

Article

Factors Contributing to Residential Vacancy and Some Approaches to Management in Gyeonggi Province, Korea

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Abstract: With the decrease in the demand for large-scale apartments as a result of an aging society and a decrease in population, there has been an increase in vacant houses due to a supply that exceeds the projected demands. As a method of urban regeneration in rural areas and activation of citizen communities, the utilization of vacant houses has become one of the ways to promote a new lifestyle, active movement for citizen participation, and business model for long-term revitalization. This study aims to uncover and examine the major causes and factors behind the upswing in vacant houses. We investigated the current state of vacant houses, the recent policies concerning them, and the types of vacant houses in Korea's Gyeonggi province. We then categorized and analyzed the causes of houses being vacant, their types, and the methods of utilizing them under different local conditions in order to understand the efficient processes and strategies for their utilization. The results showed that an excess of building construction (especially recent construction permits), the number of recipients of the national basic livelihood scheme, and the number of elderly people showed the strongest correlation with vacant houses.

Keywords: vacant house; abandoned house; shrinking cities; urban stocks; utilization; Gyeonggi province; population

1. Introduction

In 1915, Patrick Geddes wrote that the final destination of urban development would be the slums, adding that it would diversify from slum to mid-slum to super slum [1]. In highly populated cities in Korea, the paradigm of urban development is gradually turning to urban regeneration. Regional development plans are being canceled and concerns regarding the decline of old urban areas are increasing. With the decrease of the demand for large-scale apartments resulting from an aging society and population decrease, we are also experiencing increased vacancies from an oversupply that exceeds projected demands. This oversupply and regional aging will eventually lead to an increase in the number of vacant houses, which in turn leads to regional and social issues such as safety concerns, crime rate increases, decreased property values, *etc.*

Gyeonggi Province has the highest number of vacant residences in Korea with a variety of causes for these vacancies. Of the 793,848 vacant houses in the country, approximately 400,000 are apartments. Of 154,099 total vacant houses in Gyeonggi Province, about 90,000 (about 60%) are apartments, half of which are vacant due to being unsold [2]. When we examine the number of vacant houses compared to the number of total houses, they are distributed throughout the mountain areas, agricultural and

fishing areas, or the outskirts of cities. The number of vacant houses when compared by region is remarkably high in urban regions. This is the result of unsold apartments from oversupply, cancellation of new downtown regions in old city centers, changes in the city's industrial structure, a shift in central administration, *etc.*

To systematically manage and use the increasing number of vacant houses, a long-term system must be established and supported by a shift in social awareness. In Korea, 20 different regions throughout the country enacted regulations for vacant house management in response to this increase [3]. Vacant house management does not necessarily require massive investment, nor does it need to involve blind demolition; rather, it is about precise management and usage. Objective standards that select and govern demolition, management, and usage—instead of blind demolition—must be administratively established at a provincial level in such a way that regional attributes are enhanced for each type of vacant house and can be used as regional assets.

This study examines the cause of vacant houses and their usage plans in Gyeonggi Province in Korea by looking at actual cases steadily arising from population decrease and an aging society. We will also deduce political implications and practical measures by analyzing the supporting details and related subjects. We will subsequently find ways to use the increasing number of vacant houses through strategies that create spaces for the local community, which would enable the continual growth and independence of the region. Furthermore, we will present a detailed methodology that validates regional resources.

2. Materials and Methods

2.1. Definition of Vacant Houses and Scope of Research

The definition and investigative scope of vacant houses differs in each country, and the results indicate their standard of usage. However, generally speaking, a “vacant house” is one that has been unoccupied for an extended period of time; the vacant house rate defines the number of empty and unsold homes out of the total amount of houses [3]. The U.S. considers a reasonable vacant house rate to be between 3% and 5%; yet in 2008, the rate after the collapse of the U.S. housing bubble was 13%. In Japan in the same year, it reached 13.1%. In regard to a detailed example of the definition of a vacant house, the Ministry of Internal Affairs and Communications of Japan defines vacant houses as structures with no record of use, which includes electricity, gas, water, *etc.*, for one year, identified via field investigation. In order to assess the current status of these areas, vacant house investigations are performed by each local government [4].

Korean law defines a vacant house as having been empty since its residents moved to another region, and the house subsequently not being used for an extended period of time. However, the statistics on “vacant houses” managed by the National Statistical Office of Korea only consider homes with less than a 50% destruction rate; furthermore, the data do not include all other abandoned houses with a destruction rate of over 50% (*i.e.*, deserted ones) [5].

2.2. Research Questions, Method and Hypothesis

Our research is aimed at discovering the factors that are closely related to the generation of vacant houses. Although it is hard to find the exact causes and effects by chronologically following specific examples, it is still helpful in revealing the correlation between the number of vacant houses and the state of other relevant socioeconomic factors. In order to define the relevant socioeconomic factors, we examined previous studies on shrinking cities and reorganized the key factors into three categories: population, urban decline and excessive supply. Our major data source, the National Statistical Office of Korea, does not disclose data regarding the number of vacant houses in small districts with fewer than five empty residences because of private property protection, and a full investigation is not being performed on the level of local governments; therefore, it is impossible to obtain an accurate total count. Hence, we examined the present distribution conditions of vacant houses throughout Korea

and Gyeonggi Province based on the 2010 population and housing census [5], which is the primary statistical data on vacant houses. To define the type of vacant house usage, length of vacancy, and presence of partial damage as well as to assess the regional traits and causes of vacancy in Gyeonggi Province, we analyzed the present status of both vacant houses and residential supply according to population status, urban decline, and urbanization.

Before beginning this study, we generated three hypotheses regarding the cause of vacant houses, which are described in greater detail in Section 3.1 as theoretical background. First, the aging population might have a close relation with the number of vacant houses. Also, since an increase in population leads to less vacant houses, it thus follows by the law of supply and demand that decrease in population could cause a housing surplus.

Secondly, local decline and increase in slums can be one of the underlying causes of housing vacancies. Local decline can be evaluated through several factors, including the status of industrial development, local economy, welfare of the employee, *etc.*

Thirdly, the excessive supply of housing due to indiscreet and expeditious urban development increased the number of vacant houses. Large-scale development has caused the supply to exceed the expected demands, which can lead to an increase in unsold and vacant houses.

2.3. Study Background: Global Trends Regarding Vacant Houses

Many American and European cities are facing demographic and economic trajectories leading to urban shrinkage. According to official data, 13% of urban regions in the U.S. and 54% of those in the EU have lost population in recent years [6].

As the population has been decreasing in Europe, there have been more policies that decrease city size through actions such as the demolition of vacant houses. In Europe, many cities face a range of social, economic and physical challenges. Social and economic challenges include shrinking populations, concentrated poverty, poorly performing schools, and decreasing tax revenues. Spatial challenges include obsolete or under-utilized infrastructure and vacant land and buildings [7].

Wiechman (2008) proposes that Europe possesses four main types of shrinking regions: (1) Western European industrial agglomerations in economic decline (e.g., Ruhr, Mersey Side, Pays Noir); (2) Peripheral, sparsely populated depopulation areas (primarily northern Sweden, eastern Finland and Scotland); (3) Transformation regions with serious industrial regression (large parts of Russia and Central and Eastern European states); and (4) Rural emigration areas with a rapid decrease of births (e.g., parts of Spain and Italy) [8]. Moreover, the European Parliament (2008) argues the influential economic aspect of shrinking cities. Over the 1995–2005 period, the economic situation of the “shrinking regions” was less favorable than that of other areas, *i.e.*, lower GDP per capita and higher unemployment rates. Most of these regions consisted of relatively poor outlying areas that were generally benefiting from cohesion policy investment. However, it is important to note the very diverse nature of regions in demographic decline (agricultural, industrial and sometimes metropolitan) [9].

While this information focuses upon address (unit) vacancy, as opposed to land vacancy, it does provide a consistent metric that illuminates the varied distribution of abandonment within different cities [8].

