Cheonggyecheon Restoration Project

PARK Kil-Dong, Seoul Metropolitan Government, Korea

1. Background

About the Cheonggyecheon

Joseon Period

Cheonggyecheon was a stream running through the center of Seoul from east to west. Its waters flowed down from Mt. Bugaksan and Mt.Inwangsang to the north, Mt. Naksan to the east, and Mt. Namsan to the south.The 600-year history of Seoul began when King Taejo, the founder of the Joseon Dynasty, moved the capital to Hanyang (today's Seoul) in 1394. Ever since, the Cheonggyecheon has been inextricably linked to Seoul's history. The stream overflowed every time there was heavy rain, and it was usually so polluted at all other times due to lack of flow that there was already talk of covering Cheonggyecheon during the early Joseon period.

King Taejong (1400-1418) opposed this notion, reasoning that it was against nature to do so. In his 11th year of reign (1411), he ordered the construction of Gwanggyo Bridge. It was a stone bridge, and it was built of remarkable proportions for the time to make sure that it would not be swept away by floods. During the reign of King Sejong, the stream was occasionally dredged, and Supyogyo Bridge was built over it. The water table was established at the mid-point of the stream to measure the height of water to give indication of possible floods. In 1760 (the 36th year of King Yeongjo's reign), 200,000 people were mobilized to widen the stream and build stone embankments along both banks, and the waterways were straightened as it is today.

Cheonggyecheon Stream was fed by 14 tributaries, including Baegundongcheon Stream and Junghakcheon Stream. Records of the Joseon period indicate that 86 bridges were built over the stream. Today, only a few of these bridges remain, including Gwanggyo and Supyogyo Bridges. As Seoul's sewage system, a laundry for women, and playground for children, Cheonggyecheon was an integral part of the common people's lives. Various events, including bridge stepping festivities, team events, and lantern festivals were held at the bridges of Cheonggyecheon. In the late Joseon period, the homeless made Cheonggyecheon their shelter as they gathered along its banks. Cheonggyecheon is an important historical cultural site that witnessed the difficult lives of the common people during the Joseon period.

Japanese Occupation

During the Japanese colonial period, farmers who had been deprived of their farmlands migrated to Seoul. They flocked together along the banks of Cheonggyecheon and illegally built houses there. With the increase in the urban poor population, the stream became more polluted, earning notoriety as a breeding ground for infectious diseases and crime. Because yearly floods continued to take lives and inflict property damage, the Japanese used Cheonggyecheon as a sewage system. In order to protect the Japanese residences to the south of Cheonggyecheon, dredging of Cheonggyecheon and its tributaries began around 1913.

- 1918~1924 : Dredging of Cheonggyecheon and improvement of tributaries
- 1937~1942 : Covering of sections from Taepyeongno to Gwangtonggyo

After Liberation from Japan

From 1937 to 1942, the section of the Cheonggyecheon from Gwanghwamun to Gwanggyo Bridge was covered for the first time. In the years immediately following the nation's liberation from Japan and the Korean War, the construction to cover the Cheonggyecheon was abandoned due to social unrest and lack of funds until 1958, when full-scale work to cover the stream started. It took 20 years to complete the project. The construction of Cheonggye Elevated Highway started in 1967 and was completed in 1976.

- 1949 \sim 1950 : Sewerage from Gwanggyo to Yeongmido improved
- 1958 \sim 1978 : The Cheonggyecheon covered
- 1967 \sim 1976 : Cheonggye Elevated Highway constructed

2. Description of the initiative or project (Cheonggyecheon before Restoration)

Cheonggye Road

Cheonggye Road was created by covering Cheonggyecheon Stream and is 50-80m wide and approximately 6km long. It became a publicly accepted road on November 7, 1984. The structure covering the stream is 6.27 km long. Under the structure covering Cheonggyecheon Stream is a 2~5m wide and 11km long intercept sewer that extends from Gwanggyo Bridge to Sindapcheolgyo Railway Bridge. There is a sewage under drainage 7m wide and 480m long from Taepyeongno to Gwanggyo Bridge and electric power points under the crossings of Cheonggye Road.There are also 32 buried pipes with a combined length of 33.5 kilometers, most of which are beneath the pedestrian walks on either side of Cheonggyecheon, including 5,620m of water pipes, 13,960m of sewage pipes, 4,560m of electric power ducts, 9,090m of telecommunications ducts, and 330m of gas lines.

