ONE

INTRODUCTION

After they had noted what a profusion of resources has been begotten by Nature, and what abundant supplies for construction have been prepared by her, they nourished these with cultivation and increased them by means of skill and enhanced the elegance of their life with aesthetic delights.

Vitruvius, *de architetura*, 2.1.VII[1]

Villas typified many of the cultural and socio-economic aspects of being Roman. They were a fundamental component of the economy and landscape of Roman imperialism. We know of more than 1,000 villas in every region of the Empire, from Britain to Turkey, though there were undoubtedly more.[2] Ancient authors tell us, first and foremost, that villas were farms. But as A. Marzano and G. Métraux highlight, this limited definition does not do justice to the complexity of what we might now consider a villa in our study of the Roman world. Many villas in central Italy, for example, performed only a little or no agricultural production, as the *otium* villas around the Bay of Naples highlight.[3] Furthermore, many farms in the Romano-British landscape would hardly qualify as 'villas' because they lack a resemblance in scale, architectural design, or construction materials to that of their Italian counterparts.

In the Republican period, the first 'villas' were intended as large rural plots for agricultural production, in part as places to settle army veterans and to 'Romanize' newly acquired territories.[4] Villas were seen and encouraged as the respectable way for the elite to make and maintain their wealth – through

agricultural production. This image of the aristocratic farmer, created and maintained through villas, was a Roman cultural ideal for centuries.

As the complexity of the Roman economy grew, and the wealth and power of aristocratic individuals increased, villas also expanded in agricultural capacity and architectural design. Ancient authors bemoan the ostentatiousness of villa buildings in the first and second centuries CE, noting that they exceeded the requirements of a rural property for processing wine, olive oil, or wheat, and instead conspicuously displayed wealth.[5] Indeed, archaeology establishes that in the early Imperial period the residential part of villa settlements developed beyond the prior standard of a simple farmhouse with provisions for agricultural processing. In many regions, the agricultural activities were moved to outbuildings. The growth and stability of the Roman Empire also led to regional variance and typification of the architectural forms of villas. In the northwest provinces (Britain, Gaul, Germania), villa buildings were often organized axially, with the main residential building in a central position at the back of the block, and the secondary buildings arranged in perpendicular rows on either side around a large open yard (for example, at Anthée, Belgium; Verneuil-en-Halatte, France; and Ditchley, United Kingdom).[6] This can be contrasted with villa architecture throughout Italy in the early Empire, where rooms in the *pars urbana* were arranged around closed courtyards, and connected by porticoed walkways. This diversity in form responded to local landscapes, traditional ways of farming, and the overall scale of the villas.

In the third and fourth centuries, some villas went into decline, but many others across the western provinces were remodelled into larger, luxurious dwellings that conspicuously displayed the owner's power and wealth. In this period, the residential villa may have overshadowed the agricultural villa, and audience halls, dining suites, and bathing complexes became focal points for aristocratic entertaining and relaxation. K. Bowes has argued that the surge of later Roman villas in Hispania was the result of increased bureaucratic activity in the province in the fourth century.[7] She believes that these villas were the product of social competition, and thus villa architecture and decoration were the physical manifestations of an elite culture. G. Métraux notes that these exaggerated architectural forms may have been related to the agglomeration of sites into larger entities and/or the ownership of multiple estates by the same elites.[8] These changes, which had begun in the early Empire, may have resulted in the higher status of villa owners, with Palladius referring to them as *dominus*, or lord, by the fourth century.[9] Despite a perceived elevated social status, and changes to the architectural design of many villas, the importance of traditional Roman ideals and institutions remained.[10] L. Stirling has demonstrated that the sculptural display in late Roman villas across France and Spain made specific reference to the ideal classical education of the elite, and despite many of these

elites being Christian in the fourth and fifth centuries, they continued to display classical subjects in their villas.[11]

By the sixth century, villas, as a Roman form of settlement, had been abandoned or completely transformed, and archaeology indicates that the rural landscape instead had been populated by churches, monasteries, and as the centuries progressed, villages and castles. But the influence of villas had a dramatic impact on the construction of these new forms of settlement, in three ways: (1) villas physically defined and altered the landscape for future uses, (2) villas added cultural memory to sites, and (3) villas became a significant source of building materials.[12] This present study is most interested in the third of these influences, and how architectural materials added value to late and post-Roman society.

At some Roman villa sites, more recent excavations have noted a phase that falls in between the structures' demise or abandonment and any subsequent afterlives. These intermediate phases are marked by what appears to be a gap in formal occupation and often the presence of ephemeral hearths and other productive features. These post-villa phases have been variously interpreted since first noted in excavations of the mid-twentieth century. Earlier scholarship on such changes included the 'squatters' interpretation, which argued that these hearths and productive remains must be the result of people looting or passing through abandoned, decaying, and ruined villas.[13] This attitude to ephemeral remains found in the context of what was once a luxury villa adheres to the thesis that the Roman empire (and its material culture) was superior than the politically fragmented and economically challenged phases of late antiquity.[14] The decline of villas was viewed as symptomatic of the ruin of culture. Roman attitudes to ruin will be discussed in more detail in the next section, but when one removes the decline-and-fall paradigm from the analysis of these phases, it becomes clear that something more consistent and significant was happening than simply a decimated landscape.[15] Indeed, T. Lewit, who was among the first scholars to take a broader comparative look at these post-villa phases, asks 'how many squatters were there?'.[16]

This book investigates these intermediary or post-villa productive phases in greater detail. As will be laid out in the following chapters through an interdisciplinary and comparative analysis, I argue that the archaeological features of these phases reveal complex systems of material salvage and recycling. Not simply the actions of desperate or impoverished squatters, but the actions of organized groups of craftspeople who were commissioned to perform material recuperation. Based on this interpretation, I have developed a series of processual and economic models for considering recycling in the ancient context and draw comparisons with contemporary concepts of a circular economy.

It is only in recent decades that our understanding of the extent of Roman reuse and recycling of architectural materials has become clearer, never mind efforts directed at understanding the complex remains of such activities archaeologically.[17] This present in-depth examination of transitional and recycling phases at villas enables the exploration of the value of reusable and recyclable architectural materials, the *chaîne opératoire*, technological processes, and socio-economic contexts of such activities. These phases provide a surprising and significant insight into (de)construction logistics, local economic networks, the workforces of craftspeople, and the flow of recycled materials, about which we have few written records. The recycling phases also ultimately inform us about the enduring importance of villas and value of architecture beyond its original function.