There is a high distribution of vacant houses in cities that are encountering population decrease from industrial decline, such as Leipzig in Germany—from the population outflow of East Germany through its reunification with West Germany. Through the corporate downsizing in the U.S. following the global economic recession, there has been an increase in the number of vacant houses, which are now being managed by private corporations [7]. Also in Ohio, the Youngstown 2010 plan looked to face the reality of its smaller size and focus on quality of life issues above urban growth [10].

Studies of vacant houses have increased in Japan. The general flow of these studies involve the regeneration of vacant houses in historical areas, the proper management of vacant houses and their valid uses as city resources, in addition to the renovation of vacant houses, and vacant house regeneration as it pertains to the activities of Non-Profit Organizations (NPOs). When we examine

the projects for “Maintenance Environment Improvement for Long-Term Vacant Houses” from the Ministry of Land, Infrastructure, Transport, and Tourism in 2011, which supports the use of these vacant houses as a nationwide project, we know that the projects being performed include disaster prevention, demolition support, renovation support, regional environment improvement projects, *etc.*

3. Present Status of Vacant Houses in Gyeonggi Province

3.1. Socioeconomic Factors Leading to Vacant Houses

The Shrinking Cities International Research Network (SCiRN) was founded in 2004 to conduct systematic research on shrinking cities. SCiRN defines a shrinking city as “a city with minimum of 10,000 people that showed a significant decrease in population over 2 years and suffers from economic decline due to a potential structural economic risk”. One may wonder about the relationship between shrinking cities and vacant houses. According to research conducted by the U.S. government, a shrinking city results in a dysfunctional real estate market (much more supply than demand) and a surplus of underutilized public infrastructure [11]. The remaining residents and businesses are burdened with higher taxes as the city tries to maintain its infrastructure for a significantly reduced population. In a shrinking city, population and economic growth are not anticipated in the foreseeable future, resulting in continued dysfunction in the market. Shrinkage exhibits itself in vacant and abandoned properties. Shilling and Logan (2009) define a shrinking city as an old, industrial one with more than a 25% decrease in population over a 40-year period, and an increased vacancy of both residential and commercial buildings [12]. Shilling (2009) suggests the use of vacant homes as a solution to meet the growing demand for affordable housing, and an opportunity for new smart growth policies by presenting the relationship between the U.S.’s smart growth plan and the use of vacant houses.

Within planning circles, a good deal of attention has been placed on the issue of shrinking cities, most notably at a symposium held at Berkeley, California in 2007 and the 2011 OECD symposium on the topic, held in Paris. Most of this work, however, concentrates on the serious socioeconomic problems the trend of urban shrinkage represents. Decreased tax bases, infrastructural abandonment and residential migration all exist as primary concerns in many post-industrial cities. Projects from planners, designers and artists around the issue of shrinking cities have run the gamut, most attempting to draw attention to the issue itself or advocate for temporary-use projects [13].

In the UK, a high rate of vacancy has been shown in old industrial zones of northern England such as Manchester, which implies a high correlation between the vacancy of houses and the high unemployment rate due to the downfall of the area’s manufacturing industry. Thus, this study attempts to identify the main socioeconomic factors related to the increase in house vacancy issues.

Previous studies were used to extract factors related to shrinking cities as we see from Table 1.

Table 1. Relevant Reference.

Index for Urban Shrinkage	Authors of Study	Three Research Hypotheses
Population	Oswalt (2005) [14], Pallagst (2009) [15], Wiechmann (2008) [8], Shilling and Logan (2009) [12]	Population
Industry	Oswalt (2005) [14], Pallagst (2009) [15], Wiechmann (2008) [8]	Urban decline
Financial Conditions (Tax)	Wilkinson (2011) [16], Hwang (2011) [17]	
City Decline	Dewar (2013) [18], Hwang (2011) [17]	Excess of building construction
Ratio of Vacant Houses	Shilling and Logan (2009) [12]	
More supply than demand	Molly (2014) [19]	

Japan, where there is an aging and low population, has encountered resultant urban issues. These not only include regional economic issues, such as an increase in the number of vacant houses and a decrease in land or real estate value, but also various social urban issues, such as safety and crime concerns arising from a lack of management, as well as sanitation problems arising from trash disposal in vacant houses. Thus, it is important to understand that vacancy should not only be considered a physical phenomenon, but also a much more complex social occurrence (for example, including the population distribution based on age, residential mobility, the return to rural areas, and the process of city formation). Accordingly, this study analyzes the factors with three different categories (Population, Urban Decline, Excess of Building Construction) behind the formation of vacant houses along with all related social aspects, and extracts factors most closely linked to the vacant house phenomenon by performing a correlation analysis.

3.2. Policies Regarding Vacant Houses in Korea

Vacant house investigations in Korea are being slowly expanded from those directed by the National Statistical Office into full investigations by local governments. After the mid-1990s, studies on usage plans for vacant houses in agricultural villages began with an analysis of actual vacant houses in agricultural areas. In 2010, investigations and studies of vacant houses throughout different cities began in addition to those in agricultural areas, as did experiments on residential communities regarding vacant houses. As the issue of the increasing number of vacant houses in city centers began to gain significance, regulations regarding vacant house management were established, and full investigations by local governments started to take shape [20].

The National Statistical Office, from which basic data regarding the vacant houses for this study was collected, began to manage the causes and types of vacant houses systematically in 2010 [5]. Although the National Statistical Office counts the number of vacant houses through conducting a housing census every five years, it is difficult to establish plans for each region because the data regarding small districts and differentiated counts are not disclosed due to private property protection laws. Furthermore, because the current vacant house investigations focus on the real estate offerings that were counted during the housing census, they do not fully reflect the actual state of vacant houses. However, we must examine the current status of vacant houses in Korea and the Gyeonggi Province based on this minimal, nationwide data from the National Statistical Office, and we must urgently establish plans that address this issue.

The existence of vacant house regulations in local governments can be used as a criterion that indicates the gravity of the vacant house issue and the reliability of the community's involvement regarding their use. There are currently 20 regions that enforce regulations for vacant house management in Korea as seen from (Table 2), and these regulations can be divided into those that manage and improve vacant houses, those that improve vacant houses in agricultural areas, those that improve vacant houses in downtown business-improvement areas, *etc.* [20]. These regulations are enforced in Busan in Gyeongsangnam Province, Anyang, Chungju, Uljin, Jeonju, Gwangyang, Naju, Namwon, Mokpo, Boseong, Suncheon, Gurye, *etc.* However, integrated management of vacant house information is still difficult because the investigation and management systems are divided by different departments, such as business-improvement areas and agricultural areas. Additionally, because vacant houses are being managed differently by each department—through differing thoughts in and out of business-improvement areas—a management system that integrates all cities cannot be achieved [3].

As mentioned (Table 2) in Nowon-gu, the areas with concentrations of vacant houses experienced an increase in crime, and issues such as accidents and arson began to arise. Therefore, vacant house regulations were enforced in 2011. Daejeon began an alley regeneration project in 2011 that would revitalize the city center to create art and welfare spaces using empty areas, and it established a need for investigation and management of these unused areas. Furthermore, there were vacant houses that owners have consented to have used for low income families or beneficiaries of the National Basic

Living Security Act, or areas to be used as public spaces for at least three years after demolition (resident shelters, culture and leisure facilities, sports facilities, public gardens, green belts, and public parking lots). All or a portion of the vacant house improvement expenses are supported, and information management systems are built and operated.

Table 2. Current status of support regulations for vacant house improvements.

