

06 Environmental Planning

A Study on Functional Improvement and Management for Streamlets in Seoul

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Summary

The Seoul Metropolitan Government(SMG) should create waterfront parks at *Silgaecheons* in restorable conditions.

1. Introduction

SMG needs to establish a healthy urban ecological environment by restoring *Silgaecheons*

Silgaecheon is a Korean term referring to a brook. By definition, it is a small, narrow stream that resembles a long, thin thread. *Silgaecheon* includes every brook or stream that is classified as neither small, local nor national rivers defined by the River Act. In other words, there is no legal status attached to *Silgaecheon* and its very name is not a legal title. Concrete sluices and small man-made rivers featuring natural characteristics are also referred to as *Silgaecheon*. However, this report only looks at naturally created *Silgaecheons*. [Table 1] presents the list of *Silgaecheons* selected for the investigation.

[Table 1] 15 *Silgaecheon*s Selected for Investigation

Name of <i>Silgaecheon</i>		Total length	Location		Name of main stream
			Head	Confluence	
1	Gingorangcheon	2.9km	Yongmasan(Mt.)	Donggok samgeori (Crossroad)	Jungnangcheon
2	Nangokcheon	8.6km	Samseongsan (Mt.)	Nanhyang Elementary School	Dorimcheon
3	Daehakcheon	4.4km	Bugaksan	Jongno 5-ga sageori (Crossroad)	Cheonggyecheon
4	Manjocheon	11.4km	Muakjae(Mt.)	Wonhyo Bridge	Han River
5	Motjarigolcheon	0.9km	Bukhansan(Mt.) (West)	Hyundai I-Park Apt.	Changneungcheon
6	Musucheon	3.1km	Bukhansan(Mt.) (East)	Nowongyo(Bridge)	Dobongcheon
7	Mulpuregolcheon	0.9km	Imalsan(Mt.)	Gupabal Station	Jingwannaecheon
8	Baeksasilgyegokcheon	0.9km	Bugaksan(Mt.)	Unidentified	Hongjecheon
9	Baegundongcheon	3.7km	Bugaksan(Mt.)	Gyeongbokgung Station	Cheonggyecheon
10	Bugeyongcheon	3.7km	Bugaksan(Mt.)	Cheonggye 3-ga	Cheonggyecheon
11	Ongnyudongcheon	1.2km	Inwangsan(Mt.)	Post office at Tongui-Dong	Baegundongcheon
12	Junghakcheon	1.2km	Bugaksan(Mt.)	Mugyo Sageori (Crossroad)	Cheonggyecheon
13	Jihyangcheon	10.3km	Jiyangsan(Mt.)	Guil Station	Oryucheon
14	Jingwannaecheon	3.5km	Bukhansan(Mt.) (West)	Tongilgyo(Bridge)	Changneungcheon
15	Pildongcheon	2.9km	Namsan(Mt.)	Euljiro 4-ga	Cheonggyecheon

Today, Seoul is considered a leading and rising global city as a result of phenomenal economic boom called the Miracle on the Han River. Long before the economic success, however, the city has been recognized as one of the beautiful cities in the world: It is situated on the Han River, of which the lower stretches are lined with pedestrian walkways, bicycle paths, public parks and restaurants throughout the city. Seoul is also enveloped by mountains which are found in both

the center and outskirts of the city. Seoul once had problems arisen from rapid economic growth accompanied by a high population density. It impinged upon the surrounding nature, including numerous *Silgaecheons* and small rivers flowing into the Han River. Most of them have been covered over with concrete to be served as roads. But there recently has been done various works at local government level to restore the city's natural environment to previous conditions. For instance, a number of parks and greens have been established.

In recent years, people have increasingly spent their leisure at *Silgaecheons* (and small rivers) nearby their residences. *Silgaecheon* not only facilitates the passage of rainwater into streams and rivers, but also provides green spaces and relaxing areas, where grownups can take a rest while children play. Moreover, it cools down heat islands in summer, while creating natural habitats for various living organisms.

Silgaecheons like Baeksasilgyegokcheon are popular among Seoul citizens, partially for the beautiful scenery. Legions of people make short trips to *Silgaecheons* especially in summer.

