

# Theoretical Foundations of the Adaptation of Sustainable Development Principles in Preserved Historical Fortification Complexes



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# Theoretical Foundations of the Adaptation of Sustainable Development Principles in Preserved Historical Fortification Complexes



This topic explores the possibilities of integrating contemporary sustainable development approaches into historical environments.

# 1. Context

This context defines the relevance of rethinking the role of historical sites.



Sustainable development addresses global challenges: climate change, urbanization, and war.

**For Ukraine, this is a dual task:**

- post-war reconstruction
- preservation of cultural heritage

1707 buildings of culture heritage  
**were destroyed in Ukraine**  
During the war 2014-2026

This is an example of a city where heritage preservation is challenged by physical destruction.



Bakhmut is a city in Ukraine, located in Donetsk Oblast. It serves as the administrative center of the Bakhmut Region and the Bakhmut urban territorial community.

Before the Russian invasion of 2022, the city was a major center of Ukraine's salt industry and an important railway hub. During the Battle of Bakhmut, approximately 80% of the city was destroyed.

**Bakhmut was founded as a permanent settlement by Cossacks of the Izium Sloboda Regiment around the 1680s–1690s.** It is

documented that a fort (ostroh) on the Bakhmut River was built by Sloboda Cossacks in 1703, with its first description recorded in 1704. As of 1712, Ukrainians constituted the clear ethnic majority of the population.

The city of BILHOROD DNISTROVSKYI demonstrates the continuity of a cultural landscape through its multi-layered historical development.

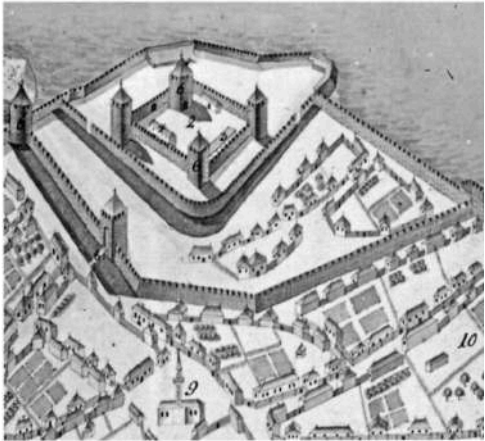


Рис. 4. Фортеця Київ. 1770 р. Фрагмент плану. Цитадель (архів Г. А. Гребенішкіної).

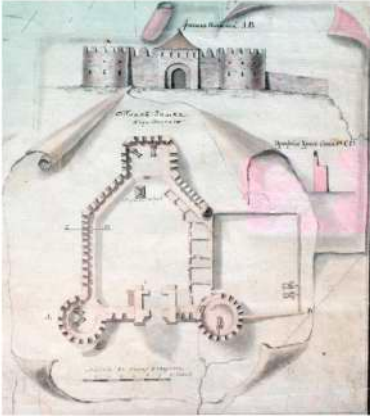


Рис. 7. План плану Гаджибівського замка 1789 р. Фасади і креслення замка. Фрагмент [61].

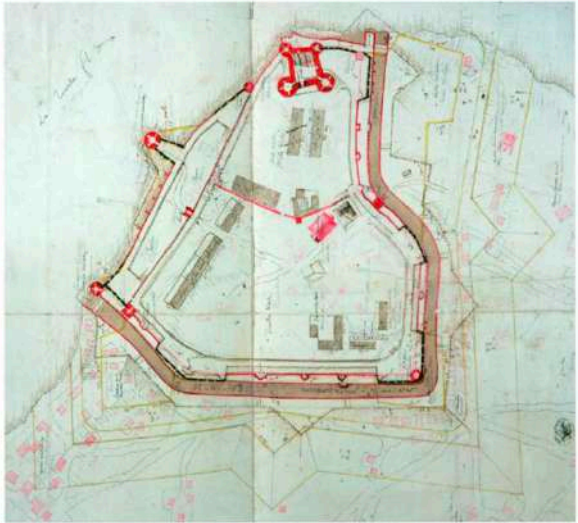


Рис. 1. Ситуаційний план Аккермана. Ф. Кюффер. 1793 р. [323, с. 48-49; 70].

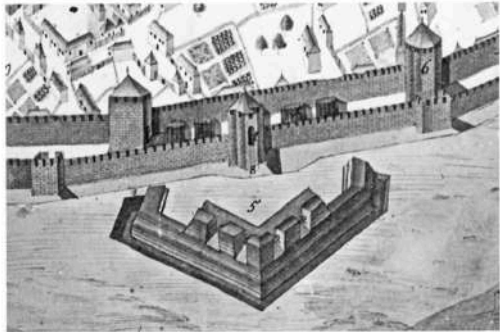


Рис. 5. Фортеця Київ. 1770 р. Фрагмент плану. Головна брама (архів Г. А. Гребенішкіної).



Рис. 9. Осциляційний план бастионної фортеці Київ. Після 1797 р. [628, р. 108].



Рис. 2. Видля Аккерманської фортеці з південного заходу. М. М. Іванов. 1790 р. Фрагмент [323, с. 262-263; 17].

