STG Program 2024 Report

Under the guidance of the Japan Society of Civil Engineers (JSCE)
Through the International Scientific Exchange Fund (ISEF)

Reported by:

Mr. Satharat Pianfuengfoo

Ph. D. student at King Mongkut's University of Technology North Bangkok (KMUTNB)

With the recommendation of the
Engineering Institute of Thailand (EIT)

September 01-06, 2024
Sendai, Japan

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Study Tour Grant 2024 Report

Submitted by

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Ph.D. student at
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STG Participant (Thailand)

September 01-06
Sendai, Miyaki, Japan

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1. Introduction

1.1 About JSCE and STG program

Japan Society of Civil Engineers (JSCE) was established in 1914 and entrusted with the mission to contribute to the advancement of scientific culture by promoting the field of civil engineering and expanding civil engineering activities. Since its establishment, JSCE has endeavored to achieve its mission. JSCE established the Study Tour Grant (STG) program in 1992, a unique initiative that is one of the missions supported by the International Scientific Exchange Fund (ISEF) (established by the JSCE). This program brings young civil engineers (C.Es) from many countries to visit and learn about Japanese civil engineering technologies, projects, the environment, and cultures, providing remarkable and insight learning opportunities.

1.2 Speech of Gratitude

First, I would like to express my gratitude to the JSCE committee for the valuable opportunity to participate in the STG program. The program, supported by ISEF, has improved my knowledge and significantly contributed to my professional growth. I thank the devoted JSCE members, including Ms. Shibuya, Mr. Arai, Mr. Sugino, and Assoc. Prof. Ishizaka for their effort to the program's success. Their support and planning itinerary have been the key to the program's success. I also appreciate Mr. Oguri, an ISEF committee member, for his support in preparing my presentation paper and ensuring the presentation material was ready on time.

Second, I express my gratitude to the Engineering Institute of Thailand (EIT) and the Chairman of the JSCE's Thailand section (Assoc. Prof. Smith Songpiriyakij) for entrusting me to learn in the program. This exchange gave me a fresh aspect of my research interest (concrete material). The program offered not only my interest but also that of earthquake-resistant technologies. Moreover, it provided me with a new experience, being subjected to earthquake simulation (Great Hanshin Earthquake 1995) and damage reduction using building isolation technology.

Finally, I would like to express my gratitude to my advisors, including Prof. Piti and Asst. Prof. Sumonthip, for their support. Without them, I may not have participated in the program. They expressed a writing procedure, preparation, and presentation direction. They also explained how to live in other countries. Moreover, I would like to thank my family, friends, and STG participants for their support.

1.3 2024 STG Participants and Itineraries

Organization	Name	Country
MACE	Ms. URANTOGOS AGVAANKUVSAN	Mongolia
Fed. MES	Mr. Zin Moe Htut	Myanmar
EIT	Mr. Satharat Pianfuengfoo	Thailand
IEB	Mr. Hachnayen Ahmed	Bangladesh
PICE	Mr. John Mark A. Guimba	Philippines

Date	Time	Event
9/1, SUN	-	15:45 from Thailand Go to Hotel Intergate Tokyo Kyobashi and check in the hotel.
9/2, Mon	-	Canceled due to the typhoon Free time
9/3, TUE	8:40~	Check out the hotel and go to the JSCE
	9:30~11:00	JSCE orientation
	11:00~12:00	Lunch at the JSCE
	12:10~	Go to the Kajima Technical Research Institute Nishichofu Complex by bus
	13:30~15:30	Visit the complex
	15:30~	Go to Tokyo Station by bus
	17:28~19:37	Take the Shinkansen (Yamabiko 151) to Sendai from Tokyo
	20:00~	Check in Sendai International Hotel
9/4, WED	8:30	Leave the hotel and go to the Sendai International Center
	10:00~12:00	Participating in the IAC Discussion Theme: Junctions, Paths, and Future ~Paradigm Shift~ at Sakura, Sendai International Center
	12:00~12:20	Meet at the entrance and board the technical tour bus
	13:00~14:00	Lunch at Kirin Brewery Sendai
	14:10~16:10	Visit Sendai City Minami Gamo Wastewater Treatment Plant
	16:20~17:00	Visit Ruins of the Great East Japan Earthquake: Sendai Arahama Residential Foundation
	17:10~17:40	Go back to the hotel
	18:30~20:00	Attend 2024 JSCE Annual Meeting Welcome Reception at Hotel Metropolitan Sendai
9/5, THU	7:50~	Meet at the hotel entrance and move to Tohoku University
	9:00~17:40	Participate in the 26th International Summer Symposium, JSCE annual meeting at Tohoku University
	14:00~16:00	STG meeting at Mozart Klees coffee, *STG ambassadors are invited to attend
	18:00~19:00	Join the IAC Networking Reception at Kitchen Terrace Krull
9/6, FRI	-	Move to Narita Airport and depart from Japan (17:25 to Thailand)

