

Rotterdam in Transition: A Design Case for a Low-Carbon Transport Node in Lombardijen

Authors : Halina Veloso e Zarate, Manuela Triggianese

Abstract : The urban challenges posed by rapid population growth, climate adaptation, and sustainable living have compelled Dutch cities to reimagine their built environment and transportation systems. As a pivotal contributor to CO₂ emissions, the transportation sector in the Netherlands demands innovative solutions for transitioning to low-carbon mobility. This study investigates the potential of transit oriented development (TOD) as a strategy for achieving carbon reduction and sustainable urban transformation. Focusing on the Lombardijen station area in Rotterdam, which is targeted for significant densification, this paper presents a design-oriented exploration of a low-carbon transport node. By employing a research-by-design methodology, this study delves into multifaceted factors and scales, aiming to propose future scenarios for Lombardijen. Drawing from a synthesis of existing literature, applied research, and practical insights, a robust design framework emerges. To inform this framework, governmental data concerning the built environment and material embodied carbon are harnessed. However, the restricted access to crucial datasets, such as property ownership information from the cadastre and embodied carbon data from De Nationale Milieudatabase, underscores the need for improved data accessibility, especially during the concept design phase. The findings of this research contribute fundamental insights not only to the Lombardijen case but also to TOD studies across Rotterdam's 13 nodes and similar global contexts. Spatial data related to property ownership facilitated the identification of potential densification sites, underscoring its importance for informed urban design decisions. Additionally, the paper highlights the disparity between the essential role of embodied carbon data in environmental assessments for building permits and its limited accessibility due to proprietary barriers. Although this study lays the groundwork for sustainable urbanization through TOD-based design, it acknowledges an area of future research worthy of exploration: the socio-economic dimension. Given the complex socio-economic challenges inherent in the Lombardijen area, extending beyond spatial constraints, a comprehensive approach demands integration of mobility infrastructure expansion, land-use diversification, programmatic enhancements, and climate adaptation. While the paper adopts a TOD lens, it refrains from an in-depth examination of issues concerning equity and inclusivity, opening doors for subsequent research to address these aspects crucial for holistic urban development.

Keywords : Rotterdam zuid, transport oriented development, carbon emissions, low-carbon design, cross-scale design, data-supported design

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