1.1 RECYCLING, REUSE, AND 'SPOLIA'

In the twenty-first century, we have an abundance of terms to describe the transformations that happen to an object at its end-of-life – disposed, reused, upcycled, recycled, repurposed, recirculated, etc. However, many of these terms have themselves been taken from other contexts, and most, including 'recycling', do not predate the twentieth century. In the ancient literature, there are very few specific terms for using materials again, which we can assume is because processes of materials reuse, recycling, etc. were not special. These were deployed on all materials, and waste was avoided where possible in production and construction processes, and in the domestic setting.[18] In this book, I will use three terms to describe the transformation of materials from villas: recycled, reprocessed, and reused.[19]

As the examples to follow demonstrate, despite these practices being common throughout the ancient world, distinguishing between reuse, recycling, and reprocessing that was an ordinary part of the production process and that which was an extraordinary or a circumstantially specific activity is important. **Ordinary** recycling, reprocessing, and reuse was practiced by individuals, groups, craftspeople, and workshops throughout antiquity. Glass vessel production workshops (as today) recycled cullet and collected broken glass. Old ceramics, broken concrete, mortar fragments, and small stones were used as levelling fill in foundations and floors of renovations or new buildings.[20] Secondary metal production workshops (those that produced objects) always had a store of scrap metal for recycling.[21] Even the bars of Pompeii opted for reused marble paving for their countertops in the Julio-Claudian period.[22]

In late antiquity and the early medieval period, however, we begin to see what we might call **extraordinary** recycling, reprocessing, and reuse. This is driven not by normal cycles of new production but by a higher-than-usual quantity of material available from abandoned buildings and in conjunction

with a cultural change – that is to say, circumstantially specific recycling and reuse, which includes practices of ideological reuse. These extraordinary practices emphasize and change the value of materials, and that is why scholars have been interested in studying examples of reuse in late antiquity, in particular. While we recognize that periods such as late antiquity provide the right circumstances for higher volume material recycling and reuse, conceptually, reuse and recycling were not unique to this period and represent part of a continuum of these practices that existed throughout antiquity.[23] Furthermore, from the late Roman period onwards, officials, conquerors, builders, private citizens, and tourists continued to dismantle and reuse/recycle the materials of antiquity.[24] But the rate of these later examples slows as new/regular production cycles resume.

To better understand my rationale for using the terms 'recycle', 'reprocess', and 'reuse', it is pertinent to provide a brief introduction to the history of scholarship in these areas, in particular the predominance of reuse studies. Each practice that we have recognized in standing architectural remains and in archaeology has elucidated its own trends in scholarship. Reuse (and *spolia*) studies have tended towards discussing the cultural motivations for the practice, while recycling (and reprocessing) studies have tended towards discussing the archaeological context, technologies, and material properties. Where the former is highly embedded in the language and traditions of art history, the latter is embedded in the language and traditions of archaeological materials science. What this present study attempts to do is bridge these two traditions by exploring logistical and economic relevance of reuse and recycling, as well as engaging with more traditional discussions of value and technology.[25]

1.1.1 *Reuse*

Scholarship on reuse and *spolia* has a long and extensive history, which does not need to be fully rehearsed here.[26] Instead, I provide an overview of terminology and trends in scholarship to gain an understanding of how the field has developed. Until recently, practices of reuse had only been considered from the perspectives of meaning and value in the field of art history, broadly investigating the ways in which these material fragments linked past with present.[27] The term 'spolia' was first used in the sixteenth century to describe Classical marbles taken from decaying structures in the cities of the former Roman Empire for use in early medieval buildings.[28] Late antique and early medieval churches in Rome, for instance S. Sabina, S. Stefano in Rotundo, and S. Maria Maggiore, contain reused Roman marble columns.[29] These examples provide easily recognizable instances of extraordinary reuse.

I generally avoid the term 'spolia' in the chapters that follow because it has connotations that are not relevant to the situation of villas in the rural

environment. The term derives from Latin and can be literally translated as 'spoils' – in ancient literature referring to the spoils of war. As D. Kinney points out with reference to its Latin roots, the term 'spolia' implies a violent acquisition or theft of this building material, the "rape of the classical past", which, in most cases, was not the nature of the processes at villas.[30]

Contemporary studies on reuse highlight the ubiquity of the practice, particularly, though not exclusively, in late antiquity, and discuss the various motivations for reusing structural and decorative elements, which ranged from religious to political, and propagandistic to practical.[31] Broadly, publications focus on two categories of materials destined for reuse: marked or carved stones (sculptural blocks, statuary, funerary inscriptions, dedications) and functional stones (wall blocks, columns, thresholds, veneer/paving). The reason for this distinction relates to the embedded meanings and different values of the objects (see Chapter 2 for a discussion of value). Those that portray a person, religious story, or text had more immediately recognizable origins or meanings than a fragment of wall or paving. That is not to say that specific types of marble, for instance, would not have conjured ideas of wealth, status, or imperial conquest.[32] It is more about scales of meaning and histories – does the cultural importance of an object speak for itself, or would it require social translation? When is a reused fragment of stone solely functional, and when is it intended to arouse memory?

