UNDERSTANDING THE INFLUENCE OF URBAN AGING ON HAPPINESS AND RESIDENTIAL SATISFACTION

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In recent years, due to the progression of population decline and aging research on factors influencing population change has attracted much attention in regional development policies. In particular, the influence of such an important component of well-being as happiness is viewed as one of the urgent topics in urban development. In this research, the actual state of happiness in Japan considering the impact of urban aging is analyzed in comparison with residential satisfaction. The following results were revealed: 1) There is a correlation between happiness and population change, although happiness is less varied than residential satisfaction. 2) The distribution of values of happiness and residential satisfaction in city typology considering urban aging is narrower for happiness, but with more outliers. The general trend is the increase of both indicators with the increase in population. 3) As for the influence of urban aging problems, happiness is more affected by components related to personal life, such as the number of families in a municipality. 4) There are some exceptions from the general trend of the distribution of values of happiness and residential satisfaction in city typology, which can be explained by the conditions of urban aging problems.

Key Words: *happiness, residential satisfaction, population change, city typology*

1. INTRODUCTION

Population decrease and the aging population are considered to be one of the most urgent problems in Japan. After peaking in 2009, the population has been decreasing for 12 consecutive years, and in 2022 this trend continued (-0.43％ from the previous year). The increase in population was recorded only in 15.7% of all Japanese municipalities [Note 3)]. Moreover, according to the same data, the share of the elderly population keeps rising, and it exceeded 15% of the total population for the first time in 2022[Note 4)]. The increase in population in almost the entire territory in Japan happens because of social increase[7)]. Therefore, research on factors influencing population change in different living conditions has recently attracted special attention.

Until recently, the focus of urban planning aiming at increasing the population was the development of infrastructure. Lately, a demand for a human-centered urban environment has appeared. There are examples of cities, such as Hamamatsu, Toyama, etc., that made improving subjective well-being one of the key points of their development[Note 1)]. Well-being is sometimes restricted to happiness, but is defined as

good mental states, including all of the various evaluations, positive and negative, that people make of their lives and the affective reactions of people to their experiences by OECD[Note 2)]. Apart from happiness, subjective perception of the living space as residential satisfaction can also be included as an aspect of well-being. It is well-researched and appeared to have a noticeable correlation with the population growth rate[12)]. With the increasing attention to happiness in urban planning, its relationship with population change and relevant urban problems also needs to be studied from various viewpoints.

According to previous studies, factors with a major impact on happiness are personal, such as family relationships and self-realization opportunities, and satisfaction with work[1),13)]. Therefore, there might be limitations to improving the sphere of personal life on the level of municipalities. So, one of the issues for urban planning is to investigate the characteristics of the cities with higher levels of happiness and the problems of the cities with low levels. As for the relevant problems of Japanese municipalities, aging and decreasing population lead to certain urban issues, such as infrastructure deterioration, increasing vacant houses, and withdrawal of commercial facilities[10)].

Consequently, there is a need to analyze in more detail the relationship of happiness with demographic characteristics in order to reveal the influence on population change. Moreover, the impact of the most relevant problems related to population decrease and aging is required to be studied as an essential part of the characteristics of municipalities.

Based on the background, the purpose of the research is to understand the actual state of happiness in Japan considering the impact of urban aging, as well as the possible reasons for such an impact.

This research will be practical not only in Japan but also overseas, as the development of urban planning improving people's well-being source in the presence of population aging becomes a more and more urgent topic, and the Japanese experience can be relevant for countries with less extent of this problem.

2. LITERATURE REVIEW

Studies on happiness, residential satisfaction, and urban aging problems were analyzed.

(1) Happiness and residential satisfaction

A range of papers based on the data of the "Livability Ranking" provides an understanding of residential satisfaction and the structure of happiness in Japanese municipalities. As a result, the impact of satisfaction with the residential area on happiness was revealed, and it appeared to be greater than, for instance, of workplace relationships and satisfaction with housing[13)]. However, the research area is limited to three big cities and studies mostly the impact of personal attributes, without residential characteristics. The structure of happiness based on the factor analysis of personal characteristics is presented in the report based on the ranking data for the year 2021[5)].

Along with an overview of happiness, there is a variety of foreign studies investigating the spatial differences in its perception and level. Especially, there is much research on urban-rural differences and differences within these two groups. Most studies claim lower happiness in rural areas due to lower incomes and employment opportunities[8)], poorer access to public transport and health services[2),11)]. Nevertheless, for example, in a study on well-being in Scotland based on a factor analysis of satisfaction with life was revealed that people tend to be happier in rural areas than in urban ones, mostly because of the influence of higher average age and larger share of married people[3)].

