Archaeologia Historica Polona
vol. 30, 2022, pp. 131–156, ISSN 1425–3534, DOI: 10.12775/AHP.2022.006

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The inner perimeter of the town fortifications and its role in townspace: a case study of Wrocław in the transition period from the Middle Ages to modernity*

Abstract. The aim of the article is to trace changes in the development of the area of the former town fortifications as an example of space recycling and adapting the town to changing conditions. A case study was carried out in Wrocław, one of Poland's few cities with medieval fortifications on the inner and outer perimeter. We used archaeological sources, architectural research, documents, and iconography to reconstruct the changes in the urban plots created by the division of the fortification area. The function of the town walls was changing from military objects through workshops, residential buildings, gardens, roads, until demolition. The role of the inner moat is also described with ecological aspects of its functioning in focus. Efforts were made to determine the long-term impact that those transformations had on the social structure and the development of the city. Analogical processes took place in many European cities in the Middle Ages and in the modern era.

Keywords: city walls, castle, empty spaces, recycling.

Introduction

A city is considered a palimpsest of structures changing in time in which new layers overlap with the old ones. The re-use of space is therefore a process permanently connected to urban life (Engbersen 2001; Bailey 2007). Economic, political, and

* The article was contributed as part of grant no. 2019/35/B/HS3/00088 of the National Science Centre, Poland, implemented at the Institute of Archaeology, University of Wrocław, titled "Luxury, standard and poverty in the civilisation of the burghers of East-Central Europe in the 15th–18th centuries. Case studies of Wrocław and Prague".

social changes are the main causes behind the adaptation of existing buildings and other elements of urban structure. Archaeologists, historians, and architects tend to identify their relics, reconstruct their original appearance, and document the process of their modernization. They rarely paid attention to social aspects related to them (Christophersen 2015).

In the Middle Ages, many European cities expanded beyond their borders. The fortifications that marked their former borders ceased to play a strategic role. Usually, researchers perceived town walls in a traditional way, that is, through the prism of their original function (Creighton, Higham 2005). This article seeks to outline the problem of the developing space of fortifications that lost their military functions. Were they demolished, or rather adapted? How did this affect the structure of a modern city? This seemingly very narrow problem turns out to have broader and more universal meanings. The space of former fortifications had become temporarily an "empty space" with a great potential (Smith 2008; Cembrzyński, Radomski 2020). The way in which this "empty space" was managed had an impact on the ecology of the city and the valorisation of the cityscape (Jervis *et al.* 2021). It touches upon aspects of the city's functioning, such as social inequality – creating luxurious spaces and poverty enclaves. It is also related to ecological issues of town functioning, such as the issue of access to fresh water, waste disposal, and biological hazards management (Padberg 1996; Sowina 2016; Piekalski *et al.* 2020). To delve deeper into the transformations related to the reuse of fortifications, we investigate the example of Wrocław – the capital city of Silesia, a historical region located on the borderland of Poland, Germany, and the Czech Republic (*Wrocław* 2017).

Wrocław: a case study

The historic centre of Wrocław (in German – *Breslau*) was significantly damaged during the Second World War. Owing to large-scale rescue-excavations conducted from the 1970s, it was possible to reconstruct the process of the development of the former fortifications area (Lasota, Wiśniewski 1998; Konczewski *et al.* 2010). However, the re-use of fortifications has never been of interest to researchers. References to post-medieval phases appear sporadically in archaeological reports. For this reason, this study was supported by an analysis of tax records and the town's council documents developed by historians, which provided grounds for the reconstruction of the socio-topography of the town at the end of the Middle Ages (Goliński 1997). Iconography was an important source of information, especially plans and panoramas of the town created from the 16th century onwards. Most useful were plans developed by Barthel Weiners in 1562, Friedrich Gross and Frederik H. Vroom, ca.1587, Georg Hayer in 1591, Matthäus Merian in ca.1650,

and Friedrich B.Wernher in ca. 1765, as well as modern cadastral plans from 1837 and 1902–1912 (*Wrocław* 2017). We also find useful narrative sources, including descriptions of the town created by residents and visitors from the 16th to 19th century, e.g., Bartholomäus Stein (1995) and John Quincy-Adams (1804).

Development of medieval fortifications in Wrocław

The town of Wrocław was founded on the German law on the left bank of the Odra River (Fig. 1). Its first borders consisted of an earth embankment and a dry ditch (Lasota, Wiśniewski 1998, p. 21). Building of the new brick wall took a few decades, and was initiated by the threat of the first Mongol invasion in 1241 (Bimler 1940; Goliński 1986; Kastek, Mruczek 2016, pp. 17–18). The first document mentioning the existing wall dates back to 1261 (Goliński 1986, pp. 23–41). The shape of the fortifications was dictated by a compromise between the desire to protect the whole developed area, the cost of construction, and time constraints. The wall surrounded the most densely populated area, but its course did not overlap with the town border planned at the time of the parcelling – as indicated by the intersection of plots on the inner side of the wall. It can be concluded that the construction of the wall narrowed down the originally planned townspace.

The wall was built of brick in the monk bond (two stretchers – one header), in the *opus emplectum* technique. Its foundation, 2.1–2.6 m wide, was made of erratics sealed with humus and brick debris. The foundation was shallow, which was compensated by covering the wall with a layer of sand from the outside (Piszczałowski *et al*. 1993, p. 51). The wall was approximately 2.0–2.3 m wide and 8–9 m high. The towers with a forehead length of 7–8 m were spaced every 28–32 m (around 100 feet), having a height of the wall crown, and were put in front of the wall line by approximately 3.5–4.0 m. The number of towers is estimated at about 62 (Lasota, Wiśniewski 1998, p. 28). Originally, five gates were leading into the town; later the number of gates increased to seven (Fig. 2) (Goliński 1986; Romanow 2001).

The wall was built in batches, as evidenced by the distortions identified in several sections (Lasota, Wiśniewski 1998, p. 21). The humus layers observed in the internal structure of the wall indicate interruptions in the construction process (Kitliński *et al*. 2004, p. 155). The erection of the northern section of the wall, from the side of the Odra River, was the last step to be finished. Probably, this is because the river and the earth embankment provided sufficient protection in that area.

Due to the increasing threat of attacked from the south, the town wall was additionally strengthened with two lower pre-walls forming a double *Zwinger* (Lasota, Wiśniewski 1998, pp. 15–16). It consisted of two terraces surrounded by walls and a ditch. A ditch on the outer side of the second wall line was interpreted as remains of the first town moat (Lasota, Wiśniewski 1998 p. 15; Limisiewicz,

