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The Impacts of the Green Growth Policy on Green Living of Residents in Multifamily Housing

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Abstract To ameliorate a long-standing, persistent housing shortage in Korea, large-scale massive housing production has been an imperative, and the extensive growth highly values development and consumption. The state's priority for the quantitative growth of housing stock has proved to be successful, but the state faces with economic and environmental crises in a global era. To achieve the qualitative growth, the previous administration pronounced a green growth policy from the inception, and a series of strategic measures under a holistic plan have been taken widely and vigorously. As part of the strategies, the green home project was undertaken, and simultaneously the movement of green living led by the governance has been activated. However, little attention to the grassroots effort was paid and the efficacy hasn't been adequately addressed. This study examines the factors affecting green living of residents in multifamily housing. Based on public guidelines to green living, 106 specific items were drawn out and largely categorized into 6 areas (water, waste, transportation, air quality, consumption, and energy), and the questionnaire was constructed using them. Of 750 survey forms mailed out, 161 responses were returned and the collected data were used for statistical analysis. The findings indicated that varying degrees of green living was well practiced, the state-led green home project was relatively well recognized, and the green growth policy was strongly supported. Also the respondents' attitude toward green living were more associated with demographic variables than housing characteristics, and familiarity with green home project was related to attitudes toward green living. Since the on-going approach to green living has focused on simple and economical ways, it has proved to be effective but progressive strategies to make living greener are necessarily developed.

Keywords: Green Growth Policy, Green Living, Multifamily Housing, Housing Provision, Housing Policy

1. INTRODUCTION

In response to the prevalent and persistent housing shortage in Korea, the supply-centered housing policy was inevitably adopted in the second half of the last century. Since the first five-year economic development plan was implemented in 1962, the production of high-rise, multi-family housing has reshaped urban landscapes nationwide and even housing norms have drastically changed. In fact, the housing structure norm shifted from single-family home to high-rise condominium building. On the contrary, the traditional value of homeownership remained enduring. The steady and massive production of large-scale housing estates has contributed to increasing homeownership, and the number of total housing stocks has exceeded the number of households since 2008 (Statistics Korea, 2013a). Despite the constant housing supply, the demand for housing, in particular in larger cities, is strong, and it's ascribed to a rising number of households (e.g, non-traditional families, and smaller households in size).[1] The provision of high-rise housing units is accompanied with easy and convenient lifestyles formulating standard patterns of household consumption (Lee, 2007). Consequently, the consumption-oriented lifestyle undermines the traditional values on spending and saving whereas reshaping housing culture (Lee, 2011).

Meanwhile, the Myung-bak Lee (MB) administration from 2008 to 2013 conceptualized a vision and transformed its agenda in the face of global crises. The MB administration from the inception has been aggressively advocating green growth as the state policy, and its strategies have made use of horizontal and vertical approaches to making the state green. For instance, the top-down policy (a green home project) and the bottom-up movement (green living) have been posed to the nation in the recent years, and many efforts to make the movement feasible are made. In spite of the actual effects that are expected to be substantial in the nation acting as one of the

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[1] The nation expects that housing demand will shrink within decades owning to low fertility which results from late and less marriage that in turn is attributed to women's attainment of higher education and their participation in labor force.

greenest country around the world, little attention to grassroots efforts has been paid.

This research is to examine the impacts of the green growth policy on green living of residents in multifamily housing, so-called apartments (high-rise condominium housing) and also to find out the factors affecting particular behaviors of green living.

2. LITERATURE REVIEW

(1) Housing Provision

Housing shortage has been an enduring and chronic issue in Korea, and the only and unique solution to the high demand for housing was multifamily housing. Multifamily housing has been strikingly supplied in many decades since a series of national economic development plans with strong emphasis on industrialization and urbanization took place from 1962. The high density land use has been promulgated in line with the state policy, and accordingly the housing construction was strikingly outstanding in the neoliberal regimes from Y. Kim administration to MB administrations (Table 1).

The housing policy of the state affirms pro-homeownership and pro-owner occupation, which lies in the traditional value of owning a home, and the prolonged policy agenda is still sustained. While a vast majority of newly constructed homes were privately owned, the ratio of owner-occupied housing has been decreased due to distinctive reasons (e.g., relocation for job and education, high housing price, speculation and the like).

The steady and massive production of large-scale housing estates has substantially contributed to increasing homeownership, and the proportion of total housing stocks to the number of households stood at 102.3% in 2011 (Statistics Korea, 2013a). In spite of constant housing supply, the demand for housing, in particular in larger cities, is strong due to a rising number of households (e.g, non-traditional families, and smaller households in size).[2] Besides, the provision of high-rise housing units is accompanied with easy and convenient lifestyles formulating standard patterns of household consumption. Consequently, the consumption-oriented lifestyle erodes traditional values on spending and saving while reorienting housing culture.

