



Minerva // Nippon Foundation Sustainability Lab: Separate Grant Report

September 15, 2025

Overview

The Minerva Sustainability Lab is an interdisciplinary innovation lab that teaches students from around the world how to localize action on global sustainability problems. During the academic year, faculty guided students to learn disciplinary skills in one of three areas: (1) the application of satellite data to sustainability problems, (2) policy making and sustainable development, and (3) the intersection of AI, sustainability, and entrepreneurship. Students took courses and collaborated with Minerva faculty to engage in the topic-specific learning. Students had activities with local governments, academics, businesses or NGOs to put their academic learning into practice in real world settings. The 8-week summer program in Tokyo took a project-based approach to teach students how to take action on sustainability through support from local Japanese sustainability experts, cultural exchange with Japanese students, and excursions outside Tokyo. The Sustainability Lab programming aimed to provide Comprehensive Solutions to Sustainability Issues, Promote Interdisciplinary Education, Enhance International Collaboration, Provide Practical Learning Experiences, and Support Regional Revitalization. The activities during the Academic Year and Summer also helped Prepare for the Rotation City Program.

Academic Year

Comprehensive Solutions to Sustainability Issues

A range of programming delivered online learning, research activities, and project design for students. Minerva professors leading each of the three Sustainability Lab Programs (AI Sustainability Startups, Policy Pathways, and Satellites and Sustainability) held regular weekly Lab meetings with students during the Academic Year to teach them disciplinary skills relevant to their projects before advising them on those projects during the summer program. Thirty students participated in one of the three programs during the academic year working on a range of projects tackling societal issues. Team projects included an app using AI to predict spoilage to help consumers reduce food waste, satellite analysis to map areas suitable for low-greenhouse gas rice cultivation, and policy proposals to improve waste management.

Promotion of Interdisciplinary Education

Four courses and one extracurricular seminar series were added to Minerva's curriculum of 90 courses, constituting a ~5% increase.

- Climate Tech Coffee Talks (extracurricular seminar series; taught Fall 2024; [syllabus](#))
- Policy Pathways to Sustainable Development: Foundations, Contexts, and Coalitions (taught fall Semester 2024; [syllabus](#))
- Policy Pathways to Sustainable Development: Policy Design Process (taught Spring Semester 2025; [syllabus](#))
- Global Sustainability Exchange (taught Spring Semester 2025; [syllabus](#))
- Interdisciplinary Sustainability Innovation (taught Summer Sessions 2025; [syllabus](#))

The twenty students who participated in the Tokyo Summer Sustainability Lab took multiple courses. Over 50 other Minerva students also participated, in particular in the Global Sustainability Exchange and the Climate Tech Coffee Talks. Together they represent more than 30 countries. More students will take these courses in future years.

Enhancement of International Collaboration

The Global Partnerships benefit Japan in a few ways. First, they are an opportunity to transfer Japanese perspectives and approaches to sustainability to other countries. For example, the Minerva Sustainability Lab team analyzing Japanese rice production was able to share with EARTH and Zamorano students, who study agricultural sciences in Costa Rica or Honduras and come from many Latin American and Sub-Saharan countries. Second, they help forge global ties and bring more people and organizations to be involved in the Nippon Foundation's Social Innovation Hub. Here we highlight a few of the international organizations with which we had strong, ongoing collaborations that we built or extended upon. This set the stage for the domestic partnerships highlighted in the section on the Summer Program.

EARTH University (Costa Rica) and Zamorano University (Honduras): During the Sustainability Lab Programming, students from Minerva U, EARTH U, and Zamorano U had shared sessions of the Global Sustainability Exchange course. Ongoing collaboration will include future years of the course.

SAYDS (Kenya): During the Sustainability Lab Programming, SAYDS Fellows working on policy problems in Kenya collaborated with Minerva students as part of the Policy Pathways courses, providing opportunities for cultural exchange to learn how the policy process varies across the world. Ongoing collaboration includes similar interactions with Minerva students as part of the upcoming year's Policy Pathways course.

