Restoration of the Brackish Ecosystem in the Nakdong River Estuary

Current Status & Key Tasks

기후에너지환경부 K water

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01 Overview

Overview of the Nakdong River Estuary Bank

Cases of Upstream Salinity Increase at the Estuary Bank

[Saltwater Intrusion Before Bank Construction]

* PSU : Salt mass (g) per 1kg of seawater

Note	Water withdrawal Suspension(days)	Maximum Salinity Concentration (PSU)
'75	16	1.14
'76	9	2.30
'77	45	3.59
'78	17	2.77
'79	1	0.47
'80	1	0.55
'81	7	1.23
Avg	14	1.72

[Annual Days of Water Intake Suspension(Mulgeum)]

Water Intake Suspension(Mulgeum) ('82.3.18, Busan Daily)

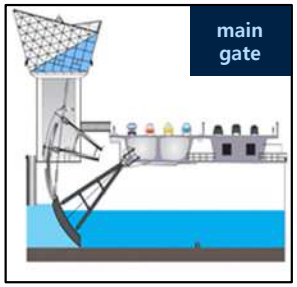
Water Supply Emergency('82.7.22, Busan Daily)

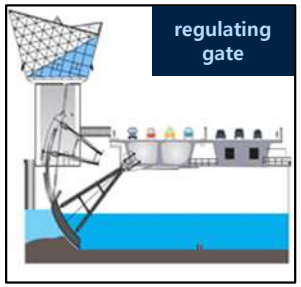
01 Overview

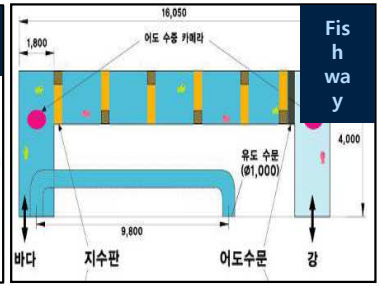
Facility Overview

Left Bank Drainage Sluice

- Project Period / Budget: 5 years ('83–'87) / KRW 200.6 Billion
- Overview: Total length 510 m / 6 main gates, 4 regulating gates
- Purpose: Prevention of Saltwater Damage, Flood Mitigation

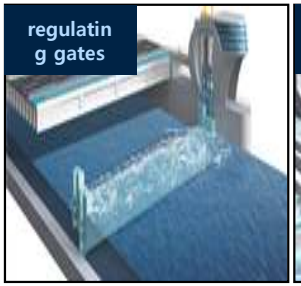






Right Bank Drainage Sluice

- Project Period / Budget: 5 years ('09–'13) / KRW 267.6 Billion
- Overview: Total length 343 m / 3 main gates, 2 regulating gates
- Purpose: Flood mitigation, Enhancement of levee stability

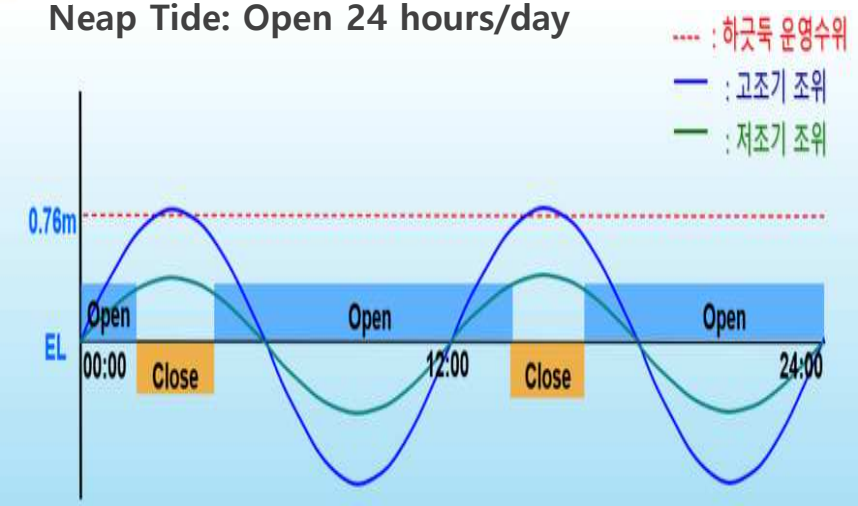


Operational Guidelines

» Managed Water Level: EL. 0.51~1.01 m
(Based on Gupo Bridge water level station)

