연구논문 「환경정책」 제27권 제1호 2019. 3: 27-54

DOI http://dx.doi.org/10.15301/jepa.2019.27.1.27
ISSN 1598-835X

The Impact of Urban Regeneration Projects on Livability:

Focusing on Urban Regeneration Priority Areas in South Korea*

도시재생사업이 지역주민의 삶의 질에 미친 영향: 한국의 도시재생사업 선도 지역을 중심으로

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Abstract: Livability is essential to sustainability of city life. Urban regeneration projects are a national political priority in South Korea; the government plans to promote the Urban Regeneration New Deal project in 500 cities over the next five years. However, we found the following limitations in policy and previous research. First, processes of selecting project areas and analyzing policy effects fail to consider livability. Second, policy effects have not been tested empirically; previous studies examined policy effects only during temporal ranges beginning after the policy had been implemented. The purpose of this study is to derive a livability indicator and examine whether the urban regeneration project improves site livability. The livability indicator is an objective index for judging "good places to live". Residents may use this livability indicator to evaluate their own communities and improve their quality of life through urban regeneration projects, including appropriate business selection and monitoring. Finally, we present indicators for selection and subsequent evaluation of urban regeneration projects.
Key Words: Urban Regeneration Project, Livability, Index

요약: 지속가능하고 살기 좋은 도시에서 'Livability'는 가장 본질적이며 중요한 요소이다. 현재 문재인 정부에서 가장 중점적으로 추진하고 있는 도시재생 뉴딜사업에서는 정작 'Livability'에 대한 고려가 빠져있다. 도시재생사업은 기존 낙후된 도시지역에 거주하는 도시민이 살기 좋고 지속가능한 곳으로 만들어 최종적으로 삶의 질을 높이는 것을 목적으로 하고 있다. 하지만 도시재생 사업대상지 선정기준을 살펴보면 인구감소, 사업체 감소, 노후 건축물 비율 등 단일쇠퇴지표만 적용하고 있어 해당 지역 및 주민특성 등이 배제될 가능성이 있다. 이에 본 연구의 목적은 'Livability'지표를 도출하여 도시재생사업 대상지가 사업 후 도시의 'Livability'가 향상되었는지를 보는 것이다. 그리고 현재의 도시재생 사업선정 및 평가를 위한 지표를 최종적으로 제시 할 것이다. 대한민국 정부는 향후 5년 동안 500여 곳에 도시재생 뉴딜사업을 추진할 계획이다. 'Livability'지표는 일상생활 속에서 '살기 좋음'을 판단할 수 있는 객관적 지표이다. 이러한 'Livability'지표를 도시재생사업 선정 및 모니터링지표로 사용하여 지역사회 시민들이 자발적으로 지역사회를 진단하고 도시재생사업을 통해 삶의 질 향상을 보다 체감할 수 있을 것이다.
핵심주제어: 도시재생사업, 삶의 질, 지표

* 본 논문은 환경부 「기후변화특성화대학원사업」의 지원으로 수행되었습니다.
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I. Background

In response to the decline of the city, which is becoming a national problem, the current South Korean government is promoting an Urban Regeneration New Deal as the main policy for cities. The Ministry of Land, Infrastructure and Transport announced plans to set up a "New Deal Roadmap" in 2017, selecting a total of 500 locations and spending 50 trillion won (about $45 billion) over five years.

Recently, on August 31, 2018, the 13th Special Committee on Urban Regeneration selected 99 regions and determined to focus on improving the quality of life of residents through investment in community-based living infrastructure. Because the government is spending a substantial amount of money and time on the business of urban regeneration, very prudent standards and evaluation are needed in the selection of urban regeneration project sites.

〈Table 1〉 Criteria for selecting urban regeneration regions (Decline Index)

Index	Criteria1	Criteria2
Population	A region which has lost more than 20 percent of its population over the past 30 years, compared to the largest population in its history.	A region showing evidence of more than three consecutive years of declining population in the last five years.
Industry	A region in which, over the past decade, the total number of businesses has decreased by more than 5 percent from the time when the total number of businesses subject to the National Statistical Office (NSO) approval under Article 18 of the Statistics Act was at its highest.	Areas where the total number of businesses has decreased for more than three consecutive years in the past five years.
Old buildings	A region in which more than 50 percent of the buildings are more than 20 years old.	

Source: Special Act on the Promotion of Urban Regeneration

The focus of urban regeneration aims to build sustainable communities through the environmental, social, and economic regeneration of under-developed and neglected locations (Won, 2013). In Chapter 1, Article 1 of the Special Act on the Promotion of Urban Regeneration, the urban regeneration projects promote the public's role in, and support for, the recovery of economic, social, and cultural vitality in the city. It also stipulates that the objective is to expand the city's growth, enhance the city's competitiveness, restore the local community, and contribute to the improvement of quality of life for the people.