Local Government	Name of Ordinance	Enactment Date
Seoul, Nowon-gu	Vacant House Management Ordinance for Redevelopment District	2011.10
Seoul, Gwanak-gu	Vacant House Maintenance Ordinance	2014.02
Gyeonggi Province, Anyang	Ordinance for Vacant House Management	2015.04
Incheon, Nam-gu	Vacant House Management Ordinance	2015.03
Chungcheongbuk-do, Cheongju	Support Ordinance for Vacant House Maintenance	2015.06
Gyeongsangnam-do	Maintenance Ordinance to Support Vacant House	2015.10
Chungcheongbuk-do, Uljin-gun	Support Ordinance for Vacant House Maintenance in Rural District	2015.06
Busan	Support Ordinance for Vacant House Maintenance	2013.10
Busan, Nam-gu	Vacant House Management Ordinance for Redevelopment District	2015.06
Gwangju, Nam-gu	Support Ordinance for Vacant House Maintenance	2015.04
Daejeon, Yuseong-gu	Management Ordinance for Old Buildings and Vacant Houses	2013.08
Daegu, Suseong-gu	Vacant House Maintenance Ordinance for Redevelopment District	2015.10
Jeollabuk-do, Jeonju	Support Ordinance for Vacant House Maintenance	2015.11
Jeollanam-do, Gwangyang	Support Ordinance for Vacant House Maintenance	2015.06
Jeollanam-do, Naju	Support Ordinance for Vacant House Maintenance	2015.08
Jeollabuk-do, Namwon	Support Ordinance for Vacant House Maintenance in Urban District	2015.09
Jeollanam-do, Mokpo	Vacant House Management Ordinance for Maintenance District	2015.10
Jeollanam-do, Boseong-gun	Support Ordinance for Vacant House Maintenance	2015.10
Jeollanam-do, Suncheon	Support Ordinance for Vacant House Maintenance	2015.10
Jeollanam-do, Gurye-gun	Ordinance for Vacant House Maintenance	2015.11

Source: Enhanced Local Laws and Regulations Information system [3].

Gyeonggi Province has actively begun to demolish and improve its vacant houses. Seongnam has persuaded the owners of 14 of the 21 unlicensed buildings, which were neglected as vacant houses for at least one year, to demolish them and procure parking lots and small parks. Icheon, Anseong, Gapyeong, Gimpo, and other cities are actively supporting the vacant house improvement project through agricultural housing improvements.

3.3. Current Vacant House Distribution in Korea and the Significance of Gyeonggi Province

According to the 2012 population and housing census from the National Statistical Office, there are about 800,000 empty houses throughout Korea, and Gyeonggi Province holds the highest percentage of them at 154,000 (20%), followed by Seoul at 78,000 (10%) [5] (Table 3).

Table 3. State of vacant house per major Korean City.

Administrative District	2010	Number of Houses	Rate (Vacant House/Total)
Total	793,848	14,677,419	0.054086349
Seoul	78,702	2,525,210	0.031166517
Gyeonggi	154,099	3,217,483	0.04789427
Gangwon	52,218	536,485	0.097333569
Incheon	41,437	822,552	0.050376146
Busan	40,957	1,031,331	0.03971276
Daegu	29,766	691,702	0.043032982

When we examine the vacant houses throughout Korea, there are many distributed throughout mountainous and agricultural areas as compared to the number of houses in use, and there are many distributed throughout cities compared to the surface area. Areas with many vacant houses in small districts of metropolitan areas include Gapyeong, Yangpeyong, Yeoncheon in Gyeonggi Province, and Jung-gu in the Ongjin County of Incheon. The majority of them are distributed throughout mountainous regions, agricultural areas, city outskirts (borders), and island areas.

And we examined the number of total vacant houses of Gyeonggi Province compared to the number of total vacant houses of Korea as we see from Figure 1.

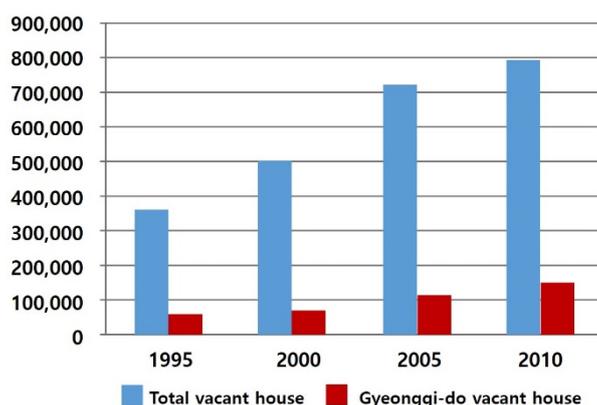


Figure 1. Changes in the number of vacant houses (from 1995 to 2010). Source: General Assessment for Population and Housing Census Report (2010) of Bureau of Statistics of Korea [5].

The highest proportion of vacant houses (vacancy rate) compared to the total number of houses is in Gangwon Province, followed by Incheon, and then Gyeonggi Province, and these vacancies are distributed throughout mountainous areas, agricultural areas, city outskirts (border), and island areas. The proportion of vacant houses compared to the number of houses is about 5.4% nationwide. Gangwon Province has the highest proportion at 10%, followed by Incheon at 5%, Gyeonggi Province at 4.8%, and Seoul at 3% [5].

The proportion of vacant houses compared to surface area is significantly higher in cities than in provinces as we see from Figure 2. Dong-gu and Nam-gu of Incheon as well as Eunpyeong-gu, Yongsan-gu, Map-gu, Dongdaemun-gu, Seongbuk-gu, and Yangcheon-gu of Seoul were among the top 15 regions, and Gyeonggi Province displayed mid-range status among 16 cities and provinces as of 2010. The number of vacant houses compared to surface area is higher in city centers due to unsold apartments, developmental restrictions arising from the cancellation of new downtown areas in light of an aging population, or changes in the city's industrial structure and administration center.

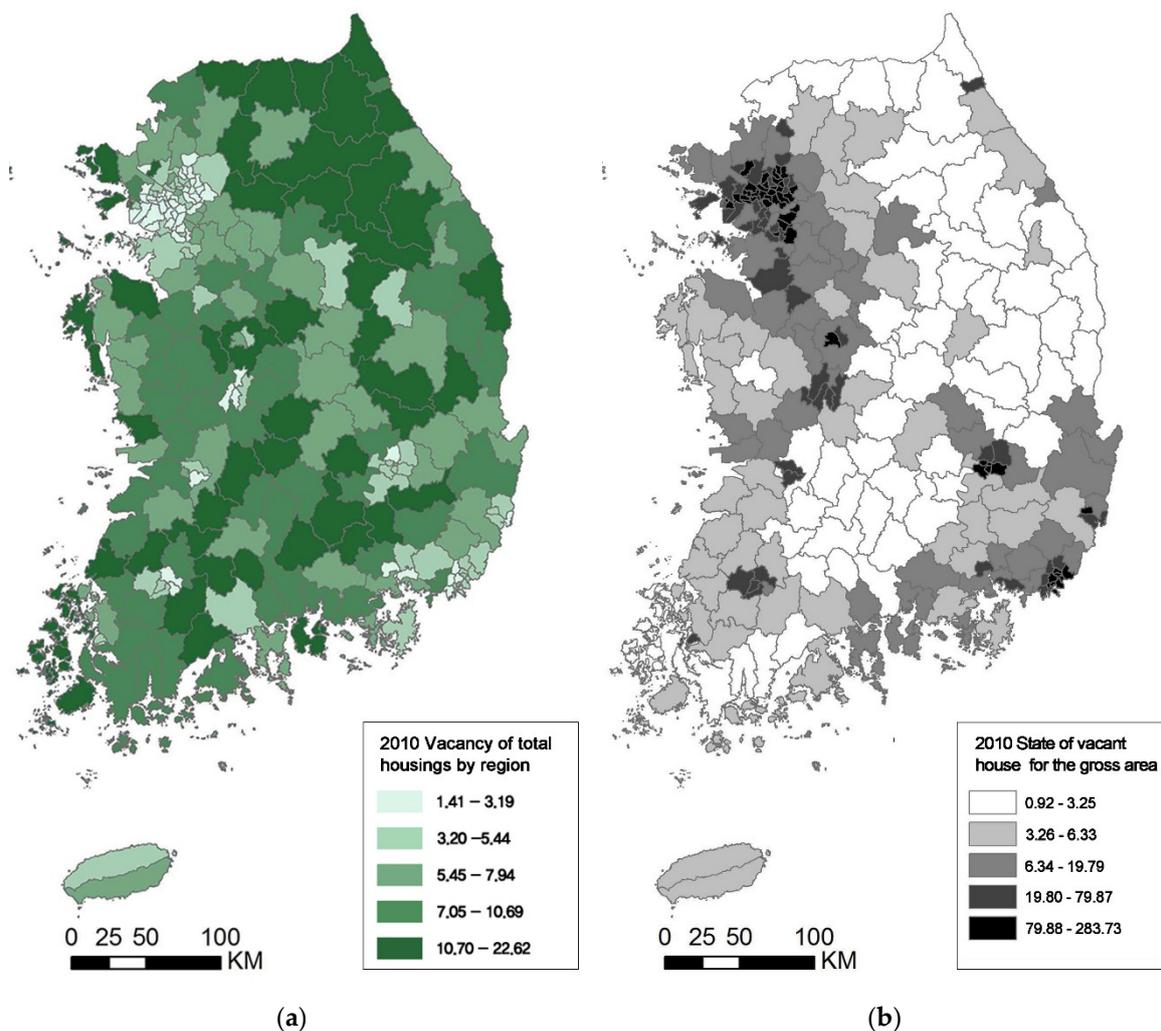


Figure 2. (a) 2010 State of Vacant House for the Number of Total Houses (b) 2010 State of Vacant House for the Gross Area.