(2) Green Growth

Green growth is broadly defined as a new paradigm seeking for both economic growth and sustainable use of environmental resources. The agenda of green economy fostering both economic growth and environmental protection has been challenging to both developed and developing countries, and being convinced of the importance, they are forced to work on economic and environmental policies together.

Just like many countries in which the potential benefits and costs of economic development still outweigh environmental damages and losses, Korea still seeks for more economic growth while being pressured to transform the state policies phasing out gray growth and phasing in green growth. It's widely known that the nation has a great dependence on fossil fuels; as one of the planet's largest energy importers, the nation imports 97% of total energy demand, and the largest portion (45%) of the nation's total energy consumption comes from petroleum (UNEP, 2009; U.S. Energy Information Administration, 2010). Indeed, the nation became the world's tenth largest energy consumer in 2007 – the fifth largest importer of crude oil, the second largest importer of hard coal and liquefied natural gas (LNG) (U.S. Energy Information Administration, 2010). With lack of domestic energy resources available and full reliance on oil imports, Korea has been long geared to the supply-based energy policy that substantially weakens the energy self-sufficiency, threatens the state energy security, and is severely vulnerable to the impacts of climate changes. Moreover, the rapid industrialization and urbanization in the second half of the last century has made the nation one of the world's fastest growing sources of greenhouse gases like carbon dioxide, which causes climate change.

To deal with escalating environmental issues and simultaneously to tackle economic crisis, the Korean government proposed its agenda for the national development, "Low-carbon, Green Growth," in 2008, and the new vision has formulated the green growth policy (PCGGRK, 2009a & 2009b). A series of measures have been taken to implement the policy – the Presidential Committee on Green Growth established in August of 2009, the Green New Deal Project created in January of 2009, the National Strategy of Green Growth and its 5-year Plan[3] established in July of 2009, and the legislation on Green Growth enacted in April of 2010 (GRK, 2009b & 2009c). The specific plan for green growth is mainstreamed into the policy-making of the MB administration, and also various bottom-up instruments are adopted to drive green growth. In fact, the government has developed wide-ranging strategies to reinforce greener behaviors and activities for individuals and firms including public education, publicity, more bicycle lanes to reduce pollution, carbon labeling system to boost low-carbon consumption, green consumption of central and local governments through the Green Consumption Enhancement Act, and the carbon point system to increase consumption of eco-friendly products (UNEP, 2009).

(3) Green Living

One of the ten concrete and solid actions in the state strategy for green growth is green living, and as part of the actual steps to reduce carbon emissions in daily life, the government has extensively supported the development and dissemination of guidelines to green living. According to the 'Low Carbon, Green Growth' Act, green life is defined as a lifestyle addressing the importance of climate change, saving energy in daily life, and minimizing the emission of greenhouse gases and pollution (GRK, 2009a). Generally speaking, green living is a lifestyle that does as little damage as possible to the planet and the living things and as little harm as possible to other people (Jeffrey, Barclay, &

[2] The nation often predicts that housing demand will shrink within decades owning to low fertility that results from late and less marriage that in turn is attributed to women's attainment of higher education and their participation in labor force.

[3] The state plan includes 10 specific policy directions of 3 objectives; the first objective focuses on measures to combat climate change and energy security consisting of reduction of greenhouse gas emission, energy independence and reduction of carbon dependency, and adaptation to climate change; the second describes new drives of green growth representing development of green technology and growth engines, green industry and industrial innovation, industrial realignment for green growth, and green economy and its infrastructure; and the last addresses better quality of life directing green city, green living, and leading green nation.

Table 1. Overview of Housing Production by Periods

Period	Structure Types			Housing stock ratio	Tenure Types			Rental housing stock ratio
	Single-family home	Multifamily housing	Total		For-sale	Rental	Total	
D. Chun Administration (1982-1987)	374,516 (26.8%)	1,024,856 (73.2%)	1,339,372 (100%)	69.9%	114,664 (90.7%)	129,637 (9.3%)	1,339,372 (100%)	9.3%
T.W. Noh Administration (1988-1992)	362,798 (12.9%)	2,450,459 (87.1%)	2,813,257 (100%)	72.6%	2,394,950 (85.1%)	418,307 (14.9%)	2,813,257 (100%)	15.4%
Y. Kim Administration (1993-1997)	264,305 (8.5%)	2,861,492 (91.5%)	3,125,797 (100%)	86.0%	2,707,560 (86.6%)	418,237 (13.4%)	3,125,797 (100%)	12.2%
D. Kim Administration (1998-2002)	195,099 (8.3%)	2,145,530 (91.7%)	2,340,629 (100%)	96.2%	1,852,342 (79.1%)	488,287 (20.9%)	2,340,629 (100%)	20.9%
M. Noh Administration (2003-2007)	193,370 (7.6%)	2,344,748 (92.4%)	2,538,118 (100%)	104.9%	1,992,236 (78.5%)	545,882 (21.5%)	2,538,118 (100%)	21.5%
M. Lee Administration (2008-2011)	243,602 (14.4%)	1,445,606 (85.6%)	1,689,208 (100%)	101.5%	1,279,270 (75.7%)	409,938 (24.3%)	1,689,208 (100%)	29.7%