This concept of quality of life is closely related to livability, including such factors as environment, housing, economy, society, and all the elements of daily life. Livability is a core value for creating a livable city in architecture, urban design, and urban planning with concepts derived from new urbanism, sustainability and smart growth. In urban regeneration projects, livability means the ability to maintain and improve the vitality of a city (Carlos, 2004).

However, there is a possibility that the characteristics of the area and the residents are excluded from consideration because only certain indicators of decline, such as population decrease, business decline, and the ratio of old buildings are applied as criteria to the urban regeneration project site selection (Jeong and Lee, 2017). In addition, following completion of the urban regeneration projects, it is debatable whether the quality of life of residents has improved comparably with improvements in population, industry, and buildings. Hence, there is a need for business selection criteria and evaluation indicators that can indicate improvement of the quality of life of residents, which is an essential purpose of the urban regeneration

projects (Architecture & Urban Research Institute, 2016).

In view of the above, the purpose of this study is to develop a livability indicator for the selection and evaluation of urban regeneration project sites. Secondly, it considers whether this indicator improves the livability of the urban regeneration project areas. To this end, the study examines whether the existing urban regeneration project has improved the living conditions in the project areas. In order to see if livability has improved, the study analyzes the 2014 urban regeneration project areas, proposing the selection of urban regeneration projects and improvement of the monitoring index.

II. Theoretical Considerations

1. Literature Review

1) Criteria for urban regeneration project selection

Currently, the selection criteria for urban regeneration projects are the quantitative indicators of population, industry, and ratio of old buildings, as shown in Table 1, and the level of decline is monitored for selected priority sites. Table 2 presents previous studies relating to the selection criteria for urban regeneration projects. The studies suggested in Table 2 indicate the limitations of the existing decline index and the necessity for developing additional indicators (Seoul Metropolitan Council, 2017; Kim et al., 2017; Kim et al., 2015; Yu and Yeo, 2015) for monitoring urban regeneration projects (Jung et al., 2017; Choi et al., 2013). Seoul Metropolitan Council (2017) added crime rate as a decline index and Yu and Yeo (2015) suggested

indicators for monitoring changes in societies over time, including indicators for responding to climate change. Kim et al. (2015) and Kim et al. (2017) developed additional indicators through case studies and expert surveys. Kim et al. (2017) emphasized the importance of citizen participation in urban regeneration projects and presented qualitative indicators for regional policies and capabilities.

Previous studies have established indicators for selecting and monitoring urban regeneration projects. Jung et al. (2017) analyzed the effectiveness of urban regeneration projects by considering the resident population, card sales, and building permits. Choi et al.

〈Table 2〉 Previous studies on selection criteria for urban regeneration projects

Author	Contents
Seoul Metropolitan Council, 2017	Development of evaluation indicators for selecting priority areas for urban regeneration projects. Existing decline index + crime index.
Kim et al., 2017	A Study on Qualitative Indicators and Methods of Urban Regeneration Activation. Regional characteristics indicators (quantitative) + regional policies + regional capacity (qualitative) indicators.
Kim et al., 2015	A Study on Priority of Evaluation Factors for Selecting Urban Regeneration Districts. Index developed from evaluation indicators and prior research on urban regeneration projects.
Kim, 2017	A Study on Priority of Evaluation Factors for Selecting Urban Regeneration Districts. Indicators developed through previous studies and the final index after IPA analysis.
Yu and Yeo, 2015	Development of Urban Regeneration Indicators in Response to Climate Change and Selection of Activated Regions Decline index + climate change + energy index.
Jung et al., 2017	A Study on the Application Methods of Indicators for Monitoring Urban Regeneration Projects. Use of resident population, card sales, and construction license numbers as monitoring indices.
Choi et al., 2013	The Study on Elaboration and Applications of the Urban Regeneration Monitoring Indicators. : Monitoring indicators of USA, UK and France and suggesting direction of derivation of monitoring index.

(2013) reviewed the monitoring indicators of London, San Francisco, and France, but did not develop any indices.

In summary, the previous studies' focus on selecting criteria for urban regeneration projects highlighted the limitations of the existing decline index for evaluating quality of life. However, only a few studies emphasize livability in measuring the overall quality of daily life.

2) Urban regeneration and livability

In South Korea, very few studies have considered livability in relation to urban regeneration. Seo and Kim (2012) reviewed multiple definitions of livability and categorized them into four concepts; quality of life, place, comfort, and accessibility. Im et al. (2016) pointed out that the decline index for urban regeneration failed to serve as a sub-conceptual for each period and stage to determine the achievement of the goal of improved quality of life. Oh et al. (2013) also emphasized the need for community-based indicators because urban regeneration emphasizes quality of life, sustainability, people-centered development, and participation.

