The Current Status of Indoor Garden Design and Construction in Service Areas on Korea's Expressways

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ABSTRACT

The purpose of this study is to investigate the current status of the construction of indoor gardens in expressway service areas. This study can be utilized as basic data for efficient and successful indoor garden introduction in future service areas and improvements for current service areas on expressways. The study period was from September 2, 2016 to October 11, 2017. The status of indoor garden was determined by visiting 147 expressway service areas in Korea. Physical environment survey items include architectural structure, usage type, facility and garden ornament, mobility, material of planter, soil type and planting plants. Among the 147 major expressway service areas, 56 were constructed with indoor gardens done, showing an indoor garden construction ratio of 38%. In terms of the number of service areas with indoor gardens in expressway, Gyeongbu Expressway had the largest number of 16 areas. This was followed by 10 in Jungang Highway, 8 in the Jungbunaeryuk Expressway, 6 in the Seohaean Expressway, 4 in the Namhae Expressway, 4 in the Youngdong Expressway, 3 in the Donghaean Expressway, 3 in Tongyeong-daejeon Jungbu Expressway, and 2 in Honam Expressway. Thirty five service areas in expressway were constructed with natural flowers, 7 service areas were decorated with artificial flowers, and 14 service areas were arranged with both natural and artificial flowers. Most of the indoor gardens in the expressway were constructed in the restroom space, 47 in the men's restroom and 50 in the women's restroom. The indoor garden landscape in the expressway service area was all designed as a fixed garden type, except for three places composed of portable planters. There were 19 families, 27 genera, and 30 species of plants found in the indoor gardens in the expressway service areas.

Keywords: interior landscape, interior plants, service areas planting concept

Introduction

Gyeongbu Expressway, which has the Route number 1 in South Korea, was opened on December 23, 1968 from Seoul to Suwon (23.6 km) and completed in July 1970 connecting to Busan, and was officially opened in August 1971. Korea's first expressway service area is Chupungryeong Service Area (Lee et al., 2015), and as Naerincheon and Hongcheon Service Area also opened along with Seoul-Yangyang Expressway in June 2017, there are currently 189 expressway service areas in Korea (Korea Expressway Corporation, 2017).

An expressway service area is the hub of traffic and transportation that reflects the region's image, and is the central

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space where many people come and go. However, while approximately 3.2 million vehicles a day are stopping by expressway service areas, they are merely serving as amenities or facilities for convenience such as to take a break, use the restrooms, refuel the car, or grab a bite (Choi and Lee, 2014). Most expressway service areas lack the ability to provide a pleasant resting place or efficient eco-friendly space for users.

According to studies on green space at expressway service areas in Korea, landscape space in service areas does not show differentiated features among service areas due to standardized establishment and implementation of plans according to the expressway landscaping standard drawing (Lee and Kim, 2011). In addition, landscape spaces and green areas have been eaten up rapidly due to the expansion of utilities and excessive implementation of commercial facilities led by increased users of expressway service areas (Lee et al., 2015). Moreover, Lee and Kim (2011) stated that it is necessary to create diverse and stereoscopic landscapes, increase the revegetation ratio, and expand resting places with nature in terms of improving design components of green spaces at the Youngdong Expressway service area. However, there has been almost no research on the indoor garden design in expressway service areas in Korea thus far.

Recently, garden-type interior landscapes have been widely constructed in expressway service areas as part of the policy to improve the environment and create a pleasant and beautiful expressway service area. Therefore, this study is conducted to examine the current state of indoor garden design in expressway service areas and determine the components of plants, garden ornaments and landscaping, thereby seeking effective ways to implement interior landscape.

Research Method

This study was conducted from September 2, 2016 to October 11, 2017. The current state of interior landscaping was determined by visiting 147 expressway service areas of 9 routes, such as Gyeongbu, Namhae, Donghaean, Seohaean, Youngdong, Jungbunaeryuk, Jungang, Tongyeong-Daejeon Jungbu and Honam Expressway, out of 189 expressway service areas nationwide operated by Korea Expressway Corporation.

