**Institute for
Disaster Reconstruction
and Regeneration Research
Tohoku University**

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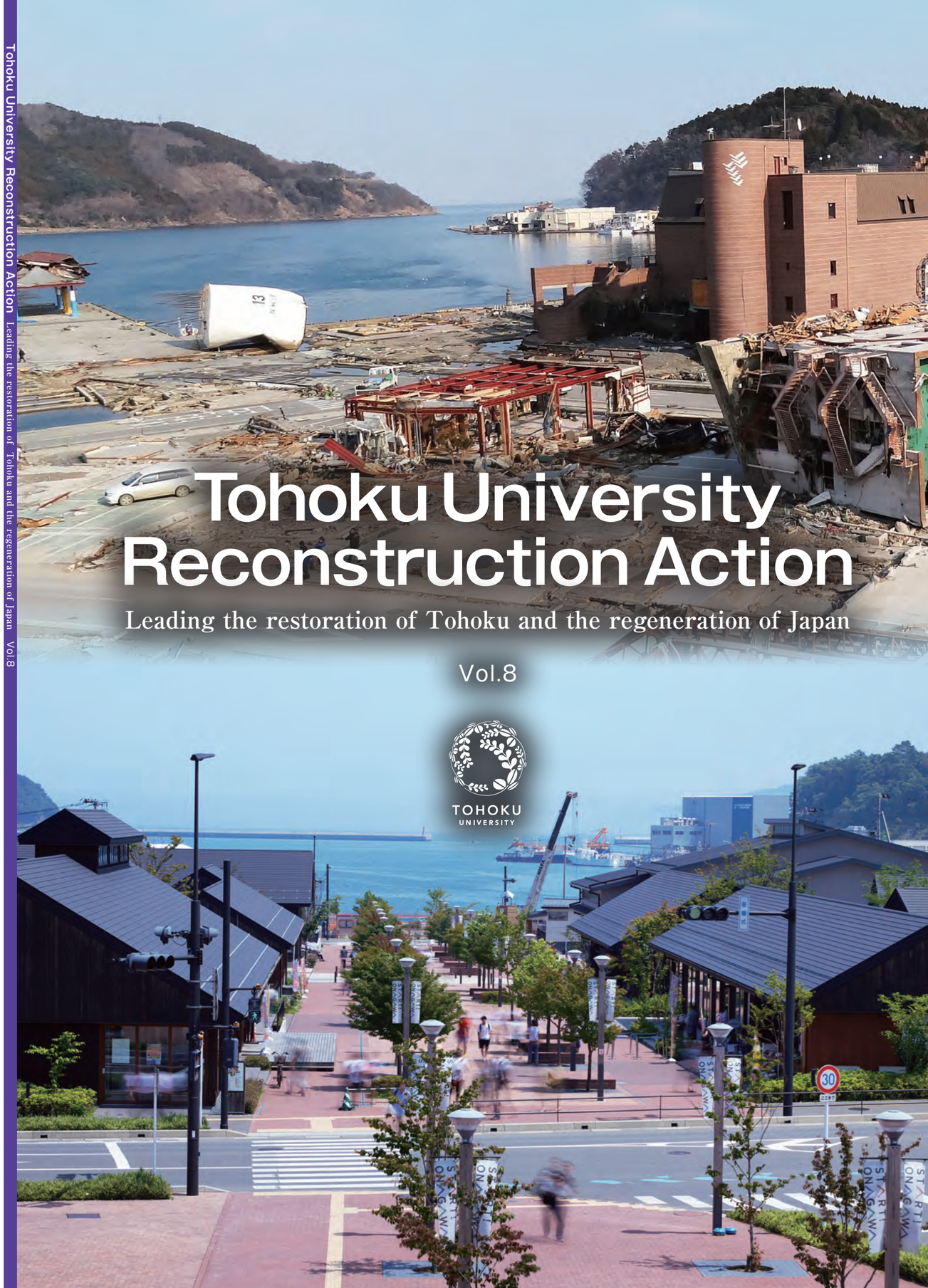
Tohoku University Reconstruction Action Leading the restoration of Tohoku and the regeneration of Japan Vol.8



Tohoku University Reconstruction Action

Leading the restoration of Tohoku and the regeneration of Japan

Vol.8

TOHOKU
UNIVERSITY

Tohoku University
Reconstruction Action

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Tohoku University
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The Mission to “Help Communities for a Better Future”

Tohoku University President

Hideo Ohno

Since the foundation in 1907, Tohoku University has uphold the principles “Research First”, “Open Door” and “Practice-Oriented Research and Education” to educate future leaders, excel in research and help communities both at home and overseas. Furthermore, in June 2017, our university was selected as one of the first three Designated National Universities as an acknowledgement of the continuous efforts of our activities.

Tohoku University was founded with considerable support from the private sector and local communities and over the time evolved together with these communities. The Great East Japan Earthquake in 2011 had severe consequences to our research as well as the environment of our university, but by supporting each other we were able to recover together with the people of the region. We are very grateful to all the help we got during the dire times and we have implemented a multitude of Reconstruction Actions to support everybody affected by the catastrophe. We understand the importance of being part of the community and helping each other. But through the disaster of 2011, we resuscitated the identity as a university with a mission to help communities for a better future.

Currently the world is experiencing rapid changes due to the advancements of the fourth industrial revolution. Global issues such as social dissonance and environmental problems are also becoming increasingly complex. In order to solve these pressing issues and problems, three principal agendas were established: the Sendai Framework for Disaster Risk Reduction 2015-2030, the Sustainable Development Goals (SDGs) and the UNFCCC Paris Agreement. Our Reconstruction Actions aim towards contributing to those goals and we will continue our work to help the international community to assure a safe and secure environment. As part of the community, it is our duty as comprehensive university to support the progress and advancements of society toward a better future for all.

But this progress is not possible without the understanding and support of all people involved and we will continue our combined efforts to create new societal value in collaboration with the communities both at home and abroad.

Toward the “Regeneration of Tohoku and Rebirth of Japan”

~Going Hand in Hand toward the Future~

Tohoku University Executive Vice President for Outreach Activity and Earthquake Disaster Reconstruction

Nobuyoshi Hara

The Institute for Disaster Reconstruction and Regeneration Research (IDRRR) was established in April 2011, directly after the Great East Japan Earthquake. The combination of a huge earthquake, the following tsunami, and the resulting accident at the TEPCO Fukushima Daiichi Nuclear Reactor led to an unprecedented catastrophe, which also affected Tohoku University. Ca. 56.9 billion JPY worth of damages were afflicted primarily to buildings and research facilities, and the university had to put considerable effort into the recovery of educational and research activities. However, even under such circumstances, Tohoku University and especially the IDRRR had the responsibility to support local communities and lead the recovery of the disaster stricken area.

The University Hospital supported emergency response and medical care in disaster stricken areas, we communicated various information regarding the earthquake and tsunami, monitored radiation, dispatched rescue robots to the facilities of the nuclear reactor, and members of the university utilized their specialized knowledge to support various necessary activities after the earthquake. Eight primary projects involving Disaster Science, Community Health Care, or Environmental Energy were initialized, as well as more than 100 individual projects suggested by our members. The content of this booklet is a summary of our efforts regarding the “Reconstruction Actions” during the past eight years. We want to express our deep gratitude to the various ministries and agencies, corporations and organizations for their cooperation.

In November last year, we established the Tohoku University Vision 2030 to clarify our goals for the coming years. And one major aspect for our mission was the continuous effort of the IDRRR to support and restore the region as well as the entirety of Japan after the disaster. In particular, the eight priority projects were reorganized to assure even more flexible actions and enable further developments to support communities. Furthermore, we will continue to distribute our achievements in research to society as a model for “creative reconstruction” to both national and international communities and work together with all our supporters to advance important progress for disaster risk reduction as well as the realization of a safe and secure society.

It is also part of our duty to document the experience of the disaster for future generations and together with residents in disaster stricken areas as well as our many supporters and collaborators, we will work toward restoration and the realization of a new society. We kindly ask for you continued cooperation and thank you in advance for your support.

The Great East Japan Earthquake

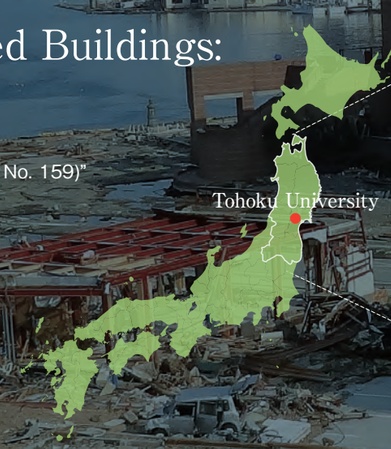
Magnitude 9.0

Tsunami Incursion on the Pacific Coast
(Maximal Height 12m, Maximal Run-up 40m)

Nuclear Power Plant Accident

Tsunami Inundation Area 561㎢

Totally & Partially Destroyed Buildings:
404,934
※See “About the 2011 Great East Japan Earthquake (Report No. 159)” Fire and Disaster Management Agency, March 8, 2019.



22,252 Dead or Missing
※From the Fire and Disaster Management Agency “About the 2011 Great East Japan Earthquake (Report No. 159)” March 8, 2019.

Evacuees: ca. 470,000
※From the Reconstruction Agency “Status on Reconstruction”, July 3, 2019.

Total Damage Amount: ca. 17 Trillion JPY

Damage Status of Tohoku University

Loss of Lives	3 Students Dead (by Tsunami)
Building Damages	ca 30 Billion JPY (27 Partial & 3 Total Reconstructions)
Research Facilities	Damages Worth ca. 26.9 Billion JPY
Residential Damages at Student’s Homes	640 Cases of Total or Partial Destruction
Others	Melting of Research Samples due to Long-lasting Blackout, Deaths of Livestock due to Water and Gas Outage

2011.3.11

Contents

Institute for Disaster Reconstruction and Regeneration Research, Tohoku University

As the only comprehensive university in the center of the disaster stricken area, Tohoku University has the mission to contribute to the regeneration and reconstruction of the region.

"We wish to be the driving force for the recovering and rebirth of not only the surrounding Tohoku region, but Japan itself." In order to realize this desire, Tohoku University installed the Institute for Disaster Reconstruction and Regeneration Research, collaborated with the government, local communities and residents, as well as various institutions and corporations, and advanced support through 8 projects organized university-wide and numerous individual concepts summarized as Reconstruction Action 100+.

Our objective could be called "Creative Reconstruction". Whilst contributing to the recovery of everyday life in disaster stricken communities, we continue to participate in cutting edge education and research leading to a new Tohoku and a better Japan. We are determined to consolidate diverse knowledge and contribute to activities leading to the regeneration after the Great East Japan Earthquake.

Establishment	April, 2011	Purpose: To play a leading role in the recovery and rebirth as a university located in the center of the disaster-affected area
Missions	Mission1	Contributing to Post-disaster reconstruction and regional regeneration
	Mission2	Creating a multidisciplinary center of excellence for postdisaster reconstruction
	Mission3	Establishing a cross-disciplinary research organization to conduct problem-solving projects

Organization Chart

Director / Executive Vice President for Earthquake Disaster Reconstruction

Steering committee

Planning and Promotion Office
Chief / Director

- Planning / Promotion
- Liaison
- Public relations
- Progress management
- Organizing a symposium
- Overall coordination

Tohoku University Priority Projects

Eight Projects

1. International Research Project on Disaster Science
2. Project for the Reconstruction of Community Health Care
3. Project for Environmental Energy
4. ICT Reconstruction Project
5. Tohoku Marine Science Project
6. Nuclear Decommissioning and Environmental Restoration Project
7. Regional Industries Restoration Support Project
8. Industry-Academia Collaboration Development Project for Reconstruction

Tohoku University Member's Projects

Reconstruction Action 100+ (More than 100 various voluntary projects)

※April 2016 Appoint the Executive Vice-President for Earthquake Disaster Reconstruction as Director of the Institute (formerly led by the President himself)
※September 2017 Reorganize the "Project for Decontamination of Radioactive Materials" to the "Nuclear Decommission and Environmental Reconstruction Project".

"Tohoku University Reconstruction Action"

In order to communicate Tohoku University's actions to the general public, issues of the "Tohoku University Reconstruction Action" are published on a regular basis.

※ Past issues are available online.
http://www.idrrr.tohoku.ac.jp/about/book/

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The 3rd UN World Conference on Disaster Risk Reduction

The 3rd UN World Conference on Disaster Risk Reduction was held from March 14 to March 18, 2015, with more than 15,000 participants.

The conference focused on the on the Sendai Framework for Disaster Risk Reduction, which detailed plans to mitigate the effects of natural disaster and outlined a path to increase safety and security of global communities.

The Institute for Disaster Reconstruction and Regeneration Research was able to communicate its findings and contribute greatly to the international society.

And we will continue to promote the activities related to the Sendai Framework for Disaster Risk Reduction to create a better future for everybody.

Disaster Reconstruction and Regeneration Symposium

The institute organizes annual symposia to report on the progress of projects and promotes the collaboration and cooperation with local and global communities. In order to overcome various difficulties in the disaster stricken area as well as to utilize the characteristics and resources of the region, Tohoku University promotes "Creative Reconstruction" toward the development of a new Tohoku via necessary research of important technology and education of future leaders.

2018 Symposium

"Leading Disaster Recovery through Creation and Reforms"

On February 2, 2018, the Institute for Disaster Reconstruction and Regeneration Research organized the symposium "Leading Disaster Recovery through Creation and Reforms" at the Yuraku-cho Asahi Hall in Tokyo with more than 500 participants.

Former Parliamentary Secretary Hideki Nizuma and former Deputy Minister for Reconstruction Toru Doi gave the opening remarks and former Tohoku University President Susumu Satomi presented future plans of the university. Furthermore, Executive Vice President Nobuyoshi Hara presented the progress of the recovery activities by the Institute and provided an outlook for futures tasks and objectives.

During the main discussions, Director Imamura of the International Research Institute of Disaster Science detailed the activities of the International Research Project on Disaster Science and the formation of Disaster Science as part of Tohoku University's Core Research Cluster, Director Watanabe from the Center for Fundamental Research on Nuclear Decommissioning explained the scientific progress regarding the Nuclear Decommissioning and Environmental Restoration Project, and Director Yamamoto of the Tohoku Medical Megabank Organization outlined the achievements of the integrated biobank toward the establishment of Next Generation Medicine. The talks highlighted not only the current progress but also the detailed contributions to the local communities as well as future aspects for further developments.

After the symposium, musician 幹 miki, who is actively involved in the reconstruction of Miyagi's coastal area, gave a small concert.

Executive Vice President Hara

Concert by musician 幹 miki

Participants at the Symposium

Tohoku University President Ohno

2019 Symposium

In Collaboration with Society - The Importance of Disaster Risk Reduction

On February 13, 2019, the Institute for Disaster Reconstruction and Regeneration Research organized the symposium "In Collaboration with Society - The Importance of Disaster Risk Reduction" in Sendai with more than 150 participants from the government, industry and the general public.

Tomonori Nishii from MEXT's Scientific Research Institutes Division addressed the relevance of the event for future nation wide projects.

During the symposium Executive Vice President Hara summarized the activities and achievement of the institute in his talk "Reconstruction Actions for a better future", Prof. Toda from the International Research Institute of Disaster Science detailed his findings regarding earthquakes from active faults, Director Matsuzawa from the Research Center for Prediction of Earthquakes and Volcanic Eruptions communicated the dangers from earthquakes occurring in oceanic trenches. Director Imamura from the International Research Institute of Disaster Science presented findings regarding tsunami damages and Prof. Kuriyama explained necessary actions to approach public health after large scaled disasters. Each presenter was able to express the importance of Disaster Science and possible measures to reduce risks of natural disasters.

The participants were able to engage in lively discussions with the presenters after the main talks, establishing a place for important communication to spread the word regarding disaster risk mitigation.

Main projects for recovery and reconstruction

An outline of Tohoku University's actions to lead the restoration of Tohoku and the regeneration of Japan.

Main projects for recovery and reconstruction

2011

03.11	14:46 The Great East Japan Earthquake
	Establishment of the Headquarters for Disaster Countermeasures
03.12	Accepting patients at the Tohoku University Hospital from disaster stricken areas
03.13	Emergency damage assessment of Tohoku University's facilities
03.14	The Tohoku University Hospital dispatched medical staff to the disaster stricken area, including the Ishinomaki Red Cross Hospital, the Kesennuma Hospital, and the Ishinomaki area together with supplies and medical equipment
	Termination of all lectures and conferment ceremonies, as well as press release regarding entry examinations, freshmen admission, and admission ceremonies
03.15	Web page for emergency contacts
03.24	"Tohoku University Regional Restauration Project 'Haru'" established by volunteers of Tohoku University
04.01	Establishing the Research Center for Disaster Recovery
	Organization of an investigative research project for regional industries restoration
04.05	Web page for disaster support by Tohoku University student volunteers
04.13	Emergency debriefing 1 month after the Great East Japan Earthquake
04.25	Tohoku University activity announcement & partial resumption of lectures
04.26	Lifeline restoration within the university's perimeters
04.27	Establishment of the Institute for Disaster Reconstruction and Regeneration Research
05.01	Establishment of the Center for Community Health Care at the School of Medicine
05.06	Entrance ceremony at each faculty and graduate school
05.09	Start of all lectures
06.07	Establishment of the Office for Tohoku University Volunteers Disaster Support
06.10	Debriefing 3 month after the Great East Japan Earthquake
06.24	Dispatch of the rescue robot "Quince" to the Fukushima nuclear power plant
07.01	Organization of 7 priority projects by institutes
	Tohoku University Restauration PR Campaign "Striding Forward – Tohoku University" (~March 31, 2012)
07.16	Former Tohoku University President Inoue and U.S. Ambassador John V.Roos exchange thoughts on the development of regenerative activities
08.01	Starting evaluation of radiation effects on Animals
08.02	Visit by the German Ambassador Volker Stanzel
09.13	Debriefing 6 month after the Great East Japan Earthquake
09.21	Special session with Akira Ikegami "Starting over from Japan's 'second ruins' – Issues which cannot be postponed"


2011.03.11


2011.03.12



2011.03.14

2011.03.24


2011.06.24

2011.07.01

10.01	Establishment of the Research Organization of Electrical Communication
10.22	Disaster Prevention and Japan Rebirth Symposium "What kind of Earthquake was the Great East Japan Earthquake 2011?"
10.23	Collaboration Agreement of Kobe University and Disaster Science Laboratories of Tohoku University
10.24	UN Day @ Tohoku University "Recovery and Regeneration from the Great East Japan Earthquake – Messages from Tohoku to the World"
10.27	International Symposium "Regeneration and Recovery after the Catastrophe"
11.10	Joint research agreement with Sendai City and Tsukuba University regarding alga biomass
10.17	Green energy research development symposium toward the regeneration of Tohoku
11.22	Collaboration agreement with IBM Japan (Risk assessment of mega earthquakes & tsunamis)
12.11	Visit by Los Angeles Mayor Antonio R. Villaraigosa, sharing ideas with former President Inoue on the "TOMODACHI Fund" as well as disaster recovery related collaborations
12.21	Establishment of the "Tohoku University 'Striding Forward' Scholarship"

2012

01.01	Establishment of the Comprehensive Education Center for Community Medicine
01.19	Collaboration agreement between the National Institute of Information and Communication Technology and Tohoku University
02.01	Establishment of Tohoku Medical Megabank Organization (ToMMo)
03.11	Disaster Experience Memories Toshinroku "Listening and Writing the Disaster Experience – The 3.11. Experience from the Eyes of 90 Tohoku University's Members"
	Debriefing 1 year after the Great East Japan Earthquake by Tohoku University
	Spirit of Tohoku University 2011.3.11 One-year memorial symposium of the Great East Japan Earthquake "Disaster Recovery and Social Businesses"
04.01	Establishment of the International Research Institute of Disaster Science
	Installment of the Resilient ICT Research Center within the Research Organization of Electrical Communication
05.23	Opening ceremony of the International Research Institute of Disaster Science and joint declaration with national and international collaborating organizations
06.01	Relocation of the Tohoku University Clinical Skills Laboratory
06.19	Reorganization of the 7 priority projects by the institutes into 8 projects with the amendment of "Project for the Decontamination of Radioactive Materials"
10.16	Comprehensive collaboration agreement with the Japan Agency for Marine-Earth Science and Technology (JAMSTEC)
12.01	Establishment of the Technological Research Center for Early Living Environment Recovery
12.10	Opening the Tohoku Medical Megabank Organization Community Support Center in Ishinomaki
12.13	Opening the Tohoku Medical Megabank Organization Community Support Center in Kesennuma