Cheonggye Elevated Highway

Cheonggye Elevated Highway, stretching from Namsan Tunnel no.1 to Majang-dong is 16m wide and 5.8km long. It has a four-lane two-way highway exclusively for automobiles. Before the highway was dismantled, daily traffic volume was 168,556 vehicles, with 65,810 going down Cheonggye Road and the remaining 102,747 going up Cheonggye Elevated Highway.

Maintenance of the Structure

The Korean Society of Civil Engineering conducted a safety evaluation on Cheonggye Elevated Highway from January 1991 to October 1992. According to a report prepared by the Society in 1992, the bridge piers were in fair condition. The beams of pre-stressed concrete (PSC) were found to be in relatively good condition, but more than 20 percent of the steel beams were found to be corroded or damaged. The top plates were generally in poor condition, and it was recommended that they be reinforced or replaced. During the first phase, from August 1994 to December 1999, the 2-kilometer section from the entrance of Namsan Tunnel No. 1 to Cheonggye 4-ga was completely repaired. Access to the Cheonggye Elevated Highway by all vehicles except passenger cars was prohibited

starting in May 1997. The results of the evaluation on the structural engineering on the section from Cheonggye 4-ga to Majang-dong conducted from August 2000 to May2001 revealed that work should be done to address certain deficiencies of the elevated expressway. Based on this report, a second phase detailed design for3.8kilometers of this section was drafted from May 2001 to June 2002. It was decided that repair work would be conducted for three years starting in 2003 with a budget of 100 billion won. However, despite the fact that repair work has been on-going nearly continuously since 1992, the long-term stability of the structures still could not be ensured. It was for this reason that the Cheonggyecheon Restoration Project was formulated. It addresses the stability and safety problems as a solution to fundamental problems.

Surrounding Markets

The area to be restored stretches east to west and covers 13 dong (smallest municipal administrative unit) in four different gu (district office). Following Cheonggyecheon from Taepyeongno to Cheonggye 1-ga through 8-ga, there are 6,026 buildings, most of which are less than 50 pyeong (165m³) in size. Of these, 29% are offices, 49% are commercial, 13% are residences, and the remaining 9% are used for miscellaneous purposes. Most of the 200,000merchants in this area are engaged both in wholesale and retail trade. Most of the building in Cheonggye 1-ga and 2-ga are office buildings. Those on 3-gaand 4-ga are wholesale and retail establishments selling tools, fire extinguishing devices, electronic goods, electric appliances, and lighting. They are also home to the traditional Korean markets of Gwangjang Market and Bangsan Market. Along 5-ga and 6-ga, which have been designated as a Special Tourist District named Dongdaemun Fashion Town, are numerous shops for apparel and other fashion goods. From 7-ga to 8-ga are shops that sell shoes, aquariums, birds, second-hand electronic goods, and many other types of shops. There are as many as 500 street venders in Hwanghak-dong and Cheonggye 5-ga and 6-ga. On weekends, some 300 of these street venders set themselves up in the streets.

Necessity of Restoration

Seoul needs to transform itself into a human-oriented and environment-friendly city.

The covering of Cheonggyecheon Stream may have been prudent during the early years of Korea's economic development, when it was necessary to focus on functionality and efficiency. Now that Korea has reached a level of considerable affluence, environmental protection and respect for ecology have become the major concerns. The restoration of Cheonggyecheon will transform Seoul's image, presently associated with gray concrete, to that of a lush, green city where clear waters flow. Through this and other such projects, Seoul will be re-born as a human-oriented environmental city, greatly increasing Seoul's 'brand' value.

