Introduction of institutions

Tsukuba Central Research Institute

Tsukuba Central Research Institute aims at improving civil engineering technology by conducting studies on civil engineering techniques, experiments, research and development, as well as giving technical instruction and disseminating research achievements.
It also aims at contributing to society by efficiently improving infrastructure and appropriately accomplishing the duties in land, infrastructure, transport and tourism policy.

Introduction of institutions

Civil Engineering Research Institute for Cold Region

Civil Engineering Research Institute for Cold Region, as only one laboratory core of civil engineering technology for cold regions, actively disseminates research results and development technologies to cold regions both in Japan and other countries.
It also takes leading role as an organization to offer information about the civil engineering technology for cold regions in Japan.

Tsukuba Central Research Institute

Construction Technology Research Department

PWRI is responsible for high-quality research and development showing leadership in the innovation of civil engineering technology, turning research results into "technologies utilized", and widely disseminating them. Based on these underlying aims, our Construction Technology Research Department engages in advanced interdisciplinary research and development that goes beyond civil engineering technology. As well as supporting their progress, we actively disseminate the results of our projects both in Japan and overseas.

ICT-assisted construction machine

Remotely operated excavator

Pump diagnostic method

The Advanced Technology Research Team is engaged in research and development aimed at improving productivity in construction projects, conserving the global environment, and raising the level of national resilience. We undertake, in cooperation with partners such as central and local government, i) research and development relating to the application of ICT to construction machinery, robotics for disaster response, and other kinds of leading technology (including robotics, artificial intelligence, and measurement techniques); and ii) advanced research and development contributing to the management of relevant machines and equipment, such as dams and river pumping system.
The Technology Applications Research Team i) undertakes research and development projects aimed at the practical use of civil engineering techniques on construction sites; ii) provides technical information via various publications and events; iii) offers support via technical evaluation, discussion, and guidance; iv) effectively manages intellectual property rights; and v) collects information on international standards to facilitate internationalization. The activities of the Technology Applications Research Team are outlined on pages 35-41.

▶ **Advanced Technology Research Team** http://www.pwri.go.jp/team/advanced/index_en.html

Tsukuba Central Research Institute

Geology and Geotechnical Research Group

The Geology and Geotechnical Research Group is conducting extensive research targeted survey, design, construction and management that including disaster prevention and environmental protection measures in ground and rock, slopes, earth structures, soil environments, and other areas.
The Geology and Geotechnical Research Group is comprised of the Geology Research Team, Soil Mechanics and Dynamics Research Team, and Construction Technology Research Team.
The Geology Research Team develops objective criteria and methods to find out properties of foundation ground.
The Soil Mechanics and Dynamics Research Team conducts research using model test and numerical analysis for the development of design methods including seismic design and reinforcement methods for earth structure.
The Construction Technology Research Team conducts research for the development of construction and maintenance/ management technologies used in earth structures.

