# The Current Circumstances Surrounding Cities and the Trends of the Research

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## 1. Introduction

The cities in our country are experiencing problems such as condensed city areas that are dangerous from the viewpoint of disaster prevention and the degradation of city center areas, while depopulation, decreased births, and the aging of the population have been advancing, the awareness of the global environment has been growing, and some conspicuous changes have been ongoing in the social circumstances that we face.

Under these circumstances, natural disasters that have been gradually intensifying and occurring more frequently in recent years, the realization of a carbon neutral society in 2050, the new working styles and housing styles triggered by the coronavirus pandemic, the rapid growth of digitalization, and the like have had a great influence on urban lives and urban activities. In this background, there is a desire to implement urban policy that corresponds to the changes and diversification of people's awareness and the sense of value in relation to them.

The City Research Department, on the basis of this direction of city policies, grasps the problems onsite and the needs for technological policies and is advancing research, study, and the development of technology, aiming at the realization of excellent town building by way of the achievement of research that is reflected in national laws, ordinances, technological standards, and other policies, which is also used effectively by municipal governments.

## 2. The Three Important Research Themes in Our City Research

### (1) City Building in the Depopulating Society

For future town building in urban areas, in a background of rapid depopulation and aging, the major tasks are to realize a wholesome and comfortable living environment for seniors and for the child-rearing generation to feel secure, and to enable sustainable urban management in terms of finance and economy. Therefore, it is important to review the structure of the whole urban area, including social welfare, transportation, and other systems, with the concept of "compact plus network", medical and social welfare facilities, commercial facilities, houses, and the like being aggregated, and with residents able to access these life amenities by way of public transportation systems. Furthermore, to correspond to the decrease in the working-age population and the diversification of the social economy, it is necessary to form spaces where a variety of people can gather and communicate and to enhance the attractiveness of towns.

The NILIM, for the formation of the compact urban space where "you feel comfortable and want to walk," has been advancing the research on ① the aggregation of urban functionalities and residences and measures for promoting wide-area collaboration among cities, ②technology to enhance the living and transportation environment in suburban apartment buildings, ③ methods of regenerating public spaces in station squares and other locations as a vibrant public space, and so forth. In addition, to improve the quality of urban life with the use of digital

technology and enhance the usefulness for urban activities, we have been advancing research in relation to ④ the tools for the evaluation of planning to support municipal governments that are making endeavors in relation to smart cities, ⑤ data specifications of 3D urban models organized as the basic data of smart cities, and ⑥ methods of grasping pedestrian movement lines by analyzing the movement of terminals, such as mobile phones (Fig-1).
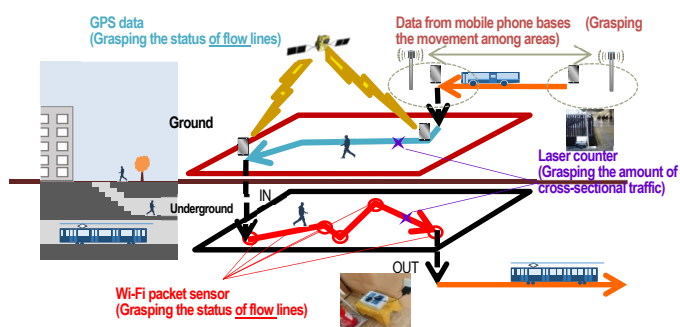


Using data from mobile phone bases and GPS data to grasp the long-distance movement and switching to the collection with Wi-Fi sensors when targets enter a building, underground space, or the like.

Fig-1. Continuously observing the movement lines of the people from other cities

(2) Building Disaster-resistant Cities

In recent years, the influence of climate change has been causing climate disasters to become more severe and more frequent and—in addition—the likelihood of large-scale earthquakes, such as Tokyo inland earthquakes, has been increasing; thus, there is a desire for town building that attempts to secure the safety of housing and daily lives and which is resistant to disasters.

