



- Take a subway line (Toei Subway Mita line) and get off at Uchisaiwaicho Station and take Exit A3. CDIT is 1-minute-walk from the station
- Take a subway line (Tokyo Metro Ginza line) and get off at Toranomon Station and take Exit 1 or 9 or 10. CDIT is 6-minutes-walk from the station
- Take a JR line and get off at Shimbashi Station and go out the Hibiya Exit. CDIT is 5-minutes-walk from the station

 **COASTAL DEVELOPMENT
INSTITUTE OF TECHNOLOGY**

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Advancement and prevalence of coastal and marine technology – Aiming to improve people’s lives and to ensure safety and security –

With a renewed awareness of the importance of countermeasures against earthquakes and tsunami after the Great East Japan Earthquake, Japan has been enhancing its strategic approach as a maritime nation. It has become increasingly important to promote the development, utilization, and preservation of Japan’s coastal regions and oceans, the maintenance of structures, and prevention of coastal disasters in order to bring prosperity and wealth to our country, make contributions to improve people’s lives and develop economic activities, and build a safe and secure society.

The Coastal Development Institute of Technology(CDIT) has so far addressed various challenges of coastal technology, conducting research, developing and disseminating new technologies since it was founded in 1983. CDIT will continue to participate in innovation of technologies to develop, utilize, preserve coastal areas and prevent disasters based on its advanced technology and with the assistance of industry, administration and academia. CDIT will thereby contribute to improvement of people’s lives and world-wide dissemination of technological information.



Objectives of Founding

To prepare a common platform for researchers and engineers actively at work in coastal technology to collaborate in creative and inter-disciplinary technology development

To contribute to enhancement of Japan’s technological capacities in the field of coastal development, utilization and preservation

Established in September 1983 as a public foundation by the auspice of the Ministry of Transport (presently the Ministry of Land, Infrastructure, Transport and Tourism)

The Institute for International Coastal Technology was established within CDIT in June 2004.

The Institute of Technology for Disaster Management was established within CDIT in December 2005.

CDIT established the Office of Conformity Confirmation as an independent entity in August 2007.

Offshore Wind Power Generation Laboratory was established within CDIT in July 2017

Research and Investigation

COMENS : Coastal Oceanic and Meteorological Information System

Examination and certification service of New Coastal Technologies developed by Private Companies

Dissemination of Information and Education

Service for Conformity Confirmation with the Technical Standards of Port and Harbor Facilities

Engineer Qualification Service

Types of Research and Investigation

Independent Research

CDIT carries out research in a concentrated way focusing on its selected themes which require urgent addresses for technological solutions from mid- and long-term perspective of future development of coastal areas.

Collaborative Research and Development

CDIT conducts research on port & harbor, shipbuilding technologies and their related technological challenges necessary for the development, utilization and preservation of coastal areas in collaboration with universities, public research institutes and private enterprises. The research outputs are widely disseminated to society.

Consulting Service

CDIT carries out investigation, testing and research and provides consulting service, according to entrustment by national and local governments and private companies, on varied technological challenges which arise from implementing projects of coastal development, utilization and preservation.

Research and investigation on prevention of coastal disasters

Since the Great East Japan Earthquake on March 11, 2011, we have conducted research and investigation on the causes of damage and the subsequent restoration of disaster-stricken port facilities, as well as the prevention and reduction of seismic and tsunami disasters caused by future massive earthquakes or large-scale tidal waves caused by heavy typhoons.

Research and investigation of the causes of damage and restoration of port facilities stricken by the Great East Japan Earthquake



Disaster status of container wharf in the Port of Sendai

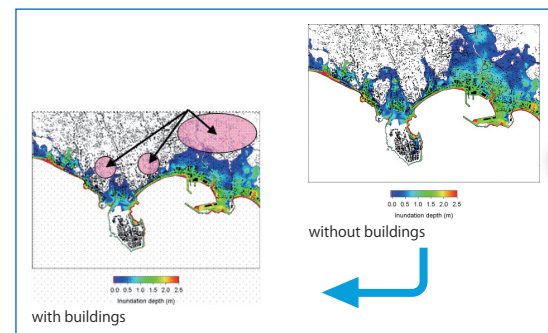


Disaster status of the Port of Ishinomaki



Research committee for restoration policy

Research on upgrading numerical simulation model for tsunami and storm surge



Improving applicability of a tsunami and storm surge simulator (STOC)* (Example of the effect of buildings in reducing inundation)