After the breakdown of the bubble economy, there was a decrease in long-term residents when lifetime employment decreased in the same regions. In city centers with a vibrant economy, the supply and demand for new construction are active; but, during an economic recession, the supply rate (number of vacant houses/total number of houses) increases exponentially. There are more houses for lease than for sale, and the population decreases. Therefore, the demand for houses decreases compared to the supply of houses that were built. This unbalance in supply and demand increases the vacancy rate, and if this persists, there will remain buildings that cannot be demolished even though their market value has diminished. We will be making use of such hidden resources by properly investigating these vacant houses and turning them into usable resources.

We examined the correlation between the vacant houses and the population of Gyeonggi Province by analyzing statistical data from 2005, 2010, and 2015. The residents of Gyeonggi Province comprise about 24% of the entire population of Korea, and Gyeonggi Province is therefore the most populated local government in the country. In addition, Suwon, Seongnam, Goyang, Yongin, and Bucheon, where much development has occurred compared to other regions, are highly populated [21]. Additionally, the number of vacant houses from 2005 to 2010 has increased quickly in Yongin, Seongnam and Ansan (Figure 3). When we examined the population density of cities and counties from 2005, 2010 and 2015, the lowest value in 2005 was 55.35 people/km² and the highest was 16,045.26 people/km² (Figure 4). The year 2015 had a range from 53.52 people/km² to 16,192.59/km², which showed no changes

in population density over 10 years. However, since the overall population growth has continued, it suggests that the cities with previously low population densities have grown to have mid-scale population densities [21].

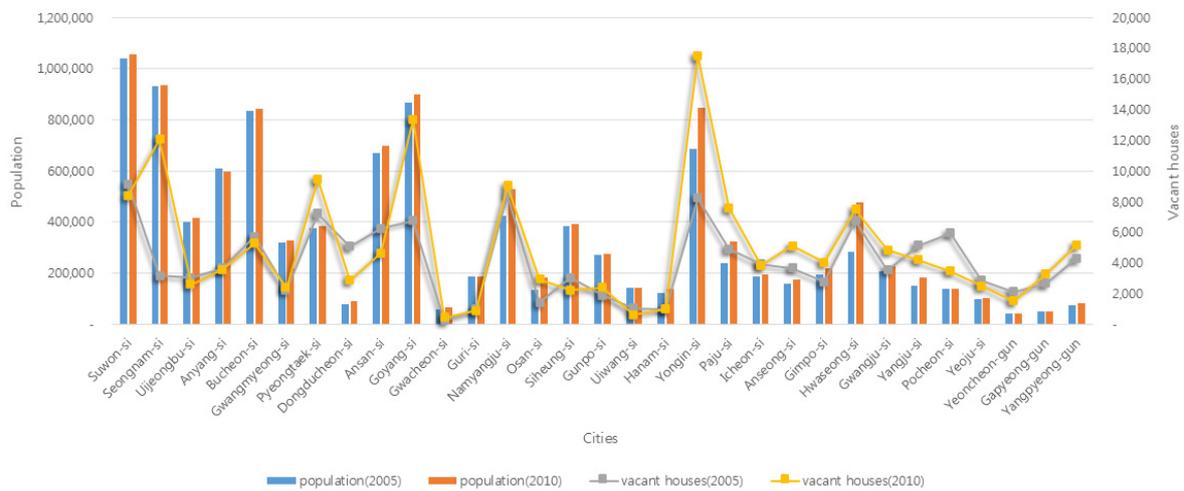


Figure 3. Population and vacant houses in Gyeonggi Province (2005 and 2010).

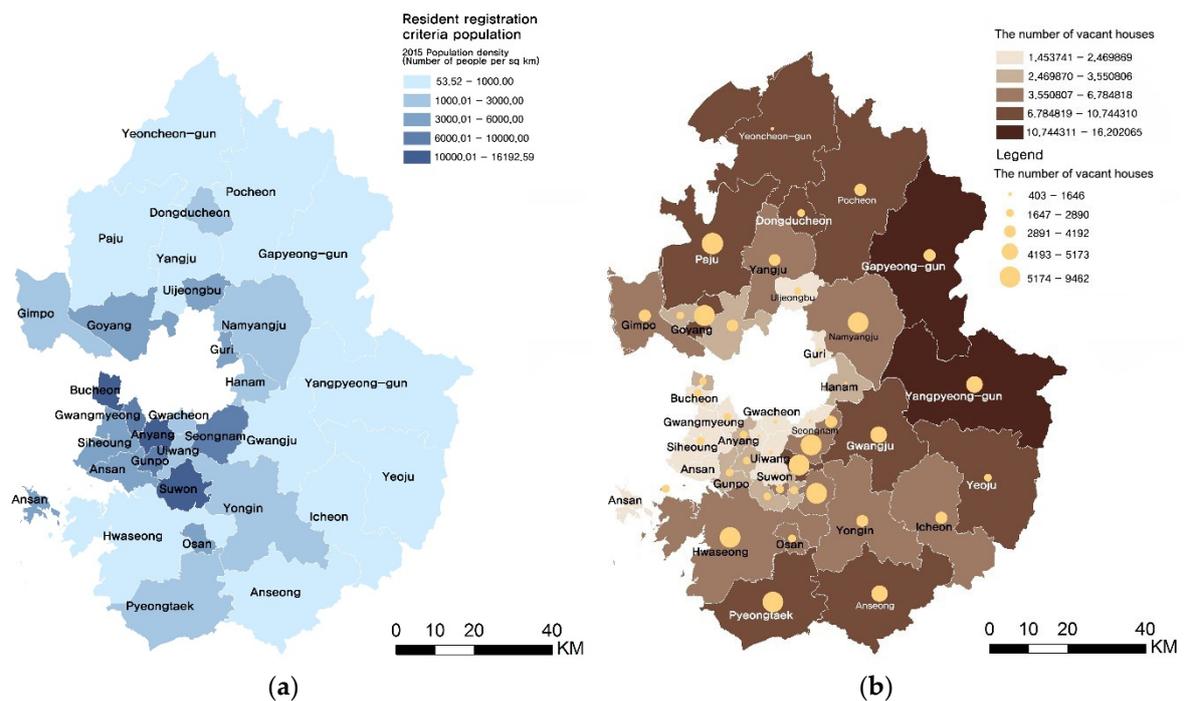


Figure 4. (a) State of Population Density; (b) State of Ratio of Vacant House for Total Number of Houses (Data: Written based on the Population and Housing Census (2010) [5].

4. The Major Socioeconomic Factors and Vacant Houses in Gyeonggi Province

4.1. Population Density and Status of Vacant Houses

There are both large and small cities in Gyeonggi Province. As populations declined all over, the number of vacant houses increased, leading to a negative correlation in the ratio of vacant houses to lived-in houses. However, the cities of Yangpyeong and Gapyeong show a different trend with this

correlation because they are resort areas with a low number of permanent residents but a high floating population comprising owners of second houses and accommodations.

The population of Gyeonggi Province was subdivided into the categories of children, the elderly, females, and males, and we examined the population and the ratio of vacant houses in different cities of Gyeonggi Province (Figure 5). The types of houses were categorized as “unsold” and “partly damaged” in order to examine the correlation between the population distribution in each category and the vacancy of each house type in greater depth.

