Armies and Ecosystems in Premodern Europe

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Chapter 2

FORTIFICATIONS

Defences and Their Basic Maintenance

Apart from frontiers, another kind of militarized landscape plays a significant role in debates about the ecological effects of warfare and military forces. The Meuse Region abounds with abandoned fortifications, from prehistoric and Roman times to the Second World War. Every year thousands of bats seek out bunkers, forts, and ruins for hibernation, because of the constant low temperatures and high humidity. Many have also become sanctuaries for rare species of wall vegetation and lichens, or serve as city parks (such as Namur, Liège, Jülich). A handful of former fortifications have even been turned into nature reserves to protect the rare species that dwell there. The Bossche Fronten in Maastricht for instance provides a home for one of the northernmost populations of wall lizards (*Podarcis muralis*) in Europe, not to mention many rare flowers, herbs, and lepidoptera (butterflies and moths).

The aim here, as with the previous chapter, is not to question the value of such structures for current ecological conservation, but to expose some of the underlying assumptions. Very few, if any, serious attempts have been made so far to assess to what extent the biodiversity of former fortifications is based on or relates to their management when armed forces still controlled them. Old walls overgrown with various plants or a ruin covered with moss and/or lichens fit well into a romantic idea of nature reclaiming its rightful place, and support a general belief that ecological conservation and peace are intrinsically linked to each other. It also creates a dichotomy between those who want to preserve the structures’ heritage and those who primarily seek to maintain their ecological value. The city of Namur for example suffered disputes on the issue whether the trees standing on the former castle should be removed because their roots could damage historical edifices.

This chapter studies the ecological impacts of these varied types of fortifications when they still had military value and were maintained with this function in mind. It thus considers fortifications as militarized landscapes in order to establish a link between the historical management of defensive edifices, and their current ecological state. The main aim is to consider whether armed forces had a significant role in bring-

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3 Boosten, Jansen, and Borkent, *Beplantingen*, 108–11; Bragard et al., *Namur, la citadelle hollandaise*, 140–42.
ing about and preserving landscape elements that are now considered valuable for ecological conservation, and to what extent they preserved these structures in a manner currently recommended by environmental organizations. If this were the case, then this chapter lays the second keystone for the argument that armed forces did preserve ecosystems centuries before the rise of environmentalism.

Most historical analyses of fortifications only examine them from the perspective of military architecture, or their relationship to general society, and devote little attention to the ecological aspects of such structures. The field of castle studies is an exception, for it has seen an increasing number of studies since the year 2000 that aspire to go beyond the traditional image of “strongholds,” and analyze castles as central elements within larger “noble” or “elite” landscapes. Such novel approaches are invaluable in understanding interactions between armed forces and ecosystems. The meaning of the term “castle” (castrum, castellum) in medieval sources is in fact quite ambiguous. Often they simply refer to noble “houses.” Recent emphasis on a castle’s basic function as a residence is especially important since it has led to a better understanding of landscape elements that figure as symbols for lordship (woodlands, ponds, gardens, and suchlike). Still, arguing that most castles had no military function, or at least that this function was subordinate at best, as Robert Liddiard has done, might be equally missing the point.4

The poem “Le Jugement dou roy de Behaigne,” for example, was written in the 1330s by Guillaume de Machaut, secretary of Johann von Luxemburg, King of Bohemia and Count of Luxemburg (1310/1313–1346). It gives an exceptional description of the house (“castle”) of Durbuy on the Luxemburg–Liège frontier, and describes it as being located on a rocky mount in the middle of a valley, surrounded by a river (the Ourthe). There were orchards filled with birds whose song echoed through the valley, a spring, a fountain, and broad and long meadows above the riverbanks with many kinds of herbs and grasses. The protagonists (a knight and a lady) had never seen a place so beautiful, so noble, and so easy to defend. Even the kings or France or Germany could not take it. The poet also specified that the house was located far enough from the surrounding hills so that no crossbow or siege weapon could reach it. The castle’s aesthetic and military qualities were thus complementary rather than conflicting.5

It is worth noting that while this poem certainly gives an idealized image, it is still based on the site’s actual geographical features. Any missile fired from the hills would have to cover at least three hundred metres to reach the fortress. This is indeed outside crossbow range. A trebuchet might still be able to target the fortress, but only by throwing smaller stones, which could only inflict limited damage.6 Furthermore, Count Johann of Luxemburg did make efforts to make his house more secure, for in 1325 he asked papal permission to demolish a chapel that impeded its defence, and rebuild it on another location.7

4 Coulson, Castles; Creighton, “Castle Studies”; Liddiard, Castles, 70–96, 151–52.
Given that distinctions between armies and general society were not drawn very rigidly before the eighteenth or nineteenth century, it is only natural that many fortifications had multiple functions and were well integrated into people’s daily lives. Every inaccessible place, including caves, quarries, woodlands, and marshes, could of course become a refuge in times of insecurity. This does not automatically turn it into a “fortification.” Churches for instance had an important refuge function, but one can only consider them as fortifications if they incorporated features such as arrow or gun slits, and battlements with or without murder holes (machicoulis). A fortification will therefore be defined in this study as a material reinforcement or barrier constructed or adapted to strengthen a place against attack. It is therefore invariably man-made to some extent, for even rivers, hedges, or woodlands need to be modified to military needs in order to become defensible.

In this context the question against whom people were trying to defend oneself becomes of major importance. One of the reasons why many types of fortifications have been left largely unexamined until now is that scholars assume that a certain scale is a prerequisite before we employ the terms “warfare” or “armies.” If one does not accept that huge armed forces with the latest siege equipment were the only threat, then the military function of less elaborate defensive structures is much harder to ignore. Such an approach also has the advantage of contradicting the simplistic, but widespread, idea that rural areas are essentially undefended, or “flat” (plat pays, platteland).

The safety provided by fortifications often went beyond warfare and armies, as attested by an example from a late medieval fiscal account. In 1495 the high bailiff of ’s-Hertogenbosch sent members of the city’s shooting guilds to the village of Liessel, between Eindhoven and Venlo, to bring a notorious highwayman, who had been taken prisoner by the villagers at their landweer, to him. Landweren or Landwehren, earthen embankments with hedges planted on top of them, which could be several kilometres long, had an important role in maintaining safety in the countryside, because they restricted the movements of both people and animals, and forced them to use guarded routes.

It is indeed significant that the term Landwehr or landweer originally referred to the duty of a population to defend the land if called upon. Given this origin, the word chiefly appears in sources from German-speaking lands, as well as the Northern Netherlands. It is possible that such defences were more elaborate in those areas, but one can find similar structures throughout the Meuse Region. They are just not called Landwehren. When the chronicler Jean de Stavelot wrote that horsemen from Maastricht rode up to the hedges of Heure le Romain in the late fourteenth century to draw out the defenders,

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10 Brussels, ARA, 1107 Rekeningen Hoogschout ’s-Hertogenbosch, inv. no. 12996, 080.1.2.12 (transcript Henk Beijers Archieffcollectie); Kraus, Die Aachener Stadtrechnungen, 426. See also Contamine, “Scènes de chasse,” 238.
he meant that they approached the barriers that defined the spatial limits of the village. The settlement might have been fortified with ditches and earthen embankments in the same way as a city wall.\footnote{De Stavelot, Chronique, 114.} Hedges, with or without ditches, are one of the most ubiquitous, but also most neglected, object of study as fortifications. Similar defences can be found in many parts of Europe, in Sub-Saharan Africa, the Yucatan, and Southeast Asia. Caesar already mentioned their use by the Nervii, probably in the Scheldt basin, in the first century BCE. It is an agricultural technique that could easily be converted to warfare.\footnote{Caesar, Gallic Wars, Book 2, chapters 17–26; Charney, Southeast Asian Warfare, 92; Palka, “Ancient Maya Defensive Barricades,” 428; Seignobos, “Pre-Colonial Plant Systems.”}

Many hedges would have been composed of common hawthorn (\textit{Crataegus monogyna}), which is still used in the Meuse Region today. Alternatives could include blackthorn, seabuckthorn, and non-thorn bearing trees or shrubs such as beech, oak, and hazel, depending on the hedge’s primary function. Woodlands acting as barriers in frontier landscapes could also be called “hedges” for instance (such as the Haies d’Avesnes). A hawthorn hedge is the most difficult to get through, but its wood is an unsuitable source of either fuel or timber. The “laying” of a hedge, a general term to describe techniques to cut and intertwine branches in such a way that the hedge becomes an impassable wall, was likewise a common way to turn a hedge into a more formidable defence, but it made it a far less productive supplier of wood. Some hedges were not even composed of living plants: the use of wooden poles with willow branches woven between them was a common alternative.\footnote{Brokamp, “Landweren,” 1:46–48; Capelle, “Landwehrbau,” 26–28; de Groot, \textit{De stadsrekeningen}, 1385 fol. 6; 1386 fol. 7; 1387 fol.; 8; Duceppe-Lamarre, \textit{Chasse et pâturage}, 240–41; Kraus, \textit{Die Aachener Stadtrechnungen}, 155; Kuppers, “De stadsrekeningen,” 105, 134, 220; Vera, \textit{Grazing Ecology}, 159–62; Weerth, “Westfälische Landwehren,” 160–61.}

The late medieval accounts of cities like Geldern, Grave, and Venlo suggest that many structures were actually combinations of living hedges and fences, as they mention the use of wooden poles, planks, willow branches, and thorns.\footnote{Grave, SLC, Archief Gemeente Grave, inv. no. 217, fols. 7r, 94r; 217r, 258r, 267r, 277v; inv. no. 218, fols. 173v, 175v; de Groot, \textit{De stadsrekeningen}, 1384 fol. 5; 1385 fol. 7, 8, 39; 1386 fol. 7; 1387 fol. 24, 26, 28; 1388 fols. 9, 15, 26; 1394 fols. 9–10; 1396 fol. 16; 1397 fol.; 8–9; 1399a fol. 8; 1400 fol. 6; 1402 fols. 9, 20; 1404 fol. 24; 1405 fol. 14; 1406 fol. 8; 1407 fol. 15; 1408 fol. 10; 1409 fols. 10–12, 14; 1412 fol. 41; 1415 fol. 28; Kuppers, “De stadsrekeningen,” 8–11, 20–22, 35, 48–49, 61, 83, 124.} Given that it takes several years before a newly planted hedge becomes a real obstacle, and that it is always possible that gaps appear because individual plants die, it was common practice to combine living with non-living materials. Once a hedge has matured, however, it is far easier to maintain than fences or palisades.\footnote{Bragard, “Soldats et jardiniers,” 95–96; Bragard et al., \textit{Namur et ses enceintes}, 42; de Groot, \textit{De stadsrekeningen}, 1377 fol. 6; 1400 fol. 7; 1408 fol. 9; Marchal, \textit{Inventaire}, 155; Moreau, \textit{Bolwerk der Nederlanden}, 128; Pagnotta, \textit{Les églises fortifiées}, 21–23; Rizzo, “La prévôté de Marville,” 28; van Nispen, \textit{Willemstad}, 36.} A small town like Bree for example, located in the Campine/Kempen, planted three thousand eight hundred thorn bushes and twelve
willows on the slope next to its moat in 1507–1508. This corresponds closely with the known length of its walls; about twelve hundred and twenty-nine metres.¹⁷

It is precisely this maintenance argument, aside from the resistance to artillery fire, which led famous engineers such as Daniel Specklin (1536–1589), Sébastien Le Prestre de Vauban (1633–1707), and Henri-Alexis Brialmont (1821–1903), to recommend their planting. Thorn bushes in particular performed a similar function to barbed wire, and it is illuminating that the demise of hedges, first in military contexts (late nineteenth century), then in agriculture (mostly after the Second World War) corresponds closely to the latter’s adoption.¹⁸ Jean d’Haynin, a nobleman from Hainaut, obtained first-hand experience of hedges’ defensive value during the Burgundian invasions of the Prince-Bishopric of Liège in 1466–1468, and later wrote down a description of these encounters in his memoirs. According to this exceptional witness account the hedges were

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¹⁷ Maes, *De geschiedenis van Bree*, 2, 21.
eventually overcome, but only after the soldiers dismounted, and they had great difficulty getting through (once they even had to use ladders). Hedges seem to have been especially valuable as anti-cavalry obstacles in open landscapes, such as Hesbaye, but d’Haynin also mentions that the villagers of Loverval, near Charleroi, turned their woodlands into more effective barriers by constructing hedges (les bois estoie hayes). It is possible that events similar to those described by Jean d’Haynin found their way into literary works as well, for tales of medieval romance are enduring testimonies to the efficacy of these hedges (see figure 10). In the famous Roman de la Rose, from the second half of the thirteenth century, the narrator fell in love with a rose that grew in an enclosed garden protected by a thorn hedge, and later had to rescue her from the fortress where she was held prisoner. It served as a major inspiration for the Roman de Perceforest, probably written in the County of Hainaut in the early fourteenth century. This remarkable story tells of the deeds of a knight errant who also had to pass through thorns and dense woodlands to reach his beloved. It is one of the oldest written versions of the fairy tale later known as “Sleeping Beauty.”