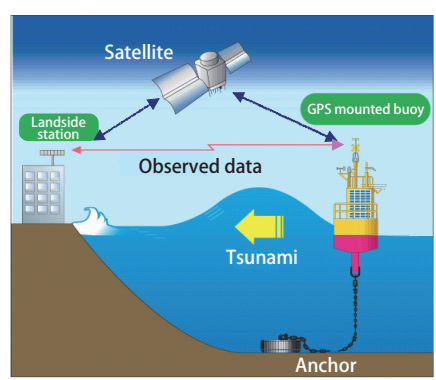


Examples of disaster prevention manuals prepared by CDIT

Research on GPS wave observation system* to observe tsunamis, storm surges and waves at offshore, and on the use of collected data for disaster prevention purpose



GPS wave observation system



Development of observation network of tsunami, storm surge and offshore waves

disasters

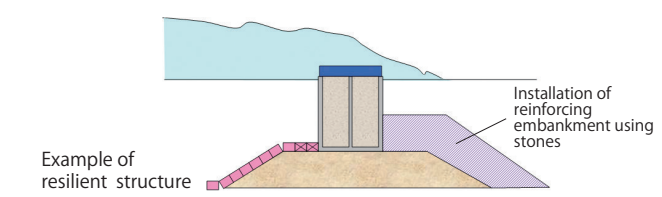
igation on the causes of damage and the subsequent restoration of disaster-stricken port facilities, as well as the prevention and tidal waves caused by heavy typhoons.



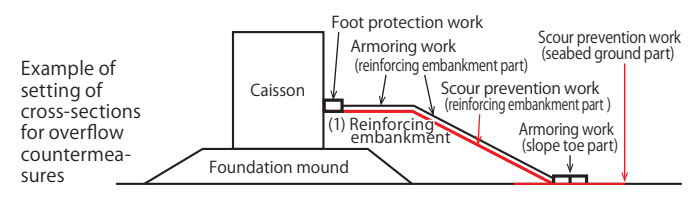
Disaster status of the Port of Soma



Disasters status of Ofunato Breakwaters

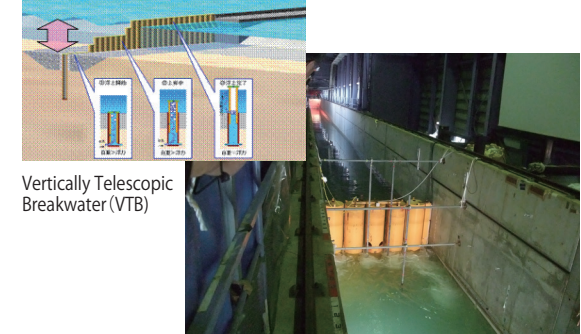


Example of resilient structure



Example of setting of cross-sections for overflow countermeasures

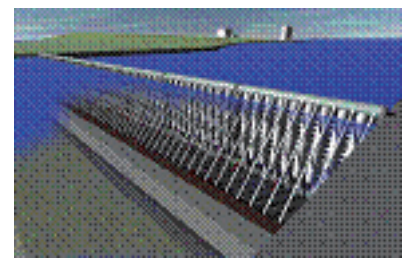
Research on a new type of breakwater which enables co-existing of ship navigation and tsunami protection



Vertically Telescopic Breakwater (VTB)



Experimentation of VTB in a long channel at Port and Airport Research Institute



Flap-gate type breakwater

Research on the facilities for control of tsunami driftage



Tsunami driftage capturing facility



Example of capturing tsunami driftage (Port of Tokachi)



Example of capturing tsunami driftage (Port of Erimo)

Technical Terms

GPS wave observation system (GPS denotes a Global Positioning System.)

It is a marine observation device for monitoring vertical motion of a floating buoy using GPS satellites, and thereby directly measures a movement of sea surface such as waves and tides.

Storm surge and Tsunami simulator in Oceans and Coastal areas (STOC)

STOC is a numerical simulation model developed for making an accurate prediction of a tsunami which travels over such a wide space as the Pacific Ocean, and changes its shape according to topography and obstacles on the way. It also shows a behavior of a tsunami and its likely damaged area in a way people can clearly understand.