It is worth highlighting that both types of origin materials were often *destined* for the same categories of new construction projects in late antiquity. The city walls of Bordeaux, Leon, Lincoln, and Barcelona incorporated reused capitals, inscription fragments, and pieces of frieze blocks.[33] I. Jacobs' study of newly built architecture in eastern late antique cities also highlights the extensive reuse of elements in fortifications, which by this period had changed from ashlar to mixed construction using smaller cut blocks.[34]

The reuse of former dedicatory or funerary inscriptions, recognizable portraiture (for instance, imperial or official portraiture), and sculpture with mythological scenes has provoked discussion on the extent to which reusers of these elements were making political or religious statements.[35] One needs to look no further than the famous example of the Arch of Constantine (which reused Trajanic, Hadrianic, and Aurelianic elements) to survey the variety of scholarly arguments on intent and reception. While most scholars interpret the reuse of these sculptural fragments as intended to link Constantine with emperors and traditions of the past, it is less clear how much viewers of the Arch would have perceived and understood these connections.[36]

The example of the Arch of Constantine also demonstrates the range of actors in reuse – owners and commissioners; designers and architects; construction crew and craftspeople; viewers and users – and scale of the operations. The control or administration of the reuse business in late antique North Africa, for

instance, was highly complex. A. Leone demonstrates that there was both state control over the reuse of large (and arguably more costly) marble pieces and the reconstruction of public buildings, and also more haphazard and unadministered patterns of dismantling and reuse in the private sphere.[37] In Rome, the initials of individuals have been found inscribed on reused columns in fourth and fifth century churches – at S. Maria Maggiore, the initials PAT DECI ('of Patricius Decius') appear on Thasian column shafts, and at S. Sabina, the name *Rufenus* is inscribed at the base of a column shaft in the left colonnade.[38] These types of inscriptions either denoted the patron or owner of the reused materials/new construction project and/or the owner or manager of a storage depot which collected, organized, and distributed such materials.[39]

With the high volume of marble and stone elements available for reuse in late antique cities, it should be no surprise that there was both complexity and a high degree of organization to these operations. In the fourth century, legal efforts were made to stop abusive practices of spoliation of smaller towns by provincial officials.[40] S. Barker points out that the state also sanctioned the refurbishment and repurposing of whole structures in late antiquity.[41] Cassiodorus in his *Variae* notes three examples where private owners were given permission to renovate public buildings – a portico in Spoleto, a granary in Rome, and the Porticus Curva in Rome.[42] Barker rightly notes that without this legal record, archaeologists probably would have assumed that these properties were reused illegally.[43]

Indeed, recent studies of reuse in architecture have focussed more on the logistical, practical, and economic advantages of reusing materials, and the discussions have shifted away from solely stone materials and the construction industry.[44] E. Swift examines the reuse of jewellery in late antique Britain; J. P. Wild demonstrates the different reuses of Roman textiles; and E. Salmenkivi situates the reuse (and recycling) of papyrus in its economic context.[45]

The economic relevance of reuse throughout antiquity cannot be underestimated. It was practiced by individuals, households, communities, and the state, which meant that it impacted levels of demand for and supply of new goods.[46] The recent studies highlighted also make clear that reuse was often subtle and ordinary and may have kept materials and objects in circulation for hundreds of years in modified states.

Despite this boom in scholarly interest in Roman reuse, one area that has been neglected is study of reuse in the rural context, especially the built environment. We know of many instances of stone being taken out of more rural communities for reuse in urban centres in late antiquity, but the degree to which materials were reused within the rural context is understudied. This may result from the fact that there is simply more to study in the urban environment, due to the higher quantity of disused buildings and possible

destinations for reused architecture in the late Roman and medieval periods.[47] There was no need, for example, for long distance transport of materials that were procured and then reused within the same city. Even trade between cities may have been easier and more cost efficient because there was likely already high traffic between urban areas; in general, rural settlements may have been more difficult to access. Since this present study examines the dismantling and reprocessing of materials from villas, at villas, it provides a relevant framework for considering the processes, economics, and ultimate value of reuse, as well as recycling, and demonstrates that reuse and recycling frequently occur together.[48]

1.1.2 Recycling

Recycling – the process of dismantling, melting down, or significantly altering materials and making new objects – had been overlooked in archaeological scholarship until the early twenty-first century, and indeed, very few non-specialists in materials even distinguish between reuse and recycling.[49] While much work has been undertaken on reuse in stone (as described), until very recently, few archaeological studies examined, recognized, or outlined recycling as a distinctly different method of preparing materials to be used as new. Initially, ancient glass and recycling studies were situated in the domain of archaeological material science. For instance, the work of M. Uboldi and M. Verità on glass recycling in late antique northern Italy and that of M. Baumeister on ancient metals recycling highlighted the significance that chemical analyses can play in pinpointing recycling in fragmentary remains.[50] When these analyses are combined with studies of the archaeological contexts of workshops, such as has been done at the glass workshop at San Vincenzo al Volturno, we begin to be able to reconstruct sources of recyclate (the materials that will be recycled), the technology that facilitated such recycling, and even the scale of the activities.[51] Similar to today, the metals and glass production industries in the Roman period relied on recycling to provide a source of raw materials and material 'top-ups', colourants, and for other highly technical operations, such as altering the hardness of metals. Scholars who study ancient glass and metals have long recognized recycling as an integral component of these industries, though it is only recently that this recognition has been integrated into wider archaeological studies.[52]

Beyond the investigation of individual artefacts, assemblages, or workshops, recycling was not considered as relevant to the construction industry of antiquity until recently. Part of this was because recycled components are not easily recognizable in buildings and recyclable (and recycled) materials often comprised more structural or utilitarian parts.[53] Examples include iron nails, wall clamps, fences, lead pipes, or lead seals for iron. These can be

contrasted with reused columns and other marble features, which have been well studied because of their recognizability and relatively high contemporary cultural value.

Of crucial importance is that the technical processes of recycling leave traces in the archaeological record, and where reuse studies have struggled to address technical and labour issues, recycling studies can fill the gap. The only problematic part about studying recycling is that the technical processes were regularly combined with the production of new materials and can be archaeologically indistinguishable without un-recycled or 'raw' materials left behind in the workshops.[54] This is where the chemical analyses of materials has provided invaluable techniques for identifying recycling.[55] The recycling processes for individual materials and their archaeological remains will be discussed further in Chapters 3–5.

1.1.3 Reprocessing

In addition to reuse and recycling, I also make a distinction between these practices and reprocessing. In the context of ancient, recycled materials, we do not often find the *destination* of the new objects but only the archaeological remains of the *processing* operations. These workshop settings often display hearths or kilns, material residues, and stockpiles of unprocessed materials. This combination of elements has been used to suggest recycling operations, but without any evidence of finished items, the term 'reprocessing (ed)' is preferred.

1.2 ENVIRONMENTALISM, MORALITY, AND CIRCULARITY

The term 'recycling' is a twentieth century one, which originated in the oil industry and was popularized from the 1960s onwards as an environmental preservation and waste reduction strategy.[56] Our contemporary experience of recycling differs significantly from that of the Romans, especially for those who live in contemporary European or American countries. And this is where we must exercise caution with analytical approaches. It is not only our own experience of recycling, which in high-income countries is usually operated and regulated to some degree by government, but also the climate crisis under which we now live that affects our understanding of these processes and their place in society.