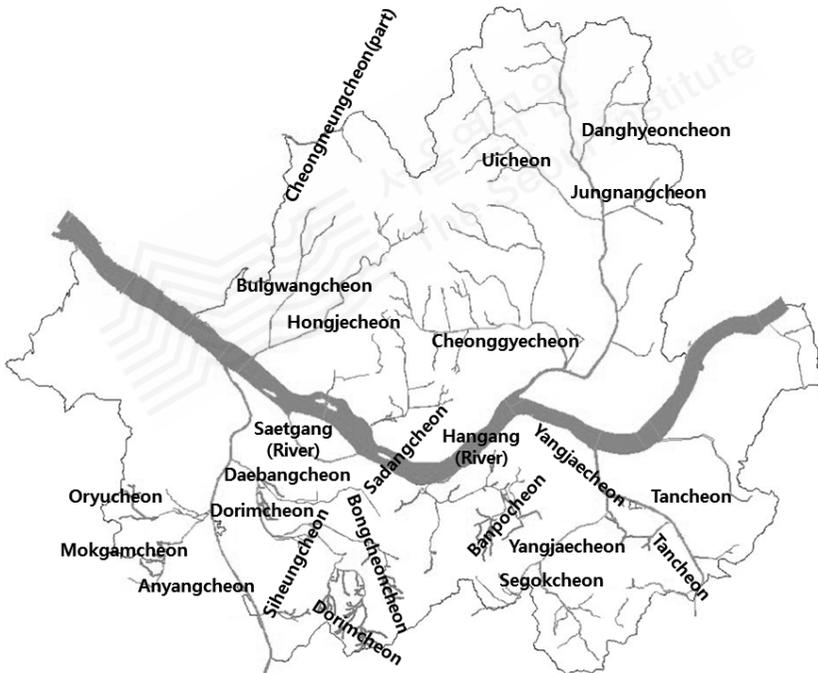
In Seoul, 36 rivers and 18 small rivers are officially designated by the law as either national or local rivers and managed by the public sector. As explained earlier, *Silgaecheons* do not belong to any of the two categories. Consequently, they are currently in blind zones, not being managed nor preserved properly. The objective of this report is to investigate *Silgaecheons* located throughout Seoul and present policy recommendations about how the SMG should manage *Silgaecheons*. In other words, this paper outlines directions and strategies for preserving currently ill-managed *Silgaecheons*.

2. Main Findings

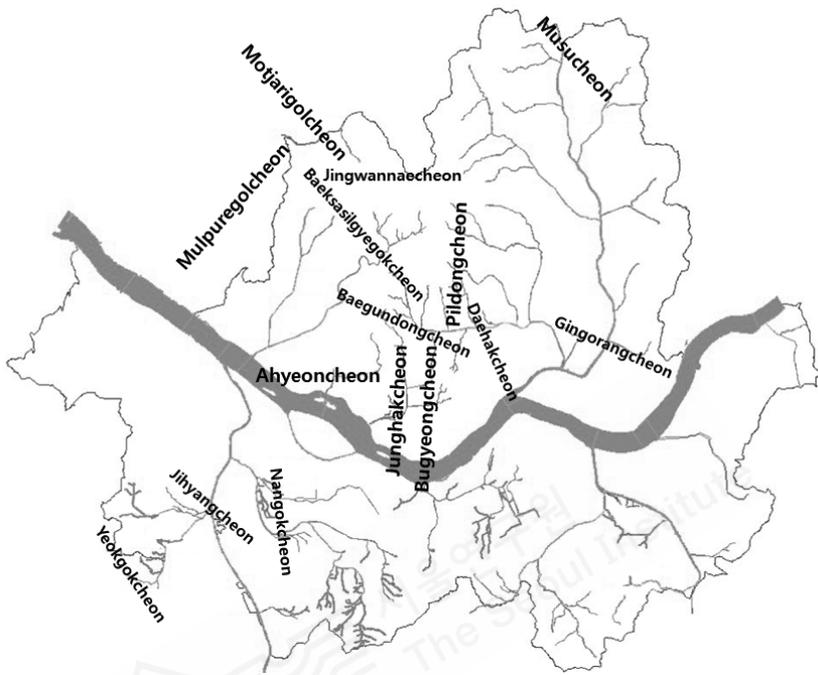
Drawing a map of Seoul showing every waterway in the city based on the Geographic Information System database

This research presents maps containing all types of waterways in Seoul including

Silgaecheons, streams, creeks and rivers. It is the first attempt in its kind. Based on the Geographic Information System (GIS) database, the map has been constructed through the following steps: First, we checked the locations of rivers that have been covered over to be used as roads by making reference to the existing map showing the topography of Seoul in 1976. Second, we adjusted or confirmed the locations by referring to satellite Figures and other related documents. [Figure 1] and [Figure 2] below are the maps that indicate the locations of some waterways in Seoul produced based on the GIS database. There are total 73 waterways in the city, consisted of 4 national rivers, 36 local rivers, 18 small rivers, and 15 *Silgaecheons*.