Hedges are one of the most important, but not the only, type of fortification that is often overlooked because it does not fit well into the traditional military–civilian dichotomy. Many churches in the Meuse Region were also fortified, a logical consequence of their role as ultimate refuge. Relatively large numbers of such fortified churches have been preserved in the southern half of the Meuse Region, but they existed elsewhere as well. The city accounts of Grave record, for instance, that its citizens besieged the church of Herpen in 1463. Some churches had defensive value that went beyond mere local defence, as in 1408, when John the Fearless, duke of Burgundy (1404–1419), insisted during the peace settlement with Liège that the walls of all fortified churchyards located next to the Sambre had to be demolished, which is difficult to understand if they were mere refuges for the villagers.

The use of fortified mills, and forges, is even more poorly understood than that of fortified churches. Mills were a prime target for raiders because they had a crucial socio-economic function, represented wealth, and their supply of water or wind energy made them stand apart of the rest of a settlement. In 1397, for example, Willem I Duke of Guelders and Jülich (1377/1393–1402), attempted to destroy a windmill built on top of a bulwark outside the gates of ’s-Hertogenbosch, but retreated when one of his knights was shot down. To save face he then burned a windmill that stood unprotected outside one of the other gates. Forges were vulnerable because of their role in arms

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production, and their need for running water. Fortifying both mills and forges could thus become a valid option in times of insecurity. The most conspicuous are two of the largest forges in the Meuse Region, those of Nouzon, near Charleville, and Ster (Vaux-sous-Chèvremont near Liège), which accommodated small garrisons in the seventeenth and eighteenth century.\(^{24}\) Perhaps the most striking case is the so-called "Tomp," a fifteenth-century windmill in the north of the Prince-Bishopric of Liège (at Achel). This structure was studied as a noble tower for decades, simply because it included obvious defensive features (gun slits, a hedge/fence, and a ditch).\(^{25}\)

Noble houses ("castles") certainly constitute one of the most archetypical fortifications, but here similar confusion exists. First of all, relatively few such noble houses resemble the classical castle as traditionally depicted. Jacques de Hemricourt, a nobleman from Liège, wrote in the late fourteenth century a history of the famous feud between two of the most powerful noble families in the Prince-Bishopric: the War of d’Awans and de Waroux (1297–1335).\(^{26}\) In this book he makes a distinction between three types of noble houses: a fortress (forteress), a tower (tour), and a simple house (plat maison). The first corresponded closely to the stereotypical medieval stronghold, while the others refer to simpler structures. It is in fact unclear whether a plat maison could be considered as a fortification at all.\(^{27}\)

Still, even the smaller types of noble house, which were also the most common, had some defensive worth. The Dutch/German word for a manor house with a tower, a blokhuis, is the same term used to describe temporary fortifications built from the thirteenth to the mid-sixteenth century during armed conflicts to either block access to a besieged city or fortress, or control traffic on a major river such as the Meuse.\(^{28}\) A fourteenth-century book of fiefs from the County of Loon, for example, mentions in 1367 unam assisiam, cum una turri dicta vulgariter blockehuys, located near the village of Millen, close to Maastricht. It is likely that when the Count of Loon agreed to participate in the siege of Gripekoven, near Roermond, in 1354, and provide thirty men-at-arms and thirty crossbowmen as garrisons for two blokhuizen, that these structures were closely modelled on such noble houses.\(^{29}\) The major difference being that they were typically made of wood rather than stone. Fiscal accounts suggest that their defences included ditches, fences, and gabions. At least one sixteenth-century blokhuis also comprised a drawbridge. They might have resembled both the bastilles of the Hundred Years

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\(^{25}\) Claassen, Van mottoren tot kasteel, 27–34; Doperé and Ubrechts, De donjon, 130.

\(^{26}\) de Hemricourt, Traité.

\(^{27}\) Coulson, Castles, 42–63; Genicot, ed., Les tours, 31–38.


\(^{29}\) de Borman, Le livre, 55–56; Ennen, Quellen, 394–95.
War, and bastions (bulwarks, bolwerken, boulevards) built to defend gateways in the Late Middle Ages (the word blokhuis was often used interchangeably with bolwerk).

These blokhuizen played a similar role to the motte-and-bailey castles made during military campaigns in the eleventh and twelfth centuries, and the earthen forts (sconces, schansen, Schanzen, or redoubts) constructed from the late sixteenth century onwards. All these fortifications have in common that they can be built relatively quickly, and that their construction mainly requires the presence of large numbers of semi- or unskilled labourers. Alpert of Metz records for example that in the early eleventh century Count Wichmann of Vreden ordered local peasants to make a motte-and-bailey castle on an island in a lake, which was located about two hundred paces from the Meuse River itself. This refers to the village of Boxmeer, which lies next to a dead arm of the Meuse, and a Roman road connecting Nijmegen with Cuijk. Wichmann’s fortification was taken and demolished shortly after its construction, but the location retained major strategic value. A blokhuis situated at Boxmeer was besieged in 1284 by the count of Holland, and again in 1365 by the duke of Brabant, because its owners exacted toll from merchants travelling along the Meuse. Habsburg forces partially demolished a castle built on this same location in 1572 and 1590.


32 Alpertus Mettensis, De diversitate temporum, 710–11; Aarts, “Montferland’ en de consequenties,” 34–37; Bachrach, “Civilians and Militia”; Burgers and Dijkhof, eds., De oudste stadsrekeningen, lxxviii, 30–31; van Helen, Rymkronyk, 108.
Broadening our definition of the range of structures that functioned as fortifications is only the first step. In order to come to a better understanding of army–ecosystem interactions at a landscape level, we need to consider them as elements in larger defence systems rather than as isolated points of resistance. Creating systems or networks of defence, that is organizing communication and cooperation between the defenders of individual fortifications, adds to the strength of the whole. In ideal circumstances defence systems ensure that the entire landscape works against the enemy. Given that the establishment of such defence systems is well known for early modern and nineteenth-century states (such as the Hollandic Water Line or Vauban’s *pré carré*) this chapter emphasizes their functioning in the absence of permanent armed forces.33

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33 See also Strickland, “Securing the North.”
From the eleventh century onwards the most important, most elaborate fortifications, the very core of defence systems, were invariably made of stone. Stone stood as the preferred building material because of its durability and resistance to the two most common assault techniques: setting fire and breaking down obstacles with an axe.34 Fire in particular presented a very serious threat: fiscal accounts from castellans and urban councils demonstrate that the roofs of towers and gates in major fortresses, such as Valkenburg, and prominent cities, such as Maastricht, were made of straw until well into the fifteenth or sixteenth century.35

The Meuse Region itself was a well-known centre of stone production. The Meuse valley from Givet to Maastricht more specifically had a good reputation for the quality of its limestone, and it was transported along the Meuse. A few isolated shipments ended up as far as Utrecht and Frisia. River cobbles, silex, schists, or sandstone provided the main alternatives, sandstone being especially common in the Eifel and Ardennes. Because land transport was so expensive such natural stone constituted only a relatively small part of building materials, bricks being the main component of most stone structures. However, since bricks were generally made from local materials, many of these can be considered calcereous as well. Fortresses located on rocky hilltops, such as Poilvache or Valkenburg were simply built or expanded by broadening the moat.36

The background of a well-known fifteenth-century painting, “Madonna of Chancellor Rolin,” shows various stone fortifications (fortresses, city walls, a fortified bridge) scattered throughout a landscape, which is centred on a major river (see figure 11). It is possible that the artist, Jan van Eyck, who came probably from Maaseik, had his native region in mind when he created this work of art. Jean Lejeune has identified the stone bridge as the Pont des Arches of Liège. This bridge, fortified by a massive gateway, existed from the eleventh century until its destruction by massive flooding of the Meuse in 1409. It protected the city’s core from the district on the right riverbank, Outre-Meuse, which lacked city walls until the thirteenth century.37

The landscape created by Jan van Eyck is more or less fictional, as one of the city’s towers is based on the Dom Tower in Utrecht, but actual defences in the Meuse Region might still have looked quite similar to it. The paintings of the brothers van Eyck are indeed famous for their realism and detail. This depiction of a river valley is significant, because it shows that fortifications have to be considered as part of larger defence systems rather than as individual structures. A similar emphasis on landscape control

34 Raynaud, A la Hache!, 346–49.
existed in the small city-state of Aachen, where the watchtowers in the Landwehr stood in direct visual contact with the towers of the city walls. The inclusion of visual control, reminiscent of the original meaning of the term landscape (land- scape: a view, or scenery of a collection of lands), is necessary to understand individual fortifications as parts of networks, not to be seen in isolation from other ways of communication.\textsuperscript{38}

Once a threat was identified and located mobilization of defending forces generally occurred through sound.\textsuperscript{39} Horns, drums, and gunshots could all raise the alarm, but none of these instruments could rival the importance of the bancloque or stormklok, kept in the bell tower of a parish church, belfry, or fortress, to assemble the ban’s population in case of alarm (some villages did not have a bancloque, but instead sounded all church bells at the same time). When this bell called all able-bodied adult males had to assemble and prepare to either defend the settlement, pursue criminals, or put out a fire. This bell was also the heaviest and largest one because its sound needed to carry across the entire territory of the ban (its “soundscape”). The reach of the bancloque corresponded to the limits of the ban’s jurisdiction.\textsuperscript{40}

Organizing systems of defence was rarely such a straightforward process, however. Authority over Maastricht for instance was shared between the duke of Brabant and the bishop of Liège, and to make matters even more complicated the city’s hinterland included several imperial immediacies, lordships that were held directly in fief from the emperor. When Maastricht became involved in a conflict between Brabant and Julich–Gelders in 1396, the city council made known to several lords in the area (those of Korstessem, Stein, Elsloo, Rekem, Neerharen, Born, Pietersheim, and Mopertingen) that if any raiders passed through their lordships, they had to sound the bells and pursue them, or the city would recompense itself double for the damage done by confiscating their goods or those of their subjects, and taking them prisoner. The lords in question were fiefholders of the duke, and some might have been citizens of Maastricht, but theoretically the city had no authority to command them.\textsuperscript{41}

This order, while threatening, was not an isolated incident, for both cities and rulers did their best to convince more or less independent lords or village communities to cooperate with them and join their defence system. A classic example are agreements between a particular nobleman on the one hand, and a ruler or city on the other, which stipulated that the former would provide armed service when required, or that the latter could treat his fortress as an “open house,” meaning that they had access to it during

\begin{thebibliography}{9}
\bibitem{39} Desbrière, Chronique critique, 31; Sabron, De oorlog, 2:32–33, 2:xv; Unger and Bezemer, Oudste stadsrekeningen, 50; van Masttrigt, Willemstad prinsheerlijk, 79, 158–59; van de Venne, Het beleg, 20.
\bibitem{40} Becquet, “Montaigle,” 123–24; Berens, Territoriale Entwicklung & Grenzbildung, 140; Jacobs, Justitie en politie, 161; Kaisin, Annales historiques de la commune de Chatelineau, 94; Sartelet, La principauté, 67.
\bibitem{41} van der Eerden-Vonk, Raadsverdragen, 218–19. See also Coun, “Een Middelnederlandse rol” and Koreman, De stadsrekening, 98, 108–9, 116, 118, 120.
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armed conflicts. Yet such contracts invariably included caveats that a nobleman could not be forced to fight against a ruler to whom he owed fealty, a consideration of particular importance in the politically fragmented Meuse Region.

