# Characteristics of Regional Issues in Local Municipalities of Japan in Consideration of Socio-Economic Condition

Akiko Kondo, Akio Kondo

*Abstract*— We are facing serious problems related to long-term depopulation and an aging society with a falling birth rate in Japan. In this situation, we are suffering from a shortfall in human resources as well as a shortage of workforce in rural regions. In addition, we are struggling with a protracted economic slump and excess concentration of population in the Tokyo Metropolitan area. It is an urgent national issue to consider how to live in this country and what kind of structure of society and administration policy is needed. It is necessary to clarify people's desire for their way of living and social assistance to be provided. The aim of this study is to clarify the characteristics of regional issues and the degree of their seriousness in local municipalities of Japan. We conducted a questionnaire survey about regional agenda in all local municipalities in Japan. We obtained responses concerning the degree of seriousness of regional issues and degree of importance of policies. Based on the data gathered from the survey, it is apparent that many local municipalities are facing an aging population and declining population. We constructed a model to analyze factors for declining population. Using the model, it was clarified that a population's age structure, job opportunities and income level affect the decline of population. In addition, we showed the way of the evaluation of state of local municipality.

*Keywords*—Evaluation, Local municipality, Regional analysis, Regional issue.

## I. INTRODUCTION

A N aging population is one of the most serious problems in Japan. The population of Japan started to decrease after its peak in 2004. In addition, we are facing an aging society with a falling birth rate. In this situation, we are suffering from a shortfall in human resources as well as a shortage of workforce in rural regions. Taking public transportation service as an example, almost all of local municipalities cannot provide enough public services because of a decrease in the number of users as well as a shortage of funds for maintaining them. In other words, the quality of service for daily life is degraded due to population decline, which causes population decreases in these regions. Obviously, these phenomena can be seen in many areas. In addition, we are suffering from a protracted economic slump and excess concentration of population in the Tokyo Metropolitan area. It is an urgent national issue to consider how to live in this country and what kind of structure of society and administration policy is needed.

In this situation, it is necessary to clarify people's desire for their way of living and social assistance to be provided.

Therefore, in this study we analyze characteristics of regional issues and the degree of their seriousness in local municipalities of Japan. Previous studies related to migration and sustainable development of local municipalities have achieve much [1], [2], [6]-[8].

First, in order to gather data for the analysis, we carry out a questionnaire survey about regional agenda in all local municipalities about regional agenda in Japan. We clarify that the actual situation concerning the seriousness degree of aging population and declining population, and the degree of importance of policies related to declining population based on the data obtained by the questionnaire survey. In addition, we construct a model to analyze factors of declining population. Also, we show the condition of the evaluation of state of local municipality. An outline of this study is summarized in Fig. 1.

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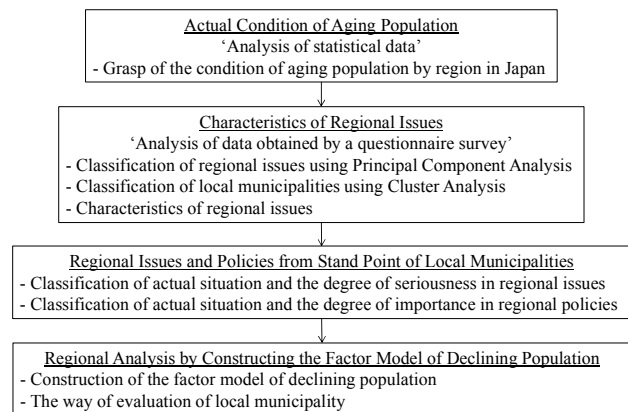
Fig. 1 Structure of paper

## II. ACTUAL SITUATION OF AGING POPULATION

Elderly people are defined as those who are older than 65 years old in Japan. Then, the rate of elderly people is a percentage of elderly people to the whole population. The rate of elderly people is taken to be the aging rate. The rate of elderly people of Japan in 2010 was 23.0% [4]. It increased year by year compared with 20.1% in 2005 and 17.3% in 2000 [3]. We use data of all of Japan in 2010. Percentages of the number of municipalities which aging rate of more than 23.0%

in prefecture $i$ is indicated as $R_{Ni}$. $R_{Ni}$ can be calculated using (1):

