

POST-MILITARY URBAN REGENERATION IN GERMANY: A COMPARATIVE STUDY OF BORNSTEDTER FELD, SCHARNHAUSER PARK, AND VAUBAN

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Abstract. In the wake of German reunification and the withdrawal of foreign military forces, vast tracts of former military land became available for redevelopment across the country. This paper investigates how three notable post-military sites (Bornstedter Feld in Potsdam, Scharnhauser Park in Ostfildern, and Vauban in Freiburg) were transformed into sustainable urban districts through distinct governance models and planning strategies. Utilizing a qualitative, comparative case study methodology, the research analyzes each site's approach to governance, citizen participation, financial mechanisms, sustainability, and legal frameworks, particularly the use of §165 of the Federal Building Code (BauGB). The comparative analysis highlights that the success of post-military redevelopment depends not only on legal tools or financial models but also on civic inclusion and ecological vision. While all three projects achieved functional reintegration and urban quality, their varied outcomes underscore the importance of aligning governance structures with context-specific goals. These German experiences offer valuable lessons for cities in Korea, Eastern Europe, and post-conflict regions facing similar challenges in military land reuse. The study contributes to the broader discourse on adaptive urbanism, participatory governance, and sustainable redevelopment of brownfield sites.

Keywords: post-military urban redevelopment, governance models, sustainability strategies, citizen participation, BauGB §165.

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1. Introduction

1.1. Research background and purpose

The dissolution of the Cold War geopolitical order fundamentally altered urban landscapes across Europe, and Germany became a particularly striking example of this transformation (Diefendorf, 2023). Following reunification, the country inherited an extensive inventory of military installations previously controlled by Soviet, American, British, and French forces. As these foreign troops withdrew, vast tracts of underutilized or abandoned military land in or near urban areas were returned to local jurisdictions (Sheffer, 2011). While this process presented a rare opportunity for regeneration, it also introduced complex challenges, particularly in terms of environmental remediation, land governance, and social reintegration.

Former military sites, or military brownfields, are more than just physical voids. They represent spaces of exclusion, historical conflict, and ecological degradation (Clark, 2009; Niemets et al., 2024). Contaminated soils, defunct infrastructure, and ambiguous ownership structures complicate redevelopment (Krupar, 2024). Moreover, their integration into existing urban frameworks demands not only technical solutions but also political negotiation, community engagement, and long-term strategic vision (Dixon et al., 2008).

Germany stands out as a global reference point for post-military redevelopment due to its legal innovation and institutional capacity (Baek & Lee, 2020). Central to its strategy is Section 165 of the Federal Building Code (Baugesetzbuch, or BauGB), which grants municipalities special rights to designate redevelopment zones, acquire land, regulate resale prices, and coordinate long-term development agendas in alignment with public interest (Bundesamt für Bauwesen und Raumordnung, 2000). This legal instrument has enabled cities to convert formerly exclusionary military landscapes into inclusive, sustainable urban districts.

This study investigates three of the most renowned examples of post-military redevelopment in Germany: Bornstedter Feld (Potsdam), Scharnhauser Park (Ostfildern), and Vauban (Freiburg). Each exemplifies a distinct governance model (public-led, public-private, and citizen-led, respectively) and reflects divergent planning tools, sustainability strategies, and community dynamics.

The research aims to explore:

- How governance was structured in each case and what roles were played by public, private, and civil society actors;
- What legal, financial, and ecological instruments were used to support sustainability and affordability;

- What transferable lessons can be drawn for other countries and cities confronting similar post-military urban transformation challenges.

1.2. Scope and method of the research

To address these questions, the study applies a qualitative, comparative case study approach, focusing on three representative German redevelopment projects. The selection of Bornstedter Feld, Scharnhäuser Park, and Vauban was based on their international visibility, documented outcomes, and diversity in planning approaches.

Each case is analysed across six key dimensions: governance structure, planning and legal instruments, financial strategy, sustainability focus, mobility infrastructure, and citizen participation. This multi-dimensional framework enables both within-case depth and cross-case comparison. Data sources include planning documents, municipal development reports, citizen group publications, academic research, and legal frameworks such as the BauGB.

The methodological choice is guided by prior literature emphasizing the role of institutional flexibility, local capacity, and participatory governance in successful brownfield redevelopment (De Sousa, 2003; Lehmann, 2011). Furthermore, the German experience offers comparative value for cities in Eastern Europe, Korea, or post-conflict regions, where similar base closures are generating opportunities and dilemmas for urban transformation.

