Geohazard Management

NIPPON KOEI

INTERNATIONAL ENGINEERING CONSULTANTS

Overview

The International Geohazard Management department of Nippon Koei provides comprehensive consulting services for effectively managing geohazards and associated risks. Our coverage of Geohazards includes landslides, earthquakes, tsunamis, volcanoes, and floods. We manage all aspects from hazard identification to risk reduction measures, non-structural and structural, proactive and reactive. We also provide technical assistance and formulating technical projects funded by Japan International Cooperation Agency (JICA), World Bank (WB), Asian Development Bank (ADB), Inter-American Development Bank (IDB) as well as other local governments and private companies.

- Over the last 50 years, our department has contributed to geohazard management. We have developed and proven many technologies.

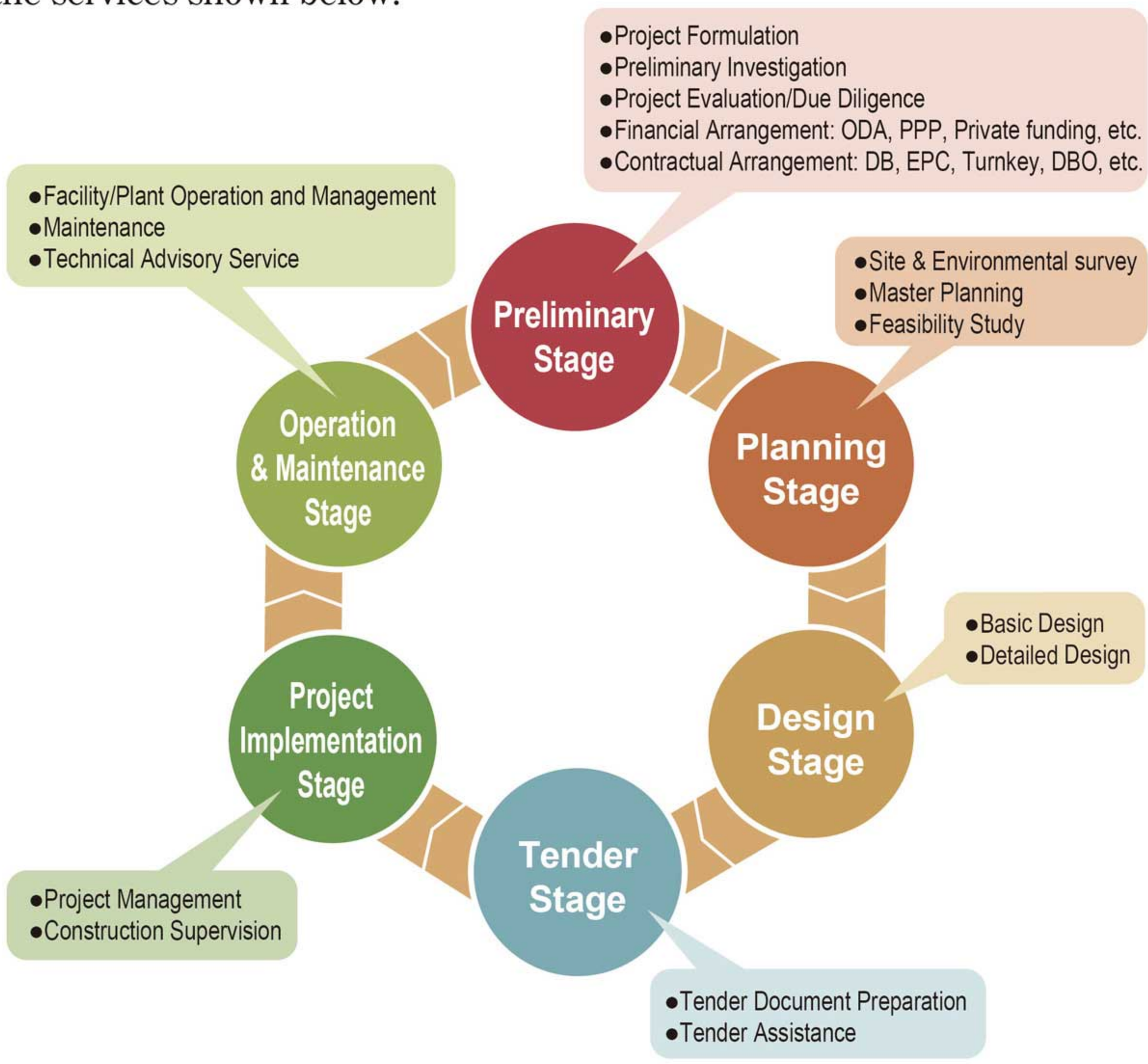
- Our department has significantly improved the capacity of national crisis management planning and has effectively protected the integrity of country infrastructure in the face of geohazards and associated risks.

- We cover all aspects of geohazards and risk management, from preparedness to recovery and early warning system development, from identification and assessment of geohazards and risk to incorporation of such geohazards into developments, as well as from geological and geotechnical investigation and monitoring to design and construction supervision of structural measures.

