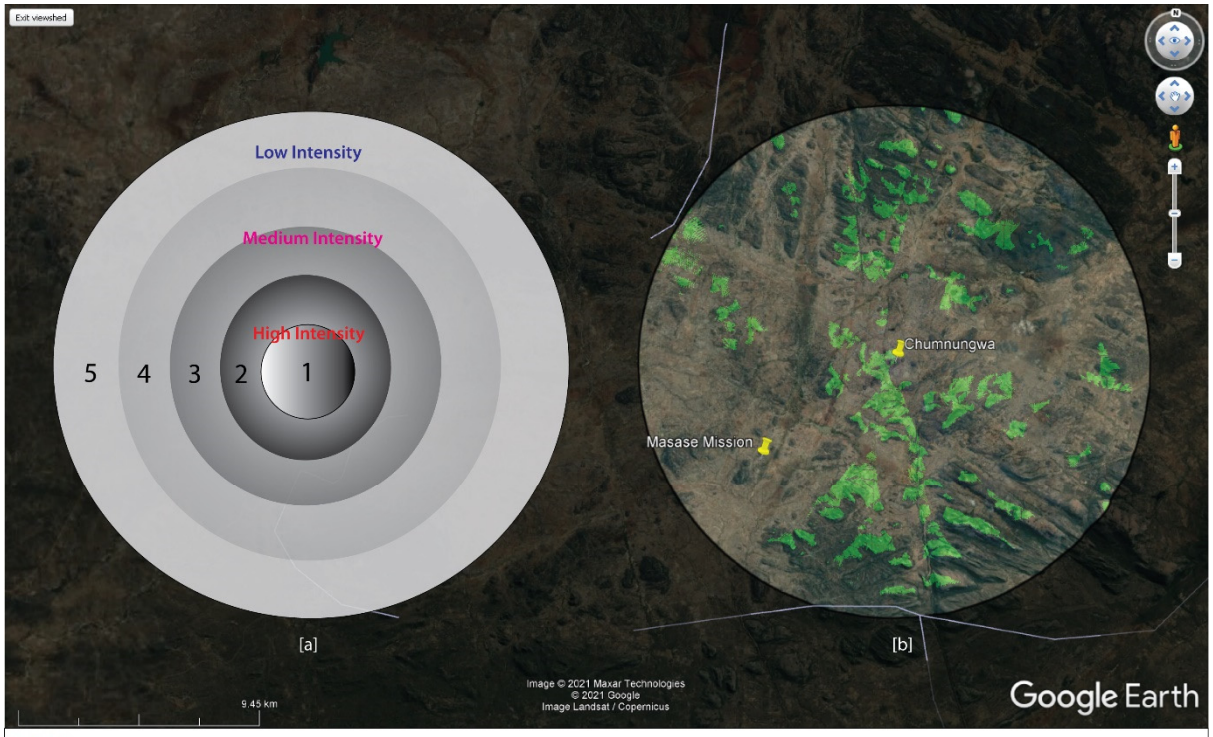
### *4.3. Houses, Grain Bins, and Kraals*

Remnants of houses and grain bins made from *dhaka* were recorded within the walled and unwalled areas of most Zimbabwe tradition sites (see Table 1). We know from the historical record that many of these structures were destroyed by antiquarians and treasure hunters as they searched for gold, and the other 'treasures' [36]. In addition, site formation processes, including burrowing, also contributed to their demolition. Nevertheless, the recent excavations at Chumnungwa exposed grain bin foundations, house rubble, and cross-sections of *dhaka* house floors that were reinforced with a gravel foundation and red-brown soil (Figure 7). Two livestock kraals (enclosures, pens, or byres) with huge accumulations of vitrified dung were also recorded onsite. The smaller one was situated on the northern end of the hill summit, while the larger one was positioned on a plain that stretched from the northern end of the foothill to the north-western end (Figure 7).


**Figure 7.** (**a**) Section of large kraal with vitrified dung situated on the northern end of Chumnungwa foothill, (**b**) *dhaka* fragments of housing recorded at Chumnungwa, (**c**) large ashy midden with visible scatters of potsherds, slag, bone, and charcoal spread on the south-eastern section of the Chumnungwa hilltop, (**d**) remnants of a grain bin foundation recorded at Chumnungwa.

## 5. Discussion: Modelling the Land Use Practices of the Zimbabwe Tradition Societies in Ancient Mberengwa, CE 1200–1700

The archaeological datasets presented in this study enabled us to untangle the intersections between the Zimbabwe tradition societies and ancient Mberengwa. Thus, based on their material residues, we can model the land use practices of this Later Iron Age culture, deciphering how they adapted this gold-belt territory to enhance their everyday life and the implications of such alterations to the physical environment. The wide presence of stone-walled and unwalled homesteads with dense scatters of *dhaka* house remains, grain bin foundations, livestock pens, ashy middens, and many other traces of household refuse within a 0–0.50 km radius at most sites demonstrate that the Mberengwa landscape was mainly used for settlement purposes (Figure 8).