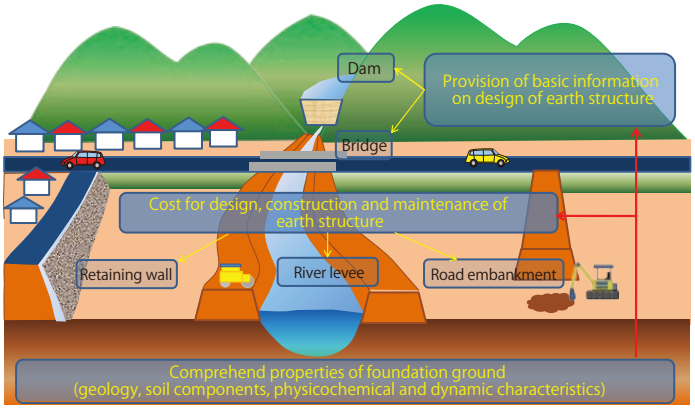


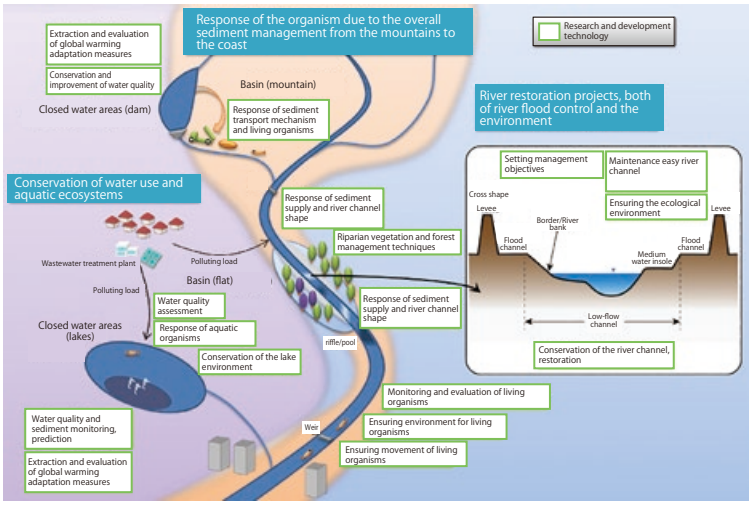
Image of research field of the Geology and Geotechnical Research Group

We also develop and promote innovative techniques to investigate and evaluate soil pollution and integrated geophysical exploration technologies, which are combined solutions to survey and analyze the internal structure of ground and earthworks.

▶ **Geology Team** http://www.pwri.go.jp/team/tishitsu/index_e.htm
▶ **Soil Mechanics and Dynamics Research Team** http://www.pwri.go.jp/team/smd/index.htm
▶ **Construction Technology Research Team** http://www.pwri.go.jp/team/sekou/eng_index_33.html
▶ **Geophysical Exploration** http://www.pwri.go.jp/team/geosearch/english.html

Tsukuba Central Research Institute

Water Environment Research Group



Water environment research group, targeting the rivers and lakes that receive a variety of impact due to human activities, conducts research to understand the mechanism of ecosystem and its anthropogenic impact/ and mechanism of water pollution. It also conducts research on the river management techniques which are for both flood control and the environment, monitoring of pollutants and measures/ approach.

Concerning biological, ecological and environmental conservation and restoration of rivers/lakes, the River Restoration Research Team uncovers the relationship of the terrain, the physical environment and material dynamics and ecosystems and conduct research on impact assessment method and approach to ecosystem. The Water Quality Research Team is engaged in the development of methods for analyzing and monitoring chemical substances in rivers, lakes, reservoirs, dam reservoirs, and sewage effluent in order to reduce regional water quality risk. It also develops methods for understanding the behavior of contaminants and for evaluating and mitigating the impact on aquatic ecosystems. The Aqua Restoration Research Center (ARRC) located in Kagamihara, Gifu Prefecture has full-scale model rivers and ponds for experiments and using these facilities the center carries out research on multi-natural river development and flow and sediment management such as river flow, sediment supply, and response of ecosystems to the structural modifications of the river.

- **River Restoration Research Team** http://www.pwri.go.jp/team/rrt/eindex.html
- **Water Quality Research Team** http://www.pwri.go.jp/team/suisitsu/index_e.htm
- **Aqua Restoration Research Center** http://www.pwri.go.jp/team/kyousei/eng/index.htm

Tsukuba Central Research Institute

Hydraulic Engineering Research Group

Hydraulic Engineering Research Group engages in the following developments; (1) Development of accurate sediment supply technology ,which can supply necessary quantity and quality sediment to downstream from dam reservoir, which is the technical issues to carry out the comprehensive sediment management, (2) high-performance sediment supply technology to overcome the shortcomings of the existing sediment supply from structural point of view, (3) Research on influence and adaptation measures of water quality in dam reservoirs due to climate change (4) development of advanced technology using the sensor, which has been significantly improving in recent years, to observe the river flow rate at the time of the flood, that becomes the basis of the flood defense plan, (5) technology to monitor riverbed fluctuations such as the river bed waves that occur at the time of the flood in real time. River and Dam Hydraulic Engineering Research Team is responsible for (1) ～ (3), and (4) and (5) are for Hydrologic Engineering Research Team

Sediment simulation technology for dams

Sediment bypass tunnel (Outlet of Miwa Dam facility)

Flow rate observation technology using the ADCP

- **River and Dam Hydraulic Engineering Research Team** http://www.pwri.go.jp/team/dam_hydraulic/english.htm
- **Hydrologic Engineering Research Team** http://www.pwri.go.jp/team/hydro_eng/index_e.htm

