

Investigating Urban Sustainability in Asia as a Case Study for Future Civil Sustainable Development

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I. INTRODUCTION

In December of 2019, we (Lawrence Lin and Iris Arbogast) travelled to Bangkok in Thailand, Bangalore and Chennai in India, Hong Kong, and Wuhan in China in order to study sustainable cities in Asia. As an economics major, Iris was interested in the societal influences on sustainability in cities. As a physics and math major, Lawrence focused on the technological developments. Overall, we found that sustainability wasn't a major focus for the government of Thailand and Hong Kong, but that consultants in the area were optimistic about the potential for the energy sector. In India, the smart cities program was ambitiously trying to improve the sustainability of 100 model cities. In Wuhan, a new city had just been built based on 5 key sustainable design elements and it was starting to attract people.

II. BANGKOK, THAILAND

Our first stop was Bangkok, Thailand. We interviewed Mark Dunn, an infrastructure, sustainable development and policy advisor who previously worked for the U.S. Trade and Development Agency and is now an independent consultant. He gave us a general overview of his perception of sustainability in Thailand. He argued that Thailand is not as advanced as it could be, and talked about potential next steps such as integrating intelligent transportation, incentivizing electric vehicles and incentivizing LEED buildings.

In terms of plastics, we learned that Thai people are pushing back against the movement to eliminate plastic bags and straws from places like 7-11 and grocery stores. Stores in Thailand were doing 2 days a month without bags, but the street food in Thailand uses a ton of this non-sustainable type of packaging. However, there are a few street markets that

have found a way around using plastic bags. For example, Lawrence and I were walking in the streets of Bangkok and we found a market that sold food on reusable plates that customers returned to the stalls.

In terms of energy, there was a backlash against coal and nuclear use primarily because people don't want the plants built in their local areas. Most companies in Thailand also aren't prioritizing sustainability, except those with a lot of money. Some companies that are more sustainable are publicly traded companies where international shareholders state what processes they want to be implemented.

During our trip to Thailand, we went to check out the Energy Complex, a LEED platinum certified building that housed the Ministry of Energy and several other companies. Walking around the complex, we found a lovely green garden on the top of the building (pictured below) although no one was in it. There was an eco-friendly café and a very complicated elevator system that gave each person a card for the floor they were going to and grouped people based on the floors they were going to in order to save energy. The energy savings from this elevator were displayed in a general energy information display at the entry of the building.



FIG. 1. The rooftop garden at the Energy Complex

Although the energy sector and plastics were not having the most successful campaigns, Mark Dunn was hopeful about the future of sustainability in Thailand. Vietnam, for example, was eventually able to develop a regulatory structure for solar and established a target of 500 MW. Within 8 months they had developed 8 – 9 times more solar power than their

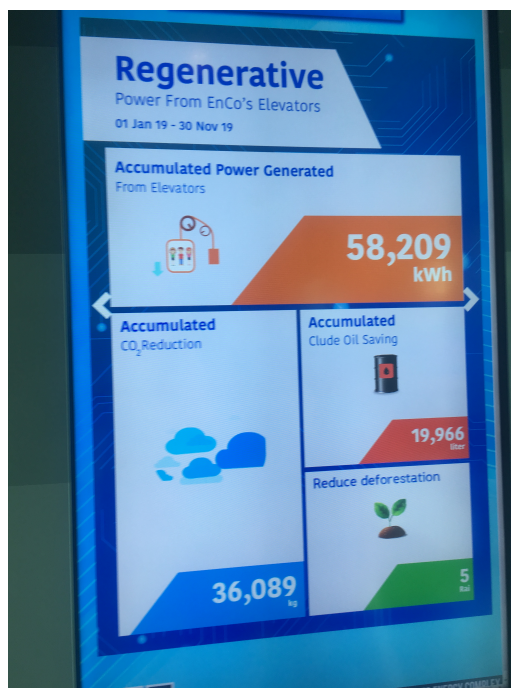


FIG. 2. Sustainability statistics for the elevators in the Energy Complex

target. If Thailand were to establish an effective regulatory structure, perhaps improvements could develop similarly quickly.

