

Seamankeum Comprehensive Tideland Reclamation Project

Lim, Byong Ho

Chief of Design Division Saemankeum Area Project Department, Rural Development Corporation

I. Gernal Description

In order to overcome the unfavorable internal and external circumstances with which Korea is confronted and to meet the increasing industrial demand for land and water resources, the Rural Development Corporation(RDC) has pursued a long term development program for southwest coast tideland reclamation, which can facilitate appropriate multi-purpose land use and management, intensive utilization of limited national resources and environmental conservation. The program is based on RDC's high level technological knowledge and much experience accumulated through the implementation of many large-scale tideland reclamation projects for the past 30 years.

The Saemankeum Comprehensive Tideland Reclamation Project has been initiated in the process of carrying out this program. RDC conducted the feasibility study for the project based on reconnaissance survey in 1987, and a follow-up master plan has been formulated in 1989. The detailed design of seadikes and sluices has been completed in 1991, and seadike No. 1 is under construction since Nov. 1991 with the approval from the authorities for the project execution. This comprehensive reclamation project has established to be closely linked with the related national development project such as the West Coast Expressway Project, the Kunsan-Janghang Industrial Complex

Project, etc.(refer to <Fig. 1>).

The project provides for the comprehensive development of the Mankyong river, the Dongjin river and the adjacent islands. Water stored at the estuary of the rivers will be supplied for agriculture, horticulture, aquaculture and other industries in the entire project area and facillitate fishery and recreational development.

The project will expand infrastructural facilities including transportation and harbour which can serve as an advanced base for the forth-coming western coastal era. In addition, the project will enhance and integrate the management of available resources and accelerate active rural industrialization of the project area.

II. Project Area

The project area, lying on the southwestern coast of Korea between latitude $35^{\circ}38'$ and $35^{\circ}50'$ and longitude $126^{\circ}26'$ and $126^{\circ}45'$ E, is located in the estuary of the Mankyong and the Dongjin river of the Jeonlabukdo province.

The area covered by the project is geomorphologically characterized by vast reclaimable tidal flats with a gentle slope around the estuaries of the aforementioned two rivers. The favorable topographical conditions and good foundations along the seadike alignments allow the enclosure of the area with relatively short lengths of seadikes. Materials

