INNOBIZ 기술혁신형중소기업 | Venture Enterprise 벤처확인기업 | KAB | 가족친화 우수기관 Best Family Friendly Management

A group of earth science
and technology experts,
we provide the best solutions
for customer satisfaction.

GeoSR
GeoSystem Research Corporation

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|주| 지오시스템리서치
www.GeoSR.com

A company of world-class earth science and technology experts who values the conservation of human and nature. GeoSystem Research Corporation.

Our experts in earth science and technology will provide the best solution to fulfill customer satisfaction.

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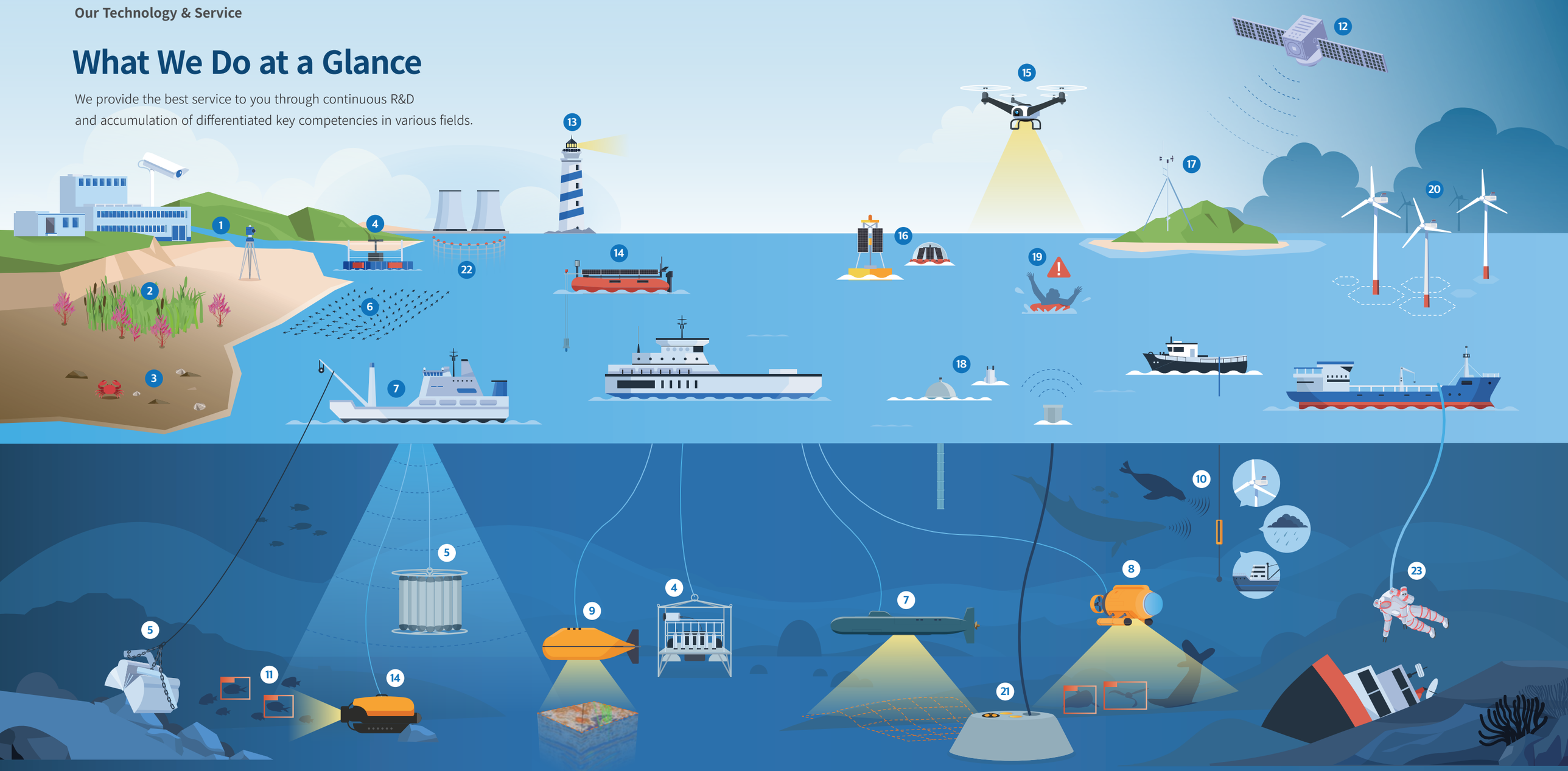
Our Technology & Service

What We Do at a Glance

We provide the best service to you through continuous R&D
and accumulation of differentiated key competencies in various fields.



1 Coastal Management
- Coastal erosion and disaster management
- Coastal environment and coastline video monitoring
- Wave-induced current and rip current monitoring
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- Climate change impact prediction
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- Underwater/seafloor structure installation
- Coastal area maintenance

Greetings from the CEO

"We will provide the best service to you through continuous R&D and accumulation of differentiated key competencies"

Since our foundation in 2000, we have been working hard to realize our customer's needs through sustainable environment management. To realize this value, we've been providing honest service by pursuing technological excellence in science and engineering, from monitoring to modeling, for areas including the ocean, rivers, and estuaries.

With over 20 years of accumulated experience, we are keeping a keen eye on innovative changes currently taking place in related fields of science and industrial technology. We will continue to place our value on saving the water environment, and now we want to get closer to fulfilling the values we are pursuing by taking on new challenges.

Based on this spirit of challenge and our most valuable asset, our human resources, we will strive to gain more trust from our customers and contribute to enriching the lives of the public through better services.

We look forward to your continued support, encouragement, and love. I and the entire staff would like to thank you all with one accord.

CEO **Kim, Kiyeon**

Mission & Vision

MISSION

Contribute to conservation and sustainable development of the global environment by bringing together leading competencies in earth science and technology

VISION

A leading group of world class experts in earth science and technology

CORE VALUES

Ethical Management
We abide by relevant laws and regulations and act in the best interests of the company and the public.

Customer Satisfaction
We work hard for customer satisfaction by ensuring quality results through optimal technology.

Continuous Innovation
We provide differentiated customer service through continuous innovation.

Pursuit of Happiness
We value the happiness of our employees, their families, customers and partners, and we strive to improve their health, safety, and quality of life.

Cooperation and Communication
We maximize our collective intelligence through active cooperation and communication.

Thrift
We practice thrift and only use what is necessary to preserve the global environment.

HISTORY

History of GeoSystem Research

GeoSystem Research Corporation is an earth environmental engineering service company founded in July 2000. We continue to devote ourselves to the development of earth science and technology. To take the steps to become a world-class earth science and technology expert group, we declared our vision in 2016 and have been striving for continuous innovation, customer satisfaction, and ethical management. All the employees and executives of GeoSystem Research Corporation are working hard in unison to achieve our vision.

Foundation, a New Start
2000~2005

2000.07 • Foundation of GeoSystem Research Corp.
• Establishment of auxiliary research institute.
2000.08 • Registered as a software service provider (KOSTA)
• Registered as an engineering service provider specialized in oceanography (KENCA)
2001.05 • Registered as a Venture Company (MSS)
2001.10 • Registered as an engineering service provider specialized in aquaculture (KENCA)
2002.01 • Designated as an military duty alternative company (MMA)
2002.08 • Registered as an engineering service provider specialized in water resource development (KENCA)
2004.05 • Registered as an engineering service provider specialized in port and coastal engineering (KENCA)
2004.10 • Selected as a company with outstanding technology (KOTEC)
• Relocated company office for expansion
2005.02 • Registered as a hydrographic survey provider (KHOA)
• Registered as a coastal survey provider (NGII)

Advancement and Growth
2006~2010

2006.07 • Registered as a Gyeong-gi Industry Family company
2006.11 • Establishment of company factory (Gunpo City)
2007.04 • Qualified as an Inno-Biz company (MSS)
2007.05 • Registered as an aids to navigation management provider (MOF)
2007.07 • Selected as a promising SME (Gyeonggi-do Provincial Government)
• Selected as an outstanding SME (IBK)
2007.09 • Registered as a geodetic survey provider (NGII)
2008.02 • Changed to hydrographic service provider from hydrographic survey provider
2008.04 • Registered as a research and development service provider (MSI)
2008.05 • Registered as a marine environmental impact assessment provider (MOF)
2009.05 • Certified for ISO 9001 (KIC)
2009.07 • Selected as an outstanding new growth engine company in Korea (MOTIE)
2010.12 • Received the grand prize in Gyeonggi Province SME awards (Gyeonggi-do Provincial Government)

Endeavor for Innovation
2011~2016

2011.03 • Accreditation of measurement and analysis capabilities as a marine environmental investigation agency (MOF)
2011.05 • Registered as a meteorological equipment provider (KMA)
2012.01 • Certified for ISO 14001 (CreBizQM Co., Ltd.)
2014.02 • Registered as an information and communication construction provider (KICA)
2014.03 • Registered as an underwater construction provider (Gunpo City)
2014.08 • Registered as a metal structure, doors & windows works provider (Gunpo City)
• Registered as a marine environmental impact assessment provider (MOF)
2015.04 • Registered as a weather forecast service provider (KMA)
2016.04 • Selected as a youth-friendly, small giant company (MOEL)
2016.10 • Certified as a promising SME of Gyeonggi Province (Gyeonggi-do Provincial Government)
2016.12 • Established new company vision for 2020

Challenge towards a New Vision
2017~

2017.04 • Registered as an ultralight aerial vehicle operator (MOLIT)
2017.09 • Received the grand prize in the field of marine engineering at the Korea Oceans & Fisheries Industry Awards (KMI)
2018.01 • Registered as a weather consulting service provider (KMA)
2018.04 • Selected as a small giant company (MOEL)
2018.12 • Received the main prize at the Jang Bogo Awards (Minister of Oceans and Fisheries)
2019.01 • Accreditation of cadastral survey specialization (KENCA)
2019.04 • Registered as a public survey provider (NGII)
2019.10 • Certified as a family-friendly, great-to-work-for company in Gyeonggi Province (Gyeonggi-do Provincial Government)
2019.12 • Certified as a family-friendly company (MOGEF)
2020.11 • GeoSR's Smart Marine CAM designated as an Excellent Quality Product by the Public Procurement Service (PPS)
2021.02 • Certified as a work-study-friendly company (MOEL)
2021.03 • Registered as a KHOA certified ocean observation and hydrographic survey company
2021.04 • Registered as a KHOA certified marine information service company
2021.06 • Designated as an outstanding corporate research institute (MSIT)
2021.09 • Registered as a publisher (Gunpo City)
2021.10 • Registered as a mail-order business (Gunpo City)
2021.12 • Registered as a contaminated marine sediment investigation agency (MOF)
2022.06 • Registered as a professional research and development company (MSIT)
2022.12 • Certified for ISO 45001, standard for management systems of occupational health and safety (KQCSA)
2023.01 • Selected as a youth-friendly, small giant company for 4 consecutive years (MOEL)
2023.05 • Selected as a small giant company (MOEL)

MAIN BUSINESS AREAS

We provide optimal technology and the best service in the field of earth science

The experts of GeoSystem Research can provide marine environmental engineering services in 13 major fields, including physical oceanography and hydrodynamics survey, coastal erosion survey, coastal disaster survey and vulnerability assessment, marine information analysis and marine forecast, numerical modeling, establishment and operation of real-time ocean forecast systems, AI and big data technologies, AI based object detection, ecosystem survey and restoration.