This present study was initiated in 2007 to investigate the archaeological phases that were noted by excavators at villas as a dramatic shift in spatial use, often between the fifth and seventh centuries CE. This shift in occupation type at villas denoted a move away from the world of the wealthy villa owner to productive activities conducted by unknown actors. This study was never intended to seek out recycling, nor to pass comment on Roman concepts of

environmental preservation.[57] Rather, through reassessment of archaeology and by considering this evidence across disciplines (materials science, chemistry, ethnography), the remains of these post-Roman phases indicated industrial processes aimed at material salvage and recycling. In addition, as will be demonstrated throughout, the motivations for recycling architectural elements from villas appear to have been economic, related to supply chains, perceptions of material value, and trade networks, and not motivated by environmental concerns.

The contemporary circular economy movement emphasizes the need to consume less, and to reuse and reprocess that which we do consume, in response to growing landfills and rising CO_2 emissions. It sets out that there should be no material waste in the economy, thus retaining manufactured value of products. The popular 'reduce, reuse, recycle' adage of the 1980s set out a way for the average consumer to participate in this environmental movement, with the hierarchy being emphasized – that we should reduce before we reuse, and reuse before we recycle, and this is being reinvigorated by the circular economy movement. Much of the sociological scholarship on the circular economy now focuses on consumption and consumers as drivers of waste-culture.[58] The current climate crisis and the Anthropocene thesis, which sets out that the current era is more shaped by human activity than other natural processes, highlight that the balance between human production and consumption of resources and materials is more wasteful than recuperative.[59]

Despite being highly engaged with variation in their natural world, the Romans did not perceive, or at least record, that there was an overarching environmental crisis.[60] However, we are now becoming aware that the Romans engaged in much more circularity of materials than we do in the contemporary world.[61] For instance, C. Cheung has recently analysed more than 400 examples of the repair of *dolia*, a type of ceramic vessel often considered utilitarian.[62] Similarly, as noted previously, examination of preserved cloth fragments demonstrates that Romans repaired their textiles multiple times before throwing them away.[63] Recent excavations at the Porta Stabia at Pompeii also highlight complex systems for waste organization and material reuse.[64] A. Emmerson explains that the small size and types of materials that made up these suburban refuse dumps are highly suggestive of the type of material that would be used as fills in concrete construction, to level, or as structural fill for foundations and floors, and perhaps was collected in the suburbs for such a future use.

All that said, the few instances of material salvage noted in the ancient literature mocked the practice. Martial and Statius both imply that door-to-door broken glass collecting was a morally dubious activity.[65] This provides an echo to a cultural shift in the early twentieth-century US, when repairing or reusing your household objects was a sign of poverty among the growing

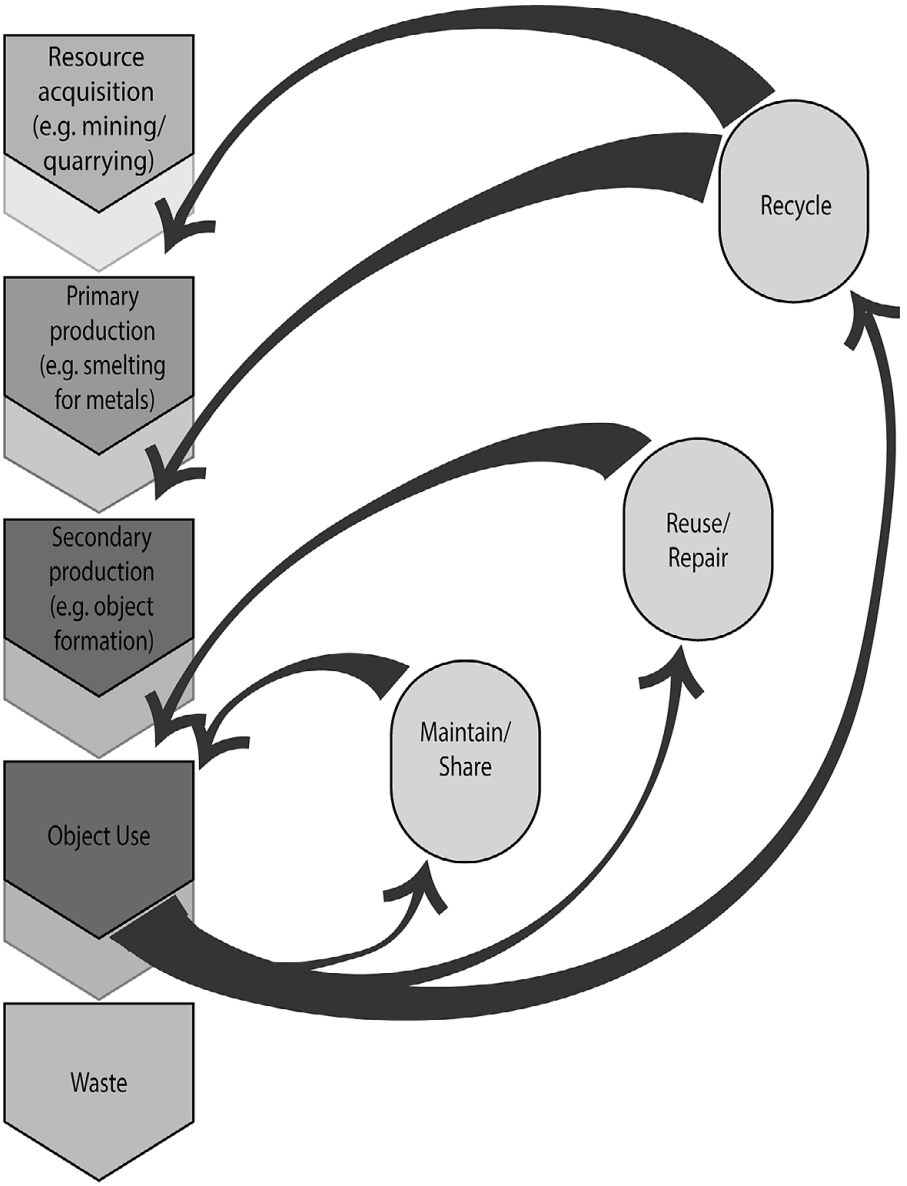
middle class.[66] There was important cultural value in the 'newness' of things. Part of this was also that reusing and recycling objects and clothes was viewed as unhealthy.[67] Reuse and recycling were still happening, of course, but increasingly not by individual households and instead by scrap collectors, often from immigrant backgrounds, who traded in other people's rubbish.[68] The circularity of materials in early twentieth-century America and England was diminishing and rubbish dumps were increasing.