ZONE 1 (0-0.50km) = settlement, livestock penning, grain storage, craft production, family and community rituals (i.e rain imploring ceremonies - mukwerera), burials, recreation, and sourcing of raw materials for constructing settlement infrastructure (i.e., gravel, granite, dolerite).
ZONE 2 (0.50-2km) = crop cultivation, sourcing of raw materials for crafting and construction of settlement infrastructure (i.e., clay, thatching grass, freshwater mussel shell, granite, dolerite, and gravel), livestock pasturage, firewood, snaring, foraging (wild vegetables, edible insects, herbs, and fruits), and water sourcing.
ZONE 3 (2-5km) = livestock pasturage, mining, hunting, foraging, snaring, firewood, sourcing of raw materials for crafting and construction of settlement infrastructure (i.e., timber, ostrich eggshells, red ochre, graphite, soapstone, chert, quartz, gold, copper, and iron ore).
ZONE 4 (5-10km) = mining, hunting, foraging, snaring, livestock pasturage, sourcing of raw materials for craft production, and community rituals.
ZONE 5 (10-30km) = community rituals, mining, foraging, hunting, snaring, livestock pasturage (transhumance), and sourcing raw materials for craft production.

**Figure 8.** (**a**) Mixed land use categories within a 30-km radius modelled at the Zimbabwe sites in Mberengwa using a combination of archaeological, anthropological, and historical datasets (see Appendix A) (after [8,9]). (**b**) Catchment area (green sheds) of Chumnungwa within a 10-km radius (modelled using Google Earth Pro Viewshed 360-degree view).

Based on the survey data (Table 1), it appears that both walled and unwalled settlements were widely established across the Mberengwa landscape. However, many of the visible settlements are those associated with families or individuals who had the wealth and means to construct homesteads (*misha*) with monumental architecture on the summits and precipices of granitic kopjes protruding from intrusive igneous rock formations, such as Gomututu and Domboshoko. However, Mt Mberengwa, Mt Buhwa, and the other hill summits with an altitude exceeding 1500 mm (Figure 2) appear to have been avoided for settlement, perhaps due to their frequent exposure to low temperatures and excessive rainfall during the dry and wet seasons.

Upon the habitable kopjes, the Zimbabwe societies constructed *dhaka* houses (*dzimba*) that were encircled and detached by a series of dry stone-walled enclosures that were abutted and reinforced with natural rock boulders. In some instances, gigantic trees such as the *Adansonia digitata* at the Pamuuyu settlement also adjoined and buttressed some of the walls. Millions of stone blocks used to construct these walls were likely to have been sourced from the protruding granitic rock outcrops that are abundantly present at most settlements (see Figure 3) and the surrounding kopjes. Otherwise, sourcing them from distant areas elsewhere could have been laborious and time-consuming for the stonemasons to transport them back to the settlements. In addition, as demonstrated in Figure 4, most of the stone blocks used to construct walling at Chumnungwa, and the

other architecturally related *madzimbahwe*, have layered veins, which shows that they were quarried using both the natural and artificial exfoliation methods (sensu [104]). Historically, the artificial exfoliation technique was commonly used by the ancient Shona; stonemasons are said to have set a fire on granite rock outcrops, and upon gaining enormous heat, these outcrops were cooled down using water to fracture them (see [98,104–106]). Naturally, the same process might have been enabled by mechanical weathering, in which sheets of granite were detached from their parent outcrop from continued heating and cooling from the sun and frost, respectively (sensu [98]). Repetition of these processes possibly helped in dislodging the top layer of the outcrops from the parent rocks. Thereafter, sheets of the outcrops were broken into sizeable dressed or undressed blocks by specialist masons (sensu [98,105]). Thus, the granite and dolerite blocks on the walling of Nenga, and other settlements such as the Mutabvuri Homestead, are likely to have been made using these processes, especially artificial exfoliation since the method is faster and more effective. Regionally, this method is renowned to have been used by the stonemasons who constructed walling at Great Zimbabwe and many other Zimbabwe culture sites spread across southern Zambezia (see [98,104,105]). Besides, architectural data from Chumnungwa walling (Figure 9) revealed numerous stages of construction, restoration, and alteration. There is a possibility that the outer walls were constructed first as security barriers to control access to these hilltop settlements, followed by the inner walls that divided the open spaces that were encircled by the earlier walls.

Visibility data modelled at Chumnungwa using Google Earth Pro Viewshed (Figure 8) also show that the hilltop settlements offered a 360-degree strategic wider view of the surrounding landscape, and they secured their dwellers from dangerous wild animals, potential raiders, and dense vegetation that attracted tsetse flies and other parasites harmful to livestock and humans. Aside from security purposes, these elevated granitic kopjes were possibly chosen for habitation, figurative of the social status of those who controlled socio-political power [86,105–109]. Nevertheless, settling in these elevated places would also have come with a price, as lots of labor and resources were required to make them more habitable and navigable, especially when transporting building materials such as gravel, *dhaka*, timber, thatching grass, and many other everyday necessities such as water and food.