1.4 First time experiencing Japan and STG Program

My trip to Japan exceeded my expectations by far. I was stressed before the program, worrying that I couldn't communicate well with others, but in the end, I overcame that, which is the aspect I'm most proud of. I was also impressed by how comfortable traveling in Japan is; just a short walk would take me to the train station. The train system is well-managed, and the trains run on time. While exploring Japan, I noticed a sense of calm everywhere. Public spaces are well-managed, with noise control in various construction sites. The pavement is also clean, with no litter except for fallen leaves. I loved my time here. If I get the chance, I'll visit again!

The tour conductors and the JSCE team were incredibly kind, always offering help whenever I needed it. My friends in the STG program were also great—they were always willing to assist me. We even had time to wander and explore together on the last day, which became an excellent memory. I think I'll remember this trip for the rest of my life.

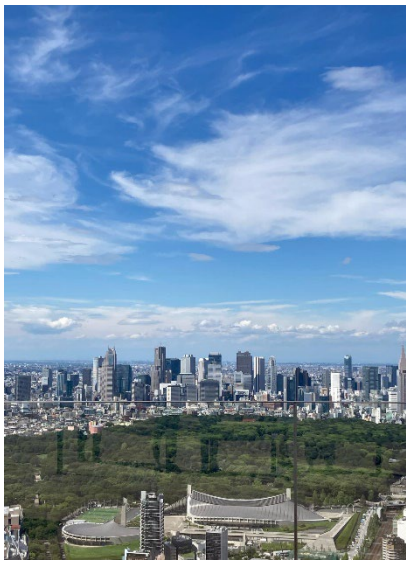
2. STG Program Activities

2.1 September 01 and 02

JSCE reserved my round-trip ticket. I departed from Thailand at 07:55 A.M. (Thailand time zone) on flight TG676 and arrived in Japan around 04:20 P.M. (Japan time zone). When I arrived, I headed to find the staff waiting for me. I found Mr. Fukumoto and told him, "This is my first time aboard." We had small talk while we waited for others to arrive. Then, he bought a bus ticket and sent me to Tokyo Station. The bus took around an hour to get to the station. After getting off the bus, I found Ms. Sakamoto. She brought me to the Hotel Intergate Kyobashi to meet Mr. Okuda (tour conductor) at the front desk. Unfortunately, the half-day tour in Tokyo was canceled this year due to the typhoon. However, they suggested an easy-to-go travel spot for me, e.g., Shibuya, Tokyo's half-day tour by bus. They also guided the reservation procedure for the tour spot ticket and the nearest station for transportation. After the small talk, I headed to my room and was well-prepared for tomorrow.

Due to the cancellation on September 02, this day was free. I was so excited for my first time aboard. I assertively reserved a Shibuya Sky ticket in the morning and went to it by the Yamanote line. I had wished for a long time to visit Japan. This time, the wish came true; I could quickly experience Japan. The view from the Shibuya sky is charming (a half civilization and clear blue sky). A half-day passed with the Shibuya Scramble Square. Then, I visited the Senso-ji temple (Asakusa Kannon Temple) and the Ameyoko night market, the other half. I walked around the temple for a few minutes and headed to Ameyoko. Surprisingly, it might be a bit crowded, even if it is Monday. This place has various foods and a friendly price. I can only choose what I prefer. Embarrassingly, this is my first time picking the food by its picture. So, I decided to select the Shanghai Kaisen-don. The bowl has a

delicate taste of Sashimi, which makes this bowl very delicious. Afterward, I returned to the hotel and prepared for the next day's STG program.



Full day Tokyo tour

2.2 September 03

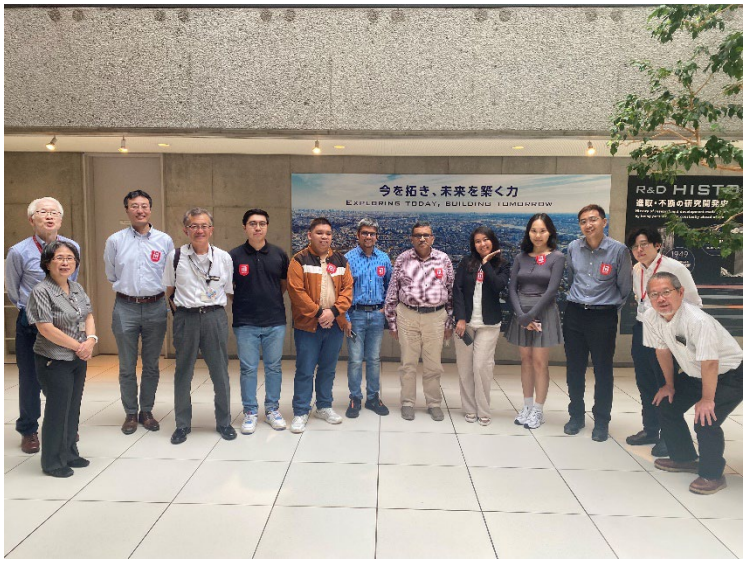
Today is the first day of the STG program's official activities. I had breakfast and checked out of the hotel. Before leaving, I met with all STG participants for the first time. We got to know each other. Then, Mr. Mori and Mr. Okuda took us to Tokyo Station for the JSCE Headquarters.