At the other end of the spectrum, cooperation between the different elements that constitute a premodern territory could not be taken for granted. The numerous messages that rulers, cities, and individual lords sent to one another in wartime, payments for which appear regularly in accounts, certainly give a perception of regular cooperation and communication, but defence primarily remained a local matter. The town of Tongres (Tongeren in Dutch) for instance refused the bishop's soldiers entry in December 1566, and only acceded to its ruler's demands after extended negotiations, during which he promised to pay for their upkeep.

While cities and noblemen had good reasons to fear loss of autonomy and status, it was the mass of lowly peasants that paid the heaviest price. The duke of Bar instituted a policy of *traîre à forteresse* in the mid-fourteenth century, meaning that the rural population had to seek refuge in fortresses with their movable belongings in case of attack. This reinforced their dependency on local lords and undermined the relative increase in status and autonomy they had gained during the preceding period. In exchange for protection during a period of insecurity, the Hundred Years War, they were forced to perform labour duties typically associated with serfs: maintenance work on a ruler's fortress, notably cleaning the moat, and delivering certain supplies, such as wood, free of charge. Some also had to perform guard duty. The significant development is thus that obligations that had previously been bought off now had to be performed physically again, or were now being imposed for the first time.

In 1402 the villagers of Vaux-la-Grande started a lawsuit against Amé de Sarrebruck, lord of Commercy, because he forced them to perform guard duty in his fortress. The villagers argued that Commercy was not part of the kingdom of France, that the road was long and led through woodland (the village lies about fifteen kilometres southwest of the town), and that they had their own fortified church. Their opponent responded that Commercy was an important city on the frontier, and that its security was in the king's interest. Furthermore, the villagers were not allowed to turn their church into a fortress, it could only serve as a refuge during a raid.

The southern half of the Meuse Region was hardly unique in this (re)imposition of labour duties. The Habsburgs and the bishops of Liège similarly ordered peasants to

43 Burgers and Damen, “Feudal Obligation or Paid Service,” 788.
45 Tongeren, SAT, Resoluties, inv. no. 2, fols. 262, 264v.

A notarial act from Maaseik from 1697 lists the complaints of villagers from Haelen, Buggenum, Neer, Heythuysen, and Ophoven, who all had to provide manpower to defend the castle of Horne (the seat of this small county). Most villages had to supply guards, except for Ophoven, which was located at considerable distance and instead had to clean the castle’s moat and ponds once a year. Apparently, they now had to obey a new castellan who demanded six guards instead of four; made them stay day and night instead of solely acting as night watchmen, and tripled the fine for disobedience. Moreover, the guards now had to bring their own firewood, and often had to perform chores, such as helping with the harvest, with just one man standing guard.\footnote{Hasselt, RAH, Notaris Claessens 1663–1702 (microfilm no. 1462274, item 5) fol. 616: act June 16, 1697.}

Such misuse of military obligations encouraged rural populations to maintain or expand their own defences, especially fortified churches, which gave them stronger leverage to refuse newly imposed obligations, but also weakened the organization of defence systems. It is precisely because of its unpopularity that arrested vagrants or beggars were increasingly forced to construct or maintain fortifications from the mid-sixteenth century onwards (see chap. 4). It also reveals the difficulty of organizing and sustaining defence systems in the absence of permanent armed forces.

The imposition of labour duties reflects a fundamental but often overlooked problem: that of maintenance. Every man-made structure will eventually disintegrate due to a combination of factors: decay of organic materials, impact of weather and climate, and processes of ecological succession. Ecological succession refers to phases of vegetation growth, which follow each other after a disturbance, in this case the building of a fortification, until a climax point is reached. In Western Europe this climax stage consists typically of oak-beech forests. If a stone wall is not maintained, soil will start to accumulate on the wall’s surface, and in cracks and fissures. This in turn allows different kinds of plants to establish themselves, first grasses and herbs, then woody plants. Their root system adds to the destabilizing of the wall until only ruins remain. Moats filled with stagnant water likewise become shallower over time due to the accumulation of soil and the growth of plants such as reeds.\footnote{Peeters et al., \textit{Sloten}, 51–55; Segal, \textit{Ecological Notes}, 46–47, 67–75.}
chronicler Jean de Stavelot that this house was burned down and abandoned in 1445. Only twelve men defended it. Pollen research now reveals that the banks of the moat originally, in the fourteenth century, supported relatively little vegetation, and that vines and fruit-bearing trees (common walnut and hop) grew close to the moat, presumably in a garden. Over time, aquatic plants, such as meadowsweet (*Filipendula ulmaria*), gave way to weeds such as redschank (*Polygonum persicaria*), which means that the moat turned into land. This process occurred gradually at first, and then accelerated, possibly in tandem with the abandonment of nearby agricultural fields and the use of the moat as a watering trough and for disposing waste. These results can be compared to a study of plant seeds in the castle of Eindhoven from the sixteenth and early seventeenth centuries. This analysis suggests that the moat was quite shallow and polluted by waste from butchering and faeces. Historical sources confirm that when the castle was attacked in 1604 the moat was only 1.26 metres deep and constituted no obstacle to the attackers’ assault ladders.

Medieval fiscal accounts are filled with references to the construction or maintenance of fortifications, but this does not necessarily prove that defences were well preserved. Many fortifications were so extensive, with city walls measuring several kilometres or more in length, that there was always work to be done. The accounts of Venlo note for instance that master Harman Wegge and his attendants needed 137 days to clean the city’s moats in 1411. This hardly indicates regular maintenance. The city council did call upon its citizens to clean the moats in 1409, a war year, but this might not have been enough, or the work was not done properly. Cutting a plant above water level was after all not sufficient; it had to be pulled out entirely. Accounts from Maastricht, from 1399–1400, specify that the city bought a hook as well as a scythe to remove grass from the moats. The cleaning of the moats of Mons was apparently noteworthy enough in 1523, also a war year, for Antoine de Lusy to include it in his chronicle. He explicitly said that the work came at great cost to the city, but that they also profited from it, because they could sell the grass. The 1581 accounts of the castellany of Longwy mention that seventy-two villagers had to remove trees and bushes from the fortress’s moat.

It is indeed revealing for the haphazard character of the preservation of fortifications that authorities might have not proceeded with it if not for external events. Every fortification built next to the Meuse or its main tributaries ran the risk of being flooded after which repairs needed carried out, if only to prevent worse disasters in the future. In most cases, however, an imminent enemy threat provided the most convincing reason for spending money on fortifications. The accounts from Venlo reveal that in 1388,

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51 de Stavelot, *Chronique*, 555; Heim, “Wellin/Lomprez.”


53 de Groot, *De stadsrekeningen*, 1388 fol. 15; 1409 fol. 15; 1411 fol. 16; Koreman, *De stadsrekening*, 148, 155.


when a French army attempted to invade, the Count of Jülich sent four knights to inspect the defences.\textsuperscript{56} The cutting of wood in the \textit{Landwehr} that defended the frontier between the Duchy of Limburg against attacks from the Prince-Bishopric of Liège had always been a punishable offence, but in 1468, when Duke Charles the Bold was at war with Liège, an offender risked capital punishment and the confiscation of his possessions, instead of a heavy fine of six Rhenish florins.\textsuperscript{57}

Enemy threats thus ensured that military needs came to dominate structures that normally served multiple purposes. The town of Grave, for example, leased several of its towers and gates to private citizens in the fifteenth century. A 1452 contract, copied into the urban accounts, specified that a widow and her son could rent the tower and associated land located next to their own house on condition that they constructed a slate roof. The town reserved the right to take full control over the tower again in case of war.\textsuperscript{58} In an agreement from 1480 the city council of Maastricht similarly let a section of the city wall of Wijck, the part of the city that lay on the eastern riverbank, for four years to a citizen, who could fish in the moat, and pollard the willows.\textsuperscript{59} These willows served as sources of wood, and their roots stabilized the soil. The fact that some towers were named after individual guilds (such as the Lakenmakerstoren in Tongres/Tongeren) suggests that in some cases the latter were responsible for maintenance or defence of specific stretches of the city wall.\textsuperscript{60}

Private citizens also owned gardens or fields next to the walls and made posterns to allowed them to go in and out the city without having to pass through one of the main gates. It goes without saying that such entrances had to be filled up with solid masonry if there was any threat of an attack.\textsuperscript{61} This in turn created different problems. A municipal act from Namur, dating to 1430, when troops from Liège invaded the county, indicates

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\textbf{58} Grave, SLC, Archief Gemeente Grave, inv. no. 217, fols. 194r, 220r, 263r; inv. no. 218, fols. 34r, 43r, 54r, 131r.

\textbf{59} W.G., “Verpachting.”


that waste kept piling up alongside three houses on the city wall, because the nearby postern had been closed.\textsuperscript{62} A surviving copy of a 1396 charter kept in the archives of the bailiwick of Alden Biesen demonstrates that the city council of Maastricht went a step further and granted the Teutonic Order custody over one of the city gates, located within the gardens of the bailiwick. This privilege still applied in 1784 when the chief engineer of Maastricht ordered his assistants to investigate how a sortie, a small gate, in the commandery’s orchard could be secured without violating the institution’s rights.\textsuperscript{63}

Responsibility for the upkeep of fortifications lay with bodies or individuals who, at least theoretically, were concerned with the common good. This involved the upholding of law and order, as well as socio-economic concerns and public health. It is unlikely that urban councils, castellans, or high bailiffs would have given priority to military matters above all others unless a specific threat gave them a good reason to do so.\textsuperscript{64} The use of fortifications for other functions besides warfare can be considered as a practical way to ensure basic maintenance. It also means that a considerable part of maintenance work does not appear in fiscal accounts. Gateways and towers typically became living spaces for gatekeepers, gunners, or watchmen, and served as storage places for gunpowder and prisons. Some were even used to store archives (such as a tower in Namur castle). Because urban councils kept fish in the moats or allowed the construction of water mills some citizens had an incentive to clean and deepen the ditches.\textsuperscript{65} A thirteenth-century charter from Liège shows that the city council leased part of the moat to a private citizen on condition that he made sure it remained at least two metres wide.\textsuperscript{66}

This ambiguity is mirrored in the contested presence of animals in or near the fortifications. The accounts of Rotterdam from the year 1426–1427, for example, include a payment for the making of a fence to prevent livestock walking on the walls.\textsuperscript{67} This suggests that a considerable part of the city’s fortifications was still composed of earth, and that citizens did not respect official regulations against the pasture of animals. Still, when Albrecht Dürer published his fortification treatise in 1527, he also suggested that moats could serve as animal parks as well as shooting ranges. Toponyms in Liège and Maastricht indicate that this advice was based on actual practice, for they imply the presence of rabbit warrens (Tour aux Lapins and Konijnenberg in or next to the city walls.\textsuperscript{68} These might even have inspired the miniaturists who made the Maastricht

\begin{itemize}
\item \textsuperscript{62} Bodart, \textit{Société et espace urbains}, 101.
\item \textsuperscript{63} Maastricht, RHCL, 07.E01., inv. no. 1: Guarnisoensboek, B, December 17, 1784; Grauwels, ed., \textit{Regestenlijst}, 3:98–99.
\item \textsuperscript{64} Reyerson, “Medieval Walled Space,” 102–14; Wurtzel, “Defense, Authority, and City Limit,” 169–73.
\item \textsuperscript{66} Lemoine, “L’enceinte de Liège,” 56–57.
\item \textsuperscript{68} Dürer, \textit{Befestigung}, D; Moreau, \textit{Bolwerk der Nederlanden}, 84; Ulrix, “Le rempart d’Avroy.”
\end{itemize}
Book of Hours (see figure 12). Many rulers, such as the dukes of Guelders, incorporated impressive menageries, which even included lions, in their residences.⁶⁹

Archaeozoological research is far more informative in this regard than written sources. The study of animal bones in fortress moats and waste pits has revealed the remains of animals that lived in or around these noble houses: peafowl, swans, pigeons, dogs, horses, sparrowhawks, and goshawks. Many of these species might have moved around more or less unimpeded, swans’ wings usually being clipped, but birds of prey typically stayed in cages when not being involved in a noble hunt. Still, these reports also make clear that most bones found are the remains of species eaten by the occupants and did not necessarily live near the fortifications. Others might come from animals that were just killed and discarded. In the fortress of Franchimont for instance the bones of western jackdaws have been found, deposited in the early sixteenth century. This species is often treated as a nuisance animal or pest because it nests in buildings.⁷⁰