The improvement of quality of life should be fundamental to ensuring a minimum standard of living for all residents. Thus, it emphasizes the need for more diverse communication activities, considering the social exclusion caused by existing large-scale urban regeneration projects and the disadvantages for people in the neighborhood (Ha and Kim, 1997; Won, 2013; Lee and Hwang, 2013; Kashef, 2016). noted that some indicators from OECD, EIU, and Mercer are used to measure the quality of life of a country or a city but may evaluate livability on the basis of expert-elitism.

Hence, a critical review of urban regeneration projects and the

complementation of the relevant indicators is being studied in terms of changing an urban policy paradigm. In South Korea, the term livability has not been used directly, but there are an increasing number of studies emphasizing the importance of related concepts such as 'quality of life', 'community', 'communication', 'people-centeredness', and 'sustainability'.

〈Table 3〉 Previous studies related to urban regeneration and livability

Author	Contents
Won, 2013	The Critical Review of Large Scale Urban Regeneration Projects. A critical study on social exclusion, distribution equivalency, hierarchy and spatial separation through urban regeneration projects.
Lee et al., 2013	Urban Regeneration, its Political Background and New Paradigm shift. Urban regeneration projects highlight the concerns of the narrow concepts of community and the various acts of communication.
Im et al., 2016	A Relationship between Measures of Urban Decline and Quality of Life indicators. Existing decline index + OECD BLI + Seoul happiness index: comparative analysis to discuss whether it meets the urban regeneration objectives.
Her et al., 2017	The Effects of Kevin's Concept on Life Satisfaction – Focused on Five Dimensions of Good City Form Theory. Analysis Kevin Lynch's five concepts of satisfaction(vitality, sense, fitness, access and control) within Seoul City.
Oh et al., 2013	Changes in Urban Policy Paradigm and Composition of Community Indicators. OECD BLI, Jacksonville JCCI community index, and the importance of quality of life, sustainability, and health index.
Ha and Kim, 1997	A Study on the Quality of Life: Policy Themes and Indicators. Indicators of quality of life are divided into six categories: environment, economy, social culture, education, welfare, infrastructure, and settlement environment.
Seo and Kim, 2012	A Review of Ambiguous Concepts on the Urban Livability Discourse. Livability interpreted in relation to quality of life, place, property, comfort, and accessibility.
Yoon and Yun, 2013	A Study on Constructing Public Design Livability Indicators in an Urban Neighborhood. Conceptualizes public design livability as comfort, convenience, sociability, and sustainability and developing an evaluation index.
Kashef, 2016	Urban Livability Across Disciplinary and Professional Boundaries. Livability composite indicator comprising EIU, OECD BLI, Mercer, Monocle and others can be used to measure design and planning outcomes as well as to provide guidance for improvement.
Carlos, 2004	Measuring the Livability of an Urban Centre: An Exploratory Study of Key Performance Indicators. Analyzes the concept of City Centre Livability and the use of key performance indicators.

2. Theoretical Consideration of Livability

1) Policy discussion of livability

Although there is consensus about the definition of livability, it typically means that a location is a good place to live, where basic facilities are accessible. The concept of livability is divided into the conceptual aspects of sustainable development (economy, ecology, and equity) and aspects of public space, movement systems, and building design (Godchalk, 2004). Livability also includes social factors such as quality of life in the community, the artificial environment, the natural environment, the economy, social stability, equity, education, and leisure (Partner for Livable Communities, 2011).

Since the 1970s, the United States and Europe have adopted livability as a major agenda for national and urban development and have actively promoted various related policies and projects. In 1999, the Clinton administration in the United States established a 'livability agenda' at the national level to build livable communities with the aim of improving quality of life and establishing a strategy for economic prosperity (Clinton-Gore Administration, 2000). As a result, the American Association of Retired Persons (AARP) created the first evaluation system for developing a livability indicator and it is still the most widely used indicator in the United States. The livability indicator consists of seven categories (housing, neighborhood, transportation, environment, health, engagement, and opportunity) together with 40 sub-indicators.

Consistent with the global trend, South Korea has started similar projects such as livable cities, walkable streets, and town development since the late 1990s. In 2013, the urban regeneration projects began

in earnest with the enactment of the Special Act on the Promotion of Urban Regeneration. In 2014, the Ministry of Land, Infrastructure and Transport created a system for assessing the 'urban sustainability' and 'living infrastructure' in order to improve the sustainability of the land and the quality of life for the people.