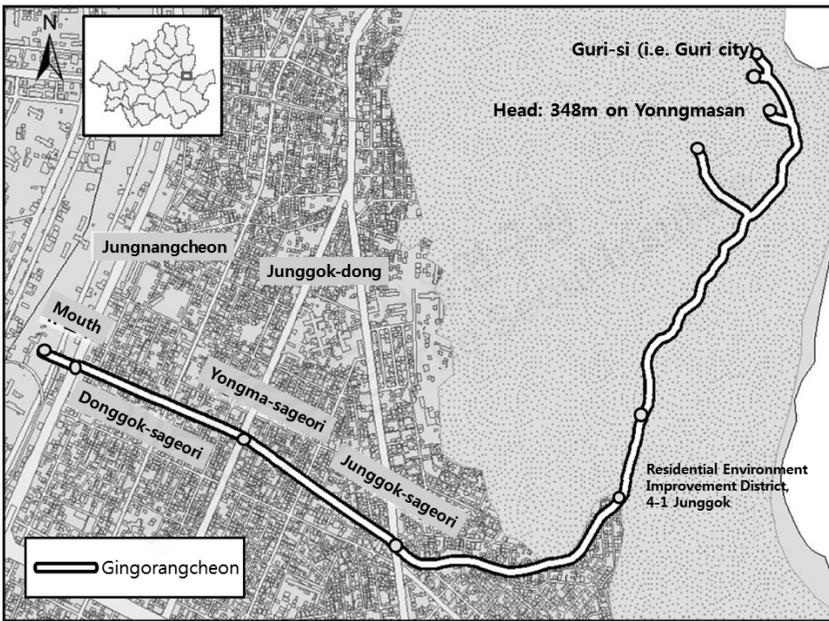
[Figure 1] Map of National and Local Rivers

[Figure 2] Map of *Silgaecheons*

In this study, a map showing detailed information on the locations of 15 Silgaecheons in Seoul has been constructed. Among them, this report presents herewith the map of Gyeongrangcheon. Gyeongrangcheon is total 4.04km long, starting from Yongmasan through Junggok-sageori to Jungnangcheon. Most parts of Gyeongrangcheon have been covered over, but the upper stream recently has been restored in the process of Yongma Park construction. It is currently used as the park's green space for the public. Areas constructed above the mid- and lower streams of Gyeongrangcheon, on the other hand, are populated by low-rise apartments. Places nearby Yongma-sageori comprise commercial streets, whereas one lane of Gyeongrang-no (a street built on the covered Gyeongrangcheon) is used by drivers who wish to park or stop to load their cars. [Table 3] below shows the geographic features of Gyeongrangcheon. [Figure 3] is the map of Gyeongrangcheon.

[Table 2] Geographic Features of Gingorangcheon

Covered area	Mid- and lower stream	Total length	4.04km
Head	Yongmasan (Mt.)	Characteristics of sections in use	Residential, commercial, preservatory(of nature)
Course of stream	Yongmasan ▶ Junggok redevelopment site ▶ Junggok-sageori ▶ Yongma-sageori ▶ Jungnangcheon		



[Figure 3] Map of Gingorangcheon

The ecological condition of six Silgaecheon including Baeksasigyegokcheon are reported to be sound

According to the study on the environmental state of *Silgaecheon* in Seoul, *Silgaecheon* that have not been covered over are in good ecological condition. They are, namely, Baeksasilgyegokchoen, Musucheon, Mulpuregolcheon,

Jingwannacheon, and the upper streams of Bugyeongcheon, Ongnyu-Dongcheon and Jihyangcheon. They are expected to purvey waterfront spaces that Seoul citizens can use for recreational purposes and therefore should be preserved. [Table 3] below shows the list of *Silgaecheons* that are found to be in sound condition considering its biotope and ecological environment.