As for the analysis of differences in happiness in Japan, there is a study on regional disparities in income and happiness using a questionnaire survey conducted by the Osaka University 21st Century COE[15)]. It was found that disparities in happiness were smaller than disparities in income, and they do not aggravate interdependently throughout the time period. Nevertheless, the analysis is conducted only on the prefectural level. Since urban planning takes place at the municipal level, it is essential to consider the level of cities. In addition, it does not include more relevant changes.

As for recent research, there is a study on the difference in the impact of certain facilities on happiness. For instance, the impact accessibility of "the third place" in urban and rural areas was studied[4)]. Although "the third place" increases happiness in both rural and urban areas, the demands there are different. In urban areas, there is a request for places for studying and eating out, while in rural ones recreational facilities are more desired.

(2) Urban aging

As for the general trends in urban aging, there is a comparative evaluation of the level of urban decline in metropolitan areas. Three domains of urban decline (population-society, industry-economy, and

physical environment) are analyzed, and 6 types of urban decline are identified. As a result, the further away from the center of Tokyo the fringe areas are, the more severe the combined decline problem is[14].

Furthermore, the patterns of the progression process of urban problems in Japan were clarified by this research, urban problems associated with an aging society were defined based on text data from academic papers, and by showing the long-term changes in the progression process every five years since 2000. The irreversible problem progression of urban aging was defined as "cascading"[9]. In the subsequent study, the categorization of the cities by progressing urban aging problems was made[10].

Based on the above, there is an accumulation of studies on the structure and factors of happiness and its spatial differences, as well as research on urban aging, its components, and progression. However, there are no studies that examined the actual state of happiness from a more prolonged time perspective and a nationwide scale, taking into consideration the impact of the area type. Therefore, the features of this study are in analyzing the concept of happiness on the level of municipalities nationwide, as well as using objective information about the actual situation with the use of open data, and governmental statistics in addition to the actual subjective perception of people's well-being.

3. DATA AND METHODOLOGY

This study uses the "Livability Survey" on living preferences conducted nationwide in the years 2019-2022 by the Daito Trust Construction Co. This survey has the largest sample among surveys in Japan that can capture subjective happiness and residential satisfaction nationwide and is suitable for use in achieving the objectives of this study. A summary of the survey is shown in **Table 1**. The sample size of the survey is 646,562 people from 1,889 municipalities.

Table 1 Outline of the survey.

Summary of the "Livability Survey"	
Survey method	WEB Questionnaire
Object of a survey	Nationwide (1,889 municipalities)
Time period	2019-2022
Sample Size	646,562
Selected survey items	Overall satisfaction with the area, happiness

In our study, the municipalities that have more than 30 respondents in the "Livability Survey" were selected. The period of the data used was extended to 4 years to ensure reliability. Hence, the sample size was reduced to 459,106 respondents and the number of municipalities to 1072.

As for the indicators used in the analysis, two items were selected: happiness and overall satisfaction with the area of residence. The indicator related to happiness was rated on a scale from 1 to 10, where 1 is for very unhappy and 10 is for very happy. The answers to the question of the overall satisfaction with the living area vary from 0 to 100 and are grouped according to the "Livability Survey": very dissatisfied (0), dissatisfied (25), neutral (50), satisfied (75), and very satisfied (100).

Firstly, the state and significance of happiness in comparison with residential satisfaction, as one of the components of well-being, were analyzed throughout the relationship with the demographic situation in Japanese municipalities. The correlation between happiness and residential satisfaction is also observed.

Secondly, the outline of urban aging problems is given based on the research of H.Shimizu. Based on the results of principal component analysis and cluster analysis presented in their research, a new classification of cities by urban aging problems is made.

Thirdly, the distribution of some demographic parameters, happiness, and residential satisfaction of municipalities within the revealed city types is analyzed. There, reasons for deviation from common patterns are explained based on the cluster characteristics and progression of problems.

Then, a factor analysis was conducted to look at the impact of principal components of urban aging on happiness and residential satisfaction and contribute to finding the reasons for deviations from general trends of the distribution of happiness and residential satisfaction.

The results obtained in this study, their potential for development, and certain policy recommendations are finally summarized in Section 6.

4. UNDERSTANDING THE STATE OF HAPPINESS AND RESIDENTIAL SATIS-FACTION THROUGH RELATIONSHIP WITH THE POPULATION

In order to grasp the state of happiness and residential satisfaction in Japan, their relationship with

both total population and population change was observed.

Figures 1 and **2** represent the relationship between the total population in the year 2022 and both happiness and residential satisfaction.

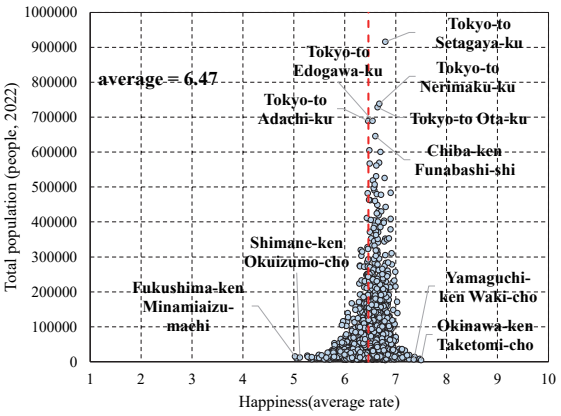

Fig. 1 Relationship between happiness and total population.