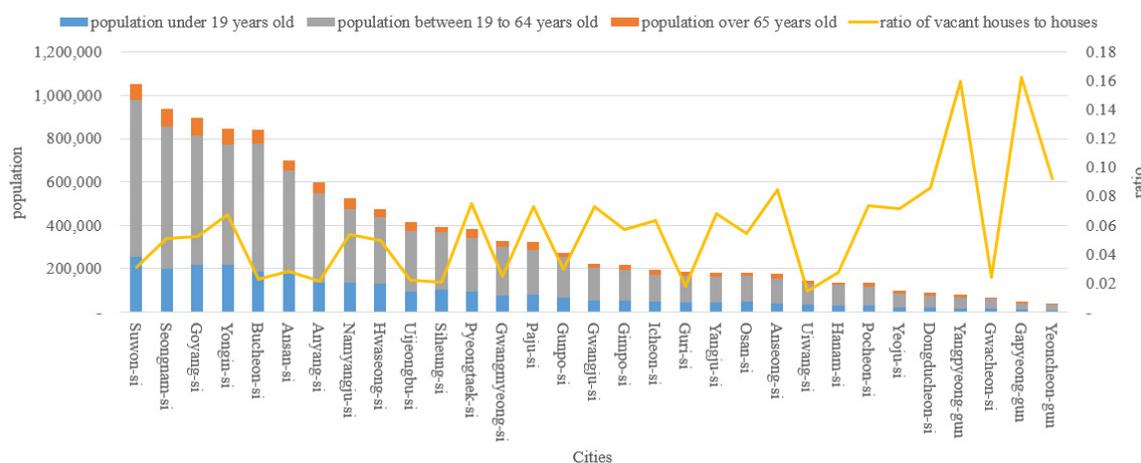


Figure 5. Population of cities in Gyeonggi Province; ratio of vacant houses to occupied houses and population density.

From the data, it is evident that vacant houses and population size were positively correlated, especially among the elder population (Table 4). Although it is natural to have more vacant houses in cities with large populations, the interesting finding is that unsold houses have an important influence on vacant houses as compared to those with partial damage.

Table 4. Correlation between vacant house and population density.

Population		Youth Population	Elderly Population	Female Population	Male Population	Total Population
Number of vacant houses	Pearson correlation coefficient	0.742 **	0.829 **	0.721 **	0.728 **	0.724 **
	p-Value	0	0	0	0	0
	N	31	31	31	31	31
Unsold houses	Pearson correlation coefficient	0.700 **	0.781 **	0.680 **	0.693 **	0.687 **
	p-Value	0	0	0	0	0
	N	31	31	31	31	31
Partially damaged	Pearson correlation coefficient	0.222	0.306	0.196	0.191	0.193
	p-Value	0.231	0.094	0.292	0.303	0.297
	N	31	31	31	31	31

** Source: General Assessment for Population and Housing Census Report (2010) of Bureau of Statistics of Korea [5].

However, according to the population ratio analysis (Table 5), the total population ratio has a strong, negative correlation with vacant houses, while the elderly population has no significant relationship with vacant houses. In other words, while a low population density (rather than just the size of the population) can lead to a huge number of vacant houses, a dense population district with many elderly people can also lead to many vacant houses. In addition, it is inferred that vacant houses are related to the factors of age and sex. To identify the relation, correlation analysis is applied for population statistics and vacant houses. As a result, it can be ascertained that only one population factor, the elderly population rate, is not significant in terms of Pearson’s r values according to Table 5

whereas all the others have a significant negative correlation. This means that the higher ratio of vacant houses exists in lower population regions. Although it would appear that the elderly people ratio contributes a negative correlation, it is actually a lower correlation and not significant, thereby suggesting that this factor affects different aspects of housing vacancies.

Table 5. Correlation between population ratio and the ratio of vacant houses.

Factors	Detailed Factors	Correlation(r) with Ratio of Vacant Houses
Population	The ratio of youth population	−0.370 ($p < 0.040$)
	The ratio of elderly population	−0.238 ($p < 0.198$)
	The ratio of female population	−0.371 ($p < 0.040$)
	The ratio of male population	−0.367 ($p < 0.042$)
	The ratio of total population	−0.363 ($p < 0.045$)

Source: General Assessment for Population and Housing Census Report (2010) of Bureau of Statistics of Korea [5].

As we see from the correlation analysis table, there is a strong interrelation between the number of population and the number of vacant houses.

The image above shows data regarding the increasing rate in both population and the number of vacant houses. When we examine the change of the number of vacant houses in 2005, 2010, and 2015, the number was found to increase steadily as the population decreases. This may cause a decline of vitality in these regions. It is important to eliminate long periods of neglect regarding those potential vacant houses caused by the growing number of senior citizens, and we must establish plans to use these houses and to put them back on the market.

Next, we examined the proportion of vacant houses compared to the population of those who returned in order to farm for each region of Gyeonggi Province.

In order to find the correlation between the two factors, we examined the Pearson correlation coefficient, and found an extremely high correlation of 0.678. The image on the right shows that Yangpyeong County was the region with the highest percentage of returning farmers compared to vacant houses; Paju and Pocheon were also found to have a similarly high correlation. Programs must be developed that allow farmers in these regions to utilize these vacant houses.

Gyeonggi Province actively supports the funding for repairing vacant houses according to the return to farming and rural support policies. Yeoncheon County provides moving funds for applicants to return to farming and rural areas, repair fees for detached houses, construction funds for houses, policy grants, agricultural machine rental fees, *etc.* Pocheon also provides settlement funds for farmers, agricultural utility fees, housewarming funds, *etc.* We must set up projects that investigate vacant houses for people wishing to farm or live in Yangpyeong, Paju, or Pocheon—areas with high farming populations and many vacant houses—and that connects them with potential farmers while concurrently searching for owners and providing agricultural training and information free of charge.

4.2. Regional Decline and Vacant Houses

Vacant houses are distributed throughout all regions of Gyeonggi Province, including those that are in decline and those that are not.

The small districts of Gyeonggi Province, which satisfy all three standards of urban decline, are regions inside cities and counties where relatively many vacant houses are distributed. The complex decline index shown on the next table includes indexes that consider seven different factors (manufacturer proportion, proportion of aged houses, number of medical personnel per 1000 people, library's seating capacity per 1000 people, net migration rate, number of recipients of basic living securities per 1000 people, and amount of local tax collected per person). On the other hand, the decline index from the Ministry of Land is based on three different factors (number of businesses, population, and number of old buildings) and is applied to the selection of urban regeneration regions.

In this study, we used the complex decline index with seven different factors, in order to analyze the factors causing the shrinking of the city. To calculate the Decline Complex Index (DCI), a total of seven variables were selected through the survey conducted by government officials in previous research [17]. These variables were classified into two categories, *i.e.*, enhancing declination factor and diminishing declination factor. The ratio of the damaged house to the total number of houses and the number of the national basic livelihood recipients per 1000 people are categorized as indicators of deepening declination, while others are categorized as alleviating. These two categories are applied to two types of Z-scoring that convert alleviating factors into decreasing DCI and *vice versa*, and then seven Z-scored variables are used to calculate the eigenvalues and the communality through factor analysis. It was determined that DCIs are summarized from the results of the multiplication between each weight value, which was obtained from the calculation results using the seven variables (Table 6).

Table 6. Correlation between vacant houses and degree of city decline.

	Declined Complex Index	Vacant Houses	Ratio of Vacant houses	Damaged Houses/Total	Damaged/Vacant Houses	Ratio of Trading Leases	Ratio of Unsold Houses	Ratio of Rouses in Need of Repair	Ratio of Temporary Use	Ratio of Commercial	<i>Etc.</i>	Ratio of Urbanization	
Declined Complex Index	Pearson correlation coefficient	1	0.196	−0.517*	−0.369	−0.211	0.227	0.226	0.283	−0.035	0.296	0.095	0.445
	<i>p</i>-Value	-	0.436	0.028	0.132	0.401	0.364	0.366	0.255	0.89	0.232	0.707	0.064
	N	18	18	18	18	18	18	18	18	18	18	18	18
Correlation of non-declined district													

From the declined city degree (Table 6), the higher declined complex index has a strong correlation with the ratio of unsold houses (0.280). As is evident from the Pearson correlation index, the ratio of vacant houses has the maximum correlation with DCI with -0.517 . After subsequently analyzing the correlation of all vacant houses, we found that vacant houses are heavily distributed due to unsold apartments, even in city centers that are without decline factors.