The location of interior landscape in service areas was first examined, followed by cultivated plants, decorations of artificial flowers, and decorations of both plans and artificial flowers. The installation type, usage type mobility, and planter material were surveyed in both men's and women's restrooms where interior landscape is installed. For the installation type, we distinguished the special combination type from general landscape type, such as garden type, planter-box type, artificial flower type, fountain type, and aquarium (Yun et al., 2016). We categorized usage type into appreciation, experience, and rest according to how users use interior landscape (Shin et al., 2013), and for mobility we determined whether the landscape is fixed type or portable type. We classified planter material into marble, glass and preservative wood.

Items such as garden ornaments or soil of interior landscape were also surveyed. The planting type of plants in the interior landscape is classified into upper, middle and lower plants. This study is limited in that it examined the current state of interior landscape in expressways nationwide, thereby not conducting statistical analyses aside from frequency analysis.

Results and Discussions

Current state of interior landscaping in expressway service areas

There were total 147 service areas in 9 major expressway routes in Korea, and 56 of them had interior landscaping, showing the ratio of 38.0% overall (Table 1). As for the number and ratio of service areas with interior landscaping per

Table 1. The installation status of indoor garden in expressway service areas.

Expressway routes	No. of Service areas	No. of Indoor garden (%)
Gyeongbu	34	16 (47.0)
Namhae	13	4 (30.7)
Donghaean	6	3 (50.0)
Seohaeae	18	6 (33.3)
Youngdong	13	4 (30.7)
Jungbunaeryuk	16	8 (50.0)
Jungang	14	10 (71.4)
Tongyeong-daejeon Jungbu	18	3 (16.6)
Honam	15	2 (13.3)
Total	147	56 (38.0)

expressway route, there were 16 on Gyeongbu Expressway (47%), 4 on Namhae Expressway (30.7%), 3 on Donghaean Expressway (50%), 3 on Seohaeae Expressway (33.3%), 4 on Youngdong Expressway (30.7%), 8 on Jungbunaeryuk Expressway (50%), 10 on Jungang Expressway (71.4%), 3 on Tongyeong-Daejeon·Jungbu Expressway (16.6%), and 2 on Honam Expressway (13.3%). Compared to Gyeongbu Expressway, only 2 service areas on Honam Expressway had interior landscape installed, showing a remarkable difference. This low installation ratio of interior landscape is due to the fact that expressway service areas in Korea are still mostly for satisfying the physiological needs for long-distance travel, refueling, or selling commercial goods such as foods and beverages (Kwon et al., 2010), while lacking perception about improving resting places or serving as an interior landscape (Lee et al., 2015). Accordingly, it seems necessary to implement efficient interior landscaping for visitors at expressway service areas to feel refreshed, relieve fatigue, and enjoy a pleasant and beautiful atmosphere.

Location of indoor garden in service areas and current state of decoration type

The expressway interior landscapes were mostly in the restrooms (Table 2), with 47 gardens in men's restrooms and 50

Table 2. Number of indoor gardens by location in expressway service areas.

Expressway routes	Men's restroom	Women's restroom	Other places
Gyeongbu	12	13	4
Namhae	4	3	2
Donghaean	2	3	1
Seohaeae	5	6	4
Youngdong	4	4	2
Jungbunaeryuk	8	8	1
Jungang	7	9	5
Tongyeong-daejeon Jungbu	3	2	2
Honam	2	2	2
Total	47	50	23

Table 3. Number of indoor gardens in each decoration type in expressway service areas.

Expressway routes	Decoration with natural flowers	Decoration with artificial flowers	Decoration with natural & artificial flower
Gyeongbu	10	2	4
Namhae	2	2	
Donghaean	1		2
Seohaean	6		
Youngdong	2	1	2
Jungbunaeryuk	3		
Jungang	5	1	5
Tongyeong-daejeon Jungbu	4	1	1
Honam	2		
Total	35	7	14

in women's restrooms, indicating that there were slightly more interior landscapes in women's restrooms.

