Tokyo Tech

Tokyo Institute of Technology

Environmental Report

【Digest Version】

2023

President's Message

Amid the growing global warming and energy crisis, in 2020 the Japanese government declared its intention to become carbon neutral by 2050, and also announced that same year its goal to reduce greenhouse gas emissions by 46 percent (compared to FY2013 levels) by FY2030. To realize these goals, it is imperative to promote green transformation (GX) measures aimed at reforming the entire socioeconomic system to both reduce greenhouse gas emissions and boost industrial competitiveness.

On April 1, 2022, we at Tokyo Tech launched our Green Transformation Initiative (Tokyo Tech GXI) to conduct research and development designed to identify and solve the challenges of establishing sustainable energy systems. We are pursuing these initiatives with partners from industry, academia, government, and local communities, as well as international research institutions. In addition, we are promoting initiatives designed to achieve carbon neutrality by accelerating energy research with the aim of creating an "ambient energy society" that is both ecological and economical.

The Minister of Education, Culture, Sports, Science and Technology also designated Tokyo Tech as a Designated National University Corporation (DNU) in March 2018. Our DNU scheme consists of initiatives that were created to "pioneer a new era through continuous dialogue with society and the discovery of hidden possibilities in science and technology." We strive to develop talented people with an emphasis on our environmental curriculums. Our initiatives include producing highly competent individuals through enhanced educational and research activities, and we help solve social problems by supplying the practical outcomes of our research to society. Through such efforts, we contribute to society surrounding Tokyo Tech and to society as a whole, and share and realize a prosperous society of the future.

Regarding environmental issues, we will tackle them in accordance with our basic principle on environmental policy, in which we see the problems as major challenges on a global scale that pose an existential threat to all of humanity. As such, we will help create a sustainable society by fulfilling our mission and role as a research and educational institution to share the global environment with future generations. We will address various environmental issues in light of new education and research styles, and contribute to society through the development of skilled individuals and our research activities.

We compiled this report in accordance with the Ministry of the Environment's environmental reporting guidelines, with a focus on our environmental performance. It summarizes our environmental, safety and health activities in FY2022 in light of the global Sustainable Development Goals (SDGs).

We hope you will read this report and continue to support Tokyo Tech activities.

Kazuya Masu
President, Tokyo Institute of Technology

Tokyo Institute of Technology Environmental Policy

Enacted January 13, 2006

Basic Principle

As we strive to become the world's best science and engineering university, Tokyo Institute of Technology recognizes that environmental problems are not just issues for certain regions. They are major challenges on a global scale that pose an existential threat to all of humanity. To ensure that future generations have a viable global environment, Tokyo Tech will contribute to the creation of a sustainable society as it fulfills its mission as a research and education institute.

Basic Policies

In accordance with the basic principle "To share the global environment with future generations," Tokyo Tech will deal with the various problems facing the environment, based on the following policies, to create a twenty-first century civilization in which the earth and humanity coexist harmoniously.

- **Research Activities**
  We will further promote scientific and technological research that contributes to the creation of a sustainable society.
- **Talent Development**
  To foster the creation of a sustainable society, we will develop talented individuals with high environmental awareness, a rich knowledge base, and the potential to become leaders in various fields.
- **Social Contribution**
  We will contribute to Japan and the world through our research activities and talent development.
- **Reduce Our Environmental Footprint**
  We will establish environmental goals, develop plans based on those goals, and execute those plans to minimize our impact on the environment.
- **Environmental Management System**
  We will create an advanced environmental management system suitable for a world-leading science and engineering university, implement it effectively, and strive to continually improve it.
- **Promote Environmental Awareness**
  We will conduct environmental education and awareness-building activities that target every student and university employee, including executives, to increase their understanding of Tokyo Tech's environmental policies, etc. and the environmental awareness of everyone associated with the university.

Scientific and Technological Research Contributing to the Environment

Exploring the Circulation of Greenhouse Gases

Interest in global warming has grown in recent years because in addition to causing rising temperatures it also triggers extreme weather events. The greenhouse gases that cause global warming include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O). Although these gases have been in the atmosphere in greater and lesser concentrations since ancient times, their concentrations have increased at a nearly constant rate over the last century, and human-generated emissions are thought to be primarily responsible. However, human activity is not the only source of these gases; a variety of natural environments produce them as well. After being released into the atmosphere, such gases can mix together, be transported far away, break down in the atmosphere, or be absorbed by water, plants and soil. On a global scale, greenhouse gases circulate over time, all while changing form. So, how can we investigate the mechanisms of this circulation, and what changes may occur in the future?

In our lab, we explore the circulation of greenhouse gases by precisely measuring not just their concentration but their stable isotope ratios as well. The ratio of stable isotopes (such as ^{12}C and ^{13}C in the case of carbon, and ^{14}N and ^{15}N in the case of nitrogen) is nearly constant on Earth. When measured precisely, however, we find the ratio varies slightly depending on the substance and how it was made or destroyed. The variation is incredibly minute, mostly falling into the range of 0.00338 to 0.00424 in the case of ^{15}N and ^{14}N. We collect air, water and soil samples from various locations and then determine the stable isotope ratios of greenhouse gases in them.