Most of the Zimbabwe people likely inhabited unwalled settlements that were spread across the open flats and the adjacent plains currently inhabited and cultivated by the contemporary agropastoralists. Archaeologically, this is confirmed by the presence of *dhaka* house remains, ashy middens, grain bin foundations, at 2030:CB55, 2030:CB56, 2030:CB57, and many other unwalled settlements (*misha*) that were sparsely spread across the Mberengwa landscape. Nevertheless, survey data from Chumnungwa [77] also show that both the hilltop and foothill settlements could be occupied simultaneously. So far, Chumnungwa is the only Zimbabwe tradition site in the region with a securely dated $^{14}C$ chronology. As demonstrated in Figure 10, it appears that a wholly developed cultural entity of the Zimbabwe tradition first occupied the hilltop around CE 1298, and sometime around CE 1413, their settlements spread to the foothill. The same sequence of occupation might have unfolded at the neighbouring settlements, but this needs verification. Nonetheless, the available radiocarbon data from Chumnungwa clearly show the longevity of some Zimbabwe settlements to have spanned more than three centuries. Perhaps the long settlement history at Chumnungwa could be attributed to political stability and food security, among other contributors. However, there is a possibility that settlements could be relocated depending on the circumstances [31,63]. The move could be inspired by the need to secure fertile new farming land, and the abandoned settlements (*matongo*) usually remained unoccupied.

