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Conflict and Coordination Pathways Between Environmental Sustainability and Social Equity in Public Facilities of High-Density Cities: The Case of Denmark's Dokk1 Library

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Abstract:

Amid intertwined global urbanization and climate change, Copenhagen's Dokk1 Library exemplifies how high-density cities' public facilities pursue dual environmental-social value, revealing its transition challenges. This paper employs a combined approach of literature analysis and case study methodology, grounded in relevant theoretical frameworks. It scrutinizes the design philosophy, operational model, and urban context of Copenhagen's Dokk1 Library, aiming to reveal its effectiveness, contradictions, and integration strategies in achieving dual environmental and social objectives. Research indicates that while Dokk1 successfully integrates green technology with vibrant public spaces at the building level, it faces the risk of being regarded as a symbol of gentrification in the broader urban context. This reflects the pervasive latent issue of "unintended social exclusion" within sustainable practices. This phenomenon illustrates that outstanding architectural design alone does not automatically ensure social equity. Without forward-looking policy interventions to curb gentrification, environmentally sustainable outcomes may paradoxically erode the authenticity and inclusiveness of existing communities. Consequently, the true value of green public facilities in high-density cities lies not merely in technological sophistication, but in their capacity to serve as institutional anchors for advancing and sustaining spatial justice – a universal challenge confronting global urban sustainability transitions.

Keywords: High-density Cities; Public Facilities; Environmental Sustainability; Green Gentrification; Social Equity

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1. Introduction

Building upon a rich body of existing literature, numerous studies have laid theoretical foundations from diverse perspectives. However, when examining the interplay between environmental sustainability and social equity within the specific context of high-density urban public facilities, the existing academic discourse still leaves room for further exploration:

Concerning green gentrification, Melissa Checker, in her work *Wiped out by the "greenwave": Environmental gentrification and the paradoxical politics of urban sustainability,*[1] adopts ethnographic methods to introduce the concept of "environmental gentrification" by analyzing the case of waterfront renewal in New York City. When sustainable policies are integrated with urban redevelopment, they risk becoming exclusionary governance tools—where improved environmental quality forces low-income groups to relocate, revealing the potential paradoxes inherent in the urban political-economic logic of "green" initiatives.

Concerning research into the social functions of public libraries, Aabø and Audubon observed in Use of library space and the library as place[2] that users prioritize the library's value as a "place" over its informational services. The core function of the modern library is to serve as a low-threshold urban living room that accumulates social capital and facilitates serendipitous interactions between individuals from different social strata, thereby significantly supporting the library's role in promoting social equity.

From a holistic perspective of sustainability assessment, Umberto Beardie critiques mainstream green building rating systems like LEED in Beyond Sustainability Assessment Systems: Upgrading Topics by Enlarging The Scale of Assessment[3], criticizes mainstream green building rating systems such as LEED for overemphasizing the technical performance of buildings themselves while generally neglecting broader social and economic impacts. Truly comprehensive sustainability assessment must transcend the boundaries of individual buildings, incorporating social dimensions such as community well-being and equity into the evaluation framework.

While existing research has touched upon core issues of this study from various angles—such as environmental gentrification, the social functions of public spaces, and the limitations of sustainability assessment—no study has yet systematically integrated these three research strands. This paper, therefore, centers on the Dokk1 Library—a globally influential green public facility—as its case study, systematically exploring the inherent contradictions and potential opportunities for coordination between its environmental and social objectives.

This study employs the Dokk1 Library in Copenhagen, Denmark, as its core case study, seeking to address the following key questions: What systemic internal contradictions arise when public facilities such as libraries in densely populated cities attempt to simultaneously meet the demands of environmental sustainability and social equity? What avenues exist to mitigate these contradictions? Through literature review and case analysis, this paper will elucidate key concepts, examine the interplay between policy and design strategies within the Dokk1 project, and reveal the practical dilemmas underlying green infrastructure implementation. By re-evaluating this 'exemplary' project, we aim to issue a cautionary note to planners in high-density cities: The green transformation of public facilities must prioritize social policies that counter gentrification as a prerequisite for achieving social equity, thereby redefining the assessment criteria and planning priorities for such projects.

2. What is the nature of the conflict?

Dokk1 Library represents a strategically significant urban renewal project in Copenhagen, acclaimed for its pioneering green technologies and iconic architectural design. This situation warrants profound reflection. Specifically, did its location, substantial green construction investment, and designation as an engine for urban regeneration inadvertently drive the process of "green gentrification"? How might this transformation be reshaping surrounding social structures, potentially contradicting its founding purpose of serving all citizens—particularly those from disadvantaged backgrounds—through social equity? This paper argues that the deeper root of this conflict lies in the redistribution of spatial rights: a public project originally intended to advance social justice may, precisely due to its outstanding environmental performance, evolve into a force with inherently exclusionary characteristics.