Take the example of N_2O, which is not only a greenhouse gas but also depletes the stratospheric ozone layer. As shown in Fig. 1, N_2O comes from various sources, but we were able to identify several of them by measuring their isotope ratios. We also discovered that ^{15}N and ^{14}N have been decreasing as atmospheric N_2O concentrations have been increasing year on year (Fig.2). The main reason for the increase is that microorganisms are making N_2O from the nitrogen fertilizers used in large quantities in agriculture and releasing it into the atmosphere. We are also conducting research into how the production and absorption of greenhouse gases by microorganisms change as the Earth warms.

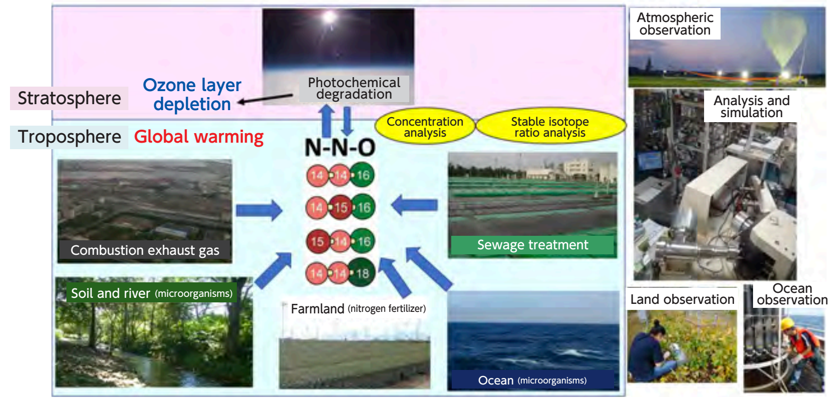


Fig.1 Left: Sources of N_2O; right: Research methodologies

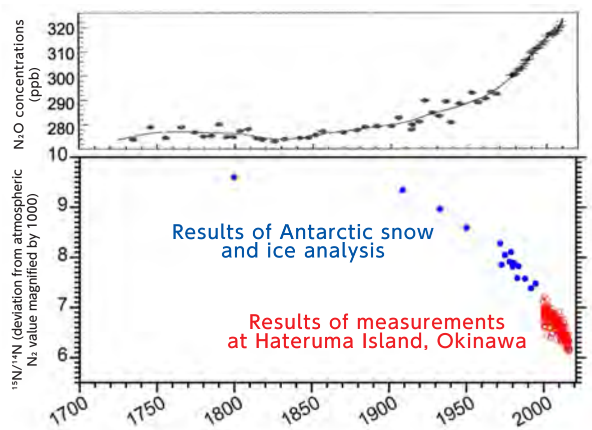


Fig.2
Changes in atmospheric N_2O concentrations and nitrogen isotope ratios over time. (Concentrations are taken from Nakazawa et al., 2015, "Global Environmental System," Kyoritsu Shuppan.)

School of Materials and Chemical Technology
Department of Chemical Science and Engineering
Associate Professor Sakae Toyoda
Toyoda Lab HP http://silab.cap.mac.titech.ac.jp/toyoda/index.html

Scientific and Technological Research Contributing to the Environment

Interdisciplinary Research Endeavor to Develop Eco-Friendly Concrete That Is Recyclable

As a researcher, I specialize in energy conversion technology for fusion reactors, which are a potential zero-carbon energy source. However, I had the opportunity to think about the issue of recycling civil engineering and construction materials when I participated in Tokyo Tech Research Festival 2018. The Office of Research and Innovation of Tokyo Tech planned and hosted this event to accelerate the fusion of research fields. While there, I learned about the development of fiber-reinforced concrete (FRC), which combines concrete and fiber to improve the fracturing characteristics of concrete. FRC is now used in various aspects of our daily lives. However, I also found out that while very strong and resistant to fracturing, FRC is difficult to be recycled.

Through conversations with experts in different fields, we came up with the unique idea of using the low-melting-point metals (LMPMs) I'm researching as the fibers that reinforce the cement and concrete matrix. The concept of this LMPM fiber-reinforced concrete (LMPM FRC) is that the metal fibers can be separated and recovered from a waste concrete matrix by heating it to a temperature above the melting point of the fibers after minimal pulverization (Fig. 1). That makes this an eco-friendly resource that can be reused instead of becoming waste.

The material characteristics that the reinforcing fibers must possess are sufficient strength and resistance to melting on usage environment. Alkali metals such as sodium (Na) and lithium (Li) were considered unsuitable due to their overly low melting points and chemical reactivity with water, which cement contains in large amounts. As for heavy metals such as lead (Pb), although we expect that they can chemically coexist with cement due to their chemical stability, we believe their toxicity makes them unsuitable.

Thanks to the FY2019 Interdisciplinary Research Support for Scientists, I was able to form a research team including associate professor Nobuhiro Chijiwa (who specializes in civil engineering materials) and assistant professor Minho O (who specializes in metallic materials). We decided to create a small test piece of LMPM FRC using tin (Sn), zinc (Zn), aluminum (Al) and alloys thereof as our fiber reinforcements. We conducted bending tests to verify the basic functionality of the test piece (measuring just 40 mm x 40 mm x 160 mm).

As a result, we found that the LMPM fiber reinforcement added a certain level of durability compared to specimens without fibers. We also found that the hot molten metal fibers do not chemically react with the cement matrix, and that the molten fibers move as a liquid out of the narrow gaps in the matrix. We will continue to develop LMPM FRC with improved recyclability to help achieve a more sustainable society.