Tsukuba Central Research Institute

Erosion and Sediment Control Research Group

The Japanese archipelago is vulnerable in terms of the nature of its terrain, with around 70% of its area being mountainous or hilly and containing many fast-flowing rivers. Each year, there are debris flow, drift wood, and landslides after sudden heavy rainfall, earthquakes, volcanic eruptions, and sediment-related disasters, such as slope failures. Furthermore, as well as snow avalanches after heavy snowfall, landslide disasters could be occurred when snow melts.
Such sediment-related disasters have a significant impact on communities, not least in terms of harm to human life, houses, and social infrastructure. In recent years, there have been many serious disasters caused by unprecedented sudden heavy rainfall and large-scale earthquakes.
The Erosion and Sediment Control Research Group conducts research and development related to the mechanisms of sediment-related disasters, risk evaluation, and countermeasure methods. This is with the aim of effectively implementing advance countermeasures, emergency response measures immediately after the event, and permanent countermeasures. In addition, immediately after a disaster has occurred, the group is active at the scene; for example, technical support related to subsequent investigations and countermeasures.


Investigating ash distribution from the 2014 Mount Ontake eruption


Investigating drift wood from the 2017 northern Kyushu heavy rain disaster


Investigating the 2017 landslide in Watada district, Bungo-Ono city, Oita Prefecture


Avalanche survey in Maki district, Otari village, Nagano Prefecture in 2019

- **Volcano and Debris Flow Research Team** http://www.pwri.go.jp/team/volcano/eindex.html
- **Landslide Research Team** http://www.pwri.go.jp/team/landslide/english%20pages/index.htm
- **Snow Avalanche and Landslide Research Center** http://www.pwri.go.jp/team/niigata/english.html

Tsukuba Central Research Institute

Road Technology Research Group

The Road Technology Research Group conduct research to resolve the ways of efficient construction and maximum utilization of roads with the objective of providing safe and comfortable road space. The Pavement Research Team conducts research on the pavement technologies by investigating performance evaluations of pavement and design methods, analyzing the economical management of pavement, improving the roadside environment and promoting energy conservation and recycling.
The Tunnel Research Team carries out field-based research through experiments, numerical analyses, and on-site measurements to establish rational and economical methods for investigations, design, construction, maintenance and management of tunnel structure and attached facilities such as ventilation and emergency facilities.


Accelerated load test and non-destructive test for pavement


Example of field test to establish rational inspection and diagnosis

- **Pavement Research Team**
  http://www.pwri.go.jp/team/pavement/eindex.html
- **Tunnel Research Team**
  http://www.pwri.go.jp/team/tunnel/index-e.htm

Civil Engineering Research Institute for Cold Region

Cold-Region Construction Engineering Research Group

As aging of the public infrastructure is progressing, efficient and effective maintenance, update and maintenance of the public infrastructure with consideration of specific environmental conditions which is unique to the cold and snowy regions is required. In addition, there is a growing demand for responses to landslides and earthquake disasters which frequently occur and public infrastructure to protect safety for lives of people.

Cold-Region Construction Engineering Research Group conducts research in order to address these challenges. Structures Research Team develop design and construction technology for road structure to prevent disasters caused by falling rocks and earthquakes. It also develops maintenance technology of road structure in the snowy cold environment. Geotechnical Research Team conducts research on improving technology for safety and durability of civil engineering facility built on peaty soft ground which is widely distributed in the cold climates, and development of technology related to strong soil structure which is durable to frost heave and freeze-thaw. Geological Hazards Research Team conducts research on development of technology to avoid landslides and rock slope disaster of the snowmelt season and development of assessment and countermeasures of natural origin of the heavy metals.

Deterioration of the road bridge deck due to frost damage

Liquefaction damage in a residential area

Massive rockfall disaster

Landslide disasters occurred in snowmelt season

- **Structures Research Team** http://kouzou.ceri.go.jp/ev/index_en.html
- **Geotechnical Research Team** http://jiban.ceri.go.jp/index.html
- **Geological Hazards Research Team** http://chishitsu.ceri.go.jp/

Civil Engineering Research Institute for Cold Region

Cold-Region Maintenance Engineering Research Group

Civil engineering structures in cold snowy regions are subject to the actions of freezing and thawing caused by low temperatures, and chloride ions from seawater and antifreezing agent. So they are deteriorated by frost or combined frost and chloride attack etc., and their functions are reduced by frost heaving or insufficient bearing capacity.

In order to improve durability and to appropriately maintain the functions of civil engineering structures for a longer period of time, in the Cold-Region Maintenance Engineering Research Group, Materials Research Team (mainly concrete structures) and Road Maintenance Research Team (mainly pavement structures) are conducting research to develop technologies to preserve structures such as quality control and maintenance, repair, reconstruction and other technologies to improve durability in the cold snowy environment.