$$R_{N_i} = N_i / T_i \times 100 \ (\%) \tag{1}$$

where $N_i$: The number of local municipalities whose aging rate exceeds 23.0% in prefecture '$i$'; $R_{Ni}$: The percentage of $N_i$ in prefecture '$i$'; $T_i$: The total number of local municipalities in prefecture '$i$'.
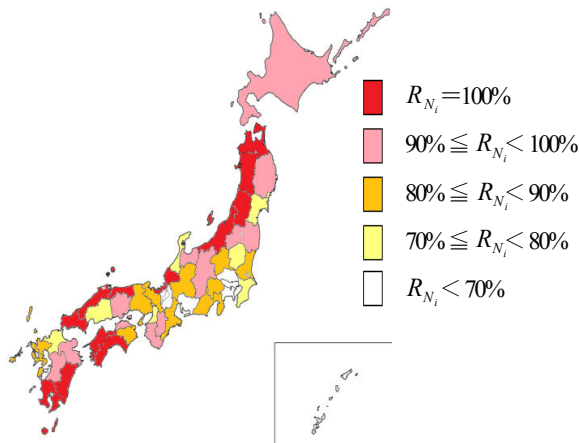


Fig. 2 Distribution of $R_{Ni}$

We can understand what percentages of local municipalities in which aging rate exceeds the basic rate are present in each prefecture from Fig. 2. 12 prefectures shown in red had no local municipalities in which the aging rate is lower than the 23.0% in 2010. We can say that $R_{Ni}$ of rural areas are higher than that of urban areas in Japan.

III. CHARACTERISTICS OF REGIONAL ISSUES

A. Summary of Questionnaire Survey

We conducted a questionnaire survey in all local municipalities of Japan in order to grasp the condition of regional problems and directions of regional policies compared with data of the period of 2010. This questionnaire survey was conducted by mail in March 2014. In this survey, a response rate of 33.3% and the number of responses was 639.

B. Classification of Regional Issues and Degree of Their Seriousness

We classified regional issues from the results of the questionnaire survey. Concerning regional issues in the questionnaire survey, we selected 20 items of issues related to life, sightseeing, convenience, and so on. And asked to what extent each municipality regards their problems using 5 categories; "5: very serious, 4: serious, 3: becoming a problem, 2: no problem, 1: no problem at all". The degree of seriousness of 20 regional issues is analyzed and shown in Fig. 3.

We summarized regional issues using the method of principal component analysis. As a result, they are summarized as 4 groups. As shown in Table I, Issue 1 indicates that confrontive issues of aging population and depopulation. This issue includes 10 items. Issue 2 indicates life convenience such as traffic convenience and shopping convenience. Issue 3 indicates tourism issues and Issue 4 indicates issues of safety and security related to evacuation from disaster and regional community.

TABLE I
CLASSIFICATION OF REGIONAL ISSUES
'THE RESULT OF PRINCIPAL COMPONENT ANALYSIS'

| Summarized regional issue | Items | Factor 1 | Factor 2 | Factor 3 | Factor 4 |
|---|---|---|---|---|---|
| Issue 1. Confrontive Issues of Aging Population and Depopulation | $C_{1-1}$ | **0.92** | 0.03 | -0.16 | -0.07 |
| | $C_{1-2}$ | **0.87** | -0.05 | -0.14 | -0.08 |
| | $C_{1-3}$ | **0.79** | -0.08 | -0.01 | -0.07 |
| | $C_{1-4}$ | **0.74** | -0.14 | 0.10 | 0.09 |
| | $C_{1-5}$ | **0.70** | 0.00 | 0.07 | 0.04 |
| | $C_{1-6}$ | **0.53** | 0.15 | 0.11 | 0.00 |
| | $C_{1-7}$ | **0.52** | 0.05 | 0.14 | -0.01 |
| | $C_{1-8}$ | **0.44** | 0.04 | -0.02 | 0.16 |
| | $C_{1-9}$ | **0.29** | 0.13 | 0.12 | -0.06 |
| | $C_{1-10}$ | **0.20** | 0.09 | 0.06 | 0.14 |
| Issue 2. Issues of Life Convenience | $C_{2-1}$ | -0.02 | **0.98** | -0.06 | -0.06 |
| | $C_{2-2}$ | 0.00 | **0.76** | -0.01 | 0.01 |
| | $C_{2-3}$ | 0.30 | **0.33** | 0.01 | 0.08 |
| Issue 3. Issues of Tourism | $C_{3-1}$ | -0.01 | -0.06 | **0.86** | -0.02 |
| | $C_{3-2}$ | 0.02 | 0.01 | **0.85** | 0.00 |
| Issue 4. Issues of Safety and Security | $C_{4-1}$ | -0.06 | -0.03 | -0.01 | **0.91** |
| | $C_{4-2}$ | 0.01 | -0.07 | -0.08 | **0.90** |
| | $C_{4-3}$ | 0.01 | 0.22 | 0.06 | **0.34** |
| | $C_{4-4}$ | -0.01 | 0.00 | 0.18 | **0.27** |
| | $C_{4-5}$ | 0.22 | 0.20 | 0.05 | **0.26** |
| Cumulative Contribution Ratio (%) | | 28.3 | 50.8 | 66.7 | 82.5 |