There were 35 expressway service areas decorated with natural flowers, 7 decorated with artificial flowers, and 14 decorated with a combination of both natural and artificial flowers (Table 3).

Indoor garden installation type, usage type and planter material in expressway service areas

This study analyzed the installation type, usage type, mobility and planter material of interior landscape installed in men's and women's service areas for each expressway route of Gyeongbu, Namhae, Donghaean, Seohaean, Youngdong, Jungbunaeryuk, Jungang, Tongyeong-Daejeon Jungbu, and Honam Expressway (Table 4-10). As a result of examining the installation type of interior landscapes, 81 of them were general garden type with mixed plantations of multiple plants, taking up most of the landscapes, 4 were artificial flower type with a combination of special forms aside from plants, 4 were planter-box type, 1 was fountain type, and 3 were aquarium type (Yun et al., 2016). For usage type, all landscapes were to appreciate the indoor gardens without installing facilities for experience or rest (Shin et al., 2013). The mobility survey showed that all gardens were fixed type except for 3 places (Table 4-10).

For the types of interior landscapes installed in men's and women's restrooms at Gyeongbu Expressway service areas, 18 were garden type, followed by 3 planter-box type and 1 fountain type. They were all for appreciation and installed as fixed type except for 1 portable type. Marble was most commonly used planter material, followed by installation of both marble and preservative wood, and then glass. Some service areas had interior landscape only on either men's or women's restrooms (Table 4). Namhae Expressway and Donghae Expressway service areas also had the landscapes installed in garden type for appreciation in fixed form, with marble and glass used as most common planter materials (Table 5, 6). Haengdamdo Service Area on Seohaean Expressway had a single-file parallel type interior landscape, most for appreciation and in fixed type (Table 7).

The interior landscape installed in Chilseo Service Area on Jungbunaeryuk Expressway was aquarium type, while others were garden type installed for appreciation in fixed form, using marble and glass (Table 9). At Andong Service Area on Jungang Expressway, women's restroom had the interior landscape installed in planter-box type, while other service areas were garden type installed for appreciation in fixed form, using marble (Table 10). In Deogyusan Service

Table 4. Installation and usage type of indoor garden in Gyeongbu expressway service areas.

Name of service area		Installation type	Usage type	Mobility	Material of planter
Geoncheon	M ²	Garden type	Appreciation	Fixed type	Marble, Preservative wood
	W	Garden type	Appreciation	Fixed type	Marble, Preservative wood
Gyeongsan	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Glass
Gyeongju	M	Artificial flower type	Appreciation	Fixed type	Preservative wood
	W	-	-	-	-
Geumgang	M	Planter-box type	Appreciation	Fixed type	
	W	Garden type	Appreciation	Fixed type	Preservative wood
Gimcheon	M	Garden type	Appreciation	Fixed type	Glass
	W	Garden type	Appreciation	Fixed type	Glass
Manghyang	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble, Preservative wood
Sintanjin	M	Artificial flower type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Anseong	M	-	-	-	-
	W	Planter-box type	Appreciation	Portable type	Marble
Okcheon	M	Garden type	Appreciation	Fixed type	Marble, Preservative wood
	W	Garden type	Appreciation	Fixed type	Marble, Preservative wood
Ipjang	M	-	-	-	-
	W	Fountain type	Appreciation	Fixed type	Marble
Jugam	M	-	-	-	-
	W	Garden type	Appreciation	Fixed type	Marble
Cheonan	M	Planter-box type	Appreciation	Portable type	
	W	-	-	-	-
Cheonan (Samgeori direction)	M	-	-	-	-
	W	Aquarium type	Appreciation	Fixed type	Glass, Marble
Cheongju (Cheongwon direction)	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Preservative wood
Chilgok	M	Garden type	Appreciation	Fixed type	Marble, Glass
	W	Garden type	Appreciation	Fixed type	Marble, Glass
Tongdosa	M	Garden type	Appreciation	Fixed type	Stone
	W	-	-	-	-

²M=Men's restroom; W=Women's restroom.