● Jacket pier

In Jacket Method, a prefabricated steel jacket is placed on ground piles. The jacket is manufactured at factories, transported and placed at construction site in a large block so as to ensure quality and shorten construction period.

● Immersed tunnel

It is an underwater tunnel constructed by sinking and burying precast hollow units in the excavated trench section. Immersed tunnel elements are prefabricated elsewhere, transported to the construction site and are buried once they are connected. Compared to a shield tunneling method, it reduces the length of tunnel section and is much more economical.

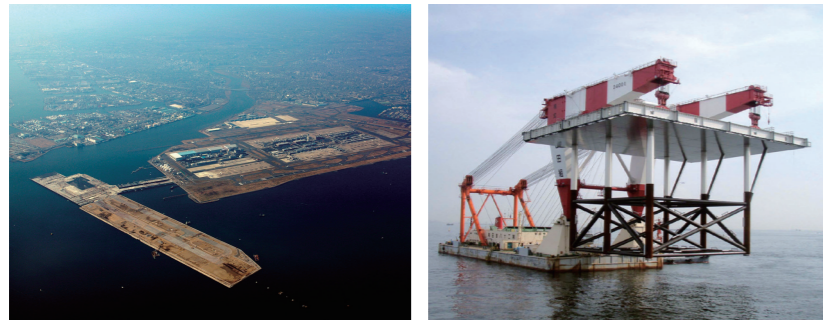
● Long-period waves

The wave period of long-period waves is about 30 seconds or more, but the height is rather low and unremarkable. Nevertheless, they tend to induce oscillation of berthed vessels and hamper cargo handling.

Research and Investigation on Construction Technologies for Ports and Harbors, Coasts and Airports

CDIT conducts research on construction technology to safely and efficiently develop ports, airports and coastal facilities as well as research on the improvement of logistic infrastructure, material recycling and development of new energy.

■ Research on construction technology of an offshore airport



(Left) Panoramic view of D-Runway at Tokyo International Airport (Haneda) which is under construction for the first hybrid type structure of reclamation and piled pier.
(Right) Jacket pier[®] installed in the piled pier section
(Photo: Tokyo International Airport Construction Office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism)



Kansai International Airport constructed on the deep-sea soft ground.
(Photo: Kansai International Airport Land Development Co., Ltd)

■ Research on the dehydration of dredged soil to reduce its volume for the efficient use of a waste disposal facility



Dredged soil after dehydration treatment (dehydrated cake)

■ Research on utilization of recycled materials



Utilization of scallop shells for concrete aggregates

■ Research on an immersed tunnel[®]



Immersed tunnel installed in New Wakato Harbor Highway

■ Research on port highway bridges



Tokyo Gate Bridge (image after completion)
(Photo: Tokyo Port office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism)



Tokyo Gate Bridge (under construction)
(Photo: Tokyo Port office, Kanto Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

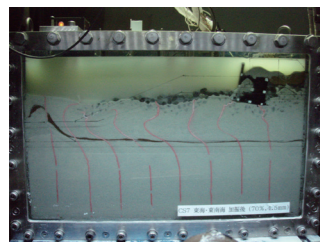
■ Research on new construction method and development of new construction material



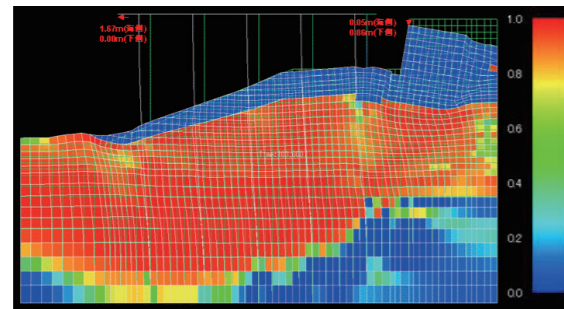
Airport pavement using UFC slab (Ultra high strength Fiber reinforced Concrete: it is light, strong and very durable)
(Photo: Haneda D-Runway Expansion JV)



■ Research on upgrading numerical simulation model for estimating ground deformation induced by large seismic shakings



Deformation by a model experiment
(Upper-right is a model revetment. The ground is deformed due to shakings and a revetment is inclined accordingly.)