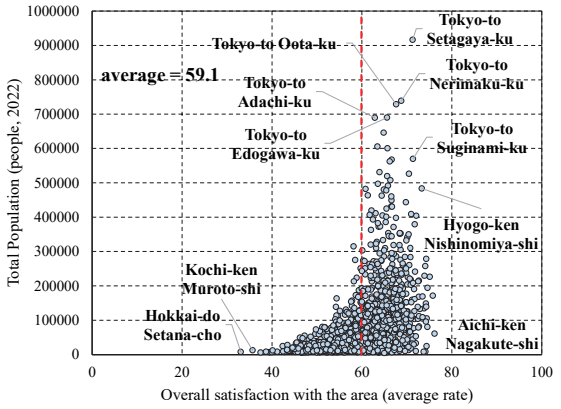

Fig. 2 Relationship between overall satisfaction with the area and total population.

These scatterplots represent the distribution of average scores of happiness and residential satisfaction of the Japanese municipalities for the years 2019-2022. Both scatterplots show a normal distribution, with average scores of approximately 6.47 for happiness and 59.1 for satisfaction. They indicate that in municipalities with a population, larger than 300,000 people, the levels of both happiness and satisfaction are above average. As for the bottom, where the population is less than 100,000 people, there can be both extremely low and high levels of happiness and satisfaction.

However, the difference is that happiness tends to be less varied. While the municipalities with the highest level of happiness are concentrated below the population level of 100,000, the highest level of satisfaction can be observed in municipalities with any population size.

Next, the relationship between happiness and satisfaction (**Fig. 3**) was analyzed. The correlation appeared to be positive, with a coefficient of 0.656.

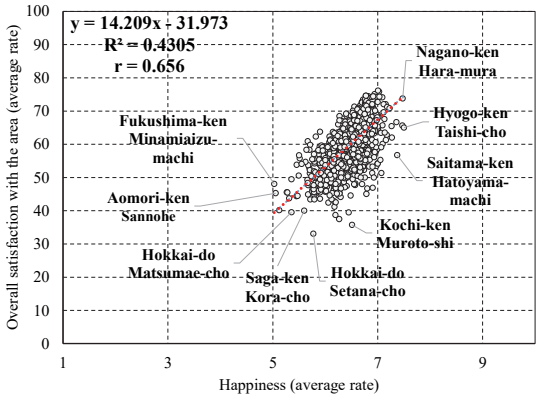

Fig. 3 Relationship between happiness and overall satisfaction.

Finally, the relationship between happiness and residential satisfaction and population change in the years 2000-2015 was studied (**Fig. 4, 5**) to grasp the actual situation in the target period.

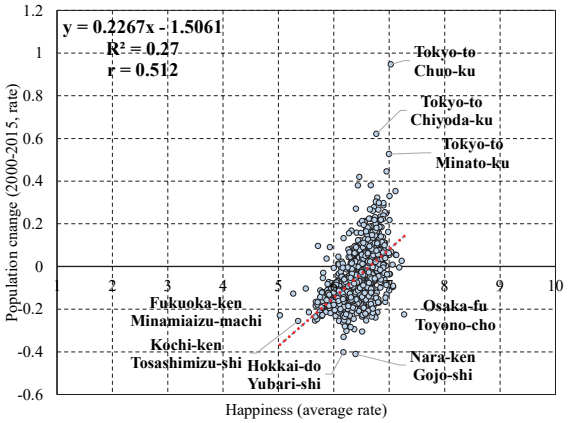

Fig. 4 Relationship between happiness and population change.

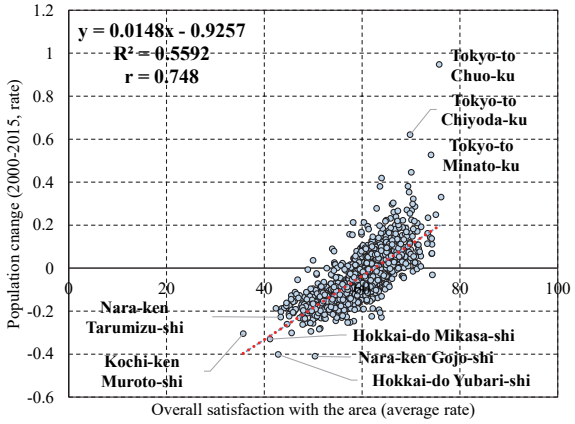

Fig. 5 Relationship between overall satisfaction with the region and population change.

