

Article

The Transition from Traditional Infrastructure to Living SOC and Its Effectiveness for Community Sustainability: The Case of South Korea

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Received: 23 October 2020; Accepted: 5 December 2020; Published: 8 December 2020



Abstract: In 2018, the South Korean government began promoting a “livelihood-improving” social overhead capital policy based on the concepts of an inclusive city, smart shrinkage, and the balanced development of metropolitan and provincial cities. Based on a review of the extant literature and relevant policies from South Korea, this study explores this policy’s implementation and makes some suggestions for its sustainability. This study compares the current state of South Korea’s urban facilities’ and the balance of their supply between metropolitan and provincial cities. To discern which type of facility central and local governments should prioritize, this study conducts a stepwise regression analysis and identifies which preexisting facilities influence the facility type proposed by the current policy. Results show that South Korea’s living infrastructure is well distributed among metropolitan and provincial cities. However, urban planning shows little consideration for minimizing the distance between facilities and residential zones. In terms of facility types, the supply of education and local community facilities was adequate throughout the country, while culture and art facilities were inadequate. In metropolitan cities, the supply of sports and leisure facilities was insufficient.

Keywords: social capital; living environment; living infrastructure; soft infrastructure; living social overhead capital; inclusive growth; inclusive city

1. Introduction

First presented by the United Nations as a theme of its Global Campaign on Urban Governance in 1999 [1], the concept of city inclusion comprises three dimensions: social, economic, and spatial. Of these, spatial inclusion refers to equal accessibility to living infrastructure and public services [2], mainly because people with limited access to living infrastructure and public services experience social exclusion from various social opportunities [3]. Accordingly, the global community has sought sustainable, inclusive growth by ensuring universal access to living infrastructure and public services [4]. In addition to the concept of inclusive growth, there is a growing emphasis on nonphysical infrastructure (or soft infrastructure) beyond the conventional concept of living infrastructure and public services [5]. Unlike physical infrastructure (or hard infrastructure), such as roads and ports, nonphysical infrastructure refers to all services essential for maintaining a nation’s economy, health, and culture. From the late twentieth century, European and North American scholars have defined parks, green areas, and community sports facilities as social infrastructure and have actively participated in policymaking and research related to social infrastructure [6–9].

In 2018, South Korea proposed a “livelihood-improving” social overhead capital policy (hereinafter, Living SOC) as a practical alternative to realizing “spatial inclusiveness”. Defined as “a small-scale

living infrastructure easily accessible to people in the community”, the Living SOC reflects the paradigm of global change while promoting balanced development between South Korea’s regions and cities and creating more equitable living standards [10]. While the policy draws on the concept of the “living infrastructure” insofar as it includes the same type of facilities, it also reflects the concepts of “spatial equality” and “equal accessibility” [11]. The Living SOC policy was motivated by South Korea’s 2018 Gini coefficient, which showed that the regional disparity between metropolitan and provincial cities in the Living SOC supply across the country was worse than the income disparity between individuals [12]. In general, metropolitan cities refer to large central cities with a population of more than 50,000. They serve as hubs for social and economic activities in the surrounding area, while provincial cities refer to other areas [13]. However, following Article 175 of the Local Autonomy Act, South Korea has defined metropolitan cities as specific cities with a population of more than 500,000 and eligible for special treatment, and this study follows this definition. With the national budget increasing by approximately KRW 10.4 billion per annum [14], the government allocated funds for a national project for balanced development based on the Living SOC—including some KRW 500 billion for startup expenses alone [15]. As such, policies related to Living SOC are increasing in significance.

However, despite relatively refined standards, the Living SOC policy faces the criticism that it is not much different from the previous policy of supplying “living infrastructure” in terms of its exhaustive list of facilities [16]. Urban shrinkage is becoming common in cities worldwide, including over 20 cities in South Korea [17]. Here, urban shrinkage is a concept established through the 2002 in German miniature city project [18,19]. Urban shrinkage does not mean that a city’s physical size is getting smaller, but rather an urban phenomenon in which boundaries and infrastructure remain the same, while the population and economy decline [20,21]. Provincial cities experiencing urban shrinkage may suffer from various problems, including poor usability due to a superfluous supply of facilities and their deteriorating conditions, and the difficulty of procuring the financial resources necessary for the upkeep of facilities. Nonetheless, with the area of various convenience facilities intended to sustain people’s lives predicted to increase from 2792 km² in 2015 to 3842 km² in 2040 [22], the significance of adequately supplying such infrastructure has also been emphasized.

As such, South Korea is facing the complicated task of supplying Living SOC equitably and sustainably to cope with urban change and resolve spatial inequality. Accordingly, it is necessary to analyze the characteristics of cities to address urban shrinkage and identify the type of infrastructure. In particular, as the current Living SOC policy overlaps with preexisting living infrastructure in urban areas, it is essential to determine whether the current supply of living infrastructure overlaps with the facilities proposed by the new policy and whether the pertinent facilities are distributed equitably. Extant studies from South Korea [23–25] are limited insofar as they primarily focus on examining the condition of major living infrastructure and strategies for improving accessibility. Moreover, investigating and analyzing the physical and demographic conditions of each city, as well as the current condition of the major urban facilities that can be categorized as Living SOC, will improve the implementation of relevant policies.