Ultimately, the study contributes to broader discourses in sustainable urbanism, post-industrial spatial restructuring, and civic-driven planning. By situating post-military land reuse within contemporary debates on ecological justice and adaptive governance, this paper highlights not only the physical reconfiguration of space, but also the evolving social contracts embedded in urban redevelopment.

2. Literature review

2.1. Post-military land redevelopment

The conversion of military brownfields into urban areas presents one of the most complex forms of land redevelopment. As noted by Dixon et al. (2008), such land transitions are often complicated by contamination, restricted access, fragmented ownership, and public resistance rooted in historical identity. In the context of Germany, these issues were amplified due to the country's extensive Cold War-era military infrastructure and subsequent reunification in the early 1990s.

Szabó et al. (2025) argue that former military sites must be treated not merely as technical clean-up challenges, but as opportunities to reconnect fragmented urban structures and reframe national identity through space. Their work highlights how redevelopment efforts can either bridge or reinforce socio-spatial divisions inherited from military use. Germany's proactive approach, supported by its strong

planning legislation and land management policies, sets it apart as a valuable case study in post-military urbanism.

The literature also discusses the role of multi-level governance and institutional adaptability. Cowan (2005) emphasizes that adaptive reuse requires legal flexibility and community negotiation, especially where the military withdrawal leaves infrastructural voids and social discontinuity. The success of military site conversion depends on both spatial transformation and social reintegration.

2.2. Sustainable urbanism and ecological design

Sustainability is a recurring theme in the redevelopment of military lands. Beatley (2012), in his work *Green Urbanism*, proposed that sustainable cities must integrate compact land use, green infrastructure, efficient energy systems, and community well-being. German cases like Freiburg's Vauban are often cited as exemplary applications of such principles (Register, 2006).

In line with these ideas, Lehmann (2011) argues that urban redevelopment should adopt a zero-carbon and zero-waste vision where possible. This includes maximizing passive solar orientation, integrating stormwater reuse, and supporting non-motorized transport systems. Several German redevelopment projects, especially Vauban and Scharnhäuser Park, have been recognized for achieving high ecological standards, including the widespread use of passive house designs, district heating based on biomass, and sustainable stormwater management.

The emphasis on long-term ecological resilience also appears in studies on post-industrial land use (De Sousa, 2003). These works highlight that former military sites can serve as testbeds for sustainable urban planning innovations, provided that political will and planning capacity align.

2.3. Participatory governance in urban redevelopment

The transition from state-owned military land to civilian use often challenges conventional planning hierarchies. Ansell and Gash (2008) introduced the concept of collaborative governance, where stakeholders from government, civil society, and the private sector jointly participate in decision-making processes. Their model emphasizes trust-building, institutional design, and shared incentives as key success factors in complex planning environments.

Vauban's redevelopment process is a widely studied example of participatory urban governance (Scheurer & Newman, 2009). The initiative was largely driven by Forum Vauban, a citizen organization that coordinated input from various community actors, including housing cooperatives, environmental NGOs, and future residents. The co-housing models and car-free mobility policies in Vauban would likely not have been realized without early and sustained citizen involvement.

In contrast, Scharnhäuser Park followed a more conventional governance model, with the local municipality forming a partnership with the House of Württemberg. While public engagement was included, it was primarily consultative rather than co-creative. The comparison between the two highlights different pathways to legitimacy and innovation in planning.

Participation also influences social equity. As Tonkiss (2013) notes, participatory planning can function as a mechanism for redistributive justice, allowing marginalized groups to influence outcomes in land-use decisions. However, she cautions that invited spaces of participation must be critically assessed for their depth and inclusiveness.

2.4. Legal framework: the German BauGB and §165

Germany's legal infrastructure for land-use planning provides a unique foundation for military land conversion. The Federal Building Code (Baugesetzbuch, BauGB) offers municipalities strong tools for managing urban development. Of particular relevance is §165, which enables the designation of Urban Development Measures (Städtebauliche Entwicklungsmaßnahmen), allowing municipalities to freeze land prices, expropriate properties, control resale conditions, and lead planning with public-interest objectives.

