

Thesis Abstract

No. 1

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Thesis Title Rethinking the Role of Industrial Parks for Sustainable Urbanization in the Peripheries of Tokyo Metropolitan Area			
Thesis Summary Suburban industrial parks (SIP) are essential instruments in urbanization since WWII, functioning as local economic engines, employment receivers, and providers of aggregated infrastructure solutions. These functions have been underestimated in the pursuit of urban sustainability due to limited research on eco-industrial parks and industrial symbiosis. This study aims to reclarify the roles of SIPs in metropolitan peripheries by framing them within their surrounding urban systems. It addresses the research gap in empirical studies on SIP evolution within polycentric urban planning theories and the lack of the systematic assessment method for sustainable urbanization. To achieve the purpose, the author introduced a comprehensive framework of Suburban Industrial Communities (SIC) for understanding the role of SIPs across multiple spatial and temporal scales. The performance of SICs was then quantitatively assessed using a gravity-based spatial model with three indicators: industrial agglomeration indicator (AI) which examines the temporal patterns of spatial features (TPSF); area energy performance (AEP) which evaluates energy efficiency; and relative/absolute diversification indices (RDI/ADI) measuring urban function diversification of land use. The methodology was validated using 133 SIP samples in the Tokyo Metropolitan Area (TMA), spanning 74 municipalities and covering developments from the 1960s to 2010s. The results showed that urbanization in peripheries of the TMA has experienced three distinct transitional phases: Phase I (established under 20 years) with strongest agglomeration in SIPs driven by growth acceleration policies, Phase II (established for 20-35 years) as a stable transitional period, and Phase III (established over 35 years) with mixed land use through redevelopment. The TPSF categorization provides a comparable assessment framework that enables policy interventions adaptive to agglomeration grades. Energy efficiency proved the synergetic effects of SIPs with their neighborhoods in environmental benefits. The diversification indices revealed the effectiveness of land use regulation. These findings fundamentally reposition SIP from a traditional development instrument to an integral part of the suburban system for sustainable urbanization. The originality of this research lies in the progressive SIC approach that bridges critical gaps between traditional individual park studies and metropolitan-urban theories. The gravity-based spatial modeling and three-dimensional quantification system (agglomeration, efficiency, diversification) create applicable assessment tools for global megacities commonly facing suburbanization challenges. As SIPs globally evolve toward digitalization, climate resilience, and mixed-use development, the SIC concept provides actionable insights for adaptive land use policies and transportation-industrial integration. Keywords: Suburban Industrial Community (SIC); Industrial agglomeration; Energy efficiency; Urban function diversification; Urban planning			