TOHOKU UNIVERSITY

INTEGRATED REPORT 2022

Following our report last fiscal year, we are pleased to announce the publication of our second Integrated Report.
In order to communicate our as comprehensive university, with characteristics distinct from those of a corporation, we "comprehensively" integrate our financial information (quantitative data) with our non-financial information (qualitative data) on education, research, community co-creation, and management to provide our stakeholders with a clear understanding of the direction that Tohoku University is heading and the value that we are creating for society.
The year 2022 marks the 115th anniversary of our founding as well as our 100th year of operation as a comprehensive university, and we are now at a significant turning point in our efforts toward designing a new future for Tohoku University.
In line with our origin as a university advancing together with society, we hope that this report serves as an opportunity to further enhance these efforts in co-creation through dialog with all of you.

<Scope of Application>
National University Corporation Tohoku University

<Period of Application>
April 1, 2021, to March 31, 2022 *Includes some information from outside of this period.

<Guidelines Referenced>
International Integrated Reporting Framework, International Integrated Reporting Council (IIRC)
Recommendations of Task Force on Climate-Related Financial Disclosures (TCFD)

In Commemoration of the 115th Anniversary of Our Founding and 100th Anniversary as a Comprehensive University

Hideo OHNO
22nd President of Tohoku University

The Three Principles of Tohoku University

Tohoku University was founded in 1907 in Sendai, the "City of Trees," as Japan's third national university after The University of Tokyo and Kyoto University, and this year, 2022, marks the University's 115th anniversary. In addition, the long-anticipated Faculty of Law and Literature was finally established in 1922 to stand alongside the Faculty of Science, the Faculty of Medicine, and the Faculty of Engineering, and the other schools and faculties that were established early in the University's history. To put it another way, this is a milestone year that marks the 100th anniversary of Tohoku University's inauguration as a comprehensive university with the addition of faculties in the humanities and social sciences.

Under the principles of "Research First," "Open Doors," and "Practice-oriented Research and Education," the University has been committed to the creation of new value by presenting original and world-class research findings, while fostering human resources who will serve as leading roles in society. Here, I would like to further introduce these three principles.

The principle of "Research First" originates from a speech given at the initial entrance ceremony by the very first president of the University, Masataro Sawayanagi, in which he stated, "In this regard (research), we at Tohoku University are determined and committed to be second to no other university (in the world)." Tohoku University was the first university in Japan to clearly define itself as a research university. In our view, world-class research is the driving force behind outstanding educational activities and the creation of social value, as well as the source of society's trust in us. In the Japan University Rankings, published by the *Times Higher Education* (THE), a British magazine that reports on news and issues related to higher education, Tohoku University ranked number one in Japan for three consecutive years. The University's educational and research achievements have been highly lauded by external organizations.

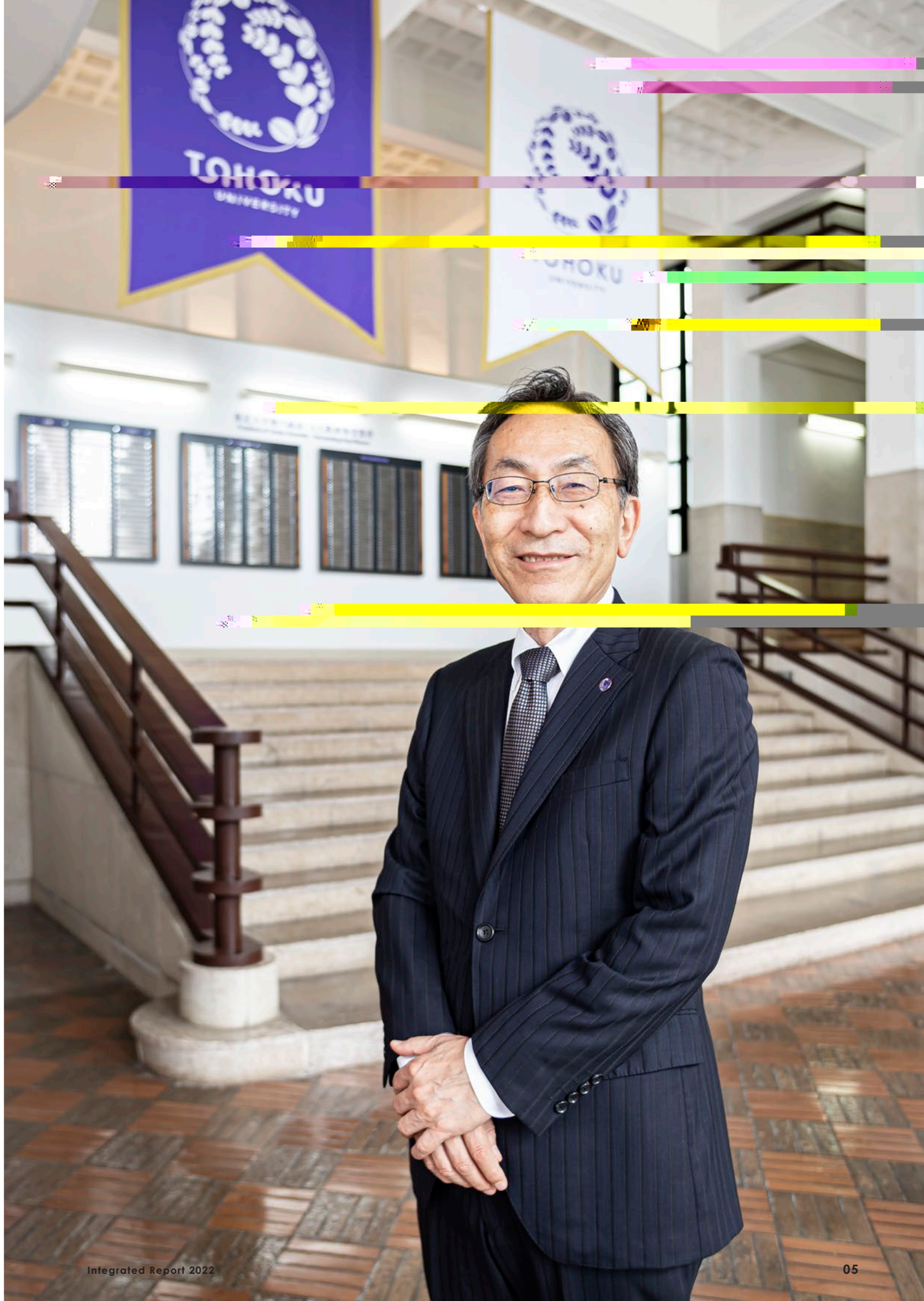
The principle of "Open Doors" refers to what is known nowadays as the promotion of diversity. From the time of its founding, the University has practiced diversity, equity, and inclusion. From its inception, Tohoku University has been open to students from outside of Japan's old high school education system, and with the enrollment of three female students in 1913, it became the very first university in the country to admit female students. These were Japan's first-ever "college girls." It is also well known that the great Chinese writer and thinker Lu Xun studied at Sendai Medical College, the predecessor of our Faculty of Medicine. The University has been practicing this "Open Doors" principle for more than a century by accepting a broad range of outstanding human resources regardless of their school background, gender, nationality, or any other characteristic. In April of this year, we decided to further enhance the University's "Open Doors" principle through the release of Tohoku University Declaration of Diversity, Equity and Inclusion (DEI).

Finally, "Practice-oriented Research and Education" refers to the creation of new social values. The modern age is said to be one of volatility, uncertainty, complexity, and ambiguity – summarized into the acronym VUCA. The state of human society is now being re-examined as we are called upon to work toward carbon neutrality and address geopolitical risks, among other issues, all the while dealing with natural disasters, pandemics, and other unpredictable phenomena. Resolving these issues will require the ability to co-create future value together with a diverse range of stakeholders by leveraging a comprehensive base of knowledge covering everything from state-of-the-art science and technology to the social sciences. The principle of "Practice-oriented Research and Education" represents the importance that we place on such practices.

As a University Engaged With Society

Ever since its foundation, Tohoku University has been "engaged with society" and owes its development to the tremendous support and high hopes of the private sector and communities. Our members reaffirmed this identity in 2011 at the time of the Great East Japan Earthquake. Immediately following the disaster, the University began reconstruction actions in cooperation with a range of regional, national, and international sectors, and has been at the forefront of regenerating the disaster-stricken areas and Japan as a whole.

During the COVID-19 pandemic, the University Hospital took the lead in establishing the Tohoku University Vaccination Center, which – in parallel with vaccinations conducted on campus – greatly contributed to community health care by providing a total of 790,000 vaccination shots (as of the end of July 2022) to residents of the prefecture. In 2021, we issued the



Tohoku University Green Goals Initiative, which significantly bolsters our activities as a comprehensive research university in tackling issues faced by all of human society, including achieving the SDGs and carbon neutrality, among others. Under this initiative, the University has been working to create new value through such means as establishing the Co-Creation Research Center to promote robust on-campus industry-academia collaboration, as well as supporting the creation of university startups.

Developing a Connected University with Ties Throughout the World

Universities are trusted by society and demonstrate their value through collaboration with a diverse range of stakeholders. Tohoku University Vision 2030, which the University published when I assumed the position of president in 2018, identified "Community Co-creation" as one of the University's core visions. We have decided to further accelerate this vision through the application of digital transformation under the Tohoku University Connected University Strategy, which was updated in response to the COVID-19 pandemic. We are working to achieve a higher degree of freedom in learning and to co-create knowledge by making use of cyberspace to transcend the concept of distance and the barriers between organizations, cultures, and value systems in order to connect with the world in a more dynamic way. Furthermore, as a university connected with the world in an inclusive manner, we also intend to transcend the divisions and disparities manifested by the COVID-19 pandemic.

Ever-Developing Public Role

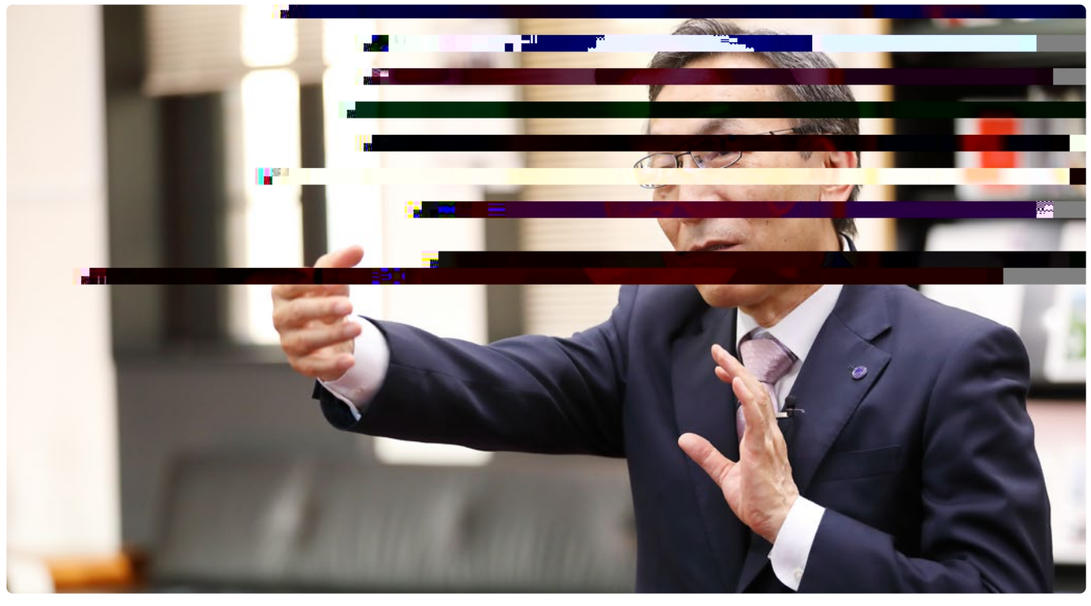
The research universities of the future will need to continuously expand and develop their public role beyond the conventional framework. Tohoku University will contribute to society and the world by expanding and evolving its various activities, including education and research, and will enhance its management resources by ensuring that the results of these activities provide value to communities both at home and abroad. In addition, we will make use of the highly flexible management resources obtained to attract talented individuals from around the world and pursue further excellence in research, including in fundamental fields. Managing based on this type of value cycle will greatly propel the University forward.

The developing project for the new extension of the Aobayama campus is an example of strategic management at Tohoku University. The University made the management decision to self-finance the extension project and invest the funds upfront. The Graduate School of Agricultural Science, Graduate School of Environmental Studies, International Research Institute of Disaster Science, and Center for Innovative Integrated Electronic Systems are also all located on the Aobayama campus. The Next Generation Synchrotron Radiation Facility "NanoTerasu" will become operational in 2023, and we will also launch the Science Park Project to facilitate industry-academia collaboration. We are moving forward with the aim of turning our vast campus into a problem-solving platform that is open to the world.

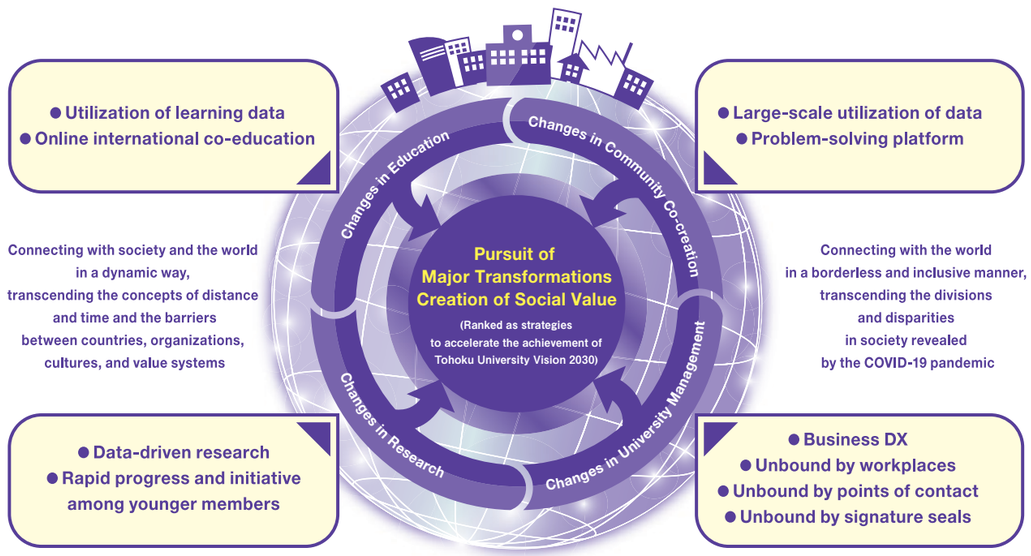
We are engaged in a wide range of activities, including but not limited to deepening our understanding of nature and humanity, applying the knowledge that has been gained, integrating that knowledge into a foundation for solving even larger social issues, and discovering and developing individuals talented in various fields. With an eye toward the future, we will continue to transform the University with the goal of further enhancing our ability to create such outstanding value.

This Report "integrates" our financial information with our non-financial information on education, research, community co-creation, and management to provide our stakeholders with a clear understanding of the direction that Tohoku University is heading and the value that we are creating for communities. We hope that it serves as an opportunity to further enhance these efforts in co-creation through dialog with all of you.

We thank you for your continued understanding and support of Tohoku University.

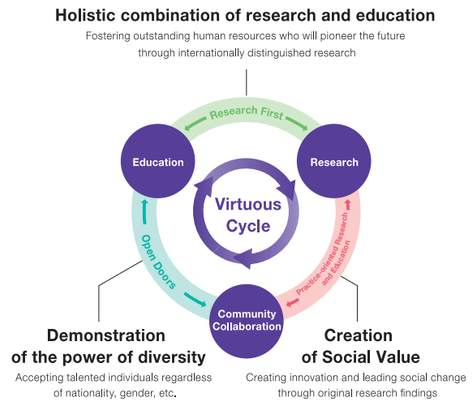


Tohoku University Connected University Strategy



Achieving a Virtuous Cycle of Education, Research, and Community Collaboration based on Our Founding Principles of "Research First," "Open Doors," and "Practice-oriented Research and Education"

The three principles of Tohoku University are "Research First," "Open Doors," and "Practice-oriented Research and Education." These are also the driving forces that effectively link together the University's various activities in education, research, and community collaboration. First, the tradition of "Research First" refers to fostering outstanding, bright individuals who will pioneer the future through their research while creating internationally distinguished research findings. Second, our "Open Doors" principle refers to accepting talented people regardless of nationality, gender, or other characteristics to demonstrate the power of diversity and provide society with the further enhanced talents of these individuals. Third, "Practice-oriented Research and Education" refers to the creation of new social values based on original research findings. The virtuous cycle of education, research, and community collaboration enabled by these three principles form the foundation of Tohoku University's vision for the future.



Our Vision

Taking on the Challenge of Creating a Green Society Following the Great East Japan Earthquake and COVID-19 Pandemic

— Progress aligned with the three major agendas of the international community —

**As a comprehensive research university that is engaged with society,
Tohoku University is committed to tackling the issues faced by all of human society, including achieving the SDGs,
enabling a "great reset" following the COVID-19 pandemic, and realizing carbon neutrality,
by leveraging the experience and knowledge gained through activities to restore the region following
the Great East Japan Earthquake.The University will continue to promote co-creation in a manner open to society
as an ever-developing public asset and problem-solving platform.**

① Activities of the Institute for Disaster Reconstruction and Regeneration Research aimed at recovery from the Great East Japan Earthquake and reconstructing communities in Japan (2011 to 2021)

Advancement of priority research and social implementation aimed at restoration and regeneration.

② Development of Research with Social Impact (Since 2015)

Advancement of cross-sectoral interdisciplinary research aimed at solving critical social issues.

③ Taking on the new challenge of realizing a green society in the future based on disaster restoration activities

GREEN GOALS INITIATIVE
グリーン未来創造機構

Establishment of the Green Goals Initiative (Since April 2021)

Established to apply the University's comprehensive capabilities based on previous disaster recovery activities to the goal of contributing to the creation of a green society in the future, as the mission of a comprehensive university located in the center of the disaster areas stricken by the Great East Japan Earthquake. Formed a new industry collaboration community in collaboration and cooperation with Green Goals Partners. Entered into a comprehensive partnership agreement with Fukushima Prefecture in March 2022 to further contribute to the restoration and regional revitalization of Fukushima Prefecture.

Tohoku University Green Goals Initiative (July 2021)

Advancement of carbon neutrality on University campuses, while also promoting community co-creation, research and development, and the fostering of human resources that will contribute to realizing a green society to ensure a sustainable future for the global environment and humankind.

- Fostering SDG-oriented human resources through University-wide education, etc.
- Research and development including green technologies, etc.
- Contributing to the realization of a sustainable and resilient society
- Carbon neutrality on University campuses

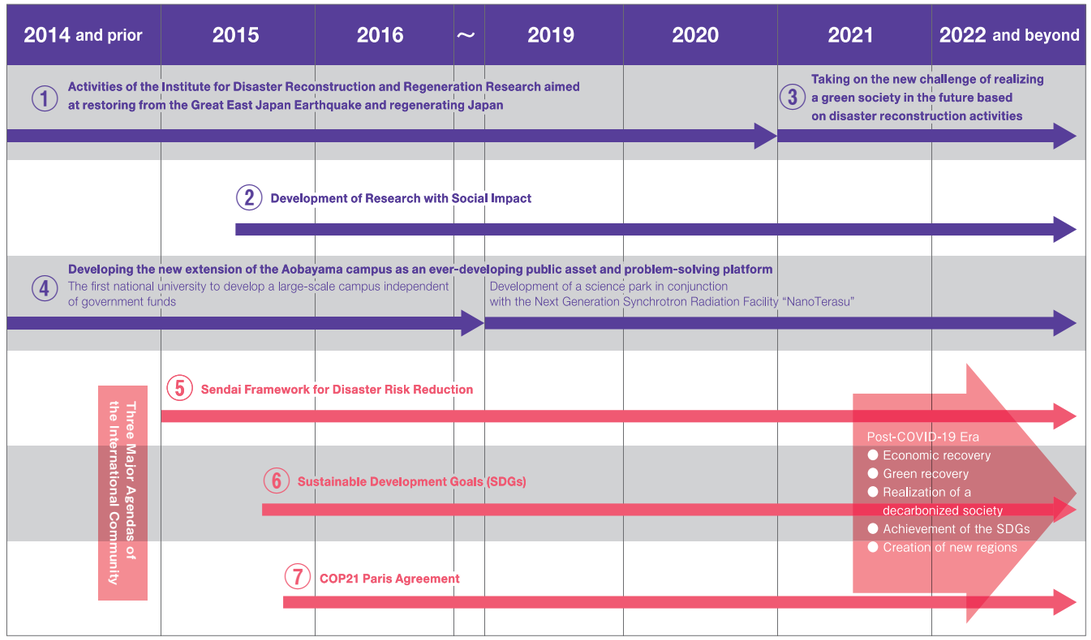
④ Developing the new extension of the Aobayama campus as an ever-developing public asset and problem-solving platform

The first national university to develop a large-scale campus independent of government funds (Concluded in 2018)

Allocated a total of 26 billion yen of the University's own funds to develop a large-scale campus under the new extension of the Aobayama campus project spanning a quarter of a century since the decision to relocate made in 1994. Further development planned for the future with the goal of being a problem-solving and value creation platform as Japan's largest research complex using the under-one-roof industry-academia collaboration center as a stepping stone.

Development of a science park in conjunction with the Next Generation Synchrotron Radiation Facility "NanoTerasu" (Since 2019)

The Next Generation Synchrotron Radiation Facility "NanoTerasu" is scheduled to become operational on the new extension of the Aobayama campus in FY2023. Currently developing the science park to facilitate industry-academia collaboration.



⑤ Sendai Framework for Disaster Risk Reduction (2015 to 2030)

World Conference on Disaster Risk Reduction 2015 Sendai Japan

- Adopted at the 3rd UN World Conference on Disaster Risk Reduction held in Sendai in March 2015
- International guidelines on disaster risk reduction by 2030

[The Four Priority Actions] Understanding disaster risk / Strengthening disaster risk governance to manage disaster risk / Investing in disaster risk reduction for resilience / Enhancing disaster preparedness for effective response and to "Build Back Better" in recovery, rehabilitation and reconstruction

⑥ Sustainable Development Goals (SDGs) (2016 to 2030)

SUSTAINABLE DEVELOPMENT GOALS

- Adopted unanimously by member states at the UN Summit held in September 2015
- Consists of 17 goals and 169 targets and pledges to "leave no one behind" on the planet

⑦ COP21 Paris Agreement (Since 2020)

PARIS2015 COP21-CMP11

- Adopted at the 21st Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change held in December 2015
- Pursues efforts to limit the average increase in temperature since the Industrial Revolution to well below 2°C and preferably to 1.5°C as a long-term globally shared goal

Our Strategy

Forming Japan's First Research Complex Centered on the Science Park and the Next Generation Synchrotron Radiation Facility "NanoTerasu"

Science Park is a soon-to-be-launched venue for innovation and creation within the new extension of the Aobayama campus. The Next Generation Synchrotron Radiation Facility "NanoTerasu" will be a powerful tool to aid the players gathered there in generating disruptive innovations. With these as the core, we intend to continue solving social issues and creating new social value through industry-academia-government-funded co-creation.

The new extension of the Aobayama campus has a total area of 810,000m^2. Aobayama already functions as a "town" with educational and research facilities, restaurants, daycare centers, and other necessities. The campus continues to develop through a system of co-creation between industry, academia, and government, which is an unprecedented achievement for a national university.

In 2018, the University consolidated a group of organizations engaged in industry cooperation on campus, and forged an "under-one-roof industry-academia collaboration center" to promote industry-academia cooperation division and enhance planning and management functions.

Research buildings were constructed in 2013 and 2020 using donations from the private sector.

In addition, the Next Generation Synchrotron Radiation Facility "NanoTerasu," which is under development through a Regional Private-Public Partnership, is scheduled to become operational in FY2023.