Table 4 compares the livability index of the AARP with the sustainability and living infrastructure evaluation indicators of the Ministry of Land, Infrastructure and Transport which governs the housing, environment, and transportation sectors. The number of detailed indicators has increased in Korea, but most of them are quantitative indicators such as the number of facilities or the ratio of facilities to population. Also, all of the cities are uniformly evaluated, so that small and medium cities are evaluated, based on the index, without considering characteristics such as the size of the city (The Seoul Institute, 2017). In order to develop an appropriate livability index, it is necessary to construct qualitative indicators such as access to public facilities, spatial comfort, and convenience of public facilities, rather than considering only quantitative indicators such as the number of public facilities. Still, there are limitations in obtaining all indicators.

3. Livability and Relevant Concepts

1) New urbanism and smart growth

Livability was a vision for creating livable communities through new urbanism and smart growth, which were at the core of the urban movement in the early 20th century (Godschalk, 2004). Livability emerged from the concept of community planning in new urbanism

〈Table 4〉 The comparison of index (AARP, MOLIT)

	Livability Index (AARP)		Urban sustainability and living infra-structure evaluation index (Ministry of Land, Infrastructure and Transport, MOLIT)
Housing	Housing accessibility	Percentage of housing units with basic passage.	Ratio of rental housing to total number of households. Rent to income ratio(RIR). House price level by income(PIR). Expansion, reconstruction, large repairs, and building numbers compared with the number of old buildings. Best Practices of Urban Regeneration and Town Development. Efforts to improve the quality of housing for low-income families.
	Housing option	Percentage availability of multi-family housing units.	
	Housing affordability	Housing cost per month.	
		Income spent on housing.	
		Availability of subsidized housing units per 10,000 people.	
Environment	Water quality	Drinking water: number of people exposed to polluted or substandard water.	Recycling rate of municipal waste. Urban area ratio vs. water supply and demand rate. Forest area reduction ratio. Efforts to produce, distribute and utilize renewable energy. Number of certified eco-friendly buildings. Efforts to adapt to climate change. Efforts to develop low impact (rooftop greening, penetration of storm water, stormy storm, etc.)
	Air quality	Regional air quality: unhealthy air quality days per year.	
		Near-roadway pollution: people exposed.	
		Local industrial pollution: index from 0-311,000.	
Transportation	Convenient transportation options	Frequency of local transit service: buses and trains per hour	Public transport share. Number of traffic accidents per 1,000 cars. Number of registered cars using public parking lots. Amount of public transportation loss support per 1,000 people per year. Policies and programs for active walking and cycling. Policies and programs for promoting eco-friendly vehicles.
		Walking trip: trips per household per day.	
		Congestion: hours per person per year.	
	Transportation costs	Per year.	
	Safe streets	Speed limits: miles per hour.	
		Fatal crashes per 100,000 people per year.	
	Accessible system design	ADA-accessible stations and vehicles: stations and vehicles are accessible.	

Note: Compared only with the housing, environment and traffic indicators

and it is the first principle to address a fully integrated community that includes homes, shops, workplaces, schools, parks, and public facilities. Smart growth is the emergence of the seven principles of new urbanism to be implemented politically.

This paper adopts livability as a key strategy for smart growth. The first principle is neighborhood livability. As mentioned above, in 2009 the United States federal government promoted the six principles of livability which provide a variety of transportation options. In other words, smart growth is an urban regeneration paradigm that aims for socially healthy cities while enriching environmental and economical sustainability (Won, 2013).

2) Sustainability and quality of life

The concept of a sustainable city is linked to the quality of life of a city, including the stability of its economy, society, and environment. Sustainable cities ensure economic development and a good quality of life for the residents while preserving the environment. Sustainability is a fundamental concept that includes the vital concept of livability, and it can be said that the relationship between sustainability and livability is an interdependent one that affects quality of life.

Quality of life is based on subjective satisfaction and happiness relating to how people feel about the place where they live (Shin, 1981; Han, 1998) and it is synonymous with livability (Meyers, 1987; Song and Park, 1999). The quality of life (QoL) of each country and city is evaluated every year through the quality of living survey of Mercer, the global consulting group, the Better Life Index (BLI) of OECD, and the British EIU livability ranking. The QoL shown in Table

5 is based on the 3E concepts of sustainability.

3) Urban health

'Health' is a concept that cannot be excluded from that of livability. Health indicators are indispensable in measuring progress towards sustainable development goals and quality of life. 'Urban health' includes individual health affected by rapid urbanization, and macroeconomic issues such as population change and climate change. Factors that determine health risk vary from the individual to the regional level.