Sustentar (Argentina): During the Sustainability Lab Programming, Sustentar provided projects for students to work on, such as a policy analysis of recycling procedures, establishment of a marine preserve, and using AI to automate data collection of Buenos Aires residents' adherence to recycling procedures. Ongoing collaboration includes hosting a Sustainability Lab member as an intern the upcoming academic year and serving as a Civic Partner for Buenos Aires-based students.

Provision of Practical Learning Experiences

During the Academic Year, students participated in eight different fieldwork/internship activities. This helped set the stage for the twelve different fieldwork/internship activities students engaged in during the Summer Program, and together these experiences helped students learn the importance of local expertise and cultural context to creating successful solutions.

Berlin: "Planet Labs Satellites": Students visited Planet Labs' Space Systems Team to learn how the company provides high resolution satellite data. The Minerva students participated with students from Technische Universität Berlin.

Buenos Aires: "Is BA a Sustainable City?": Students visited the Palace of Water to learn from government officials and local sustainability experts about efforts to clean up the Riachuelo, the most polluted river in the world. The fieldwork also was integrated with the third-year Natural Sciences course Keeping Earth Habitable.

Buenos Aires: "Living on the edge: Social inclusion in Buenos Aires": Students visited Barrio Mugica, a disenfranchised settlement of the city that is struggling with urbanization to hear from local residents how they are working with the municipal government to develop their neighborhood sustainably. The fieldwork also was integrated with the third year Arts & Humanities course Social and Political Philosophy.

Buenos Aires: "The Science of Environmental Consciousness": Students visited the Center of Environmental Information and Education, a government office that focuses on building awareness of environmental issues and teaching best practices on sustainability. They learned how to take water samples and spent time volunteering in the Center's garden.

Buenos Aires: Sustentar Marine Sanctuary: Students worked with the Buenos Aires-based nonprofit Sustentar on an internship project researching non-traditional ways of financing conservation of a Marine Sanctuary in Chubut, Argentina.

Buenos Aires: Sustentar Circular Economy: Students worked with the Buenos Aires-based nonprofit Sustentar on an internship project creating a policy brief for improving urban

cleanliness, and another project using AI to automate data collection of how well recycling is sorted.

San Francisco: “Beach Cleanup”: Students organized a beach cleanup as part of a weeklong series of events for Climate x SDG week.

Taipei: “New Taipei City Dept of Secretariat and SDG implementation”: Students visited the New Taipei City government to learn about how they modify SDGs to be locally appropriate.

Supporting Regional Revitalization

Most of the activities during the Academic Year focused on student learning and preparation for the Summer Program in Japan. However, some of the activities, such as the Social Inclusion event and the Circular Economy projects in Buenos Aires contributed to those areas.

Summer Program

Comprehensive Solutions to Sustainability Issues

Students had many opportunities for face-to-face research activities in Japan, including research presentations, workshops with local experts, networking events, interviews about policy, and discussions about research projects with local stakeholders. Learning from Japanese experts helped students transfer their disciplinary skills and project ideas to effectively localize them to issues important to Japan, including ocean plastic pollution, policies about aging societies, and Urban Heat Island analysis. They continued to be supported by Minerva professors with weekly virtual visits as well as in-person visits that had a Minerva professor in Japan for the extent of the program.

Each of the nine Minerva undergrad teams was partnered with a student from Kyoto University. This partnership began with a symposium held in Kyoto in which Minerva students shared their academic year research, which was followed by regular virtual meetings to collaborate on localizing those research projects to Japan. These meetings provided an opportunity for Minerva students to learn the local Japanese issues of their particular sustainability problem, as well as gain additional networking connections. The project-based interactions provided an opportunity for cultural exchange. The relationships between Minerva and Kyoto University students sometimes extended beyond project collaboration, and in at least one case extended beyond the program. When asked to describe interactions with their Kyoto student counterpart partway through the program, Minerva students had mostly, but not entirely, positive things to say:

“Our mentor Kota was very helpful in our last meeting, getting to know what we did, understanding the subject matter of elderlies problem, and navigating us to get more resources. He suggested to introduce some people related to this field and research about this topic more.”