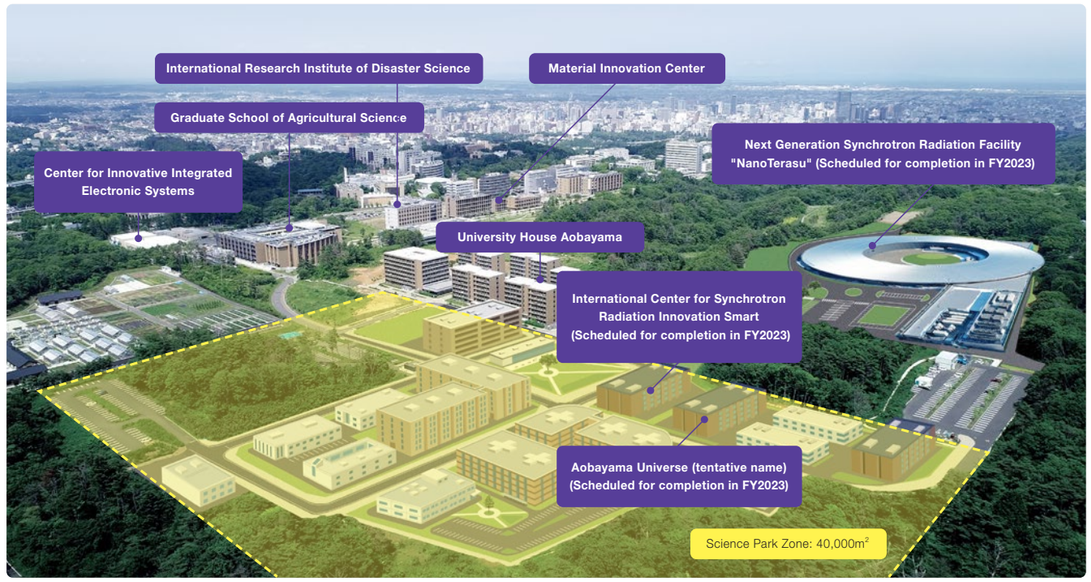
Here, on this new extension of the Aobayama campus, the University is developing the Science Park, which will serve as a focal point for industry-academia-government funds as a venue for the creation of social value.

In FY2023, within the Science Park Zone, located to the west of the Next Generation Synchrotron Radiation Facility "NanoTerasu," the University plans to construct the research building that will house the International Center for Synchrotron Radiation Innovation Smart as well as Aobayama Universe (tentative), which will function to promote open innovation, enable incubation, and offer facilities for conducting joint experiments with the private sector.

In 2021, we established the Co-Creation Research Center system, which enables companies to set up on-campus activity centers that are equipped for research and development as well as training future leaders of respective fields. Many companies have already set up collaboration centers, and are planning and carrying out a broad range of co-creation activities using the various infrastructure elements available.

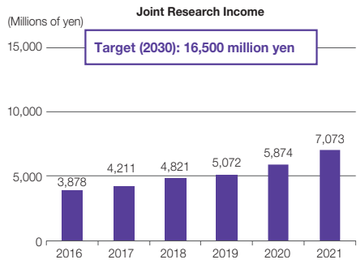
Moving forward, the area established inside the Science Park Zone will be occupied by companies and other organizations that make use of the Next Generation Synchrotron Radiation Facility "NanoTerasu" as well as by private-public research groups, including teams from Tohoku University. Exchange and cooperation between these entities are expected to create new social value, form an open-innovation ecosystem, and generate new knowledge and disruptive innovations, while at the same time inducing a virtuous cycle of presenting outstanding research findings, promoting industry-academia-government funded cooperation, and increasing the number of people engaged in the exchange.

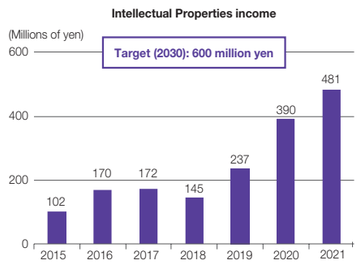
Through these activities, we are making steady step-by-step progress toward turning our spacious campus into a problem-solving platform that is open to the world.



Science Park under development in the new extension of the Aobayama campus *Some elements in the image are computer generated

Keiichi Sasaki, Executive Vice President
(In charge of Co-creation Strategy, Disaster Reconstruction and Regeneration)





10 Co-Creation Research Centers established
(as of September 2022)

Main Concept

Basic Concept: Co-Creation

Venues for Co-Creating Social Value	by Industry, Academia, and Government Entities Gathering	Both On and Off Campus
WHAT	**HOW**	**WHERE**
Co-creation platform where funds and talent circulate	**Co-creation ecosystem encompassing all stakeholders**	**Locations both on and off campus as hubs for co-creating international, national, and regional innovations**
● A shared foundation to facilitate the creation of business based on circulating funds through various types of financing and circulating human resources among stakeholders	● Designed to spearhead industrial innovation based on the dynamism of knowledge ● Designed to facilitate the creation of new businesses that consolidate human resources, technologies, funds, and knowledge from universities, companies, venture businesses, and financial institutions ● Designed to aid social innovators in achieving social change	● Integrated use of cyber spaces and real-world spaces ● Broad establishment of centers throughout campus and in surrounding areas ● Networking both domestically and internationally

Tohoku University "F" Science Park Project

In April 2021, Tohoku University launched the Green Goals Initiative with the aim of realizing a green society in the future. Also, in March 2022, we entered into a comprehensive partnership agreement with Fukushima Prefecture with the aim of contributing to the restoration from the Great East Japan Earthquake and regional revitalization of the prefecture. In the future, we intend to take advantage of the establishment of the Fukushima International Research and Education Organization, promoted by the government, in order to expand laterally and develop a Science Park as a venue for co-creating social value in the coastal region of Fukushima Prefecture. While participating in the Fukushima International Research and Education Organization, which – as the name implies – is a venue for research and education, Tohoku University also envisions establishing a campus in the coastal region as a venue for verification experiments, social implementation, start-up support, and as a place for local residents to study and improve their skills, all made possible through Private-Public Collaboration. Nothing would make us happier than to be able to serve as the "engine" for solving regional issues, supporting industry, and promoting urban development, while contributing as much as possible to improving the future of Fukushima Prefecture. We hope that demonstrating our willingness and desire to do so will inspire the creation and development of a broad range of initiatives and projects in collaboration with existing educational and research institutions, the private sector, and local governments.

■ "F" Science Park Project Concept

A Gateway to the Future

Functions as a gateway to knowledge in which anyone can participate

Tohoku University is laterally expanding its Science Park Project, which is being promoted mainly on the new extension of the Aobayama campus, into the Hamadoori coastal region of Fukushima Prefecture

■ Our Vision of the Gateway Function "Fukushima Connected Campus"

We aim to build a campus where people, technology, knowledge, cities, regions, and the world are all interconnected, inspiring new innovations and leading to the restoration of Fukushima as well as solutions to social issues around the world

Related companies, etc. | Related R&D centers | Local municipalities | **Fukushima International Research and Education Organization** | Fukushima Innovation Coast Framework | Fukushima Prefecture | Related government agencies

"Open" Campus, Tohoku University's forte

Campus Where Many People Can "Connect"

Campus "Connecting" People with Technologies and Knowledge

Campus "Connecting" Cities, Regions, and the World

Carbon Neutral | Nature Positive | Climate Change Countermeasures

Activity and Vitality | **Job Creation** | **Resident Population Growth** | **Human Resource Production**

Tohoku University is working together with everyone to create an innovation ecosystem centered on the Science Park and the Next Generation Synchrotron Radiation Facility "NanoTerasu."

The Next Generation Synchrotron Radiation Facility "NanoTerasu," currently under development; Upper photo: As of July 2022 (courtesy of the National Research and Development Agency, National Institutes for Quantum and Radiological Science and Technology) / Lower photo: As of May 2022

Next Generation Synchrotron Radiation Facility "NanoTerasu"

(Scheduled to be operational in FY2023)

The Next Generation Synchrotron Radiation Facility "NanoTerasu," under development in the new extension of the Aobayama campus through Japan's first ever Regional Private-Public Partnership, makes use of light (synchrotron radiation) that is over one billion times brighter than sunlight to view the nanoscale (one billionth of a meter) world– in other words, it's a gigantic microscope.

In June 2022, the nickname "NanoTerasu" was chosen by soliciting suggestions from the public. The nickname expresses the facility's characteristic of brightly illuminating (or "terasu" as said in Japanese) and observing the nanoscale world of matter.

The Next Generation Synchrotron Radiation Facility "NanoTerasu" is equipped with the most advanced accelerator technologies and light source technologies originating in Japan, and through digitization (visualization) of this previously unseen world, the facility is expected to be applied in a broad range of fields, including the development of new materials and devices, as well as research and development relating to biological functions and new pharmaceuticals. This will be a powerful tool to aid the players gathered at Science Park in generating disruptive innovations.

As a member of a Regional Private-Public Partnership, Tohoku University will leverage its available knowledge and analyze the measurement results and other data generated at the Next Generation Synchrotron Radiation Facility "NanoTerasu" to provide industry and other users with services instilled with high added value and to continue to build an innovation ecosystem that brings together a diverse range of participants including industry and academia and encourage the fusion of different fields.

Through these activities, we will pioneer and promote utilization of the Next Generation Synchrotron Radiation Facility "NanoTerasu" from the perspectives of both academia and industry cooperation, and continue to contribute to the fundamental enhancement of Japan's research capabilities.

Events Commemorating the 115th Anniversary of Our Founding and 100th Anniversary as a Comprehensive University

With an Eye on Our Future as Tohoku University and as a Comprehensive University

Tohoku University was founded in 1907 with the hopes and support of the private sector and communities, and this year, in 2022, the University celebrates its 115th anniversary. In addition, with the establishment of the Faculty of Law and Literature in 1922, this year also marks 100 years as a comprehensive university. Upon reaching this milestone, we are more determined than ever to make further contributions to society upon a foundation comprised of the knowledge that we have gained and integrated over these many years, and we will continue to transform the University with an eye to the future.

June 22, 1907

Tohoku Imperial University Founded; College of Agriculture Established

The groundwork for the foundation of Tohoku University was laid by numerous private sector and community donations, including from the Furukawa family and Miyagi Prefecture.

1911
Masataro Sawayanagi inaugurated as the first president; College of Science established

1915
College of Medicine establishedSawayanagi inaugurated as the first president; College of Science established

1919
Faculty of Engineering established (College of Science reorganized as the Faculty of Science / College of Medicine reorganized as the Faculty of Medicine)

1922
Faculty of Law and Literature and Research Institute for Iron, Steel and Other Metals (RIISOM) Established

With the establishment of the Faculty of Law and Literature in 1922, Tohoku University makes a great leap forward, becoming a comprehensive university with courses in both liberal arts and sciences.

1935
Research Institute of Electrical Communication established

1947
Faculty of Agriculture established; Renamed from Tohoku Imperial University to Tohoku University in October

1949
Tohoku University reorganized under the new national school system Faculty of Arts and Letters, Faculty of Education, Faculty of Law, and Faculty of Economics established

1965
Faculty of Dentistry established

1972
Faculty of Pharmaceutical Sciences established (Reorganized as Department of Pharmaceutical Sciences, Faculty of Medicine)

1989
Institute of Fluid Science established

1993
Graduate School of International Cultural Studies, Graduate School of Information Sciences, and Institute of Development, Aging and Cancer established

1907 1911 1915 1919 1922 1935 1947 1949 1965 1972 1989 1993

PICK UP YEAR 1933

Kotaro Honda develops New KS Steel

Through research into the magnetic properties of iron, Honda invents permanent magnetic steel (KS Steel) and later New KS Steel, with magnetic resistance several times higher than that of KS Steel

PICK UP YEAR 1922

Albert Einstein Visits Tohoku University

From left to right: Kotaro Honda (6th President), Albert Einstein, and two interpreters

Masataro SAWAYANAGI
First President

*Titles and honorifics omitted

2007

100th Anniversary of Our Founding

On the University's 100th anniversary of our founding, we announced the intention to become a World Leading University in order to establish the University's position as a world-class research and education center, and created the Tohoku University Fund to serve as a financial base for further contributions to the development of human society.

2001
Graduate School of Life Sciences and Institute of Multidisciplinary Research for Advanced Materials established

2003
Graduate School of Environmental Studies established

2008
Graduate School of Biomedical Engineering established

2012
International Research Institute of Disaster Science established

2017
Selected as Designated National University

2018

New extension of the Aobayama campus constructed

Allocated a total of 26 billion yen of the University's own funds to develop a large-scale campus under a project spanning a quarter of a century. Further development planned for the future with the goal of being a problem-solving and value creation platform as Japan's largest research complex.

2022

The 115th Anniversary of Tohoku University's Founding and 100th Anniversaryas a Comprehensive University

We have created the anniversary logo to commemorate the 115th anniversary of Tohoku University's founding and its 100th anniversary as a comprehensive university. The design, which is primarily typographical, features a bush clover symbolizing Sendai and represents that dignified intelligence 'sprouts' in this land and graces the world. We feel that this uniquely Tohoku University design, which is also tailored to harmonize with the University logo, expresses the essence of the University's past and future.

115th ANNIVERSARY TOHOKU UNIVERSITY

Hideo OHNO
22nd President
(Since April 2018)

2001 2003 2007 2008 2012 2017 2018 2022

Overview of Events Commemorating the 115th Anniversary of Our Founding and 100th Anniversary as a Comprehensive University

In FY2022, which will be the milestone year of the 115th anniversary of our founding and 100th anniversary as a comprehensive university, to celebrate, we are holding a variety of other related events, including the following commemorative events.

Main Commemorative Events

Ceremony Commemorating the 115th Anniversary of Our Founding and 100th Anniversary as a Comprehensive University (Homecoming Day)

Time and Date: 11:00 am to 3:00 pm, Saturday, October 1, 2022
(The outdoor portions of the event will also be held on October 2.)
Venue: Centennial Hall (Kawauchi Hagi Hall), Tohoku University

Tohoku University was established with the great hopes and financial backing of the private sector and local communities. At this event, we will look back on the history of Tohoku University's development and present our vision for the future, while highlighting the University's pioneering spirit.

Illustration of the planned ceremony

Hasekura Summit

Time and Date: 1:00 pm to 6:00 pm,
Friday, September 30, 2022
Venue: Centennial Hall (Kawauchi Hagi Hall), Tohoku University

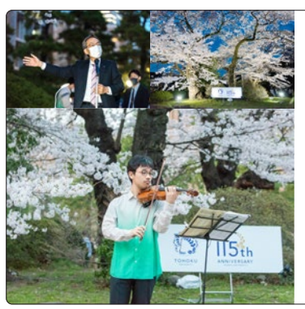
Leaders in the humanities and social sciences at universities participating in the Hasekura League, an international network for unique Japanese studies mainly in the U.S. and Europe, have been invited to Sendai to share their policies of international and interdisciplinary collaboration and social contribution throughout the world in the 21st century. In addition, discussions with young university and high school students who aspire to enter the humanities and social sciences were held, reviewing the new value provided by the humanities and social sciences and the future vision of academic and educational exchange starting at Tohoku University.

The 35th Tohoku University International Festival

Time and Date: 11:00 am to 4:00 pm,
Sunday, October 2, 2022
Venue: In front of Centennial Hall (Kawauchi Hagi Hall), Tohoku University

This year's theme was the Reunion of Cultures. As Tohoku University marks its 115th anniversary of our founding, we aimed to celebrate the reunion of diverse cultures into one cohesive whole. This included food stalls selling dishes from around the world, amazing stage performances, and impressive hands-on activities.

Photograph taken at the 33rd festival (July 2018)



Sakura Light-up Held on Katahira Campus

Related Event

In April 2022, when the cherry blossoms on campus were in full bloom, the Katahira Campus held a cherry blossom lighting ceremony, Sakura Light-up, to kick off the series of events commemorating the 115th anniversary of Tohoku University's founding and 100th anniversary as a comprehensive university. Prior to the lighting ceremony, a Tohoku University student who is also an active musician held a mini-concert, and the participants enjoyed the harmony between the music and cherry blossoms in full bloom.

Using the Anniversary as an Opportunity to Display the University's Numerous and Diverse Appeals

We are expanding our circle of stakeholder support by producing and selling Tohoku University Official Goods and releasing a short movie to provide more opportunities for people to become better acquainted with Tohoku University.

Tohoku University Official Goods

We are also currently planning a variety of other attractive goods. A portion of the proceeds is donated to the Tohoku University Fund.

Tohoku University 115 Premium Beer - Kawatabi Berry - an Original Craft Beer

(Upper photo) An original necktie by Tohoku University in collaboration with J.PRESS and Fujisaki / (Lower photo) (Right) "Smart mini eco-bottle" by Tohoku University and Thermo Mug (Left) Original field notebook (sketchbook) by Tohoku University and KOKUYO

Official LINE Stamps

The Tohoku University campus characters are now available as LINE stamps.

Short Movie Release

A short movie titled "Tohoku University 115th Anniversary Movie" is now available for viewing. Numerous students were involved in all aspects of creating this movie, including cast members and staff.

Tohoku University Fund Green Milestone

We ask for your support in realizing a prosperous and sustainable society of the future.

In celebration of the 115th anniversary of our founding and 100th anniversary as a comprehensive university, we have established the Tohoku University Fund Green Milestone to support the realization of a green society in the future, which Tohoku University holds as a goal. The 115th anniversary fundraising project is currently underway.

Create and Transform

**Under the "Tohoku University Connected University Strategy,"
Tohoku University is creating new social value.
From here, among the wide range of activities of the University,
we will spotlight brilliant researchers who help us be a "university engaged with society,"
and introduce the "social effects" brought about by such activities.**

The quantum world that fulfills "wishes" in daily life

Quantum technology is attracting interest worldwide. The Tohoku University "Quantum Solution Hub" was recognized as a quantum technology innovation hub in the "Vision for a Quantum Future Society" by the Cabinet Office. This is a result of the research Masayuki Ohzeki led and accumulated, as well as the many findings produced in collaboration with companies. We are convinced quantum technology will lead to a brighter future.

[Anticipated Social Effects]

- **Ensured safety at times of disasters, including navigation systems for congestion-free evacuation routes, etc.**
- **Logistic network optimization that leads to increased productivity**
- **Quantum annealing applications making everyday life more convenient and affluent**

"Things possible with quantum technology may at first glance seem like science fiction, but it is something that is surprisingly close at hand, responding to the 'what ifs' that we experience in our daily lives." Researchers and companies around the world are competing in research and development for quantum technology. Masayuki Ohzeki, a leader in the field, tells of the attraction of quantum research. As demonstrated by more and more news coming out about "quantum computers" in the past few years, quantum is becoming more and more prevalent in ordinary companies and in our daily lives. Although the current boom in the field is overheated, Ohzeki has been steadily and surely accumulating research findings by his activities including teaming up with corporations.

A quantum is a unit that cannot be divided into smaller units, manifested on a scale in which very small things such as the atoms and molecules that make up matter play a leading role. Unlike ordinary computers that calculate either "0" or "1," a quantum bit computer can calculate "0" and "1" at the same time, and has the characteristics of being able to efficiently perform prime factorization and similar procedures at an astonishing speed. One technology that uses this, "quantum annealing," is a high-performance computation method that provides answers to a variety of optimization problems. "For example, when we use a smartphone to find a route to a destination, a computer does the calculations and compares various routes to show the shortest distance. Quantum annealing can handle such a huge amount of calculations in a very efficient manner. So, for example, when you go to the supermarket and are struggling with a menu, you can quickly calculate and answer the question of how to use what you have in the refrigerator and what to buy to make a well-balanced menu for the week. In this way, research that can provide everyday pleasure."

A notable research topic of Ohzeki is technology for finding evacuation routes in the event of a tsunami. After receiving his position at Tohoku University, he visited the coastal areas severely damaged by the 2011 Great East Japan Earthquake and saw the scars of the disaster. Learning that one of the reasons for the larger number of victims was traffic congestion during evacuation, Ohzeki developed a technique to calculate evacuation routes that would not cause congestion. This received great acclaim at international conferences. "It is the philosophy of Tohoku University that we conduct practice-oriented research that is useful to people. The fact that I was able to conduct research based on lessons learned from the 2011 Great East Japan Earthquake gave me a feeling of having become a Tohoku University academic."

Subsequently, Ohzeki has continued to conduct joint research with third parties, working on factory optimization to eliminate traffic congestion with automated guided vehicles and a recommendation system for hotel reservation services, and he was recognized at international conferences for the world's best example of a quantum computer application that is closest to uses in society. He is also conducting business at Tohoku University start-up company Sigma-i Co., Ltd.

Quantum and Quantum Computers

A "quantum" is a very small unit of matter or energy that has both particle and wave properties. The atoms themselves, which form matter, and the even smaller electrons, neutrons, and protons that form atoms, are major players. A "quantum computer" is a computer that can efficiently perform prime factorization and the like at an astonishing speed by taking advantage of quantum characteristics.

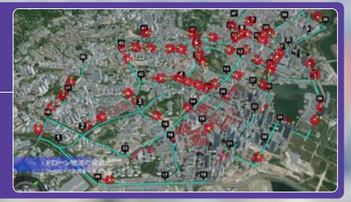
Masayuki OHZEKI
(Professor, Graduate School of Information Sciences)

Quantum + Traffic

Traffic signal optimization using quantum annealing to improve efficiency

Quantum + Logistics

Optimizing drone logistics using quantum annealing



In acknowledgment of these achievements, Tohoku University was recognized as "Quantum Solution Hub." It is one of the quantum technology innovation hubs in the "Vision for a Quantum Future Society" by the Cabinet Office's Quantum Technology which plays an important role in strengthening industrial competitiveness, and it is attracting increasing attention for developing quantum solutions for use in society. Tohoku University as "Quantum Solution Hub" trains future leaders and promotes new developments to support further advances.

Ohzeki is active in fostering 'quantum natives' through a variety of outreach activities, such as live-streaming lectures on YouTube, seminars for private companies, media appearances, and even holding a quantum annealing solution contest.

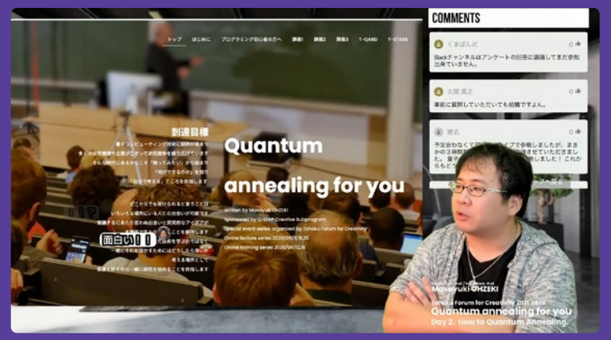
"There are many excellent educational materials available about quantum computers, but it is difficult to actually pick them up and understand them. Even if one does not know anything about quantum computers, I feel that just the idea of 'using a quantum computer for something you want to help or fix' will make you very familiar with them and perk interest. All research conducted in collaboration with companies so far has contributed to social issues, even if in a modest way. If we can gain more peers through research findings and through outreach activities, we can provide answers to many of the world's problems. Moreover, solving the optimization problems and thus making society more convenient and giving people more free time will create more leeway for people. That may allow us to try new things, and a new culture may emerge. I am truly excited about the future that quantum technology will create."

Quantum Annealing Solution Contest (December 18, 2021)

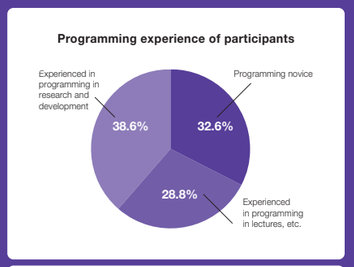
TOPICS

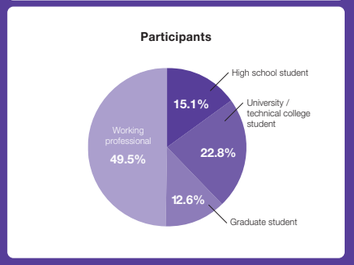
Fostering nationwide quantum natives through practical research and development

As part of his diverse outreach activities, Ohzeki is also focusing on training future leaders and talent, and he has been actively disseminating information on how to utilize quantum annealing through live broadcasts after being selected for the Japan Science and Technology Agency's (National Research and Development Agency) "Quantum Leap Flagship Program (Q-LEAP)."