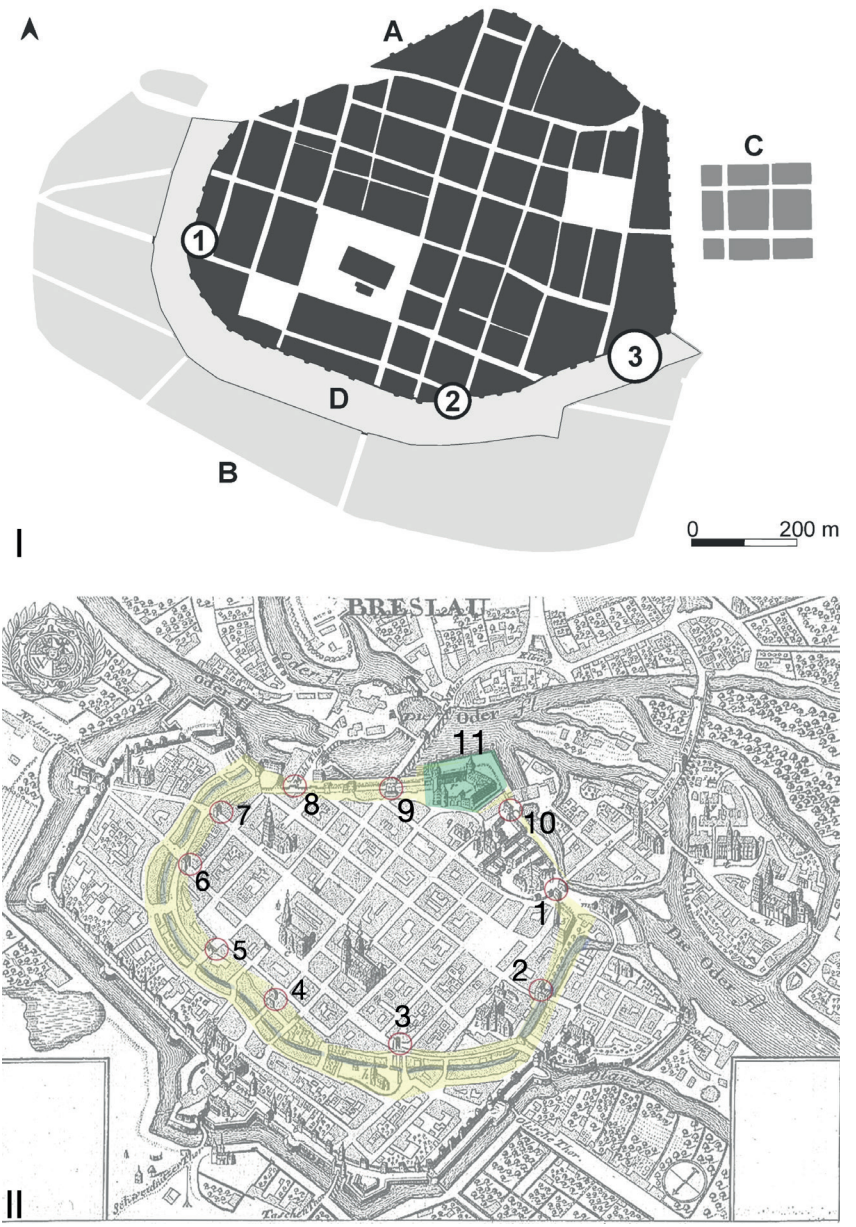

Fig. 1. I. Wrocław, main elements of mediaeval town: A – inner city (before 1261), B – outer city (1261), C – New Town (1263), D – area of inner fortifications. II. Location of main archaeological excavations described in the text: 1 – Białoskórnicza, no. 1, 2 – Łaciarska Street, 3 – Dominikański Square (developed by M. Legut-Pintal and M. Grossel). II. Wrocław/Breslau in 16th/17th century, plan from Johann Stridbeck, yellow – area of inner fortifications, 1 – Sand Gate, 2 – New Town's Gate, 3 – Oławska (Ohlauer) Gate, 4 – Świdnicka (Schweidnitzer) Gate, 5 – Saltz Pforte, 6 – Ruska Gate, 7 – Mikołajska (Nikolai) Gate, 8 – Mühlpforte I, 9 – New Oder Gate, 10 – Mühlpforte, 11 (green) – left-bank castle (National Library, no. ZZK 34 627)

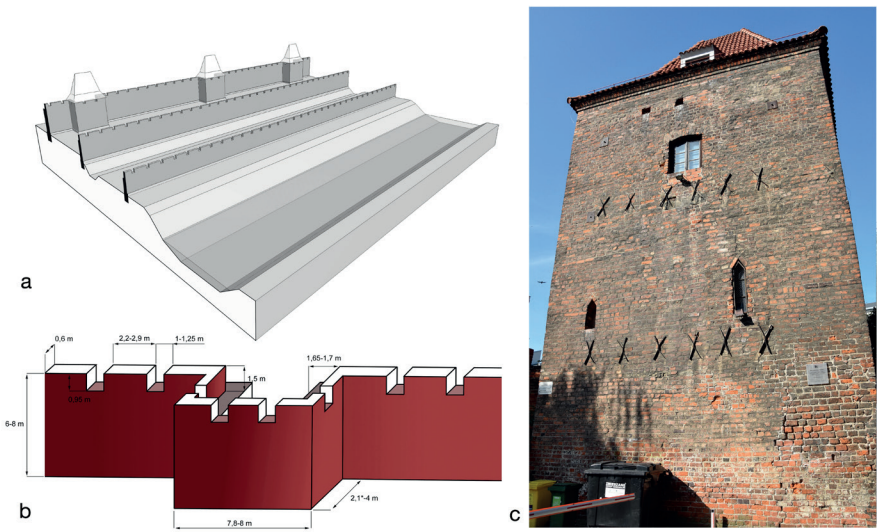

Fig. 2. Wrocław, Old Town. Inner defensive perimeter: a – reconstruction of the appearance of the wall with two pre-walls (*Zwinger*) (developed by P. Rajski); b – reconstruction of a typical half-shell tower of the main defensive circuit (after Konczewski *et al.* 2010, pp. 597–614); c – tower from the 13th century defensive walls (green), heightened in the modern period and rebuilt after WWII damages, Kraińskiego Street, Wrocław (developed by R. Mruczek)

Wiśniewski 1998, pp. 37–40). These *Zwinger* walls were 1.1–1.2 m wide at the level of foundation and about 1 m thick in the upper part. The release of waters of the Oława (in German – *Ohlau*) river into the new moat in 1291 ended the process of building internal fortifications of the town, which lasted about half a century (SUb. 1998, no. 4, 5; Chmal, Traczyk 1998, p. 279; Lasota, Wiśniewski 1998 p. 27). The width of the moat at the widest point was about 46 m, whereas its depth was up to 6.5 m. At the time of the completion of the internal perimeter of the walls on the southern side of the town, there were three lines of walls, an old and a new moat. The cross section of the entire fortifications was up to 75 m long (Fig. 2: a).

Meanwhile, in 1261, the inhabitants of the southern suburbs received civic rights (Goliński 1986). The temporary border of the expanded town was limited by a moat and an earth embankment (Kastek 2010). The protection of the enlarged area of the town required the construction of new fortifications on the outlines. Construction of the masonry wall was documented from 1299 to 1348 (Goliński 1986, pp. 27–31). The area covered by the outer ring of fortifications provided a relatively small reserve for the further development. There was about 55 ha of building land inside the walls, and in the outer strip, between the fortifications,

only 25 ha, and an additional 10 ha in the New Town founded in 1263 (SUb. 1864, p. 436; Słoń 2010).

Once the outer defensive wall and the moat were completed, the southern, best fortified part of the internal fortifications lost its military function (Goliński 1997, pp. 33–34). Nonetheless, even before the "reserve" of land in the southern suburb began to shrink, the space of the former fortifications had been transformed.