Through continuous R&D and accumulation of differentiated core competencies, we will provide optimal technology and the best service as a world-class earth science expert group and an innovation leader in science and technology.

Conservation and Restoration of Aquatic Environments

- Understanding and Integrated Numerical Modeling of Aquatic Environments
- Consulting for Sea Area Utilization and Marine Environmental Impact Assessment
- Conservation and Monitoring of Ecosystems
- Marine Debris and Microplastics Solution

Climate Change and Coastal Disasters

- Coastal Erosion Survey, Cause Identification, and Solution
- Coastal Disaster Assessment and Mitigation
- Coastal Inundation Prediction Map and Countermeasures
- Marine Forecast in Response to Climate Change

Smart Technology

- Marine and Aquatic Environment Survey with Unmanned Observational Platforms
- Computer Vision based Image Analysis
- Digital Twin
- Monitoring, Diagnosis, Assessment with Advanced Sensing Technologies

Renewable Energy and Blue Carbon

- Offshore Wind Farm Site Assessment and Digital Information Map
- Living Shoreline

Conservation and Restoration of Aquatic Environments

Pressure on the environment and ecosystem is increasing due to various factors such as climate change, land development, economic growth, and changes to the social structure. In response, the government is making a lot of effort for the conservation of aquatic environments, and demands for relevant technology have been increasing as well. Also, efforts are being made domestically and internationally to create an abundant and sustainable system by improving and restoring aquatic environments, such as mudflats, coasts, rivers, and lakes, damaged by environmental changes and artificial impacts.

GeoSystem Research provides technical services for policymakers, administrators, and users based on knowledge and technology acquired from our extensive experience in the fields shown below, and we can review any irreversible approaches and provide various alternative solutions.

1. **Understanding and Integrated Numerical Modeling of Aquatic Environments**
2. **Consulting for Sea Area Utilization and Marine Environmental Impact Assessment**
3. **Conservation and Monitoring of Ecosystems**
4. **Marine Debris and Microplastics Solution**

Conservation and Restoration of Aquatic Environments 1

Understanding and Integrated Modeling of Aquatic Environments

Aquatic environments are constantly changing due to the interactions between weather, river flow, tides, currents, sediments, and various organisms. Numerical modeling is the process of writing dynamical processes and physical, chemical, and ecological laws that govern such complex environments into mathematical equations and calculating them using a computer.

We utilize globally recognized numerical models and possess outstanding technical prowess in the fields of numerical modeling regarding flow, waves, sedimentation, water quality, and ecology.

We can proudly say that we are currently the best Korean company in the fields of environmental diagnosis, environmental prediction based on changes in policies and development conditions, and practical numerical forecasting.

Main Content

- Hydrodynamics
- Thermal effluent
- Shallow-water design waves
- Shoreline deformation
- Sediment transport
- Suspended sediment dispersion
- Harbor tranquility
- Wave-induced current
- Water quality
- Pollutant dispersion
- Numerical wave channel
- Harbor operating ratio
- Ecological modeling
- 3D local flow and scouring
- Ship wave

Owned Equipment

Model	Modeling Items
Delft3D (The Netherlands)	Hydrodynamic, sediment transport, water quality, ecology, oil spill, storm surge
MOHID (Portugal)	Hydrodynamic, sediment transport, water quality, oil spill
EFDC (USA)	Hydrodynamic, sediment transport, water quality
TELEMAC (France)	Hydrodynamic, sediment transport, water quality
SWAN (The Netherlands)	Wave deformation
SWASH (The Netherlands)	Wave deformation
ADCIRC (USA)	Hydrodynamic, storm surge
CADMAS-Surf (Japan)	Numerical wave channel
X-Beach (The Netherlands)	2D nearshore bed level changes
GENESIS (USA)	Shoreline changes
SBEACH (USA)	Beach profile change
SWAN-Shorecirc (The Netherlands, USA)	Wave-induced current
Flow-3D (USA)	Fine-structure flow, local scouring
Open FOAM (UK)	Fine-structure flow

Major Projects and Clients

Korea Institute of Marine Science & Technology Promotion
- Saemangeum area marine environment and ecosystem management R&D
- Ecosystem-based marine spatial analysis and practical technology development

National Institute of Fisheries Science
- Establishment of marine resource prediction system based on marine ecosystem changes
- Sanitary survey of shellfish growing areas and study on pollutant dispersion prediction model

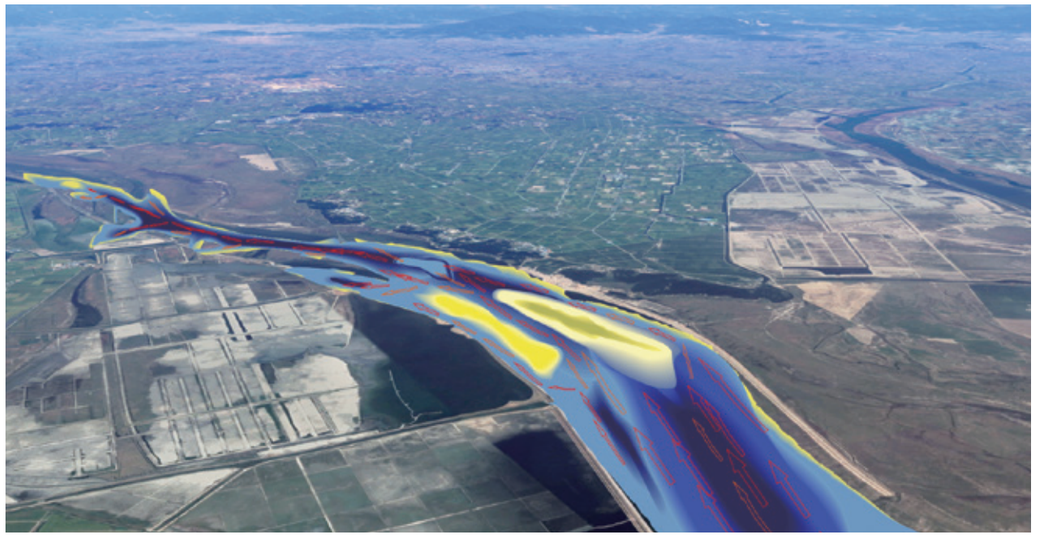
Ministry of Oceans and Fisheries
- Study on establishment of restoration criteria for marine aggregate extraction sites
- Study on hydraulic characteristic survey

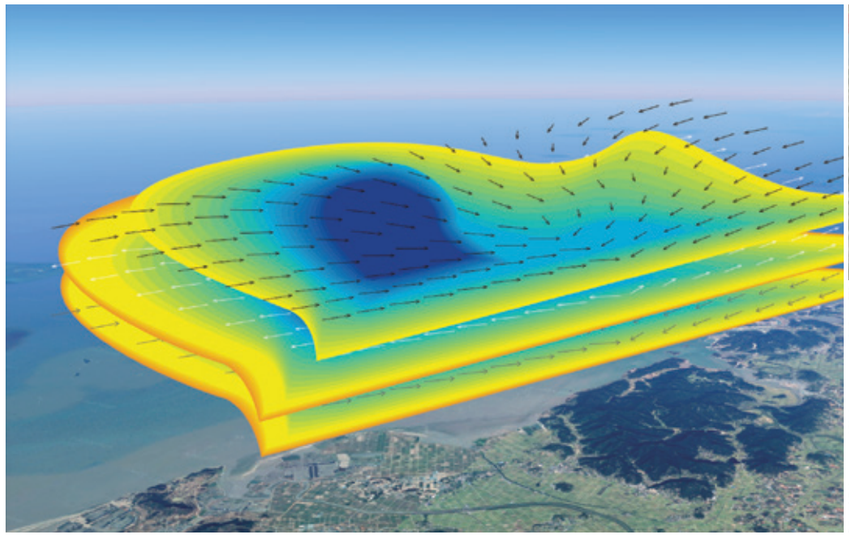
National Institute of Environmental Research
- Feasibility study on basin water management using digital twin

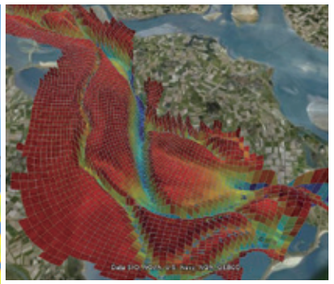
Korea Marine Environment Management Corporation
- Planning for Yubu-do mudflat ecosystem restoration project
- General study and feasibility study on Ung-do mudflat ecosystem restoration project

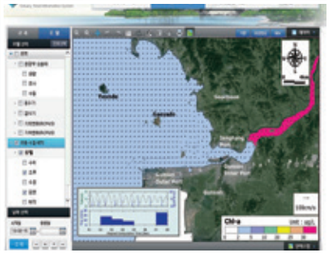
Korea Institute of Ocean Science and Technology
- Study on establishment of OpenFOAM-based movable seawall numerical model and construction of its visualization system
- Evaluation of wave CFD model's applicability and improving the tidal wave program

Ministry of Environment
- Study on water quality prediction methodology for weir evaluation
- Study on improving the water quality prediction modeling of Han River and Nakdong River









Conservation and Restoration of Aquatic Environments 2

Consulting for Sea Area Utilization and Marine Environmental Impact Assessment

Our work area includes identifying biogeochemistry characteristics of aquatic environments, determining variables and coefficients for water quality modeling, consulting for sea area utilization, and marine environmental impact assessment. After collecting water and sediment samples through field surveys, we analyze the samples according to domestically and internationally certified testing methods, and we use CRM (certified reference materials) for each analysis to insure data quality control.

We hold the certificate from the Ministry of Oceans and Fisheries for marine environment measurement and analysis capabilities, and we are a designated specialized agency of marine sediment pollution survey.

We also own environment analysis facilities for water quality and sediment analysis, and use inductively coupled plasma mass spectrometry (ICP-MS) and nutrient autoanalyzer (AA) for trace element analysis.