Seoul must recover its 600-year history and create cultural spaces.

The Cheonggyecheon Restoration Project is of historical significance in that it will help Seoul rediscover its historical roots and original look, which have been long forgotten. Gwanggyo Bridge is a valuable part of the historic heritage of the Joseon period, and it is presently buried under the roads over Cheonggyecheon. Supyogyo Bridge was relocated to Jangchungdan Park. The purpose of the excavation was to preserve the historical sites under Cheonggye Road. As it was being carried out, foundation stones were discovered at four sites of bridges, and as tone embankment was found near Mojeongyo Bridge and Gwanggyo Bridge. The restoration project will recover these artifacts of historic heritage and restore the pride of the Korean people in their 600-year old city. It is also necessary for Seoul to explore its cultural resources in order to become a cultural city for all citizens to share and enjoy.

The safety of citizens is threatened.

The structures covering the Cheonggyecheon and Cheonggye Elevated Highway were built in the late 50s and 60s. In view of the technology and construction materials in use during those times, it is safe to say that these structures are well past their intended life expectancies. These structures are so old and worn that they are beyond repair. What is worse, the bottom of Cheonggyecheon bed is polluted with heavy metals such as lead, chromium, and manganese. The corrosion of the structures is accelerated by carbon monoxide, methane gas, and other gases underground. Under these circumstances, the dismantling of the elevated highway and structures covering Cheonggyecheon Stream was inevitable to ensure the safety of the citizenry.

Balanced regional development should be achieved by revitalizing neglected city centers.

The neighborhood around the Cheonggyecheon Stream is of mainly dilapidated buildings aged 40-50 years, and it is rapidly losing its population of permanent residents. With the area deteriorating rapidly, it is becoming a slum and losing any appeal it may have had as a residential or commercial area. When Cheonggyecheon is restored, the neighboring areas will be revitalized and will be able to realize their growth potential by attracting important industries such as international financing, the cultural industry, and the fashion and tourism industry. The project will also stimulate urban redevelopment, which will contribute to the balanced regional development of regions to the south and north of the Hangang River. This will, in turn, bolster the prospects for Seoul to become more competitive as an international center of finance and business in Northeast Asia.

Progress in the Restoration Effort

Sections of Cheonggyecheon Stream to be Recovered

The Cheonggyecheon Restoration Project engendered a master plan to dismantle the structures covering the Cheonggyecheon Stream and the Cheonggye Elevated Highway, move existing facilities to other places, build facilities to restore Cheonggyecheon Stream, including the sewage system, road, bridges, landscaping, and lighting. Restoration of the Baegundongcheon and Junghakcheon Streams at the upper reaches of the Cheonggyecheon will be pursued over the long-term. The improvement of the section from Majang-dong to Jungnangcheon will also be carried out as a separate project and will apply the same concept as that for Cheonggyecheon.The section to be restored under the Cheonggyecheon Restoration Project stretches 5.84 kilometers from Taepyeongno to Dongdaemun to Sindapcheolgyo Railway Bridge. Considering that the construction work is being done within the center of the city, the entire section was divided into three construction sectors on a design-build basis. In order to ensure continuity and consistency of the stream, the entire project is being coordinated by a joint design office staffed by

architects and contractors.