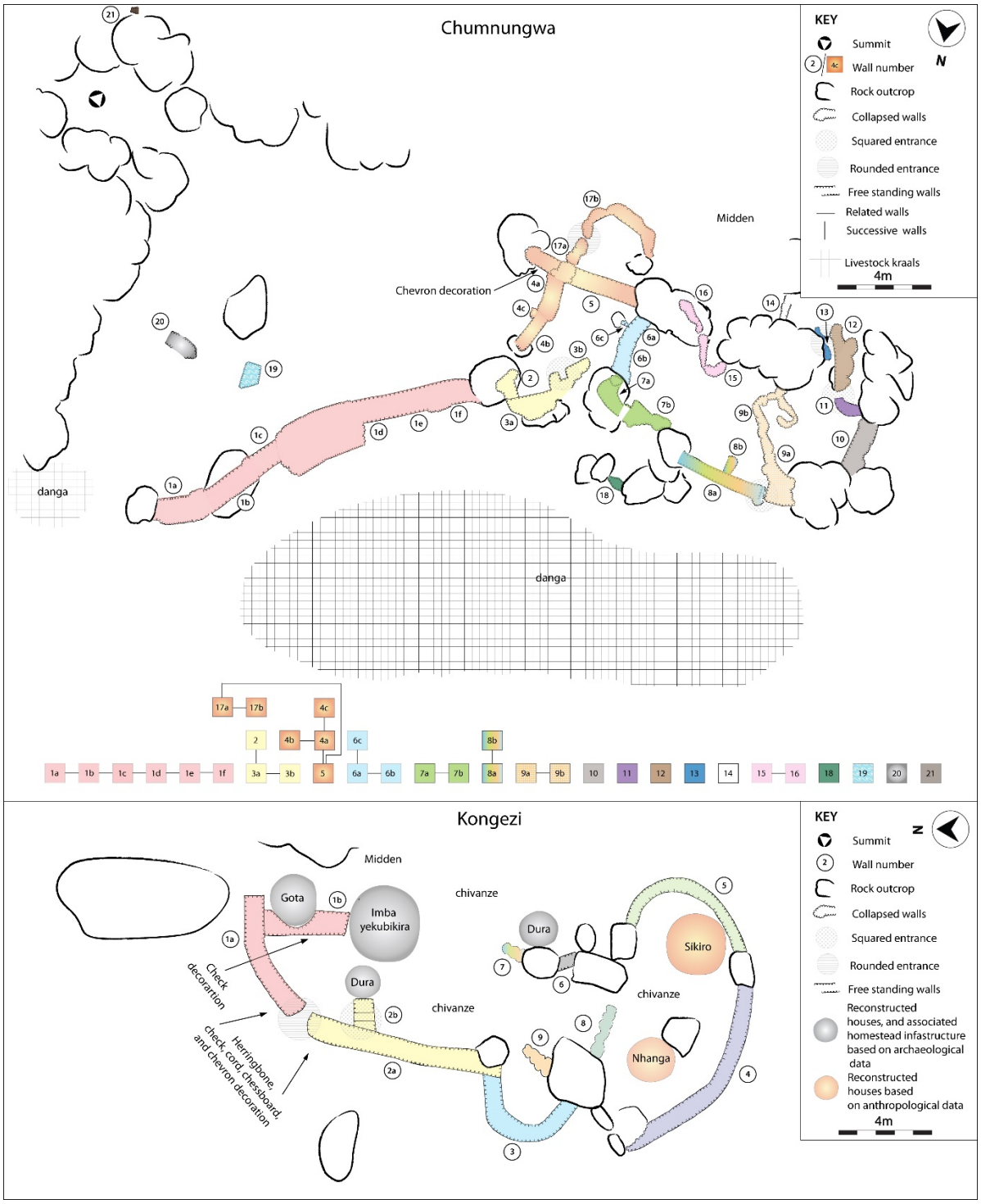



**Figure 9.** Above is the site map of Chumnungwa showing the construction affinity of the dry-stone walling modelled using Harris Matrix 2 and various features recorded onsite. Below is the site layout of Kongezi showing reconstructed houses and associated settlement infrastructure based on the archaeology, history, and anthropological datasets.

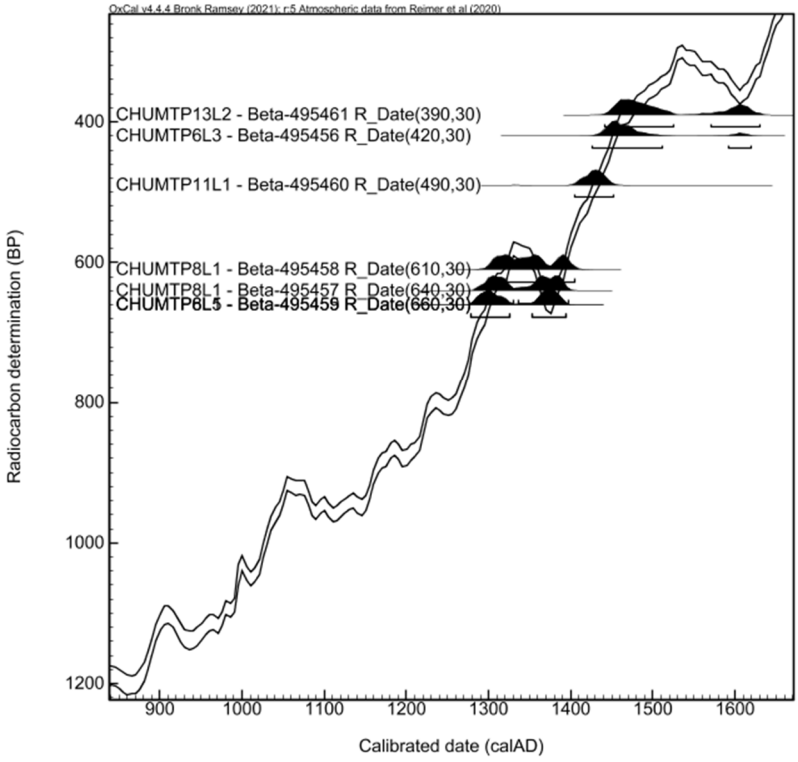



**Figure 10.** Calibrated $^{14}C$ dates of charcoal recovered from Chumnungwa.

The legacy of colonial and post-colonial vandalism at Iron Age sites in Mberengwa [77,78] inhibits the available data to comprehensively model how the Zimbabwe people living in ancient Mberengwa used space within their settlements. However, a reading of anthropological texts on settlement practices of their Shona progenies [35,66,79,81,83,87,88,109,110] suggests the spaces to have been used for accommodating houses (*dzimba*), granaries (*matura*), grinding stones (*huyo nemakuyo*), smelting precincts, and livestock pens (*matanga*). Archaeologically, these structures are embodied by the derelict *dhaka* house floors, grain bin foundations, furnaces with dense scatters of broken tuyeres, slag residues, and livestock pens with massive deposits of vitrified dung that were recorded at several Zimbabwe settlements (Table 1). In addition, as demonstrated at Kongezi (Figure 9), these spaces could be divided into several enclosures to create order.

For instance, sections of the open spaces at Nenga could probably have been used as middens where the inhabitants dumped their refuse. A similar practice is also suggested at Chumnungwa, where most of the excavated objects were uncovered from an artificial terrace midden (Figure 9). Likewise, as demonstrated by the housing remains at Kongezi and the other sites, most of the houses and grain bins were probably built in the format of rondavels with wood, grass, and *dhaka* (Figure 9).