Investigation of concrete structures deteriorated by combined effect

Measures against deterioration/ damage unique to cold region

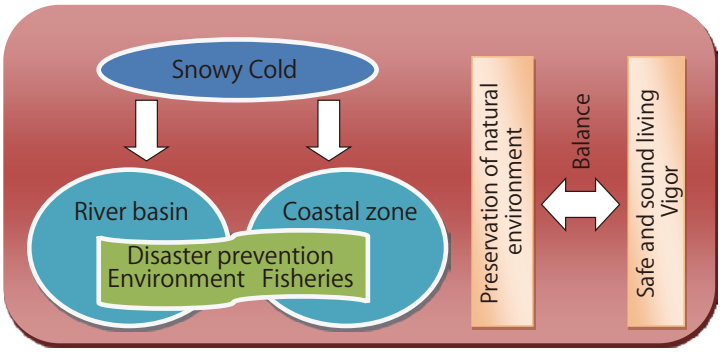
When concrete structures are subjected to combined deterioration of the frost and salt damages cracking and scaling will occur. It accelerates quality deterioration of concrete and reinforcing steel. So we conduct research to predict its degradation progress and selection of appropriate repair method to perform efficient maintenance and reconstruction. In addition, pavement in snowy, cold regions has been deteriorated and damaged uniquely by frost heaving and low-temperature cracking in midwinter, decreased subgrade bearing capacity and freeze-thawing in snowmelt season as well as snow removal and spraying of anti-freezing agents in winter, we also conduct research on countermeasure for deterioration in these cold environment.

- **Material Research Team** http://zairyo.ceri.go.jp/research/research_eng.htm
- **Road Maintenance Research Team** http://www2.ceri.go.jp/eng/iji.htm

Civil Engineering Research Institute for Cold Region

Cold-Region Hydraulic and Aquatic Environment Engineering Research Group

Cold-Region Hydraulic and Aquatic Environment Engineering Research Group conducts research and technology development necessary to strike a balance among securing a safe and sound living, maintaining vigorous socio-economic activities and preserving the rich natural environment in the river basin and coastal zone of the cold, snowy regions.
Cold-Region Hydraulic and Aquatic Environment Engineering Research Group consists of four teams and has collaboration among teams to conduct basin-based research on disaster prevention, environment and fisheries from headwater area to coastal zone. River Engineering Research Team conducts engineering development for flood mitigation and river management by the hydraulic experiments and numerical analyses. Watershed Environmental Engineering Research Team develops technologies associated with the conservation of aquatic ecosystems and monitoring and management of water resources and sediment dynamics at the watershed scale. Port and Coast Research Team develops assessment of storm surge and high waves by tsunami and climate change with a large amount of flotsam like ice and damage mitigation. Fisheries Engineering Research Team conducts research on development of fisheries infrastructure engineering to improve productivity and promote fisheries in the cold coastal water.



Research images of Cold-Region Hydraulic and Aquatic Environment Engineering Research Group

- **River Engineering Research Team** http://river.ceri.go.jp/
- **Watershed Environmental Engineering Research Team** http://kankyou.ceri.go.jp/
- **Port and Coast Research Team** http://cecore.ceri.go.jp/
- **Fisheries Engineering Research Team** http://suisan.ceri.go.jp/

Civil Engineering Research Institute for Cold Region

Cold-Region Road Engineering Research Group

In cold, snowy regions, it is essential to secure and effective snow and ice disaster measures of winter road traffic function to support rich and quality of life and bring out the vitality of the regions. For this reason, Cold-Region Road Engineering Research Group conducts research on winter road management, snow and ice protection, traffic safety and road geometric structure in order to solve these problems due to the cold, snowy natural environment and unique traffic environment in Hokkaido.
The Cold-Region Road Engineering Research Group consists of the Traffic Engineering Research Team and the Snow and Ice Research Team. The Traffic Engineering Research Team is involved in research programs that aim to ensure safe and reliable wintertime road traffic services, even under the current social circumstances of a declining population, aging society, lack of financial resources. Meanwhile, the Snow and Ice Research Team is involved in research programs that contribute to mitigation of transport disruption because of snow and ice events, which have become more frequent and complex in recent years in terms of location, type, and scale.