Deformation estimation by numerical simulation
(Output of numerical simulation for the same condition as a model experiment left)

■ Research on the structure of a deep-sea quay



Steel plate cell: Yokohama port

■ Development of new mooring system to protect from long-period waves[®]



Vessel mooring system against long-period waves

■ Development of technology for an offshore floating platform for wind turbine power generation



Image of floating-type offshore wind turbine power generators

●Boussinesq equation

This theory is used for calculation of wave deformation in shallow waters at ports and coasts. The waves around coastal structures can be estimated accurately because this theory takes into account wave refraction and diffraction as well as long-period waves induced by nonlinear wave interaction.

●Yorimawari waves or long-period waves traveling to Toyama Bay

This is a swell which is generated by storm wind in the northern area of the Japan Sea and travels long distance to Toyama Bay. It has long been known as "Yorimawari waves" since it hits various villages of Toyama Bay, circulating inside once it comes.

●PIANC

PIANC (formerly: Permanent International Association of Navigation Congress) is an international organization established in 1885 to promote and develop water traffic for human welfare.

●NOWPHAS

NOWPHAS (Nationwide Ocean Wave information network for Ports and Harbors) is the ocean wave information network of the Japanese coasts that Ministry of Land, Infrastructure, Transport and Tourism has maintained. This information is used for wave forecast by the Japan Meteorological Agency (JMA) and contributes to navigation safety.

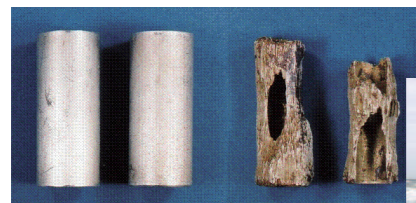
●COMEINS Database

Wave observation data (height, period, direction) obtained at more than 50 observation stations of NOWPHAS have been stocked at COMEINS since 1991. Clients can access and view them in the form of time charts and tables.

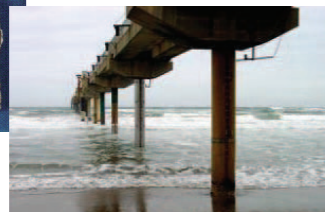
Research on Maintenance, Management and Preservation of Coastal Structures

Social infrastructure, which was mostly developed during the period of Japan's rapid economic growth, now requires massive renewal. It is crucial for coastal structures to be properly maintained, managed and preserved because they are placed in a severe environment such as salty water and consolidation settlement of soft ground. CDIT addresses these technological challenges and conducts necessary research.

■Research on upgrading corrosion control methods for steel pipe piles



Comparing steel pipe piles between with and without corrosive control



On-site experiment

■Development of Corrosion Control and Maintenance Manual for Port and Harbor Steel Structures

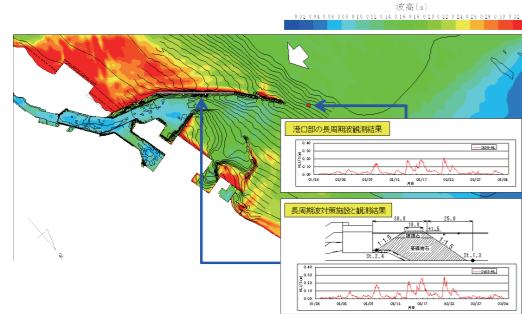


An example of mortar coating method using FRP covering

Research and Investigation on Coastal Meteorology and Oceanography

CDIT conducts research on the analysis of long-period waves and harbor calmness etc. in the coastal area.

■Research on Yorimawari waves i.e., long-period waves traveling to Toyama Bay*, and analysis on harbor calmness based on Boussinesq equation*



Comparison of outputs between numerical analysis and observed data for harbor calmness



Yorimawari waves, i.e., long-period waves traveling to Toyama Bay (Photo by Mr. Takahiro Akeno)



Disasters caused by Yorimawari waves in Toyama Bay

Research on international standardization of design method etc.

It is important to disseminate information on designing method and other guidelines of Japan to the world. CDIT conducts research on overseas trend of international standardization of technical standards and dissemination of Japan's design and technical standards while actively participating in international conferences.