Based on the presence of house floors, there is a possibility that most settlements had at least four rondavels, and their sizes and arrangement varied from one homestead to another. For a nuclear family, these included the sleeping quarters for the girls (*nhanga)*, boys (*gota*), and parents (*sikiro*), as well as the kitchen (*imba yekubikira*) (Figure 9). Kitchen rondavels were probably common at most settlements since each wife or mother in most Shona families has her own *imba yekubikira,* particularly those who are part of polygamous marriages (*zvipare*) [66,109,110]. More importantly, the kitchens likely served as the main spaces for food preparation and housed most of the kitchen utensils. There is a high probability that some of the kitchenware included the fragmented pottery vessels that were excavated at Chumnungwa (Figure 5). Moreover, every kitchen possibly had a hearth (*choto*) at the center that was used for cooking everyday meals. There is a possibility that, at times, the kitchen could be secondarily used as a venue for conducting family rituals

(*zvikaranga zvepamusha*) such as libations and sacrificial offerings (*mipiro*) to ensure the health and well-being of the family [66,79]. Usually, in such contexts, the head of the homestead knelt on a built-in earthenware platform (*chikuva*) and approached the supreme God (*Mwari*) via the family ancestors (*midzimu yomumusha*) [66]. In some contexts, the same kitchen was used to shelter some of the poultry overnight. One incident in the late 19th century was reported by Theodore Bent when he spent a night at the homestead of Chief Mugabe, one of the chieftaincies that surround Great Zimbabwe today. Bent reports having been allocated a kitchen rondavel to sleep in, which he shared with his wife, Mabel. In the same rondavel, there was also a stable (*chirugu*) for chickens (*huku*) [35] (p. 79).

*Matura* (*dura-singular*)—smaller rondavels represented by the *dhaka* floors recorded at Kongezi (Figure 9)—probably functioned as grain bins for storing surplus grain such as sorghum and millet, which was preserved for future consumption, particularly in times of drought (*shangwa*) (sensu [20,25,101]). There is a possibility that grain bins could at times be temporarily converted into sleeping quarters, especially when having too many visitors. Open spaces or the courtyards (*zvivanze*) probably served as common areas that were used for a range of activities (see Figure 9). This included the processing of cereals, washing, and sun-drying kitchen utensils, as well as various craft production activities such as shell bead making, basketry, metal smelting and smithing, potting, bone and soapstone carving, and fiber weaving [31,35,37,38,63,66,83,92,109,110]. Archaeological residues alluding to these crafting activities were recovered at numerous Zimbabwe settlements in Mberengwa, including Mundi, Nenga, Chumnungwa, and Chipukuswi. Among these included furnaces, gold bead molds, lithics, bone whistles, flow slag, clay spindle whorls, bronze wires, soapstone bowls, shell beads, and crucibles attached with gold droplets (Figure 5).

Other spaces within the common area probably included a court (*dare*) where men, and sometimes including elderly aunts (*madzitete*), gathered to strategize, make collective decisions, adjudicate disputes, and socialize [35,66,79,83,109]. Part of the social events included playing games. Hall and Neal [36] recorded numerous soapstone gameboards at Mundi, Chumnungwa, and the other Zimbabwe settlements. We know from Shona anthropology that these gameboards were used to play *tsoro*, a two-player game that was played for edutainment purposes [89,111]. The common area within settlements also probably functioned as a space for hosting public rituals or ceremonies such as work parties (*nhimbe*) and burying deceased family members. Several infant and adult burials were recorded inside Zimbabwe settlements in Mberengwa (Table 1). Finally, livestock pens (*matanga*), particularly those of cattle (Figure 9), were situated a stone's throw away from the houses, perhaps for health reasons.

The adjacent lands outside the settlements were probably used as fields (*minda*) for crop cultivation. The available data from the surveys show that the bulk of open tracts of land encircling most of the Zimbabwe settlements are arable and comprise brownish and reddish-brown soils (Figure 3). These Fersiallitic soils are a product of the disintegration of gneisses and granitic rocks, and their textures vary from coarse to fine-grained [57–62,65]. Despite having a low water-retention capacity that is susceptible to erosion and high infiltration, these soils are regarded as good for the cultivation of cereals and legumes [38,62,63,65,68]. As we discussed earlier, there is direct archaeological evidence of grain storage facilities at some Zimbabwe settlements in Mberengwa, including Kongezi and Chumnungwa (Table 1). In addition, cultivable land is conventionally regarded by most scholars to have been part of the top priorities for most Iron Age communities that inhabited southern Zambezia since they were sedentary food-producing societies that thrived on economies that largely depended on rain-fed agriculture [31,77,92,105,108,112]. The picture emerging from oral traditions [37,38,65,68,93] shows that each settlement in precolonial Mberengwa had a piece of land whereupon families cultivated a range of crops such as sorghum (*mapfunde*), pearl millet (*mhunga*), and finger millet (*rukweza*) for daily subsistence. The rainfall received in both the Middleveld and Lowveld sections of Mberengwa was probably adequate to sustain the cultivation of these drought-tolerant crops since they do not require more than 300 mm to mature. Although, this might have been difficult in times of drought,

