

Compact, Human-centered Urban Development Using Smart Technologies

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1. Introduction

Among the recent Cabinet decisions related to urban policies, the "Basic Policy for Urban Revitalization (revised in part)" (Cabinet Decision in October 2022) states that, against the backdrop of a rapidly declining and aging population, proper town development requires: (i) creation of a safe, healthy and comfortable living environment for the elderly and the child-rearing generation, (ii) financially and economically sustainable city management, (iii) an urban structure contributing to decarbonization, and (iv) transformation to a compact urban structure to promote protection of human life from disasters, etc. In addition, the "Comprehensive Strategy for the Digital Rural City Initiative" (Cabinet Decision in December 2022) states that digital power will be utilized to deepen and accelerate initiatives to solve social issues and improve the attractiveness of rural areas.

In light of these recent national policies, the Urban Planning Department is working on compact city planning and smart urbanization for urban sustainability as a series of research themes. This paper provides an overview of the Urban Planning Department's research on this series of themes, divided into "compacting urban structures," "smart city," and "utilization of digital technology (traffic and human flow big data).

2. Compact urban structure

Due to population decrease, declining birthrate, and aging population, Japan is experiencing "urban sponging" in towns and cities, especially in local cities. In addition, the impact of COVID-19 infection has led to the development of remote work, changing the way Japanese people live and work. Accordingly, in downsizing the urban structure, it is considered important not only to revitalize the inner city, but also to aim for sustainable, human-centered, compact urban development where local life centers that support the daily lives of citizens are easily accessible.

As part of the comprehensive "Development of Strategic Stock Management Technologies for Regional Safe Residence Functions (FY2015-FY2017) project, for the purpose of supporting the location optimization planning system, the Urban Planning

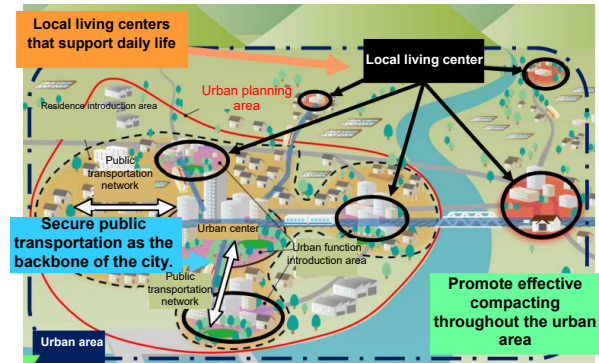


Fig. 1: Compact, human-centered urban development
(Prepared from data of the Subcommittee on Basic Urban Planning Issues in the Council for Social Infrastructure Development)

Department developed a future population structure projection¹⁾ based on subregional units so that appropriate placement of facility functions (medical facilities, welfare facilities, etc.) that support the security of local residence can be planned and evaluated, and developed technologies to predict and map the future requirements and excess/deficiency status of each function spatially and temporally. In the comprehensive "Development of Technologies Contributing to the Utilization of Existing Buildings through the Rationalization of Fire Prevention and Evacuation Regulations, etc." (FY2016 - FY2019) project, we developed a method of deregulation to encourage life support facilities to locate locally and published the results as Technical Note of NILIM²⁾ for specific administrative agencies.

In the comprehensive project "Development of Technologies for the Revitalization of Suburban Residential Areas in Response to a Matured Society" (FY2018 - FY2022), we developed an introduction planning method for life support functions (living environment, mobility environment) to revitalize, as a hub, suburban housing complexes that are becoming old towns. For example, we showed that it is effective to integrate a convenience store and community facilities as support function for the living environment, and this was reflected in the "Guide for Revitalization of Housing Complexes" prepared by the Housing Bureau in March 2022. For the mobility environment, we showed through a demonstration experiment that the introduction of small mobility vehicles in areas where public transportation is not available can promote outings by local residents. The

results will be published as a Technical Note of NILIM.