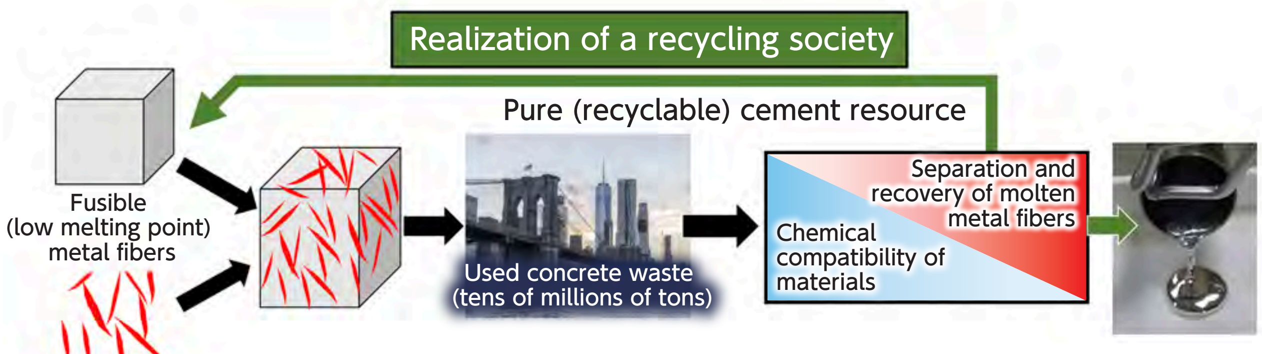


Fig.1 Concept of fusible metal fiber-reinforced concrete

Institute of Innovative Research
Laboratory for Zero-Carbon Energy
Associate Professor Masatoshi Kondo
Kondo Lab HP http://www.lane.iir.titech.ac.jp/~kondo.masatoshi/index.html

Scientific and Technological Research Q&A Contributing to the Environment

Sakae Toyoda ● Associate Professor

Q1. What inspired you to begin researching this field?

Analyzing CFC gases in the laboratory as a student. While the concentration of ozone-depleting CFC gases is decreasing due to joint international efforts, that of greenhouse gases only continues to increase. I wanted to address the environmental issues caused by invisible gases.

Q2. How do you conduct air and water observations and soil sampling?

With the help of many people from other universities and institutes. We collect air in glass flasks at places such as remote islands in Okinawa and at Showa Station in Antarctica. We also use balloons to collect air from 30 km aboveground. River water and seawater is collected at various depths using boats and other means, and we measure the dissolved gases. We collect gases in the soil by placing a box over the surface or inserting a tube in the soil.

Q3. What is the difference between global warming and the greenhouse effect?

The “greenhouse effect” refers to phenomena in which CO2, water vapor and other certain substances in the air absorb infrared rays emitted from the Earth’s surface, which warms the air. Without the greenhouse effect, the average temperature near the Earth’s surface would be about -18° C. However, if the concentration of greenhouse gases increases due to human activities or other causes, the air temperature will also increase, causing global warming. We cannot afford to ignore global warming, since it can significantly change the climate and cause sea levels to rise, among other effects.

Q4. What are your aspirations regarding environmental issues, SDGs initiatives and so on?

Substances that humans release into the environment, even in minute quantities, can have a major impact. I’d like to continue my research into the state of trace gases and other substances through careful observation of air, water and soil.

Associate Professor ● Masatoshi Kondo

Q1. What inspired you to begin researching this field?

I was studying liquid metals with the intent of using them as coolants (fluids that carry heat) in fast reactors and fusion reactors. However, I realized they had new possibilities. I wondered whether they could be applied to an entirely different field. Participating in Tokyo Tech Research Festival 2018 led me to research their application as civil construction materials. This was exciting, because I had not anticipated using liquid metals to develop technologies for the civil engineering field.

Q2. How did this unique idea of using low-melting-point metals as reinforcing fibers come about?

Low-melting-point metals are mostly used in a liquid state. However, this research began when we considered also using them a solid state. Concrete reinforced with low-melting-point metal fibers can be easily crushed by raising the temperature and melting the fibers to separate them and recover them in liquid form. This is the birth of a new civil engineering and construction material designed with post-use recycling in mind.

Q3. As you continue to research and develop fusible metal fiber-reinforced concrete, what are some of the challenges of putting the technology to practical use?

The first is strength. We wish concrete reinforced by low-melting-point metal fibers to be as durable as possible. Next is the ease of separation and collection. After use, we want to recover just the low-melting-point metals from the concrete in liquid form, without any contamination. We are developing low-melting-point metal fibers that satisfy both requirements.

Q4. What are your aspirations regarding environmental issues, SDGs initiatives and so on?

Our efforts to address environmental issues and the SDGs have implications not only for society today, but also for the society of the next generation. I want to keep doing research on many new technologies with an eye on the future.

— — What is your message to aspiring researchers currently in junior or senior high school? — —

I encourage you to value simple questions like “What is this?” and “Why does this happen?” and to deepen your knowledge by conducting research and consulting with others as your interests dictate. As a researcher, you can devote yourself fully to what you love.

Internet technology has developed greatly since I was in junior and senior high. Now we can communicate smoothly with people in distant locations via the Internet. In a society that has developed such IT, I hope you’ll become a researcher who can help people in need around the world.