$C_{1-1}$: Depopulation, $C_{1-2}$: Increase in Marginal Hamlets, $C_{1-3}$: Aging Population, $C_{1-4}$: Decline of Regional Industry, $C_{1-5}$:Lack of Employment Opportunity, $C_{1-6}$: Shortage of Successors, $C_{1-7}$: Maintenance of Mountain Forest and Field, $C_{1-8}$:Increase in Empty House, $C_{1-9}$: Decline of City Centers, $C_{1-10}$: Shortage of Housing, $C_{2-1}$: Worsening of Convenience of Shopping, $C_{2-2}$: Lack of Commerce Facility, $C_{2-3}$: Worsening of Traffic Convenience, $C_{3-1}$: Effective Utilization of Tourism Resources, $C_{3-2}$, Weakening of Acceptance Mechanism of Tourism, $C_{4-1}$: Lack of Shelter for Disaster, $C_{4-2}$: Lack of Evacuation Route for Disaster, $C_{4-3}$: Lack of Care Facilities, $C_{4-4}$: Weakening of Local Community, $C_{4-5}$: Weakening of Medical Service.

The degree of seriousness of each regional issue is shown in Fig. 3. In particular, issues included in Category 1 which indicates a low birth rate and an aging population, are more serious than other categories.
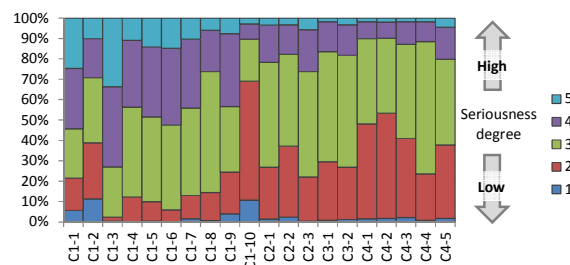


Fig. 3 Degree of seriousness of each item

### C. Classification of Municipalities and Characteristics of Regional Issues

Based on questionnaire survey data concerning regional issues, local municipalities were classified using a cluster analysis. The result of classification is shown in Fig. 4. As shown in this figure, all local municipalities can be classified into 6 groups. Then, we analyzed characteristics of regional issues of 6 groups which were classified by the cluster analysis. Fig. 5 shows a cobweb chart of regional issues in each group. These values are the average value of all regions comprised in each group concerning the answer of seriousness degree of regional issues.
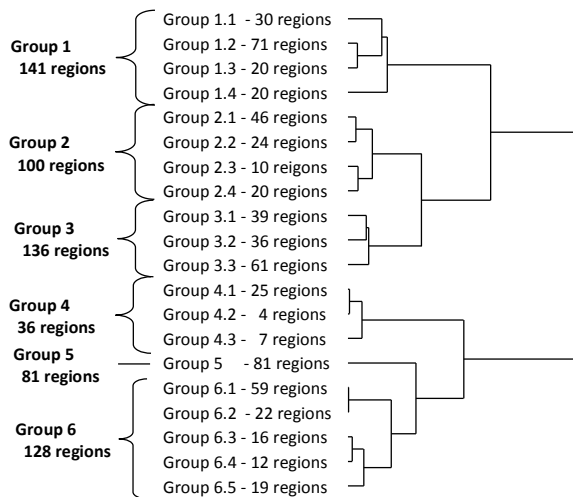


