Living Environment of Nomads Residing on the Outskirts of Ulaanbaatar, Mongolia
– Dispositional Characteristics from the Perspective of a Comparison of Nomads and People Living in Ger Fixed Residences in the City –

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Abstract
This study can be placed in a series of researches and studies we have conducted regarding the relation between the life style with few environmental burdens the nomads have fostered in their traditional pastoral society and their perception of their life and communities. For the study, the authors conducted a questionnaire survey targeted at the nomads living in the suburbs of Ulaanbaatar in Mongolia and then organized the responses to identify the characteristic tendencies of their awareness of life and their activities.

In this paper, the characteristics of the perception of the living environment the nomads residing in the suburbs of Ulaanbaatar have were compared and analyzed with those of the residents in the ger districts (Gandan district in the Bayangol region) in the urban area of Ulaanbaatar with the aim of identifying similarities and differences in their living environments and perception of their living. By this process, the authors fully understood the actual situation and characteristic tendencies of the pastoral life and also gained a basic knowledge regarding the establishment of a sustainable living environment where coexistence can be found between people and people and between man and nature based on the region-specific environmental characteristics.

Keywords: Ulaanbaatar; nomad; lifestyle; living environment; attitudes of residents

1. Introduction
The authors conducted an opinion survey of nomads residing on the outskirts of Ulaanbaatar as part of a study of the living environment of nomads residing there and compiled the responses regarding the attitudes of nomads toward their lifestyle and the dispositional characteristics regarding their activities, in order to study the relationship between the lifestyle system, one that does not place a great burden on the environment, that is nurtured in traditional nomadic society on the one hand and their attitudes regarding lifestyle and community on the other. The series of studies conducted by the authors up to now have resulted in findings that include the following:

1) An awareness of tradition and the attitudes toward community and group have a major impact on the formation of the nomadic lifestyle, and form the basis for a sustainable lifestyle based on environmental characteristics in which people live in harmony with nature and domesticated animals.

2) For modern nomads, the shift from a socialist system to a democratic one has caused social changes that have produced changes in their attitudes toward their lifestyle as well, with the result that some inclination toward permanent residence in the city has appeared.

This study is based on the basic knowledge of the living environment of nomads obtained through the series of studies conducted up to now. The results of an opinion survey on the living environment in the nomadic lifestyle of nomads conducted in August 2006 were compared with the results of an opinion survey regarding the living environment of residents of a fixed residence ger district (Note 1) in central Ulaanbaatar, conducted by the Japan International Cooperation Agency (JICA) in October 2001, in order to identify the actual status of the living environment of nomads living on the outskirts of Ulaanbaatar and the dispositional characteristics of nomads with regard to their living environment.

2. Objective of Study
The objective of this study was to conduct a comparative analysis of the living environment of nomads residing on the outskirts of Ulaanbaatar with the living environment of the residents of a fixed residence ger district (Gandan District in the Bayangol region) in central Ulaanbaatar, in order to determine the similarities
and differences between the living environment of nomads and their attitudes toward their lifestyle on the one hand, and the living environment of residents in fixed residence ger districts in the city center and their attitudes toward their lifestyle on the other, in order to determine the actual status of the nomadic lifestyle and the dispositional characteristics of nomads with regard to their lifestyle.

3. Survey and Analysis Methods

First, let us examine the living environment of nomads and their attitudes toward their lifestyle, as determined from the opinion survey of targeted nomad households conducted in August 2006. One copy of the survey form was distributed to each household and responses were obtained from the head of each household. The content of the survey included the source of household income (economic status), access to water supply, the use of electricity, the method of disposing of garbage and wastes, the health care and medical treatment environment, the attitude toward the natural environment and environs, and so on.

Next, the results of this survey of nomad households were compared with the results of an opinion survey regarding the living environment of residents (households) in a fixed residence ger district (Gandan District in the Bayangol region) in central Ulaanbaatar, conducted by JICA in October 2001, in terms of the following items: source of household income (economic status), access to water supply, use of electricity, method of disposing of garbage and wastes, and health care and medical treatment environment.

4. Living Environment Characteristics as Determined From a Comparison of Opinion Surveys of Nomads and Residents of Fixed Residence Ger Districts

4.1 Overview of Opinion Surveys of Nomads and Residents of Fixed Residence Ger Districts

With regard to the survey of nomads, in August 2006 an opinion survey and interviews regarding the living environment of nomads were conducted for nomads residing on the outskirts of Ulaanbaatar. The method used to distribute and collect the surveys was to visit the target nomad household directly and provide a general explanation of the survey and then distribute the survey form. In the same manner, each household was visited directly to collect the survey forms. One copy of the survey form was distributed to each household and responses were obtained from the head of the household. Valid responses were obtained from 57 households (persons).