Note: Housing stock ratio is the proportion of housing stocks to total households while rental housing ratio is the proportion of rental housing stocks to total households.
Source: KMLTMA (2012a, 2012b); KNHC (2009); Statistics Korea (2013a, 2013b)

Grosvenor, 2008). Therefore, green living is viewed as human-related behaviors and activities that barely have negative impacts on all living creatures, environments and the earth.

The bottom-up approach to living greener is more effective to spread the lifestyle in daily life, to lead public participation in green living, and to heighten cooperation among public, non-profit and private sectors. Although the effectiveness and efficiency of green living haven't been accurately and closely examined, green living in line with green growth raises public awareness and is seen as a global trend. It's often stated that the societal movement toward sustainability is planned to achieve better quality of life.

Almost all the guidelines to green living delineate low carbon living, energy saving, use of environmentally friendly products and reduction of environmental impact. The guidance is somewhat indirect and handy, rather than proactive, ways to do in daily life.

(4) Sustainability

Green living lies in green growth of which the model is closely related to sustainable development. Sustainable development was considered to address the interlocking crises – economic crisis and environmental crisis across the globe (The World Commission on Environment and Development, 1987). Kahn (1995) described sustainable development upholding three dimensions and their elements – social sustainability (e.g., equity, empowerment, accessibility, participation/sharing, cultural identity and institutional stability), economic sustainability (e.g., growth, development, and productivity), and environmental sustainability (e.g., eco-system integrity, carrying capacity, and bio-diversity). The interrelationships of the dimensions are contextual at institutional, cultural or international levels to achieve sustainable development in countries. Moreover, Chiu (2004) applied the concept of sustainable development to housing in order to provide a holistic approach to housing issues. The analytical framework displays social and cultural sustainability and their components to attain the sustainability in housing that is often elusive. Unlike economic and environmental sustainability, social sustainability can be measured by using quantitative and qualitative indicators, rather than vague standards and their criteria, due to unique and diverse characteristics of housing issues. In reality, sustainability in housing issues isn't easily measured in that the traits are inclusive and context-sensitive, and further the scope of home-based green living and its behaviors would be relatively limited and clear.

3. METHOD

The research method adopted in this study was a self-administered questionnaire survey, and the questionnaire was constructed by using the guidelines to green living. The eight guidelines from seven different entities[4] including the governance were identified and analyzed, and 106 items of 6 specific areas were extracted including water, waste, transportation, air quality, consumption, and energy. With the items, the questionnaire was constructed and reviewed by a panel of professionals in housing studies. Using Likert scaling, each item was rated on a 1-to-5 (very disagree-very agree) response scale. The survey instrument was mailed out to residents in major metropolitan areas nationwide by utilizing purposive sampling, 161 out of 750 survey forms were returned (21.5%) and 161 responses were used for data analysis.

[4] Including the Korea Ministry of Environment; Green Start; Korea Environmental Industry and Technology Institute; Korea Environment Corporation; Metropolitan Air Quality Management Office; Korea Water Resources; and Korea Environmental Preservation Association

4. RESULTS

(1) General Characteristics of Respondents

Many of the respondents are likely to be middle-aged, highly educated, working housewives with religious affiliation, and their household is likely to consist of a couple with children (Table 2). The average age of the respondents in this survey was 46.8, ranging from 27 years old to 80 years old. The respondents were college-educated or higher (70.2%) and employed (68.3%). Seven out of ten respondents participating in this research had religion such as Christianity, Buddhism or Catholic (70.8%) while more than one quarter of them (28.6%) didn't hold any religious orientation. The average household size was 3.5 persons, which means that the respondents lived with their spouse and more than one child. Also, the average monthly income of the respondents was KRW5.07 million (USD4.6 thousand[5]), which implies that they were middle-class.

Most of the respondents are likely to be homeowners living in mid-sized units of multifamily housing aged more than a decade (Table 3). Three quarters of the respondents owned their home (75.8%) and more than three out of four respondents lived in condominium housing, so-called apartment (77.6%). The average size of current housing was 130.6 m2, the average age of current housing was 12.8 years, and the average duration of current residence was 6.7 years.

The green home project is one of action plans of the state policy for green growth in which green living lies (Table 4). About half of the respondents (49.1%) perceived the state-led green home project, and more than four out of five respondents (83.2%) were in favor of the green growth policy. The findings indicate that the state project wasn't widely recognized, but many agree that environmentally friendly measures in the housing industry are appropriate and in a right direction.