Restoration of the Stream

The Cheonggyecheon will be restored as an 'urban stream in nature,'a human-oriented, environment-friendly urban space with a waterfront and walks along the banks. The proper safety management of the stream including measures to prevent overflowing is also under careful consideration. Due to global warming, weather anomalies are increasingly frequent: there could even be torrential rains in the central part of the city in summer. In consideration of the increasing incidence of floods and the extraordinarily heavy volume of floods, Seoul Metropolitan Government received consultation and advice from the Citizens' Committee for Cheonggyecheon Restoration and experts on streams. It designed

the sections of the stream in such a way as to ensure maximum flood capacity and built embankments that can withstand the worst possible flood that is expected to occur every 200 years. The safety of the citizenry comes first. The torrential rain last July inflicted huge damage in the center of city. Gwanghwamun, City Hall, and Seosomun districts were all flooded. Tall buildings, not to mention small ones, including the Dong-A Ilbo Daily building and Sejong Center, were inundated. Sejong-no main street was also inundated. Terraces and lower-lever sidewalks will be built along the upper and lower reaches of the stream. The mid-stream section from Samil-ro to Nangye-ro, extending 3.4 kilometers, will be made water-friendly. Main roads will be built along the lower level of the left bank of the stream to allow citizens visiting Cheonggyecheon to access the water more easily. From Baegundongcheon to Junghakcheon, the upper reach of Cheonggyecheon, intercepting sewage lines will be installed to collect rainwater and wastewater separately. Covering structures will be used in order to prevent wastewater from flowing into Cheonggyecheon during periods of rainfall.

Water Supply

It is most desirable for a stream to receive water from its upper reaches. However, Cheonggyecheon is an intermittent stream: it is normally dry and, therefore, requires additional flow to maintain a certain depth of water throughout the year. The water for the restored Cheonggyecheon will come from the Han River, until advanced technology to treat environmental hormones, smell, and foaming of wastewater is developed. The Ttukdo water plant will supply a maximum120,000 tons of water daily. In emergencies, Jungnang sewage treatment plant will supply 100,000 tons a day. Only after the results of monitoring on the wastewater treated at Jungnang plant prove that the BOD level of the water is below $3mg/\ell$ will the treated water be supplied to the restored Cheonggyecheon, or mixed with water from the Hangang River. The water for Cheonggyecheon will be supplied at four locations; at the starting point, Samgak-dong, Dongdaemun, and the downstream of Seongbukcheon. Cheonggyecheon will be accessible 22,000 tons of groundwater each day from the subway stations. All told, the average water depth will be 40cm, and 120,000 tons of water will flow through Cheonggyecheon each year.

Waterfront Roads and Access Road

The roads will be as small size as possible in order to minimize the flood hazard. The roads will facilitate the business operations of neighboring stores and allow for parking. According to this plan, the central parts of structures covering the

stream were dismantled. Along either bank of the Cheonggyecheon, a two-lane road will be constructed. A five-meter-wide road including two meters for parking will be constructed for stores. Thus, the function of Cheonggyecheon-ro will be changed to allow access instead of serving as one of the city's major arteries. (intended speed limit: 50km/hr)Apart from sidewalks for stores, there will be a two-meter-wide sidewalk along the stream where citizens can enjoy the scenery of Cheonggyecheon. Access to Cheonggyecheon will be afforded by bridges and waterfront roads. Citizens will be able enjoy walks along the waterside and use various facilities.The restored stream will be accessible at 17 locations, nine on left bank and eight on the right bank. The handicapped will be able to access the stream at seven locations, four on left bank and three on right bank. For emergency escape due to flooding, emergency ladders will be set up at 16 locations at appropriate intervals. Two accesses for vehicles for maintenance will be constructed, one each at the starting point and the ending point.

Restoration of Ecology

Basic concept of ecology of Cheonggyecheon restoration The effort to restore the ecology of Cheonggyecheon is based on the concept of three axes: history, culture, and nature. These three axes are further classified into eight key sceneries, which serve as modules of what will be known as the ecology street. As Cheonggyecheon is an urban stream running through the center of the capital east to west, it cannot be practically restored as a natural stream. As such, sections of the central part will be restored as an ecology section and street, and key scenery and biotope will be created at specific intervals for environmental conservation. At the downstream section where Cheonggyecheon and Jungnangcheon Streams join, a swamp and habits for fish and birds will be created so that nature and the city can co-exist.