Re-use of the inner town wall

The area adjacent to the inner part of the old defensive wall was occupied the earliest. This had probably happened before the completion of the construction of external fortifications, since in 1331, collection of wall rent was recorded (Goliński, Żerelik 1992, pp. 3–28). This tax was collected from the owners of plots adjacent to the defensive wall. The amount of rent depended on the length of the wall within the plot. The wall was included in the plots inside the town, which resulted in the liquidation of the underwall way, originally used as an emergency passageway and needed for fire safety reasons. The tax was in fact a payment for the enlargement of the plot at the expense of the communal area.

The area near the inner walls became an investment zone for the patricians living on Junkerstrasse (today's Ofiar Oświęcimskich Street). By 1564, all plots on the western side of the street had already reached the inner moat – the White Oława (Goliński 1997, p. 34). Some even merged with plots on the opposite side of the moat. In the description of Wrocław, Bartolomeus Stein explained that the exceptional prestige of Junkerstrasse resulted not only from the proximity of the old town market square, but also from "the benefits of access to water" (Stein 1995, p. 22). However, the expansion of the plots caused the wall street to disappear and disturbed communication between the south-western and eastern parts of the town.

The defensive wall was used as a support for constructing outbuildings and over time, it was incorporated into masonry buildings. An example of a building leaning against a wall was found in archaeological research at Łaciarska Street, where a building was added to the *Zwinger* wall (building no. 47) (Fig. 3) (Guszpit, Limisiewicz 1998, p. 125). Rectangular holes were carved in the wall to allow beams supporting the structure to be inserted.

An analysis of iconographic records and archaeological research confirmed that wooden buildings leaning against a defensive wall and constructing walls into the foundation of a defensive wall were a common phenomenon. Examples of such structures were found during the excavations in Domnikański Square (Piszczałowski *et al.* 1993). Foundations of a 15th-century building were discovered there, filling the space between the towers on the outer side of the wall. Structural

Fig. 3. Building block between streets Szewska, Ofiar Oświęcimskich and Łaciarska. A – fragment of the plan of B. Weiner from 1562 (Wrocław University Library, Ref. 6687–III.B; b); B – plan of archaeological finds: 1 – three lines of defensive walls from 13th century, 2 – late mediaeval, 3 – renaissance, 4 – baroque, 5 – 19th and 20th century (after Konczewski 2007, p. 15, Fig. 8)

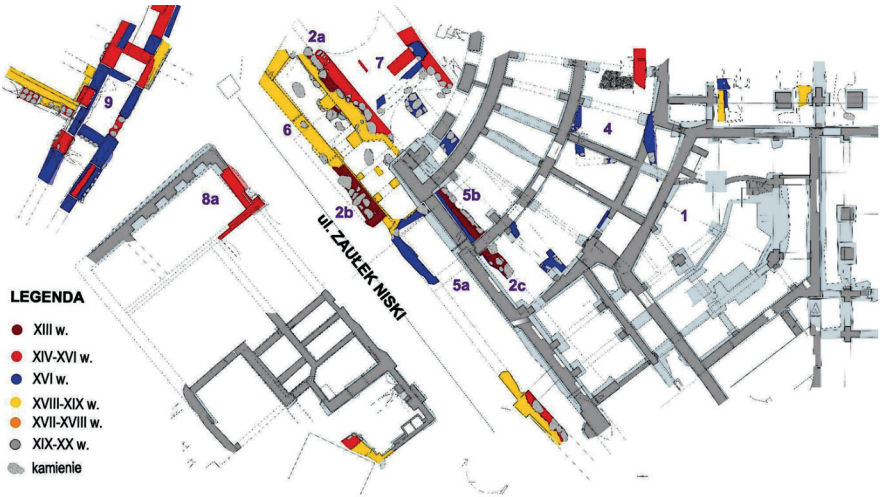

Fig. 4. Wrocław, Old Town. A relic of the 13th-century defence system of the city on the branch of the Oławska Gate I and the modern Dominikański Square, along with the currently blurred urban layout – studied in 2004–2006 (the current quarter between the streets: Oławska, Krawiecka, Wita Stwosza and Bl. Czesława/Just in Center building). Markings: 2a/2b/2c – relics of the oldest defence wall with a shell tower, adapted for the needs of late mediaeval and early modern buildings; discovered in the vicinity of the non-existent street Zaułek Niski (in German – *Graben*) (measurement and chronological stratification: R. Mruczek, M. Stefanowicz 2005; drawn by R. Mruczek, A. Szymańska 2008 – unpublished work)

beams of the buildings were embedded in holes curved in the wall. The level of the basement floor in some cases was below the foundation of the defensive wall (Piszczałowski *et al.* 1993, p. 56). Buildings constructed in similar ways were discovered along inexistent Graben Street (Figs. 4–5) (Zaułek Niski).

Over time, the thickness of the wall (about 2.2 m) began to be a disadvantage, so the wall was gradually dismantled. The first reason was that this considerable thickness was unnecessary for residential buildings. After the walls had been dismantled, it was possible to build thinner walls and obtain a few more square metres of space. There is also evidence that the building material from the demolition of the wall was reused from excavation in plot no. 1 on Białoskórnicza Street (Kitliński *et al.* 2004, pp. 151–173). The material obtained from the demolition was used mainly for non-residential buildings. The second reason for the demolition of the wall could be its poor structural condition. The wall was not systematically repaired and the quality of construction might have been so poor that there was a risk of a collapse in some of its parts. However, the wall was lowered with only several layers of bricks used and continued to serve as a stable foundation for new buildings (Fig. 5).

One of the most interesting adaptations of the town wall was the extension of a section of the passage at the top of the wall into a residential house. It was located