(2) Effects on Green Living

To find out the variables affecting the green living of the respondents, the selected 106 items of green living were used for multiple regression analyses. Independent variables were 13 factors consisting of 6 demographic variables (including age, education, employment status, and religious affiliation of respondents, and their household size, and monthly household income), 5 housing variables (including tenure, structure type, size, age, and residence duration of current housing), 2 variables related to the green growth policy (the perception on the state-led green home project and support for green growth policy). On the contrary, the dependent variables were largely divided into 6 groups; 15 items in the area of water, 14 in waste, 20 in green driving, 19 in air quality, 16 in green consumption, and 22 in energy saving.

Before the regression analysis was conducted, Pearson's correlation among the 13 independent variables was computed in order to see the overall effect of the predictors on the dependent variables and to detect multicollinearity among the variables. All of the coefficient values among predictors were no greater than .5, and didn't present any serious multicollinearity effect.

[5] 1USD is equal to 1,100 KRW as of March in 2013

Table 2. Demographic Characteristics of Respondents

Characteristics	Number (N=161)	Percentage (100%)
Age		
Mean	46.8	
Median	44.0	
Standard deviation	11.583	
Range (from minimum to maximum)	27 to 80	
Education		
High school or lower	46	28.6
College graduate	93	57.8
Graduate degree	20	12.4
Missing	2	1.2
Employment status		
Employed	110	68.3
Unemployed	49	30.4
Missing	2	1.2
Religious affiliation		
Yes	112	70.8
No	46	28.6
Missing	1	0.6
Household size		
Mean	3.5	
Median	4.0	
Standard deviation	1.049	
Range (from minimum to maximum)	1 to 8	
Monthly income (millions KRW)		
Mean	5.07	
Median	5.00	
Standard deviation	2.14	
Range (from minimum to maximum)	1.00 to 10.00	

Note: "Yes" including Christianity, Buddhism and Catholic

A multiple regression analysis was performed to predict the dependent variables of green living from the 13 predictors. Out of the 106 dependent variables, only 16 regression equations were found to have statistical significance at the $p<.05$ level. They included 4 dependent variables related to water ("checking toilet for leaks," "reduction in shower time," "installation of water-saving shower," and "participation in river cleanup activities"), 1 variable associated with waste ("curbing illegal garbage dumping activities"), 3 variables regarding green driving ("use of public transport," "minimizing the use of car air conditioning," and "thrifty gasoline saving"), 1 variable from air quality ("good house cleaning"), 2 variables attributed to green consumption ("buying biodegradable goods," and "consumption of eco-friendly goods"), and 5 variables for energy saving ("setting the thermostat at 26°c or higher in

summer," "setting the thermostat at 20°c or lower in winter," "wearing thermal underwear in winter," "turning off unused lights," and "use of smart power strips").

Table 3. Housing Characteristics of Respondents

Characteristics	Number (N=161)	Percentage (100%)
Housing tenure		
Owned	122	75.8
Rental	38	23.6
Missing	4	2.5
Housing structure type		
Condominium	125	77.6
Multifamily housing	18	11.2
Single family home	15	9.3
No response	3	1.9
Housing size (m2)		
Mean	130.6	
Median	115.5	
Standard deviation	60.203	
Range (from minimum to maximum)	33 to 660	
Age of current housing		
Mean	12.8	
Median	11.0	
Standard deviation	9.358	
Range (from minimum to maximum)	1 to 33	
Duration of residence		
Mean	6.7	
Median	4.3	
Standard deviation	6.114	
Range (from minimum to maximum)	1 to 30	

Table 4. Perception on Green Home Project and Support for Green Growth Policy

Characteristics	Number (N=161)	Percentage (100%)
Perception on green home project		
Yes	79	49.1
No	76	47.2
Missing	6	3.7
Support for green growth policy		
Yes	134	83.2
No	2	1.2
Missing	25	15.5

"Checking toilet for leaks" was significantly influenced by the specified variables as a group, and the duration of current housing and the perception on green home project had positive effects on the explanation of the dependent variable at the p<.01 level (Table 5). Those who lived in current housing longer and were familiar with the state project were likely to save toilet water by checking the leaks.

The statistical association with "reduction in shower time" was significant, and the age and religious affiliation of the respondents were important factors for the dependent variable (Table 6). The respondents who were older and had religion was stronger were more likely to decrease shower time.