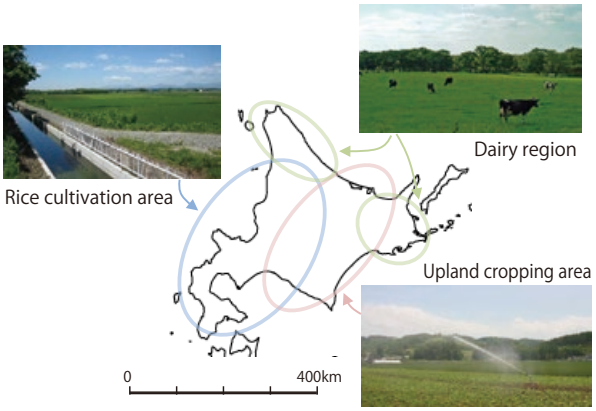
- **Traffic Engineering Research Team** http://www2.ceri.go.jp/eng/koutsu.htm
- **Snow and Ice Research Team** http://www2.ceri.go.jp/eng/bousai.htm

Civil Engineering Research Institute for Cold Region

Cold-Region Agricultural Development Research Group

Cold-Region Agricultural Development Research Group consists of Rural Resources Conservation Research Team and Irrigation and Drainage Facilities Research Team. These teams have been conducting research on civil engineering technology necessary to advance the state-owned agricultural and rural development projects in Hokkaido that deploys the large-scale agriculture with high productivity.
In recent years, natural and socio-economic conditions of agriculture in Hokkaido region are changing greatly due to the situations including global warming, lack of manpower, and international food distribution under TPP etc. In response to such environmental changes, it is necessary to maintain and develop agriculture by taking advantage of abundant land and water resources of Hokkaido. Therefore, we develop technologies for the reclamation and water management of large-sized fields, the improvement of longevity of irrigation and drainage facilities and the conservation of water environment in rural areas.

▶ **Rural Resources Conservation Research Team** http://hozen.ceri.go.jp/
▶ **Irrigation and Drainage Facilities Research Team** http://suiri.ceri.go.jp



Using Hokkaido as a field, where the large-scale agriculture has been running, we develop various technologies such as maintenance and management of large sized field, improving longevity of irrigation facilities, disaster response planning to handle risks at the time of large-scale disaster, assessment and maintenance of water quality environment.

Outreach and dissemination of results to other regions

Civil Engineering Research Institute for Cold Region

Director for Cold-Region Technology Development Coordination

The organization solves technical issues and disseminates research result efficiently which is needed for development and promotion in the cold and snowy regions mainly in Hokkaido. The Cold-Region Technology Promotion Division disseminates research results inside and outside of Hokkaido and promotes use of intellectual properties.
Machinery Technology Research Team conducts research on mechanical technology for snow removal machine in snowy cold regions and inspection technology that contributes to stock management of civil engineering facilities and machinery equipment.

▶ **Cold-Region Technology Promotion Division**
http://chouseikan.ceri.go.jp/suishin/
▶ **Machinery Technology Research Team** http://kikai.ceri.go.jp/

Appropriate and efficient snow removal machine maintenance technology

Civil Engineering Research Institute for Cold Region

Director for Special Research

The 1st century BC Roman architect Vitruvius described “solidity”, “usefulness” and “beauty” as the three essentials for structures. This is why we must consider landscape when developing infrastructure in addition to considering durability and function. In recent years in Japan, the need to ensure scenery landscapes when maintaining infrastructure is increasing, as is the need to contribute to tourism promotion. The promulgation of “The Landscape Act” and “The Basic Act for Promoting a Tourism-Oriented Country” are among the responses to such needs. Also, tourism has become an important industry in Japan, especially in Hokkaido. In response to such needs, the Scenic Landscape Research Team has been established under the Director for Special Research. We conduct research that supports communities in raising the quality and utility of their public spaces and in creating a rich living environment.

▶ **Scenic Landscape Research Team** http://scenic.ceri.go.jp/index.eng.htm

Proposal of planning, maintenance and management techniques for good public space

Introduction of institutions

International Centre for Water Hazard and Risk Management under the auspices of UNESCO (ICHARM)

United Nations Educational, Scientific and Cultural Organization

ICHARM

Introduction of institutions

Center for Advanced Engineering Structural Assessment and Research (CAESAR)

CAESAR

Introduction of institutions

Innovative Materials and Resources Research Center (iMaRRC)

iMaRRC

International Centre for Water Hazard and Risk Management under the auspices of UNESCO (ICHARM)

United Nations Educational, Scientific and Cultural Organization

Having been approved at a UNESCO general session, ICHARM was established in March 2006 as an international centre under the auspices of UNESCO. Its aim is to transfer relevant knowledge and technology fostered in Japan to nations and regions impacted by water disasters based on their needs and conditions and to support their efforts to mitigate future disaster damage.