Main Content

- Water and sediment sampling
- Water and sediment quality analysis
- Consulting for sea area utilization and marine environmental impact assessment
- Oil spill & land-based pollution source investigation
- Impact assessment of pollutant
- SOD and geochemical processes
- Measurement and determination of parameters or coefficients for water quality modeling

Owned Equipment

- **ICP-MS (iCAP-RQ)** : Heavy metal analysis of water and sediment
- **seaFAST SP3** : Heavy metal pretreatment of water
- **Nutrients AutoAnalyzer (Quaatro)** : TN, TP and nutrient analysis
- **Organic carbon analyzer (TOC-Vcph)** : TOC and DOC analysis
- **Particle size analyzer (Mastersizer 2000)** : Particle size analysis
- **Oxygen microelectrode sensor** : Water and sediment oxygen measurements
- Centrifuge
- GC-MSD (8890 GC / 5977B MSD)
- **Benthic Lander** : Benthic flux measurement

Major Projects and Clients

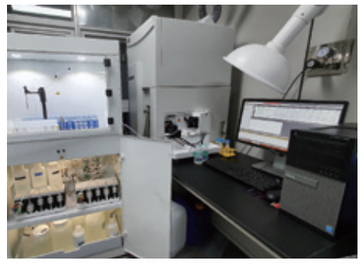
Ministry of Oceans and Fisheries
- Research and development of an integrated estuary management system

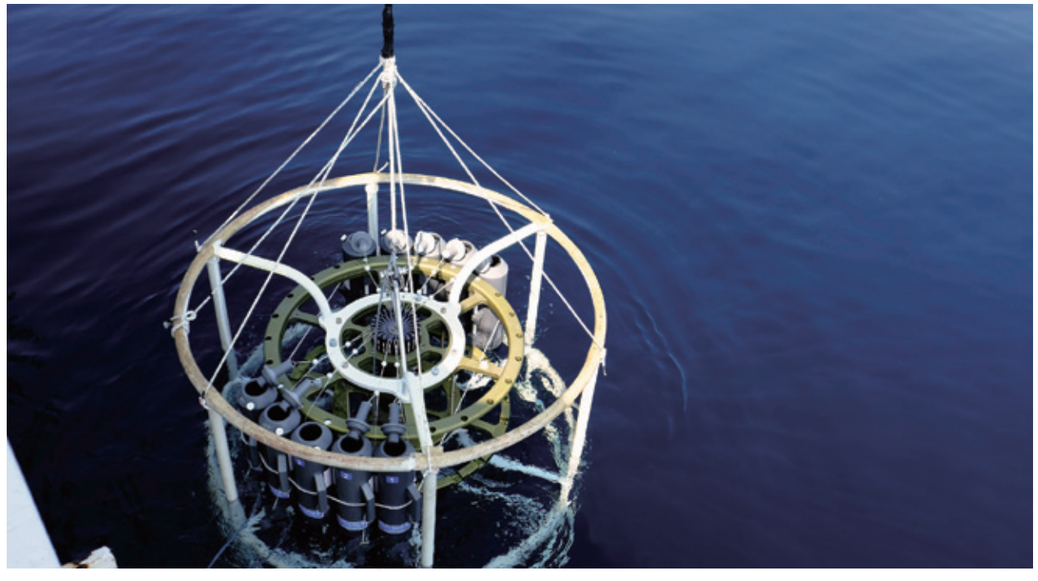
Korea Marine Environment Management Corporation
- Joint study on the Korea's marine ecosystem
- Environmental impact assessment of marine aggregate extraction sites in EEZ, south sea of Korea

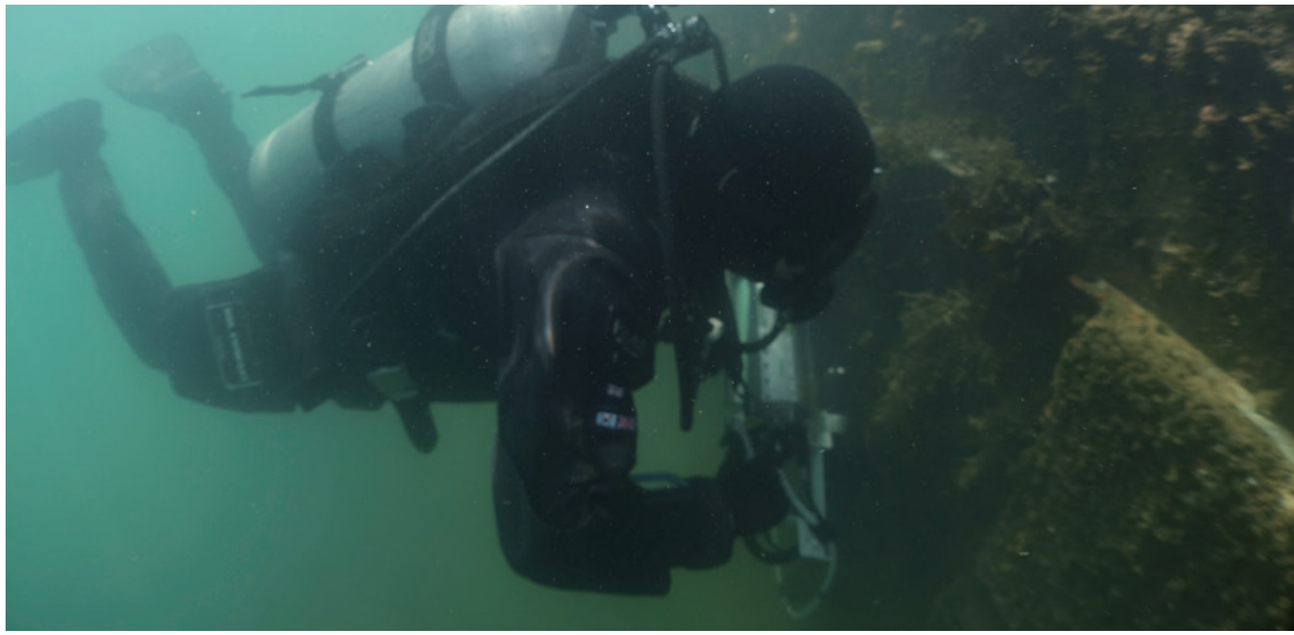
National Institute of Environmental Research
- Surveying and assessment of sediment emission from weirs of the 4 major rivers of Korea

National Marine Biodiversity Institute of Korea
- Analysis of mudflat material cycles and calculation of mineralization rate of mudflat organic matters

Korea Energy Agency
- Government-led site suitability study for offshore wind farms







Conservation and Restoration of Aquatic Environments ❸

Conservation and Monitoring of Ecosystems

Our professionals in taxonomy and ecology can accurately ascertain the status of aquatic ecosystems and identify their characteristics. We can also quickly diagnose and assess environmental impact of various human activities and specialize in projects related to climate change. We are contributing to carbon neutrality by monitoring changes in the ecosystem due to climate change and by improving and assessing blue carbon capability of ecosystems.

For the sustainable use of marine organisms and mudflats, we actively participate in nationwide mudflat conservation and restoration projects. Our diverse knowledge and experience with marine organisms will vastly contribute to protecting mudflat organisms and enhancing their diversity.

Main Content

- Monitoring of aquatic ecosystems
- Environmental impact assessment
- Conservation and restoration of ecosystems
- Assessment on benefits of eco-friendly development
- Climate change monitoring
- Measurement of carbon uptake ratio

Owned Equipment

- **Dissecting microscopes** : Biological analysis
- **Optical microscopes** : Biological analysis
- **Mesocosms** : Measurement of oxygen consumption rate
- **Artificial ecosystems** : Cultivation of vegetation and fishes
- **Chlorophyll fluorometer** : Measurement of primary production
- **Quadrats, grab sampler, etc.** : Equipment for biological field (quantitative) survey

Major Projects and Clients

Ministry of Oceans and Fisheries

- Development of blue carbon based climate change adaptive coastal construction technology

Korea Marine Environment Management Corporation

- Study on the selection and utilization of climate-sensitive biological indicator species from marine ecosystems

Conservation and Restoration of Aquatic Environments 4

Marine Debris and Microplastics Solution

To support the process of establishing management policies by government agencies related to aquatic environments, we developed a behavior prediction technique for marine debris and micro-plastics and have been applying it to real sea conditions to derive prediction results necessary for establishing management policies. Additionally, we possess specialized microplastic survey technologies suitable for various environmental characteristics such as rivers, sea waters, sediments, and are participating in the task of evaluating the amount of micro-plastics entering the ocean.

Main Content

- Movement·distribution behavior model of marine debris and microplastic based on particle tracking method
- Production of microplastic survey equipment
- Field survey of microplastics in rivers and lakes

Owned Equipment

- High performance computers for numerical model computation and numerical modeling software (EFDC, Delft3D, SCHISM, MOHID)
- In-house developed marine debris behavior prediction model (In-house developed using Fortran)
- Field sampling and filtration system

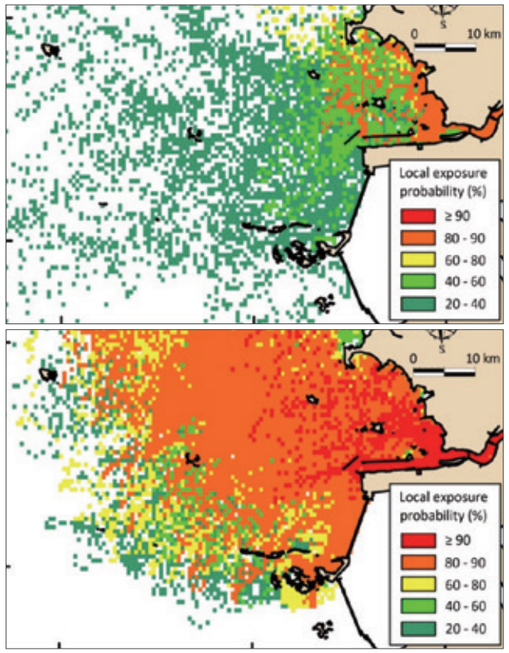
Major Projects and Clients

Korea Institute of Marine Science & Technology Promotion

- Development of smart technology to support the collection of marine debris

Incheon National University

- River surveying to evaluate the amount of micro-plastics entering the ocean



Climate Change and Coastal Disasters

Today, coastal disasters are occurring more frequently and the extent of damage from them are rapidly increasing due to reckless development of the coastal space and climate change factors, such as rising sea levels and sea water temperatures. In the event of a coastal disaster, not only does it endanger human lives and cause simple property damage, but can also cause significant social and economic damage due to the destruction of coastal ecosystems and coastal spaces.