- Our geohazard experts have actively joined national and international professional activities and shared state-of-the-art technologies and know-how.

Our Services and Specialties

We provide our clients with the highest quality engineering consulting services in all disciplines to take projects through all life-cycle. Depending on project financial and contractual arrangement, we conduct all or a combination of the services shown below.

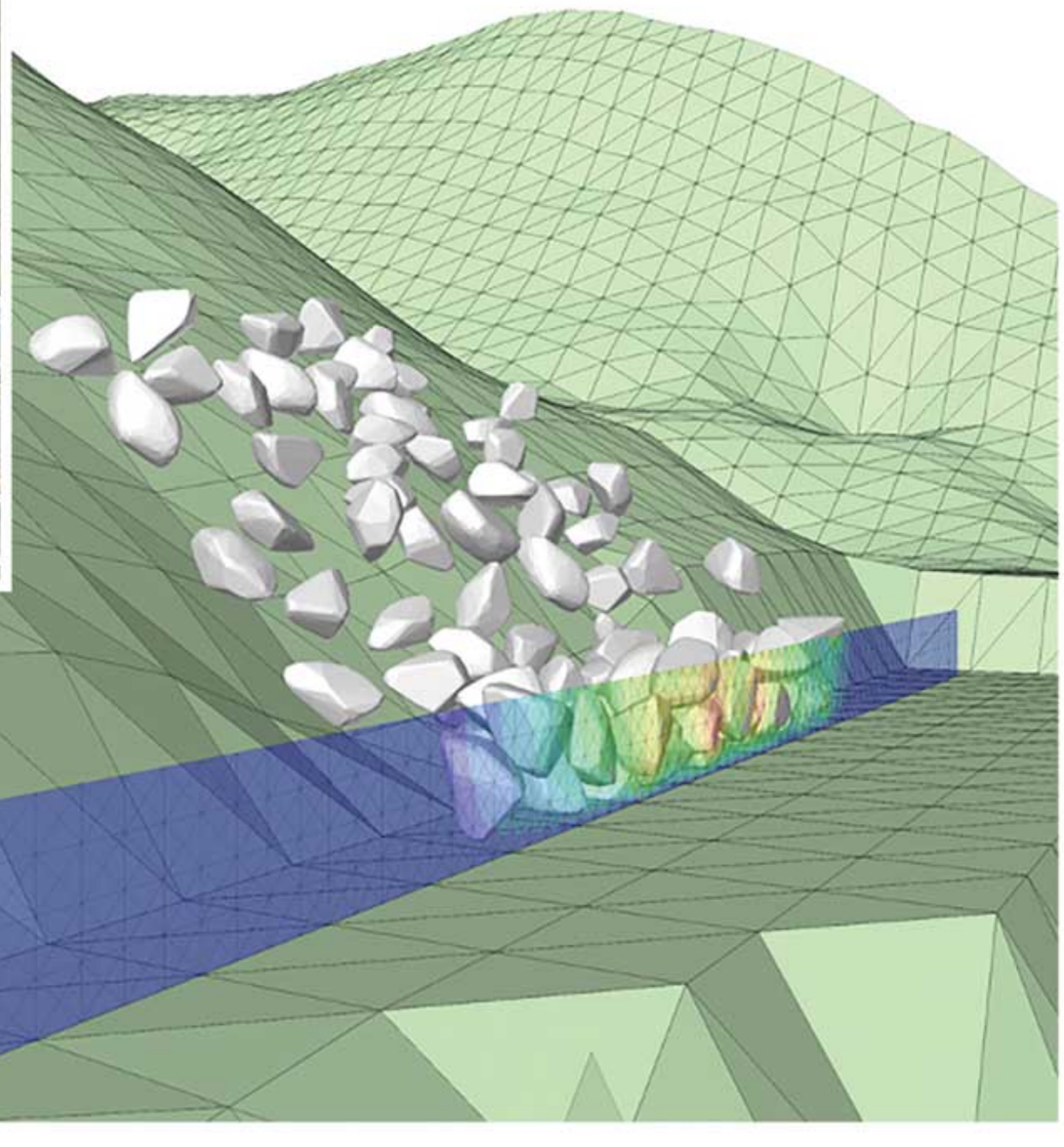


Landslide Management

We manage all types of landslides and slope instabilities associated with a wide range of developments, such as road networks, power generations and other lifeline infrastructures. We bring strong experiences and wide know-hows in the investigation and monitoring of landslides, selection and evaluation of appropriate alternative measures, design and construction supervision of protective and preventative structural measures.

Our Services

- Roadway landslides
- Reservoir rim landslides
- Landslide dams
- Hydropower and water canal slope failures
- Pipeline and other lifeline infrastructure hillslope instabilities
- Filling and cutting slope instabilities
- Emergency response and early warning system development
- Geohazard and natural hazard management planning
- Preparation of various guidelines and manuals for landslide management
- Technical assistance and technology transfer to government officers



Above : Landslides often causes considerable damage to road networks, leading to significant repair costs, access difficulties for emergency services, and disruption to road users and local communities.