Livestreaming on YouTube



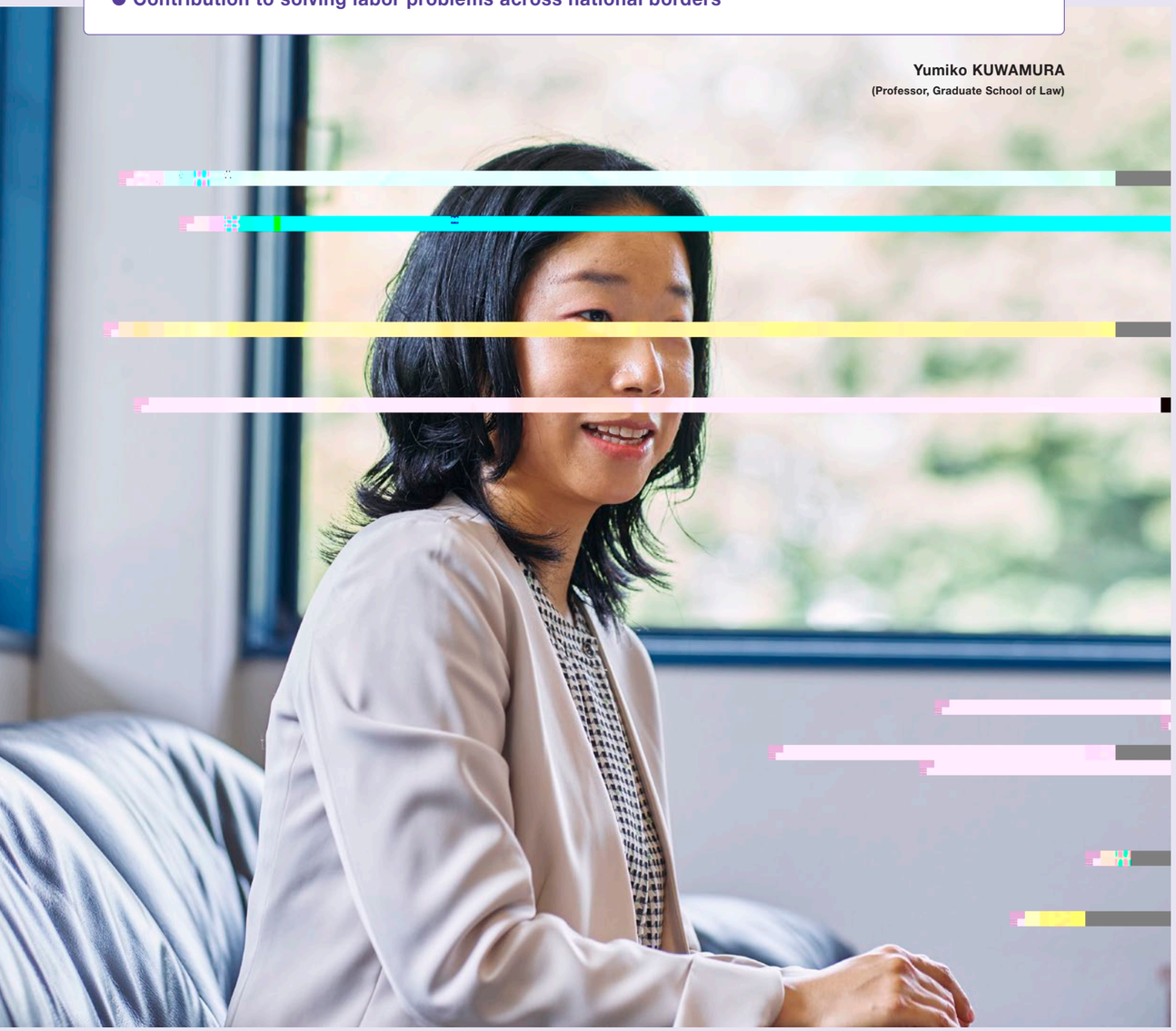


Exploring the legal structure of modern worker protection through original comparative legal analysis

The transformation and diversification of work styles are accelerating in the modern age. In response to the demand for fundamental reforms and systematizations of worker protection laws, we advance research to create better systems based on comparative legal analysis of Japan, Germany, and France. This not only contributes to improve the domestic legal system, but also provides solutions to labor problems around the world, and is thus gaining attention from communities at home and abroad.

[Anticipated Social Effects]

- **Creation of a legal framework that responds to changes in labor relations and diversification of forms of work**
- **Contribution to solving labor problems across national borders**



Yumiko KUWAMURA
(Professor, Graduate School of Law)

Yumiko Kuwamura, who won the 18th (FY2021) JSPS Prize and Japan Academy Medal for Comparative Study on a New Framework of Protection Law and Regulations for Diversified Workforce is one of Japan's leading labor law scholars.

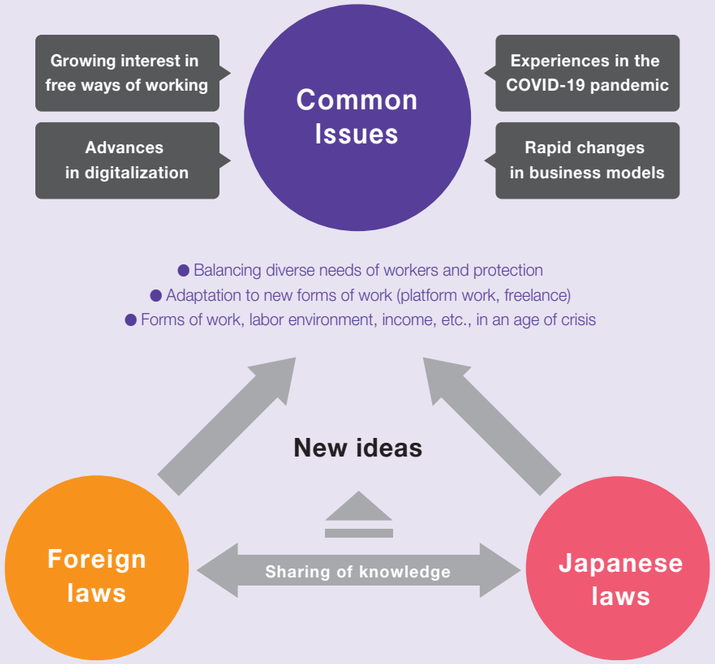
"Worker protection laws were created with factory workers in mind. The idea is to establish and apply minimum standards for the protection of exploited workers. However, this has also led to a lack of freedom especially for those who are able to work autonomously. Although flex-time systems, discretionary labor systems, and the like have been established as exceptional frameworks, they are inconsistent in their system design because of the ad hoc legislative reforms. I thought that fundamental, comprehensive analysis of the legal structure of worker protection was necessary. Forms of work have continued to transform before and in the COVID-19 pandemic, as seen by non-standard employment, working elderly, remote work, and platform work such as delivering goods via smartphone apps. We need to restructure worker protection laws which provide the foundation for a better working environment."

Her main work, Toward a new framework for worker protection laws: a comparative study of flexibilization of minimum labor standards (Yuhikaku Publishing), has attracted international attention for its profound comparative legal analysis of Japan, Germany, and France, taking Germany as a model for modern Japan and, conversely, France with its tradition of completely different labor-management relations. How should the state, worker representatives and individual workers be involved in the process of restructuring worker protection, and are certain minimum standards necessary regardless of the transformation of work styles? Studying for two years in Germany provided a perspective on the historical and cultural background of labor laws, adding originality and depth to the research.

"There are things that can only be understood by coming into contact with people's activities and that cannot be understood by simply reading literature. Since balancing diversity and protection is a common concern in all countries, studying abroad was an invaluable experience for me to learn by what approach each country formed its laws. The opportunity to interact closely with local researchers also proved to be a great asset. Graduate School of Law of Tohoku University has a tradition that encourages researchers to study abroad for long periods of time, and I feel that the school is open to the world."

Kuwamura, who is further expanding her research areas, also participates in study groups and councils in the Ministry of Health, Labor and Welfare as an expert. Law is a mechanism for helping people in difficulties. By sharing knowledge with foreign researchers, it is possible to get hints for a better legal system in Japan. At the same time, it is hoped that Japan's experience will contribute to solving problems in other countries.

■ Approaches to solving issues through comparative legal analysis



Co-creating convergence of knowledge for a resilient society that can flexibly recover from disasters

Knowledge from various fields of humanities, social sciences, and natural sciences has been accumulated based on the experience of and lessons learned from the 2011 Great East Japan Earthquake. We aim to enhance the "resilience" of the disaster-affected society so that it can recover more quickly and better. We are building new systems for disaster mitigation and response, including the use of cutting-edge simulation and sensing technologies as well as data science.

[Anticipated Social Effects]

- **Supporting disaster response by the real-time tsunami inundation damage forecast system that provides estimates quickly to responders.**
- **Achievement of rapid and optimal recovery from disasters by creating a "Disaster Digital Twin" infrastructure**
- **Co-creation of convergence of knowledge to solve social issues that could not be solved before**

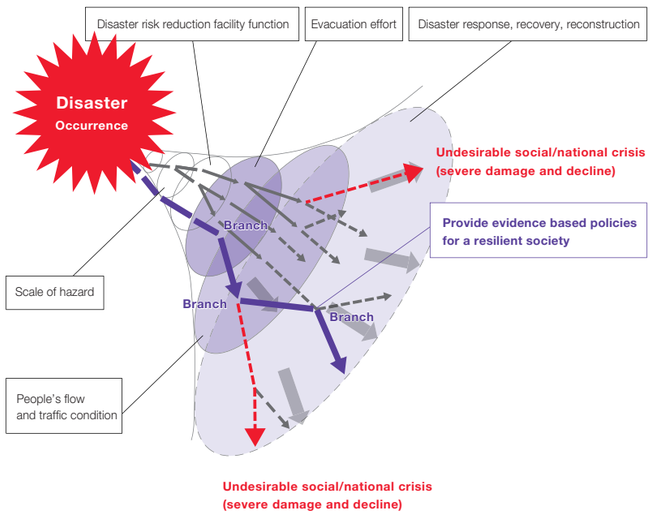
The Co-creation Center for Disaster Resilience established in April 2022 is working with the National Research Institute for Earth Science and Disaster Resilience (NIED) and other organizations to conduct research and social implementation to enhance resilience in the event of a disaster.

Resilience is defined as: "the ability of a system, community or society exposed to hazards to resist, absorb, accommodate and recover from the effects of a hazard in a timely and efficient manner, including through the reconstruction and restoration of its essential basic structures and functions" (UNISDR, 2009). At the UN World Conference on Disaster Risk Reduction held in Sendai in 2015, "enhancing disaster resilience" was agreed on as the most important issue. As natural disasters have become more complex and large-scale, the efficient recovery and build back better is a common goal worldwide.

"We cannot completely eliminate damages, but we can minimize the effects, and society can respond flexibly and aim for a speedy recovery. But that depends on how effectively we react. Better recovery does not mean to return to the pre-disaster state, but to build an even better society. In other words, to build back better. Disaster risk reduction research is meaningful only when it is utilized in the real-world. That is why we want to bear responsibility up to the stage of social implementation, where the technology developed is put to use."

Deputy Director Shunichi Koshimura's area of expertise is Tsunami Engineering and Geo-informatics. We have been advancing joint research on a real-time tsunami inundation damage forecast system, focusing on the "response when a disaster occurs" within the disaster cycle of prevention/mitigation, preparedness, response at time of disaster occurrence, and recovery/reconstruction. This system, which utilizes earthquake information from the Japan Meteorological Agency and the Geospatial Information Authority's GEONET (GNSS continuous observation system), reveals the state of fault rupture from observed crustal movement information and forecasts tsunami inundation and damage in real time. This is revolutionary in that specific damage on land can be estimated in a short period of time. The system was adopted by the Cabinet Office in 2018 and has been implemented in society as a function of the National Disaster Information System. "As experienced in the 2011 Great East Japan Earthquake, the larger the scale of a disaster, the more difficult it is to gather information on damages and grasp the whole picture. I myself was initially at a loss as to what to do,

■ **Disaster process and scenario branching**



Shunichi KOSHIMURA
(Deputy Director, Co-creation Center for Disaster Resilience, International Research Institute of Disaster Science)

having only been in contact with fragmentary information.

For example, in 2011, if we had known instantly how far the tsunami would penetrate inland in addition to its height, and this information had been accurately communicated to residents, they would have been able to evacuate more safely and lives would likely have been saved. I also keenly realized the importance of understanding damage information in the immediate aftermath of a tsunami disaster, and my wish to overcome the situation became a motivation for my research."

The center's symbol project is the creation of a "Disaster Digital Twin" infrastructure. "Nowadays, many kinds of information are being distributed in real-time. This includes not only earth observation data, but also information on the people's flow, traffic, social statistics, and the likes. 'Disaster Digital Twin (DDT)' is the fusion of data-interpretation-inference, to capture the real physical world from various sensors and simulations, creating a copy (or twin) in the virtual world (on a computer), running simulations with the copied data to find out optimal solutions for enhancing disaster resilience, and provide the insights into the physical world's policy or decision. AI (Artificial Intelligence) is one of the key elements of DDT but the goal is a deployment of a mixed-initiative of human and machine (computer) systems as the convergence of knowledge. We believe that it emerged from the convergence of disaster science research from multiple disciplines with a deep understanding of physical and social systems."

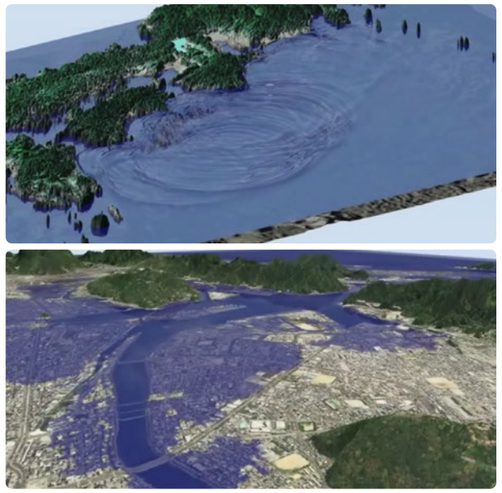
Deputy Director Koshimura specializes in tsunami engineering and geo-informatics, collaborating with diverse experts in fields such as seismology and computer sciences

Even if the earth observation data is fragmentary, the whole picture can be estimated and fed back to the real-world to enable the best decision-making. The ultimate role of "Disaster Digital Twin" is to enable rapid identification of the situation, which was lacking at the time of the 2011 Great East Japan Earthquake, as well as to provide suggestions from a vast array of options to make accurate decisions on a case-by-case basis, which is limited with analog technology.

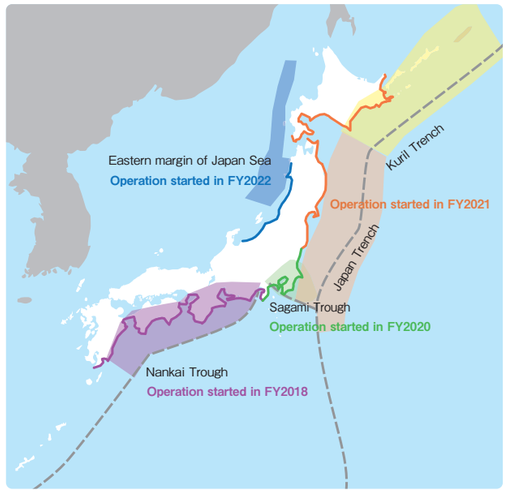
These projects are pursuing "convergence of knowledge," by multi- and cross-disciplinary research. "By combining empirical, tacit, and formal knowledge in the social sciences with hypotheses, verifications, predictions, inferences, and the likes in natural sciences, we can approach issues in society that previously could not be solved. Our mission is to co-create 'convergence of knowledge' that enhances resilience through the exploration of common norms, encompassing knowledge that is not bound by specialized fields or organizations."

We have created a network with international organizations, private sectors, and researchers in various fields, in addition to NIED with which we collaborate, and are working together to advance joint research. This all done to create a resilient society.

■ Real-time tsunami inundation damage forecast system from Tohoku University-originated startup, RTi-cast Co., Ltd.

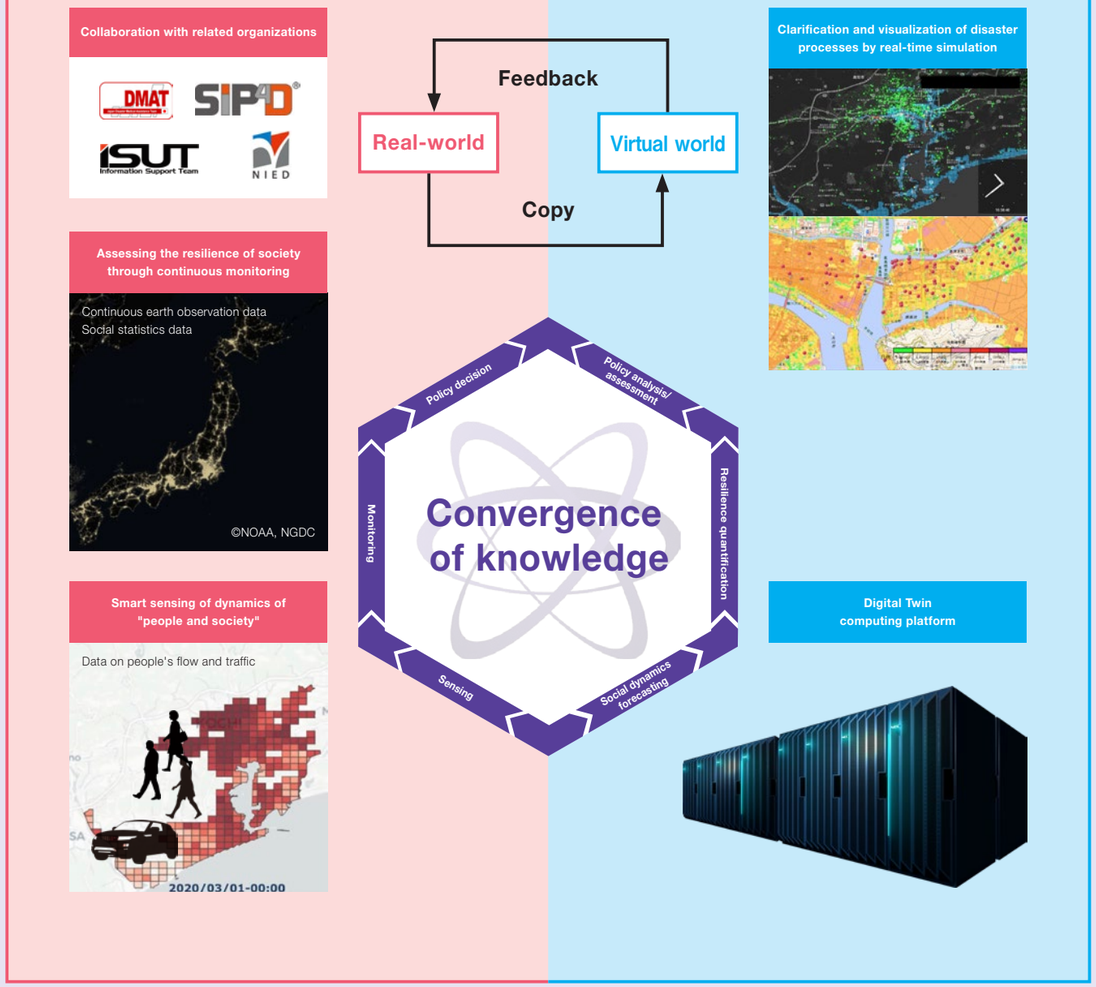


Tsunami inundation simulation for Kochi Prefecture



Range of forecast for real-time tsunami inundation damage forecast system in Japan (as of 2022)

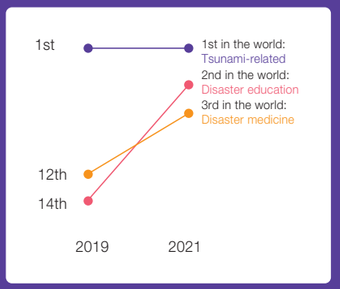
Symbol Project of the Co-creation Center for Disaster Resilience: Project for creating Disaster Digital Twin



TOPICS

Number of papers published by Core Research Cluster of Disaster Science (surveyed by SCOPUS)

The number of papers published by Tohoku University's Core Research Cluster of Disaster Science (surveyed by SCOPUS) is steadily increasing. In 2021, we ranked 1st (2019: 1st), 2nd (2019: 14th), and 3rd (2019: 12th) respectively in the world in the fields of "tsunami-related," "disaster education," and "disaster medicine." And we are broadly communicating to society our knowledge as the only comprehensive university in the world to have experienced a major earthquake.



Leading the world in "neutrino geoscience"

McDonough is an expert in geoscience, one of Tohoku University's strengths. We are leading neutrino geoscience in collaboration with Research Center for Neutrino Science, Tohoku University, which houses KamLAND, the world's leading neutrino experiment in terms of geo-neutrino observation findings. We explore the mysteries of the Earth's system that has not been solved yet.

[Anticipated Social Effects]

- **Identification of the chemical composition of the entire Earth using geo-neutrino observations as a tool, deepening our understanding of the Earth's interior**
- **Creation of innovations that contribute to the sustainability of the Earth's environment and human society**

William F. McDonough
(Specially Appointed Professor, Graduate School of Science)

Since it is more than 6,000 kilometers to the center of the Earth, and even the deepest drill hole is only 12 kilometers deep, much of its planetary properties and dynamics remain a mystery. In 2005, the KamLAND experiment led by the Research Center for Neutrino Science (RCNS) at Tohoku University succeeded for the world's first observation of geo-neutrinos (elementary particles that have no charge, have almost no mass, and are extremely difficult to detect). Those antineutrinos are produced when radioactive elements decay inside the Earth. This pioneering observation created a new discipline called "neutrino geoscience."

McDonough, a geologist and "neutrino geoscience" specialist, explains that the advent of this research field has made it possible to define the Earth's radioactive fuel balance. "When radioactive elements decay, heat is released. This energy drives plate tectonics, mantle convection, and metallic core convection, producing a protective magnetic shield around the Earth. The Earth is a hybrid vehicle powered by the energy from radioactive elements and the initial energy from collisions during the formation of the Earth. However, there is no fuel meter for that yet."

In order to gain geoscientific insight from geo-neutrino measurements, a geological model of the Earth's interior is required, and this is where McDonough's expertise is most utilized. "It is difficult for us to build a three-dimensional geological model because of the complexity of the continental subsurface. So we want to bring a detector to the ocean, where the geology is simpler."

At the kick-off meeting of the JAMSTEC and Tohoku University joint research team (McDonough is fourth from the left in the front row)

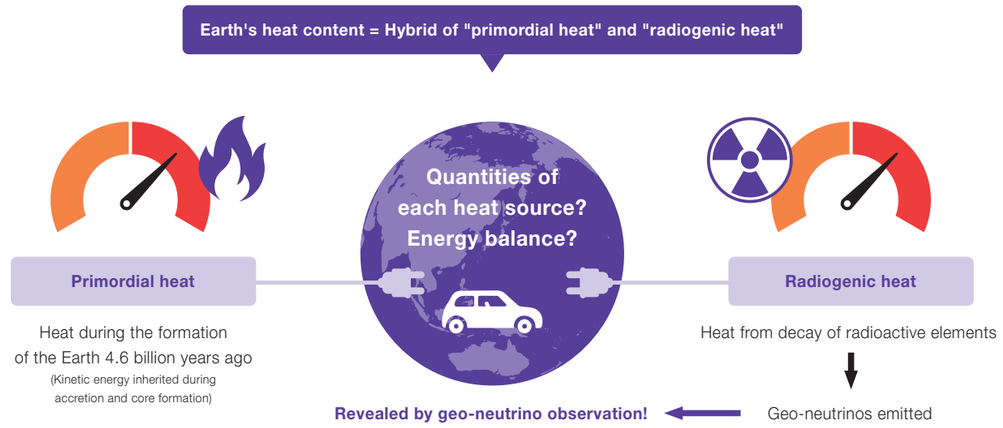
Measurements with mobile ocean-going detector are an innovative method that allows mantle signals to be obtained directly at the bottom of the ocean. As part of a joint research team developing a mobile ocean-going detector, McDonough is currently working with particle physicists from RCNS and engineers and geoscientists from JAMSTEC (Japan Agency for Marine-Earth Science and Technology, National Research and Development Agency) to test and build a prototype detector to be installed at an area off the coast of Japan 1 km deep.