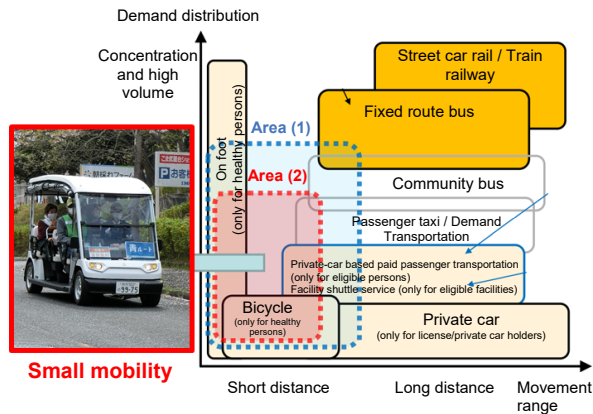


Fig. 2: Positioning of compact vehicles

3. Smart city

Recent technological innovations have led to the utilization of new technologies to solve urban problems, not only in energy conservation, but also in transportation, life support, disaster prevention, crime prevention, etc., and progressive local governments are conducting demonstration experiments for smart city development. In the itemized study titled "Development of Planning and Evaluation Technologies for Solving Major Urban Problems to Support Smart City Promotion" (FY2020 - FY2022), the Urban Planning Department systematically organized examples of smart city projects in which urban problems were solved with new technologies for local governments that intend to plan a smart city project. The results were published in October 2022 as "A Collection of Smart City Examples [Introduction]"³⁾. We plan to continue to update this collection by adding new examples. We also plan to develop a method of evaluating the effectiveness of smart city introduction for local governments.

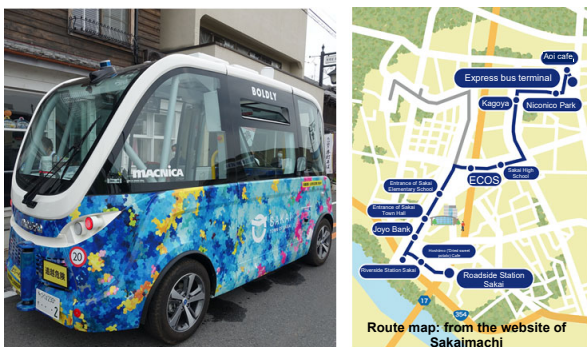


Fig. 3: Automated bus (Sakaimachi, Ibaraki Pref.)

4. Big data on traffic and human flow

Personal trip surveys of human mobility have been utilized in urban and transportation planning, but included issues such as low collection rate and high cost due to questionnaires and manual counting. To solve these issues, the Urban Planning Department

developed a new technology for efficiently and accurately understanding human mobility utilizing big data such as GPS and cell phone base station data as a new technology that complements personal trip surveys as part of its "Development of a Method for Grasping Traffic Behavior Using Traffic-related Big Data" (FY2019 - FY2023). The results are intended to function as technical data for national urban transportation researches and as a tool to support urban planning by local governments.

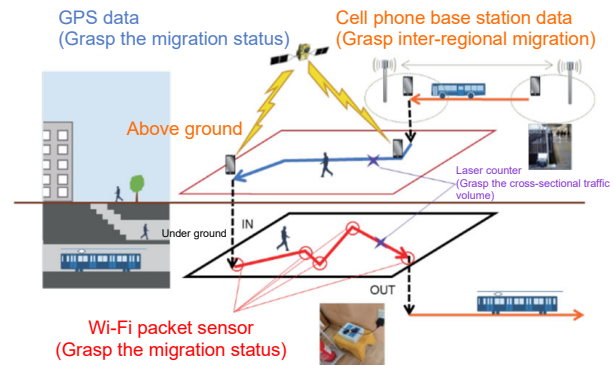


Fig. 4: Image of grasping the flow of people from wide area to narrow area

5. Future development

In order to pursue the long-term goal of compact cities and smart cities, the Urban Planning Department will promote research in cooperation with the MLIT (Urban Affairs Bureau, Housing Bureau, etc.), related organizations, and other research departments within the NILIM, and return the results to society.

☞ See the following for details.

- 1) Future Population Household Projection Tool v2 2015 National Census version
<https://www.geospatial.jp/ckan/dataset/cohort-v2>
- 2) Actual Operation of Deregulation of Building Usage and its Explanation, Technical Note of NILIM No. 1123
<http://www.nilim.go.jp/lab/bcg/siryuu/tnn/tnn1123.htm>
- 3) A Collection of Smart City Examples [Introduction]
<http://www.nilim.go.jp/lab/jbg/smart/smart.html#smart>