When we arrived at the JSCE HQ, the members welcomed us warmly. We officially introduced ourselves. This time, we met Ms. Shibuya and Mr. Arai, whom we had previously contacted for months. The STG orientation began with the representation of Assoc. Prof. Ishizaka. He officially explained the entire STG's itinerary, history, and technical tour programs. He also introduced the Sendai City Minami Gamo Wastewater Treatment Plant and the Ruin of the Great East Japan Earthquake.

After the orientation, we discussed many topics, such as disaster experience, flood management, and our presentation. We intensively addressed how to deal with disasters and their effects. A few minutes passed, and then we presented our topic. After that, we had lunch at the JSCE HQ and prepared to go to the Kajima Technical Research Institute (KaTRI). After that, we took a bus to the KaTRI.

Group picture in front of the JSCE HQ

When we arrived at KaTRI, Ms. Umehara and her team welcomed us warmly and took us to the meeting room. We were at the Nishichofu Complex, which is around 21,871 m^2 in size. She briefly introduced us to KaTRI and the itinerary. Then, they showed us a video about the complex and the other branches of the KaTRI. This place consisted of many laboratories, including an Exhibit zone, a Shaking Table, Concrete and Wind Tunnels, Large-size Structural Testing, Soil Mechanics and Foundations, Environmental Engineering, Construction and Fire Safety, and an Equipment Storage Building. This year, we had an opportunity to visit the Exhibit zone, Shaking Table, Concrete exhibition, and Large-size Structural Testing. A base isolation building tour is also included.



Group picture at the KaTRI

2.2.1 Exhibit zone and Laboratory (KOLabo)

As mentioned, we first visited this zone to obtain information about the Nishichofu Complex. In addition, this is the last tour place we visited to experience an earthquake. The machine, with a capacity of 200 kg, simulated the Great Hanshin Earthquake of 1995 from the actual situation of Kobe city. The magnitude of the simulation was around 6.9 to 7.3. The KaTRI staff suggested the machine procedure to us before we were experienced. The procedure included the actual earthquake and the experience of the base isolation building. This time is my first experience with an earthquake. The actual quake was very intensive and powerful. The movement of the earthquake occurred in every direction. Without a seat and belt, I cannot stand for any second. However, base isolation technologies can relieve earthquake damage. An isolated flexible foundation can allow the building to move in each direction and absorb the quake energy, reducing the quake impact.

2.2.2 Shaking Table Laboratory

The Shaking Table was the second place we visited. This laboratory involves a shaking table for earthquake subjection of the building, known as W-DECKER (3-Dimensional 6 D.O.F Shaking Table). The table contains two platforms: a big one and a small one. The big one is a width of 5 m. x a length of 7 m. It can move in each direction of 0.3 m vertically and 10% of each side horizontally. Its maximum acceleration is 2,000 gal (twice gravitation). The equipment can support a load of 60 tons and simulate building sway up to 70 cm. It can reproduce various earthquakes, including the most severe one's ever recorded. The smaller table, approximately 2 m x 2 m, can move by about ±2 meters and support a load of 5 tons. The smaller table is used to simulate long-period earthquakes.

The simulations from the table provide us the data on building behavior, such as behavior during earthquakes, collapse conditions, and the effectiveness of base isolation and dampers. The information obtained from these tests can be used to develop and design building structures, enhance the performance of base isolation systems. This shaking table simulation covers both short-period and long-period earthquakes. Building collapse due to earthquakes varies depending on the type: short-period earthquakes tend to cause damage to a small to medium-sized buildings with low heights. In contrast, tall buildings are more prone to collapse during long-period earthquakes. This is because the collapse depends on the building's natural frequency. It will collapse if the building resonates with the earthquake's frequency or wavelength.

2.2.3 Base Isolation Building

Before moving on to the following structural lab, the team took us for a tour of the Base Isolation technology installed at the Environmental Engineering Laboratory building. This system consists of alternating rubber and steel plates with a lead core in the center.