"Knowing the strength of the mantle signal also allows us to better understand the continental subsurface through existing observations."

The structure of the Earth's interior can also be studied by measuring seismic wave propagation, but information on chemical composition that can be obtained from a small sample of less than a kilogram is limited for understanding the entire planet. McDonough has this to say. "By measuring the geo-neutrino flux, we can determine the chemical composition of the entire Earth and even reveal how much fuel is left to drive its engine. Moreover, it can be a unique tool that will prove the habitability of the Earth into the future."

Tohoku University's geo-neutrino observations will lead the world as one of the few tools to measure the Earth's interior on a global scale.

■ **Earth's heat source and fuel balance**

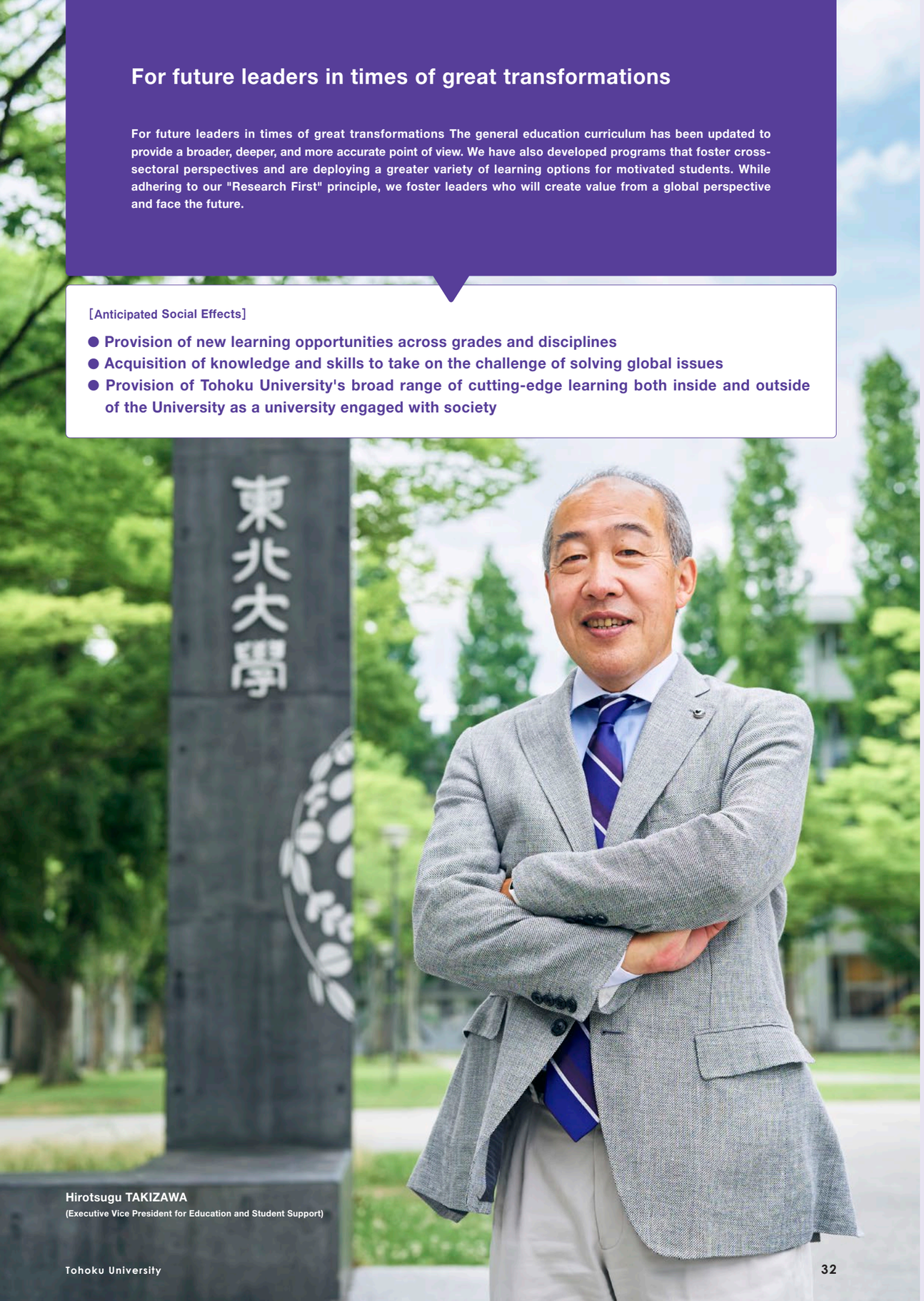


For future leaders in times of great transformations

For future leaders in times of great transformations The general education curriculum has been updated to provide a broader, deeper, and more accurate point of view. We have also developed programs that foster cross-sectoral perspectives and are deploying a greater variety of learning options for motivated students. While adhering to our "Research First" principle, we foster leaders who will create value from a global perspective and face the future.

[Anticipated Social Effects]

- **Provision of new learning opportunities across grades and disciplines**
- **Acquisition of knowledge and skills to take on the challenge of solving global issues**
- **Provision of Tohoku University's broad range of cutting-edge learning both inside and outside of the University as a university engaged with society**



Hirotsugu TAKIZAWA
(Executive Vice President for Education and Student Support)

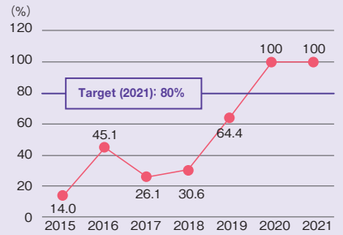
We live in an era of great transformation where increasingly diverse and complex problems are coming to light. Human resources who can identify and solve real issues are needed. Tohoku University has thus undertaken drastic reforms of our educational program with the aim of fostering value-creating leaders both in research and in society. "Climate change and gender issues, for example, cannot be dealt with by traditional academic disciplines alone. So, we have created a new educational foundation to nurture people with the motivation and sense to tackle these complex issues of the future," says Executive Vice President Hirotsugu Takizawa.

The centerpiece of the reform is university-wide education. It encompasses universal cultural subjects and contemporary liberal arts, and is unique in that it is designed for both upper-year undergraduate and graduate students studying specialized fields. As one of the research-oriented comprehensive universities in Japan, we are able to provide deep and advanced knowledge because we have experts in a wide range of academic fields.

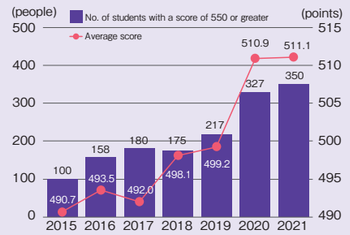
Another major reform is education that cultivates the ability to accurately read and understand social information and to logically explain one's own thoughts on those. We are developing English language education to cultivate EGAP (English for General Academic Purposes) skills, establishing the "College of Creative Endeavor" program to provide further learning opportunities for motivated students, and deploying advanced education that responds to the evolution of information and communication technology (ICT) and an international co-education environment in which Japanese and international students study together. "We want to be tolerant of all students of different backgrounds and beliefs. We also conduct regular faculty training to ensure that we understand and support the ever-changing character of our students."

Also noteworthy is recurrent education for working adults. MOOCs (Massive Open Online Courses), which offer open online courses on a variety of topics, have been taken by 82,000 people. "While we have our commitment to lead the world with the 'Research First' principle, it is also important for education to nurture the spirit and leadership to face current issues. We will work to foster talented specialists so that everyone who comes to the campus, including faculty/staff, students, and working adults, can experience 'Tohoku University Learning'."

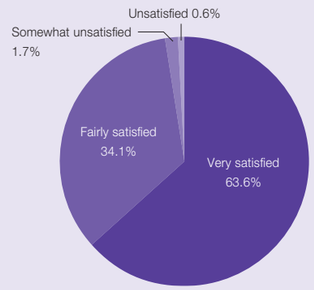
Rate of lecture participants who use ICT



TOEFL-ITP® test scores (for first-year students in all academic departments)



Satisfaction level of MOOC participants



Education reforms

New curriculum for FY2022

Issues with the current system
- Modernity of classification of common subjects
- Educational connections from the first year to the upper-year undergraduate
- Academic discipline-specific curriculum

Curriculum connected to the future
- **Connections between secondary and higher education**
  Establishment of new large-scale active learning "academic group theory"
- **Connection with society**
  Career design education, modern skills education
- **Connections between educational programs**
  General education ⇔ Undergraduate specialized education ⇔ Graduate school education

Cross-sectoral curriculum
- **Balanced study of universal liberal arts and modern liberal arts**
  Establishment of a new group of liberal arts subjects (data science, etc., regardless of humanities or sciences)
- **Issues of modern society, including sustainability**
  New 0.5 credit courses utilizing MOOC contents

Enhancement of international education
- **Academic English and multilingual education**
- **The largest number of international co-education courses in Japan**

Supporting new curriculum
- **Utilization of information and communication technology (ICT)**
  HyFlex international co-education courses, etc.
- **New TA (teaching assistant) system**

Intercultural Co-education
– Connecting the World in an Academic Metaverse

A new course format has been designed that transcends time and space, bringing together students of diverse nationalities in a metaverse space. Combined in-person and online courses utilizing advanced VR technology enable learning in a way unattainable in a traditional in-person setting. With a view of developing our own academic metaverse, we are working to create a learning environment where anyone in the world can enjoy high-quality learning.

[Anticipated Social Effects]

- **Providing new learning venues with a sense of presence and immersion that transcends physical barriers through advanced VR technology**
- **Developing a robust educational environment that does not create academic isolation and loneliness due to differences in in-person and online participation**

In a metaverse, users can manifest themselves with avatars on the internet. Virtual Reality (VR) technology is generally known in the area of entertainment, such as games and art. Masako Hayashi, who specializes in language education, is advancing collaborative HyFlex intercultural co-education courses that make full use of this technology, aiming to utilize and develop it in the educational and academic fields.

Intercultural co-education involves students with different cultural and language backgrounds working together to deepen their mutual understanding, and create new values by understanding and reflecting on diverse ways of thinking. The format of HyFlex courses allows students to choose their participation format from in-person, online, or on-demand. Hayashi's course, which has themes of cross-cultural understanding and introducing one's own culture, is developed using metaverse platforms Virbela, Mozilla Hubs, and Gather, as well as VR technology.

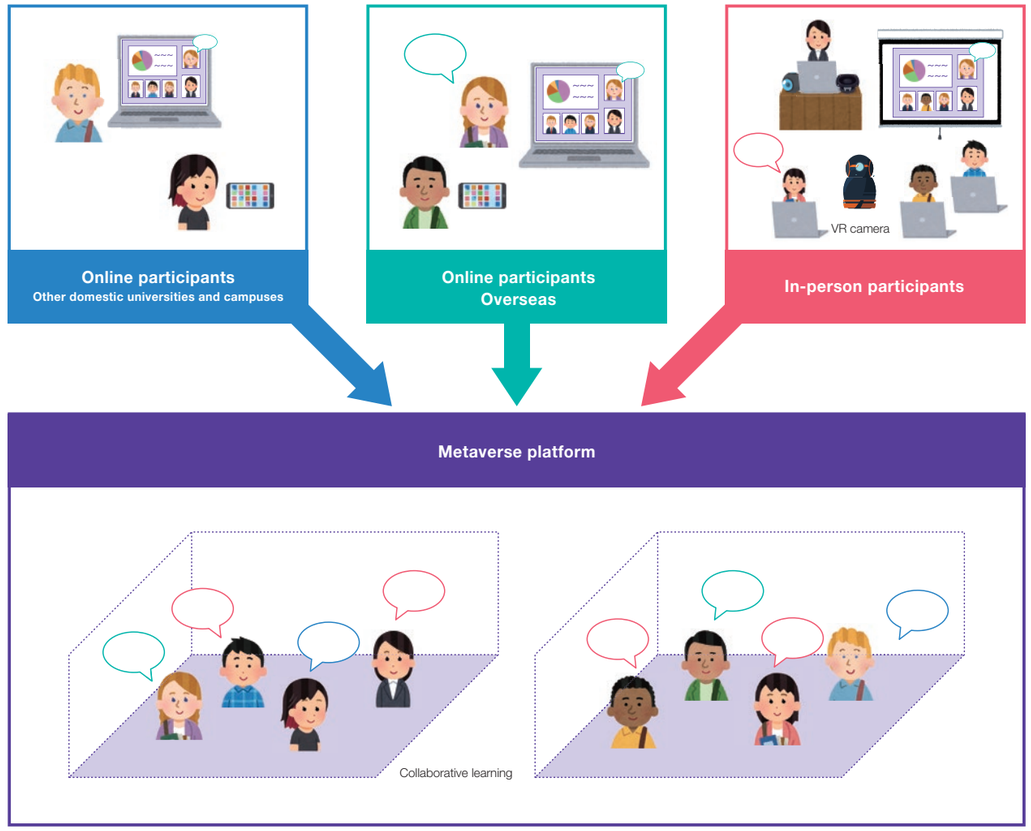
"In total, there are 130 students from 20 countries. There are students from various faculties at Tohoku University, as well as international students who cannot travel to Japan and students from domestic consortium participant universities, making it one of the largest intercultural co-education programs at a national university. We have found that group work and discussions become more lively through the students' own avatars. It is possible to do things that are difficult to do in a traditional in-person setting, while also bringing a sense of togetherness, presence, and immersion that cannot be achieved in standard online settings."

While some students were unable to realize their planned study abroad programs due to the COVID-19 pandemic, Hayashi sought to create an intercultural collaborative learning environment utilizing metaverse and VR technology. Participants have commented, "This is a one-of-a-kind course where you can learn about different cultures while making full use of the metaverse and experiencing the latest technology firsthand (domestic student)" and "It is a wonderful experience to use the metaverse to understand the cultures of various countries (international student)."

Virbela (upper) and Mozilla Hubs (lower) metaverse platforms where student avatars freely play active roles

Masako HAYASHI
(Associate Professor, Institute for Excellence in Higher Education)

■ Collaborative HyFlex classes using XR technology



An attraction for students includes that they can directly experience advanced VR technology, for example wearing head-mounted displays. Another attraction is the ability to study together with students from diverse cultural backgrounds, transcending time and space.

Students are able to encounter the diversity of the world that they did not know before, and to view their own culture from an outside point of view.

On the other hand, students who cannot travel to Japan also have the benefit of being able to learn the Japanese language and culture without having to physically travel abroad.

"With collaborative HyFlex classes, traditional conferencing tools tend to create a psychological barrier between online participants and in-person participants.

It is also difficult to acquire equal knowledge and skills in practical and hands-on classes.

Our goal is to develop and promote a robust educational and academic environment that eliminates such academic isolation and loneliness.

We believe this perspective is also important for post-COVID education.

If we return to a fully in-person format just because the risk of infection has decreased, and in-person classes become possible, overseas students who cannot travel to Japan will lose the opportunity to learn.

We want to build the best learning environment under any circumstances.

We also have a strong desire to provide students who are uneasy or uncomfortable with in-person communication with an option for learning by using avatar interaction in the metaverse. That is why we aim to build a method that utilizes 'XR (extended reality) technology,' which combines real and virtual worlds."

The specific goal is to develop and popularize a unique platform with which academic activities such as education, research, and symposiums can be conducted in a metaverse space.

In the long term, this involves development of an "academic metaverse" dedicated to education and research.

By further vitalizing education and academic exchange in the metaverse, we can contribute to education for reskilling of workers, as well for the various stages of schooling, from primary school through to high school. In turn, this will enable people from countries and regions where it is difficult to study abroad to overcome the hurdle of travel and receive high-quality education.

"If we can connect the world through an academic metaverse and make education accessible to all who wish to study, transcending all barriers, we can contribute to Sustainable Development Goal 4: 'Quality education for all.' I really believe so."

TOPICS

Virtual participation of President Ohno Addresses at the NII-sponsored "DX Symposium for Educational Institutions"

In February 2022, the "46th Cyber Symposium on Online Education and Digital Transformation in Universities and Other Institutions" was held at the Educational Institution DX Symposium using the Metaverse, hosted by the National Institute of Informatics (NII). At this symposium, University President Hideo Ohno (right) attracted much attention when he gave a lecture virtual space wearing a head-mounted display. (NII Director Masaru Kitsuregawa is on the left)

(Upper photo) Wearing a head-mounted display allows online participants to convey natural reactions such as nods, further enhancing a sense of unity
(Lower photo) Over 130 students from Japan and abroad participated online and in person, across borders in the same space on the metaverse

Creating "Comfortable" Hospitals

Tohoku University Hospital has played a central role in community health care in response to the 2011 Great East Japan Earthquake and the COVID-19 pandemic. Under the key phrase "Comfortable for All," we are working to solve medical issues while promoting smart hospital functions to create a comfortable and rewarding work environment not only for patients and their families, but for medical staff as well.

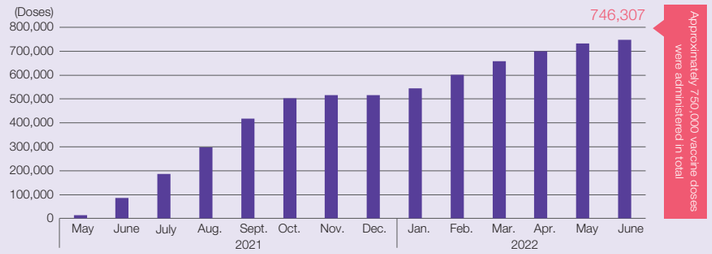
[Anticipated Social Effects]

- **Establishment of medical system know-how that can deal with various disasters by applying and evolving experience learned from the earthquake disaster to pandemic response**
- **Creation of a hospital where everybody feels "comfortable" and high-quality medical care is provided**

"The novel coronavirus (COVID-19) pandemic broke out at a point where experiences from the 2011 Great East Japan Earthquake had led to a mindset that 'university hospitals are a bastion of community health care.' In the event of a disaster, close cooperation between the government and medical care providers is essential. The quick response led to a sense of crisis that united the 22 hospitals in the prefecture, medical associations, health centers, and medical personnel." So says Tohoku University Hospital Director Dr. Teiji Tominaga, who also serves as head of the Miyagi COVID-19 Medical Coordination Headquarters.

In response to a request by Miyagi Prefecture in April 2020, we began providing medical support to accommodation treatment facilities (hotels). As of the end of June 2022, Tohoku University Hospital has been in charge of on-call response for a total of seven of the 11 facilities in the Sendai medical region. One of these facilities was assigned medical functions, and we provided medication, fluid replacement, and testing. This support has contributed significantly to reducing the shortage of hospital beds in the prefecture. In addition, the Tohoku University Vaccination Center, a large-scale vaccination site for COVID-19 vaccines, was established in May 2021 ahead of other sites in Japan. Approximately 750,000 vaccine doses have been administered by the end of June 2022.

Tohoku University Vaccination Center - Number of vaccine doses (cumulative) (as of June 30, 2022)



■ **Tohoku University Hospital COVID-19 infection response**

Actions		Response details	Activity results overview (to June 30, 2022)
Prevention	①	Tohoku University Vaccination Center Since May 2021	**Vaccination results: 746,307** (First and second dose: suspended on Nov. 12, 2021 Third dose: Since December 20, 2021
Testing	②	Drive-thru outpatient PCR testing Since April 2020	**Cumulative tests: 15,873**
Treatment coordination	③	Leadership of meetings such as for directors of Miyagi hospitals handling COVID-19 Since March 2020	**Held total of 21 times** Hospital directors and others from 25 hospitals accepting COVID-19 patients in the prefecture participated Chair: Dr. Teiji Tominaga (Director, Tohoku University Hospital)
	④	Leadership of the Miyagi COVID-19 Medical Coordination Headquarters Since December 2020	Daily care matching for new patients testing positive **Coordination cases: 3,364 inpatient admissions, 40,225 hotel admissions**
Treatment	⑤	Support for accommodation treatment facilities (hotels) Since April 2020	Responsible for on-call for **seven of the 11 facilities** in the Sendai medical region **Medical functions assigned to one of the facilities** (medication, fluid replacement, testing)
	⑥	Management of system of support for elderly facilities, etc. Since May 2021	Cumulative number of support cluster facilities **Infection control guidance: 76 facilities; Continuity of operations support: 31 facilities**
	⑦	Antibody cocktail therapy center Since September 2021	**Cumulative number of patients administered: 82** (suspended on October 11, 2021)

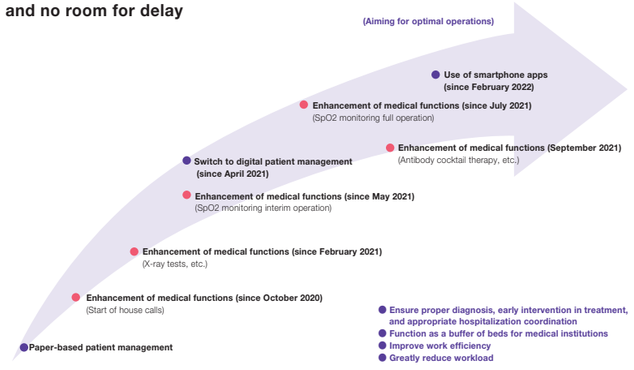
Dr. Teiji TOMINAGA
(Director, Tohoku University Hospital)

The system for coordinating tests such as X-rays, blood sampling, and electrocardiograms at accommodation treatment facilities and the reservation system for workplace vaccinations at the Tohoku University Vaccination Center were developed in-house by the Medical IT Center of Tohoku University Hospital. Our activities to contribute to the control of COVID-19 cases in Miyagi Prefecture by promptly and flexibly implementing DX in the midst of the medical care shortage have been widely recognized, and in November 2021, we received the Best Performance Award in the support category of the TOHOKU DX Awards (sponsored by the Tohoku Bureau of Economy, Trade and Industry) and in June 2022, the grand prize in the support organization category of the Japan DX Awards (sponsored by the Japan DX Awards Executive Committee and supported by the Digital Agency, Ministry of Internal Affairs and Communications, and others).

This proactive use of IT in the medical field is a result of the "Smart Hospital Project" that Tohoku University Hospital has been working on since before the COVID-19 pandemic. "Tohoku is at the forefront of the world's medical issues. In other words, all kinds of medical issues are accumulating, including the aging of the population and the uneven distribution of physicians. The use of IT as a tool to solve these is a cornerstone of our 'Smart Hospital Project.'"

"Smart hospital" refers to activities to improve the content of medical care and patient convenience, as well as to improve the work efficiency of all healthcare professionals, including doctors, nurses, pharmacists, and lab technicians in order to make that work smarter. Under the philosophy of "Comfortable for All," Tohoku University Hospital aims to be a smart hospital where all medical personnel can work efficiently and safely while feeling job satisfaction in addition to providing convenience for patients and their families.

Practical gradual application of digital transformation at COVID-19 minor illness accommodation medical care facilities where there is no clear future and no room for delay



"Another feature along with the use of IT is industry-academia cooperation. We have an office of industry collaboration as a department within the Hospital, which is rare for a university hospital, and we are working to solve a wide variety of issues with the potential of our Hospital and healthcare professionals and by collaborating with companies that have the know-how that we do not have. In a project called Open Bed Lab (OBL), which started in January 2020, we are providing hospital bed functions to companies as test beds and conducting joint research and development that incorporates the perspectives of the medical worksite."

To become a smart hospital in the future, it is also essential that we foster medical personnel who can utilize AI. Tohoku University, in collaboration with Hokkaido University and Okayama University, has formed Japan's largest AI education consortium and launched a program as one of the country's AI human resources development centers in the medical field. The goal is to train a wide range of human resources who can organize medical issues unique to the region, identify real needs, and design solutions. The education program consists of two courses: a doctoral course that includes clinical practice and an intensive course format that can be taken by those from other faculties, other hospitals, and general companies. The practical content of the course nurtures the potential for students to become future top innovators.

Tohoku University Hospital is engaged in a variety of initiatives while protecting community health care in the Tohoku region, but the foundation of these activities is the physical and mental health of the staff.