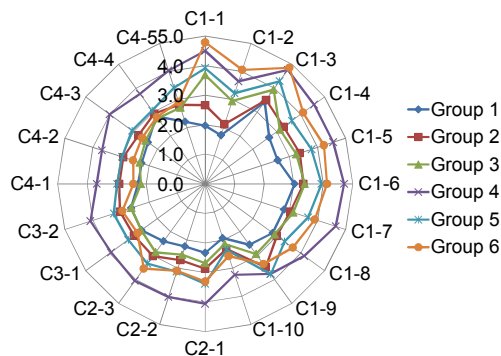Fig. 4 Classification of region 'the result of cluster analysis'



Fig. 5 Distribution of seriousness degree of regional issues in each group

Based on Fig. 5, regional issues in each group are summarized. For almost all items, the degrees of seriousness of Group 1 are lower than other groups. As the values of Group1 to Group 4 spread outward by gradation; the degree of seriousness of these issues increases. The degree of seriousness of 'Issue 1; Confrontive issues of aging population and depopulation' and 'Issue 2; Issues of life convenience' are generally high in Group 5 and 6. On the other hand, the degree of seriousness of 'Issue 4; Issues of safety and security' is low. In these groups, variability is seen in the degrees of seriousness.

### IV. REGIONAL ISSUES AND POLICIES FROM STAND POINT OF LOCAL MUNICIPALITIES

### A. Actual Situation and Degree of Seriousness of Aging Population

Many local municipalities are facing an aging society which is one of the most serious problems in recent years. The relationship between the actual situation of aging population and recognition of regional issues is analyzed here. Fig. 6 shows a distribution of actual aging rate and seriousness degree of aging as a regional issue.

The median ratio of elderly people of whole local municipalities is 23.861 %. On the other hand, the median rate of seriousness degree of whole local municipalities is 4. These values are used as baselines.

Figs. 7 and 8 show distributions based on these two indexes for urban regions and rural regions. We defined that urban regions are prefectures which belong to Kanto area, Kinki area and Chubu area, for example, Tokyo and Osaka. These regions are generally defined as three metropolitan areas in Japan.
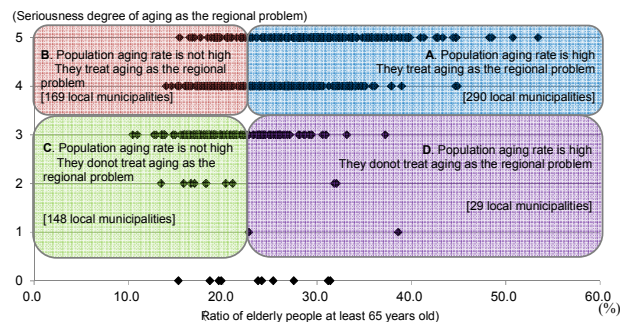


Fig. 6 Scatter graph of aging rate and seriousness degree of aging as a regional issue
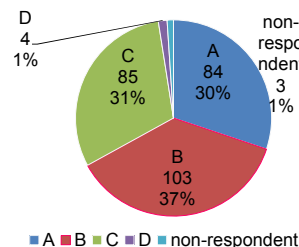


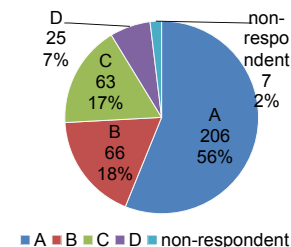Fig. 7 Seriousness degree of aging as a regional issue (urban regions)



Fig. 8 Seriousness degree of aging as a regional issue (rural regions)

The relation between actual condition of aging rate and seriousness degree of aging as a regional issue can be divided

into four types as follows. They are "A: aging rate is high and the local municipality recognizes aging as a regional issue, B: aging rate is not so high however the local municipality recognizes aging as a regional issue, C: aging rate is not so high and the local municipality does not recognize aging as a regional issue, and D: aging rate is high however the local municipality does not recognize aging as a regional issue". Local municipalities falling in category "D" do not recognize aging as a regional issue despite a high rate of aging population in comparison with other regions. In these regions, the condition is seen positively however it is of concern that regional policies lag behind actual condition in an aging society. Ratio of local municipalities classified in "D" in rural regions is higher than that in urban regions.

