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- Selecting Inter-Korean Collaborative Projects in the Border Region in the East Sea Coastal Area and the Analysis of its Ripple Effects

- The Evaluation of TMV (Transport Mode Value) for Green Growth in Korea

- U-City Policy and Planning System of Korea
Selecting Inter-Korean Collaborative Projects in the Border Region in the East Sea Coastal Area and the Analysis of its Ripple Effects

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The Evaluation of TMV(Transport Mode Value) for Green Growth in Korea

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U-City Policy and Planning System of Korea

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1. Introduction

Since 2000, when the inter-Korean summit was held, the South Korean government has been making efforts to relieve political and military tension with North Korea by continuously organizing talks, such as inter-Korean ministerial-level talks and military talks. The Inter-Korean Economic Collaboration Execution Committee has presented a systematic basis for the execution of inter-Korean exchange and collaboration projects by addressing matters relating to the inter-Korean economy, such as the construction of Gaeseong Industrial Complex, the opening of Gyeongui railway, Donghae railway and road, shipping, joint fishing, and agriculture collaboration.

Through these continuous collaborative efforts in the Korean border regions, areas where military tension was high are being transformed into sites of reconciliation and cooperation. Furthermore, with the US government’s recent removal of North Korea from the list of state sponsors of terrorism, making it possible for N. Korea to engage in overseas economic activities, N. Korea’s economy is expected to gain competitiveness. Therefore, if we push ahead with collaborative projects with N. Korea from a reciprocal position, the inter-Korean exchange and collaboration project will gain traction in the future.

Nevertheless, it can be said that systematic preparation for the revitalization of collaboration projects in the border regions is still insufficient. Worse still, in the border region near the East Sea coastal area, there are no concrete plans for exchange and collaboration, or approaches that take into account the unique characteristics of the area. For this reason, it is necessary to prepare comprehensive and systematic
plans for the improvement of these areas, in preparation for the revitalization of inter-Korean exchange and collaboration, and for future economic collaboration in the border region of the East-Sea coastal area.

In particular, military tension resulting from the occasional trespass of both North and South Korean fishing boats in the East Sea coastal areas has hindered the improvement of inter-Korean reconciliation and the promotion of a collaborative relationship. Therefore, it is becoming urgent to prepare execution plans for joint use and collaborative projects in these waters, to promote permanent peace and inter-Korean reconciliation. In addition, it is becoming more and more necessary to establish the Mt. Kumgang and Mt. Seorak tourism project to resolve the stagnancy of tourism to Mt. Seorak, and to establish distribution routes into Northeast Asia, in order to secure overseas competitiveness in this era of cooperation between the Northeast Asian countries.

The purpose of this study is to select inter-Korean exchange and collaboration projects, and to present the outcome of an analysis of the economic ripple effects of those projects, in an effort to revitalize inter-Korean exchange and collaboration projects and to build the foundation for collaboration in the inter-Korean border regions in the East Sea coastal area.

It is expected that the revitalization of inter-Korean exchange and collaboration will make a positive contribution to relieving military tension and establishing peace, while promoting economic cooperation, improving the living environment, and facilitating the systematic conservation of the natural eco-system. In addition, it is anticipated that the synergies resulting from the connection of each factor will have ripple effects on the nation as well as local communities.

2. Literature Review

A number of previous studies have been conducted by domestic and overseas academics and research institutes on methods for the peaceful use of the inter-Korean border regions. First, the study of Young-bong Kim (1997) is helpful for gaining insight into issues regarding the border regions, as it deals with general matters affecting the current status and actual conditions of S. Korea’s border regions. However, this study has its limitations in terms of its methodology, because it employs mostly qualitative analysis methods such as literature study and field research.

Second, the study of Young-bong Kim et al. (2004) aimed to present a plan to designate and manage the border region of the West Sea coastal area as a marine protection area. This study conducted a wide-ranging analysis by studying diverse overseas and domestic literature, and by collecting opinions from various relevant
ministers and departments. However, this study failed to present a comprehensive ‘big picture’ of the border regions, as it focused solely on the establishment of the marine protection area and its cooperative management.

Third, the study of Jung-ho Nam (2003) aimed to create a cooperative zone and prepare execution plans for exchange and collaboration projects that could revitalize exchange and collaboration in the border region of the West Sea coastal area. This study examined examples of exchange and collaboration efforts in foreign border regions, to derive implications for Korea. In addition, it suggested plans to utilize the inter-Korean border regions and adjacent isles.

Fourth, the study of Yong-seok Shin (2005) examined the current status of tourism exchange between South and North Korea, and established a roadmap for inter-Korean tourism exchange and collaboration through different scenarios. This study dealt with the current status of tourism in North Korea as well as South Korea, and suggested feasible tourism exchange projects or plans. However, the study failed to present a comprehensive concept on feasible exchange and collaboration projects in the border regions, as it limited its objects for study to tourism.

The purpose of this study is to embody the inter-Korean exchange and collaboration plans in the Amendment to the Fourth Comprehensive National Territorial Plan by collaborative project. This study intends to suggest actual collaborative projects in the land and sea of the inter-Korean border regions in the East Sea coastal area and the surrounding waters of the NLL (Northern Limit Line), and suggests plans for the revitalization of inter-Korean exchange and collaboration through the relief of military tension and cooperation in sea and land.

While most of the previous studies have focused on the border regions of the South Korean side or in the West Sea coastal areas, this study sets the geographic range as the inter-Korean border regions in the East Sea coastal areas.

In particular, unlike the previous studies, which were dependent solely on qualitative analysis in the process of selecting exchange and collaborative projects, this study utilized both scientific analysis and qualitative analysis. This study used the AHP analysis method to derive the priority of the projects, and in particular, added the analysis on the quantitative ripple effects of the projects of priority, which differentiates this study.

3. Methods

The geographic range of the study, as shown in Figure 3.1, includes the entirety of Gangwon-do on both the South and North Korean sides in the East Sea coastal areas, and adjacent waters including the Maritime Military Demarcation Line. The geo-
graphic range in a broad sense includes the entirety of Gangwon-do in both the North and South Korean sides, and the adjacent coastal waters including the NLL (Northern Limit Line). The range in a narrow sense includes Wonsan-si, Anbyeon-gun, Tongcheon-gun, Huiyang-gun, Changdo-gun, Kumgang-gun, and Goseong-gun in the North Korean province of Gangwon-do, and Gangreung-si, Sokcho-si, Goseong-gun, Inje-gun, Yanggu-gun, Yangyang-gun, Donghae-si, and Samcheok-si in the South Korean province of Gangwon-do.

To select feasible inter-Korean projects, the 1st survey was conducted with local residents, local civil servants, and experts, and exchange and collaboration projects were selected for various areas, including tourism collaboration, marine products collaboration and shipping collaboration. In addition, as a method to execute the selected projects by time and stage, the relative priority of the selected projects was determined by conducting a 2nd survey with experts. For this, in this study, the AHP analysis method was used to estimate the composite weight between projects, and the priority of the projects was determined.

Finally, this study analyzed the ripple effects of the project selected as the top priority, in an effort to estimate the quantitative value of pursuing the project while pushing ahead with inter-Korean exchange and collaboration projects.

### 3.1 Selection of inter-Korean exchange and collaboration projects

The projects for inter-Korean exchange and collaboration were selected through a survey of local civil servants, North and South Korean experts, professors and NGOs on inter-Korean exchange and collaboration. For the survey, four broad categories of tourism, marine products and shipping, environment and ecology, and life zones and
resources were established and specific projects for each category were derived. In addition, a survey on the possibility of inter-Korean exchange and collaboration and the time-frame for such exchange was conducted in order to predict the potential for executing exchange and collaboration projects.

As the inter-Korean exchange and collaboration projects need to be continuously carried out, taking into account the political, social, and economic conditions of the two Koreas, it is necessary to select multiple projects for each category, and to suggest them by stage. Therefore, this study selected five projects for each category from the projects that were most supported by respondents.

Only five projects for each category were selected in order to secure statistical significance by maintaining the consistency of responses for the AHP analysis conducted on experts to assess the priority of projects. In particular, with regard to the analysis on the priority of exchange and collaboration projects, it is necessary to limit the number of projects for each category in order to induce quantitative outcomes from qualitative factors through relative evaluation. To sum up, in this study, survey questions on feasible inter-Korean exchange and collaboration projects induced from the 1st stage were prepared in order to select exchange and collaboration projects, the expert survey was conducted two times, and projects for exchange and collaboration were selected, and based on this, the relative priority of these projects was derived.

3.2 Analysis on the priority of exchange and collaboration projects

As the execution of inter-Korean exchange and collaboration projects, unlike other projects, depends on the political conditions of South and North Korea, it is necessary to take a careful approach that considers all of the related factors. For this reason, exchange and collaboration projects must be executed while taking into account conditions such as profitability, the symbolic meaning of the project, and social factors. For this, this study attempted to prioritize the 20 selected projects by analyzing their degree of importance.

Through this approach, the projects with top priority can be executed as short-term projects, while projects with a lower priority can be executed later as mid-term or long-term projects, considering future conditions and political situations. In this study, 20 exchange and collaboration projects were selected through surveys and studies of the existing literature, and the priority of the projects selected by 46 relevant experts was identified through the AHP method.
3.3 Analysis on ripple effects

This study used the input-output model to analyze the ripple effects of the Seorak-Kumgang tour project, which has been selected as the top priority through AHP analysis. The input-output model was invented by Leontief in 1930. It is a model for analyzing the economy through inter-industrial relations, and shows the relationships that occur when the products of one industry are input to produce the products of another industry. In this study, the ripple effects were analyzed with the area largely divided into South Korea, North Korea, and the region of Gangwon-do that spans both of the Koreas. First, the ripple effects on South Korea were analyzed using I/O between Gangwon-do and the non-Gangwon-do area. Second, the ripple effects on North Korea were analyzed by comparing the outputs of North Korea’s main industries with the outputs of South Korea, rather than by directly using North Korean data, as the data on North Korea has tended to be very insufficient. The report by the Korea Development Bank titled ‘North Korea’s Industries (1995)’ shows the current status of each industry in North Korea by comparing North Korea’s level of technology with that of South Korea. Based on this, in this study, it was assumed that the current economic situation of North Korea is similar to that of South Korea in 1975, and the ripple effects on North Korea was analyzed by deriving I/O according to the Leontief table for 1975 provided by the Bank of Korea. Third, the ripple effects on Gangwon-do in both of the Koreas were analyzed by studying the geographical and cultural similarities between South and North Gangwon-do. For this reason, in this study, it was assumed that Gangwon-do in North Korea has similar industrial relations to Gangwon-do in South Korea, and based on this, the ripple effects for all of Gangwon-do was analyzed by using only I/O from the South Korean part of Gangwon-do.

3.3.1 The ripple effects on South Korea

Region input-output models can largely be divided into single-region input-output models, which focus on a single region, and inter-regional input-output models, which are inter-industrial models that examine multiple regions in a nation. As the purpose of the analysis on the ripple effects on South Korea is to analyze the ripple effects on the whole area, both Gangwon-do and the other regions, the analysis was performed using the inter-regional input-output model.

For the analysis, the transaction table ($28 \times 2 \times 2 \times 28$ matrix) consisting of Gangwon-do and non-Gangwon-do (the sum of the Metropolitan Area, Chungcheong, Honam, Gyeongsangbuk-do, and Gyeongsangnam-do) was prepared,
by using the existing transaction table \((28 \times 6 \times 6 \times 28\) matrix) on 28 industries in six metropolitan self-governing areas, such as the Metropolitan Area, Gangwon, Chungcheong, Honam, Gyeongsangbuk-do and Gyeongsangnam-do. To gain the I/O in and between regions of Gangwon-do, Gangwon-do was tagged as \(K\), and non-Gangwon-do as \(R\), and the following formula was derived.

\[
Z = \begin{bmatrix}
Z_{KK} & Z_{KR} \\
Z_{RK} & Z_{RR}
\end{bmatrix}
\]

\(Z_{KK}\): Transaction volume from Gangwon to Gangwon
\(Z_{KR}\): Transaction volume from Gangwon to another region
\(Z_{RK}\): Transaction volume from another region to Gangwon
\(Z_{RR}\): Transaction volume between other regions

The I/O coefficient can be gained by dividing the above formula by the total output of each region, as in the national I/O.

\[
A = \begin{bmatrix}
A_{KK} & A_{KR} \\
A_{RK} & A_{RR}
\end{bmatrix}
\]

The following is the total output and final demand within and without a region gained by using the above formula.

\[
(I - A)X = Y
\]

\(X\) = Total output
\(Y\) = Final demand (investment)

If you gain the Leontief inverse matrix and multiply it with the final demand, the total output is gained, as follows.

\[
X = (I - A)^{-1} Y
\]

If only the increase of the total output is considered, the following formula is used, and is the increase of the total demand (investment).

\[
\Delta X = (I - A)^{-1} \Delta Y
\]

With regard to the ripple effect, it can be said that if the investment is made in a certain industry, the final demand increases in an amount equal to the amount of the investment, so if this value is entered into, \(\Delta Y\), the increase in the total output can be gained.