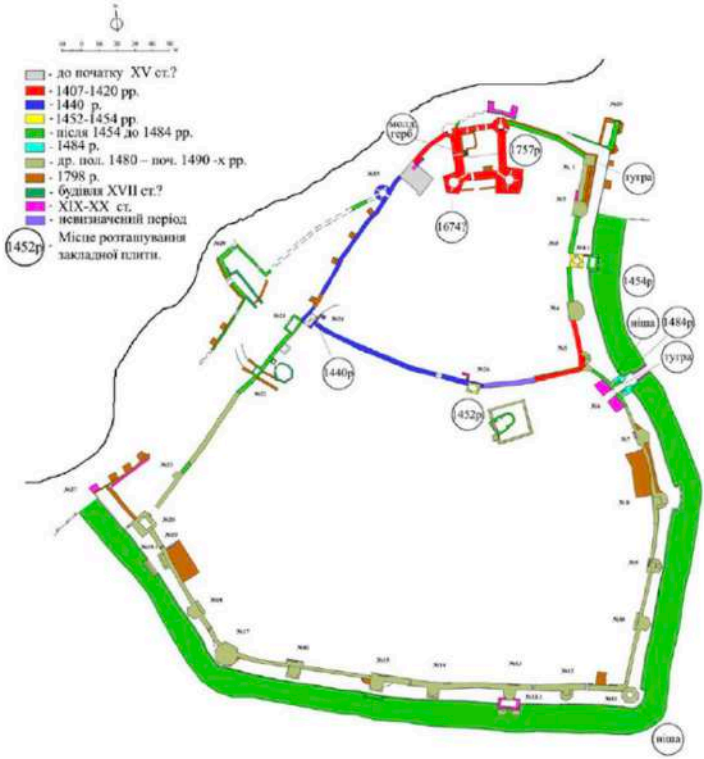


Рис. 10. Фортеця Білгород. Картограма будівельних періодів [324, рис. 351].

**Bilhorod-Dnistrovskyyi**

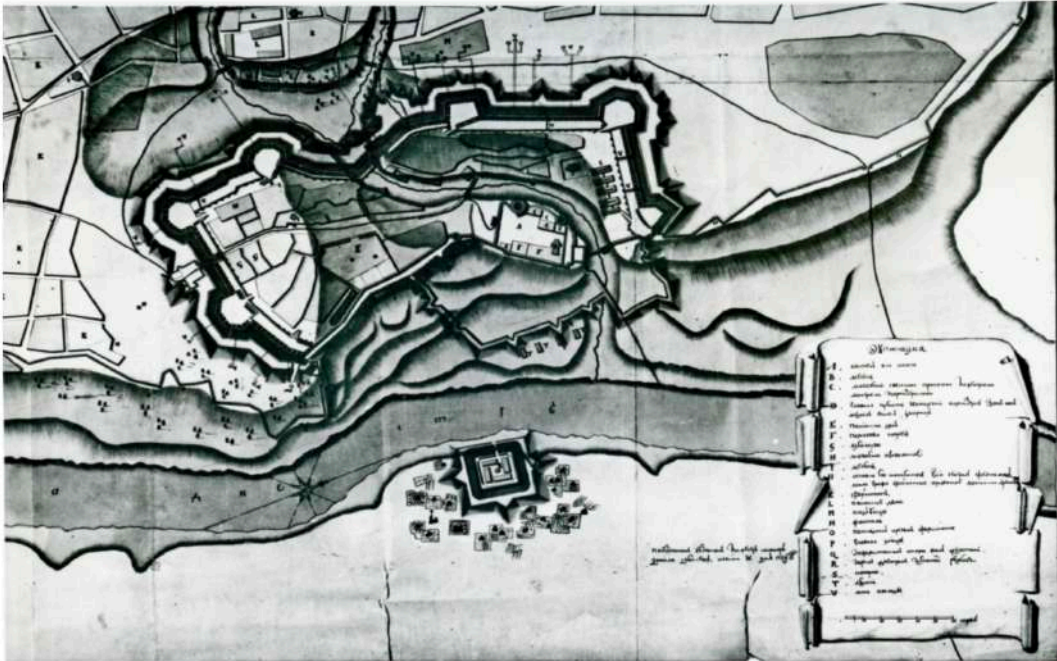
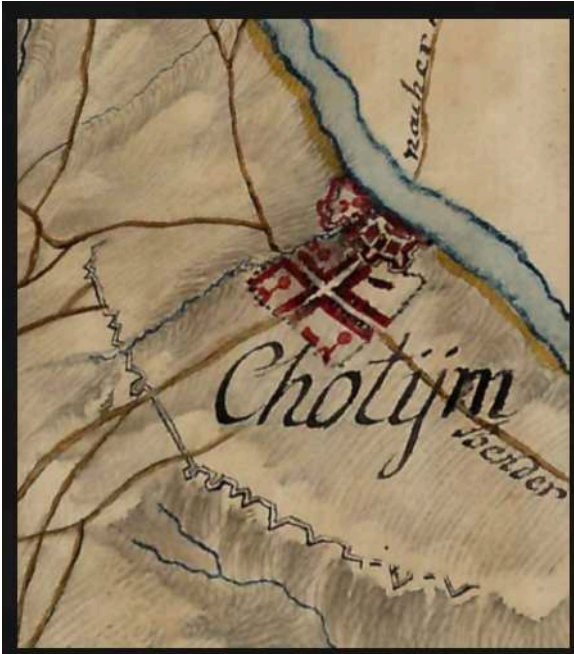
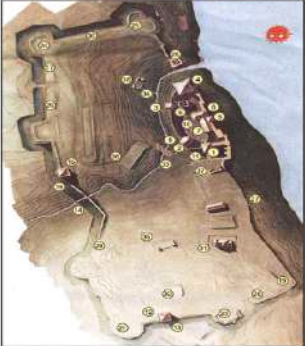
(Latin: Tyra, Ancient Greek: Τύραç, Turkish: Akkerman, Romanian: Cetatea Albă; until 1944 — Akkerman)

Founded in the 4th century BCE, the city played a significant role in the Middle Ages and possessed a powerful defensive structure that has survived to this day — the Akkerman Fortress.