### B. Actual Situation of Aging Population and Seriousness Degree of Depopulation as a Regional Issue

We can recognize depopulation as a regional issue from a stand point of local municipality. Fig. 9 shows a distribution of actual condition of aging rate and seriousness degree of depopulation as a regional issue. Median rate of seriousness degree of whole local municipalities is 4. This value is used as a baseline. Figs. 10 and 11 show distributions of these two indexes by urban and rural regions.

The number of local municipalities classified in "D" is 67. It is not necessarily appropriate to suggest that aging population does not correlate with depopulation; however, these social issues are commonly referred to as regional issues. Concerning seriousness degree of this issue, ratio of local municipalities classified in "D" is also higher in rural regions than urban regions.
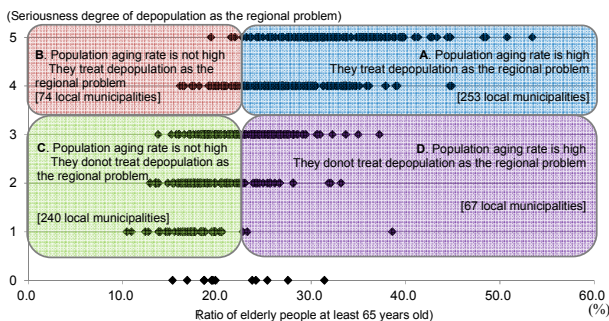


Fig. 9 Scatter graph of aging rate and seriousness degree of depopulation as a regional issue
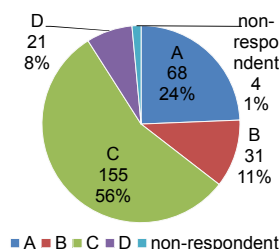


Fig. 10 Seriousness Degree of depopulation as a regional issue (urban regions)
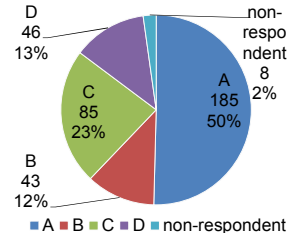


Fig. 11 Seriousness Degree of depopulation as a regional issue (rural regions)

### C. Degree of Importance in Policies Related to Declining Population

Importance of a countermeasure to declining population, which many local municipalities take into one of the regional policies is analyzed here and compared with actual aging rate. The degree of importance of this policy is asked in the questionnaire survey where a '10' response is paramount importance. Fig. 12 shows a distribution of actual aging rate and degree of importance in policies related to declining population. Median important degree is 7, and this value is used as a baseline. Figs. 13 and 14 show distributions of these two indexes for urban and rural regions.
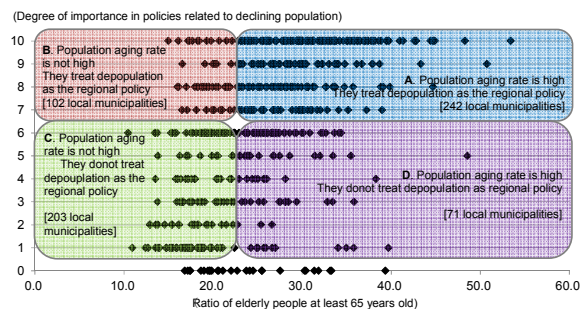


Fig. 12 Scatter graph of aging rate and degree of importance in policies related to declining population
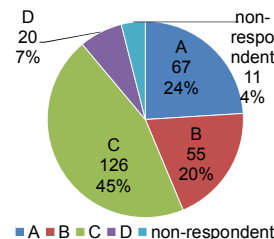


Fig. 13 Degree of importance in policies related to declining population (urban regions)
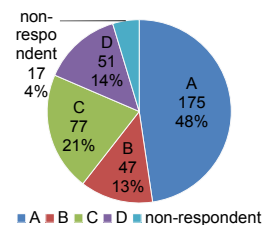


Fig. 14 Degree of importance in policies related to declining population (rural regions)

Concerning this distribution, there is a difference between urban and rural regions. Local municipalities classified in "A" and "B" which are the regions that respond important degree of policies related to declining population is high, is a majority in rural regions.

## V. REGIONAL ANALYSIS BASED ON THE FACTOR MODEL OF DECLINING POPULATION

### A. Construction of the Factor Model of Declining Population

As previously discussed, many regions are facing serious problems which are related to aging population and depopulation. As these are very serious, almost all of local municipalities are working together to find effective countermeasures.