2013

02.11	NHK regeneration support "'Toward Tomorrow' at Tohoku University"


2011.09.21

2011.10.23


2011.10.24


2012.01.19

2012.03.11


2012.05.23

2013.02.11


2013.02.22

02.14 Opening the Tohoku Medical Megabank Organization Community Support Center in Iwanuma

02.22 Michael Sandel Special Classroom @ Tohoku University “Let’s Talk about Restauration”

02.25 Establishment of the Disaster Management Promotion Office

03.09 Symposium of the Institute for Disaster Reconstruction and Regeneration Research “Toward ‘Leading the Reconstruction of Japan’”

03.27 Cooperation agreement with the Tohoku University Consumers’ co-operative regarding mutual support in cases of disasters

04.25 Cooperation Agreement of the 7 national universities in the Tohoku region in cases of disasters

05.01 Cooperation agreement of Tohoku University and Iwate Medical University regarding collaboration with respect to the Tohoku Medical Megabank Organization

05.16 Opening the Tohoku Medical Megabank Organization Community Support Center in Tagajo

07.01 Adoption of a project by the Graduate School of Engineering to the Qatar fund

10.01 Publication of “Tohoku University Records of the Great East Japan Earthquake”

2014

03.09 Symposium of the Institute for Disaster Reconstruction and Regeneration “Toward ‘Leading Reconstruction of Tohoku and Rebirth of Japan’”

03.28 Collaborative cooperation agreement of Tohoku University with the Japan Atomic Energy Agency

04.01 Establishment of the Tohoku Agricultural Science Center for Reconstruction

04.25 Disaster Mitigation Pocket – the “YUI” Project

06.03 Ceremony of the U.S. Prudential Foundation’s announcement for financial support of Regional Innovation Producer School graduates

07.29 Completion ceremony for the Tohoku Medical Megabank Organization facilities

07.30 Opening ceremony of the Tohoku Qatar Science Campus Hall

Reconstruction of the Graduate School of Agricultural Science Field Science Center (Onagawa Field Center)

08.20 Tohoku University’s “Fundamental Research and Core HR Education Program for Decommission of Nuclear Reactors, Maintenance of Structural Building Integrity, and Disposal of Nuclear Waste” was selected by the Fundamental Research and HR Education Project for Safe Decommission and Related Measures

09.02 Opening ceremony of the Material Solutions Center

10.01 Installment of the Safety Confirmation System

11.10 Completion ceremony for the International Research Institute of Disaster Science facilities

2015

03.14 The 3rd UN World Conference on Disaster Risk Reduction (~ March 18)

03.15 Reconstruction Symposium “Messages from Tohoku University ~ Connecting the Lesson from the Disaster to the Future”

04.01 Establishment of the Global Center for Disaster Statistics

10.14 Publication of “After the Third World Conference on Disaster Risk Reduction ~ Ongoing Projects of Tohoku University”

11.05 Establishment of a Tohoku University Venture “Tohoku Magnet Institute”


2013.03.09


2013.04.25


2013.05.01


2014.03.09


2014.07.30


2014.11.10


2015.03.14


2015.03.15

2016

03.01 Establishment of a disaster prevention and business continuity plan

03.08 Disaster Reconstruction and Regeneration Symposium “Toward the future - 5 Years after the Great East Japan Earthquake”

04.01 Reviewing regulations to increase functionality of the institute

Inauguration of Executive Vice President for Earthquake Disaster Reconstruction Nobuyoshi Hara as director

Establishment of the Research Center for Remediation Engineering of Living Environment Contaminated with Radioisotopes

04.16 Start emergency investigation of the Kumamoto Earthquake

06.02 Establishment of a Steering Committee

12.01 Establishment of the Center for Fundamental Research on Nuclear Decommissioning

2017

03.09 Symposium of the Institute for Disaster Reconstruction and Regeneration Research “The Power of the Next Generation ~ Creating the Future”

06.30 Selection as Designated National University Corporation

Establishment of leading research activities at the Core Research Cluster with Disaster Science as one of its four pillars

07.05 Investigation and recovery support after the storm in northern Kyushu

09.08 Investigation and recovery support after the earthquake in Mexico

09.11 Partially reorganizing projects of the Reconstruction Action 100+ including the Center for Fundamental Research on Nuclear Decommissioning and the Tohoku Agricultural Science Center for Reconstruction as part of Tohoku University Priority Projects

11.25 First “World Bosai Forum / International Disaster Risk Reduction Conference in Sendai”(~ November 28)

2018

02.02 Disaster Reconstruction and Regeneration Symposium “Leading Disaster Recovery through Creation and Reforms”

02.06 Investigation and recovery support after the earthquake in Taiwan

06.18 Investigation and recovery support after the earthquake in northern Osaka

06.28 Investigation and recovery support after the storm in western Japan

09.06 Investigation and recovery support after the Iburi earthquake in eastern Hokkaido

09.28 Investigation and recovery support after the Sulawesi earthquake in Indonesia

11.27 Announcing the “Tohoku University Vision 2030” in order to clarify the university’s mission until 2030 for disaster recovery and a sustainable future.

2019

01.03 Investigation and recovery support after the Kumamoto earthquake

02.13 Disaster Reconstruction and Regeneration Symposium “In Collaboration with Society - The Importance of Disaster Risk Reduction”


2015.10.14


2015.11.05


2016.03.08

CORE RESEARCH CLUSTER
2017.06.30


2017.11.25


2018.02.02

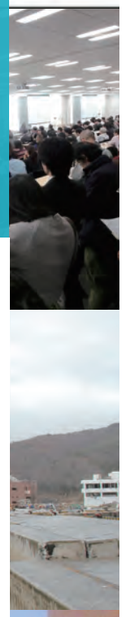
TOHOKU UNIVERSITY VISION 2030
東北大学ビジョン2030
2018.11.27


2019.02.13

PROJECT 1

International Research Project on Disaster Science

Since 2007, Tohoku University had organized the Research Group on Disaster Prevention and Management where researchers gathered to conduct multidisciplinary disaster prevention studies, considering especially the countermeasures for an earthquake off the coast of Miyagi Prefecture which was foreseen to occur in the near future. However, the reality of the 2011 disaster far exceeded all predictions and the Group was unable to respond adequately.
Tohoku University undertook a major expansion of the Group to learn lessons from the disaster, resulting in the establishment of International Research Institute of Disaster Science (IRIDeS) in April 2012.
Disaster science IRIDeS promotes is based on "the disaster cycle" that has four main phases: "Understand and prepare for a disaster," "Respond to the disaster after it occurred," "Recover from the disaster," and "Mitigate future disasters through disaster risk reduction education. Illuminating events of each process, IRIDeS researchers explore how to integrate lessons learned. The mission of IRIDeS is to create Practical Disaster Prevention Research which subsumes the lessons from the 2011 disaster and the findings of the world-leading research into our societies, effectively responding to natural disasters which are becoming more and more complex today.
Based on the mission, this project promotes diverse interdisciplinary research on disaster science, working with industry, government, academia and citizens in Japan as well as abroad.

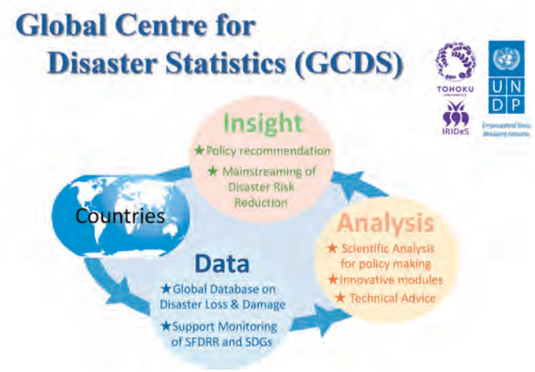


Activities

2011	9	Started the archive project of the Great East Japan Earthquake, "Michinoku Shinrokuden"
2012	3	Story-tellers' symposium "Kataritsugi" (passing on) (annual event thereafter)
		Debrief meeting 1 year after the Great East Japan Earthquake
	4	Establishment of IRIDeS, with Prof. Arata Hirakawa as its first Director.
	7	"World Ministerial Conference on Disaster Reduction in Tohoku"
	9	8th Association of Pacific Rim Universities (APRU) Natural Disaster Research Symposium
2013	1	The Great East Japan Earthquake Archive Symposium
	2-	Concluded comprehensive partnership agreements with 9 municipalities and Tagajo City, Miyagi
	3	2nd Annual Symposium on the Great East Japan Earthquake
		Community activity project "Strength to Live" Released "Disaster prevention notebook for all"
	6	Publication of research outcomes, "Analyzing the Great East Japan Earthquake"
2014	3	3rd Annual Symposium on the Great East Japan Earthquake
	4	New administration of IRIDeS (Prof. Imamura as second Director)
	9	Opening of a new IRIDeS building in the extension of the Aobayama Campus
2015	3	The Third UN World Conference on Disaster Risk Reduction
	4	Establishment of the Global Centre for Disaster Statistics
	11	First success in measuring the speed of tectonic platen movement of the pacific plate in the Japan Trench after the Great East Japan Earthquake
2016	3	5th Annual Symposium on the Great East Japan Earthquake
	4-	Emergency investigations and reconstruction assistant and collaboration after the 2016 Kumamoto Earthquake
2017	3	6th Annual Symposium on the Great East Japan Earthquake
	11	1st "WORLD BOSAI FORUM / International Disaster Risk Reduction Conference 2017 in SENDAI"
2018		Field Survey and debrief meetings after Northern Osaka Prefecture Earthquake, Hokkaido Eastern Iburi Earthquake, and earthquake and tsunami in Sulawesi, Indonesia
2019	3	8th Annual Symposium on the Great East Japan Earthquake

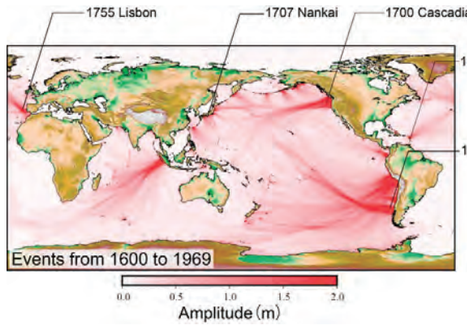
Global Centre for Disaster Statistics and World Bosai Forum

The international disaster risk reduction guideline “Sendai Framework for Disaster Risk Reduction” was approved in 2015 at the 3rd UN World Conference for Disaster Risk Reduction held in Sendai and we established the Global Center for Disaster Statistics to support further activities. This center collects disaster related information on a global scale, archives and analyzes it, and utilizes the results for policy recommendations as well as technological support, contributing to the disaster prevention and risk reduction capabilities of each country. Furthermore, the World Bosai Forum is organized biennially to present actual measures for disaster risk reduction and communicate important findings.



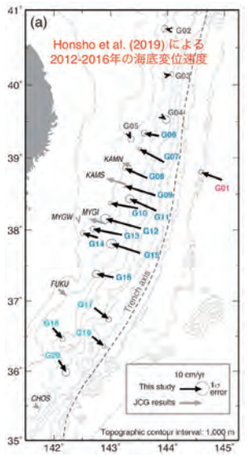
Global Activities Commemorating the "World Tsunami Awareness Day"

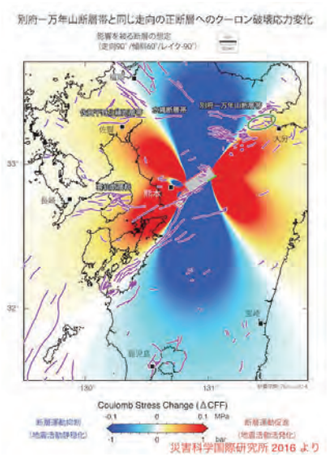
The UN General Assembly designated November 5 as World Tsunami Awareness Day in December 2015. IRIDeS started global awareness activities in 2016 commemorating the first “World Tsunami Awareness Day”, collaborating with people from Hawaii, Indonesia and Thailand. Furthermore, to analyze and visualize the impact of earthquakes and tsunamis of the past 400 years, we continue to communicate important findings to the media. We also collaborated with the United Nations International Strategy for Disaster Reduction (UNISDR) and presented findings on the web page.

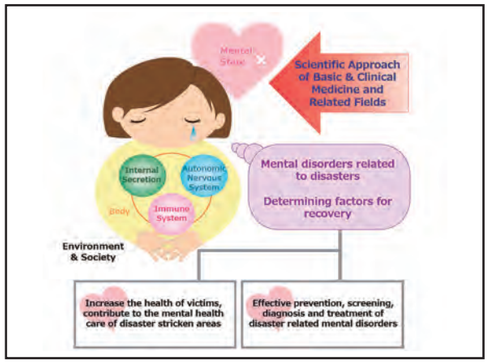


Mechanisms of the 2011 off the Pacific coast of Tohoku Earthquake and Inland Earthquakes from Seafloor Geodesy and Geological Surveys

In the event of the Great East Japan Earthquake in 2011, we were able to observe the movement of the seabed leading to the mega earthquake for the first time in history. Continuous observations in the following years showed the complex long-term changes after the earthquake as well. We shared the valuable observation results with other national and international research institutes, searching for ways to predict possible mega disasters in advance. Furthermore, we theorized a new trench model based on geological surveys and continue to analyze the occurrence of inland earthquakes.







Mitigating Disaster Related Stress for Psychological Health Care

By conducting surveys in disaster stricken communities, we clarified the impact of the Great East Japan Earthquake on the mental health of local residents and disaster related stress, determining necessary measures as well as issues for an early recovery. Furthermore, we analyzed the damages and lessons of psychological health care institutions, and used our results to advance mental health care policies at times of disasters and properly prepare psychological health care institutions for future emergencies.

Recovering Historic Documents and Material Affected by the Great East Japan Earthquake and Sharing Information

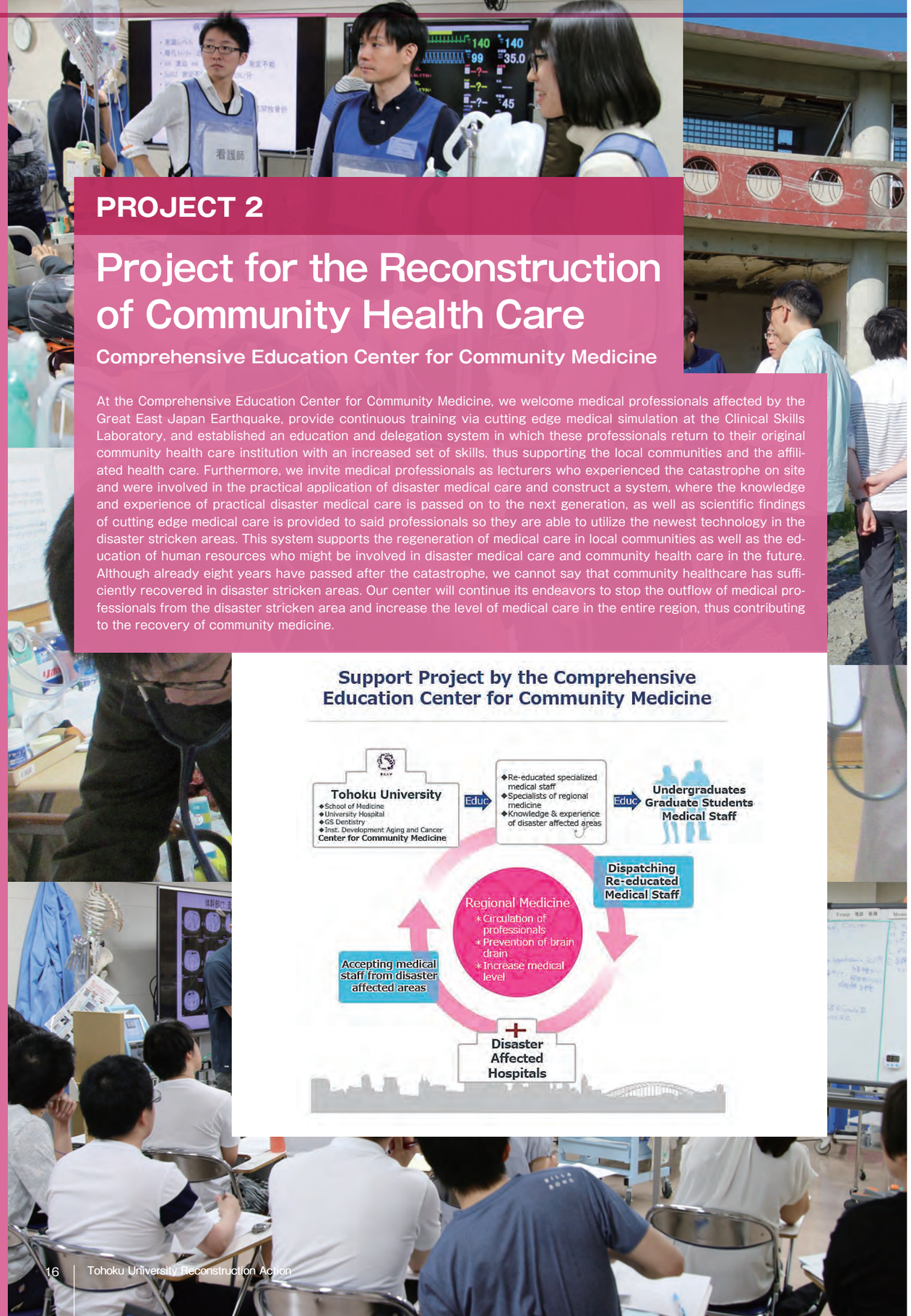
There are numerous historical manuscripts and material left all over Japan. We collaborated with municipalities and local residents in Miyagi and Iwate to preserve them from disasters since 2003. As a result of our efforts, ca. 60000 regional historic documents in areas destroyed by the Great East Japan Earthquake were recoverable, proving the importance of collaboration and preservation activities in ordinary times. Practical recovery support as well as active communication of disaster experiences as part of the Sendai Framework for Disaster Risk Reduction such as the collaboration with UNESCO’s Memory of the World Programme in December 2018 are important missions of our activities.

Rescue of historic documents from damaged storehouses.

World Memory Forum (UNESCO, Dec. 2018)

APRU-IRIDeS Multi Hazard Program

In collaboration with 50 universities from 16 countries of the pacific region, we established the Multi Hazard Program in 2013 in collaboration with the Association of Pacific Rim Universities (APRU). We are organizing annual summer schools as well as symposia to share the knowledge regarding natural disasters. Currently, we established a new international journal “Progress in Disaster Science” to further support research in Disaster Science and communicate important findings to our partners at the UN or APEC as well as to contribute to the policy-making of governments and communities around the world.



PROJECT 2

Project for the Reconstruction of Community Health Care

Comprehensive Education Center for Community Medicine

At the Comprehensive Education Center for Community Medicine, we welcome medical professionals affected by the Great East Japan Earthquake, provide continuous training via cutting edge medical simulation at the Clinical Skills Laboratory, and established an education and delegation system in which these professionals return to their original community health care institution with an increased set of skills, thus supporting the local communities and the affiliated health care. Furthermore, we invite medical professionals as lecturers who experienced the catastrophe on site and were involved in the practical application of disaster medical care and construct a system, where the knowledge and experience of practical disaster medical care is passed on to the next generation, as well as scientific findings of cutting edge medical care is provided to said professionals so they are able to utilize the newest technology in the disaster stricken areas. This system supports the regeneration of medical care in local communities as well as the education of human resources who might be involved in disaster medical care and community health care in the future. Although already eight years have passed after the catastrophe, we cannot say that community healthcare has sufficiently recovered in disaster stricken areas. Our center will continue its endeavors to stop the outflow of medical professionals from the disaster stricken area and increase the level of medical care in the entire region, thus contributing to the recovery of community medicine.

