

# Three Dimensional Mixtures of Different Activities in Buildings around Railway Stations in Tokyo – Shibuya, Azabu-Juban and Kasai

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## 1 ABSTRACT

In Japan, there are several major “building types” according to the purposes of building, such as apartment building, commercial building or office building. However, actual activities inside buildings are sometimes different from original purposes of the buildings and different activities are often mixed in a single building. Japanese urban cities are consisted of mixtures of different building types and activities, which eventually complicate street images and also attract people visiting the cities. Though such mixtures of activities characterize Japanese cities, there are a few researches which figure the mixtures. In this paper, we clarify the characteristics of three-dimensional mixtures, as research activities in buildings nearby three railway stations in Tokyo, and visualize the activities from past to present in the following method: 1) count up activities in each building, 2) draw figures of urban section, 3) color-code each unit according to the activity.

Information of usage in each property is collected by surveying present activities of 370 buildings from the nameplates of mailbox at the entrance of the buildings. Information of past activities of 130 buildings is also collected from the map data 10 and 20 years ago. These survey were done in three areas in Tokyo were selected. The first area is Shibuya, which has developed since Meiji era as one of the most bustling places in Tokyo. The second area is Azabu-juban located in south-central district of Tokyo, developed as a local midtown. The third area is Kasai, a relatively new residential area around 15 minutes away from the center of Tokyo.

Main findings of this research are as follows; In Shibuya case, there are many mixtures near the station, and the rate of office units in an apartment building goes down gradually with the distance. At Azabu-Juban, usages as office in an apartment exist at random, and this tendency doesn't change over the years. At Kasai, there were many units which have had user's name on nameplates until 2000. However, in 2010, number of anonymous units without user's name has increased rapidly.

## 2 INTRODUCTION

In Japan, rules and regulations on landscapes or building types are loose compared with many Western countries. As a result, variety of shapes and usages of buildings exist. Then, different kind of buildings mix in neighborhood. For instance, at classical areas with many wooden low-rise houses, some modern high-rise buildings stand. Mixtures of many kind of buildings means mixtures of many types of usages of land and buildings in the area. Such diversity gives image of complexity and sometimes attracts people visiting Japanese urban cities. As part of this trend, not only mixture of many shapes and usages of buildings, mixtures of different activities inside buildings, which didn't designed at planning phase of architecture, are found. We know many offices, shops and service activities are in dwelling units of apartment building. By the contraries, some people dwell in office buildings. Control of users' activities tend not to be done and mixtures of activities inside buildings tend to be ignored. However, for the residents in apartment buildings, mixture of different activities is not welcomed state from viewpoint of security, privacy and comfort because unspecified people enter the common space for residents.

These mixed activities inside buildings cannot be distinguished from its façade. Even from nameplates on the mail boxes or doors because many people living in apartment buildings don't show their names for outsiders. It is difficult to grasp ratio of residents and non-residents. Relations between mixture of different activities and trend of anonymities of resident in apartment buildings are not focused and clarified, but it is supposed that people living in commercial purposed buildings or apartment buildings highly used in non residential uses tend not to show their information even it is small information like “names”. It may show loss of the community at area societies.

There are several research on mixture of activities. Hatori analyzes mixture in buildings locate on Tokyo 23 wards by using NRR (Non resident-ratio) that is ratio of non resident units inside of the building and is calculated from “The Zenrin Zmap town2” and “the GIS data of the Tokyo metropolitan government”. This

study clarifies that over 20 % buildings have different usage from the original. And also clarifies that mixtures of activities are prone to occur low floor in the buildings. Hibata focuses on mixture of non residential uses in the residential zone around Yamanote Railway Line in sub-center of Tokyo. Ant it analyzes mixture of non residential uses by area characteristics, traffic convenience, zone district, and temporal-spatial change. Yamaga researches 13 business zones in Tokyo by defining “Usage Section” which color-codes cross-section diagrams of buildings with 53 patterns of categorized usages. Yamaga finds peculiar characters in each district from Usage section. It demonstrates diversity of those business zones.