“It was insightful to talk with Kyoto Uni. students, and especially they bringing the local way of doing things, for instance I got to learn a bit more about the attitude of young people towards farming and agriculture, additionally they seem very eager and hungry to learn and share and see how can they help our projects.”

“We have met with Hiro, and discussed our project, and its objectives, and how he can help us through reaching out to retailers that we're targeting and get some information from them and their operations. We will check in with him again this week to actually talk about the progress and share with him a survey that he will be sharing it with his college friends to assess their willingness to use such a product and so on.”

“[The interactions are] Tense. Our expectations are in different places for sure. She expects us to reply very quickly and we expect her to have connections that are beyond something we could have found online ourselves.”

“The Kyoto University students were more interactive and open than we imagined! It was a bliss to talk to all of them, and we all wish we could meet in person more times.”

More project details are available in the Highlights section below.

Promotion of Interdisciplinary Education

The 8-week project-based summer program provided students with an opportunity to put the coursework and activities of the Academic Year into practice. One of the courses was taught over the summer (Interdisciplinary Sustainability Innovation) and some of the Summer activities facilitated interdisciplinary collaboration among students from the three different programs. For example, the Hackathon (see Highlight #6 below) put students in interdisciplinary teams to generate prototypes of solutions for topics like disaster readiness and agricultural adaptation to climate change.

Enhancement of International Collaboration

In addition to the global partnerships described above, we have established multiple domestic partnerships. Two MOUs have been signed with NTT East and the Tokyo Metropolitan Government. We are currently in discussion with Kamaishi City, Tanabe City, Kyoto City, Mori

Building, and Seibu on signing MOUs. Additional functional collaborations have also been established by the Sustainability Lab that are continuing for future Minerva programming beyond Sustainability Lab.

NTT East: During the Sustainability Lab Programming, NTT East hosted students at the NTT East eCity Labo, where Minerva students learned about NTT initiatives ranging from high tech agricultural innovations to natural disaster response. Ongoing collaboration includes NTT acting as a Civic Partner to work with Minerva students spending the academic year in Tokyo.

Tokyo Metropolitan Government: With the support of TMG, Minerva students will be collaborating with Tokyo High School students. In both the Fall and Spring semesters, Minerva students will be visiting Tokyo-based high schools to support experiential learning and provide mentorship.

Kamaishi City: Minerva students will be visiting Kamaishi City as part of their Japanese Society and Culture course. Here they will be learning about disaster preparedness in collaboration with city officials and NTT East partners.

Seibu: Owns the residence hall where Minerva students are living and has expressed interest in other collaborations including hosting civic projects and offering the use of their facilities at deep discounts.

Kyoto University Original Co., Ltd and the Kyoto City Government: During the Sustainability Lab Programming these organizations collaborated with Minerva on an event in which students visited Taizo-In Temple to participate in monastery activities and hear a lecture from Monk Matsuyama, before sharing their sustainability projects and research in a symposium with Kyoto University students, Doshisha University students, Kyoto City Government officials, and participants of the IVS Startup Conference. Ongoing collaboration involves programming focused on entrepreneurship and AI in which Minerva students work with Kyoto University students with local Kyoto startups.

Project Mint and University of Tokyo Institute for Future Initiatives: During the Sustainability Lab Programming these organizations collaborated with Minerva on a project evaluating how policy can be used to increase the well-being of isolated, elderly individuals in Japan's aging society. Ongoing collaboration includes continuing that project as part of a Social Sciences Core course that will be taught to Minerva students in Tokyo.

Blue Ocean Initiative and Dentsu, Inc.: During the Sustainability Lab Programming, Blue Ocean Initiative hosted Minerva students at the Blue Ocean Dome at the Osaka Expo. They also acted as advisors to three student projects (AI-driven prediction of ocean microplastics movement to

facilitate cleanup; Satellite analysis of harmful algal blooms to provide actionable information to fisheries workers; Policy analysis of potential implementation of Global Plastics Treaty to reduce plastic pollution from Japanese fisheries), and facilitated connections to other Japanese experts who supported students. Specific plans for ongoing collaboration have not been scoped out, but both parties have expressed satisfaction with the Sustainability Lab collaboration and a desire to grow a partnership.