"Through response to COVID-19, I keenly realized the importance of keeping the staff always in good health in order to provide stable, high-quality medical care. Tohoku University Hospital has made a 'well-being' declaration with the aim of supporting the maintenance of the physical and mental health of the staff. We are creating a system that allows a balance between work and possible illnesses, such as supporting a work system that allows personnel to work with peace of mind while undergoing treatment, and partially subsidizing medical expenses for staff members whose work efficiency tends to decline due to certain illnesses such as migraine headaches." Aiming to create a hospital that is "comfortable" for everybody will lead to the provision of well-rounded medical care. The challenges for Tohoku University Hospital will continue in the future.

■ Medical AI human resources development program

Contribute to the future development of Japan by fostering "cutting-edge AI R&D personnel" with the ability to solve "global and local medical issues"

Issues in Japan's provincial areas

2040
Half of all municipalities are in danger of disappearing
(especially severe in Tohoku)

2050
20% of where people currently reside in non-residential areas

People who are vulnerable in terms of access to health care are becoming apparent
(Most notably in the Tohoku, Hokkaido, and Chugoku regions)

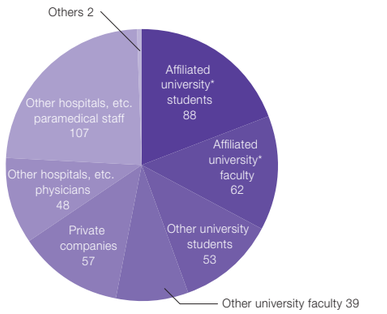
Regional universities are showcases of accumulated medical issues

In areas without large companies but with academia, that academia is at the center of solving issues in the region

AI human resources development in provincial areas of Japan, a developed country with advanced issues

Breakdown of intensive course participants
(as of July 2022)

In addition to program-affiliated schools, we also accept a wide range of participants from other universities, other hospitals, general companies, etc.



*Universities affiliated with this program: Tohoku University (representative university), Hokkaido University (cooperating university), Okayama University (cooperating university)

Tohoku University Hospital "Well-being" Declaration

Tohoku University Hospital has made a "well-being" declaration under a concept that states that a good physical, mental, and social state is what it means to be healthy. In order to protect the health of patients, the staff must first be mentally and physically healthy. With this declaration, faculty/staff can gain an environment where they can work efficiently, safely, and rewardingly, leading to the provision of even higher quality medical services and the realization of being the smart hospital that we aim to become.

TOPICS

Treatment began with the Elekta Unity MR linear accelerator system, the first next-generation high-precision cancer treatment system in Tohoku

In November 2021, Tohoku University Hospital became the first hospital in the Tohoku region (and the second in Japan) to install an Elekta Unity MR linear accelerator system, a next-generation high-precision cancer treatment system, and treatment of the first case using the system was in February 2022.

This is a high-precision radiotherapy system that combines high-field MRI imaging and a linear accelerator. Starting with the treatment of prostate cancer, we plan to expand application to pancreatic, kidney, liver, and esophageal cancers, metastatic bone tumors, and many other diseases.

The introduction of this device, one of the few in the world, will greatly expand the possibilities for cancer treatment in Tohoku. Tohoku University Hospital will continue to provide safer and more advanced medical care tailored to each individual cancer patient.

Creating Startups That Drive Social Change

Tohoku University strongly supports entrepreneurs who take on the challenge of overcoming difficulties and delivering value to society, based on their own intellectual curiosity. Here, we focus on the passion of the talent and brains of our community and introduce the social and economic impact they create.

Startup Entrepreneur

01

Changing the World from Futaba. Building a Community, Together.

Rurio is a student group that plans and operates PaletteCamp Fukushima, a tour for young people centered in Futaba, Fukushima Prefecture. The group is working with tour participants to create a sustainable community while building relationships with the town from a perspective that is based on something other than the earthquake disaster and nuclear power station accident. This is the beginning of an attempt to change the world through incremental small social changes.

[Anticipated Social Effects]

- **Creation and revitalization of local communities that are free from stereotypes**
- **Establishing a social system that respects diversity and allows everyone to take active steps**

Birth of PaletteCamp

PaletteCamp was born in Futaba in 2021, with the aim of creating ideas by visiting the region with a free mindset and without being bound by stereotypes.

The group avoids the terms "earthquake disaster" or "nuclear power station" in its promotions, but instead attracts a diverse range of people through morning yoga and other fun activities. The people who gathered naturally developed friendships, and regardless of the reason for their participation, think about the future of the region of their own accord.

What Follows from Here

"I met some good people," "I wanted to know more," "I got some ideas I want to try" - the participants had great variety of impressions. Various activities have emerged as a result of continued conversations with participants afterwards through the online community in which they are invited to participate during the tour. The content of the PaletteCamp tours is also evolving steadily, incorporating suggestions from participants.

Talking to people. A community where people can voice their opinions. Reaffirm the importance of personal connections.

PaletteCamp

https://www.palettecamp.com/en/

© Hiroki Oikawa

(Right) **Masayuki KOBAYASHI** — Founder of Rurio / 4th-year student, Department of Mechanical and Aerospace Engineering, School of Engineering, Tohoku University

(Middle) **Swastika Harsh JAJOO** — CCO of Rurio / 1st-year doctoral student, Graduate School of International Cultural Studies, Tohoku University

(Left) **Trishit BANERJEE** — Co-Founder of Rurio / 1st-year doctoral student, Graduate School of Science, Tohoku University

On March 11, 2011, an accident occurred at the TEPCO Fukushima Daiichi Nuclear Reactor as a result of the Great East Japan Earthquake. PaletteCamp Fukushima is a two-day, one-night tour, first held in October and November 2021 in Futaba, where the nuclear power station is located, and its immediate neighbor, Tomioka. A total of 32 people of various nationalities and a wide range of ages gathered from across Tohoku and Kanto to enjoy activities such as stargazing and yoga by the sea. Organized by Futaba County Regional Tourism Research Association (F-ATRAs), planning, organization, and interpretation were carried out by a multilingual, multinational trio comprising Masayuki Kobayashi, Trishit Banerjee, and Swastika Harsh Jajoo, then-advisors to the association. Banerjee and Jajoo, both students from India, also served as yoga instructors.

The tour aims to revitalize the community from a new perspective. What makes this tour very different from other so-called disaster-stricken area tours is that it chose to avoid the terms "earthquake disaster," "nuclear power station accident," or "lessons learned" in promotional material. It all started in the summer of 2021 when Kobayashi and Jajoo were invited by Banerjee, who was working as an advisor for F-ATRAs, to visit Futaba for the first time. Kobayashi, who proposed the tour, spoke as follows.

"I was surprised. The area is deserted, with vacant lots and abandoned areas in contrast with lines of brand-new megastructures. Restoration is not about building roads and buildings. It is about revitalizing the community where people live. People then visit and interact with each other. Although no one lives in Futaba, 11.3% of the original residents would like to return. We, as outsiders, can come here and think together about the revitalization of the town. Generally, tourism to disaster-stricken areas, known as dark tourism, attracts people using the earthquake disaster and nuclear power station accident, so only a small number of participants have an interest in the actual area itself. We wondered what we needed to do to attract a wider audience, to get people to visit the town of Futaba rather than Fukushima in general, and to enjoy rather than just learn, and to continue to be interested in the town."

The program is designed to trace the history of the area while walking around it, including life before the earthquake disaster and the ingenuity to follow the reconstruction process of the past 11 years is elaborated. Of course, along the way, participants inevitably see the scars left by the tsunami and the nuclear power station accident and finish the tour with a visit to the 2011 Great East Japan Earthquake and Nuclear Disaster Memorial Museum. They naturally deepen their understanding of Futaba.

As a young boy, Kobayashi frequently moved locations as his father was transferred, and lived in India for five years. From this experience, he noticed that Japanese people tend to become attached to one fixed image. There are things you cannot see if you stay in the same place all the time. Each small region has a number of cultures and these contribute to the regional diversity. The "palette" of PaletteCamp reflects the idea of valuing multifaceted diversity.

In agreement with the activities of the three, many of the past tour participants have joined in on the management side. In order to develop the project more autonomously, they also established the organization Rurio to serve as the operating body, which then conducted PaletteCamp in May 2022. Rurio will plan and operate tours in collaboration with F-ATRAs, the Tohoku University Green Goals Initiative and other related organizations, and also work to work toward sustainable urban development by training leaders, producing the magazine "*iro*," and developing products such as Futaba Daruma Cookies.

"What is needed is active town branding," says Kobayashi. "If we can bring in more people from the outside and shape each project individually, I feel that local people will also participate. We want to spread the change that started in this small community to other towns and regions. Our hope is to transform society by learning from the current situation, including negative legacies, and creating new social systems. In short, we want to change the world."

Rurio's goal: Create a sustainable business in Futaba

	2022	2023	2024
	Foundation for Rurio Improvement of relationships, performance, and recognition	**Establishment of Rurio's main business Preparation and fundraising for incorporation**	**Establishment and incorporation of business Job Creation**
Creation and revitalization of local communities	Creation of a sustainable community of people from outside the region through PaletteCamp	Creation of a community where people from inside and outside the region, including returning residents, can mingle	Creation of business from the community formed Follow-up and refinement of business
Creation of business and Job	Development of PaletteCamp into a self-sustaining business Recruitment and training of tour staff Creation of a magazine version of the "*iro*" newsletter and sales of the magazine	State where PaletteCamp can be feasible and HR independent; increase in newsletter income, building of editorial department, building preparation	State where PaletteCamp and "*iro*" both create employment, the start of business in the "Home of Dawn"
Dissemination of information in Japan and overseas	Development of website, SNS accounts, and relationships in Japan and overseas	Establishment of communication network and provision of topics	Possess a strong communication capability that equates Rurio with Futaba through expanded recognition

Examples of projects carried out by Rurio

PaletteCamp

Already completed four times, once completely autonomously

iro

First issue already published and over 100 copies distributed

Product development
(Futaba Daruma cookies)

Prototype completed and developed by a registered dietitian who participated in a PaletteCamp

Rurio

https://www.rurio.jp

An organization run mainly by three current Tohoku University students. The goal is to register in Futaba and start a business in the near future. With a concept of "community-based urban development," the project connects locals with people from outside the area in order that they may build industries together and create the Futaba brand. Rurio's name is based on the Japanese for " Lapis Lazuli Blue," signifying the beautiful color of Futaba's seas.

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Startup Entrepreneur

02

Commercializing Seeds Management Utilizing Highly Accurate DNA Analysis Technology

The only technology in the world that gives cheaper, faster, and more accurate DNA analysis. GENODAS was launched combining traceability and intellectual property management by elucidating the differences in the DNA of all organisms. As the first startup registered in the Aobayama Garage, the company aims to create an international DNA certification system.

[Anticipated Social Effects]

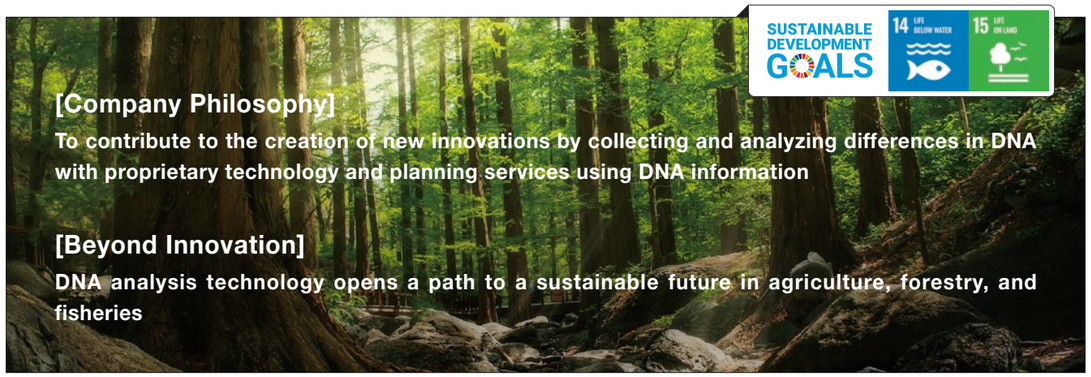
- **Proprietary identification technology for varieties, individuals, places of origin (regions), and species based on highly accurate DNA analysis**
- **DNA-based management of seeds and seedlings (intellectual property) for a society that rewards developers and producers**
- **Become a DNA-certified platformer with an international seeds and seedlings management license**

Matsuo majored in Forest Ecology at the Graduate School of Agricultural Science, Tohoku University. Under Professor Yoshihisa Suyama, she devoted herself to research on the individual identification of Bamboo spp. based on DNA. "Bamboo spp. are used throughout the world in clothing, food, and shelter," she says. "I got hooked on research when I investigated the simultaneous flowering and death of dwarf bamboo., a phenomenon which occurs once every several hundred years."

Matsuo once took a job away from research, but when she returned to her alma mater as an academic researcher, she learned about the support system for female researchers, and her passion for research was rekindled.

Addressing her research theme for the first time in approximately five years, events took an unexpected turn. Requests came in one after another for DNA analysis of various organisms, from microorganisms to plants and animals, and it became difficult to respond to them in the laboratory.

As a result, she launched GENODAS in December 2021 to successively meet the needs for DNA identification. GENODAS is a start-up company that detects DNA information at a lower cost, in a shorter period of time, and with higher accuracy than conventional methods, and is planning services using this information. In the first six months after launch, the company contracted and conducted joint research with seven universities, three institutions, and eight companies. As a highly trusted company, GENODAS also cooperates with police investigations into infringements of breeder's rights (seeds and seedlings developer rights). Matsuo says that DNA analysis gives her an intimate feel for the troubles of society. One major opportunity to start the business came from an inquiry regarding the identification of shiitake mushroom varieties from the Japan Edible Mushroom Spawn Association. It is estimated that 10 billion yen worth of annual domestic sales of shiitake mushrooms are produced by reimporting mushroom beds made from seeds suspected of having been illegally leaked.



[Company Philosophy]

To contribute to the creation of new innovations by collecting and analyzing differences in DNA with proprietary technology and planning services using DNA information

[Beyond Innovation]

DNA analysis technology opens a path to a sustainable future in agriculture, forestry, and fisheries

Ayumi MATSUO Representative and Technical Development Lead of GENODAS Inc.

GENODAS

GENODAS Inc.

September 2019: Hired as Assistant Professor at Tohoku University Graduate School of Agricultural Science
December 2021: GENODAS Inc. founded
2025: DNA Mark service planned to protect breeder's rights
2027: International seeds and seedlings license management system planned for establishment

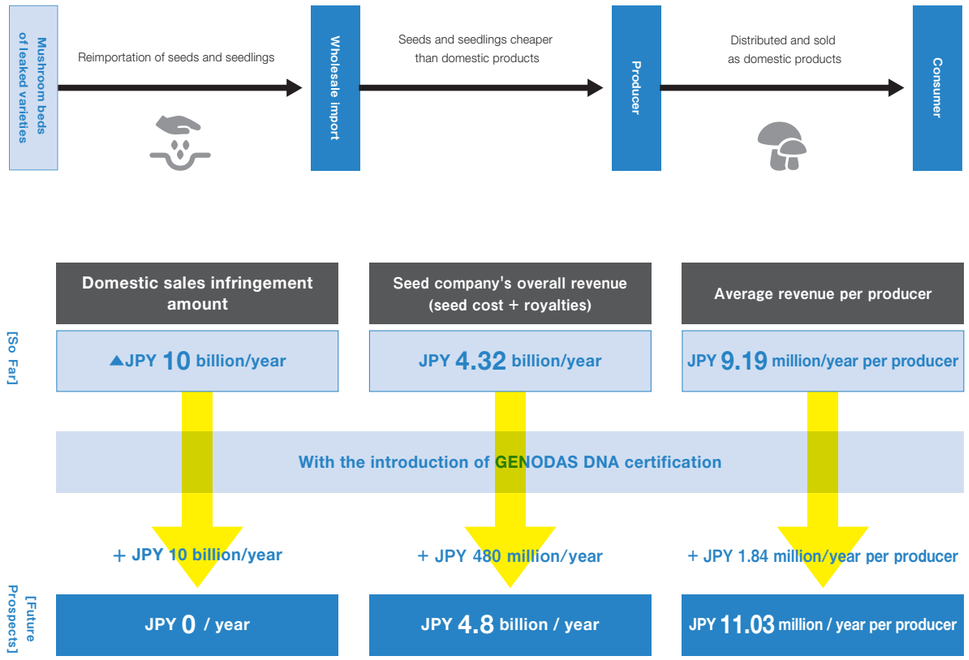
Ongoing Outflow and Deliberate Mislabeling of Agricultural, Forestry and Fishery Products

● **Illicit outflow and overseas localizing production are increasing**
▶ Example: Shine Muscat (China), royalty loss of over JPY 10 billion/year

● **Deliberate mislabeling of species and place of origin**
▶ Example: Deliberately mislabeling Chinese clams as originating from Japan

First target is the shiitake industry

Total domestic sales amount to approximately 100 billion yen
Approximately 12,000 tons/year of shiitake mushroom beds suspected of infringement are imported each year and sold as domestically-produced shiitake mushrooms for **over 10 billion yen per year**



Infringements amount to approximately 10 billion yen per year in domestic sales opportunities. When calculated from general royalties and cost rates, seeds and seedlings companies are being deprived of approximately 480 million yen in costs and royalties to which they are entitled, and approximately 1.84 million yen in revenue is lost per producer. GENODAS aims to introduce DNA certification and use it to prevent reimportation of seeds. Joint research with the Forest Research and Management Organization (National Research and Development Agency), and the Japan Edible Mushroom Spawn Association, and collaboration with the Japan Association for Techno-innovation in Agriculture, Forestry and Fisheries (Public Interest Incorporated Association), and the National Agriculture and Food Research Organization (NARO) (National Research and Development Agency), Bio-oriented Technology Research Advancement Institution (BRAIN) have paved the way for social implementation of GENODAS' research results.

"Seeds and seedlings of strawberries, Shine Muscat, etc., are also taken out of Japan illegally and grown overseas," says Matsuo. "Royalties alone amount to 10 billion yen per year for the Shine Muscat variety, and it is difficult to stop the infringement simply by legal measures under the Plant Variety Protection and Seed Act and the Food Labeling Act. GENODAS' technology uses highly accurate DNA identification technology to reveal the "differences" among all organisms, and this is where it comes in handy. We want to integrate traceability and intellectual property management to protect rights and interests."

Adding DNA information to the existing seeds and seedlings registration process will also make registration faster and more accurate. Beyond that, Matsuo envisions a seeds and seedlings version of the Japanese Society for Rights of Authors, Composers and Publishers (JASRAC). The society would manage intellectual property for seeds and seedlings by traceability using DNA information based on scientific evidence, generating revenue from intellectual property management fees from growers and other parties.

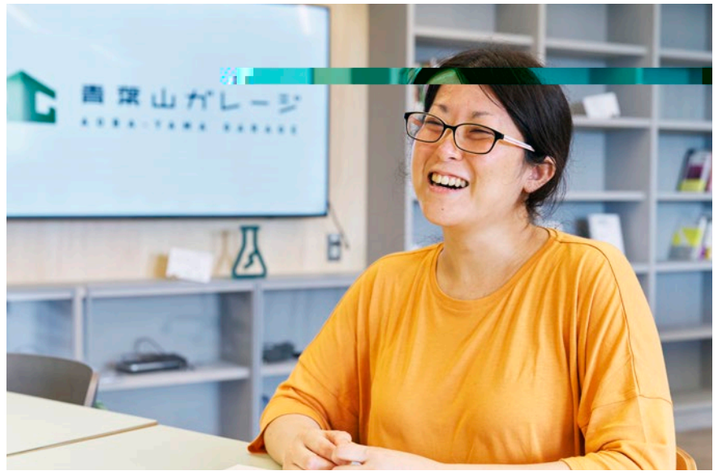
In founding GENODAS, Matsuo took advantage of the Tohoku University Business Incubation Program (BIP), which supports the commercialization of research results. The capital of 2.5 million yen came from her own funds. The headquarters is located in Aobayama Garage, a shared office for startups on the new extension of the Aobayama campus. For research and development, she uses equipment provided by the Tohoku University Technical Support Center. With stable employment of post-doctoral fellows and local talent in mind, GENODAS has established a research base at the affiliated Integrated Field Science Center (Naruko Onsen, Osaki), which has a laboratory, as well as in Aobayama.

"Agricultural science is a discipline closely related to our daily lives, but I wasn't really aware how useful it was to society when I was a student," says Matsuo. "Now I am certain it is. We want to create a social framework in which the efforts of agriculture, forestry, and fisheries-related industries are duly rewarded. Our aim is to change the world through DNA analysis. The Aobayama Garage brings together companies grounded in a variety of academic disciplines, so we can get ideas and practical advice there. Someday, I hope to co-create a new business with someone I meet at the Garage."

Matsuo's priority is to bring happiness to the world rather than to expand the company's business. Currently, she is accumulating demonstrations for her DNA certification business while receiving commissions to develop new varieties of seeds and seedlings and perform quality control of the manufacturing process utilizing her proprietary DNA analysis. GENODAS aims to provide a DNA certification mark in three years, and acquire ISO certification and establish an international seeds and seedlings management license conforming to the International Union for the Protection of New Varieties of Plants (UPOV) Convention in five years.

GENODAS' innovation targets

Combination of traceability and intellectual property management through proprietary DNA identification technology
↓
Realization of a society in which the efforts of seeds and seedlings developers and producers are rewarded



GENODAS Inc. is the first company to be registered at Aobayama Garage
"Since we are a university-originated startup company, customers seem to be comfortable placing consignments with us in terms of technology and cost"

Ayumi MATSUO

Representative and Technical Development Lead. Graduated from the Tohoku University Graduate School of Agricultural Science, and engaged in the development of technology for individual identification of species, place of origin, variety, and individual organisms by high-precision next-generation DNA analysis. After working as a laboratory assistant at Akita Prefectural University and as an academic researcher at the Tohoku University Graduate School of Agricultural Science, she became an assistant professor. Now investigating traceability services utilizing proprietary DNA analysis technology. Established GENODAS Inc. in 2021.

Startup Entrepreneur

03

A World Where Everyone Can Live in Space

Starting a business in his first year of the master's program, Kobayashi aims for a prosperous future by creating a new world through his own work. Together with Associate Professor Toshinori Kuwahara (Graduate School of Engineering), Kobayashi is developing ELS-R, a small satellite that can be used for experiments and manufacturing in space. He has a grand vision, starting with the development of a platform to replace the International Space Station.

[Anticipated Social Effects]

- **Realization of Japan's first space environment platform**
- **Development of services that allow private companies to carry out experiments and manufacturing in space**
- **Development of technologies to enable everyone to live in space**

Image of space station type ELS-R

April 2018: Admitted to the Faculty of Engineering, Tohoku University
February 2021: Started ElevationSpace Inc. while still enrolled
2023: Development of ELS-R underway and launch scheduled
Around 2025: Services for space experiments are scheduled to begin
- Raised approximately 350 million yen by the seed round
- Signed four joint research agreements with Tohoku University

After studying architecture, Ryohei Kobayashi aspired to develop technology that would allow everyone to live in space utilizing the field of space architecture. In February 2021, he established ElevationSpace with Associate Professor Toshinori Kuwahara, who has a proven track record in the development and operation of small satellites, as CTO. ElevationSpace develops the ELS-R, an unmanned, 100-kilogram class satellite that will return to Earth and Japan's first space environment platform.

"Space travel is now in full swing, but to live in space, we need to conduct various demonstration experiments, such as the reactions of organisms and the growth of plants in zero-gravity conditions," says Kobayashi. "The service life of the International Space Station, which is responsible for these experiments, is coming to its end in 2028, so the development of a new platform is a great opportunity."

The goal is to establish a service that allows private companies to conduct experiments within the satellite. The coming era when everyone can go to space will necessitate a wide variety of space-oriented products, and we expect the need for space applications to develop these products to increase rapidly. The goal is to launch the ELS-R technology demonstrator in 2023 and start the space experiment service around 2025. His vision has expanded to include space transportation, construction of space hotels, entertainment and education in space, and the like. "There are still very few researchers working in this field," he says with a twinkle in his eye, "I want to create a new world by my own."

ElevationSpace has attracted investment from venture capitalists, operating companies, and individual investors, and has raised a cumulative total of approximately 350 million yen in funding (as of March 2022). For Kobayashi, who originates from Akita Prefecture, it means a lot to base his grand project here in Tohoku.