These previous researches show that mixtures of activities have three-dimensional characters and characters of mixtures of activities are different by area. Therefore this study analysis mixtures of activities three-dimensionally in three local areas. by collecting past-to-present data of names of buildings dwellers. Units without information of dwellers names are also recorded. Also, characteristics of dwellers inside buildings are not found data. Mixtures and distributions of activities inside buildings are horizontally and vertically visualized.

### 3 DEFINITION AND METHOD

#### 3.1 Definitions

##### 3.1.1 Mixed rate

Mixed rate is a ratio of different usage from the original usage in the building. When define number of whole units in each building that can contract as “W”, and number of units that don’t conform to original usage as “a”. Mixed rate is presented “a / W”.

##### 3.1.2 Non – named rate

Non-named rate is a ratio of non-named mailboxes that locate on building entrance. And such non-named mailbox can categorize two types. One is the case that there are no people who use those units. And other is the case that there are used by the contractants but they don’t named on their nameplate because of security. But, it is already fully-clarified that latter case is the large part from questionnaire to the managers of the buildings. So, in this paper, assume all case is the latter. When define number of whole units as “W”, and number of units that don’t exist name on the nameplate of the mailboxes as “b”. Non-named rate is presented “b / W”.

#### 3.2 Investigation method of usage in the building

##### 3.2.1 Survey

In this research, authors collect activity data of the units from the name on the mailboxes in the building. And collect such data from three areas in Tokyo – Shibuya, Azabu-juban and Kasa. These areas have different histories, size of city block. The fields of survey is nearby the railway station of these areas, and list up other characteristics (distribution character of the building type, use district etc.) on the Table 1. Also, do this survey to apartment buildings and buildings that can’t recognize its original usage from façade. And this survey conducted between August, 2010 and July, 2011.

- Shibuya

Shibuya is the one of most bustling area in Tokyo. But Shibuya has also residential area. There are commerce buildings very near of the station, and high-rise buildings also exist. And number of detached houses and low-rise buildings is increase with increasing distance from Shibuya station. And this area has developed from Meiji period (1880’s). So old and new buildings are mixing. 104 buildings that locate on between Shibuya station and Kyu-yamate dori Avenue are chosen.

- Azabu-juban

Azabu-juban locates on Minato ward where is the center of Tokyo metropolitan area. This area has developed as city for merchants from Edo period (16th century). And Roppongi or Ebisu where are famous area to the foreigners are near from this area. As consequence of this history, blocks of this area are divide smaller than other area and various ages and usages of buildings are mixing. 272 building that locate on

south-west side of Azabu-juban station where gathers many residential buildings or office buildings are chosen.

- Kasai

Kasai locates on 15 minutes away from Tokyo station and there is new commuter twon. There are many commercial buildings near the station, but there are almost residential buildings with increasing distance. This area's characteristics is there has been farmland since urbanize plan started about 40 years ago. So blocks are larger than other area. And because of this, building area is also large and there are many building has over 100 units. 318 building that locate on between Kasai station and Nishi-kasai station and along the main streets are chosen.

### 3.2.2 Counting past activities from ZENRIN bekki data

In this research, it is very important to analyze usages inside of the buildings of the past. So authors collect such past data. By using ZENRIN bekki data that is on the appendix of the ZENRIN map, we can collect decennial data from units' name, and that data is almost same to our survey's data because that data also has gathered from mailboxes in the buildings or questionnaire to the people who live. But this data exist only specific buildings. So there are some buildings that can't collect usages of the buildings. We use 1990 and 2000 data.

	Shibuya	Azabu-Juban	Kasai
number of surveyed buildings	104	272	318
main building type	commercial building apartment building	commercial building apartment building	large apartment building commercial only building
use district	commercial district, category 2 residential district, category 2 low-rise exclusive residential district	commercial district, neighborhood commercial district	commercial district, neighborhood commercial district, quasi industrial district, category 1 residential district
history	from Meiji period	from Edo period	from past 40 years
land price <sup>2)</sup>	4.88 million yen / tsubo <sup>(3)</sup>	4.11 million yen / tsubo	1.26million yen / tsubo

Table 1: characteristics of areas and other profile

## 4 TWO DIMENSIONAL ANALYSIS OF MIXTURE OF ACTIVITIES

We draw Mixed rate and Non-named rate of each areas by using GIS (Geographic Information System) and analyze these distribution tendency. The maps of result show on the Table 2.