This technology helps reduce the energy transferred from an earthquake by isolating the underground structure from the above-ground structure. As a result, the pile system below and the building above are independent of each other. When the building becomes independent, the lower structure can move during an earthquake with only partial impact on the upper structure. In contrast, buildings without this technology, which are dependent on each other, would sustain damage from the energy of an earthquake.

Additionally, one of the participants asked how to install existing buildings without this technology. This technology can be installed later by using jacks to lift the existing building and installing the Base Isolation system. However, the original structure must be considered its behavior, as the entire building cannot be lifted at once. The installation must be done in phases to minimize disruption to the building's functionality during the installation process.

2.2.4 Large-size Structural Testing Laboratory

This lab aims to test unique or large-scale structures' behavior, damage, and mechanical properties. This is because the Reaction Wall here is massive (12 meters high, 16 meters wide, and 3 meters thick), allowing the testing of components cast in unique forms or challenging to predict regarding behavior, strength, or damage. The testing equipment can accommodate such components as it allows for the design of support points that can hold components of various shapes. Moreover, the equipment can simulate a wide range of static and dynamic forces and apply multi-axial forces in multiple directions. It can also test the fatigue of building elements.

From what we learned during the briefing, most of the testing focuses on components related to bridge piers, but sometimes, the behavior of large building structures is also tested to predict the points where damage might occur.

2.2.5 Concrete Laboratory and Exhibition

This part is what I had been looking for, as it is my field of work. I was impressed using technology to display information on different types of concrete. The section I visited was a concrete exhibition room. Upon entering, I was greeted by various types of concrete, each demonstrating different technologies. In the center of the room was a round table made of concrete, which served as a screen for a projector. When placing various types of concrete prepared by the research center onto the table, the system could identify the type of concrete, and the projector would then display a video explaining the technology behind that concrete.

Before allowing the participants to explore the concrete technology freely, the staff introduced us to CO_2-SUICOM. This concrete modifies its mixture proportions and is defined

by its setting with carbon dioxide instead of water, as traditional cement does. The component that enables the use of carbon dioxide for setting is γ-C_2S. The mixture used for production includes fly ash or ground slag to reduce waste and pollution from industrial byproducts. Additionally, they explained that carbon dioxide captured from industrial plants can be used to cure this type of concrete. CO_2-SUICOM is suitable for precast applications and small slabs for paving sidewalks.

Aside from this, other concrete technologies have been developed for sustainability. EIEN is some concrete with an altered mixture ratio designed for high durability through carbonation curing, which increases the surface density of the concrete. They also demonstrated the application of 3D printing technology with CO_2-SUICOM to print concrete into various shapes, although the 3D printing technology is still on a small scale. ECO-CRETE R^3 is a type of concrete made by mixing cement produced from ready-mix concrete that was about to be discarded. The strength of this concrete might not be equivalent to regular cement-made concrete, with a strength of about 60-90% of regular concrete. However, regarding environmental impact, it can reduce carbon dioxide emissions by 20-90% (depending on the parts and quantities used). Lastly, there is HIGH-FLUIDITY concrete, which has excellent workability, making it suitable for complex molds and heavily reinforced elements. The flow of the concrete can be controlled depending on the amount of fluidizer mixed into it.

All these technologies are fascinating. The world is trying to reduce carbon dioxide emissions from cement production. Even in my country, cement manufacturers are paying attention to these issues, whether by replacing limestone with new materials, adjusting concrete mixtures by substituting various materials to reduce cement usage, or adopting the concrete technologies learned from the KaTRI. All these efforts aim to reduce the greenhouse effect on the planet. I have started to place more passion on sustainable concrete. Thus, studying in Japan this time has been an important and valuable experience for my future career.

After finishing the activities at KaTRI, we took a group photo and headed to Tokyo Station by bus to catch the Shinkansen train to Sendai. In this city, the main activities of the program will take place. Before departure, we had a little time to find dinner. I asked Mr. Mori for recommendations on train food and settled on a bento box, which conveniently offered a variety of foods neatly arranged in one box, making it perfect for eating on the train. The train ride took about 2 hours, and I sat in the middle seat between Mark and Zin. We casually talked about school and why we joined the program while sharing dinner. Surprisingly, I got to know that Mr. Zin is studying in Thailand at the Asian Institute of Technology (Geotechnical Engineering). It probably made for a good connection during the trip.

When we arrived in Sendai, we took a taxi from the station to Sendai International Hotel (Sendai Kokusai Hotel). We confirmed the schedule for the following day at the front desk, and then we all headed to our rooms.

2.3 September 04

Today is the second day of the program's activities. We met at the front desk in the morning to have breakfast together. The day's schedule was divided into three parts. In the morning, we attended a lecture discussing current issues that civil engineers are grappling with, and we also worked together to explore ways to shift paradigms.