But while certain Roman authors were critical or morally sceptical of glass recyclers, for example, archaeological evidence indicates that there was much more circularity of materials in antiquity than there was in some mid-twentieth-century cultures. Indeed, the Romans operated what we are now referring to as a circular economy, where there is a closer interaction between users and manufacturers, who took back, repaired, and reused materials with much greater frequency (Figure 1.1).[69] As will be outlined in detail in the following chapters, this appears to have been determined by the high cost, time, and energy expenditure associated with producing new materials in a non-industrialized society.

1.3 AIMS AND SCOPE

This study provides an in-depth view of an often overlooked phase at villas – the period in between their abandonment as Roman residences and any possible afterlives. These phases were not necessarily resettlements of sites but transitory phases before a longer site abandonment or reoccupation for ecclesiastical or other functions. The 'end of the villa' has received significant attention in scholarship over the past twenty-five years.[70] However, the focus of many of these publications has been on describing the cultural mechanisms for site transformation. In much of the literature, the archaeology of the final phases of villas has been interpreted too generally, in an attempt to populate the late and post-Roman countryside with specific cultural groups, be they 'barbarian' tribes, Christians, or peasantry. In doing so, the evidence of 'productive' and 'squatter' features at villas has been overlooked, misinterpreted, and agglomerated. The evidence I am particularly interested in includes hearths, installations, kilns, stockpiled materials, and storage containers in post-villa phases. While many excavations have noted these features, they have been categorized too generally because they fall within phases that appear to lack cohesion, good dating evidence, and clear stratigraphy.

This story is not so much about cultural groups but about the building materials of villas and how these materials were dismantled and reprocessed for perceived economic advantage. I argue that the building materials that owners had acquired for their villas in earlier periods continued to hold cultural and economic value in the post-Roman period. Crucially, this study also



1.1. Diagram of a simplified 'circular economy', as it may have functioned in antiquity.

demonstrates that the logistics of unlocking such value from the building were not the result of haphazard operations but the careful organization of technology and workforces; the recycling of building materials was a process embedded in the Roman and post-Roman psyche. The evidence found at villas of recycling provides useful examples of many of the processual and technological

stages of a circular economy in antiquity. Often, we only see the result of materials circularity – the reused columns in early churches, for example. But the evidence examined here points to the multitude of stages of materials recovery and reprocessing before final reuse; processes which avoided the acquisition of a new resource (either because that resource was expensive or scarce). By examining the specific case of villas, we can gain a much better understanding of how craftspeople and owners treated and understood materials in antiquity. It highlights that the Romans and their predecessors had a much more complex relationship with building materials than has been previously understood.

This study combines several disciplines and areas of focus, including ancient construction studies, materials science and ancient technology studies, and economic and architectural studies. It emphasizes the various components of the architecture and decoration as valuable commodities and explores how these were transformed to prepare them for other construction projects or for use as other objects.

The transformation potential of certain natural materials was well recognized in antiquity and indeed was a vital component in the success of the construction industry in the Roman world. The large-scale processing of wood, metals, glass, clay, and stone allowed for the construction of monumental, intricate, and stable buildings throughout the empire. Aside from marbles and precious metals, other building components were also considered to be valuable commodities, both before they had been incorporated into the fabric of a building and after that building had ceased to function, because their primary production and acquisition came at a significant cost.[71] At the end of the empire, when it has been assumed that many quarries and mines went out of use, the value of building materials that had already undergone primary production processes inevitably increased. In the rural environment, villas would have been an ideal source for these types of materials.

Villas provide exceptional evidence for three reasons: firstly, due to the rural nature of most villas, there is greater archaeological visibility of destruction and recycling phases than there is at urban sites. In the urban environment, structures were often continuously recycled and rebuilt throughout antiquity and into the Middle Ages. If successfully rebuilt on its former foundations, the physical remains of recycling are not as readily visible archaeologically. Secondly, the study of materials recycling at villas occurred in what could be termed a 'closed-loop' setting. That is to say that materials were primarily crafted, used and reprocessed at the same place. Finally, unlike other types of rural settlement, villas contained both luxury (high-cost) and utilitarian (lower-cost) materials, making the decision to recycle more economically interesting and dynamic than it would have been at say a small rural farmstead.

What follows in subsequent chapters provides a theoretical background for understanding value in ancient recycling and a hypothetical modelling of the

architectural materials at the site of San Giovanni di Ruoti (Italy) (Chapter 2); a review and chronology of changes to villas in late antiquity and an examination of the processes for dismantling architectural materials (Chapter 3); a discussion of processes of material collection and organization (Chapter 4); an examination of the archaeological evidence for materials reprocessing at villa sites, which is compared against other archaeological and historical studies of craft technologies and workshops (Chapter 5); a discussion of the destination of the salvaged and recycled villa materials, again largely hypothetical, through economic modelling (Chapter 6); and a discussion of the changes to ownership of villas and their implication on recycling activities between the fourth and seventh centuries (Chapter 7).

1.3.1 Villa Case Studies

Firm evidence for material recycling at villas only exists at about 5–10 percent of known villa sites across Italy and the northern and western Roman provinces.[72] This low percentage is partly an archaeological recognition problem – only in the past 15–20 years have these phases been recognized as significant – and partly due to archaeological invisibility – the removal of many materials from villas may have been done so fast that there was no significant trace of this activity on site, other than missing materials. Future research in this area will expose better examples of these activities; over the past ten years since I started this research, recognition of recycling evidence at villas has increased noticeably and in general, reuse and recycling has been more widely recognized throughout the Roman and former Roman empire.[73] The currently low-recognized incidence also makes dating the activities difficult. At most sites it is hard to say when the architectural materials recirculated back into economies of production or construction – in some cases it is thought to have been as late as the nineteenth century – and much evidence has been excluded from this study on this basis.