Tanabe City Government: During the Sustainability Lab Programming, the Tanabe City Government hosted Minerva students in the Satellites program. Those students conducted preliminary satellite analysis of issues important to Tanabe City (ume plum agriculture, landslides and flooding, and fisheries) and presented those to city officials in a symposium. Then, they visited locations associated with those issues to learn from local Tanabe experts. Ongoing collaboration includes discussion of projects specifically focused on Tanabe City that Minerva students can work on in future years. Students will be visiting Tanabe City in November as part of their coursework.

Mori Building, Co.: During the Sustainability Lab Programming, the Mori Building Co. collaborated with Minerva in multiple ways. They hosted an interdisciplinary hackathon, Minerva students visited the Urban Lab Tokyo simulation, and they hosted the in-person Demo Day. Ongoing collaboration includes discussion to involve Minerva students in the 49th Floor Project, which brings together corporate, government, and academic stakeholders to address societal problems.

Provision of Practical Learning Experiences

During the Summer Program, students participated in twelve different fieldwork/internship activities.

NTT eCity Labo: All twenty Sustainability Lab students visited NTT East's eCity Labo, where they learned about NTT initiatives ranging from high tech agricultural innovations to natural disaster response.

Experiential learning at Myoshin-ji Temple + symposium with Kyoto U / IVS: All twenty Sustainability Lab students traveled to Kyoto to experience Zen rituals before presenting their academic year work to Kyoto University students (see Highlight #1 for more details)

Osaka Expo + Blue Ocean Dome: Seven students from the AI Sustainability Startups program and three from the Satellites program visited the Osaka Expo. We were invited to visit the Blue Ocean Dome, which directly related to two student team projects (see Highlights #2 and #3 below).

Sustainability Hackathon: Students formed interdisciplinary teams across the three Sustainability Lab programs to take Hackathon approaches to create prototypes for either sustainable food systems or natural disaster response (see Highlight #6 below). The session was held at the Mori Building's 49th Floor and led by Prof. Patrick Watson.

Workshop with Sustainable Labs, Inc.: The CTO of Sustainable Labs led students through a workshop on Sustainable Labs' TERRAST platform, which uses AI and Big Data to visualize companies' ESG contributions.

Tanabe City Excursion: Five students from the Satellites Program traveled to Tanabe City to visit sites, learn from local experts about ume plum cultivation, fisheries management, and disaster response. They performed preliminary analysis of satellite data on those topics to prepare for the trip, which they presented to Tanabe City officials. This helped them learn how to connect science to local problems in conversation with stakeholders.

WWF-Japan and Global Plastics Treaty: The Circular Economy Manager and leader of the Japan Business Coalition for a Global Plastics Treaty gave a lecture to students about the strategy taken by WWF to position Japan as a key player in the efforts to pass the treaty.

Tokyo AI Salon: Students joined the monthly event to hear about Japan's position in the global AI ecosystem and network with local AI practitioners.

Akiya Tour: University of Tokyo researchers led students in the Policy program to an area on the outskirts of Tokyo to a neighborhood with many vacant houses. After seeing the problem first-hand, they learned about the solutions that those researchers are proposing to address it.

Mori Building Urban Lab: Students gained another perspective on Tokyo by visiting the Mori Building Urban Lab, which visualizes various characteristics and data about Tokyo over its history in a room-sized simulation.

Hiroshima Peace Ceremony: As part of the commemoration of the 80th anniversary of the dropping of the first atomic bomb, students traveled to Hiroshima. They toured the Hiroshima Peace Memorial Museum, attended the Hiroshima Peace Ceremony, and visited other locations in the city. Students reported learning, "the importance of telling and sharing stories from the past for the next generations," as well as, "the deep and complicated history of Japan," and that, "Japan is so much more than just Tokyo."