[Table 3] List of *Silgaecheons* in Sound Ecological Conditions

Name	Biotope Assessment1)				Overall condition (the result of fact-checking investigation reflected)
	Entire stream (Grade, %)	Upper	Mid	Lower	
Musucheon	1st (52%)	1	1	5	Excellent
Mulpuregolcheon	1st (54%)	1	1	3	Mostly excellent
Baeksasilgyegokcheon	1st (69%)	1	1	1	Excellent
Ongnyu-Dongcheon	5th (47%)	1	5	5	Excellent at the upper stream, but the rest are mostly not
Jihyangcheon	4th (26%)	1	5	4	Excellent at the upper stream, but the rest are mostly not
Jingwannacheon	3rd (42%)	1	3	3	Mostly excellent

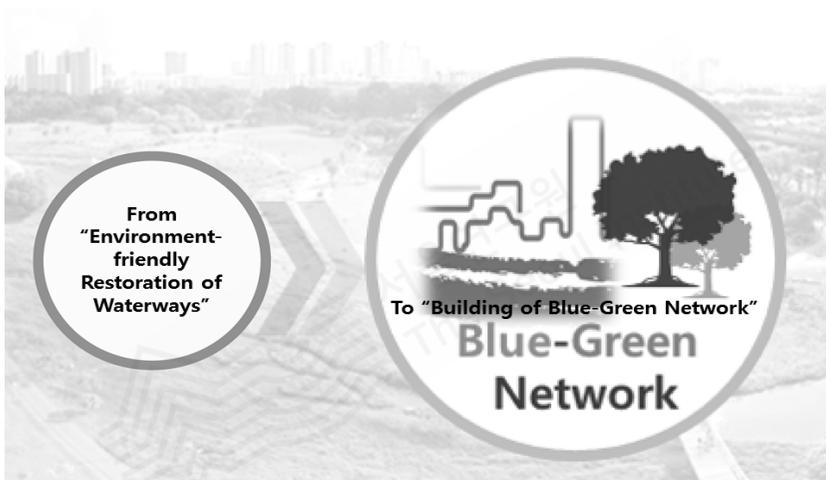
1) "Biotope" is the region of a habitat associated with a particular ecological community. Biotope Assessment grades regions with one (for the best condition) to five (for the worst condition)

Waterways should be restored by constructing the Blue-Green Network

The management of waterways is an important part of urban planning. In the past when rapid economic development took place, overly many people migrated to Seoul from other cities and regions in Korea. This inevitably resulted in damaging most of *Silgaecheons* in the city. In particular, raw sewage was discharged to *Silgaecheons*, which became polluted and began to reek. As a solution to avoid such problems while securing more sidewalks and roadways, many *Silgaecheons* have

been covered over.

As people have come to enjoy a higher standard of living, the SMG has increasingly recognized that waterways including *Silgaecheons* have positive influences on people's emotions as well as their living environment. In this sense, the government has introduced the concept of "environment-friendly restoration of waterways." Under this concept, SMG has restored several waterways in different regions and not stopped its endeavor yet.



In recent years, the direction of waterway restoration project has shifted from focusing on the aspect of "environment-friendliness" to establishing a wide network of living creatures across different ecosystems. Such a network is called the Blue-Green Network (BGN) (refer to [Figure 4]). The idea of BGN emphasizes the interconnection between aquatic ecosystems (e.g. waterways) and green ecosystems (e.g. ecological parks, forests). It believes that this interconnection will expand the green network, which will in turn bring ecological continuity. Besides this environmental benefit, natural landscapes created by a line of water, trees and forests will provide people with a sense of stability and comfort as well as aesthetically pleasing scenery.

Blue : ecosystem of aquatic spaces

Green : ecosystems of green spaces and parks,
interconnected to one another

- Aquatic spaces refer to waterways and waterfronts
 - Green spaces refer to ecological parks, forests and roads embowered in trees
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- Water and trees create ecological continuity, which in turn fosters the migration and reproduction of living creatures.
 - Water and trees detoxify and eliminate pollutants
 - Natural landscapes offer beautiful views and a sense of stability

[Figure 4] Concept of Blue-Green Network(BGN)

There are more than 70 waterways in Seoul. Many rivers and *Silgaecheons* have not been restored and still remain covered over. However, living environment of Seoul citizens will significantly improve if the construction of BGN gradually takes place and succeeds. The network will link waterfronts to nearby green spaces, generating synergy effect. This will then greatly help improve and sustain the ecological services of waterways.

To yield desired outcomes from the restoration project under the BGN concept, the SMG must first secure properly preserved and managed ecological spaces close to waterways. Therefore, it should ensure that wetlands and waterways in excellent ecological condition remain in their current good state. Moreover, it needs to look for a way to connect such natural sites to larger ecological spaces around waterfronts. In other words, the government should try to link *Silgaecheons* to small or local rivers as it has been doing so far. Next the SMG ought to maintain

biological diversity on and around waterfronts. This requires it to preserve waterways and waterfronts by regularly monitoring their ecological condition, while minimizing negative impact of development on them.