The Federal Ministry for Environment (Umweltbundesamt, 2014) provides case studies demonstrating how §165 has been used to guide redevelopment of complex sites, including former military zones. The tool allows local authorities to intervene directly in the land market, preventing speculative pressure and ensuring coherent urban growth. These provisions were utilized in all three cases examined in this paper, particularly in Bornstedter Feld.

Recent research by Baek (2024) emphasizes that while BauGB §165 provides strong statutory support, its success relies heavily on municipal capacity, strategic vision, and stakeholder alignment. Thus, legal tools are necessary but not sufficient; their effectiveness depends on integration with governance and community structures.

2.5. Research gaps and contributions

While existing literature offers valuable insights into post-military redevelopment and sustainable urbanism, comparative analyses of implementation across governance models remain limited. Most studies tend to focus on either top-down (public) or bottom-up (community-driven) projects, with few exploring hybrid approaches like public-private partnerships.

This study contributes to filling this gap by juxtaposing three German cases with distinct governance configurations. By applying a structured comparative framework across governance, sustainability, and participation, the paper extends existing discourse on how former military lands can be leveraged for transformative urban development.

3. Methodology

This study adopts a qualitative, comparative case study methodology to explore how former military lands in Germany have been transformed into sustainable urban districts through different governance and planning strategies. The selection of the three case study areas (Bornstedter Feld in Potsdam, Scharnhäuser Park in Ostfildern, and Vauban in Freiburg) was based on purposeful sampling. Each site represents a distinct model of redevelopment: public-led, public-private partnership, and citizen-driven respectively. They have all gained international recognition for their innovative approaches and have reached a relatively mature phase of development, making them appropriate subjects for in-depth analysis.

3.1. Data collection

The research relies primarily on secondary data sources. These include official municipal planning documents, such as masterplans and land-use development reports, alongside legal texts related to the German Federal Building Code (particularly Section 165 of the BauGB), sustainability assessments, and academic publications that evaluate the projects' long-term impacts. Additional materials such as citizen-group publications, especially from Forum Vauban, were also consulted to gain insight into participatory mechanisms. Data was collected through publicly accessible municipal archives, planning agency websites, and academic platforms including Google Scholar and ResearchGate.

3.2. Analytical framework

To ensure systematic comparison, a six-dimensional analytical framework was developed. The dimensions include: (1) the governance model employed in each case, whether public, hybrid, or community-led; (2) financing strategies, including public investment, land sales, and cooperative ownership; (3) the implementation of sustainability measures, such as renewable energy, ecological water systems, and building standards; (4) mobility infrastructure, particularly the integration of public transport and car-free design; (5) the degree and timing of citizen participation; and (6) land use strategies involving zoning, density, and mixed-use configurations. Each case was analysed across these dimensions to identify key differences, overlaps, and transferable innovations.

This methodological approach provides a robust comparative lens through which to evaluate how different governance and planning frameworks can shape sustainable outcomes in the context of post-military land redevelopment.

4. Case studies

4.1. Bornstedter Feld, Potsdam

Bornstedter Feld is a prime example of a publicly led redevelopment project implemented under the auspices of BauGB §165. Located in the northern part of Potsdam, this 300-hectare site was formerly used by Soviet military

forces until their withdrawal in the early 1990s. Redevelopment began in 1991 and continued until around 2015. The site was envisioned to accommodate approximately 15,000 residents in about 7,000 housing units (Figures 1–2).

The project was coordinated by Entwicklungsträger Bornstedter Feld GmbH, a public development agency owned by the City of Potsdam. One of the key innovations in the redevelopment process was the freezing of land prices at pre-development levels, thereby avoiding speculative inflation. This allowed the municipality to maintain control over the pace and quality of development, while also channeling revenues from land sales into infrastructure provision, including schools, roads, and public transport extensions.

Urban planning was guided by principles of mixed-use development, with a central green corridor of approximately 60 hectares forming the ecological spine of the neighborhood. This park system also served as an environmental compensation zone. Public transit, including buses and tram connections to the city center, was integrated early into the masterplan.



Figure 1. Aerial view of Bornstedter Feld (source: <https://www.potsdam.de/de/bornstedter-feld>)



Figure 2. Plan of Bornstedter Feld (source: <https://www.potsdam.de/de/bornstedter-feld>)

However, Bornstedter Feld also exhibits limitations in terms of innovation and participation. While the legal and financial tools enabled efficient development, citizen participation was relatively weak and largely limited to formal hearings. In contrast to Vauban or Scharnhauser Park, the project lacked strong ecological or architectural identity, with many developments conforming to mid-range energy standards rather than low-carbon benchmarks.