Support Project by the Comprehensive Education Center for Community Medicine

Activities

2012	1	Establishment of the Comprehensive Education Center for Community Medicine
	3	Hands-on training for medical care in disaster stricken communities
	6	Commemorative Lectures for the opening of the “Comprehensive Education Center for Community Medicine” and the “Tohoku University Clinical Skills Laboratory”
	7	“Disaster Dentistry” Lectures at the Faculty of Dentistry
		Begin emergency airway management training
	8	Begin acute heart failure simulations
	9	Begin emergency response simulations
	10	“Oral Health Care Consultations” at the Hibiki industrial park in East Matsushima
		Special Lecture “The Role of Dentistry and Oral Health Care at Times of Disasters”
		Begin surgery training on animals
2013	1	Eating and swallowing rehabilitation workshops
	4	Begin simulations of percutaneous cardiopulmonary support devices (PCPS)
		Begin simulation training course “SimMarathon”
	10	Begin pathology workshop utilizing virtual slide systems
		“Seminar for Chinese Medicine useful for daily medical care”
2014	2	Disaster dentistry symposium in cooperation with the West China School of Stomatology Sichuan University and on-site visit of disaster stricken areas of the Sichuan earthquake
2015	2	Lecture “Learning nursing basics for understanding patients with dementia”
	3	Lecture “Basics of simulation education for nurses”
	6	Special project “Learning chest compression (heart massage) and AEDs” at the Clinical Skills Laboratory
	10	Lecture “Support of severely disabled people in need of medical care”
	12	“On-site seminar emergency care for children with food allergies”
2016	11	Public project “To save babies’ lives – Understanding and preventing the sudden infant death syndrome”
2017	1	Begin “Lectures on emergency care for children with food allergies” for firefighters
	2	Lecture “Hands-on seminar for insulin injections”
	5	Lecture “Auscultation training for non-cardiology doctors”
		Heart auscultation training for non-cardiology doctors utilizing simulations
	6	Hands-on seminar for peripherally central catheter insertion
	7	Medical healthcare experience for middle-school students of the Miyagi area at the Department of Nursing
	8	“A backyard tour - Medical Care in Action” at the Tohoku University Hospital
	9	“Simulation User Network” to utilize simulation technology in medical education in the Tohoku region
	8-9	Simulation training course for nurses and practitioners
	10	Oral health seminar
	11	Public project “To save babies’ lives – Understanding and preventing the sudden infant death syndrome”
		Lectures for nurses working in correctional facilities of the Miyagi area
		“Supporting patients with ventilators in times of disasters”
2018	1-2	Lecture “Simulation for emergency care in case of allergic reactions” for firefighters, teachers and nurses.
	3	“POT & FTP” seminar utilizing simulations for paramedics
	6	Lectures for nurses working in correctional facilities of the Miyagi area
		“Skills Laboratory” for doctors in Kesennuma and “POT” training course for members of the Sendai Fire Department
	7	Heart auscultation training for non-cardiology doctors utilizing simulations
	8	Lecture “Simulation for emergency responses in case of allergic reactions” for teachers and nurses.
		Medical health care experience for middle-school students of the Miyagi area at the Department of Nursing
	8-9	Simulation training course for nurses and practitioners
	10	“Simulation User Network” to utilize simulation technology in medical education in the Tohoku region
2019	1-2	Lecture “Simulation for emergency care in case of allergic reactions” for firefighters, teachers and nurses.
	2	Organizing the Iwanuma Project









Surgery training on animals

We organize surgery training for medical residents on pigs, in order to educate them on thoracic and abdominal surgery and increase their skill level. In addition to the surgery techniques, conditioning of animals as well as an intensive course are part of the exercise, providing advanced training concurring with animal ethics and welfare. The training has received high praise from participants, since experienced surgens from the Tohoku University Hospital are engaged as an instructor.



The clinicopathological conference using a virtual microscopy and an online meeting device

To share the clinical and pathological information of the patients between pathologists and clinicians is pivotal for the accurate therapy selection and for understanding the disease. The virtual microscope and the online meeting device enable to view the microscopic image and to discuss each cases in remote locations.

Program for Chinese Medicine Useful for Daily Medical Care, Community Health Care, and Times of Disasters

Based on the experiences of the disaster healthcare activities using Chinese medicine at evacuation shelters after the Great East Japan Earthquake, we organize workshops and seminars for utilization of Chinese medicine in various situations such as times of disasters as well as community health care since July 2011. Since January 2017, 12 seminars with a total of 202 participants and 6 training workshops with a total of 215 participants were organized.


Learning ECMO Therapy for Patients with Cardiopulmonary Dysfunction

In order to increase effectiveness and not rely on the skills of individual, experienced staff, we introduced team based training for treatment of patients with cardiopulmonary dysfunction. Paramedics of the region as well as medical staff involved in disaster healthcare have the opportunity to receive training with extra corporeal circulation devices and experience various scenarios regarding priming, echo-guided cannulation and other methods, that will support their activities. In 2018, the course attracted 202 participants.


Open Interactions with Local Communities through the Tohoku University Clinical Skills Laboratory

In order to contribute to the recovery of the health care system in areas damaged by the Great East Japan Earthquake, we established the Tohoku University Clinical Skills Laboratory for open interactions with local communities in June 2012 with support from the government and the prefecture. We educate people in clinical skills utilizing medical treatment simulators and team training for medical safety, providing a practice oriented scenario based training. In 2018, we had 17,396 participants, 1/3 of which were non-university members. We will continue to establish a medical simlutation facility that is open to medical professionals of the community.




SimMarathon & SimNight: Real Simulations of Emergency Situations

Patient care in emergency rooms or intensive care units requires comprehensive decision making and swift treatment considering patient's condition.
In order to provide opportunities to gain experience and training of these stressful situations, we arranged real-life situations with high functional simulators for all healthcare providers in the community. Participants have the opportunity to obtain experience that will help them to save more patients during their activities. In 2018, the course attracted 43 participants.


Hands-on training of medical care in disaster stricken communities

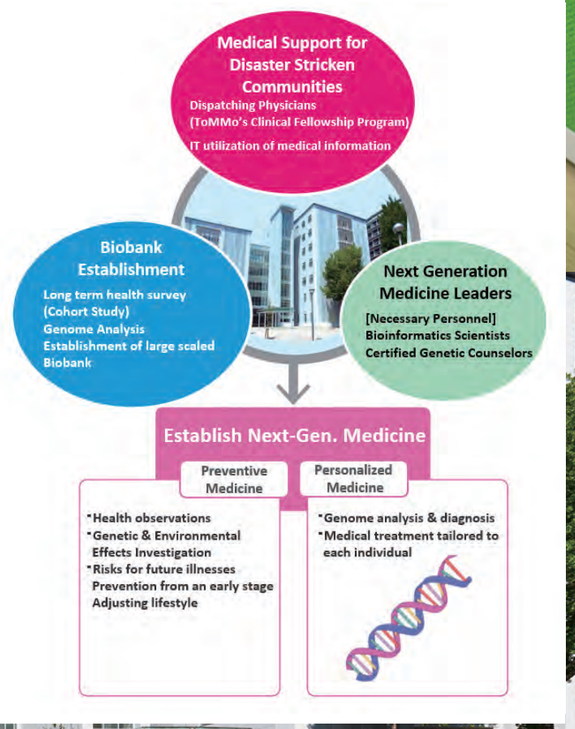
Since July 2011, we provided a medical educational program within the areas damaged by the Great East Japan Earthquake in collaboration with regional hospitals for the medical students from all over Japan to provide opportunities to gain experience in disaster related medical care. As of March 2019, the program attracted 141 participants and 17 students were involved in the regional hands-on training after 2017. Many participants expressed, that the experience of the training course has influenced their decision for the future. We will continue this program with the support of the Miyagi prefecture.


PROJECT 2

Project for the Reconstruction of Community Health Care

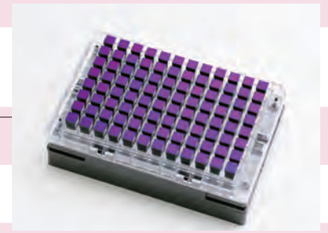
Tohoku Medical Megabank Organization

The Tohoku Medical Megabank Organization (ToMMo) was founded after the Great East Japan Earthquake to provide medical care to the disaster stricken communities of the Tohoku region. The main objective was to establish a new way to treat people, utilizing the various developments in medicine on a global scale.
ToMMo's biobank project managed to conduct a long-term cohort study of 150,000 people, accumulating the genetic information upon consent to obtain detailed data regarding the health and illnesses of community members. The information was then analyzed and utilized to establish personalized medicine, the ambition to provide necessary health care for each on everyone based on their genetic information and their everyday habits. Furthermore, we established a comprehensive biobank accumulating biological samples, health data and detailed analyses and are sharing research related information with nationwide scientists. In addition, we established the ToMMo Clinical Fellow System to provide education and circulation of medical staff in disaster stricken areas and thus support medical institutions in regional hospitals of Tohoku's coastal area. We are also heavily involved in medical training and education, providing support to the local medical community by dispatching genome medical research coordinators and certified genetic counselors. These activities not only support the people of the disaster affected area, but also nurture future experts in data management, bio information and genomics, and strengthen the ties with the region for further mutual support.
We strive to establish Tohoku-made "Next Generation Medicine" utilizing the analyses of the biobank as well as the support of the people.



Activities

2012	2	Establishment of the Tohoku Medical Megabank Organization (ToMMo)
	9	Cooperation agreement between ToMMo and the prefecture of Miyagi as well as all 35 municipalities Cooperation agreement with the Tohoku Medical Megabank Organization (~2014.8)
	10	Begin of ToMMo's Clinical Fellowship program
	11	Begin of ToMMo Child Health Study (~2016.3)
	12-	Setting up Community Support Centers in 7 places of Miyagi as base for health investigations
2013	4	Symposium "A Healthy Miyagi Created by Everybody"
	5	Cooperation agreement of Tohoku University and Iwate Medical University
		Begin of the Community Based Cohort Study and the Birth and Three-Generation Cohort Study
	11	Completing the high-accuracy whole genome sequencing analysis of 1,000 healthy Japanese people (up to 15 million new single nucleotide polymorphisms gathered)
	12	33 briefing sessions to explain result of the Community Based Cohort study to benefit community health care at various places in Miyagi (~2016.10)
2014	7	Begin operation of ToMMo's Supercomputer System "Large scale genome cohort analysis system"
	12	Commercialization of the SNP array "Japonica Array®" optimized for Japanese people
2015	6	Acquisition of the ISO9001 certificate at the Biobank Office of ToMMo
	8	Success of comprehensive high-accuracy whole genome sequencing of 1,070 Japanese people, publication of result in Nature Communications
	12	Release of the locations and allele frequencies of all SNVs in the whole genome reference panel
2016	2	Success in treatment effectiveness assessments of acute lymphoblastic leukemia using the whole genome sequencing
	4	Development of the Integrated Database "dbTMM", integrating the large scaled health survey data and the genome analysis information
	8	Release of the Japanese Reference Genome Sequence (JRG)
	12	Begin operation of remote security area for ToMMo Supercomputer System utilization outside ToMMo
2017	2	Begin data sharing SNP array data of 10,000 people, etc.
	3	Closing recruitment of the Community Based Cohort Study and the Birth and Three-Generation Cohort Study
	4	Tohoku Medical Megabank Project (TMM) symposium "Medical Care in the Future and Recovery of Tohoku via Data Sharing"
2018	6	Adding the mitochondria and X chromesome information to the genome sequencing of 3,500 people (3.5KJPNv2)
	8	The human metabolome information registered in jMorp2018 exceeds 10,000 people.
	12	Press conference regarding the bone density of participants of the cohort study who were heavily affected by the disaster in 2011
2019	1	MRI brain imaging exceeds 10,000 data sets
	1-2	Public briefing and reporting of long-term health survey to participants and supporters of the study
	2	Release of the genome reference panel "JG1", that will provide a model for the genome analysis of Japanese people



Repeat Assessment Center-Based Survey During Second Period of the Long-term Health Survey

In order to establish personalized and preventive medicine, a long-term health survey of healthy individuals is necessary to obtain reference data comparable to patients with illnesses. We began our repeat assessment center-based survey in 2017 and asked participants from the first analysis four years prior to provide biological samples and questionnaire.
Furthermore, we included children to analyze their development and monitor skin condition.

Checking skin condition

Providing Important Health Information to Members of Local Communities

From January to February 2019, we organized briefing and reporting events in the cities, Tagajo, Kesennuma, Shiroishi, Iwanuma, Sendai, Ishinomaki and Osaki to present our findings of the long-term health survey and a total of more than 1,400 people joint the events. We explained how obesity or smoking is connected to pregnancy hypertension syndrome, or what lifestyle likely leads to arteriosclerosis. An important aspect during the event was also the effect of the disaster and its long-term impact on the communities.

Presenting results of the project in Iwanuma

The Impact of Damage to Housing through the Long-term Health Survey

In the course of the long-term health survey with more than 150,000 participants, many research results emerged, that will greatly benefit everyday life in the communities. As an example, we found a connection of the participant's bone density to the damage of the housings during the disaster. Most notably, people whose houses were severely damaged, generally displayed a lower density than people whose houses were only lightly damaged. Compared with the first study, the effects had a greater impact on the people over time, suggesting a vicious cycle of "damage to the homes → lower daily step-count → lower bone density". The follow-up survey will continue to contribute to the everyday life of the people in the communities and, in the long run, will lead to the full, non-superficial recovery of the region.

Release of the Japanese Reference Genome Assembly "JG1"

Press conference in Tokyo

In order to conduct genome analysis, a Reference Genome Assembly is essential. Currently many researchers utilize the human reference genome, which has entries not suitable for the analysis of the genome of Japanese people.
ToMMo established the Japanese Reference Genome Assembly with the support of the participants of the long-term health survey and published the results online for other researchers to utilize. Employing this Japanese reference genome for further analysis, it will be possible to study causes of illnesses and establish new methods for medical treatment.

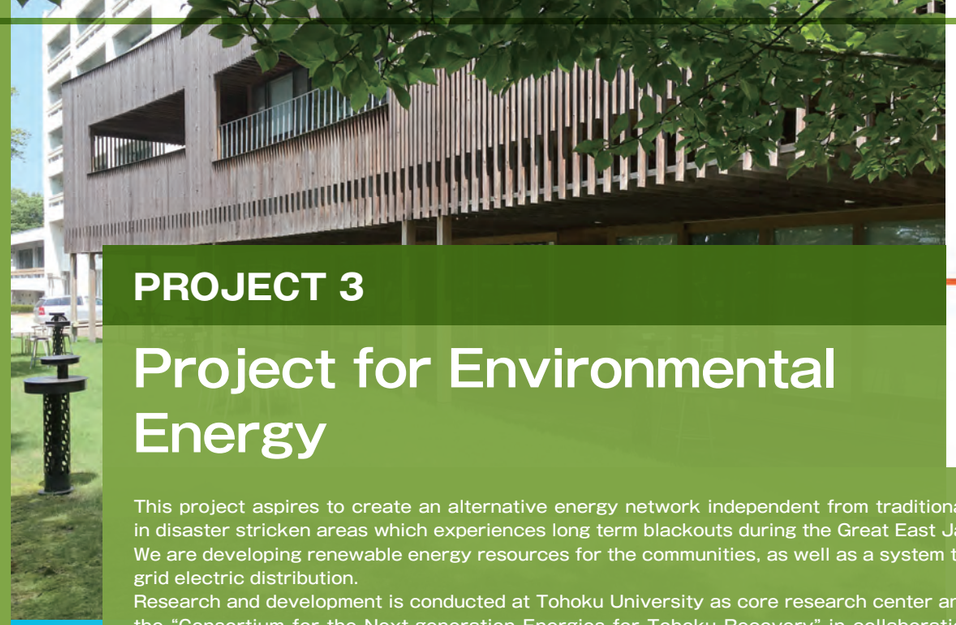
iPS Cell Development from Blood Samples of Long-term Health Survey Participants

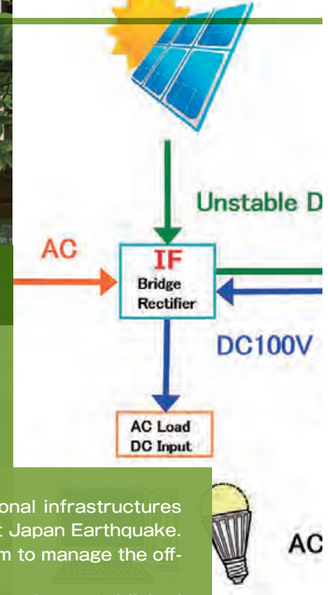
In collaboration with Kyoto University's Center for iPS Cell Research and Application (CiRa), ToMMo succeeded to create iPS cells from blood samples of six participants of the long-term health survey. This established new possibilities to build iPS cells with special characteristics based on the detailed data of the 150,000 participants.
Fortunately, many people from the region participated in the long-term health survey. And we are thankful to each and everyone for making the scientific progress possible.

Press release in collaboration with CiRa

Joint Research and Industry Cooperation

By adding the long-term health survey to our activities, we were also able to promote joint research with the industry. Among a variety of projects, we are currently analyzing the relation of disorders such as high blood pressure to data obtained from the everyday life in collaboration with OMRON HEALTHCARE Co., Ltd., utilizing tools such as sleepmeters. Furthermore, we are analyzing the intake effect of lactic acid bacteria and the impact of the intestinal flora on the personal condition in collaboration with Yakult Honsha Co., Ltd.





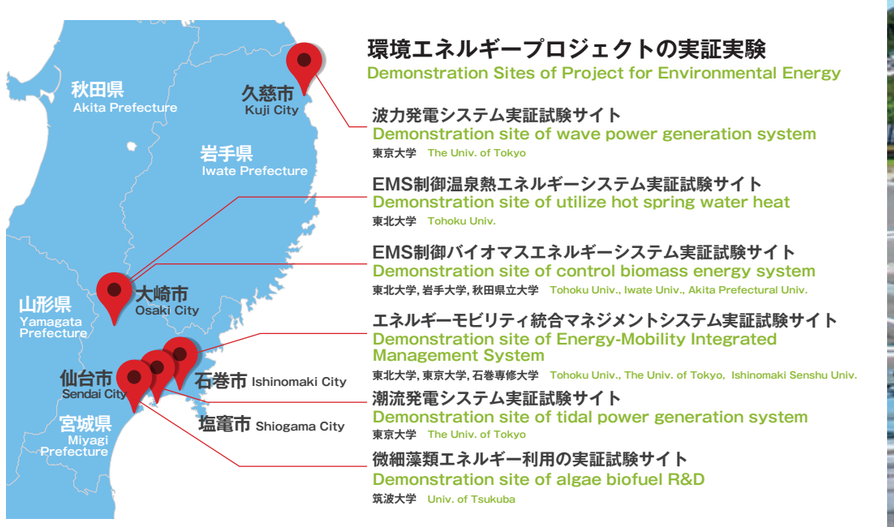
PROJECT 3

Project for Environmental Energy

This project aspires to create an alternative energy network independent from traditional infrastructures in disaster stricken areas which experiences long term blackouts during the Great East Japan Earthquake. We are developing renewable energy resources for the communities, as well as a system to manage the off-grid electric distribution.
Research and development is conducted at Tohoku University as core research center and we established the “Consortium for the Next-generation Energies for Tohoku Recovery” in collaboration with affiliated municipalities to promote new resources of energy and the necessary management system to society and lead the recovery of Tohoku. We have three main research objectives.

[Research Objectives]

Objective 1 : R&D on Wave Power and Other Ocean Renewable Energies Applicable to the Sanriku Coast
Objective 2 : R&D on Algae Biofuels
Objective 3 : R&D on Integrated Community Renewable Energy Control Systems to Enhance Human and Vehicle Mobility



環境エネルギープロジェクトの実証実験
Demonstration Sites of Project for Environmental Energy

波力発電システム実証試験サイト
Demonstration site of wave power generation system
東京大学 The Univ. of Tokyo

EMS制御温泉熱エネルギーシステム実証試験サイト
Demonstration site of utilize hot spring water heat
東北大学 Tohoku Univ.