The opinion survey of residents of fixed residence ger districts was conducted by JICA in October 2001. The method used to distribute and collect
the surveys was for a survey worker to visit the target household directly and provide a general explanation of the survey, distribute the survey form, and then return that same day to collect it.

The opinion survey of residents in fixed residence ger districts conducted by JICA was conducted for the three districts of Ulaanbaatar: one in the city center, one on the periphery of the city center and one in the suburbs.

Considerations with regard to this study included the following:
1) In Mongolia, urbanization and the change to fixed residency are proceeding at a rapid pace, and there has been a notable influx of population into Ulaanbaatar. Moreover, this trend is expected to continue and even increase in the future as well.
2) This study was conducted in order to determine the effect that differences in location and the surrounding environment of nomads and residents of fixed residence ger districts in the center of Ulaanbaatar have on the living environment and attitude toward lifestyle, and to identify the characteristics of the living environment of nomads, as well as to determine how to preserve and develop their traditional living environment and lifestyle system, which does not place a great burden on the environment, in the face of the trend toward urbanization and fixed residency, in order to obtain basic knowledge for use in developing a systematic methodology that can help build a sustainable society.

Accordingly, the survey focused on a fixed residence ger district in the center of Ulaanbaatar (Gandan District in the Bayangol region), and these results and the results of the nomad survey were compared and analyzed. For those items with multiple responses, the results for each item were tabulated as 100% and then analyzed.

Table 1. and Fig.2. shows an overview of both opinion surveys as well as an overview of the Gandan District in the Bayangol region.

4.2 Living Environment (Lifestyle) of Households Targeted by the Survey
4.2.1 Source of Household Income
(1) Household Occupations With the Highest Income (Fig.3.)
In the case of nomad households, "(1) Stock farming" was the most common response, selected by 80.7% of respondents. Next came "(16) Pension" at 5.3%. These results show that stock farming (livestock) constitutes the primary source of income for almost all households.

In the case of residents (households) in fixed residence ger districts, "(11) Service" was the most common response, selected by 9.0% of respondents. The next highest percentages were for "(10) Official work" "(6) Telephone, Transport" and "(16) Pension." These results show that residents (households) in fixed residence ger districts derive their income from a variety of occupations, leading to the conclusion that these residents have the opportunity to obtain employment at various occupations.

(2) Is Your Current Income Sufficient to Support Your Lifestyle ? (Fig.4.)
In the case of nomad households, the most common response was "(4) It is adequate for ordinary living needs, but I feel it is not adequate when I have to pay for my child's education and when I want to make a major purchase." This response was selected by 36.8% of respondents. The next common response was "(3) Sometimes I feel it is not adequate for ordinary living needs." This response was selected by 28.1% of respondents.

In the case of residents (households) in fixed residence ger districts, the most common response was "(3) Sometimes I feel it is not adequate for ordinary living needs." This response was selected by 34.8% of respondents. The next common response was "(2) It is not adequate for ordinary living needs, and I'm having a hard time making a living." This response was selected by 28.9% of respondents.

These results show that residents (households) in fixed residence ger districts tend to feel more dissatisfied with their economic status than nomad households.

4.2.2 Access to Water Supply
(1) Frequency of Purchase in the Event that Water is Purchased for my child's education and when I want to make a major purchase." This response was selected by 36.8% of respondents. The next common response was "(3) Sometimes I feel it is not adequate for ordinary living needs." This response was selected by 28.1% of respondents.

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4.2.2 Access to Water Supply
(1) Frequency of Purchase in the Event that Water is Purchased (Fig.5.)
With regard to nomad households, the most common response was "(5) No response." This response was noted in 52.6% of respondents. The next most common response was "(2) Two or three times a week." This
response was selected by 29.8% of respondents. The households selecting "(5) No response" were those households that do not purchase water and instead get all of their water from rivers, wells and so on.

With regard to residents (households) in fixed residence ger districts, the most common response was "(2) Two or three times a week." This response was selected by 47.6% of respondents. The combined total for the percentage of respondents who selected "(1) Daily" and "(2) Two or three times a week" was 86.1%, indicating that residents (households) in fixed residence ger districts frequently purchase water.

