

Changnyeong Haman Weir Project for Nakdong-River Restoration

1. PROJECT

A. Description

Changnyeong Haman Weir Project for Nakdong-River Restoration stretched from Oisan-ri, Bukmyeon of Changwon City to Macheon-ri, Gilgokmyeon of Changnyeong County with total length of 13.14km. The components of the Project were to construct multi-function weir, to dredge the stream bottom, to make ecological stream, and to make scour protection work and river bed protection work, and to strengthen a water pumping and distribution system.



B. Flood control and Stable securing of water

Changnyeong Haman Weir as a combined fixed and movable weir, can cope with localized flooding by discharging water via opening floodgate. Specifically, it copes with flooding by operating movable weir in coordination with operation of the dams, reservoirs, and weirs at upstream and downstream of the river. At normal times with closure of floodgate, water level arises and water discharge increases. However, when flooding occurs, the water levels of main stream and its tributary will simultaneously decline by opening floodgate. This is because stream bottom is deeper owing to dredging and the velocity of flow in the main stream is faster.



C. Amenities in riverside area

This Project enables its neighboring residents to use various amenities in riverside area such as ecological park. At the weir, a bridge-way is constructed for enabling its neighboring residents to use it as bike path and a spectacular tower on weir is used as resident's amenities. In addition, the weir is a landmark contributing to revitalization of the local economy by installing night-lighting on the weir. An ecological park around the weir is expected to contribute to the better quality of resident's life.



D. Installation of movable weir and Small-scaled hydropower generation

Changnyeong Haman Weir has a movable weir designed to make discharge of sediment at the upper stream of the weir easier and to improve water quality using water flowing. At the right bank of the weir, small scaled hydropower plant with the capacity of 5,000kW is constructed so that it produces clean energy with 30,042MWh / year.

2. Innovation, Quality and Excellence

Changnyeong Haman Weir was planned as a multi-functional weir in order to bring about regional economic prosperity and balanced regional development by making it a local attraction through improved water quality by securing usable water capacity and stable supply of instream water. Total length of the weir is 549.3m, of which 144m is movable, and 405.3m is fixed. For the doors of the movable weir, rising sector gate was introduced. For this type of water gate, when excluding the upstream soil the bottom part of the gate is opened (underflow), and in times of flooding, the door is moved completely to the bottom (overflow) to allow for smooth flood control. The symbols of long cultural traditions with its unique history, such as the Haman 'Ara Gaya' and Changyeong 'Bitbeol Gaya' were reflected in the design of Changnyeong Haman weir, and it was designed as a multi-functional and environmentally friendly weir shaping the wings of green growth depicted in the motif of a large swan's wings embracing the Nakdong river and its flight.



On each side of the right and left banks of the weir, step type fish-way and ice harbor type fish-way were planned, and on the upper part of the weir, a public bridge-way was planned. Also, in the right bank, small hydro-power generator facility with the capacity of 5,000kW (1,250kW × 4 units) was installed.



In this Project, dredging of the river bottom was planned in order to improve the stability of the flood control, and the basic direction for the maintenance of the Project is as follows:

- Ensure stability in flood control with improvement of low-lying flooding areas by dredging low water channel which causes decrease of flood level.
- Plan the width of improvement for low water channel considering the current width of the stream and width of low water channel.
- Plan the cross section of low water channel improvement as a single cross section so that the entire base cross-section will be a compound cross section
- Determine drilling depth considering the benefits of natural river slope, average bed slope, equilibrium bed slope and period-specific grade plan considering the primer characteristics by section, dimensions

The basic direction of composition of the ecological stream in this Project is to hold the look and environment of existing natural, historic and cultural heritage within this space

to create space for a various local identity.

Specific plans include amenities in the riverside areas with good accessibility due to its location adjacent to the Haman county forming convenience facilities such as sports facilities for all, picnic areas, and relaxation facilities, etc., as well as formation of regional community space by introducing ferry experience site, cultural experience site in consideration of the locality.