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Incidental references in fiscal accounts corroborate a general impression that unwanted animals were ruthlessly pursued and exterminated. The city of Mons, for example, paid a bounty in 1324 for the killing of an otter, which threatened the extensive fish stocks introduced into the moat. The accounts of the high bailiff of Montfort from 1397–1398 likewise indicate that someone was sent to Maastricht to buy lime for the capturing of house sparrows, which had established themselves in the fortress. The steward of Hambach (Jülich) paid a mouse-catcher for the killing of no fewer than one hundred and eight "large mice," probably rats, in 1440–1441. Two hundred years later, in 1661, the town council of Maaseik retracted its own prohibition regarding the killing of pigeons, and ordered citizens to shoot those dwelling near the city walls, because their waste damaged the ramparts.71

Similar remarks can be made about plants. Archeobotanical research becomes ever more important and, as argued above, provides some of the best evidence we have about plant growth in or near fortifications. Their results can be complemented with what scarce written evidence remains. An exceptional inventory of the gardens of the lordship of Chimay in 1606, for instance, lists no fewer than one hundred and twenty different species.72 Plants that expanded beyond these controlled contexts might initially have survived relatively unscathed, but sooner or later they would be curtailed just the same. The accounts of Grave thus mention the cutting down of an elder tree that grew next to the town wall in 1453.73 Even more revealing are payments by the city council of Luxemburg to labourers in 1445–1448, 1453–1454, and 1456–1457 for the mowing of grass, herbs, nettles, and thorns, which grew on or next to the city's (earthen) walls, and prevented guards from conducting patrols.74 Exactly because fortifications were well integrated into people’s daily lives proper maintenance was rarely an easy matter.

Imposing Military Perceptions

Fortifications were clearly far more diverse than has traditionally been claimed and have to be studied as part of larger systems of defence. Their multiple functions were simultaneously a response to, and the source of, basic maintenance problems. The logical next step is therefore to consider the reaction of armed forces to these issues: the militarizing of fortifications from the sixteenth century onwards. This eventually cre-

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ated a divergence between a handful of permanent garrisons and a mass of traditional fortifications that were only militarized during armed conflicts.

In the Meuse Region, most settlements only constructed stone fortifications (fortresses, city walls, churches) after the tenth century. A handful had the advantage of being able to lay claim to continuity with a long-distant past (such as Verdun or Tongres). The most important cities in the Meuse Region—Verdun, Namur, Liège, Maastricht, Aachen, and ’s-Hertogenbosch—built a series of city walls during the Central and Late Middle Ages as the population grew. It is typically the second city wall, built in the thirteenth to fifteenth century, which remained in use until the nineteenth century.75 Given the time, cost, and effort needed to build such elaborate stone structures, it comes as no surprise that in many late medieval cities large parts of the walls were still made of earth rather than stone.76

This continuity between the Central Middle Ages and the nineteenth century is remarkable in light of the common emphasis on the supposedly “revolutionary” effects of gunpowder weapons on fortifications, especially in the fifteenth and sixteenth centuries. Medieval walls were not abandoned, but simply became part of early modern defences. There are in fact only two examples of major fortifications where the original medieval fortress was discarded in favour of an entirely new structure: Agimont-Charlemont (Givet, mid-sixteenth century) and Longwy (late seventeenth century).77 The famous engineer de Vauban, who was paradoxically also the mastermind behind the reshaping of Longwy, declared in his report of the 1692 siege of Namur that medieval walls were “the best of all.”78

This is not to deny the significant effect gunpowder weapons had on fortifications. It is meant to demonstrate that many studies about military architecture, especially those affiliated with the “Military Revolution” thesis, underestimate the continued value of medieval fortifications. Armed forces in the Meuse Region were familiar with gunpowder weapons by the mid-fourteenth century at the latest, as I mentioned in the introduction. The initial, mainly fifteenth-century, adaptations to gunpowder weaponry were relatively simple and consisted of constructing so-called barbicans to shield the gates from direct artillery fire, and adding bulwarks to provide firing platforms. When the effectiveness of gunpowder weapons increased, fortification design had to respond as well: by the mid-sixteenth century the famous trace italienne, low thick stone walls with bastions intended to eliminate blind angles, was introduced to the Low Countries.79

Very few settlements in the Meuse Region, however, could rely on such elaborate defences in the Italian manner; only the fortifications of Jülich, and a few new forts

77 Bertrand, “Une construction continue”; Garcin, De Longwy et Vauban.
(such as Philippeville and Mariembourg) were built entirely in this style. In most cases renewal consisted simply of adapting the old medieval walls to new demands, which meant constructing new bastions, lowering the towers to the same height as the walls, and making both walls and towers wider by building an earthen embankment behind them or filling them with earth. Lowering the walls made them more vulnerable to an assault so the moats had to be enlarged and deepened as well. These works required so much earth that household waste, manure, and soil from gardens and cemeteries were used in emergencies to fill the new defences. Practical measures thus lie at the origin of the so-called Old Dutch system of defence, which developed during the Eighty Years War, and combined earthen walls with the extensive use of water and vegetation. Such fortifications are much faster and cheaper to construct than the expensive stone walls of the Italian system, and at least as effective.

The literature on military architecture is quite extensive, but surprisingly few scholars have commented on the ecological effects of these changes, or even on the widespread use of plants. Noteworthy exceptions are Philippe Bragard’s and Klaus Jordan’s studies on the function of plants in fortifications, which also clarify how complex the building of these earthen walls must have been. In the Low Countries labourers used special techniques to construct earthen defences, called gazonnage or placage, an important detail that is generally overlooked. These methods date back to at least the fifteenth century and consisted of constructing several layers of earth (placage) or grass blocks (gazonnage) with bundles of branches (fascines) in between. The earth had to be fairly thick (black) and was often filled with seeds or roots of plants in order to add to the strength of the whole. These techniques were a prerequisite for constructing walls with a slope of forty-five or sixty degrees, designed to resist both cannon balls and infantry assaults, as such steep walls cannot be constructed by simply making a mound of earth. They also required considerable cost and effort, as the actual construction had to be done by skilled artisans, and blocks of grass had to be dug from nearby meadows. Because of its complexity and cost gazonnage was abandoned in the late eighteenth to early nineteenth centuries, and placage in the later nineteenth century. From that moment on, the earth was simply piled up and grass was sown later.

A second, and far-better-known element in the increased use of plants was the planting of trees on the top of the scarp or main wall from the late sixteenth century onwards. The most common species were field elm, linden (or lime), aspen, oak, willow, and common walnut. Gunners preferred field elm above all others for the making of gun carriages, and engineers appreciated its extensive root system. During the nineteenth century engineering treatises increasingly recommended planting Lombardy poplars and Canadian poplars, man-made varieties of the black poplar, which have a


very straight silhouette, produced good timber, and grow relatively fast. This large-scale introduction of trees served multiple purposes: their roots reduced erosion, strengthened the wall against artillery fire, and made mining more difficult. The trees' crown denied the enemy a view of the inner city and also provided shade for guards stationed on top of the walls (see figure 13). The trunks also served as a welcome source of timber, especially since many garrisons lacked access to extensive woodlands.⁸³

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⁸³ Geldern, Stadtarchiv, A, no. G9, Stadtrechnung, fol. 147r (1590–1591), fol. 221r (1592) (transcript Rien van den Brand); Maastricht, RHCL, 07.E01., inv. no. 1: Guarnisoensboek, December 24, 1771; Belonje, “Beplantingen”; Boonen, “De Maaseiker wallen,” 59; Boosten, Jansen, and Borkent, Beplantingen, 38–43; Bragard, “Soldats et jardiniers,” 97–99; Bragard et al., Namur et ses enceintes, 42, 51, 54, 73; Freitag, Architectura, 26; Hasselbrink, Manuductio ad Architecturam Militarem, 178–79; Jordan, “Grün in Festungen”; Lawrence, City Trees, 24–26; Merker, Verhandeling, 2:163–65; 2:100–110; Moreau, Bolwerk der Nederlanden, 68, 128, 152, 223; Muller; “Bouillon,” 71; Speckle, Architectura, 27r, 31r, 108v, 109r; van Bavel et al., De kroniek, 400; van den Brand and Manders, Vesting ’t Genneperhuys, 388.
Other considerations, aesthetic ones, played a role as well. When brigadier de Pichard, commander of the citadel of Liège, wanted to convince the Estates, always reluctant to spend any more on military matters than necessary, of the need to provide funding to buy trees in 1744, he mentioned in his request that field elm provided suitable wood for gun carriages. It was only five years later that another staff officer, captain Colson, who lived in the citadel and had his own garden there, arranged with one of the councillors of Liège to buy field elms and lime trees in Amsterdam, and transport them to Liège. By 1750 two hundred and fifty trees embellished the citadel, and were maintained by gardeners. Once these trees grew too big they were sold, for financial reasons, rather than cut down (1786). Technological improvements thus simultaneously brought about the expansion of fortifications, and a relative increase in the use of plants, though this does not mean that military concerns always governed their exact use.

The gradual encompassment of medieval stone walls in extensive layers of earthen walls and ditches needs to be seen in the context of the history of engineering science. While master carpenters, masons, architects, and artillerymen served as military engineers throughout the Middle Ages, during the fifteenth and sixteenth century the knowledge required for such matters, especially fortress building, became so complicated that it stimulated the development of the engineer as a profession. The first engineers who appeared in the Meuse Region in the early sixteenth century came from Italy. By the turn of the century the Low Countries and other parts of the Holy Roman Empire supplied engineers of their own. These men were highly sought-after specialists, but not members of the military in the strict sense of the word. Distinctions between “military,” and “civic” engineers only came about in the late seventeenth and early eighteenth centuries. A major dividing line did exist, however, between architects who designed or improved fortifications (ingénieurs de places), and officers who had experience in assaulting them (ingénieurs de tranchées).

The development of the engineering profession was of major importance for the ways armed forces interacted with ecological systems, because it provided them with far more tools to influence landscapes, in the form of maps, drainage techniques, canal building, mining, ballistics, and similar. Local hydrography had after all exerted significant influence on the construction of medieval fortifications. The urban accounts of Geldern indicate that in the fourteenth century living hedges, as opposed to fences or a combination of hedge and fence, could only be found on the east side of the city, near the Yssumer and Gelder Tor. Given that the river Niers, which is connected to the town’s moats, runs much further to the west, it is likely that the water level in this part of the moat was very low, and could occasionally even have dried up. The planting of living hedges might thus have compensated for a local deficiency of water as a barrier.
Medieval armies did have knowledge of water management and mining, and certainly applied this during sieges (see below), but this was relatively basic in comparison to the large-scale projects early modern engineers designed. Fortresses located on hills, for example, rarely had access to running water, and thus depended on cisterns or wells. Medieval armed forces could also construct or destroy dams, dikes, and sluices for defensive purposes. The castellan of Valkenburg, for instance, ordered the building of a dam in the Geul in 1465 to ensure that the water in the town moat remained deep enough during a potential siege. Difficulties associated with water management probably go a long way to explain why most noble houses were located near streams or waterlogged terrain rather than hills.

By the 1700s the principal fortresses in the Meuse Region depended for their defence on floodplains and moats that could be filled with water through complex systems of sluices and canals. Breaching or building dams was easy enough but allowed very little control over the extent of the flooded area, the water level, and the speed of inundation. A major turning point was thus the construction of evermore extensive systems of inundation sluices from the late sixteenth century onwards. Such devices were only effective, however, if they could be secured against enemy attacks as well as local inhabitants who opposed the flooding of their lands. The security of water management systems therefore encouraged the building of ever more fortifications, such as detached forts.