(2) Method of Purchase in the Event that Water is Purchased (Fig.6.)

With regard to nomad households, the most common response was "(5) No response." This response was noted in 52.6% of respondents. The next most common response was

"(1) On foot or by domesticated animal using a plastic container." This response was selected by 29.8% of respondents.

Of the nomad households who chose "(5) No response," many do not buy potable water but instead draw water from shared wells and from a river located near their camps. There is also a tendency that they purchase only drinking water and use the water from shared wells and rivers for other purposes.

With regard to residents (households) in fixed residence ger districts, the most common response was "(2) Using a wheelbarrow." This response was selected by 53.5% of respondents. The next most common response was "(1) On foot or by domesticated animal using a plastic container." This response was selected by 38.0% of respondents.

When comparing the two surveys, a difference can be noted in the ratio of "(2) Using a wheelbarrow." and "(3) By car or taxi." This can be judged as a result of the difference in the distance from their dwellings to the place where they can obtain water; for nomads, as far as to Ulaanbaatar or a nearby town and for those living in ger districts, to a potable water selling station set up in a neighborhood.

(3) Ways to Facilitate Access to Water (Fig.7.)

For this question, respondents were asked to select multiple responses for ways to make it easier to obtain water.

With regard to nomad households, the most common response was "(1) Increase the number of water depots." This response was noted in 31.6% of respondents. The next most common response was "(7) No response." This response was selected by 29.8% of respondents.

With regard to residents (households) in fixed residence ger districts, the most common response was "(7) No response." This response was selected by 32.1% of respondents. The next most common response was "(2) Have a water truck go around." This response was selected by 26.2% of respondents.

A comparison of these responses reveals that the percentage of residents (households) in fixed residence ger districts who selected items relating to the sale of water and supply systems tended to be higher than that of nomad households. This indicates that the responses were affected (albeit only slightly) by the frequency of water purchase.

(4) Perceived Difficulties in Water Use (Fig.8.)

For this question, respondents were asked to select multiple responses for items for which they had difficulty with regard to the use of water.

With regard to nomad households, the most common response was "(2) Unable to bathe at home." This response was noted in 47.4% of respondents. The next most common response was "(3) Unable to use enough water when doing laundry." This response was selected by 38.6% of respondents.

With regard to residents (households) in fixed residence ger districts, the most common response was "(2) Unable to bathe at home." This response was noted in 56.1% of respondents. The next most common response was "(3) Unable to use enough water when doing laundry." This response was selected by 38.6% of respondents.
response was "(3) Unable to use enough water when doing laundry." This response was selected by 33.7% of respondents.

A comparison of these responses reveals that the same trends are evident in both nomad households and residents (households) in fixed residence ger districts. With regard to the water purchase and supply system, however, there is more dissatisfaction evident in residents (households) in fixed residence ger districts than in nomad households.

### 4.2.3 Electricity Use

(1) Do You Use Electricity? (Yes / No) (Fig.9.)

With regard to nomad households, the most common response was "(3) Would like to use electricity, but don't have it." This response was noted in 54.4% of respondents. The next most common response was "(1) Use electricity." This response was selected by 17.5% of respondents. Households that use electricity employ small generators powered by solar panels or gasoline.

With regard to residents (households) in fixed residence ger districts, all respondents (except those that selected "No response") said their household uses electricity. This reflects the differences in infrastructure and lifestyle resulting from differences in the site environment in the regions surveyed.

(2) Ownership of Electric Appliances

Both surveys asked respondents about the electric appliances owned by the household. In the case of nomad households, more than 70% of the households owned a radio, and this was the item with the highest percentage of ownership. More than half of the households owned both a TV and a radio. With regard to residents (households) in fixed residence ger districts, more than 90% of the households owned a TV, and this was the item with the highest percentage of ownership. Eighty percent of households owned a TV, a refrigerator, an electric stove and an iron.

There were great differences between the surveys in terms of the ownership of electric appliances. This strongly reflects the infrastructure status. The results also reveal that nomad households use the radio as a source of information in their daily lives, while residents (households) in fixed residence ger districts use the TV as a source of information in their daily lives.

(3) Perceived Difficulties in Electricity Use (Fig.10.)

For this question, respondents were asked to select multiple responses for items for which they felt difficulty with regard to the use of electricity.

With regard to nomad households, the most common response was "(5) Don't have electricity." This response was noted in 56.1% of respondents. The next most common responses were "(3) Electric bill is high" and "(7) Other" at 19.3%. Those respondents who selected "(7) Other" noted that "It costs money to buy gasoline (for use as fuel for the generator)" "The construction materials needed to produce power (solar panels, etc.) are expensive" and so on.