3. The principle of transparency and integrity

Nakdong River Restoration Project is a single project closely related to a large-scale long-term national development plan, and has a typical characteristic of large-scale central Government led project with a great ripple effect of socio-economic. Therefore, there is no choice but to come out diverse values and perspectives voices in favor of or opposed by various parties, so solving this conflict is bound to be difficult. The initial conflict generated over the pros and cons of the Project lasted throughout the project period. However, starting with explanation of the ongoing national plan before start of the construction helped gain support of the local people who were benefitted from the Project. In addition, empirical verification by the people was possible due to the rapid promotion of the Project, and the Project was able to be completed within the planned time and budget by opening all aspects of the Project to the people throughout the Project implementation period. The salient features of the Project implementation are as follows;

- The professional public relations organization for Nakdong River restoration Project was formed and operated. Professional public relations organization were focused on providing accurate information construction progress to residents in real time
- Organizing and operation of public-private joint special Korean auditors before and after completion: The Korean inspection team consisting of private experts was organized to perform the on-site inspection of the Project. The technical documents such as design documents and construction photos, structure review reports and etc. were checked and concurrent review of field inspections was also performed.
- Reflect people's opinion through continuous public hearing and discussion after the completion of the design process from the master plan,
- In order to communicate with the young people, events such as debate consisting of university students on the truth behind the Nakdong River restoration Project, and University Students Supporters contests for Four Rivers were held.
- Hold Various Seminars : International Symposium on Four Rivers Restoration Project; Technical Seminar on improving the four Rivers Water Quality; 2012 World River Forum, etc., were held
- Bi-directional communication with the residents: Operate internet portal sites, and Social Network Services platforms: through use of the internet mediums, produce online events and PR videos (User Created Contents), as well as online public competitions were held. New culture market was planned that utilizes the User's Guide to the four Rivers portal site (www.4rivers.co.kr) as its medium.
- Aside from this, interaction with the residents were done through various marketing and events such as the weir opening ceremony and four major rivers cultural center opening, auto-camping festival, flying stunt experience etc.

4. Contribution to Sustainability and Environment

Wastewater from factories and domestic sewage from upstream of the Nakdong River have deteriorated the downstream water into Grade 3~4. A plan was established to restore and distribute the downstream water into a drinkable, Grade 1~2 water.

A plan was established to secure 127,000,000m³ of flow water with the construction of multi-function weir. With the water security plan, floods that have been caused by climate change can be handled, and hydro-ecological restoration and streams with falling water levels can be restored. With the expansion of the flow water capacity, ecological stream was restored with rich and clean water flowing year round, regardless of rainy and drought seasons. Areas around the restored stream have been planned to be turned into a pleasant riverside area.

Culture plaza, exercise facility, rest area, and walking paths were established along the riverside, which was previously polluted with various trashes.

With the establishment of an ecological park, waterfront area was made that local residents could visit, and a bike path was installed that circles the perimeter.

The public bridge-way along the top of the weir is accessible with a bike, and utilization plan was established to install a spectacular tower with a gallery and an ecology promotional plaza.

We are moving from the era of trees, coals, and oil, and are facing a low carbon, green growth energy era. This green growth refers to the sustainable growth with the reduction of greenhouse gases and environmental pollutions. A small scale hydropower plant that uses the difference in up and downstream currents was installed to create new and renewable energy.

Small scale hydropower plant has been receiving praise for not emitting pollutants, compared to thermal power plants. Maintenance costs are low because there are no fuel costs, and also no risk of air pollution, nuclear waste, and radiation that thermal and nuclear power plants bring.

Rising Sector Gate that opens as floodgate turns has been installed at the weir, and not only does it control water levels during flood and drought, it allows upstream sediments to be easily deposited. This allows water quality management to be easily controlled with the flow of water in the weir.

In order to continuously maintain the improved water quality, water quality measurement network was instituted and management reinforced. Water quality forecast system was introduced to be notified when quality levels fall, and plan was made to monitor the changes in water quality of the Nakdong River.