In this study, the total production inducement effect was calculated according to the increase of the final demand (investment) of the construction industry, and it was multiplied by the value-added inducement coefficient and the employment
inducement coefficient announced by the Bank of Korea (2003) to identify the ripple effects of each industry.

3.3.2 The ripple effects on North Korea

To estimate the ripple effect on North Korea, the single region input-output model using South Korea in 1975 as a single unit was used. By using the transaction table of domestic goods and services of the Leontief table for 1975 given by the Bank of Korea, a 27x27 matrix was prepared that includes 27 industries (according to the 1975 table, public administration, national defense, education and health were treated as a single industry).

If this is divided by the total output of each region, the input-output coefficient A can be gained, and if the total output and the final demand are calculated using the technical coefficient A, the same form as Formula 1 is produced, as follows. The rest of the process is carried out using the same method:

\[(I - A)X = Y\]  
\[X = \text{Total production}\]  
\[Y = \text{Final demand (investment)}\]

3.3.3 The ripple effects on Gangwon-do in both Koreas

An analysis of the ripple effects on Gangwon-do in both Koreas was made using the Leontief table for Gangwon-do. For this, the input-output table for 28 industries was prepared based on the inter-industrial analysis for 2003 given by the Bank of Korea, and the transaction amount of Gangwon-do Z (28x28 matrix) was gained using the existing data for the 28 industries of Gangwon-do.

If this is divided by the total output of each region, the input-output coefficient A can be gained, and if the total output and the final demand are calculated using the technical coefficient A, the same form as Formula 1 is produced, as follows. Likewise, the rest of procedure was processed in the same way as the estimation of the ripple effects on South Korea.

\[(I - A)X = Y\]  
\[X = \text{Total output}\]  
\[Y = \text{Final demand (investment)}\]
4. Results

4.1 The result of selecting inter-Korean exchange and collaboration projects

According to the survey on the possibility of inter-Korean exchange and collaboration made prior to the selecting of exchange and collaboration projects, 46.7% of respondents chose high possibility, 29.5% normal, and 23.8% low, and thus about 80% answered positively (Figure 4.1). This result not only validates the efforts of the central government and Gangwon-do for inter-Korean collaboration, but also seems to indicate that previous inter-Korean efforts, such as Mt. Kumgang tourism and the construction of the Gaeseong Industrial Complex, have had a positive influence.

As shown in Figure 4.2, with regard to the opinions on the appropriate time for inter-Korean exchange and collaboration, 31.7% selected “immediately,” but 30.3% chose “after the North Korean nuclear issue is resolved,” while 21.1% chose “when free travel between the two Koreas is possible,” implying that it is necessary to deal with the political and military peace between the two Koreas for inter-Korean exchange and collaboration.

In addition, according to Figure 4.3, the most promising areas for inter-Korean exchange and collaboration projects include collaborative tourism projects (38.4%), marine products and shipping projects (29.5%), collaborative environment and ecology
The significance and reliability of the survey materials were verified using multiple regression analysis, which is a statistical analysis model for understanding the accuracy of selected exchange and collaboration projects. The Dubin-Watson statistic to verify the independency of error is 1.82, and thus autocorrelation does not occur.

Northeast Asian Sea, and marine resorts and leisure.

Five projects in the area of marine products and shipping collaboration can be classified as infrastructure support, such as harbors, support for fishing boats, repairs, and equipment, support for transportation and processing of marine products, support for fishing techniques and fish species culture technology, and the opening of Northeast Asia distribution routes.

Five selected projects in the area of environment and ecology collaboration are the creation of a green environment, marine ecosystem experience, research and conservation of rare ecological resources, and research for the establishment of a management system for South and North Korea’s ecosystems, and joint efforts to prevent natural disasters such as fires and floods.

Finally, five projects for the area of life zone and resources collaboration are the joint use of markets and medical services, improvement of residential environments, installation and use of roads and railways, joint development and use of underground resources, and joint management of water resources. To sum up, the four basic areas each have five specific inter-Korean exchange and collaboration projects, for 20 projects in total.\textsuperscript{1)

\textsuperscript{1) The significance and reliability of the survey materials were verified using multiple regression analysis, which is a statistical analysis model for understanding the accuracy of selected exchange and collaboration projects. The Dubin-Watson statistic to verify the independency of error is 1.82, and thus autocorrelation does not occur.
4.2 Analysis on the priority of inter-Korean exchange and collaboration projects

To prioritize inter-Korean collaborative projects, as seen in Figure 4.4, the general categories of tourism collaboration, marine products and shipping collaboration, environment and ecology collaboration, and life zone and resources collaboration were set as basic items (LEVEL 1), with specific projects in the general categories as specific items (LEVEL 2).

As the relative priority of the LEVEL 1 projects has a huge influence on the results of evaluation, this study derived questions on relative priority with a scale of 100 points by adopting the measuring scale for the sum of constants, and derived questions on relative priority for LEVEL 2 projects using the 9-point scale paired comparison method, a basic form suggested by Satie.

In terms of the relative priority of the basic items for inter-Korean

Figure 4.4. The Hierarchical Structure of Each Category of Projects
collaborative projects in the border region of the East Sea coastal area, the results showed that the first priority is tourism collaboration (0.324), followed by life zone and resources collaboration (0.235) and marine products and shipping collaboration (0.232), while the lowest priority turned out to be environment and ecology collaboration (0.209).

As seen in the evaluation of the priority for specific items in Figure 4.5, the Seorak-Kumgang tour project headed the evaluation (0.358), followed by the exploration of major tourist attractions (0.217). Second, for specific projects in the area of marine products and shipping collaboration, the top priority is support for infrastructures such as harbors (0.265), followed by the opening of Northeast Asian distribution routes (0.225) and support for fishing techniques and fish species culture technology (0.205). Third, in the area of environment and ecology collaboration, joint

2) The stage of consistency verification is the merit of AHP to determine how consistent and logical the answers of a respondent are. In this survey, the maximum CR value was set as 0.1, and the passage rate was usually over 62%.
efforts to prevent natural disasters such as fires and floods and the creation of green eco-environments in the Demilitarized Zone were the co-winners (0.243 each), followed by the research and conservation of rare ecological resources (0.233). Fourth, in the area of life zone and resources collaboration, the installation and joint use of roads and railways was first (0.324), while the joint development and use of underground resources was second (0.211).

In this way, projects into basic items and specific items for each basic item were

<table>
<thead>
<tr>
<th>Basic Item</th>
<th>Specific Item</th>
<th>Weight</th>
<th>Priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tourism collaboration (0.324)</td>
<td>Kumgang-Seorak tour (0.358)</td>
<td>0.116</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>Cruise ship service among the major harbors of East Sea coastal areas and isles (0.125)</td>
<td>0.040</td>
<td>14</td>
</tr>
<tr>
<td></td>
<td>Tourism linked with Northeast marine and air transport (0.148)</td>
<td>0.048</td>
<td>11</td>
</tr>
<tr>
<td></td>
<td>Exploration of main tourist attractions, such as historic sites (0.217)</td>
<td>0.070</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>Marine resorts and leisure (0.153)</td>
<td>0.049</td>
<td>9</td>
</tr>
<tr>
<td>Marine products and shipping collaboration (0.232)</td>
<td>Support for infrastructures such as harbors (0.265)</td>
<td>0.061</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Support for fishing boats, repairs and equipment (0.141)</td>
<td>0.033</td>
<td>18</td>
</tr>
<tr>
<td></td>
<td>Support for marine product transport and processing facilities (0.165)</td>
<td>0.038</td>
<td>17</td>
</tr>
<tr>
<td></td>
<td>Fishing techniques and fish species culture technology (0.205)</td>
<td>0.048</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>Opening of Northeast Asian distribution routes (0.225)</td>
<td>0.052</td>
<td>5</td>
</tr>
<tr>
<td>Environment and ecology collaboration (0.209)</td>
<td>Creation of green environment in the Demilitarized Zone (0.243)</td>
<td>0.051</td>
<td>7</td>
</tr>
<tr>
<td></td>
<td>Experience of marine eco system (0.093)</td>
<td>0.019</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>Research and conservation of rare ecological resources (0.233)</td>
<td>0.049</td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>Research on ecosystems of South and North Korea and establishment of a system for their management (0.189)</td>
<td>0.039</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>Joint efforts to prevent natural disasters such as fire and flood (0.243)</td>
<td>0.051</td>
<td>6</td>
</tr>
<tr>
<td>Life zone and resources collaboration (0.235)</td>
<td>Joint use of markets and medical services (0.122)</td>
<td>0.029</td>
<td>19</td>
</tr>
<tr>
<td></td>
<td>Residential environment improvement (0.164)</td>
<td>0.039</td>
<td>16</td>
</tr>
<tr>
<td></td>
<td>Installation and joint use of roads and railways (0.324)</td>
<td>0.076</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Joint development and use of underground resources (0.211)</td>
<td>0.050</td>
<td>8</td>
</tr>
<tr>
<td></td>
<td>Joint management of water resources (0.178)</td>
<td>0.042</td>
<td>13</td>
</tr>
</tbody>
</table>
derived, and the degree of importance of each item was analyzed, and based on the result, the priority of the projects was ascertained by adding up the local weight and finally calculating the composite weight to determine the relative priority of 20 inter-Korean collaborative projects (Table 4.1).

Among the collaborative projects, the Seorak-Kumgang tour project headed the list at the level of 0.116, followed by the installation and joint use of roads and railways (0.076), the exploration of major tourist attractions such as historic sites (0.070), support for infrastructures such as harbors (0.061), and the opening of Northeast Asian distribution routes (0.052). On the other hand, the project with the lowest priority was the marine eco-system experience (0.093), followed by the joint use of markets and medical services (0.029), support for fishing boats, repairs and equipment (0.033), support for marine product transport and processing facilities (0.038), and residential environment improvement (0.039).

4.3 Analysis of ripple effects

4.3.1 Analysis on the input factors of the input-output model by area

To analyze the ripple effects of the expansion of infrastructures, constructions, and facilities occurring in each industry due to the Seorak-Kumgang tour project, it is assumed that the investment cost of construction is approximately 50 billion won based on the size of similar facilities. This level of investment is equal to the investment for the construction of facilities of approximately 30,000 m² (including Onjeonggak, hot spring facility, Kumgangsan Hotel, and Cultural Center), which are part of the Onjeong-ri area in the 1st stage plan for Kumgang Mountain Tour Area by Hyundai Asan Co., Ltd.

It is possible to analyze the ripple effects in each industry based on the profits from the operation of tourism services. According to the prediction of tourist demand generated by the Hyundai Research Institute, the number of visitors to Mt. Kumgang is expected to reach 581,000 in 2012.

To identify the customer transaction of Mt. Kumgang tours, the ratio of visitors in the busiest season, busy season, normal season, and off-peak season was set as 4:3:2:1, and the ratio of tourists for 2 nights and 3 days, 1 night and 2 days, and day trips were set as 6:3:1, and the cost for accommodation was set as the average room charge in the hotels available. The average customer transaction produced based on this is 287,514 won.

While the number of visitors to Mt. Seorak reached a peak in 1995 at 3.61
million, and has declined somewhat since then, by and large it has remained fairly consistent since the late 1990s. Therefore, it is expected that the number of tourists to Mt. Seorak in 2012 will show little change from the average number of annual visitors from 2000 to 2006, and thus 2.787 million tourists are anticipated to visit Mt. Seorak. However, on the assumption that there will be an approximately 10% increase by linking Mt. Seorak tours to a Mt. Kumgang tour, the number of visitors to Mt. Seorak is predicted to increase to 3.066 million.

It is difficult to predict the precise customer transaction of Mt. Seorak tours because unlike the Mt. Kumgang tours, the tour does not proceed according to a certain program, but the price is estimated as 95,838 won, a third of the cost of the Mt. Kumgang tour, by comprehensively considering data on actual spending by tourists, existing sightseeing products by tour companies, and school trip expenses.

The investment cost for the area of operation through the connection of Seorak and Kumgang has been estimated as 460.9 billion won in 2012.

4.3.2 The ripple effect on South Korea

(i) Production inducement effect
The production inducement effect of the construction area on industries was predicted to be 131.4 billion won. In particular, the ripple effect of construction is 50.9 billion won, and it is seen that this area only received a ripple effect that was similar to the investment cost. However, real estate and business services and electricity, gas, and waterworks received high economic ripple effects, of 12.1 billion won and 11.3 billion won, respectively.

The ripple effect of operations was a total of 1.4246 trillion won, which is much higher than that of construction. The highest area was social and other services, followed by real estate and business services, and finance and insurance, and it can be seen that overall, the ripple effect on the service area is high.

(ii) Add value inducement effect
The add value inducement effect of the projects was calculated by taking the above production inducement effect by industry and multiplying it by the value-added inducement coefficient of the Leontief table given by the Bank of Korea. The total add value inducement effect of construction is 107.6 billion won, while the add value inducement effect of operation is 1.2118 trillion won. As for the value-added inducement of each industry, the ripple effect of construction was high, as was the ranking of the production inducement effect.
(iii) Employment inducement effect
The labor inducement effect is produced by multiplying the production inducement effect by the employment inducement coefficient, while for the labor inducement effect by industry that was produced on this basis, the effect of construction amounts to a total of 27,560 persons, while the effect of operation is 210,330 persons. The area with the highest labor inducement effect is construction, while the highest of the operation areas is social and other services.