It becomes clear that the correlation of population change with satisfaction is stronger than with happiness. So, in Yubari in Hokkaido, the city with the largest rate of population decrease throughout the 5-year period, the rate of happiness is considerably higher than that of residential satisfaction. Also, the level of happiness stops increasing with the increasing population after reaching a certain level.
The highest values of both happiness and satisfaction are in the central ward of Tokyo, Chuo-ku, with a significant difference from other cities. Other high values also represent central areas of large cities. In contrast, although the distribution of the lowest values is slightly different for satisfaction and happiness, they mostly show cities with the smallest population, such as Minamiaizu in Fukushima and Muroto in Kochi.

5. DEFINING CITY TYPOLOGY BY THE COMPONENTS OF URBAN AGING

In order to reveal the main urban problems related to population aging and understand their state in different areas, a categorization of cities by the degree of progression of urban problems. It was made based on the principal component analysis (**Table 2**) and cluster analysis conducted in the previous research on urban aging problems (Shimizu et al., 2021). The division into 8 clusters was selected in this study, and the clusters were named according to their characteristics and urban typology.
The results of the calculated average principal component scores for each city are shown in **Table 3**, and the examples of cities of each type are in **Table 4**.
The general description of the typology is presented below.

Table 3 Average principal component scores of urban aging problems by city typology.

Type number	Type name	Number of cities*	Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7
			Population aging	High density of people/facilities	Enrichment with facilities	Fiscal burden	Enrichment with medical facilities	Family households	Moving-outs and vacant houses
I	High fiscal burden areas	11	**1.56**	-0.06	**-0.25**	**11.28**	**0.54**	-0.08	**1.12**
II	Population aging areas	377	**1.35**	**-0.27**	-0.08	0.29	**0.57**	-0.25	0.68
III	Low-density regional areas	197	0.98	**-0.51**	**-0.16**	0.78	0.04	**-1.01**	**-0.29**
IV	High-density central areas	17	-0.08	**5.06**	**2.01**	0.11	**-1.21**	**-0.84**	0.15
V	Low fiscal burden areas	299	0.32	-0.16	0.08	**-0.28**	-0.73	0.63	-0.24
VI	High-density regional areas	122	0.05	1.24	0.26	-0.25	**-1.21**	**0.72**	0.10
VII	Young population and family areas	54	**-0.42**	0.07	-0.01	**-0.29**	-0.49	**1.44**	**-0.86**
VIII	Tokyo's central three wards	3	**-1.54**	**6.71**	**15.68**	**2.15**	-0.03	-0.79	**0.77**

The 2 top and bottom ranks are shown in bold. Upper rank: red, lower rank: blue. * 2015 time point

Table 4 Specific cities belonging to each type.

Type number	Type name	Cities by the time 2015 year				
I	High fiscal burden areas	Mikasa	Miyako	Ofunato	Yubari	Yamada
II	Population aging areas	Muroto	Tsuchiura	Gojo	Tarumizu	Tosashimizu
III	Low-density regional areas	Minamiaizu	Oarai	Minamiuonuma	Kurihara	Izumo
IV	High-density central areas	Shinjuku	Shibuya	Toshima	Shinagawa	Osaka
V	Low fiscal burden areas	Chitose	Tsukuba	Narita	Toyono	Yahaba
VI	High-density regional areas	Sapporo	Yokohama	Nagoya	Hiroshima	Fukuoka
VII	Young population and family areas	Moriya	Koshigaya	Owariasahi	Kikuyo	Shingu
VIII	Tokyo's central three wards	Chuo	Minato (Tokyo-to)	Chiyoda		

Table 2. Extracted urban aging problems and results of principal component analysis (Shimizu et al., 2021).

