주택도시연구 제11권 제3호 https://doi.org/10.26700/shuri.2021.12.11.3.103
SH Urban Research & Insight Vol. 11, No. 3, pp. 103~135(2021. 12)

공항소음대책지역의 토지매수 후 지역활성화 계획*

Research on the Urban Revitalization Planning of Land Purchase and Compensation Areas in the Airport Noise Countermeasure Area

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Abstract

The purpose of this study was to examine the use of empty houses and abandoned land left in the process of land compensation of aircraft noise countermeasure areas, and also to suggest solutions which can contribute to local community in cooperation with urban regeneration projects. Thus, this study proposes a revitalization plan for temporary use of residences and living labs on the sites of residential areas with Weighted Equivalent Continuous Perceived Noise Level (WECPNL) above 85 inside airplane noise damage areas of Seoul. First, we define the background and purpose of the research and provide a review of previous academic research on the theme. Second, we analyze the policy and system related to domestic noise countermeasure areas and summarize limitations and problems of the policy. Third, we analyze the method for coexistence of the local community through living lab proposals. Finally, we discuss the possibility of a noise countermeasure area functioning as a Test-bed area with short-term and long-term usability. It is expected to become a basic benchmark to establish a practical plan to provide sustainable living environment benefiting to local people, and also to help minimize civil complaints on aircraft noise.

| Key words | 공항소음대책사업, 토지매수지역, 리빙랩, 도시재생, 소규모주택정비사업
Airport Noise Countermeasure Project, Inverse Condemnation Area, Living Lab, Urban Regeneration, Small-block Housing Redevelopment Project

* This research was supported by the Basic Science Research Program through the National Research Foundation of Korea. (NRF-2020R1A2C1006354). I would like to express my gratitude to student researchers Kim Ji-soo and Hyun Sun-yong for helping us with this study. Also, we would like to thank Shinwol 3-dong Urban Regeneration Support Center and Yangcheon-gu Office for helping us with this study.
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1. Introduction

1.1 Background and Purpose

The government has been executing various noise countermeasure projects including housing with soundproofing and cooling facilities, public television license fee, subsidy on electricity charges, and local welfare improvements in designated/notified areas through the Enforcement Decree of the Airport Noise Prevention and Areas Assistance Act which took effect on September 23rd, 2010. All these policy measures carried out through the top-down process with no comprehensive approaches to the areas in trouble along with support activities to enhance the bond with local residents. Current airport noise countermeasures in effect including installation of soundproof walls and an operation of noise reduction and surveillance center still have revealed the limits in reducing direct or indirect noise damage in the school and residential areas.

Thus, 'Compensation of Noise Countermeasure Area and inverse condemnation' has been enacted on February 2017 in order to provide a feasible solution to noise damage areas based on the Enforcement Decree of the Airport Noise Prevention and Areas Assistance Act. With the implementation of this act, however, many difficulties were exposed in the process of implementing public projects as it took a long time unexpectedly for procedure especially in case of purchase and compensation of small scale housing land divided into many parcels in the noise control areas. As the push to revitalize the area through the public support projects was delayed in the compensation process, environments of neighborhood were threatened by numerous problems caused in the maintenance of abandoned land and unoccupied houses. In addition, it needs to consider that alternative policy approaches applicable to each phases of residential environment changes are necessary since the implementation process of public projects may lead to the gradual decline of the site and its surrounding areas.

Sinwol 3-dong as a case of this research site, a neighborhood in the province of Yangcheon-gu, was designated as the 4th Seoul-type Urban Regeneration Promotion Area in 2019, but the project site contains significant amount of small parcels of housing units designated for compensation and inverse condemnation of noise countermeasure areas.

Source : Urban Regeneration Support Center in Sinwol 3-dong, New Deal Project Master Plan in Sinwol 3-dong, Yangcheon-gu Office, Feb. 2021)

〈Figure 1〉 Current status and development direction of Sinwol 3-dong, Yangcheon-gu

With the need for the transformation of public sector's policy paradigm into the community regeneration initiative in the airport noise countermeasure areas, it is necessary to develop a comprehensive diagnosis and monitoring system for the planning of projects and also to make a community-centered operation strategy based on different phases of the compensation procedure to the completion of the project.

Thus the purpose of this study is to propose the practical utilization method of deteriorated residential areas which are mostly subject to land acquisition and compensation properties through noise countermeasure projects. More specifically, this paper also targets to propose a policy and planning directions for the regeneration of the areas by dealing with issues such as migration of existing residents, safety caused by the increase of empty houses, and the need to develop construction materials to reduce aircraft noise.

1.2 Content and Scope of Research

The site of this research is an area with 72 multi-family unit houses on an area of 7.169㎡

and severely affected by airport noise of 85WECPNL or higher in the urban regeneration area of Sinwol 3-dong. Even though the site is designated as an inverse condemnation zone by the publics sector developers, but none of the owners are willing to sell their properties by allowing the elderly and the socially disadvantaged to live in the area due to low rental costs.

The procedure of the research is as follows. Firstly, it tries to clarify the limitations and problems of policy measures by the analysis of current policies related to aircraft noise and noise countermeasures. Secondly, it is to propose a plan for the coexistence of local communities in the deteriorated residential areas through the suggestion of living lab alternatives. Thirdly, it opens policy-related discussions with the suggestion of directions of policy improvement by applying small-scale housing redevelopment projects into the site areas based on the analysis of emergent local issues of dilapidated old residential areas with 85 WECPNL or higher in the aircraft noise-affected areas.

For this study, a series of literature review and policy analysis were carried out. In addition, field surveys, expert consultations, and interviews with the staff of airport corporation were also conducted.

1.3 Review of Previous Research

A number of pilot research projects on aircraft noise have been conducted in the Republic of Korea. Research has also been carried out on the relationship between aircraft noise and value change of properties(Jang, J.H., 2004), effect of aircraft noise on housing price (Bang, Y.C. & Ahn, Y.J., 2015; Park, D.H., 2014; Jang, D. I., 2004), and on supporting local residents with compensation improvement (Park, G. C., 2013; Woo, J. H. et al., 2018). Also, architectural research on aircraft noise has been done. There is a research paper on sound insulation performance of school windows near an airport by Song, H. et al.(2004), on soundproofing facility and special plan by Kwon, T. J.(2010), and housing sound insulation performance by Cho, C. G. & Shin, I. S.(2007) and Kim, K. W. et al.(2010). Also, research has been carried out on impact of aircraft noise on human health by Son, J. H. et al.(2008) and Kim, Y. J. & Kim, M. H. (2019), and stress and psychological problems by Jeong, Y. (2011) and Kim, S. A. et al.(2019)

〈Table 1〉 Pilot research of aircraft noise

Category	Author	Title of the article
Property	Jang, J. H.(2004)	Relationship between Aircraft Noise and Value Change of Properties
	Bang, Y. C. & Ahn, Y. J. (2015)	The mediating effect of aircraft noise on housing price: A case of apartment complexes located in Dong-gu, Daegu
	Park, D. H. (2014)	The Effects of Aircraft Noise and Airport Accessibility on Housing Prices
	Jang, D. I. (2004)	A Study on the Effects of Aircraft Noise on Apartment Price Focused on Dae-gu Airport Area
Effectiveness	Park, G. C. (2013)	A Study of the Efficacy of Community Support Projects for Noise Control Areas - With a Focus on Gimpo International Airport -
	Woo, J. H. et al. (2018)	A study on the new proposal of the compensation criteria for noise pollution areas in the vicinity of the airports
Design Plan	Song, H. et al. (2004)	A Study on the Window Design of Classroom Exposed to the Aircraft Noise
	Kwon, T. J. (2010)	Spatial Planning Approach to Noise Mitigation for Areas Adjacent to Civil Airports
Performance	Cho, C. G. & Shin, I. S. (2007)	Acoustical Performance of Houses and Subjective Responses about Aircraft Noise
	Kim, K. W. et al. (2010)	Comparison Research on Method of Evaluating Sound Insulation Performance of House using Aircraft Noise and Artificial Noise
Health	Son, J. H. et al. (2008)	Questionnaire Study Conducted Around Gimpo International Airport by Using THI - Comparison with the Responses of the Residents at Gimpo and Futenma, Okinawa
	Kim, Y. J. & Kim, M. H. (2019)	A Study on the Effect of Aircraft Noise on Residents' Health by Using Q Method
	Jeong, Y. (2011)	The association of aircraft noise exposure and hearing loss with anxiety and depression in residents around a military airbase
	Kim, S. A. et al. (2019)	The Correlation of Residence Near the Airport to Stress Level and Subjective Noisy Perception

