EnviroLab Asia

Volume 3
Issue 1 *Japan*

Article 2

9-12-2019

Towards universal design for all: Understanding Japan's environment from an accessibility standpoint

Bailey Lai
blj2015@mymail.pomona.edu

Towards universal design for all: Understanding Japan's environment from an accessibility standpoint

Bailey Lai[1]

The EnviroLab Asia clinic tackles social injustices with environmental concerns across cultural landscapes. This type of interdisciplinary research attracted me when I first applied to the program as a first-semester senior, while I was writing my thesis on the history of transportation and its relationship to erasure and displacement of communities of color in the Greater Los Angeles area. By participating in this unique program, I wanted to continue pursuing my passions for environmental justice by collaborating with others to find interventions in existing social and ecological spaces in other regions such as East Asia. The Spring 2019 course taught by Professor Marty Meyer focused on Japan and was split into four lab clinic groups, each led by a faculty member. During the semester I met biweekly with Professor Angelina Chin and classmates Yufei Guo, Alida Schefers, and Meena Venkatraman for our accessibility group. We studied how Japan's technological advancement, urban infrastructure, and sociocultural values converge to inform attitudes toward accessible design in the country's built environment, focusing on the greater Osaka (*Keihanshin* 京阪神) metropolitan area. Meanwhile, EnviroLab Asia Coordinator Karin Mak worked tirelessly on the program's complex logistics, organizing every individuals' paperwork and the four groups' travel plans for the two-week trip to Japan.

After our spring EnviroLab Asia class contextualizing environmentalism from a Japanese perspective, we embarked on our clinic trip from May 20 to May 31. A lengthy 12-hour flight took us from Los Angeles International Airport across the Pacific Ocean to Kansai International Airport, located atop an artificial island in the middle of Osaka Bay. That first evening our class of 17 students and four faculty made our way to our first night of accommodation. All of us stayed our first night in Japan at the Big-I, an accommodation facility designed to showcase barrier-free accessible design. After a short briefing from Professor Chin upon our arrival, we settled into our rooms and quickly went to sleep. I awoke in my hotel room to the sun shining through the window. Had I overslept on my first morning of EnviroLab clinic trip? No, it turns out: Japan has no daylight savings time, so the sun had risen by 5 AM and had woken me up. On top of this, I was still jetlagged from 12 hours of flying and moving 16 hours ahead of the American West Coast. Unable to fall back asleep, I decided on an early start to our first full day. After a traditional Japanese breakfast in the hotel's restaurant, our class boarded a bus headed

---

Bailey Lai graduated from Pomona College in May 2019, majoring in Environmental Analysis with a concentration in Sustainability and the Built Environment. His senior thesis, "Exploring Transit-Based Environmental Injustices in San Gabriel Valley and Greater Los Angeles," is available on the Scholarship @ Claremont website in an open-access format: https://scholarship.claremont.edu/pomona_theses/198/. In September 2019, Bailey began a year-long AmeriCorps fellowship with the Local Government Commission, working as a CivicSpark Fellow for the Santa Ana Watershed Project Authority's Disadvantaged Communities Involvement Program.

towards the iconic Osaka Castle. Visiting this historic castle first thing in our clinic trip grounded me in the reality that we were truly in Japan.

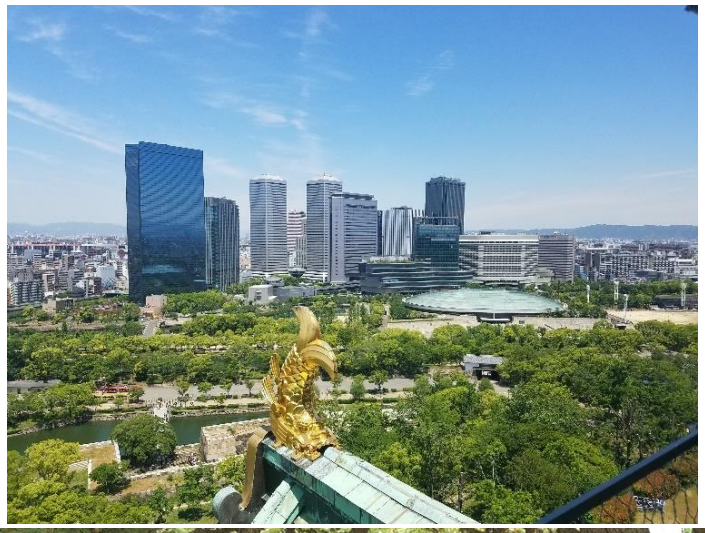


Fig. 1 & 2: Osaka Castle sits in the heart of a modern metropolis full of skyscrapers. Photo Credit: Bailey Lai
Fig. 3: The EnviroLab class. Photo Credit: Karin Mak