〈Table 5〉 Quality of life index

Sustainability	Mercer quality of living survey	OECD 'Better Life Index(BLI)'	EIU livability ranking
Environment	utilities, recreational facilities housing, and natural environment	safety housing, environment	culture and environment infrastructure recreational amenities
Equity	socio-political environment sociocultural environment education, health	governance, work-life balance, education, social support system, life satisfaction	healthcare, education, stability
Economy	economics, market	income, employment	-

Seoul Metropolitan City developed Seoul City's urban health indicators in 2016 to manage the health risk factors of citizens and monitor their related health levels. What should be noted here is an attempt to link these health indicators to urban infrastructure by including them in a comprehensive plan. This is because access to medical facilities and parks, and the surrounding environment, affect health more than the number of facilities relative to the population

density. That is, the shape of the city, the land use, and the walk-friendly environment are the context in which people are able to maintain healthy lifestyles and improve livability.

4. Research Questions

So far, this paper has reviewed the relevant concept of livability. The interest in quality of life, which arose from anxiety about the problems caused by rapid industrialization and urbanization, led to efforts to improve South Korean cities' livability. If environmental, economic, and social sustainability objectives are met, this will ultimately lead to improved livability. New urbanism and smart growth provide policy and planning directions for enhancing livability.

The South Korean government defined shrinking cites with the use of a simple decline index and selected pilot areas for urban regeneration projects. However, in the process of selecting and evaluating, it is necessary to include a livability index relating to the purpose of the policy. The following research questions were developed following consideration of the policy objectives and the literature review.

- Question 1: Are project areas relatively low in livability compared to other, non-project areas?
- Question 2: Have the urban regeneration projects improved livability within the project areas?

5. Livability Index

In developing the livability index, this study combined literature reviews and relevant concepts of livability. Table 6 summarizes the basic indicators of sustainability in terms of the categories of

〈Table 6〉 The synthesis of livability index

Index		Decline	AARP Livability	New Urbanism	Smart Growth	MOLIT Sustainability	Quality of Life
Environment	Old buildings	●					
	Housing		●	●	●	●	●
	Diversity of transportation		●	●	●	●	
	Environment		●	●	●	●	●
	Mix-used development		●	●	●		
	Pedestrian friendly		●	●	●		●
	Energy efficient			●			
	Utilities				●		●
	Infrastructure						●
	Appropriate scale		●	●			
Equity	Disaster prevention and safety		●			●	●
	Social welfare facilities				●	●	●
	Cultural facilities		●	●	●	●	●
	Citizen participation		●				●
	Education opportunities		●				●
	Income inequality		●				●
	Preserving existing communities				●		
	Life satisfaction						●
	Work-family compatibility						●
	Health						●
Economy	Number of businesses	●					
	Employment opportunities		●				●
	Jobs in community			●	●		
	Revitalization of city center				●		
	Leverage existing infrastructure				●		
	Population	●				●	
	Economy					●	●
	Market						●
	Income						●

environment, society, and economy. The decline index for existing urban regeneration projects is limited to the environmental and economic sectors, which limits the monitoring of the social sector.

The AARP's Livability Index is composed of indicators very similar to those of new urbanism and smart growth, because livability has been presented as a vision of these concepts. In particular, the AARP index is the most commonly used tool in the United States so we have examined it in this study. Sustainability and quality of life indicators are almost duplicated in the Livability Index. In the case of quality of life, individual level indicators such as life satisfaction and work-family compatibility are added.

Ⅲ. Research Design and Methodology

1. Data

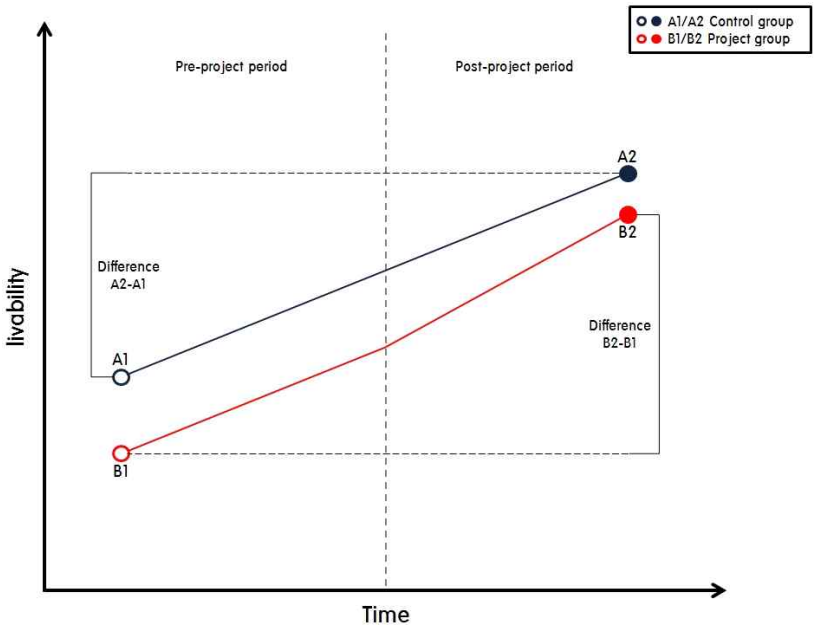
The geographical range of the study covers cities throughout South Korea. As of 2017, there are 228 cities in South Korea. However, because of difficulties in obtaining data, this research has limited the geographical range to 226 cities, excluding Jeju and Seogwipo. In addition, the 226 cities were grouped into the regions where urban regeneration projects were or were not implemented. The timescale of the analysis covers the eight years between 2008 and 2016. We also considered the periods before and after 2014, the year in which urban regeneration projects were initiated.