Extracted urban problems	Indicator	Principal component axes							Data source *
		Axis 1	Axis 2	Axis 3	Axis 4	Axis 5	Axis 6	Axis 7	
		Population aging	High density of people/facilities	Enrichment with facilities	Fiscal burden	Enrichment with medical facilities	Family households	Move-outs and vacant houses	
Population decline	Population density (people/km^2)	-0.02	1.04	-0.27	-0.01	-0.14	0.01	-0.09	1
Declining birthrate and an aging population	Percentage of youth (%)	-0.79	-0.28	0.00	0.03	0.27	0.21	-0.14	
	Percentage of elderly (%)	0.92	-0.14	0.06	-0.02	-0.01	-0.09	0.03	
Shrinking households and increase in single-person households	Percentage of single-person households (%)	0.22	0.61	0.01	0.11	-0.25	-0.08	0.36	
	Percentage of nuclear family households (%)	0.04	-0.15	0.04	-0.02	0.14	0.96	-0.03	
	Percentage of elderly single-person households (%)	0.87	0.19	-0.02	0.02	0.13	0.17	0.22	
	Percentage of elderly couple only households (%)	0.97	-0.15	0.09	-0.01	0.03	0.39	0.09	
Creation of local leaders, including migrants from cities, and population outflow	Overrate of move-ins (%)	0.17	0.17	0.35	0.09	-0.07	0.42	-0.44	1. 2.
Increase in vacant houses, withdrawal from declining population areas Increase in vacant and underutilized land, decline of apartment complexes	Vacant house rate (%)	0.19	-0.12	-0.03	0.04	0.03	0.00	0.79	3
	Aging rate (%)	0.92	-0.14	0.07	-0.11	-0.04	-0.12	-0.14	
Deterioration in retail store business, decline in central city areas, revitalization of urban centers	Retail sales per employee (10,000 yen/person)	0.03	-0.03	0.93	0.04	-0.19	0.03	-0.06	4
	Retail sales per business establishment (mln yen/person)	0.03	-0.06	1.00	0.01	-0.11	0.05	-0.09	
Withdrawal of commercial facilities and vulnerable shoppers	Number of retail stores per capita (stores/1,000 people)	-0.21	-0.10	0.43	-0.02	0.55	-0.36	0.23	1. 4.
	Density of retail stores (stores/km^2)	-0.09	0.89	0.11	-0.01	0.07	-0.12	-0.07	
Maintainance/decline of public transportation services. Maintainance regional network/increase mobility difficulties Improve transportation environment/ decline of public transportation	Number of stations per area (stores/km^2)	0.02	0.60	0.47	-0.02	0.09	-0.08	-0.10	1. 6.
Securing urban functions/withdrawal of urban activities. Withdrawal of urban services	Number of hospitals per capita (facilities/100,000 people)	0.11	0.12	0.01	-0.02	0.69	0.16	0.27	1. 7.
	Number of clinics per capita (facilities/100,000 people)	0.10	0.06	0.82	-0.08	0.26	0.01	0.07	
	Number of welfare facilities for the elderly per elderly population (facilities/100,000 people)	-0.08	-0.05	-0.12	0.13	0.67	0.17	-0.13	1. 8.
	Number of hospitals per area (facilities/km^2)	-0.04	1.00	-0.10	-0.04	0.19	0.05	-0.03	1. 7.
	Number of clinics per area (facilities/km^2)	0.02	0.83	0.25	-0.01	-0.01	-0.09	-0.11	
Reduction of the budgetary scale	Total revenue per capita (1,000 yen/person)	0.19	0.01	-0.01	0.79	0.16	-0.06	0.01	1. 9.
	Total expenditure per capita (1,000 yen/person)	0.21	0.02	-0.01	0.77	0.18	-0.07	0.01	
	Taxable income per capita (1,000 yen/person)	-0.45	0.38	0.28	0.07	-0.09	0.18	0.06	1. 5.
	Ratio of independent financial resources (%)	-0.47	-0.09	0.19	-0.02	-0.47	0.21	0.30	9
Burden of maintenance and management of green areas. Maintenance of social infrastructure	Civil engineering cost per capita (yen/person)	-0.32	0.02	-0.04	1.01	0.03	0.09	0.04	1. 9.
	Maintenance and repair cost per capita (yen/person)	0.09	-0.22	0.15	0.40	-0.32	-0.39	-0.07	
Eigenvalues		**7.65**	**5.82**	**2.27**	**1.54**	**1.26**	**1.17**	**1.02**	
Contribution rate		**29.40**	**22.37**	**8.73**	**5.93**	**4.86**	**4.49**	**3.92**	
Cumulative rate		**29.40**	**51.78**	**60.51**	**66.45**	**71.30**	**75.79**	**79.71**	

Rotation method: Promax method with Kaiser's normalization Blue: Low ⇔ Red: High

* **Data source:** 1.Population Census (2015, 2010, 2005, 2000) 2. Report on Internal Migration in Japan (2015, 2010, 2005, 2000) 3. Housing and Land Survey (2018, 2013, 2008, 2003) 4. Census of Commerce, Economic Census for Business Activity (2007, 2002) 5. Municipal Taxation Status Report (2018, 2012) 6. National Land Numerical Data (GIS) 7.Medical Facilities Survey (2015, 2010, 2005, 2000) 8. Survey of Institutions and Establishments for Long-term Care (2015, 2010, 2005, 2000) 9. Settlement of Accounts by

1) Type I “High fiscal burden areas” consists predominantly of cities with high financial expenses, for example, those affected by the Great East Japan Earthquake.
2) Type II “Population aging areas” contains cities with a high concentration of the elderly population and a large outflow of population.
3) Type III “Low-density regional areas” represent small municipalities with a high degree of population dispersion and facilities and fewer families.
4) Type IV “High-density central areas” consists of municipalities surrounding the three central wards of Tokyo and the city of Osaka with urban characteristics, such as notably high concentration of population, facilities, and services.
5) In Type V, “Low fiscal burden areas” there are mostly cities located around the metropolitan area and regional centers, which are often bases for transportation.
6) Central areas of regional centers and cities in metropolitan areas fall in type VI and are therefore named “High-density regional areas”.
7) Most of the cities of Type VII are located on the outskirts of central areas and are named “Young population and family areas”.
8) Type VIII corresponds to Chuo, Minato, and Chiyoda wards, with a high quality of living conditions and the highest density of population, and all kinds of facilities. Thus, it is named “Tokyo's central three wards”.