"Tohoku University is also home to two other high-profile space startups, ALE and ispace, as well as the Japan Aerospace Exploration Agency (JAXA) (National Research and Development Agency) rocket facilities in Noshiro, Akita Prefecture, and Kakuda, Miyagi Prefecture," he says. There is a lot of potential for the space industry in Tohoku. I would like to revitalize the regional economy from here."

Examples of services utilizing the ELS-R

Experiments & tests	Manufacturing	Entertainment & education
Protein crystallization	Semiconductor manufacturing	Promotions
Life science experiments	3D bioprinting	Image and video data
Space equipment testing	Special alloys	Science classes

Ryohei KOBAYASHI

Co-Founder & CEO. An encounter with space architecture at the age of 19 changed his life while attending Akita National College of Technology Later, he majored in architecture and aerospace engineering at Tohoku University, where he received his master's degree in engineering. While at University, he was involved in the research and development projects of satellite and next-generation space architecture. He won first place in Japan and second place in the world in space architecture. After internships with various companies, including a space startup, he launched ElevationSpace Inc. He has received awards from various programs and contests, including Forbes JAPAN 30 UNDER 30 2022 and the Sido Next Innovator organized by METI and JETRO.

Startup Entrepreneur

04

Pioneering the Future of Agriculture With Apple Transport Robots

Kisui Tech is developing a robot that will be useful in apple farms. The CEO, Tamir Blum, who aims for the commercialization of the robot, is a space robotics expert who studied aerospace engineering at Tohoku University. He hopes to support aging farmers by reducing heavy labor during harvest with the development of robots and AI technology. Kisui Tech will pioneer the future of agriculture and empower rural communities, which constitute the backbone of our societies and enable our lives.

[Anticipated Social Effects]

- **AI robots to improve productivity and reduce labor in agricultural works**
- **Economic revitalization of rural areas**
- **Dissemination of next-generation agriculture from Tohoku to the world**

(Left) **Tamir BLUM** Founder and CEO, Kisui Tech Co., Ltd.

Oct. 2018: Entered the Graduate School of Engineering, Tohoku University
Feb. 2021: Founded Kisui Tech Inc. while still enrolled
Around 2023: Commercialization of robots planned
● Crowdfunding Challenge Project for Tohoku University students
Secured a 950,000-yen donation through the Tomoni Program (also known as Tomopro!)

While being a student at the University of New Hampshire, Blum was attracted to the research of Professor Kazuya Yoshida (Graduate School of Engineering), who was participating in an international race to conduct an unmanned exploration of the Moon's surface. This led him to a short study abroad at Tohoku University for three months. Blum later earned a master's degree in aerospace engineering from UCLA, but he wanted to study again in Sendai under Professor Yoshida, and so entered the doctoral program at Tohoku University. While in Tohoku, he saw elderly people doing hard labor in farming villages and became interested in the idea of helping farmers with specialized robots and AI technology. When Blum interviewed apple farmers to find out how he could make their work easier, he found that it would be helpful to have a robot assist harvesting, which is the hardest part.

Each basket of harvested apples weighs 20 kg. Carrying a total of 5,000 kg of apples a day to the pickup location is a major burden for aging farmers. Blum first founded Kisui Tech Inc. in 2021 to develop a transport robot. They had apple farmers use prototype products in various regions and made many improvements. The final product was an AI-equipped tracking robot that carries a basket of harvested fruit to a pickup location at the push of a button, then automatically returns to the harvest site and follows the movements of the human operator. They estimate that this will improve harvest efficiency by 33%.

While agricultural tracking robots are a field that is attracting attention worldwide, Kisui Tech's strength lies in its application of lunar exploration robot technology. Simultaneous localization and mapping (SLAM) technology, which automatically creates a map without GPS, enables the robot to skillfully avoid obstacles and move. Kisui Tech plans to conduct user tests with the aim of utilizing the technology for other fruit trees and vegetables, and commercialization around 2023.

The project was adopted by the Ministry of Agriculture, Forestry and Fisheries (MAFF) as a Demonstration Project to Promote University-Originated Startups in Agriculture, Forestry and Fisheries, and other Research Fields, and has attracted investment from MAKOTO CAPITAL inc., a venture investment company in Sendai. Blum is enthusiastic; "We will ship robots designed at Tohoku University that help farmers all over the world, and create a society where everyone can live happily in every community."

Kisui Tech Co., Ltd.

https://kisuitech.com/en/

AI-based agricultural robots incorporating space exploration technology to improve harvesting efficiency by 33% (projected)

Tamir BLUM

Dr. Tamir Blum is the CEO and founder of Kisui Tech Co., Ltd. Kisui Tech aims to bring AI, robotics, space engineering, and space robotics know-how into agritech to empower orchard farmers in Japan and around the world. At Tohoku University's Space Robotics Lab, he worked on the application of reinforcement learning and other AI techniques for various lunar robots including rovers and legged/climbing robots, and received his doctorate. He is also a UCLA Master's graduate where he focused on controls and robotics. Blum has conducted numerous exchange programs, including the International Space University, located in France; Tsinghua University in Beijing, China; and Universidad Carlos III de Madrid (UC3M), Spain. He also has obtained industry experience through work at SpaceX and AeroVironment, space startups both located in California.

Startup Entrepreneur

05

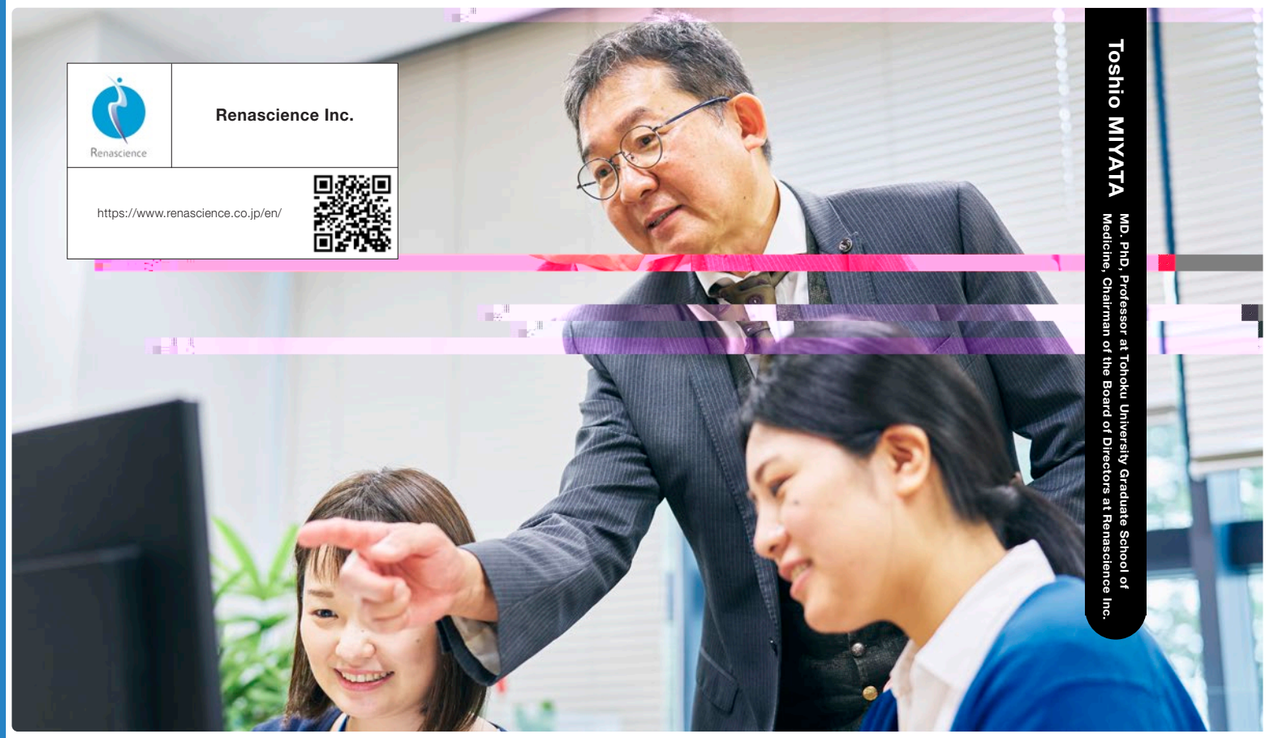
From "Creating Novel Healthcare" to "Developing Human Resources for Next Generation."

A Medical Startup from Tohoku University

Renascience was established with the aim to bring research results of the university to patients more steadily and as early as possible. Renascience uncovers what the clinical practice really needs and conducts the research & development, and medical implementation of pharmaceuticals, medical devices, and artificial intelligence (AI). As a company listed on the Mothers market of the Tokyo Stock Exchange, Renascience will create the healthcare for the next generation from Tohoku University.

[Anticipated Social Effects]

- **Medical implementation of various modalities to solve clinical issues**
- **Rapid clinical development through investigator-initiated clinical trials**
- **Solving medical issues through Open Innovation**



Toshio MIYATA, MD. PhD.

Professor at the Graduate School of Medicine and Chairman of the Board of Directors at Renascience Inc. After graduating from Nagoya University School of Medicine in 1986, Miyata served as Assistant Professor at the Research Institute for Microbial Diseases, Osaka University; Associate Professor at Department of Internal Medicine, Nagoya University School of Medicine; Professor at Department of Nephrology and Metabolism, Tokai University School of Medicine ; and Director of the Institute of Medical Sciences, Tokai University, before joining Tohoku University. Miyata is also Member of Royal Academy of Medicine in Belgium; Program Supervisor for Science and Technology Platform Program for Advanced Biological Medicine, Japan Agency for Medical Research and Development (AMED); a member of the Council on Pharmaceuticals of the Headquarters for Healthcare Policy, Prime Minister and His Cabinet Office; and Chair of the MEXT Life Science Committee.

Renascience conducts basic research and clinical development of diverse modalities, including pharmaceuticals, medical devices, and AI solutions. Since the establishment, led by Toshio Miyata, who specializes in nephrology, Renascience has broadened its research focus to include chemistry, biology, medical engineering, information engineering, and other diverse perspectives to address a variety of medical issues.

"It is the most important to bring cutting-edge research outcomes at the university to patients as early as possible," says Miyata. "We started the biotech to encourage collaboration between universities and business companies, and to contribute to the translational science. Tohoku University, which upholds a philosophy of respect for practical learning, is strong in the field of engineering. Tohoku University also has an abundance of medical data at the University Hospital and the Tohoku Medical Megabank Organization. By fully utilizing the research infrastructure that is one of the strengths of the university, we can efficiently lead the research outcomes to the medical applications."

Renascience focuses on the issues related to the declining birthrate and aging society, including aging-related diseases (cancer, respiratory diseases, diabetes, and cardiovascular diseases), and female/pediatric medical issues. Renascience develops "PAI-1 inhibitor" as the new medicines for chronic myeloid leukemia and malignant melanoma. Renascience also undertakes the development of an oral therapeutic to prevent deterioration of new coronavirus pneumonia, which is socially an urgent and important issue. Renascience has so far conducted over 20 investigators-initiated clinical trials in cooperation with many medical institutions including university hospitals across Japan and overseas. In addition to pharmaceuticals, Renascience will also contribute to solving medical issues by developing the disposable ultrafine endoscope for peritoneal dialysis and various AI software for diabetes treatment support etc.

Miyata furthermore hopes to actualize a ripple effect on the development of novel human resources and the increase in investment through startup companies.

"In addition to external funding such as public funds and collaboration with business companies, I expect that a new framework of the investment to university research through equity investment, e.g. through venture capital, will support the research activities and accelerate medical implementation of the research outcomes. I also expect that such new investment also have a positive impact on the development of human resources, who will in turn create new values," he says. "The development of human resources who consider and act independently, regardless of the existing values, will further revitalize society and accelerate the above positive cycle. I would like to link this cycle to the activation of local economies and thereby contribute to the next generation."

Renascience is the first startup company from Tohoku University to be listed on the Mothers market of the Tokyo Stock Exchange. The new medical value and business models, born from Renascience, now attract further attention.

Renascience aims for new medical care

Modality	Application	Stage
Pharmaceutical products	Chronic myeloid leukemia	Phase III in progress
	New coronavirus pneumonia	Late Phase II in progress
	Malignant melanoma	Phase II in progress
	Vitamin D-resistant rickets	Clinical study in preparation
	Angiosarcoma	Phase II in preparation
	Alopecia	Phase I in preparation
	Autism spectrum disorder	Phase II completed
	Premenstrual syndrome / Premenstrual dysphoric disorder	Phase II in progress
	Menopausal disorder	Clinical study in preparation
Medical equipment	Peritoneal dialysis (Disposable ultrafine endoscope)	Preparing filing for approval
Artificial intelligence (AI)	Respiratory function diagnosis	Development stage
	Support for chronic dialysis system	Development stage
	Support for diabetes treatment	Development stage
	Assessment of swallowing function	Exploratory stage
	Pediatric developmental disability	Exploratory stage
	Pathological imaging of breast cancer	Exploratory stage
Diagnostic pharmaceuticals	Phenylketonuria	Development stage

TOPICS

Development of Therapeutics for the Treatment of Lung Injury Associated with Novel Coronavirus Infection

Renascience is developing a drug for lung injury caused by novel coronavirus infection. A clinical trial is conducted at 20 medical institutions nationwide in collaboration with Tohoku University, with the support totaling 600 million yen from the AMED Research Program on Emerging and Re-emerging Infectious Diseases.

Summary of Financial Report

**In this section we clarify the University's summary of financial report.
The financial statements for a national university corporation in Japan are different than the financial statements and framework used for a normal company.
To facilitate the understanding of our stakeholders, we have provisionally calculated, and made available, financial statements conforming to corporate accounting, in addition to financial statements that comply with accounting standards for national university corporations.**

Tohoku University Archives (the former Reading Room at Tohoku Imperial University, which is a Registered Tangible Cultural Property)

Clarifying the Financial Position of Tohoku University

Balance sheet

(Unit: Millions of yen)

Item	FY2021 As of March 31, 2022	FY2020 As of March 31, 2021	Change from previous year
Assets			
(Non-current assets)	338,787	345,864	(7,077)
Land	122,125	122,125	0
Buildings	142,604	151,169	(8,565)
Machinery and equipment	27,024	27,057	(33)
Books/Work of art	27,273	26,376	897
Construction in progress	1,514	344	1,170
Investment securities	12,384	12,092	292
Shares of subsidiaries and associates	143	138	5
Other securities of subsidiaries and associates	4,554	5,499	(945)
Other	1,162	1,059	103
(Current assets)	62,813	53,625	9,188
Cash and deposits	47,745	39,987	7,758
Accounts receivable	13,936	12,581	1,355
Securities (Redeemable within one year)	171	171	0
Other	960	885	75
Total (Assets)	401,601	399,490	2,111

Item	FY2021 As of March 31, 2022	FY2020 As of March 31, 2021	Change from previous year	
Liabilities				
(Non-current liabilities)	105,280	107,173	(1,893)	
Deferred inflow of assets	70,749	67,917	2,832	※1
Long-term borrowings	23,654	26,840	(3,186)	
Other	10,877	12,414	(1,537)	
(Current liabilities)	53,109	52,335	774	
Deferred inflow of grants for operations	0	2,950	(2,950)	※1
Deferred inflow of donations	17,062	16,286	776	※1
Deferred inflow of sponsored research	5,427	4,401	1,026	※1
Current portion of long-term borrowings	3,541	3,610	(69)	
Accounts payable	20,816	19,518	1,298	
Other	6,261	5,567	694	
Total (Liabilities)	158,390	159,508	(1,118)	
Net assets				
Capital	192,192	192,192	0	
Capital surplus	13,963	19,890	(5,927)	
(Capital surplus	125,558	126,382	(824))	
(Accumulated depreciation not included in income statement	(108,683)	(104,262)	(4,421))	※2
(Accumulated gains or losses on investment securities not included in income statement	(2,912)	(2,229)	(683))	※2
Earned surplus	37,054	27,899	9,155	
(Gross profit	9,866	2,306	7,560)	
Total (Net assets)	243,210	239,982	3,228	
Total (Liabilities, Net assets)	401,601	399,490	2,111	

*Amounts are rounded down to the nearest million, so the total amounts may not necessarily match. (The same applies hereinafter throughout the summary of financial report.)

The balance sheet presents information about Tohoku University's financial position on the reporting date (March 31) by presenting assets, liabilities, and net assets.

One feature of the balance sheet in FY2021 is that, due to the declining trend in new facility improvement projects over the past few years, depreciation exceeded the amount spent on acquiring new assets, leading to a reduction in the amount recorded for Buildings.

The Income Statement presents information about the University's financial performance during the reporting period by stating all of its revenues and expenses.

One feature of the income statement for FY2021 was that the amounts for sponsored research and other grants were higher because of an increase in large-scale contract research with the Japan Agency for Medical Research and Development (AMED) (National Research and Development Agency) and joint research with private companies, as well as grants to the University Hospital for COVID-19 research from the national government and Miyagi Prefecture.

In FY2021, gross profit was pushed up compared to that of a typical year due to accounting treatments peculiar to national university corporations in the final year of National university corporations are public institutions that conduct educational and research activities funded in part by the taxes paid by citizens, and unlike commercial companies, they do not aim to acquire profit. For this reason, unique accounting treatments are applied that are different than those for general corporate accounting. These include temporarily recording part of revenue as liabilities before recognizing it as revenue (*1) in accordance with the prescribed rules, and deducting part of depreciation directly from net assets without recording it as an expense (*2).

Growth in Size of Business Due to Increases in Sponsored Research and Other Grants

Income Statement

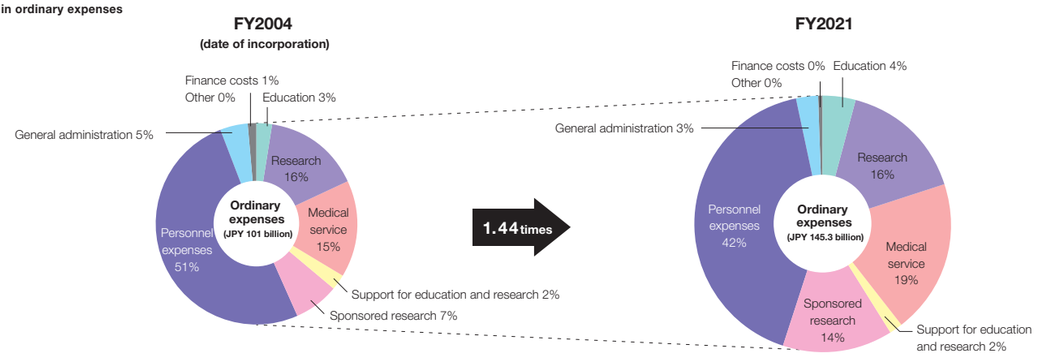
(Unit: Millions of yen)

Item	FY2021 From April 1, 2021, to March 31, 2022	FY2020 From April 1, 2020, to March 31, 2021	Change from previous year
Ordinary expenses			
Education	6,105	5,429	676
Research	23,114	18,708	4,406
Medical service	28,408	27,364	1,044
Support for education and research	2,456	2,592	(136)
Sponsored research	19,924	15,851	4,073
Personnel expenses	60,534	60,832	(298)
General administration	3,987	3,504	483
Finance costs	802	910	(108)
Other	2	1	1
Ordinary expenses total	145,336	135,195	10,141
Extraordinary loss	1,116	470	646
Gross profit	9,866	2,306	7,560

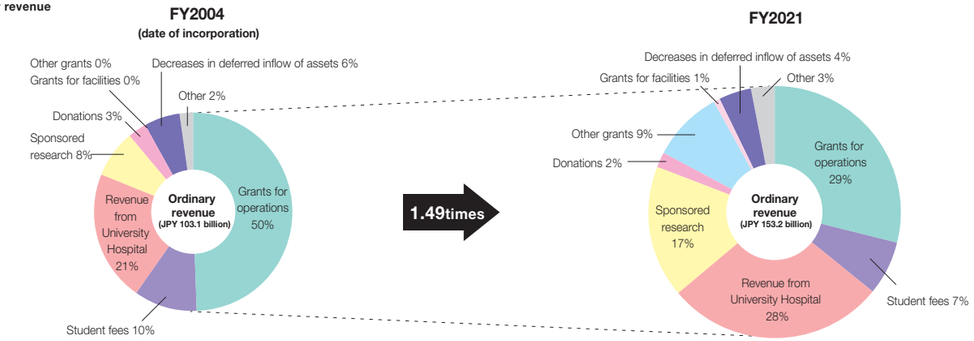
Item	FY2021 From April 1, 2021, to March 31, 2022	FY2020 From April 1, 2020, to March 31, 2021	Change from previous year
Ordinary revenue			
Grants for operations	44,684	41,779	2,905
Student fees	10,659	10,714	(55)
Revenue from University Hospital	43,612	41,519	2,093
Sponsored research	25,298	20,631	4,667
Other grants	14,151	8,460	5,691
Donations	2,635	2,477	158
Grants for facilities	956	807	149
Decreases in deferred inflow of assets	6,559	6,367	192
Other	4,686	4,456	230
Ordinary revenue total	153,243	137,213	16,030
Extraordinary profit	2,499	147	2,352
Reversal of reserve for specific purposes	575	610	(35)

[Change in Size of Business]

Change in ordinary expenses



Change in ordinary revenue



As a result of actively promoting the diversification of our funding sources, external funding such as sponsored research, and revenue from the University Hospital have increased significantly since incorporation in 2004, and there has been a growth in the size of business as a whole.

Using Provisional Calculations to Visualize Tohoku University's Summary of Financial Report

In this section we review and discuss the issues facing Tohoku University, using provisional calculations of financial statements conforming to corporate accounting.

[Supplementary Information on Provisional Calculation of Financial Statements Conforming to Corporate Accounting]
- Expenses not recognized in profits or losses (such as depreciation not recognized in profits or losses) were recorded as expenses in the fiscal year under review.
- Expenses not provided for (such as provision for retirement benefits not provided for) were recorded as expenses in the fiscal year under review.
- Grants for operations and donations, etc., are not used as a balancing item to expenses executed, in order to equalize profits and losses, and as a rule, the amount of grants or the amount received for the current period is recorded as revenue.
- Decreases in deferred inflow of assets recognized as revenue as a balancing item for depreciation to equalize profits and losses are reversed.
- The reversal of reserve for specific purposes recorded as a balancing item for expenses executed in relation to the reserve for specific purposes to equalize profits and losses is reversed.