Despite these limitations, the case is often cited for demonstrating how public land ownership and planning autonomy can ensure financial sustainability, control over land use, and equitable infrastructure development. The Bornstedter Feld model illustrates the potential for municipalities to act as master developers within a regulated framework, offering a stable and predictable model for urban growth.

4.2. Scharnhauser Park, Ostfildern

Scharnhauser Park is located in Ostfildern, near Stuttgart, and was formerly occupied by the U.S. Army as the Nellingen Barracks. Following the military's withdrawal, the 140-hectare site was redeveloped from 1990 to 2016, with an estimated investment of €1.1 billion. The project stands out as a hybrid model of urban redevelopment led by a public-private collaboration between the municipality and the House of Württemberg, a major private landowner in the region (Figures 3–4).

One of the defining features of Scharnhauser Park is its strong commitment to ecological sustainability. The project was awarded several national planning prizes for its innovative environmental infrastructure, most notably its decentralized stormwater management system. This system uses vegetated swales (Grasmulden) to filter and retain rainwater, thereby reducing pressure on the municipal drainage network and supporting biodiversity.

Energy sustainability was also prioritized. Over 90% of the district's heating needs are supplied by a biomass plant powered by wood chips, sourced locally. Residential and commercial buildings adhere to stringent energy efficiency standards, and soil reuse practices during construction minimized environmental disruption. Mobility planning was also integral to the project: the extension of the Stuttgart light rail (U7) into the district ensured direct, high-frequency transit access from the outset.

From a planning perspective, the project adopted a flexible yet coordinated framework. The municipality retained planning sovereignty, while the private partner contributed land and engaged in infrastructure financing through shared revenue models. This cooperation allowed for faster implementation and greater architectural diversity across sub-neighborhoods.

Public participation was present but less influential than in Vauban. While community feedback was solicited during the planning phase, decision-making remained centralized. Nonetheless, the project successfully integrated public amenities, parks, and cultural facilities that reflect local preferences. Scharnhauser Park today houses



Figure 3. Aerial view of Scharnhäuser Park (source: <https://seg-ostfildern.de/stadterneuerung/scharnhäuser-park/>)



Figure 4. Plan of Scharnhäuser Park (source: <https://seg-ostfildern.de/stadterneuerung/scharnhäuser-park/>)

about 8,000 residents and offers approximately 2,000 jobs, demonstrating the viability of well-balanced, medium-density urbanism.

In summary, Scharnhäuser Park offers a compelling example of how strategic partnerships can leverage private resources while maintaining public interest. Its success reflects the capacity of hybrid governance to implement environmentally advanced, economically viable urban districts on complex former military land.

4.3. Vauban, Freiburg

Vauban, located in the city of Freiburg, is internationally renowned as a pioneering model of citizen-led, ecologically oriented urban redevelopment. The site, covering approximately 41 hectares, was formerly occupied by the French military. Redevelopment began in 1993 and proceeded in phases through to 2016, with a target population of around 6,000 residents (Figures 5–6).

The defining characteristic of Vauban is its participatory planning model, coordinated largely through Forum Vauban, a civil society organization composed of future residents, local activists, architects, and planners. Unlike conventional top-down planning models, Vauban's development process was structured around community workshops, democratic decision-making, and co-design exercises. This process enabled deep social buy-in and produced a neighborhood that reflects shared values of environmental stewardship, equity, and communal living.

Ecological innovation in Vauban is unparalleled among German redevelopment projects. Buildings in the district adhere to Passivhaus standards, with many producing surplus energy through rooftop photovoltaics and solar thermal systems. Car ownership is strongly discouraged; instead, a car-free model is enforced through spatial design and legal covenants. Residents without a declared car are offered discounted housing and access to neighborhood-scale mobility services, such as car-sharing and bicycle networks.

Housing in Vauban includes a mix of co-housing models, cooperative ownership (e.g., Genova eG), and subsidized units for low-income households. This mixture ensures socio-economic diversity and long-term affordability. In addition, the district's layout encourages walking and social interaction through narrow streets, pocket parks, and communal gardens.