2. Analytical Approach

This study used the difference in differences (DiD) model to analyze the impact of urban regeneration projects on livability. The DiD approach uses a research method designed to estimate the effects of certain policy interventions by analyzing the average difference between the project group and a control group (Lechner, 2011). In the DiD analysis, the areas affected by the policy are treated as project groups, and areas not affected by the policy are set as control groups. At the same time, the DiD approach addresses timescale by dividing the analysis into pre- and post-project periods 〈Figure 1〉. Hence, the DiD approach is a methodology used to accurately analyze the effects of the policy by controlling for other factors that might affect the dependent variables. In particular, it is appropriate to use the DiD approach to accurately analyze the impact of urban regeneration policy on regional livability. DiD is based on the assumption that the project and control groups are subject to the same timescales, and the error term should have the same variance when using multiple time-periods. In addition, the DiD method includes an interaction term in the regression equation, so that the impact of policy can be analyzed by the coefficient of the interaction term.

This study treated 13 cities as project groups in which urban regeneration projects had been implemented, and the remaining 213 cities as a control group.

〈Figure 1〉 Conceptual framework



3. Variables

The study set the livability index as the dependent variable. Explanatory variables are the dummy variable for the urban regeneration area, time since project implementation, and an interaction term.

The livability index is divided into the sub-indices of health, disaster safety, welfare, culture, population, economy, environment, traffic, land use management, and citizen participation. Each sub-index was determined by standardizing the sub-sub-indices as shown in Table 7. All the sub-sub-indices were normalized to values between 0 and 1 using a re-scaling method. In addition, the influence of each sub-index on livability was considered in the process of developing the sub-indices.

〈Table 7〉 Variables

Category			Sources
Main category	Sub category	Sub-sub category	
Social Sector	Health	Obesity rate(−)	Korean Statistical Information Service
		Walking rate(+)	
		Number of beds in hospital per 1,000 population(+)	
		High blood pressure rate(−)	
		Diabetes rate(−)	
	Disaster Safety	Damages by natural hazard(−)	Disaster Annual Report
		Number of fires per 10,000 residents(−)	Korean Statistical Information Service
	Welfare	Nursing facilities per 1,000 children(+)	Korean Statistical Information Service
		Number of kindergartens(+)	
		Number of kindergarten children(+)	
		Number of elementary school students(+)	
		Number of doctors engaged in medical institutions per 1,000 population(+)	
		Number of elderly welfare facilities per 1,000 elderly population(+)	
	Culture	Number of culture facilities per 100,000 population(+)	Korean Statistical Information Service
		Number of sports facilities(+)	
		Area of park(+)	
Economy Sector	Population	Population growth rate(+)	Korean Statistical Information Service
		Number of births(+)	
		Net population migration(+)	
		Aging rate(−)	
	Economy	Number of business per 1,000 population(+)	Korean Statistical Information Service
		Financial self-reliance(+)	
		Budget per capita(+)	Local Finance Integrated Open System
Environment Sector	Environment	Recycling rate of waste(+)	Korean Statistical Information Service
		Water supply rate(+)	
		Area of forests(+)	
		Concentration of particulate matter(−)	Atmospheric Environment Annual Report
	Traffic	Number of traffic accidents per 1,000 cars(−)	Korean Statistical Information Service

Supporting System	Land Use Management	Number of development permits in urbanization area(+)	Korean Statistical Information Service
	Citizen Participation	Voting rate(+)	National Election Commission
Urban Regeneration	Urban regeneration project	Project area : 1, else : 0	
	Time after project	Before 2014: 0. After 2014: 1.	
	Project*Time	Interaction term	
Project Type	General Neighborhood	General Neighborhood: 1, other: 0	-
	Small Neighborhood	Small Neighborhood: 1, other: 0	-

Source : Reconstructed urban sustainability and livability index

The 13 designated areas for urban regeneration can be grouped into general neighborhoods, small neighborhoods, and economic bases depending on the business type. Each business type is classified according to the characteristics of the project, and the government grant varies depending on the business type. Therefore, in order to control for the influence of the business type, the study set the dummy variables of general and small neighborhoods. Economic base type is excluded because of the multicollinearity problem since the type corresponds to only two cities.