Considering the foregoing, this study examines the implementation and sustainability of South Korea’s Living SOC policy. To overcome the limitation in the extant research and relevant policies, this study examines the current condition of the living infrastructure established in South Korea before 2018, when the Living SOC was introduced, from the perspective of urban planning and land use. Per the concept of balanced development, this study examines the distribution of the preexisting facilities and analyzes whether the pertinent facilities are evenly distributed between metropolitan and provincial cities. By discerning which types of preexisting facility influence that proposed in the Living SOC policy, this study identifies which type of facilities the central and local governments should prioritize in terms of supply. The findings of this study can facilitate economic stability and sustainability by improving the implementation of relevant policies going forward.

2. Literature Review

2.1. Social, Soft, and Living Infrastructure

This study understands the concept of Living SOC to be similar to that of an inclusive city, which was proposed in the 1990s as a solution to a regional imbalance between cities [10]. The concept also draws on practical land and urban planning strategies and policies proposed by countries in Europe, North America, and East Asia [12].

In this respect, the concept of Living SOC is the closest to that of social infrastructure—that is, a composite of resources and facilities—including spaces, services, and networks—that vitalize the local community [26] and preserve the happiness and quality of life of community residents [27]. The concept of social infrastructure is generally contrasted by physical or economic infrastructure. While the physical infrastructure directly supports economic growth, social infrastructure aims to help build the community by providing the necessary social services [28] and improving residents' quality of life [29]. Social infrastructure also contributes to economic development by ensuring the effective utilization of human resources [30]. Social infrastructure can be defined as the physical environment that determines the successful development of social capital [31].

Compared to social infrastructure, living-related infrastructure refers to more specific physical facilities that community members need for daily life, such as houses, parks or green areas, water facilities, parking lots, and hospitals [32]. Meanwhile, living infrastructure refers to physically alive and easy infrastructure for community members to access and utilize [33]. Living infrastructure is similar to the living-related infrastructure insofar as it is defined in the scope of the preexisting infrastructure in close relation to daily life from the perspective of social and natural science. However, in contrast to living-related infrastructure, the concept of living infrastructure emphasizes the sustainability of the local and urban residents by adding to it “being alive” [34].

Infrastructure can also be divided into hard and soft infrastructure which provide both physical and social services. Hard infrastructure is a new category of large-scale infrastructure, comprising the basic urban structures such as roads, ports, electric/energy plants, water supply, and sewage systems [35]. In contrast, soft infrastructure refers to the necessary services for maintaining a community's economy, health, and culture [5].

As such, new definitions of infrastructure transcend the traditional definition of infrastructure as the physical and essential facilities for constructing and operating cities to include those intended to improve community sustainability and improve residents' quality of life. Such a perspective of infrastructure is widely accepted by developed and advanced countries seeking to ensure cities' sustainability and their inclusive growth. Certainly, South Korea's latest policy adopts a social infrastructure perspective—recognizing that improving quality of life by providing facilities and services supporting people's daily lives will positively affect local production. Living SOC differs from conventional SOC (or social infrastructure) in that it tries to provide equal access to essential living services [36]. In this respect, South Korea's current Living SOC policy seeks to minimize the physical distance between residential zones and the daily living services, ultimately making the routes of urban residents more compact.

2.2. Living SOC as a Community-Supportive Infrastructure

Since the late twentieth century, policies similar to South Korea's Living SOC policy have been established and implemented in several countries in Europe and East Asia [6–9]. To understand similar policies, first, it is necessary to understand the concept of Smart Shrinkage and Compact City, which is one way to achieve an inclusive city [37]. Smart Shrinkage and Compact City is an urban regeneration method that focuses on improving the quality of life of existing urban residents while reducing population and building land use [38]. This concept differs from existing urban regeneration in that it improves the quality of life rather than inducing population inflow and employment growth [39]. Smart Shrinkage and Compact City can be a strategy to prevent the vicious cycle of decline by reorganizing the

urban infrastructure to fit a new level of population, such as returning the abandoned neighborhoods of the city to nature, increasing the walking space, and fitting housing prices [40]. Poppers defined this as less planning, less population, fewer buildings, and less land use, and argued that small could be beautiful [41].