With regard to residents (households) in fixed residence ger districts, the most common response was "(5) Once a month or less frequently." This response was noted in 75.4% of respondents. Compared to nomad households, which dispose of their garbage frequently, residents (households) in fixed residence ger districts dispose of their garbage less frequently.

### 4.2.4 Garbage and Waste Disposal

(1) Frequency of Garbage Disposal (Fig.11.)

With regard to nomad households, the most common response was "(1) Daily." This response was noted in 56.1% of respondents. The next most common response was "(2) Two or three times a week." This response was selected by 15.8% of respondents.

With regard to residents (households) in fixed residence ger districts, the most common response was "(5) Once a month or less frequently." This response was noted in 75.4% of respondents.

(2) Method of Garbage Disposal (Fig.12.)

For this question, respondents were asked to select multiple responses regarding the method of garbage disposal.

With regard to nomad households, the most common response was "(3) Electric bill is high." This response was noted in 63.6% of respondents. The next most common response was "(4) Tangled power lines pose the danger of accident or fire." This response was selected by 21.9% of respondents.
the garbage dump" at 12.3%.

With regard to residents (households) in fixed residence ger districts, the most common response was "(8) Pay a government garbage collection truck to haul it away." This response was noted in 59.4% of respondents. The next most common response was "(7) Pay a private garbage collection truck to haul it away." This response was selected by 29.4% of respondents.

Different trends are evident in the garbage disposal methods of nomad households and residents (households) in fixed residence ger districts. Nomad households dispose of garbage themselves, naturally and with no adverse environmental impact. In contrast, residents (households) in fixed residence ger districts rely on private companies and the government for garbage collection and disposal. These responses show the differences in garbage disposal frequency.

In addition, all of the nomad households that responded "(8) Pay a government garbage collection truck to haul it away" responded that they disposed of garbage "(5) Once a month or less frequently." (3) Perceived Difficulties and Unpleasantness Regarding the Garbage Disposal Environment (Fig.13.)

For this question, respondents were asked to select multiple responses for items for which they perceived difficulty and unpleasantness with regard to the garbage disposal environment.

With regard to nomad households, the most common response was "(1) Garbage is scattered here and there." This response was noted in 61.4% of respondents. The next most common response was "(2) Garbage is dumped in rain gutters and hollows within the district." This response was noted in 47.4% of respondents.

With regard to residents (households) in fixed residence ger districts, the most common response was "(5) It takes a long time for the garbage collection truck to get here." This response was noted in 61.0% of respondents. The next most common response was "(4) Garbage collection is infrequent and garbage piles up." This response was selected by 58.3% of respondents.

These responses correlate with the frequency and method of garbage disposal and back up the survey results. Moreover, in recent years garbage scattered about has become a major problem in Mongolia, not only in Ulaanbaatar but on the steppes as well. The responses from nomad households provide evidence of this.

(4) Perceived Difficulty in Toilet Use (Fig.14.)

For this question, respondents were asked to select multiple responses for items for which they perceived difficulty with regard to toilet use.

With regard to nomad households, the most common response was "(3) Using an outdoor toilet in the cold of winter." This response was noted in 47.4% of respondents. The next most common response was "(4) Using a toilet in the dark in the middle of the night." This response was noted in 36.8% of respondents.

With regard to residents (households) in fixed residence ger districts, the most common response was "(6) Disposing of waste and putting in place a new toilet when the toilet has become full." This response was noted in 58.3% of respondents. The next most common response was "(1) Bothered by the dirtiness and smell of the toilet." This response was noted in 59.9% of respondents.

Different trends are evident in the responses of nomad households and residents (households) in fixed residence ger districts. These differences generally reflect the difference in the installation status of toilets. Nomad households set up toilets on the steppe some distance away from the ger. Residents (households) in fixed residence ger districts set up the toilet on the premises of each ger.

4.2.5 Health Care and Medical Treatment Environment (Fig.15.)

For this question, respondents were asked to select multiple responses regarding the problems relating to the health care and medical treatment environment.

With regard to nomad households, the most common response was "(7) Medical costs are high and we can't
get adequate treatment." This response was noted in 56.1% of respondents. The next most common response was "(10) Other." This response was noted in 54.4% of respondents. Respondents who selected "(10) Other" gave opinions that included "There are few medical treatment facilities", "There are few health care facilities", "A facility for senior citizens is needed" and "The poor health care and medical treatment environment is a serious problem."