EMS制御バイオマスエネルギーシステム実証試験サイト
Demonstration site of control biomass energy system
東北大学, 岩手大学, 秋田県立大学 Tohoku Univ., Iwate Univ., Akita Prefectural Univ.

エネルギーモビリティ統合マネジメントシステム実証試験サイト
Demonstration site of Energy-Mobility Integrated Management System
東北大学, 東京大学, 石巻専修大学 Tohoku Univ., The Univ. of Tokyo, Ishinomaki Senshu Univ.

潮流発電システム実証試験サイト
Demonstration site of tidal power generation system
東京大学 The Univ. of Tokyo

微細藻類エネルギー利用の実証試験サイト
Demonstration site of algae biofuel R&D
筑波大学 Univ. of Tsukuba

Activities

2012	9	“Kick-off Symposium for the Recovery of Tohoku and R&D of Next Generation Energy”
2013	3	“International Symposium for the Recovery of Tohoku and R&D of Next Generation Energy”
	4	Joint research initiation ceremony of Ishinomaki and Tohoku University at Kazuma elementary school, Ishinomaki
		Opening ceremony of the “Algae Biomass Technology Development Laboratory” at the Minami Gamou Sewage Treatment Plant, starting experiments on “R&D on Microalgae Energy Utilization”
	7	Letter of appreciation presented by Ishinomaki for the installation of the EMS controlled solar power system in public facilities of Ishinomaki
	7-8	Special exhibition at the Sendai Science Museum on fuel generation from algae
	12	“Osaki-Tohoku University Forum”, reporting on R&D achievement utilizing biomass and heat from hot springs
		Presentation of recovery projects at energy mobility integrated management system testing facilities to Prime Minister Abe visiting Miyagi
2014	6	“Briefing and electric car testing session for residents” on Tashiro Island, Ishinomaki
	7	“ene café METHANE” utilizing biogas energy resources in parking spaces in Naruko
	10	“Presentation Ceremony of Solar Power Systems” on Tashiro Island, Ishinomaki
		R&D overview and progress presentation to Prime Minister Abe at microalgae energy utilization testing site at the Minami Gamou Sewage Treatment Plant
	11	Installation of tidal power generation devices at Sabusawa waterways in Shiogama
2015	3	Study tour of the UN World Conference on Disaster Risk Reduction presenting the microalgae energy utilization testing site at the Minami Gamou Sewage Treatment Plant and the multi-purpose power supply facility at Aobayama Campus
	6	Development of new transformation methods for algae oils to transportation fuels
		Power transmission from the tidal power plant of Sabusawa Island to refrigerators of the Fisheries Cooperative Association
	12	“Special Good Life Award from the Minister of the Environment” at the Third Good Life Awards by the Ministry of the Environment for “ene café METHANE”
		Presentation ceremony of the multi-purpose power supply station installed in the parking space of Kagobou Hot Spring Sakuranoyu in Tajiri, Ohsaki
2016	1	Completion of the wave power generator to be installed in Tamanowaki Area, Kuji, and release of important information to the press
	5	Minister for Reconstruction Takagi visits the wave power generator installation site in Tamanowaki Area, Kuji
		Official visit of the G7 Finance Ministers and Central Bank Governors’ Meeting in Sendai to the microalgae energy utilization testing site at the Minami Gamou Sewage Treatment Plant
	9	Installation of the wave power generator in Tamanowaki Area
	11	Opening the wave power plant in Tamanowaki Area to the general public
		Installation of EV power stations (V2H) at Kazuma elementary school, Ishinomaki, completing basic maintenance of necessary elements for the energy mobility management system
	12	Closing Reports on the “Project for the Next-generation Energies for Tohoku Recovery”

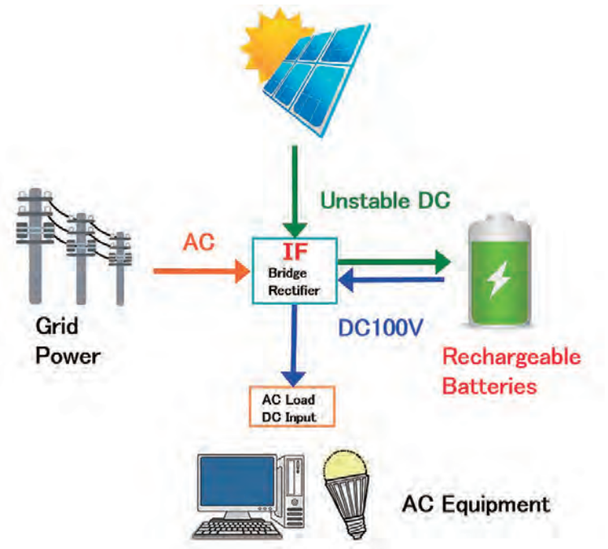
Achieving ZEB 104% at the Eco Laboratory in the Graduate School of Environmental Studies

The Ecollab. of the Graduate School of Environmental Studies achieved the status of ZEB 104% (zero-energy building) ※ in March 2019. The improvements to achieve the ZEB status are part of the “Project for 100% Production of Renewable Energy” in collaboration with enagia Inc.

※ We achieved the ZEB 104% rating during the BELS evaluation of the Miyagi Building and Housing Center

High Efficient Solar Power through the Re-utilization of Car Batteries

In August 2018, the joint project with Techno-Labo Co., Ltd. was selected by NEDO’s “Project for the Development of New Energy Technology”. We are currently experimenting with new ways to utilize lossless solar energy at the Eco-laboratory in the Graduate School of Environmental Studies. The project utilizes used car batteries and existing infrastructure to implement optimal energy conversion and low costs via minimalistic device structures.



Re-utilizing Batteries of Hybrid Cars for Cheap PCS Alternative

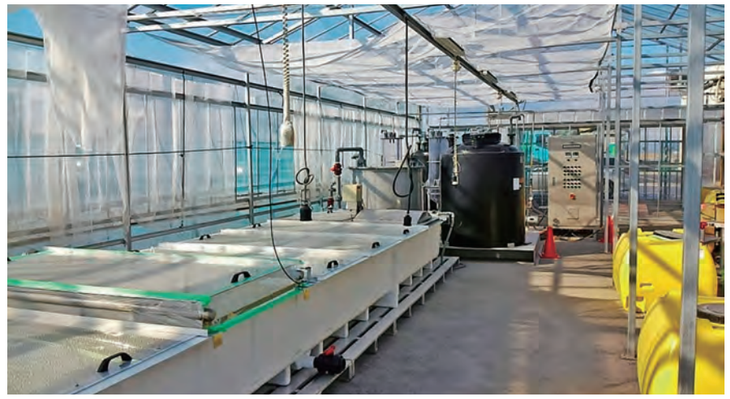
In June 2019, the joint project “R&D for LIB Stabilizer Technology” with Nomura Research Institute, Ltd. was selected by the “Project for the Development of CO_2-Efficient Recycle Technology” announced by the Ministry of the Environment. We aim to re-utilize old Lithium-Ion rechargeable Battery (LIB) from hybrid cars - that will increase in numbers in the coming years - to establish stable solar power production. Currently the new system is tested at the experimental housings of HOKUSHU Co., Ltd. as alternative Power Conditioning System (PCS) to improve the quality of the power delivered to the equipment.

Toward Energy Generation from Sewage Treatment Plants

In collaboration with Tsukuba University and the city of Sendai, we aimed to lower the energy costs for sewage treatment as well as to create and generate energy from this sewage at the Minami Gamou Sewage Treatment Plant, utilizing algae biomass.
Since 2017, we are continuing the project in private-public cooperation with more involvement of private companies.
Our research is one of the projects in Sendai City’s Earthquake Recovery Program and was supported by local communities with a lot of attention.

Activities

- Optimization of algae cultivation based on genetic information
- Extracting Algae Biofuels
- Feasibility study for commercialization of algae biofuels
- Cultivation of algae for other utilization
- Exploring other ways for production



PROJECT 4

ICT Reconstruction Project

After the Great East Japan Earthquake, the vulnerability of information communication technology (ICT) was exposed, such as failure of communication lines, inabilities of information acquisition, and insufficiency of transmitting information. We had recognized the issues to improve the resilience of existing ICT, which have to be dealt with as soon as possible.

To solve these issues, Tohoku University initiated projects to develop disaster resilient information communication infrastructures. We aim to establish a safe and secure ICT, as well as integrate research institutes and industries to improve disaster prevention and mitigation. The objective of our project is the realization of a "disaster resilient information communication network", and we established the cross-departmental Research Organization of Electrical Communication (ROEC) led by the Research Institute of Electrical Communication in order to accomplish our goals.

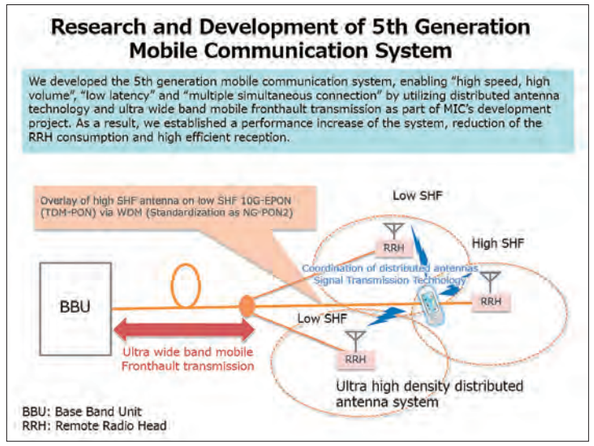
Furthermore, we had signed a comprehensive partnership agreement with the National Institute of Information and Communication Technology (NICT), a public research institution promoting research and development in ICT, and installed world leading research centers within Tohoku University. We will promote private-public research projects, thus aspiring the realization of resilient ICT as well as the regeneration of an active economy in disaster area.

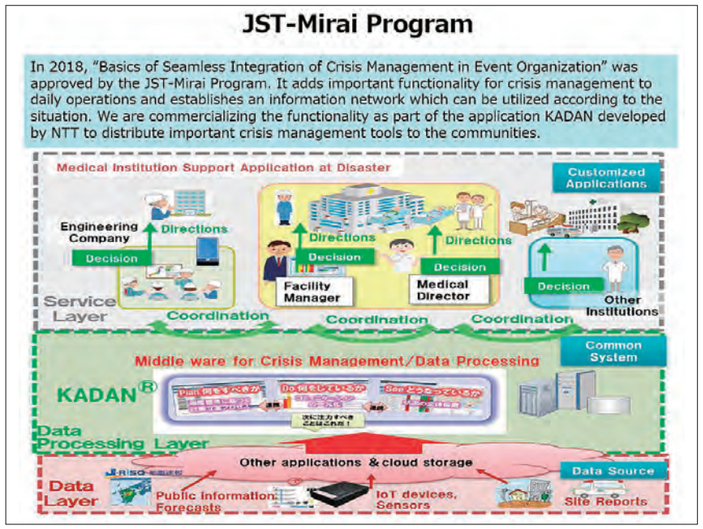
Activities

2011	10	Establishment of the Research Organization of Electrical Communication
2012	4	Establishment of the Resilient ICT Research Center in the National Institute of Information and Communications Technology (NICT)
	10	Partnership agreement between Tohoku University and the Japan Agency for Marine-Earth Science and Technology
	11	Demonstration of "R&D on multi-layered disaster information and communication systems integrating various methods of communication and broadcasting" funded by MIC
		Demonstration of "R&D on fundamental integrated broadcasting and communication technology for swift communication of disaster information" funded by MIC
2013	1	MoU with France Télécom (now Orange)
	2	Success of 2.5km message relays in urban areas with Wi-Fi function of smartphones
	3	Development of ad-hoc network technologies via Wi-Fi in cases of communication line failures after disasters
		"Disaster Resilient ICT Research Symposium and Demonstration of Disaster Resistant ICT – Connected & Never die!"
		Symposium on the establishment of the NICT Resilient ICT Research Center
	4	1st Orange-Tohoku University Workshop on Highly Robust Networks
	7	ROEC Symposium "Toward the Regeneration of Tohoku via Disaster Resilient ICT "
		First Issue of ROEC's "NEWS"
	8	Demonstration of communication technology to transmit information from isolated areas in emergency situations (Success of demonstration of connection between with "Relay-by-Smartphone" and relay systems with unmanned aerial vehicles)
	11	Tohoku University Tokyo Forum 2013 on Electronics and Information "From Recovery to Regeneration – Future Aspects of Information and Communication Technology"
2014	1	Connecting "Relay-by-Smartphone" and "ICT Car" (development of communication for the area far from evacuation center at a time of large-scaled disaster)
		MoU with the Industrial Technology Research Institute (ITRI) in Taiwan
	2	Issue of ROEC's "NEWS Volume 2"
		Demonstration of disaster resilient ICT R&D Project "ICT car to immediately recover communication network after Large-Scaled Disasters" founded by MIC
	3	Demonstration of satellite communication networks at a time of disaster in Yamamoto, Miyagi
		Development of communication system switching easily between mobile and satellite communication lines
	4	Demonstration of power supply and efficient operation of network equipment at a time of disaster
2015	3	Demonstration of disaster resilient network technology in Kochi
	7	Disaster response exercise with disaster response information system in Kashihara, Nara
	10	Demonstration of Tohoku University's disaster response drill on SIP (disaster prevention & mitigation) Project
	11	Demonstration in Cebu Island, Philippines on SIP (disaster prevention & mitigation) Project
2016	3	NICT Resilient ICT Research Symposium
	8	Workshop with participation of the general citizen in San Remigio, Philippines on SIP (disaster prevention & mitigation) Project
	11	Workshop with the Industrial Technology Research Institute (ITRI) in Taiwan
2017	6	Demonstration of "Relay-by-Smartphone" by Sendai Television Inc.
2018	1	Workshop with the Industrial Technology Research Institute (ITRI) in Taiwan
		The city of Kochi introduces "Relay-by-Smartphone", testing in a real-life environment
	7	Establishment of the innovation consortium for relay communication via smartphones
		Revision of the "Guidelines for a Disaster Resilient Information Communication Network"
		Participation in the Aqua LAN Consortium
	10	Establishment of the JSPS R&D Committee "Realizing a Super Smart Society via Convergence of Power and ICT Networks"
2019	1	Workshop with the Industrial Technology Research Institute (ITRI) in Taiwan
	3	Exchange about resilient ICT with the Technical University of Darmstad

Research and Development of 5th Generation Mobile Communication System

We developed the 5th generation mobile communication system, enabling “high speed, high volume”, “low latency” and “multiple simultaneous connection” by utilizing distributed antenna technology and ultra wide band mobile fronthault transmission as part of MIC’s development project. As a result, we established a performance increase of the system, reduction of the RRH consumption and high efficient reception.



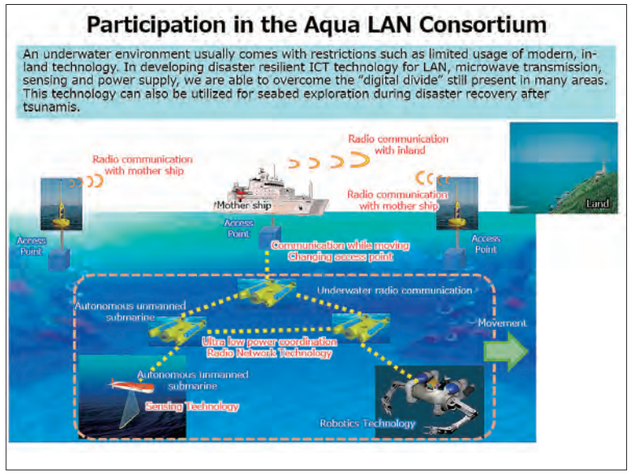


JST-Mirai Program

In 2018, the research and development project “Basics of Seamless Integration of Crisis Management in Event Organization” was approved by the JST-Mirai Program. It adds important functionality for crisis management to daily operations and establishes an information network which can be utilized according to the situation. We are commercializing the functionality as part of the application KADAN developed by NTT to distribute important crisis management tools to the communities.

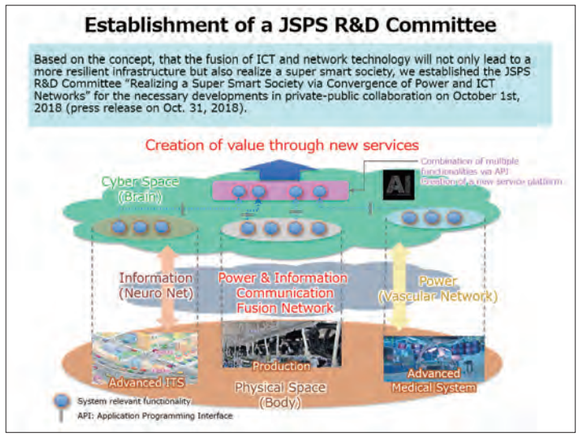
Participation in the Aqua LAN Consortium

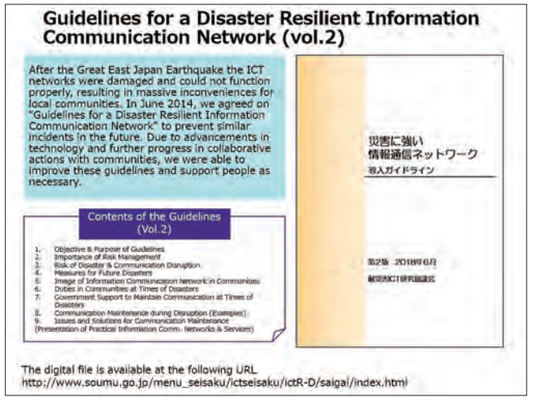
An underwater environment usually comes with restrictions such as limited usage of modern, in-land technology. In developing disaster resilient ICT technology for LAN, microwave transmission, sensing and power supply, we are able to overcome the “digital divide” still present in many areas. This technology can also be utilized for seabed exploration during disaster recovery after tsunamis.



Establishment of a JSPS R&D Committee

Based on the concept, that the fusion of ICT and network technology will not only lead to a more resilient infrastructure but also realize a super smart society, we established the JSPS R&D Committee “Realizing a Super Smart Society via Convergence of Power and ICT Networks” for the necessary developments in private-public collaboration on October 1st, 2018 (press release on Oct. 31, 2018).





Guidelines for a Disaster Resilient Information Communication Network (vol.2)

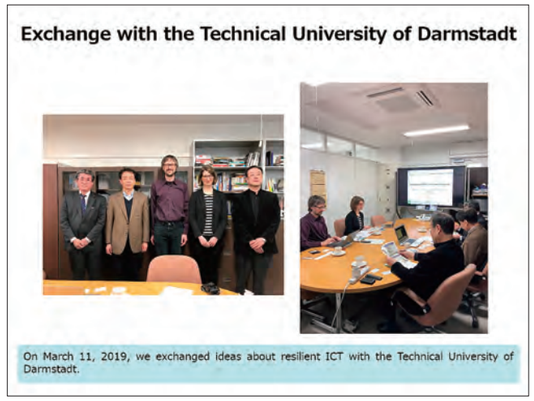
After the Great East Japan Earthquake the ICT networks were damaged and could not function properly, resulting in massive inconveniences for local communities. In June 2014, we agreed on “Guidelines for a Disaster Resilient Information Communication Network” to prevent similar incidents in the future. However, due to advancements in technology and further progress in collaborative actions with communities, we were able to improve these guidelines and support people as necessary.

Workshop with the Industrial Technology Research Institute (ITRI) in Taiwan

On January 5th, 2018, we organized a workshop with the Taiwan Industrial Technology Research Institute (ITRI) and discussed important topics such as 5G mobile communication, resilient ICT and other IoT projects.