as little precipitation would be received in most places due to the high frequency of climatic oscillations caused by El Niño [64,68]. Nevertheless, elevated places such as Mt Buhwa possibly effected orographic rainfall, which was brought inland by the monsoon winds rising from the Indian Ocean [40,64]. As we denoted among the contemporary agropastoralists that inhabit Mberengwa, they are used to these climatic oscillations; hence, they have cropping mechanisms that enable them to yield bumper harvests from the available rainfall. For instance, they adjust their planting season in tandem with the first rains, locally known as *gukurahundi*, to ensure a successful harvest [63,113]. Thus, given the historical connection between the Shona societies currently inhabiting Mberengwa and the Zimbabwe culture [40,63,66,91], it is plausible to envision the arable lands situated close to the Zimbabwe tradition settlements as ancient fields that were used for cultivating a range of cereals and legume species such as sorghum and beans. However, during the off-season, there is a possibility that the fields (*minda*) were used as a snaring ground for catching red veld rat/mice (*mbeva*) represented by Chumnungwa fauna by digging up their burrows (*mwena*) [114,115].

Further away from the agricultural fields, the outlying areas endowed with indigenous grasses, shrubs, and tree species of Miombo and Mopane woodlands were probably used for livestock pasturage (Figure 8). The recovery of faunal remains of *Bos taurus* (cattle) and *Ovis/Capra* (sheep/goat) species at Chumnungwa and the presence of livestock enclosures with huge layers of vitrified dung deposits, at settlements such as Isinknombo and Escep(g)we (Figure 8; Table 1), suggest that large numbers of cattle (*mombe*), sheep (*makwai*), and goats (*mbudzi*) were domesticated by the Zimbabwe people that inhabited ancient Mberengwa. The diverse sweetveld C4 grasses and C3 shrubs, bushes, and trees possibly served as browse and graze pasturage, depending on the nutritional requirements of the livestock and prevailing season. Some of the consumed sweetveld grasses and browse plants could have included *Cenchrus ciliaris* (Buffalo grass), *Hyparrhenia* (Common thatching grass), *Brachystegia spiciformis* (Msasa), *Parinari curatellifolia* (Mobola plum), *Uapaca kirkiana* (Muhobohobo), and *Colophospermum mopane* (Mopane), species which are preferred by modern cattle and caprine [58,67,69,70]. However, as highlighted by Garlake [15], the wide presence of Mopane woodlands across Mberengwa could have promoted the breeding of tsetse flies during the dry season, consequently posing mortality problems to local livestock (also see [13,15,16,63,66,71]). Thus, to reduce the rate of infection from tsetse-flies, the Zimbabwe societies likely employed centralized herding systems to restrict the movement of their livestock, as demonstrated at Chumnungwa (Figure 9). We know from Shona herd management practices that cattle belonging to many families were centrally penned together in most villages to secure them and share the herding duties between families [63,66,116–127]. Alternatively, in cases where the vegetation cover was depleted, there is a possibility that cattle at Lowveld settlements such as Chumnungwa could have been seasonally transferred to distant cattle posts along the bushveld of perennial waterways such as Bubi, Runde, Mwenezi, Ngezi, and Unmzingwane Rivers, where herdsman looked after them. Another transhumance strategy to cope with the shortage of pasturage was perhaps through loaning part of the herd to nearby relatives and friends, especially those situated further northeast in the moist savanna areas such as Mashava, Deyateya, and Zvishavane (Figure 3), where other Zimbabwe settlements were recorded [15,27,35–38]. This transhumance mechanism locally known as *kuronzera* is commonly practiced among agropastoral societies of southern Africa [15,19,20,63,66,92,116–118,126,128]. Consequently, success in managing the risk of tsetse-flies and fodder scarcity promoted growth in cattle and ovicaprine numbers, which subsequently led to the growth of the economy of the Zimbabwe polities in ancient Mberengwa and ensured food security.

Beyond herding, the Miombo and Mopane woodlands were probably used as hunting grounds for wildlife. As drawn from the environmental history of southern Zambezia, Mberengwa is a semi-arid landscape that occasionally experiences *shangwa* [20,22,31,62,63]. Therefore, to ensure food security, the Zimbabwe people supplemented their meat diet with wild game. The presence of large-sized ungulates such as buffalo (*Syncerus caffer*),

eland (*Taurotragus oryx*), kudu (*Tragelaphus strepsiceros*), and impala (*Aespyceros meumpus*) at Chumnungwa (Table 2) demonstrates this and even suggests members of the Zimbabwe communities as expert hunters who employed specialized hunting skills to capture these animals for food and other purposes. Hunting (*kuvhima*) is likely to have been a seasonal activity that could be performed at an individual or communal level where men amalgamated forming hunting expedition parties that led them to disappear into the bush for weeks or months to hunt [63,66,72,87,103,129]. Depending on the prevailing season, the Mberengwa ecosystem equally enabled the foraging of wild vegetables, edible insects, tubers, herbs, nuts, and fruits, as well as the sourcing of firewood and raw materials for the crafting and construction of infrastructure such as houses and livestock pens [31,63,66,87,130]. There is a possibility that some of the crafted objects recovered at Chumnungwa and other Zimbabwe tradition sites in Mberengwa could have been fabricated using raw materials sourced from these woodlands (Figure 8).