Area (Tongyeong direction) on Tongyeong-Daejeon Jungbu Expressway, men's restroom had the interior landscape formed with artificial flowers for appreciation in fixed form, using preservative wood. The others such as Insam Land and Hamyang Service Area were garden type installed for appreciation in fixed form, using marble (Table 11). The interior

Table 5. Installation and usage type of indoor garden in Namhae expressway service areas.

Name of service area		Installation type	Usage type	Mobility	Material of planter
Munsan	M ^z	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Seomjingang	M	Garden type	Appreciation	Fixed type	Marble, Preservative wood
	W	-	-	-	-
Jin-yeong	M	Garden type	Appreciation	Fixed type	Glass
	W	Garden type	Appreciation	Fixed type	Glass
Haman	M	Garden type	Appreciation	Fixed type	Glass
	W	Garden type	Appreciation	Fixed type	Glass

^zM=Men's restroom; W=Women's restroom.**Table 6.** Installation and usage type of indoor garden in Donghean expressway service areas.

Name of service area		Installation type	Usage type	Mobility	Material of planter
Gujeong	M ^z	Garden type	Appreciation	Fixed type	Preservative wood, Glass
	W	Garden type	Appreciation	Fixed type	Glass
Donghae	M	-	-	-	-
	W	Garden type	Appreciation	Fixed type	Marble
Okgye	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble

^zM=Men's restroom; W=Women's restroom.**Table 7.** Installation and usage type of indoor garden in Seohaean expressway service areas.

Name of service area		Installation type	Usage type	Mobility	Material of planter
Goindol	M ^z	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Glass
Daecheon	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Glass
Seosan	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble, Brick
Seocheon	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Haengdamdo	M	Parallel type	Appreciation	Fixed type	Preservative wood
	W	Parallel type	Appreciation	Fixed type	Preservative wood
Hongseong	M	-	-	-	-
	W	Garden type	Appreciation	Fixed type	Marble

^zM=Men's restroom; W=Women's restroom.

Table 8. Installation and usage type of indoor garden in Youngdong expressway service areas.

Name of service area		Installation type	Usage type	Mobility	Material of planter
Gangneung	M ²	Garden type	Appreciation	Fixed type	Marble, Glass
	W	Garden type	Appreciation	Fixed type	Marble
Deokpyeong Ecoland	M	Garden type	Appreciation	Fixed type	Glass
	W	Garden type	Appreciation	Fixed type	Glass
Munmak	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Hoengseong	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble

²M=Men's restroom; W=Women's restroom.

Table 9. Installation and usage type of indoor garden in Jungbunaeryuk expressway service areas.

Name of service area		Installation type	Usage type	Mobility	Material of planter
Goesan (Yangpyeong direction)	M ²	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Namseongju	M	Garden type	Appreciation	Fixed type	Marble, Glass
	W	Garden type	Appreciation	Fixed type	Marble, Glass
Mungyeong	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Yeongsan	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Chungju	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Chilseo	M	Aquarium type	Appreciation	Fixed type	Marble, Glass
	W	Aquarium type	Appreciation	Fixed type	Marble, Glass
Hyunpoong (Daegu direction)	M	Garden type	Appreciation	Fixed type	Preservative wood
	W	Garden type	Appreciation	Fixed type	Preservative wood
Hyunpoong (Hyunpoong direction)	M	Artificial flower type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Glass

²M=Men's restroom; W=Women's restroom.

landscapes installed in men's and women's restrooms on Honam Expressway service areas were also garden type for appreciation in fixed form, mostly using glass and marble for planter materials (Table 12).

The results of this study showed that most interior landscapes installed in service areas are mostly garden type for simple appreciation, thereby not displaying their functions properly (Yun et al., 2016). Therefore, it is necessary to improve practicality in the resting places of service areas and implement various designs that are refreshing and sophisticated (Bang et al., 2013), and to develop types of interior landscapes in expressway service areas considering irrigation control where it is easy to maintain and replace indoor plants.

Table 10. Installation and usage type of indoor garden in Jungang expressway service areas.