Exchange about resilient ICTwith the Technical University of Darmstadt

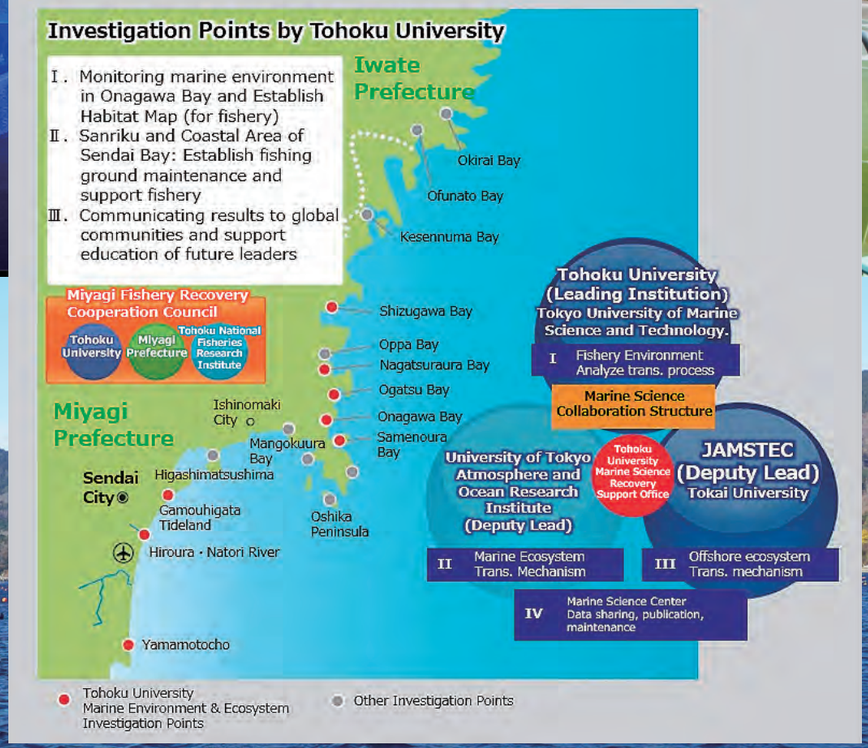
On March 11, 2019, we exchanged ideas about resilient ICT with the Technical University of Darmstadt.



PROJECT 5

Tohoku Marine Science Project

The 2011 Great East Japan Earthquake and resulting tsunami devastated extensive area of the Pacific coast of northern Japan and severely damaged fishery related infrastructure, including entire aquaculture installations. To recover the tsunami-affected communities, reconstruction of fisheries and aquaculture was essential. However, unlike on land, the marine environment below the surface cannot be readily observed. It was therefore crucial to obtain a detailed understanding of the marine environment and to monitor the changes in the state of the ecosystem.
To regain the rich seas using sound scientific principles, Tohoku University (lead institution), Atmosphere and Ocean Research Institute at the University of Tokyo (deputy lead) and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) (deputy lead) initiated a decade-long project called "Tohoku Ecosystem-Associated Marine Science" (TEAMS). The project has also been supported by a number of marine scientists throughout the nation. Tohoku University is responsible for undertaking studies on "Transition Process of Fishing Grounds" and we have conducted a coordinated monitoring program to obtain a holistic view on the spatio-temporal dynamics of the marine ecosystem. We have also established means to restore the population of sea urchins in Sizugawa Bay, developed optimum methods for culturing oysters in Nagatsuraura, provided efficient means to cultivate scallops in Ogatsu Bay, investigated the relationships between growth of cultured organisms and environmental conditions in Onagawa Bay, and helped restore various clam fisheries in the areas of Natori and Yamamoto. In this volume, we will present further actions undertaken to support the local communities after the disaster. During the remaining two years of the restoration and creation period, we will continue our efforts to progress the recovery of the tsunami-affected region.

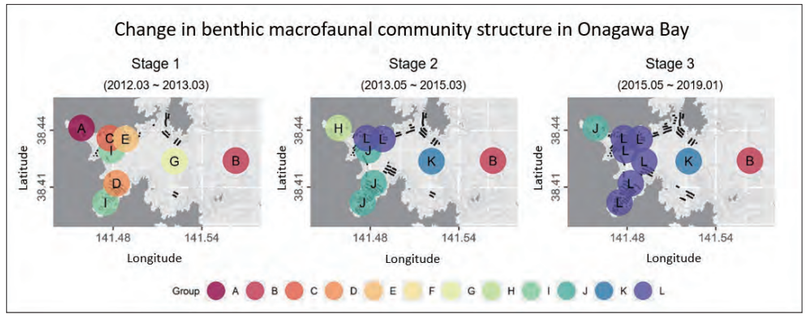


Activities

2012	2	TEAMS mini-symposium "Impact of the Great East Japan Earthquake on the Marine Ecosystems and Efforts for Reconstruction"
	4	Tohoku University - JAMSTEC joint symposium "One Year after the Great East Japan Earthquake – Lessons Learned and Best Practices"
	6	Lectures at the Korea Institute of Ocean Science & Technology "Introduction of TEAMS and Current State of Japan after the Great East Japan Earthquake"
2013	11	TEAMS public symposium "What Happened to the Sea along Tohoku?"
		The Science Council of Japan Conference "Towards Recovery and Regeneration of the Fishing Industry, Coastal Communities and the Natural Environment after the Great East Japan Earthquake"
2014	3	The Japanese Society of Fisheries Science Symposium "Current State of Coastal Regions in Tohoku after Three Years of the Earthquake and Tsunami – Natural Disturbances by the Disaster and Anthropogenic Disturbances by Reconstruction
	8	Workshop on seaweed aquaculture for Miyagi prefectural fishery affiliates
	10	Opening of the Onagawa TEAMS Headquarter
	12	Workshop on natural seed collection for cultured ascidians and oceanographic monitoring buoys
		Workshop on natural seed collection for cultured ascidians and hydrodynamic conditions in Samenoura Bay
2015	3	TEAMS symposium "How Did the Great East Japan Earthquake Affect Marine Ecosystem?" in the public forum, the World Conference on Disaster Risk Reduction
	9	Special symposium in the 2015 Japanese Society of Fisheries Science Council Meeting
	10	Meeting at the Miyagi Yagawa Branch, the Japan Fisheries cooperative, reporting on the results of the ascidian investigations
	12	Workshop on how to identify eggs and larvae of ascidians in Samenoura Bay
2016	2	Field seminar as part of an international symposium on the recovery state of disaster stricken areas in the coastal region of Miyagi
	3	Workshop on observations of ascidian seed collections in Samenoura Bay
	4	Workshop on observations of ascidian seed collections at the Miyagi Yagawa Branch Office, the Japan Fisheries cooperative
	6	Field seminar of the Global Learning Center, visiting the 2011 disaster stricken areas
	8	Field seminar for JST foreign visitors, visiting the 2011 disaster affected areas (Sakura Science Program)
	12	Kesennuma high school workshops studying the disaster stricken areas
2017	3	The Miyagi Fishery Recovery Cooperation Council public symposium "Disasters and Oceans – Future Fishery and Aquaculture"
	11	World Bosai Forum session "Marine Ecosystem Disturbances by Earthquakes and Tsunamis"
2018	3	The Miyagi Fishery Recovery Cooperation Council public symposium "Disasters and Oceans – Aquaculture in the Changing Marine Environment"
	10	Public briefing of TEAMS's activities at the signing ceremony of the collaborative partnership between the Graduate School of Agricultural Science and the town of Onagawa
	11	Public Event "Restore Tohoku's Sea! - Let's talk with Marine Experts" at the National Museum of Emerging Science and Innovation (Miraikan)
2019	3	The Miyagi Fishery Recovery Cooperation Council public symposium "Disasters and Oceans – Face the Changing Aquaculture and Fisheries Environment"

Creating a Habitat Map of Onagawa Bay

We have collected significant amounts of environmental data through a coordinated monitoring program in Onagawa Bay since March 2012. We have also investigated, for example, changes in distribution of fauna and flora in intertidal zones and seagrass/seaweed beds, as well as changes in growth rate of cultivated species in relation to environmental conditions. Based on our findings, we have been constructing a multi-layered habitat map, beneficial not only for researchers but also for the general public.



Spatio-temporal change in the distribution of benthic macrofaunal communities following the 2011 Tohoku disaster (The black solid lines represent aquaculture facilities)

Establishing Advanced Seaweed Aquaculture Technology

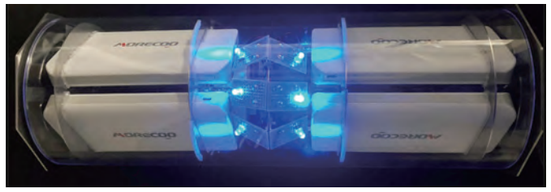
To prevent decoloration and accelerate growth of cultured *Undaria pinnatifida*, we are conducting blue LED exposure experiments by night in Sizukawa Bay of Minamisanriku. Furthermore, it is suggested that the blue LED light has the benefits to protect the seaweed from marine pests such as shellfish. Details are currently subject of additional investigation. For the future we are planning to establish and commercialize advanced seaweed aquaculture technology utilizing the blue light exposure.

Area of *Undaria pinnatifida* aquaculture

Blue LEDs

Recording seaweed growth by punching holes

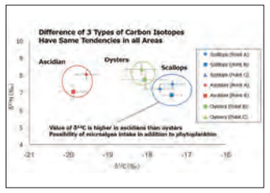
Blue LEDs on site



Light of the blue LEDs

Efficient Suspended Aquaculture at Onagawa Bay

We are investigating the transformation of the aquaculture environment regarding plankton as food for scallops, oysters and ascidians in Onagawa Bay after the recovery from the damages of the tsunami. In particular, we utilize various methods i.e. stable isotope ratio analysis to determine the origin of the cultivated species and advice efficient policies and strategies for sustainable and efficient aquaculture.



Carbon and nitrogen isotope ratio of the three cultivated species

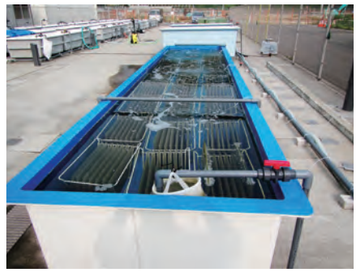
Suspended aquaculture (oysters)

Suspended aquaculture (scallops)

Aquaculture at Onagawa Bay

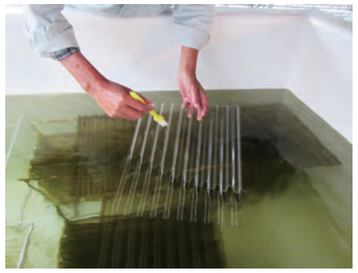
Developing an Aquaculture System for the Cultivation of Sea Cucumbers

In recent years, there has been an increasing demand for the production of sea cucumbers. However, to properly manage the resources and avoid overfishing, the placement of seedlings has become essential. One important issue of the seedling production is the extermination of vermin such as copepods. For the extermination, we designed ballast water processing technology. Currently, we are proceeding further development and commercialization together with the town of Onagawa.



Cultivating seedlings of sea cucumbers

Cultivating feed for the seedlings of sea cucumbers



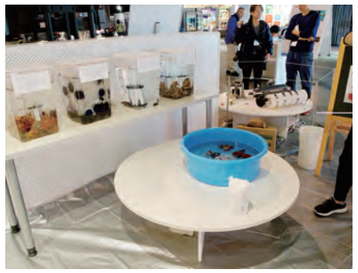
Gathering seedlings of sea cucumbers

Onagawa Field Center

Cultivation facility for seedlings of sea cucumbers

“Restore Tohoku’s Sea! - Let’s talk with Marine Experts”

In November 2018, we organized the public event “Restore Tohoku’s Sea! - Let’s talk with Marine Experts” at the National Museum of Emerging Science and Innovation (Miraikan). Researchers presented their findings as well as displayed the actual equipment and live samples, attracting much attention form the visitors. There were also many attendees who came from other parts of the country, showing great interest in the current state of the Sanriku Ocean. It was a good opportunity to communicate the important results of the project to the general public.



Display of live samples

Interaction with live samples

Talk show event

PROJECT 6

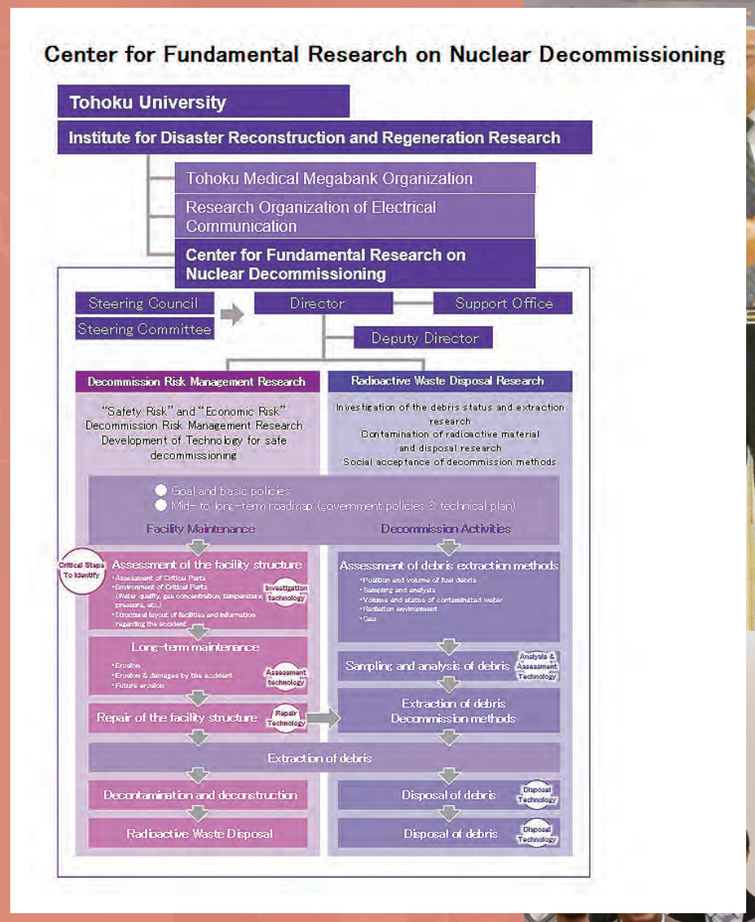
Nuclear Decommissioning and Environmental Restoration Project

Center for Fundamental Research on Nuclear Decommissioning

After the Great East Japan Earthquake, we committed to become a central hub for research regarding nuclear decommissioning not only for Tohoku but also on a global scale. Since 2014 we initiated projects for fundamental research on nuclear decommissioning and human resource development in collaboration with Fukushima University and the Fukushima College of the National Institute of Technology.

In order to realize safe and steady progress for the decommission of Fukushima Daiichi Nuclear Power Station, it is important to consolidate a wide range of academic knowledge, expertise in engineering and proficiency in technology as well as fostering the next generation of researchers and engineers who will continue the process in the future. Since this is an essential objective for the sustainability of our communities, we established the Center for Fundamental Research on Nuclear Decommissioning (CFReND) in December 2016 as a cross-departmental organization within Tohoku University.

The centers main objective is fundamental research and development of basic technology for the safe and steady progress regarding the nuclear decommission of Fukushima Daiichi Nuclear Power Station. This research also has the potential to be applied to general decommission of nuclear reactors in the future. Furthermore, we are also committed to the education of young engineers and researchers who will lead future projects regarding nuclear decommissioning with further upgraded safety.

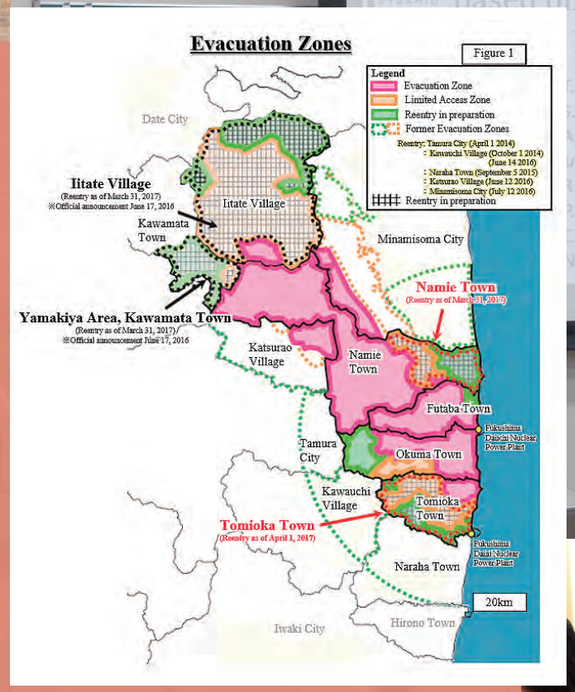


Technology for Decontaminating the Environment

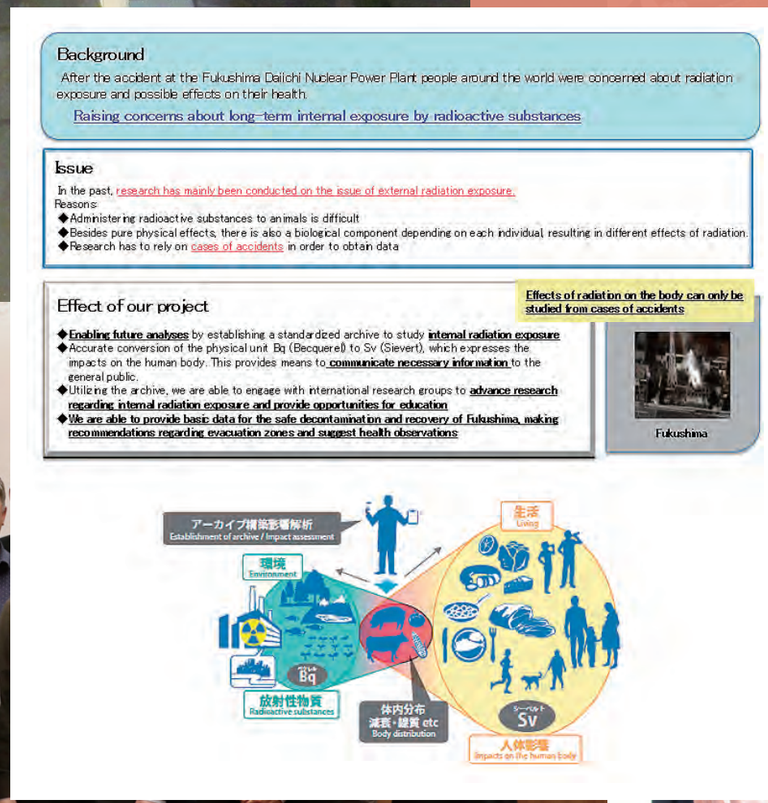
After the accident at the Fukushima Daiichi Nuclear Power Plant, radioactive materials were released into the environment, contaminating living environments at homes, fields, forests, or schools. In addition to concerns regarding the health of local residents, the radioactive contamination greatly impacts agriculture, forestry, and fishery products, and thus the lives of producers and consumers.

We established the Center for Remediation Engineering for Living Environments Contaminated with Radioisotopes and aspire to develop technology for the restoration of living environments contaminated with radioactive materials, e.g. decontamination technology for soil, technology effectively utilizing collected radioactive materials, methods for the cultivation of non-radioactive crops, or non-destructive (whole) monitoring technology for gamma radiation. These outcomes will be systematized and classified as Nuclear Disaster Remediation Engineering.

As of 2016, we are continuing our project as "Development of Technology for the Restoration of Living Environments Contaminated by Radioactive Material".



Evaluation of Radiation Effects on Animals



After the Fukushima Daiichi Nuclear Power Plant (FNPP) accident, large amounts of radioactive materials were released into the environment, leaving many communities worried how the long-term continuous exposure to radiation might affect human health and the ecosystem. The purpose of this project is to correctly understand the effects of radioactive substances on living organisms and contribute to the radiation protection of humans. We are continuing to analyze the impact of the accident on livestock and wildlife in the ex-evacuation zone within a 20 km radius of FNPP. In addition, along with the exposure dose, blood and tissue samples from affected animals have been collected and stored for future scientists to analyze.

Activities

2012 8 Site visit to Fukushima Daiichi Nuclear Power Station

2014 8 Initiation of MEXT's "Enhanced Program for Nuclear Decommissioning Research and Human Resources Development" at Tohoku University

2016 3 Site visit to Fukushima Daiichi Nuclear Power Station and the Nuclear Science Research Institute of the Japan Atomic Energy Agency (JAEA)

First "Conference on Next-Generation Initiatives for Nuclear Decommissioning Technology"

10 Site visit to Fukushima Daiichi Nuclear Power Station and the JAEA Naraha Remote Technology Development Center

12 Establishment of the "Tohoku University Center for Fundamental Research on Nuclear Decommissioning" (CFReND)

PYRAMID
Japan & France collaboration research

2017 2 Electromagnetic Ultra-Sonic Monitoring System for Corrosion Observation of Piping at Fukushima Daiichi's Nuclear Power Station

10 Site visit to Fukushima Daiichi Nuclear Power Station and the JAEA Naraha Remote Technology Development Center

11 Fukushima Research Conference on "Corrosion Prediction and Mitigation for Key Components of Fukushima Daiichi NPS"

Establishment of the PYRAMID project bringing together French and Japanese researchers to develop new tools and techniques to provide a risk management system based on prediction-monitoring of wall thinning in piping systems.