With regard to residents (households) in fixed residence ger districts, the most common response was "(7) Medical costs are high and we can't get adequate treatment." This response was noted in 45.5% of respondents. The next most common response was "(9) There is no way to contact anyone in the event of an emergency." This response was selected by 37.4% of respondents.

A comparison of the results reveals that many nomad households feel that the health care and medical treatment environment is poor. The percentages for each item are higher than those for residents (households) in fixed residence ger districts.

5. Attitudes of Nomads Regarding the Natural Environment and Environments

5.1 Consideration for Avoiding Placing a Burden on the Natural Environment in Daily Life (Fig.16.)

In the opinion survey conducted for nomads, respondents were asked to respond in their own words regarding "Things in daily life for which we try to avoid placing a burden on the natural environment." The individual opinions were extracted from these responses, and the results are shown in Fig.16.

The responses can be divided into two categories: "traditional attitudes" and "attitudes toward the land."

Respondents had a high degree of awareness of carrying on and preserving the lifestyle of harmony with the environment that Mongolian nomads have nurtured in traditional nomadic society. This is shown in responses such as the following:

"We observe our traditions from long ago and do not foul the natural environment."

"It is our duty to keep our surroundings (natural environment) clean."

"Nomads observe the traditions from long ago. We use the dung from domestic animals as fuel for heating with the objective of protecting the natural environment."

Nomads also have a high degree of awareness of striving to reduce the burden on the land (natural environment) and maintain a good environment. This is shown in responses such as the following:

"When we move camp, we clean up the previous location and return the land to its former state."

"Every one of us takes care not to foul the steppe, the water location (river), the well and so on."

5.2 Recycling of Resources and Materials

In the opinion survey conducted for nomads, respondents were asked to respond in their own words regarding "methods of use and disposal of unneeded felt, clothing and other materials, utensils etc." The individual opinions were extracted from these responses.

In almost all households, clothing that can no longer be worn is made into belly-warmers for domesticated animals and rope, or used to cover or repair gers or animal huts, or converted into bags and bottom mattresses and so on. Other opinions that were expressed included the following:

"We use things as long as we can, until they can no longer be used, and then we burn them."

"We reuse everything that can be reused."

"We use it in place of firewood."

These responses reveal a close connection with the method of garbage disposal and also back up the results of the survey.

6. Conclusion

Following the introduction of the Socialist system in Mongolia, policies encouraging fixed residency for the population were adopted, and the urban population has increased dramatically. As a result, several social issues have been raised as serious problems in Mongolia. At the same time, serious environmental problems have also been produced on a global scale, and in the 21st century and beyond, there is a need to shift to a sustainable society, one based on the recycling of resources.

Finding a methodology through which the unique sustainable lifestyle system of Mongolian nomads, which is based on their environmental characteristics, can be preserved, expanded and adapted in the midst of urbanization and the trend toward fixed residency will serve as an important proposal for the creation of a sustainable society and living environment in the future. In this study, the results of opinion surveys conducted for nomads and residents of fixed residence gers in the city center were studied and compared to determine the characteristics of their attitudes toward their living environment, in order to make an overall...
determination of the actual status and characteristics of the living environment of nomads. The results can be summarized as follows.

1) For almost all nomads, livestock constitute not only their primary source of income but also their means of livelihood. The dung of domesticated animals is used as fuel for heating in winter, and articles that are no longer needed by human beings are recycled for use by animals. This makes a contribution (albeit small) to reducing the quantity of wastes and increasing waste recycling.

Among the nomad household, it is observed that they dispose of waste generated from their daily life themselves and reuse it, thereby maintaining their own living environment in good condition. In contrast, as regards the residents (households) in fixed residence ger districts, it can be said that as regards their domestic waste, they depend on contractual services and government administration, and consequently, that they are less conscious of waste disposal methods and recycling.

2) An overview of the survey results reveals that nomads tend to have a lower degree of dissatisfaction than residents of fixed residence ger districts with regard to access to water and health care and sanitation (garbage/pollution). However, in general, the percentage of respondents citing problems with regard to electricity use and the health care and medical treatment environment was higher in the case of nomads, indicating the poor living environment of nomads with respect to these items. These results reflect the characteristics of the lifestyle in which nomads move from place to place, as well as the characteristics of the location of pastureland. With regard to problems concerning health care and medical treatment environment in particular, there was a great disparity between the responses of nomads and residents of fixed residence ger districts located in central Ulaanbaatar in terms of "distance to the hospital" and "difficulty in transport access." These results indicate the need to establish a medical treatment system that ensures opportunities for regular examinations, one that has an emergency communication system using mobile telephones or the like and so on.