Through proposing various solutions based on accurate scientific evaluations and developing eco-friendly coastal protection technologies, GeoSystem Research Corporation strives to conserve human-coast coexistence and to create a solid foundation for a sustainable coastal environment.

1. Coastal Erosion Survey, Cause Identification, and Solution

2. Coastal Disaster Assessment and Mitigation

3. Coastal Inundation Prediction Map and Countermeasures

4. Marine Forecast in Response to Climate Change

UAV Monitoring

Beach Survey

Video Monitoring

Wave Observation

Bathymetric Survey

Climate Change and Coastal Disasters 1

Coastal Erosion Survey, Cause Identification, and Solution

In recent years, the extent of damage from coastal erosion has increased due to reckless development of artificial structures and rising sea levels caused by climate change. Not only does coastal erosion cause sand loss, but it also destroys coastal ecosystems and threatens our safety and property.

With such context, it is necessary to accumulate quantitative data through continuous monitoring to identify the causes of coastal erosion and establish erosion prevention plans.

We can provide optimal solutions for coastal erosion prevention measures based on our accumulated experience from many years of conducting coastal erosion surveys and our advanced technologies, including the nation's only video monitoring analysis technology and various in-house developed software.

Owned Equipment

- GNSS (GX1230, LEICA) / GNSS (S82T, SOUTH)
- Wave gauge (AWAC, NORTEK) / Wave gauge (SIGNATURE, NORTEK)
- UAV (PHANTOM, DJI) / UAV (MAVIC, DJI)

In-house Developed Software

- Camera Scheduler (Video settings)
- Imagemaker (Creation of analysis images)
- Real File Management (Image processing)
- Image Processing (Image analysis)

Main Content

- Investigation of erosion history
- Erosion class evaluation
- Real-time video monitoring of coastline
- Surface sediment analysis
- Identification of causes of erosion and establishment of counter-measures
- Long-term video image acquisition
- Analysis of aerial and satellite images
- Analysis of coasts' natural resiliency
- Characterization of long-term coastline changes
- Analysis of coasts' natural resiliency
- Characterization of short-term coastline changes
- Wave monitoring
- Real-time continuous video image surveying
- Analysis of changes to beach area
- UAV monitoring
- Analysis of tide data and acquisition of shoreline information at different tide levels
- Observation of visibility distance during sea fog

Major Projects and Clients

Ministry of Oceans and Fisheries
- Coastal Erosion Monitoring System Project I ~ V
- Coastal erosion monitoring 2013 ~ 2019
- Coastal erosion survey

Korea Hydrographic and Oceanographic Agency
- Coastal Erosion Monitoring System Project VI ~ VII
- Coastal erosion monitoring 2010
- Expansion and operation of real-time rip current monitoring system

Provincial Government of Gyeongsangbuk-do
- Coastal erosion monitoring and survey in the province of Gyeongsangbuk-do 2010~2019

Climate Change and Coastal Disasters 2

Coastal Disaster Assessment and Mitigation

We have developed the coastal disaster assessment system and coastal inundation prediction map technology to proactively respond to coastal disaster risks, such as sea level rise and climate change.

The coastal disaster assessment system (CDAS) is a GIS system that integrates various coastal information to quantitatively assess disaster vulnerability based on causes of disasters and is used by 72 local governments in 218 locations for national disaster response and coastal management. The coastal inundation prediction map utilizes the storm surge scenario database to provide forecast information such as storm surge height, inundation extent, and inundation depth along the coast, and is used by 39 local governments in 160 locations.

The coastal disaster vulnerability assessment is a GIS system that integrates various coast information to quantitatively assess disaster vulnerability according to the cause of the disaster. The coastal inundation prediction map utilizes the storm surge scenario database to provide forecast information, such as storm surge height, inundation area, and depth.

Recently, we have developed and implemented real-time technologies for vulnerability assessment and storm surge prediction.

Main Content

- Establishment of 3D geospatial information database and GIS system
- Virtual scenario simulation for future and current typhoons
- Forecast of coastal inundation frequency
- Establishment of storm and inundation damage reduction plans
- Assessment and index development of coastal vulnerability
- Real-time forecasting of storm surge and inundation
- Prediction of complex disaster impact
- Establishment of climate change adaptation measures
- Assessment of climate change risks
- Establishment of vulnerable coastal areas and disaster information map
- Prediction of impacts caused by climate change and development projects
- Disaster environmental impact assessment

Owned Equipment

- GNSS (GX1230, Leica;S82T, South)
- Wave gauge (AWAC/SIGNATURE, Nortek)
- Intel XEON E5-2650v3, 512 / 200core HPC cluster

Software

- ADCIRC (ADvanced CIRCulation Model)
- EFDC (Environmental Fluid Dynamics Code)
- ROMS (Regional Ocean Modelling System)

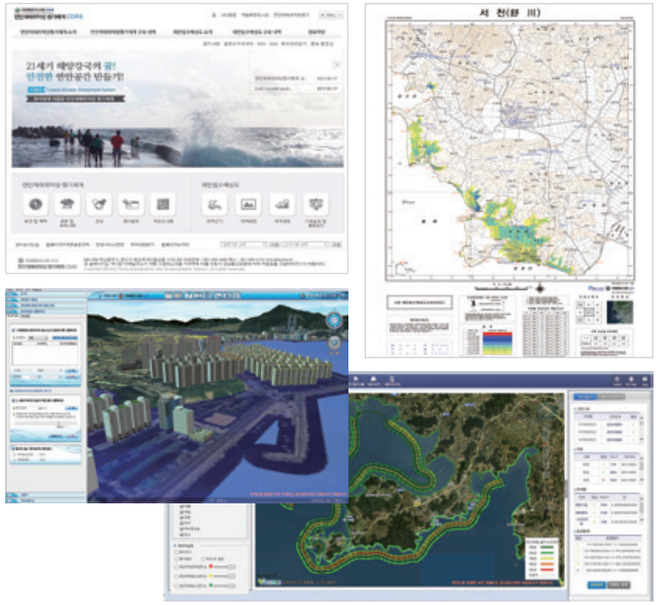
Major Projects and Clients

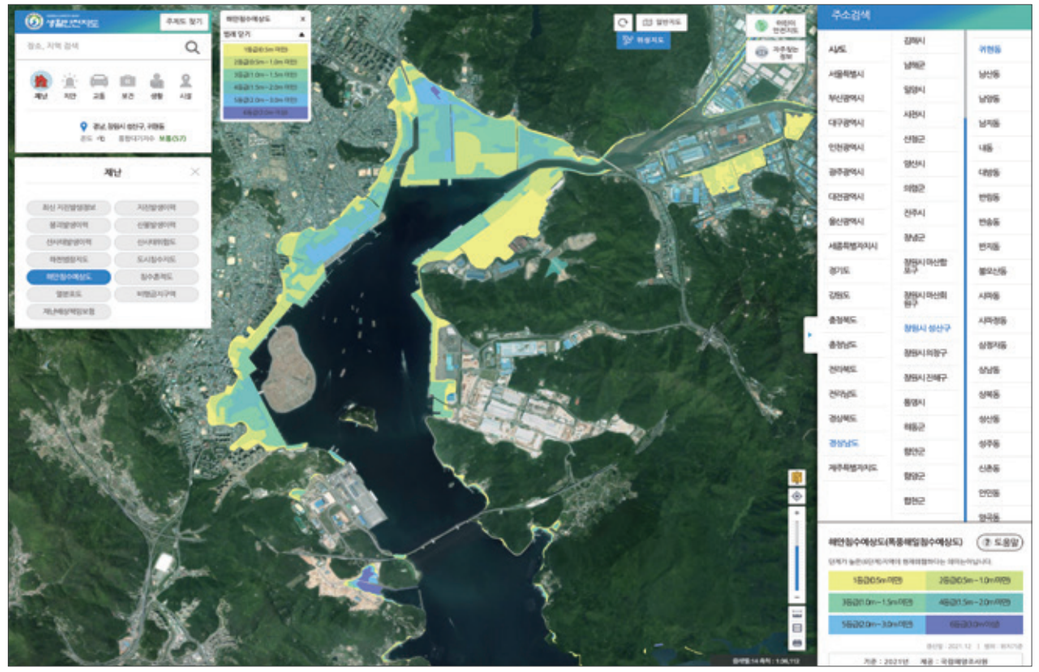
Korea Hydrographic and Oceanographic Agency
- Coastal disaster vulnerability assessment
- Construction of coastal inundation prediction map

Rural Development Administration
- Assessment of storm surge inundation in farmlands

National Emergency Management Agency
- Development of countermeasure techniques for swell waves

Ministry of Oceans and Fisheries
- Identification of the cause of damage from Typhoon Chaba





Climate Change and Coastal Disasters ❸

Coastal Inundation Prediction Map and Countermeasures

Coastal inundation caused by typhoons can cause substantial damage to coastal lowlands in a short period, so various studies are being conducted at the national level to minimize the damage caused by typhoon inundation and to establish countermeasures against it.

The coastal inundation prediction map developed by our company used the storm surge scenario database to provide forecast information, such as storm surge height, inundation area, and inundation depth at 50-year intervals to 39 local governments in 179 locations. Our prediction map was used as a basis to establish long-term measures for managing the safety of coastal structures and lands.

In recent years, we have applied various methods like combining heterogeneous models to predict inundation caused by complex factors, such as tsunamis, wind waves, wave overtopping, sea level rise, rainfalls, and structure geometries that may occur in coastal areas. We are continuously researching to improve the accuracy of inundation prediction.