In the afternoon, we had lunch together at the Kirin Brewery Sendai, near our technical tour's location later in the day. After lunch, we proceeded to the technical tour site. Finally, we were invited to participate in the Kagami-biraki ceremony.

2.3.1 IAC Discussion

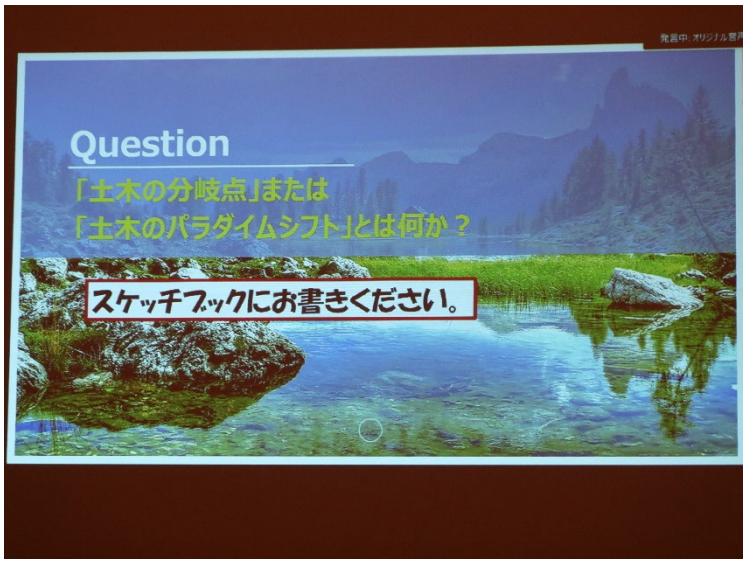
The discussion focused on exchanging ideas about infrastructure development and civil engineering challenges. The event presented various significant projects in Japan, such as the planning and executing of the new Linear Chuo Shinkansen, which will connect Tokyo and Osaka. This project aims to stimulate Japan's economy while also considering the environmental impacts of these infrastructure developments.

Several other vital projects were also discussed, such as the proposal for constructing the second Aomori Tunnel, which is critical in connecting and transporting goods between Hokkaido and Honshu. The discussion touched on geographic challenges, resource shortages, and the impact of climate change on civil engineering structures.

Soil liquefaction was also discussed during the conference. Information was presented on past natural disasters and infrastructure collapses, such as bridges in the Kansai-Awaji area affected by earthquakes. The liquefaction of fine-grain soil areas and the destruction caused by seismic vibrations had a significant impact. Future solutions and preventive measures were proposed to mitigate these damages.

At the end of the meeting, a question was raised: What is the turning point or paradigm shift in civil engineering? This question required deep reflection on the topics discussed. Mr. Ryo suggested "The wonderful uniqueness of the Japanese," Mr. Masatake proposed "Make and tell your own story," Mr. Shogo focused on "Future lifestyle." Mr. Ko emphasized "External and Internal harmony." Mr. Koji pointed to "Determination." My opinion would be *conscious awareness*.

After the event, the team and delegates from other countries took us for lunch at Kirin Brewery Sendai. I also had the honor of meeting Ms. April J. Lander, Society Director of the American Society of Civil Engineers (ASCE). Speaking with her was a privilege; she even gave me her card. She also introduced me to the process of becoming a member of ASCE and the benefits of membership.



The raised question

2.3.2 Kirin Brewery Sendai

During the ride from Sendai International Center to Kirin Brewery Sendai, since we were about to visit a site damaged by the tsunami, the tour guide shared their personal experience during the Great Earthquake. From what I experienced firsthand with earthquakes; I could fully grasp how intense it was. They also shared other stories, such as how the roads acted like barriers against the tsunami and detailed the places that were severely impacted by the waves. We had lunch together when we arrived at our destination and prepared ourselves for the technical tour program.

Lunch at Kirin Brewery Sendai

2.3.3 Sendai City Minami Gamo Wastewater Treatment Plant

We arrived at the wastewater treatment plant and proceeded to the learning room. This facility treats over 70% of Sendai's wastewater, which the Great East Japan Earthquake heavily damaged on March 11, 2011. The Miyagi earthquake (a Mw 9.0-9.1 undersea megathrust earthquake) caused a tsunami that hit the entire coastal area, with the recorded wave height reaching 10.4 meters above ground level. While many parts of the wastewater treatment plant have been repaired, some buildings remain as a reminder of the disaster.

The staff began with a presentation on the wastewater treatment system, starting with the history of this facility. Construction of the plant began in 1959, and simple wastewater treatment processes commenced in 1964. By 1993, the facility had fully implemented enhanced treatment processes. The first sludge incinerator was introduced in 1996, followed by a second in 2005. Unfortunately, the 2011 earthquake caused extensive damage to the structures and treatment systems. Recovery efforts began shortly after, with the plant entirely restored by 2016, and a third incinerator started that year, followed by a fourth in 2021.