12 1st anniversary symposium of the Center for Fundamental Research on Nuclear Decommissioning "Challenging the Frontier of Basic Research for Nuclear Decommissioning"

2018 2 Institute for Disaster Reconstruction and Regeneration Symposium

5 Next-generation nuclear decommissioning specialists seminar

11 4th International Conference on Maintenance Science and Technology (joint event by ICMST and Tohoku)

12 Site visit to Fukushima Daiichi Nuclear Power Station and the TEPCO Nuclear Decommissioning Archive

2019 2 Publication and briefing of research results by Tohoku University's "Fundamental Research and Core HR Education Program for Decommission of Nuclear Reactors, Maintenance of Structural Building Integrity, and Disposal of Nuclear Waste"

Awards at NDEC-3 and NDEC-4

In order to provide a platform for students to exchange thoughts and ideas on nuclear decommissioning, the Conference for R&D Initiative on Nuclear Decommissioning Technology by the Next Generation (NDEC) is organized annually since March 2016. In March 2018, 4 Master students and 1 Bachelor student received conference awards at NDEC-3. In March 2019, 3 Master students received conference awards at NDEC-4.



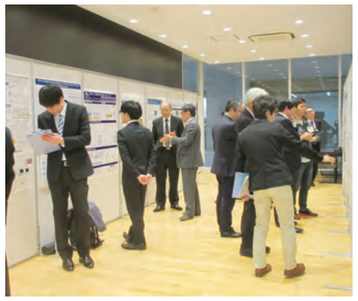


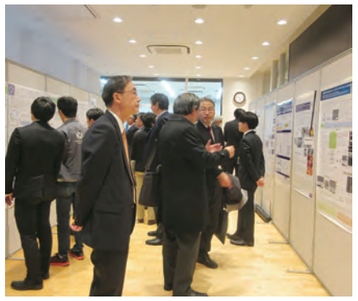
ICMST-Tohoku Joint International Conference

From October 23 to 25, 2018, the Center for Fundamental Research on Nuclear Decommissioning co-organized the joint international conference ICMST-Tohoku 2018 with a total of 240 participants (47 participants from 9 overseas countries). The conference focused on assessing and evaluating the safety of a system and discussed new methods for the safe decommissioning of the Fukushima Daiichi Nuclear Reactor.

Presenting Results of the Program for Nuclear Decommissioning Research and Human Resources Development

On February 25th 2019, we organized a presentation event of the Program for Nuclear Decommissioning Research and Human Resources Development. More than 70 people including MEXT representatives and experts from the industry participated to listen to the presentations given by university members.
There was a lively Q&A session as well as a poster session for students with very active discussions.



Activities

2012	5	Initiation of the Project “Development of Technology for the Restoration of Living Environments Contaminated by Radioactive Materials”
	7	Radiation monitoring at Kanayama elementary school in Marumori, Miyagi, and Matsukawa, Fukushima.
	8	Radiation monitoring at multiple points in Fukushima and Miyagi
	12	Establishment of the Center for Remediation Engineering for Living Environments Contaminated with Radioisotopes, decontamination experiment at local homes in Iitate, Fukushima
2013	3	Presentation at the “13th International Conference on Particle Induced X-ray Emission” (PIXIE2013) in Gramado, Brazil
	6	Presentation at the “21st International Conference on Ion Beam Analysis” (IBA2013)
	8	Joint announcement of the continuous non-destructive contamination monitoring system for food with the Ishinomaki Harbor, Miyagi
	9	Completion of the common design for the non-destructive contamination monitoring device, initiation of regular inspections in more than 20 places in Fukushima, contributing to the safety and relief of Fukushima’s communities regarding food
	10	Invited lectures at Academia Sinica, Taiwan, regarding the current state at Fukushima and projects of the center
2014	4	Contamination monitoring of bamboo shoots in Marumori, Miyagi
	5	Presentation at the “23rd International Conference on the Application of Accelerators in Research and Industry”
	6	Contamination monitoring of fish in Ohtsu Harbor, North Ibaraki, and Onagawa Harbor, Miyagi
	7	Installation of a non-destructive contamination monitoring device for crops at the Yakurai Souvenir Center in Kami, Miyagi
	9	Presentation at the “7th Bio-PIXIE International Symposium” in Bled, Slovenia
		Installation of a whole body counter for children at the Azuma Hospital for Neurosurgery
	12	Installation of unmanned radio monitoring systems for detection of radioactive cesium 137 in the countryside of Fukushima (24 devices) and Miyagi (2 devices) to assess the effects of decontamination measures and automated monitoring
2015	1	Presentation of projects regarding the state of recovery after the nuclear accident at the Fukushima Daiichi Nuclear Power Plant at the City University of Hong Kong
	4	Installation of a whole food monitoring device in the Kosai area of Marumori, Miyagi
	6	Presentation at the “22nd International Conference on Ion Beam Analysis” (IBA2015)
	7	Fourth “Workshop on Nuclear Facility Testing and Decontamination of Fukushima”
	12	Development for Cs monitoring for surfaces of trees without felling, joint investigation with the Ohira Branch of the Miyagi Prefectural Forestry Technology Institute
2016	3	Installation of unmanned monitoring devices for instant detection radioisotopes on the rooftop of the Center for Remediation Engineering for Living Environments Contaminated with Radioisotopes and monitoring of radiation
	4	Initiation of the project “Development of Technology for the Restoration of Environments Contaminated by Radioisotopes”
		Establishment of the Center for Remediation Engineering Research of Nuclear Disasters
2017	5	Discovery of low contaminated wild vegetables (below 137Cs 20Bq/kg) growing on high contaminated soil (137Cs 20000Bq/kg) within the restricted area in Iitate, Fukushima
		First demonstration of radioactive cesium absorption in the surface of sediment particles via autoradiography, presentation of the result in the Journal of Nuclear Science and Technology, Cogent Engineering (2017), 4: 1326200 titled “An analysis of radioactivity distribution in soil particles using an autoradiogram method”
		First visualization of the contaminated soil distribution utilizing imaging plates Publication of the results in the international journal of Cogent Engineering, Vol. 4, 2017, issue 1
		Vegetation analysis in the highly contaminated Itate area, Fukushima, regarding radiation. Most of the plants exhibited values below 100Bq/kg.
	10	Presentation at the 33rd PIXE Symposium, elution of alkalines and alkaline earth metals from tea leaves
2018	1	Publishing results regarding clay prevents from contaminating at the 9th International Symposium on Bio PIXE
		Publishing self-cleansing effect of radioactive cesium in rain in the international journal Cogent Engineering
	9	Investigating radioactive contamination of fish in Minamisoma, Fukushima
	11	Publishing properties of radioactive cesium contamination in clay at the 9th South Tohoku Atomic Energy Symposium
		Publishing results regarding the accumulation of alkaline earth metals in shitake mushrooms at the 34th PIXE Symposium
2019	3	Publishing results regarding the elution of radioactive cesium and nonelution of strontium from tea leaves

Health Assurance and Security for Children

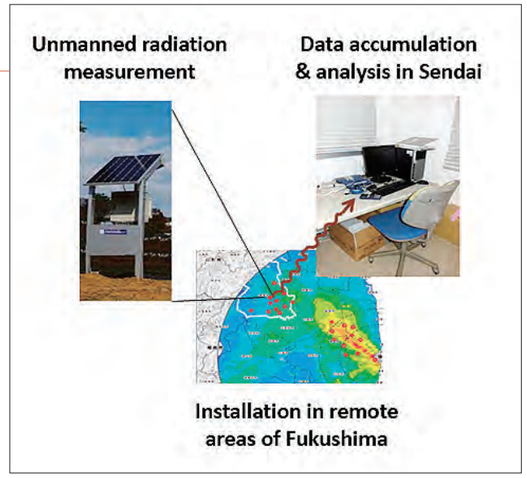
It is said that the effects of radioactive exposure on children is about twice as it is the case with adults and there is continuous anxiety of parents after the accident at Fukushima Daiichi’s nuclear power plant. In this project we developed a whole body counter for children and organized measurements at two places in the city of Fukushima, providing relief regarding radiation and contributing to the health assurance of children.

Whole body counter for children (Fukushima Health and Welfare Center)

Whole body counter for children (Azuma Hospital for Neurosurgery)

Natural Cleansing and Decontamination Effect of Radioactive Cesium

We established an observation system, to monitor the radioactivity of cesium and the weathering effect from rain in remote areas and mountains by transmitting radiation data via radio waves to the laboratory in Sendai. Currently 23 locations including Marumori, Fukushima, Itate, Minamisoma and Namie are under observation.



Installation in remote areas of Fukushima

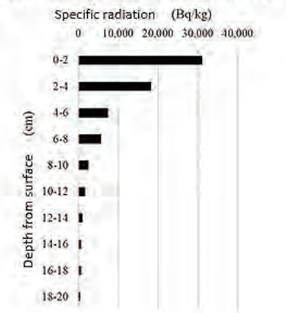
Investigating the Vegetation in Highly Contaminated Areas

We monitored the specific radioactivity of cesium in highly contaminated areas of Itate, Fukushima. Although the soil displayed values of 30000Bq/kg 2cm from the surface, the intensity decreased exponentially with the depth. The vegetation displayed values below 100Bq/kg.

Specific radioactivity from cesium

Species	Soil Bq/kg	Plant Bq/kg	Transition
Bracken	33488	87.4	0.0026
Aralia elata	30919	71	0.0023
Petasites japonicus	30629	166	0.0054
Fern	30629	311.2	0.0102

Radioactive cesium distribution in soil

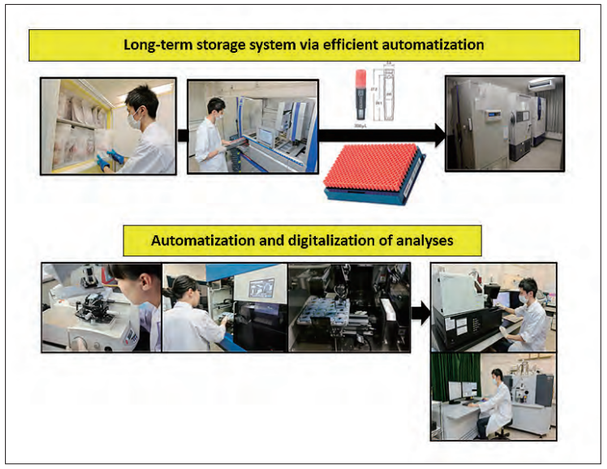


Activities

2011	8	Initiation of the Project for the Comprehensive Radiation Assessment of Disaster Affected Animals
	11	First introduction of findings about the internal distribution of artificial radionuclides in the body of disaster affected cattle in The Nikkei and Asahi Shimbun
2012	4	“Kick-off Meeting of the Project for the Comprehensive Radiation Assessment of Disaster Affected Animals”
	9	Multiple sessions related to the nuclear accident at ”The 55th Annual Meeting of the Japanese Radiation Research Society” at the Tohoku University Kawauchi Campus organized by Prof. Fukumoto (IDAC)
2013	1	Publication of findings related to internal distribution of artificial radionuclides in disaster affected cattle by Asso. Prof. Fukuda (GS Agri. Sci.) and Asso. Prof. Kino (GS Sci.) in the journal PLOS One
	5	Presentation of project activities by Prof. Fukumoto (IDAC) as Keynote speaker in five international meetings held in Germany (May, 2013), India (Nov, 2014) and Japan (May and Jul, 2015 and Jun, 2017)
	6	Japan Pathology Award for Prof. Fukumoto (IDAC)
	7	Production of a French documentary film about contents of the project
	10	Publication of findings related to the impact of artificial radionuclides on testicles of disaster affected cattle in the journal Scientific Reports by Asst. Prof. Yamashiro (Niigata University)
2014	3	“Workshop on Research for the Comprehensive Radiation Assessment of Disaster Affected Animals”
	4	Achievement Award by the Radiation Effects Association (2014.4.) and Sugawara Award by the International Association for the Sensitization of Cancer Treatment (2014.6) for Prof. Fukumoto (IDAC)
	10	Workshop on research related to disaster affected animals at “The 57th Annual Meeting of the Japanese Radiation Research Society” by Asst. Prof. Suzuki (IDAC) and Asst. Prof. Yamashiro (Niigata University)
2015	5	“The 1st International workshop on Sample/Tissue Archiving of Radiobiology STAR2015” as a satellite meeting of ICRR2015, where Prof. Fukumoto presented project activities as President of the Japanese Radiation Research Society
	9	Presentation of project activities by Prof. Fukumoto (IDAC) at the “59th Annual at Meeting of the Japan Society of Nuclear and Radiochemical Sciences” organized by Prof. Sekine (GS Sci.)
	10	Best Presentation Award for Asst. Prof. Suzuki (IDAC) at the “First Radiation Workshop”
	12	Management of the Fukushima Special Edition of the Journal of Radiation Research by Prof. Fukumoto
2016	3	Presentation of our research results in the NHK and BS1 TV Specials “The Exposed Forest”
	4	Publication of research result regarding radioactive strontium in teeth of disaster affected cattle in the Journal Scientific Reports by the group of Graduate Student Koarai (GS Sci.)
	5	Publication of research related to eight blood plasma components highly correlated to internal exposure of cattle in PLOS ONE by Research Fellow Urushihara
	10	Best Presentation Award for Graduate Student Koarai (GS Sci.) at “The 59th Annual Meeting of the Japanese Radiation Research Society”
2017	8	“Workshop on the Impact of the Nuclear Accident on Organisms around Fukushima Nuclear Power Plant” for four years in a row by Prof. Fukumoto (IDAC) Since then, regularly held in August every year
	9	Best Young Scientist’s Award for Graduate Student Koarai (GS Sci.) at “The 61st Annual Meeting of the Japanese Radiation Research Society”
2018	3	Special Researcher Award for Graduate Student Kaneko (GS Sci.) at the 19th Environmental Radiation Conference
		Publication of research result regarding radioactive strontium in teeth of disaster affected cattle in the Journal of Environmental Radioactivity by the group of Graduate Student Koarai (GS Sci.)
	6	Young Scientist Poster Prize for Asst. Prof. Oka at the “EPR BioDose 2018”
	9	Asst. Prof. Oka presents new methods to measure low radiation doses using dental enamel in the Nikkan Kogyo Shimbun
	11	Achievement Award by the Japanese Radiation Research Society for Prof. Fukumoto
		Publication of radiation effects on wild Japanese macaques by Asst. Prof. Urushihara (School of medicine) in Scientific Reports
		Workshop on research related to insoluble radiocesium-bearing particle at a workshop of “The 61st Annual Meeting of the Japanese Radiation Research Society” by Asst. Prof. Suzuki (IDRRR)
2019	3	Hirama Award for student Ono (GS Sci.) for research on the distribution of radioactive cesium and evaluation of radiation effects in wild animals.
		Publication of results regarding the absorption of radioactive cesium by intestinal bacteria by graduate student Saito (GS Agri.) in Frontiers in Veterinary Science
	5	Presentation of research achievements in the Hokkaido Shimbun by Prof. Fukumoto and Sen. Asst. Prof. Suzuki (IRIDeS)

Establishment of sensitive Electron Spin Resonance (ESR) Dosimetry for Japanese Macaques

In order to know whether or not a phenomenon has occurred due to radiation, it is necessary to know whether there is a dose-effect relationship for that phenomenon or not. Applying electron spin resonance (ESR) tooth dosimetry for Japanese macaques, we have established a sensitive dose assessment method which can quantify even a low dose of 50 mGy. This method has made it possible to find biological effects of radiation that were previously unknown.

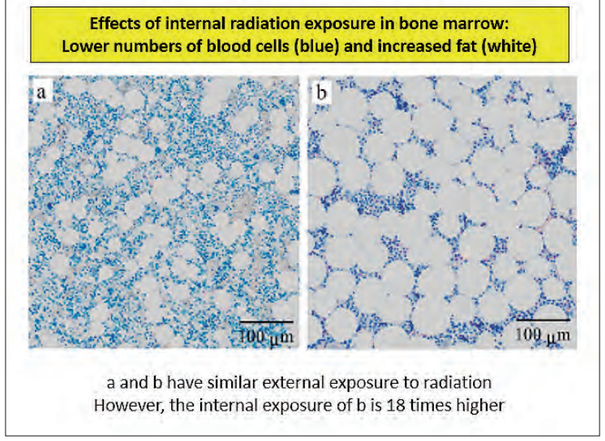


Archives of Affected Animal Samples and Data

To enable further analysis of samples collected in the future, we maintain an archiving system that allows samples to be stored for long periods without deterioration. Currently, we have accumulated 544 wild Japanese machques (as of June 2019). Those samples are available to researchers as needed and have already been distributed in various collaborative research projects.

Findings from Animal Samples Affected by the FNPP accident

Increasing oxidative stress in blood plasma from cattle of the ex-evacuation zone was observed in relation to internal radiation dose-rate from radioactive cesium. Although there were no significant abnormalities in peripheral blood cells of wild macaques affected by the FNPP accident, internal dose-rate related suppression of hematopoietic cells in bone marrow was suggested.
These findings are valuable indicators for assessing the persistent low-dose-rate radiation effects on humans.



PROJECT 7

Regional Industries Restoration Support Project

Regional Innovation Research Center

In order to recover from the Great East Japan Earthquake, we have to not only solve apparent issues such as hardware e.g. infrastructure support, but also continue to investigate local industry and communities, clarifying problems and recommending solutions, as well as educate revolutionary producers who will initiate innovations (create new values) and thus establish new opportunities for employment.
The Regional Innovation Research Center aspires in the following investigative research and human resource development projects to support mid to long term recovery of the industry and communities in the Tohoku region.