» Standard Gate Operation

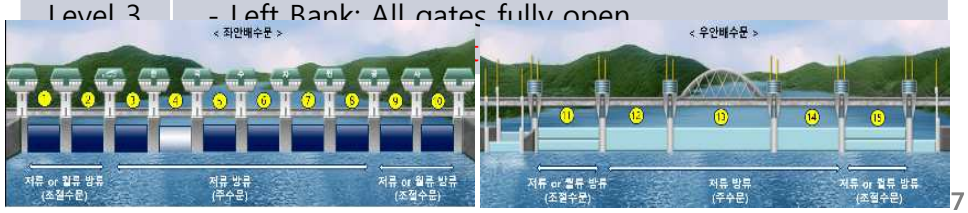
- **When the upstream water level exceeds the downstream level by 0.2 m or more : Gate Open**
- **Spring Tide: Open 16 hours/day**
  Neap Tide: Open 24 hours/day



» Flood Gate Operation

- **Discharge ≥ 1,200 m³/s at Changnyeong–Haman Weir (75 km upstream)**
  Gates operated under flood conditions

	Discharge ≥ 1,200 m³/s at Changnyeong–Haman Weir
Level 1	○ Weir Discharge: 1,200 – 14,500 m³/s - Left bank: Main gate operation - Right bank: Regulating gate release (max. 150 m³/s)
Level 2	○ Weir Discharge: 14,500 – 16,800 m³/s - Left Bank: All gates fully open - Right Bank: Regulating gates and main gates opened
Level 3	○ Weir Discharge: Exceeding 16,800 m³/s - Left Bank: All gates fully open



02

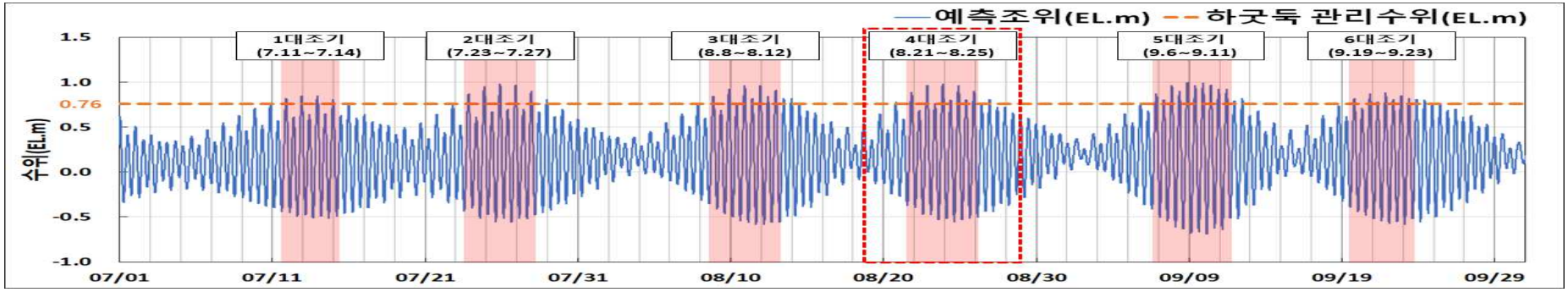
Brackish Ecosystem Restoration : Current Status