Table 5. Summary of Regression Analysis for Variables Predicting "Checking Toilet for Leaks"

Variables	B	SE	Beta
(Constant)	4.009	1.493	
Age	-.011	.013	-.116
Education	-.091	.294	-.036
Employment status	-.203	.252	-.087
Religious affiliation	-.249	.268	-.096
Household size	-.068	.143	-.057
Monthly household income	.001	.001	.145
Housing tenure	.457	.295	.194
Housing structure type	-.131	.347	-.043
Housing size	.000	.002	.023
Age of current housing	.004	.013	.037
Duration of residence	.072	.028	.344*
Perception on green home project	.544	.230	.255*
Support for green growth policy	-1.116	.994	-.113

* p<.05; R^2=.309, $R^2_{adj.}$=.183, F(13, 71)=2.445, p=.008

Table 6. Summary of Regression Analysis for Variables Predicting "Reduction in Shower Time"

Variables	B	SE	Beta
(Constant)	.215	1.504	
Age	.019	.013	.207
Education	.689	.294	.280*
Employment status	-.174	.248	-.077
Religious affiliation	.680	.263	.271*
Household size	.169	.144	.146
Monthly household income	.000	.001	-.032
Housing tenure	.000	.297	.000
Housing structure type	-.139	.345	-.046
Housing size	.000	.002	.001
Age of current housing	-.008	.013	-.065
Duration of residence	.035	.028	.180
Perception on green home project	.373	.231	.178
Support for green growth policy	.597	1.001	.061

* p<.05; R^2=.270, $R^2_{adj.}$=.139, F(13, 72)=2.051, p=.028

The selected variables entered as a block had significant relationships with "installation of water-saving shower" among respondents (Table 7). Age of respondents, household size, and support for green growth policy were significantly related to the dependent variable. The respondents who were older, had larger household, and supported for green growth policy were likely to install water saving shower.

The equation predicting the relationship between specified independent variables and "participation in river cleanup activities" as a dependent variable was significant (Table 8). Employment status and the perception on green home project were important variables in the equation at the p<.05 level. The respondents who were employed and unfamiliar with the state project were less likely to take part in river cleanup activities.

The selected variables as a group were significantly related to "curbing illegal garbage dumping activities" at the p=.001 level and they had approximately 25% explanation of variance in the regression analysis (Table 9). Age and education of the respondents were important effects on the dependent variable. It's likely that the respondents who were aged and had college education closely supervised illegal garbage dumping activities.

The specified predictors as a block were significantly related to "use of public transport" at the p<.01 level and the regression equation accounted for 21.3% of the variation in the dependent variable (Table 10). Age of the respondents was the only important factor that significantly contributes to using public transport at the p<.05 level. In other words, older respondents were likely to use the public transit.

The set of a regression analysis predicting "minimizing the use of car air conditioning" from 13 variables was significantly associated among respondents at the p<.001 level, and the independent variables had 26.5% explanation of variance in the regression analysis (Table 11). Age of the respondents and the perception on green home project were significant variables in the equation. Older respondents knowing well about the state project were likely to minimize using car air conditioning.

Table 7. Summary of Regression Analysis for Variables Predicting "Installation of Water-Saving Shower"

Variables	B	SE	Beta
(Constant)	1.525	1.562	
Age	.035	.014	.358*
Education	.486	.305	.189
Employment status	-.203	.258	-.086
Religious affiliation	-.201	.273	-.076
Household size	.332	.150	.274*
Monthly household income	.000	.001	.071
Housing tenure	-.142	.309	-.058
Housing structure type	.066	.358	.021
Housing size	-.001	.002	-.094
Age of current housing	.017	.014	.143
Duration of residence	.034	.029	.163
Perception on green home project	.339	.240	.155
Support for green growth policy	-2.086	1.039	-.205*

* p<.05; R^2=.281, $R^2_{adj.}$=.151, F(13, 72)=2.163, p=.020

Table 8. Summary of Regression Analysis for Variables Predicting "Participation in River Cleanup Activities"

Variables	B	SE	Beta
(Constant)	2.937	1.437	
Age	.006	.013	.072
Education	-.177	.281	-.076
Employment status	-.613	.242	-.282*
Religious affiliation	-.056	.251	-.024
Household size	-.039	.137	-.036
Monthly household income	.001	.001	.201
Housing tenure	-.065	.288	-.030
Housing structure type	-.217	.330	-.077
Housing size	-.002	.002	-.155
Age of current housing	.009	.013	.081
Duration of residence	.029	.027	.155
Perception on green home project	.763	.225	.380***
Support for green growth policy	-.925	.956	-.101

* p<.05, *** p<.001; R^2=.276, $R^2_{adj.}$=.142, F(13, 70)=2.054, p=.028

Table 9. Summary of Regression Analysis for Variables Predicting "Curbing Illegal Garbage Dumping Activities"