PIANC* WG49 Meeting



Overseas port facility constructed based on Japanese standards (Semi-circular breakwater: Yangtze River, China)

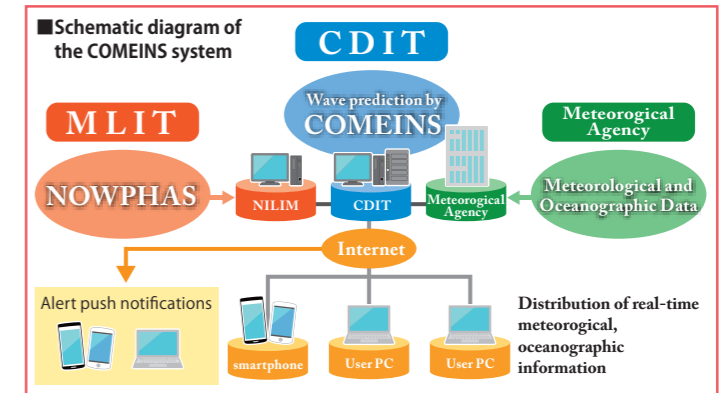


CDIT provides wave and wind prediction information and the other disaster prevention information

—COMEINS : Coastal Oceanic and Meteorological Information System

Improvement in the precision of wave prediction and upgrading of latest wave model and information provision system

By way of the "Coastal Oceanic and Meteorological Information System" (launched in 1995 and distributed since 1997) CDIT provides meteorological and oceanographic information observed at NOWPHAS, and wave prediction output based on them. Also, a web-based internet system is put into service to provide accurate wave prediction information up to 10-days later.

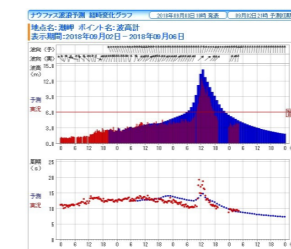


Service of Meteorological and Oceanographic Information

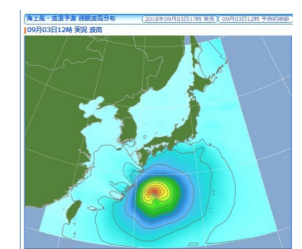
■Provision of observed data on ocean waves



■Service of Ocean wave forecasting



Ocean wave forecasting at NOWPHAS (Nationwide Ocean Wave information network for Ports and HarbourS) points



Forecasting of Ocean wave and sea-surface wind

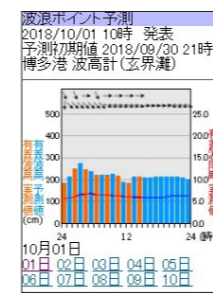
■Provision of general meteorological information

Typhoon Information, Earthquake information, Tsunami information, Marine alerts, Warning and Advisories, Short-term forecast of Precipitation, Weather Chart, Weather Forecasts, Satellite Imagery, AMeDAS (Automated Meteorological Data Acquisition System) information, Earthquake, Tsunami and Volcano warning and advisories, weather radar imagery

■Providing past data of observed ocean wave

Providing information via mobile devices (COMEINS on Mobile)

Detailed meteorological and oceanographic information as well as ocean wave observation and forecasting information are provided via cellular websites. Consequently, clients can receive those data real-time no matter where they are.



Wave observation and forecasting screen



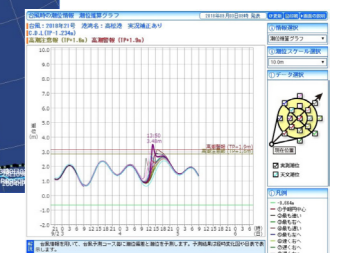
Earthquake information screen

Support of Disaster Prevention Activities

CDIT provides meteorological and oceanographic database necessary for preparing precautionary measures to prevent disasters. Besides, CDIT provides real-time meteorological and oceanographic information required for assisting disaster prevention activities.



COMEINS database (Search for similar typhoon cases)



Disaster Prevention Assisting Information (Sea-level forecasting during a typhoon)

CDIT examines and certifies new technologies developed by private companies in order to facilitate the use and spread of excellent technology

—Examination and Certification Service of New Coastal Technologies developed by Private Companies

Examination and certification of Coastal Technologies developed by Private Companies

CDIT examines and certifies technologies developed by private companies (for development and use of ports and harbors, navigation channels and coasts) from an objective and independent viewpoints, and offers necessary assistance to promote their use.