02 Brackish Ecosystem Restoration: Current Status

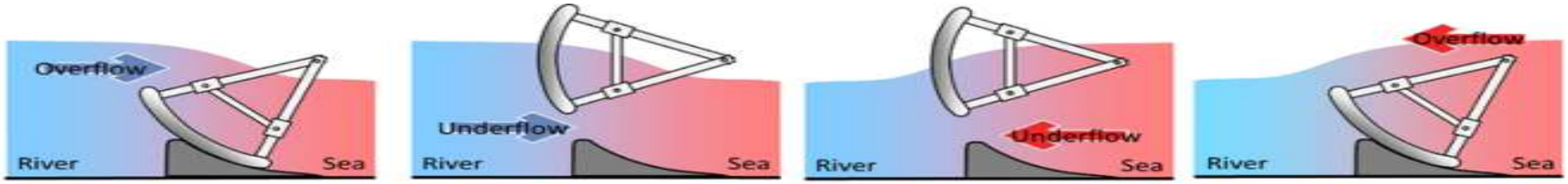
Creation of a Brackish Water Zone

Seawater inflow implemented during each spring tide, considering gate conditions

››› (Inflow Timing)Implemented when the tide level rises above the managed water level of EL. 0.76m



››› (Inflow Methods) Determined based on gate conditions and fish migration periods →Overflow or Underflow



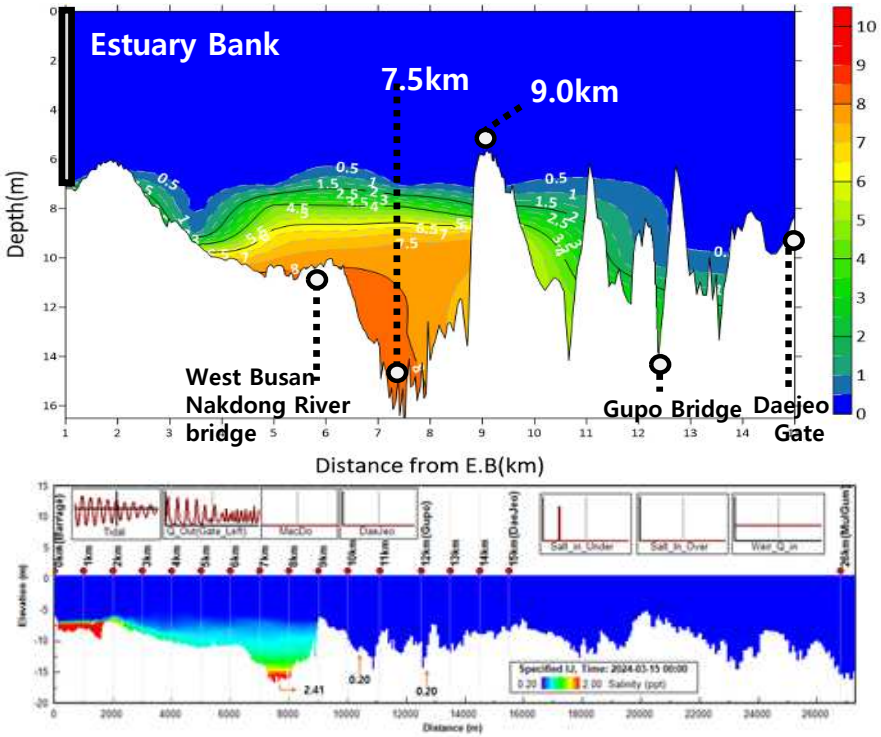
[월류방류] [저류방류] [저류유입] [월류유입]

02 Brackish Ecosystem Restoration: Current Status

Salinity Prediction Modeling & Monitoring

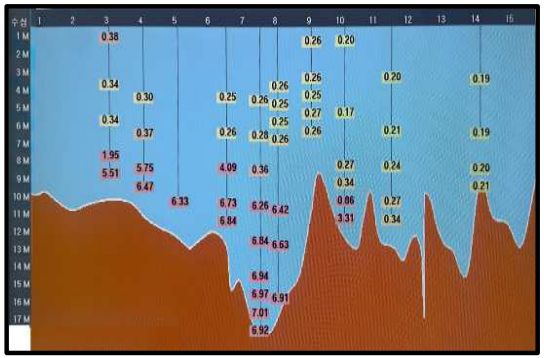
Salinity Intrusion Prediction (Distance & Concentration) and Real-time Monitoring