The wastewater treatment system here is like what I've learned in my studies. First, the wastewater passes through a sand basin to filter out large particles. Then, it undergoes primary sedimentation, where suspended solids settle in the first tank. The wastewater is then moved to a reaction tank, where bacteria break down dissolved impurities and fine particles. These bacteria require a significant amount of oxygen to facilitate decomposition. Afterward, the water is transferred to the final sedimentation tank, where microorganisms settle to the bottom, and the water is directed to a disinfection tank before being released into the sea. The sludge at the bottom of the tank, composed of microorganisms and waste, is partially recirculated into the reaction tank as seed bacteria, while the rest is incinerated to ash. Once the wastewater enters the disinfection tank, it is sterilized before being discharged into the ocean.

Some separated sludges, meant for incineration, is first condensed by combining the sludge from the primary and final sedimentation tanks. This sludge is then centrifuged to separate the water from the solids, forming a sludge cake, which is stored in the sludge cake storage tank before being incinerated. Once enough sludge cake is collected, the incineration process begins at approximately 850°C. Finally, ash can be utilized in various ways, such as mixing with concrete or being used in landfills.

After the presentation, the team took us to the rooftop to get an overall view of the wastewater treatment plant. Since we couldn't enter the wastewater treatment area, they explained each part of the system again. They also mentioned that the rooftop we were standing on had been a refuge for people seeking help during the 2011 disaster. Afterward, we visited the remains of the damaged buildings.


Sendai Minami Gamo Wastewater Treatment Plant rooftop

We arrived at the remains of the ruin. The water level was 10.4 m. from ground level. Suddenly, the tour conductor asked if anyone knew why the damage to the building was uneven between the two sides. Before I could even think of an answer, Ms. Win Mon Mon Lwin (Myanmar STG Ambassador) quickly responded with her vast knowledge and experience. She explained that one side of the structure had bracing while the other did not. The braced side was more substantial and less susceptible to deformation, so it sustained less damage than the unbraced side. The damage is visible in the following image. We didn't stay long to hear more about the tsunami's impact as it was time to move on to the following location.



Ruin of the wastewater treatment plant

2.3.4 Sendai Arahama Residential Foundation

Due to the lack of time this year, we arrived at Sendai Arahama Elementary School but spent about 20 minutes walking around the ruins caused by the damage. We split into two teams, each exploring nearby areas. The destruction was quite severe. Small buildings were almost completely gone. Previously, this area was home to 800 households (over 2,200 residents), where most residents farmed or fished for a living. However, when the Great East Japan Earthquake occurred, although there was a warning, many people couldn't escape in time, leading to the instant death and disappearance of 190 people. It was a genuinely miserable event.



Sendai Arahama Residential Foundation

In the area, a memorial has been built to honor those who lost their lives. This includes a statue of Bodhisattva Kannon and a black stone monument. After walking around for a few more minutes, we headed back to the hotel to prepare for the Kagami-biraki ceremony in the evening.

2.3.5 Hotel Metropolitan Sendai: Kagami-biraki Ceremony

"The Kagami-biraki ceremony is a popular custom, performed at special celebrations in Japan, such as the New Year, a wedding, an anniversary, or the opening of a new business, in which a cask of sake, rice wine is cracked open with a wooden mallet. The wooden mallet that is used in the ceremony is called kizuchi. The sake is ladled to wooden masu (square wooden cup) and given to the participants who then make a toast. Literally translated, kagami-biraki is the opening of a mirror, Kagami. The shiny surface of sake in the barrel looks like a mirror."

In this ceremony, I had the honor of being the delegation leader to open the sake cask. I was excited because I had no prior knowledge or expectation of standing in such a position. When I went up on stage, there was a kizuchi (a wooden mallet) with my name on it, and I felt very pleased to be part of this moment alongside other delegation leaders. Together, we opened the sake cask and drank to celebrate the ceremony.

After the opening ceremony, as I walked down from the stage, I heard someone ask, "Are you Thai?" This surprised me since I hadn't expected to hear Thai in Japan. I turned around to greet him, and it turned out to be Mr. Anawat, an Associate Professor at Tohoku University, working at the International Research Institute of Disaster Science. He specializes in earthquakes and tsunamis. We briefly discussed why I attended the event, university life, and more. He gave me his card, and then we went our separate ways. I returned to my table to continue enjoying the meal and received a business card from Assoc. Prof. Ishizaka. We briefly talked before returning to the hotel to rest and prepare for the next day.