Type of technologies evaluated	
1	Basic technology for new construction method, new structure and new material related to port development
2	Technology related to environment, recycling and landscaping
3	Technology to properly maintain port related facilities
4	Technology related to information, communication, disaster prevention and risk management

Evaluation Report



END construction method (which enables dredging thin layer and is environment-friendly)



Rakunikan Joint (a mechanical coupler for steel pipe piles or sheet piles to connect each other in a shorter period than a currently used welded joint)



CDIT carries out various dissemination and education activities in order to promote extensive use and popularization of advanced technologies

—Dissemination of Information and Education Service

Preparation and publication of technical guidelines and manuals

CDIT prepares and publishes various kinds of guidelines and manuals for designing, construction, maintenance, disaster prevention etc. based on the output of its research in order to promote effective utilization and wide spread of advanced technological information (48 manuals and guidelines issued by 2010.)

Guidelines and Manuals published and distributed by CDIT



Examples of projects implemented based on our technical manual



Tokyo International Airport (Haneda Airport) where compaction grouting method was applied for liquefaction countermeasure.

National Land Technology Development Award

CDIT awards National Land Technology Development Award every year to commend excellent technologies with an aim to help motivate private sector technology development and to help improve the technological level of the construction industry, and, in so doing, to contribute to the development of new technologies as a whole.



Commendation Ceremony of National Land Technology Development Award

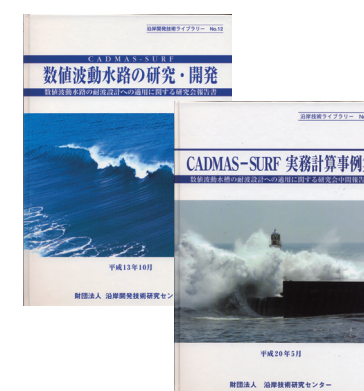


The 11th National Land Technology Development Award Grand Prize, Key Element Construction Method (New method for connecting immersed tunnel elements without the works of the last coupler as is needed in a conventional method)

Development of Software

CDIT develops computer software for various numerical simulation models in cooperation with institutes such as Port and Airport Research Institute, sells them and holds work shops as well.

Numerical Wave Channel (CADMAS-SURF®)

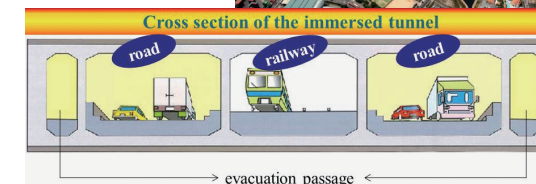


CADMAS-SURF, Its Research and Development/ Examples of practical calculation

Forecasting Program for Structural Damage due to Liquefaction (FLIP®)



Yumesaki Tunnel at Osaka Port designed based on FLIP



General-purpose Ground Analysis Program (GeoFem®)



GeoFem Manual

Technical Terms

●CADMAS-SURF

CADMAS-SURF (Super Roller Flume for Computer Aided Design of Maritime Structure) is a numerical simulation program used to estimate wave force and wave topping for coastal structures instead of implementing model tests which require large experimental facilities.

●FLIP

FLIP (Finite Element Analysis Program for Liquefaction Process) is a numerical simulation program for dynamic effective stress analysis to estimate the residual deformation of ground and structure by earthquake shaking as well as the stress in structure members.

●GeoFem

This is a numerical simulation program to analyze deformation of ground supporting breakwaters and other upper structures

●The North-East Asia Port Symposium

The North-East Asia Port Symposium is held every year taking turns by Japan, Korea and China in order to exchange updated information and experience of ports and harbors, and thereby strengthen friendly ties.

●IAPH

IAPH (The International Association of Ports and Harbors) is an international NGO established in 1955 where people engaged in ports gather from all over the world. It aims to promote development of ports and communication among port related people in the world. Its headquarters is in Tokyo.

●KORDI

Korea Ocean Research and Development Institute established in 1973 plays a central role in oceanographic research in Korea. The present name is KIOST (Korea Institute of Ocean Science and Technology)

Organizing Symposiums and International Conferences

CDIT organizes seminars, symposiums, international conferences and work shops to widely disseminate advanced technologies for effective development and utilization of coastal areas.

■Special seminar on an anniversary day of foundation



Opening address by the president of CDIT

■Annual research output reporting seminar (Coastal Technology)



Presentations by researchers of CDIT



Collection of CDIT research papers which is published annually

Worldwide dissemination of advanced technologies

CDIT carries out activities overseas to transmit advanced technology and knowledge for disaster prevention and development in coastal areas.