In terms of the labor inducement effect of construction on industries, the highest was construction, followed by real estate and business services, and finance and insurance, which is the same ranking as for the production inducement effect and the add value inducement effect. In addition, the labor inducement effect of the operation on industries was high, with social and other services gaining the most again, followed by real estate and business services, and finance and insurance, as with the ranking of the production inducement effect and the add value inducement effect.

4.3.3 The ripple effect on North Korea

(i) Production inducement effect
The total amount of the production inducement effect of construction on industries is 124.3 billion won, which is a huge effect for the investment cost of 50 billion won. As in South Korea, the production inducement effect of investment in construction was 50.2 billion won, which is the highest, followed by wood and paper products (6.9 billion won) and non-metallic mineral resources (6.8 billion won), and this is quite different from construction.

The production inducement effect of operation was 738.8 billion won, which is a high degree of output inducement for the investment cost. The highest production inducement effect was made by social and other services, followed by chemical products and wholesale.

(ii) Add value inducement effect
The total add value inducement effect of the investment in construction was estimated as 94.6 billion won, while that of the investment in operation was 615.7 billion won. While the ranking of industries for added value was somewhat changed, for the add value inducement effect on each industry in the area of construction, construction was still the highest with 42 billion won, but wood and paper products, which were ranked second in terms of the production inducement effect, lost the second place and instead, the 1st metal replaced the second rank, followed by wholesale. As for the add
value inducement effect of industries in the area of operation, social and other services was the highest, followed by wholesale and chemical product manufacturing.

(iii) Labor inducement effect
The labor inducement effect of construction was estimated as 24,000 persons, while that of operation was 102,490 persons. Given the amount of funds put in, it is understood that the labor inducement effect of investment in the construction stage is relatively higher than in the operation stage. (For the employment inducement over investment cost, construction is 0.48 persons/1 m won, while operation is 0.22 persons/1 m won.)

The total labor inducement effect is anticipated to be 126,790 persons, and the degree of the production inducement effect of investment in construction was in order of construction, wholesale, transport, and warehousing, while that of investment in operation was in the order of social and other services, wholesale, and construction.

4.3.4 The ripple effect on Gangwon-do in both Koreas

(i) Production inducement effect
According to the analysis of the input-output model, the production inducement effect of construction on industries was estimated to be a total of 85.3 billion won. The output inducement of construction was 50.5 billion won, which is the highest, followed by electricity, gas and waterworks (10.1 billion won) and real estate and business services (5.3 billion won).

As for the area of operation, the output inducement amount is a total of 1.52 trillion won, which is a huge effect for the invested amount. The highest area was social and other services, and the service area showed a high degree of production inducement effects such as real estate and business services, and finance and insurance.

(ii) Add value inducement effect
By and large, the add value inducement effect shows similar aspects to the production inducement effect. The total amount of add value inducement effect in investment in construction was estimated as 69.9 billion won, while that of investment in operation was 868 billion won. The ranking of industries in terms of the level of added value was the same as that for the production inducement effect.

(iii) Labor inducement effect
The labor inducement effect of investment in construction is 22,390 persons, while that
of investment in operation is 163,230 persons, and this is a high degree of labor inducement effect. In terms of the effect of specific industries, the direct-invested industries such as construction and social and other services have the highest labor inducement effects, followed by the area of real estate and business services.

4.3.5 Summary

Table 4.2 shows the summary of the ripple effects on South Korea, North Korea, and on Gangwon-do in both of the two Koreas. The table was prepared with the categories of construction and operation. According to the table, the total production inducement effect for South Korea is approximately 1.556 trillion won, for North Korea is 863 billion won, and for Gangwon-do is 1.09 trillion won. In terms of the value-added inducement effect, for S. Korea it is approximately 1.319 trillion won, for N. Korea it is 710 billion won, and for Gangwon-do it is 938 billion won. Regarding the labor inducement effect, for S. Korea it is 238,000 persons, for N. Korea it is 126,000 persons, and for Gangwon-do it is 186,000 persons. As to the comparison of the production inducement effect of construction between two Koreas, the ripple effect between the two does not show a big difference.

In terms of the ripple effect of operation, the effect on South Korea is the highest,
followed by Gangwon-do and North Korea, and it is seen that compared to construction, the ripple effect of operation is relatively high in the relevant regions across the whole nation. As for the total ripple effect, which is the sum of construction and operation, the ripple effect for South Korea is bigger than that of North Korea.

5. Conclusion

5.1 Expected effects on policies

The two inter-Korean summits provided opportunities to establish peace and harmony in a Korean peninsula characterized by conflict and tension, in which the separation between North and South has made the two countries stand in opposition to each other, and also put the spurs to inter-Korean collaborative efforts. In particular, the connection of traffic networks, the execution of Mt. Kumgang tours, and the construction of Gaeseong Industrial Complex, all in the inter-Korean border regions, which are the fields of separation and military conflicts between the two Koreas, provided a symbol of the relief of inter-Korean tension and the unification of national lands.

This study is a foundational study to prepare concrete plans for inter-Korean collaboration projects in the inter-Korean border regions of the East Sea coastal area, as part of the plan to establish a “peace belt” in the Korean peninsula, suggested in the Fourth
Comprehensive National Territorial Plan (2000-2020). Therefore, the aim of this study is to prepare a foundation for selecting inter-Korean collaborative projects in the border region of the East Sea coastal area, in an effort to revitalize inter-Korean collaborative efforts and achieve peace.

From a nation-wide perspective, this study makes the following major contributions to policies. First, the revitalization of inter-Korean collaborative efforts in the border region of the East Sea coastal area can create the conditions for the relief of military tensions and eventual peace. Second, the study presents specific and realistic execution plans for collaborative projects for the revitalization of inter-Korean exchange and collaboration in the inter-Korean border region of the East Sea coastal area. Third, this study discovered feasible inter-Korean collaborative projects by undertaking a systematic analysis on the linkage and joint use of the tourism resources within the border regions, such as Mt. Kumgang and Mt. Seorak. Fourth, this study predicted the economic ripple effects on related areas arising from the joint use of tourism resources in the border region of the East Sea coastal area.

5.2 Characteristics and limits of this study

The limitation of this study is that sufficient research and analysis were not conducted regarding the cultural, social and natural environments of Northern Gangwon-do, including the Mt. Kumgang area, due to insufficient data on North Korea’s border regions and difficulties in accessing those places. Therefore, the data on its ecosystems, culture and history was analyzed by referring to the literature and historical data, and inter-Korean collaborative projects were planned by focusing on urgent inter-Korean initiatives and peace-making.

At the same time, in the process of selecting major projects, the dependency on qualitative analysis was high due to a lack of quantitative data, and thus efforts to raise the precision of the data of this study were made by using scientific analysis methods, through reference to the existing field research and the experience of researchers and opinions of experts. In addition to this, insufficient contents were supplemented by conducting field research and surveys of residents in the main South Korean areas. Therefore, if the social and economic relationship between the two Koreas is restored and inter-Korean exchange is revitalized in the future, it is necessary to secure data through joint research on the ecology of the Demilitarized Zone and the cultural and social environments of the North Korean border regions.
5.3 Policy proposal and future research agenda

For the execution of such exchange and collaboration projects, systematic supports will be required. To smoothly carry out the collaborative projects linking the inter-Korean border regions suggested in this study, more than the current projects executed in the inter-Korean border regions are required. Therefore, to improve South Korea’s related systems, the relevant laws, such as the Act on Inter-Korean Exchange and Collaboration, the Act on Inter-Korean Collaboration Funds, and the Act on Border Region Support, should be improved first and also a special law (tentatively named “the Act on the Support for Inter-Korean Exchange and Collaboration Project in Border regions”) should be established to systematically support the execution of joint collaborative projects in the inter-Korean border regions. In addition, it is necessary to execute the projects efficiently by diversifying fundraising methods, and it is particularly important to prepare systematic devices to raise national, private and foreign funds by project stage. In terms of the improvement of related systems in North Korea, though North Korea has designated the Mt. Kumgang area and the Gaeseong Industrial Complex as special districts and established separate laws on Mt. Kumgang tourism and the development of Gaeseong Industrial Complex, it is difficult to apply these to the entire border regions of North Korea. Therefore, it will be necessary to establish a special law (tentatively named “the Special Act on Exchange and Collaboration in Border Regions”) to designate the border regions as a special district, and to manage them in a way that efficiently promotes inter-Korean collaboration.

To push ahead with the inter-Korean collaborative projects in the future, it is first necessary to relieve the inter-Korean tension and establish mutual trust, and at the same time, to realize the peaceful resolution of the North Korean nuclear issue before undertaking the project. While the removal of North Korea from the US list of state sponsors of terrorism and the relative flexibility of the Obama administration to North Korea have enabled an actual approach to the resolution of the North Korean nuclear issue, it will take some time to reach a complete agreement between US and North Korea because their positions on this issue are still quite divergent. In addition, there could be significant difficulty in securing agreement from the parties to the Korean cease-fire agreement in terms of addressing the legal barriers to the entry and use of the Demilitarized Zone defined in the cease-fire agreement. Prior to gaining the agreement of the parties from North and South Korea, it is also essential to gain the approval of the Secretariat of the United Nations to push ahead with inter-Korean collaborative projects in the border regions and the Demilitarized Zone.

The most urgent issue for executing the projects in this area is the resolution of the political problems between the two Koreas in order to resume the Mt. Kumgang tour programs. In addition to this, it is necessary to set the range for joint fishing, and
carry out mutual cooperation in the East Sea. Furthermore, any major agendas must include the moving of North and South Korea’s military facilities out of this area in order to preserve major ecological resources and historic sites, and the promotion of exchange and collaboration projects. For the successful execution of inter-Korean collaborative projects in the border regions of the East Sea coastal area, the most important thing is to establish mutual trust between the two Koreas, as well as to create a mood of reconciliation and cooperation between the two by peacefully resolving the North Korean nuclear issue.

5.4 Conclusion

Since the end of the cold war era, the international community has significantly expanded openness and liberalization, and has actively executed international exchange and collaboration. Considering the inter-Korean relationship, after the two inter-Korean summits and the resulting progress in exchange and collaboration, military tension is being relieved and manpower and physical exchange and collaboration is being revitalized. This revitalization of inter-Korean collaboration and improvement of mutual understanding have brought us the expectation that we can change the military conflicts and tension that have characterized the Korean peninsula for more than the last half century into peace and prosperity.

It is becoming more necessary to systematically prepare for the joint use of the North and South Korean lands, and to create the conditions required for the reunification of Korea by predicting the activation of inter-Korean exchange and collaboration and the development of inter-Korean relations following the unification of national lands. In this sense, the Mt. Kumgang tour, which is the first fruit of inter-Korean exchange, collaboration and reconciliation, is very meaningful, and it is expected that the mid-to-long-term plan for Seorak-Kumgang tours will make a further contribution to the harmony and prosperity of South and North Korea.

Moreover, it is expected that the balanced development of the national land and the improvement of the competitiveness of the Korean peninsula can be achieved by playing a role as a hub for tourism and distribution in the Pan East-Sea Economy.
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Goseong-gun Office (http://goseong.org/)
Hyundai Asan (http://www.hyundai-asan.com/)
Inje-gun Office (http://www.inje.gangwon.kr/)
Inter-Korean Transit Office (http://peaceway.unikorea.go.kr/)
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Nae-Seorak (http://nsa.invil.org)
Naver Encyclopedia (http://100.naver.com/)
NKchosun (http://www.nkchosun.com)
Punchbowl Village (http://punchbowl.invil.org/)
Samcheok-si Office (http://www.samcheok.go.kr/)
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Yangyang-gun Office (http://www.yangyang.go.kr/)
The Evaluation of TMV (Transport Mode Value) for Green Growth in Korea

- Kim Jong-hak, Associate Research Fellow
- Ko Yong-seok, Associate Research Fellow
1. Introduction

Popularization of the private automobile (sometimes referred to as “auto” throughout this paper) in the 21st century has led to the revolution of individual movement and contributed to economic growth. But there are drawbacks regarding automobile-centric transportation system development. Urban congestion has become extremely expensive for individuals and government agencies. Transportation-related emission accounts for 70-80% of air pollution in Korea’s urban areas. This pollution impacts air quality and global warming. If nothing is done to arrest increasing carbon dioxide (CO₂) emissions, the cost of global warming to the world economy could be very significant.

The Korean government has been pursuing green-growth policies and trying to maximize cooperation between its environmental and economic sectors since the 60th anniversary of the Republic of Korea. As part of this strategy, the government has been aggressively pushing transit-oriented policies to improve air quality and reduce
traffic congestion in the metropolitan area. The government has constructed 125 km of urban railways and pursued Bus Rapid Systems in Sudokwon\(^1\) since 1996. However, transit (bus and subway)’s mode share has decreased 1.6% while the automobile’s mode share increased 5.1%.