With more archaeological evidence of recycling emerging, it is important to provide some broader context to that evidence. This study is not intended to provide a full catalogue of recycling evidence (at villas or otherwise).[74] Instead, this study discusses the technological, economic, and social themes that emerge from the recycling evidence at villas. Half of the evidence for recycling at villas comes from sites in Italy. This may be a result of preservation and site history, excavation strategies, and history of scholarship. It also likely reflects the high concentration of villas in Italy and certain established networks in antiquity, and proximity to major urban centres such as Rome, that would have made materials circularity in all periods easier. But certainly, the phenomenon is not restricted to Italy.

Table 1.1 provides a summary of a selection of villa sites with evidence of recycling activities. However, the evidence is not even across sites, and the

TABLE 1.1. *Summary of case study sites.*

Villa site name	Modern country location	Recycling dates	Type of Evidence		
			Material dismantling	Material storage	Material reprocessing
Ahrweiler	Germany	Third-Fourth c. CE			x
Aiano-Torraccia di Chiusi	Italy	Sixth c. CE	x	x	x
Castelculier	France	Sixth c. CE	x		x
Cesson-Sévigné	France	Fourth c. CE			x
El Ruedo	Spain	Fifth c. CE			x
Els Castellets	Spain	Seventh c. CE			x
Faragola	Italy	Sixth c. CE	x		x
Fishbourne	England	Third–Fourth c. CE	x		x
Folkstone	England	Third–Fourth c. CE	x		
Gerace	Italy	Fifth c. CE	x		
Horath	Germany	Third–Fourth c. CE			x
L'Horta Vella	Spain	Fourth c. CE	x		
Leudersdort II	Germany	Fourth c. CE			x
Limetz-Villez	France	Fourth c. CE	x		x
Linguella	Italy	Fourth–Fifth c. CE	x	x	
Lixhe	Belgium	Fourth c. CE			x
Matagne-la-Petite	Belgium	Fourth c. CE			x
Milhaud	France	Fifth c. CE	x	x	
Minister-in-Thanet	England	Third–Fourth c. CE	x		
Monte Gelato	Italy	Fourth c. CE	x	x	x
Montmaurin	France	Fifth c. CE	x	x	x
Newel	Germany	Fourth–Fifth c. CE			x
Niederzier (sites 1–3, 5, 7, 11)	Germany	Fourth c. CE			x
Orbe-Boscéaz	Switzerland	Fourth c. CE	x	x	x
Rippweiler	Luxembourg	Fourth c. CE			x
Roquemaure – *La Ramière*	France	Fourth – Fifth c. CE			x
Saint André-de-Codols	France	Fifth c CE			x
Saint-Émilion – *Le Palat*	France	Sixth c. CE	x		x
San Giovanni di Ruoti	Italy	Sixth c. CE	x		x
San Giovanni in Tornareccio	Italy	Second–Fourth c. CE	x		x
San Giusto	Italy	Fifth–Sixth c. CE	x		x
San Pietro di Tolve	Italy	Fourth–Fifth/Sixth c. CE			x
San Felice	Italy	Third c. CE	x		x
San Vincenzo al Volturno	Italy	Fourth–Fifth c. CE			x

(continued)

TABLE 1.1. *(continued)*

Villa site name	Modern country location	Recycling dates	Type of Evidence		
			Material dismantling	Material storage	Material reprocessing
Settefinestre	Italy	Third–Fourth c. CE	x	x	x
Séviac	France	Fifth–Sixth c. CE			x
Torre degli Imbrici	Italy	Sixth c. CE	x		x
Torre de Palma	Portugal	Fifth–Seventh c. CE			x
Torre Llauder	Spain	Fifth c. CE	x		

intent here is not to provide an exhaustive catalogue. Rather, Table 1.1 provides an indication of the geographic and chronological spread and categorizes the type of evidence available to assess these post-villa phases. Many of these have the remains of material reprocessing – glass and metalworking installations and lime kilns in the post-villa phase. Some have evidence of systematic material dismantling, while fewer have evidence of material stockpiling and storage on site.

These sites have been identified as 'villas' in the Roman or late Roman period and display evidence of the systematic removal or recycling of architecture in post-Roman phases. The selected villas were not only rural, productive settlements dating to the Roman period, but more specifically included a residence adorned with some luxury fittings and features, including mosaics, bathing complexes, audience halls, dining rooms, wall paintings, marble statuary, and architectural detailing. While this excludes many smaller or less-luxurious rural settlements which might otherwise be considered 'villas', it should not imply that recycling did not occur in these other types of settlements as well. It is simply that recycling is more visible archaeologically when there were higher quantities and a wider variety of materials typically found at the largest villas.

All the case study villas underwent several reconstructions throughout their long histories. These reconstructions increased their size and level of luxury. Both these factors were important in deciding whether the architecture of a villa could be and would be desirable to recycle. Even those villas that went out of use in earlier centuries, like Settefinestre or Linguella, were enlarged in the phase prior to their abandonment.[75] And villas whose chronologies extend later, like Montmaurin, Faragola, and San Giovanni di Ruoti, display significant enlargements.[76] The scales of these luxury villas meant that they would have been constructed of many materials that could have been usefully recovered, at economic advantage.

Crucially, in addition to evidence of the systematic removal of materials, many of the case study sites also have the archaeological remains of installations used for processing materials. In some cases, this is because the recycling facilitated on-site church construction. But in other more intriguing cases, the sites appeared to be reprocessing the materials ahead of their transport off-site. Why did this happen at some sites and not others? This question will be explored in Chapters 6 and 7, and represents the highly complex cultural, technological, trade, and economic landscape of late antiquity.