III. CHENNAI AND BANGALORE, INDIA

Our next stop was India. We wanted to investigate the sustainability aspect of the 30 billion dollar smart cities initiative launched by the Indian government in 2015. The goal of the project was to choose 100 cities in India as example cities for the other 4,000 cities in India. Changes in cities would include ensuring adequate water supply, affordable housing, urban mobility, IT connection and a sustainable environment. We spoke to Inder Gopal, a professor at the Indian Institute of Science. His main role in the smart cities project is to develop a data platform to collect data in smart cities. He says that “What makes a city smart is the instrumentation that’s put in the city” mentioning sensors for collecting information on pollution, air quality, traffic, water and population density. The quantity of information available to governments is huge so it can be difficult for them to make use of all of it. His solution to this is to allow government agencies, private companies as well as academics to access this data. Typically, data exists in siloes because the people who collect it have no incentive to share it. His program creates a system where data can be

easily shared (and can even be sold) with whichever groups they want it to be shared with in a standardized way. For example, Inder is a software engineer, so he is not an expert on understanding the implications of traffic patterns and their impacts on air quality but maybe someone developing an application for profit will if they have access to the data. The two cities we visited, Chennai and Bangalore, were both part of the smart cities initiative. Chennai was one of the first cities picked, so its projects were further in progress than in Bangalore. We accidentally stumbled upon one of the projects while walking with some friends down a market street in Chennai. She suggested that we get one of the smart bikes from nearby and this ended up being one of the smart city projects. It was good to see that people were actually thinking about and using smart city projects.



FIG. 3. Bikes for the bike share program in Chennai

However, these friends (who live in Chennai) also expressed some doubts about the usefulness of the program. The smart city projects have been implemented slower than expected. In Bangalore, there was nothing that we could go to visit as no projects had been implemented yet.

There is also some public backlash against the program because some people think that having smart cities shouldn't be a priority. Inder thinks that there's no clear immediate answer to that but that we need to walk and chew gum at the same time – investing in advanced technology can accelerate or help the other problems too. Air quality, for example, hurts everyone. Inder argued that overall, Indian people wanted to invest in technology. For example, India recently launched a moonlander. There was a huge amount

of national support and enthusiasm for it although some might argue that they should have been focusing on poverty instead.

IV. HONG KONG, CHINA

In Hong Kong, we talked to Mike Thomas, an energy consultant for the Southeast Asian region at the Lantau Group. He argued that city planning wouldn't have as much of an impact (as quickly) as using renewable energies. In Hong Kong, everything is already compact. The subway system is efficient and apartments are small. Although people could recycle more, things are actually recycled on the side market (for example the cardboard gets taken and sold). Therefore, he argued that the best way to make an impact in these already compact cities are changes in the energy system.

According to Mike, there is not much renewable energy in Southeast Asia yet (aside from China and India). This is changing in Malaysia, however, because Malaysia has a new minister that has been focused on making renewable energy commitments. But even in Malaysia the prime minister doesn't have much room to operate as energy prices are a very politically sensitive issue.

In China, there was a huge green energy program that was supposed to be funded by a surcharge for customers. But, they didn't end up charging the customers and the surcharge fund doesn't have any money. The investors who came into China to build green infrastructure are not going to get the last 20% of their revenue. But since this infrastructure has already been built, China has no incentive to pay them. Coal is also very cheap in China. At this point, they have an assembly-line-like ability to assemble coal plants, so it's difficult for them to stop building them. The new plants are more efficient, but since they are new they won't be going away anytime soon.

These factors make the system seem hopeless, but change can happen much more quickly than you would think, argued Mike. Private companies are waiting for green policies to be put in place and planning how to take advantage of them. Every massive solar buildout was anticipated by someone 3-4 years beforehand – they got the sites, made the plans and got ready for policy to make it possible.

Mike argued that coal will die soon simply because it will become harder and harder to finance. International financial agents are no longer financing new coal plants because of

the risks that they involve. In fact, he argued that you could solve all of these problems by raising the price of electricity by 10%. Energy costs already vary by much more than that between countries. The huge revenues created could be used to pay the costs of installing new renewable technologies. It wouldn't have to apply to small energy users, therefore making sure they aren't affected by the changes. Basically, according to his perspective, climate change isn't an unsolvable problem – if we spend enough money on it it can be fixed.

V. WUHAN, CHINA

The address of our contact in Wuhan led us to a looming concrete skyscraper standing strong in the torrential downpour we were experiencing on our first day in Wuhan. We arrived in the lobby half soaked from the short hurried run from the curbside where our car dropped us off at the building's front steps. We collected ourselves and took the elevator up to one of the top floors in the building. Clueless as to where the office of our contact was we wandered around the floor until someone asked us who we were looking for. They pointed us to the right office. We knocked on the door and Mr. Duan Yu greeted us at the door. He introduced himself to us and we sat down and quickly got down to business.

Mr. Duan Yu worked as a chief engineer for city development companies in the Hubei province. Now he works as a chief engineer in constructing eco-cities near the Wuhan region. He worked on the plans and pushed eco-city development, so far constructing 7-8 of them with still more on the way. These new cities act as satellite cities to the greater Wuhan area.