Main Content

- Establishment of storm surge inundation frequency map
- Forecast of complex disaster inundation
- Application of virtual scenario simulation of future and current typhoon
- Real-time forecasting of storm surge and inundation
- Forecast of complex disaster (wave overtopping, tsunami, heavy rain, sea level rise, etc.) inundation

Owned Equipment

- Intel Xeon ES-2650v3, 200 core HPC cluster
- AMD EPYC 7543, 2.8GHz, 512 core HPC cluster

Software

- ADCIRC (Advanced CIRCulation Model)
- SWAN (Simulating WAves Nearshore)
- FLOW-3D

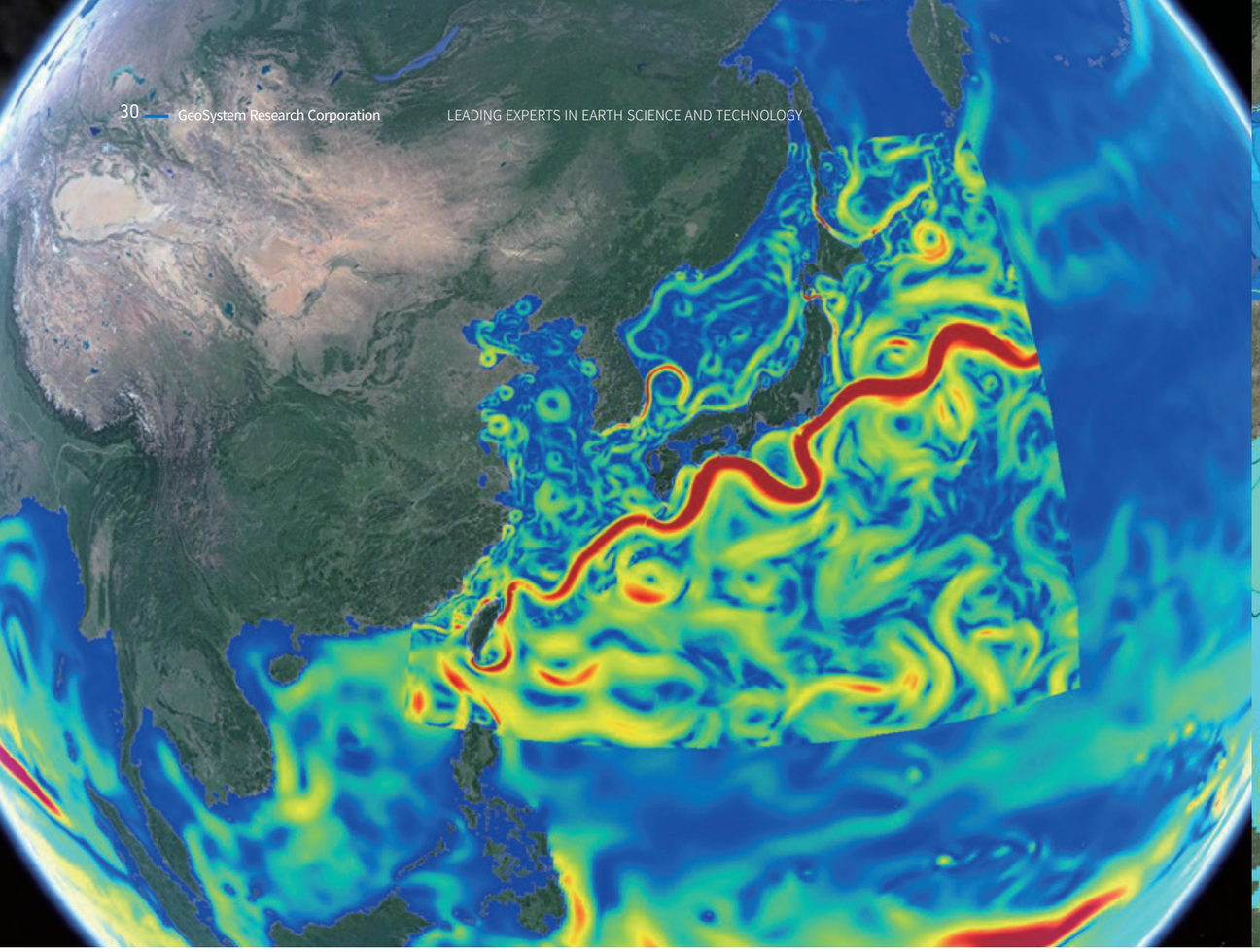
Major Projects and Clients

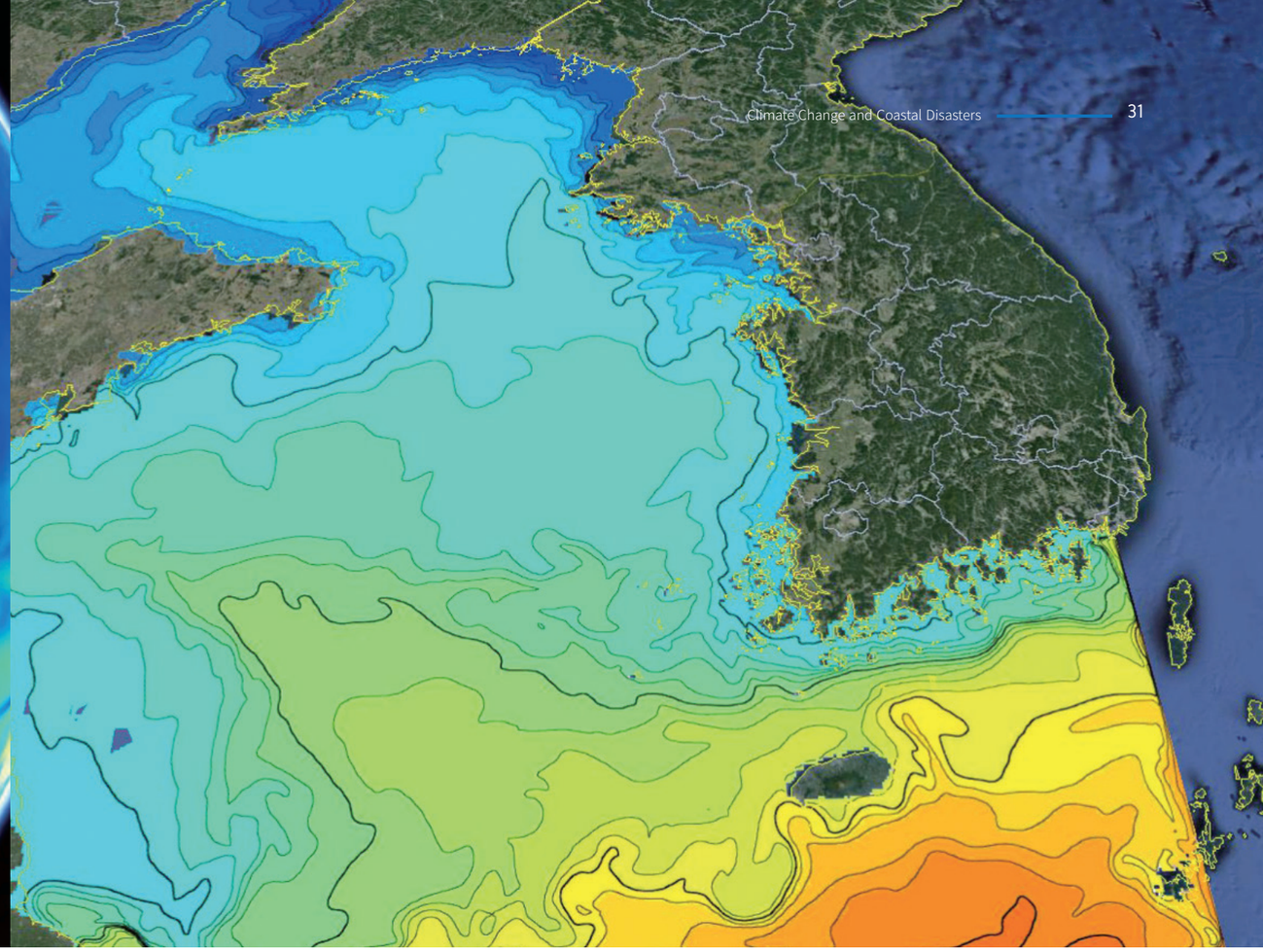
Korea Hydrographic and Oceanographic Agency
- Establishment and distribution of the coastal inundation prediction map

National Disaster Management Research Institute
- Assessment of inundation caused by complex disasters

Rural Development Administration
- Assessment of storm surge inundation in farmlands

Ministry of Oceans and Fisheries
- Identification of the cause of damage from Typhoon Chaba





Climate Change and Coastal Disasters 4

Marine Forecast in Response to Climate Change

The Real-Time Ocean Forecast System (RTOFS) is a system that forecasts various ocean phenomena, such as water level, flow, water temperature, salinity, waves, etc., using observation data and numerical modeling.

We have built our own real-time ocean forecast system that simulates ocean circulation and waves, and it produces predictive data for the Northwest Pacific, Northeast Asia, the Korean Peninsula, and its major coastal areas. These data are used to predict changes to the marine environment caused by climate change, to support search and rescue and disaster prevention activities in the event of marine accidents, and to support military operations. As the largest and best simulation expert group in Korea, we are continuously researching and developing innovative technologies to improve the accuracy of our forecast data.

Software

- EFDC (Environmental Fluid Dynamics Code)
- ROMS (Regional Ocean Model System)
- ADCIRC (ADvanced CIRCulation Model)
- RIAMOM (RIAM Ocean Model)
- SWAN (Simulating WAve Nearshore)

Hardware

- Intel Xeon E5-2650v3, 256 / 200 core HPC cluster

Main Content

- Real-time ocean forecast system of the Pacific Northwest
- Maintenance and operation technique of real-time ocean forecast system
- Verification and evaluation system for prediction accuracy
- Ocean forecast system of Northeast Asia and seas surrounding the Korean Peninsula
- Real-time prediction system for dispersion of thermal effluents
- Parallelization techniques for numerical modeling (OpenMP, MPI, GPGPU-based parallelization)
- High-resolution forecast system of major coastal areas
- Real-time prediction system for ocean environmental changes, such as red tide, etc.
- Real-time wave prediction system of the seas surrounding the Korean Peninsula
- Real-time ocean forecast system for naval operations
- Data assimilation techniques for better accuracy
- Aiding search and rescue activity and disaster prevention activity during marine accidents by providing data
- User support system for the visualization of forecast results

Major Projects and Clients

Korea Hydrographic and Oceanographic Agency

- Establishment of a real-time ocean forecast system for military operation support

Korea Hydro & Nuclear Power Co., Ltd.

- Establishment and operation of a real-time thermal effluent dispersion prediction system
- Development of a technique to improve the accuracy of ocean forecast system

Smart Technology

With the advent of the 4th Industrial Revolution, new smart technologies such as big data, AI, metaverse, and digital twin are being introduced in the marine and water environment sector. Especially, the demand for monitoring, prediction, diagnosis, and evaluation technologies based on remote sensing, unmanned, real-time, fully automatic, and Internet of Things (IoT) platforms is rapidly increasing.

GeoSystem Research Corporation has been transitioning labor-intensive traditional technologies into smart technologies such as multi-beam, LiDAR-hyperspectral-based drones, unmanned surface vehicles (USV) based ocean observation systems, stereo camera-based 3D image analysis technology, and computer vision (CV) based artificial intelligence image analysis technology.
Through continuous research and development, we are advancing our capabilities in climate change measures, disaster monitoring, forecasting, diagnosis, and assessment in the field of marine and water environments.