One of the main reasons for the automobile’s increasing is that users prefer its advantages despite transit’s savings in travel time and travel cost. The decision of mode choice is caused by empirical experience, not rational judgment. This empirical cognition can be understood by considering perceived or expected usefulness of mode. But until now, there have been only a few research studies on empirical cognition of mode that can be applied to sustainable transport strategy.

To help shape this strategy, the automobile user’s expectancy and contents on transport mode should be examined. Hence, the methodology of the automobile user’s empirical cognition should be developed in order to enhance the market viability of a sustainable transport strategy. This study aims to suggest reasonable methods for analyzing the automobile user’s empirical cognition regarding travel mode choice by examining transport mode value (referred to as “TMV” throughout this paper). A transport strategy should begin with investigating TMV to enhance the efficiency of the transport system.

2. Energy Consumption and Emissions in Korea’s Transport Sector

Energy consumption in Korea’s transport sector in 2006 was 21% of the total energy consumption, representing an average increase of 6.3% from 1990 to 2006. The growth of energy consumption in the transport sector was due to a steady increase in cars. This preference for the automobile was a result of pursuing more convenient transport modes. The highest energy consumption sector in transportation was roads (79%) and the lowest energy consumption sector was rail (1%). The average annual consumption growth rates of the transport business and private automobiles were 5.2% and 8.9%, respectively\(^2\). It is essential to control and lessen the demand for private automobiles in order to meet the requirements of a green-growth era.

As energy consumption increases, so do greenhouse gas emissions. The CO\(_2\)
emissions in the transport sector in 2005 comprised 16.6% of all greenhouse gas emissions in Korea. The CO₂ emissions in Korea constitute 1.7% of global greenhouse gas emissions. Most CO₂ emissions occur from car fuel combustion, which increased by 6.3% annually between 1995 and 2005.

Greenhouse gas emissions per capita are 2.05(t-CO₂), comparable to Japan, the UK and France. However, Korea’s greenhouse gas emission per GDP is 0.14(t-CO₂/capita), which is three times higher than these countries. The global greenhouse gas emission in transport increased 0.8% annually between 1990 and 2000. But Korea’s increasing ratio during the same period was 6.2% which was the highest increasing ratio among OECD countries.

The transport systems that depend heavily on automobiles have many problems, such as increasing traffic congestion on roads, increasing greenhouse gases and
air pollution. The current trends in private automobile usage are contradictory to a green-growth policy. In order to keep the country moving and breathing efficiently, transport policy needs to include advanced technologies and ways to control the growth of automobiles by investigating Transport Mode Value (TMV).

3. The Concept of TMV and Frame Analysis

The 21st century is a green growth era. Any transportation policy in this green era needs to control the user’s satisfaction by maintaining a certain level of transportation service quality.

The control of TMV is not about managing the travelers themselves, but about the management of user’s satisfaction. This is the main reason why we need the concept of TMV. The concept of TMV is derived through the right mode choice and customer value (CV). This study corresponds to an empirical study because it develops a new concept of TMV and measures it. The purposes of the empirical study are to 1) subject the concept postulated above to a rigorous empirical examination and 2) test
The Evaluation of TMV (Transport Mode Value) for Green Growth in Korea

its robustness by conducting a case study. In this process, TMV is defined as follows:

What is the Transport Mode Value (TMV)?
The ratio of transportation service that a user acquired in relation to the cost that the user paid

Travelers can be categorized into two groups. One group consists of the choice rider, who has the ability to choose a transport mode, and the other consists of the captive rider, who has no choice except transit. Automobile users correspond to the choice rider group, achieving a dominant position compared with the transit (captive) rider group. The analysis frame for TMV was developed by considering customer value (CV) and the SERVQUAL model.

Customer value is the ratio of acquired service to the cost paid in acquiring service (Heskett 1997). The following is a simple formula of CV, which was created to express the concept of CV by Heskett.

\[
CV = \frac{\text{Quality of Output Result} + \text{Process Quality}}{\text{Cost of Product} + \text{Cost of Acquisition Service}} \tag{1}
\]

In this formula, the quality of output result is a product purchased by a customer or the service provided to the customer. The process quality is the service quality in the purchasing process. The SERVQUAL model is a measurement tool of service quality, which is defined as the result of the comparison that customers make between their expectations about service and their perceptions of the way in which the service is performed (Parasuraman et. al, 1988). This model is an empirically derived method that may be used by a service organization to improve service quality. This model can be used for performing a gap analysis between a customer’s perceived service and expected service. When perceived service (PS) is less than expected service (ES), a customer will rationalize unacceptable service quality, resulting in an increased discrepancy between ES and PS. On the other hand, when perceived service (PS) is greater than expected service (ES), a customer will rationalize ideal service quality, resulting in an increased discrepancy between ES and PS. Figure 3.1 shows the concept of SERVQUAL in measuring the service quality gap between customer’s perception and expectation suggested by PZB (Parasuraman, Zeithaml, and Berry, 1990).

Using the concept of CV and the data surveying method of SERVQUAL, this study developed a method of measuring TMV. This method starts with an identifica-
tion of the construction element of TMV. This element can be developed after canvassing the relevant literature, consulting a SERVQUAL professional and using experimental knowledge. TMV is largely composed of two elements: transportation service quality (TSQ) and cost of acquiring transportation service. TSQ is subdivided into the outcome of travel and the process quality in travel; cost is subdivided into the fare of

### Table 3.1. Elements of TMV

<table>
<thead>
<tr>
<th>Elements of Customer Value</th>
<th>Transportation Service Items</th>
<th>Elements of TMV</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Automobile</td>
<td>Transit</td>
</tr>
<tr>
<td>Quality of outcome results</td>
<td>Reliability</td>
<td>Outcome travel</td>
</tr>
<tr>
<td>Process quality</td>
<td>Convenience</td>
<td>Process quality in travel</td>
</tr>
<tr>
<td>Price of product</td>
<td>Economical burden</td>
<td>Purchasing price of car</td>
</tr>
<tr>
<td>Cost of acquisition service</td>
<td>Gas price</td>
<td>Transit fare</td>
</tr>
</tbody>
</table>

![Figure 3.1. Concept of SERVQUAL Model](image-url)
transit and the price of gas for the automobile. To further process this study, definitions of reliability and convenience of transportation mode need to be made. Reliability of mode means arriving at the destination (office, school, etc.) at exactly the time expected.

For example, when one travels to the office by automobile in the morning, one departs from home 20 minutes earlier than usual to arrive on time and compensate for traffic congestion. In this case, if one arrives on time at the office, the service quality of reliability is satisfactory because one is willing to put up with the effort of early departure and traffic congestion. There are several sub-items of convenience, however, for this paper. Convenience of mode will be divided into three items: access, transfer and waiting. The first item is the convenience of access to transit, considering its relationship to the automobile. The second item is the convenience of transfer between transit points, considering its relationship with the automobile. The third item is the convenience of waiting time at the departing station, considering its relationship with the automobile. These three items show a clear distinction between transit and automobile from the user’s view and is important in showing the elements of needed improvement in the transportation policy.

After defining the TMV element, in which the automobile user has the ability to choose from each mode (automobile and transit), it is measured by a numerical

<table>
<thead>
<tr>
<th>Concept</th>
<th>Alternatives of choice</th>
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<tbody>
<tr>
<td><strong>Mode</strong></td>
<td><strong>Automobile (using mode)</strong></td>
</tr>
<tr>
<td><strong>Formula</strong></td>
<td>Outcome travel + Process quality Purchasing cost + Gas cost</td>
</tr>
</tbody>
</table>

Table 3.2. Equations of TMV

<table>
<thead>
<tr>
<th>i</th>
<th>k</th>
</tr>
</thead>
<tbody>
<tr>
<td>User</td>
<td>Convenience Item k</td>
</tr>
</tbody>
</table>

\[
\begin{align*}
\text{AW}_i^m \cdot \text{AM}_i + \frac{1}{n} \sum_{k=1}^{n} (\text{AW}_k^m \cdot \text{AC}_k^m) \\
\text{AW}_i^p \cdot \text{AP}_i + (\text{AW}_k^p \cdot \text{AG}_k) \\
\text{TW}_i^m \cdot \text{TM}_i + (\sum_{k=1}^{n} \text{TW}_k^m \cdot \text{TC}_k^m / n)^{-1} \\
\text{TW}_i^p \cdot \text{TP}_i \\
\text{TW}_i^m : \text{Reliability Weight on Auto} \\
\text{TM}_i : \text{Reliability Satisfaction on Auto} \\
\text{TW}_i^m : \text{Convenience Weight on Auto} \\
\text{TC}_k^m : \text{Convenience Satisfaction on Auto} \\
\text{TW}_i^p : \text{Transit Fare Weight} \\
\text{TP}_i : \text{Transit Fare Satisfaction} \\
i : \text{User} \\
k : \text{Convenience Item k} \\
\end{align*}
\]
In naming the numerical expression of the TMV equations, TMV equations can measure both automobile and transit modes. Regarding process quality of travel, there is no need for access, waiting and transfer with the automobile, but these are essential to transit. For this reason, they are reflected as discomfort elements in the transit equation. The satisfaction of each transportation mode’s service items are calculated by multiplying each item weight and perceived or expected item satisfaction. The measurement method of TMV is explained by the survey method of input data and TMV equation. Data is acquired by surveying the automobile user’s perceived and expected satisfaction for each mode, as they do in the SERVQUAL model.

After these initial discussions clarify the research constructs, the analysis method is defined as data collection and data analysis. The data collection is conducted by adapting the SERVQUAL model and TMV equations developed in this study which is used to analyze the surveyed data to measure TMV by mode. Following is the methodology of TMV developed in this study.
4. Evaluation of Transportation Service for TMV Analysis

4.1 Data collection

The analysis of TMV and service quality is based on the development of a suitable survey instrument. The relevant questionnaire was generated as a detailed analysis of the TMV entity and used the survey method of SERVQUAL. To achieve this, various survey methods of SERVQUAL were examined, based on transportation service. The previous section developed the measurement method of TMV. Before this method is adopted, some further discussion is needed—especially regarding expected service of transportation and perceived service—to enhance the design of the questionnaire. The survey is designed for automobile users who have experience with the transportation service. Their satisfaction regarding transportation service can be divided into two types: expected satisfaction (i.e., the level of performance desired) and perceived satisfaction, or the performance level that has been experienced. Satisfaction scores were measured on a 5-point Likert scale. In survey research, the use of a multi-item scale actually decreases the measurement validity rather than enhances it. Therefore, in this study, all questionnaires are asked using the 5-point Likert scale to enhance reliability of results.

The survey was conducted over 10 days in May 2008 at Sudokwon Metropolitan in Korea. Respondents were selected at random among travelers who periodically commute to work or home by automobile. A total of 363 people (120 in on-line surveys, and 243 in off-line surveys) were given the questionnaire. All had undergone pre-testing to ensure comprehension. Each individual was assured that his/her responses were treated confidentially. The response rate was 91.6% in on-line surveys and 87.7% in off-line surveys. Of the total 363 participants, 78.7% of respondents were male and 21.3% were female. Just over half of the respondents said they use their automobiles 5-6 times per week to go to work, and pay $150-300 a month in gas fees.

4.2 Traveler behavior analysis

Nearly two out of ten respondents said they did not prefer transit because of its longer travel time compared to the automobile. This is the most cited reason why automobile users do not use transit when going to work. Just over 10% of respondents said they did not prefer transit because of disliking other’s intervention and social position. In other words, nearly one out of ten people use the automobile for privacy reasons.
Nearly four out of ten respondents said they do not use transit due to discomfort, such as waiting time, transfer and difficulty of access at the transit station. This means that it is possible to persuade these automobile users to choose transit by improving transit frequency and transfer facilities, without constructing additional rail.

Respondents were asked about their degree of satisfaction regarding gas and automobile costs, to examine the economic burden for the automobile. This survey was conducted on a scale of 1 to 5, with 1= no satisfaction and 5= very satisfied. Nearly 60% of the respondents indicated they are not satisfied with gas costs, while 41% said that they are satisfied. Gas prices were particularly high gas ($130/bar) during the survey period, which may explain why respondents said that gas price is more of a burden than the purchasing price of an automobile.

This paper analyzed the change of gas price elasticity of the automobile demand.
to examine the possibility of modal shift from automobile to transit during a 4-month time lag (May-September). To do this, surveys were conducted twice, once in May and once in September. At these times, gas prices were similar at $1.32/lit. The consciousness of modal shift was examined by asking about the automobile user’s intention to use transit when the gas price increases by 5%-25%. Following is the questionnaire of elasticity.