Figure 5. Aerial view of Vauban (source: <https://www.freiburg.de/>)



Figure 6. Plan of Vauban (source: <https://www.freiburg.de/>)

Governance in Vauban was complex but effective. The city retained formal planning authority but delegated significant influence to Forum Vauban during the planning and early implementation stages. Although this approach required more time and consensus-building, it resulted in a socially cohesive, climate-resilient neighborhood that continues to serve as a global reference point for sustainable urbanism.

Vauban illustrates how civil society, when given institutional legitimacy and financial support, can lead transformative urban projects. It challenges the assumption that only public or private actors can produce large-scale development and redefines the role of residents from passive recipients to active co-creators of urban space.

4.4. Comparative analysis

The comparative evaluation of Bornstedter Feld, Scharnhäuser Park, and Vauban reveals distinct models of post-military urban redevelopment, shaped by differing governance structures, environmental ambitions, financing mechanisms, and degrees of civic engagement. While all three projects benefited from the legal foundation provided by Germany's Federal Building Code (§165 BauGB), the implementation strategies varied significantly, reflecting both institutional capacities and local sociopolitical cultures.

Governance models play a central role in defining the development trajectory. Bornstedter Feld exemplifies a public-led approach, with strong municipal control over land, planning, and sales. This model allowed for efficient coordination but limited public involvement. Scharnhäuser Park operated under a public-private partnership, leveraging both municipal leadership and private landowner contributions. This hybrid model allowed for shared financial risk and faster development timelines. In contrast, Vauban

pursued a citizen-led approach, with the civil society group Forum Vauban playing a central role in shaping the district. This governance model fostered deeper civic ownership and social cohesion, albeit at the cost of longer planning periods and more complex negotiation processes.

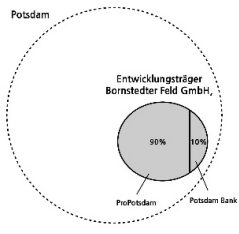
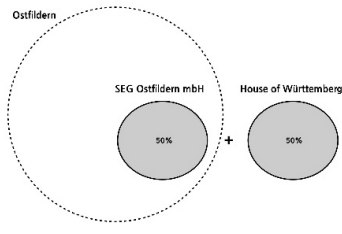
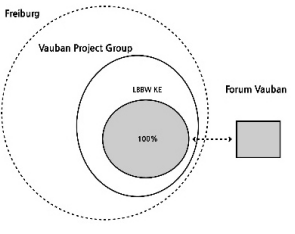
In terms of environmental strategies, the differences are especially pronounced. Bornstedter Feld emphasized environmental compensation through large green spaces but lacked innovative energy or water systems. Scharnhäuser Park was a national leader in environmental engineering, employing decentralized stormwater management and biomass heating. Vauban set the highest ecological benchmarks, incorporating passive house standards, car-free zones, and renewable energy generation as default planning tools. These outcomes underscore that the depth of sustainability integration often correlates with the extent of citizen participation and local ecological culture.

Citizen participation ranged from minimal (Bornstedter Feld) to consultative (Scharnhäuser Park) to deeply embedded (Vauban). The level of engagement directly influenced both the social fabric and the degree of innovation. Vauban's participatory model supported the emergence of co-housing, inclusive design, and strong social capital, while Bornstedter Feld's limited engagement resulted in a more conventional urban form.

Mobility infrastructure also reveals critical differences. Vauban prioritized non-motorized and shared transport from the outset, with strong legal mechanisms to reduce car ownership. Scharnhäuser Park extended a major tram line into the district, enabling sustainable commuting. Bornstedter Feld relied more on existing bus and tram networks but lacked an integrated mobility vision.

From a financial perspective, all three projects avoided major public debt, but through different mechanisms.