Akasaka Palace: Students were given a tour of Akasaka Palace, after which they had a discussion with the Director of the State Guest Division to learn about Japanese approaches to diplomacy and how international cooperation is crucial to progress on sustainability.

Supporting Regional Revitalization

There were four regional events and eight regional projects.

Regional events (see above for descriptions)

1. Kyoto Symposium
2. Osaka Expo
3. Tanabe City Field Trip
4. Hiroshima Peace Memorial Ceremony

Regional projects

1. Satellite analysis of ume plum agriculture

A team of students performed [exploratory analysis](#) to see how Normalized Difference Vegetation Index (NDVI) can provide insight into seasonal growth patterns relevant to ume plum cultivation.

2. Satellite analysis of local fisheries

A team of students performed [exploratory analysis](#) to assess water quality in coastal waters to provide insight into whether phytoplankton biomass has changed in Tanabe Bay and its effect on the coastal fish habitats.

3. Satellite analysis of landslide and flood detection

A team of students performed [exploratory analysis](#) on how satellite data might be used to detect landslides and facilitate responses to those natural disasters.

4. AI prediction of microplastics in Tsushima Island

One student focused on Tsushima Island's plastics problem, and [used AI to predict](#) where and when plastic concentrations would be higher in the nearby oceans to help facilitate cleanup efforts (see Highlight #2 below).

5. Mapping better and worse locations for environmentally friendly rice cultivation methods

Two students in the Satellites program performed a [landscape analysis](#) to identify places where rice yields would likely be negatively impacted by the cultivation method and other places well-suited to the method.

6. Urban Heat Islands

Two students in the Satellites program used satellite analysis to [map urban heat islands \(UHIs\) in Tokyo](#). They expanded their analysis to the Osaka-Kyoto-Kobe metropolitan area to establish a methodology that could be used for heat-stressed cities across Japan and worldwide (see Highlight #5 below).

7. Ikigai and Policy for Aging Societies

Students worked closely with Project Mint, a Japanese startup that focuses on ikigai to help adults find purpose later in life. They explored how policy approaches can be used to improve wellbeing of people in aging societies (see Highlight #4 below).

8. Harmful Algal Blooms in the Seto Inland Sea

The Seto Inland Sea is subject to Harmful Algal Blooms (HABs) that impact fisheries. The students used satellite data to [create a prototype of an app](#) to improve prediction of harmful algal blooms (see Highlight #3 below).

Preparation for Rotation City Program

Along with the activities of the Sustainability Lab contributing to the Rotation City Program, other progress has been made toward ensuring that we meet our KPIs in the future. As the rotation program has been built, systems and processes are being put in place to support our KPIs.

Level of Student Satisfaction and Well-being: Learning Outcomes: Evaluation of students' performance by Civic partner

Civic projects offer students and organizations the opportunity to work collaboratively on issues that are impacting local communities and organizations. In order for these projects to be successful, students and their community partners must understand the scope of the collaboration and have shared expectations. To support a successful program launch, several steps have been taken including

- Developing training material for the partners in order to increase their understanding of Minerva students and the program as well as develop shared expectations for the program.
- Initiating a spring civic project course for Minerva students to build upon the learning from students' projects in their first year and to support continued career development and cultural understanding.
- Adding content in the Fall course to support student understanding of Japanese history and work culture to build an understanding of how culture can play a part in contemporary society.

Level of Student Satisfaction and Well-being: Satisfaction with the JHC course

The primary structure for the student experience in Japan will be the Japanese Society and Culture course. This course will provide students with an opportunity to explore several important themes for those living in Japan. Over the course of the semester, students will see various parts of Tokyo as well as venture to other prefectures in Japan.

- This course has been developed with multiple internal and external partners taking into account student feedback on experiential learning courses from previous semesters. Contributing faculty, staff, and external experts come from interdisciplinary backgrounds, bringing a variety of perspectives to the course development. ([Fall Syllabus](#))
- Building on lessons from the Sustainability Lab, Minerva created pre-learning sessions to better prepare students for excursions, ensuring they engage thoughtfully and appropriately with local contexts.