### 4.1 Shibuya

Character of Shibuya is that Mixed rate is gradually decrease with distance from the station. And by contrast, Non-named rate gradually increase. Use district gives great effect to this trend. There is commercial district nearby the station and use district changes to category 2 low-rise exclusive residential district around 300m away from the station. And these districts affect to Mixed rate and Non-named rate.

### 4.2 Azabu-Juban

Character of Azabu-juban is that two indicators spread widely in the area. This is also strong effect of use district. Commercial district is the use district. However this area has developed also for merchant, so there are many demands for living and for business. By consequence of this, Azabu-juban has this characteristic.

### 4.3 Kasai

Character of Kasai is that there are a lot of high Non-named rate buildings. In addition, a lot of buildings have over 80 % Non-named rate. However, from aspect of Mixed rate, Kasai's buildings indicate low value and this result shows that activities are distribute correctly in this area.

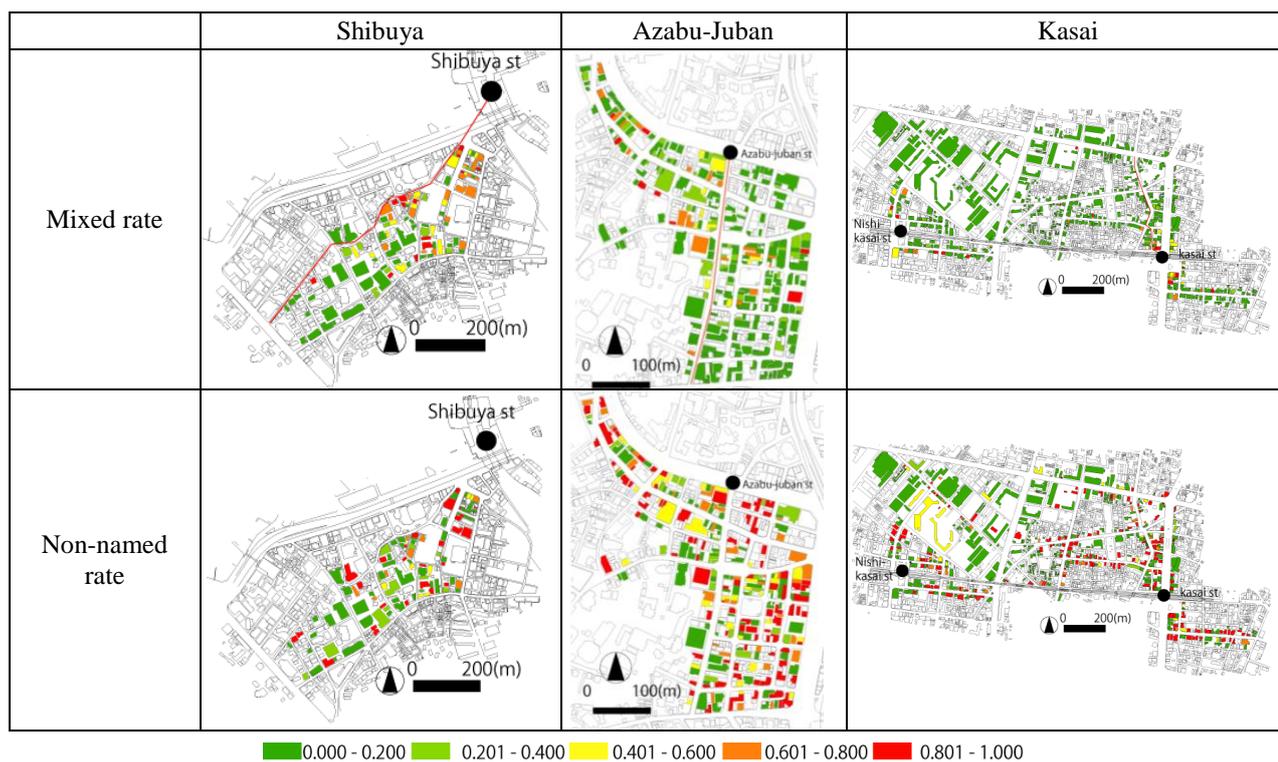


Table 2: result of each indicator in 2010 of each area

## 5 THREE DIMENSIONAL ANALYSIS OF MIXTURE OF ACTIVITIES

The distribution characteristics of each area are written in section 3. And in this section, we choose one street from each area which has characters of distribution and connects to station directly, and then, draw urban section of these streets. Then, by using data from survey and ZENRIN bekki data, we color-code each unit of 1990, 2000 and 2010. The chosen streets are the red lines on the Table 2. And urban sections of these streets are shown figure 1, 2 and 3. As a result of color-code from type of business, almost retailing stores or restaurants, those colored red or orange, locate on the lower floor. And other industries don't have relation with number of floor.

### 5.1 Shibuya

Character of this area is that, same to two dimensional analysis, commercial of office activities inside of the building is decrease. And this character has not changed 20 years. In building No. B - 13 in 2010 case (in 2000: No. B - 12, in 1990: No. B - 12), there are almost used for residence in 20 years ago but different activities from the original usage gradually increase and there is most units are used for office now. And farther than 500m from station, there are mostly low-rise detached houses.

### 5.2 Azabu-Juban

Case of Azabu-juban, distance from station doesn't have relation with mixture of activities. During this 20 years, mode of mixture has not changed in this area and activities has mixed at random in almost all buildings.

### 5.3 Kasai

Case of Kasai, number of non-named units increases sharply 2000 to 2010. Look at building No. B - 7 (in 2000: No. B - 7, in 1990: No. B - 7), some units had changed to non-named 1990 to 2000, but during 2000 to 2010 almost all units have changed to non-named.