Example of an Graduate Course

Geochemistry

Undergraduate major in Chemistry

Institute of Innovative Research
Multidisciplinary Resilience Research Center
Associate Professor Akihiko Terada

Geochemistry covers an extremely broad range of subjects. This course, however, focuses on volcanic eruptions (Fig.1) because Tokyo Tech has an unique research facility—the Kusatsu-Shirane Volcano Observatory.

As the name suggests, the observatory has an observation facility (Fig.2) at Mount Kusatsu-Shirane—a volcano made famous by the Kusatsu hot springs—where it conducts observations around the clock. The facility's staff have also taken samples and various measurements on foot all over the volcano for almost four decades (Fig.3).

In this course, we draw upon the experience and knowledge gained at the observatory to convey the significance and academic pleasure of thinking about natural phenomena from a chemical perspective.

While volcanoes provide us with benefits such as hot springs and beautiful landscapes (Fig.4), they are also dangerous, sometimes taking human lives (Fig.5). For this reason, society has high expectations for volcanological research. Students also learn about various problems researchers may face when attempting to use scientific findings for the benefit of society, including anecdotes about difficulties that I have faced in the field.

Fig.1
Mt. Kusatsu-Shirane emitting a plume of volcanic gas and ash (1983).

Fig.2
Seismic station operated by Kusatsu-Shirane Volcano Observatory, Tokyo Tech.

Fig.3
Sampling volcanic gas at Mt. Kusatsu-Shirane.

Fig.4
This beautiful crater lake is close to tourist facilities and is easy for people to access.

Fig.5
A survey of the new crater formed by the January 23, 2018 eruption—volcanic ejecta from this crater resulted in twelve casualties.

Environmental Education and Human Resource Development

Example of an Graduate Course

Science of Metabolism

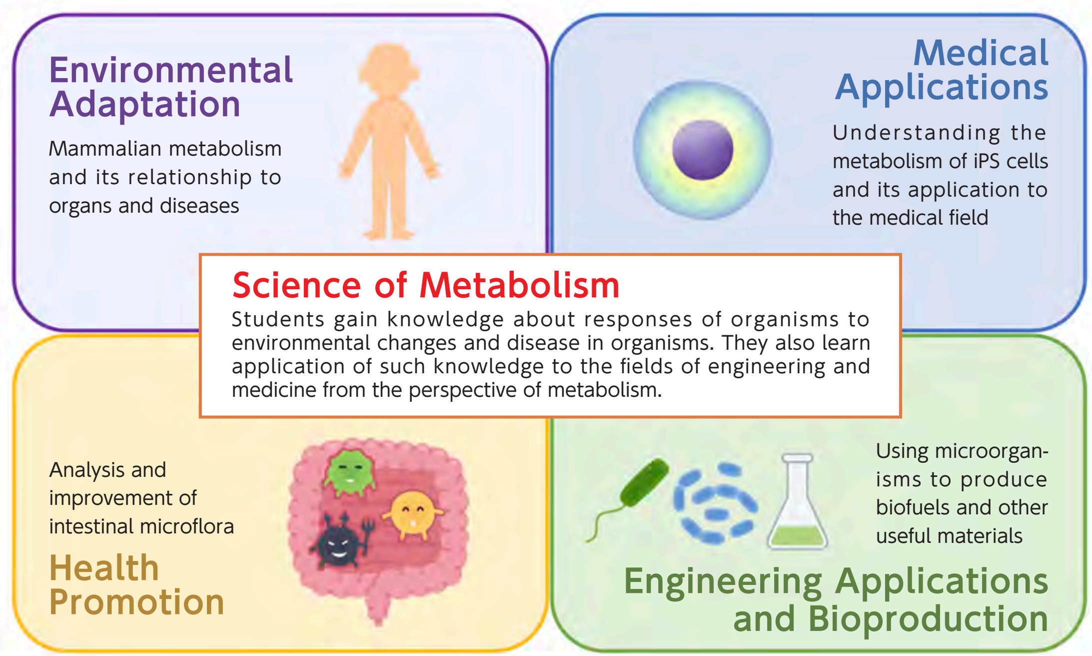
Graduate major in Life Science and Technology

School of Life Science and Technology
Department of Life Science and Technology
Associate Professor Takashi Hirasawa

Humans and other animals as well as plants and microorganisms sense changes in environments, including alterations in temperature, sunlight and salinity, and adapt their behavior to survive in changed environments. When organisms adapt to such environments, cells obtain energy to live from carbohydrates and produce cellular components using obtained energy such as amino acids and nucleic acids. These biochemical reactions in which cells obtain energy and produce cellular componetnts is called “metabolism.”

The Science of Metabolism course focuses on this process. It outlines how individual animals and cells respond and adapt to changes in external environments, as well as how the metabolic process is involved in medicine and promotion of health. The course introduces the research results of the instructors as well.

Furthermore, certain microorganisms can use their metabolic processes to produce substances that are useful in our daily life. It is also possible to degrade environmental pollutants using metabolic functions in microorganisms. In the lectures, the instructors explain the role of microbial metabolism in production of useful substances and the decomposition of environmental pollutants.