The mission of ICHARM is to serve as the Global Centre of Excellence for water hazard and risk management by observing and analyzing natural and social phenomena, developing methodologies and tools, building capacities, creating knowledge networks, and disseminating lessons and information in order to help governments and all stakeholders manage risks of water-related hazards at global, national, and community levels. To fulfill this mission, we construct effective information networks globally and carry out practical action tailored to local needs and conditions while combining innovative research with effective capacity building.

Innovative Research

Our current research projects cover the following five areas:

1. Data collection, storage, sharing, and statistics on water related disasters.
2. Risk assessment on water-related disasters
3. Monitoring and prediction of changes in water-related disaster risk
4. Proposal, evaluation and application of policy ideas for water-related disaster risk reduction
5. Support in constructing the applicability of water-related disaster management

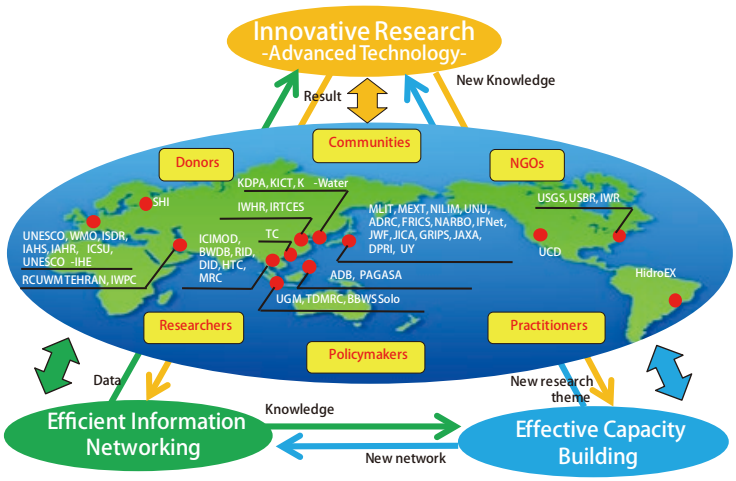
Effective capacity building

We support practitioners, mainly from developing countries, in building their capacity to resolve problems based on scientific and engineering knowledge and to take a lead in disaster prevention and mitigation measures.

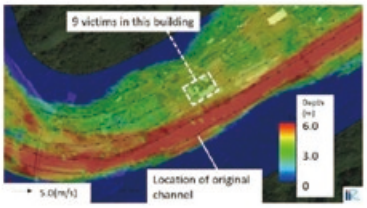
Effective information networking

We maintain and strengthen a global network of researchers, which contributes to the collection, analysis, and sharing of information and experience related to major water disasters around the world. We are also committed to mainstreaming disaster risk reduction in countries around the world by organizing and managing international networks, such as the International Flood Initiative (IFI). One important IFI project is the establishment of a platform on water and disasters in each country, based on the 2016 Jakarta Statement. We assist Asian countries in organizing this platform to reduce water disaster risk in the region in cooperation with other IFI partners and report on this activity at special UN sessions to share information with other countries.

▶ http://www.pwri.go.jp/icharm/index.html



Three main activities of ICHARM



Results of the analysis of flood discharge after change in the riverbed and flow channel of a valley floor river in a semi-mountainous area

Exchanging views with residents while supporting the production of a flood risk management plan

IFAS training

2017 Masters Award Ceremony

Water and Disaster platform (May 2017, Myanmar)

Special session on science and technology at the Third UN Special Thematic Session on Water and Disasters (July 2017, New York)

Center for Advanced Engineering Structural Assessment and Research (CAESAR)

Bridges and Structural Engineering Research Group

Civil engineering structures in Japan have been exposed to severe traffic demand and the natural environment, and aging of many structures to have begun already. There is an urgent need to establish technology for assessing the soundness of structures, as well as technology for maintenance and replacement. The Center for Advanced Engineering Structural Assessment and Research(CAESAR), along with the road administrators, lead to problem-solving for the proper maintenance of the road bridges including earthquake issues. The related researches conducted by CAESAR contribute to standardization for technologies related to design, construction and maintenance for the road bridges, involving accumulated knowledge, research results and integrated technology.