1. **Marine and Water Environment Survey with Unmanned Observation Platforms**
2. **Computer Vision based Image Analysis**
3. **Digital Twin**
4. **Monitoring, Diagnosis, Assessment with Advanced Sensing Technologies**

Smart Technology 1

Marine and Water Environment Survey with Unmanned Observation Platforms

We conduct the entire process of development, establishment, and maintenance of observation systems as well as the design, manufacture, and R&D of marine weather observation and aids-to-navigation equipment.

We have developed various marine weather observation equipment and have been building and operating real-time remote monitoring systems for public institutions, such as the Korea Meteorological Administration, Ministry of Oceans and Fisheries, Ministry of Environment, Korea Hydrographic and Oceanographic Agency, National Institute of Fisheries Science, and Korea Institute of Ocean Science and Technology. We aim to provide integrated marine weather solutions through continuous research and development of marine weather observation systems and software.

We are also capable of providing aids to navigation (AtoN) related services and equipment. We design, manufacture, install, and manage AtoN facilities, such as lighthouses, light beacons, and buoys, and supply major AtoN equipment supplies. We also manufacture, establish, and operate remote management systems that enable real-time remote management and control of AtoN facilities using WCDMA, LTE, and AIS-based communication networks, and provide real time maritime safety information to vessels through our tidal current signal systems.

Main Content

- Real-time marine & weather monitoring system
- ROV monitoring
- Development of real-time monitoring software
- Seawater flow (tide) monitoring system
- Autonomous sea drone system
- Development of ocean observation equipment
- Development and operation of drifting buoys
- Special-purpose ocean observation buoys and equipment
- Establishment and management of aids to navigation system
- Establishment and management of tidal current signal system
- Aids to navigation equipment (lighthouse lantern, etc.)
- Remote control system of aids to navigation

Major Projects and Clients

National Institute of Fisheries Science
- Maintenance of real-time information system for aquaculture environment

Korea Hydrographic and Oceanographic Agency
- Installation and maintenance of real-time seawater flow monitoring equipment

Korea Meteorological Institute
- Maintenance of marine weather observation equipment on weather ships

Korea Institute of Marine Science & Technology Promotion
- Development of long-range, wide-area ocean observation drones

Regional Office of Oceans and Fisheries
- Establishment and management of marine weather signal system
- Establishment of aids to navigation management system in Ulsan region
- Purchase, manufacture, installation of tidal current signal system in Jindo sea area

Korea Institute of Ocean Science and Technology
- Study on the surface current of Indian Ocean using satellite-tracked drifting buoys

Korea Hydro & Nuclear Power Co., Ltd.
- Operation of marine environment management system near nuclear power plants in the coast of the East Sea

Korea Gas Corporation
- Construction and maintenance of marine environment observation buoy near Tongyeong LNG Terminal
- Management of private aids to navigation

Provincial Government of Gyeonggi-do
- Underwater construction, metal structure and doors, windows construction

Korea Water Resources Corporation Sihwa Business Division
- Maintenance service of maritime safety equipment in Sihwa lake tidal power plant

Korea Midland Power Co., Ltd. Boryeong Power Generation Site Division
- Management and repair of aids to navigation system
- Construction and installation of lighthouses during the construction of Daepo Geunpo Port

Smart Technology 2

Computer Vision based Image Analysis

Computer vision is a technology that uses artificial intelligence (visual intelligence) techniques to extract features. We can use computer vision to detect and classify marine life (fish, jellyfish, invasive species, etc.), occurrences of oceanographic phenomena, such as rip currents, and aquatic trash distribution.

We expect this technology to be used in various ways, like warning systems for quick disaster response, smart fish farm monitoring, and underwater ecosystem surveying, in the field of ocean and fisheries.

Software

- YOLO

Major Projects and Clients

Korea Fisheries Resources Agency

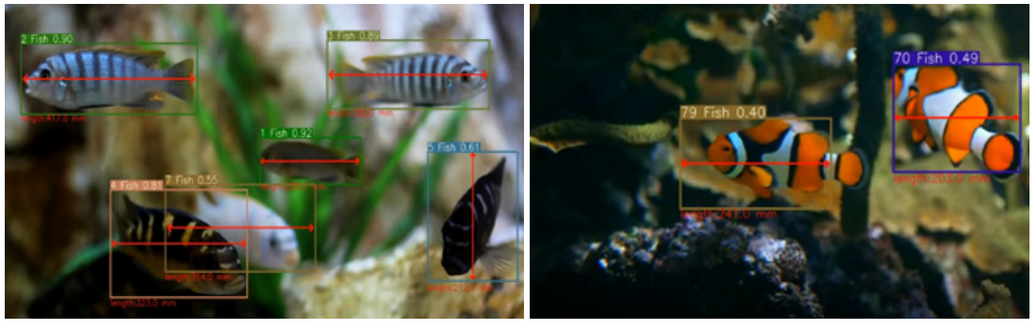
- Development of method to study the impact of fishing using deep learning and computer vision

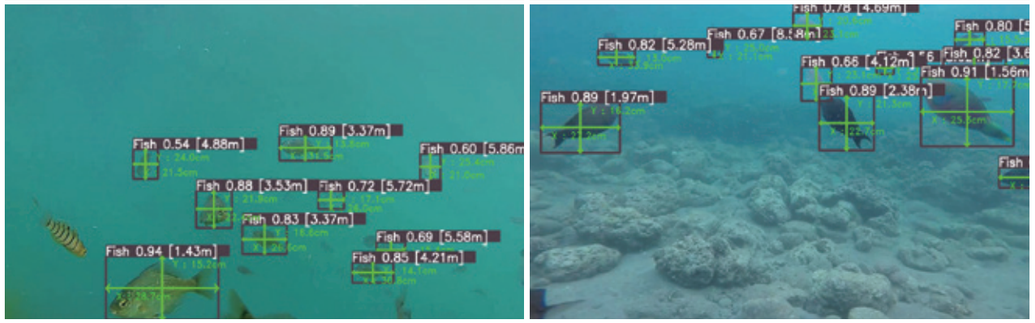
Korea Hydro & Nuclear Power Co., Ltd.

- Development of method to study the impact of fishing using deep learning and computer vision

Main Content

Technology that analyzes marine life prevalence characteristics, rip current occurrence, etc., from images or videos of underwater and coastal environments via detecting, counting population, and calculating the size of objects and distance from the camera using artificial intelligence algorithms.





Smart Technology 3

Digital Twin

By rendering a virtual model that reflects the physical characteristics of a real object and then running simulations synchronized with real space and time, we can use the digital twin to monitor, diagnose, predict, and help with decision-making.

Owned Equipment

- High performance computer for numerical model computation
- Numerical modeling software (EFDC-NIER, Delft3D, SCHISM)

Major Projects and Clients

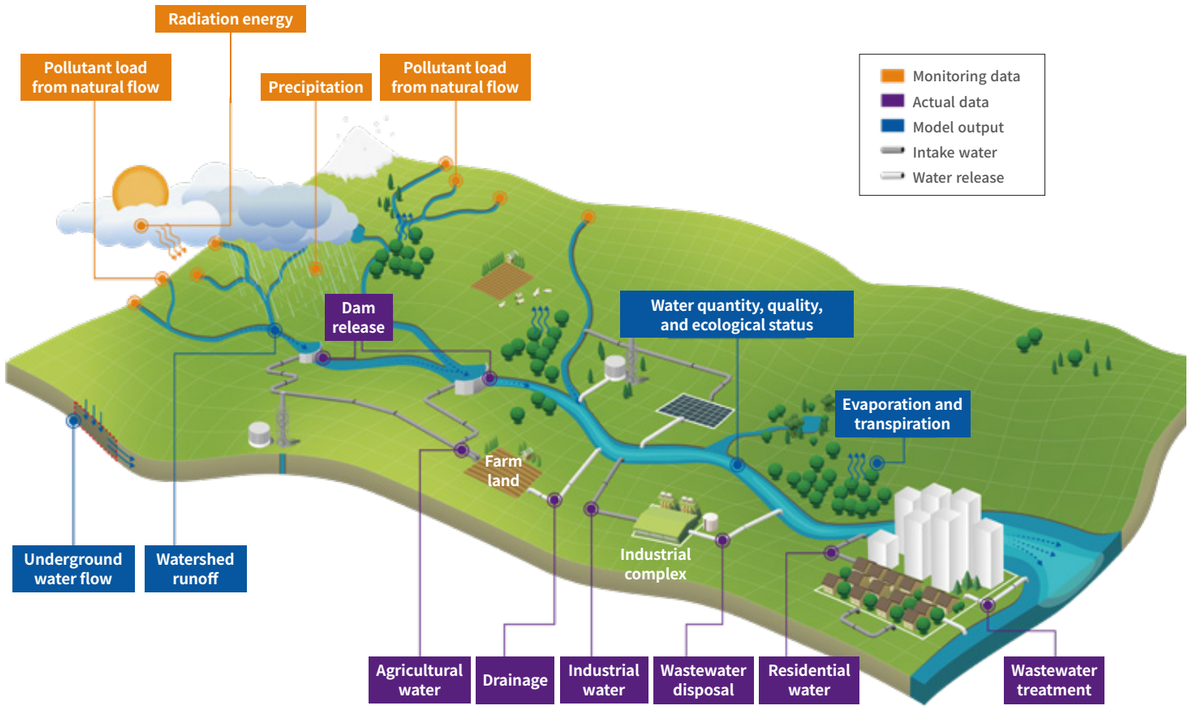
National Institute of Environmental Research