Social Contribution Activities

Project Vision 2022: Rethinking the Contact Lens Blister Pack

We at the Nohara Lab conducted a one-year project in collaboration with CooperVision Japan Inc. During the first half of this project, we conducted an academic study on contact lenses and their containers (blister packs) through literature reviews, surveys and other means. During the second half, each student in the lab created a work that poses questions to society through design and artistic expression. We held a three-day exhibition (March 3-5, 2023) of the works along with a talk event at Shibuya QWS to present the results of our project.

The contact lenses we use daily cause a variety of environmental problems. For example, when a used contact lens is flushed down a drain or toilet, it breaks into smaller pieces but does not decompose. Contact lenses end up being carried out into the ocean as microplastics, where they pollute the marine environment.

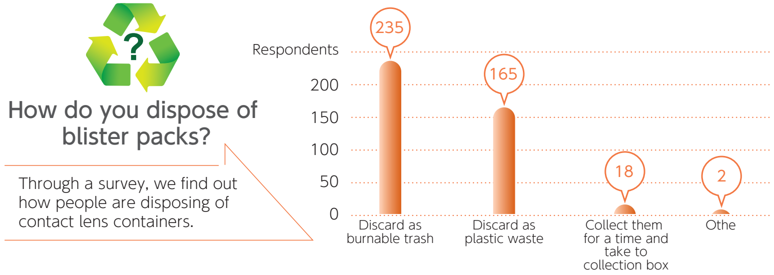
Blister packs, on the other hand, are made of a plastic called polypropylene, and can be recycled as pure plastic waste because they have not been dyed with ink or otherwise treated with chemicals. However, research shows that their recycling rate is just 1 percent, with most being thrown away as garbage. Environmental issues such as this involve scientific, engineering, social and many other factors. It is vital to have an overarching understanding of these factors before trying to solve the root causes.

At the Nohara Lab, we consider language as well as things like art, design, materials and systems as symbols that could convey our thoughts. Every day, we conduct research with the aim of sending out new messages to society through the creative interpretation and transformation of these symbols.

During this project, we worked on "interpreting" issues related to contact lenses. More specifically, we asked ourselves: How can we encourage contact lens users to act sustainably? From this general question, each student generated new questions by transforming data into something other than numbers, reinterpreting linguistic aspects of the problem, and so on. These questions led to ideas for our works.


Contact lens packaging and containers


Microplastics on the beach




Exhibition

Project Vision 2022: Rethinking the Contact Lens Blister Pack

I would like to introduce a few of our works, and explain the thought process and the message that accompany each.

For example, the work entitled "The Wall of Nine Percent" asks: Do numbers that feel real to you positively change your behavior? as a starting point. From there, we created a game that enables people to understand that according to a research finding the worldwide recycling rate of plastic waste was just 9 percent in 2019.

I think the reality is that environmental issues don't feel real to us in most cases, since we cannot imagine how they are connected to our own lives. This work turns the tiny number of 9 percent into a game that anyone can play. We were happy to provide this opportunity to gain new insights through this type of interpretation, which actually led to discussions with visitors.

The piece entitled "The Price of Daily Behavior" also starts with a question: What is the cost to the environment for what contact lens users casually do on a daily basis? We created a scale in which you see empty contact lens containers (blister packs) with aluminum lids still attached to them hanging at right, and fish and jellyfish that represent the environment hanging at left. This scale transmits the movement of one side to the other.

The first thing you must do when recycling contact lens containers is to pull the aluminum lid off of the blister pack; do you always do this, or not? If not, that means you are imposing a large cost on the environment. In other words, the simple act of not pulling off the aluminum lid eliminates the possibility of recycling that plastic later, and plastics discarded as burnable trash have a negative impact on the environment.

Our goal was to have people look at their everyday behaviors they unconsciously engage in and think about those behaviors in a different way. Put differently, we wanted to interpret our everyday actions and present them as a new way of looking at things.

This work, too, inspired visitors and people involved in the project to think about sustainable attitudes. I truly felt that the constructive discussions and consideration such efforts sparked have generated real value. The exhibition was a great success, and CooperVision Japan presented awards for the best works.

There were many more works displayed at the exhibit, so please check out the Nohara Lab and project websites.

"The Wall of Nine Percent" (Artists: Tezuka, Uchino)

"The Price of Daily Behavior" (Artists: Tezuka, Chia)

School of Environment and Society
Department of Transdisciplinary Science and Engineering
Nohara Lab 1st-year master's student Daichi Tezuka
ProjectURL：https://x.gd/YxXaF

Social Contribution Activities

Tokyo Tech VG Environmental Conservation Activities

The Tokyo Tech VG focuses on three main areas: revitalization support, disaster preparedness activities, and community collaboration. In the area of community collaboration, we work to achieve the SDGs primarily through cleanup activities. Here are a few examples:

Activity 1 Midori Santa Project

We participated in the Midori Santa Project in December 2022. Yokohama City's Midori Ward organized this event for elementary school students. We participated because Tokyo Tech's Suzukakedai Campus is located in the ward. The event took place in Tokaichiba, where we picked up trash around the station with local elementary school students. After the cleanup activity, we gave the students a presentation about the environment. They listened intently to our study on recycling. We were impressed by their interest in and knowledge about recycling.