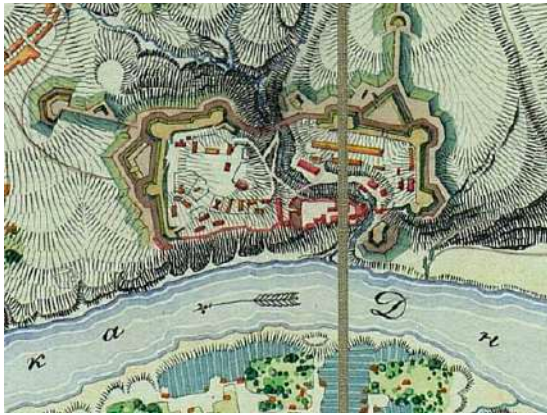
In the 12th century, Bilhorod was part of the Galicia–Volhynia Principality.

The fortress is an example of the integration of defensive architecture into the natural landscape.



**Khotyn Fortress** is a medieval fortified structure located in Khotyn (Chernivtsi Oblast, Ukraine), built by Ruthenian–Wallachian masters during the rule of the Muşat dynasty in the Principality of Moldavia between the 13th and 18th centuries, on the site of an earlier Ruthenian hillfort (10th–13th centuries).

Situated on the right bank of the Dniester River, this stronghold was one of the most powerful in Eastern Europe at the time and served as an **important defensive and trading hub** of Moldavia during the reign of Alexander the Great. Initially, it was a small wooden fortress built by Slavic tribes; its remains were discovered during archaeological excavations.



Follop part of a unified defensive line along the southwestern borders of Kyivan Rus.

Throughout the 11th–13th centuries, the Khotyn hillfort and its surroundings belonged to the Terebovlia and Halych principalities, and later to the Galicia–Volhynia Principality.

With the development of the Dniester as an important trade route, Khotyn, like other Ruthenian settlements along the river, played a key role in securing this waterway.

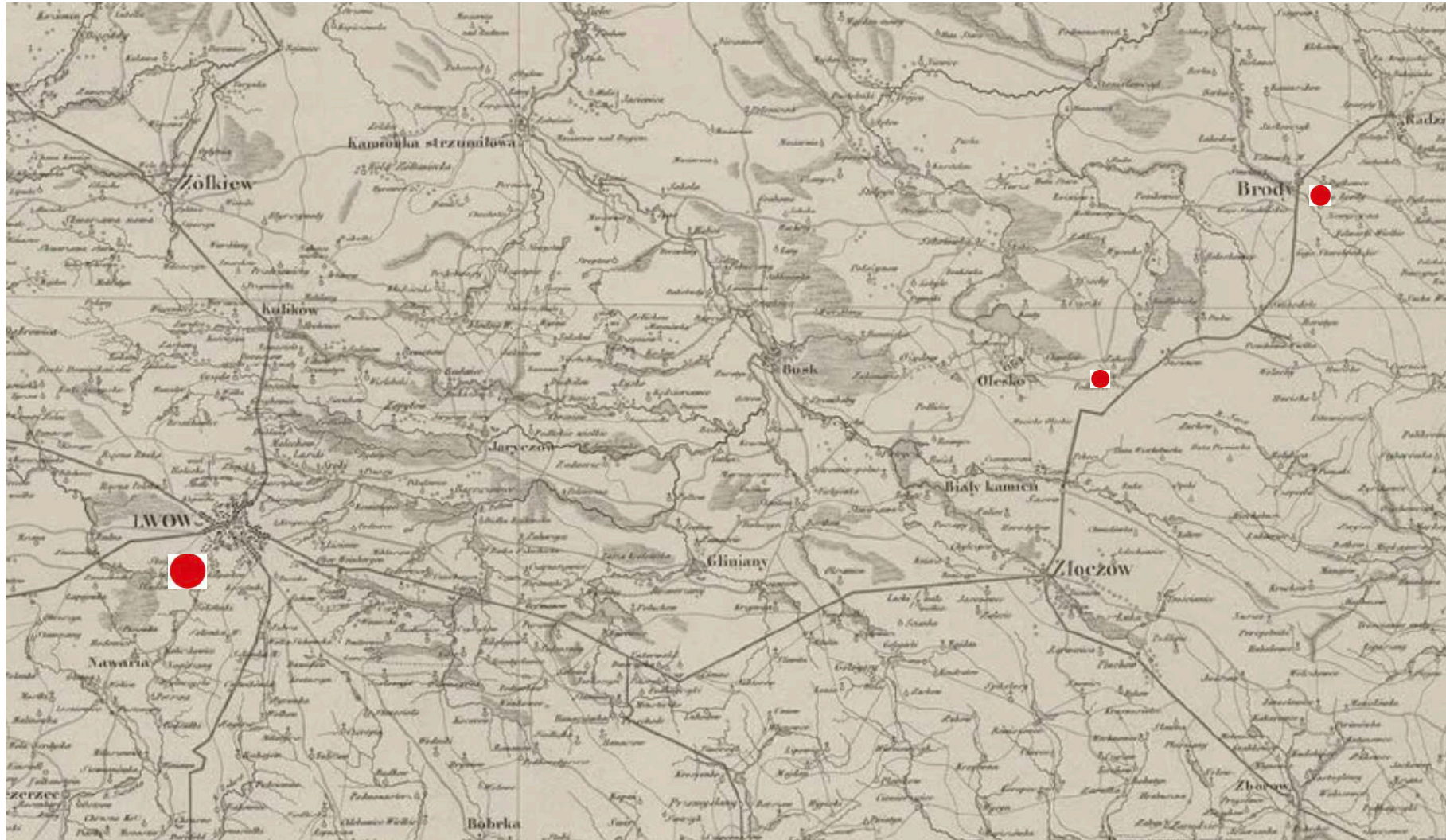
It is believed that the first stone fortifications of Khotyn Fortress may have been constructed in the 1240s–1250s, when King Danylo of Halych reinforced existing strongholds and built new ones to defend against the Mongol invasion.