Right : We can forecast the extent of damage in the event of a landslide disaster and the effectiveness of countermeasure works by numerical analysis.

Nippon Koei immediately surveyed the landslide dam formed due to slope failures following the 2018 Hokkaido Eastern Iburi Earthquake, and thereby proposed emergency and permanent measures, contributing to minimizing the damage
(Photo: Hokkaido Regional Development Bureau, Ministry of Land, Infrastructure, Transport and Tourism)

Survey of torrents with debris flow hazard for developing debris flow countermeasure plan

Volcano Management

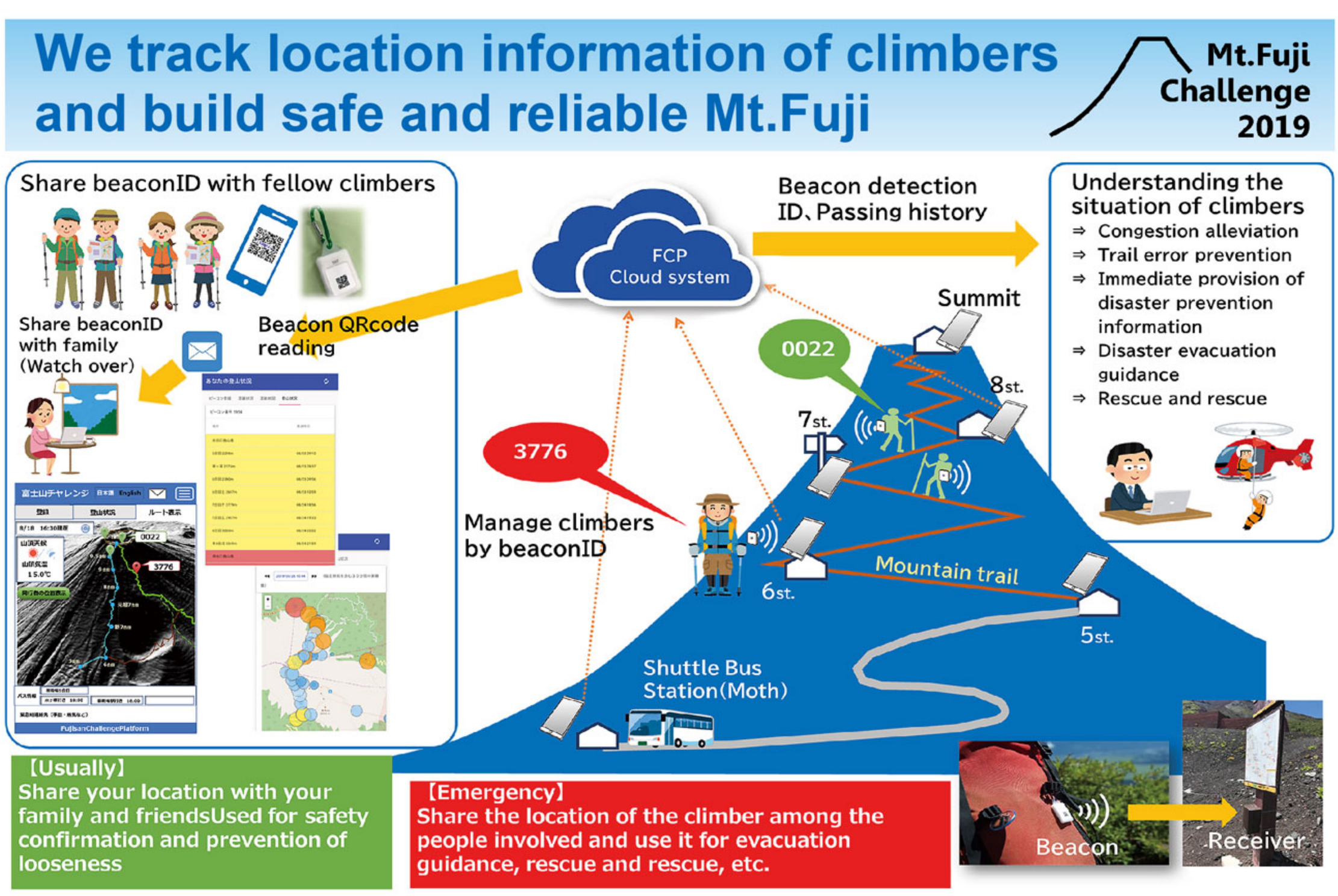
Volcanic eruptions cause a variety of mass movement and landslide phenomena such as pyroclastic flows, lahars, volcanic landslides, and volcano flank collapses. These volcanic eruptions and associated landslides have caused catastrophic and major socio-economic impacts to people, property and infrastructures. We have contributed to the advancement of structural and non-structural measures to prevent volcano-associated disasters in Japan and internationally.