To address the population decline and a worsening local economy, Japan implemented the concept of a Compact City in 2014, placing residential zones in proximity to public transportation and necessary service facilities [42]. To be specific, in July 2014, the Ministry of Land, Infrastructure, and Transport and Tourism (MLIT) unveiled the "Grand Design of National Spatial Development towards 2050", with Aggressive Smart Shrinkage as an alternative to population decline [43]. The concept of Aggressive Smart Shrinkage is not a defensive response that prevents the city from shrinking and disappearing if the population decline is inevitable; it is a reduction plan to proactively continue urban function even if the population decreases by predicting the reduction mode. "Grand Design of National Spatial Development towards 2050" proposes a connection between Compact and Network to maintain urban functions even in the face of a declining population [44]. It is a strategy to prevent urban functions' departure by spatially integrating urbanized areas and resolving insufficient urban functions through the interaction of surrounding areas by reinforcing public transportation. Expressly, in a city with a population of 100,000 or more, a 1-km grid range of reach within an hour is set as an urban area, and a high-level regional urban association is established so that the urban area can sustain a population of 300,000 or more. An institutional response that applies the concept of a Compact City is a plan to appropriate its location. It will seek a network that allows access to medical, welfare, and business facilities through public transportation in areas where population reduction is expected lead to a failure in meeting the minimum residential standards. More specific measures include inducing urban functional facilities, such as medical care and welfare in the hub area, inducing residences in areas with public transportation connection, overhauling the walking and vehicle environments in the center, and introducing community buses. Besides, urban function inducement zones were established to enable urban function services to ease regulations and provide subsidies to induce urban function concentration rather than coercion. To ensure the smooth execution of the policy, the Japanese government implemented a "city function initiation zone" initiative by designating residential zones and collecting feedback from citizens to maintain an optimal population density [45]. The city function initiation zone promotes healthcare, business, education, and basic service facilities, thereby providing optimal services for urban residents. Regarding administration, the Japanese government monitors current convenience facilities and provides support in policy and finance for pertinent facilities when there is a shortage of individual convenience facilities.

In a similar context, Germany is implementing a policy to ensure equal living conditions based on the constitution, which guarantees "living conditions with equal value", and the 1965 Federal Space Planning Act [46]. As the industrial structure changed in Germany, manufacturing declined, and suburbanization increased, resulting in a decline of cities. In particular, in the former East German region after reunification, urban shrinkage became more severe as people who lost their jobs moved to the former West Germany or surrounding large cities [47]. Cities such as Dresden, Leipzig, and Cottbus are typical examples. House remain unoccupied in both the old and newly redeveloped areas of some cities. Therefore, the German government has adopted and implemented a strategic plan for Smart Shrinkage at the local level [48]. INSEK, an integrated strategic plan to respond to the smart-reduction problem, is the basis for allocating all subsidies to promote urban regeneration. In Germany, the government has stipulated that subsidies should be made only after establishing INSEK after 2002. INSEK is an integrated plan for urban development, established by each local government, to review the development priorities to designate areas subject to maintenance and areas of focus. The overall direction of urban development is thus set, and specific plans are flexibly adjusted according to the circumstances. More specifically, the law mandates that all 38 provinces identify a hub city with a population of over 100,000 people and equally distribute various living facilities for each hub city so that each region can enjoy similar living standards [46]. The guidelines are divided

into the social infrastructure category, which involves service facilities such as daycares and hospitals, and the technical infrastructure category, including water supply and treatment facilities. The German government has also focused on creating a universal living environment by monitoring changes in regional characteristics [49].

Numerous scholars have researched balanced urban development with the land as the spatial background. For example, Peters et al. [50] examined communities' social infrastructure to determine the degree of smart shrinkage in small towns based on population, land use, and transportation. Similarly, Chang and Liao [51] identified strategies for improving accessibility to urban parks and balanced distribution while highlighting public facilities' spatial equity. Examining the size and shape of a city and the attributes of urban planning, Hodge and Gatrell [52] highlighted the significance of determining the service area and argued that the attributes of urban planning could be a constraint on the related activities of the political, economic, and social systems. Regarding well-balanced development—the ultimate goal of South Korea's Living SOC policy—the extant research demonstrates the significance of the following: the establishment of relevant strategies prioritizing the investigation of urban land use status [53], an appropriate supply of facilities and commercial zones [54], the equal supply of education facilities [55], and hard and soft infrastructure [56]. Moreover, as the supply should meet the demand in terms of the accessibility and availability of these facilities [57], identifying the demand and the current condition of relevant facilities can positively affect the optimal supply of facilities when implementing relevant policy initiatives.

3. Methodology

3.1. Research Model

Like other countries, South Korea defines the Living SOC's scope as facilities assisting citizens in their daily lives, including those related to education, healthcare, welfare, transportation, culture, sports, and parks. South Korea also emphasizes the accessibility of these facilities. In addition to promoting the development of different regions, South Korea seeks to develop land equitably and improve citizens' lives. Therefore, this study examines the entire territory of South Korea to derive implications for the Living SOC policy. Data collection, analysis, and interpretation were conducted in two stages, as follows.

First, this study compares metropolitan and provincial cities in terms of population, the average age of urban residents, urbanization ratio, and the area size of each zone according to South Korea's land-use planning (i.e., residential, commercial, industrial, and green zones, respectively), and the total number of major facilities in the category of the Living SOC policy presented by the government. In doing so, this study examines the type of imbalance between metropolitan and provincial cities using independent sample *t*-tests. Various studies have verified and highlighted the validity of the variables mentioned above [58] and the use of independent *t*-test to compare regional differences [59,60].