Kagami-biraki Ceremony

2.4 September 05

Today marked the final day of the STG program, and we spent the entire day at Tohoku University, where we had the honor of serving as special presenters in various sessions at the 26th International Summer Symposium, organized annually by JSCE. This symposium gathers participants from over 20 countries to bring together young civil engineers to discuss and exchange ideas on technology and share insights into the projects each of them is working on.

The range of research and projects presented was incredibly diverse. I was particularly amazed to learn that many experimental technologies are nearly ready for

practical application. One example that surprised me was using AI to detect damage on road surfaces and using Mixed Reality technology (currently in a non-real-time experimental stage) to simulate on-site conditions.

I was not participating in the STG Ambassador meeting due to my participation in ISS. However, when I finished, I asked Hachnayen about the meeting topics. He kindly explained that. So, the meeting topics are exciting. They discussed the future STG program and further activities.

We attended the IAC Networking event in the evening, which brought together people from various countries to build a network of civil engineers. Attendees engaged in conversations and exchanged business cards, fostering professional connections across borders.

2.4.1 26th International Summer Symposium (ISS)

The ISS was held at Tohoku University, and Mr. Arai led us there by metro. I was excited to see how the train connected directly to the university, which differs from Thailand, where trains typically only reach the front of the university. While it might seem contradictory, I expect trains to integrate into campuses partially, but it was still fascinating. We had to get off the train and walk a bit to reach the Law Building for our conference. Upon arrival, we registered for the ISS event. I had to split from some other participants to head to Hall 1, where my presentation was scheduled for the afternoon. I spent the morning listening to other participants' presentations. In my hall, the first STG participant to present was Mr. Hachnayen in Session 1, followed by Ms. Urantogos in Session 2. I was in Session 3, and the last one in our hall was Mr. Zin in Session 4.

After Session 2, we all had lunch together. Honestly, it was my first time presenting at an international academic conference, and I was so nervous that I had a stomachache and couldn't eat much. However, my STG friends encouraged me, helping me eat a little before my presentation. I was scheduled to present from 14:10~14:20, and I had 10 minutes to present my work, which was quite challenging. My topic was "Buffer treatment method for Bacillus thuringiensis crack healing applications," where I discussed methods for reducing the alkalinity on concrete surfaces to enable non-alkaline-tolerant bacteria to repair cracks. After my presentation, many people in the hall were eager to ask me questions. In the end, my presentation went smoothly.

Presentation at ISS

Once all the STG presentations were finished, we gathered to walk around before the upcoming IAC Networking event. We had some time to explore Tohoku University together, and our first stop was the Sendai City Museum. Unfortunately, we missed the last ticket sale for the day, so we took a group photo in front of the entrance instead. After that, we continued to the Sendai Ryokusaikan Visitor Center, where some people bought souvenirs and took pictures. I spent my time reading a Sendai travel book. When the time came, we headed back to Kitchen Terrace Couleur for our meeting.

2.4.2 IAC Networking Reception

This dinner was a gathering with JSCE, STG participants, and guests. Everyone, including myself, gave a speech. I shared my feelings about the five days I spent in Japan and wished everyone happiness. The meal offered sushi and other dishes. I wasn't quick enough to grab the different food, so I ate only sushi, which I enjoyed.

We are attending IAC Networking Reception

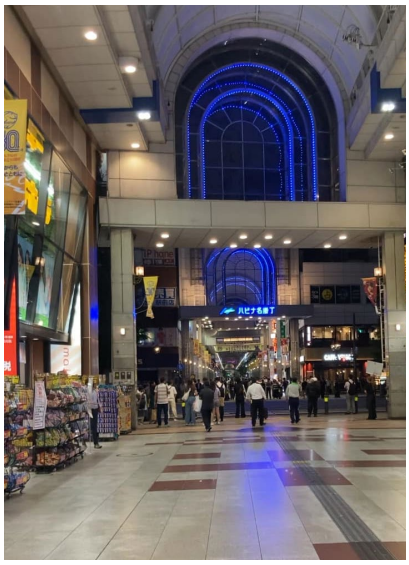
As the event progressed, Zin and Mark invited me to try some sake from Miyagi. Four kinds were available to sample, and I decided to try all of them. While tasting the sake, Mr. Iwai came over and handed me his business card, so we had a brief conversation. Afterward, I tried the red wine from Miyagi as well. Then, I suggested everyone in the STG group walk in Sendai together. I told them I planned to go sightseeing alone before returning, but I'd rather go with everyone. Hearing this, they all agreed. After the Networking event ended, we returned to the hotel and arranged to meet at the front desk at 21:00.