Our Services

- Volcanic hazard and risk assessment, volcanic risk mapping
- Emergency disaster prevention Sabo plan and volcanic Sabo plan (Sabo works involve erosion and sediment control.)
- Evacuation plan and drill for government or community base
- Volcanic mudflow investigation, simulation and mitigation planning
- Design of structural countermeasures such as Sabo dam, training dike, etc.

Volcanic ash monitoring system at Sakurajima, Japan, which was designed and installed by Nippon Koei

Sand retarding area for volcanic debris at Sakurajima in Japan, designed by Nippon Koei
(Photo:Osumi River and National Highway Office, Ministry of Land, Infrastructure, Transport and Tourism)



The purpose of the joint project was to establish a system for enhancing the safety of climbers by “visualizing” real-time dynamic data of climbers on Mt. Fuji which is an active volcano and the highest in Japan. Nippon Koei is leading this project.

Earthquake & Tsunami Risk Management

We have provided consulting services for earthquake and tsunami disaster risk assessments prior to an earthquake such as model simulation, damage estimation, disaster prevention map preparation, emergency operation and evacuation plans, and risk reduction plans at local, regional, and national levels. Our services also include comprehensive damage survey and recovery planning following an earthquake event such as earthquake damage inspection, geological investigation, laboratory tests (static and dynamic), seismic monitoring, and developing emergency measures and recovery plans.

Our Services

- Seismic diagnosis, inspection and monitoring
- Ground shaking and fault rupture investigation and evaluation
- Earthquake and tsunami disaster risk maps
- Earthquake-induced landslides and liquefaction assessment
- Earthquake- induced tsunami simulation and assessment
- Seismic reinforcement design
- Earthquake or tsunami damage estimation and risk management planning
- Urban rehabilitation and reconstruction plan after earthquake
- Preparation of guidelines and manuals for earthquake risk management plan

Site observation by experts

Tsunami disaster in Iwate, Japan, showing catastrophic damage

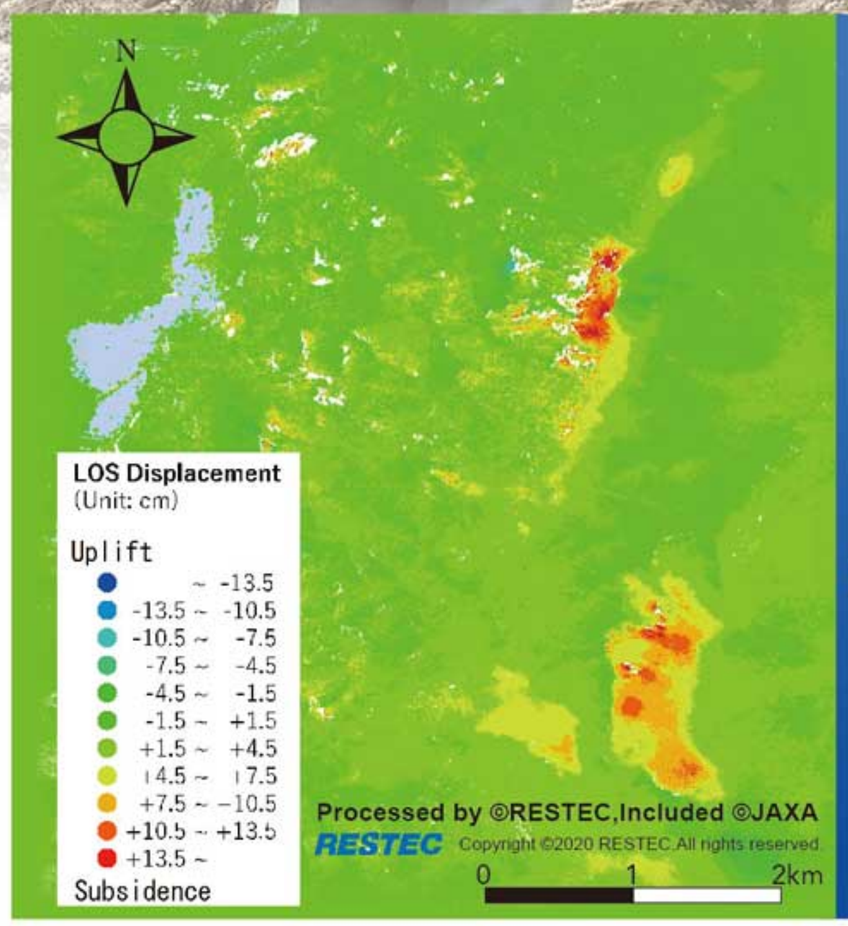
Simulation of tsunami inundation for formulating tsunami risk management plan

Our Advanced Technology Tools

We can mobilize a team of over 200 multidisciplinary geohazard experts

We form teams, covering advanced and wide range of technologies based on long-standing experience, to provide optimum solutions customized for each condition and need.