Second, this study examines how the amount of basic service, convenience, and cultural and sports facilities in each city influences the number of Living SOC. There is already a wide variety of preexisting basic service, convenience, and cultural and sports facilities throughout the country, many of which are included in the Living SOC policy. Accordingly, if the research model is statistically significant, the type of facilities closely related to the current Living SOC policy is already sufficiently distributed from the policy's perspective when the number of the Living SOC is set as the dependent variable and other facilities as independent variables. Therefore, they are relatively unimportant. By analyzing each city throughout the country, this study derives implications for improving the implementation and efficacy of future policy initiatives. To identify the determined balanced development, we divided the cities into metropolitan cities and provincial cities, conducted two rounds of regression analysis, and compared the results. Various studies have highlighted the importance of conducting regression analysis in analyzing the current condition of facilities in a specific area [61–63]. Figure 1 illustrates this study's research process and methodology.

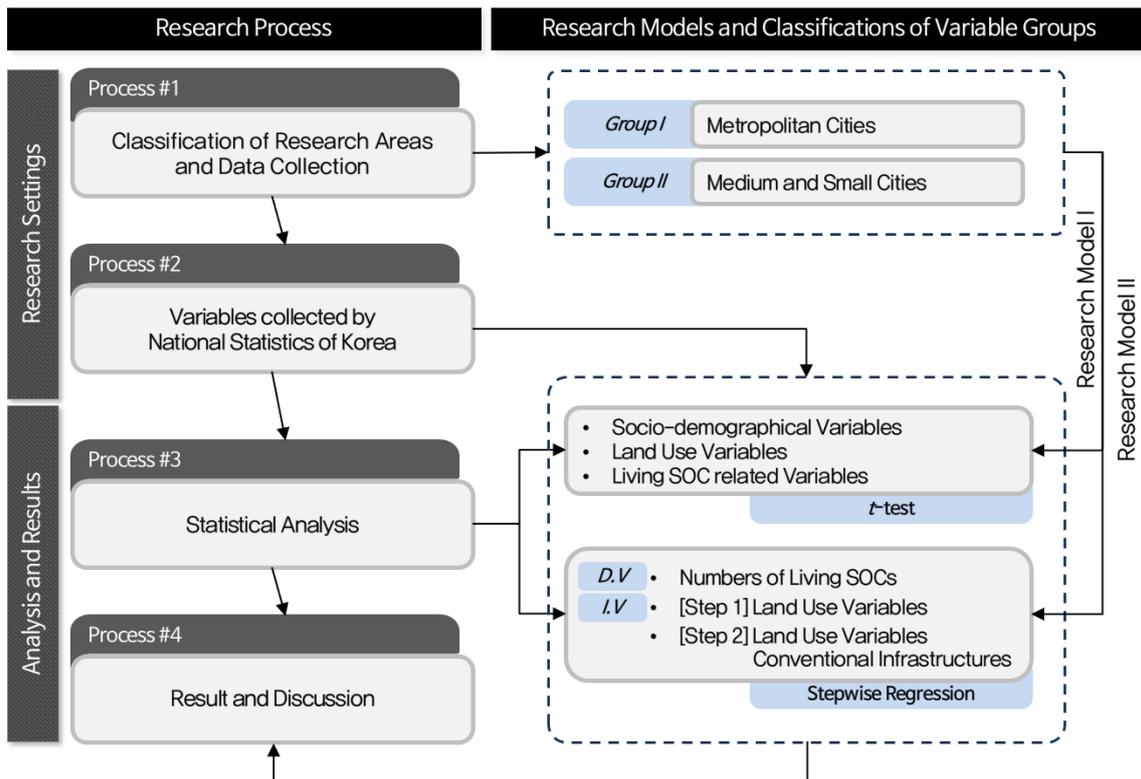


Figure 1. Research process and methodology.

3.2. Study Areas and Variables

As noted, the spatial scope of this study is the entire territory of South Korea. All data used in this study are based on the 2020 administrative division of South Korea. A total of 229 regions were used as samples, including 69 autonomous districts, 75 autonomous cities, 82 counties, one special self-governing city, and eight provinces (Figure 2). These samples are the minimum unit of all data used for statistics and include the entire are of South Korea.