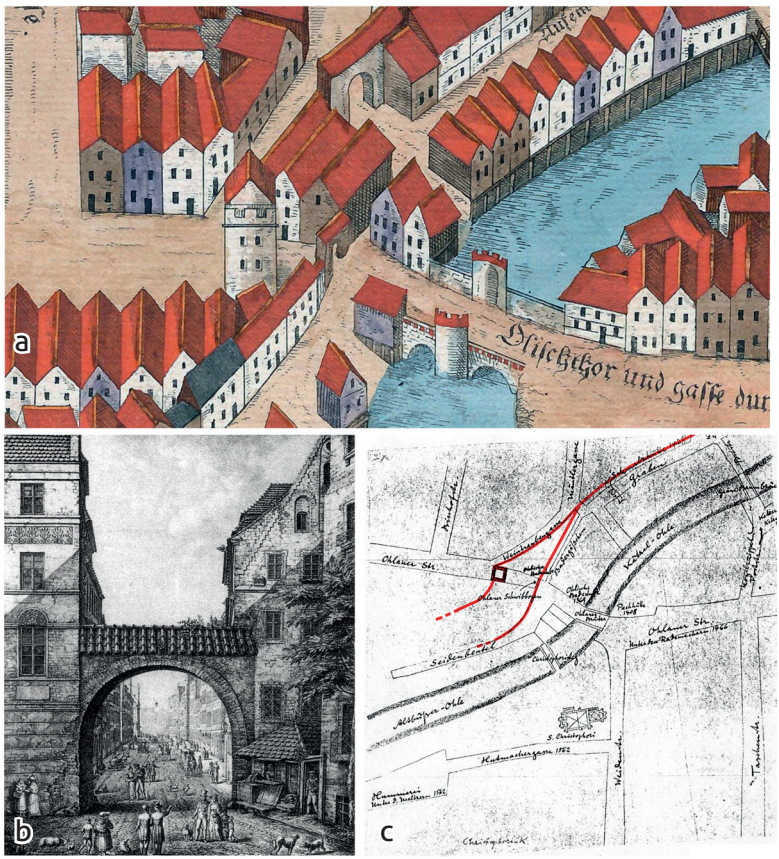

Fig. 5. Wrocław, Old Town. Relics of the 13th-century defence system of the city on the branch of the Oławska Gate I and Dominikański Square, along with the currently blurred urban layout – examined in 2004–2006: a – Oławska Gate I. fragment of B. Weiner, 1562 (Contrafactur der Stadt Breslau, Wrocław University Library, Ref. 6687–III.B); b – Ohlauer Schwibbogen – the last remnant of the Oławska Gate and the exit of the *Badergäßchen* – Bath Alley, will appear in H. Mützel's engraving from 1824; c – all of the above on the plan of F. Gross from 1578, along with the reconstructed course of the defensive walls (after Limisiewicz, Mruczek 2010, p. 94, Fig. 12)

at Weintraubengasse – a now non-existent street near Oławska Gate (Markgraf 1896, pp. 234–235). In the 19th century, it was shown as a curiosity – "the house without an entrance" (Fig. 6).

The half-towers were part of the wall most easily adapted for living purposes. To transform them into houses, it was enough to close them with a wall from the townside. An example of this was identified owing to iconographic sources within the quarter at Łaciarska Street (Fig. 7) (Brzezowski *et al.* 1998, p. 163). The towers

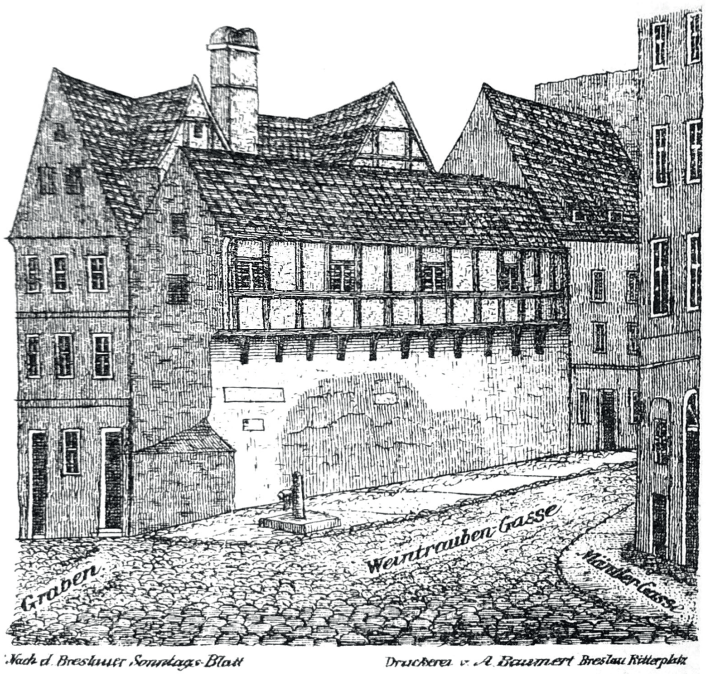

Fig. 6. "House without an entrance" at the Weintraubengasse (after to drawing printed by Baumert around 1885)

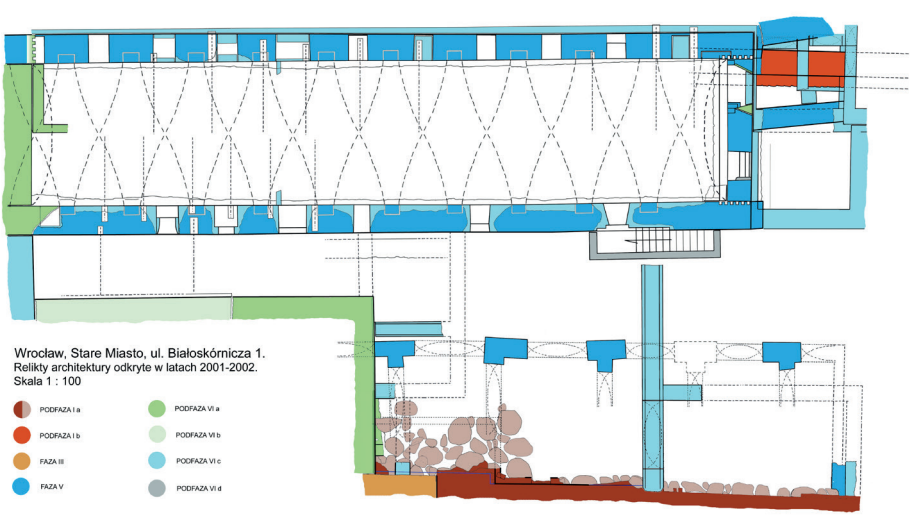

Fig. 7. Wrocław, Old Town. Relics of the 13th-century defence system of the city on the section between the Ruska Gate and Mikołajska I, discovered at ul. Białoskórnicza 1 in 2001–2002. Phase Ia–b dark red and red – mediaeval city walls – 13th century. Phase III orange – filling the mediaeval wall. Phase V dark blue – stable from the 16th century. Phase VIa–d green, blue, grey – 19th century (after Kitliński *et al.* 2002; developed by R. Mruczek)

were also raised with new storeys or deepened to create cellars. The foundations and walls of several towers have been found in the basements of today's houses along Rzeźnicza Street (Lasota, Wiśniewski 1998, p. 17). Foundations of a few towers transformed into houses were discovered in Dominikański Square (Piszczałowski *et al.* 1993, p. 57). In the modern period, as in the case of the curtain wall, the walls of towers were also dismantled (Fig. 8) (Fabisiak, Mruczek 2002).

The "Bear Tower" at Kilińskiego Street, the only existing wall tower, was reconstructed in the post-war period (Fig. 2: c). In the 18th century, it was crowned with a belvedere and a decorative cupola, and served as a *Lusthaus*, an element of a baroque garden.

The main town gates of the inner wall were preserved as a symbolic and prestigious element, even after they lost their defensive function. The municipal community's care for the representative function of the gates is demonstrated by an example of a baroque extension of the New Town's Gate from 1618–1624, which was decorated with a new helmet (Brzezowski 2005a, p. 22).