Salinity Transport Modeling(EFDC)



Real-time Monitoring

☞ Data collected from K-water (30 stations), Busan City (23), and KOEM(2)



< Fixed Sensors >

< Mobile Sensors >

< Installation of Salinity Sensors >

03 Key Implications

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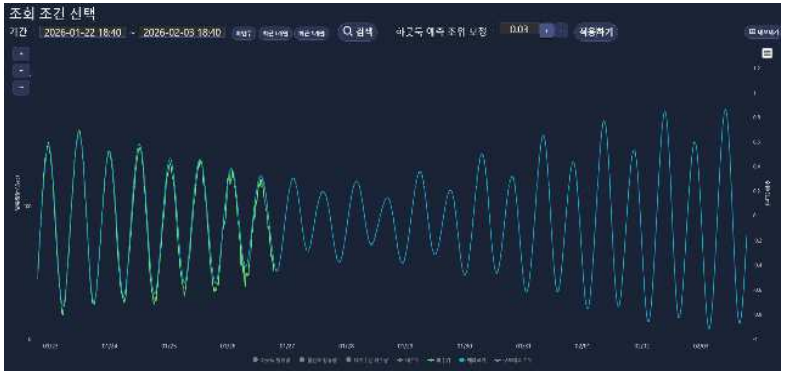
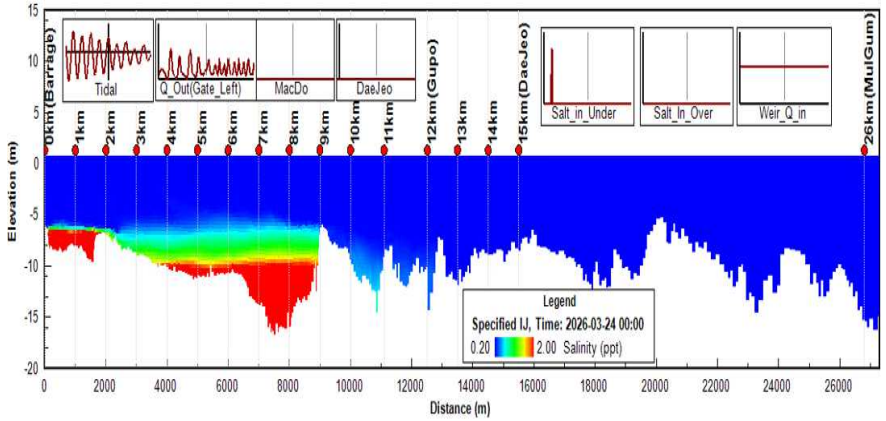
Type	Pre-Opening	Post-Opening
Integrated Water Management	Focus on Salinity Control	Brackish Ecosystem Development
	Focused on Upstream Flood Control	Interaction of Salinity, Flow, and Tides
	Freshwater-Marine Separation	Fresh–Marine Ecosystem Connectivity Needed
	Low Density Flow Mixing Capability	Advanced Modeling of Density Flow Mixing & Dispersion