Picking up trash with elementary school students

Presentation on recycling

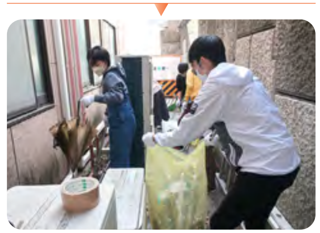
Activity 2 Campus Cleanup

In March 2023, we conducted a campus cleanup, picking up garbage at the Tokyo Tech Ookayama Campus from Taki Plaza to the gymnasium.

While most areas we normally go past were generally clean, there was a lot of trash in places that are harder to see, such as behind buildings, trash cans and hedges. We figure that the people who left the trash there felt guilty about it. There is a need to install trash cans in appropriate locations. Students also need to bring along something to take their trash home in when there are no trash cans.

Campus cleanups have been done since before the last academic year, and we saw that even some areas that had a lot of trash last year had none this year, and vice versa. We believe that when someone has littered somewhere, it encourages others to do the same.

Garbage left behind a building



VG members who participated in the campus cleanup

Everyone knows that recycling is essential and that littering is not allowed. That said, I believe only a limited number of people actually follow the rules. When it comes to environmental conservation, however, the cumulative effect of small actions can make big changes.

AY2022 was a year in which we started carrying out activities in the field again. It reminded us that actually doing work with our hands, whether it's a cleanup or anything else, is the most crucial part of contributing to the community as a volunteer group.

School of Environment and Society
Department of Civil and Environmental Engineering
Kanae Lab 1st-year master's student Aoi Matsunaga

Social Contribution Activities

Initiative on Possible Tropical and Subtropical Infectious Disease Epidemics Due to Global Warming
:International Synthetic Biology Competition for Undergraduates

Due to global warming, the average temperature in Japan is on a long-term upward trend, increasing at a rate of 1.15° C per century[1]. If global warming continues unabated, the proportion of subtropical areas in Japan—which has a long north-south axis—is expected to expand. Insects such as mosquitoes that live in tropical and subtropical areas are also expected to move northward, causing the infectious diseases they carry to become more prevalent in Japan (Fig.1).

Of these infectious diseases, dengue fever is one with a particularly large number of cases. This disease causes symptoms such as high fever, headache, and in severe cases, bleeding. With a domestic outbreak confirmed in 2014, it is the biggest infectious disease threat at the moment. There are four types (strains) of dengue viruses that cause dengue fever, and subsequent infection with different strains reportedly causes severe symptoms. For this reason, if someone is infected with dengue fever, it is essential to identify which strains they have been infected with in the past (infection history). To that end, iGEM TokyoTech is developing a test for identifying which strains of dengue virus a person has been infected with (Fig.2).

The test allows for safer and more efficient testing than existing methods, and also makes it possible to make early preparations for cases that could develop severe symptoms. This suggests the method could make a significant contribution to fighting dengue pandemics.

References: [1] Japan Meteorological Agency, 2012: Climate Change Monitoring Report 2011

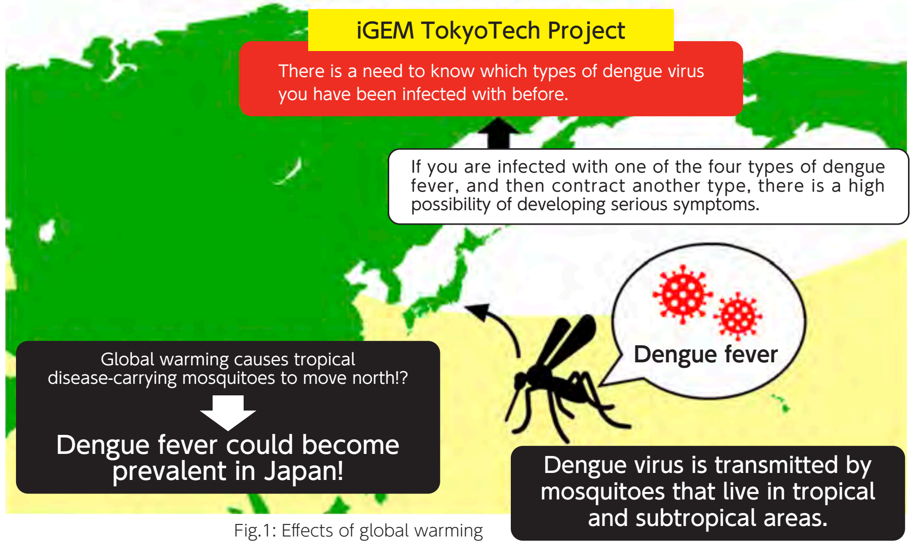


Fig.1: Effects of global warming

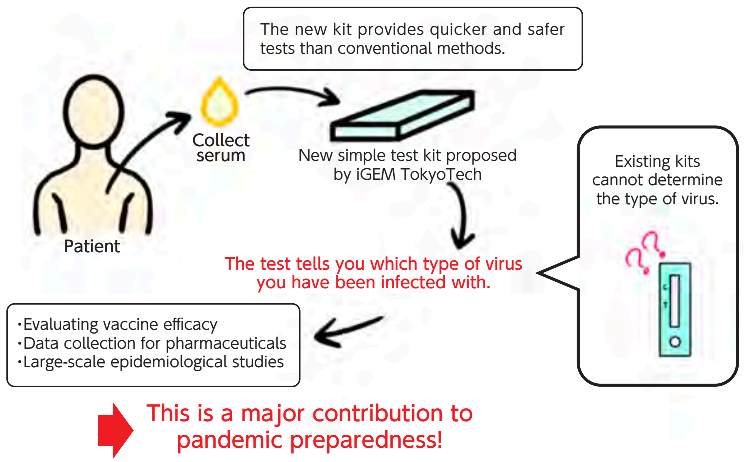


Fig.2: iGEM TokyoTech initiative

iGEM TokyoTech

iGEM TokyoTech is an official student group that participates in iGEM, the International Genetically Engineered Machine Competition, with the goal of applying molecular biology techniques to contribute to society. It holds the world record for the number of consecutive gold awards at iGEM.