From the late seventeenth century onwards, engineers also created permanent (masonry) mining galleries in a handful of fortresses (Verdun, Maubeuge, Philippeville, Namur, Maastricht). Mining was already a well-known siege technique in the Middle Ages, but the spread of gunpowder made mining activities far more efficient and dangerous. These galleries were often very extensive, with those of Philippeville, which have still been preserved, measuring about ten kilometres in length. Given the general humidity of these underground constructions, small gaps were left in the walls which could be closed at short notice, as it was impractical to install wooden doors in peacetime. Ventilation shafts, some six metres in length, were indispensable as were small canals designed to dispose of the excess water. The galleries could also be used to store supplies, albeit only for short periods of time due to the humidity, and shield the defenders during bombardments.


Nevertheless, even engineers had to take into account the environmental constraints posed by the landscapes they sought to defend. Casemates, cellars, and water-filled ditches were common enough, but only two fortresses depended on both inundations and mining galleries: Verdun and Maastricht. Engineers also focused on the tributaries of the Meuse to establish inundations, because its main current proved too strong to control. The Maastricht inundation thus operated with water from the river Jeker/Geer. The landscape modifications that did succeed came moreover at a very high cost of manpower and resources. The registers of the French Hôtel des Invalides give an original perspective on the difficulties faced when constructing or improving fortifications in the late seventeenth and early eighteenth century. During this period of intensive warfare thousands of soldiers became invalids, which led to writing down service records that would otherwise not have been preserved. These lists reveal that one soldier got affected with rheumatism because he spent long hours constructing sluices in Sedan, another one, a miner, fell down the rocks when making staircases for the fortress of Dinant, and many others got wounded during mine explosions because the hard underground in Givet necessitated their use.

The important role of engineers in the changing relationship between armed forces and the ecosystems with which they interacted lay in their role as government representatives as well as the increased potential of landscape modification that their profession represented. By the eighteenth century appointing military engineers to oversee the preservation of fortifications had become the norm, as revealed by the administration they left us. The combination of these specialists with the institution of more extensive guard systems (see chap. 4) gave military forces much more leeway in imposing their view on fortifications, and urban defences in particular. The military engineer was the “expert” who knew best how to defend a landscape, and the permanent military garrison provided him with the means to enforce his view, against the wishes of local residents if necessary.

In a minority of cases the authority of military engineers became so all-encompassing that governments charged them with tasks that had very little or nothing to do with military matters. The engineer brigade stationed in the Austrian Netherlands enjoyed a particularly high reputation, and became an important tool of government control. A typical example is the government in Brussels’ order to Philippe De Laing, major general of the engineers, to devise measures to prevent the flooding of the Meuse in the 1760s. In the kingdom of France by contrast a military engineering academy was only founded in 1749–1750, later than its civilian equivalent (1747), and in the Dutch Republic control over water was even more strongly concentrated in the civilian hands.

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94 Moreau, *Bolwerk der Nederlanden*; Groussard, "Vauban et l’eau."
95 Vincennes, SHD, GR, 2Xy09: Jan La Plaine; 2Xy12: Claude Croissant dit La Jeunesse; 2Xy13: Jean du Bord dit St Jean, Hubert Grangé dit Beaupré; 2Xy14: Jean Du Barry dit Leytoure; 2Xy22: Jean François Bourguignon dit Jasemin, Antoine Collardon dit Comtois; 2Xy25: François Paquet dit Belmont, Jan Bap.te Mazuret dit La Tulippe (transcript www.hoteldesinvalides.org).
96 See for instance Maastricht, RHCL, 07.E01, inv. no. 1: Guarnisoensboek.
of water boards. Nevertheless, military engineers were quick to exploit opportunities created by natural disasters. In 1757, when melting ice water from the Rhine and Meuse basins destroyed dikes and flooded large areas of land, Dutch military engineers came to the aid of local governments, and simultaneously charted the regional hydrography to provide the military with a new mechanism of control.\textsuperscript{98} Engineers played a key role in military forces’ growing control over landscapes, but their efforts did not go unchallenged nor were without their limitations.

The sheer cost of and complications resulting from adaptations to fortifications have been mentioned repeatedly, but one logical consequence has been left unexamined: the fact that these changes, impressive as they were, only applied to a handful of major fortresses of which Heusden, ’s-Hertogenbosch, Venlo, Maastricht, Namur, Givet, Maubeuge, Mézières, Sedan, Longwy, and Verdun were the most important. The growing gap from the sixteenth century onwards between a handful of up-to-date fortresses with permanent garrisons and the great mass of more traditional fortifications, is relatively well known within military history. The main issue is that most scholars assume that these latter defences simply lost their military value altogether.

It cannot be emphasized enough that large armed forces of thousands of soldiers with the latest siege equipment did not constitute the most typical army, even in a zone as strategic as the Meuse Region. For most people up to the eighteenth century the most common, and most direct, threat remained that of relatively small bands of raiders who stole, kidnapped, and burned, or extorted money not to do so. More traditional fortifications, well imbedded in people’s daily lives, retained their effectiveness because bringing up artillery was such a complex process. It is revealing that many churches in the French \textit{département} of the Meuse were not fortified in the Middle Ages, but only in the sixteenth or early seventeenth century, when political turmoil created a climate of insecurity.\textsuperscript{99}

Another noteworthy example are so-called sconces or \textit{schansen}, forts made from blocks of earth and \textit{fascines} (the word \textit{schans} originally referred to such a bundle of branches), which were commonly used by armed forces of a state to defend strategic routes in the late sixteenth and seventeenth century. They also spread rapidly throughout the Campine/Kempen during the Eighty Years War, as villagers had to find new ways to defend themselves, and their property. Some of the first forts appeared around parish churches, which again confirms these buildings’ central defensive role in rural areas. Most, however, were entirely new constructions in the most inaccessible part of the village: marshes or heathlands. These peasant \textit{schansen}, an acre to two hectares large, existed in peace as well as war, and were in fact miniature villages or hamlets, since some villages had several \textit{schansen}, in which every household had a plot of land, and was obliged to help with its maintenance. They only disappeared in the late eighteenth and nineteenth century.\textsuperscript{100}


The spread of gunpowder did make many medieval fortifications redundant, but this was hardly the linear process traditionally presented. The diary of Splinter Helmich, a citizen from Utrecht who joined the “Sea Beggars” and participated in the taking of Den Briel, is a good example. He fought as captain of his own company in the area around Venlo and Roermond in the 1570s, and regularly encountered medieval fortresses and village churches, which were unable to resist cannon, but remained quite effective against an unsupported infantry unit.  

In the 1700s military treatises still gave practical advice on how to adapt traditional defensive structures, such as hedges, churches, or castles, for use as field fortifications. Medieval fortifications did not lose their defensive value as a result of ineffectiveness, but because violent encounters between soldiers and local residents became increasingly rare (see chaps. 3 and 4). This meant that the general population felt increasingly less pressure to maintain multifunctional structures with respect to defensive needs. So-called *fermes en carré*, built in Hesbaye during the eighteenth and nineteenth centuries, are a good example. These resemble medieval fortresses, but only functioned as fortifications in exceptional circumstances (such as the farm of Goumont/Hougoumont during the battle of Waterloo). The ongoing importance of more old-fashioned fortifications, despite the spread of ever more effective gunpowder weapons, goes a long way to explain the Prince-Bishopric of Liège’s deviation from a general pattern towards the adoption of ever more extensive fortifications. The great majority of its fortresses and city walls saw few adaptations after the early sixteenth century, the citadel of Liège, constructed in the mid-seventeenth century, being the only modern fortress erected by order of the bishop. The Prince-Bishopric correspondingly retained only a handful of permanent garrisons in the medieval fortresses of Bouillon, Dinant, Huy, and Stokkem, as well as the citadel of Liège. Most of these forces were also quite small to contemporary standards: a surviving muster list of the soldiers stationed in the fortress of Stokkem in 1655 indicates that the garrison consisted of a mere forty-two men: the high bailiff, two lieutenants, and three squads of thirteen men headed by a corporal. By the eighteenth century only one garrison remained: a single infantry regiment of six hundred men housed in the partially demolished citadel of Liège.

This exceptional case has its origin in the bishopric’s policy of neutrality, adopted in the late fifteenth century, but is also related to the constant conflicts between the bishops and their own subjects, which made the latter reluctant to provide funds for military forces that would have given their ruler too much power. In 1636 Bishop Ferdinand of Bavaria (1612–1650) even directed the infamous Imperial general Johann von Werth against his own subjects in order to bring them to obedience. The building of the citadel of Liège was a repercussion of this open war. The downside of this policy was the Prince-

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101 Helmich, *Journaal*.
Bishopric’s vulnerability to almost every potentate that sought to take advantage of the strategic value of the Meuse.\textsuperscript{105}

Attempts by the Habsburgs, French monarchs, and the Dutch Republic to secure their own frontiers, their “garden,” came regularly at the expense of the Prince-Bishopric: Givet, Mariembourg, Philippeville, and Bouillon were more or less forcibly ceded to Spain and France for strategic reasons, while the fortresses of Charleroi and Maastricht expanded their defences by encroaching upon the bishop’s territory. When the French army occupied large parts of the principality of Liège during the Franco-Dutch War (1672–1678) they turned the towns of Dinant and Maaseik, Stokkem being considered too small, into fortresses capable of resisting modern siege artillery. When they retreated again, in 1678 in the case of Maaseik and 1698 for Dinant, they demolished everything, including large parts of the original medieval defences.\textsuperscript{106}

Similar processes could be observed in other parts of the Meuse Region that were unfortunate enough to lay on the edges or outside the French and Dutch “gardens.” The French army ruined fortifications in the Duchy of Bar–Lorraine and the Spanish Netherlands on a large scale in the second half of the seventeenth century, and the Dutch army demolished parts of the medieval fortress of Valkenburg with explosives in 1672. An undefended fortification is after all a liability rather than an asset. The maintenance of a handful of up-to-date fortresses and settlements as the only proper fortifications within military structures, with the rest being dismissed as either irrelevant or simple field fortifications, was thus not left to chance, but enforced violently. Still, since urban walls and noble houses were too large to be destroyed at short notice, soldiers just created breaches with explosives to make them indefensible. These structures eventually turned into ruins because local residents no longer looked after them.\textsuperscript{107}

The final demise of all existing fortifications in the Meuse Region, medieval as well as early modern, originated as much in changing political contexts as in technological developments. Emperor Joseph II’s wish to expel Dutch garrisons stationed in the Austrian Netherlands, a result of the so-called Barrière treaties in 1697–1715, led him to order the demolition of large parts of the fortifications of Namur in 1782. The French takeover of most of Western Europe in 1795–1814 likewise entailed the neglect of almost all remaining fortifications in the Meuse Region. The fortresses of Verdun and Givet for instance simply became gaols for British prisoners of war.\textsuperscript{108} The creation of a new kingdom of the Netherlands and the Belgian secession fifteen years later did seem to reverse this trend, since Liège, Huy, Dinant, Charleroi, Namur, and Bouillon were refor-


tified, but these new forts were again replaced by the Brialmont fortresses around Liège and Namur in the last decades of the nineteenth century. The Dutch army also decided to abandon the fortresses of Maastricht and Venlo in the 1860s because of their isolated position, and fell back on the New Hollandic Water Line. These developments did not spell the end of vegetation in fortifications; their use was actually expanded towards the end of the nineteenth century because of an increasing emphasis on camouflage. What matters is that the thread linking medieval fortifications to nineteenth century garrisons had finally been severed.

Conserving Fortifications

Technological change in combination with an increasing distinction between armies and the general population brought about a divergence between a handful of defences that became permanently incorporated into military structures, and the great majority which were only militarized during armed conflicts or lost their defensive value altogether. So, our next object of study turns to how armed forces sought to preserve fortifications, as opposed to fortifications as multifunctional structures maintained by the general population. This focus on military management of fortifications allows the making of a comparison between their current ecological value and historical management practices.

The militarizing of fortifications, the fact that armed forces, initially just soldiers and later military forces in the strict sense of the word, took control over defensive structures, was a very gradual process. Individual watchmen and sentinels were ubiquitous in medieval fortifications, but acted as urban officials or members of noble households (see chap. 4). The first permanent garrisons only became established in the late fifteenth century. The number of soldiers engaged in such garrison duty remained relatively limited, rarely exceeding a single infantry company before the late sixteenth century, and more importantly, was restricted to a handful of strategic fortresses and newly constructed forts in frontier contexts (such as Charlemont, Mariembourg, and Philippeville).