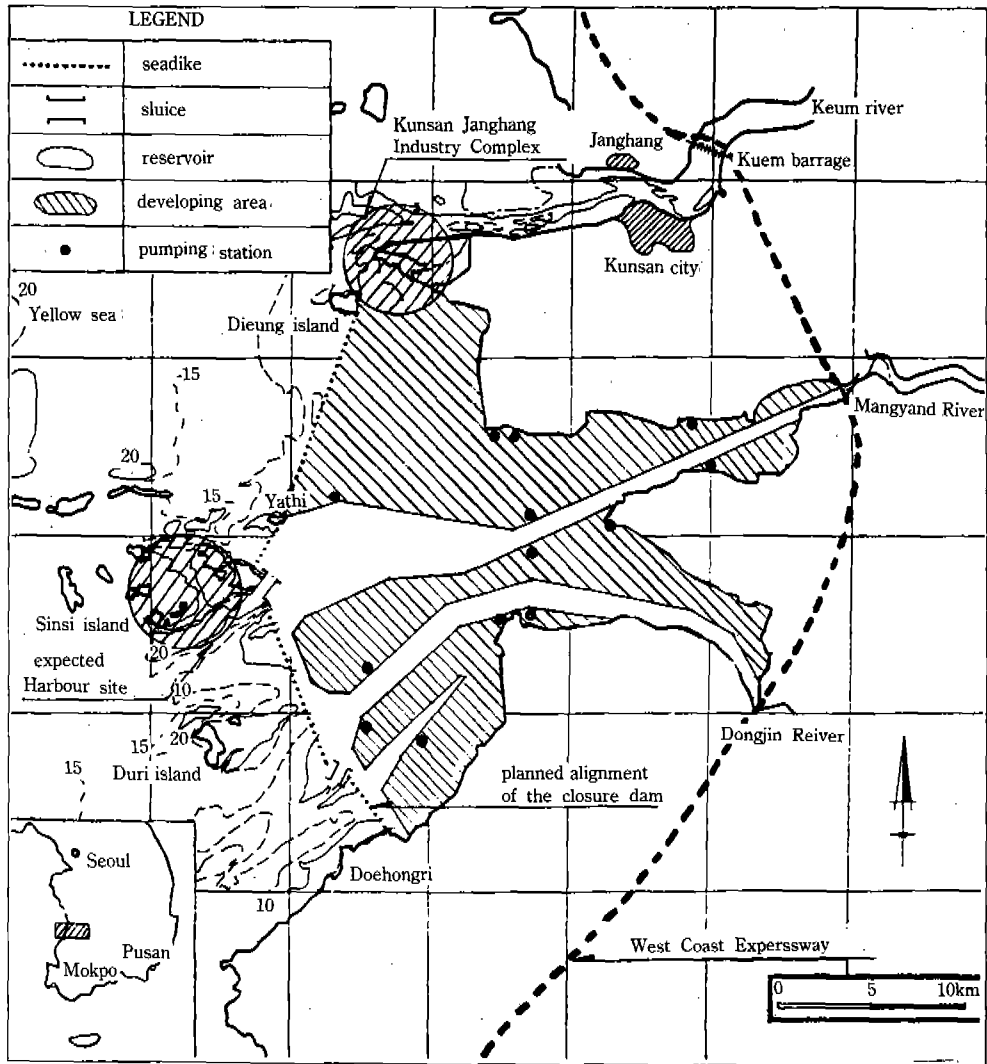


Fig. 1. Saemankeum comprehensive tideland reclamation project

for dike construction are abundantly available within or in the vicinity of the project area. Especially, a naturally advantageous harbour with an excellent navigable channel of some 18~25 meters in depth will be available in front of the Gogunsan islands, resulting in significant contribution to the Yellow sea international maritime transportation.

Some selected industrial indicators are inferior to those in the other regions as set out in Tables

1 and 2. This Seoul metropolitan region and southeastern part of the peninsula are densely populated with secondary and tertiary industries whereas the southwestern region, especially the project area, is largely composed of primary industry area. The employment proportion of the agriculture, forestry and fishery sector amounts to about 50 percents, which shows in Table 1 that the project area is under developed compared with the

other areas. However, this means, in other words, that the potentiality of productivity increase in those sectors will be very high with a small additional infrastructural investments and development priority.

III. Research and Design

For the Saemankeum project, a considerable number of alternative designs and research activities have been made with the assistance of many related scientific and engineering research institutions, with completion of this project, RDC's engineering and construction skill and experience will break new ground in closure works, requiring a substantially higher level of technology in both engineering and construction. This higher level demanded

a fundamentally different integrated approach to that of simply extrapolating present experience and know-how. Especially, special attention has been paid to the treatment of deep channel, a large amount of tidal prisms and final gap closing in this project.

The major structure comprise seadikes and discharge sluices. The total length of seadikes is 33 km long, which is the longest one in the world, connecting the heads of the islands of Garyuk, Sinsi, Yami and Bieung in the Jeonlabukdo province. The alignment investigations have been made for 5 years since 1986, and on the basis of a variety of considerations, in particular, technical and economical factors, the choice finally fell on the present alignments as given in Fig. 1.

Shape of the dikes will be a trapezoidal cross-section with a maximum structural height of 36m and base width of 200m, and the dike body consists of dredged materials with a protective layer of riprap, which is expected to make a full resistance to a heavy storm. The upper berm width at reservoir side of the dike body accommodates a four-lane paved road, which functions as a link between the future harbour and the existing inland industrial districts. The major quantities of

Table 1. Structure of employment by industry (1990) (unit : %)

Industry	Whole country	Jeonlabukdo
Primary	24.4	49.6
Secondary	25.6	11.4
Tertiary	50.0	39.0
Total	100.0	100.0

Source : EPB, industrial census report, 1990

Table 2. Selected social indicators of project area(1990)

Item	Unit	Whole country	Seoul metropolitan region	Central region	Southeast region	Southwest region		Other
						Jeonbuk ¹	Jeonnam	
Land for factory	1,000m ²	317,050	94,599	29,743	137,807	11,390	35,655	7,856
Firms	—	61,723	35,079	3,389	17,097	1,724	3,040	1,394
Workers	1,000psns	3,208	1,520	204	1,211	81	112	80
Production	US billion \$	181	79	11	72	4	11	3
	billion won	135,689	59,374	8,263	54,169	2,887	8,495	2,501
Population	1,000psns	41,975	17,195	4,329	12,385	2,163	3,705	2,198

Note : ¹including project area

Source : EPB, Yearbook of local area statistics, 1990

the dike construction involved include 30million cubic meters of riprap and 70 million cubic meters of dredged materials.