School of Life Science and Technology
Department of Life Science and Technology
Second-Year Undergraduate Yuki Oheda

Environmental Performance

Material Balances

Tokyo Tech's activities consume a great deal of energy and a wide range of materials. Most of the energy we consume is in the form of electricity and gas. The primary materials we use are chemical substances, paper, and water. While we need to use these to conduct our cutting-edge education/talent development activities and research activities, we're also engaged in minimizing the environmental footprint of our operations.

We have summarized our FY2022 inputs (resource and energy used) and outputs (environmental emissions) as the material flow shown below.

INPUT

Energy

• Purchased Electricity (1,000 kWh)	67,188
• City Gas (1,000 m³)	349
• Fuel Oil (kl)	0.84
• Gasoline (kl)	0.3

Material

• Chemical Substances (t)	95.3
• PRTR-related Substances (t)	42.2
• Paper (t)	28.5
• Water (1,000m³)	183.7

Main Activities of the University

Education

Research

Outreach

Global

OUTPUT

Atmospheric Emissions

• Greenhouse Gas Emissions (t-CO_2)	31,316
• Purchased Electricity (t-CO_2)	30,404
• Fossil Fuels (t-CO_2)	783
• Water and Sewage (t-CO_2)	129

Waste

• General Waste (t)	161
• Industrial Waste (t)	589

Water Discharged

• Total Sewage Discharged (1,000m³)	189.6
• Pollutant Emissions BOD (t)	16.6
Nitrogen (t)	8.9
Phosphorus (t)	0.8

RESYCLE

• Paper (t)	237
• Other Recycled Materials (t)	395
• Graywater Reuse (1,000m³)	43

Environmental Performance

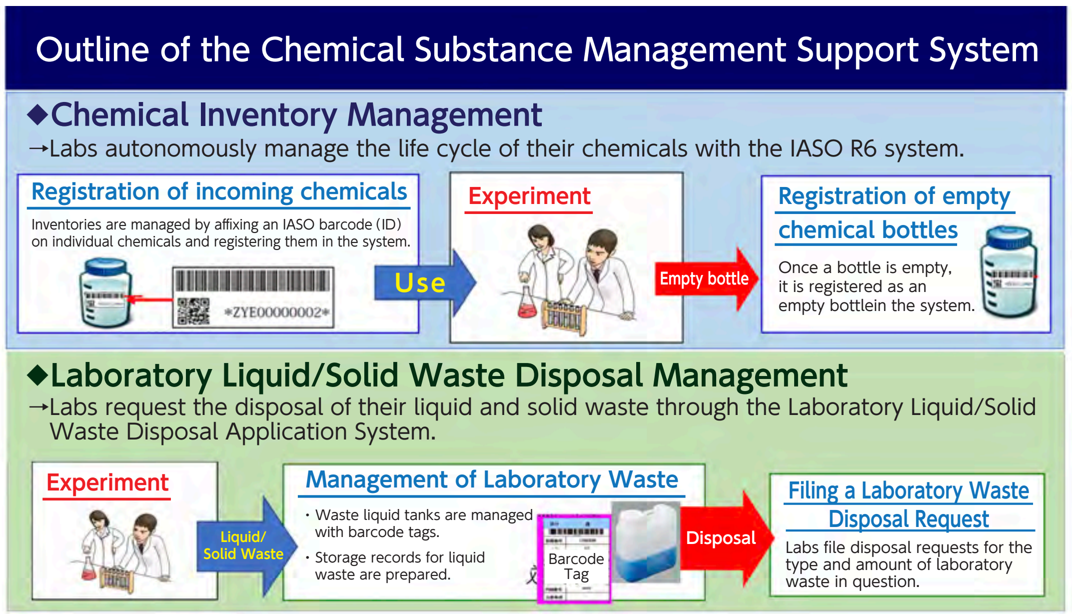
Initiatives to Minimize the Environmental Impact of Chemical Substances

An Overview of Chemical Substance Management at Tokyo Tech

Tokyo Tech is a science and technology university, and around 500 of its 700 laboratories keep chemical substances on hand. The chemical substances these labs use are extremely diverse, both by type and usage, with most only being employed in small quantities.

Since our labs are conducting cutting-edge research, the types and quantities of chemicals they use are changing constantly and radically. For this reason, labs use the chemical substance management support system to register every bottle of every chemical substance using IDs and manage the inventory of chemical substances in their possession (type, amount, storage location, amount used, etc.). The system's chemical information database (chemical master) contains data on approximately 720,000 chemicals provided by both manufacturers and users, around 20,000 of which are registered as inventory.