Bridges and Structural Engineering Research Group, with mainly developing technology to assess and predict performance of the bridge structure accurately and promptly , conducts research on comprehensive technologies of design/construction, maintenance/management, inspection/diagnostic techniques, and repair/ strengthening. The group also conducts research on comprehensive maintenance management technology system and establishment of disaster recovery technology system. Of the issues related to the bridges, material properties including soil and specific events unique to the cold regions are studied together with staff of Tsukuba Central Research Institute and Civil Engineering Research Institute for Cold Region. Engineers/ scientists from the road administrator, universities and private sectors join our team aiming improvement of technical capabilities, and cooperate with related fields for solving problems.

Research that prevents "Japan in ruins"

We will work on solving problems by the forensic engineering research approach to prevent collapse and damage due to deterioration of the existing bridges.

- Developing inspection technology to detect conditions of bridges efficiently and reasonably.
- Developing technology to assess impact on soundness of the entire bridge by damage of the material
- Developing maintenance and management system of accumulation and use of information

Research that saves "Japan from becoming fragile country for a disaster"

We will develop and integrate comprehensive countermeasure technologies for large earthquakes.

- Development of technology for accurate assessment of seismic behavior, resistance and vulnerability of structures.
- Development of technology for quick recovery from the damage or for proper retrofitting.

More efficient road bridge maintenance using AI

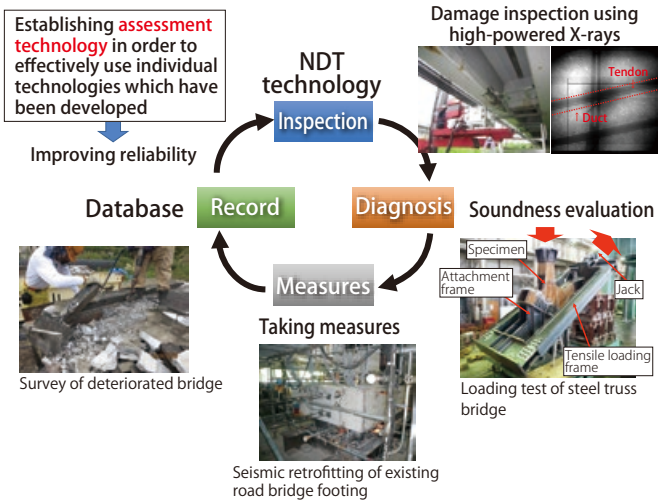
We focus on AI technology that is rapidly advancing, aiming to improve the reliability of inspection, diagnosis, and countermeasure in the maintenance cycle in order to realize efficient management.

- Development of AI that will assist judgments by engineers, after visualizing diagnosis logic based on the tacit knowledge of skilled engineers and past inspection data.
- To deal with the disintegration of concrete decks, establishing technology to quickly detect water using such as electromagnetic wave (radar) and proposing countermeasure methods premised on early detection.

※ For more information about the CAESAR, please refer to the following HP.

▶ http://www.pwri.go.jp/caesar/index-e.html

Development of maintenance and management system for preventing "Japan in ruins"

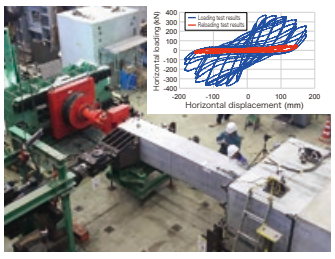


Survey of deteriorated bridge

Loading test of steel truss bridge

Seismic retrofitting of existing road bridge footing

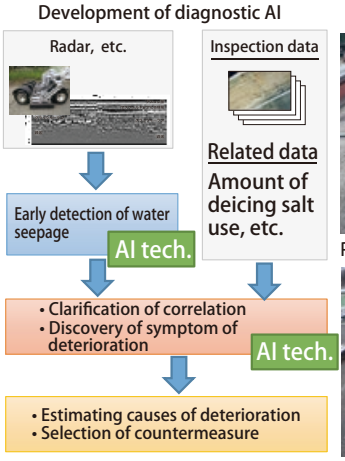
Research that saves "Japan from becoming fragile country for a disaster"

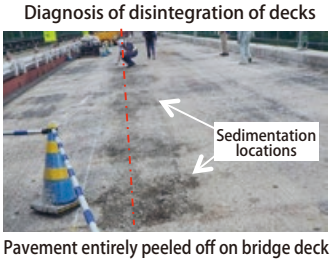


Cyclic loading test to clarify residual capacity of bridge column beyond ultimate limit state.