6. GRASPING THE INFLUENCE OF URBAN AGING ON HAPPINESS AND RESIDENTIAL SATISFACTION BY CITY TYPOLOGY

The distribution of average population change from 2000 to 2015 (**Fig. 6**), the total population of the year 2015 (**Fig. 7**) average rates of happiness (**Fig. 8**), and residential satisfaction (**Fig. 9**) in municipalities in each city type is presented in the following box plots. The identified categories were assigned to cities from I to VI in descending order of the population change rate from the High fiscal burden areas with the highest population decrease to Tokyo’s central three wards with the highest population increase by a wide margin.
The distribution of population change (**Fig. 6**) shows that the dispersion in all city types is approximately the same, except for a slightly larger dispersion in type VII “Young population and family areas” and type VIII “Tokyo’s central three wards”. It can be explained by a smaller number and diversity in geographical location at the same time in type VII in comparison with other types and by the presence of only three cities in type VIII.

As for the large dispersion in total population (**Fig. 7**) in types VI “High-density regional areas” and IV “High-density central areas”, it is caused by the diversity of administrative centers for type VI and the diversity of Tokyo wards in type IV.

Regarding the values of happiness and residential satisfaction (**Fig. 8** and **9**), the distribution of happiness in each type appears to be noticeably narrower than that of the satisfaction, but with more outliers, especially in types II “Population aging areas”, III “Low-density regional areas” and V “Low fiscal burden areas”. The general trend is the increase of both indicators with the increase in population change rate, which is viewed more clearly in the distribution of residential satisfaction. Especially, there is an obvious upward trend within types V, VI, and IV. The principal component axes values of “High density of people/facilities”, and “Enrichment with facilities” demonstrate the same trend as the satisfaction, and values of the “Population aging” and “Family households” axes in these clusters show the reverse trend.

To define the influence of main urban aging problems on both happiness and satisfaction, a multiple regression analysis was conducted on the average rates of happiness and residential satisfaction in municipalities (**Table 6**). Happiness and overall satisfaction with the region were set as dependent variables and all the principal components of urban aging problems as independent variables. The principal component scores of each municipality of the year 2015 were used.

From the values of adjusted R^2, it can be concluded that the impact of urban aging is stronger on residential satisfaction than on happiness. The general trend of positive and negative impact is the same for both indicators. Two principal components (“High density of people/facilities” and “Family households”) appeared to have a positive influence, two (“Population aging” and “Fiscal burden”) has a negative impact on happiness and satisfaction, and two (“Enrichment with facilities” and “Enrichment with medical facilities”) are statistically insignificant. The impact of all the components above is stronger for satisfaction than for happiness. However, there are some differences. While the “Move-outs and vacant houses have a negative impact on satisfaction, it is statistically insignificant for happiness. Also,

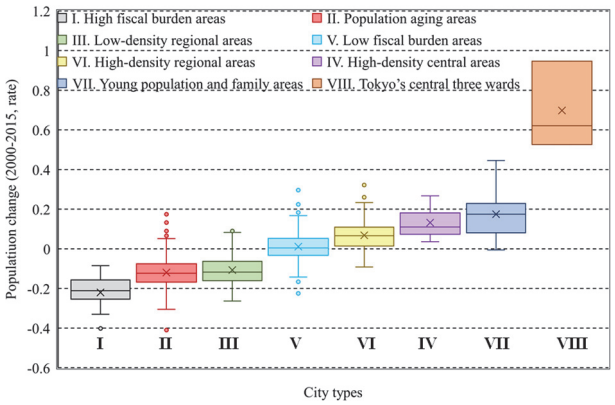

Fig. 6 Distribution of population change (2000-2015) by city typology.

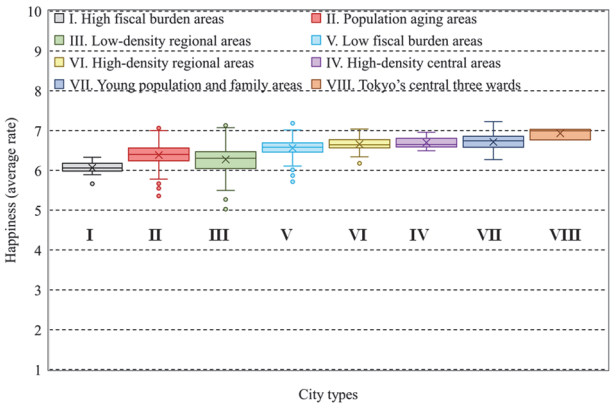

Fig. 8 Distribution of happiness by city typology.