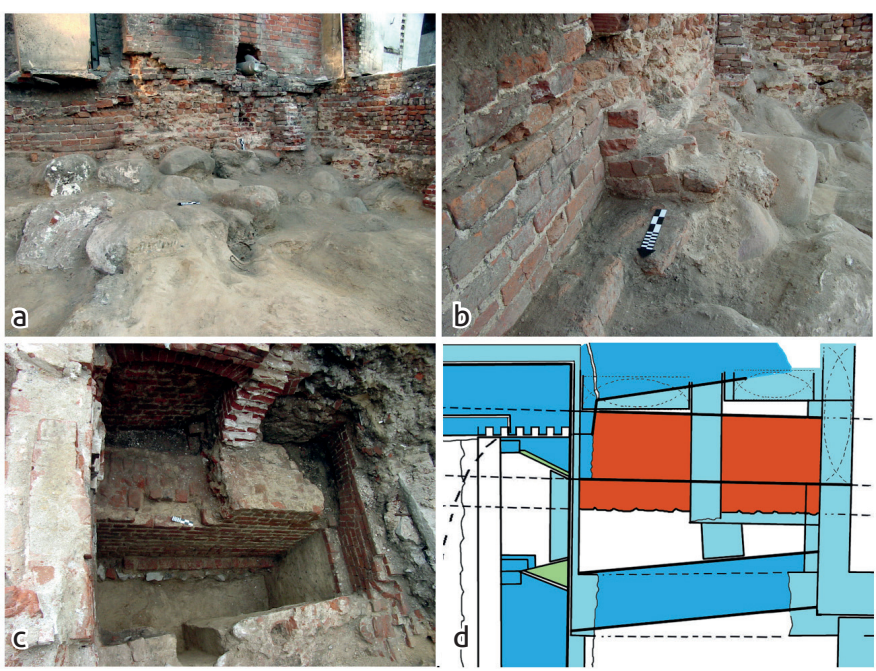

Fig. 8. Wrocław, Old Town. Relics of the 13th-century town wall, section between the Ruska Gate and Mikołajska Gate I, discovered at Białoskórnicza Street 1 in 2001–2002: a–b – relics of the tower of the main 13th-century defensive circuit of the city (subphase Ia); c–d – relics of the pre-wall (subphase Ib) preserved in the communication annex of the 16th century building. For colour key, see Fig. 6. (photo by R. Mruczek; plan – after Kitliński *et al.* 2002)

The existence of the inner perimeter of the town walls hindered communication between the outer and inner parts of the town, and between the town and the river. In order to facilitate passage, new gates were made on the extension of most streets leading from the Old Town (Fig 1.II). Even then, symbolic arches were left to mark the former border. Theoretically, it is possible that they were fulfilling a defensive function to a limited extent, e.g., serving as a barricade in the event that the enemy gets inside the outer walls. Just like the town gates, they were demolished in the 18th or 19th century.

Use of space between the walls and the moat: social issues

The area of the former fortifications belonged to the town and it first served for municipal investments. A new road with a water main under its surface was laid out in *Zwinger*, improving communication after the passage inside the wall was eliminated (Limisiewicz, Wiśniewski 1998, pp. 41–42). In the medieval period, a prison, baths, and town stables were located on the plots obtained as a result of the demolition of the fortifications. The last big communal investment was Almshouse (in German – *Armenhaus*), established in 1688 (Markgraf 1915; Brzezowski *et al.* 1998).

The emergence of a new land reserve in the area of former fortifications made it possible to locate groups of people with lower incomes there. The land along the walls was divided into small plots. In the north-western part, settlements were built for individual groups of people – potters, leather manufacturers, fishermen. They were poorer citizens whose professions required access to water. This translocation of people enabled a socio-topographic correction of the town. Small plots of land created as a result of the parcelling of the former fortifications were much more accessible to low-class townspeople than large plots located in the outer town.

First private buildings were erected in the *Zwinger* area in the first half of the 14th century. Objects built in a half-timbered construction were interpreted as accompanied buildings of a temporary character. In the second half of the 14th century permanent buildings with deep basements appeared. The specification of objects discovered in archaeological research rarely allows archaeologists to determine their original function. In Dominikański Square, traces of a metallurgical workshop were discovered, where water was used for cooling the ore (Piwko, Romanow 1993, pp. 71–83). At 1 Białoskórnicza Street, several facilities were discovered that could have served as production workshops. In the filling of an oval object with a diameter of approximately 2.3 m, created as a result of burying the object with humus, numerous fragments of vessels and entire vessels were found, along with an underlay made of mud clay, which may indicate that a potter's workshop was run there (Kitliński *et al.* 2004, p. 158).

In the 15th century, the buildings were made predominantly using perishable materials, as evidenced by numerous fires recorded in the sources. In the south-eastern part on the Oława River, in the area where the town authorities tried to limit the development of buildings, the former fortifications were occupied by gardens. Orchards and vegetable gardens are mentioned in sources from the beginning of the 15th century in 1438 and 1474 (Goliński 1997, p. 159). From the 16th century, as a result of the growing number of inhabitants resulting in land hunger, the gardens in the fortification zone were replaced with residential estates. In their place, outbuildings related to the properties located on the inner side of the moat and small wooden houses of uniform width were erected on the quay. Single tree-lined gardens are still visible in the town views from 1650, whereas around 1750, the entire area was already fully developed. Small gardens were preserved only as part of prestigious residential complexes.

At the end of the early modern period, there were about 270 plots of land on the site of the former fortifications, differing in size and the degree of development. The number fluctuated over time due to war damages, the plots were divided or joined. The narrowing of the moat enabled the expansion of small plots. The area outside the moat was protected the longest from building development. For a long time, it housed gardens and temporary buildings of an unstable nature. Until the end of the 19th century, half-timbered buildings prevailed there, and it turned into a main pocket of poverty (Górska 2014).

A luxurious space might also have appeared in the area of the former fortifications. To the south, the town wall was adjacent to the richest district, inhabited by wealthy patricians (Goliński 1997, p. 35). The emergence of the territorial reserve made it possible to expand their possessions. Early residences referring to the Renaissance models were built here. First was the palace belonging to patrician Melchior Hirsch, occupying several joint plots (Goliński 1997, p. 159; Markgraf 1896, p. 195). In compensation for the granted permission to erect a residence in a place that disturbed the layout of the city's streets, Hirsch was to build a footbridge over the Oława canal at his own expense. It is a unique example of urban space transformation by a single private investor. In 1522, he bought and demolished houses in *Zwinger*, at *Seidenbeutel* alley, and then erected a four-wing mansion with a courtyard, a garden, and a house above the moat. It was an early example of the adoption of the Italian design. Later, the baroque garden created in the same place became the largest green area in the whole old town (Fig. 9: A) (Brzezowski, Jagiełło 2017, pp. 181–183).

One of the most impressive ones was the house that belonged to Heinrich Rybisch (Sulej 2011, pp. 43–59). The residence complex was located on a long plot on both sides of the moat. It consisted of three buildings – a representative building, a residential building, and a summer house, all separated by courtyards with fountains. It also had its own bridge over the moat leading to a private secret garden.