The present research aims to extend on the following previous research covering 'Living lab'– research on living lab in the fields of architecture and transportation by Song, T. H. (2017) and Jeon N. et al. (2018), and research suggesting the living lab model as smart city by Choi, M. J. et al.(2020), Kim, H. D. et al. (2020), Jang H. Y. & Kim, K. (2019), and Park, J. H. et al. (2019). Also, research has been reported on a direction and management plan of living lab in the near future. Additional research was found on suggesting the

direction of a living lab in a post-aged society(Park, S. I. & Choi, S. L. 2017), compositions of urban living lab (Seong, J. et al., 2017; Han, K. & Lee J., 2019), analyzing the current situation and advance of the living lab (Park, J. H., 2017), management plan of the living lab (Lee, E. K. & Park, E. S., 2019), and evaluation index of urban regeneration living lab (Kim, E. J. & Park, Y. I., 2019).

〈Table 2〉 Pilot research on living lab

Category	Author	Title of the article
Architecture	Song, T. H. (2017)	Analysis of reinforcing effect of sound insulation between existing buildings through living lab
	Jeon, N. et al. (2018)	A study on the Application of Living Lab in Transportation: Focused on the Auto-Image Sensing Signal System for Pedestrian
	Choi, M. J. et al. (2020)	The Living Lab Model of Smart City Based on Citizen Participation. The Journal of the Korea Contents Association
	Kim, H. D. et al. (2020)	The Study for City Innovation Platform Using Living Lab-Based Smart City Service Modeling
	Jang, H. Y. & Kim, K. (2019)	Policy Directions for Citizen-led Smart City Based on Living Lab
	Park, J. H. et al. (2019)	A Study on the Activation of Citizen Participation through Living Lab
Directivity	Park, S. I. & Choi, S. L. (2017)	A Study on the Development Direction of the Living environment in a Post-Aged Society through Living lab.
	Seong, J. et al. (2017)	Current Status of Korean Living Labs and Its Development Plan
	Han, K. & Lee J. (2019)	A study on Deriving key characteristics and factors of Urban Living Lab
Operating Plan	Park, J. H. (2017)	Operation Method of Civic Participation Type Living Lab and Empirical Study
Urban Regeneration	Lee, E. K. & Park, E. S. (2019)	A Preliminary Study on the Application of Living Lab in Smart Urban Regeneration Project
	Kim, E. J. & Park, Y. I. (2019)	A Study on development of Urban Living Lab Evaluation Indicators

Other prior studies on environmental damage similar to noise damage and consequent damages are divided into the Compensation Policy Proposal (Choi, J. S., 2018), Environmental Damage Case Analysis (Kwak, K. S. et al., 2004; Kim, J. S., 2009; Kim, Y. M. & Chang, H. S., 2020), Environmental Damage Impact Analysis (Lee, M, J. al., 2018).

〈Table 3〉 Pilot research on Environmental Damage & Compensation

Category	Author	Title of the article
Propose a policy on compensation	Choi, J. S. (2018)	Suggestions for Revisions of Compensation Policy on Environmental Damages of Regions with Coal Fired Power Plants : TheCase of Chungnam Province
Environmental Damage Cases	Kwak, K. S. et al. (2004)	A Case Study of a Dispute over Damage on Sunshine Environment
	Kim, J. S. (2009)	A Case study of Dispute Resolution on Construction Noise and Vibration Damages for National Environmental Dispute Resolution – Focused on the 1993-2007 Years
	Kim, Y. M. & Jang, H. S. (2020)	An Analysis of the Differences in Abandoned Mine Area Residents'Perception of Environmental Damages
Environmental Damage Impact Analysis	Lee, M, J. et al. (2018)	Evaluating the Economic Value of Damages from Environment Noise : Analysis of Land Prices Around a Military Live-fire Complex

In addition, a law similar to the plan for post-purchase use of land in open-air noise countermeasures areas proposed by the study is the Compensation and Support Act (No. 14994) on the surrounding areas of transmission and substation facilities.

The purpose of the relevant Act is to promote the stability of electricity supply and demand and contribute to the development of the national economy and local communities by promoting compensation and support projects for areas surrounding transmission and substation facilities. This specifies what residents of affected areas can be compensated for, such as claims for compensation for land and claims for housing purchases, and support projects. Claims for housing purchases in the affected areas are legally established, but practical problems such as forced purchase and friction between construction and residents with purchase compensation are expected during the process. In order to realize the land purchase and utilization plan proposed by this study, changes in the system related to land purchase in affected areas will have to be preemptive.

A number of studies on noise measures in Korea are centered on analysis of phenomena, general direction, impact on specific areas, and policy proposals.

In this respect, existing studies have identified the impact of environmental damage on a variety of factors, but there is little consideration from an urban regeneration perspective and lack of practical solutions to address the problem of environmental damage.

In addition to the theoretical analysis of the preceding studies, this study focused on

planning to propose realistic solutions such as land purchase and the use of small-scale housing maintenance projects to overcome these limitations. It was intended to be a reference material for policy and business progress in environmentally damaged areas in the future.

2. Noise Countermeasures and Related Policies

2.1 Noise Countermeasure Area System

According to the National Noise Information System, aircraft noise has been measured through the automatic measuring system networks since 1989. The measurement of aircraft noise considers various factors such as the frequency, magnitude, noise exposure time, and change of noise. WECPNL is used as the aircraft noise assessment unit. But the measurement unit will be changed in 2023 from WECPNL to Lden whose measurement method is based on the equivalent noise level. The expected noise level standards according to the noise countermeasure area when changing to Lden are shown in 〈Table 3〉.

〈Table 3〉 Transformation of noise measurement method

(unit: dB)

Noise countermeasure area		WECPNL	Lden (WECPNL-13)
Class 1 area		above 95 WECPNL	above 83 Lden
Class 2 area		90~95 WECPNL	77~82 Lden
Class 3 area	Ga District	85~90 WECPNL	72~77 Lden
	Na District	80~85 WECPNL	67~72 Lden
	Da District	75~80 WECPNL	62~67 Lden

According to the Airport Noise Prevention and Areas Assistance Act (referred to as “Airport Noise Prevention Act”), a noise countermeasure area is defined as an area for promoting airport noise countermeasures and local residents’ support projects for those who suffer due to airport noise, based on expected Weighted Equivalent Continuous Perceived Noise Level (WECPNL[1)]). Designation and notification of a noise countermeasure area is

1) WECPNL: Unit of aircraft noise measurement and calculated by weighting hourly number of flights into average of highest sound level. According to the Airport Noise Portal, WECPNL is an aircraft noise

executed as a Presidential decree, and an area with WECPNL above 95 is classified as 'Class 1 Area', and an area with WECPNL above 90 and under 95 is classified as 'Class 2 Area', by the Enforcement Decree of the Airport Noise Prevention Act. In case of 'Class 3 Area', districts are classified as 'District Ga' for WECPNL above 85 and under 90, 'District Na' for WECPNL above 80 and under 85 WECPNL, and 'District Da' for WECPNL over 75 and under 80 WECPNL, by the Decree of the Ministry of Land, Infrastructure and Transport.

According to Article 8 of the Airport Noise Prevention Act (Formulation, etc. of Airport Noise Countermeasure Project Plan), airports should execute yearly airport noise countermeasure projects. Subjects of the project are grouped into living conditions, education, medical, and public facilities. The project covers the installation of soundproofing and air conditioning facility, subsidy for public television license fee, subsidy for electricity charges for air conditioning facility in school, housing facility, and child & geriatric welfare institutions, establishment of automatic noise measuring system, compensation, and inverse condemnation.