■The 9th North-East Asia Port Symposium* (Dalian, China), Presentation on Tsunami



Presentation of Research

■The 26th IAPH* World Ports Conference (Genoa, Italy)



Presentation of Research

■The 6th international workshop on coastal disaster prevention (Bangkok,Thailand),



Opening address by the president of CDIT

Agreement on Research Cooperation

CDIT has made an agreement on research cooperation with many universities and research institutes, and carries out joint research and seminars as well as exchange of research information and publications.

■Signing Ceremony of Research Cooperation Agreement at Korean Ocean Research and Development Institute (KORDI)* in Seoul, Korea



Right : Kang Chung Guk, Director General of KORDI
Left : President of CDIT

■Seminar jointly held by CDIT and KORDI based on Agreement on Research Cooperation



Worldwide dissemination of knowledge on disaster mitigation measures against tsunami

CDIT edited a book titled "TSUNAMI---To survive from tsunami" and published its Japanese version from Maruzen Publishing Co. in November 2008 to help people survive a tsunami. Then, CDIT successively published a book "TSUNAMI" in English and Indonesian languages, respectively from World Scientific Publishing Co. and PT. Sarana Komunikasi Utama. In addition, CDIT held workshops in Indonesia and other disaster stricken countries by Indian Ocean Tsunami to disseminate knowledge on tsunami and necessary precautionary measures to mitigate disasters based on the book "TSUNAMI". This project was financially assisted by a Nippon Foundation. In connection with English and Indonesian publications, CDIT is commended and awarded "the Book of the Year 2009" by Japan Society of Civil Engineers.

Thereafter, CDIT edited a book titled "Tsunami is Deadly." which is a much easier version for children to understand major points written in the book "TSUNAMI", and published it in various languages such as Japanese, Indonesian and Spanish.

■Japanese, English and Indonesian versions of the book "TSUNAMI" as well as the book "Tsunami is Deadly."



■Dissemination of tsunami knowledge in Indonesia (Ceremony and Seminar commemorating publication of the Indonesian version of the book "Tsunami")



Left : His Excellency Minister Mr. Kadiman Kusumayant ,
Ministry of Research and Technology, Indonesia
Right : President of CDIT

■Workshops in Indonesia



Bali



Padang



Yogyakarta

Patents

CDIT holds patents of various technologies to develop, use and preserve coastal areas and prevent from disasters, and thereby promotes the transmission of such excellent technologies.

■Examples of patented technology in actual use (new technology involving light mixed ground material)



Reconstruction work of the embankment of Yumesima Immersed Tunnel at Osaka Port

CDIT examines and confirms conformity of structure designing in light of new technical standards to ensure safety of port and harbor facilities

—Service for Conformity Confirmation with the Technical Standards for Port and Harbor Facilities of Japan

CDIT established "Office of Conformity Confirmation" which was approved and registered with the Government and provides a service of examining and confirming conformity with the Technical Standards for Port and Harbor Facilities of Japan.

■ Outline of Examination Procedures of Conformity Confirmation



Conformity Confirmation Examination Committee



Shinagawa Wharf under construction after obtaining the Certificate of Conformity Confirmation



CDIT contributes to technology inheritance and enhancing capacities of port and harbor engineers.

—Engineer qualification service

Qualification of Maintenance Engineer for Port and Harbor Infrastructure

Maritime and port & harbor facilities in Japan were mostly constructed about half a century ago during a rapid economic growth, and therefore faces growing challenges for aging and proper maintenance. Accordingly, CDIT examines and certifies "Maintenance Engineer for Port and Harbor Infrastructure" as a qualified engineer who is expected to play a leading role in preparing a maritime and port and harbor facility maintenance plan and its implementation.



Aged facility



Inspection of Aging condition



Renewal works

Qualification of Design Engineer for Maritime, Port and Harbor Infrastructure

According to the revised Technical Standards of Port and Harbor Facilities in 2007, the designing of port and harbor facilities changed to a performance design in which performance criteria and performance verification methods were entrusted to the discretion of design engineers. As such, CDIT started a qualification service in 2010 to examine and certify "Design Engineer for Maritime, Port and Harbor Infrastructure" as a qualified design engineer who is capable of designing based on his free idea and creativity while ensuring the quality of its design.

一般財団法人 沿岸技術研究センター
Coastal Development Institute of Technology

国際沿岸技術研究所
Institute for International Coastal Technology

沿岸防災技術研究所
Institute of Technology for Disaster Management

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確認審査所
Office of Conformity Confirmation