Remote Sensing Technology



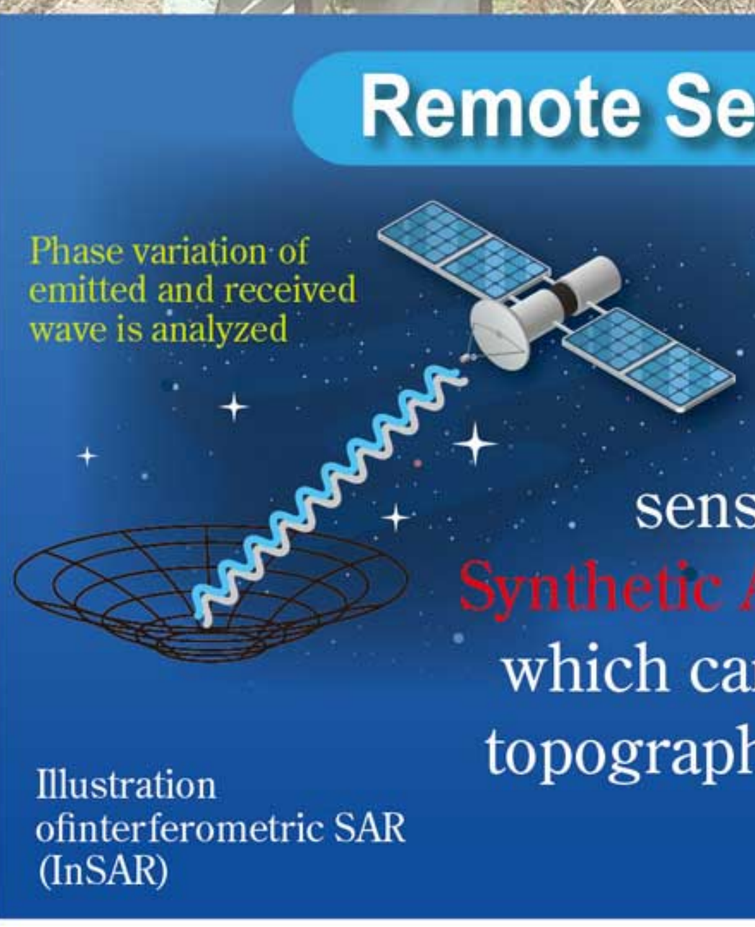


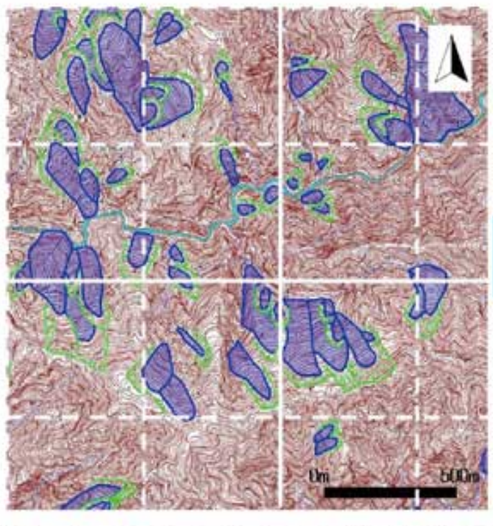
Illustration ofinterferometric SAR (InSAR)

We can assess potential hazards around the globe by optical remote sensing and Interferometric Synthetic Aperture Radar (InSAR) which can detect land-resources, topographic features, and ground deformation.