The following is a simple formula used to calculate the percentage of change in automobile demand as per the percentage change in price by 5%-25%.

\[
\frac{\Delta Q}{Q} = \frac{\Delta P}{P}
\]

Where, \(Q\): Automobile demand, \(P\): Gas price, \(E\): Elasticity

The price range in which most responded to change to “use of transit” was around $1.6/lit in September, up from $1.5/lit. The price elasticity of $1.4/lit in May was 4.98, changing to a low of 2.44 in September. The price elasticity of 4.98 means that the 4.98% of respondents have the intention to use transit per 1% increase from the price range of 1.4$/lit. The change of elasticity from 4.98 to 2.54 indicates that the impact absorption of increasing gas prices increased. The “experienced” price range of $1.4-1.5/lit was decreased while the “not experienced” price range of $1.6/lit was

Table 4.2. The Price Elasticity of Automobile Demand

<table>
<thead>
<tr>
<th>The change ratio of gas price</th>
<th>Willingly use transit(%)</th>
<th>Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Survey May</td>
<td>Survey Sep</td>
</tr>
<tr>
<td>Experienced price ($1.39-1.52)</td>
<td>0%</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>5%</td>
<td>25%(25%)</td>
</tr>
<tr>
<td></td>
<td>10%</td>
<td>12%(37%)</td>
</tr>
<tr>
<td></td>
<td>15%</td>
<td>27%(64%)</td>
</tr>
<tr>
<td>Non experienced price ($1.59-1.65)</td>
<td>20%</td>
<td>11%(75%)</td>
</tr>
<tr>
<td></td>
<td>25%</td>
<td>25%(100%)</td>
</tr>
</tbody>
</table>
increased. This indicated that the automobile demand might be inelastic with a small increase in gas price. Thus, the price policy for demand control might be affected shortly in the transportation market.

4.3 Evaluation of service quality by transportation mode

Before evaluation of service quality, correlation between perceived value and expected value in each mode was analyzed to identify how strongly pairs of value are related. Table 5 shows the result of correlation of expected value and perceived value of each mode’s service quality. When automobiles are used, there is no need for transfer or waiting at a station; thus the automobile’s convenience item is not analyzed. All correlation coefficients are positive. This means that as expected value increases, perceived value increases regarding transportation service. The highest coefficient is 0.744 the subway’s reliability. The lowest coefficient is 0.462 bus convenience.

Automobile user satisfaction with transit and automobile service was evaluated by the SERVQUAL model, which divides satisfaction into perceived and expected. Following Figure 4.2 are the results of reliability in each mode. The survey of satisfaction with reliability of each mode was conducted using a maximum score of 10. The results indicated that satisfaction with reliability was 6.60 for subway, 6.11 for automobile and 6.02 for bus. Because both the automobile and bus experience involves traffic

<table>
<thead>
<tr>
<th>Service Item by Mode</th>
<th>Correlation Coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td>Reliability</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.623</td>
</tr>
<tr>
<td></td>
<td>0.554</td>
</tr>
<tr>
<td></td>
<td>0.744</td>
</tr>
<tr>
<td>Convenience</td>
<td></td>
</tr>
<tr>
<td></td>
<td>0.462</td>
</tr>
<tr>
<td></td>
<td>0.570</td>
</tr>
</tbody>
</table>

Table 4.3. Result of Correlation Analysis
congestion on the road, whereas the subway has its own rail right-of-way with no traffic congestion, the subway was ranked first. It is not easy for automobile users to reach its destination within the desired time. Thus, it is possible to infer that automobile users do not choose automobile just for travel reliability. There might be other reasons to choose the automobile. The perceived service quality of reliability was higher than expected service quality in all modes.

What distinguishes the automobile from transit is that transit requires access (to a station), transfer and waiting time for completing travel. These three items are selected to analyze the automobile user’s satisfaction with convenience. The Figure 4.3 showed that that automobile users expected the automobile to be 1.3 times more convenient than transit and perceived the automobile as 1.5 times more convenient than

---

**Figure 4.2. Reliability**

![Bar chart showing perceived vs expected service quality for different modes.]

**Figure 4.3. Convenience**

![Bar chart showing perceived vs expected service quality for different modes.]

---
transit in reality. The gap between expected value and perceived value with transit was -1.2 for subway and -0.89 for bus. This result indicated that automobile users thought the bus was more convenient than the subway. The main reason for the subway’s convenience score, a low 0.31 compared to the bus, was caused by the difficulty of subway transfers. The convenience of use on transit should be improved since the expected value of convenience (7.63) on transit was higher than the perceived value (6.58). According to the survey results of reliability and convenience, the improvement of convenience on transit would be a more effective policy than constructing another transit line for an existing system.

4.4 IPA on service quality of transportation mode

The IPA model considers a relationship between importance (expected value) and performance (perceived value) and theorizes that target levels of performance for a particular service’s attributes should be proportional to the importance of those attributes (Slack 1991). This analysis identifies strengths and weaknesses of a market offering in terms of two criteria that consumers use in making a choice. One criterion is the relative importance of attributes; the other is consumer evaluation of the offering in terms of those attributes.

Figure 4.3 showed that private automobile users placed the highest importance on the auto’s convenience (10.0), followed by bus’s convenience (7.65), and subway’s convenience. With regard to performance, automobile users attributed the highest per-
formance to the auto’s convenience (10.0), followed by auto’s pleasantness and subway’s safety. Figure 4.5 shows which service items should be urgently improved and which should be maintained regarding good service. Transit (bus, subway) convenience fell into the second quadrant (i.e., “Concentrate here”). The importance of transit’s convenience scored higher than average and the performance was rated lower than average. This finding shows that automobile users perceive the convenience of transit as less than reliable and perceive transit’s convenience to be improved above all. The service items falling in the 3rd quadrant (i.e., “Low priority”) are transit’s pleasantness, automobile safety and bus reliability. In this result, the discomfort of transit, such as access and waiting, is the main reason why automobile users choose the automobile. It dominates over other service items such as reliability and pleasantness. The service items in need of improvement are automobile safety, and reliability and comfort of transit.
5. The Evaluation of TMV

5.1 Measurement of TMV

The expectancy-value theory was adopted to examine the automobile user’s preferences regarding each mode and to analyze the automobile user’s motivation of mode choice. Psychologist Martin Fishbein created the expectancy-value theory in the 1970s. This theory states that attitudes are developed and modified based on assessments about beliefs (expectancy) and values (perception). This theory has been used to develop others and is still utilized today in numerous fields of study.

There are three basic components of this theory: beliefs, values and attitudes. First, individuals respond to new information about an item or action by developing a belief about the item or action. Second, individuals assign a value to each attribute that a belief is based on. Third, an expectation or attitude is created or modified based on the result of a calculation based on beliefs and values.

For example, a student finds out that a professor has a reputation for being humorous. The student assigns a positive value to humor in the classroom; as a result, the student has the expectation that the experience with the professor will be positive. When the student attends class and finds the professor humorous, the student calculates that it is a good class. This theory also states that the result of the attitude stems from complex equations that contain many belief/values pairs. Fishbein represented the theory with the following equation. This equation shows that attitudes are a factorial function of beliefs and values. In this equation, if beliefs or values will be close to zero, then attitudes will also be close to zero.

\[ A = \sum_{i=1}^{n} b_i \cdot v_i \]  

(3)

Where, A: attitudes, b: beliefs, v: values

This formula indicates that an individual is motivated by one’s beliefs as much as by the expectation to win, that value being endowed by oneself. Each of two elements in attitudes can be adapted to the SERVQUAL model. Belief is similar to expected satisfaction and value is similar to perceived satisfaction in the SERVQUAL model. According to this similarity between expectancy-value theory and the SERVQUAL model, the motive of automobile use can be explained by the following simple equation.

\[ M_i = P_i \cdot E_i \]  

(4)
The Evaluation of TMV(Transport Mode Value) for Green Growth in Korea

Where, M: Motive of automobile use, P: Perceived TMV, E: Expected TMV.

In this study, TMV is measured by TMV equations, followed by the result of TMV per each mode. In the case of the automobile, the perceived TMV (1.37) was higher than the expected TMV (1.03); thus the service quality of the automobile was indicated as good. But in the case of the bus, the perceived TMV (0.47) was lower than the expected TMV (0.48); therefore the bus service quality is in need of improvement. In the case of the subway, the perceived TMV (0.52) was lower than the expected TMV (0.56); thus the service quality of the subway should be improved. The 1.37 perceived TMV of automobile implies that automobile users perceived a 1.37 times higher utility per 1 unit cost. The bus’s perceived TMV of 0.47 implies that automobile users perceived a lower utility of 0.47 per 1 unit paid cost.

According to the aforementioned motivation of automobile use, we consider the question of how the automobile’s motive (attractiveness) is higher than the transit motive to an automobile user. The analysis showed that automobile’s motive was 1.41, the bus was 0.23 and the subway was 0.29. This indicated that the automobile’s motive is 6.13 times higher than the bus’s motive and 4.86 times higher than the subway’s motive. In other words, an automobile user is 5.5 times more cognitive in preferring the automobile over transit. This is the most important result of this study, because there exists no research that measures the preference for the automobile quantitatively using the scientific method. The quantitative results show that it is not easy for automobile users to shift from automobile to transit mode.

Before shaping a transit policy to induce modal shift, there should be an investigation of the TMV to evaluate how much the policy will coincide with the demands that automobile users will have of transit.

Table 5.1. Result of TMV

<table>
<thead>
<tr>
<th>Choice mode</th>
<th>Perceived Value(PV)</th>
<th>Expected Value(EV)</th>
<th>PV-EV</th>
<th>M=PV×EV</th>
</tr>
</thead>
<tbody>
<tr>
<td>Automobile</td>
<td>1.37</td>
<td>1.03</td>
<td>0.34</td>
<td>1.41</td>
</tr>
<tr>
<td>Transit</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bus</td>
<td>0.47</td>
<td>0.48</td>
<td>-0.01</td>
<td>0.23</td>
</tr>
<tr>
<td>Subway</td>
<td>0.52</td>
<td>0.56</td>
<td>-0.04</td>
<td>0.29</td>
</tr>
</tbody>
</table>
5.2 Path analysis of TMV between modes

Using path analysis, correlations between transportation modes are examined. Path analysis is suitable for checking the relationship between perceived value and expected values for each mode. Path analysis was invented by geneticist Sewall Wright in the 1930s. It is a type of multiple regression analysis, a statistical method of finding cause/effect relationships. Each correlation can be decomposed into one or more of the following four types of effects (Knoke, 1994).

- Direct Effect (DE): Path coefficient from one variable to another
- Indirect Effect (IE): Sequence of paths through one or more variable with cause of the second.
- Unanalyzed effect due to correlated causes (UE): Correlation of variable with cause of the second.
- Spurious effect due to common cause (SE): Variable that causes both first and second variable.

Table 5.1 shows the result of effectiveness in an auto’s expected value and perceived value using motive3). Expected value is an expected TMV and perceived value is a perceived TMV that is calculated by the TMV equation. The effectiveness of expected value to automobile motive is 0.422 and the effectiveness of perceived TMV to automobile motive is 1.32, which is 3.1 times greater than the expected TMV. All coefficients of this analysis are highly significant, proving strong evidence of the following: when the automobile’s demand needs to be controlled, it is better to control the perceived satisfaction than the expected satisfaction. In other words, it is more effi-

<table>
<thead>
<tr>
<th>Direct Effect(DE)</th>
<th>Indirect Effect(IE)</th>
<th>Unanalyzed Effect(UE)</th>
<th>Spurious Effect(SE)</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Diagram of Direct Effect" /></td>
<td><img src="image2" alt="Diagram of Indirect Effect" /></td>
<td><img src="image3" alt="Diagram of Unanalyzed Effect" /></td>
<td><img src="image4" alt="Diagram of Spurious Effect" /></td>
</tr>
</tbody>
</table>

Table 5.2. Effects Types of Path Analysis

3) Expected value is expected TMV and perceived value is perceived TMV that is calculated by TMV equation.
cient for automobile users to have a difficult experience parking in a CBD (Central Business District) than to promote using transit.

Results of the path analysis are shown in Table 5.5 with the accompanying coefficients. The bus’s expected value and perceived value are positively associated with the subway’s expected value and perceived value. However, the automobile’s expected value and perceived value have an insignificant relationship with the bus’s expected value. In path analysis of expected value and perceived value, the t value between automobile and subway has low significance, thus providing no interpretation. The result of path analysis in motive\(^4\) Perceived Value, shows that the effectiveness of

---

**Table 5.3. Result of Auto’s Motive Analysis**

<table>
<thead>
<tr>
<th>Path</th>
<th>Coefficients</th>
<th>Std. Error</th>
<th>t-value</th>
<th>Sig.(2 tailed)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(x_1 \rightarrow x_2)</td>
<td>0.422</td>
<td>0.113</td>
<td>3.730</td>
<td>0.000**</td>
</tr>
<tr>
<td>(x_1 \rightarrow x_3)</td>
<td>1.321</td>
<td>0.041</td>
<td>32.582</td>
<td>0.000**</td>
</tr>
<tr>
<td>(x_2 \rightarrow x_3)</td>
<td>1.074</td>
<td>0.022</td>
<td>49.552</td>
<td>0.000**</td>
</tr>
</tbody>
</table>

Note) \(X_1\): Expected value, \(X_2\): Perceived value, \(X_3\): Motive

---

**Table 5.4. Path Analysis of Auto Motive**

<table>
<thead>
<tr>
<th>Effect</th>
<th>(X_1 \rightarrow X_3)</th>
<th>(X_2 \rightarrow X_3)</th>
<th>(X_1 \rightarrow X_3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Effect</td>
<td>r_{13} ( (0.422) )</td>
<td>r_{23} ( (1.774) )</td>
<td>r_{21} ( (1.631) )</td>
</tr>
<tr>
<td>Direct Effect</td>
<td>p_{13} ( (0.422) )</td>
<td>p_{23} ( (1.321) )</td>
<td>p_{21} ( (1.074) )</td>
</tr>
<tr>
<td>Indirect Effect</td>
<td>- ( (0.453) )</td>
<td>p_{13} \times p_{21} ( (0.557) )</td>
<td>-</td>
</tr>
<tr>
<td>Spurious Effect</td>
<td>-</td>
<td>-</td>
<td>p_{13} \times p_{23} ( (0.557) )</td>
</tr>
</tbody>
</table>

\(^4\) Motive = Expected Value \( \times \) Perceived Value
automobile’s motive to bus’s motive and subway’s motive was 0.058 and -0.044, respectively. As a result, the signs of coefficients are not important because they are close to zero.