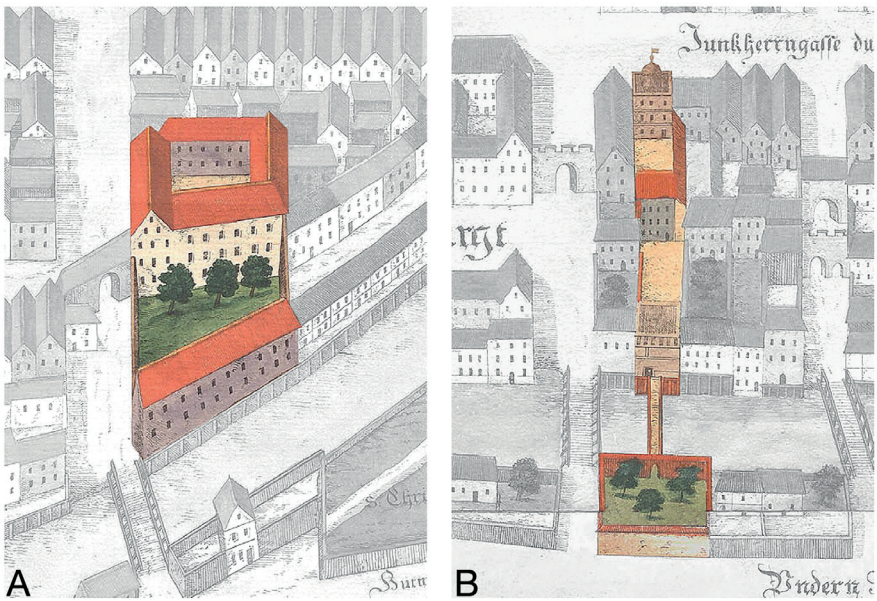

Fig. 9. Wrocław/Breslau, Renaissance bourgeois residential complexes extended with areas of former fortifications: A – house of Melchior Hirsch, B – house of Heinrich Rybish. Fragments of the copy from 1826 of plan from 1562, B. Weiner (Contrafactur der Stadt Breslau; Wrocław University Library, Ref. 6687–III.B; developed by M. Legut-Pintal)

The decoration of the facade with a high artistic level testifies to the high rank of the residence (Fig. 9: B).

Other patrician residences adjacent to the zone of former fortifications, although they did not differ from medieval patterns, grew to include the area adjacent to the moat's quay. The gardens that appear next to patrician tenement houses are rather a manifestation of a new fashion, and an unused garden in the back part of the plot, characteristic of the Middle Ages (Buśko 1995; Brzezowski, Jagiełło 2014, p. 71). They should be seen as an element of luxury that only the richest could afford within the limits of the inner town.

In the area of the former fortifications, a space of a different nature was created, ranging from luxurious, such as patrician residences, to degraded (small plots of land intended for the poor and burdensome workshops). The development of the fortification strip was a step-by-step process, with different intensity depending on the location. It is faster on more expensive plots of land or where municipal money was invested. Slower in places where the town council has imposed legal restrictions. The interest in occupying the space near the moat was diversified. The development of plots on the north-west side and in the vicinity of Dominikański

Square progressed rapidly. The area on the southern side of the moat was less developed, apart from the gardens and stables. In each case, access to water was the asset that was taken into account.

Other fortifications of the Wrocław Old Town and the left-bank castle

The eastern section of the town wall from the side of the New Town theoretically retained its defensive functions until the bastion fortifications were erected. In fact, its usability was limited much earlier, by the construction of transverse border walls separating individual properties and blocking access to the wall (Goliński 1997, p. 128). There was an orchard outside of the fortifications between the wall and the moat. In the 17th–18th century, garden pavilions, so-called *Lusthaus*, were built there (Brzezowski, Jagiełło 2014).

The wall on the northern side still had a defensive function, but it was not modernised. In practice, numerous gates were pierced from the side of the Oder, allowing access to the river. Fragments of the fortifications were also used as building elements. A significant part was occupied by the buildings of the Jesuit college, erected in place of the left-bank castle.

The erection of the left-bank castle in Wrocław was simultaneous with the foundation of the German law town. In 1263, the existence of a defensive perimeter of the duke's residence was confirmed (SUb. 1984, p. 436, Małachowicz 1994). As the seat of the Piasts, it functioned until 1335. After passing Wrocław to Czech jurisdiction, the former residence became a royal seat, and soon afterwards an imperial seat. The reconstruction in the times of Charles IV of Luxembourg, gave it a multi-wing layout with three inner courtyards and three rectangular towers (Mruczek *et al.* 2003). At the same time, it lost most of its defensive features, becoming a town palace (Fig. 10).

The reason for the demolition of the Wrocław left-bank castle was not – as was the case in many other cities – the desire to get rid of the visible symbol of feudal power by the town government. Its phased recycling proceeded in a planned manner, with the consent of the ruler, with a view to building a Jesuit college. A major turning point in its history took place in 1659, when the castle was handed over to the Jesuits by Emperor Leopold I Habsburg for temporary use (Burgemeister 1902). In the same year, the reconstruction of the great hall for the purposes of the Jesuit college took place (Burgemeister 1902; Bimler 1933). In 1670–1671, the castle was handed over to the Jesuits for permanent use (Müller 1844, p. 302). It was the beginning of the demolition works of this vast residence. Already in 1675, the northern wing was lowered. In 1676, when the castle was mentioned as Jesuitenburg, the monks applied for permission to demolish the eastern part of the building in connection with the planned

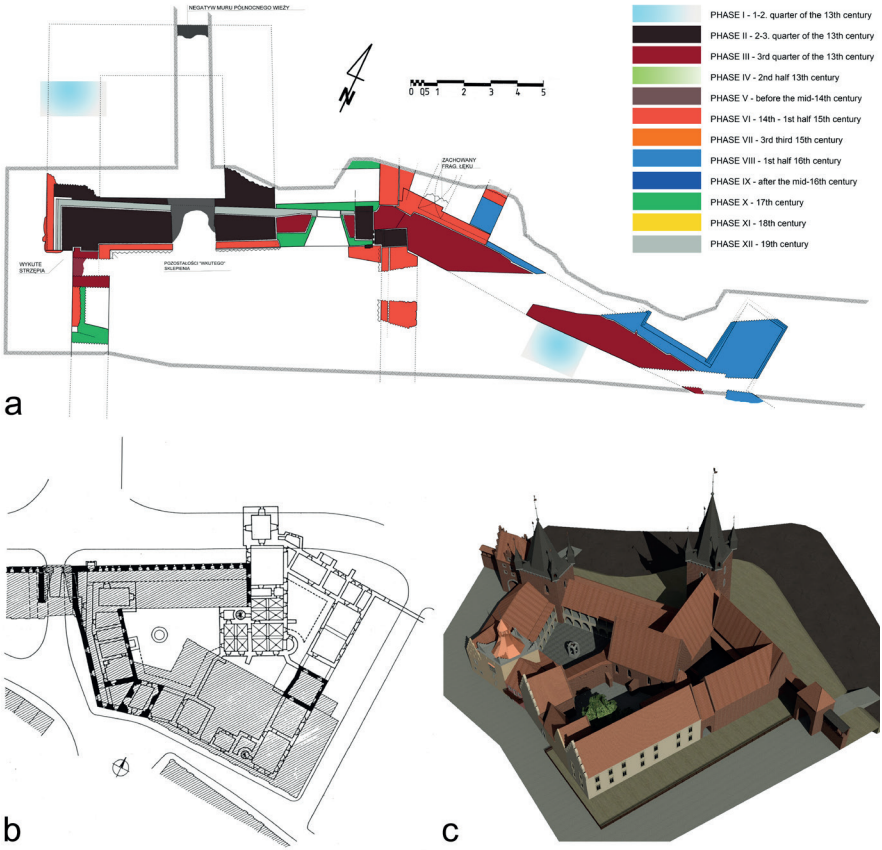

Fig. 10. Wrocław, Old Town. Left-bank (imperial) castle: a – Relics of the northern wing of the castle, built using the lower parts of the 13th-century tower of the Silesian Piast dynasty, fragments of the palace building (cross buttresses) (phase 1) and the 13th-century defensive walls (phase 2ab) (chronological measurement and stratification – Cz. Lasota and J. Burnita 2005; after Konczewski *et al.* 2014; new graphic design based on total station measurements by R. Mruczek and M. Stefanowicz); b – reconstruction plan of the left-bank castle (after Bimler 1940; developed by K. Kwaśniewski); c – reconstruction of the imperial castle after Renaissance (developed by M. Caban)

construction of a church. In 1689, the south-eastern wing of the castle was demolished. In 1703, the stable was converted into a school. In 1728 the neighbouring area, so-called *Sperlingsberg* (in Polish – Wróble Wzgórze) passed into the hands of the Jesuits, and demolition works began immediately (Eysymontt 1995; Zabłocka-Kos 1995). The building of the college stood in the place of an approximately 200-metre section of the medieval wall, disrupting the former communication systems.