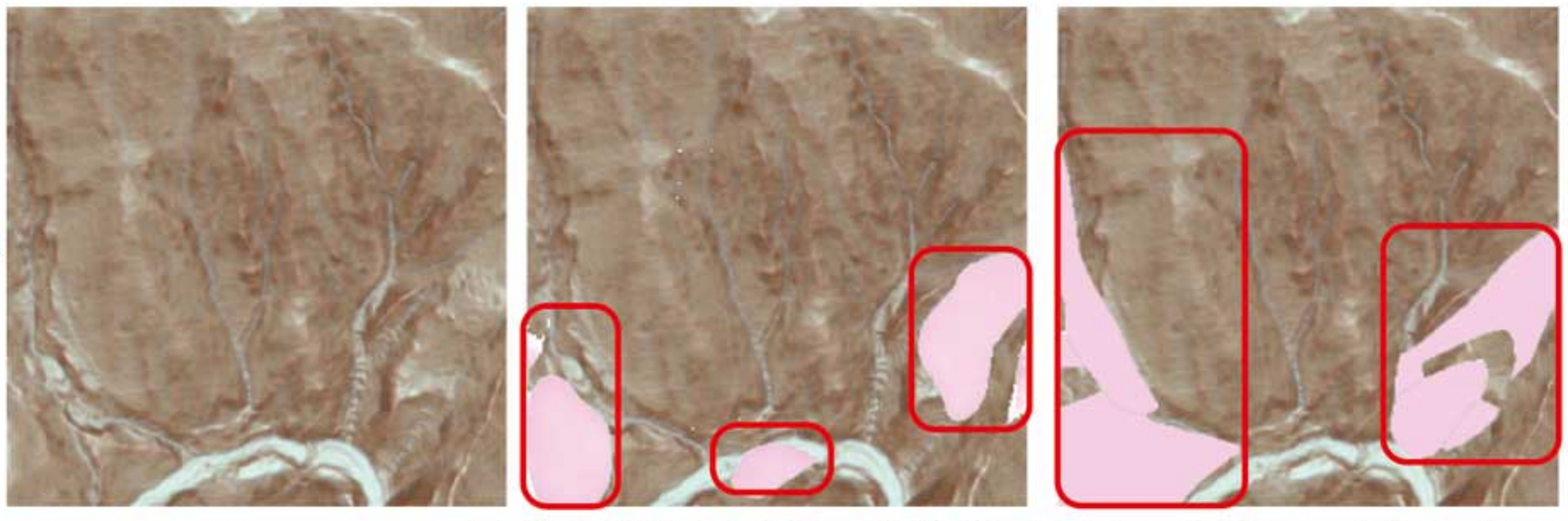
AI Technology

We quickly and automatically exact landslide or collapse topography by using AI technology.

In volcano areas, AI helps to quickly extract the unstable terrain immediately after the eruption.



Extracted landslides by an expert



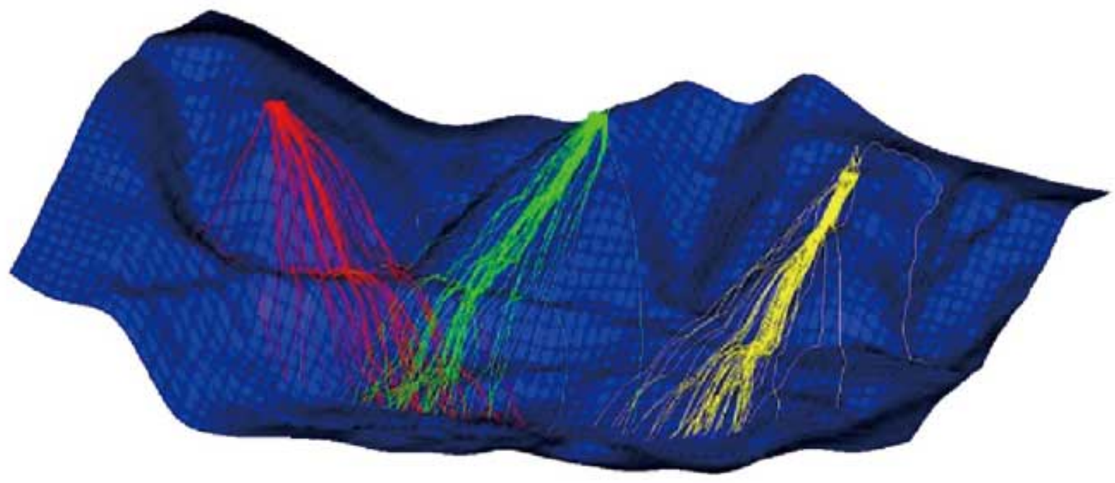
Extraction of landslide topography using AI

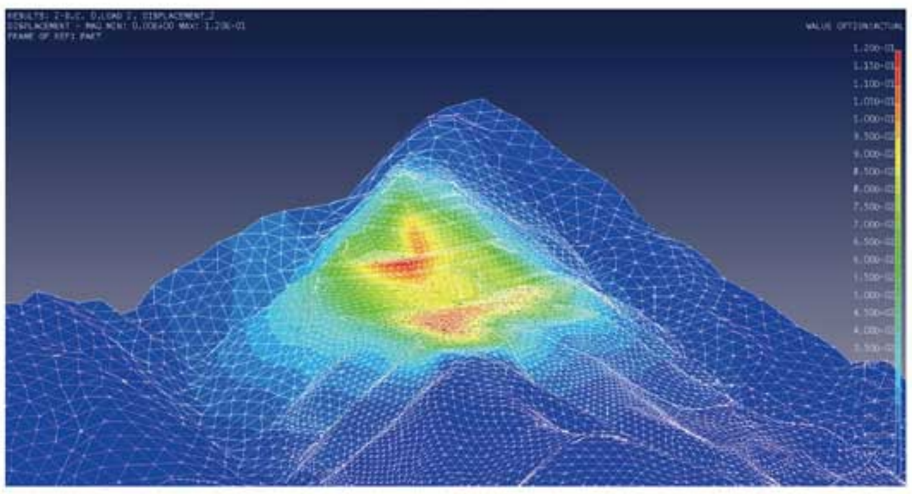
Virtual Office for Disaster Management Using MR

We set up virtual offices for disaster management using MR (Mixed Reality) technology. This virtual system can serve as an essential tool for making rapid decision-making under emergency situations which people cannot enter due to dangerous natural disasters or communicable disease.

3D Simulation for Rockfall

We estimate the runout and deposition of rockfalls by 3D analysis, and thereby examine the necessity of rockfall countermeasures, plan the effective combination of rockfall countermeasures, and prioritize the implementation order of rockfall countermeasures.