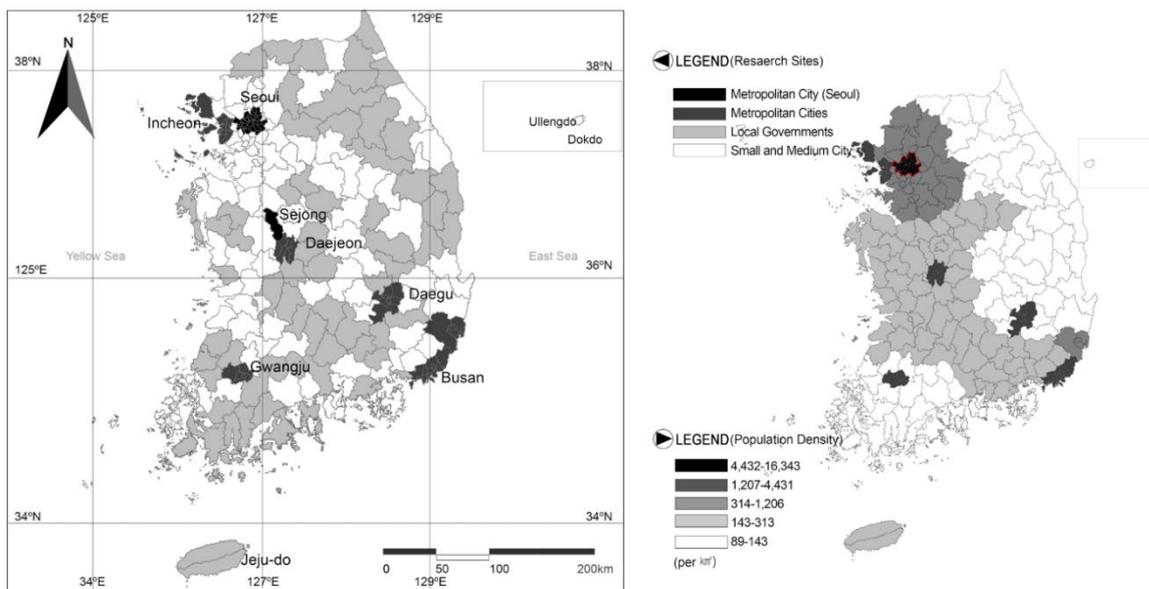


Figure 2. Classification of research areas and population density (from Statistics Korea).

For the two rounds of regression analysis, we categorized cities into metropolitan cities and provincial cities based on the relevant statutes, resulting in 74 self-governing cities (or self-governing areas) and 155 provincial cities. In this categorization process, we collected data to compare the two categories of cities in terms of population, average age, number of residents per city, and the ratio of residential/commercial/industrial/green zones. This study used open-access data from the Korea Statistical Information Service (KOSIS).

This study used the following two-step method to obtain and classify convenience facilities. First, according to the government's proposal, Living SOC facilities are intended to enhance the convenience of people's lives and encompass culture, sports, education, healthcare, welfare, and park facilities [13]. Specific facilities include community sports centers; outdoor sports facilities, such as baseball parks, soccer fields, gate ball courts, and artificial rock-climbing walls; and cultural and educational facilities, such as libraries, museums, art galleries, parking lots, daycare centers, kindergartens, elementary schools, welfare facilities for elderly, hospitals, highway rest areas for safe traffic, fire or disaster safety facilities, forests, recreation forests, campsites, and urban parks. Among the listed facilities, the supply of Living SOC facilities is provided by the public sector, and statistics are officially totaled by the central government. There are seven types of Living SOC facilities in total: elementary schools, job training schools, libraries, culture centers, post offices, police stations, and fire stations. As the supply of Living SOC facilities is provided by the central and provincial government, other private facilities were not included as variables. However, there is a possibility that, at the local level, critical private facilities were excluded from this process.

Second, the preexisting living infrastructure used as an independent variable in the regression analysis includes public and private facilities proposed in the pertinent policy and statues. Among over 30 facilities, we selected nine facility types with available open-access data from KOSIS as follows: elementary schools, job training schools, libraries, culture and art facilities such as museums, art galleries, and culture centers; sports facilities such as baseball parks, basketball courts, soccer fields, and gyms; and local community facilities such as recreation forests, campsites, fields, and urban parks. There is a possibility that major facilities may have been excluded during the process of limiting the variables to those for which national data exist. This study recategorized the nine selected facility types into facilities with similar functions to ensure commonality between the variables, resulting in the following four categories of facilities: (1) education and empowerment facilities, (2) culture and art facilities, (3) sports and leisure facilities, and (4) local community facilities—Table 1 details the content of each category. The three-year Living SOC plan of the South Korean Government was referred to for the classification of categories.

Table 1. Specific types of facilities.

	Facilities
Living SOC	Total number of Living SOC facilities.
Education and Empowerment	Total number of elementary schools, job training schools, and libraries.
Culture and Arts	Total number of museums and galleries.
Sports and Leisure	Total number of sports facilities (gyms, pools, bowling alleys, golf clubs, tennis courts, etc.).
Local Community	Total number of community sports facilities and urban parks.

4. Results

4.1. Comparison between Metropolitan and Provincial Cities

South Korea's Living SOC policy aims to supply facilities equitably among metropolitan cities and provincial cities. Using the aforementioned methodology, this study quantitatively compares metropolitan

and provincial cities' conditions by conducting independent sample *t*-tests. Through *t*-tests, this study examines the difference between the two types of cities to identify the significant differences in the major variables reflecting regional attributes, such as population, average age of residents, urbanization ratio, the level of Living SOC, and the area ratio of residential, commercial, industrial, and green zones in South Korean urban planning—Table 2 details the results of the analysis.

Table 2. Comparison of the key variables by region.

Dependent Variables	Group	Numbers	Mean	Std. Deviation	<i>t</i>	<i>p</i>
Population	Metropolitan	74	300,907.72	147,607.04	4.239	0.000 ***
	Provincial	155	177,991.13	227,457.26		
Ave. Age	Metropolitan	74	41.45	2.65	−7.305	0.000 ***
	Provincial	155	45.21	5.14		
Urbanization Ratio	Metropolitan	74	95.43	18.28	19.315	0.000 ***
	Provincial	155	32.58	30.69		
Residential zone	Metropolitan	74	34.76	21.73	7.421	0.000 ***
	Provincial	155	15.57	6.86		
Commercial zone	Metropolitan	74	5.27	8.42	3.329	0.001 **
	Provincial	155	2.00	1.13		
Industrial zone	Metropolitan	74	7.12	10.78	0.316	0.753
	Provincial	155	6.68	7.48		
Green Area	Metropolitan	74	47.07	24.84	−8.509	0.000 ***
	Provincial	155	73.19	12.92		
Living SOC	Metropolitan	74	192.78	87.17	2.078	0.039 *
	Provincial	155	164.21	115.72		

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. $t = t$ -value; $p = p$ -value.