Use of the moat and its ecological issues

In the Middle Ages, the wide moat, irrigated by the clean waters of the Oława River, was an asset of the town. The inner town moat, after the river waters were released into it, became the main source of water for households (Piekalski 2013). Access to the water was possible thanks to many ramps and platforms. Water could be drawn by buckets directly from the river, which was facilitated by descents in the form of ramps, serving also as places for watering animals. Ramps were located mostly near main inner gates to the town. The town council tried to keep the water clean by introducing prohibitions (Goliński 1997 p. 160; Brzezowski 2005b). Archaeological excavations confirmed good water quality in the moat during the Middle Ages (Berduła *et al.* 1993, p. 116). In archaeological profiles, sediments of clean river sand were found up to the 15th century. At the end of the Middle Ages, it was still possible to fish in the eastern part of the moat called the White Oława (in German – *Weiße Ohle*, in Polish – *Biała Oława*). Plots near the water were desirable. There were also workshops by the moat which required water in the production process (leather makers, weavers, potters) (Goliński 1997, pp. 149–153).

As a result of the loss of its military significance, the internal moat was deepened and narrowed. Town council made efforts to transform it into a channel of economic and communication importance. For this purpose, the banks were initially protected against washing with fascines and wooden structures (Konczewski 2001). In the 16th century, a brick wall was built on the bank; it was additionally secured by wooden structures. Until the beginning of the 16th century, the width of the moat was limited from 45–50 m to 14–16 m (Piwko, Romanow 1993, p. 79). Due to the narrowing of the moat, an additional strip of land was obtained. The construction of the quay allowed the buildings to occupy a strip of land above the moat and to expand the backyard part of the plots. The quay was secured with wooden piles and tails (Markgraf 1896, pp. 65–66). The replacement of wooden formwork with a brick wall took place after the mid-15th century, in connection with the construction of the bastion fortifications. The quay wall discovered during the research was about 1.1 m thick and had a stone facing in the form of slabs arranged with rustication (Piwko, Romanow 1993, p. 81). In the upper part, the wall was 0.8 m thick. It was used as a support for Renaissance tenement houses (Fig. 11).

In the area obtained as a result of the narrowing of the moat, craft workshops were set up, using water in the production process. Wooden platforms floating on the water surface and connected to the quay by ladders were used by tanners and washerwomen (Rawcliffe 2009). The narrowing of the moat and its siltation caused a problem with the water level in the White Oława river that feeds the moat (in the eastern section of the town). The solution was to change the course of the waters. Around 1460, the flow of water in the moat was reversed by diverting the waters from the Oder into the moat (Goliński 1997, p. 226). There were two 13th-century

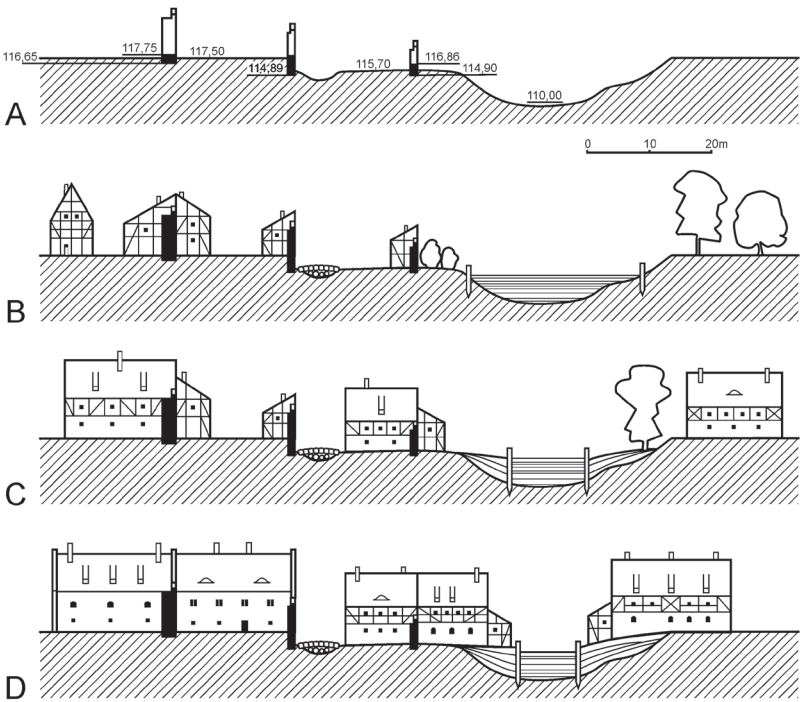

Fig. 11. Theoretical reconstruction of the development phases of the former fortifications in the southern part of Wrocław: A – reconstruction of the fortification profile (after Lasota, Wiśniewski 1998); B – temporary buildings and workshops; C – permanent – timber-framed buildings; D – post-medieval brick houses with outbuildings (developed by the M. Legut-Puntal, L. Legut)

mills on the moat and water craftsmanship was established here, supplying clean water to richer houses through a water supply system (Piekalski 2013).

The possibility of economic use of water from the city moat was undoubtedly an advantage, but this neighbourhood also had its dark sides. This was a risk during floods, which were relatively frequent in Wrocław and sometimes very violent (Kasprzak 2010; Czaja 2011). Periodic fluctuations in the groundwater level associated with rainfall or snowmelt could be a nuisance for the inhabitants of plots located near the moat. In the basements of houses located near the edge of the moat, during archaeological excavations, layers associated with periodic flooding were discovered, alternating with layers of sand used to clear the space (Kitliński *et al* 2004, p. 158). Archaeological records document other ways of dealing with flooding. The numerous series of bottomless barrels dug into the ground could have served the lowering of the groundwater level in the area adjacent to the moat.

Ditches for removing excess water to the moat were also identified (Konczewski 2007, p. 79).

Between the 16th and the end of the 18th century, the town was surrounded by a perimeter of bastion fortifications. In two hundred years, the number of inhabitants has doubled, all the time being on the same surface (Ziątkowski 2017, pp. 36–40). This resulted in an increase in the density of buildings and raising buildings by constructing new floors. The culmination of these processes took place at the turn of the 18th century, when the town had a population of nearly 60 thousand, approximately 45 thousand of whom were still compressed within the borders from the 13th century. Protecting the purity of the Oława's waters became an impossible challenge.