Restoration of Ecological Environment

The waterfront will be planted with wide plants that grow well along bodies of water to create natural scenery. Some parts of the waterside will be restricted from access by citizens, and will be created as green areas for insects and birds. Following the stream, plants will be planted and swamps will be created, making a link of greenery.

Reservoirs will be built to allow the fish from the Hangang River to move, to serve as habitats for plants and animals, and also to control water depth. Channels will be created where the water flow is interrupted to allow fish to pass.

3. Main partners

Chenongguecheon retoration project was accomplished by only Seoul Metropolitan Government. (All budjet, staffs etc)

4. Impact

City Center will be recreated anew – Development Plan for the Center of Seoul

When the Cheonggyecheon is restored, the center of Seoul will be greatly changed. Seoul City formulated a long-term vision and development principles for the entire central part of Seoul and the neighborhood of Cheonggyecheon. It is preparing a plan for vital and healthy change in the area, while preserving the unique characteristics of the city center. The plan, in principle, will seek a balance between conservation and development to make

the city both more economically competitive and livable, keeping the charms of the city center. Unplanned, haphazard development will be prevented, while private sector-led natural changes will be respected. The competitiveness of Seoul will be raised by increasing public sector investment. The plan for the management of the Cheonggyecheon Restoration Project and urban development will increase economic vitality. The cultural and historical heritage of the city center will be preserved. Seoul city will make the city center a pleasant place for citizens to shop as well as to learn about and enjoy culture. The neighborhood of Cheonggyecheon had long been neglected despite the fact that it is in the center of the city, but it will now be managed under a well-organized plan. In order to make the area more pleasant, the streets and roads will be laid out with pedestrians being given priority. At the same time, historical and cultural resources will be recovered, restored, and fully utilized as tourism resources. Furthermore, the neighboring areas of Cheonggyecheon will be designated as redevelopment districts of the city center or districts for unit development to be placed under systematic management. The plans hall unfold over several phases, and it will restore the dignity and prestige of the center of Seoul, a city boasting a long history and rich culture. The area will, therefore, play central role for Seoul, a hub of Northeast Asia with a dynamic economy, diversity, and vitality.

Establishment of the Cheonggyecheon Cultural Center

The Cheonggyecheon Restoration Project is giving momentum to the construction of the Cheonggyecheon Cultural Center, where citizens are invited to reflect on the past, feel the present, and imagine the future of Cheonggyecheon. The Center will be a place of culture and history, and it will be located in Majang-dong, Seongdong-gu, which is easily accessible by public transportation. The Center will be a four-story building with floor space of 5,715m² on a plot of 2,486m². It will house exhibition halls for permanent exhibits and special exhibits, an auditorium, seminar room, and maintenance office. The Cheonggyecheon Cultural Center will be designed as a more dynamic exhibition space for the public rather than an elegant and quiet place such as a gallery or museum. An outdoor escalator will take visitors to an observation platform, from which they will be able to command a view of the blue sky, clearwater, Mt. Namsan, and Seoul Tower instead of the concrete buildings seen along the Cheonggye Elevated Highway in the past. The Center will open in September2005. There, citizens will learn about the historical, social, cultural, economic, and urban environmental change brought about by the Cheonggyecheon Restoration Project. It will explain the restoration process and will serve as a place for academic research on the historical, cultural, urban architectural, environmental, social, and economic impact of the project. The Cheonggyecheon Cultural Center will be a joyful place for citizens to visit and an attraction with a friendly atmosphere.