## 2. Problem

Historical fortifications have lost their original function but remain important elements of the cultural landscape.



- Historical fortifications have lost their original function but remain important elements of the cultural landscape.
- Current condition:
  - fragmentation
  - physical deterioration
  - lack of clear use strategies
- A new conceptual approach is required.



## **BRODY–PIDHIRTSI**

This complex serves as a case study for exploring the adaptation of fortifications to contemporary needs.



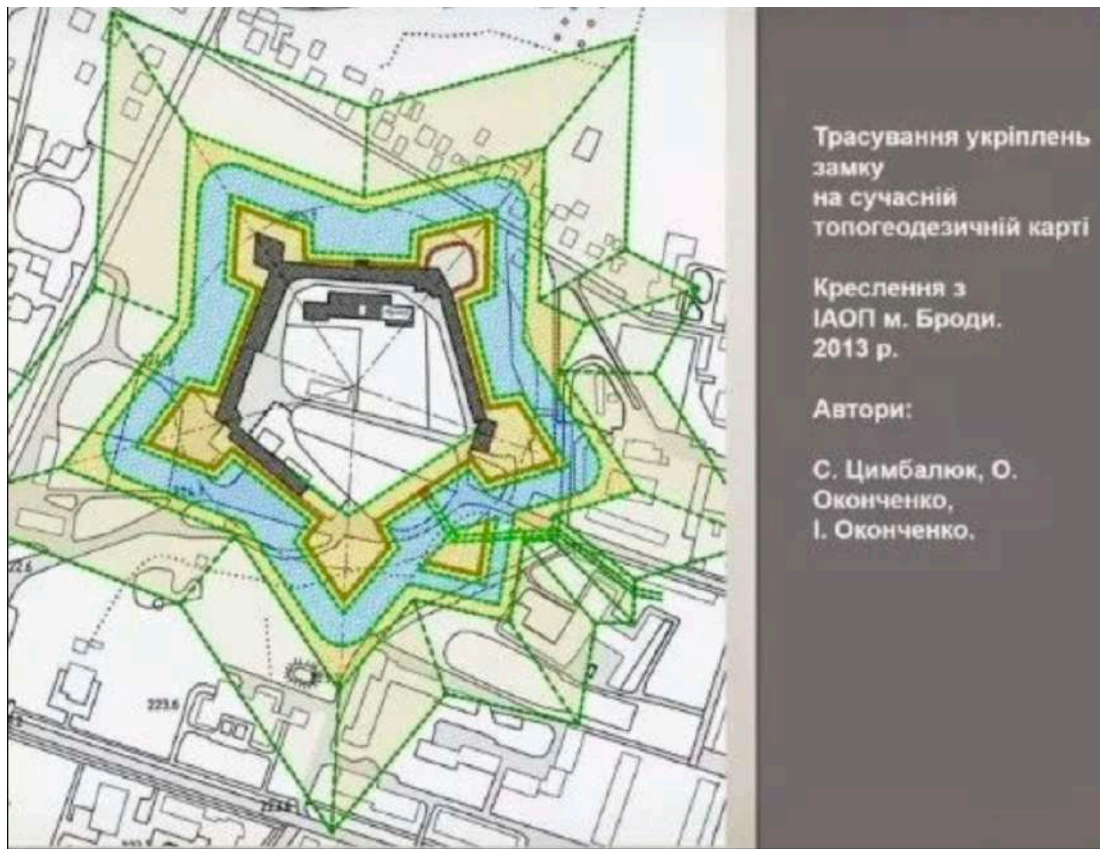
Коронний гетьман  
Станіслав Конєцпольський  
(невідомий художник, XVII  
століття



The Grand Crown Hetman of the Polish–Lithuanian Commonwealth, Stanisław Koniecpolski, decided to transform Brody into an ideal fortress city modeled on the then-modern Dutch school of fortification.

He reinforced it with ramparts, walls, and palisades, and constructed a large pentagonal castle that became an integral part of the city's overall defensive system.