The abundance of ancient mines suggests mining to have been widely practiced across the Mberengwa landscape. As demonstrated by the survey data (Figure 3), most of the Zimbabwe settlements were strategically positioned in close proximity to the greenstone belts that host these ancient mines. These interlayered greenstone belts, including Mberengwa, Buhwa, Filabusi, and Mweza, are richly embedded with a range of minerals [50–55]; hence, there is a high probability that they were exploited by the Zimbabwe people for iron, copper, and gold ore. The prevalence of open shafts with heavily eroded soil mounds suggests open mining to have been widely used to extract these ores from the ground. This method of mining was widely used in precolonial southern Africa, including regions such as Musina in Limpopo [128] and Dukwe and Thakadu in northeastern Botswana [101,131]. However, given the abundance of hematite, especially in Buhwa, there is also a likelihood that ores could be easily collected as surface deposits [100]. Moreover, alluvial gold panning could be undertaken in local river channels with gold deposits, including the confluence of Ngezi and Runde (Figure 2).

It is plausible that the Zimbabwe people envisioned some natural landmarks such as hills, caves, rivers, and mountains as emblems of group identity, ancestral abodes, and ritual spaces that connected them with the spirit world. A reading of the oral traditions from the 18th century shows that various portions of the Mberengwa landscape were associated and populated with several Shona polities, such as the Nyamhondo, Negove, and Romwe, whose boundaries were demarcated by natural landmarks [31,35–39,63,66,91]. Nearly all these eponymous polities were led by generations of chiefs emerging from their founding lineages, whose legitimacy to socio-political power was buttressed by custodial rights to control territories (*nyika*) under their jurisdiction as the first comers [31,63,66]. Part of their chieftaincy duties involved redistributing land to their subjects/latecomers for settlement use and crop cultivation; however, losing land control was synonymous with losing socio-political power [63]. Originally, land within each polity belonged to the royal ancestry (*mhondoro*)—spirits of the deceased former chiefs [66]. These were regarded as the spiritual guardians of the land, and they were responsible for the fertility of the land [66]. *Mhondoro* were propitiated at the polity level and relayed the petitions to the *Mwari,* creator of mankind (*Musikavanhu*), who provided the rains. As commonly practiced in Shona divinity, the Zimbabwe people may have often carried out rain imploring rituals popularly known as *mukwerera* to ensure agricultural prosperity [79,84,85,132]. *Mukwerera* might have been annually held before the beginning of the wet season, and it was presided over by *masvikiro* (spirit mediums) [66]. Consequently, the *masvikiro* worked with chiefs and other community leaders to ensure that everything was organized following the laws of the land to avoid *shangwa*. Such an exercise usually prompts the mistaken belief that chiefs and village leaders were 'rainmakers' who had the agency to withhold or bring forth rain (i.e., [21,41,63,101,108,133]). The actual process of rain imploring took place at various sites, from settlements to the woodlands, caves, or hills, depending on the area. For instance, the Romwe of the Chingoma polity who occupied the area drained by the Mundi and Mwenezi Rivers on the western side of Mberengwa around the early

17th century are renowned to have used Imbahuru hill (Figure 11) as their shrine for rain imploring ceremonies [63,66,93]. In fact, most of the oral traditions collected by Zachrisson [63] emphasized the influence of Imbahuru as a rain imploring center to have paralleled that of Matonjeni in the Matopos, where chiefs sent emissaries (*manyusa*) to consult Mwari/Musikavanhu as a last resort [66,79,85,134,135].

**Figure 11.** Imbahuru hill, one of the highly revered shrines in Mberengwa that has a long history of use as a venue for rain-imploring rituals.

## 6. Conclusions

In this study, we sought to model the land use practices of Iron Age societies that lived in ancient Mberengwa to generate a better understanding of how they related to nature over space and time. Based on the archaeological residues recorded at several Zimbabwe tradition sites, it is evident that societies that inhabited this gold belt territory adapted a mix of land use practices that varied in intensity. As shown in Figure 8, the greater part of the Mberengwa landscape was primarily used for settlement purposes, followed by crop cultivation and livestock pasturage. Other secondary land use categories included mining, hunting, snaring, foraging, and hosting fertility rituals. While delimitation and quantification of these land use categories vis-à-vis cultural continuity and change is still a work in progress, the preliminary findings direct us to appreciate Mberengwa and many other understudied gold-belt territories as potential 'laboratories' for understanding the entanglements of humans and the physical environments in the deep past. Such as most Iron Age agropastoralist societies spread across southern Zambezia, the Zimbabwe societies that lived in ancient Mberengwa were vulnerable to a host of problems that included tsetse-flies, limited precipitation, and too much heat. However, despite exposure to these environmental and climatic problems, their material residues clearly show us that they successfully settled across the landscape and established livelihoods that were centered on stock raising, crop cultivation, mining, crafting, hunting, and a lot more. This automatically translates to success in managing the risks of living in a dryland. Consequently, this makes Mberengwa, and the other gold-belt territories spread across southern Zambezia worthy of archaeological research, since useful lessons can be drawn on sustainable land use practices, which can help modern agropastoralists living in similar landscapes. Globally, this study reinforces the significance of landscape archaeology in bridging the gap between