The results of the analysis show that the two groups differ significantly in terms of population, average age, urbanization ratio, and the ratio of residential, commercial, green, and Living SOC. With regard to population, metropolitan cities were found to have a larger population than provincial cities ($t = 4.239$). With regard to age, the average age of the residents in provincial cities was found to be higher than that in metropolitan cities ($t = -7.305$). With regard to urbanization ratio, metropolitan cities were found to have a higher urbanization ratio than provincial cities ($t = 19.315$). With regard to the ratio of residential zones, metropolitan cities were found to have a higher ratio of residential zones than provincial cities ($t = 7.421$). With regard to the ratio of commercial zones, metropolitan cities were found to have a higher ratio of commercial zones than provincial cities ($t = 3.329$). With regard to the ratio of green areas, provincial cities were found to have a higher ratio of green zones than metropolitan cities ($t = -8.509$). With regard to the Living SOC, metropolitan cities were found to have a higher level of Living SOC than provincial cities ($t = 2.078$). However, with regard to the ratio of industrial zones, there was no significant difference between the metropolitan and provincial cities.

The findings can be summarized as follows. Compared to metropolitan cities, provincial cities had a smaller population, a lower urbanization rate, and a lower ratio of residential and commercial zones. Meanwhile, the average age of the residents and the ratio of green zones in provincial cities were greater than those in metropolitan cities—a common difference between metropolitan and provincial cities. Moreover, with respect to Living SOC facilities, metropolitan cities were found to have a higher number of Living SOC facilities. However, the maximum capacity per facility in metropolitan cities was 1560, whereas the maximum capacity per facility in provincial cities was 1083. This shows

that public-initiated Living SOC facilities are successfully supplied in provincial cities throughout the country.

4.2. Results of the Regression Analysis of the Living SOC Perspective

This study conducted a regression analysis to test the independent variables' effect on the current Living SOC of South Korea's metropolitan cities. The independent variables included the supply of education, culture and arts, sports and leisure, and local community facilities, classified based on population, average age, urban planning attributes, the urbanization ratio, and preexisting convenience facilities. Between rounds of analysis, this study employed stepwise regression analysis to derive the results. This method has the advantage of showing an increase in the explanatory power in accordance with the inclusion of each independent variable group by stage. This study examined the effect of the urban planning perspective on Living SOC as well as its implications by applying population, age, and land-use status to Model I. In contrast, in Model II, this study applied all the variables to examine the related facilities' overall effect and compared the results for metropolitan and provincial cities.

Table 3 presents the results of the regression analysis in metropolitan cities. The analysis of the results showed that the regression model was statistically significant in Stage 1 ($F = 13.423$, $p < 0.001$) and Stage 2 ($F = 46.709$, $p < 0.001$). Based on the adjusted R^2 , the explanatory power was 57.7% in Stage 1 and increased to 88.3% in Model II, indicating a high explanatory power. The Durbin–Watson statistic was 1.731, producing an approximate value of 2. This indicates that the residuals can be presumed to be independent. The variance inflation factor (VIF) was also found to be below 10, indicating no problems with the correlation of variables. Accordingly, the majority of current facilities in metropolitan cities belong to the category covered by the Living SOC policy.

In Model I, the population was found to have a significant effect on the dependent variable ($t = 7.348$, $p = 0.000$). This result indicates that cities with large populations are the main recipients of Living SOC. In contrast, in Model II, which includes all the variables, the size of the population was not significant, while the average age of the residents was found to influence the dependent variable. In both Models I and II, land use was found to be insignificant, indicating a need for revision of the current government policy of creating a dense assortment of Living SOC facilities around the residential zones. Of the four independent variables (education, culture and arts, sports and leisure, and local community facilities), education ($t = 7.327$, $p = 0.000$) and local community facilities ($t = 9.870$, $p = 0.000$) were found to affect the dependent variable. In other words, in metropolitan cities with dense populations, the supply of Living SOC increases in areas with a sufficient supply of education and local community facilities.

Using the same method, this study performed a stepwise regression analysis on provincial cities, the results of which are presented in Table 4. The results show that the regression model was statistically significant in both Stage 1 ($F = 13.423$, $p < 0.001$) and Stage 2 ($F = 46.709$, $p < 0.001$). Based on the adjusted R^2 , the explanatory power was 20.9% in Model I and increased to 72.5% in Model II, indicating a relatively high explanatory power. The Durbin–Watson statistic was 2.120, showing no problem with presuming the independence of the residuals. The VIF was also found to be below 10, indicating no issue with the correlation of variables. As such, similar to metropolitan cities, the majority of the current facilities in provincial cities also influence the Living SOC.