The aging of buildings and the degree of damage in vacant houses are standards that describe the reasons behind regional decline and vacant houses.

Damage in vacant houses can be criteria for determining whether they are currently being maintained, and damage can also identify faulty houses. Hwaseong, Pyeongtaek, Anseong, Paju, Gimpo, and Yangju are cities with many vacant houses that are partially damaged in Gyeonggi Province.

The factors used for calculating Declined Complex Index were selected based on the status of industrial development, the local economy, and the welfare of the employee. In order to find the correlation and the impact factor, the factors were examined using Pearson's correlation analysis before computing the DCI. It could be concluded that only the one factor of the national basic livelihood recipients per 1000 was significant and demonstrated a positive relation with a Pearson's r value of 0.633, as shown in Table 7.

Table 7. Correlation between vacant houses and index of urban decline.

Factors	Detailed Factors	Correlation(r) with Ratio of Vacant House
Declined Complex Index	Ratio of manufacture to whole company	−0.110 (not significant)
	Medical workers per 1000 people	−0.068 (not significant)
	Library seats per 1000 people	−0.035 (not significant)
	Net migration rate	0.173 (not significant)
	National basic livelihood recipients per 1000 people	0.633 ($p < 0.01$)
	Amount of local tax collection per one person	−0.010 (not significant)
	Ratio of old houses to whole houses	−0.133 (not significant)

Source: Company Survey (2010) and General Statistics for the Korea (2010) of Bureau of Statistics of Korea [5].

Vacant house damage proportion was the highest in Yeosu, followed in descending order by Hwaseong, Pocheon, Gimpo, Yangju, Yeoncheon, Icheon, Anseong, and Yangpyeong (Figure 6). The proportion of partially damaged vacant houses signified a phenomenon from regional aging, and this was applicable to historical regions or regions in decline, unlike apartment distribution. Since Yeosu, Hwaseong, Pocheon, Gimpo, and Yangju had the highest proportions of partially damaged vacant houses, we examined the relationship between the aging of houses and the vacant house phenomenon by comparing the number of buildings built before 1979, from 1980–1994, and from 1994–2010 for each region. We found that many vacant houses were distributed at the locations wherein many buildings had been constructed from 1980–1994 (blue section in Figure 7).

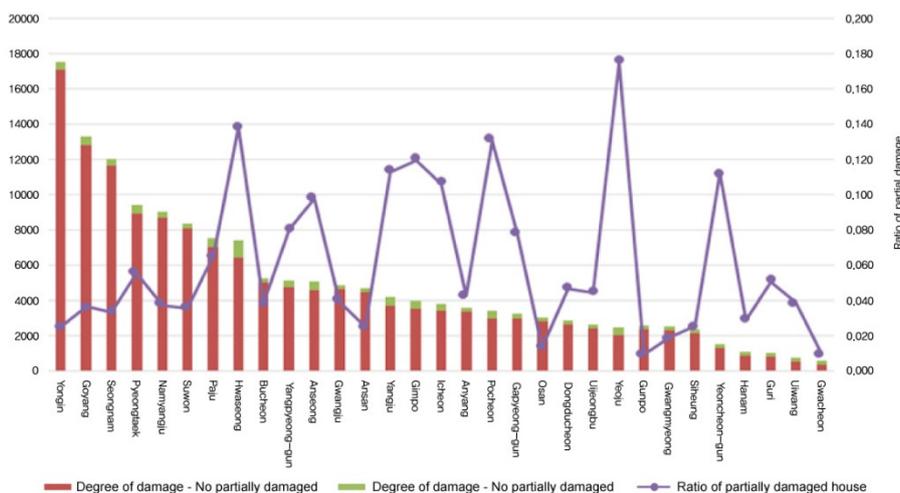


Figure 6. Degree of damage of vacant houses.

In particular, the aging of a region is a more obvious factor than the aging of a house regarding the cause of said vacancy because industrial changes or existing city centers decline as new city centers are built, the population decreases with the loss of key functions, and vacant houses arise as a result. The characteristics of an aged region are shown with the aging of its buildings and population, and are complexly linked to the long-term issues in the region, such as slumification and social welfare. Long-term planning with continual support and a vision is required at the local government level, and a more long-term, discerning methodology is required regarding region regeneration and village creation.

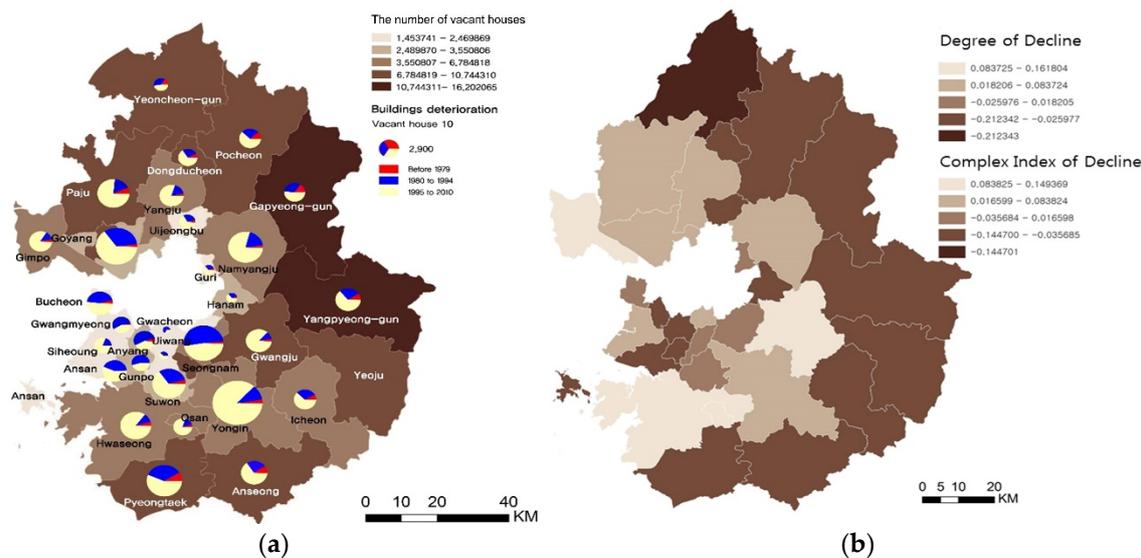


Figure 7. (a) Ratio of Old Houses (Red: Before 1979, Blue: 1980~1994, Yellow: 1995~2010); (b) Degree of Shrinking City of Gyeonggi Province.

4.3. Excess Supply of Urban Development and Vacant Houses

Korea’s policy on residential houses has mainly focused on the quantitative supply of homes in response to the demand for houses, which was due to a high increase in the population, which in turn resulted from the process of city formation [22]. This indiscriminate and large-scale development, however, eventually exceeded demand, leading to unsold apartments and vacant houses. The occurrence of vacant houses and population outflow accelerate regional decline and create regional issues such as a decrease in the value of land and real estate, safety issues from a lack of management, and sanitation issues.

We may deduce that an excess supply of houses is the reason behind the increase in vacant houses, but we have examined the correlation between the number of vacant houses compared to all houses and the housing supply rate in order to verify this.

It is suggested that the distribution of buildings influences the number of vacant houses, as more buildings lead to more vacant houses. Detailed factors were chosen from the building statistics of Korea and a correlation analysis was performed. It was found that all factors exhibit a significant positive correlation, as shown in Table 8.

Table 8. Correlation between vacant house and distribution ratio of house.

Factors	Detailed Factors	Correlation(<i>t</i>) with Ratio of Vacant House
Distribution of building	Distribution ratio of housing	0.776 (<i>p</i> < 0.01)
	Construction permit per one person	0.896 (<i>p</i> < 0.01)
	Building per one person	0.833 (<i>p</i> < 0.01)

Source: Building Statistics (2010, 2012) of Ministry of Land, Infrastructure and Transport of Korea [5].