The details of the project are as follows: Compensation can be claimed to project operator or facility manager in case of demolishing structures in Class 1, 2, and 3 areas or when land owners execute the demolition. Inverse condemnation can be offered in case land owners in noise countermeasure areas request the project operator or facility manager to purchase their land.

Also, a yearly project plan must be compiled according to the act of formulation, etc. of the airport noise countermeasure project plan; the projects are classified as local welfare project, income increasing project, and extra project, according to their characteristics. Local welfare projects focus on enhancing the welfare of local residents, including establishment of public facilities and education-culture projects. Income increasing projects focus on activities to increase the income, such as common workshops or common agricultural facility.

The government promotes installation of soundproofing and air conditioning facility, and provides subsidy for public television license fee, subsidy for electricity charge, and local welfare enhancement projects in areas designated as noise countermeasure areas, by execution

assessment method regulated by the International Civil Aviation Organization(ICAO) and it has the advantage of being able to reflect the noise around the airport exposed to aircraft noise.

of the Airport Noise Prevention Act, 2010 (Airport Noise Portal, 2020).

The designated areas of each airport are as follows: Noise countermeasure projects are underway in designated areas of Gimpo International Airport entirely covering Yangcheon-gu, Gangseo-gu, and Guro-gu of Seoul; Bucheon-si, Gimpo-si, and Gwangmyeong-si of Gyeonggi province; and Gyeyang-gu and Seo-gu of Incheon metropolitan city. Designated areas of Gimhae International Airport cover part of Gangseo-gu of Busan metropolitan city and Gimhae-si. Designated areas of Incheon International Airport cover Ongjin-gu and Jung-gu of Incheon metropolitan city, and some areas of Jeju province, Ulsan metropolitan city, and Yeosu-si, where designation of noise countermeasure areas have been announced.[2)]

According to the project index of the Airport Noise Portal, soundproofing facility, air conditioning facility, and subsidies qualify for noise countermeasure areas (with WECPNL above 75), and inverse condemnation and compensation qualify for land and housing in Class 3 Area (85 WECPNL).

Also, airports operate curfew time, meaning regulation hours for night flights. Each airport grounds selected flights for noise reduction. Currently, Incheon International Airport, Jeju International Airport, and Cheongju International Airport run for 24 hours, not adopting curfew time; Gimpo International Airport and Gimhae International Airport operate curfew time from 23:00 to 06:00 KST. Curfew time is imposed by prohibiting take-off and landing and airport operation considering the bedtime of neighborhoods and airport management of each airport.

2.2 Public Support for Residents of Airport Noise Countermeasure Areas

Welfare and income increase projects are typical types of public support projects for residents living in the noise control areas of less than 70-75 WECNPL and its neighboring areas. In airport noise countermeasure areas, subsidies for resident support projects are given to promote welfare projects in the areas. According to data provided by local resident support centers, 5.9 billion won was allocated for the improvement of residents' welfare to local authorities of Yangcheon-Gu, Guro-Gu, Gangseo-Gu of Seoul and neighboring authorities of Bucheon City and Gimpo City near Gimpo Airport. Public support projects are

2) Refer to the internet site of airportnoise center(http://www.airportnoise.center/home/service_area.jsp)

implemented to promote welfare and increase income of residents in noise countermeasure areas(less than 70-75 weckles) in accordance with the 「Airport Noise Prevention and Areas Assistance Act」.

Details of the projects are shown in 〈Table 4〉.

〈Table 4〉 Details of public support projects

Classification	Projects	Support percentage of cost to total budget
Welfare Improvement project	Building for social welfare service facilities	75/100 %
	Building for sport facilities	
	Building for education and culture facilities	
	etc	65/100 %
Income Increase Project	Building for communal work places	75/100 %
	Building for communal farming facilities	
	etc.	65/100 %

Source: Local Support Centers for Residents in aircraft noise countermeasure areas (Yangcheon-Gu, Guro-Gu and Gangseo-Gu of Seoul City)

It needs to look at the details of how those public support projects are implemented by the analysis of case studies. According to the Airport Noise Portal, local authority of Yangcheon in the city of Seoul operates the Resident Support Project Subcommittee which plays a critical role in collecting public opinions from residents over the quality of performance and process of project implementation.

On September 28, 2020, the first subcommittee meeting was held for the review of 2021 project plans focused on the relevance of project schemes and allocation of project costs. After the subcommitte reached the final decision, Yangcheon-Gu has decided to promote 4 major support projects for residents in the aircraft noise countermeasure areas as shown in 〈Table 5〉.

As stated above, Yangcheon-gu is receiving continuous resident support project expenses due to airport noise, and the subsidy is being allocated by the priority of projects through collecting people's opinions from each individual administrative unit. The direction of noise countermeasures has been continuously established, and a pilot project of living lab has been operated to draw implications with the Airport Corporation. In particular, the independent

〈Table 5〉 Yangchen-Gu's Final plan for resident support projects in 2021

(unit: 1,000 won)

Division	Project title	Supportive budget(a)	Public budget(b) (a/b)	Total budget	Result of subcommittee
Div. of Resident Cooperation	Community Complex Building Construction	2,134,500	1,149,347 (35%)	3,283,847	proved
Div. of Urban Regeneration	Wifi zone expansion	65,000	35,000 (35%)	100,000	proved
Div. of Elderly Welfare	Eco garden installation	15,000	5,000 (25%)	20,000	proved
Div. of Environment	Scholarship projects	225,000	75,000 (25%)	300,000	Increase of budget up to 400 m. won
Total		2,603,000	1,264,347	3,703,847	

Source: Report of subcommittee for resident support project 2021, Yangcheon-Gu

research team of Yangcheon-gu operated a smart living lab from 2019 to 2020 and proposed directions for improvement of living lab plans baded on the survey of people's recognition of airport noise.

However, there was a limit to continuously collecting the opinions of residents and preparing practical alternatives as more complicated requirements were produced after more resident surveys and expert consultations were carried out. Conflict was intensified as residents and the Airport Noise Countermeasure Committee presented their opinions in the direction of immediate economic profit, so it was getting more difficult to provide a sustainable residential environment in the long term. Case analysis shows that an alternative approach is needed to overcome the limitations of existing support projects and improve the living environment of residents.

Therefore, next chapter is organized to clarify the meaning and value of living lab and discuss the direction of application in the target area.

3. Application of Living Lab Projects for Community Regeneration

3.1 Need for the Introduction of Living Lab Projects

Living lab stands for laboratory in everyday life which leads field centered studies with its users. Adoption of living lab provides the advantage of receiving rapid feedback from local users and developing a sustainable model of research with community participation. Living lab has been gaining interest world-wide since 2010 and some foreign cases have already introduced the living lab concept in the first decade of the 21st century. Foreign living labs are operating and developing in various fields including urban planning, architecture, living conditions, environment, and etc.

〈Table 6〉 Case of Living Lab

Classification	Project	Main Contents
Domestic case of Living Lab	Daejeon 'Geon neo yu' Project (2015)	Need to solve safety problems due to heavy rain. Residents' Workshop and Solutions in order to solve local problems on their own
	Bukchon Internet of Things Living-Lab (2015)	Urban problems such as noise, garbage, parking, etc. occur at a tourist destination. The Seoul Metropolitan Government will lead the process, and the process will be changed to user-driven.
	SOS-Lab, Urban Renewal New Deal Living Lab, Seoul Innovation Park Living Lab, Sewoon Living Lab, etc.	There are various living-labs such as private-sector, public-led, and user-driven, but they show limitations in completing the workshop. It also tends to be applied to a single building or town-oriented restriction.
Foreign case of Living Lab	Amsterdam Smart City (2009)	An open platform in which the government, private sector, university and local residents participate to solve urban problems.
	Kalasatama smart city (2010)	Public-private partnerships to promote and support digital business development.
	22@Barcelona, LTTT (Tokyo Living Lab), CASA WX iMinds, etc.	The old downtown regeneration project, future industry, science and technology system with local residents, etc. are showing tendency of living lab operation system.