Furthermore, even though many such fortifications were closely integrated into urban defences the influence their garrisons could exert was rather small. Particularly revealing is a court record from Stokkem, dating to 1610–1612, regarding a man who built (pig)stables on or next to the walls. The high bailiff had ordered him to tear down the stables on multiple occasions, but the offending citizen claimed that his authority did not extend beyond the old medieval fortress. Cities were not surprisingly very reluctant to accept garrisons, perceiving them as a threat to their autonomy, until the prolonged and large-scale wars of the late sixteenth and seventeenth centuries (in turn,

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110 Dauphant, Le Royaume des quatre rivières, 244–45.

111 Hasselt, RAH, Schepenbank Stokkem, inv. no. 162: Paulus Jegher s.
the French Wars of Religion, the Eighty and Thirty Years’ Wars) forced them to give way. The city of 's-Hertogenbosch for instance enlisted soldiers of their own during conflicts between Brabant and Guelders in the fifteenth and early sixteenth century, but by the 1560s it had to accept the presence of Spanish soldiers sent by their monarch.  

Aspirations of urban autonomy did not stop with the establishment of large permanent garrisons. While soldiers could more or less impose control over the newly established earthen outworks and outlying forts, authority over the original city wall continued to be divided. This was the only part of the fortifications citizens could access, albeit with restrictions: in peacetime they could walk there during the day. The governor of Maastricht, for example, made his soldiers construct the oldest public park of the city next to its main wall in 1653. This park, which still exists, was probably built to gain the citizens’ favour; but might have had the additional advantage of keeping them away from the rest of the fortifications. The records kept by the chief engineer in Maastricht reveal that he had to compensate the city council in 1741 for seven trees, which stood on the main wall, that were cut down and used as wood for gun emplacements. In December 1745 he even started an inquiry to find out to whom the trees on the walls actually belonged.

Military control of fortifications ultimately rested on two pillars: the imposing of a more extensive guard system and the attribution of responsibility for fortification maintenance to (military) engineers. These engineers in their turn hired contractors to execute the necessary works. A surviving agreement from nineteenth-century Maastricht specified that plants such as rushes had to be removed from the water-filled moats twice a year, which seems like an improvement compared to earlier practices. This outsourcing of government tasks was a characteristic of early modern warfare, but also created obvious security concerns. The constructing and maintenance of underground casemates or mining galleries, the most covert elements in fortifications, thus became the prerogative of military miners during the eighteenth century, as proven by surviving reports from Namur. They were not accessible to anyone else except engineers and high-ranking officers.  

The increasing involvement of soldiers in fortification maintenance can also be seen in this light, although their main function seems to have been that of a cheap labour force. An early example comes from an account regarding the fortification of Geldern in 1597–1598. It includes payments to two soldiers for cutting fascines, and digging. By the late seventeenth century soldiers regularly worked on fortifications to earn some

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112 Adriaenssen, Staatsvormend geweld, 37, 42, 46, 111; Gudde, Garnizoen, 7, 13–28.
113 The Hague, NA, Raad van State, inv. no. 2057: Garnisoensorderboek, October 2, 1785; Maastricht, RHCL, 07.E01., inv. no. 1: Guarnisoensboek B, December 22, 1741, December 17, 1745; Haanen, “Het eerste stadspark.”
114 The Hague, NA, Raad van State, inv. no. 2599: Records concerning the construction of casemates by miners of the garrison of Namur; Maastricht, RHCL, 07.E01., inv. no. 1: Guarnisoensboek, 9: Contracts regarding the maintenance of the fortifications of Maastricht; Moreau, Bolwerk der Nederlanden, 286, 289, 296, 299, 307.
115 Maastricht, RHCL, 01.002 Rekenkamer Roermond, inv. no. 385: Accounts fortification Geldern, 1597–1598 (transcript Rien van den Brand).
extra pay, either as day labourers with the contractors or under the direct orders of military engineers. Particularly instructive for the low status attributed to this kind of work is that in 1748 in the Dutch army forced labour on the fortifications became the official punishment for desertion (see chap. 4).

The use of large numbers of labourers became a necessity, because of the vulnerability of these steep earthen walls to erosion. The average life expectancy of such a wall, if not maintained, was around three to four years. This explains why military authorities were so concerned with limiting access to the fortifications. A garrison order from Namur, dating to June 1714, even forbade soldiers to lie on the grass. French regulations from 1750 similarly specified that governors could not cut the grass on the walls more than twice a year, and that they had to make sure that no one damaged these structures. A garrison’s staff officers were after all entitled to the income generated by the fortifications: hay production and the renting out of fisheries in the moats.

Two contracts from Maastricht, dating to 1710 and 1716, reveal that a representative of the garrison commander rented a considerable part of the outworks along the river Jeker/Geer to a sheep merchant. Such agreements must have been quite common, but they have rarely been preserved, possibly because officers considered them part of their private archive. Sheep are quite agile, and in contrast to cows or horses, would not have damaged earthen walls in any significant way. Other governors, such as those of ‘s-Hertogenbosch, cut the grass as much as possible, which in turn prompted the Dutch government to buy off their entitlments, and grant contractors the right to cut the grass instead.

This renting out of the fortifications in peacetime was, unfortunately for the military officers involved, not the only remnant of medieval practices. Local residents continued to perceive fortifications as multifunctional structures, but instead of an accommodating city council, they now saw themselves confronted with an organization that had little patience for such matters. Many citizens considered fortifications as an appropriate, perhaps the only suitable, place for pasturing livestock, for waste disposal, bleaching or drying linen, fishing, and playing games.

117 The Hague, NA, Raad van State, inv. no. 2079, order June 28, 1714; Ordonnance du roi (June 25, 1750) article dclcv; Vallée and Pariset, eds., Carnet, 82; Vermeesch, Oorlog, Steden en Staatsvorming, 222–25.
118 Maastricht, RHCL, 07.E01, inv. no. 40: Archief garnizoenscommandant, Pachtcontracten January 29, 1710, and May 1, 1716.
119 ‘s­Hertogenbosch, BHIC, 178, inv. no. 188, fol. 632r; inv. no. 326, fol. 301r; inv. no. 331, fol. 20r, inv. no. 332, fol. 124r; Maastricht, RHCL, 07.E01, inv. no. 1: Guarnisoensboek B, June 1, 1756; Ordonnance du roi (June 25, 1750) article dclcv; Caminada-Voorham, Loevestein, 51–54; Sangers and Simons, Geschiedenis, 94–95, 105.
of Namur were in a horrific state. Everyone and everything could access them at will, they were filled with gardens, and groups of dogs assembled there and chased mice and moles. Medieval walls were already closely associated with such activities, and low earthen embankments were even more appealing.121

Yet soldiers were also not without fault where the damaging of fortifications was concerned. Aside from fishing, hunting, and digging for loam (see chap. 4), many also created gardens in or near the fortifications. The governor of the fortress of Gennep, which controlled the junction of the Niers and the Meuse, gave two subordinate officers on May 5, 1650 permission to establish gardens in the empty space behind the guardhouse. Their example inspired others and less than a year later, in March 1651, when government representatives (gecommitteerden) inspected the defences, citizens and soldiers had already expanded their gardens to such an extent that in many places the walls had become too small to accommodate cannons. They had to be removed immediately, but appeared again during the 1654 and 1671 inspections.122 This example makes clear that officers had no issue with gardens as such; they recognized the value of having access to fresh vegetables, but wanted to ensure that they did not impede defensive efforts. This meant in practice that generally only officers and military hospitals had their own gardens. Some of these would still have been quite large. The officers’ gardens in the eighteenth-century fortress of Montmédy measured no less than six hundred square metres.123

Remarkably enough, given the importance of plants in fortifications, it is quite unclear to what extent military officers, and engineers in particular, had the minimum of botanic knowledge necessary to ensure their wellbeing. The French engineer de Cormontaigne gave some brief advice on how to remove worms and moss from the trees standing on walls in a 1741 treatise, but this was quite uncommon. The French military engineering school in Mézières, founded in 1748–1751, did not consider botany to be a very important subject, and put it only occasionally on the curriculum.124 Some of the most detailed instructions regarding the cultivation of plants come from a journal on military engineering, which published an article on tree planting in 1829. This piece listed existing regulations applied within the garrison of Verdun, and addressed an apparently widespread concern among engineers at that time: that the planting of trees in fortifications often failed. The author, an engineering captain, blamed the carelessness and ignorance of the contractors and labourers who had to carry out this task. His own directives are relatively basic. He mentions, for instance, that plants raised in nurseries might have difficulty adapting to the soil of the fortifications and recommends

121 Bragard, Dictionnaire, 312–13.
123 Liège, AEL, Etats, inv. no. 3007; Barbe, “Rocroy,” 119–20; Bragard, “Soldats et jardiniers,” 87–88; Mourroux, “Stenay, ville militaire,” 42; Muller, “Arlon, Bastogne, Laroche, Marche,” 264; Muller, “Boillon,” 76; Sartelet, La principauté, 60, 61, 63; See also Ottersbach, “Der Garten in der Festung.”
specific species for different soil types. The rarity of this captain’s interest in botanical matters is corroborated by the fact that his name also appears in a horticultural journal, in which he describes a rare apple variety found at Verdun.¹²⁵

Surviving records from the nineteenth-century garrison of Maastricht confirm this impression. The stronghold, like many other large garrisons at this time, had its own plant nursery that occupied more than one acre. In the year 1824 the director of the fortifications offered a contract for the delivery of five thousand field elms, sixteen thousand willows, eight thousand birches, eight thousand alders, two thousand hazel shrubs, two thousand oaks, and one thousand beech trees. Most of these were planted as coppice wood near the Boschpoort, on the northwest side of the city. Another fourteen baskets with acorns and thornapple seeds, seven pounds of alder and birch seed, eight thousand young ash trees, and three thousand Canadian poplars had to be supplied for the garrison’s nursery. Even if one takes into account the sheer size of the fortifications and that the garrison initiated a major planting program in this period, the number of plants that perished on a yearly basis must have been enormous. The year 1825 again saw the planting of at least one thousand six hundred and seventy trees (nine hundred and fifty Canadian poplars, four hundred and fifty field elms, one hundred and seventy-five ash trees, seventy Lombardy poplars and twenty-five nut trees), and the planting of forty-four thousand young trees and shrubs in the nursery.¹²⁶ Military forces considerably expanded their control over fortifications, but they never fully succeeded in imposing their grip on a complex ecological reality.

Maintaining fortifications was clearly no easy matter, neither for medieval urban councils and high bailiffs nor for early modern military organizations. It was far from obvious that armies could enforce their views on how fortifications should be managed. We will now turn to the one, perhaps the only, circumstance in which military views predominated at the expense of all others: an actual siege. The term siege is interpreted here as a formal blockade of a fortification with the object of conquering it through attrition or direct assault, not a sudden attack. This means that our next focus will be on the most extensive and stereotypical fortifications: fortresses and cities.