Balance sheet before restatement

Balance sheet (FY2021) (Unit: Millions of yen)

Assets	
(Non-current assets)	338,787
Land	122,125
Buildings	142,604
Machinery and equipment	27,024
Books/Work of art	27,273
Other	19,759
(Current assets)	62,813
Cash and deposits	47,745
Accounts receivable	13,936
Other	1,131
Total assets	401,601
Liabilities	
(Non-current liabilities)	105,280
Deferred inflow of assets	70,749
Long-term borrowings	23,654
Provisions	875
Other	10,001
(Current liabilities)	53,109
Deferred inflow of grants for operations	0
Deferred inflow of donations	17,062
Deferred inflow of sponsored research	5,427
Current portion of long-term borrowings	3,541
Accounts payable	20,816
Provisions	1,081
Other	5,180
Total (Liabilities)	158,390
Net assets	
Capital	192,192
Capital surplus	13,963
(Capital surplus	125,558)
(Accumulated depreciation not included in income statement	(108,683))
(Accumulated gains or losses on investment securities not included in income statement	(2,912))
Earned surplus	37,054
(Gross profit	9,866)
Total (Net assets)	243,210
Total (Liabilities, Net assets)	401,601

Balance sheet after restatement

Provisionally calculated financial statements conforming to corporate accounting (FY2021) (Unit: Millions of yen)

Item	Whole University	Education and research business	Externally funded business	Hospital and medical service business
Assets				
(Non-current assets)	338,787	265,487	35,581	37,718
Land	122,125	114,629	-	7,496
Buildings	142,604	105,286	13,638	23,679
Machinery and equipment	27,024	12,270	8,312	6,440
Books/Work of art	27,273	26,730	530	11
Other	19,759	6,569	13,099	89
(Current assets)	62,813	31,908	15,868	15,037
Cash and deposits	47,745	30,406	11,236	6,101
Accounts receivable	13,936	1,026	4,326	8,583
Other	1,131	474	304	352
Total (Assets)	401,601	297,395	51,449	52,756
Liabilities				
(Non-current liabilities)	63,573	31,725	641	31,206
Long-term borrowings	23,654	-	-	23,654
Provisions	29,934	23,812	-	6,121
Other	9,985	7,913	641	1,430
(Current liabilities)	40,154	19,544	12,411	8,197
Deferred inflow of grants for operations	1,996	1,996	-	-
Advances received for sponsored research	5,398	-	5,398	-
Current portion of long-term borrowings	3,541	-	-	3,541
Accounts payable	20,816	11,152	6,079	3,584
Provisions	3,241	2,490	-	751
Other	5,159	3,904	933	321
Total (Liabilities)	103,727	51,270	13,053	39,404
Net assets				
Capital	192,192	208,672	-	(16,479)
Capital surplus	129,858	113,771	-	16,086
Earned surplus	(24,177)	(76,318)	38,396	13,745
(Gross profit/loss	(2,984)	(9,073)	6,396	(307))
Total (Net assets)	297,873	246,125	38,396	13,352
Total (Liabilities, Net assets)	401,601	297,395	51,449	52,756

P&L before restatement

Income Statement (FY2021) (Unit: Millions of yen)

Ordinary expenses	
Education	6,105
Research	23,114
Medical service	28,408
Support for education and research	2,456
Sponsored research	19,924
Personnel expenses	60,534
General administration	3,987
Finance costs	802
Miscellaneous losses	2
Ordinary expenses total	145,336
Ordinary revenue	
Grants for operations	44,684
Student fees	10,659
Revenue from University Hospital	43,612
Sponsored research	25,298
Other grants	14,151
Donations	2,635
Grants for facilities	956
Decreases in deferred inflow of assets (revenue as a balancing item for depreciation)	6,559
Financial revenue	43
Miscellaneous profit	4,643
Ordinary revenue total	153,243
Extraordinary loss	1,116
Extraordinary profit	2,499
Reversal of reserve for specific purposes	575
Gross profit	9,866

P&L after restatement

Provisionally calculated income statement conforming to corporate accounting (FY2021) (Unit: Millions of yen)

Item	Whole University	Education and research business	Externally funded business	Hospital and medical service business
Grants for operations	46,010	41,935	-	4,074
Student fees	10,659	10,659	-	-
Revenue from University Hospital	43,612	-	-	43,612
Sponsored research	25,298	-	25,298	-
Other grants	16,250	-	16,250	-
Donations	3,671	-	3,671	-
Total revenue	145,501	52,595	45,219	47,686
Education	7,089	4,575	2,490	22
Research	27,248	16,323	10,692	232
Medical service	28,537	-	1,023	27,514
Support for education and research	2,933	2,831	102	-
Sponsored research	19,924	-	19,924	-
Personnel expenses	60,557	35,193	6,006	19,357
General administration	4,464	3,074	1,068	321
Total expenses	150,756	61,998	41,309	47,448
Business profit or loss	(5,254)	(9,402)	3,909	238
Financial revenue	283	135	148	-
Miscellaneous profit	4,643	2,071	2,344	227
Finance costs	1,583	861	5	716
Miscellaneous losses	2	2	-	0
Ordinary profit or loss	(1,914)	(8,059)	6,397	(251)
Extraordinary profit	54	48	-	6
Extraordinary loss	1,124	1,061	0	62
Gross profit/loss	(2,984)	(9,073)	6,396	(307)

The accounting system used by national university corporations is characterized by accounting treatments peculiar to such organizations and different than corporate accounting, which has led to stakeholders expressing the view that the financial statements are difficult to understand. In response to this, the University began to provisionally calculate financial statements conforming to corporate accounting to enable the substance of its summary of financial report to be more easily understood. We began provisionally calculating financial statements in FY2019 and have implemented improvements every year. This fiscal year marks the third time we have undertaken this initiative.

In FY2021, despite recording 9.8 billion yen in gross profit when using national university corporation accounting, the result of using the provisional calculations conforming to corporate accounting was that the University conversely recorded a 2.9 billion yen gross loss (a decline of 12.8 billion yen when compared to the figures before restatement). The main cause of this loss was accounting treatment for depreciation. Treatment used to restate in accordance with corporate accounting included depreciation for buildings (6.2 billion yen) which had not been recognized in profits or losses being recognized as an expense on the P&L, and decreases in deferred inflow of assets (6.7 billion yen) in which revenue is recognized mainly as a balancing item for depreciation for facilities to equalize profits and losses, which resulted in an increase in expenses.

Through these provisional calculations made in conformance with corporate accounting, the size of the impact of depreciation for facilities, etc., on the management of the University becomes visible. Depreciation reduces the value of assets such as facilities every year, and grants for facilities provided by the state, which are the source of funding for upgrades, continue to be insufficient. Installing and upgrading facilities while actively diversifying funding sources to avoid being solely dependent on government funding is one of the issues faced by the University going forward.

Looking at gross profit by business, the Education and research business recorded a large amount of depreciation for buildings, and because sources of funding from the state in the form of grants for operations and grants for facilities were insufficient to cover this, a gross loss of 9.0 billion yen was posted. On the other hand, the Externally funded business, which is the result of the University's self-help activities, posted a profit of 6.3 billion yen due to active efforts made to acquire external funding. By showing how insufficient funding for the education research business is supplemented by the externally funded business, it makes the reality of the University's management easier to understand.

Through a process of trial and error, we will continue to provisionally calculate financial statements conforming to corporate accounting, aiming to actively disclose information that makes our summary of financial reports easier to grasp, and hoping to gain the continued understanding and support of all our stakeholders.

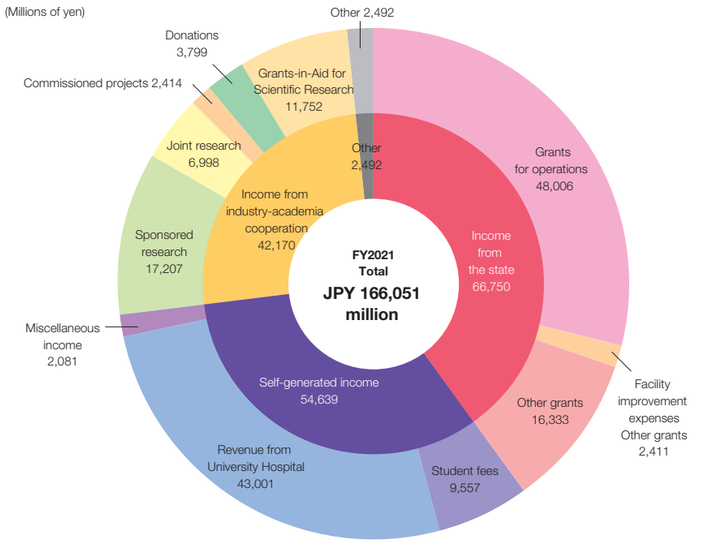
All External Sources of Funding Increased Year-on-Year

In particular, external funding arising primarily from joint research with private-sector organizations showed remarkable growth.

1. Total income

The income of Tohoku University can be broadly divided into income from the state, self-generated income, and income derived from industry-academia cooperation. It consists of a diverse range of income sources, including grants for operations, subsidy income, income from student fees, revenue from University Hospital, income from industry-academia cooperation, and donations.

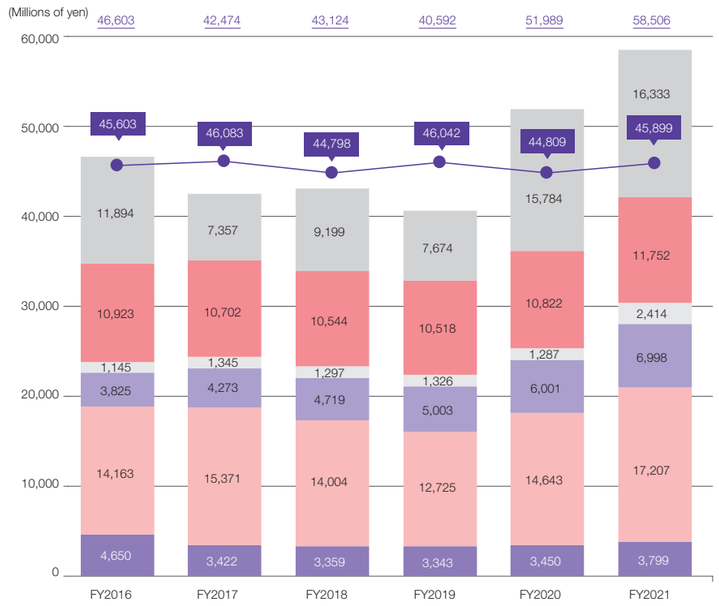
Total income in FY2021 was 166 billion yen, with the combination of self-generated income and income from industry-academia cooperation, which represent the University's self-help activities, reaching 96.8 billion yen, or 58.3% of total income.



1. Amount of External Funding and Grants for Operations Received

Total external funding acquired in FY2021 increased 58.5 billion yen year-on-year. In addition, looking according to financial resources, all sources of funding recorded year-on-year increases. In particular, sponsored research, joint research, and other grants rose significantly due to the advancement of large-scale sponsored research with the Japan Agency for Medical Research and Development (AMED) (National Research and Development Agency), and increases in joint research with private-sector organizations.

*These figures are the amounts received the fiscal year under review as stated in the supplementary schedules to the financial statements. Grants for operations does not include amounts related to recovery and restoration projects (2.1 billion yen in FY2021).



3. Private-Sector Funding

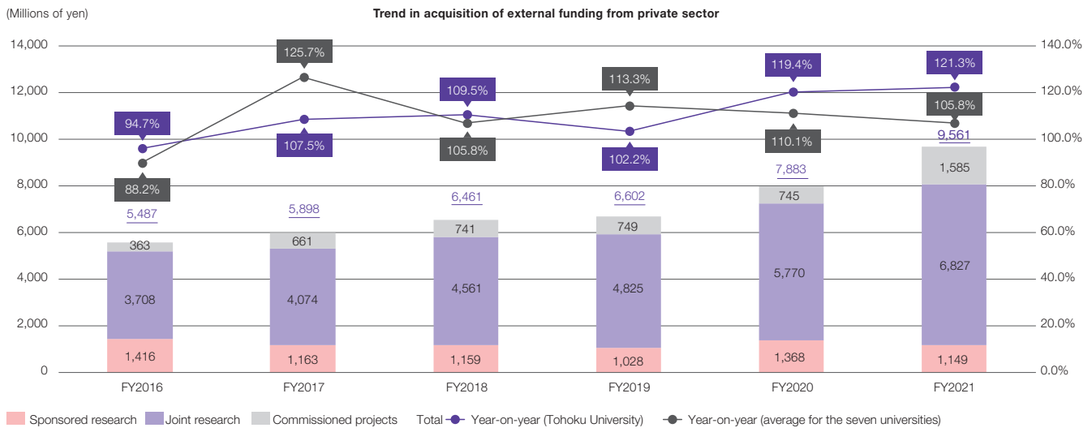
External funding acquired from the private sector has increased every year, reaching 9.5 billion yen in FY2021, and putting the University in third place among the seven universities. Year-on-year growth significantly exceeded the average for the seven universities, leaving the University in the first place.

In particular, joint research achieved remarkable growth through the active advancement of international joint research and by establishing joint research courses.

(Millions of yen)

	FY2016	FY2017	FY2018	FY2019	FY2020	FY2021
Sponsored research	1,416	1,163	1,159	1,028	1,368	1,149
Joint research	3,708	4,074	4,561	4,825	5,770	6,827
Commissioned projects	363	661	741	749	745	1,585
Total	5,487	5,898	6,461	6,602	7,883	9,561
Year-on-year (Tohoku University)	94.7%	107.5%	109.5%	102.2%	119.4%	121.3%
Year-on-year (average for the seven universities)	88.2%	125.7%	105.8%	113.3%	110.1%	105.8%

Trend in acquisition of external funding from private sector



*Aggregate figure for amounts received from joint-stock companies in the areas of sponsored research, joint research, and commissioned projects
*Seven universities: Hokkaido University, Tohoku University, University of Tokyo, Tokai National Higher Education and Research System, Kyoto University, Osaka University, Kyushu University
*Prior to FY2019, figures for Nagoya University are used for Tokai National Higher Education and Research System, and figures for Tokai National Higher Education and Research System are used from FY2020 onward

Obtaining credit ratings from rating agencies

The University obtains credit ratings through objective assessments by external rating agencies with the aim of increasing its creditworthiness and the transparency of management, and of diversifying methods for raising funds.

Rating agency	Rating/outlook	Rating acquisition date
Japan Credit Rating Agency, Ltd. (JCR)	AAA / Stable	November 16, 2021
Rating & Investment Information, Inc. (R&I)	AA+ / Stable	

[Key Credit Rating Issues]

- As a designated national university corporation, our role is to drive tertiary education and research in Japan.
  In rankings of highly cited research papers, the University occupies a favorable position among universities, and has extraordinary capabilities in education and research.
- Based on the principles of "Research First," "Open Doors," and "Practice-oriented Research and Education," we have achieved a virtuous cycle of education, research, and community collaboration.
- We have a strong international presence centered on materials science, spintronics, next-generation medicine, and disaster science.
- By leveraging strengths such as our outstanding human resources, the completeness of our facilities, and our advanced research functions, we have become one of the leading players in Japan in terms of acquiring external funding.
- We are working on strategic allocation of resources by securing a President's Budget, which is the largest scale among national university corporations.
- In addition to contributing to community health care, the University Hospital plays an important role as an organization for the training of physicians.
  Our strengths of cutting-edge facilities and highly ranked medical services have enabled us to achieve stable income and expenditures.

Committing to Further Substantial Investments in Education and Research Activities

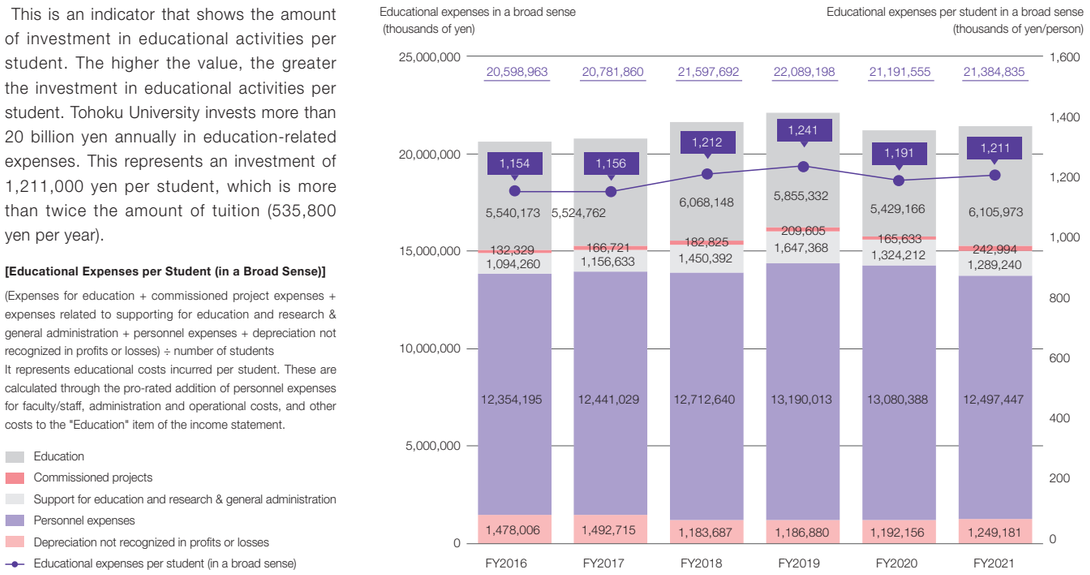
We invest more than twice the fee received per student.

1. Educational Expenses per Student (in a Broad Sense)

This is an indicator that shows the amount of investment in educational activities per student. The higher the value, the greater the investment in educational activities per student. Tohoku University invests more than 20 billion yen annually in education-related expenses. This represents an investment of 1,211,000 yen per student, which is more than twice the amount of tuition (535,800 yen per year).

[Educational Expenses per Student (in a Broad Sense)]

(Expenses for education + commissioned project expenses + expenses related to supporting for education and research & general administration + personnel expenses + depreciation not recognized in profits or losses) ÷ number of students
It represents educational costs incurred per student. These are calculated through the pro-rated addition of personnel expenses for faculty/staff, administration and operational costs, and other costs to the "Education" item of the income statement.

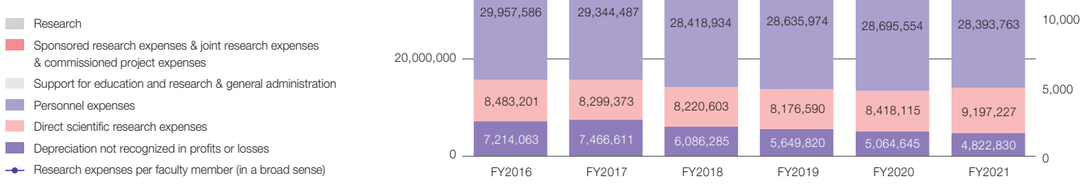


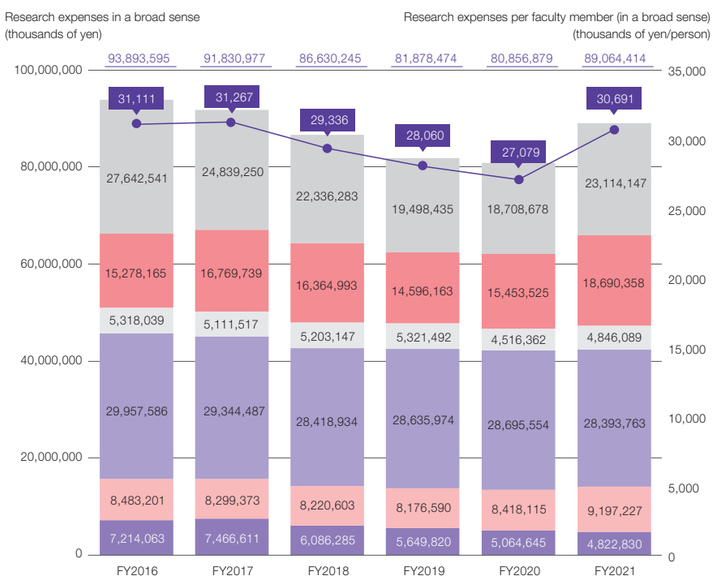
1. Research Expenses per Faculty Member (in a Broad Sense)

This is an indicator that shows the amount of investment in research activities per faculty member. The higher the value, the greater the investment in research per faculty member. In FY2021, this rose year-on-year due to increases in sponsored research, joint research, and external funding such as other grants.

[Research Expenses per Faculty Member (in a Broad Sense)]

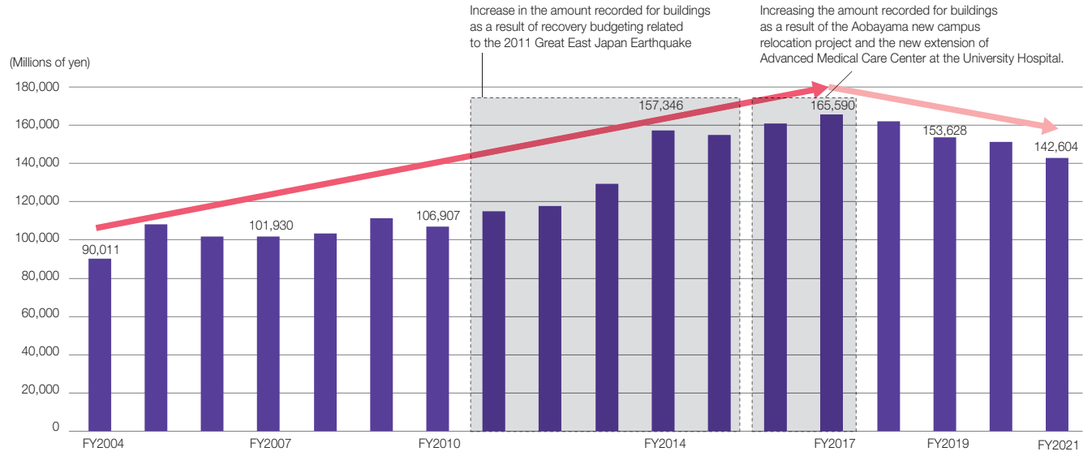
(Expenses for research + sponsored research expenses & joint research expenses & commissioned project expenses + expenses related to supporting for education and research & general administration expenses + personnel expenses + direct scientific research expenses + depreciation not recognized in profits or losses) ÷ full-time faculty members
It represents research costs incurred per faculty member. These are calculated through the pro-rated addition of personnel expenses for faculty/staff, administration and operational costs, and other costs to the "Research" item of the income statement.





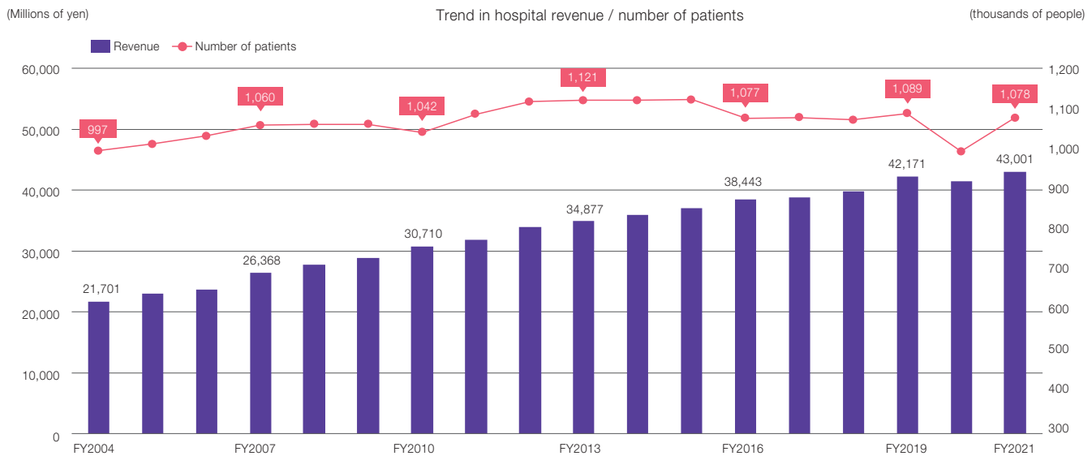
3. Amount Recorded for Buildings

After the incorporation of the National University in 2004, the value of assets such as buildings rose steadily, due to factors that include earthquake recovery-related budgeting, and the new campus relocation project. This peaked in FY2017 at approximately 1.8 times (90 billion yen → 165.5 billion yen), but in recent years, new facility improvement projects have been on a downward trend, which has resulted in depreciation exceeding the amount spent on acquiring new assets, and turn to a reduction in the amount recorded for buildings.



4. University Hospital

The University Hospital is a place for developing and practicing cutting-edge medicine, whose mission is to apply this knowledge so as to generate returns for the general public. To enable the fulfillment of this mission, strengthening the Hospital's financial base so that it is able to secure large numbers of outstanding human resources and install cutting-edge medical facilities has become an urgent matter, and we are taking various steps to reduce expenses while making efforts to increase revenue.



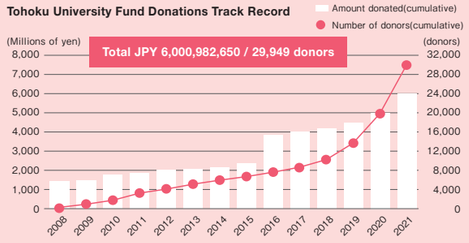
Building a Better Future, Hand in Hand with Society

Working hand in hand with society is essential to Tohoku University's identity. As such, we are committed to advancing various activities that support students and research through the generous donations made to the Tohoku University Fund. The Fund is a reflection of the community's great hopes and support of the University. Hand in hand with the community, we will build a better future together.