Level of Student Satisfaction and Well-being: Satisfaction with Civic Partners

In the late summer, students completed a survey, identifying the types of civic partners and projects that they would like to participate in while studying in Japan. These interests are being used to identify and develop appropriate partners. Additionally, students are taking part in smaller projects throughout the fall term, providing scaffolding and opportunities for cultural immersion in Japan.

- Outreach to over 25 potential partners. This has resulted in approximately 10 commitments for Spring Civic Partnerships. Many more partnerships are in development. Minerva alumni in Japan are an essential resource connecting the institution to organizations that are interested in working with international students on collaborative projects.
- The Sustainability Lab built strong student-centered partnerships with organizations eager to continue working with Minerva, while also generating momentum and interest from new partners—a clear proof of concept for future rotation programs.

Level of Student Satisfaction and Well-being: Satisfaction with Living and Learning Environments

Students live and learn in their residential building, making that space one of the most important features of the student experience. After much consideration, Minerva secured a 5 year housing contract for a residence hall near Shinagawa station that is being remodeled to meet Minerva's specifications including a Universal Design room, living quarters for our residential staff, and multiple kitchen and common room facilities. The location of the hall allows easy access to public transportation, food, and local study and coffee shops. Additionally, this residence hall allows Minerva the opportunity to expand the number of students coming to Japan in future years should Minerva decide to send larger groups of students to Japan.

Level of Student Satisfaction and Well-being: Index of student well-being in Japan

The City Staff collaborate with the Global team to provide services and support to Minerva students. The experience and understanding of Minerva of the city staff members are vital to the well-being of students. In order to provide the appropriate support for Minerva students, 4 full time staff members were hired onto the Tokyo City Team, most with over 7 years working with international students in Japan.

- Most staff were hired in April and able to receive training from staff in multiple Minerva cities in order to understand Minerva systems and processes as well as have time to develop programming.
- Over the summer, staff not only provided direct support to students but also laid critical groundwork for the future programs and partnership. Staff established emergency protocols, created a comprehensive residential living guide, and deepened their understanding of the Minerva student community. These efforts have equipped the Tokyo team with the systems, insights, and confidence needed to successfully expand into a larger, more ambitious program.

To support student connection to and integration into city life, Minerva has established several peer group collaborations. This has begun with a collaboration with Zen University whose students offered pre-departure information to Minerva students to support their acculturation and well-being in Japan.

Student Diversity

Minerva continues to recruit diverse groups of students and the cohort graduating in 2028 (M28) maintains a high level of diversity. 127 students are coming to Japan in the Fall semester, and those students are citizens of 80 different countries. The M28 students also represent diverse financial backgrounds. 36% of the students come from families with incomes of less than \$20,000 a year. The average family income of this 2028 class is \$43,600 a year. 85% of the class receives some kind of financial assistance from Minerva University.

Highlights

Highlight #1: Kyoto Temple Visit and Symposium

This day-long event began with a visit to Taizo-In at Myoshin-ji Temple, generously led by Monk Matsuyama. After experiencing a traditional lunch and zen meditation, students were led around the temple grounds by Monk Matsuyama, who also delivered a lecture. The experience informed students about traditional Japanese values and approaches to sustainability, giving them new perspectives on sustainability and an understanding of the cultural context in which they would work on their projects.

Students then moved to nearby Hanazono-Kaikan Hall for a symposium in which select students from each of the three Sustainability Lab Programs (Policy, Satellites, AI) presented their work from the academic year to share their approaches to sustainability problems and to receive feedback from a panel of local experts on how their work could be successfully localized to Japan. The event concluded with a reception that served as a start to mentorship relationships with Kyoto University students, who provided local cultural context and Japanese contacts to support Minerva student projects throughout their two months in Japan. [The event was a success](#) and led to lasting impacts, with Minerva students sharing how Monk Matsuyama's wisdom shaped their thinking and with relationships between Minerva and Kyoto University students extending beyond project collaboration, and in at least one case extending beyond the program. Discussions with Kyoto University Original Co., Ltd are ongoing to fundraise together for AI programming involving Minerva and Kyoto University students.