The population growth resulted in an increased water consumption and growing waste production that gradually polluted the watercourse together with household waste. Despite municipal regulations aimed at protecting the water in the moat, it became the main destination for sewage, workshop waste, and toilet contents. It should not be surprising that the final section of the moat, to which the impurities were drained, began to be called the Black Oława (in German – *Schwarze Ohle*, in Polish – *Czarna Oława*). After the 15th century, the amount of biological waste and rubbish thrown into the moat increased. Archaeological research and written sources confirm that the pit latrines were intentionally built leaky so that they could be emptied less frequently (Guszpit, Limisiewicz 1998). Ditches running parallel to the moat could also be used to drain waste or excess water. Such objects were identified on both sides of the internal moat (Berduła *et al.* 1993, p. 109; Konczewski 2007, p. 77). During the archaeological research carried out inside the moat, in layers dated between the end of the 16th and the beginning of the 19th century a significant amount of rubbish and organic matter was found. The lack of clean sand sedimentation levels indicates an increased pollution of the waters of the Black Oława in relation to the medieval layers (Berduła *et al.* 1993, p. 117).

Dirty water in the moat was a biological hazard that manifested itself through numerous epidemics. The cholera epidemics that plagued Wrocław in the 19th century were related directly to the pollution of the Oława canal. The vicinity of the dirty canal, into which the moat was turned into, was no longer an advantage, since water was obtained from waterworks anyway. The overcrowded, cramped and practically devoid of green spaces Wrocław did not make a good impression on visitors. The alleys inhabited by poorer people and built with wooden buildings had a bad reputation. In 1800, J. Q. Adams, who travelled around Silesia, described Wrocław, as "nothing more than a large, old and very dirty city" (Adams 1804, p. 220).

In 1807, the city broke free from the prison of its own fortifications. The territorial expansion that began at that time continues until now. The outbreak of a cholera epidemic in Wrocław in 1853 sealed the fate of the inner-city moat, which was filled in in 1869. The charming streets and alleys running along the town walls

were demolished after the damages brought by the Second World War. The works of destruction were completed with the building of the city bypass in the 1970s in lieu of the moat and a demolished block of buildings.

Inner walls in European cities

Inner defensive walls were prominent features in numerous European cities that underwent expansion either in the Middle Ages or during the construction of modern fortifications (Baeriswyl 2003). Fortifications from earlier periods, including those from the Roman era, were seamlessly integrated into the urban landscape. They were found in places like Florence, Vienna, Cologne, Paris, London, Regensburg, and various others. Cities exhibited different patterns of expansion, ranging from concentric growth as observed in Aachen, Brussels, or Nördlingen, to adopting a crescent shape, particularly when situated along a coast or a riverbank, e.g., in Amsterdam, Antwerp, and Basel. When a new section was incorporated into a city, the defensive function of the adjoining part of fortifications was only partially diminished, as exemplified in Prague. However, in the case of double and multiple cities, the individual parts of which had different legal status, the fortifications of each of them constituted a separate element and retained their independence for a long time, as shown in Gdańsk, Elbląg, or Toruń (Słoń 2011).

The loss of defensive functions of the defensive walls provided an opportunity for the townspeople to utilise the resulting "empty space" and engage in the recycling of building materials. Iconographic representations suggest that internal fortifications did not necessarily blend immediately with buildings. The pace of integration depended on factors such as land availability and municipal policies. German cities, characterised by the inclusion of suburbs within their borders, often developed large reserves. The prolonged existence of internal defensive circuits in cities in the German speaking regions may also be associated with halted development or even a process of urban contraction after the 14th-century crisis (Untermann 2008).

In this respect, the most notable example is the city of Cologne, whose borders expanded in 1180 (Deeters 2022). Due to economic and political conditions that were limiting population growth from the 12th to the 18th century, the expanded area of the city remained undeveloped for residential purposes until the 19th century (Curdes, Ullrich 1997, pp. 76–79). Even when there was plenty of space, unused towers and parts of internal walls were adapted for this purpose. Houses were built between towers along streets that ran along the older perimeters of the walls in the early modern period. The proximity to the city centre probably made this location highly attractive. An additional advantage of this area was likely the use of existing walls and the reuse of building materials.

Having expanded multiple times in the Middle Ages, Munich retained an older, internal perimeter of defensive walls within the city (Behrer 2019). The former moat, transformed into a city canal, served economic purposes until the 19th century when it was completely filled in. The city gates of the inner perimeter continued functioning until the 19th century, albeit without military purposes. They became showcases of the city and received new architectural decorations in the early modern period. Similarly, in Stockholm, the expansion of the city in the 14th century led to the absorption of former fortifications by new buildings. The defensive wall persisted as an orientation element in space and defined a separate district, even as the city gates were removed in the 16th and 17th centuries (Söderlund 2010, pp. 751–755).

In Prague's Old Town, the defensive wall from the mid-13th century partially lost its significance with the establishment of the New Town in 1348. The walls were dismantled in some sections to integrate two parts of the city, but it was rebuilt later on (Kupka 2008, pp. 54–65). The moat was filled in in the 16th century. The wall's military importance declined as a result of bastion fortification being raised, eventually leading to its demolition in the 18th century. The Gothic gate tower Prašná Brána marks the boundaries of the former inner city and still serves a symbolic and representative function to this day.

The similar process of adapting medieval walls took place in numerous European cities. In many instances, the existence of internal city walls left a lasting imprint on the city's morphology. Nevertheless, their elimination enabled the integration of city parts and the development of communication arteries.

Conclusions

The traces of Wrocław's internal defensive circuit are poorly legible today. Their remains are known owing to archaeological and architectural research. The information about them and their second life comes mainly from historical sources, though the influence they had on the shape of the city and its history was significant. The fortifications of the inner perimeter have gone through a life cycle from an element that was protecting residents, through a place where they lived and work, to a construction and biological hazard. Today, one of the city's most important communication arteries runs in the place of the demolished walls and moat. The 13th century left the strongest mark on the current plan of the left-bank Wrocław, as well as on the parcelling of the entire "outer town". It should therefore be marked that after a short period of being used for defensive purposes and developed for several centuries, the once-determined border is still a symbolic one. Despite the few visible traces, the line of the internal fortifications is etched in the consciousness of the city's inhabitants and still valuates the space of the Old Town centre. It has

also determined its contemporary infrastructure and transport solutions, which have been certainly developed on the basis of the "inner old town bypass". This is probably not the last function of the former fortifications introduced in the area. Forecasting further changes based on similar experiences of large European cities, one should rather expect the introduction of a recreational function and "ecological" solutions.

The example of Wrocław is not unique; despite numerous economic, legal and social differences, it is rather representative for European cities. It presents a wide spectrum of possibilities of using the space of former fortifications as well as the long-term consequences of their improper management. This case study shows that such a small element of urban space that unused fortifications are could have a significant impact on the development of a city. It shows that the integration of city space, once separated, is a demanding task. Earlier structures, even if dismantled, often determined the later urban layout of cities. Despite the physical and legal unification, a mental boundary between the area inside and outside inner walls has often remained. Our goal was also to draw attention to the problem of documenting the changes in building structures that took place after the loss of their original function. This issue required wider comparative research on a European scale. The same processes of adapting medieval walls took place in the modern period in many European cities, when bastion fortifications were built outside. Although cities differed in terms of topographic location, legal regulations, and the dynamics of economic and social processes, when former fortifications were developed, the new functions were usually similar. The processes and phenomena identified in this example have a universal range.

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