We clarify factors of depopulation by using regional socio-economic condition. We assume a simple linear model shown as (2). Parameters of this model are estimated using data of the year 2014 [5].

$$Y_i = aP_i + bRE_i + cRIF_i + dRI_i + eRC_i + h. \qquad (2)$$

where $Y_i$: Seriousness degree of depopulation as a regional issue in municipality $i$; $P_i$: Population of municipality $i$; $RE_i$: Aging rate in municipality $i$; $RIF_i$: Ratio of inflow in migration to municipality $i$; $RI_i$: Income per person in municipality $i$; $RC_i$: Ratio of business commuter from other region per employee in municipality $i$; $a, b, c, d, e, h$: Parameters

The seriousness degree of depopulation in municipality $i$ is evaluated from rank 5: very serious to rank 1: no problem at all in the questionnaire survey. The estimation result of this model is shown in Table II.

TABLE II
RESULT OF PARAMETER ESTIMATION OF 'THE FACTOR MODEL OF DEPOPULATION'

| Variable | Parameter | t-value |
|---|---|---|
| The number of people | -0.000001 | -2.29 |
| Ratio of elderly people at least 65 years old | 7.87 | 10.35 |
| Ratio of inflow of people | -9.26 | -2.80 |
| Income per person | -0.33 | -1.93 |
| Ratio of business commuter from other regions per persons engaged | -1.76 | -6.04 |
| Constant | 2.61 | 7.63 |
| Coefficient of Determination R$^2$ | 0.522 | |
| Number of Sample | 641 | |

From the result, the following were clarified.

1) Depopulation is affected by population demography, particularly elderly people. In regions with less population as well as a low ratio of migration inflow, the problem of depopulation is seen to be a very serious regional issue.

2) The more the ratio of business commuters from other regions per employee increase, the less depopulation is recognized as a regional issue. In addition, as previously discussed, aging rate has a strong effect on depopulation. The higher the aging rate becomes, the more depopulation becomes a serious regional issue.

3) Condition of job affects depopulation. The values of parameters and t-values of income per person and ratio of business commuter from other regions per employee show evidence concerning this relationship. It was clarified that working condition is a very important factor related to depopulation.

### B. The Way of the Evaluation of State of Local Municipality

In Japan, awareness of regional problems has moved to vanishing hamlets from marginal hamlets. We face a serious situation where it is difficult to sustain rural regions. A vanishing hamlet means a hamlet with population of "0" due to residents moving and death although residents existed there once. According to the questionnaire survey of the Agriculture, Forestry and Fisheries Research Information Technology Center, it was found that 289 local municipalities among 1,243 local municipalities fell into the category of vanishing hamlets in 2007.

Marginal hamlets refer to the village where 50% of the population has reached or exceeded an age of 65 because of depopulation. In such villages, it is quite difficult to maintain social symbiosis. Various regional policies are considered and implemented to resolve this kind of serious problem. However, we are yet to see any obtainable solution. It is necessary to review the status of regions while considering the problem of population distribution. From the factor model of depopulation, it is clarified that depopulation is affected by 'securing population' and 'securing stable job'. The model can contribute to evaluate state of local municipality in the future.

## VI. CONCLUSION

The aim of this study was to clarify the degree of seriousness of regional problems in Japan. From the findings of this study, we could understand that regional issues can be divided broadly into 4 categories. These are: 'confrontive issues of aging population and depopulation', 'issues of life convenience', 'issues of tourism' and 'issues of safety and security'. It was clarified that many regions are facing serious problems related to aging population and depopulation, in particular.

Concerning aging population and depopulation, the following was found. Several local municipalities did not recognize the aging as a regional issue although a high rate of aging population can be seen in such regions in comparison with other regions. In these regions, as the condition is seen positively, it may be because regional policies lag behind actual condition in their aging society. This trend can be seen in rural regions more than in urban regions.

From the result of analysis using the factor model of depopulation, it was clarified that the problem of depopulation is recognized as a serious issue in regions having less population as well as a low ratio migration inflow. In addition, it can be said that working condition in regions is a very important factor related to depopulation.

It is inevitable that we will have an aging population and depopulation in the near future in Japan, which is accelerating in many local regions. Therefore, it is necessary to design and built up ideal regions in the future in consideration of actual

socio-economic conditions as well as regional issues which were discussed in this study.

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