Table 3. Results of the regression analysis of metropolitan cities ($n = 74$).

Class.	Independent Variables	Model I					Model II				
		B	β	t	p	VIF	B	β	t	p	VIF
-	(Constant)	-2.869		-1.219	0.227		-4.397		-3.528	0.001 ***	
Demographical Variables	Population	0.000	0.755	7.348 ***	0.000	1.821	-0.000	-0.014	-0.167	0.868	4.592
	Average Age	0.016	0.042	0.312	0.756	3.156	0.105	0.279	3.789	0.000 ***	3.367
Land-Use Variables	Residential Zone	0.005	0.115	0.829	0.410	3.338	0.003	0.063	0.845	0.401	3.421
	Commercial Zone	0.005	0.044	0.435	0.665	1.751	-0.002	-0.020	-0.375	0.709	1.791
	Industrial Area	-0.002	-0.022	-0.209	0.835	1.954	-0.006	-0.068	-1.201	0.235	1.994
	Green Area	0.010	0.249	1.690	0.096	3.737	0.000	0.010	0.128	0.899	4.013
	Urban Area	0.090	0.090	0.694	0.490	2.893	0.002	0.002	0.030	0.976	3.221
	Non-urban Area	0.060	0.060	0.568	0.572	1.956	-0.094	-0.094	-1.569	0.122	2.248
Facility Variables	Education	-	-	-	-		0.491	0.491	7.327	0.000 ***	2.795
	Culture and Arts	-	-	-	-		0.034	0.034	0.762	0.449	1.209
	Sports and Leisure	-	-	-	-		0.064	0.064	1.107	0.273	2.076
	Local Community	-	-	-	-		0.676	0.676	9.870	0.000 ***	2.916
	F	13.423 ($p < 0.001$)					46.709 ($p < 0.001$)				
	R ²	0.623					0.902				
	adjR ²	0.577					0.883				

*** $p < 0.001$. B = Unstandardized Coefficients; β = Standardized Coefficients; t = t -value; p = p -value.

Table 4. Results of the regression analysis of provincial cities ($n = 155$).

Class.	Independent Variables	Model I					Model II				
		B	β	t	p	VIF	B	β	t	p	VIF
-	(Constant)	-0.263		-0.196	0.845		-1.091		-1.378	0.171	
Demographical Variables	Population	0.000	0.458	4.656	0.000 ***	1.883	-0.000	-0.212	-1.551	0.123	8.502
	Average Age	-0.007	-0.037	-0.370	0.712	1.980	0.013	0.067	1.110	0.269	2.064
Land-Use Variables	Residential Zone	0.010	0.066	0.537	0.592	2.906	0.005	0.036	0.484	0.629	3.084
	Commercial Zone	-0.119	-0.135	-1.103	0.272	2.912	0.005	0.006	0.084	0.933	2.977
	Industrial Area	0.007	0.054	0.464	0.643	2.611	0.005	0.039	0.561	0.576	2.677
	Green Area	0.004	0.048	0.353	0.725	3.661	0.007	0.095	1.144	0.254	3.858
	Urban Area	0.119	0.119	1.535	0.127	1.160	-0.076	-0.076	-1.300	0.196	1.892
	Non-urban Area	0.201	0.201	2.487	0.014 *	1.273	0.053	0.053	1.093	0.276	1.323
Facility Variables	Education						0.406	0.406	2.828	0.005 **	9.539
	Culture and Arts						0.073	0.073	1.146	0.254	2.251
	Sports and Leisure						0.311	0.311	6.307	0.000 ***	1.358
	Local Community						0.613	0.613	11.067	0.000 ***	1.721
F			6.074($p < 0.001$)					34.827($p < 0.001$)			
R2			0.250					0.746			
adjR2			0.209					0.725			

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. B = Unstandardized Coefficients; β = Standardized Coefficients; t = t -value; p = p -value.

Testing the significance of the regression coefficients, this study found that population and the non-urbanization ratio were significant and positive (+) in Model I. Specifically, population ($t = 4.656$, $p = 0.000$) and the non-urbanization ratio ($t = 2.487$, $p = 0.000$) affected the supply of Living SOC. This indicates that, in provincial cities, Living SOC is generally established in non-urban areas rather than residential zones. In contrast, the aforementioned independent variables were not statistically significant in Model II. Of the four independent variables (education, culture and arts, sports and leisure, and local community facilities), all except for culture and art facilities were found to affect the dependent variable in Model II. In this respect, the supply of Living SOC was found to be sufficient in terms of education facilities ($t = 2.828$, $p = 0.005$), sports and leisure facilities ($t = 6.307$, $p = 0.000$), and local community facilities ($t = 11.067$, $p = 0.000$).

5. Discussion

The extant literature reflects the growing significance of the inclusive city concept—a global trend in the development of Living SOC policy, particularly with respect to improving the spatial equality and quality of life in communities. In this regard, this study aligns with extant urban planning theories, including notions of Compact City and Smart Shrinkage. Examining current urban planning in South Korea, this study found that various living infrastructures lack a connection to residential zones, irrespective of city type (i.e., metropolitan or provincial cities). In terms of facility type, this study found that the supply of facilities related to local communities and education is adequate. The supply of culture and art facilities is insufficient throughout the country, and the supply of sports and leisure facilities in provincial cities is relatively adequate. Based on these findings, this study identified the Living SOC's scope in terms of land planning to ensure the balanced development of metropolitan and provincial cities. This study also discerns the actual disparity between metropolitan and provincial cities and how this might be resolved. The results of this study can be summarized as follows.