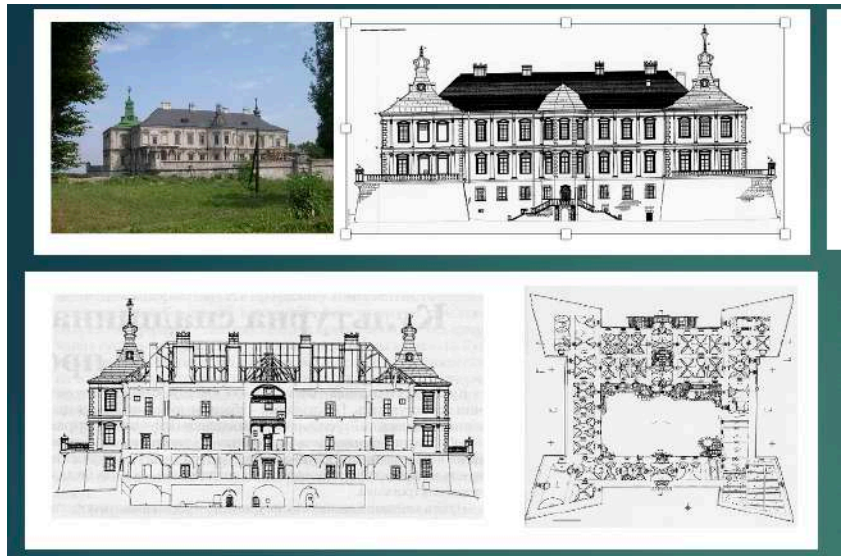
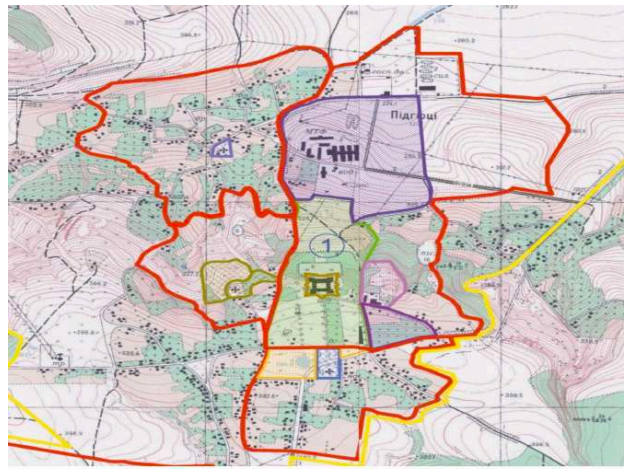
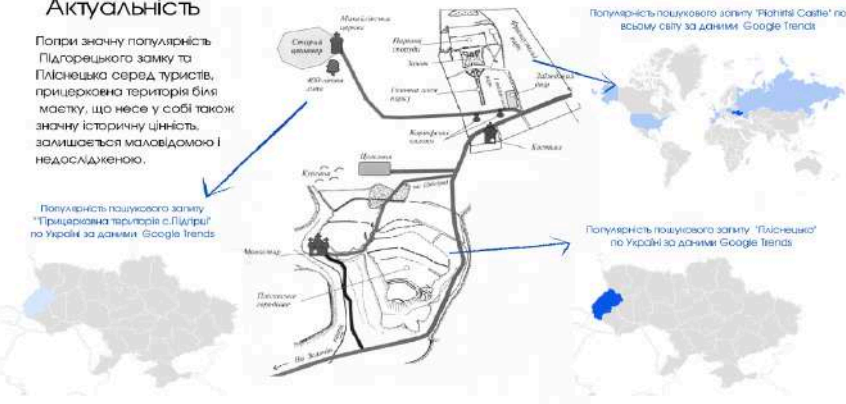
The design of the castle was likely influenced by the Venetian architect Andrea dell'Acqua and Guillaume Le Vasseur de Beauplan. The urban layout was organized in a parallel-perpendicular grid and was "inscribed" within the oval form of the earthen bastioned fortifications. From that time on, the city served as a stronghold of Polish magnates on Ukrainian lands.

Olha Okonchenko, PhD in Architecture and Associate Professor at Lviv Polytechnic, notes that in 1659 the architecture of the castle is mentioned for the first time. Brody was compared to impregnable casemate-type fortresses such as Zamość, Nesvizh, and Lyakhavichy. This type of fortification, as seen in Brody, belongs to the Old Italian school. From that period, casemates, remains of scarping, and part of one bastion have been preserved.

### Актуальність

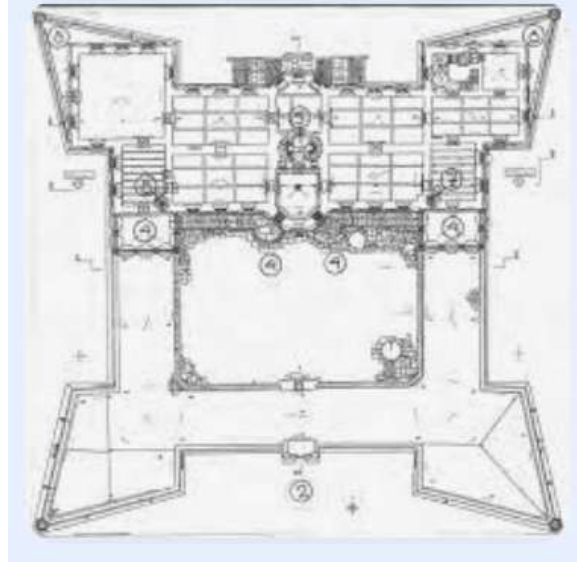
Попри значну популярність Підгорецького замку та Пліснеська серед туристів, прибережна територія біля мосту, що несе у собі також значну історичну цінність, залишається маловідомою і недослідженою.