Name of service area		Installation type	Usage type	Mobility	Material of planter
Gunwi (Busan direction)	M ^z	Garden type	Appreciation	Fixed type	Glass
	W	Garden type	Appreciation	Fixed type	Marble, Glass
Gunwi (Chuncheon direction)	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble, Glass
Danyang (Busan direction)	M	Garden type	Appreciation	Fixed type	Marble
	W	-	-	-	-
Dongmyeong (Chuncheon direction)	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble, Glass
Andong (Busan direction)	M	-	-	-	-
	W	Planter-box type	Appreciation	Portable type	
Andong (Chuncheon direction)	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Chiak (Busan direction)	M	-	-	-	-
	W	Garden type	Appreciation	Fixed type	Marble
Chiak (Chuncheon direction)	M	-	-	-	-
	W	Garden type	Appreciation	Fixed type	Marble

^zM=Men's restroom; W=Women's restroom.

Table 11. Installation and usage type of indoor garden in Tongyeong-daejeon Jungbu expressway service areas.

Name of service area		Installation type	Usage type	Mobility	Material of planter
Deogyusan (Tongyeong direction)	M ^z	Artificial flower type	Appreciation	Fixed type	Preservative wood
	W	-	-	-	-
Insam Land (Tongyeong direction)	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Hamyang (Tongyeong direction)	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble

^zM=Men's restroom; W=Women's restroom.

Table 12. Installation and usage type of indoor garden in Honam expressway service areas.

Name of service area		Installation type	Usage type	Mobility	Material of planter
Gokseong	M ^z	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble
Juam	M	Garden type	Appreciation	Fixed type	Marble
	W	Garden type	Appreciation	Fixed type	Marble

^zM=Men's restroom; W=Women's restroom.

Table 13. Soil conditions and introduced material for indoor garden in Namhae expressway service areas.

Name of service area		Garden ornament	Soil
Munsan	M ^z	-	Field soil
	W	-	Field soil
Seomjingang	M	Cylindrical wooden fences, Thatched house model, Doll model	Field soil
	W	-	Field soil
Jin-yeong	M	-	Field soil
	W	-	Field soil
Haman	M	-	Field soil, white gravel
	W	-	Field soil, white gravel

^zM=Men's restroom; W=Women's restroom.

Table 14. Soil conditions and introduced material for indoor garden in Donghaean expressway service areas.

Name of service area		Garden ornament	Soil
Gujeong	M ^z		Field soil
	W		Field soil
Donghae	M	-	Field soil
	W		Field soil
Okgye	M		Field soil
	W		Field soil

^zM=Men's restroom; W=Women's restroom.

Table 15. Soil conditions and introduced material for indoor garden in Seohaean expressway service areas.

Name of service area		Garden ornament	Soil
Goindol	M ^z	Pond	Field soil
	W	Cage Stepping Bridge stone Stone pagoda	Field soil
Daecheon	M	-	Field soil
	W		Field soil
Seosan	M	-	White gravel Black gravel
	W		Field soil
Seocheon	M	-	Field soil
	W		Field soil
Haengdamdo	M	-	Field soil
	W		Field soil
Hongseong	M	-	Field soil
	W		Field soil

^zM=Men's restroom; W=Women's restroom.

Interior landscape garden ornaments and soil in expressway service areas

Types of garden ornaments for some interior landscapes installed in expressway service areas of each route include wooden fences, stones, pond, Korean traditional totem pole symbolizing love and hope, and ginseng model, and also other materials such as light, bird cage, stone pagoda, male and female figures, duck model, and water mill. Most common soil type was field soil, decorated with white or black gravel on top (Table 13-20). Recently, service areas in some regions succeeded in increasing the rate of use and customer satisfaction by repairing the facilities, creating a space with a distinctive

Table 16. Soil conditions and introduced material for indoor garden in Youngdong expressway service areas.