Loading test of removed precast RC pile to clarify shear capacity of pile constructed based on old technical standards.

More efficient road bridge maintenance using AI





Pavement entirely peeled off on bridge deck

Measurement using radar before peeling the asphalt pavement

Innovative Materials and Resources Research Center (iMaRRC)

Materials and Resources Research Group

In recent years, cases in which deterioration of civil engineering materials affects safety of the structure have occurred. With respect to public infrastructures which will further get older, it is required to repair, apply reinforcing materials and improve the durability of civil engineering materials for prolonged life of infrastructures. It is also necessary to improve durability as well as performances or functions of civil engineering materials. In these circumstances, "realization of effective and efficient maintenance and renewal of infrastructures" was positioned as a focused goal to be achieved in 2030 in "Comprehensive Strategy on Science, Technology and Innovation 2014" adopted by the Council for Science, Technology and Innovation, i.e. it was determined to promote the development of technologies to improve the durability of structural materials for infrastructures. It is also required to examine the applicability of advanced materials to be developed here to the civil engineering sector and carry out research toward practical use of them.

On the other hand, it is also necessary to promote research and development toward a low-carbon recycling society, e.g. promoting effective utilization of construction waste and those derived from other public works and streamlining energy use relating to this utilization. In order to conduct research in these fields, the Innovative Materials and Resources Research Center (iMaRRC) was established. iMaRRC promotes research and development of sophisticating and diversifying material resources in collaboration with other research institutes, and contributes to efficient maintenance and renewal of civil engineering structures as well as building of a low-carbon recycling society. In particular, iMaRRC conducts research on engineering evaluation and suggestion for improvement of advanced materials for site application, as well as studying sophistication of overall civil engineering materials such as durability improvement.

iMaRRC develops advanced structural materials such as FRP or materials which function as sensors for structural monitoring. iMaRRC conducts research on commonly-used materials such as concrete and asphalt as well. For example, developments of durability verification method for concrete through long-term exposure test under severe environmental condition. The research results are reflected in the revision of national design standards and specifications for concrete structures.

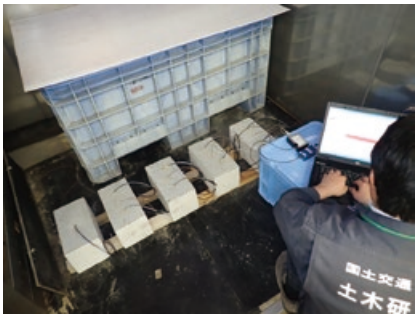
With regard to construction waste, iMaRRC examines new recycling techniques and carries out research on evaluation and improvement of environment safety/energy efficiency.

With respect to technology development, iMaRRC offers required standards to be uniformly applied across the country such as securing of safety and reduction in environmental impact, streamlines safety and environmental preservation measures utilizing regional characteristics and techniques to improve individual and regional energy efficiency and realizes technologies which are able to respond to Japan's various local environments and changes in the local society in the future.

We also realize technologies that will deal with changes in a variety of regional environment and the future of the community of our nation.

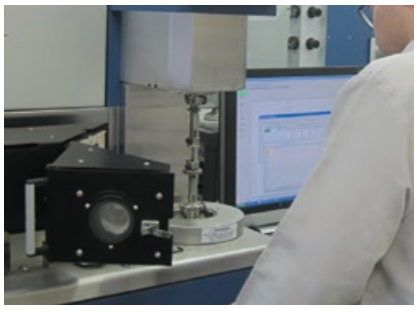
▶ http://www.pwri.go.jp/team/imarrc/english/top.html

Full-scale model experiment of advanced structural materials (experiment of structural FRP)

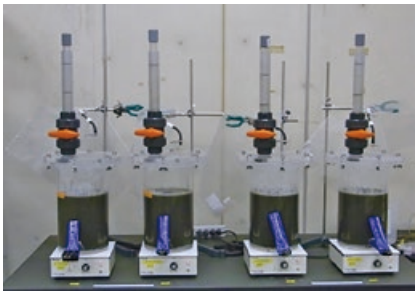


Experiment of materials having sensing functions (neutralization detection sensor)

Outdoor exposure tests of concrete specimens



Experiment of asphalt materials for paving



Methane fermentation experiment using a mixture of sewage sludge and crushed cut grass