This indicates that automobile users have a low preference for transit. Thus, it is difficult for automobile users to make a modal shift from automobile to transit. If tran-

### Table 5.5. Path Analysis of Modes

<table>
<thead>
<tr>
<th>Variable</th>
<th>Mode Path</th>
<th>Auto → Bus</th>
<th>Auto → Subway</th>
<th>Bus → Subway</th>
<th>Path Diagram</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Expected Value (EV)</strong></td>
<td>X1→X4</td>
<td>0.174 (0.001)</td>
<td>-0.007 (0.891)</td>
<td>0.855 (0.001)</td>
<td></td>
</tr>
<tr>
<td>Total Effect</td>
<td>r41 (0.174)</td>
<td>r71 (0.142)</td>
<td>r74 (0.854)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Effect</td>
<td>p41 (0.174)</td>
<td>p71 (-0.007)</td>
<td>p74 (0.855)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Effect</td>
<td>-</td>
<td>p41*p74 (0.149)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spurious Effect</td>
<td>-</td>
<td>-</td>
<td>p41*p71 (-0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Perceived Value (PV)</strong></td>
<td>X2→X5</td>
<td>0.940 (0.251)</td>
<td>-0.031 (0.258)</td>
<td>0.724 (0.001)</td>
<td></td>
</tr>
<tr>
<td>Total Effect</td>
<td>r52 (0.040)</td>
<td>r82 (-0.002)</td>
<td>r85 (0.723)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Effect</td>
<td>p52 (0.040)</td>
<td>p82 (-0.031)</td>
<td>p85 (0.724)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Effect</td>
<td>-</td>
<td>p52*p85 (0.029)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spurious Effect</td>
<td>-</td>
<td>-</td>
<td>p52*p82 (-0.001)</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Motivation (EV×PV)</strong></td>
<td>X3→X6</td>
<td>0.058 (0.009)</td>
<td>0.946 (0.001)</td>
<td>0.946 (0.001)</td>
<td></td>
</tr>
<tr>
<td>Total Effect</td>
<td>r63 (0.058)</td>
<td>r93 (0.011)</td>
<td>r96 (0.943)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Direct Effect</td>
<td>p63 (0.058)</td>
<td>p93 (-0.044)</td>
<td>p96 (0.946)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Indirect Effect</td>
<td>-</td>
<td>p63*p96 (0.055)</td>
<td>-</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spurious Effect</td>
<td>-</td>
<td>-</td>
<td>p63*p93 (-0.003)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note 1) PV: Perceived TMV, EV: Expected TMV
Note 2) Table ( ): path effect, Figure ( ): p value
sit service does not improve to the level of automobile user’s demand, the modal shift to transit will not happen. This analysis could be applied to a rough estimation of modal shift effectiveness in transit’s pre-feasibility analysis.

6. Conclusions and Implications

In this study, we defined the concept of Transport Mode Value (TMV) and invented a measurement method by considering traveler behavior. The goal is to suggest substantial policy alternatives in the green growth era. This study defines the concept of TMV as the ratio of transportation service that automobile users acquire to the cost that they pay. We have based our analysis on the SERVQUAL model, in which service quality is measured in two forms. According to this model, TMV is divided into expected value and perceived value. Our empirical result qualitatively shows a difference in cognitions between private automobile and transit for automobile users. There has been little research that quantitatively measures the preference for the automobile using the scientific method. TMV is in fact an important element of traveler satisfaction with transport mode services. Certain aspects of TMV are more important for the process of mode choice. More importantly, there exists a clear difference between the automobile user’s preference between transit and automobile in the expectancy-value theory.

The major findings are summarized as follows. First, the analysis of TMV indicates that the TMV score is higher for the private automobile than for the subway and bus. It shows that automobile users are 5.5 times more cognitive in preference for private automobile than for transit. This result means that metropolitan transport systems based on the private automobile cannot be easily changed into transit. It might explain why the transit mode share is decreasing, even though the rail network is expanding. The issue is that the region, a well-developed public transport network, has a road congestion problem. Yet not many more people are using transit. Before pursing a transit policy, TMV should be investigated to understand how much that transit policy will meet the demands of automobile users.

Attempting to change a user’s travel behavior is a formidable effort that requires social consent, risk-taking and long-term planning. The costs appear immediate but the benefits will be for posterity. What is clear is that green growth in the transport aspect mainly refers to traveler’s behavior based on mode service quality. More attention should be paid to emerging issues regarding the traveler’s behavior, costs of transport-related pollution and health effects of relying too much on private automobiles.

Second, the TMV survey methods and results could be applied to decision-making systems for reducing traffic congestion and decreasing transport-related emissions. This system includes the TMV surveying method, understanding of user
demand and relevant strategy. Also, it helps to resolve the conflict between traveler demand and policy objectives. If it is not affordable for decision-makers to accept the traveler’s demand for transit service improvement, then TDM (transportation management methods) should be strategically applied in metropolitan areas to reduce congestion. Achieving greater green growth in transportation require three actions: promoting technical advances such as development of eco-friendly cars; targeting modal shifts; and pursuing a sustainable TDM policy.

Third, this paper presents the possibility of developing a mode choice model by adopting the qualitative variables of perceived TMV. If this mode choice model is further developed, the estimation of mode-sharing ratio will be more precise than the existing Logit model, which does not consider user value. Various policy alternatives for modal shift have been created to relieve transportation problems; however, the automobile’s share continues to increase, primarily due to ignorance of the transport mode’s value. In order to precisely calculate the vested advantages of automobiles in the market, it is strongly recommended that the TMV be surveyed and included with the Logit model’s independent variables.

The objectives of sustainable transport can be achieved by not only providing transport facilities (rail, road, etc.), but also by evaluating Transport Mode Value (TMV) using the scientific method to establish efficient transport systems.
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U-City Policy and Planning System of Korea

- Kim Jung-hoon, Research Fellow
- Cho Chun-man, Associate Research Fellow
1. Summary of U-City

1.1 Concept of the term ‘Ubiquitous’

The term ‘ubiquitous’ originated from the Latin word meaning ‘to exist any time anywhere’, regardless of time and space, just like water and air. Recently, this term has been used to indicate an environment in which the general public can access a network freely, regardless of time and space.

It was Mark Weiser of Xerox’s Palo Alto Research Center who first used this word as a new IT term. He raised the question of what computing should be like in the future and coined the term ‘ubiquitous computing’.

Mark Weiser suggested that ‘the most profound technologies are those that disappear.’ This does not, of course, mean that computers will disappear, but it means we might live easily and comfortably without having to recognize computers, as if they had all disappeared. He said the concept of ubiquitous computing describes a human-centered computing environment where computers understand and learn about people and work according to what we do, rather than require us to make an effort to utilize them.

If these so-called ‘ubiquitous’ environments are established, this will create not only convenience in lifestyle, but open up a new paradigm where the interface between object and human, human and human, and object and object becomes important in all activities and relationships. In other words, it represents an environment where anyone can obtain the information they want easily, at any time and anywhere, with the accompanying opportunities to create new value.

1.2 Concept and Components of U-City

1.2.1 Definitions of U-City

According to the Act on the Construction of Ubiquitous Cities (hereinafter referred to as the Act), a U-City is defined as a city that enables residents to access services at any-time and from anywhere through the U-City infrastructures built by utilizing U-City technologies, for the city’s improved competitive edge and quality of life.

Meanwhile, Wikipedia defines it as follows: ‘A ubiquitous city or U-City is a city or region with ubiquitous information technology. All information systems are linked and virtually everything is linked to an information system through technologies such as wireless networking and RFID tags.’
Mark Weiser’s environment, in which people can gain the information they need at anytime and from anywhere, without recognition or manipulation, could be a good example of an ideal vision of the future, but many controversies arise when it comes to its potential at present.

Therefore, when we try to establish the concept of a U-City, we should establish the concept differently for each phase. The early U-City will focus on the provision of public sector information services in a city, through wired or wireless internet, based on a BCN (Broadband Convergence Network). When the concept of a U-City is established to some extent and is in the development phase, the U-City will focus on the provision of various kinds of public services and urban management services, through wired or wireless networks, at anytime, from anywhere, and with any device. Finally, if the maturity phase is reached, U-services will prevail, as the entire city will become an intelligent city, and ubiquitous services

Figure 1.2. Concept of U-City

Note. Adapted from The 1st Open Hearing for Establishment of U-City Comprehensive Plan (Revised Edition), by the Ministry of Land, Transport and Maritime Affairs, 2009.
will be realized on a full scale). In this way, the interpretation of the concept of the U-City can vary depending on one’s point of view. As technologies develop, infrastructures and services will keep evolving, and consequently the concept will keep changing as well.

1.2.2 Main components of a U-City

We can select U-City technology, U-City infrastructure, and U-City services as the main factors comprising a U-City, based on the definition of a U-City provided in Article 2, Clause 1 of the Act.

(i) U-City technology

U-City technology is the construction, IT, and IT convergence technology used for providing a U-City service by building a U-City infrastructure (Article 2, Clause 4 of the Act).

i) “Construction and IT Convergence Technology” is technology selected by Presidential decree that converges the technologies of electronics, control, and telecommunications into construction technology, in an effort to form intelligent infrastructures according to Article 2, Item 6 of the Act on the Planning and Use of National Land, or public facilities according to Item 13 of the same Article (Article 2, Clause 5 of the Act).

ii) “Technology designated by Presidential decree” according to Article 2, Item 5 is the technology in which the technologies of electronics, control, and telecommunications have been converged into the technology mentioned in each of the following items. (Article 5 of the Enforcement Ordinance).

① Construction technology according to Article 2, Item 2 of the Act on Construction Technology Management

② Electric Power Technology according to Article 2, Item 1 of the Act on Electric Power Technology Management

(ii) U-City infrastructure

U-City infrastructure is a facility falling under one of the following items (Article 2, Clause 3 of the Act).

i) An intelligent facility in which construction and IT convergence technology

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3) Study on National Strategies for Establishment of U-City (p.31-32), by Jung-hoon Kim et al., 2006, Gyeonggi: Korea Research Institute for Human Settlements.
are applied to the infrastructure according to Article 2, Item 6 of the Act on Planning and Use of National Land, or public facilities according to Item 13 of the same article.

ii) The high-speed network of Article 2, Item 5 of the Basic Act on Informatization Promotion, the broadband convergence network of Item 5.2 of the same article, and other networks designated by Presidential decree. (Article 2, Item 3 B of the Act)

1 "Other networks designated by Presidential decree” of Article 2, Item 3 B of the Act refers to the ubiquitous sensor network that delivers the data collected by intelligent facilities, and enables the service provided by U-City management facilities (Article 3 of the Enforcement Ordinance).

iii) The facility designated by a Presidential decree that is run for the management and operation of a U-City, such as the U-City integrated operation center for the provision of U-City services (Article 2, Item 3 C of the Act).

1 "The facility designated by Presidential decree” of Article 2, Item 3 C of the Act includes the integrated urban operation center that is run by linking and incorporating information systems for each area for providing U-City service.

2 It also includes similar facilities that are designated after the Minister for Land, Transport and Maritime Affairs consults with the heads of central administration institutes (Article 4 of the Enforcement Ordinance).

(iii) U-City service

U-City service, designated by Presidential decree, is a service that is formed by collecting the main data of the city by function, such as administration, transportation, welfare, environment, and disaster prevention, and providing them or linking one another and providing them. U-City services designated by Presidential decree in accordance with Article 2, Clause 2 of the Act include the following services, as described in Figure 1.3.

With the nation-wide U-City project, the demand for U-City services is increasing, and diverse U-City services are being introduced as a result. However, as there are various interpretations and definitions of U-City service, sometimes confusion arises in the application of the service, and this hinders the efficient construction of a U-City, considering the need for interoperability. Therefore, we need first to define U-City services systematically, so as to realize a common understanding of the diverse U-City services, thus enabling their systematic and efficient development.
2. Direction of Executing U-City Policies

2.1 Direction of executing U-City policies by governmental ministries and departments

2.1.1 Direction of executing U-City policies by the Ministry of Land, Transport and Maritime affairs

The Korean government is pushing ahead with the policy of promoting 17 new growth engines in three areas, which are green technology, cutting-edge convergence, and high-value services, as the growth engines that will lead the Korean economy. U-City is the core factor of the cutting-edge green city, which is one of the 17 new growth engines. The cutting-edge green city is defined as the city that provides residents with the services they want, such as transport, safety, education, and health, through the unified management of the locations and features of the city, while providing a pleasant and convenient living environment by reducing carbon emissions. The range of the cutting-edge green city includes the U-City, the ITS (Intelligent...
The U-City policies of government ministries and departments are being actively carried out based on the unique service area of each department. The Ministry of Land, Transport and Maritime Affairs, as the relevant ministry for the establishment of U-Cities, is focusing on strategies for the development of cutting-edge green city transport systems, the GIS (Geographical Information Systems), and the low energy eco-friendly houses.