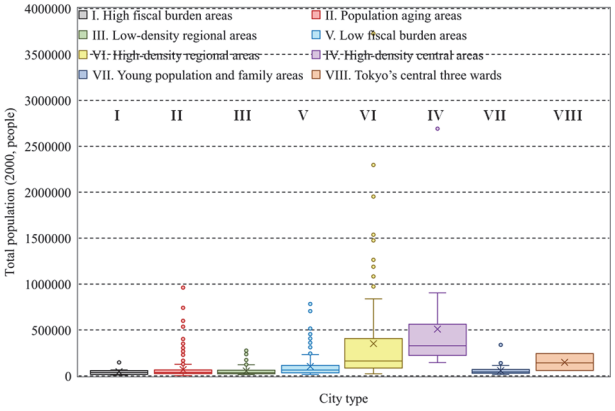

Fig. 7 Distribution of total population (2015) by city typology.

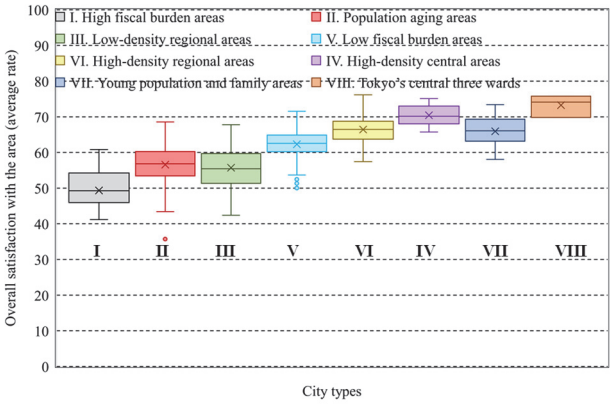

Fig. 9 Distribution of overall satisfaction with the area by city typology.

Table 6 Multiple regression analysis of the happiness and overall satisfaction with the area and urban aging problems.

	Principal component	Happiness				Overall satisfaction with the area			
		Standardized Beta	Std. Error	t-value	p-value	Standardized Beta	Std. Error	t-value	p-value
Axis 1	Population aging	-0.20	0.01	-5.54	*** 0.00	-0.31	0.21	-11.06	*** 0.00
Axis 2	High density of people/facilities	0.15	0.01	4.63	*** 0.00	0.30	0.16	12.43	*** 0.00
Axis 3	Enrichment with facilities	0.06	0.01	2.02	*0.04	0.04	0.14	1.87	*0.06
Axis 4	Fiscal burden	-0.15	0.01	-5.98	*** 0.00	-0.13	0.08	-6.59	*** 0.00
Axis 5	Enrichment with medical facilities	0.01	0.01	0.40	0.69	-0.03	0.16	-1.03	0.31
Axis 6	Family households	0.38	0.01	13.27	*** 0.00	0.33	0.15	14.81	*** 0.00
Axis 7	Move-outs and vacant houses	0.04	0.01	1.38	0.17	-0.12	0.14	-5.62	*** 0.00

N = 1072, adjusted R^2(happiness) = 0.39, adjusted R^2(overall satisfaction with the area) = 0.64, ***: 1% significance, *: 10%significance.

for satisfaction the degrees of the influence of the "High density of people/facilities" and "Family household" components are the strongest and very close to each other, for happiness, the impact of the "Family households" component is noticeably stronger than of the High density of people/facilities" component. That indicates more significance of the component related to personal life than to living conditions for happiness.

Nevertheless, there are some exceptions. Although the population increase is higher in type III "Low-density regional areas" than in type II "Population aging areas", the level of happiness is slightly higher in type II, and this difference appears to be statistically significant ($t(339) = 4{,}16$, $p = 4.07483E\text{-}05$). According to previous research, the elderly population tends to be happier (Kurokawa, 2012). Besides, according to the factor analysis the component of "Population aging" which includes, for example, the share of people older than 65 and elderly households, affects negatively the levels of both happiness and satisfaction. The value of the "Population aging" axis of type II is actually higher than that of type III, which means a larger share of the elderly population. Nevertheless, even though the average age of respondents in type II (45.0) is also slightly higher than in type III (44.4), it differs by less than one year.

One of the reasons for such a difference in values of happiness might be in the size of the type II cluster. The total population, as well as the number of respondents, is approximately twice as large as that of the type III cluster. At the same time, the value of the "Family households" axis is also higher in type II, which indicates a larger share of nuclear families. Moreover, the value of the "High density of people/facilities" axis is lower in type III. Both components affected happiness positively in the factor analysis. The "High density of people/facilities" axis means not only less density of stores, stations, and other facilities but also less share of single households. With less share of nuclear families, this indicates a larger share of extended families. Thus, another reason for the difference in the happiness levels may be not only the impact of lower concentration of facilities but also the difference in the share of families and family types. The value of the "Enrichment with medical facilities" axis is also significantly higher in type II. But, according to the results of factor analysis, the influence of this component on happiness is not significant. In general, the population in type II might be happier because living conditions meet their needs to a better extent than in type III.