Популярність пошукового запиту "Грицькозна територія в Підгір'ї" по Україні за даними Google Trends



### PIDHIRTSI-PLISNESKO 7-14 wiek





### 3. Aim

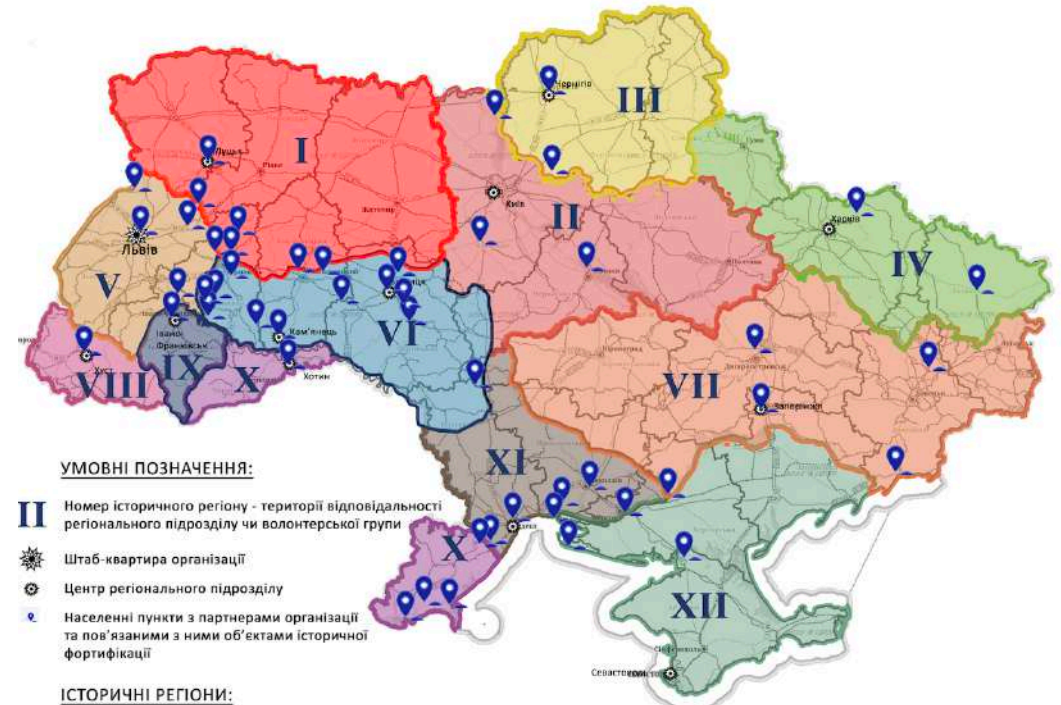
To define how sustainable development principles can be applied to historical fortification complexes in Ukraine as **contemporary socio-cultural spaces**.

This forms the foundation of the research and its practical relevance.



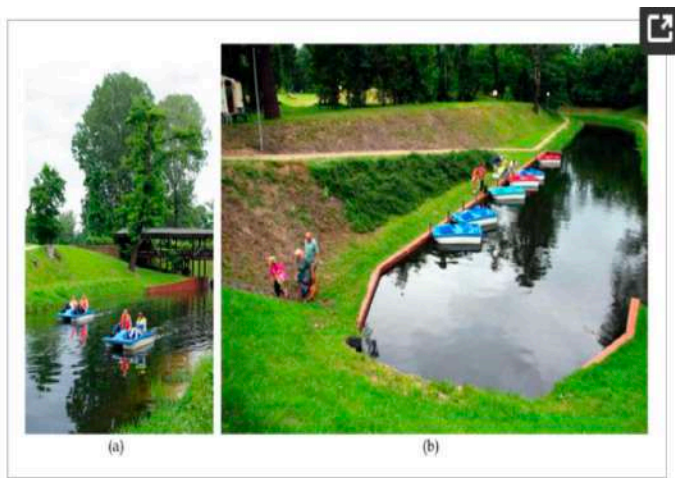
#### Sustainable Development Principles in Preserved Historical Fortification Complexes:

1. Environmental sustainability
2. Social inclusion and accessibility
3. Economic viability
4. Preservation of cultural heritage and authenticity
5. Minimal intervention in the historical fabric
6. Reversibility of interventions
7. Integration into the cultural landscape
8. Adaptive reuse
9. Interdisciplinary management approach
10. Long-term sustainability and governance



# 4. Key Concept: Cultural Landscape (UNESCO, ICOMOS)

Fortifications are part of a living landscape. This emphasizes their **interaction with the surrounding environment**.



**Figure A9.** Fortifications of Fort Bema, image from 2001, i.e., before reclamation (a) and the same section appropriately restored, after reclamation (b); source: own elaboration.



- Legend:**
- 1. Fortification of Fort Bema
  - 2. "Przemysław" Shooting Range
  - 3. Location of the Estate on Ochotnicza Street
  - 4. Site and Water Drain
  - 5. Elements of Trade, Architecture and Parkland
  - 6. Bridge and Walking Paths
  - 7. Sports Facilities (SQU)
  - 8. Former Trees and Shrubs
  - 9. Modernized WZL - 4 Facilities
  - 10. Parking for 600 Vehicles
  - 11. Water Transfer Reservoirs
  - 12. Service Facilities
  - 13. 27' and 50' Bastions

Innovative Approaches to Urban Revitalization: Lessons from the Fort Bema Park and Residential Complex Project in Warsaw