Transport Systems, the GIS (Geographical Information Systems), and the Low Energy Eco-Friendly Houses.

The U-City policies of government ministries and departments are being actively carried out based on the unique service area of each department. The Ministry of Land, Transport and Maritime Affairs, as the relevant ministry for the establishment of U-Cities, is focusing on strategies for the development of cutting-edge green cities.


5) The Intelligent Transport Systems (ITS) include diverse applications, such as u-transportation service and ITS services, which can be used conveniently by everyone, at any place and at any time.
6) Geographical Information Systems (GIS) indicate the properties and location $(x, y, z)$ of a certain place, nature or artificial buildings, such as land, roads, buildings, underground facilities, and rivers.
7) A low energy eco-friendly house is a clean and convenient environmentally-friendly house using low-carbon energy, and minimum energy consumption.
edge green cities in its policies for new growth engines. In an effort to improve the systems for developing U-City industries, the Ministry is establishing a unified plan for U-City development, including the idea and basic direction of the U-City and the government systems for promotion and strategies. In addition, it is preparing guidelines and standards that suggest specific matters regarding the planning, construction, and maintenance of U-City.

The Ministry also supports the development of U-City technologies through its R&D projects, so that core original technologies that currently have a high level of reliance on foreign suppliers can be developed domestically, preventing the outflow of capital as well as increasing profits from the construction of the U-City. It also plans to designate some cities as model U-cities to lay the foundations for developing U-City industries, and to create a successful U-City model by applying core technologies and standard models developed through R&D. In addition, as the size of the U-City market is rapidly expanding, the ministry is making efforts to carry out its U-City personnel programs to develop core personnel and experts. It is also planning to organize the tentatively-named Korea-driven “U-City World Forum,” to establish systems for international collaboration and prepare plans for export, in efforts to lay the foundations for the export of U-City technologies. Through these strategies, the ministry intends to develop the U-City industry into Korea’s new growth engine.

### Table 2.1. Strategic Goals of the Cutting-edge Green City, by Section

<table>
<thead>
<tr>
<th>Section</th>
<th>Index</th>
<th>Strategic Goals</th>
</tr>
</thead>
<tbody>
<tr>
<td>U-City</td>
<td>Developing core personnel of U-City</td>
<td>0 pers. (’08) ⇒ 4,720 pers. (’13) Development of unified operational middleware (’13)</td>
</tr>
<tr>
<td></td>
<td>Developing core technology of U-City</td>
<td></td>
</tr>
<tr>
<td>ITS</td>
<td>Exporting Korean ITS</td>
<td>$100m (’08) ⇒ $500m (’13) Revision of the Act on Traffic System Efficiency and its subordinate provisions</td>
</tr>
<tr>
<td></td>
<td>Revising the Act on Traffic System Efficiency</td>
<td></td>
</tr>
<tr>
<td>GIS</td>
<td>Establishing relevant laws on spatial information</td>
<td>Establishment and enforcement of subordinate provisions of the Act on National Space Information and the Act on the Promotion of the Spatial Information Industry (’10)</td>
</tr>
<tr>
<td>Low Energy Eco-friendly Houses</td>
<td>Supplying new low-energy eco-friendly homes</td>
<td>0 (’08) ⇒ 770 (’13)</td>
</tr>
</tbody>
</table>

2.1.2 Direction of executing U-City policies by other government ministries and departments

The Ministry of Public Administration and Security is dealing with the informatization of local governments as its main policy, and is pushing ahead with the plan for local informatization support projects. Based on the basic plan for national informatization, the Ministry intends to build intelligent and sophisticated cutting-edge digital convergence infrastructures using various u-IT technologies. The Ministry is also pushing ahead with the policies of “Local Informatization (U-Life 21)” and “Cutting-edge Infrastructure for a More Efficient Society (U-Infra)” in an effort to create safe and sound living conditions.

The Ministry of Knowledge Economy is carrying out policies that lay the foundations for the realization of a ubiquitous society, such as IT, industry development, and technology development. In other words, the Ministry is forming the strategies and plans required for establishing a ubiquitous society, such as the IT839 strategy, the BcN basic plan, the USN basic plan, the IPv6 basic plan, and U-Post Office. In particular, when it comes to U-City, the Ministry is developing the core element technologies of software required to develop the ubiquitous technology service-based integration platform through USN/RFID.

The Korea Communications Commission seeks to build a cutting-edge city and create jobs through the convergence of broadcasting and communications technologies and the early activation of IPTV, by using U-City technologies to promote the city’s competitiveness and improve living quality.

The Ministry of Education, Science and Technology is pushing ahead with ubiquitous-related projects for the training of new talents and the improvement of technologies. The Ministry seeks to provide quality education through individual terminals by establishing an education informatization system (U-Learning) and realizing lifelong education for various demand classes. It is establishing strategies and plans for mid-to-long-term strategies for u-learning, training and the utilization of world-class talent, and the development of national core scientific


10) Plans for Promoting Convergence Service Such As IPTV, by Korea Communications Commission, Dec. 2008.
technologies\textsuperscript{11). The Ministry for Health, Welfare and Science hopes to construct a healthy city by establishing U-Healthcare and U-Welfare\textsuperscript{12).}

The ministry is also pushing ahead with the global network establishment project\textsuperscript{13} and the u-Airport establishment project\textsuperscript{14}. In this way, each ministry and department is establishing and promoting diverse policies and plans in relation with the U-City. Therefore, it is very important to prevent redundant investments and to


\textsuperscript{13) Unified Branding of Overseas Volunteer Groups and Establishment of Unified Network of Overseas Koreans for Enhancing Nation Brand, by the Ministry of Foreign Affairs and Trade, Mar. 2009, 1st Briefing Meeting of the Presidential Commission on Nation Branding.}

\textsuperscript{14) “U-Airport Project Strategies,” The Electronic Times, Apr. 2009.}
continuously share the outcome of policies to maximize the effectiveness of the U-City-related policies carried out by each ministry and department.

### 2.2 Direction of executing U-City policies by local governments

#### 2.2.1 Current status of nation-wide U-City construction projects

Starting with Hwaseong Dongtan New Town, which was completed in September 2008, about 41 local governments (56 districts) are currently pushing ahead with U-City construction projects (refer to Table 2.2). As the nation’s U-City construction is expanding, it is estimated that the population of U-cities will amount to approximately 2.3 million by 2015 (Samsung Economics Research Institute, 2006).

<table>
<thead>
<tr>
<th>Classification</th>
<th>Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Completed (1)</td>
<td>Hwaseong Dongtan</td>
</tr>
<tr>
<td>In Progress (18)</td>
<td></td>
</tr>
<tr>
<td>Under construction (4)</td>
<td>Yongin Heungdeok, Paju Wunjeong, Eunpyeong New Town and Seongnam Pangyo</td>
</tr>
<tr>
<td>Project preparation and planning (14)</td>
<td>Busan, Incheon Songdo, Seungnam, Wonju Business Town, Chungju Business Town, Sejong, Yeosu, Suwon Gwang-gyo, Ansan, Yeongi-gun, Seoul Mapo-gu, Gwangju Nam-gu, Incheon Cheongra, and Daejeon Seonambu</td>
</tr>
<tr>
<td>Scheduled (37)</td>
<td>Total 37 areas</td>
</tr>
</tbody>
</table>

*Note. Adapted from *U-City Execution Policies* (Revised Edition), by the Ministry of land, Transport and Maritime Affairs, 2009.*
2.2.2 Direction of executing U-City by area

The direction of executing U-City projects by local governments is set by establishing policies and plans according to the nature of the area. Currently, many local governments are announcing their U-City related policies and plans, and the characteristics of the policies and plans for each area are as follows.

The Metropolitan area (Seoul, Incheon, and Gyeonggi-do) seeks to be an international city and a hub of business in Northeast Asia, and is pushing ahead with projects to solve pending questions such as centralization and city management, in response to the diverse demands of citizens. The Daejun area (Daejun, Chungcheongbuk-do, and Chungcheongnam-do) is finding and developing U-industries such as cutting-edge cultural industries and the biotech industry, with its high level of industrialization. The Daegu area (Daegu and Gyeongsangbuk-do), which is the hub of the nation’s distribution industry, provides a cutting-edge industry and business environment, and seeks to establish a futuristic cultural and healthy city. The Busan area (Busan, Ulsan, and Gyeongsangnam-do) seeks to

![Figure 2.3. Policies on U-City by Local Governments](image)

*Note. Adapted from Comprehensive U-City Plan (tentative plan) (p.9), by the Ministry of Land, Transport and Maritime Affairs, Mar. 2009.*
establish a leading-edge city that plays the role of a ubiquitous gateway for the flow and linkage to a world-leading cutting-edge city and a city of ecology, culture and welfare. The Gangwon area (Gangwon-do) seeks to shift from traditional industry to new industrial structures and to develop the health industry, by linking with the information and tourism industry and U-marketing. The Jeju area (Jeju Island) is focusing on the tourism industry, through campaigns such as ‘Cool Town’ and ‘Cool Travel,’ by utilizing its natural beauty. \[15\]

### 3. U-City Plan Systems

In order to suggest visions and methods for support at the level of the central government, while securing the autonomy of local governments, U-City Planning should have a hierarchical phase structure, in which the central government and local governments have separate plans. The U-City plan has a three-phase structure consisting of central government, local government and project. Therefore, the U-City plan sys-

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**Figure 3.1. U-City Plan Systems and Execution Procedures**

| U-City Comprehensive Plan | - Established by the Minister of Land, Transport and Maritime Affairs  
<table>
<thead>
<tr>
<th></th>
<th>- Reviewed by U-City committee</th>
</tr>
</thead>
</table>
| U-City Plan               | - Established by the mayor (special city, metropolitan city, and city) and county governor  
|                         | - Approved by the Ministry of Land, Transport and Maritime Affairs |
| U-City Construction Project Plan | - Established by project executor  
|                             | - Approved by mayor (special city, metropolitan city, and city) and county governor |
| U-City Construction Project Execution Plan | - Established by project executor  
|                             | - Approved by mayor (special city, metropolitan city, and city) and county governor |
| U-City Project Execution  | - Project executor |
| Completion Permit         | - Mayor (special city, metropolitan city, and city) and county governor |

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tem has the hierarchical phases of the national-level U-City plan, the city-level U-City plan, the project area level U-City construction plan, and the U-City construction project execution plan. The U-City plan system and execution procedure are provided in Figure 3.1.

3.1 U-City comprehensive plan

3.1.1 Summary of U-City comprehensive plan

The purposes of establishing the U-City comprehensive plan are firstly to present a national-level master plan for the realization of a U-City, which is the model of a cutting-edge 21st century city that fuses urban construction and IT; secondly, to suggest basic directions and policies in each sector for efficient construction and management of the U-City; and finally, to suggest national-level guidelines to support the construction of U-Cities by local governments.

The hierarchical level of the U-City Comprehensive Plan is the sub-concept of the Comprehensive National Territorial Plan, which is the highest-level plan in relation to national lands. The U-City comprehensive plan is a sub-plan of the Comprehensive National Territorial Plan for establishing a long-term blueprint for U-City throughout the national land.

The spatial range of the U-City comprehensive plan includes the entire national land within the sovereignty of Korea. In terms of the temporal range of the plan, 5-year plans will be established for the efficient construction and management of u-cities (Article 4 to 7 of the Act). Some plans, such as the comprehensive national land plan, the comprehensive housing plan, the basic urban plan, and the urban management plan are established as 20-year or 10-year plans, while IT-related plans such as the basic informatization promotion plan and the basic national geographical information system plan are established as 5-year plans. As the U-City is based on information and information technology, comprehensive 5-year plan should be established to respond to speed of informatization and change of conditions, and if changes in conditions are required, feasibility should be reviewed in advance.

The establishment of the U-City comprehensive plan is carried out in the order of a request for the submission of a comprehensive (proposed) plan (The Ministry of Land, Transport and Maritime Affairs → relevant ministries and departments), preparation of a comprehensive (proposed) plan, the opening of a public hearing, discussions with related administrative institutes, and review and approval by the U-City committee.
3.1.2 Main contents of U-City comprehensive plan

The contents of the U-City Comprehensive Plan are as follows.