After getting a panoramic view of the city atop Osaka Castle, we took our bus to the Asia-Pacific Trade Center in Osaka Bay to visit the Ageless Center. Seeing the showcase of hundreds of assistive technology at the Ageless Center grounded our prior research and readings on Japan's high-tech approach to accessibility as well as complemented our study of barrier-free universal design. Our class got to experience first-hand different ways in which rooms can be retrofitted with assistive technology and designed with accessibility in mind. We got to ride on wheelchairs through an obstacle course of daily barriers with doors, small ledges, tight corners, and bumpy footpaths. The attendants even let us test a motorized electric wheelchair, which provide a boost going up a slope and automatically brake going down a slope. However, one thing that fellow lab mate Alida and I noted was that a lot of the most advanced assistive technology was quite expensive. For example, the wheelchair with two extra sets of wheels to climb stairs looked helpful for homes with staircases, but its cost of over one million yen (USD 10,000) would make it economically inaccessible to most households.

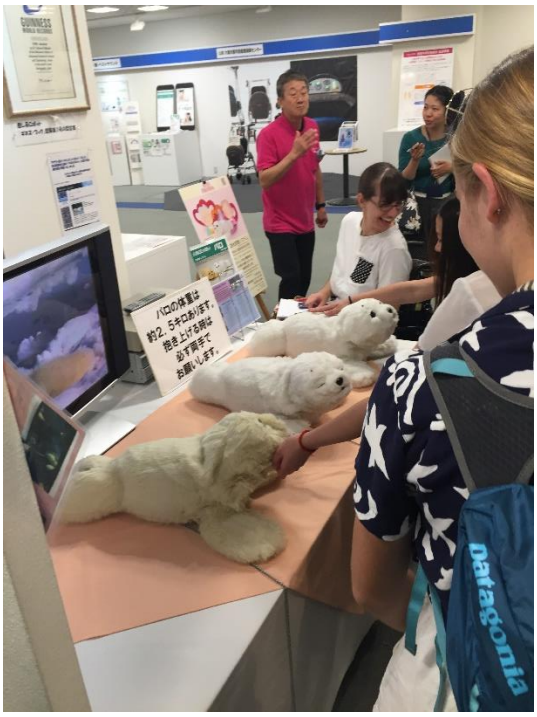


Fig. 4 & 5: Ageless Center's high-tech assistive technology, such as the therapeutic seal doll Paro and stair-climbing wheelchairs. Photo Credits: Karin Mak

Next to the Ageless Center was the Green Eco Plaza, a government-sponsored exhibit of companies implementing environmentally friendly products. We saw some novel ideas when touring this showroom. In Japan, many companies reduce their waste by relying on each other's different expertise to create new systems of sustainability. For example, the beverage company Itoen produces over 50,000 tons of tea leaf waste annually, so they asked over 150 outside companies to design products to recycle and reuse this byproduct. This led to creative results like paper envelopes and plastic containers made partly from used tea leaves. From this presentation, we learned the importance of many companies collaborating to find opportunities for reuse, repurpose, and reselling of what we once considered "waste."

Fig. 6: Itoen's tea leaf waste is repurposed as office paper products. Photo Credit: Bailey Lai

That evening, we toured the barrier-free guest rooms in the Big-I International Communication Center for Persons with Disabilities, the hotel we are staying at. Looking at the guest rooms gave us a better sense of how barrier-free design has been implemented in real life. Like the Ageless Center, hotel employees raised the issue of maintaining expensive accessible equipment as a concern. Japan's national government originally paid to build and run Big-I as the country's first showcase of barrier-free accessible design back in 2001, but after budget cuts a non-profit now runs the center. As funds from NGOs are much more limited, the Big-I has seen few upgrades its grand opening 18 years ago, since maintaining and keeping up the existing equipment and building absorbs most of the annual budget. After this initial trip, we started considering the financial costs associated with high-tech solutions to accessibility and took that into account with our approach to preparing for the collaboration with Osaka Institute of Technology.

Fig. 7-9: Big-I is a large facility and hotel built by the Japanese government in 2001 to showcase assistive technology. Photo credit: Bailey Lai

After our first two days at the Big-I in Sakai, my clinic group moved to central Osaka, staying in the Umeda neighborhood at the Yamanishi Guesthouse (next to Osaka YWCA) for a whole week. In the morning, we passed by Ogimachi Park to see who was using the park and to take brief photos. One part of our EnviroLab Asia research was to assess the accessibility of Ogimachi Park first-hand, so we looked at how walkable the park's pathways are within and around the neighboring community. We also took notes on how the spaces were being used, such as the central grounds and the kid's playground. Because the kid's playground has a steep hill in the middle, the ramps up to the top were not very accessible for someone in a wheelchair. Also, there were occasional steps such as the awkward sand and stone steps leading to the vending machines.