Another exception is the lower level of residential satisfaction in type VII "Young population and family areas" in comparison with types IV "High-density central areas" and VIII "Tokyo's central three wards". Besides, it can be explained by the fact that types IV and VIII represent mostly the wards of Tokyo where the level of residential satisfaction is notably higher than in any other area. In addition, the value of the "High density of people/facilities" axis of type VII is much lower than in types IV and VIII. In reality, the density of such facilities as stations and retail stores there is low, some of them are even closer to types I, II, and III than to other urban areas. According to the factor analysis, these parameters influence positively the level of satisfaction even more than the level of happiness.

7. CONCLUSION AND FUTURE WORK

This study attempted to capture the actual state of happiness in Japan considering the impact of problems related to urban aging in comparison with residential satisfaction. The results are described below.

1. Happiness tends to be less varied than residential satisfaction in a relationship with the total population and has less correlation with population change. Also, the level of happiness stops increasing with the increasing population after reaching a certain level, approximately 7. The highest values of both happiness and satisfaction are in the central areas of large cities, and the lowest ones are in cities with the smallest population. The correlation between happiness and residential satisfaction was also revealed ($r = 0.656$).
2. Regarding the distribution of values of happiness and residential satisfaction in city types related to urban aging problems, that of happiness is narrower than that of satisfaction, but with more outliers. The general trend is the increase of both indicators with the increase in population, which is viewed more clearly in the distribution of residential satisfaction.
3. The impact of urban aging is stronger on residential satisfaction than on happiness. But the general trend of positive and negative impact is the same for both indicators. Positive influence is revealed in such components as "High density of people/facilities" and "Family households". However, the difference is that happiness is more affected by components related to personal life, such as "Family households".
4. There are some exceptions from the general trend of the distribution of values of happiness and

residential satisfaction in city typology. For example, the level of happiness is slightly higher in type II "Population aging areas" than in type III "Low-density regional areas, although the population increase there is lower. That can be caused by the larger size of type II, as well as with a larger number of nuclear families and more density of stores, stations, and other facilities.

Some recommendations for those developing and implementing regional policies that emerge from the results of our study can be formulated.

First of all, it is obvious that the main objectives and the desired results for a certain place should be clearly defined. If it is required to increase the level of residential satisfaction - then it is worth paying attention to the renovation of infrastructure. But in case the priority of increasing the level of happiness, the main attention should be paid to social, rather than technical measures, such as family or elderly welfare policy.

However, regional development goals should be elaborated with both residential satisfaction and happiness in mind, as there is a correlation between these two indicators. But for satisfaction, the timeframe for achieving the goals is suggested to be shorter and improvements will come relatively quickly, while for happiness it is a more complicated process, influenced much by the factors beyond the policy control.

What is more, it is essential to consider the limitations of increasing happiness through urban development, especially with the relationship to population increase, as the correlation of happiness with population change is weaker than that of satisfaction. Here, it is worth mentioning that although it is a common fact that the average level of happiness is higher in large cities, the maximum level of happiness is in the small number of cities with less population. There, the high level of happiness is not caused by urbanization and population growth and needs further investigation.

Meanwhile, in the case of a low level of happiness, the smaller the city, the higher the cost of measures to increase the levels of happiness and satisfaction is supposed to be. It is one of the manifestations of the agglomeration effect in the social sphere. The negative impact of the "Fiscal burden" component is related to this problem. In this case, it might conversely indicate that in the areas with aggravated state of problems that require large investments the level of happiness is low. Thus, even though happiness is considered to be related to personal factors, poorer living conditions influence happiness almost as much as residential satisfaction.

Finally, the populations of cities of different types may respond differently to similar measures. We can see that there are noticeable differences in happiness and satisfaction among municipalities with similar characteristics - and at the same time, sometimes the values of dependent variables for cities from different types are close. For example, it can be assumed that cities with an older population or families are more important for increasing the availability of certain types of facilities, and those with a younger population for encouraging denser social ties.

The continuation of the study is seen, in particular, in detailing the phenomena under study, as well as paying closer attention to individual cases. For example, close values of parameters of cities belonging to different categories deserve a more thorough study, including causal analysis and search for other demi analogs, not only in Japan but also in other countries.

ACKNOWLEDGMENTS: We are grateful to Hiroki Shimizu who provided data that made the analysis possible. Also, we want to thank R&D Center for Frontiers of MIRAI in Policy and Technology for providing support.

NOTES

Note 1) Liveable well-Being city indicator guidebook. *Smart City Institute Japan*, 2022. Retrieved from: https://www.sci-japan.or.jp/vc-files/images/LWC/LWC_Guidebook_v2022-03.pdf (in Japanese)

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