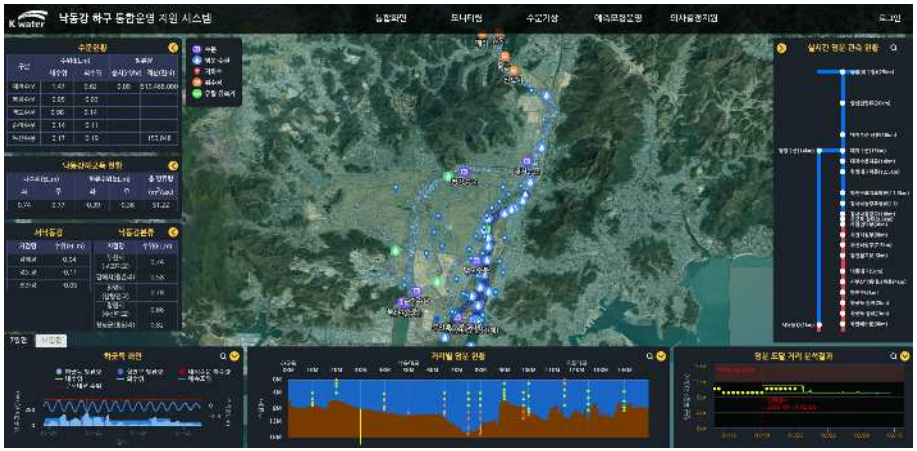
< Interaction of Salinity, Flow, and Tides >



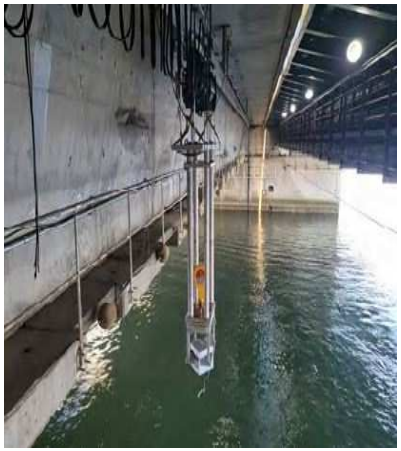
< Advanced Modeling of Density Flow Mixing & Dispersion >

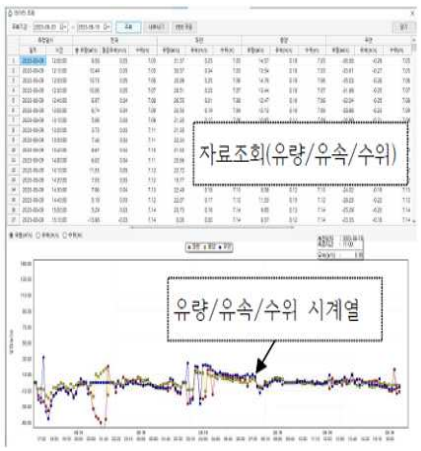
03 Key Implications

Type	Pre-Opening	Post-Opening
Digital Water Management	Prevention of Seawater Intrusion	DT-Based Estuary Management with Real-Time Seawater Intrusion Prediction
	Opening-Discharge Chart from Hydraulic Model Tests	New Opening–Inflow Charts for Seawater Inflow Charts (Hydraulic & Numerical Modeling)