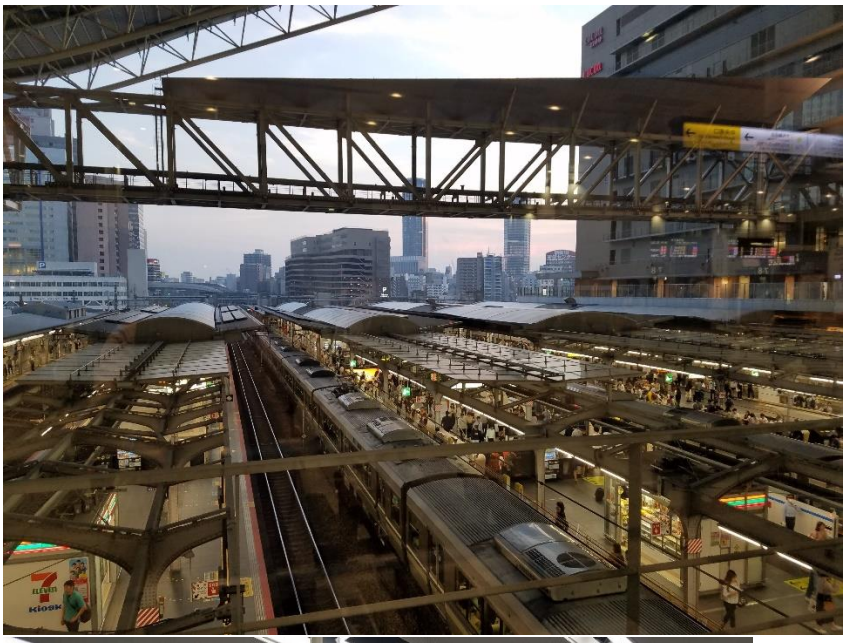
DOI: 10.5642/envirolabasia.20190301.01

Figs. 10 & 11: Our accessibility lab spent two days exploring every corner of Ogimachi Park and its surrounding environs. Photo Credits: Bailey Lai

After checking out the park, we went through Umeda's maze of malls and walkways. The busy central neighborhood of Umeda contains multiple transit stations: Umeda and Higashi-Umeda metro stops for Osaka Metro, Osaka Station for the regional and national JR trains, and Umeda station for the private Hankyu trains. Since different stations are named similarly, we noticed how difficult it is to understand where you are relative to your destination. First-timers will almost certainly get lost amidst the labyrinth of passages. We first tested entering Umeda via the JR Osaka Loop Line, going one stop from Tenma to Osaka station. Getting off at Osaka station, we were put into a huge elevated train station with over a dozen platforms for JR trains. To get from Osaka station to Umeda, we spent almost an hour navigating a few blocks of massive walkways, inside buildings filled with endless crowds. The inundation of foot traffic from all directions seemed less like rush hour and more like rush workday. We went down to ground level crossing busy street intersections going through more crowded corridors to get to Umeda station. Afterwards, we tested leaving Umeda via the underground Osaka Metro.

One immediate thing that jumps out when comparing Umeda and Greater Osaka to my studies of El Monte and Greater Los Angeles in my senior thesis is how thoroughly connected multiple modes of transport are not just in the downtown core of Osaka but also its surrounding neighborhoods. The car-oriented nature of El Monte and the surrounding San Gabriel Valley has come at the cost of accessibility at the human scale in El Monte's little-used town center. This was the opposite case in Osaka, where the central Umeda station and the more residential area around Ogimachi Park had lots of footpaths, walkable streets, and transit options connecting to different parts of the city. Whereas the constant roar of the freeway permeates El Monte and effectively prohibits walking, the centralized nature of Umeda for multiple train stations created a different issue of long labyrinthine passages with unclear signage and full of rushing commuters. On the other hand, the ability to take multiple forms of transportation made Osaka much more accessible to those who cannot drive a car compared to Los Angeles.