Table 1. Comparative overview of the three cases

Dimension	Bornstedter Feld (Potsdam)	Scharnhäuser Park (Ostfildern)	Vauban (Freiburg)
Governance model	Public-led (Municipal agency) 	Public-private partnership 	Citizen-led with NGO coordination 
Area (ha)	300	140	41
Development period	1991–2015	1990–2016	1993–2016
Target population	~15,000	~8,000	~6,000
Citizen participation	Low (formal hearings)	Moderate (consultative)	High (co-creation)
Environmental focus	Green space & land price control	Stormwater, biomass, energy design	Passive house, solar, car-free zone
Mobility strategy	Bus & Tram (existing lines)	Light rail extension (U7)	Car-free, tram, bicycle priority
Financial model	Land sales → infrastructure	Cost-sharing (municipal-private)	Co-housing, state support
Legal tool	BauGB §165	BauGB §165	BauGB §165 + cooperative agreements
Planning innovation	Park corridor, fiscal neutrality	Environmental engineering	Participatory urbanism, co-housing

Bornstedter Feld relied on land sales to finance infrastructure, aligning with fiscal neutrality goals. Scharnhäuser Park utilized cost-sharing between the public and the private aristocratic partner. Vauban leveraged cooperative housing finance and state support, highlighting the potential of grassroots financing mechanisms.

Overall, the comparison highlights that while legal tools such as BauGB §165 provide a strong planning scaffold, the success and innovation of military site redevelopment ultimately hinge on governance dynamics, civic inclusion, and long-term environmental vision. Each case offers different lessons: Bornstedter Feld demonstrates fiscal prudence and planning control; Scharnhäuser Park reveals the strength of technical innovation under hybrid governance; and Vauban illustrates how civic engagement can drive ecological and social transformation at the neighborhood scale. The key characteristics of the three cases are summarized in Table 1.

5. Discussion

The comparative analysis of Bornstedter Feld, Scharnhäuser Park, and Vauban reveals that while all three projects successfully transformed former military sites into vibrant urban districts, their development trajectories varied significantly based on governance structure, environmental ambition, citizen involvement, and financial mechanisms. This discussion synthesizes the key findings and interprets their broader implications for post-military urban redevelopment globally.

One of the most significant insights emerging from the comparison is the critical influence of governance models. Bornstedter Feld, led primarily by a municipal agency, reflects the strengths of centralized public control, particularly in terms of land-use regulation, financial accountability, and infrastructure delivery. This approach enabled effective coordination and ensured that land speculation was curbed early through the freezing of land prices. However, the limited involvement of citizens resulted in lower innovation in social and environmental dimensions.

In contrast, Vauban's citizen-led development model underscores the transformative potential of bottom-up governance. Through Forum Vauban, residents were actively involved in shaping the planning vision, housing typologies, mobility systems, and sustainability standards. This led to the creation of one of the most ecologically advanced neighborhoods in Europe. However, the participatory model required more time for consensus-building and was dependent on an unusually high level of civic organization and political support. These findings suggest that while participatory urbanism can yield resilient and context-sensitive outcomes, it also demands a supportive institutional ecosystem and long-term commitment.

Scharnhäuser Park illustrates the strengths of hybrid governance, blending municipal leadership with private sector engagement. This model allowed the city to leverage private capital while maintaining strategic planning

control. The result was a technically sophisticated, medium-density urban district with high environmental standards. Yet, its comparatively moderate level of citizen involvement suggests that technical innovation does not always translate into social inclusiveness or deep civic ownership.

Another key lesson lies in the projects' approaches to sustainability. Vauban represents the gold standard in holistic ecological design, integrating energy-efficient housing, renewable energy systems, car-free mobility, and co-housing communities. Scharnhäuser Park also demonstrated excellence in environmental engineering, especially through its decentralized water management and biomass heating systems. Bornstedter Feld, although environmentally mindful in terms of green space provision, did not achieve the same level of ecological innovation. This disparity highlights that strong planning frameworks must be complemented by deliberate sustainability objectives embedded at the core of the development process.

Citizen participation emerges as a major determinant of social innovation and community cohesion. Vauban's high engagement model fostered a unique urban identity and strong neighborhood resilience, while Bornstedter Feld's limited involvement produced a more generic urban form. Scharnhäuser Park occupied a middle ground, offering structured consultation but limited co-creation. These distinctions reinforce existing literature suggesting that meaningful participation can significantly enhance the long-term adaptability and inclusiveness of urban spaces (Ansell & Gash, 2008).

From a financial perspective, the three projects also diverged. Bornstedter Feld followed a fiscally neutral model reliant on land sales, minimizing the burden on public budgets. Scharnhäuser Park benefited from shared financial responsibility between the city and a private landowner, distributing risk while maintaining high-quality design. Vauban, by contrast, relied on a mix of cooperative housing models and public support, illustrating the feasibility of grassroots financing under the right conditions. The success of these approaches suggests that multiple financial pathways can be viable, provided they align with the project's broader social and ecological goals.