Name of service area		Garden ornament	Soil
Gangneung	M ^z	-	Field soil
	W	-	Field soil
Deokpyeong Ecoland	M		Field soil
	W	-	Field soil
Munmak	M	Light	Field soil
	W	-	Field soil
Hoengseong	M	Stone pagoda, Duck model, Wooden Fences	Field soil
	W	Stone pagoda	White gravel Field soil

^zM=Men's restroom; W=Women's restroom.

Table 17. Soil conditions and introduced material for indoor garden in Jungbunaeryuk expressway service areas.

Name of service area		Garden ornament	Soil
Goesan (Yangpyeong direction)	M ^z	-	Color gravel White gravel
	W	-	Field soil
Namseongju	M	-	White gravel
	W	-	White gravel
Mungyeong	M	-	Field soil
	W	-	Field soil
Yeongsan	M	-	Field soil
	W	-	Field soil
Chungju	M	-	Field soil
	W	-	Field soil
Chilseo	M	-	Field soil
	W	-	Field soil
Hyunpoong (Daegu direction)	M	Light	White gravel
	W	Light	Gravel

^zM=Men's restroom; W=Women's restroom.

Table 18. Soil conditions and introduced material for indoor garden in Jungang expressway service areas.

Name of service area		Garden ornament	Soil
Gunwi	M ^z	Wooden Fences	Field soil
	W	-	Field soil
Danyang	M	Stone	Field soil
	W	Stone	Field soil
Dongmyeong	M	-	Field soil
	W	Stone	Field soil
Andong	M	Millstone Stone pagoda	Color gravel White gravel
	W	Toad model Stone	Field soil
Chiak	M	-	Field soil
	W	Stone water mill	Field soil

^zM=Men's restroom; W=Women's restroom.

Table 19. Soil conditions and introduced material for indoor garden in Tongyeong-daejeon Jungbu expressway service areas.

Name of service area		Garden ornament	Soil
Deogyusan (Tongyeong direction)	M ^z	-	Field soil
	W	-	Field soil
Insam Land	M	-	Field soil
	W	Ginseng model	Field soil
Hamyang	M	Thatched house model Water mill	Field soil
	W	-	Field soil

^zM=Men's restroom; W=Women's restroom.

Table 20. Soil conditions and introduced material for indoor garden in Honam expressway service areas.

Name of service area		Garden ornament	Soil
Gokseong	M ^z	-	Field soil
	W	light	Field soil
Juam	M	Duck model 2 Korean traditional totem poles symbolizing symbol of love and hope	Field soil
	W	Korean traditional totem pole 2 Birds model 5	Field soil

^zM=Men's restroom; W=Women's restroom.

theme of regional characteristics and using regional tourism resources by making good use of the eco-friendly architecture and surrounding natural environment, thereby improving their competitive edge compared to other service areas (Lee and Kim, 2011). The results of the study also showed that Deokpyeong, Insam Land, Goindol and Seomjingang Service Areas had interior landscapes well installed in restrooms using various items that represent the regional attributes (Fig. 1).

Geoncheon

Gimcheon

Manghyang

Sintanjin

Anseong

Okcheon

Jugam

Cheongju

Chilgok

Tongdosa

Munsan

Seomjingang

Jin-yeong

Haman

Gujeong

Okgye

Goindol

Daecheon

Seosan

Seocheon

Figure 1. Pictures of different indoor gardens in expressway service areas.

As for the soil, there are studies on light artificial soil combinations with excellent ability to remove contaminants from the air that are also good for plant growth (Jang et al., 2013). Accordingly, it seems necessary to replace interior landscape soil in service areas that is mostly field soil with the kind that has functionality to improve the environment and is also economically feasible.

Hongseong

Gangneung

Munmak

Hoengseong

Goesan (Yangpyeong)

Namseongju

Mungyeong

Yeongsan

Chungju

Chilseo

Hyunpoong

Gunwi

Danyang

Dongmyeong

Deogyusan (Tongyeong)

Insam Land

Hamyang

Gokseong

Juam (Cheonan)

Figure 1. Continued.