3. Manifestations of Conflict: Dokk1 Library Paradox

Dokk1 Library, Scandinavia's largest public library, won the 2016 Public Library Award for its outstanding architectural design and environmental sustainability practices. Yet beneath its glossy exterior, it starkly reveals the inherent tension between environmental sustainability and social equity.

3.1 Limitations of Green Technology Application

Dokk1's design emphasized natural light and views, with its 360-degree panoramic glass curtain wall serving as a major highlight. Yet in high-density urban settings, extensive glazing, if poorly managed, may undermine indoor thermal comfort[4]. Simultaneously, an overemphasis on visual openness and expansive communal spaces risks eroding users' sense of territoriality, proving less accommodating to readers seeking quiet, private reading environments. Moreover, the extensive digital and smart service facilities introduced within the library, while enhancing efficiency, may create new divisions in spatial functionality and accessibility between groups with differing levels of technological acceptance.

3.2 The Dilemma of Spatial Functionality and Accessibility

Dokk1 is positioned as a key transport hub for Aarhus, featuring a dedicated light rail station, over 450 bicycle parking spaces, and a large underground car park accommodating 1,000 vehicles. However, while serving motorists, this also reinforces the dependence on private cars, creating an inherent contradiction with the project's overall sustainability objectives. Truly sustainable urban design ought to prioritize walking, cycling, and public transport[5]. Furthermore, Dokk1's location at the mouth of the Aarhus River carries significant symbolic weight as a pivotal step in urban regeneration. Examining this purely through the lens of spatial equity raises the question: does concentrating core public resources at emerging strategic nodes—rather than traditional neighborhood centers—create practical barriers to access for residents in peripheral or other areas of the regeneration zone? This warrants further consideration.

3.3 Gentrification Risks Triggered by Landmark Effects

As a potent cultural catalyst, Dokk1 substantially elevates the surrounding environment's quality and cultural appeal, thereby increasing the symbolic capital and property values of the area. From an urban development perspective, this may be deemed a success; yet, viewed through the lens of social equity, it reveals nascent signs of "green gentrification". As Checker demonstrated in studying similar New York cases, environmental improvement projects can become catalysts for gentrification, forcing existing low-income residents and local community businesses to relocate as living costs rise[1]. This outcome risks a library designed to be "open to all citizens" inadvertently excluding the very groups it aims to serve while fulfilling its environmental mission.

3.4 Conflict between Costs and Resource Allocation

Dokk1's cumulative investment totals 2.8 billion Danish kroner. Its 35,600-square-metre footprint and cutting-edge green technologies demonstrate exceptionally high environmental standards. While this substantial investment yields outstanding environmental performance, it also represents a significant concentration of initial resources: vast sums are channeled into a single landmark project. Does this create a resource competition dynamic when contrasted with a network-based strategy of distributing multiple accessible community libraries evenly across a high-density urban area? Such iconic green projects tend to centralize public resource allocation. Might this diminish investment in basic services for marginalized communities? For public facilities serving all citizens, resource allocation priorities fundamentally concern social equity. As Fainstein emphasizes in The Just City, achieving spatial justice requires public investment to strike a balance between pursuing excellence and ensuring inclusivity.

4. Where lies the path to coordination?

In response to these contradictions, Dokk1 Library has made valuable practical efforts through the concept of the 'urban living room', the integration of multifunctional spaces, and the application of smart technologies. However, the crucial question remains: are there inherent limita-

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tions to these architectural endeavors? This prompts further reflection on whether genuinely reconcile this tension, must we necessarily rely on coordinated interventions in urban planning and policy—such as integrating green public infrastructure with inclusive housing policies and community benefit-sharing mechanisms, alongside other anti-gentrification measures? The crux of coordination may lie in treating architecture as a catalyst for change rather than the solution itself.

5. Pathways to Coordination: Towards Holistic Solutions

5.1 Establishing a Cross-Departmental Governance Framework

To mitigate gentrification effects triggered by flagship green projects, urban planning departments must establish collaborative mechanisms with housing, transport, and other sectors in the early stages of the project. Around facilities like Dokk1, cooperatively plan and construct a proportionate share of affordable housing, or implement rent controls[6]. Such investments should be combined with policies protecting community commerce and local employment training, to ensure that the dividends of development benefit existing residents more equitably. Public project decision-making should not solely focus on construction investment but also incorporate a whole-life-cycle assessment perspective alongside comprehensive evaluations of implementation costs, benefits, and social impacts.