Across a broad geographic spectrum, the evidence for materials reprocessing and systematic removal/storage in post-villa phases is compelling, but highly variable. Material salvage, storage, and reprocessing has been noted at Niederzier I, II, V, VII, and XI, and Leudersdort II in Germany, where there were several glass-working installations discovered in the villas.[77] At Saint-Émilion – *Le Palat* and Saint André-de-Codols in southern France and Els Castellets and L'Horta Vella (Bétera) in Spain there was evidence of systematic materials removal and several different types of workshops, including metal workshops.[78] At the villas of Echternach and Rippweiler in Luxembourg, Lixhe and Matagne-la-Petite in Belgium, and Horath and Niederzier X in Germany there were 'domestic or other types' of installation inserted in former luxury spaces.[79] Systematic material salvage has been noted at Minister-in-Thanet and Folkstone in Britain.[80] At Santa Cristina in Caio, where there are glass and metal reprocessing installations, the team uncovered a large bath complex, but no other parts of a villa. S. Bertoldi believes these could have been public baths, but its rural location in Tuscany is curious.[81] The site at Spolverino and the neighbouring *ager Rusellanus* will also be discussed at various points. Spolverino was not securely a villa site but a small rural structure which was used to recycle glass and metal in late antiquity, likely with materials brought from ships trading recyclate and from materials collected from villas in the neighbouring landscape.[82]

As noted, there are also numerous urban sites where recycling operations have been documented archaeologically, including at the Crypta Balbi in Rome, the baths at Sagalassos, a room in the imperial complex at Portus, and the baths at Sabratha.[83] These sites provide *comparanda* that enhance a discussion of the technology and organization of recycling at villas.

As we will see, the case studies demonstrate a range in quantity and quality of evidence for architectural recycling of and at villas. These are our best examples at present. As more evidence of recycling is uncovered through excavation, this study should provide critical theoretical and methodological frameworks for considering the processes of building

dismantling and materials recycling, which have been poorly or patchily understood. The case study sites show that these recycling phases and processes can be detected archaeologically and these, in turn, need to be integrated into broader discussions on the 'end of villas'.

NOTES

1 Translation by Rowland and Howe, 1999.
2 Marzano and Métraux, 2018.
3 Rothe, 2018: 45.
4 Marzano and Métraux, 2018: xxix.
5 Cato, *Agr.*, 1.6.; Varro, *Rust.*, I.13.6.
6 Rothe, 2018: 48; Lenz, 1998: 53. See also Smith, 1997.
7 Bowes, 2015.
8 Métraux, 2018: 402.
9 Palladius, *Op. Agr.* 1 .6 .8. Métraux, 2018: 404.
10 Beckmann, 2022; Robert, 2011.
11 Stirling, 2005. This is also present in wall paintings and mosaic imagery in this period, see especially Balmelle, 2001; Darmon, 2011; though cf. with Beckman (2015) on individual expressions of taste.
12 For recent scholarship on post-villa transformation at individual sites, see Cavalieri and Sfameni, 2022. See also Smith and Gazin-Schwartz (2008) for a collection of essays on abandoned landscapes.
13 See, for example, Johnston, 2004: 52–60 and Ripoll 2018, 446. Cf. Dodd 2021: 4.
14 Classically, see Gibbon, 1776–1788. For more recent works, see Jones, 1964; Ward-Perkins, 2005.
15 Christie, 2004: 21.
16 Lewit, 2005: 254.
17 Recent collections of studies on Roman reuse and recycling include: Altekamp, Marcks-Jacobs, and Seiler, 2013 and 2017; Cuscito, 2012; Duckworth and Wilson, 2020; Frey, 2015; Ng and Swetnam-Burland, 2018; Pensabene, 2015.
18 On Roman waste, see Ballet, Cordier, and Dieudonné-Glad, 2003; Dicus, 2014; Dupré i Raventós and Remolà Vallverdú 2000; Remolà and Pérez, 2011.
19 See Peña (2020: 11–12) on the challenges of terminology. Peña adds another term to my list – *reuse-recycling* – which he defines as applicable to objects that are altered from their original forms (cut, re-carved, broken) but not totally transformed (which I have defined as *recycling* elsewhere, Munro, 2011: 76. See also 'recycling' later in the notes). This hybrid terminology is a useful addition in some cases because it can be applied to objects that are ambiguous in their reuse as object or raw material. A common example would be the reuse of inscription blocks in late antique fortifications. In these cases, the blocks are usually fragmentary, or positioned in the new fortifications on their sides but with the inscription still somewhat visible. These are neither an example of pure reuse (as we might consider for traditionally termed *spolia*,) or pure recycling.
20 On general ceramics recycling, see Peña, 2007: 250–71. On materials used for construction fill, see Lancaster, 2015: 23; Siddall, 2011.
21 Monteix, 2006.
22 Barker and Russell, 2013.
23 Barker, 2020: 108; Duckworth et al., 2020: 454–55.
24 Greenhalgh, 2009a; 2013.