Donations to the Tohoku University Fund for FY2021

Total amount donated: JPY 986,881,820
Number of donors: 10,111

(Breakdown) Individuals: 9,986, Corporations and organizations: 125

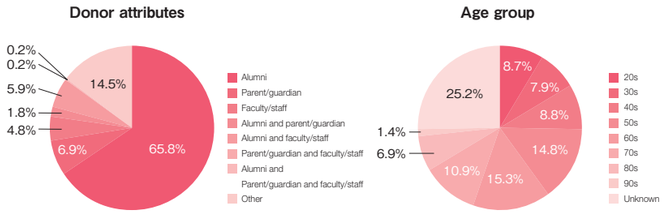


Create Together, Grow Together: Support Student Challenges

Tohoku University Crowdfunding Program for Students "Tomoni Program 2021"

In FY2021, the Tohoku University Fund launched its new donation platform that uses crowdfunding to invite support for students with ambitious ideas they want to realize. This program also incorporated a new approach to sharing information about the students' planned projects and ideas using SNS (Twitter, Facebook, etc.) by the students themselves. This was the first time the University has organized such a student-centered donation program. Thanks to the support of so many people, a large number of programs were able to meet their goals.

Support for "Tomoni Program 2021"
Number of donors: 687; Total amount donated: JPY 9,386,001



About the projects: 8 projects selected from 21 proposals

■ Waste Segregation and Recycling Project in Limbe, Cameroon

The separation of waste is important for proper waste collection and recycling. However, developing countries like Cameroon lack such practices. To improve Cameroon's environment, we work with local communities to conduct educational campaigns on waste separation and recycling, as well as to fabricate paving tiles from recycled plastic.

Number of donors: 79; Total amount donated: JPY 730,000

■ Bringing Music as Moral Support to Hospitals!
- Music practiced by medical students and musicians –

Hospitals can be stressful places. A team of musicians, including members who studied music and are currently enrolled in the Tohoku University School of Medicine, visits hospitals and performs live music to help relieve stress among patients, families, and healthcare professionals, and build positive relationships between patients and healthcare professionals, as well as between the local community and the hospital. The relationship between music, medicine, and society is examined from the perspective of the "health humanities," which has been the focus of much attention in recent years and aims to provide holistic medical care.

Number of donors: 110; Total amount donated: JPY 917,000

Giving Support Together: Supporting Student Life

To support the dietary needs of students who have been doing their best amid the ongoing COVID-19 pandemic, the University has been using financial and food donations received through the Tohoku University Fund to offer "100-Yen Breakfast for Students" and other low-cost meals since FY2021.

[Donors]
- Tanaka Kikinzoku Memorial Foundation
- Tohoku University "Shuyukai Alumni Network" Kanto
- Hayashi Farm Co. Ltd (provided through Tohoku University "Shuyukai Alumni Network" Gunma)
- Gunma Meat Co. Ltd. (same as above)
- JA Group Miyagi
- Yamagataya Co. Ltd.

[Sample Menu Items]
- Meat-and-potatoes set meal
- Morning curry (homemade curry)
- Ginger pork set meal
- Beef stew
- Miyagi-style stewed potatoes & fried wheat gluten set

Approximately 27,000 meals served (as of May 31, 2022)

Taking Challenges Together: Supporting Research

With crowdfunded support, we are taking on the challenge of cutting-edge research.
In FY2021, we launched four crowdfunded projects, all of which achieved their funding targets.

Analyzing the "language" of birds, for a future in which humans and animals can communicate with each other

Help realize the dream of communicating with animals, this project aims to advance research that analyzes the sounds of small birds in minute detail by using virtual reality technology to reproduce outdoor situations.

Challenger: Kentaro Abe, Brain Development Laboratory, Professor, Graduate School of Life Sciences
Target amount: JPY 2,000,000
Amount achieved: JPY 4,275,000
Collection period: December 20, 2021, to February 28, 2022
Number of donors: 99

Promote the development of novel molecular-targeting therapy for intractable cancers, including pancreatic cancer

Based on original research into the mechanisms of cancer development and metastasis, this project aims to develop new treatments for intractable cancers, such as pancreatic cancer.

Challenger: Yasufumi Sato, Professor, New Industry Creation Hatchery Center
Target amount: JPY 20,000,000
Amount achieved: JPY 21,966,000
Collection period: January 24, 2022, to April 22, 2022
Number of donors: 535

Towards an Engaged University Promoting Diversity, Equity, and Inclusion

**The "Open Doors" principle was one of the University's founding principles,
and we have a long history of promoting diversity, being the first university in Japan to admit female students.
To further promote diversity, equity, and inclusion from multiple perspectives,
the University has issued the Tohoku University Declaration of Diversity, Equity and Inclusion (DEI).
Fostering a DEI spirit,
we will build a future in which all members of our community play an active and vibrant role.**

Female University Enrollment Began at Tohoku University

In August 1913, three female students were admitted to Tohoku Imperial University. The names of these women, who were the first "female university students" in Japan, are still spoken of a century later as the names of women who paved the way for a new era. The date when the successful applicants were notified in the official gazette, August 21, was registered in 2020 with the Japan Anniversary Association as "A Day to Commemorate Japan's First Female University Students." In 2021, Tohoku University's "Women's Student Record in Japan's Higher Education" was selected for UNESCO's "Women in History" online exhibition, a part of its Memory of the World (MoW) Programme.

Chika KURODA, Science Ambassador
[Organic Chemist] Pioneer for female scientists
1884-1968 / Graduated from the College of Science in 1916

Raku MAKITA(Raku KANAYAMA)
[First Female Bachelor of Science in Mathematics] Wife of Heizo Kanayama, a solitary Western-style painter
1888-1977 / Graduated from the College of Science in 1916

Ume TANGE
[Chemist and Agronomist] Pioneer for female scientists
1873-1955 / Graduated from the College of Science in 1918

Since its founding in 1907, Tohoku University has achieved world-leading research results and sent many leaders into the world, guided by its three principles of "Research First," "Open Doors," and "Practice-oriented Research and Education." This year marks the 115th anniversary of our founding, as well as the 100th anniversary as a comprehensive university with the founding of the Faculty of Law and Literature in 1922.

Since the early years of our history, the University has opened its doors to a wide range of talented people, regardless of nationality, gender, or school of origin, such as when the Chinese student Lu Xun was admitted in 1904 to Sendai College of Medicine, the predecessor of Tohoku University, and when Tohoku University became the first Japanese university in 1913 to admit three females, including two from Tokyo Women's Higher Normal School, the predecessor of Ochanomizu University. It is fair to say that our University has always been ahead of its time in promoting diversity.

On April 5, 2022, Tohoku University issued the Tohoku University Declaration of Diversity, Equity and Inclusion (DEI) to affirm that diversity, equity, and inclusion remain important University principles. In doing so, we declared our conviction that the University would promote efforts to raise awareness and create the environment and institutions necessary to ensure that all members of our community respect diversity and are respected for their diversity.

Not only will the University continue to advance equity-based gender equality by fostering and supporting female researchers, promoting female staff to managerial and senior positions, and strongly encouraging male employees to take childcare leave, but we will also create an environment that ensures equity for all students, faculty/staff, enabling them to maximize their individual talents, by expanding counseling services for LGBTQ+ at the student counseling centers and developing "Guidelines on Sexual Diversity (tentative name)." By doing so, we will be an inclusive university where all members are welcomed, supported, and valued for their diverse qualities and personalities.

History of Promoting Diversity at Tohoku University

Tohoku University Declaration on Promoting Gender Equality
(2002.9.28)

Tohoku University 100th Anniversary of the First Women Students Project Symposium
"Tohoku University Gender Equality Policy"

First Women Students in 1913 Tohoku University

Japan's first female university students admitted

University is founded

1907 1913 2001 2013 2020 2022

Tohoku University Committee of Gender Equality established

2014
Center of Gender Equality Promotion opens

TUMUG

Tohoku University Declaration of DEI
(2022.4.5)

Tohoku University Declaration of Diversity, Equity and Inclusion (DEI) Commemorative Symposium
"Towards an Engaged University Promoting Diversity, Equity, and Inclusion"
(2022.6.20)

"A Day to Commemorate Japan's First Female University Students" (8/21)
registered as a nationwide commemorative day

Since 2019
Council for Strategic Management of Human Resources
Advancement of strategic personnel policies for early-career, foreigner, and female researchers, sets a 1/3 hiring target for female researchers, etc.

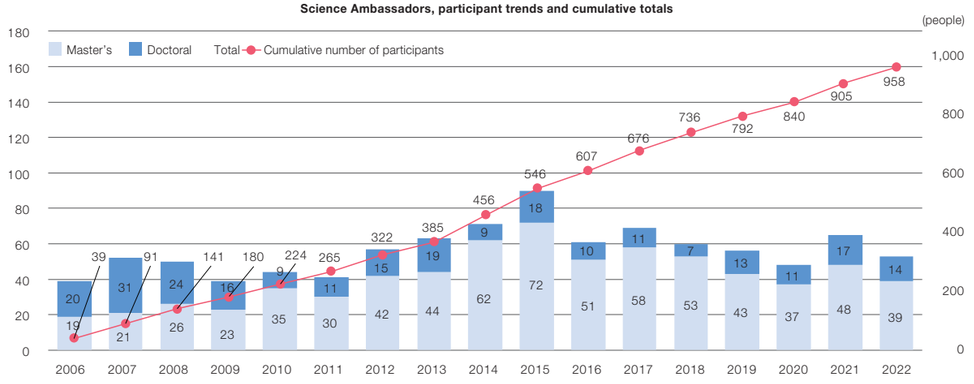
Nurturing the Next Generation

Science Ambassadors

The Tohoku University Science Ambassadors are Tohoku University female graduate students who communicate the appeal of science (natural sciences, human sciences, and social sciences) with elementary, junior-high, and senior-high-school students who are aspiring to become the next generation of researchers, by showing them "What a female researcher is like!" and that "Science is fun!" They are referred to as "SA" for short. As role models for female researchers, they participate in various SA activities to convey the appeal of science and the joy of research.

Yoshio Kojima and Science Ambassadors
Instructional science lab, March 21, 2022, at Naruko Onsen

Science Ambassadors, participant trends and cumulative totals

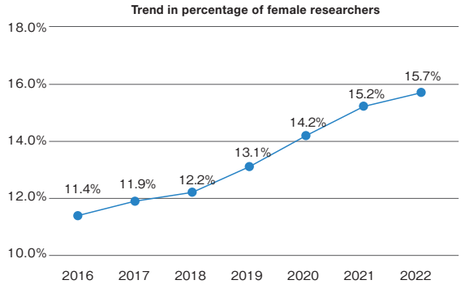


Cheering the Success of Female Researchers!

Nurturing Early-career Female Researchers

Murasaki Sendai Hagi Award

To encourage the work of early-career female researchers and create outstanding results in research, this award has been given annually since 2018 to early-career female researchers in four fields (humanities and social sciences; science and engineering; agriculture and life sciences; and dentistry, pharmacy and health).
As shown by the success of the first-annual award-winner Rie Umetsu (Institute for Materials Research, associate professor at the time), who was then awarded the Saruhashi Prize in 2019, the University's early-career female researchers are globally leading the way with their achievements in research.



Rie Umetsu (Professor, Institute for Materials Research / Winner of the 1st Annual Murasaki Sendai Hagi Award)

Reika Fukuizumi (Associate Professor, Graduate School of Information Sciences / Winner of the 2nd Murasaki Sendai Hagi Award)

Origin of the award name: "Murasaki," meaning "lavender," is the University's school color, a noble color symbolizing intelligence and creativity; "Sendai," written with old characters used for Sendai before it became a castle town, means "a thousand generations"; and "Hagi," a kind of bush clover, is a plant that symbolizes Sendai and is also used in the University logo. The award was named the "Murasaki Sendai Hagi Award" in the hopes that it produces knowledge and creativity to last a thousand generations in Sendai.

Workstyle Transformation - A New "Normal" that Advances DEI

Our University was among the first to create a comfortable work environment for each of its employees.Everyone chooses to work in different ways of their own free will.

[Major Activities]

- Introduction of home office
- Introduction of flextime
- Male employees encouraged to take childcare leave
- Creation of a flexible workspace environment
  - ・Installation of co-working spaces
  - ・Introduction of Cloud PBX (to enable a telephone environment similar to that of the workplace, regardless of one's location)

Tohoku University Digital Transformation Navigation https://www.dx.tohoku.ac.jp/english_home/english_home/

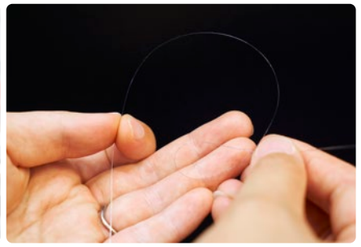
Multifunctional Device Sheds New Light on Neuroscience Research

**Yuanyuan Guo (Assistant Professor, Institute for Frontier Research Institute of Interdisciplinary Sciences), the winner of the 5th Murasaki Sendai Hagi Award in 2022, has developed a fiber sensor made of a new material that integrates a variety of functions.
Her work aims to elucidate brain pathology by improving the accuracy of recording and measuring chemical, electrical, and optical signals in the brain, which have been limited until now.
In her laboratory, where the independent environment makes it possible to dive deeply into her own research, flexible thinking and bold challenges become the driving forces that lead to unexplored heights in engineering and technology.**

Whereas fibers used for measuring brain function have conventionally been made of metals such as silicon, Yuanyuan Guo's research group is working to develop multimodal fibers made of new materials. "They are polymer-based, which makes them softer than metal and less stressful on the body. In addition to the highly sensitive recording of microscopic chemical signals that play a role in communication between brain cells, a variety of functions are integrated into a single fiber, including light, electrodes, and actuators (devices that convert 'energy' into some form of 'movement' such as linear motion, rotation, or bending). Developing a device that combines these with a semiconductor sensor will enable us to contribute to the study of brain functions that have yet to be elucidated."

She first studied at Tohoku University as an international student in 2010. Later, after earning her Master's degree in electronic engineering, she studied at MIT and Virginia Tech during her doctoral studies and developed a device to study brain activity as a joint research project. Her doctorate is in biomedical engineering. At the current Institute for Frontier Research Institute of Interdisciplinary Sciences (FRIS), she pursues independent research using thermal drawing equipment she assembles herself to fabricate multifunctional fibers.

"The appeal of Tohoku University is having an environment in which you can freely conduct research in independent laboratories like this. In addition, there are researchers of my own generation taking on challenges in various fields at FRIS, which enables rapid consultation and discussion and makes it easy for joint research as well. I often advise my undergraduate students to 'never fear mistakes and failures.'"



Electrical wires run through fibers that are capable of moving delicately and smoothly like human hair

Besides the use of multifunctional fibers in fundamental research on brain function, joint research is also being done on their use as a medical tool with applications to other parts of the body, and their potential is expanding into the fields like textiles and architecture. Wearable devices, currently in the prototype stage, make it possible to measure signals of all kinds, such as heart rate, by weaving the fibers into the fabric of clothing. Additionally, an international patent has already been filed for the technology that enables tests even in minute spaces by using the fibers' ability to move, with practical applications now awaited.

A major step forward in the next generation of engineering and technology will begin here, as disciplines such as materials engineering, electronics, chemistry, and the life sciences are all integrated.

Playing to Win and the Joy of Participating in the "Nanadaisen"

**Due to the restrictions of the COVID-19 pandemic,
the 61st National Seven Universities Athletic Meet (Nanadaisen) was held for the first time in three years.
Tohoku University served as the host institution for this year's event,
with "Reviving the Athletic Meet (Nanadaisen)" as the slogan and "The 'New Normal' Meet" as concept,
aiming to provide a stage for the young athletes from seven universities
who seek to embody both academic learning and athletic skill.
Makoto Endo, the women's captain on the University's table tennis team
who delivered the players' oath at the opening ceremony, expressed her enthusiasm
on behalf of the athletes for this year's tournament.**

Makoto Endo (women's captain, table tennis team)

Makoto Endo has been playing table tennis since she was in elementary school, and has devoted herself to the sport to the point she calls it "an indispensable part of myself." Now, as the women's captain, she shares with her teammates the techniques and approach to table tennis that she has developed over many years of experience, while at the same time aiming to reach her own personal heights.

Due to COVID-19, the competitions and contests that were supposed to showcase the fruits of their training have been cancelled across the board for the past few years. "I didn't know what I was practicing for, and it was difficult to stay motivated," Endo recalls about this period of time. Still, her love of table tennis managed to sustain her. She got through the pandemic by focusing on the joy of playing with her fellow teammates. Now, she was finally able to participate in her first National Seven Universities Athletic Meet (Nanadaisen). "I am just so excited, and at the same time, I am filled with gratitude toward all the people who worked so hard to make it happen," she says. "My senior teammates have told me, 'Nanadaisen is an important opportunity to interact with other universities.' As much as the loss of interaction over the past two years has made me sad, I am also happy to have new opportunities for communication that I can participate in," she adds. It also taught her that Nanadaisen is an important opportunity to build connections with students, one that transcends the bounds of athletic competition.

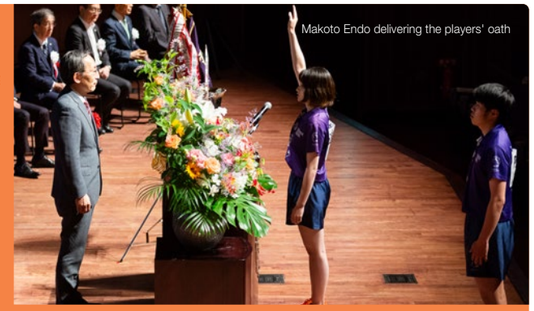
At the opening ceremony held in July, Endo took on a major role delivering the players' oath. The words of that oath, "We want to demonstrate the fruits of the training we pursued as we overcame the difficulties we faced while the Nanadaisen were cancelled due to COVID-19," expressed the desire of each and every student from the Seven Universities to compete with pride, she says. Her goal is for the team to win both the men's and women's championships together. "Tohoku University's table tennis team has won both championships in the past. I want to help the team to win both the men's and women's championships again this year, as Tohoku University becomes the first university to win the Nanadaisen four consecutive times."

(Interview date: July 14, 2022)

What is the National Seven Universities Athletic Meet (Nanadaisen)?

The National Seven Universities Athletic Meet, also known as the Nanadaisen, brings together seven universities, Hokkaido University, Tohoku University, The University of Tokyo, Nagoya University, Kyoto University, Osaka University, and Kyushu University, to compete in more than 40 events and score points to win the overall championship.
Including some 7,000 participants, the event has been independently organized to a high degree by students for a full 60 years, making it unique among sporting competitions. During the tournament, athletes from the seven universities gather from all over the country to compete fiercely in an atmosphere of extraordinary energy.

For FY2022, the competition was held from December 2021 through September 2022.



Makoto Endo delivering the players' oath

Nanadaisen Results

Tohoku University to win four consecutive times!

Event Year	Event No.	Champion	TU Ranking
FY2016	55th	University of Tokyo	3rd
FY2017	56th	Tohoku University	1st
FY2018	57th	Tohoku University	1st
FY2019	58th	Tohoku University	1st
FY2020/FY2021	59th/60th	Canceled due to the COVID-19 pandemic	
FY2022	61st	Tohoku University	1st

Tohoku University Data

Ascertaining the actual scale and research strength, etc., of a university is difficult.
Here we present some figures that provide an idea of the University's current position.
We hope the information is useful.

THE Japan University Rankings 2022

1st (1st for three consecutive years)

THE World University Rankings 2022

3rd in Japan (201-250 globally)

QS World University Rankings 2022

5th in Japan (82nd globally)

Universities Where Students Grow the Most After Admission

1st (1st for two consecutive years)

Asahi Shimbun Publications "University Rankings 2023"
Rankings by high schools (Where students grow the most after admission) 1st

Overall Reputation (education + research)

2nd

Asahi Shimbun Publications "University Rankings 2023"
Rankings by university presidents (Overall reputation (education + research)) 2nd

Featured president reputation

2nd

Asahi Shimbun Publications "University Rankings 2023"
Rankings by university presidents (president's reputation) 2nd

Total number of students

17,591

Number of international students (full year)

3,027

Estimated annual hours of administrative work reduction through digital transformation

Over 80,000 hours

Requests for lectures and media coverage of Tohoku University digital transformation actions (as of July 31, 2022)

44

Faculties	Graduate Schools	Professional Schools	Associated Research Institutes	Tohoku University Start-ups
10	15	3	6	157

Fusion Oriented Research for Disruptive Science and Technology acceptances (FY2020 to FY2021)

2nd in Japan (40 acceptances total)

University Fellowship Creation Project for Innovation in Science and Technology accepted

1st in Japan (120 people/academic year)

The Commendation for Science and Technology by MEXT The Young Scientists' Awards

1st in Japan (14 people) (FY 2022)

FY2021 Tohoku University Fund Donations

JPY 986,881,820 (10,111donors)

Most during 3rd term

FY2021 Joint Research Funds

JPY 7,072.53 million

FY2021 Grants-in-Aid for Scientific Research

JPY 10.3 billion (2,568 awards)

Climate Change Actions (Compliance with TCFD)

Recognizing that global environmental conservation is one of the most important issues common to everybody, and aiming to serve as a model for society in the near future, Tohoku University will analyze and evaluate the impacts of climate change, identify climate change risks and opportunities, and proactively disclose information regarding its activities to address "climate change," including the financial impact (provisional calculation) to achieve the goals of Tohoku University Green Goals Declaration.

	Impacts of climate change	Examples	Strategy and risk management		Provisional calculations through FY2030: Financial impact/year	Provisional calculations through FY2030: Greenhouse-gas reduction/year
Transition risk	Strengthening of national environmental regulations	· Increased costs due to the introduction of a carbon tax · Increased costs to achieve carbon neutrality	· Reduction of greenhouse-gas emissions · Reduction of energy costs · Upgrading to renewable energy facilities · Transition to electrification and clean electrical power	Carbon tax	Approximately JPY 910 million	–
Transition risk	Transition to renewable energy	· Increased demand for renewable energy, rising prices · Increased expenses due to the upgrade of energy-conserving facilities		Introduction of renewable energy sources	Approximately JPY 130 million	2,500t-CO_2
				Facility upgrades	Approximately JPY 580 million	700t-CO_2
Physical risk	Damage caused by typhoons, torrential rains, etc. Supply-chain disruptions	· Infrastructure and other supply suspensions, flooding of buildings due to flying debris, inundation, etc. · Delay in procurement of materials and equipment for research and experiments, etc. · Suspension of education and research activities, etc.	· Preventive maintenance (strengthening vulnerable areas) · Post-incident maintenance (disaster recovery) · Stockpiling of frequently used materials and equipment for research and experiments, etc.	Damage to facilities and equipment	Approximately JPY 50 million	–
Opportunities	Behavioral changes	· Strengthening activities to reduce one's own greenhouse-gas emissions and energy use	· Strengthening energy conservation activities · Reducing administrative work through digital transformation · Reducing travel between campuses through online conferencing	Energy conservation, etc.	Approximately JPY ▲920 million	1,800t-CO_2
				Reduced administrative work	Approximately JPY ▲200 million	
Opportunities	Research promotion and technology development	· Strengthening activities to promote research, develop technology, etc., that relate to intellectual contributions and mitigation measures related to climate change	· Developing technology and readying society for renewable energy, hydrogen utilization, etc. · Developing high-performance storage batteries, etc.	Research investment Technology-development revenue	–	Contribution to the reduction of greenhouse-gas emissions in society as a whole
Opportunities	Business Continuity Plan (BCP) (utilizing the experience of the Great East Japan Earthquake)	· Infrastructure-supply suspensions · Suspension of education and research activities, etc. · Intake and support of local residents, etc.	· Renewable energy generation investment and use · Early resumption of education and research activities, etc. · Supplying the city during power outages	Introduction of renewable energy generation	Approximately JPY 50 million	50t-CO_2

*TCFD refers to the Task Force on Climate-related Financial Disclosures, which was established by the Financial Stability Board (FSB) at the request of the G20 and is chaired by Michael R. Bloomberg. It studies climate-related disclosure practices and the way financial institutions respond. The TCFD published its final report in June 2017, recommending that companies and other institutions disclose information related to climate change-related risks and opportunities.

Tohoku University Integrated Report 2022

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