Ⅳ. Analytical Results

Results from the DiD method of analysis are shown in Table 8, and results are described by an interaction term.

The analysis showed that the urban regeneration project, which was initiated in 2014, did not significantly improve the livability of project areas. In particular, urban regeneration projects have not had a statistically significant impact on the environment, traffic, health,

disaster safety, welfare, culture, population, economy, land use management, or citizen participation aspects of livability 〈Table 8〉. In other words, the analysis suggests that the urban regeneration projects, conducted primarily in 13 regions in Korea, did not affect the quality of life of residents as the projects intended.

〈Table 8〉 Analytical results

Category		Time	Project	Time* Project	Dummy -general neighbor-hood	Dummy -small neighbor-hood	Cons
Main	Sub						
Environment Sector	Environment	0.0683***	0.3001***	-0.0393	-0.1057	-0.0803	0.5594***
	Traffic	0.003	-0.1446***	-0.008	-0.0324	0.1088***	-0.3234***
Social Sector	Health	-0.0588**	0.1234*	0.0597	0.1243	0.0115	-0.7058***
	Disaster Safety	-0.0407***	0.2067***	0.0335	-0.1481***	-0.2197***	-0.2989***
	Welfare	-0.0088	0.2798	0.0903	-0.025	-0.1575	1.2451***
	Culture	0.0197**	0.2246**	0.0025	-0.0396	-0.1921*	0.2702***
Economy Sector	Population	-0.1098***	0.2585*	-0.0516	-0.1659	-0.1611	0.3672***
	Economy	0.03913***	-0.0637***	-0.0005	0.1492***	-0.0051	0.5565***
Supporting System	Land Use Management	-0.0125**	0.0183	0.0154	-0.0224	0.0038	0.0614***
	Citizen Participation	0.0991***	-0.1452***	0.0508	0.1325***	0.0377	0.4665***

*** p〈0.01, ** p〈0.05, * p〈0.1

In addition, the analyzed results of the ‘project’ variable and the interaction term can be used to identify problems with the index concerning the selection process of urban regeneration projects. Health, disaster safety, culture, population, and environment were significant for the ‘project’ variable but were not significant for the interaction term. This means that the 13 project cities have higher livability than the 213 control cities in those sectors. In particular, the population index in project cities was increasing, while those of the

213 control cities was decreasing. The purpose of an urban regeneration project is to restore community and improve quality of life in areas where the population is decreasing. Nevertheless, according to the results of this study, it can be seen that the areas with high livability were designated as project areas.

Environment, health, disaster safety, culture, population, economy, citizen participation aspects of livability were statistically significant for 'time' variable. In particular, the time variable shows that the livability for whole cities in terms of health, disaster safety, population, and land use management is decreasing, while the livability for culture, economy, environment, and citizen participation is increasing.

According to the dummy variable of business type, the indices of economy and citizen participation in general neighborhoods are higher than those of other cities. In the case of small neighborhoods, the traffic index is higher than for the other cities. In other words, project cities including general and small neighborhood type are more livable in economy, citizen participation, traffic aspects of livability.

According to the results of the analysis, the implementation of urban regeneration projects did not affect the improvement of cities' livability. In addition, by selecting project areas based on certain indicators of decline, cities with high livability were paradoxically selected as project areas.

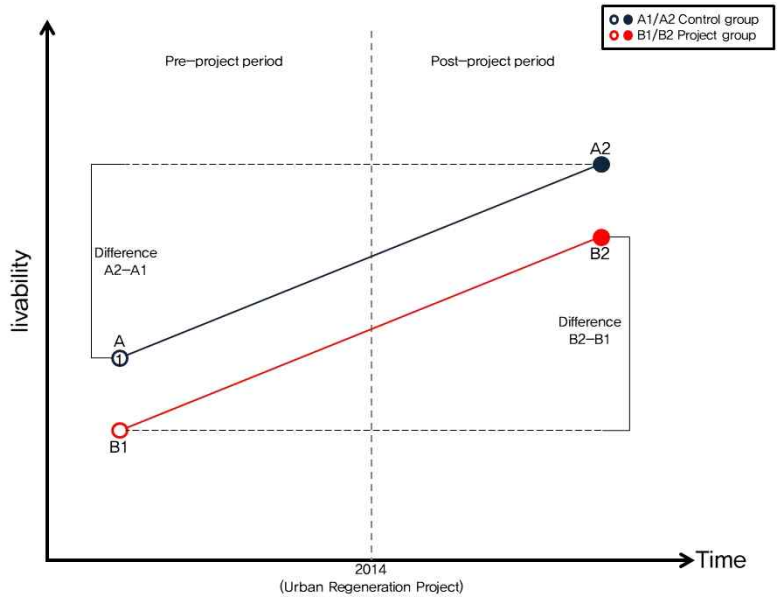
Ⅴ. Conclusion

1. Research Questions Revisited

This study empirically analyzed the impact of urban regeneration projects on livability through the DiD method. Results were based on the previously specified research questions.