As defined by the analysis of case studies, living labs have been recently adopted as an alternative implementation tools for area revitalization in the fields of social solutions, eco-friendly city planning, smart cities, etc., diverging from the existing provider-centered R&D research. Living labs are operated for liaison with colleges, supervising the community, and cooperation with local government, but still have limitations in IT based researches and sustainability of living lab. Systems and regulations covering living lab are evaluated to be still imperfect since they are not stable in the process of performing sustainability due to the dominant operation of non-professional community groups depending on simple programs of workshops.

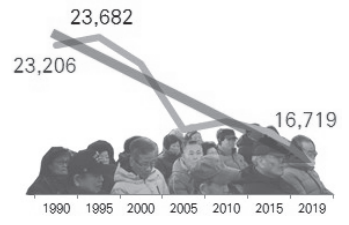
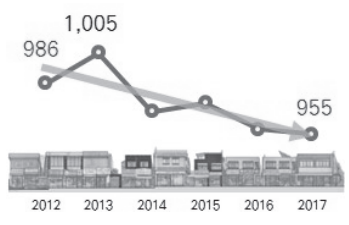
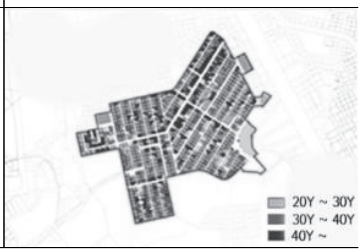
Most cases of living labs show disappointing survey results since they are bound to a specific town or buildings having physical limitations for community empowerment in terms of accessibilities and urban context. Therefore, it is necessary to formulate specific regulations including the compilation of an operation manual, and to form a strong ties with professionals in order to establish a sustainable community centered living lab.

3.2 Coexistence Strategic Plan for Local Communities through Living Lab Projects

The designated area of Sinwol 3-dong shows a constant decrease of population along with deterioration of businesses, with a significant decrease of 9.4% in 2015. Living environment deterioration is increasing, as seen in 94.2% of housing units over 20 years. Nearby Gimpo International Airport causes severe suffering due to aircraft noise from which the local residents and community are desperate to recover.

However, resources and potential still exist in the designated areas. Sinwol 3-dong contains noise damage area with WECPNL over 85 where the purchased real estate of Korea Airports Corporation can be utilized as an urban regeneration and connecting facility, and includes government owned land to be utilized as anchor area. Also, when considering economic aspects, the subsidy from local support projects of Korea Airports Corporation can be utilized continuously, which can be a resource of economy promotion infrastructure using Sinwol 3-dong market and community street in the region. Considering long term aspects including designation of Sinwol 3-dong as an urban regeneration promotion area

〈Table 7〉 Changes of regional conditions by the increase of aircraft noise

Decrease of population	Deterioration of businesses	Housing over 20 years
		

and urban regeneration new-deal, community-led environmental improvement, expansion of social infrastructure and forming town-community is expected to be activated rapidly. However, arranging countermeasures for enhancing the characteristics of Sinwol 3-dong, regional limitation of airport noise, and identification of regional isolated area are required.

Thus, we suggest a local community centered living lab to establish a plan for noise reduction and noise countermeasures, along with improvement of local impressions. It would utilize purchased or empty houses as testing grounds of the smart living lab complex for researchers and local residents to cope with various noises. Along with forming a test-bed, through constant update and documentation, sustainability can be suggested by documentation of history/living culture and developing a town information sharing system.

According to the responses obtained in a survey of 49 residents of Sinwol 3-dong about complaints, conducted in 2020, "Noise caused by landing and take-off of aircraft from nearby Gimpo International Airport" was the most frequent response, followed by urban problems like deterioration of buildings and parking spaces. When asked about impacts of airport noise, the most common response was "Pausing conversation when aircraft noise occurs", followed by health, stress problem, and interruption of daily life. When asked about solutions, the largest number of responses indicated adopting new technology and seeking fresh solutions. Local residents of Sinwol 3-dong had difficulty in the settling of solutions due to severe inconveniences.

Therefore, according to the purpose stated above, the research suggests an everyday life laboratory utilizing empty housing for both local residents and researchers through a community-led smart living lab dealing with aircraft noise. A Local survey indicated that most of the local residents do not know the term living lab. However, more than 70% of

〈Table 8〉 Survey of 49 residents of Sinwol 3-dong

Questionaires	Result of responses				
1. Complaints performed	Aircraft Noise (37)	Parking lot (22)	Deterioration of buildings (16)	-	-
2. Impacts of airport noise	Blocking conversation (23)	Health (12)	Stress (11)	Interruption of Daily life (7)	Familiarization (5)
3. Solutions	Adopting New Tech. (19)	Seeking Fresh Solution (14)	Supporting Projects for residents (5)	Airport Relocation (13)	etc. (2)
4. Living Lab Recognition	Cognitive (19)	Non-Cognitive (30)	-	-	-
5. Participating Intention	Active (16)	Often (18)	Observe (9)	Absence (5)	etc. (2)

local residents gave favorable responses when a basic introduction was given and the process was explained.

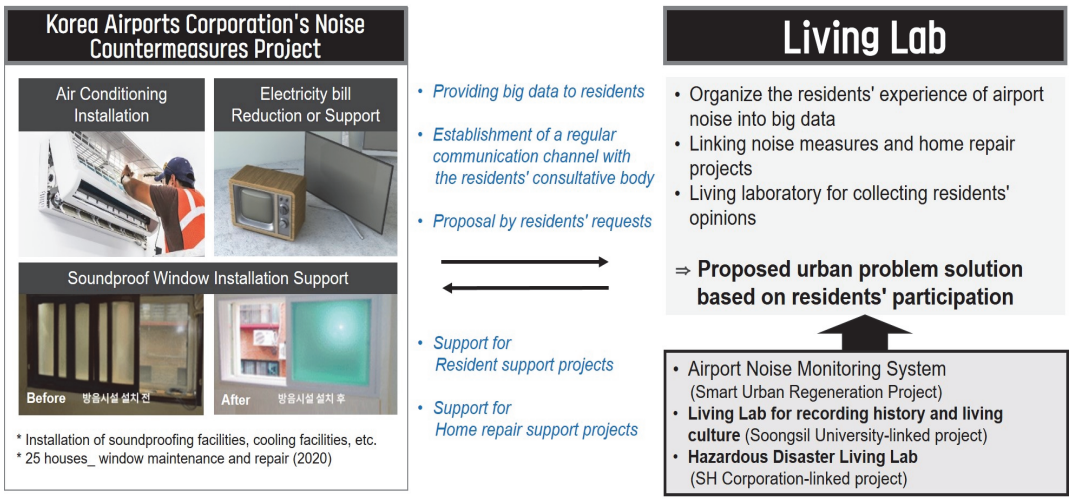
3.3 Operation Strategies of Living Labs for Noise Countermeasure Method

The target site of this study is a land compensation area within the urban regeneration area designated by the Seoul City Government, and its local condition shows that the situation of community environment can have a potential to run a living lab in collaboration with universities(Soongsil University), public institutions(SH Corporation, LH Corporation), and stakeholders(Airport Corporation). In the implementation stage of living lab projects, it is necessary to establish a sustainable and self-sufficient plan to replace the existing administrative system so that the living lab that can promote customized solutions for community revitalization strategy development through monitoring and test-bed project operation.