Investigative Research	Recovery of Regional Industry	Continuous investigative research for practical problem solving and policy making regarding disaster recovery and diversity of local communities/economy
	Regional Innovations	Investigative research on innovation steps of local innovators in Tohoku and crucial points for their success
	Innovations for the Tohoku Fishery Industry	Action research to maximize impact on changes in the local fishery industry of Tohoku for 5 years
Development of Human Resources	Regional Innovation Producer School (RIPS)	Project of human resource development to raise innovative producers who implement new businesses and innovations
	Regional Innovation Advisor School(RIAS)	Project of human resource development to raise supporters who have practical skills to aid and support innovative producers
	“Right Arm” Executive Education Lectures	Lectures to educate “right arm” executives necessary for the realization of business plans by RIPS graduates

Activities

Investigative Research of Local Communities

2011	4	Establishment of the Research Center for Disaster Recovery
		Initiation of the Investigative Research Project for Regional Industry Regeneration
2013	3	Presentation related to the disaster recovery at international conferences (South Korea, France, Belgium, UK)
2015	3	Public forum “Recovery of Industry and Communities in the Tohoku Region” as part of the Third UN World Conference on Disaster Risk Reduction
2016	5	Initiation of the Tohoku Fishing Industry Innovation Project
2017	3	Interim conference of the Tohoku Fishing Industry Innovation Project

HR Education in Local Communities

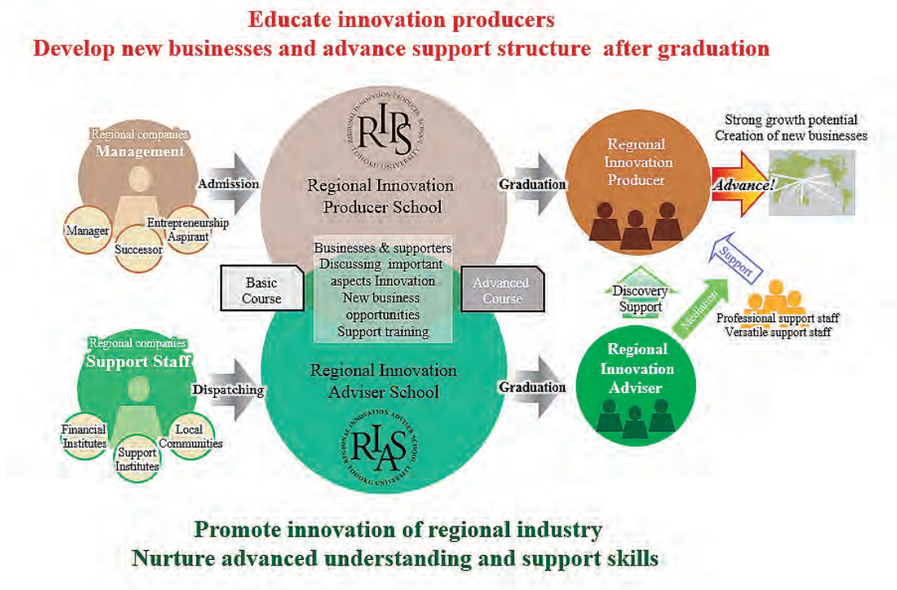
2012	9	“Kansai Entrepreneurship School” in cooperation with the Kansai Economic Federation (12 events)
2013	4	MoU regarding RIPS satellite schools in Hanamaki, Iwate, and Aizuwakamatsu, Fukushima
	8	Opening of the Regional Innovation Producer School (RIPS)
2014	5	Alumni network of RIPS graduates leading innovations in Tohoku
		Financial support of 100 Million JPY from the U.S. Prudential Foundation
	8	Initiation of two study groups (EDS & BPS) for exchange of RIPS graduates and development of new businesses
2015	5	Opening of the Regional Innovation Adviser School (RIAS)
	6	Cooperation & collaboration agreement with the Miyagi Association of Small Business Entrepreneurs
	8	Collaboration Platform “Consortium for the Promotion of Regional Innovation in Tohoku” for HR Education
2016	1	MoU regarding RIPS and RIAS satellite schools in Morioka, Iwate, and Koriyama, Fukushima
	5	Cooperation & collaboration agreement with the Sendai Cooperative Merchants Center
	7	Alumni association of RIAS graduates
2017	1	Cooperation & collaboration agreement Hanamaki Shinkin Bank
	3	Cooperation & collaboration agreement with Tome, Miyagi
	9	Opening of the “Right Arm” Executive Education Lectures
2018	3	Cooperation & collaboration agreement with the city of Sendai and the Sendai City Industrial Promotion Organization

The Regional Innovation Producer School (RIPS)

RIPS aims to educate talent and future leaders and to raise innovative producers who implement new businesses and innovations, who will engage with the local communities to improve the local industry. In 2019, more than 200 students graduated RIPS and are currently actively involved in communities of Tohoku. RIPS is organized parallel to RIAS (educating professional staff specialized to support innovators), so future innovators are able to obtain necessary knowledge and skills together with future professional staff and supporters.

Regional Innovation Advisor School (RIAS)

RIAS aims to raise supporters who have practical skills to aid and support innovative supporters through finances and other professional expertise. Participants of RIPS and RIAS have the opportunity to learn new methods for business development together and obtain a new perspective. Through the support training, we aim to nurture a wide range of supportive skills so participants are able to effectively help other businesses after graduation.



RIPS Graduates	
FY 2012	11
FY 2013	35
FY 2014	29
FY 2015	26
FY 2016	41
FY 2017	33
FY 2018	30

205 graduates in the 7th year

RIAS Graduates	
FY 2015	25
FY 2016	32
FY 2017	28
FY 2018	27

112 graduates in the 4th year

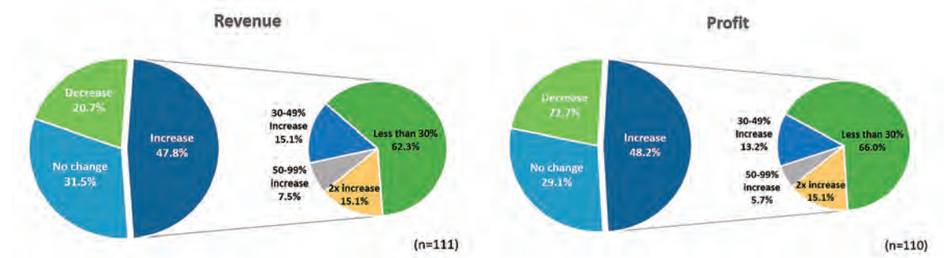
Survey of RIPS Graduates

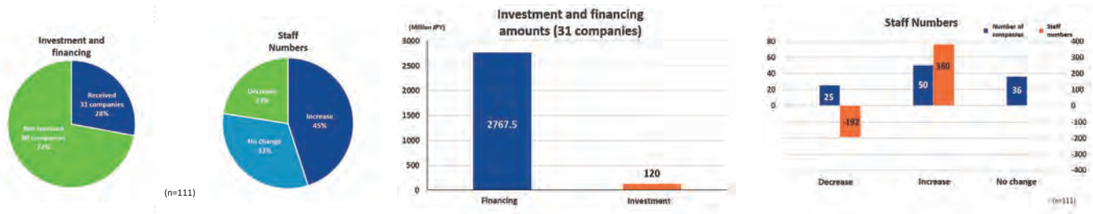
Every year, we organize a survey for graduates of the RIPS to assess the business situation after graduation. In 2018, we asked about the situation of 2012-2016 graduates 2-6 years later. (Survey results from 111 businesses, 79.8%, comparing the situation directly after graduation) According to the analysis, graduates saw an increase in sales and revenue and many businesses were able to employ more people, showing the positive effect of our programs.

Status after graduation

Survey of RIPS Graduates (2018.7-9)

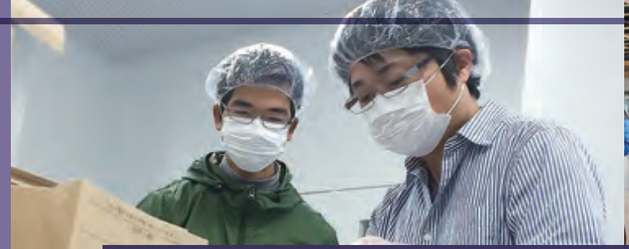
139 businesses graduating between 2012-2016⇒
Response rate 79.8%





Tohoku Fishing Industry Innovation Project

This project started in 2016 with the aim to innovate the fishery industry of Tohoku and support the local economy of the Sanriku coastal area. We visited more than 80 businesses engaged in fishery in the Sanriku area as well as in other areas of Japan and created a plan for basic policies. As of 2019, we are implementing practical steps to support the communities and businesses.

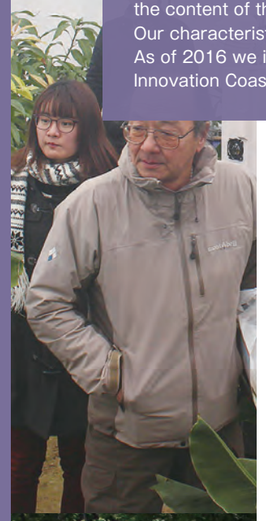


PROJECT 7

Regional Industries Restoration Support Project

Tohoku Agricultural Science Center for Reconstruction

Our Center was established in April 2014 in order to educate human resources leading recovery of agriculture and communities in disaster stricken areas as well as to prepare for issues and problems related to expected future mega disasters from an interdisciplinary point of view via education and research.
Graduates of our practice oriented lectures and exercises are conferred qualifications in Certificated Agricultural Reconstruction (CAR) or Certificated Agricultural Information Technology (CAIT). Tohoku University Students also have further opportunities to obtain higher qualifications related to their research in disaster recovery. Depending on the content of the graduation thesis, they are conferred the title of Junior Field Specialist (JFS) or Field Specialist (FS).
Our characteristic curriculum received the "President's Education Award" 2016.
As of 2016 we initiated recovery support actions in Katsurao, Fukushima, and since 2017 we promote the Fukushima Innovation Coast Framework to support regional communities.



復興農学マイスター（CAR）コース

CAR : certificated agricultural reconstruction

Participants will obtain deeper understanding of agriculture related to natural disasters as well as training in cutting-edge technology via "Recovery Agriculture Lectures", "On-site training in the field". Graduates will be ready to start working under real life conditions in disaster stricken areas.

IT農業マイスター（CAIT）コース

CAIT : certificated agricultural information technology

Participants will obtain deeper understanding of agriculture related to information technology as well as training in cutting-edge technology via "Recovery Agriculture Lectures", "IT Agriculture". Graduates will be ready to start working under real life conditions.

4 Certificates available
CAR, CAIT FS/JFS

CAR
復興農学マイスター
Certificate of Agricultural Reconstruction

General public, undergraduate and Graduate students

CAIT
IT農業マイスター
Certificate of Agricultural Information Technology

FS/JFS
復興農学フィールドスペシャリスト/ジュニアフィールドスペシャリスト
Field Specialist / Junior Field Specialist

Undergraduate and graduate students

The Graduate School of Agricultural Science will confer certificates after completion of required conditions.
※Please refer to the web page for details (http://www.tascr.agri.tohoku.ac.jp/)

FY 2016
President's Education Award

Activities

2014	4	Establishment of the Tohoku Agricultural Science Center for Reconstruction (TASCR)
		Kick-off symposium of TASCR
	5	Starting lectures of the center with 103 students
	7	Publication of "Rapeseed Science ~ the Regeneration of Saltwater Damaged Farmland" presenting achievements of the rapeseed project
	9	On-site experience workshop of the rapeseed project
	11	Award for the rapeseed project at MAFF's "Japan Award for Food Action 2014" in the "Research and New Technology" category
	12	Organic rice "Tohokudai ni Hitomebore" from Kawatabi Seminar Center sold in stores at cooperative shops in the Graduate School of Agricultural Science and School of Engineering
2015	3	Students presenting at the public forum "Let's build a Model Village – New Agriculture & Safe, Peaceful, and Fruitful Communities" at the Third UN World Conference on Disaster Risk Reduction
	4	Publication of the Second edition of "Rapeseed Science ~ the Regeneration of Saltwater Damaged Farmland"
	10	Public seminar "'The 21st Century as Environmental Epoch' Let's talk about recycling! – Livestock manure as important resource" at Tohoku University's Project of Integrated Compost Science at Kawatabi Seminar Center
	12	"Tohokudai ni Hitomebore" rice sold in all stores of cooperative shops in Tohoku University by course participants
2016	2	Memorial Lecture "Utilizing Agricultural Knowledge for Environmental Maintenance of Livestock" by Prof. Nakai on his Japan Agricultural Award at the cutting edge agriculture symposium
	5	Visit of two professors from Nizhny Novgorod State Agricultural Academy
	6	Approval of the regional development project "New ICT Technology and a "Synergetic High Value Farming Model" to Promote Agriculture in Remote Areas"
	10	Katsurao monitoring tours by volunteers to increase rural population
		Cooperation & collaboration agreement between the Graduate School of Agricultural Science and Katsurao, Fukushima
		"Tohokudai ni Hitomebore" sold at the Homecoming Day
2017	3	"Tohoku University President's Education Award 2016"
	6	Volunteers joining "Tour de Katsurao"
2018	5	Publication of Rapeseed Science results in "Utilizing Agricultural Knowledge for Reconstruction - The Rapeseed Science Project"
	6	Approval of the regional reconstruction and development project "Development of High Functional and Stable Food Supply Technology and an Efficient Sales Structure of Regional Specialties"
		Approval of the Fukushima Innovation Coast Framework "Utilizing Recovery Knowledge for the Creative Reconstruction of Katurao"
2019	3	Presentation by 2 graduate students at MAFF's "Special Exhibition regarding the Great East Japan Earthquake"

Construction of a Pilot Plant Factory at Katsurao.

With the approval of the regional reconstruction and development project “Development of High Functional and Stable Food Supply Technology and an Efficient Sales Structure of Regional Specialties” in 2018, we started the construction of a pilot plant factory in Katsurao, Fukushima. We provided agricultural IT knowledge to cultivate tropical plants such as bananas, mangoes and coffee beans, which were traditionally not farmed in the area. The project gained much attention not only by the local communities but by the media as well.

Guided Tours to the Disaster Stricken Region of Fukushima

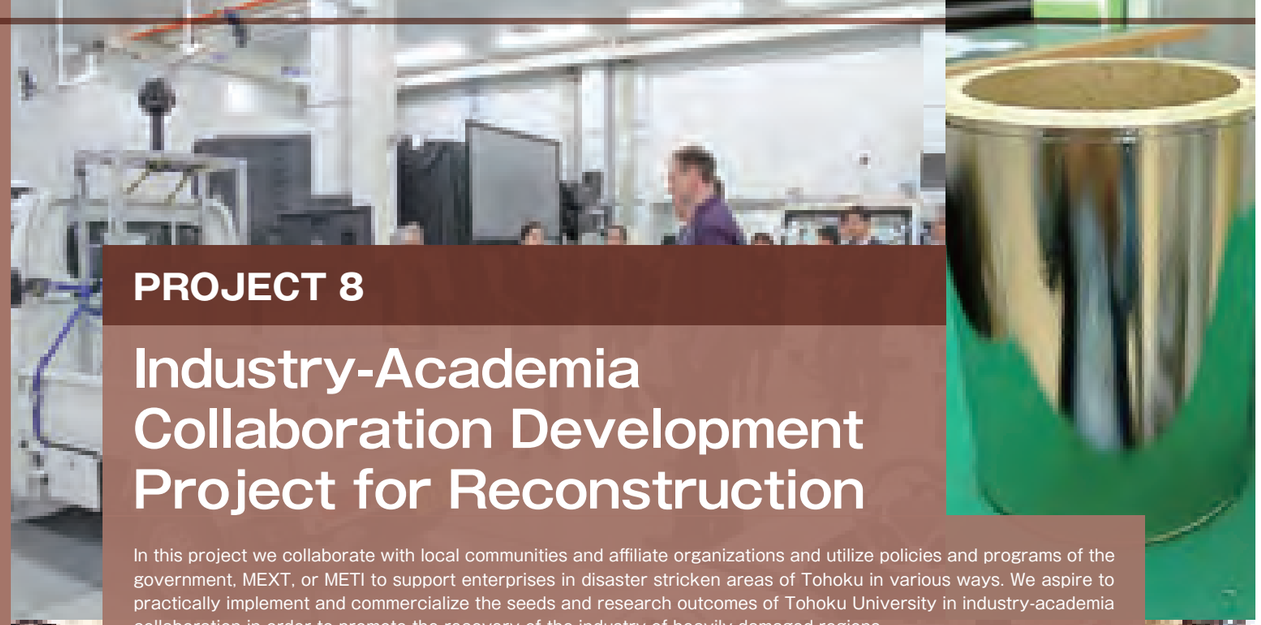
As part of the Fukushima Innovation Coast Framework “Utilizing Recovery Knowledge for the Creative Reconstruction of Katurao”, we invited Tohoku University members, affiliates from other universities and IT professionals to Katsurao and showed the current status of recovery after the disaster. Through the exchange with people from the local communities, we were able to communicate the current situation, remaining issues as well as future strategies. 61 people including many international students participated in the event.

“Tohokudai ni Hitomebore”Project, Selling Out Again

This project was initiated by graduates of the CAR and CAIT courses of the Agricultural Science Center for Reconstruction. Starting with 300g packages in 2014, we established the new rice brand of “Tohokudai ni Hitomebore” (“Hitomebore” being the brand of the rice, but also meaning “Love at first sight with Tohoku University”) grown with the “Winter Watered Paddy Field Farming Method” and attracted much attention from the general public. In 2018, a record of 800 packages were sold.

Farming in Katsurao Participation of Students from Koriyama Women’s University & College

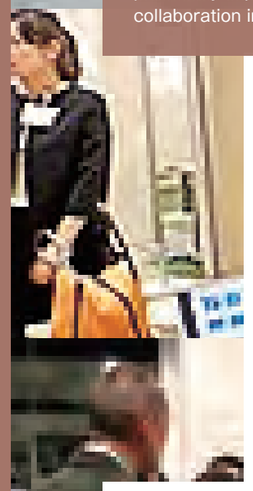
We are promoting regional activities, such as the 2019 farming event in Katrurao, in collaboration with universities of the Fukushima prefecture as part of our projects. Each university provides its own way to support disaster stricken communities through education and regional reconstruction. We will continue to maintain the collaboration with other universities through these regional events and aim to integrate the activities into our courses.



PROJECT 8

Industry-Academia Collaboration Development Project for Reconstruction

In this project we collaborate with local communities and affiliate organizations and utilize policies and programs of the government, MEXT, or METI to support enterprises in disaster stricken areas of Tohoku in various ways. We aspire to practically implement and commercialize the seeds and research outcomes of Tohoku University in industry-academia collaboration in order to promote the recovery of the industry of heavily damaged regions.



Tohoku Innovative Materials Technology

Tohoku University has already world leading capabilities in research areas such as material science and acts as center for various research related to important technology fields. We aspire to create revolutionary technology seeds and practically implement them for commercialization in the following three areas by collaborating with local universities and enterprises.

- **Ultra-Low Friction Technology Area**
  Drastic improvement of energy efficiency via development of nano-interface optimization technology for super-lubricity
- **Ultra-Low Core Loss Magnetic Material Technology Area**
  Drastic reduction and mitigation of power loss via development of new nano-crystalline magnetic materials
- **High Efficiency Rare Elements Extraction Technology Area**
  Realization of element recycling via advanced collection and reutilization of rare elements from urban mines

東北発 素材技術先導プロジェクト
Tohoku Innovative Materials Technology Initiatives for Reconstruction

Program for Strategic Regional Innovations

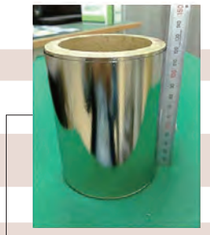
In order to support excellent initiatives for the creation of innovations, we established a system promoting a continuous support from research at universities to the realization and commercialization, aspiring a vital, attractive, and autonomous region.

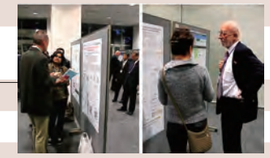
- **Next-Generation Automobiles in the Miyagi Area**
  Utilizing global cutting-edge seeds and technology, we promote the recovery after the earthquake via establishment of next-generation automobile research centers and reinforcing the technology standards of local enterprises in order to create a large and lively accumulation area of automobile industry affiliates for continuous development.
- **Knowledge Based Medical Device Cluster in the Miyagi Area**
  Based on the “Miyagi Recovery Plan”, we create medical equipment and devices utilizing diverse seeds of Tohoku University in strong private-public collaboration in order to establish a medical equipment industry area in Tohoku.