This study showed that empirically, the project areas had higher livability than the control areas, in terms of health, disaster safety, culture, population, and environment. In other words, people who live in the 13 project areas are healthier, safer against disaster and experience a more culturally and environmentally livable environment than those who live in the 213 control areas. However, the 213 control areas are more livable in terms of economy, traffic, and citizen participation than the 13 project areas. Despite the fact that the control group shows better results than the project group, the control group is nevertheless suffering from higher population decline than the project group. The urban regeneration project began with the aim of making the declining cities livable and judged the level of decline by indicators related to population. Paradoxically, however, areas that did not decline in terms of population were selected as the project group. This paradox is due to the use of certain indicators of decline such as population decrease, business decline, and the ratio of old buldings in the process of selecting project areas (Joeng and Lee, 2017). In other words, the decline index for urban regeneration failed to serve as a sub-conceptual for each period and stage to determine the achievement of the goal of improved quality of life (Im et al., 2016).

〈Figure 2〉 Conceptual framework revisited



This study showed that, empirically, livability of project areas has not improved since the 2014 initiation of the urban regeneration projects. The interaction term (Time*Project) was not significant for livability in terms of all categories. When considering the previously-established conceptual framework, it indicates that the trends of the control group and project group are the same after project implementation, and there is no difference between the two groups 〈Figure 2〉. In particular, there were no livability difference between the two groups after project implementation. In other words, the urban regeneration project did not improved the livability of population of project group which is similar to the decline index.

In order to figure out the reason why there is no difference in livability between the two groups, it is necessary to return to the discussion of urban regeneration project in South Korea. In other

words, the urban regeneration project, which was carried out by spending 140 billion won from 2014 to 2016, failed to achieve its objectives.

The Ministry of Land, Infrastructure and Transport announced plans to set up a 'New Deal Roadmap' in 2017 aiming to build livable environments. In addition, the government is promoting Urban Regeneration New Deal as the main policy for cities and spending a substantial amount of money and time (Won, 2013). Nevertheless, the government is still using only certain indicators of decline in the selection and evaluation of the urban regeneration projects.

2. Implications

In this section, the paper discusses the academic and policy implications of the study. Firstly, research is needed on indicators that measure livability in terms of the context of South Korea. South Korea is measuring livability at a national level and does not consider it at the regional and local levels. However, in order to accurately measure livability, it is necessary to measure in units that are relevant to the residents' lives.

Secondly, it is necessary to utilize in the process of implementing and monitoring urban regeneration projects. In South Korea, a total of 50 trillion won will be invested over the next five years in the Urban Regeneration New Deal Project. This Project, like the 2014 urban regeneration projects, aims to make declining cities livable. However, if the livability index is not taken into account, another project costing 50 trillion won may not achieve its goal.

Thirdly, it is necessary to consider the livability index as well as the decline index in the process of selecting project cities. As long as it

is the goal of the project to make cities livable, selecting areas that are not livable will be more relevant for the purpose. If livability indicators are not taken into account in the selection process, a livability gap will be created by making the areas more livable. In other words, despite the fact that the project has been implemented for the best of reasons, it will result in poor outcomes in terms of equity problems.

3. Limitations

This section addresses the limitations of the study. The qualitative index relating to livability in the community units was not considered due to a data acquisition problem. However, there are active studies that take into account subjective indices such as satisfaction, social network, and trust, as well as the national quality of life index announced by Statistics Korea. Therefore, a subjective index developed from interviews and satisfaction surveys in the urban regeneration project areas should be reflected in future studies. In addition, this study only analyzed the short-term effects of the urban regeneration projects since the policy was initiated in 2014. Therefore, an analysis of the long-term effects of the policy is also necessary.

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전선민: 서울대학교 환경대학원에서 환경조경학 석사학위를 취득하고 부산대학교 도시공학과 박사과정을 수료하였다. 주요 관심분야는 지속가능한 토지이용계획과 기후변화에 따른 도시방재설계, 도시재생 등이다(sunminjun2011@gmail.com).

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정주철: The University of Texas at Austin에서 도시 및 지역계획 박사학위를 취득하였으며, 현재 부산대학교 도시공학과 교수로 재직 중이다. 주요 관심분야는 토지이용계획, 환경계획 및 정책, 스마트 성장관리정책 등이다(jcjung@pusan.ac.kr).

투 고 일: 2018년 11월 12일
심 사 일: 2018년 12월 03일
게재확정일: 2018년 12월 16일