*Janusz Sobieraj Dominik Metelski*

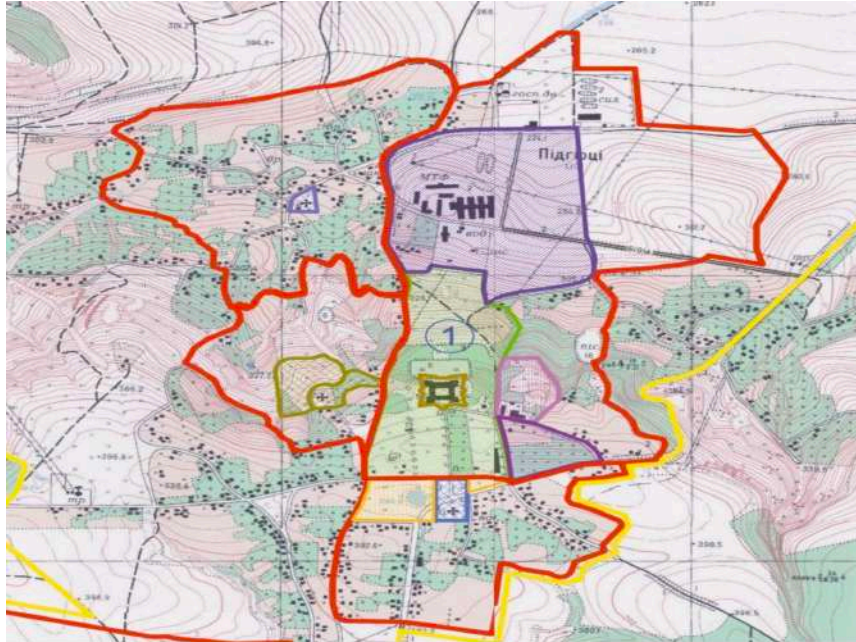
Heritage is not an isolated object, but a system:

**nature + culture + society**

Fortifications are part of a living landscape

# 5. Framework

This model ensures a comprehensive approach to the territorial development.



- Sustainable development includes:
  - environmental
  - social
  - economic
  - cultural (identity, memory)

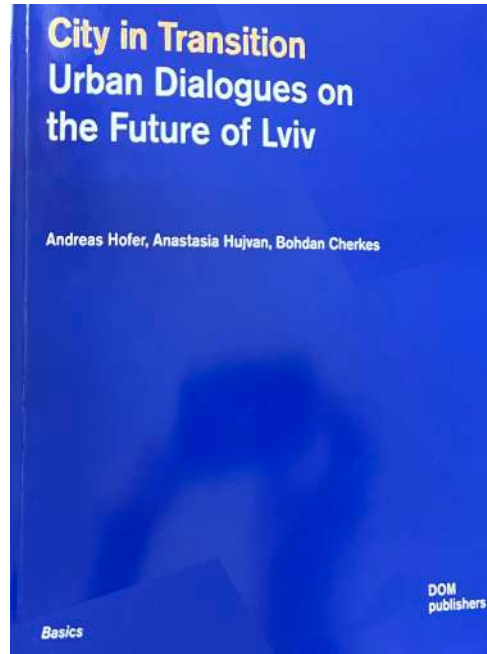
## БЕЗПЕКА, КОМФОРТ ТА ІМПЛЕМЕНТАЦІЯ

- АКУСТИКА: ФАКТИЧНА ВІДСУТНІСТЬ ШУМУ.
- ВІБРАЦІЯ: ПЛАВНА ПЕРЕДАЧА, ВІДСУТНІСТЬ РЕЗОНАНСУ.
- ФАУНА: БЕЗПЕКА ПТАХІВ.



# 7. Implementation

These define the directions for practical implementation.



Four key dimensions:

**Environmental** — minimal intervention

**Social** — inclusivity and public use

**Economic** — tourism and creative industries

**Cultural** — preservation of authenticity

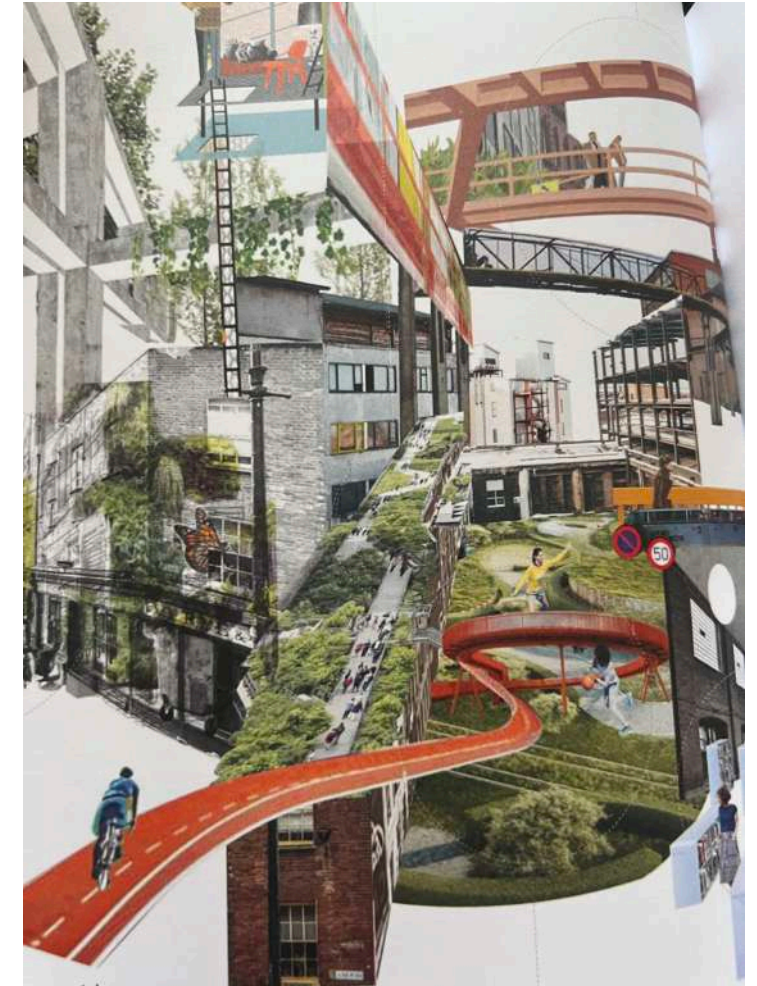
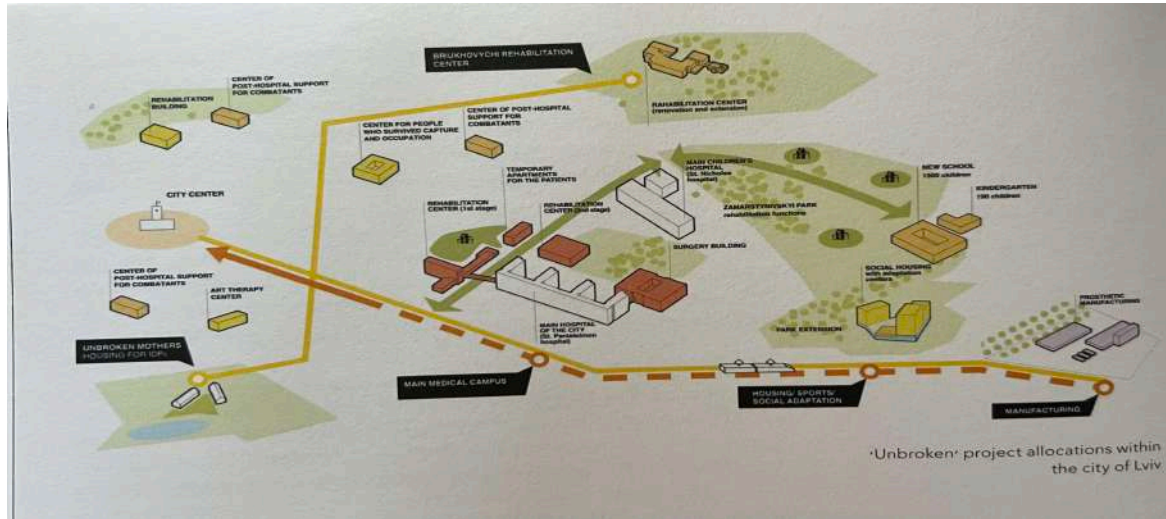