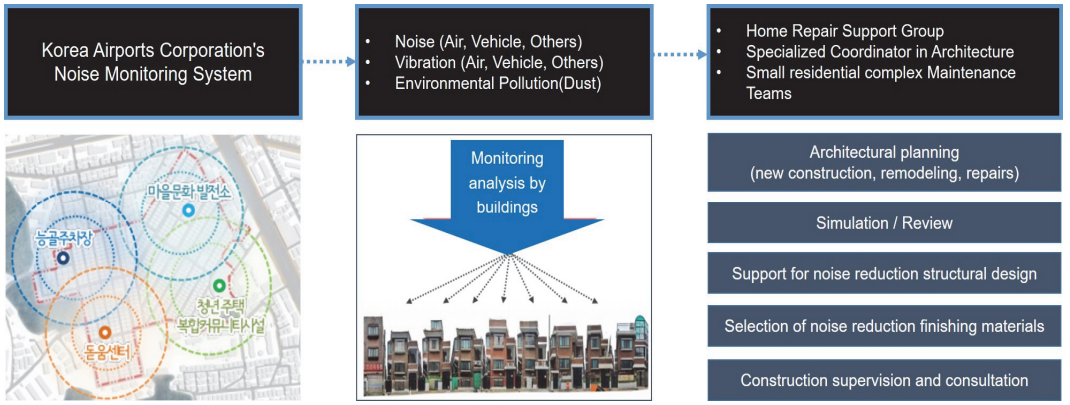
To this end, a high level of cooperation is required between the public authorities and public corporations with the close linkage between regional research institutes and universities and active participation of the residents of the target areas.

According to the established Sinwol 3-dong Urban Regeneration Revitalization Plan approved by the city government, it aims to operate at least three major living labs in the

area through the operation of pilot project called Shinsam Living Lab whose target is focused to improve the living environment and to promote economic revitalization of the community.



〈Figure 2〉 Living lab for noise countermeasure method



〈Figure 3〉 Operation strategies of living lab for monitoring information

The diagram on the left in 〈Figure 2〉 summarizes the connection plan between the airport noise countermeasure project and the Living Lab. The diagram on the right shows that the airport noise monitoring system can be operated to provide practical information to residents it is suggested that the appropriate building finishing material be selected and supported to

the residents after using various materials to test-bed houses through industry-university cooperation.

In the following Chapter 4, this research will develop possible design alternatives of living labs on Shinwol-dong sites by securing adequate properties for implementing Test-bed projects within the claimed compensation area.

When planning a regeneration schemes of an area where the airport corporation is requested for purchase due to airport noise of 85 WECPNL or more, phasing plan of short-term, medium-term, and long-term plans must be established as it is difficult to purchase the entire properties in the area at once in a short period of time.

If the purchase process is delayed, vacant houses will occur sporadically with the result in the increase of crime rate and the deterioration of living environments such as illegal garbage dumping. To prevent this, if abandoned houses increase until a total of 72 buildings are completely acquired, temporal use of vacant property is needed for a building material test-bed site or a living lab application for airport noise monitoring.

The proposal of living lab in this research will be able to provide residents with the information on proper finishing materials for home repair and maintenance of small houses through collaboration among universities, industries and public institutions. By operating living labs on the target sites, it is also enabling to provide long-term improvement measures and policy options in collaboration with Airport Corporation by continuously converging the opinions of the residents.

In order for the gradual and practical improvement of living environments in aircraft noise countermeasure areas, it needs to setting up a living lab for the sustainable management in the area even though whole areas are demolished for the small scale housing redevelopment after the entire purchase of vacant properties.

4. Direction of Plan through Test Bed Projects

4.1 Designated Test Bed Areas

The name of Sinwol 3-dong, Yangcheon-gu originated from Sinwol-ri meaning “refreshing

town resembling shape of half moon". The residential area formed by the Seoul-Incheon Land Readjustment Project in 1972 suffers from severe airport noise since the expansion of the line of Gimpo International Airport in the early 1970s. Decline of population was followed by a paradigm shift in the export market.

Sinwol 3-dong was formed by settlers in the 1970s. People displaced due to demolition by the Land Readjustment Project in 1972 moved in and it was designated as Sinwol-dong, Gangseo-gu. The town expanded due to the opening of Nambusunhwan-ro in 1978. As Yangcheon-gu was newly organized in 1988, the town was transferred to Sinwol-dong, Yangcheon-gu. Four years later, affected by the extension of the Gyeongin Expressway into eight lanes, urbanization progressed in Sinwol 3-dong and its neighborhood. However, its population began to decline in the early 2000s. The town was designated as Sinwol 1 Housing Renewal Development Unit Area two years after being designated as Sinwol Intersection Class 1 District Unit Plan in 2007. The local population continued to decrease and moved out from Sinwol 1 Housing Renewal Development Unit Area in 2017. Urban regeneration of Sinwol 3-dong area will be active due to its recent designation as Sinwol 3-dong Urban Regeneration Promotion Project Area.

The biggest problem of the current local situation is the diminishing willingness to improve, due to an aging population and the declining number of enterprises. The population was found to be decreasing since 2015 when the humanistic situation of Sinwol 3-dong was surveyed. There is a tendency of decrease of population by around 10,000 persons per year but the decrease was as high as 18,461 in 2015, 17,649 in 2017, and 16,719 in 2019. Also, the population ratio of under 60-year-olds was similar to the average of Seoul and Yangcheon-gu, but the ratio of over 60-year-old population was 26.9%.

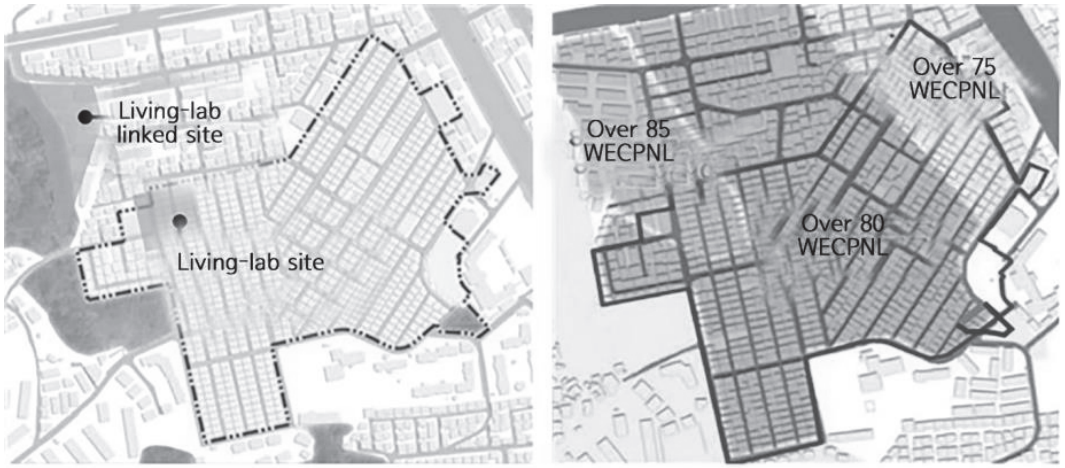
The value is much higher when compared to 14.1% for Seoul and 12.4% for Yangcheon-gu. An analysis of industrial conditions indicated that the number of local businesses dropped from 1,005 units in 2013 to 961 units in 2018. This indicates 4.4% reduction ratio compared to the number in 2013, and the situation is expected to worsen considering the local population decrease.

Overall, Sinwol 3-dong reveals complicated urban problems including decrease of market power and businesses due to population decrease, and increasing proportion of aging population. Also, as it is located near to Gimpo International Airport, consistent aircraft noise

causes a poor residential environment along with densely developed standardized multiplex housing, leaving behind Seoul's future urban vision of the 21st century.

The range of the targeted area of research and the urban regeneration promotion area covers the entire 176th street, Sinwol 3-dong, i.e., 106,023 m2. A total of 6,205 residents of 3,520 households reside in the targeted area. The land consists of 870 lots and 817 structures. As a regional characteristic, the traffic condition is favorable as Garogongwon-ro lies in the north, Gyeongin Expressway and Sinwol IC lie in the south, and the Nambu Belt way lies in the east. The targeted area is severely damaged with airport noise as Gimpo International Airport is located within a 2km radius.

The designated test-bed area of the research covers 182-8th Street, selecting buildings that have deteriorated and lost functionality as residences due to WECPNL over 85. The selected areas of the entire 184th Street, 183rd Street, and 182nd Street of Sinwol-dong have a mix of high-density residences and Class 1, Class 2 neighborhood facility area. Therefore, planning complies with the floor area ratio of Seoul city housing area, urban environment renewal density, and height regulation.



〈Figure 4〉 Target area and area classification by WECPNL

The majority of the buildings in the targeted test-bed area are utilized as residences, approved during the 1980s and 1990s. Also, most of the buildings have similar construction of a brick structure and a red-brick facade with semi-basement. Some of households extend

and utilize the rooftop of the house.