The total amount of chemicals used in our laboratories per year is approximately 30,000 to 40,000 bottles. This system makes it possible to monitor usage trends of PRTR chemicals, the amount used, and other information. We conduct annual seminars on chemical substance management for faculty, staff and students to enhance their understanding of how Tokyo Tech is reducing its environmental impact.



Chemical safety workshop materials

Environmental Performance

Initiatives to Minimize the Environmental Impact of Chemical Substances

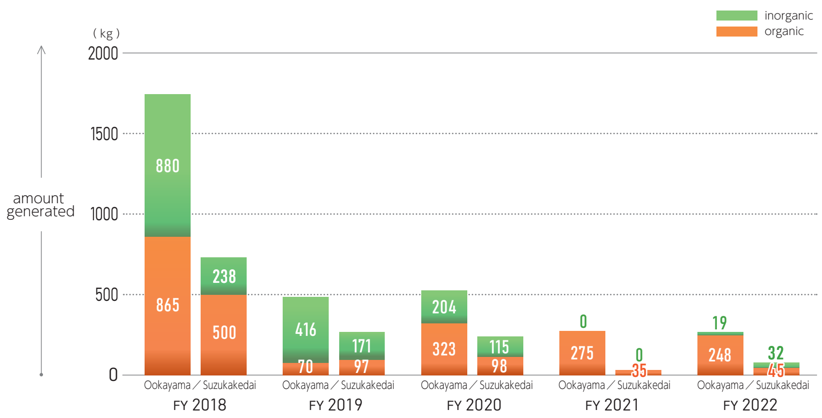
Data on Results of Environmental Initiatives

Laboratory wastes contain a wide variety of chemical substances. Therefore, we treat them appropriately according to their properties.

In addition, we prioritize heat recovery during incineration and the recycling of residual materials when carrying out the disposal process, and we carefully select contractors.

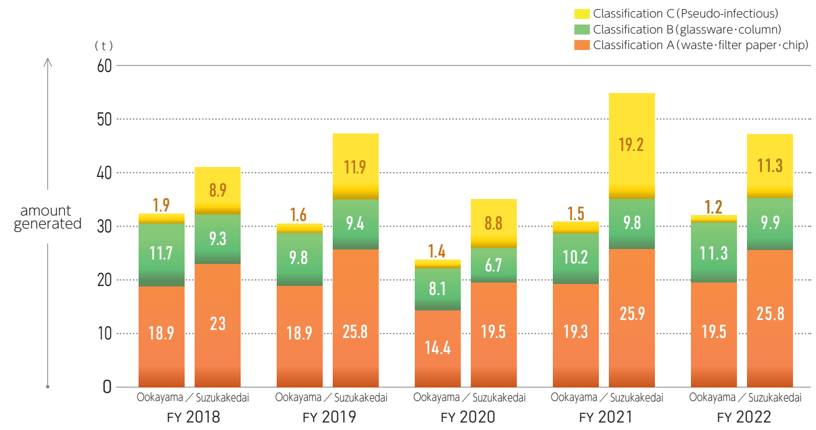
Waste Reagents and Samples

The disposal of waste reagents and waste samples involves outsourcing the organic and inorganic portions to specialized contractors for incineration and wet processing, respectively. With the partial introduction of charging of disposal costs starting in the fiscal year 2019, the generation of waste materials from FY 2019 onwards has decreased at each campus compared to FY 2018.



Solid Laboratory Waste

Solid laboratory waste is disposed of as industrial waste, and undergoes incineration and melting processes. The residual waste slag produced is reused as soil conditioner, etc. The glass material in laboratory waste, such as empty reagent bottles, is an important additive that turns the processed waste into slag.



Editorial Note

This year's Tokyo Tech Environmental Report has undergone a major change from previous years. Since the year before last, we have worked to generate a report that is both easy and interesting to read. This year, we thought we should also clarify our target audience. We decided to assume that our readers would be junior high and high school students. With that in mind, we tried to use less text and more graphics, and to make the graphics both interesting and easy to understand.

Since June 5 is UN World Environment Day, Tokyo Tech has made June its Environment Month, and we have been doing a special Environment Month presentation (p. 11) every June. The event is cohosted by the Tokyo Tech Environmental Report Preparation Working Group in cooperation with Ota and Meguro cities. This year we decided to also set aside time for a talk session by the presenter and me, the chair of the Working Group.

While it may sound like self-praise, I believe the session has been well-received, since listening to in-depth discussions of the topics covered through our dialogues has deepened participants' understanding of the presentation. The Special Environmental Month Lecture and the Tokyo Tech Environmental Report, however, are only effective if a large number of people attend or read them, so we believe the next step is to publicize them better.

Finally, I'd like to thank everyone involved in the preparation of this report. I'm sorry for asking for so many rewrites, considering the goals I mentioned earlier. Despite making "use lots of graphics" our motto, this editorial note ended up as just text. Its incompleteness is due to my inability to remain thorough. Next year's Environmental Report will be our last as Tokyo Tech, by the way. I promise to do my best on the editorial notes for the coming report.

If you do read this report, we would appreciate your feedback.

September 2023
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●About the Cover

The blue and green represent the Earth, and the cover also features a swallow—the symbol of Tokyo Tech—imagined as flying toward the sustainable society that will deliver us a shining future. It conveys our hope of restoring the global environment to good health.

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