First, establishing necessary community support facilities that are easily accessible by foot—as advanced by notions of Compact City and Living SOC—is a significant government policy in many countries, including South Korea. In Germany, the federal government operated a support program to solve urban shrinkage and established a plan (INSEK) to cope with various problems caused by urban reduction, such as vacancies in residential areas. In Japan's case, it has recognized the problems of public infrastructure operations due to aging and the occurrence of vacant homes. However, since many large residential areas had already been built in suburban areas with a population density below the stipulated number, they chose centralization as the solution. In this respect, particular emphasis is placed on the need to establish such facilities in residential zones. This study shows that the independent variables related to current land use—namely, the supply of education, culture and arts, sports and leisure, and local community facilities—did not significantly influence the dependent variable, Living SOC. Accordingly, the future policy needs to provide Living SOC centering on the residential zone(s) within a city.

Second, an analysis of South Korea's metropolitan and provincial cities reveals that population size significantly impacts Living SOC. In other words, the population was the most significant sociodemographic factor impacting the supply of preexisting education, culture, sports, and community facilities. This finding is consistent with the country's current Living SOC policy.

Third, it is crucial to increase the supply of facilities related to culture and the arts and sports and leisure facilities. Regression analysis results show that these two types of facilities did not significantly impact the dependent variable in provincial cities or metropolitan cities with dense populations. This indicates the need to ensure the sustainability of the Living SOC policy in South Korea by supplying related facilities in the future. Given the non-significant impact of such facilities in provincial cities, establishing culture and art facilities may be critical to the successful realization of the Living SOC policy in terms of providing equitable supply and access to facilities in provincial and metropolitan cities.

Fourth, it is essential to perform a business feasibility review regarding the sustainability of the pertinent facilities, particularly as South Korea's Living SOC policy is heavily funded by the central and

local government and reliant on the financial soundness of local governments. For instance, despite the result of the analysis showing the lack of sports facilities in metropolitan cities, policyholders should have a lengthy deliberation when establishing large-scale sports facilities in a metropolitan city. Because most local governments of South Korea have insufficient financial independence, consideration of efficiency should come first.

Finally, the supply of Living SOC is based on the current condition of provincial cities. South Korea's land-use system consists of urban areas (16.6% or 17,614 km²), comprising residential, commercial, industrial, and green zones; and non-urban areas (83.4% or 88,448 km²), comprising management (areas requiring systematic management), farming, and natural environment protection zones [64]. It is worth noting that the non-urban areas of provincial cities are some five to nine times larger than those of metropolitan cities, and that such non-urban areas house many residential buildings. Therefore, future policy should direct local government to establish facilities based on accessible "distance" by considering the land use and the location and density of the residential buildings. However, achieving this requires conducting micro-level research of each city or region rather than the entire country.

6. Conclusions

Establishing and executing the Living SOC policy in terms of land and urban planning is key to improving South Korea and its cities' sustainability. Policies related to cities serve as the guidelines in establishing ordinances and the duties of the local government. Therefore, to ensure the policy's sustainability, its development and implementation must reflect the local community's attributes from the perspective of balanced land development. This study is significant in that it examines the entire territory of South Korea, but further and more localized research is necessary.

Using currently available data, this study focused on current urban planning conditions and the impact on Living SOC policy implementation—a hitherto unexamined topic.

However, this study has limitations that need to be considered. First, the analysis of facilities was hindered by the difficulty of obtaining data due to data source limitations. This study focused on quantitative aspects, such as the number of infrastructures. Thus, this study excluded some qualitative aspects regarding quality of life. Further research based on a survey, which includes qualitative aspects, is necessary. Second, this study failed to consider the disparity among cities regarding urban planning, population, and social and economic status. In the same context, this study failed to consider accessibility, which is a crucial Living SOC concept. Accordingly, future studies should examine the Living SOC of each region, considering each facilities' accessibility.

Nonetheless, it is expected that the findings on South Korean policy, including those of this study, will prove useful to the global community and provide baseline data for follow-up studies in South Korea. It is expected to be a barometer to prevent budget waste through the reckless introduction of Living SOC facilities in the future. In particular, this study used quantitative research models to ensure objectivity in assessing policies, which would help the Korean government when they supply Living SOC. Indeed, it conforms to the "benefit responsiveness" section of the Nakamura and Smallwood polities, widely used in policy evaluation. Therefore, it can be used to determine how much Living SOC has been beneficial in improving the residents' quality of life in the area.

Author Contributions: Conceptualization, Y.K. and J.O.; methodology, Y.K.; software, Y.K.; formal analysis, Y.K.; data curation, Y.K.; writing—original draft preparation, Y.K.; writing—review and editing, J.O.; visualization, J.O.; supervision, S.K.; All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Conflicts of Interest: The authors declare no conflict of interest.

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