The development of eco-cities follows 5 principles. The first key principle is to protect the natural resources of the land. They accomplish this by creating “shen tai” which are safety borders for land, forest, and other natural elements. Their main goal is not to create a city that is separate from the natural elements, they want their city to hybridize with nature when planning the city. To accept the natural elements instead of fight it.

The second key principle is to limit human effect on the environment. This is the most obvious principle but one of the hardest to achieve. With China's high population density they have come up with unique ways to limit human effect. Public transportation is a big factor in limiting impact on the environment. Urban centers with effective public transportation help people use fewer cars. They design roads and transportation in ways to respect the

nearby landscape. They treat sewage by transporting it to other sewage facilities, as well as natural sewage technologies. Water is an essential element of life and thus important in designing a city. In order to design the city with the environment in mind new developments in separating different types of water have been made. They have separate pipelines for grey water from water parks that collect rainwater.

The third key principle is strength of development. This deals with the density population, criteria for buildings and the controlling of the amount of people in these cities. The “rong ji lu”, which roughly translates to the population capacity. They want to reduce the population density of these cities but this change has to be a relative change. China is not like Europe or America in terms of decentralization of living space. Their desire to reduce the population density is in relative terms to China’s current major cities. The FAR index which is a measure of how decentralized a city is, or how densely populated a city is. Shanghai’s FAR is 6-7, New York 6-7, and Hong Kong at 10. They want to make a relative change to the FAR index at 6-7.

The fourth key principle is the design element of designating different developmental areas. They want the industrial areas to have low pollution even though the city is not built as a resident city. Areas in the city are designed to include areas for science, technology and other industries. More specifically, software industry parks, science parks, colleges and universities. The phrase “Zhi ye peng heng” was mentioned a lot, which means “The balance of life and industry”. They want the city to be industrial but also beneficial for living.

The fifth and final key principle is to include daily green practices in life. The Chinese government in the past few years have been aggressively pushing out a green initiative that will see greenery increase in all cities across China. Government based roles to improve daily green practices in life have been pushed forth as well as educational programs on daily life to improve green practices in everybody.

Mr. Duan Yu then pulled out a powerpoint on his computer intent on showing us a new eco-city that was being built called Hua Shan. It was right next to Wuhan, in a good water location, right next to the riverways. It was meant to be the service center of the high-tech industry. The four big industries that were being developed here were, education, business, tourism and ports. It was considered a low environmental impact city, because it was a compact, smart and TOD (Transit Oriented Development) city. He implored us to go and see this city for ourselves as it was just on the outskirts of Wuhan. We thanked Mr. Duan

Yu for his time and left with our minds racing with new concepts and knowledge from what we learned in our content filled discussion. We planned on visiting the eco-city sometime after our meeting with Mr. Duan Yu.

We arrived at the eco-city on a cool foggy morning, after not being able to visit the day before due to a torrential downpour. The city was about a half hour from our hotel and an hour from the center of Wuhan by car. Our contact in Wuhan told us to start at the Hilton in the eco-city so we had our taxi bring us there. We were immediately struck by the decadence of the place. There were huge fountains everywhere and the hotel had been built on a beautiful lakefront. Surprisingly, there were absolutely no mentions of sustainability in either the marketing materials for the hotel or anywhere that we could find (although there were plenty of signs for an ebay convention). It's possible that the hotel was built sustainably but decided to avoid mentioning this to its customers, believing that the idea of sustainability could interfere with its 'luxury' image.



FIG. 4. The park in the Hilton Hotel

Leaving the hotel, we started exploring the surrounding area. There were huge cookie-cutter mansions surrounding the hotel. As we got further out, there were smaller cookie-cutter houses in a more 'American suburbia' style and then in other areas we saw rows and rows of apartment complexes. What we noticed as we wandered these areas was that these



FIG. 5. Marshland in the Wuhan eco-city



FIG. 6. One of the deserted eco-city mansions

buildings were certainly not all occupied. Perhaps about half of them were while the rest looked desolate. We also walked by a bunch of children playing on a school playground, a few office buildings (which also looked about half full), restaurants and a snack store. It was a bit concerning that the city wasn't at full occupancy yet, but as it had only recently been started perhaps it would be in the future.



FIG. 7. Buildings built for future businesses in Wuhan eco-city

VI. CONCLUSION

In Thailand and Hong Kong, it didn't seem like much had happened on the sustainability front yet as they are putting economic development at the forefront. However, examples from other countries gave us hope for rapid change in the energy sectors. India's smart city seemed like it would lead to a lot of learning and development in future years if it can be successfully scaled to fit a population of over one billion people. In Wuhan, the eco-city program was built on strong ideals and principles. Although what we saw was a new city with no inhabitants, it seemed like it could be successful if the city could attract more businesses and people to the development.

VII. ACKNOWLEDGEMENTS

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