**Lviv. Memorial to the Heavenly Hundred**  
(in honor of the fallen defenders of the Maidan)

# 8. Role of Design

“Soft interventions” with minimal impact

This allows the integration of new functions without damaging the historical fabric.



Design acts as a **mediator between past and present.**

Tools:

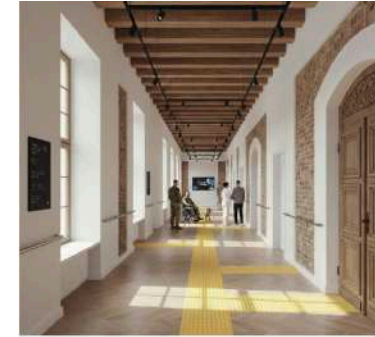
- navigation systems
- temporary pavilions
- exhibition structures

“Soft interventions” with minimal impact

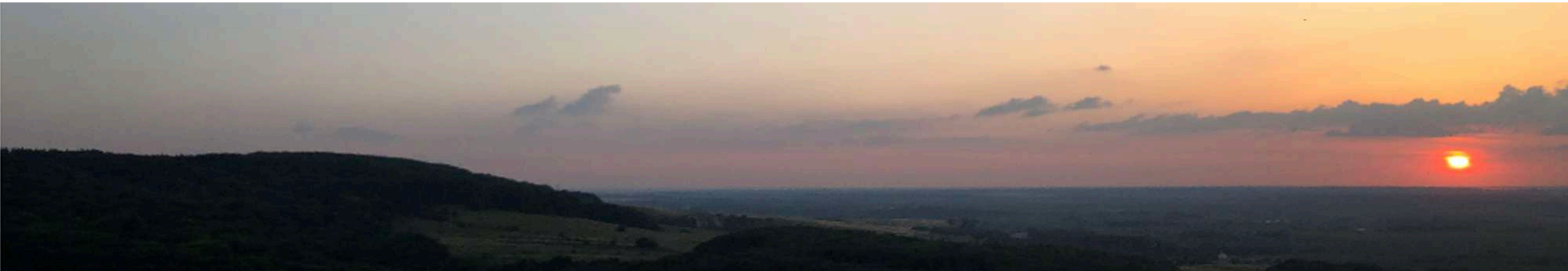


**The architectural reinterpretation of Pidhirtsi's heritage can be considered as:**

- a model of post-traumatic spatial recovery,
- a transboundary platform of shared memory,
- an economically grounded cultural asset.



The structure of the Pidhirtsi castle complex includes the 18th-century Hetman's host house, which is considered a potential rehabilitation center for military personnel.



**The conclusion is as follows:**

Pidhirtsi–Brody can become a pilot case where the cultural landscape functions as an architectural infrastructure of recovery.

Our task is not to “add something new,” but to tune the environment — to make it accessible, legible, safe, and supportive of people.

# CONCLUSION

Pidhirtsi–Brody can become a **pilot case**, where the cultural landscape functions as **architectural infrastructure for recovery**.

Our task is not to “add something new”, but to **tune the environment**:



ACCESSIBLE



READABLE



SAFE



SUPPORTIVE  
OF PEOPLE

# 9. Conclusion

- Fortifications can transform:
- from passive monuments  
→ into active spatial resources
- supporting:
  - rehabilitation
  - culture
  - territorial development



This reveals a new role of heritage in contemporary urban processes.



This year, I organized an international conference. According to its resolution, the International Summer School "Pidhirtsi 2026" will take place from May 28 to June 10, 2026.

*THANK YOU FOR THE ATTENTION!*

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