4.2 Realization Method through Design Proposals

4.2.1 Setting a hypothesis

In the case of redevelopment projects under the Urban Maintenance Act, it takes a long time from the designation of maintenance zones to completion. This means that it will take a long time to secure land and promote business even when the strong right to accept cash cleaners is supported. Therefore, it is impossible or likely to take a long time to buy all the land in the study site in accordance with the Airport Noise Prevention Act, which does not have a compulsory means of securing land.

However, since it was selected as the destination of 'the Hope Land Project' in 2019, the relevant departments of the Korea Airports Corporation, Yangcheon-gu Office, and the Urban Regeneration Support Center in Shinwol 3-dong have been holding consultations, and most of all, the mid- to long-term vision of the airport construction has been changing.

Unlike other regions, the target site is an area where the housing complex was already established before the institutional standards were established in the 1970s, and there is a possibility that it could be rebuilt as a housing complex other than a park or parking lot. Above all, if noise measurement standards change recently, the scope of the purchase claim area changes, there is a possibility that homeowners will actively participate in the public-led small sized block maintenance project.

Therefore, in conjunction with the mid- to long-term vision of the airport construction, the following plans were proposed on the premise that the project could be carried out if the local government cooperated.

4.2.1 Proposal

The target area was to be demolished after purchase and planned to use for public development. Even the Airport Corporation is receiving a purchase request, but not a single property owner in the area shows any intention for sale of houses with the contrast to 7 apartment units sold off at the adjacent Teulane apartment estate which is not even included

in the urban regeneration area. It happens mainly because indigenous residents have not been able to find a place to relocate due to the low sale price, and also because most of landlords are elderly people who are reluctant to move out of the community. In addition, the majority of house owners depend on the rental income from tenants of 2 to 3 households living together at a single house although there are some differences in housing size.

Therefore, in this study, we propose to designate this area as a "small-scale housing redevelopment management area" in order to implement a long-term land lease development project after the Korea Airports Corporation purchases entire land of the area.

Realization of this proposal seems to feasible since the airport noise-related laws and regulations are being enacted. In addition, the proposal can be considered as a positive alternative which can converge the opinions of local residents in the process and also cooperate with local governments in situations where Airport Corporation needs a medium-to long-term plan for the purchase request areas. And, in this process, I would like to propose that public companies such as LH or SH participate .

In this process, this research also draw ideas that public institutions such as LH or SH participate to propose a supply plan of circular type long-term and short-term rental housing. It would be appropriate to plan a complex building providing public parking lots in the basement, community park in the lower part of the piloti on the first floor, a new circulation type of rental housing in the lower part, and office spaces for related research institutes and organizations for living labs and test beds in the upper part.

For such a plan, we can provide a proposal for a block-type housing complex which seeks to verify its potential. Criteria for the small block unit development plan for residential complex are as follows.

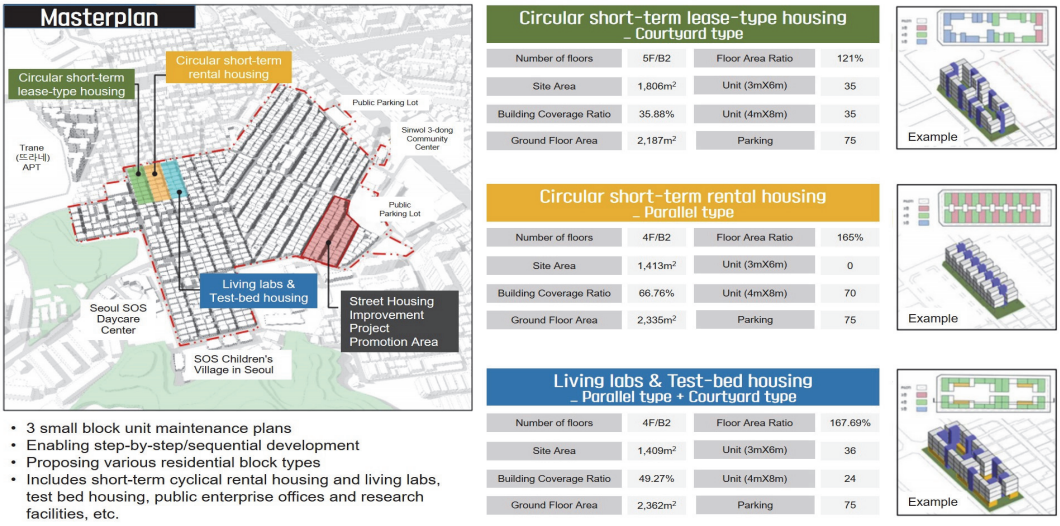
Three types of apartment composition proposals are suggested, considering the residential environment as seen in [Figure 5]. Proper apartment composition is selected considering the external residential environment for the proposal at complex level. Each proposal is suggested with floor area ratio of 150% and 200%. Under the principle of modifying structures with less than four floors, applying the floor area ratio presented above suggests the optimum size. Also, the layout is proposed with three different programs of rental housing, living lab mixed-use dwelling, and flats with shops.

This aims to provide variety and diversity when adopting the proposal, and to enhance

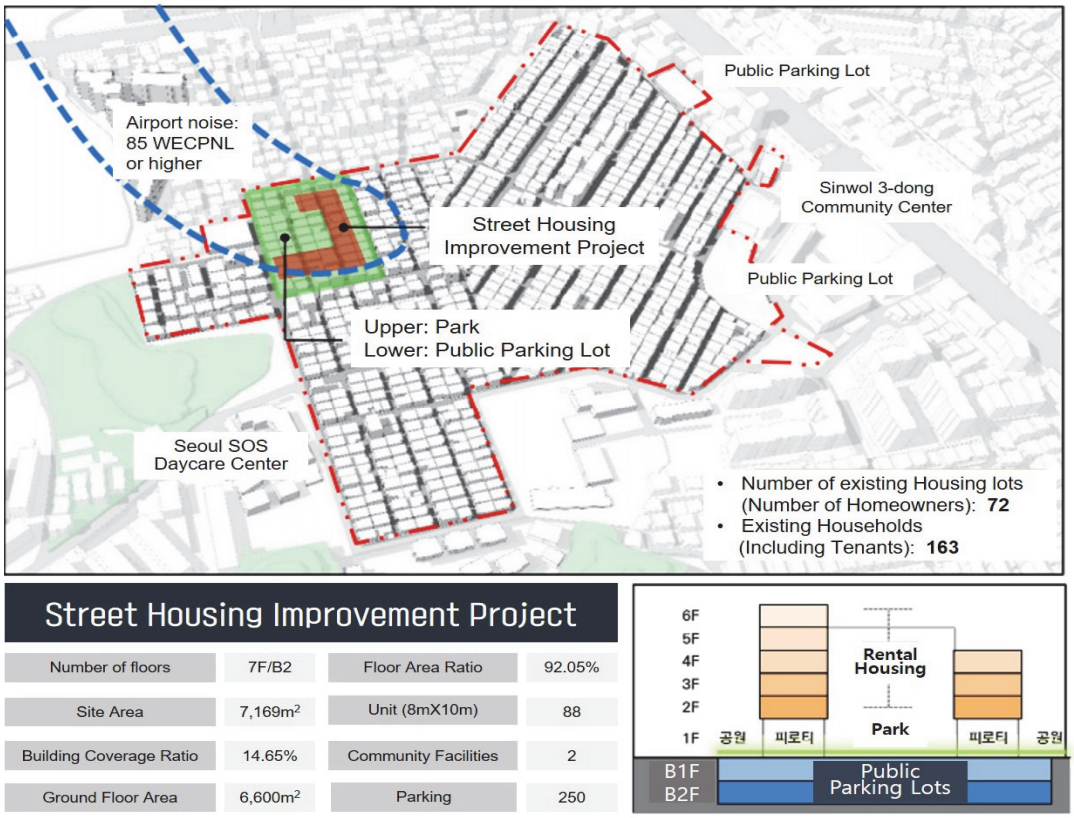
versatility of the adjacent land. Placement proposals are classified as courtyard style to infuse openness of the block, parallel style to maximize efficiency, and mixed style which adopts various styles.