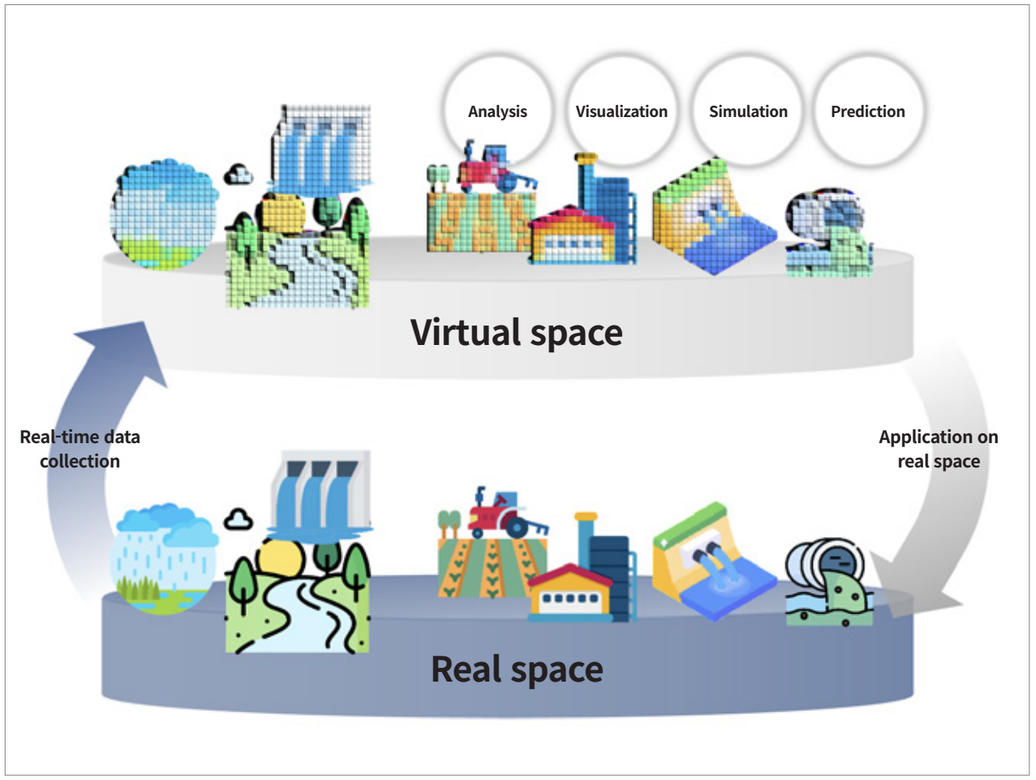
- Research and development of digital twin technology for an integrated water management

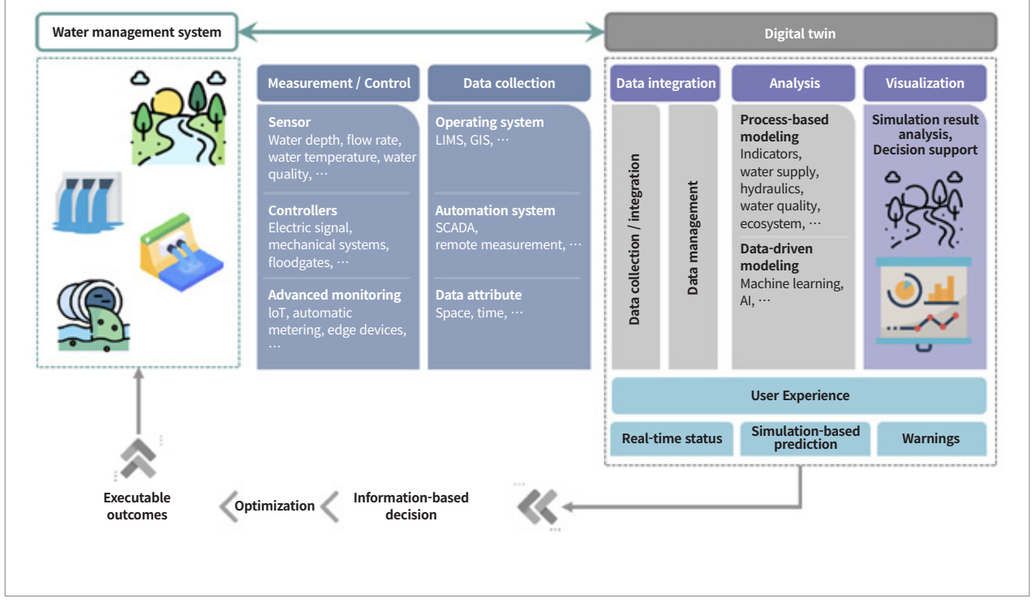
Main Content

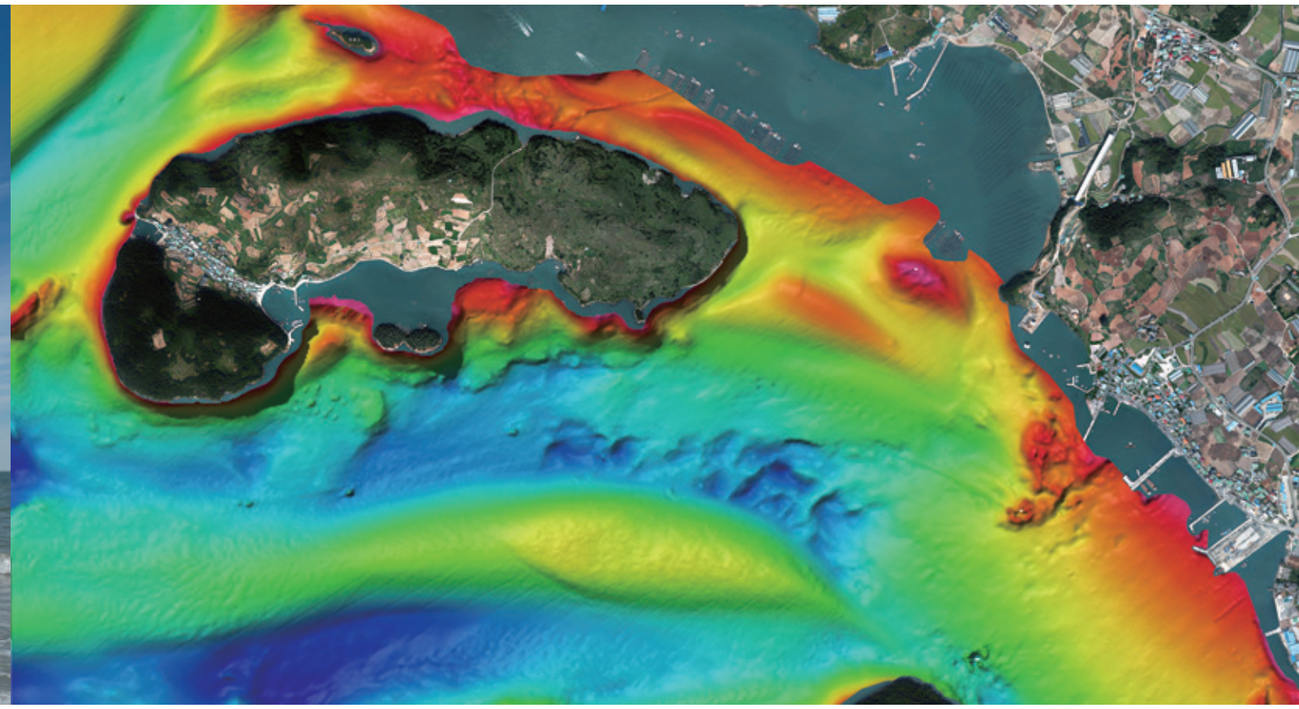
Digital Twin for Water and Environment Management

Considering the factors that affect water management, water quantity, water quality, and aquatic ecosystem environment, which were individually managed in the past, are integrated and managed more intelligently.









Smart Technology 4

Monitoring, Diagnosis, Assessment with Advanced Sensing Technologies

We conduct various water environment surveys and analyses with state-of-the-art sensors. We provide baseline data needed for the establishment of various national marine policies by surveying and analyzing water depth, geological structure, coastline shape, and reef information. We can also conduct water quality analysis and three-dimensional monitoring and analysis of the physical environment and using unmanned surface vehicles combined with state-of-the-art sensors.

Our main businesses include detailed topographic and geological surveys of coastal waters and harbors to support safe navigation, marine aggregate extraction site monitoring, coastline surveys using unmanned aerial vehicles to provide analysis and current extent of scouring and accretion of the coastline, development of USV observation platforms, and water environment monitoring using such platforms.

Main Content

- Multibeam bathymetric survey, seafloor survey, and analysis of erosion and deposition on beaches
- High-resolution seismic survey for sub-bottom profiling, anomaly detection, sunken relics, etc.
- Photogrammetry, LiDAR survey, hyperspectral imaging using unmanned aerial vehicle
- Ground control point survey
- Survey for a suitable site for artificial reefs
- Structure condition survey and underwater survey

Owned Equipment

- Multibeam echosounders (Seabat7125, Sonic2024, T-50)
- Singlebeam echosounders (Odom Hydrotrac, Aquaruler)
- Side-scan sonars (S-150A, S-150i)
- Sub-bottom profilers (Z-TAM Ⅱ,Ⅲ)
- Unmanned aerial vehicles (Matrice 300 RTK, Matrice 600PRO)
- Mobile LiDAR (Pandar-XT)
- Hyperspectral imaging sensor (microHSI 410Shark)
- Spectroradiometer (FieldSpec4)
- Magnetometer (Explorer)
- GNSS (GX10)

Software

Pix4D, Envi 5.6, CARIS HIPS & SIPS, HYPACK, QINCY, PDS2000

Major Projects and Clients

Korea Hydrographic and Oceanographic Agency
- Monitoring of seafloor topography in marine aggregate extraction sites
- Sub-bottom mapping and analysis
- In-depth survey of coastal waters
- In-depth hydrographic survey of waters in Incheon Port and Gyeongin Port
- Coastline survey

Korea Marine Environment Management Corporation
- Marine environmental impact assessment of the West Sea EEZ aggregate extraction area

Korea Fisheries Infrastructure Public Agency
- Inspection of facilities and substructures in national fishing ports of the West Sea

Gunsan Regional Office of Oceans and Fisheries
- Research on the change of hydraulic conditions in the Geum River estuary

Korea Fisheries Resources Agency
- Hydrographic survey and facility inspection of the ocean afforestation area in the East Sea

Korea Environmental Industry & Technology Institute
- Unmanned remote controlled mobile object based 3D water quality and flow rate monitoring technology development

Renewable Energy and Blue Carbon

With the Korean government joining the Carbon Neutrality 2050 mission to respond to the climate change crisis, the transition to renewable energy and the discovery of new carbon absorption sources such as blue carbon have become a national interest.

The importance of offshore wind farms among renewable energies is emerging globally, but the development of offshore wind farms is difficult in reality. Reaching an agreement for development is difficult due to how the coastal areas are highly utilized and many livelihood are dependent on them, so developers are required to consider both the environmental impact and acceptability of offshore wind farms. Blue carbon is internationally recognized by the IPCC and is an essential source of carbon reduction in Korea, given the country's limited carbon reduction capacity of forest resources. Therefore, it is urgent to discover more sources of blue carbon, including salt marshes, seagrasses, mangroves, etc.

GeoSystem Research Corporation is contributing to the national effort to achieve Korea's 2050 carbon neutrality goal through the development of digital offshore wind farm site information map and consulting services such as offshore wind farm site identification and suitability assessment, as well as blue carbon-based living shoreline research.

1. Offshore Wind Farm Site Assessment and Digital Information Map

2. Living Shoreline

Renewable Energy and Blue Carbon 1

Offshore Wind Farm Site Assessment and Digital Information Map

We provide optimal wind farm site information maps and site suitability assessment guidelines and present scientific data regarding environmental and acceptability issues with offshore wind farm development. We also resolve conflicts between wind farm developers and locals and difficulties reaching an agreement with the local governments by providing objective and scientific information and filling the informational gap between the involved parties.