Activities

Tohoku Innovative Materials Technology

2012	10	Tohoku Innovative Materials Technology Symposium (annual, ~2017.1)
■Ultra-Low Friction Technology Area		
2012	10	International tribology symposium collaborating with the Green Tribology Innovation Network (GRENE)
2013	4	Course for sharing equipment and facilities
		First regional collaboration exchange meeting for technology consultations
2014	4	Collaborative research with the Miyagi Industrial Technology Institute and 5 regional enterprises (~2017)
2015	4	Tohoku Economic Federation’s “Project for the Development of New Enterprises and Support of Alliances”
	7	METI’s “Projects to support the advancement of strategic core technologies”
2016	10	Private-public collaborative symposium on “Tohoku Innovative Materials Technology – Ultra-Low Friction Technology Area”
2017	3	Research workshop on “Tohoku Innovative Materials Technology – Ultra-Low Friction Technology Area”
■Ultra-Low Core Loss Magnetic Material Technology Area		
2014	6	Successful development of nano-crystalline soft-magnetic material drastically reducing energy loss
	9	Opening the Material Solutions Center (MaSC)
	12	Verifying the world leading energy efficiency of high efficient motors
2015	11	Successful production of FeNi magnets completely free of rare earth elements
		Establishment of the “Tohoku Magnet Institute”
2016	2	Successful pilot production of a compressor motor utilizing the revolutionary nano-crystalline alloy NANOMET®
■High Efficiency Rare Elements Extraction Technology Area		
2013	11	International workshop on rare materials recycling technology
2015	2	Pilot production of the LIBS sorter
	8	Technology seminar on automobile recycling for new developments in the recycling industry
2016	2	Seminar on the new E-Scrap recycling system
	6	Tohoku Forum on Precious Metals Recycling
		Workshop on extraction and separation of precious metals (2016.6、2017.1)





Program for Strategic Regional Innovations

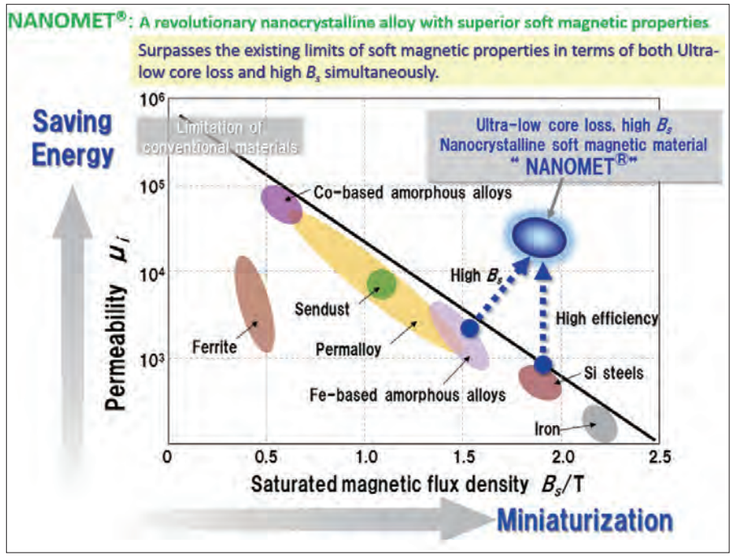
■Next-Generation Automobiles in the Miyagi Area		
2012	9	Initiation Conference for Next-Generation Automobiles in the Miyagi Area
	12	Opening of the Miyagi Reconstruction Park
2014	4	Symposium for the promotion of private-public collaborations for establishment of a regional automobile industry
2015	2	Excursion of disaster stricken areas in Ishinomaki using EV cars
2017	2	Concluding symposium
■Knowledge Based Medical Device Cluster in the Miyagi Area		
2012	7	Investigations of enterprises and health care professionals for the creation of medical devices (24 times total)
	11	Kick-off meeting
2013	3	Inspection of medical equipment manufacturing (15 times total)
	5	Miyagi School for Creation of Medical Devices 10 courses for introduction, 5 elementary part 1, 4 elementary part 2, 5 elementary part 3
2014	7	Miyagi private-public collaboration fair for creation of medical devices (annual, ~2016.7)
2015	11	“Innovation Skills Necessary for the Medical Welfare Equipment Industry” Lectures
2017	3	Summarizing Session

■ Venture Businesses Emerging from Reconstruction Actions

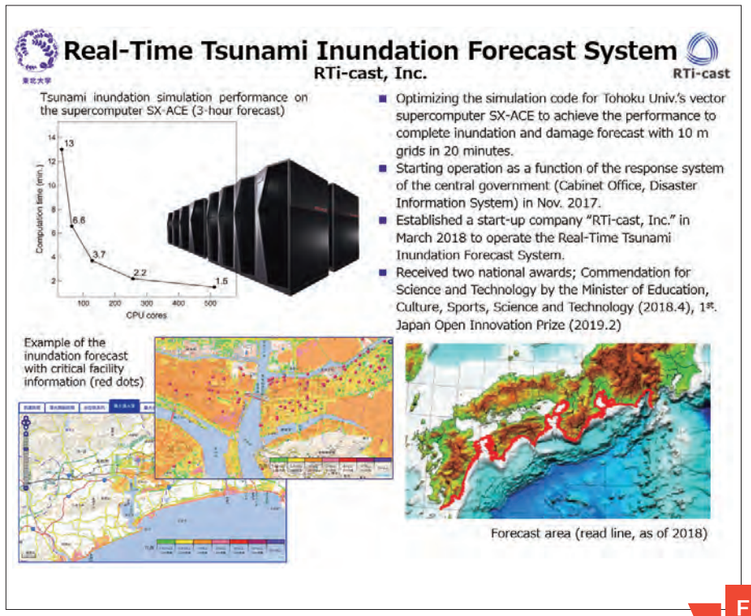
Tohoku University Venture Capitals
Establishment of the “Tohoku Magnet Institute (TMI)”
~ Utilizing Nano-crystalline Alloys “NANOMET®” for Business Ventures

In order to contribute to the reconstruction and recovery of the Tohoku area, we established the “Tohoku Magnet Institute” in 2015 that utilizes ultra low-loss soft magnetic materials, so called “NANOMET®”. Based on the research achievements regarding the revolutionary soft-magnetic alloy “NANOMET®”, we further improved the functionality and performance, and continue to develop and commercialize nano-crystalline soft-magnetic alloys with increased productivity.

※ MEXT’s Minister Award for Private-Public Collaboration for Prof. Makino (2016.8)



RTi-cast
Establishment of “RTi-cast” utilizing Technology to estimate Damages from Tsunamis in Real-Time



In March 2018, we established “RTi-cast” in order to provide services regarding real-time tsunami inundation forecast for the first time in history. The “Real-Time Tsunami Inundation Forecast System” utilizes supercomputers to provide estimates about inundation and damages by tsunamis in real time. The system was tested in 2014 as part of MIT’s “G Space X ICT Project” and started operation at the Cabinet Office in November 2017. The Real-Time Tsunami Inundation Forecast System will provide safety and security to global communities through the activities of RTi-cast.

https://www.rti-cast.co.jp

First MIT’s Minister Award for Open Innovation (2019.2.5)

Reconstruction Action 100+ - Overview

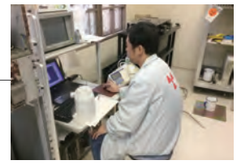
The “Reconstruction Action 100+ (Plus)” is a general term describing more than 100 projects emerging from the voluntary efforts of Tohoku University’s members to contribute to the regeneration of the region. It is based on the sole feeling of each and every one at Tohoku University: “What can we do to help?” We will continue our endeavors as comprehensive university in the center of the disaster stricken area through our strengths in individual professions to support the reconstruction of the community.

Support of Disaster Victims

- Education of “Interfaith Chaplains” and Social Implementation
  (Graduate School of Arts and Letters)
- Reconstruction Support through Art
  (Graduate School of Arts and Letters)
- Support Room for Disaster Affected children
  (Graduate School of Education)
- Provision Disaster Law Consultation Q&A
  (Graduate School of Law)
- Health Survey and Guidance for Disaster Victims
  (Graduate School of Medicine)
- Education for Multi-Level Health Promotion of a New Generation in Disaster Stricken Areas
  (Graduate School of Dentistry)
- Contribution to community medicine in Tohoku region
  (Graduate School of Biomedical Engineering)
- Prevention of Sudden Deaths at Shelters and Provisional Homes after the Disaster
  (Institute of Development, Aging and Cancer)
- Medical Consultation Support via Regeneration of Information Communication at Shelters and Provisional Homes after the Disaster
  (Institute of Development, Aging and Cancer)

Assessment and Analysis of Damages

- Grass-Root Radiation Monitoring:The Miharu Misho Project
  (Graduate School of Science)
- Long Term Monitoring of Environmental Radiation of Disaster Stricken Areas
  (Graduate School of Science)
- Radioactivity Measurements of Wild Mushrooms
  (Graduate School of Science)
- Radiation Dose Evaluation via the Analyses of Children’s Teeth in Fukushima
  (Graduate School of Dentistry)
- Joint Investigation of the Fishing Ground Environment at the Miyagi Coast
  (Graduate School of Agricultural Science)
- Investigation Regarding Disaster Prevention Function of Ecosystems
  (Graduate School of International Cultural Studies)
- Fukushima-Chernobyl Project
  (Graduate School of International Cultural Studies)
- Application of Robots to the Great East Japan Earthquake and Research into Disaster Response Technologies
  (Graduate School of Information Sciences)
- Green Regeneration Project from the Sea and Fields: “Monitoring Organism Diversity in Disaster Stricken Fields and the Coastal Ecosystems with Public Participation”
  (Graduate School of Life Sciences)
- Measuring Radioactivity of Primary Sector Products, Soil, and Waste
  (Graduate School of Environmental Studies))



- Support for Measuring Radiation
  (Institute for Materials Research)
- Promotion of Health in Shichigahama
  (International Research Institute of Disaster Science)
- Developing ICT Tools to Pass Lessons of the Disaster
  (International Research Institute of Disaster Science)
- Evaluation of Initial Disaster Response by Minamisanriku Town Officials after the Great East Japan Earthquake
  (International Research Institute of Disaster Science)
- Comprehensive Examination of Recovery from the 2011 Great East Japan Earthquake and Tsunami, and Urban Safety Induction Strategies Considering Natural Disaster Risk in the 21 Century
  (International Research Institute of Disaster Science)

Recovery & Reconstruction Activities

- Natural Disasters and Religion
  (Graduate School of Arts and Letters)
- Support of the Dialect Life at Disaster Stricken Areas
  (Graduate School of Arts and Letters)
- Dispatching Supporters for the Regeneration of Local Communities
  (Graduate School of Economics and Management)
- Establishing a Doctor Support System in Disaster Stricken Areas
  (Graduate School of Medicine)
- Development of Technology for the Restoration of Living Environments Contaminated by Radioactive Material
  (Graduate School of Engineering)
- Support of Food and Environmental Education
  (Graduate School of Agricultural Science)
- Tohoku Agricultural Science Center for Reconstruction
  (Graduate School of Agricultural Science)
- Dust my broom Project
  (Graduate School of International Cultural Studies)
- Support Regeneration Education
  (Graduate School of International Cultural Studies)
- Decontamination of Tsunami Debris
  (Graduate School of Environmental Studies)
- Technical Support Regarding the Accident at the Nuclear Power Plant
  (Institute for Multidisciplinary Research for Advanced Materials)
- Analysis of Radioactive Cesium in the Environment
  (Cyclotron and Radioisotope Center)
- Archaeological Survey for Rehabilitation from Disaster
  (Center for Northeast Asian Studies)
- Center for Northeast Asian Studies Disaster Humanities Unit
  (Center for Northeast Asian Studies)
- Tsunami-Struck Museum Rescue Activities
  (The Center for Academic Resources and Archives)
- Developing Algorithms for Environmental Radiation Measurement
  (Research Center for ELectron PHoton Science (ELPH))

Disaster Prevention & Mitigation Measures

- Sharing Research Findings Regarding the Generation Mechanism of the 2011 Great East Japan Earthquake with Society
  (Graduate School of Science)
- Disaster Debris Disposal, Recycle Management, Technology Recommendations
  (Graduate School of Environmental Studies)
- Development of Submarine Geologic Stress Measurement Methods Related to the Occurrence of Earthquakes
  (Institute of Fluid Science)

- Wide Area Damage Assessment Technology via Fusion of Monitoring, Simulation, and Sensing
  (International Research Institute of Disaster Science)

- “Pocket Notebook and Handbook for Family’s Disaster Resilience (MINNA-NO-BOSAI TECHO)”
  (International Research Institute of Disaster Science)
- Landslide monitoring by radar in Kumamoto
  (Center for Northeast Asian Studies)

Improvement of Social and Information Infrastructures

- Reexamination of Disaster Prevention Legislations
  (Graduate School of Law)
- Special Outpatient Services for Epilepsy via TV Conferences with Hospitals in Disaster Stricken Areas
  (Graduate School of Medicine)
- Capacity Expansion of the School of Medicine
  (Graduate School of Medicine)
- Oral Care for Senior Citizens Requiring Primary Nursing Care and People with Disabilities
  (Graduate School of Dentistry)
- Large Scaled(Forensic) Identification Methods after Catastrophes
  (Graduate School of Dentistry)
- Integrated Design and Analysis of a Sustainable Energy System
  (Graduate School of Engineering)
- Inspection of Election Management Systems in Disaster Stricken Areas and Efficiency of Internet Voting
  (Graduate School of Information Sciences)
- Disaster Psychology Education and Distribution
  (International Research Institute of Disaster Science)
- A High Performance Computing Project for the Revitalization of the Tohoku Region
  (Cyberscience Center)
- Construction of Resilient Campus Information Infrastructure
  (Cyberscience Center)
- Program for Archives and Publication of 3-D Pointcloud Data of the Great East Japan Earthquake for Tsunami Disaster Ruins
  (The Center for Academic Resources and Archives)

Industrial Reconstruction and R&D

- Investigative Research Project for Regional Industry Regeneration
  (Graduate School of Economics and Management)
- Regional Innovation Producer School (RIPS)
  (Graduate School of Economics and Management)
- Regional Innovation Advisor School (RIAS)
  (Graduate School of Economics and Management)
- Development of Reduction Technology for Radioactive Cesium Transfer to Cultivated Mushroom
  (Graduate School of Science)

- Next Generation Medical Care Information System “Tohoku Medical Megabank Organization”
  (Graduate School of Medicine)
- Resilient Power Supply System Utilizing Distributed Power and Power Load Equipment Clusters
  (Graduate School of Engineering)
- New Industry Creation Concept for Higher Order Industry
  (Graduate School of Engineering)
- Cooperative Agreement with Miyagi Organization for Industry Promotion regarding Industry-Academia Cooperation for Regional Regeneration Support
  (Graduate School of Engineering)
- Development of Green Power Integrated Devices with High Efficient Electric Energy Supply and Energy Saving Electric Systems
  (Graduate School of Engineering)
- Mitigation of Indoor Radiation
  (Graduate School of Engineering)
- Let’s Light the Olympic Flame 2020 with Bio Methane!
  (Graduate School of Agricultural Science)
- Arahama Project
  (Graduate School of Agricultural Science)
- Support for the Raise of Medical Equipment Production in Miyagi
  (Graduate School of Biomedical Engineering)
- Technological Seed Fostering for Practical Implementation and Commercialization of Medical Equipment
  (Graduate School of Biomedical Engineering)
- “Iwate Produced Cobalt Alloy Production Support for Medical Use”
  (Institute for Materials Research)
- Element Strategy in Design of Advanced Steel
  (Institute for Materials Research)
- Development of Emergency Response Medical Care Technology
  (Institute of Fluid Science)
- Supercomputing of flotsam mixed type Tsunami
  (Institute of Fluid Science)
- Continuous Workshops on the Great East Japan Earthquake
  (International Research Institute of Disaster Science)
- Regional Reconstruction Strategies, New Technologies & New Ideas
  (New Industry Creation Hatchery Center (NICHe))
- Regional Contribution by Advanced Mobility System Research Project
  (New Industry Creation Hatchery Center (NICHe))
- Development of Collection System for Contaminated Waste Materials at Nuclear Power Plants
  (New Industry Creation Hatchery Center (NICHe))
- Construction of "Mobility-Innovation Social Implementation & Industry Creation Base" in Fukushima Innovation Coast
  (New Industry Creation Hatchery Center (NICHe))
- ICT Reconstruction Project
  (Research Organization of Electrical Communication (ROEC))

Education of “Interfaith Chaplains” and Social Implementation (Graduate School of Arts and Letters)

After the Great East Japan Earthquake, many people lost their loved ones or experienced similar forms of loss. We established a department for Practical Religious Studies within the Graduate School of Arts and Letters to educate “Interfaith Chaplains” who would not be involved in missionary work but take care of the bereaved people. We aimed to establish a support system for the spiritual care of people with various kinds of grief by collaborating with local priests and medical personnel, implementing both national and international practical solutions to help people in need. During the years from 2012 to 2017 we helped 181 chaplains to graduate who are now active in hospitals and communities throughout Japan.

Group work of participants

Memorial ceremony in Ishinomaki

Program for Archives and Publication of 3-D Pointcloud Data of the Great East Japan Earthquake for Tsunami Disaster Ruins (The Center for Academic Resources and Archives)

We utilize 3D digital data (cloud data) to archive “Disaster Ruins”. Currently we are collaborating with the International Research Institute of Disaster Science and employ 3D Mixed Reality and Virtual Reality Systems to present the result to the general public. With the huge amount of digital data, we aim to realize a practical research and education system for mega catastrophe education. Furthermore, the information accumulated in the “Michinoku Shinrokuden” Disaster Archive will be mapped in a digital form to present the transformation of the region after the earthquake in 3D virtual reality. We plan to exhibit the contents to the general public and promote the importance of Disaster Science. Additionally, collaborating with disaster stricken communities and the Smithsonian Institution, we will continue to communicate the experience of the Great East Japan Earthquake to global communities and raise awareness for possible future disasters.

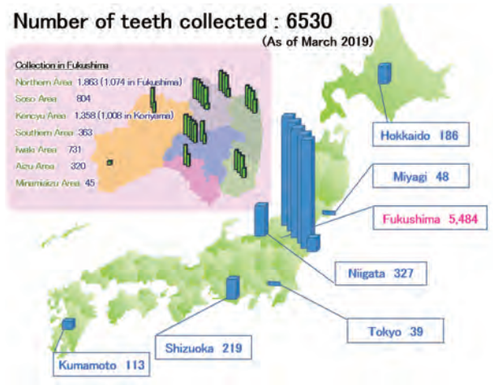
Digital archiving in Futaba, Fukushima

Disaster risk reduction strategies in Minamisanriku

Radiation Dose Assessment of Deciduous Teeth Collected from Children in Fukushima (Graduate School of Dentistry)

More than 6,000 deciduous teeth have been collected from children in the Fukushima and control prefectures through February 2015 to assess both internal and external radiation doses of individuals. We are continuing to analyze these teeth using autoradiography with imaging plates, physicochemical determination of radionuclides (Sr-90, Cs-137, and Cs-134), and carbonic radical quantification with electron spin paramagnetic resonance. These activities are new approach to obtain accurate estimates of children’s exposure to radiation after the Fukushima-Daiichi Nuclear Power Plant accident.

Collecting milk teeth



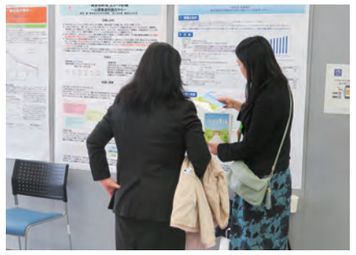
Radiation dose assessment using teeth

Support Room for Disaster Affected Children (Graduate School of Education)

In this project, we aim for long term mental health care and support of children who lost their parents due to the Great East Japan Earthquake.

- Free phone counseling
- Individual counseling of children and guardians
- Foster parents/orphans family salon
- Learning support for orphans (Tohoku University students as lectureres)
- Dispatching clinical psychologists to disaster affected communities
- Supporting the recovery supporters
- Archiving and communicating all efforts and activities
- Establishing a mental health care support network with other communities
- Symposia and internships for people who interact with children
- Constructing a database regarding the mental state and support of disaster affected children
- Communication of necessary information regarding support activities
- Advice for disaster studies

Homework support



Conference presentations

Lectures

Archaeological Survey for Rehabilitation from Disaster (Center for Northeast Asian Studies)

We established new methods to visualize underground structures or other buried objects by utilizing ground-penetrating radar (GPR) including array GPR and 3DGPR. In the process of relocating settlements to safer areas after the Great East Japan Earthquake, we had the opportunity to investigate many ruins and excavations. GPR is a non-destructive exploration method, that provides not only a fast verdict about an excavation site but also details about the state of the remains, enabling a very effective investigation. We aim to contribute to the recovery process by providing necessary technology and knowledge to local communities for effective investigations.

Inside Zuiganji, Matsushima

Search for tsunami victims in Ishinomaki

Grass-Root Radiation Monitoring: The Miharu Misho Project (Graduate School of Science)

The Miharu Misho Project was organized as a grass-roots movement by residents of Miharu town in Fukushima prefecture and volunteers from Tohoku University in order to monitor radiation levels.

Since July 11th, 2011, we have been monitoring students individually who are under Japanese compulsory education (9 years), upon their requests only, for their exposure to radiation.

The year 2019 marks the end of the 9 year monitoring period that the project intended originally; those just entered the elementary school back then will graduate from middle school next spring. We think that we are at the point of reflection of our activities over the past 9 years and of looking into the prospect of the project.

Misho Project