SMG should try to preserve the ecological condition of waterways

The “ecological services” of waterways refer to the benefits arising from the ecological functions of waterway ecosystems. Such benefits accrue to all living organisms including humans. They include the supply of natural resources, climate control, maintenance of biodiversity, and provision of recreational space. Not just one, but all these benefits affect humans’ life. For example, people use waterways as a source of drinking water, while being provided with more favorable living conditions by mitigating the effect of urban heat island and controlled microclimate. Moreover, waterways serve as habitats for various types of living creatures, increasing the diversity of organisms. Not to mention, people can enjoy aesthetically pleasing landscapes and relax.

Most *Silgaechoons* in Seoul have been incapacitated by urban development, being severed or covered over. Those preserved in relatively sound condition should also be regularly monitored to avoid rendering them incapable of providing ecological services. Furthermore, the SMG should restore *Silgaechoons* in restorable condition, particularly their upper streams close to residential areas as they can provide much more ecological services than national and local rivers.

As previously explained, *Silgaechoons* are multi-functional and offer numerous benefits: facilitating a passage of aquatic organisms, preserving biological diversity, purifying water, and mitigating the effect of urban heat island. They are especially beneficial to humans, for they provide public areas where people can use in pursuit of relaxation and recreation. By allowing people of all ages to freely come and use green spaces, *Silgaechoons* can have the positive effects on people’s emotions.

3. Conclusions & Policy Recommendations

This paper proposes herewith a detailed plan, which outlines five policy directions and seven strategies, for how the SMG should improve the condition of *Silgaecheons* in Seoul.

Five Policy Directions

1) Minimize the damage of *Silgaecheons*, while enhancing the preservation management

As mentioned earlier, a large number of *Silgaecheons* in Seoul have been covered over or destructed in the process of rapid economic development. It is crucial to prevent any more damages to *Silgaecheons*. Therefore, the SMG should pursue a policy in the direction of preserving those maintained in sound condition and sparing them from further harm. The government needs to acknowledge the positive influence of *Silgaecheons* on people's lives in terms of both physical and mental health.

2) Develop ecological foundation unique to *Silgaecheons*

SMG should aim to create a unique and distinctive ecological base of *Silgaecheons* by preserving vegetation found there. The government is to identify and cultivate plants that can be grown around walkways constructed on the waterfronts. At the same time, it should maintain biodiversity by protecting and restoring natural habitats. SMG should also ensure that *Silgaecheons* properly facilitate the passage of living creatures.

3) Improve the function of *Silgaecheons*, taking their current conditions into account

Before taking any actions to improve the ecological function of *Silgaecheons*, SMG should first allow for their current conditions and that of surrounding areas.

The upper streams of four to five *Silgaecheons* in Seoul remain in sound ecological conditions. They mostly come from the valley. SMG should focus on preserving these areas first, and then gradually move down to lower streams to purify the water and mitigate the effect of heat island.

4) Transform *Silgaecheons* that can be partially restored into parks

Most areas near *Silgaecheons* are densely populated. This renders it difficult to fully restore them. Nor is it easy to expand and connect some sections. *Silgaecheons* that can only be partly restored should be evaluated on the feasibility of restoration before undertaking any project. In the case when *Silgaecheons* pass through a park, expansion should take place in or near the park area. For some *Silgaecheons*, restoring the upper stream is quite infeasible, while the mid- and lower stream pose no such a problem. In this case, the SMG should transform the part of *Silgaecheons* into waterfront parks. Meanwhile, other waterways in rather non-restorable condition should be considered from a mid-to-long-term perspective.

5) Introduce a project in which residents can participate

Most *Silgaecheons* in Seoul run through residential areas. This implies that they are mostly used and managed by residents.

Therefore, it is desirable to encourage citizens residing nearby *Silgaecheons* to preserve and manage the waterways. In this sense, SMG should carry out policy in a way that induces the people to participate in the management of *Silgaecheons*. Their jobs may range from drinking water management for each season and water quality control by, for instance, preventing the inflow of sewage to the maintenance of *Silgaecheons* during heavy rain. In addition, the government should cooperate with various civil groups to seek vision and direction of a *Silgaecheon* preservation project.