Numerical Simulation

3D stress-displacement analysis are used to estimate displacement change and stress state during slope excavation, contributing to the prediction of slope failures and the consideration of effective countermeasures.

VR Disaster Education System

It is important that people living in the disaster area understand what has happened. We construct a disaster simulation system to reproduce the situation of disaster occurrence by virtual reality technology (VR).

This system provides a high realistic and presence simulation by tsunami, tidal wave and overflow simulation.

Major International Experience

We have conducted many international projects related to disaster prevention and management for countries in Asia, Africa, the Middle East, Latin America and other regions. These projects include Study, Master Plan, Feasibility Study, Technical Cooperation, Design and Construction Supervision.

Geohazard Management Projects

Philippines	Study on Comprehensive Disaster Prevention around Mayon Volcano
Armenia	Disaster Management Project
El Salvador	Capacity Development of the Department of Climate Change Adaptation and Strategic Risk Management for Strengthening of Public Infrastructure (GENSAI) Phase I and II
Guatemala, Costa Rica,etc.	Capacity Development for Disaster Risk Management in Central America Phase 2 (BOSAI-2)

Landslide

Malaysia	Study on Slope Disaster Management for Federal Roads
Philippines	Study on Disaster Risk Management for Sediment-related Disaster on National Highways
Nepal	Project for Countermeasures for the Landslides on Sindhuli Road (Section II)
Sri Lanka	Project for the Sindhuli Road Earthquake Rehabilitation
	Study on Disaster Risk Management for Narayangharh-Mugling Highway
	Technical Cooperation for Landslide Mitigation Project
	Project for Capacity Strengthen on Development of Non-structural Measures for Landslide Risk Reduction
	Preparatory Survey on Landslide Disaster Protection Project of the National Road Network Phase 2
Indonesia	Geohazard Mapping Services for Geothermal Field
East Timor	Project for Capacity Building in Road Maintenance
El Salvador	Support for Countermeasures against the Landslides on Pan American High-way in Metropolitan area.
Honduras	Project for Countermeasures for Landslide on National Highway - Route 6
Armenia	Pilot Project for Countermeasures against the Landslides

Earthquake・Tsunami

Indonesia	The Urgent Rehabilitation and Reconstruction Support Program for Aceh Province in North Sumatra
Maldives	The Study on Tsunami Recovery, Rehabilitation and Development
Nepal	Study on Earthquake Disaster Mitigation in the Kathmandu valley
Sri Lanka	Recovery, Rehabilitation and Development Project for Tsunami Affected Area of Southern Region
	Tsunami Affected Communities Rehabilitation Program in North-East Sri Lanka
Armenia	Project for Seismic Risk Assessment and Risk Management Planning
Kazakhstan	Study on Earthquake Disaster Risk Management for Almaty City

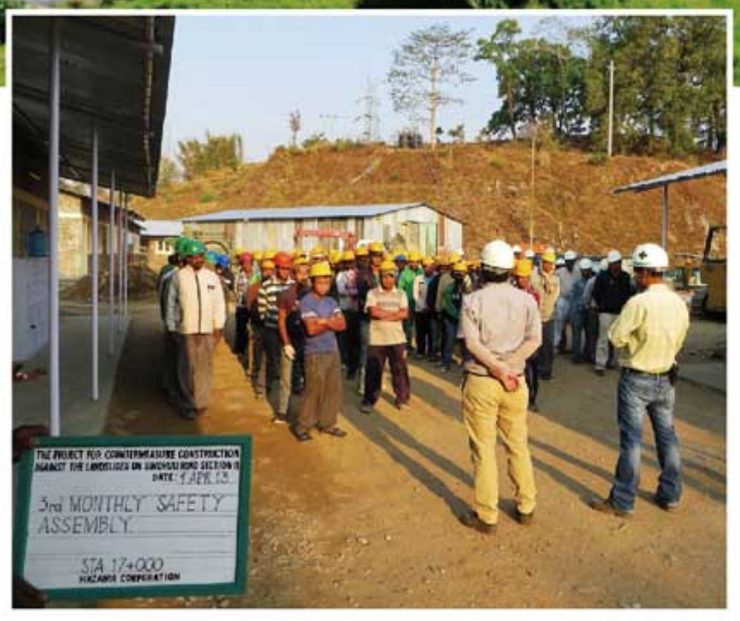
Major Work Project 1

Countermeasures for the Landslides on Sindhuli Road in Nepal

Sindhuli Road was one of the few roads in Nepal which did not close in the major earthquake of April 2015. As a result, it allowed transportation to flow from Katmandu just after the earthquake. It provided a useable route for refugees that proved safe and reliable. In addition to engaging in the planning, investigation, design and supervision to build this road of 160 km, Nippon Koei designed the pressing embankment, ground anchor and cribwork and supervised the construction.