5. Sustainablity (Challenges of the Restoration Project)

Transportation Measures

Despite the fact that various measures had been formulated to deal with expected traffic congestion as a result of the Cheonggyecheon Restoration Project, much of the citizenry was very concerned. Citizens and interest groups involved in the restoration project insisted that a simulation test be carried out under actual conditions with roadblocks as they firmly believed that the narrowing of Cheonggye Road, one of the city's major arteries, would lead to serious traffic congestion. However, it did help the citizenry

prepare for difficulties in advance by staging a massive campaign to encourage them leave their cars at home and instead use public transportation during the course of the restoration project. While implementing transportation measures, Seoul City improved services to ease traffic. Among other actions, it established traffic information facilities and deployed traffic guides to the sites where traffic congestion was serious. There was some traffic congestion at the initial stage of demolition work, but traffic flow quickly returned to normal with the full cooperation of the citizenry. The great traffic disaster that had been so widely feared never occurred. The transportation measures for the Cheonggyecheon Restoration Project were designed to minimize inconvenience to the citizenry. In several respects, the traffic flow system in the center of the city was improved. Among other measures taken, a number of streets were designated as one-way streets; public transportation was made more convenient by establishment of bus-only lanes and operation of downtown shuttle buses; and the car owners were encouraged to leave cars at home one out of every 10 days. The restoration project is also an excellent opportunity for Seoul to expand the low-emission public transportation system and encourage wider use of pubic transportation, thereby facilitating citylife without the need for cars.

Measures for Neighboring Merchants

Cheonggye Road from 2-ga to 9-ga passes through a sprawling commercial district serviced by a nationwide distribution network. This district is home to more than 200,000 merchants and 60,000 shops. It is a vital part of the economy of the capital and will play a key role in raising the competitiveness of downtown Seoul as an economic enterprise zone. To collect opinions of merchants on the impact of the Cheonggyecheon Restoration Project on business, Seoul City held public hearings and presentation sessions for each commercial block. It helped organize the Cheonggyecheon Residents and Merchants Council and the Cheonggyecheon Merchants Association. Seoul City also conducted more than 4,000 interviews with merchants before the start of the demolition work. Based on the opinions collected, measures were devised to address complaints relating to inconveniences to businesses and to find ways to stimulate business activity inconsideration of the characteristics of the Cheonggyecheon commercial district, which is composed of different business quarter with widely varying interests. The most advanced engineering technology was employed to minimize the inconvenience caused by the demolition work due to noise and dust. To resolve parking space shortage, a parking lot was created in Dongdaemun Stadium and free shuttle bus service was provided through Cheonggyecheon.

The distribution complex to be built in Munjeong-dong, Songpa-gu in the southeastern part of Seoul will be 150,000 pyeong (120 acre), and a comprehensive distribution complex will be constructed by the end of 2007. This new complex will house wholesales and retail shops, support facilities such as logistics facilities including a distribution center, a large-scale discount store, and a multiplex movie theater. It will certainly contribute to the development of economy of the region. To help street vendors who were no longer be able to do business due to restoration, Seoul City continued dialogue with them and encouraged them to move. Most of the street vendors moved to Dongdaemun Stadium and created anew and unique market there. Seoul City is preparing various measures so that the neighborhood of Cheonggyecheon can be developed in systematic and efficient way in the long-term. Plans to develop downtown and unit sections are being formulated. Seoul City formulated the Downtown Re-development Project Model, under which the downtown redevelopment project for the neighborhood of the Sewunsangga commercial district is

being implemented.

6. Transferability and upscaling

Cheonggyecheon, Witnessing a Renaissance of Culture and History

The Cheonggyecheon Restoration Project will recover the long-forgotten history and culture of Seoul. Traditional cultural activities such as bridge stepping on Supyogyo Bridge and the lantern festival will be revived, and Gwanggyo and Supyogyo Bridges will be restored, while solving fundamental safety problems of the Cheonggye Elevated Highway and structures covering the Stream. Seoul will attract more tourists by linking such traditional cultural events in the neighborhood of Cheonggyecheon to historic sites in the center of the city.

7. Innovation

Cheonggyecheon, Where Ecology Is Alive and Well

Cheonggyecheon Stream will be restored to its original state. Once again, the sun shall sine brightly over the Stream, the air will be clear, and the fish will swim in clean water. The waterfront will be created as an ecological park where the citizenry can enjoy rest and recreation. Seoul will be transformed into a human-oriented, environment-friendly city.