prehistoric societies and ancient landscapes (see [1,8,9,44,46,136–139]). However, until we fully embrace the value of the ancient past in drawing useful lessons that help us to confront our current environmental problems, archaeology in southern Africa will continue to be viewed as insignificant, especially in this era of the Anthropocene.

**Author Contributions:** Conceptualization, R.T.N.; methodology, R.T.N.; software, R.T.N.; validation, R.T.N., S.C. and A.S.; formal analysis, R.T.N.; investigation, R.T.N.; resources, R.T.N.; data curation, R.T.N.; writing—original draft preparation, R.T.N.; writing—review and editing, R.T.N., S.C., A.S. and E.N.M.; visualization, R.T.N.; supervision, S.C. and A.S.; project administration, A.S., R.T.N. and S.C.; funding acquisition, A.S., S.C. and R.T.N. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research was funded by the Re-Centering Afro-Asia project supported by the Andrew W. Mellon Foundation (Grant No.41500685). Additional funding was granted by the National Research Foundation (Grant No. 466432).

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

## Appendix A. Natural Resources Available within the Catchment Area of Zimbabwe Tradition Settlements Recorded in Mberengwa

A = 0–10 km, B = 11–20 km, C = 21–30 km = (Adapted from [35,36,40,62,77,91,93,99,100,102]).

**Table A1.** Availability of water, minerals, wildlife, pasturage, aquatic resources, and arable land within the catchment area of Zimbabwe tradition settlements recorded in Mberengwa.

| | Water Sources | | | Clay | | | Iron Ore | | | Copper Ore | | | Gold Ore | | | Wildlife | | | Aquatic Resources | | | Grazing Lands | | | Soapstone | | | Cultivable Soils | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Site** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** |
| Chumnungwa | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Little Buhwa | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2030:CB18 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2030:CB20 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2030:CB21 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2030:CB26 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Pamuuyu | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mundi/Mupandashango | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Nenga | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2030:CB55 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2030:CB56 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2030:CB57 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mutabvuri Homestead | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X |
| Kongezi | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| 2030:CB52 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Gorongwe | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Little Gorongwe | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Biri | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Chipukuswi | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Tokwe River | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Ensindi 2/Hollins Block 2 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Sabafu | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Zumnungwe | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Watoba | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Isinknombo | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Gombo's 1 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Gombo's 2 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Molindula | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Ruins [1] (Unnamed) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Ruins [2] (Unnamed) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

**Table A1.** *Cont.*

| | Water Sources | | | Clay | | | Iron Ore | | | Copper Ore | | | Gold Ore | | | Wildlife | | | Aquatic Resources | | | Grazing Lands | | | Soapstone | | | Cultivable Soils | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Site** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** |
| Ruins [3] (Unnamed) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Ihurzi | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Sesinga | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Mwenezi/Nuanetsi | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Little Mwenezi/Nuanetsi | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Escep(g)we | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Little Escep(g)we | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |

**Table A2.** Availability of wild foods, fuel, navigable rivers and raw materials for the crafting and construction of infrastructure within the catchment area of Zimbabwe tradition settlements recorded in Mberengwa.

| | Wild Fruit Trees | | | Firewood | | | Timber and Thatching Grass | | | Gravel | | | Navigable Rivers | | | Wild Vegetables | | | Red Ochre/ Graphite | | | Granite /Dolerite | | | Edible Insects | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Site** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** | **A** | **B** | **C** |
| Chumnungwa CE 1298–1627 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Little Buhwa | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| 2030:CB18 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| 2030:CB20 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| 2030:CB21 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| 2030:CB26 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Pamuuyu | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Mundi/Mupandashango | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Nenga | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| 2030:CB55 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| 2030:CB56 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| 2030:CB57 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Mutabvuri Homestead | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X |
| Kongezi | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| 2030:CB52 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Gorongwe | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Little Gorongwe | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Biri | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Chipukuswi | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Tokwe River | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Ensindi 2/Hollins Block 2 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Sabafu | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Zumnungwe | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Watoba | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Isinknombo | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Gombo's 1 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Gombo's 2 | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Molindula | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Ruins [1] (Unnamed) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Ruins [2] (Unnamed) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Ruins [3] (Unnamed) | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Ihurzi | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Sesinga | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Nuanetsi | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Little Nuanetsi | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Escep(g)we | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |
| Little Escep(g)we | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | X | | X | X | X | X | X | X | X | X |

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