As current alleys vary from 3.5 to 5 meters in width, the proposal suggests widening them up to 6 meters considering parking and traffic convenience. Lastly, this design proposal suggests that each site can have either underground parking spaces per block or integrated underground parking spaces in order to alleviate the severe parking problems of the areas.

The reason for suggesting small scale block development of housing in the form of three street-type housing redevelopment projects is that this kind of approach makes it easier to facilitate opinions of indigenous residents and also enables to introduce a step by step phase developments. But in case of entire development of site areas, some areas adjacent to the airport noise of 80 WECNPL may advance independently to the street-type housing development project. Scheme for this type of development also contains the same space programs of parking lots on the underground level, public park on the ground level and spaces for rental housing and offices for living labs and community organizations. By planning 163 households in a total of 72 lots, it is possible to guarantee short-term and long-term rental housing and some accommodation of existing tenants.



〈Figure 5〉 Alt 1: Overall plan of test-bed projects in Sinwol 3-dong 182~184 areas



〈Figure 6〉 Alt 2: Overall plan of test-bed projects in Sinwol 3-dong 182~184 areas

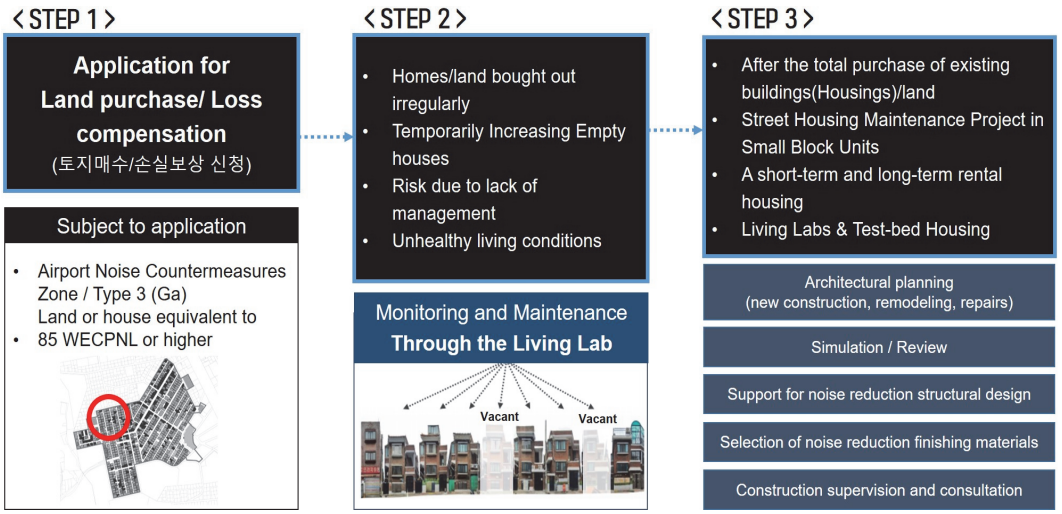
5. Conclusion

The present research aims to develop a method for regeneration and reuse of empty housing and properties which are remained devastated as unused during the process of land compensation. And it also targets to contribute to local communities by the diverse alternative approaches to those empty local assets. The direction of a plan which can be applied to aircraft noise damaged areas or nearby areas is proposed through the research and design alternatives. The research aims to provide a practical direction for operating living labs by utilizing empty housing in suggested test-bed areas in the future.

This proposal suggests that local-based and community-oriented research should be

supported by long-term and sustainable operating methods rather than a short-term perspective. The designated area may seek ways of adopting a smart management solution platform and an urban information management system. Although it would begin with management by professionals or specialized agents, community-centered systems and operation guidelines should be explored in order to achieve target goals of self-sustainability by being managed and utilized by the local community should be explored. The smart living lab program can be a part of the proposal to fulfill its objectives. Discovering additional local community-led solutions can be encouraged by operating the smart living lab throughout the process of the urban regeneration project.

Particularly, there is a strong need for promoting the test-bed projects combined with the supporting the program operation expenses. It needs to draw and illustrate local tasks drawn from the operation of the living lab by prioritizing projects according to the needs of the local community. Also, pilot projects and services should be constantly monitored through satisfaction surveys of residents. Furthermore, comprehensive governance procedures involving civil agents, local government, institutions and related industries should be established to implement the project.



〈Figure 7〉 Process and results of research

The prerequisite of the research is to plan first how targeted areas suffering from airport noise are to be designated as Test-bed sites. Creation of an living environment with reduced airport noise and related technical research on construction material should be promoted for the effective combination of further development performances.

With the review of development possibilities it proposes a plan to create three suggestions: to operate living labs utilizing vacant houses left in the process of inverse condemnation requesting; to designate the airport noise countermeasure areas as a publicly-led small-scale housing redevelopment and management area; finally to provide a rental housing complex through the public development. Through the block unit development, key functions are planned for public parking at underground level and community park on ground level with a different approach to a target area with relatively low noise by proposing a block-type street housing.

Unlike other regions, the target site is an area where the housing complex was already established before the institutional standards were established in the 1970s, and there is a possibility that it could be rebuilt as a housing complex other than a park or parking lot. It was also selected for the Hope Land Project in 2019, the Seoul-type urban regeneration area in 2020, and the Ministry of Land, Infrastructure and Transport's New Deal Project in 2021, and the Korea Airports Corporation, Public Sector, Urban Regeneration Center, and Private sector are working together to find alternatives to the problem. Above all, if noise measurement standards change recently, the scope of the purchase claim area changes, there is a possibility that homeowners will actively participate in the public-led small sized block maintenance project. Therefore, in conjunction with the mid- to long-term vision of the airport construction, the following plans were proposed on the premise that the project could be carried out if the local government cooperated.

Thus the plan enables to provide long-term rental housing to people if the owner is a resident of an elderly person over the age of 80s, and also allows people seeking temporary residences in case of evacuation during the housing improvement and community initiated housing repair and maintenance projects in nearby urban regeneration areas.

In addition, some housing units can be used as a site of Test-beds for the development of noise reduction technology and also for the operating of living labs so that monitoring results can be applied to similar areas in the future.

With the proposal of living lab and test bed project for the advantages of community revitalization, this research is expected to identify ways to minimize civil complaints on aircraft noise and to become a basis for establishing a practical plan to provide good quality living benefits to local people.

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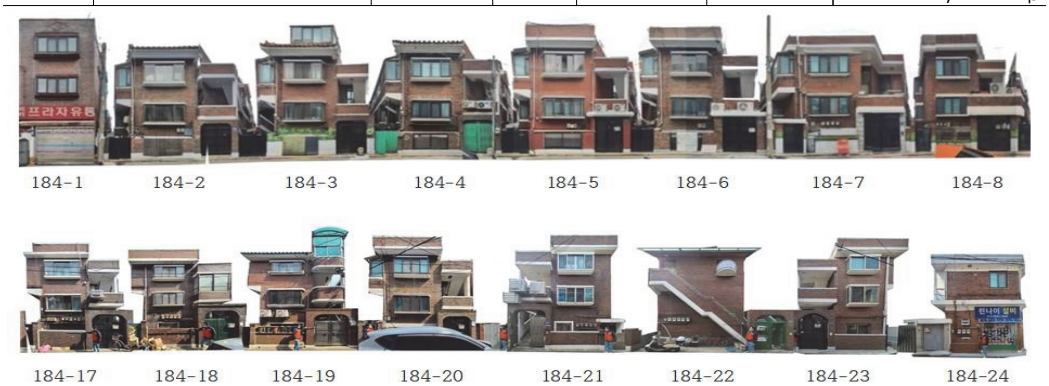
논문접수 : 2021.06.17.
1차 심사 : 2021.06.30.
2차 심사 : 2021.07.16.
게재확정 : 2021.12.23.