Main Content

- Marine environmental survey (physical, water quality, biological, sediment quality, etc.) for wind farm sites
- Feasibility study and gathering marine information using GIS
- Analysis of local fishing business to gain acceptability of offshore wind farms
- Consulting and guidance for selecting an optimal site for offshore wind farms

Owned Equipment

- ArcGis, Qgis
- Data processing servers for big data
- Web visualization server
- ICP-MS (iCAP RQ, Thermo)
- seaFAST (SP3, ESI)
- Nutrient auto-analyzer (Quaatro, Seal Analytical)
- Total organic carbon analyzer (TOC-VCPH, Shimadzu)

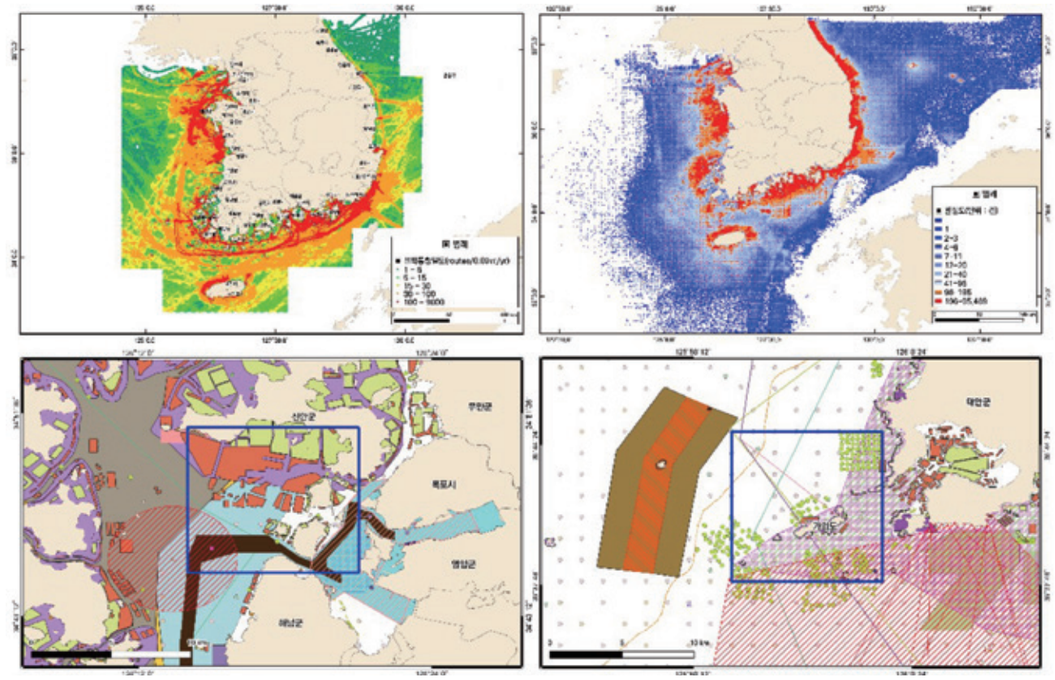
Major Projects and Clients

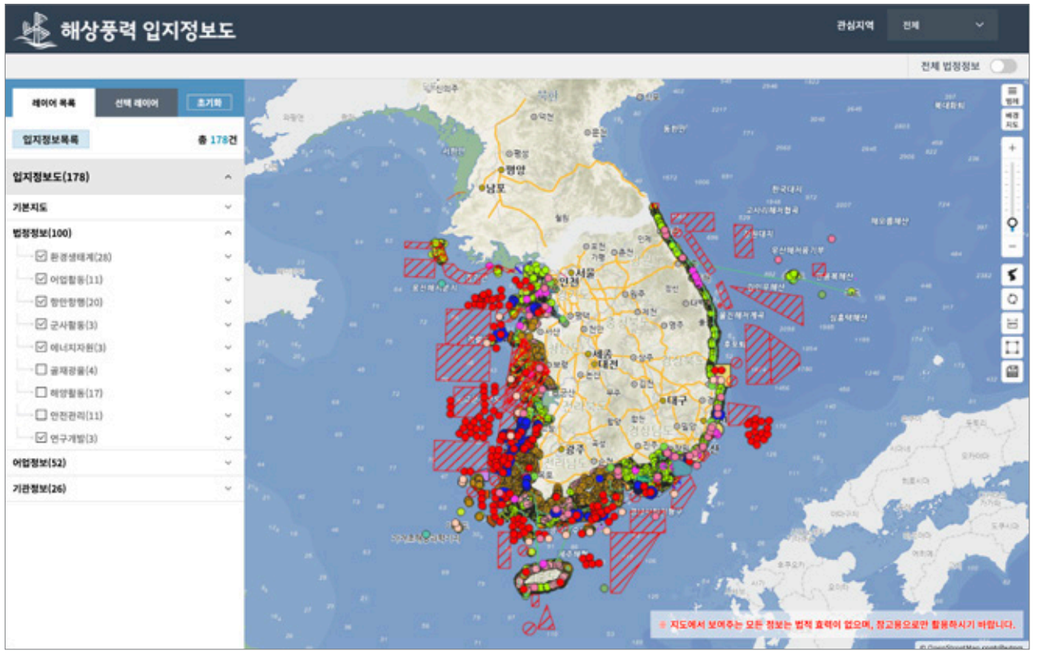
Korea Institute of Energy Technology Evaluation and Planning

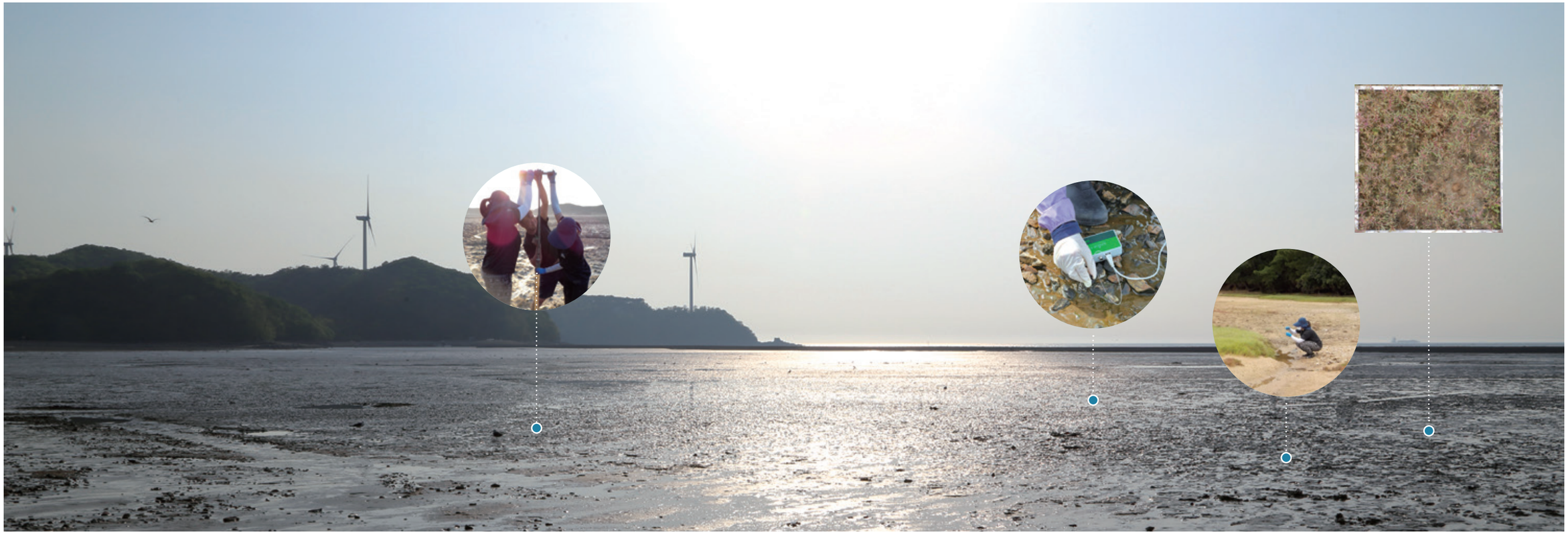
- Development of a digital wind farm site information map

Korea Energy Agency

- Government-led wind farm site discovery project







Renewable Energy and Blue Carbon ❷

Living Shoreline

We create carbon-absorbing and climate change adaptive shorelines, or living shorelines, to expand and promote blue carbon, a key to realizing marine carbon neutrality. Also, we analyze and evaluate the carbon absorption capacity of living shorelines.

Owned Equipment

- Dissecting microscope, optical microscope : Biological analysis
- Quadrats, etc : Field study equipment
- Chlorophyll fluorometer : Measurement of primary production
- Nutrient auto-analyzer: Environmental analysis

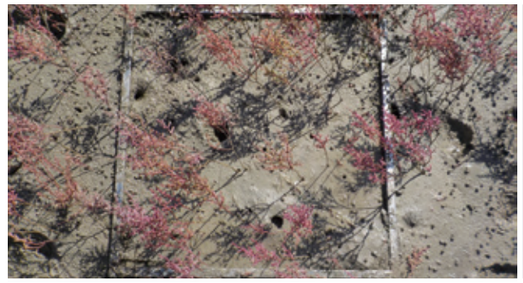
Major Projects and Clients

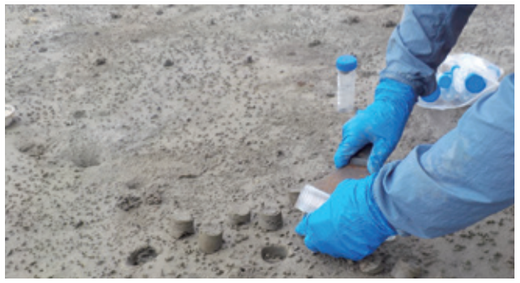
Ministry of Oceans and Fisheries

- Development of Climate Change Adapting, Blue Carbon based Coastline Creation Technique

Main Content

- Site selection for living shoreline
- Analysis of shoreline's blue carbon potential
- Restoration of blue carbon based marine ecosystems





Careers at GeoSystem Research

Recruitment Information

As our business scale and area expand and the need for talent acquisition rises, we are regularly recruiting for talents to work with us. If you are interested in joining GeoSystem Research, please check our website link below for updates on available positions. Regardless of the job postings, applicants with a major in our main field of work (physical oceanography, coastal management, marine geology, coastal engineering, marine environment monitoring, marine ecology, marine survey, geophysical survey) are welcome to apply at any time.

HOMEPAGE

Recruitment Information

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