Figs. 12-16: The urban environment around Umeda station, one of the busiest in Osaka, encompasses a dizzying array of elevated walkways, street-level pathways, and underground corridors. Photo Credits: Bailey Lai




地下鉄 東銀座駅
Whitia
ホワイティうめだ
地下街のクリーン化


NORTH MALL 1

This research into the accessibility of central Osaka's built environment gave us some preparation for our collaboration later in the week with the Robotics Faculty of the Osaka Institute of Technology (OIT). As the first week ended, we met with Jorge Luis Copete Vasco, who Professor Chin hired as our translator for when we collaborate with OIT next week. During our dinner atop the Hankyu Umeda department store, we learned that Jorge is a PhD student in robotics at Osaka University. He came to Japan from Colombia six years ago and plans to take back to his home country what he is learning in Japan, with the hope as well of encouraging Japanese collaboration in Colombia.

Fig. 17: The cityscape of Umeda and greater Osaka as seen on OIT's top floor. Photo: Bailey Lai.

For our EnviroLab Asia accessibility lab's last three days in Osaka, we collaborated with the robotics lab of Professor Hiroi Osaka Institute of Technology (OIT). We met up at OIT's Umeda campus, a tall 20-story skyscraper just a few blocks from the bustling train station we had explored days before. In his introductory presentation, Professor Hiroi showed how his robotics lab mainly created robots to compete in international competitions such as RoboCup. He said he started thinking about his robot's larger implications and potential for accessibility when a person in a wheelchair approached his team at an exhibition and asked how their their robotics could apply to real-world use. This led to a fortuitous opportunity when Professor Chin cold-

DOI: 10.5642/envirolabasia.20190301.01

emailed him about collaborating with the EnviroLab Asia program. Aside from testing in-lab and in use in competitions, Professor Hiroi has yet to test the Asahi or the Carry robot in everyday settings. Through our discussions with Professor Hiroi's lab, we learned that the Carry robot is built economically for everyday application, whereas the Asahi robot is built more for testing the lab's latest voice and AI technology. However, we identified ways in which Carry might be improved. The Carry robot needs to charge four hours for roughly every two hours of use, which would be a huge inhibitor for daily usage. In addition, the Carry robot can only track one person at a time, so in crowded situations where multiple people may be detected by the robot's sensor it can lose track of the original person and start following someone else. Without the Asahi robot's expensive artificial intelligence, the Carry robot also cannot maneuver around obstacles or remember routes. Upon testing, the Carry robot ran into the corner of the desk as the test person turned. This is because the Carry robot is set to follow very close to the target person's torso, and its single sensor lacks awareness of objects underneath. As an example, the Carry robot kept hitting Alida's wheelchair as it did not register her lower body or the chair seat. Despite these shortcomings, the Carry and Asahi robots utilize cutting-edge technology that will improve with Professor Hiroi's research. Our translator Jorge found the Asahi robot's acute spatial awareness particularly advanced given the challenges for robots to recognize a variety of obstacles in everyday environments.

Fig. 18: Testing the Carry Robot's object detection abilities. Photo Credit: Bailey Lai
Fig. 19: Testing the Asahi Robot's artificial intelligence tracking. Photo Credit: Jorge Luis Copete Vasco.

Based off these findings, Hiroi's lab helped us create a scale model of the elderly recreational space our lab had designed earlier in the semester. The space contained a living room, dining area, greenhouse garden, gym, recreational space and stage, and traditional Japanese room (*washitsu* 和室) with tatami mats. We made sure to create handrails across the entire space for people to secure themselves as they walked, and we implemented robot designs from OIT into our model. We combined a variety of materials, from clay brought by Professor Chin for furniture and decorations to the white cardboard sheets for our walls to create a life-like representation of what this hypothetical space would look like.

Fig. 20: The two labs working on the scale model in the OIT robotics lab.
Fig. 21-24: An overview and close-up of the collaborative scale model. Photo Credit: Bailey Lai

My group's on-the-ground exploration of Osaka's built environment gave us first-hand experience with the successes and limitations of accessible and barrier-ridden elements of a Japanese city's infrastructure. The collaboration with Professor Hiroi and his lab at the Osaka Institute of Technology enlightened us about the increasing role technology may play in aiding

DOI: 10.5642/envirolabasia.20190301.01

the aging demographics in Japanese and American populations. By collaborating with our lab on creating a Japanese recreational space, we wanted to explore the possibilities of how the Carry and Asahi robots may be implemented to help with accessibility in everyday environments and adapting such technology to the cultural specificity of these spaces. Thanks to EnviroLab Asia, my lab and I got a once-in-a-lifetime opportunity to collaborate with a university in Japan, creating cross-cultural exchange exploring the increasing need for assistive care in our world's collective future.

Fig. 25: The EnviroLab Asia accessibility lab with Jorge and the Osaka Institute of Technology robotics lab at the conclusion of our collaboration. Photo credit: Osaka Institute of Technology.