A common thread across all three cases is the enabling role of legal instruments, particularly §165 of the German Federal Building Code. This provision allowed municipalities to guide redevelopment through direct land acquisition, planning authority, and price regulation. The ability to steer the land market was particularly valuable in reducing speculation and aligning private investment with public objectives. This legal empowerment is a distinctive strength of the German model and serves as a reminder that transformative urban projects require both institutional autonomy and legislative backing.

Finally, the cross-case comparison underscores the importance of context-sensitive strategies. No single governance or planning model fits all situations. Rather, the choice of approach should reflect local capacities, civic culture, land ownership structures, and development goals.

Importantly, cities must strike a balance between efficiency and inclusiveness, between technical innovation and social justice.

In conclusion, the German experience in post-military redevelopment offers a multi-dimensional learning opportunity for global cities facing similar transitions. Whether in post-industrial regions, former colonial military zones, or post-conflict areas, the ability to harness underutilized land for sustainable, inclusive urbanism depends not just on design or financing but on governance, legal frameworks, and the active inclusion of citizens in shaping their urban futures.

6. Conclusions

6.1. Results and significance of research

The redevelopment of former military sites presents both a complex challenge and a powerful opportunity for cities undergoing spatial, social, and ecological transformation. This study examined three exemplary cases from Germany to understand how different governance models, planning strategies, and participatory mechanisms shape the outcomes of post-military urban redevelopment.

The comparative analysis reveals that while all three projects successfully achieved residential integration and infrastructure renewal, their approaches diverged significantly in terms of environmental ambition, citizen engagement, and implementation dynamics. Bornstedter Feld exemplifies a centralized, public-sector-led model with strong fiscal control and efficient infrastructure delivery. Scharnhauser Park demonstrates the potential of hybrid governance, blending municipal oversight with private land contribution to enable environmentally advanced development. Vauban stands out for its citizen-led planning model, which embedded sustainability and inclusiveness at the core of every decision-making layer, even at the cost of a slower, more complex process.

A central conclusion of this study is that there is no one-size-fits-all model for post-military redevelopment. Each case reflects a unique response to local institutional capacity, civic culture, and planning objectives. However, several transferable lessons emerge: first, robust legal frameworks such as Germany's BauGB §165 are essential for enabling cities to manage land markets and align development with the public interest. Second, meaningful citizen participation, when introduced early and integrated into formal planning processes, significantly enhances social cohesion and long-term resilience. Third, sustainability must be treated as a foundational principle, not a technical add-on, if redevelopment is to meet contemporary environmental and social goals.

These insights have broader relevance beyond the German context. Countries dealing with post-military land reuse such as Korea, Eastern European states, and post-conflict regions can draw on these examples to develop adaptive strategies suited to their own governance environments. The German experience demonstrates that

with the right combination of legal empowerment, civic inclusion, and ecological vision, former military spaces can be transformed into model districts for a just, sustainable urban future.

6.2. Limitations and future research directions

While this study provides a comparative analysis of post-military urban redevelopment in Germany and offers meaningful insights into governance, sustainability, and participation, several limitations should be acknowledged, which also point toward directions for future research.

First, the analysis relies primarily on secondary sources, including planning documents and academic literature. While data triangulation enhanced reliability, the absence of primary empirical data limits insight into stakeholder perceptions and informal governance dynamics. Future studies could incorporate interviews, participant observation, or workshop-based methods to capture these dimensions more fully.

Second, the findings are based on three German case studies embedded in a specific legal and institutional context, particularly the availability of strong statutory planning tools such as §165 of the Federal Building Code (BauGB). This context may constrain the transferability of the results. Expanding comparative research to countries with different governance systems would help assess the adaptability of the identified approaches.

Third, this research focuses mainly on planning processes and medium-term outcomes, rather than long-term social, economic, and environmental effects. Future research should adopt longitudinal perspectives to examine issues such as housing affordability, social mix, and the durability of sustainability measures over time.

Addressing these limitations would contribute to a more nuanced understanding of post-military land redevelopment as not merely a spatial transformation process, but as an evolving socio-political project involving long-term governance innovation and civic engagement. Such research would further enhance the relevance of post-military redevelopment strategies for cities worldwide seeking just, resilient, and sustainable urban futures.

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