An actual siege was a rather rare event: the cities of Maastricht and Namur, both key locations for controlling the Meuse River, experienced only fourteen and eight sieges respectively in the entire period from 1250 to 1850. This was a consequence of the difficulties associated with the transport of artillery, and the financial cost a siege entailed. An additional consideration in medieval contexts was that only a limited number of people, mostly residing in major urban settlements, had the experience necessary to construct or maintain complicated siege equipment.¹²⁷ For instance, the siege of the fortress of Sampigny in 1358 necessitated the transportation of “two large machines,” and a battering ram from Verdun to Sampigny on ten wagons, thirty carts, and the mobiliza-

１２５ Piérard, “Instruction”; Piérard, “Rapport.”
１２６ Maastricht, RHCL, 07.E01, inv. no. 9: Performance specifications concerning the maintenance of the fortifications of Maastricht, no. 76; Lienard, “Le fort,” 103.
tion of six hundred sergents de pieds (infantrymen) as guards.\textsuperscript{128} When the urban militia of Aachen participated in the siege of the fortress of Reifferscheid in 1385 they had to move a trebuchet, broken down into its constituent parts, over a distance of about sixty kilometres, a task that took sixty-one horses, fourteen wagons, and five days. Reassembling and erecting the device before the besieged fortress took another six days and twelve skilled artisans, and the stones had to be specially brought from Nideggen. The burden of using this equipment was in fact so considerable that the cities of Aachen and Cologne shared the costs.\textsuperscript{129}

When a siege did happen, however, it produced ecological effects that can only be compared to a natural disaster. At first glance, it thus appears that the only occasion armed forces could really control defence structures was also the moment their very existence was threatened. This can best be described as succeeding steps of increasing intensity. Simple preparation for an enemy attack, not necessarily a siege (see chap. 4), entailed all vegetation and structures in the immediate surroundings of a fortress or city that could benefit the enemy, such as trees, hedges, buildings, ditches, and even hollow lanes, being demolished or flattened. Such destruction initially applied to everything within bowshot range, but later to the effective reach of a gun or cannon.\textsuperscript{130} On the night of January 25 to 26, 1407, for example, watchmen from Maubeuge observed fires near the fortress of La Buissière. One of the town’s messengers went there the next day to investigate. It turned out that the fortress’ occupants had set fire to the hedges and bushes around the defences as a precaution.\textsuperscript{131} The actual carrying out of such orders must often have met with strong opposition, for resolutions of the city council of Liège reveal that mayors were permitted to enlist guards armed with halberds to accompany them on their inspection tours in 1568. We know that such defensive measures were quite often only partially performed, or even not at all, because of resistance from local inhabitants.\textsuperscript{132}

It is precisely because of the reactions such orders generated that permanent garrisons in the eighteenth and especially nineteenth centuries imposed restrictions in peace as well as wartime. The French Republic codified and expanded existing regulations when it stipulated in 1791 that nobody could build anything within a radius of two hundred and fifty metres around the outermost defences. Structures that could be easily destroyed, such as wooden buildings or vegetation, were allowed within a radius of four hundred and fifty metres, but these could be destroyed in wartime without compensa-
Especially instructive of the ecological effects of such a policy is a military map from 1753, which depicts Mézières and Charleville (see figure 14). These towns have very different street patterns because the former had a medieval origin while the latter was constructed according to a set plan in 1606 by Charles I Gonzague, duke of Nevers and Rethel, as capital of his new principality. The most important difference between them is not their street pattern, however, but rather that Mézières was a key fortress in the defence of France’s northern frontier, while Charleville lost its defensive value in the late seventeenth century. Wide-open fields thus encircled Mézières, while Charleville counted numerous gardens in its immediate surroundings.

Figure 14. Military map depicting Mézières and Charleville in 1753 (Paris, BnF, Cartes et plans, GE D–14449).

133 Ordonnance Corps du Génie (1776), 31–32; Delalleau, Traité de servitudes; Muller, “Bouillon,” 57; Parmentier, Pays de Charleroi, 77; van der Woud, Het lege land, 369–72, 476–77.

134 The French army initially constructed a fort (Mont Olympe) on the Meuse’s left riverbank, opposite Charleville, to make sure the city could not serve as a stronghold against France. This fort lost its military value simultaneously with Charleville, but its remnants still appear on the 1753 map (upper right corner). Hubert, Histoire de Charleville.
Making sure that a potential enemy would be unable to find cover was only the first step in preparing for an adequate defence. The defenders also had to restore or expand the fortifications, store sufficient supplies, and otherwise prepare for a substantial increase in the number of occupants, man and beast, for an unknown length of time. This inevitably entailed further encroachments on nearby woodlands (see chap. 3). Two members of the garrison of Montaigle, near Dinant, received a financial reward in 1465 to remove large amounts of compost and waste from the fortress, that had accumulated there as result of the many men-at-arms who came to garrison it, in combination with the livestock brought there for safekeeping. It filled the courtyard and soiled the water of the well.\footnote{Becquet, "Montaigle," 104, 106. See also Dreiskämper, "Thonis Ongewassen en Johan Copper," 181.}

When Waultrin de Fillers, general receiver and forester of Longwy, organized this fortress for a potential siege in 1474–1475, he ordered the construction of a horse-drawn mill and the cleaning of the well and the latrines.\footnote{Bar-le-Duc, ADM, B 1879, fols. 130v–141r.}

The construction of horse-drawn mills, also attested in fifteenth-century Valkenburg, was a practical response to the fact that defenders could lose access to the wind or water mills they normally used. Towns and cities sometimes constructed windmills on their walls, which safeguarded them against a direct enemy attack, but still made them very vulnerable to a bombardment (see the raid on 's-Hertogenbosch in 1397 above).\footnote{Barbe, Laverdine and Parizel, Moulines, 18; Marchal, Inventaire, 328–29; Milot, "Les garnisons," 733; Parmentier, Pays de Charleroi, 65; Sartelet, Sedan, 77; van de Venne, Het beleg, 18.}

If mills became unusable, grain could no longer be turned into flour, which effectively made available grain stocks next to useless. The Burgundian army forced Tongres/Tongeren to surrender after only eight days in 1482 by damming the river Jeker, on which the city's water mills depended. An earlier attempt by Liégeois troops besieging Maasstricht in 1408 failed because the citizens constructed new water mills on the Meuse, which was too large to be diverted.\footnote{de Stavelot, Chronique, 115–16; Molinet, Chroniques, 1:376–77.}

Military garrisons also ran into conflicts with millers because water mills slowed down watercourses, which in turn obstructed defensive inundations. The French governor of Maastricht thus forbade the millers of Tongres/Tongeren to work in July 1678 until the inundation of the fields to the south of Maastricht, which also depended on the Jeker, was complete.\footnote{Ordonnance Corps du Génie (1776), 33–35; van den Brand and Manders, Vesting 't Genneperhuys, 415; Vandewal, Moerenpoort, 14.}

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Inundations were a regular feature of many sieges, and as argued before, became increasingly complex through the involvement of engineers. One of the most famous engineering feats was the siege of 's-Hertogenbosch in 1629, where Dutch engineers nullified the defenders’ main ecological advantage: the waterlogged soil around the city, aggravated by the deliberate inundation of the rivers Aa, Dieze, and Dommel. The besiegers built twenty-one horse-drawn mills, connected them to the inundation by special canals, and then drained the area surrounding the fortress. They also rechanneled the Aa and Dommel to create a new inundation between themselves and a Spanish relief army. This event has become one of the most renowned feats of the Eighty Years War,
but was actually not that exceptional. Dutch forces already used similar drainage techniques during the 1593 siege of Geertruidenberg.\textsuperscript{140} The fame of the 1629 siege is probably based on the numerous prints and paintings made to commemorate it (see figure 15). A noteworthy detail is that the bottom image depicts a soldier fishing. This seems to have been a common practice, even though it could be dangerous. The chronicle of the Sint-Geertuiklooster mentions that a soldier was hit by a cannon ball and lost both his legs whilst fishing in the Dommel.\textsuperscript{141}

Such inundations could serve both defensive and offensive purposes. The siege of Aachen in 1248 for example saw the besieging army, joined by pilgrims from the Low Countries, build a huge dam in the river Wurm in order to flood a considerable part


\textsuperscript{141} van Bavel et al., \textit{De kroniek}, 335.
of the city. The expertise for building this huge dam has traditionally been attributed to pilgrims originating from Frisia, but the *Chronicon Regia Coloniensis* indicates that they only arrived after the dam had been built. More landlocked areas might therefore still have had their own experts in hydrology.\(^\text{142}\) Chronicles from the Prince-Bishopric of Liège in particular indicate that miners were regularly involved in attempts to divert watercourses during sieges. They undoubtedly used their experience in digging coalmines.\(^\text{143}\) As late as 1826–1827 the Netherlands regiment of sappers and miners, which was stationed in Grave and recruited most of its personnel in the Maastricht and Liège area, saved the city from the flooding of the Meuse by reinforcing the river dikes.\(^\text{144}\)

The emphasis on establishing a breach or diverting streams was primordial, for sieges were governed by rules designed to limit unnecessary suffering. It is indeed suggestive that few sieges, medieval or early modern, lasted longer than two months after the initial encircling. (The siege of Aachen in 1248, which lasted almost six months is exceptional.) This also meant that starvation rarely became the main motivation for capitulating, although many marginalized groups did suffer from hunger. Disaffected citizens could be an important cause for surrendering early, since holding out until a besieging force fought its way into a fortress or city meant risking pillage, violence, and possibly massacres. The citizens of Saint-Mihiel thus diverted the watercourse that fed the garrison’s gunpowder mill in 1635 so that the governor had no choice but to yield to the besieging French army.\(^\text{145}\) By the seventeenth century the aim of most sieges was simply to breach the main wall, which was sufficiently large to allow a potential assault to be made. At that point most defenders surrendered.\(^\text{146}\)

As a result of such de-escalation measures, sieges were in themselves rarely sufficient to cause the destruction or abandonment of fortifications, despite their similarity to natural disasters. The demolition of major defences, such as the town walls of Dinant in 1466 or those of La Mothe in 1645, was time-consuming and labour-intensive, and therefore a highly symbolic political act that should be clearly distinguished from simple attempts to make a fortification indefensible, typically by creating a breach.\(^\text{147}\) Even so, repairing the damage of a siege could still be a long drawn-out process. The *Sentence de Lille*, the peace treaty between Liège and Burgundy from 1408, specified that the citizens of Tongres/Tongeren had to fill the trenches dug during the siege of Maastricht (1407–1408), or pay others to carry out this task. The city council of ’s-Hertogenbosch paid a contractor to supply trees in 1632, and again bought one thousand willows, four hundred field elms, and two hundred linden (lime) trees in 1636 to plant on the walls,\(^\text{148}\)


\(^\text{144}\) van Hoof and Roozenbeek, *Grave*, 50.

\(^\text{145}\) Abel et Bouteiller, eds., *Journal*, 238.


which suggests that it took seven years to fully replace the trees cut down during the siege of 1629.148

Although most trenches might have been filled again relatively quickly, the disturbances they caused changed the structure of the soil permanently. Archaeological research has benefitted significantly in the last decades from the study of soil and crop marks, particularly differences in soil colour and vegetation growth. These are observable from the air and allow the identification of former fortifications as well as siege trenches. Furthermore, some structures remained a visible part of the local landscape for decades, sometimes even centuries. French engineers who charted the lands between the Sambre and Meuse in 1787, for instance, still depicted old retranchements made in 1689. Four earthen hills constructed within Mézières as artillery platforms (cavaliers) during the siege of 1521 also survived into the eighteenth century.149 Sieges evidently left scars in the landscape, but they were on their own rarely sufficient to cause fortifications’ destruction.