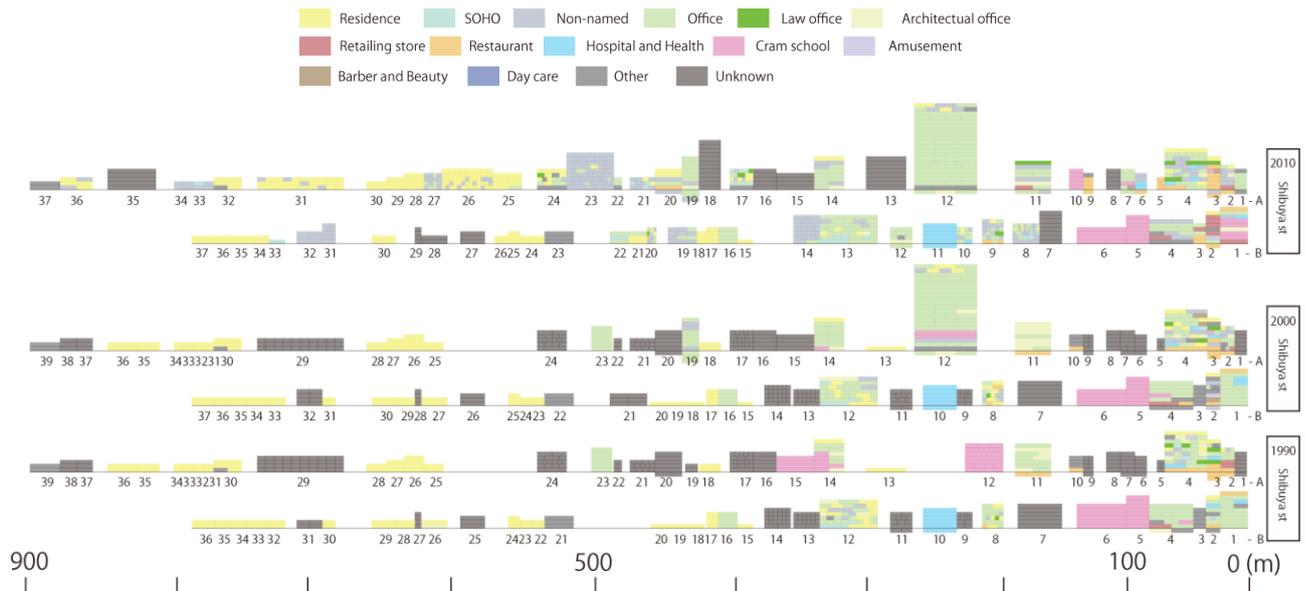


Figure 1: Urban section of Shibuya

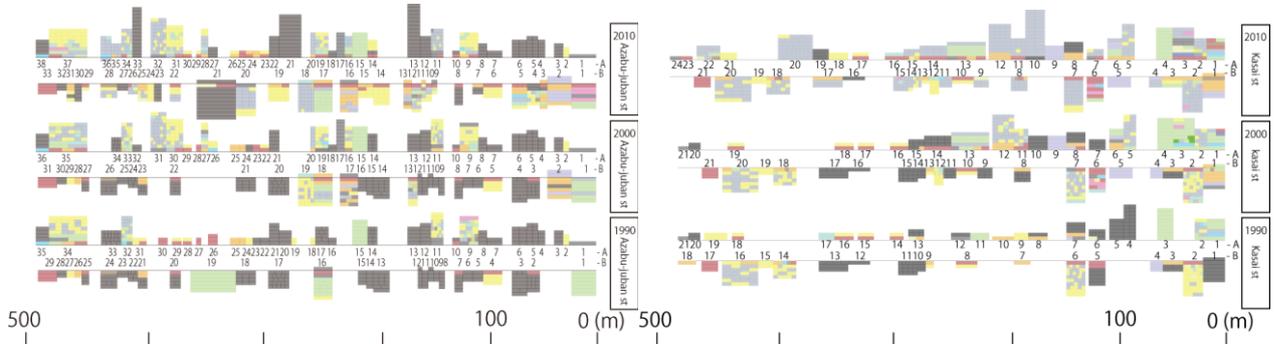
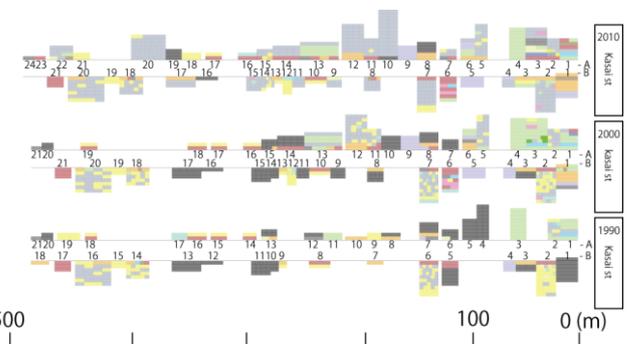


Figure 2: Urban section of Azabu-juban. Figure 3: Urban section of Kasai.



## 6 CONCLUSION

Through two and three dimensional analysis of mixtures of activities inside of the buildings, authors clarify some characters.

### 6.1 Two dimensional mixture

- Use district is affecting to the distribution tendencies every areas. Mixed rate is high in commercial district and Non-named rate is large value in residential district.
- In Shibuya, Non-named rate goes up with increasing distance from station.
- In Azabu-juban each indicators distributes at random regardless position or building type of the buildings.
- In Kasai, activities of units are separated depending on the building types or the original usages of the units and Mixed rate is indicated small value. But Non-named rate is very high and many residential buildings are over 80 %.

### 6.2 Three dimensional mixture

- In this investigation, we clarify that distribution or its change tendency is not depending on floor number excluding retailing stores or restaurant.
- In Shibuya case, there are many office units that have changed from residential usage. And the majority of building type becomes low-rise detached house more than 500m from the station.
- In Azabu-juban, it is same that mixture distribution is at random through three years, but usages change intensely in the building.
- In Kasai, during 2000 and 2010, Non-named units slightly increase no relation to floor number.

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### Note

- (1) Survey term covers to 2011, however, relating to analysis is do every 10 years in this paper, so standardize all data “2010” for descriptive purpose.
- (2) This land price is average price of land that away from the each station between 5 and 10 minutes.
- (3) Tsubo is a Japanese traditional unit that is used when measure area. 1 tsubo is equal to around 3.3 m<sup>2</sup>.