Variables	B	SE	Beta
(Constant)	-1.110	1.336	
Age	.029	.012	.323*
Education	.530	.261	.227*
Employment status	-.086	.220	-.040
Religious affiliation	.262	.234	.110
Household size	.236	.128	.214
Monthly household income	.000	.001	-.101
Housing tenure	-.006	.264	-.003
Housing structure type	.079	.306	.028
Housing size	-.001	.002	-.072
Age of current housing	.014	.012	.129
Duration of residence	.042	.024	.229
Perception on green home project	.342	.204	.172
Support for green growth policy	.636	.889	.069

* p<.05; R^2=.362, $R^2_{adj.}$=.247, F(13, 72)=3.143, p=.001

Table 10. Summary of Regression Analysis for Variables Predicting "Use of Public Transport"

Variables	B	SE	Beta
(Constant)	2.719	1.659	
Age	.037	.014	.339*
Education	-.280	.323	-.098
Employment status	.401	.274	.153
Religious affiliation	-.253	.290	-.087
Household size	.120	.159	.090
Monthly household income	-.001	.001	-.145
Housing tenure	.120	.328	.045
Housing structure type	.151	.381	.043
Housing size	-.004	.002	-.213
Age of current housing	.020	.015	.151
Duration of residence	-.001	.030	-.005
Perception on green home project	.075	.253	.031
Support for green growth policy	-.672	1.105	-.060

* p<.05; R^2=.332, $R^2_{adj.}$=.213, F(13, 73)=2.787, p=.003

The statistical association with "thrifty gasoline saving" was significant, but none of the variables had an important effect on the dependent variable at the p<.05 level (Table 12).

The relationship between the independent variables and "good house cleaning" was statistically significant at the p<.01 level, and the regression equation accounted for 19.4% of the variation in the dependent variable (Table 13). Monthly household income was important to the explanation of the dependent variable at the p<.05 level. The respondents with lower household income were likely to clean house well.

The independent variables entered as a block were significantly associated with "buying biodegradable goods" among respondents (Table 14). Age and education of the respondents, and the perception on green home project were important variables that contribute to buying biodegradable goods. Older and college-educated respondents knowing about the state project were highly inclined to purchase biodegradable products.

The statistical relationship between a group of the specified variables and "consumption of eco-friendly goods" was significant at the p<.05 level, and three variables were important – education of the respondents, current housing tenure, and the perception on green home project (Table 15). The respondents who had college education background, owned housing, and were familiar with the state project were likely to consume eco-friendly goods.

The selected independent variables were significantly associated with "setting the thermostat at 26°c or higher in summer," and two variables among them were important – religious affiliation and the perception on green home project (Table 16). The respondents who had religion and knowledge on the state project were likely to make the indoor ambient warmer in summertime, so that the reduced use of fans or cooling devices saves energy.

Table 11. Summary of Regression Analysis for Variables Predicting "Minimizing the Use of Car Air Conditioning"

Variables	B	SE	Beta
(Constant)	1.470	1.319	
Age	.029	.012	.328*
Education	.046	.256	.019
Employment status	.033	.219	.015
Religious affiliation	.262	.229	.111
Household size	.033	.126	.030
Monthly household income	-.001	.001	-.107
Housing tenure	-.233	.259	-.106
Housing structure type	.375	.301	.132
Housing size	-.002	.002	-.121
Age of current housing	.009	.012	.084
Duration of residence	-.006	.024	-.031
Perception on green home project	.804	.201	.406***
Support for green growth policy	.178	.872	.019

* p<.05, *** p<.001; R^2=.378, $R^2_{adj.}$=.265, F(13, 72)=3.363, p=.000

Table 12. Summary of Regression Analysis for Variables Predicting "Thrifty Gasoline Saving"

Variables	B	SE	Beta
(Constant)	1.894	1.230	
Age	.006	.011	.084
Education	.171	.239	.084
Employment status	-.096	.204	-.052
Religious affiliation	.382	.214	.188
Household size	.087	.117	.093
Monthly household income	-.001	.000	-.209
Housing tenure	.029	.241	.016
Housing structure type	-.146	.280	-.060
Housing size	.002	.002	.171
Age of current housing	.010	.011	.106
Duration of residence	.024	.022	.156
Perception on green home project	.349	.188	.206
Support for green growth policy	.056	.813	.007

R^2=.264, $R^2_{adj.}$=.131, F(13, 72)=1.987, p=.034

Table 13. Summary of Regression Analysis for Variables Predicting "Good House Cleaning"

Variables	B	SE	Beta
(Constant)	2.499	1.333	
Age	.017	.012	.204
Education	-.057	.267	-.025
Employment status	-.089	.219	-.043
Religious affiliation	.212	.231	.093
Household size	.089	.127	.085
Monthly household income	-.001	.000	-.297*
Housing tenure	.206	.262	.098
Housing structure type	.334	.303	.123
Housing size	.001	.002	.073
Age of current housing	.015	.012	.148
Duration of residence	.008	.024	.047
Perception on green home project	.265	.202	.139
Support for green growth policy	-.240	.879	-.027