As we see from the correlation analysis table, the ratio of vacant houses shows the strong correlation with the distribution ratio of house with 0.776 Pearson correlation coefficient, meaning the more distribution of houses can make higher ratio of vacant house. Moreover, the number of construction permits and the number of buildings also showed a high correlation of 0.896, and 0.833, respectively, as seen from the table. The number of buildings which consist of housing, has already been mentioned. When it comes to ratio of housing to buildings, the total housing accounts for 57.17%, which mainly includes single family housing (36.42%), multi-family housing (11.40%) and apartment

social enterprises. In the state of Michigan, the number of vacant houses exploded when employees at the automobile corporation, General Motors, drastically decreased from 80,000 to 5000–6000 people. The Detroit Land Bank was established in order to manage these vacant houses. The Detroit Land Bank reviewed whether vacant houses should be taken down or reused, and the properties that had been occupied by the demolished buildings were turned into green belts or community spaces. Over 1000 vacant houses have been managed thus far, and investments were made to turn 200–300 houses into high-quality buildings. The Detroit Land Bank operates by acquiring one-third of its funds from the Ford Foundation, among others, one-third from default payments and penalty fees charged to people who fail to make payments on time, and one-third from the rental fees and sales of buildings that they manage.

5.2. Vacant House Type 2: Unsold Apartment

The presence of vacant houses that result from unsold homes in new towns is a unique characteristic of Korea, especially in metropolitan areas, and about 30% of vacant houses are distributed in Gyeonggi Province. Therefore, actions must be taken to address these vacancies. The vacant house phenomenon in city centers is caused by an increase of unsold or unleased houses, or by large-scale relocation sites that cause urban sprawl. About 400,000 of the 800,000 vacant units in the country are apartments. Gyeonggi Province holds 90,000 of the total 150,000 vacant addresses, and about 68% of these are apartments. Considering this fact, there is an urgent need for countermeasures regarding vacant apartments.

Gyeonggi Province has about 50,000 unsold and unleased houses, about 53% of which comprises apartment vacancies, and this accounts for 32% of all vacant houses in all of Gyeonggi Province. The regions with many unsold and unleased houses are Bundang County in Seongnam, Suji County in Yongin, Ilsandong County in Goyang, Kiheung County in Yongin, Namyangju, Paju, Gwangju, Pyeongtaek, and Hwaseong, in descending order.

5.3. Vacant House Type 3: Agricultural and Lifestyle Houses

Lifestyle duties can be created in villages by remodeling vacant houses. Regions with many vacant houses are beginning to recognize them as regional resources, linking them with remodeling and town creation to trigger village creation projects on a small-scale distribution. A representative example in Korea is “Jangsu Village”, which remodeled its growing number of longstanding vacant houses and used them as village assets. Vacant houses that had been neglected over long periods of time in regions that were planning redevelopment in 2014 were remodeled and turned into a village cafe, the Jangsu Village museum, *etc.*; in this manner, improvement projects for aging, faulty communities proceeded. Neighborhood carpenters from village businesses, all of whom were residents, took part in various activities such as fixing houses in the village and constructing custom-made devices for people with disabilities [23].

Vacant house investigations are being performed, while searching for owners, for people who want to live in the agricultural or rural regions of Gyeonggi Province. Mindeule Cohousing, which is a social enterprise, connects vacant houses with potential farmers and also provides agricultural training and information at no charge. They provide information about renting vacant houses so that people can experience farming temporarily while deciding whether to switch to this lifestyle. Houses requiring repair are rented for free. Houses that only require a change of wallpaper or flooring are rented for 100,000 won per month.

Mindeule Cohousing, which is a social, job-creating enterprise from the Open Community Training Welfare Foundation Seoul Branch, offers free information to people wishing to live in agricultural or rural areas (Figure 9). It was recognized as a social enterprise by the Ministry of Employment and Labor on 22 December 2010. Mindeule Cohousing was appointed by local governments to perform vacant house investigations. This past February, they investigated over 500 vacant houses in 199 villages in the Jangsu country of Jeollabuk Province, and they discovered

over 40 vacant houses that could be utilized [23]. Although there is no accurate information on vacant houses in agricultural areas around the country, according to sample investigations that were performed in different counties, it is assumed that there is an average of about 500 vacant houses in each county.



Figure 9. Social enterprise mindeule co-housing [24].

Mindeule Cohousing searches for usable houses, connects them to potential farmers, and provides agricultural training. In 2010, over 300 potential farmers started agricultural tours with the investigation of vacant houses in Gwesan, Boryeong, Sangju, Asan, Bonghwa, Jangsu, and Yeongdong; vigorous remodeling and training programs are underway [25].

5.4. Vacant House Type 4: Historical Sites

Vacant houses in historical sites require management policies that pursue their preservation and usage alongside investigations of the region's historical value. Even if vacant houses in declining cities are remodeled, it is difficult to recover the amount that was invested. Therefore, it is important to demolish those vacant houses with no value and replace them with green belts and open spaces. Leipzig, Germany attempted to regenerate the declining population and address the vacant house issue, which occurred due to the deindustrialization that followed reunification, through a "preservation by usage" concept. Using this strategy, vacant houses with historical value were sorted and preserved while being utilized [24].

A vacant house mediator NPO, Haushalten, was established, centering on local resident groups (leading district associations), and the concept of preservation became the city's identifying factor. Haushalten began at a time when the vacancy rate in regions near city centers rose above 50% due to population outflow caused by industrial decline [26]. Though initially funded by subsidies from the city, it is now supported by donations from current users as we see from Figure 10. Owners receive building management fees from users to minimize the cost of building maintenance. Though it started as a movement to revive spaces that were not demolished due to their historical value, interest is being expanded gradually to form a basis upon its affordable and flexible leasing system.

5.5. Management Plans for Vacant Houses

In order to manage vacant houses efficiently, systems must be built that gather information on vacant house assets and match owners to users. Supply services that share vacant house information and match owners to users must be expanded, and real estate information on vacant houses must be acquired to generate data. A management system between local governments and various agents (real estate firms, development companies, and small-scale architecture firms) must be created in order to share information on vacant houses and repair them. Policy support is also needed so that vacant houses can be connected to community activities and turned into regional resources.

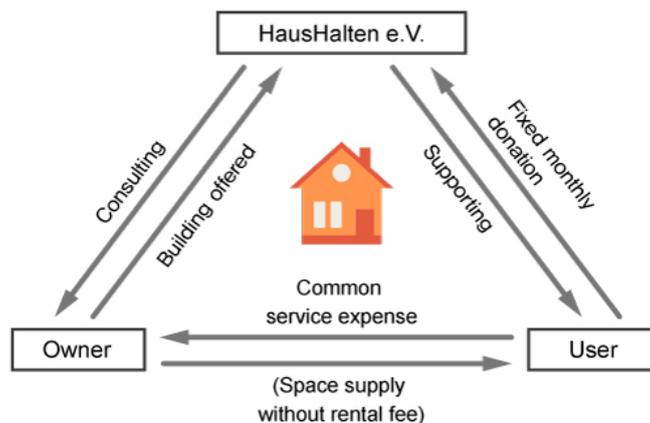


Figure 10. System of Haushalten in Leipzig, Germany [26].

The UK's central government has established policies to manage the vacant house phenomenon, such as creating a budget policy entitled the "New Home Bonus". Moreover, the government has analyzed and constructed a nationwide database on vacant houses to develop a guideline for their use by the general public. Furthermore, the government has implemented an "Empty House Premium" policy, which puts a council tax on vacant houses. Each provincial council follows the guidelines presented by the central government in coordinating such policies between landowners and service providers. Bolton Council in Manchester has formed the Empty Homes Team and hired professional coordinators to conduct operations to reduce empty homes more effectively [27].

Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT) is developing various policies and projects on the use of vacant houses, and each city council supports different types of projects that can help solve the vacant house problem (Figure 11). The well-known case of Japan's vacant house management is that of Akiya Bank. Information on vacant houses is being collected through Akiya bank franchises, a system that matches owners to users [28]. The Akiya bank system releases information on vacant houses on the internet and locates buyers and residents throughout the country to revitalize regions. It is responsible for linking 20% of Japan's migration and exchange policies to vacant house usage policies at the city level. Since 2006, the Japan Trans-Housing Institute has been operating a "Lending My House" system where users throughout Japan (regardless of nationality) over the age of 50 years old and their co-habitants may borrow houses for the rest of their lives [24]. Even if a house again becomes vacant after the first occupant has passed away or moved, safe operation is still possible through receipt of guaranteed funds from the county in the form of minimum guaranteed rent and since 10% of the rent may be used as accumulated money from vacant houses and shops. In order to lessen the uncertainty of short-term leases, a support system that offers a three-year lease guarantee is also provided.

Guidelines must be suggested so that regional organizations related to social economy and village creation can turn vacant housing into spatial resources, based on location, in order to strengthen regional activities and use them accordingly.

The investigation process is a medium that analyzes the reason why vacant houses and buildings occur and analyzes their different types so that organizations can understand the region and build customized content. In other words, the process of investigating vacant houses marks the beginning of village creation and becomes the basis for planning region-revitalization projects in the future. Training projects for agricultural and rural areas in Gyeonggi Province are taking strides forward, and demonstration projects may begin by connecting these projects with those that use vacant houses. Agricultural experience villages in various cities and counties can become more systematic through the use of vacant houses.

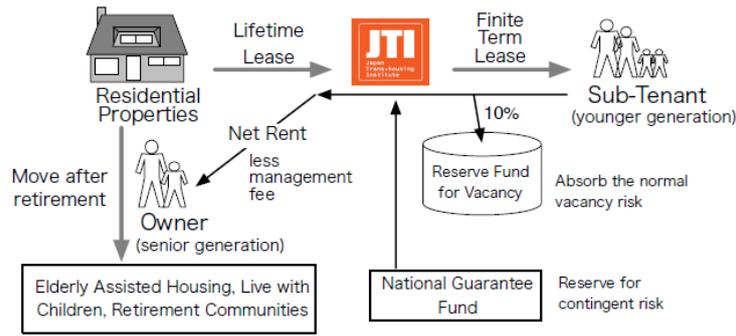


Figure 11. System of lending my house of the Japan trans-housing institute [28].

The distribution of modern inheritances within Gyeonggi Province must be understood by investigating nearby vacant houses that were built concurrently, and an alternative that can directly use these must be presented by connecting them.

For example, the plan for social housing in Korea included remodeling vacant houses, and house-leasing businesses allowed social groups protecting the less fortunate to participate. Toad Housing in Eunpyeong County is a social enterprise that manages housing renovation plans such as the utilization of the vacant house in Figure 12 [24]. These plans show how to manage houses or apartments, equipped with city-based facilities, such as anti-crime parking lots in residential areas that are filled with single and multi-family houses. As a part of Toad Housing’s business, neglected vacant houses are leased from building owners, remodeled into social houses, and re-leased to youths from vulnerable social groups. Yongsan County supports 50% of the brokerage fees as part of their support project for the spatial management of private rental apartments, and vacant houses that were neglected for long periods of time are remodeled through extended operations conducted by vacant house remodeling businesses and then utilized as rental properties.

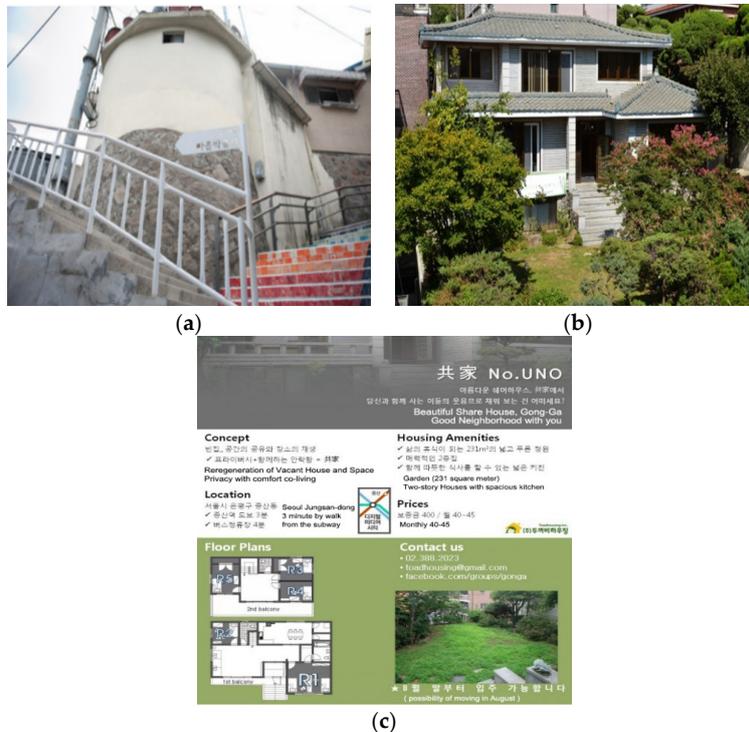


Figure 12. (a) Jangsumaeul town museum, Korea [23]; (b) Sharehouse in Eunpyung-gu, Korea [25]; (c) Utilization for Vacant House of Toad Housing, Korea [25].

6. Conclusions and Implications

At the outset of this study, we presented three hypotheses for explaining reasons behind increasing numbers of vacant houses. Among the three hypotheses (an aging population, shrinking cities, oversupply of housing). Our investigation illustrates that excess building construction (e.g., recent construction caused by overdevelopment of real estate) and the local decline (e.g., the number of national basic livelihood recipients) showed the strongest correlation with vacant houses. While there does not appear to be a direct correlation between an elderly population and vacant houses, it is nevertheless suggested by the situation of unsold houses.

It is imperative that vacant houses attract interest, have their present conditions investigated, and become repurposed for continuous growth and city maintenance. As we have examined above, the most important cause of vacant houses is the housing oversupply resulting from overdevelopment of real estate. Therefore, the most basic requirement in preventing the increase of vacant houses is to predict and manage the supply and demand of houses by region, thereby preventing vacant houses in the future.

The definition and scope of investigation concerning vacant houses differs in each country, and the investigation results become their standard of usage. In order to recognize and utilize vacant houses as a regional resource, systematic investigations must be performed by local governments. The vacant house formation process is evidence of the regional issues that follow urban development. There must be a thorough investigation that attempts to understand the region, as this will become an important foundation for future regional activities. A systematic vacant house investigation based on field visitations must take priority so that a variety of vacant houses can be used by matching them to their regional characteristics. A utilization plan based on detailed conditions and distribution investigations for each region must be presented, and investigation guidelines and manuals must be written that standardize the investigation deviations for each region. Vacant house investigations that focus on field visitation with the goal of utilization must be performed, as opposed to a simple status investigation. We must be aware that there is a risk of recklessly destroying future regional inheritances if demolitions proceed before vacant houses are appraised.

Minimal preparation and support are the basis of vacant house ordinances at the policy level. The designation of vacant house ordinances is the last resort that is used when the issue is so serious that there are no options but forcible measures. Before entering the demolition stage, incentives must be established that encourage the active participation of vacant house owners in the investigation process. We must also make sure that vacant house demolitions do not forcibly demolish the region's historical resources. There is a possibility that arbitrary improvements may be misused by local governments due to ambiguous interpretation of the law, so the enactment of vacant house ordinances must be performed in good faith.

Detailed guidelines must be presented regarding the utilization of vacant houses according to each type. Just as Gyeonggi Province, where 60% of the vacant addresses are apartments, special management is required in regions with unsold apartments. A diversification of remodeling techniques that considers the population structure and demand size by region is required. There must also be support for responsive remodeling of existing apartments to satisfy the demand for small-scale houses in preparation for future population changes, such as the aging population and single-person households. How vacant houses come to be is closely linked to the characteristics and issues of the entire region. We must understand the reasons why vacant houses occur according to their regional characteristics, assess their different types, and establish detailed countermeasures.

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