2.4.3 Hapina Nakakecho Shopping Arcade

We gathered at the front desk, and before leaving the hotel, we asked the receptionist if there was anywhere, we could go at that time since, in Japan, most shops tend to close early. The receptionist kindly informed us that Hapina Nakakecho Shopping Arcade was still open. We marked it on the map and walked there together, as it was very close to the hotel.

The shopping arcade had a similar vibe to Ameyoko Night Market, which I had visited on September 02. There were many shops, including restaurants and general stores. As we walked, we saw people performing live music. We spent about 1 to 2 hours there—some of us grabbed a bite to eat, and some picked up souvenirs. After we finished, we returned to the hotel to prepare for the next day's journey.





Hapina Nakakecho Shopping Arcade 21:30~

2.5 September 06

Today, our tour leader was Ms. Morichika, and it was my first time meeting her. She guided us onto the Shinkansen to take us back to Tokyo. We had to part ways with the STG Myanmar group when we arrived, as they were returning home on September 07. My team included Urantogos, Mark, and two tour conductors, Ms. Morichika and Mr. Fukumoto. We took the Narita Express to Narita Airport, which took over an hour to reach.

I had to part from my team at the airport, leaving just Ms. Morichika and me. She kindly escorted me to Terminal 1, where my flight, TG677, was scheduled for 17:25. Since I had quite a bit of time before my flight, she recommended a place for lunch but excused herself to return to her office due to other commitments. I reassured her that I could manage on my own. After that, I spent around 4 hours exploring the airport.

I was flying back with Hachnayen, but he arrived at the airport later. We arranged to meet before boarding at 15:30. When I went to check in, I found out that the flight was slightly delayed. However, that wasn't the case—we encountered heavy air traffic, which delayed the flight by an additional hour. In the end, I returned safely to Thailand.

3. Conclusions and Utilization

First, I was deeply impressed by the six-day tour program. I hadn't experienced such an immersive learning experience outside the classroom for a long time, and to do it in another country made me feel incredibly proud. This program gave me extensive knowledge, including cultural insights, networking, collaboration with others, earthquake science, seismic energy-reduction building technologies, concrete research, and more. All of this knowledge is invaluable. While it's possible to study these topics from books and research,

being able to experience them firsthand, observe them in person, and gain insights on the ground provides an entirely different level of understanding that pushes further learning.

This trip to Japan was my first experience with earthquake simulation, giving me a deeper understanding of the challenges of an earthquake. Although I'm not mainly specialized in earthquake science, I have some basic knowledge. Studying technologies like base isolation for reducing earthquake damage has given me vital information I plan to pass on. Whether through a report for the Engineering Institute of Thailand (EIT) or by presenting in the National Convention on Civil Engineering (NCCE) in my country, I will share this knowledge. Another technology, Damper systems, is something I hadn't experienced in earthquake simulations before. From my observations, dampers are typically installed in buildings' core for equilibrium and enhance the building's core performance when facing lateral forces, shear, and torsion.

Visiting the Kajima Technical Research Institute (KaTRI) was also highly educational, although I regret not being able to take photos. The technology there is impressive, covering various civil engineering topics. The main center focuses on tsunami research, while the Nishichofu Complex tackles multiple research areas. For instance, the large-scale simulation tools allow for better visualization of full-scale structural responses to earthquake forces. The concrete research at KaTRI focuses significantly on reducing carbon dioxide emissions, including reducing cement usage and capturing CO_2 from industrial plants to cure concrete hardened by carbon dioxide. This method reduces waste and pollution released into the environment. These research initiatives are precious and lay the foundation for future studies, mainly as concrete research increasingly focuses on sustainability.

Participating in the IAC Discussion made me more aware of the future direction. Civil engineering involves a wide range of disciplines, and sometimes, we, as engineers, don't fully consider the impacts of our constructions. The structures we build can affect society, the biological environment, and the surrounding physical environment, yet we may not always be aware of these consequences. Listening to this discussion was incredibly valuable, as their intense discusses made me realize the importance of the work I will do in the future.

Attending the ISS was also highly beneficial. It gave me an overview of research and introduced me to new ideas for managing problems and risks at construction sites using current technologies. Some of the technologies discussed included Building Information Modeling (BIM), Mixed Reality (MR) for simulating construction sites, Artificial Intelligence (AI) for detecting damage on pavement surfaces and corrosion prevention technologies for bridges and joints. Additionally, there was discussion about improving the engineering properties of soil through methods like adding fly ash and using Microbial Induced Calcium Carbonate Precipitation (MICP) to strengthen soil. All of this knowledge will be crucial for my future work. Knowing the current advancements in these technologies allows us to innovate and develop further in our research.

Finally, one of the most valuable aspects was the connections and relationships built across countries. Maintaining these relationships allows us to leverage them to share and expand our knowledge. With these connections, we can stay informed about changes and developments through ongoing communication, which is vital for our professional growth.