* p<.05; R^2=.317, $R^2_{adj.}$=.194, F(13, 72)=2.571, p=.006

Table 14. Summary of Regression Analysis for Variables Predicting "Buying Biodegradable Goods"

Variables	B	SE	Beta
(Constant)	1.425	1.210	
Age	.026	.011	.339*
Education	.638	.236	.315**
Employment status	-.152	.199	-.082
Religious affiliation	.135	.211	.066
Household size	.155	.116	.163
Monthly household income	.000	.000	.120
Housing tenure	-.054	.239	-.029
Housing structure type	-.094	.277	-.038
Housing size	.000	.001	-.023
Age of current housing	-.001	.011	-.007
Duration of residence	-.009	.022	-.054
Perception on green home project	.651	.185	.379***
Support for green growth policy	-.301	.805	-.038

* p<.05, ** p<.01, *** p<.001; R^2=.291, $R^2_{adj.}$=.165, F(13, 73)=2.310, p=.013

Table 15. Summary of Regression Analysis for Variables Predicting "Consumption of Eco-Friendly Goods"

Variables	B	SE	Beta
(Constant)	3.002	1.152	
Age	.003	.010	.045
Education	.550	.225	.292*
Employment status	-.319	.190	-.184
Religious affiliation	-.021	.201	-.011
Household size	.024	.110	.028
Monthly household income	.000	.000	.064
Housing tenure	.477	.228	.269*
Housing structure type	-.128	.264	-.056
Housing size	-.002	.001	-.151
Age of current housing	-.007	.010	-.084
Duration of residence	.007	.021	.046
Perception on green home project	.353	.176	.220*
Support for green growth policy	.213	.767	.029

* p<.05; R^2=.132, $R^2_{adj.}$=.067, F(13, 73)=1.992, p=.033

Table 16. Summary of Regression Analysis for Variables Predicting "Setting the Thermostat at 26°C or Higher in Summer"

Variables	B	SE	Beta
(Constant)	2.645	1.378	
Age	.010	.012	.120
Education	.045	.269	.020
Employment status	.054	.227	.026
Religious affiliation	.651	.241	.283**
Household size	-.057	.132	-.054
Monthly household income	.000	.001	-.049
Housing tenure	-.196	.272	-.092
Housing structure type	.580	.316	.211
Housing size	.001	.002	.089
Age of current housing	.004	.012	.040
Duration of residence	-.007	.025	-.041
Perception on green home project	.630	.210	.329**
Support for green growth policy	-.430	.918	-.048

** p<.01; R^2=.260, $R^2_{adj.}$=.129, F(13, 73)=1.977, p=.035

The equation predicting "setting the thermostat at 20°c or lower in winter" from 13 variables significantly contributed at the p=.001 level, and the independent variables had approximately 24% explanation of variance in the regression analysis (Table 17). Religious affiliation of the respondents, monthly household income, and the perception on green home project were important factors. That is to say, the respondents who had religion, lower monthly income, and knew about the state project were likely to make indoor spaces not very warm during the wintertime, which results in energy saving.

Table 17. Summary of Regression Analysis for Variables Predicting "Setting the Thermostat at 20°C or Lower in Winter"

Variables	B	SE	Beta
(Constant)	3.139	1.425	
Age	.011	.012	.121
Education	.284	.278	.114
Employment status	.387	.235	.169
Religious affiliation	.596	.249	.235*
Household size	.045	.136	.039
Monthly household income	-.001	.001	-.301**
Housing tenure	.066	.282	.028
Housing structure type	-.125	.327	-.041
Housing size	.000	.002	.022
Age of current housing	-.003	.013	-.023
Duration of residence	.015	.026	.075
Perception on green home project	.770	.218	.364***
Support for green growth policy	-1.010	.949	-.103

* p<.05, ** p<.01, *** p<.001; R^2=.352, $R^2_{adj.}$=.237, F(13, 73)=3.050, p=.001

The thirteen predictors as a group were significantly related to "wearing thermal underwear in winter," and significant predictors in the equation included age and religious affiliation of the respondents, and monthly household income (Table 18). Older respondents who had religious affiliation and lower monthly income were likely to wear thermal underwear in wintertime.

Table 18. Summary of Regression Analysis for Variables Predicting "Wearing Thermal Underwear in Winter"

Variables	B	SE	Beta
(Constant)	-.513	1.829	
Age	.040	.016	.347*
Education	.448	.357	.147
Employment status	.103	.302	.037
Religious affiliation	.765	.320	.246*
Household size	.316	.175	.220
Monthly household income	-.002	.001	-.259*
Housing tenure	.208	.361	.072
Housing structure type	-.324	.419	-.087
Housing size	.001	.002	.057
Age of current housing	.016	.016	.111
Duration of residence	-.038	.033	-.159
Perception on green home project	.446	.279	.172
Support for green growth policy	.648	1.218	.054

* p<.05; R^2=.290, $R^2_{adj.}$=.163, F(13, 73)=2.291, p=.013

The association of "turning off unused lights" with the independent variables was statistically significant, and three variables including current housing structure type, duration of current housing and the perception on green home project positively affected the dependent variable (Table 19). The respondents who lived in condominium (so-called apartment), resided in current housing longer, and were familiar with the state project were likely to turn off unused lights.