Cultivated plants in expressway service areas and photographs of interior landscape

There were total 30 species, 27 genus and 19 families planted in interior landscapes of expressway service areas (Table 21). They were classified into upper, middle, lower and flowering plants according to tree height and planting type (Yoon, 1989; Lee, 1996).

Table 21. Introduced plants of indoor garden in expressway service areas.

Planting Type	Name of Plant
Upper tree	<i>Chamaedorea elegans</i> , <i>Cycas revoluta</i> , <i>Fatsia japonica</i> , <i>Phyllostachys bambusoides</i> , <i>Phyllostachys nigra</i> , <i>Pseudosasa japonica</i> , <i>Rhapis excelsa</i> , <i>Rhapis humilis</i> , <i>Ternstroemia gymnanthera</i> (Wight et Arn.) Sprague, <i>Washingtonia filifera</i> (L. Linden) H. Wendl.
Middle tree	<i>Araucaria heterophylla</i> , <i>Ardisia crenata</i> Sims, <i>Ardisia japonica</i> (Thunb.) Blume., <i>Aucuba japonica</i> , <i>Forsythia koreana</i> , <i>Nandina domestica</i> Thunb., <i>Ophiopogon japonicus</i> , <i>Rhododendron schlippenbachii</i> , <i>Schefflera arboricola</i>
Lower tree	<i>Euphorbia pulcherrima</i> , <i>Farfugium japonicum</i> , <i>Hedera helix</i> , <i>Hedera rhombea</i> , <i>Hosta plantaginea</i> (Lam.) Asche, <i>Liriope platyphylla</i> , <i>Pachysandra terminalis</i> , <i>Pteridium aquilinum</i> var. <i>latiusculum</i>
Flowering plant	<i>Aquilegia buergeriana</i> var. <i>oxysepala</i> , <i>Kerria japonica</i> for. <i>plena</i> , <i>Viola tricolor</i> var. <i>hortensis</i>

There were 10 species, 9 genus and 6 families of upper plants, such as *Chamaedorea elegans*, *Cycas revoluta*, *Fatsia japonica*, *Phyllostachys bambusoides*, *Phyllostachys nigra*, *Pseudosasa japonica*, *Rhapis excelsa*, *Rhapis humilis*, *Ternstroemia gymnanthera* (Wight et Arn.) Sprague, and *Washingtonia filifera* (L. Linden) H. Wendl. For middle plants, there were 9 species, 8 genus and 8 families such as *Araucaria heterophylla*, *Ardisia crenata* Sims, *Ardisia japonica* (Thunb.) Blume., *Aucuba japonica*, *Forsythia koreana*, *Nandina domestica* Thunb., *Ophiopogon japonicus*, *Rhododendron schlippenbachii*, and *Schefflera arboricola*. There were 8 species, 7 genus and 6 families for lower plants such as *Euphorbia pulcherrima*, *Farfugium japonicum*, *Hedera helix*, *Hedera rhombea*, *Hosta plantaginea* (Lam.) Asche, *Liriope platyphylla*, *Pachysandra terminalis*, and *Pteridium aquilinum* var. *latiusculum*. As for flowering plants, there were 3 species, 3 genus and 3 families such as *Aquilegia buergeriana* var. *oxysepala*, *Kerria japonica* for. *plena*, and *Viola tricolor* var. *hortensis*.

A study by Jung et al. (2006) on the current state of interior landscape plants in 28 expressway service areas in Korea showed that there were 44 species and 26 families, but this study presented that there were 10 species and 7 families fewer. This may be because some plants withered away due to the poor environmental conditions at the entrance or lack of light in the restrooms, or also because they were replaced with plants that are more convenient to maintain.

Conclusion

This study determined the current state of interior landscaping by visiting expressway service areas of 147 service areas on 189 expressways in Korea. There were 56 service areas with interior landscapes, showing a ratio of 38%. On Gyeongbu Expressway with the biggest number of service areas, 16 (47%) out of 34 service areas had interior landscapes installed. Other routes had 10 or fewer. Moreover, 35 expressway service areas were decorated with natural flowers, 7 with artificial flowers, and 14 with a combination of both natural and artificial flowers. Expressway interior landscapes were mostly installed in the restrooms: 47 in men's restrooms and 50 in women's restrooms. The most common type of interior landscape was fixed garden type, and 3 of them had portable planters installed. Most interior landscapes did not have resting facilities installed around them, with focus mostly on interior landscape itself to simply watch and appreciate it.