- Matters relating to the analysis of current status and conditions for realization of the U-City
- Matters relating to the ideas and basic directions of the U-City
- Matters relating to the execution strategies by stage for the realization of the U-City
- Matters relating to the improvement of relevant laws and systems for the construction of the U-City
- Matters relating to the systems for executing U-City construction projects
- Matters relating to the roles of central and local governments, and the central administrative institutes
- Matters relating to the establishment, management, and operation of U-City infrastructures and the preparation of relevant standards
- Matters relating to the standards of U-City technologies
- Matters relating to the protection of privacy and the U-City infrastructure
- Matters relating to the raising and management of funds required for U-City construction
- Matters relating to the preparation, distribution, expansion, and interconnection of U-City services, including the administrative tasks described in the Informatization Promotion Basic Plan established under Article 5 of the Basic Act on Informatization Promotion, as well as matters defined in the plan by section in relation to the promotion of local informatization.
- Matters relating to the R&D of U-City technologies
- Matters relating to the training of experts required for the efficient construction and management of U-City
- Matters relating to the development of industries relevant to the construction of the U-City
- Matters relating to the international collaboration for the construction of the U-City
- Matters relating to the management of information, such as the production, collection, processing, utilization, and distribution of information provided through the U-City infrastructure and U-City service
3.2 U-City plan

3.2.1. Summary of U-City plan

The purpose of the U-City plan is to improve the competitiveness of a city through the efficient construction and operation of a U-City, and to enhance the living standard of residents by promoting sustainable development. The U-City plan suggests local characteristics and condition analysis, basic directions and execution strategies, and plans for the establishment and operation of U-City infrastructures and U-City services, and is a foundation for subordinate plans such as the U-City construction project plan and U-City project execution plan. The plan is a legally binding plan that presents specific images of a U-City that cities and counties should seek after based on the contents of superordinate plans such as the Comprehensive National Territorial Plan and the U-City Comprehensive Plan, and which should be harmonized with the basic urban plan in accordance with the Act on Planning and Utilization of National Lands.

The subjects for the establishment of plans are the cities and counties (other than counties within the jurisdiction of a metropolitan city) that intend to execute U-City construction projects within their jurisdiction of more than 1.65 million square meters (if they intend to include part of an adjacent city or county within their U-City plan, such part can be included, according to Article 8, Clause 3 of the Act) in accordance with each Item of Article 3 of the Act and Article 6 of the Enforcement Ordinance. As an exception, cities and counties whose U-City plans in accordance with each Item of Article 8, Clause 1 of the Act have been reflected in the Basic Urban Plan established in accordance with the Act on Planning and Utilization of National Land, may be exempted from establishing U-City plans, provided they obtain the approval of the Minister for Land, Transport and Maritime Affairs, in accordance with Article 13 of the Enforcement Ordinance.

The goal year is 5 years from the time of establishing the plan, and can be adjusted considering the time of establishing the basic urban plan in accordance with the Act on Planning and Utilization of National Land and the current status and conditions of the relevant city or county. In principle, the unit of setting planned zones is the sovereignty of cities and counties. Each mayor or county governor may establish a U-City plan that includes the whole or part of the sovereignty of adjacent cities or counties (except counties within the sovereignty of metropolitan cities) if

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necessary according to local conditions. In this case, discussions should be held with the relevant mayor or county governor in advance.

3.2.2 Main contents of U-City plan

The main contents of the U-City plan are as follows.

- Matters relating to the local characteristics, current status and analysis of conditions
- Matters relating to the basic direction of U-City construction, goal of the plan, and execution strategies
- Matters relating to the execution of U-City construction projects by stage
- Matters relating to the execution systems of U-City construction projects
- Matters relating to the roles of relevant administrative institutes, and cooperation among them
- Matters relating to the establishment, management and operation of the U-City infrastructure
- Matters relating to the U-City service, considering local characteristics
- Matters relating to the raising and management of funds required for U-City construction
- Matters relating to mutual cooperation, such as the compatibility and linkage of U-City functions between sovereign and adjacent special cities, metropolitan cities, cities or counties (except counties within the sovereignty of metropolitan cities; hereinafter the same applies in this Article) in accordance with Article 8, Clause 3 of the Act
- Matters relating to the provision and inter-connection of U-City within the jurisdiction (if a U-City plan is established for part of the sovereignty of adjacent special cities, metropolitan cities, cities or counties, that part shall be included, according to Article 8, Clause 3 of the Act; hereinafter the same applies in this Article)
- Matters relating to the development and promotion of local industries by utilizing U-City technologies
- Matters relating to international collaboration between U-cities
- Matters relating to the protection of privacy and U-City infrastructure
- Matters relating to the management of information, such as the production, collection, processing, utilization, and distribution of information provided through U-City infrastructure and U-City service of the sovereign local area.
- Matters relating to the joint utilization of information systems and the connected utilization of existing information systems for providing U-City service
3.3 Project plan and execution plan of U-City construction

3.3.1 Summary of project plan and execution plan of U-City construction

The project plan is a plan that implements the execution strategies and objectives of the U-City plan, and is a foundation for the execution plan and a permit for building completion. In addition, the plan is required to execute the execution strategies and goals suggested in the U-City plans, and to check the conformity to superordinate plans. The plan induces the systematic construction of a U-City by suggesting standards to be included in the contents of the new-concept project plan for U-City construction. In this way, the project plan includes feasible contents for a zone in the city, and also includes operation, service, and U-City project technologies as well as infrastructure. The execution plan is a plan for execution according to the project plan, which includes concrete methods for executing the project.

To efficiently promote the construction of the U-City, local governments, government-invested institutes, and private project executers can be U-City project executers. When a project executer intends to execute a U-City construction project, they should establish project and execution plans and obtain the approval of the relevant local government so that the quality of the U-City can be guaranteed. The project executer shall establish the U-City construction project plan and execution plan, which shall include the objectives and basic direction of the project, the period of execution, the investment plan by year, and the fundraising plan, as the main contents of their U-City construction project. Project executers other than central and local governments can execute U-City construction projects by obtaining approval from the person with the right of approval, such as the mayor and county governor (provincial governor or Minister for Land, Transport and Maritime Affairs).

3.3.2 Main contents of U-City construction project plan\(^{17}\)

For effective execution of the project, the establishment of U-City construction project plans shall go through the procedures of preparation of a project plan, discussion with relevant institutes, and approval of mayor or county governor. The main contents of a U-City construction project plan are as follows.

• Name and range of the project
• Objectives and basic direction of the project
• Project executers
• Period of the project
• Execution methods of the project
• Investment plan and fundraising plan by year (including a plan for cost sharing)
• Matters relating to the establishment, management and operation of U-City infrastructure
• Matters relating to the provision of U-City services
• Matters relating to U-City technologies
• Matters relating to the execution of plans by stage
• Matters relating to project execution systems
• Matters relating to project execution procedures

The procedure for the establishment of the plan is carried out in the order of determination of the project executer; discussions between the manager or operator of the U-City infrastructure and relevant institutes; preparation of project plans; approval of persons with the right of approval, and sending and notification of relevant documents. Persons with the right of approval include special city mayor, metropolitan city mayor, mayor or county governor. If the project area is located in more than two sovereignties, the relevant provincial governor or the Minister for Land, Transport and Maritime Affairs may approve the project (for example, the Suwon Gwang-gyo development area is located in both Suwon and Yong-in, and the approval for development projects is granted by the governor of Gyeonggi-do). If the person who establishes a U-City plan is the Minister for Land, Transport and Maritime Affairs, or if the project executer is a special city mayor, metropolitan mayor or county governor who establishes the plan, it is not necessary to go through the approval procedure.

3.3.3 Main contents of U-City construction project execution plan

For effective execution of the project, the establishment of a U-City construction project execution plan shall proceed through discussion with the heads of relevant institutes, and the approval of execution plans. The U-City construction project execution

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plan is required to execute the construction project of the U-City, and if the execution plan is approved, construction can be started, and the plan then also becomes grounds for a permit for building completion. The execution plan is the stage of embodying the project plan, and is legally binding, as the construction is required to conform to the contents of the approved execution plan. The plan is a subordinate concept of the project plan, and includes the contents of the U-City service as well as the construction and establishment of a U-City infrastructure, which were selected in superordinate plans. The contents of the execution plan are ① embodiment of the contents included in the U-City construction project plan, and ② project summary, design documents and drawings, documents on public facilities encompassed, and documents on discussions with relevant administrative institutes, which are commonly defined in most of the laws on development.

The following summarizes the matters stipulated in this Act regarding execution plans.

• Name and range of the project
• Objectives and basic direction of the project
• Project executers
• Period of the project
• Methods of execution of the project
• Investment plan and fundraising plan by year (including a plan for cost sharing)
• Matters relating to the establishment, management and operation of U-City infrastructure
• Matters relating to the provision of U-City service
• Matters relating to U-City technologies
• The location map and land registration map of the project area
• The ground plan and outline design drawings of the execution plan
• The statement on the cost of the installation of public facilities that will belong to the central or local government, and the statement on existing public facilities that will belong to and be transferred to the project executor (only if the executor is not the central and/or local governments).
• Documents required for discussion with heads of relevant administrative institutes
### Table 3.1. U-City Plan Systems and the Contents of the Plan

<table>
<thead>
<tr>
<th>Type</th>
<th>Contents</th>
</tr>
</thead>
</table>
| **U-City Comprehensive Plan** | 1. Matters relating to the analysis of current status and conditions for the realization of the U-City  
2. Matters relating to the ideas and basic directions of the U-City  
3. Matters relating to the execution strategies by stage for the realization of the U-City  
4. Matters relating to the improvement of relevant laws and systems for the construction of the U-City  
5. Matters relating to the systems for executing U-City construction projects  
6. Matters relating to the roles of central and local governments and central administrative institutes  
7. Matters relating to the establishment, management, and operation of U-City infrastructures, and the preparation of relevant standards  
8. Matters relating to the standards of U-City technologies  
9. Matters relating to the protection of privacy and U-City infrastructure  
10. Matters relating to the raising and management of funds required for U-City construction  
11. Matters relating to the standard preparation, distribution, expansion, and interconnection of U-City services, including the administrative tasks included in the Informatization Promotion Basic Plan established in accordance with Article 5 of the Basic Act on Informatization Promotion, as well as matters defined in the plan by section in relation with the promotion of local informatization.  
12. Matters relating to the R&D of U-City technologies  
13. Matters relating to the training of experts required for efficient construction and management of the U-City  
14. Matters relating to the development of industries relevant to the construction of the U-City  
15. Matters relating to international collaboration for the construction of the U-City  
16. Matters relating to the management of information, such as the production, collection, processing, utilization, and distribution of information provided through the U-City infrastructure and U-City services |
| **U-City Plan**             | 1. Matters relating to local characteristics, current status and analysis on conditions  
2. Matters relating to the basic direction of U-City construction, goal of the plan, and execution strategies  
3. Matters relating to the execution of U-City construction projects by stages  
4. Matters relating to the execution systems of U-City construction projects  
5. Matters relating to the roles and cooperation among relevant administrative institutes  
6. Matters relating to the establishment, management and operation of the U-City infrastructure  
7. Matters relating to the U-City services, considering local characteristics  
8. Matters relating to the raising and management of funds required for U-City construction |
Table 3.1. U-City Plan Systems and the Contents of the Plan

<table>
<thead>
<tr>
<th>Type</th>
<th>Contents</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>U-City Plan</strong></td>
<td>9. Matters relating to mutual cooperation, such as the compatibility and linkage of U-City functions between sovereign and adjacent special cities, metropolitan cities, cities or counties (except counties within the sovereignty of metropolitan cities; hereinafter the same applies in this Article) in accordance with Article 8, Clause 3 of the Act</td>
</tr>
<tr>
<td></td>
<td>10. Matters relating to the provision and interconnection of U-City of the sovereignty (if U-City plan is established, including part of the sovereignty of adjacent special cities, metropolitan cities, cities or counties, the part shall be included, according to Article 8, Clause 3 of the Act; hereinafter, the same applies in this Article)</td>
</tr>
<tr>
<td></td>
<td>11. Matters relating to the development and promotion of local industries by utilizing U-City technologies</td>
</tr>
<tr>
<td></td>
<td>12. Matters relating to international collaboration between U-cities</td>
</tr>
<tr>
<td></td>
<td>13. Matters relating to the protection of privacy and U-City infrastructure</td>
</tr>
<tr>
<td></td>
<td>14. Matters relating to the management of information, such as the production, collection, processing, utilization, and distribution of information provided through the U-City infrastructure and U-City service within the jurisdiction.</td>
</tr>
<tr>
<td></td>
<td>15. Matters relating to the joint utilization of the information system and the accompanying utilization of the existing information system for providing U-City service</td>
</tr>
<tr>
<td><strong>U-City Construction Project Plan</strong></td>
<td>1. Name and range of the project</td>
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<td><strong>U-City Construction Project Execution Plan</strong></td>
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Table 3.1. U-City Plan Systems and the Contents of the Plan

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<th>Type</th>
<th>Contents</th>
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| **U-City Construction Project Execution Plan** | 9. Matters relating to U-City technologies  
10. Location map and land registration map of the project area  
11. Ground plan and outline design drawings of the execution plan  
12. Statement on the cost of the installation of public facilities that will belong to the central or local government, and statement on existing public facilities that will belong to and be transferred to the project executor (only if the executor is not the central and/or local governments).  
13. Documents required for discussion with heads of relevant administrative institutes |

*Note. Adapted From The Act on Construction of U-City and its Enforcement Ordinance.*
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