25 More emphasis on the logistics of reuse is emerging in scholarship. See Altekamp, Marcks-Jacobs and Seiler, 2017; Barker, 2019; Barker and Marano, 2017; Duckworth and Wilson, 2020; Leone, 2007: 216.
26 Deichmann (1940) provides the first for systematic discussions of *spolia* and its use in early churches. See also Brilliant and Kinney, 2011; Deichmann, 1975; Frey, 2015: 9–22; Kinney, 1995, 1997, 2001; Pensabene, 2015, 7–20.
27 See recent contributions in volumes edited by Altekamp, Marcks-Jacobs, and Seiler, 2013; Brilliant and Kinney, 2011. See also Coates-Stephens (2003: 342–43) for a succinct and critical summary of ways to consider *spolia*.
28 Poeschke and Brandenburg, 1996.
29 Deichmann, 1975: 16, 20, 22. For more on reuse in churches at Rome, see Hammer, 2005; Mondini, 2017; Pensabene, 2015.
30 Kinney, 2001: 138.
31 Alchermes, 1994; Barker, 2010; Coates-Stephens, 2002; 2003; 2006; Deichmann, 1975; Kinney, 2001; Ward-Perkins, 1999.
32 See Russell, 2015: 8–36 for a comprehensive summary of the relative value of marble in the Roman economy.
33 Blagg, 1983: 130–31 and Balil, 1961: 82–103. See also Bugini and Folli, 2002 and Greenhalgh, 1999.
34 Jacobs, 2013: 25–38.
35 Stirling, 2005, but cf. Beckmann, 2020.
36 Barker, 2020: 120–22; Pensabene, 2017.
37 Leone, 2007: 216. See also Jacobs, 2013: 479–587 on the agents involved in late antique construction in the East; and Machado, 2017 on the elite involvement in new construction and reuse in late antique Italy.
38 Barker, 2020: 125–27, 136–37.
39 Ibid., 125; Pensabene, 1998.
40 *Codex Theodosianus* 15.1.1; 15.1.14; 8.15.16; *Codex Iustinianus* 8.10.7 prohibit provincial magistrates from removing statues, columns, and marbles from less important towns to rebuild and decorate larger cities (Barker, 2020: 127).
41 Barker, 2020: 164.
42 Cassiodorus, *Variae* 3.29, 4.24, 4.30. See also Giardina et al., 2016, La Rocca, 1992.
43 Barker, 2020: 164.
44 Barker, 2010, 2020; Bernard et al., 2008, Brandenburg, 2011, especially pp. 67–70; Brilliant and Kinney, 2011.
45 Salmenkivi, 2020; Swift, 2020; Wild, 2020.
46 Duckworth et al., 2020: 456.
47 Greenhalgh (2009: 15) also refers to an 'imbalance' between the diminishing urban populations of late antiquity and the early medieval period, and the amount of available architectural materials from disused buildings.
48 Duckwork et al., 2020: 449.
49 Nin and Leguilloux, 2003: 141 were the first authors to clearly outline the difference between reuse and recycling in relation to archaeology. See also the excellent discussion by Peña, 2020.
50 See Uboldi and Verità, 2003 on glass analyses, and Baumeister, 2004 on metals analyses.
51 Schibille and Freestone, 2013.
52 Duckworth and Wilson, 2020.
53 Ward-Perkins, 1984: 218 also explains that non-luxury, reused materials, do not often get noticed by modern scholars and indeed might not have been noted by those in antiquity either. For more on this issue, see Coates-Stephens, 2003: 342.
54 Ponting and Levene, 2015. Ricci (2001: 336–50) has been able to successfully establish recycling at the Crypta Balbi based on the unique presence of finished and unfinished objects, 'raw' (pre-recycled) materials, and production debris.

55 Duckworth et al., 2020, 451–52.
56 First use of the word 'recycle' in English was in 1924 or 1925 (www.merriam-webster.com/dictionary/recycle).
57 On this topic, see Hughes, 2014.
58 For example, see Featherstone 2007; Graeber 2011; Miller 2012; Schor 2005; Slater 1997; Smart 2010; Warde 1990; Wilk 2001.
59 On the Anthropocene thesis, see Ruddiman et al., 2020. See also Shaw, 2016.
60 There is active scholarship on environmental change and the decline of the Roman Empire. However, this considers historical and archaeological data and is firmly a contemporary interest. See, for instance, Harper, 2016; McCormick et al., 2012; Sessa, 2019.
61 Duckworth et al., 2020: 456–57.
62 Cheung, 2021.
63 Wild, 2020.
64 Emmerson, 2020: 118–19.
65 Martial (*Epigrammaton Libri*, I.41.3–5: What you are, the cheapjack from across Tiber is, who barters yellow sulphur matches for broken glass (Loeb edition, translation Goold, 1994: 69), Statius (*Silvae*, 1.6.73–4: here is the mob of the stage and vendors of common sulphur for broken glass [Loeb edition, translation Sheckleton Bailey, 2003: 93]). See also ancient references to glass collecting being a low-value activity in Juvenal, *Satires*, 5:48 and Cassius Dio, *Roman History*, 60.17.6.
66 Strasser 2001: 136, 200, 269.
67 Ibid.
68 Minter, 2013.
69 www.ellenmacarthurfoundation.org/circular-economy/concept. See also Duckworth et al., 2020: figure15.1 for a flowchart of the recycling and reuse *chaîne opératoire*.
70 Various studies on the late Roman villa as a type, and the end of the villa include: Balmelle, 2001; Brogiolo et al., 1996; 2006; Brogiolo and Chavarría, 2005; Chavarría, 2004a, 2004b, 2007; Dodd, 2021; Ellis, 1988; Francovich and Hodges, 2003; Lewit, 2003, 2006; Ripoll and Arce, 2000; Sfameni, 2003, 2006; Van Ossel and Ouzoulias 2000.
71 DeLaine, 2006; Wilson, 2006.
72 This is a broad estimate, calculated by comparing known sites for recycling at villas in Italy with the overall number of known villas in Italy, based on the FastiOnline database of fieldwork sites from 2000 onwards, and using other catalogues of villas, such as Marzano, 2007.
73 Important recent work on this has been undertaken by Barker, 2010, 2019, 2020; Barker and Marano, 2017; Duckworth and Wilson, 2020; Fant, Russell and Barker, 2013; Frey, 2015; Machado, 2017; Marano, 2012; Ng and Swetnam-Burland, 2018; Pensabene, 2015; Ponting and Levene, 2015; Siddall, 2011. See also Bernardi and Esposito, 2008.
74 There is currently no global or macro study of ancient circularity. However, another example of a well-defined, centuries-long case study of a complex circular economy is being undertaken for Palmyra, Syria, in *Circular Economy and Urban Sustainability in Antiquity* project, based at Aarhus, Denmark. Pers. comm. R. Raja, January 2021.
75 Carandini, 1985; Ducci and Pancrazzi, 1996.
76 Small and Buck, 1994: 92–7.
77 Van Ossel, 1992: 153, catalogue nos. 12, 13, 15, 17, 21, 412.
78 Jiménez and Burriel, 2007; Jiménez et al., 2005, 2008; Pomaredes, 1993–94; Roig Pérez, Gimeno Mariné and García-Medrano, 2015.
79 Anon., 1985, 1986; Cüppers, 1967; Mahieu, 1910; Metzler et al. 1981, 1983; Metzler and Zimmer, 1975; Rober, 1983, 1984; Thill, 1971, 1977; Van Ossel, 1981, 1983, 1984; Van Ossel, 1992: 151, catalogue nos. 146, 152, 89, 101, 32, 43, 19.
80 Parfitt 2006; Wigbolt 1933. See also Dodd 2021 on 'productive transformations' at villas. He categorizes agricultural production and glass/metalworking in the same category as

'production', as does Chavarría, 2007a. This book argues that these transformations and phases need to be more carefully investigated.

81 Bertoldi, 2015b.

82 Sebastiani and Derrick, 2020.

83 Leone, 2007: 216–17; Murphy and Poblome, 2021; Ricci, 2001.