When asked about their favorite part of their excursion to Kyoto, Minerva students said:

"One standout moment was our visit to the Buddhist temple. Being invited to eat in silence, with mindfulness and deep appreciation, was unexpectedly moving—it turned a simple meal into a rich, contemplative ritual. It taught me that sustainability isn't just ecological; it's also mental and spiritual."

"Definitely the Zen experience. linking to the theme of sustainability, the Japanese term of "自給自足" came to my mind as we practiced "simplicity" through Zen. it directly translates to "self-sufficiency", but meaning we have to provide for ourselves and know the line of what is sufficient for ourselves. the NTT lab mainly taught me how to provide for ourselves, by using smart agriculture, art-preservation, disaster-responding machines...etc. but Zen taught me how to understand what is enough for humankind to have, by appreciating what we are given for our food, experiencing "nothingness" and remembering how we are only part of the nature, and never above. Now, I feel like these two things, of both knowing how to provide, and knowing what is enough is both crucial for us to become sustainable."

"It was visiting the temple with monk Matsuyama, especially his talk about zazen and the impact of that even on businesses."

Highlight #2: Student Project Using AI to Inform the Cleanup of Microplastics in the Ocean

Students: Mara Dumitru (Canada) and Autinn Au-Yeung (Hong Kong)

The students developed a Machine Learning application and dashboard that infers the level of microplastics in a particular ocean location from satellite imagery. The model uses a number of

computer vision assets that are sensitive to macroplastics and uses these areas of pollution to infer nearby microplastic concentrations.

Blue Ocean Initiative support helped provide subject matter expertise, and guided them to apply their approach that had previously focused on Indonesia to relevant areas in Japan, such as Tsushima Island. The students were able to [create a microplastics prediction model](#) and write a [manuscript of their results \(Japanese version\)](#). They hope to continue contact with Blue Ocean Initiative who has suggested partnerships with a University of Tokyo researcher and a leading global nonprofit, The Ocean Cleanup. This would help validate their model and to test its value in guiding clean-up efforts. Their long-term plan is to publish their results and find a long-term partner to work with, especially one that has access to data sources that can validate their satellite model.

Highlight #3: Student Project Creating a Satellite and AI-Powered Early Warning System for Harmful Algal Blooms

Daria Bassot (Kazakhstan) and Laoise Nolan (Ireland)

The students built a machine learning framework to predict harmful algal blooms, often called "red tides," in Japan's Seto Inland Sea. Harmful algal blooms can cause In addition to predicting when a bloom might happen somewhere in the sea, this system also predicts where a bloom will occur. This location-specific approach makes the system much more accurate at identifying harmful algal blooms. To make its forecasts, the system analyzes 25 different types of environmental data. This information is collected from various sources, including satellites, ocean sensors, and weather stations, giving it a detailed picture of the ocean's properties and health. The system is operational and designed to be flexible, with three different versions that could be deployed depending on the situation: one that's fast, one that's most accurate, and one that offers a balance between the two.

The students were previously working on a different topic, but discussions with BOI guided them to Harmful Algal Blooms as an important issue to which they could apply their skills. With support from BOI together with guidance from Minerva faculty, in two months the students were able to run analysis of satellite data, test prediction models, [write a manuscript](#), and [create a prototype of an app](#) to improve prediction of harmful algal blooms. The long-term plan is to (1) publish the results in a peer-reviewed journal and (2) develop a publicly available app that can be used by fisheries, aquaculture facilities, and tourism vendors in Japan.

Highlight #4: Policy Approaches to Increase Wellbeing in Aging Populations

Patryk Borek (Poland), Raluca Grigoras (Romania), Salome Gvirjishvili (Georgia), Laurens van de Hoef (The Netherlands), Kaoru Yokomori (Japan)

The students worked closely with Project Mint, a Japanese startup that focuses on ikigai to help adults find purpose later in life. In conversation with researchers at the University of Tokyo Institute for Future Initiatives who study population decline, gerontology, and senior employment, they conducted interviews and field visits to investigate how policy can strengthen communities and the wellbeing of aging societies.