Two discharge sluices will be built at the Gar-yuk island and the Sinsi island, respectively. Various types of sluice have been reviewed and evaluated with respect to economical, structural and hydraulic aspects, and then the radial gate with the cylinder uplifted by hydraulic pressure was the final selection. Major factors which led to the selection of the sluice were its excellent discharge ability and fine view. Two sluices are controlled by eighteen radical gates of 30m wide and 15m high equipped with hydraulic pressure and each gate was designed to discharge the maximum design flow of approximately 880 cubic meters per second at a maximum reservoir elevation of 1.5m. Two navigation structures and fish-ways will be provided on each discharge sluice structure.

In addition, extensive investigations and studies for environmental impacts have also been assessed since the detailed design has been commenced. However, the unfavorable impacts due to implementing the project, if any are evaluated to be much smaller than the environmental benefits gained from improved infrastructures and living environments as a result of expansion of national territory and creation of favorable harbour site by reclaiming the otherwise wasteland.

General Information :

Projet costs : US \$ 1,090,000,000
(820 billion won)

Construction periods of : 8 years
seadikes and sluices

Fresh water reservoirs :

Total Storage capacity : 535,420,000m³
Effective storage capacity : 354,720,000m²

Design flood water level : EL 1.50m
Normal water level : EL -1.50m
Dead water level : EL -6.50m
Water surface area at full water level : 9,672 ha

Seadikes

Number of dikes : 4 alignments

Type : seabed sand fill with a protective layer of riprap

Dimension :

Total length : 33km
Maximum height : 36m
Height above MSL : 8.5~11.0m
Crest width : 4m
Average sea bottom elevation : El -7.0
Maximum base width : 200m
Road elevation(reservoir side) : El +5.0m
Road width(reservoir side) : 14.0m

Discharge sluice(2 places)

Type : double radical gate with hydraulic lifting system

Dimension :

Total length : 656m
Sill elevation : EL -6.5m
Gate height : 15m
Gate width : 30m
Number of gates : 18 gates
Navigation lock : 2 places
Fish-way : 2 places

IV. Tideland Development Plan

The project involves industrial land creation, surrounded by polder dikes, which is divided into several districts characterized by industrial sectors. The following tabulation summarizes the plan of the land use and major facilities based on infor-

mation contained in the master plan.

Tideland development

Construction costs	: US \$ 640,000,000 480 billion won)
Construction periods	: 6 years
Development area	: 40,100 ha

Land use planning

City & Industrial complex	: 9,400 ha
Agriculture & Aquaculture	: 18,900 ha
Fresh water reservoir	: 11,800 ha

Major facilities

Polder dikes	: 138.3km
Pumping stations	: 13 places
Irrigation canals	: 13 lines, 127.8km
Drainage channels	: 22 lines, 192.2km
Transportation network	: 110km

V. Project Benefits

The major benefit to be derived from the project would be substantial increase in agricultural, industrial and aquacultural production and farm incomes. The project provides about 148 million tons of agricultural and aquacultural water and 182 million tons of municipal and industrial water supply a year. The fresh water reservoir will provide about 350 million tons of water at normal water level, which also creates favorable conditions for the development of scenic and recreational opportunities in the area. Since the project area is within, at most, an hour's drive from the adjacent large cities and the heavy population centers in Jeonlabukdo, provisions for extensive industrial and recreation benefits will be very advantageous

to the regional development. With the anticipated large demands for industrial lands, the reclamation in the estuary will contribute to provide necessary lands owing to construction of the seadike.

Gogunsan harbour with an easy maintainable canal, which is created through completion of the project, will be able to accommodate 50,000 ton vessel and handle 50 million tons of cargo per year. The harbour site holds a strategically prime location at the center of industrialized areas in the southwestern regions, thus having a potential to provide a fast and flexible means of international transport.

The expansion of the industrial base, which can be the driving forces for the regional economic development, will attract the labor forces and generate large employment, increasing the overall labor productivity. Furthermore, a regionally balanced infrastructure and industry will play a major role in shaping the future industrial pattern of the project area, thus, greatly contribute to the economical growth of Korea.

References

1. Economic Planning Board, Industrial Census Report, 1990.
2. Economic Planning Board, Yearbook of Local Area Statistics, 1990.
3. Agricultural Development Corporation, Implementation Planning of Saemankeum Comprehensive Tideland Reclamation Project, 1991.
4. Korean Industrial Research Institute Quantitative Input/Output Relations Analysis in the Saemankeum Project, 1991.