< DT-Based Estuary Management >





< New Opening–Inflow Charts for Seawater Inflow Charts >

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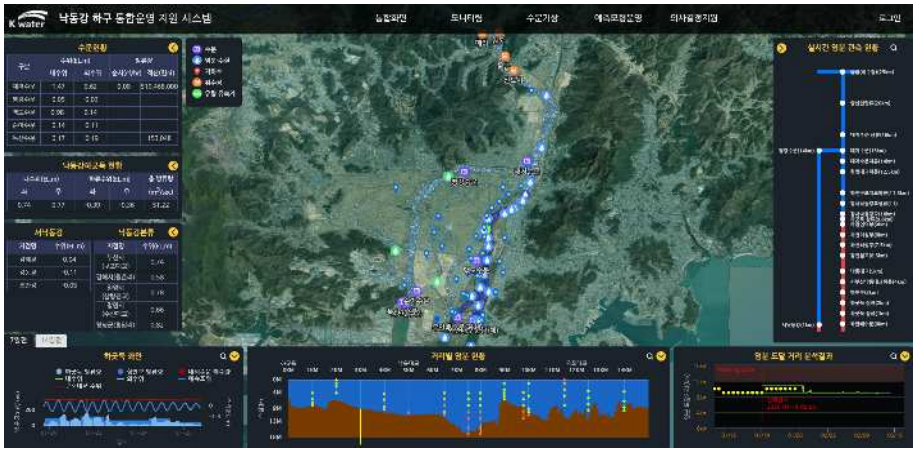
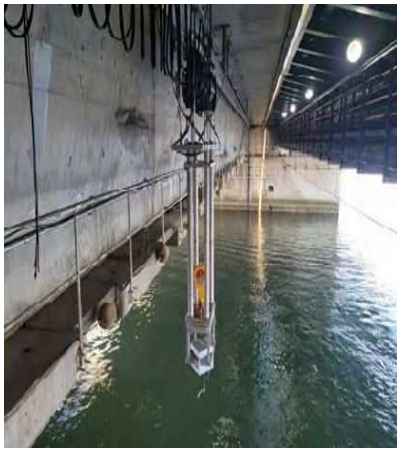
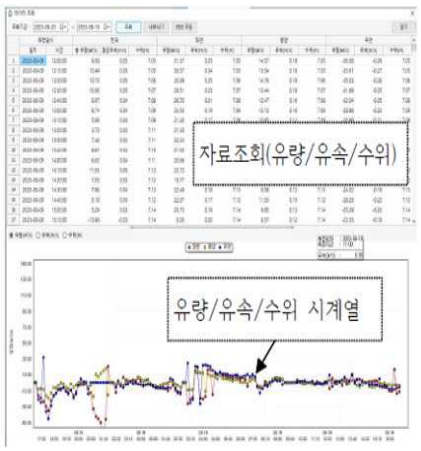


< DT-Based Estuary Management >





< New Opening–Inflow Charts for Seawater Inflow Charts >

03 Key Implications – Promotion

››› Publicity Facilities

☞ Increase In visitors following Brackish Zone restoration operations

››› Promotion Video

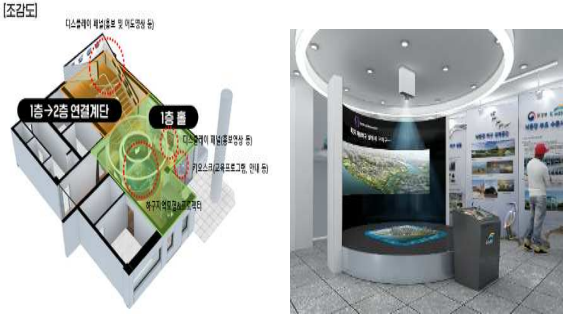
☞ Production of a video on the Need for and Approaches to integrated Water Management

››› Diorama

☞ Visual Explanation of the Estuary Integrated Operation Center and Brackish Water Restoration

››› Content

☞ Produce promotional videos on Brackish Water restoration and project them onto the scale model



< Publicity Facilities) >

<Promotion Video>

<Diorama & Content>

04 Future Plans

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Implementation of National Policy Tasks

Expansion of the duration and spatial extent of brackish water zone formation

* (National Policy Task 45) Restoring River Naturalness and Biodiversity in Korea's Four Major Rivers

- (Duration) 190 days (2025) → 200 days (2026)

- (Extent) ≤15 km → >15 km upstream (Post-Construction: Daejeo Sluice)

  * Daejeo Sluice : Salt damage prevention and stable agricultural water supply(through Aug. 2027)

  ** Formation Days : Criteria under review(currently defined at the deepest point 7.5 km upstream, ≥0.5 psu)

Type	2026	2027	2028	2029	2030
Content	Expansion of Brackish Water Zone Days (200days)	Establishing the Foundation for Brackish Water Zone Formation (Demonstration tests, monitoring, etc.)		Expanded Operation of the Brackish Zone (Beyond 15 km)	

- (Restoration Projects) Continued aquatic environment monitoring and juvenile fish release

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For Reference

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Estuary Bank Opening Process

* Based on the Nakdong River Estuary bank Operation & Ecological Restoration Study (Ⅱ)