During the academic year, students focused on other topics like circular economy policy in places like Buenos Aires and Taipei. The two-month internship in Tokyo allowed them to deeply investigate issues with an aging population they had not previously explored and compare how policy making in Japan differs from their home country and the Minerva locations they worked. They have created a draft of a book chapter on policy approaches to post-retirement work and policy design guide for those who aim to integrate ikigai into policies focusing on Japan's aging society. This work will transfer to the Minerva course Political Science and Social Change (SS112), which will work on identifying policy interventions for addressing aging issues in their location based assignments.

Highlight #5: Student Project Mapping and Mitigating Urban Heat Islands in Tokyo and other Warming Cities

Rayyan Afzal Maan (Pakistan) and Ari Perez (Spain)

The students used satellite analysis to [map urban heat islands \(UHIs\) in Tokyo](#). They expanded their analysis to the Osaka-Kyoto-Kobe metropolitan area to establish a methodology that could be used for heat-stressed cities worldwide. To facilitate analysis by global cities and enable action, they created a prototype of a [web-based dashboard](#) to allow users [to map the UHIs](#) in their city, setting up a framework to facilitate transfer of policy interventions between cities. The project has become a promising topic for a new Minerva innovation in project based learning, Global Civic Projects. Traditionally, Civic Projects at Minerva have focused on a single location, and Global Civic Projects build on that idea to create multinational projects that span Minerva rotation cities. The UHI Dashboard is a potential Global Civic Project that could involve the Tokyo Metropolitan Government, the Municipal Government of Buenos Aires, and the Minerva course Modeling and Measuring Environmental Systems, taught by the lead of the Satellites Program, Peter Zoogman.

Highlight #6: Hackathon

All students participated in a two-day hackathon in Tokyo at the Mori Building. Themed around the matsutake mushroom, which only grows in disturbed environments, the students were asked to develop machine-learning based models specifically designed to be used in areas that had been disturbed by a pollution, disaster, or climate change. The students worked in four teams to develop the following prototypes.

Subtheme 1: Disaster readiness

1. Earthquake survivor search

This team developed an application that used computer vision object recognition models and audio filtering to detect survivors in rubble after an earthquake. They tested it on their own team by hiding under furniture. With further development the team proposed that it could help first responders during natural disasters. This prototype was chosen as the “most creative” by the students.

2. Aerial building damage assessment.

This team developed a satellite application for evaluating the changes in buildings due to damage by natural disasters. This application compares “before” and “after” aerial photos and estimates the bounding boxes of buildings to identify damaged or collapsed structures. This can be of value for first responders, insurance assessment, and remediation. This prototype won the award for “highest impact.”

Subtheme 2: Supporting agriculture in a changing world

1. Farmer’s assistant

This team developed an LLM-based chat bot that was fine tuned to discuss sustainable agriculture strategies with farmers. Their model provided advice, technical support, and helped develop plans for more sustainable planting patterns and alternative strategies for pesticide and fertilizer use. They won the award for “most sustainable” project.

2. Agriculture dashboard

This team developed a dashboard for farmers that integrated a number of different technologies related to weather forecasting, dynamic market price forecasts, and generative language models to support farms in monitoring the impact of their sustainability strategies. The model attempted to provide multiple avenues of support and integrated satellite, text, market, and weather data to provide farmers with a full understanding of the circumstances surrounding their sustainability choices and to measure the impact of them over time. This platform won the “technical excellence” award.

After two days of nearly constant coding and testing, the teams presented their models to the students and faculty of the sustainability lab along with local partners from Kyoto University. While the prototypes and demos were developed in the hackathon in just over 24 hours, the teams have continued to support and develop them as part of their technical portfolios and continue to look for partners and external groups to collaborate with on these technologies.

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