5.2 Establishing Mechanisms for Community Engagement and Sustainable Operation

Dokk1 conducted "public consultation" activities during the design phase, which reportedly influenced decisions regarding the "scale of the multipurpose hall and reception area design." However, according to the ladder theory of civic participation, genuine involvement requires granting residents substantive decision-making authority throughout the facility's operation, event planning, and impact assessment processes. This goes beyond mere opinion-gathering at the design stage[7]. Library operational teams should proactively design projects that promote digital inclusion and plan activities that cater to diverse cultures and all age groups, thereby creating genuinely inclusive spaces.

5.3 Employing Policy Tools for Dynamic Assessment and Targeted Intervention

Green public facility design may leverage spatial analysis methods such as locational entropy, Lorenz curves, and Gaussian two-step walking search to periodically evaluate coverage gaps and service blind spots[8]. These assessments should inform scientific decisions regarding facility repositioning, service point expansion, or transport connectivity adjustments. Assessments of facilities like Dokk1 should transcend traditional metrics such as book holdings, visitor numbers, and energy efficiency rates, establishing a comprehensive performance evaluation framework that integrates environmental, social, and economic dimensions. The SDG 11 Sustainable Cities and Communities indicator framework offers valuable guidance, emphasizing that public facilities should promote inclusivity and sustainability. Only through comprehensive evaluation can public facilities be guided back to their inherent values of serving the public and advancing equity.

5.4 Promoting Diverse Integration Strategies in Spatial Planning

To create functionally mixed, scale-diverse environments, public facility spatial planning must accommodate both collective activities and personalized quiet corners. Design elements such as movable partitions, flexible furniture, and adjustable lighting and acoustic environments enable spaces to respond to diverse user needs. This paper proposes that public facilities in high-density cities should not exist as isolated "cultural islands" but must connect seamlessly with surrounding communities through green, pedestrian-friendly corridors. Beyond large landmark facilities, cities should prioritize micro-renewal strategies that 'greening in gaps', utilizing marginal plots and derelict land to create informal public spaces like community gardens and pocket parks. These low-cost, widely distributed "micro-green spaces" significantly enhance the overall equity of public green services in high-density urban areas[8].

6. Conclusion

This study examines Denmark's Dokk1 library as a case

study, delving into the practical dilemmas and viable solutions faced by public facilities in high-density cities when balancing environmental sustainability and social equity. Analysis indicates that these contradictions cannot be simplistically attributed to technical or design factors; their deeper roots lie in the political and economic logic embedded in the processes of urban spatial production and distribution.

Dokk1's practice specifically highlights four-dimensional conflicts: in resource allocation, a priority conflict exists between substantial investment in flagship projects and the development of inclusive service networks; Regarding functional positioning, conflicts arise between the role of transport hubs and green mobility principles, as well as between landmark locations and community service accessibility; In terms of technological application, there exists an incomplete alignment between the cutting-edge nature of green technologies and the nuanced expression of humanistic care, alongside smart services and digital inclusivity; Most notably, the landmark effect as an urban renewal catalyst risks triggering 'green gentrification', potentially transforming public projects intended to promote equity into latent drivers of spatial exclusion.

Despite these pronounced challenges, the research identifies several viable avenues for reconciliation. To effectively resolve these conflicts, we must move beyond the limited scope of singular architectural perspectives and establish a governance system based on cross-departmental collaboration. This entails integrating green infrastructure development with social policies such as affordable housing; advancing multidimensional spatial planning to address diverse needs through resilient design and green network connectivity; establishing enduring community participation mechanisms to dynamically adapt facility services to evolving public needs; and developing comprehensive dynamic evaluation frameworks that incorporate social indicators such as spatial equity into the life-cycle assessments of projects.

Theoretically, this study extends gentrification theory to public cultural facilities, demonstrating that even well-intentioned interventions may trigger unintended social consequences. This finding challenges simplistic assumptions that 'green necessarily promotes equity', presenting a more nuanced analytical perspective that emphasizes dialectical weighing of dual values across multiple dimensions—such as architecture versus the city, and short-term versus long-term objectives.

For urban planning and policy-making, this research conveys a critical message: achieving equitable outcomes through green transformations of public facilities necessitates the implementation of social policies that counter gentrification. Success should not be measured solely by environmental performance or landmark status, but rather by tangible effectiveness in promoting spatial justice and strengthening community cohesion.

It should be noted that this study constitutes an in-depth case analysis centred on Dokk1. While this case exemplifies typical characteristics, the generalisability of its conclusions to cities with differing cultural contexts and developmental stages requires further verification.

Subsequent research may explore three avenues: conducting comparative analyses across multicultural regions (e.g., North America, Asia) and diverse urban development models to identify more universal principles; undertaking long-term tracking of facilities like Dokk1 to critically examine the actual trajectories and social impacts of gentrification effects; and developing quantifiable assessment tools for the social equity performance of public facilities, thereby providing more scientifically sound and rational grounds for planning decisions.

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