3) Nomads have a high degree of awareness of the need to carry on their traditional lifestyle, and of the importance of the natural environment. In addition, they also have a high degree of awareness of the need to effectively use the resources they obtain from nature and their livestock. This supports the view that, due to the close connection between their living environment -- in which they secure water and the feed (pastureland) needed by the livestock that constitute their source of food -- and the natural environment, preserving a good natural environment will enrich their own lifestyle (environment) and create a situation that will enable this lifestyle to be maintained.

4) The unique sustainable living environment and lifestyle system (one that does not place a great burden on the environment) of the nomadic lifestyle has been maintained by the high regard of nomads for tradition that has been nurtured over time, and the great sense of belongingness of people (nomads) to nature and the environment around them. This suggests an orientation toward the creation of a sustainable living environment in which people coexist not only with one another but with nature as well. It is important for urban (apartment) residents to learn how to create, through community design, a situation such as that of the nomads, in which there is constant interaction among people and a variety of activities and in which, over time, people are able to create human activity and spatial environments, and to apply this approach in urban (apartment) lifestyles in the future as well.

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Notes
1 Ulaanbaatar, Mongolia is made up of six main regions: Sukhbaatar, Khan-Uul, Bayanzurkh, Chingeltii, Songinokhairkhan and Bayangol. Each of these six regions is divided into approximately 20 districts, each of which is classified as either an apartment district or a fixed residence ger district. This study considers all of the ger enclaves in Ulaanbaatar as constituting a single fixed residence ger district, defined as the residential area with Mongolian gers and wooden homes extending throughout both the city center and the peripheral areas with no urban infrastructure. In recent years, most of the nomads who have abandoned the nomadic lifestyle have flowed into the city in search of work. The districts that accommodate this influx of population are the fast-growing fixed residence ger districts on the periphery of the city center. As of 2005, according to interviews conducted by the urban planning and design research center in Ulaanbaatar, the ratio of apartment districts to ger districts was approximately 52% to 48%.

2 This section is based on an overview of the opinion surveys noted on pages 74-75 and 86-87 in "The Survey report of the Study of the Living Environment of the 'Ger Area' in Ulaanbaatar, Mongolia" (February 2002) published by the Japan International Cooperation Agency (JICA).

3 Issues raised included the changes in the unemployment rate resulting from the increased inflow of population to Ulaanbaatar, the insufficient supply of housing, the increase in the number of "manhole children" (street children who live in warm spaces under manholes) resulting from poverty, the inadequate urban infrastructure, the problem of garbage disposal, progressive air pollution, etc.

4 Issues raised included the excessive concentration of population in the city, global warming, progressive desertification, the increased number of natural disasters, progressive environmental pollution, excessive use of fossil fuels, the enormous quantities of industrial wastes and household wastes that are created, loss of biodiversity, etc.

Previous Publications Related to This Study
(1) Mitsuhiro Hasegawa, Umekazu Kawagishi, Ishjams Gonchibat, Takumi Nakanshi (2004.5) Study on the Living Space Planning in Ulaanbaatar, Mongolia - Common Spaces in Apartment Complexes -. Journal of Asian Architecture and Building Engineering, AJI, AIK, ASC, vol.3 no.1, pp.133-140.

(2) Umekazu Kawagishi, Susumu Ishii, Yoshimichi Tsuboi, Noboru Yuasa, Kazuo Usugi, Ishjams Gonchibat, Badrakh Batbold, Mitsuhiro Hasegawa (2005.5) Study on the Living Space Planning in Ulaanbaatar, Mongolia Part 2 - Residential and Living Environments in Apartment Complexes -. Journal of Asian Architecture and Building Engineering, AJI, AIK, ASC, vol.4 no.1, pp.151-159.

(3) Umekazu Kawagishi, Susumu Ishii, Yoshimichi Tsuboi, Noboru Yuasa, Kazuo Usugi, Ishjams Gonchibat, Badrakh Batbold, Koki Kitano, Hirofumi Sugimoto (2005.11) Study on the Living Space Planning in Ulaanbaatar, Mongolia Part 3 - Perceptions of Apartment Residents -. Journal of Asian Architecture and Building Engineering, AJI, AIK, ASC, vol.4 no.2, pp.415-422.

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