Table 19. Summary of Regression Analysis for Variables Predicting "Turning Off Unused Lights"

Variables	B	SE	Beta
(Constant)	3.566	.956	
Age	-.003	.008	-.046
Education	.201	.186	.129
Employment status	.140	.158	.097
Religious affiliation	.116	.167	.073
Household size	-.093	.092	-.127
Monthly household income	.000	.000	.059
Housing tenure	-.262	.189	-.178
Housing structure type	.581	.219	.304*
Housing size	.001	.001	.136
Age of current housing	-.010	.009	-.137
Duration of residence	.036	.017	.295*
Perception on green home project	.418	.146	.315**
Support for green growth policy	-.162	.636	-.026

* p<.05, ** p<.01; R^2=.261, $R^2_{adj.}$=.130, F(13, 73)=1.986, p=.034

The multiple regression analysis to predict "use of smart power strips" was significant, and three independent variables – education of the respondents, monthly household income and current housing size – had a positive proposition in the inclination to using smart power strips (Table 20). It's likely that the respondents who had college education background, earned lower monthly income, and lived in bigger housing used smart power strips.

Table 20. Summary of Regression Analysis for Variables Predicting "Use of Smart Power Strips"

Variables	B	SE	Beta
(Constant)	2.949	1.367	
Age	-.010	.012	-.112
Education	.766	.266	.335**
Employment status	-.170	.225	-.081
Religious affiliation	-.116	.239	-.050
Household size	.188	.131	.175
Monthly household income	-.002	.001	-.343**
Housing tenure	.015	.270	.007
Housing structure type	.437	.313	.157
Housing size	.004	.002	.279*
Age of current housing	-.017	.012	-.156
Duration of residence	.035	.025	.192
Perception on green home project	.063	.209	.032
Support for green growth policy	.019	.910	.002

* p<.05, ** p<.01; R^2=.291, $R^2_{adj.}$=.165, F(13, 73)=2.310, p=.013

Out of the 16 equations for each dependent variable of green living, 12 of 13 independent variables were important factors contributing the explanation of the selected dependent variables. The perception on green home project was the most frequently found factor (8 times out of 16 equations) followed by age (6), education (5), religious affiliation (4) and monthly household income (4). The rest of the independent variables were found twice (current housing size, and duration of current residence) or once (employment status, household size, current housing tenure, current housing structure type, and support for green growth policy) in the regression analyses. Nevertheless, the age of current housing was the only predictor that didn't significantly contribute to any explanation of the 16 analyses. In spite of the fact that only a few behaviors of green living were statistically significant, the findings imply that green living tends to be related to the perception on green home project, demographics influence green living more than do housing characteristics that show indirect effects. Thus, the research result was compelling, and each individual's attitude toward green growth policy determines the changing lifestyle and personal behaviors related to green living.

5. CONCLUSIONS

Starting from climate change, economic slowdown and environmental crisis became impending issues, and the world should deal with the balance between economic growth and environment protection. The Korean government has taken decisive actions on green economy and driven green living that was viewed as inevitable to mitigate the global crises. Indeed, Korea has been gaining the international attention in that the comprehensive framework for green growth in 2009 was provided at the state level. The green growth policy in the past few years has formed public guidelines to living green, and collaboration among sectors has been undertaken on the need for the public awareness. Accordingly, the purposes of this study are to explore the green growth policy and its impacts on green living of residents in multifamily housing, and to investigate factors influencing individual behaviors of green living. The results indicated that more than four fifth of the respondents supported the green growth policy, and the supportive and positive attitude was associated with green living in daily life. Although only a half of the research participants were familiar with green home project, a vast majority of them favored the state policy on green growth. This finding implies that many people experienced little information on the state project of green home, but they considered the green growth policy to be a right direction in the wave of global crises. Furthermore, the practice of green living was more affected by the demographic characteristics of the respondents than by their housing characteristics. Also, the perception on a green home project was more important in explaining green living. This implies that closer attention to green living determines the success of living green. Therefore, the holistic and top-down approach to green growth can't be consummated without bottom-up measures like green living driven by governance from different sectors. Most of the guidelines to green living have so far filled up with passive, indirect and economical approaches, and they proved to be effective. However, the progressive strategies for green living including technological support and design considerations are required to make living greener and to gain the actual benefits.

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