Regarding earthquake disasters, the improvement of highly dense downtown areas—where a lot of problems lie in terms of disaster prevention—is an urgent task for securing the safety of cities. "Basic Housing and Lifestyle Plan (Nationwide Plan)" (March 2021) notes that the highly dense downtown

areas that are conspicuously dangerous at the time of an earthquake with the risk of a large-scale disaster (about 2,220ha [at the end of FY2020]) should be generally resolved by FY2030 and that the completion ratio of soft measures to contribute to the enhancement of local disaster prevention abilities, in line with the aforementioned themes should be 100 percent by FY2025. Moreover, as there were many cases of the collapse or the like of retaining walls for houses in the Great East Japan Earthquake and the Kumamoto Earthquake, some of the existing housing land constructed on sloped surface are so obsolete that it makes them vulnerable to earthquakes; once an earthquake occurs, there will be some influence on the recovery of the housing land and on the rescue activities after a disaster; thus, the preparatory measures for existing retaining walls for housing before any earthquake are urgent tasks for the strengthening of cities.

The NILIM, to enhance the disaster prevention performance and safety performance of cities—including getting rid of highly dense downtowns and promoting the reinforcement in housing land—has been advancing our research in relation to ① the improvement of methods of evaluating disaster prevention performance in current highly-dense dangerous downtowns, which only evaluates the effects of hard measures, including road maintenance and rebuilding (the risk of spreading fire, difficulty in evacuation), so that it will also be able to evaluate soft measures, including measures that can be implemented by house owners or local communities, such as vibration mitigating breakers and portable pumps and ②technology to reinforce the retaining walls of existing housing land in consideration of the methods of examining the earthquake resistance of the retaining walls of housing land and the influence on the building.

## (3) Building Low Carbon Emission Cities

The realization of a green society is an important political task of our country. It is necessary to understand the green society as one that widely involves a carbon-free society, a climate change adaptive society, a society in harmony with nature, and so forth. We—the NILIM—should positively contribute to the realization of this goal. In particular, the large amount of stock, including infrastructure, houses, and architectures to support various social and economic activities, which are carried out there are the foundation of a sustainable and strong green society; as city-level measures, shortening the distance of transport of people and materials as well making transport efficient by aggregating the urban functionalities and houses, promoting the use of public transportation, making operation and maintenance management of urban infrastructure more efficient using ICT and other technologies, reducing the air-conditioning load by mitigating heat island phenomena, by increasing sources of carbon dioxide absorption by maintaining and producing greenery in cities are strongly desired.

The NILIM, in addition to research contributing to the aggregation of city functionality and housing, as introduced in section 2, paragraph (1) above, has been continuing ① research to collate the results from thermal environmental simulation and the results from the human traffic line data, the population distribution by age, and so forth using GPS data to find places with a risk of overheat to enable the provision of information at an appropriate timing and, thus, to provide prioritized countermeasures, and reduce the thermal stress on people (Fig-2), ② research on the use of AI image recognition technology for the study on the green coverage rate (the rate of the green color in the visual field of men) to make it efficient for its integration into a smartphone app for anybody to be able to easily measure the amount of green color around them, which will be related to a survey on collaboration among residents and to measures for leading to the formation of awareness on the increment of greenery (photo), and so forth.
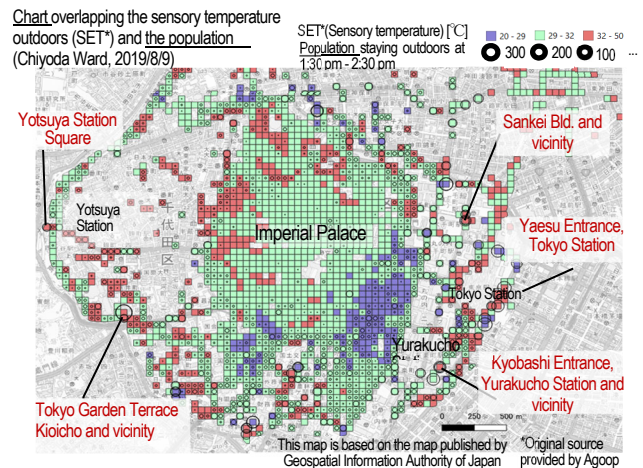


Fig-2. Objectively finding places that are is hot and where there are many people



Photo. Using a smartphone to show the green coverage rate in real time

## 3. Future Perspective

We want to continuously advance city research to correspond to need for the formation of sustainable cities, setting our sights on disaster prevention, greenery adaptation, the advancement of digitalization, and various residential styles and working styles for the post-coronavirus era.