Appendix

〈Table 9〉 Summary of building data in Sinwol 3-dong 184 area

Lot number	Current Use	Approval date	Area (㎡)	Building coverage ratio (%)	Floor area ratio (%)	No of floors
184-1	Neighborhood facility area, Multi-household house	1996.05.29	81.6	69.23	206.80	Basement 1F, Ground 3F
184-2	Detached house	1990.08.22	86.5	49.58	99.17	Basement 1F, Ground 2F
184-3	Detached house	1990.07.21	87.6	48.96	97.92	Basement 1F, Ground 2F
184-4	Detached house	1990.06.14	87.7	48.91	97.81	Basement 1F, Ground 2F
184-5	Multi-household house	1990.07.06	88.2	48.63	97.26	Basement 1F, Ground 2F
184-6	Detached house	1990.08.14	88.5	48.46	96.93	Basement 1F, Ground 2F
184-7	Detached house	1988.07.19	89.7	49.81	99.62	Basement 1F, Ground 2F
184-8	Detached house	1989.09.05	89.4	46.95	88.92	Basement 1F, Ground 2F
184-24	Neighborhood facility area	1975.06.28	85.1	62.12	172.21	Basement 1F, Ground 2F
184-23	Detached house	1998.03.26	89.3	59.54	106.36	Basement 1F, Ground 2F, Rooftop
184-22	Multi-house-hold house	1993.06.04	90.9	56.15	107.23	Basement 1F, Ground 2F, Rooftop
184-21	Multi-household house	1997.06.24	90	58.97	103.96	Basement 1F, Ground 2F, Rooftop
184-20	Detached house	1987.05.12	89.8	49.31	97.64	Basement 1F, Ground 2F
184-19	Multi-household house	1993.06.12	89.1	60.44	112.08	Basement 1F, Ground 2F, Rooftop
184-18	Multi-household house	1993.05.31	89.8	59.97	111.21	Basement 1F, Ground 2F, Rooftop
184-17	Multi-household house	1993.06.08	89.3	60.12	111.15	Basement 1F, Ground 2F, Rooftop



〈Table 10〉 Summary of building data in Sinwol 3-dong 183 area

Lot number	Current Use	Approval date	Area (㎡)	Building coverage ratio (%)	Floor area ratio (%)	No of floors
183-1	Neighborhood facility area	1991.04.30	85	56.94	166.66	Basement 1F, Ground 4F
183-2	Multi-household house	1991.12.26	87.6	52.29	102.43	Basement 1F, Ground 2F, Rooftop
183-3	Multi-household house	1991.09.25	88	56.69	110.30	Basement 1F, Ground 2F, Rooftop
183-4	Multi-household house	1993.05.27	87.8	61.16	112.18	Basement 1F, Ground 2F, Rooftop
183-5	Multi-household house	1990.12.01	87.3	53.16	106.32	Basement 1F, Ground 2F
183-6	Multi-household house	1991.09.13	90.2	56.86	108.04	Basement 1F, Ground 2F, Rooftop
183-7	Multi-household house	1993.08.17	84.7	63.22	118.34	Basement 1F, Ground 2F, Rooftop
183-8	Detached house	1990.11.20	87.7	48.91	97.81	Basement 1F, Ground 2F
183-24	Neighborhood facility area	1983.07.02	86.8	43.42	86.84	Basement 1F, Ground 2F
183-23	Multi-household house	1991.08.19	89.1	55.06	108.10	Basement 1F, Ground 2F, Rooftop
183-22	Multi-household house	1991.09.17	90.3	54.33	106.67	Basement 1F, Ground 2F, Rooftop
183-21	Detached house	1989.09.05	89.6	47.01	109.59	Basement 1F, Ground 3F
183-20	Multi-household house	1996.05.28	89.4	59.20	105.90	Basement 1F, Ground 2F
183-19	Detached house	1976.12.24	91.6	53.67	53.67	Ground 2F
183-18	Detached house	1990.06.18	88.4	50.88	101.76	Basement 1F, Ground 2F
183-17	Detached house	1990.09.06	89.8	56.33	109.00	Basement 1F, Ground 2F

〈Table 11〉 Summary of building data in Sinwol 3-dong 182 area

Lot number	Current Use	Approval date	Area (㎡)	Building coverage ratio (%)	Floor area ratio (%)	No of floors
182-1	Neighborhood facility area	1999.06.26	84.5	59.52	150.45	Ground 3F
182-2	Detached house	1990.09.28	86.8	57.57	111.45	Basement 1F, Ground 2F
182-3	Multi-household house	1996.10.11	87.6	60.59	107.27	Basement 1F, Ground 2F, Rooftop
182-4	Multi-household house	1996.10.11	87.5	60.66	107.39	Basement 1F, Ground 2F, Rooftop
182-5	Detached house	1975.01.11	88.3	59.90	59.90	Basement 1F, Ground 1F
182-6	Detached house	1973.07.25	88.4	80.92	80.92	Ground 1F
182-7	Detached house	1975.05.19	88.6	56.08	103.25	Ground 2F
182-8	Detached house	1990.05.26	89.3	46.83	133.70	Basement 1F, Ground 3F
182-24	Neighborhood facility area	1990.09.26	86.6	52.15	156.45	Basement 1F, Ground 3F
182-23	Multi-household house	1990.08.07	87.4	56.60	110.05	Basement 1F, Ground 2F
182-22	Detached house	1977.08.11	88.7	59.56	59.56	Ground 1F
182-21	Detached house	1991.01.10	88.8	50.12	100.25	Basement 1F, Ground 2F, Rooftop
182-20	Detached house	1988.08.30	89	49.55	96.67	Basement 1F, Ground 2F
182-19	Detached house	-	88.8	-	-	-
182-18	Detached house	1991.02.13	88.7	56.57	106.75	Basement 1F, Ground 2F, Rooftop
182-17	Detached house	1991.01.10	89.5	49.73	99.46	Basement 1F, Ground 2F, Rooftop

국문요약

도시재생활성화지역 내 토지매수 및 손실보상지역의 활용방안 연구

본 연구의 목적은 소음대책사업으로 토지매수 및 손실보상 대상이 된 노후주거지의 실질적 활용방안을 제안하는데 있다. 보상 과정에서 예상되는 원주민의 이주대책, 공가의 증가로 인한 안전상의 문제, 공항소음 저감을 위한 건축자재개발의 필요성 등을 고려하여 정책적, 계획적 방향을 제안하였다.

이를 위해 첫째, 공항소음 및 소음대책과 관련된 정책 및 현황, 법제도를 분석하고 한계와 문제점을 밝혔다. 둘째, 리빙랩을 통해 노후주거지의 지역사회 상생 방안을 제안하였다. 셋째, 공항소음피해지역 내 85웨클(WECPNL)이상의 노후주거지 현황을 분석하고, 소규모주택정비사업의 적용 가능성과 제도적 개선방향을 제안하였다.

연구결과, 매수청구 과정에서 빈 집을 활용한 리빙랩의 운영과 함께 매수청구 이후 공항소음대책지역을 공공주도의 소규모 주택정비 관리지구로 지정하고, 공항공사의 부지매입 후 순환형 임대주택단지로 조성하는 계획안을 제안하였다. 대상지역은 공항공사, 지자체, 현장지원센터, 연구단체가 오랜 기간 협의를 통해 이를 현실화 할 수 있는 방안을 모색하고 있다는 측면에서 시의적절한 연구로 사료된다.

계획안에서는 블록단위개발을 통해 지하층은 마을주차장, 지상층은 마을공원으로 활용하고, 소음이 비교적 적은 대상지를 중심으로 블록형 가로주택을 제안하였다. 원거주자인 소유주가 고령자일 경우, 장기임대가 가능하도록 하고, 인근 도시재생활성화지역의 주택개량 및 자율주택정비 사업시 주민의 임시거주공간으로 활용될 수 있을 것이다. 또한 일부 주택은 소음저감 기술개발을 위한 테스트베드로 활용하고, 리빙랩을 운영함으로써 모니터링 결과가 향후 유사 지역에도 적용될 수 있도록 제안하였다.

주제어: 공항소음대책사업, 토지매수지역, 리빙랩, 도시재생, 소규모주택정비사업