Nippon Koei was honored for the achievement and received the "3rd JAPAN Construction International Award" by the Minister of Land, Infrastructure, Transport and Tourism (M LIT) Japan in March 2020. This award was established to commend representative "high-quality infrastructure" overseas construction projects. The reasons for winning the award include 1) high acclaim from Nepalese Government as technology that should be used in future road construction, 2) tough road construction that had kept traffic and transporting relief supplies even if Nepal earthquake in 2015 and 3) implementation of project with the best social considerations even during political and social turmoil in cooperation with government officials.

Rock drilling by wire operation



Safety management system

Ground anchor works

Major Work Project 2

Capacity Development of the Department of Climate Change Adaptation and Strategic Risk Management for Strengthening of Public Infrastructure in El Salvador

This project is known as Project GENSAI, which is a Japanese word meaning hazard risk reduction, supporting the Government of El Salvador. Phase I (2012-2015) covered storm-induced hazards on slopes, bridges, rivers, and drainage. Phase II (2016-2021) focused on geohazards on the road with the approach of integrated seismic and non-seismic hazards. The expert team of Nippon Koei assisted the Secretariat for Central American Economic Integration (SIECA) under the Central American Integration System (SICA).

Our service is to edit and disseminate the JICA/SIECA 2019: "Geotechnics and Seismic Considerations Manual with a Risk Management Approach for Road Infrastructure in Central America Topic Slopes."

Joint inspection for the constructed geohazard countermeasures with neighboring government of Honduras.
The ground anchors against landslide along a national road were designed and supervised by Nippon Koei in another project.

Major Work Project 3

Pinatubo Volcanic Hazard Urgent Mitigation in Philippines

The eruption of Mt. Pinatubo in 1991 and associated mass movement hazards have caused huge and catastrophic damage to not only the mountain areas by the volcanic explosion, but also the nearby urban areas by the associated lahar flows and volcanic landslides. After the eruption, the project - Pinatubo Volcanic Hazard Urgent Mitigation in Philippines was carried out by Nippon Koei in stages with 7 parts, as listed below.

●Phase I (1996 - 2001) under JBIC loan

- Part 1: Flood Control Works for Sacoboa-Bambam River Basin
- Part 2: Agricultural Development Planning (F/S)
- Part 3: Monitoring and Planning of Mudflow/Flood Control Works in Pasig-Potrero River

●Phase II (1999 - 2006) under JBIC loan

- Part 1: Flood Control Works for Pasig-Potrero River Basin
- Part 2: Planning Study for Flood Control in Pasac Delta and Third River Channels

●Phase III (2008 - 2015) under JICA loan

- Part 1: Flood Control Works for Pasac Delta of Porac-Gumain River and San Fernando River
- Part 2: Non-structural Measures and Capacity Development Monitoring Plan

The project covered the identification and mapping of volcanic hazards, plan of non-structural and structural measures, and design and construction supervision of various structural measures of flood control works, bank protection works, dredging works, groin works, and so on.

Comprehensive plan to ensure safety of Mancatian Bridge against riverbed degradation, prepared by Nippon Koei

Major Nippon Koei Group Statistics

Nippon Koei is Japan's No.1 International Engineering Consultants.

over 75 Years in business

Nippon Koei was established in June 1946 by international visionary Yutaka Kubota. The word "koei" is derived from the Japanese characters for "technology" and "management".

The scale of our business ranks number one among civil engineering consulting firms in Japan.

NO.1 In sales

operations in 160 countries

Nippon Koei is one of the top international engineering consultants. Over the years, we have conducted business in 160 countries over the years.

Nippon Koei's sales orders cover civil engineering consulting and power engineering business in both international and Japanese markets.

over 5,500 orders per year

over 1,530 Professional engineers

With over 1,530 officially certified Professional Engineers we lead the industry in Japan and provide consulting services around the world.

The Nippon Koei Group has 35 operating offices outside Japan, and employs a total of over 5,700 multidisciplinary experts (Consolidated basis)

over 5,700 employees

Areas of Engineering Expertise

Nippon Koei provides a full range of engineering consulting services to support the basic infrastructure for nations worldwide. Our goal is to help build safe and secure living spaces, vibrant communities and sustainable environments. Our core areas of expertise are

- Energy Generation
- Transportation Infrastructure
- Water Resources, Water Supply, Sewerage
- Environmental Management
- Geohazard Management
- Agriculture and Rural Development
- Urban Planning and Architecture
- Social and Economic Consultancy

State-of-the-Art R&D Center

Nippon Koei has its own Research & Development state-of-the-art facility delivering high quality engineered solutions and appropriate countermeasures for the specific site conditions of our Clients by researching and developing new technology.

SDGs as Platform for Business

Action Toward Achieving the SDGs

NK-Innovation 2021 sets the SDGs as a common platform for our businesses to be incorporated into our daily activities. We constantly consider how our projects and our actions can contribute to achieving the goals.

We seek to accurately assess how our projects relate to various issues and mobilize our technologies to solve those issues.

Japan.
Committed to SDGs

Worldwide Network of Offices

August 2020

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