Seven Strategies

1) Establish a framework for managing *Silgaecheons* by enacting the *Silgaecheon Management Ordinance*

As previously explained, *Silgaecheons* do not hold any legal status as they do not belong to any of small, local or national rivers defined by the River Act. As a result, they are placed in a blind zone, in which the governmental entities fail to properly manage them. Though some *Silgaecheons* are taken care by hands of either local or central government, the focus has been mainly on making them facilitate the passage of rainwater and sewage. In other words, *Silgaecheons* have been utilized for a restricted number of purposes. It is necessary to legislate the ordinance stipulating how and what parts of *Silgaecheons* must be preserved and managed. This will serve as a framework to improve the currently disorganized, and therefore ineffective management of *Silgaecheons*.

2) Designate *Silgaecheons* in sound ecological conditions, like Musucheon, as *Ecological Landscape Protected Areas*

Musucheon, Baeksasilgyegokcheon, Jingwannaecheon, Mulpuregolcheon, the upper stream of Bugyeongcheon, and some areas near the upper stream of Jihyangcheon should be designated as Ecological Landscape Protected Areas. They are also in excellent ecological conditions, given either 1st or 2nd grade in the biotope assesment.

Silgaecheons are often deformed or destroyed to utilize land more efficiently in the process of urban development or the construction of apartment complexes. Details on how to forestall such incidents should be included in the ordinance.

3) Insert an additional clause mandating the enhancement of ecological role in the *Small River Maintenance Act*

Silgaecheons in Seoul are practically the same as small rivers defined under the law. The only difference is that *Silgaecheons* are not recorded on legal documents,

while the other is. A plan to maintain small rivers must have been devised according to the law, yet it has not been done properly. Moreover, the maintenance plan tends to only highlight the estimation of flood discharge and the control of water volume. Consequently, the whole plan is imperfect to be used to enhance the ecological role of *Silgaecheons*. Given that, the SMG should insert an additional clause stipulating the enhancement of ecological role of waterways and set it as a goal for the maintenance plan.

4) Preserve vegetation found in the areas near *Silgaecheons*, and create private waterways, rapids, and swamps

Some sections of *Silgaecheons*, particularly their upper streams, are kept in their natural conditions. SMG should preserve vegetation found in those areas while creating rapids, small cisterns or swamps so that natural purification process can occur. During the time of heavy rain, which spans over about 50 days a year, rainwater flows through *Silgaecheons*. With the construction of small-sized cisterns at the upper stream, water would flow in the waterway longer.

It would be good if *Silgaecheons* were always filled with water. Yet it would become more costly to maintain them. Thus, it is more affordable and manageable to leave *Silgaecheons* up to the nature: When it rains, *Silgaecheons* will become full of water. Then residents can swim and play in the water. In the dry weather, on the other hand, the waterfronts will become embowered in waterside plants. This will make the environment all the better for residents to take a walk and relax.

5) Establish a short, mid, and long-term plans for restoring *Silgaecheons*, and then gradually carry them out

Restoring *Silgaecheons* located close to residential areas is especially important as they can directly showcase the benefits of ecological service to people. The government should come up with a short, mid, and long-term plans for the restoration of *Silgaecheons*' ecology and implement them step by step.

6) Induce citizens to take part in preservation and management of *Silgaecheons*

Local participation is crucial in the management of *Silgaecheons*. People living close by *Silgaecheons* have better knowledge of the waterways. Moreover, they have easy access to *Silgaecheons* and therefore may manage the waterways more conveniently. Furthermore, they can form and operate cooperative organizations for managing *Silgaecheons*. A clause that can promote the participation of citizens in *Silgaecheon* management - by forming, for example, civil groups or communities, or through Social Network - should be included in the *Silgaecheon* Management Ordinance.

7) Implement a recreational program for children at waterways in excellent ecological condition

One of the numerous benefits that *Silgaecheons* offer to citizens is that they can be utilized as a playground for children. In summer, children can play in *Silgaecheons* while their caretakers can relax in the shade of trees.

SMG should use the waterways in excellent ecological conditions (i.e. given high grades in the biotope assesment) by implementing a recreational program for children in the areas. Musucheon, Baeksasigyegokcheon, Jingwannaecheon, Mulpuregolcheon, the upper stream of Bugyeongcheon, and some places near the upper stream of Jihyangcheon are the ones in good conditions. When designing recreational programs for these *Silgaecheons*, the SMG ought to pay attention to details, such as suitable locations for water activities and the maximum number of people allowed for participating in the activities per day. Not to mention, it should inform the public of such information.