There were total 30 species, 27 genus and 19 families planted in interior landscapes of expressway service areas. It turned out that there were 10 species and 7 families fewer than previous research. This indicates that it is necessary to implement various plants that present seasonality and beauty of plant colors while also well enduring the indoor environment.

Recently, there is more and more resting space as expressway service areas seek various changes in terms of function. However, there are very few interior landscapes in service areas compared to exterior landscapes. It is necessary to install

the interior landscapes, which are limited only to men's and women's restrooms, to other spaces such as souvenir shop, cafeteria and information center. Furthermore, there is a need for various interior landscape designs that display the beauty of plants as well as artistic functions and environmental control beyond just garden type. It is also desirable to come up with a distinctive interior landscape to lead to specialized regional service areas. Visitors can enjoy both a spectacle as well as natural landscape if resting places are installed around the interior landscape, thereby improving the image of service areas, helping visitors relieve fatigue of both body and soul, and providing a pleasant environment.

References

- Bang, S.W., J.E. Song, Y.E. Park, J.Y. Kim, and K.J. Kim. 2013. Evaluation of design preference on the functional Plant Pot. *J. Korean Soc. People Plants Environ.* 16(6):485-491. DOI:10.11628/ksppe.2013.16.6.485
- Choi, H.G. and Y.H. Lee. 2014. The impact of service quality and management abilities on customer satisfaction, customer loyalty, sales performance in expressway service area business. *Acad. Customer Satisf. Manag.* 16(2):79-104.
- Jang, T.J., H.Y. Kim, and K.B. Lim. 2013. Selection of artificial media suitable for the growth of foliage plants for indoor vertical garden. *Flower Res. J.* 21(1):11-16. DOI:10.11623/frj.2013.21.1.1
- Jung, J., M.H. Kwon, and K.J. Bang. 2006. A study on the maintenance condition of the interior landscaping plants in the restroom of the expressway service area: focus on the main expressway in Korea. *J. Korean Soc. People Plants Environ.* 9(4):140-147.
- Korea Expressway Corporation. 2017. 2017 Service Area. Retrieved from <http://www.ex.co.kr/site/com/pageProcess.do>
- Kwon, Y.I., C.W. Lee, J.K. Lim, and B.D. Jung. 2010. A study on user's characteristics and selection factors of the highway service area. *J. Transp. Res.* 17(4):75-84.
- Lee, W.M., B.H. Han, J.Y. Kim, and S.C. Park. 2015. A study of the functional improvement for comfortable expressway service areas : metropolitan expressway service areas. *J. Korean Inst. Landsc. Archit.* 43(3):63-76. DOI:10.9715/KILA.2015.43.3.063
- Lee, Y. 1996. *The Colored Illustrated Book of the Korean Flora* (pp.210-348). Seoul, Korea: Kyohaksa.
- Lee, Y.N. and S.W. Kim. 2011. A study of improving the spatial design components of the green-space in the Yongdong expressway service station. *J. Korean Soc. Des. Culture* 17(1):466-481. DOI:10.18208/ksdc.2011.17.1.038
- Shin, H.C., J.S. Yun, and K.O. Choi. 2013. Landscape formation states and the preference analyses of indoor garden in the working space. *J. Recreat. Landsc.* 7(2):43-52.
- Yoon, P. 1989. *The illustrated book of the Korean horticultural flora* (pp.89-536). Paju, Korea: Jisik-Sanupsa.
- Yun, J.S., J.S. Hwang, S.W. Ha, and K.O. Choi. 2016. The current status of indoor gardens creation in elementary, middle, and high-schools in Gyeongsangnam-do. *J. East Asian Landsc. Stud.* 10(2):37-47.