Studying the ways armed forces sought to preserve fortifications, or indeed threatened their very existence, is very helpful for understanding these structures’ ecological impacts, but it still does not allow a convincing comparison to be made between the historical management of fortifications and the current importance environmentalists attribute to them. It is for this reason that we will now examine an exceptional source, whose value has been mostly ignored up till now: nineteenth-century studies by naturalists of fortifications still actively managed by the military. There are many natural histories or botanical works available for earlier periods, but these rarely provide detailed information where a specific species could be found.150 This is not to say that the information these sources provide is unproblematic. Many naturalists exclusively focus on vascular plants, which means that animals, mosses, lichens, and fungi are underrepresented. Latin names have also changed markedly in the last hundred and fifty years, and some plants identified by these scholars are no longer recognized as a separate species. It is also unclear to what extent such studies provide evidence about biodiversity in fortifications before the nineteenth century.151

Still, there can be no doubt these naturalist studies, when put together, offer us a unique glimpse of the species that lived in fortifications when military organizations were still managing them. It is far from obvious that they would have been permitted

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149 Feller, “Toponymie,” 100; Lemoine-Isabeau, La cartographie, 53–54; Moranvillé, “Un incident,” 346; Renard, Toponymie, 90–91; Sartelet, Mézières, 28; Vanderbeken and Wesemael, “De belegeringen.”
150 Weeda, “Over de betrouwbaarheid van oude literatuurgegevens.”
to do so. Outsiders had limited access to defensive structures, with officers especially concerned about enemy spies. Antoine de Lusy, a citizen of Mons, wrote down in his journal that a man from Brittany was arrested and executed in 1525 for inspecting the moats of the city (a war year). The eighteenth-century regulations of the garrison stationed in the castle of Namur also state that sentries had to arrest anyone found writing or drawing something near the fortifications, and the published results of a botanists’ excursion in Givet, dating to 1867, explicitly comment that the naturalists were only able to pass through the fortress of Charlemont after they obtained permission. A captain of the garrison, an amateur botanist himself, served as their guide.\textsuperscript{152} It is likewise hardly a coincidence that a military doctor, F. J. J. van Hoven, wrote the oldest guide to the flora of ‘s-Hertogenbosch or that the pharmacist L. J. G. Dumoulin published his flora of Maastricht in 1868, the same year the fortifications lost their military status (see the appendix for a full overview of species found). Even members of the military had limited or no access to the more restricted parts of the fortifications, which might explain why van Hoven only considers lichens growing on trees and not those on the walls themselves (except one species on the outlying Fort Isabella).\textsuperscript{153}

The plant and animal diversity in nineteenth-century fortifications, as revealed by these naturalists’ publications, can be explained by drawing attention to the military desire to close off access to these areas, as well as the very landscape diversity these fortifications generated. Military forces’ concern with maintaining an open field of fire in combination with their methods of grassland management—mowing the grass only twice a year or pasturing sheep—would in effect have stimulated plant diversity.\textsuperscript{154} This diversity in turn could have attracted different kinds of creatures, such as butterflies and moths. The naturalist Félix Liénard explicitly referred to the ditches of the fortifications and fields near the citadel of Verdun as the best locations for catching lepidoptera.\textsuperscript{155}

Fortifications were also home to a wide range of water plants, a reflection of the fact that plant growth develops more easily in still or slow-moving water. Dr. van Hoven identified no fewer than three plants that could be found specifically near the inundation slush of Heusden. Mining galleries by contrast have a similar ecological function to caves because of their high humidity and constant temperatures.\textsuperscript{156} French naturalists identified the fortress of Charlemont as a hibernation place for rare bats, such as the Geoffroy’s bat (\textit{Myotis emarginatus}) and the barbastelle (\textit{Barbastella barbastellus}), as early as 1806. Finally, even plants typically associated with woodlands could be found in some fortifications, as Dumoulin discovered a very rare orchid, the violet helleborine.

\textsuperscript{152} The Hague, NA, Raad van State, inv. no. 2078, Orders Castle of Namur, art.2; de Lusy, \textit{Le journal}, 358; Devos, “Compte rendu,” 321–22.
\textsuperscript{153} van Hoven, \textit{Flora van ‘s-Hertogenbosch}, 31–32.
\textsuperscript{154} Godron, \textit{Flore}, 62, 258–59; Graatsma et al., eds., \textit{De flora}, 105; van Hoven, \textit{Flora van ‘s-Hertogenbosch}.
\textsuperscript{155} Liénard, “Catalogue,” 377–78;
\textsuperscript{156} van Hoven, \textit{Flora van ‘s-Hertogenbosch}, 5, 8, 9.
(Epipactis purpurata) in the coppice wood planted in the outworks beyond the Boschpoort in Maastricht.\footnote{157}

The most striking element in fortifications, however, proved to be neither of these environments. Stone walls are home to relatively few species, but the species that they do accommodate can be found nowhere else. Steep stone walls, like those of fortresses, churches, or city walls are, ecologically speaking, quite similar to a rock or mountain environment. A typical example of such a rare species is tower mustard (Arabis glabra), a herb that grew on the medieval city walls of Maastricht in 1868. Another typical wall plant, perennial wall rocket (diplotaxis tenuifolia) could be found plentifully on the fortifications of Montmédy, Sedan, Givet, and Rocroy in the nineteenth century. Fortifications were especially important for these plants because only a small part was effectively used on a daily basis for living purposes (simply the towers, gates, and guard houses). If a wall gets heated from the inside the variations in temperature became too extreme for such plants during the colder seasons.\footnote{158}

The importance of stone walls lies indeed not only in their specific construction, but also in the creation of warm microclimates. The term microclimate refers to a local variation of the general climate, from a few square metres to several hectares. This variation can be caused by differences in soil structure, as the presence of stone typically generates higher temperatures, but also by vegetation coverage or the presence of water (both of which have a cooling effect), the angle of the incoming sunlight, and the wind. These microclimates are essential for biodiversity, because they can support a far greater range of species than a uniform climate.\footnote{159}

One of the most significant environmental impacts of the characteristic star-shaped fortifications of the early modern period might therefore be that they created a mosaic of microclimates, given the variations in sunlight (different angles), humidity (wet or dry moats), and vegetation (trees and hedges). This is confirmed by the study of botanist André Devos from 1870, which records that hyssop grew abundantly in the ditches on the southwestern flank of the fortress of Charlemont and on the south side of the fortress of Montmédy, locations where the sunlight was most intense and winds could only exert limited influence. Many of the lepidoptera found in or near the citadel of Verdun were likewise typical of warmer climates.\footnote{160}

Hyssop is not native to the Meuse Region, but had been introduced as a garden plant in the late Middle Ages, being well known for its medical properties. Given that many other plants closely associated with the fortifications can be identified as archaeophytes, it is likely that gardens had a major role in the spread of herbs and flowers to

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158 Dumoulin, Guide du botaniste, 19; Francis, "Wall ecology"; Pierrot, Cardot, and Vuillaume, Catalogue, 78–79; Segal, Ecological Notes, 48–50.

159 Stoutjesdijk and Barkman, Microclimate.

defensive structures. These transfers, deliberate or not, would have been facilitated by the suitability of stone walls for plants of a Mediterranean origin: a rock environment, warm microclimates, and calcareous soils. The fact that limestone constituted one of the most important building materials in the Meuse Region is a crucial element in the fortifications’ ecology, because in northern Europe the diversity of calcareous soils is much higher than those of an acidic nature. This is a result of a historical bottleneck: the Ice Ages. During these periods of global cooling the Mediterranean, with its numerous calcereous soils, provided a refuge for species linked to warmer climates, while Europe north of the Pyrenees and Alps experienced a massive extinction. Fortifications might thus have assisted in the gradual recovery of Northern European ecosystems, a process that started after the last Ice Age and continues to this day. Their role might have been especially important in the context of the so-called Little Ice Age (during the sixteenth to nineteenth centuries).

While the connection between gardens and fortifications is quite strong, it is far from certain who managed them. Devos identified gardens in or near the fortresses of Charlemont, Dinant, Namur, and Huy as the origin of some typical garden plants that could be found there in the nineteenth century. This brings us to the nub of the problem: there were many gardens in or near fortifications, but their cultivation was not a military prerogative. One cannot be certain for instance that hyssop or other garden plants that grew in the fortresses of Charlemont and Montmédy had a military origin, for even these fortresses housed small communities that were not part of the garrison as such.

In some cases garden plants established themselves despite intense opposition of the armed forces. Engineers stationed in Maastricht had to devise new inundation basins in 1764, since the old ones, constructed by French forces in the late seventeenth century, had become unsuitable because citizens used them for gardening. They thus made new basins, demolished the gardens in the process, and then used the lands for inspecting the units of the garrison in battle order to ensure no one tried to cultivate these lands again. When Dumoulin gave a lecture about the flora of Maastricht in 1832, however, he still mentioned the presence of wild daffodils (Narcissus pseudonarcissus subsp pseudonarcissus) on the dikes of the inundation basins, remnants of the gardens destroyed in 1764.

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165 The Hague, NA, Raad van State, inv. no. 2057: Garnisoensorderboek, October 5, 1785; Graatsma et al., eds., De flora, 37, 47, 85; Moreau, Bolwerk der Nederlanden, 258–62.
These daffodils were far from the only species that survived in fortifications despite attempts to remove them. One of the officers of the Maastricht garrison filed a request with the forestry department in the 1820s to put fox traps in the mining galleries. He claimed that the animals could damage these underground corridors with their burrowing. This might have been a common attitude, for Eduard Lenz, a sapper lieutenant in the Bavarian army, also recommended the eradication of hole-digging animals in his treatise *Ueber technische Truppen* (1827). Contractors tasked with executing basic maintenance tasks similarly had to cut down caterpillar nests and remove nettles or thistles. Bats seem to have survived relatively unscathed, being considered just a minor nuisance. Lenz simply specified that droppings of bats and other creatures had to be cleared from the mining galleries.

The biological diversity these naturalists encountered was therefore to a large extent unintended. It does not follow, however, that the role of the military in bringing about these ecological results was negligible. Military forces created and maintained landscape diversity because it had military value, and this variety in turn made a remarkable

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167 Liège, AEL, Etats, inv. no. 3007; Maastricht, RHCL, 07.E01, inv. no. 9: Performance specifications concerning the maintenance of the fortifications of Maastricht, September 6, 1825; Caminada-Voorham, *Loevestein*, 52; Hasselbrink, *Manuductio ad Architecturam Militarem*, 177.
diversity of species possible. This can best be illustrated by taking the fortifications of
Nijmegen as an example. This city was the subject of two different botanical studies, one
from 1848, the other in 1888, which allow a systematic comparison to be made between
plant diversity before and after the city's defences lost their military value (1874). While
some typical wall vegetation survived in those parts of the walls that had not yet been
broken down, in most cases ruderal plants ("weeds") had replaced them.168

The parts of the fortifications that survived onslaughts of urban development typi-
cally became incorporated into parks. Others joined older defence structures that had
become isolated ruins in the middle of woodlands. Such abandoned fortifications still
have ecological value, but their importance mainly lies in the fact that they are green
islands in the middle of landscapes that were transformed as a result of industrializa-
tion, population growth, and an intensification of agriculture.169 Instead of allowing
trees and shrubs to take over former fortifications, which eventually contributes to their
destruction, many conservationists now opt for maintenance that strongly resembles
historical management practices. Sheep graze in the largest surviving part of the early
modern fortifications of Maastricht, the Hoge Fronten, and most woody plants have
been removed (see figure 16).

Nevertheless, even ruins of medieval fortresses, abandoned for several centuries,
could still play an important ecological role. A recent study of former castle mottes in
French woodland environments has demonstrated that they exhibit significant differ-
ces in the composition of plant species, compared to the woodlands that surround
them. These ruins act as ecological islands that are valuable from a biological viewpoint
because they add diversity to the landscape. They contain more species typical of cal-
careous and nutrient rich soils, as well as more competitive ruderal species and epizo-
ochore. A similar study regarding molluscs in the Czech Republic has confirmed these
results. Even though these medieval fortifications had been abandoned for centuries the
chemical changes in the soil structure they brought about retain their influence till this
very day.170

Conclusion

The current variety of plants and animals in disused fortifications is a logical conse-
quence of these structures' ecology when they still had military value. Neglect is not
a prerequisite for fortifications to be biologically significant. Up to a certain point it is
even counterproductive, for the landscape diversity typical for fortifications depends on
human involvement and regular maintenance. Plants, earth, and natural stone remained
the main components of fortifications until concrete and barbed wire replaced them in
the later nineteenth century. In the case of the Meuse Region continuity was so strong

169 Cremers, Kaaij, and Steenbergen, Bolwerken, 125–29; Lawrence, City Trees, 195–98; van der
170 Closset-Kopp and Decocq, "Remnant Artificial Habitats"; Jurickova and Kucera, "Ruins of Medi-
eval Castles."

that many stone fortifications built during the Central Middle Ages retained their defensive role into the nineteenth century. Their presence defined militarized landscapes across the centuries.

The biodiversity value of fortifications, as reflected in the studies of nineteenth-century naturalists, was directly related to the defensive value of preserving various landscape elements in a relatively compressed space. At the same time numerous species spread to fortifications unintentionally, or even despite military opposition. This chapter consequently does not claim that armies deliberately made fortifications a suitable place for numerous species of plants and animals, only that the need for military defence created circumstances that allowed flora and fauna to thrive. Many conservationists actually manage former fortifications in a manner that strongly resembles pre-modern practices. A ruin in the middle of woodlands, on the other hand, can also have ecological value. Everything depends on local circumstances and establishing priorities. Leaving a former fortress covered with woody plants alone might be preferable if forest ecosystems are very rare in that specific area. One just has to keep in mind that in such instances abandoned fortifications become valuable because humans have over-exploited ecosystems to such an extent that every green island in a sea of grey becomes significant. This is quite distinct from the historical contribution of fortifications to landscape diversity.