Balanced Development of the Northern and Southern Parts of the City The Cheonggyecheon Restoration Project will be an important step toward balanced development between the northern and southern parts of the city. The Gwanggyo area will become a center of history, culture, and financing; the Sewunsangga area will be developed into a center of IT and electronics; and the Dongdaemun area will play a pivotal role in the fashion industry.

Seoul, an Emerging Global City

The Cheonggyecheon Restoration Project will secure the identity of Seoul as a historical city and establish a new paradigm of urban management. The neighborhood of Cheonggyecheon will be developed into a center of international finance and business, which will increase the nation's global competitiveness. Seoul will be reborn as 'A City of Culture and Environment in the 21st Century.'

8. Recognition of the initiative

(1) Magazines

Date	Subject	Media	Note
07/25/2005	What India can learn from Seoul	Rediff	
07/25/2005	Seoul's mayor shows his green streak	International Herald Tribune	
09/12/2005	Seoul's Mayor seeks to give his city a makeover	LA Times	
09/20/2005	A river runs through Seoul city once again	e-Travel Blackboard	
09/28/2005	Festival to celebrate Seoul's Cheonggyecheon Restoration	PrimeZone	
09/30/2005	Now he's captain of Seoul	Electric New Paper	
10/01/2005	Seoul to help Hanoi develop river project	Thanh Nien Daily	
10/01/2005	Seoul revives buried stream in a bid to turn green	Reuters	
10/04/2005	Seoul restores underground stream, paved over 50 years	Taipei Times	
10/07/2005	World Chinese entrepreneurs convention to be held in Seoul	Xinhua	
10/13/2005	Seoul peels back concrete to let a river run freely once again	The Christian Science Monitor	
11/11/2005	Cheonggyecheon, the new star of Seoul's Walking Tours	e-Travel Blackboard	
11/17/2005	Seoul's way sets a good development precedent	Taipei Times	
01/08/2006	Seoul reclaims a river that development had paved over	The New York Times	
01/16/2006	Taking Back the Waterfront	Newsweek	
05/09/2006	Saving Seoul [Time Asia]	Time Asia	
10/17/2006	Seoul's revitalized waterway is awash in ideas for L.A.	L.A. Times	

(2) Journal Papers (Overseas)

- 1. J.H. Shin and I.K. Lee, Cheon Gye Cheon Restoration in Seoul , Korea, Proceedings of Institute of Civil Engineers-Civil Engineering, Nov, 2006, Vol.159, No.4, 162-170.
- 2. T.S. Lee, *Buried Treasure; Cheonggyecheon Restoration Project*, Civil Engineering, the Magazine of the American Society of Civil Engineers, 2004, Vol.74, No.1, 31-41.
- 3. J.H. Shin, Y.H. Lee, W.T. Kewon, and Y.J. Kim, *A Large Scale Demolition in a Densely Populated urban area*, Bridge Management, Thomas Telford, London, the UK, 2005, 195-202.

Some slides in the presentation







Introduction

Outline





Design for Stream Restoration Design Criteria for Stream Section and Embankments Secure the stream capacity for 200 years frequency rainfall (118mm/hr) Access to Water: Install sidewalks along the lower level of the bank



Outline

Sewer system	Outline	Bridge design	Outline
Design Criteria: acceptable stream water quality Combined system for rainfall and wastewater Capacity: ① 3 times estimated wastewater (3Q: 1.95m tons/day) ② combined sewage overflow up to 2mm/br rainfall ③ Excessive rainfall		 Number of bridges: 22 15 brs for motorists (with sidewalks) 7 brs for pedestrians 	
Combined Sewer System		 Design Criteria armony with surrounding environm artistic landmark 	「「「「「「」」





 Iteration
 Outline

 Image: Provide the identity of Seoul with 600 yr history
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