Industrial Issues & Architecture

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and to the
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Industry—the economic activity concerned with the processing of massive raw material and manufacture of goods in factories—has been created in the developed country in the 19th century because of the priority in the economy. Industry has been shifting around the world where it could take advantage of cheap raw materials, labor, and open policy to growth. The rush of industry has been creating a lot of negative impact on society and the environment in developing countries. This thesis position itself within the realm of physical relocation of Western industry to propose an architectural and infrastructural response that raises the quality of life and community around these re-appropriated sites.

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Sincerely,
Nhac Le
1.1 OVERVIEW
1.2 TIMELINE
1.3 INDUSTRIAL REVOLUTION
1.4 THESIS PROPOSED
1.5 NEGATIVE IMPACT

3.1 HISTORY OF THE SITE
3.2 TIMELINE
3.3 DEMOGRAPHIC
3.4 SITE ANALYSIS
3.5 SITE ARTIFACT

PHASE I
TRASH COLLECTION SYSTEM
4.1 LOCATION
4.2 PRECEDENCE
4.3 CRITICAL THINKING
4.4 DESIGN STRATEGIES
4.5 MASTER PLAN PHASE I
4.6 CRITICAL ISSUES ADDRESSED IN PHASE I

PHASE II
RESOURCE HUB
5.1 LOCATION
5.2 PRECEDENCE
5.3 CRITICAL THINKING
5.4 DESIGN STRATEGIES
5.5 ECOLOGICAL ASPECT
5.6 MASTER PLAN PHASE II
5.7 CRITICAL ISSUES ADDRESSED IN PHASE II

PHASE II
SUSTAINABLE HOUSING
6.1 LOCATION
6.2 CURRENT HOUSING CONDITION
6.3 DESIGN STRATEGIES
6.4 MASTER PLAN PHASE III
6.5 CRITICAL ISSUES ADDRESSED IN PHASE III
In recent years, Western manufacturing industries have been relocating to Southeast Asia. Big companies put their focus in Southeast Asia because of cheap raw materials and labor, and open policy. The uncontrollable growth of manufacturing industrial zones are creating a lot of problems for the environment, social fabric, and infrastructure. People and workers who live and work under industrial zones are surviving in low quality of life, the shortage of energy supplies and polluted environment. This thesis aims to create a new typology for industry, which will deal with the problem from the perspective of Environment, Social, and Economy. The design strategies will fully support the worker’s living condition by encouraging the development of living and working space, so it could become a role model and a world-wide solution for all industrial zones in developing countries.
The Industrial Revolution brought about a greater volume and variety of factory-produced goods and raised the standard of living for many people, particularly in the middle and upper classes. However, life for the poor and working classes continued to be filled with challenges. Wages for those who labored in factories were low and working conditions could be dangerous and monotonous. Unskilled workers had little job security and were easily replaceable. Children were part of the labor force and often worked long hours and were used for such highly hazardous tasks as cleaning the machinery. In the early 1860s, an estimated one-fifth of the workers in Britain’s textile industry were younger than 15. Industrialization also meant that some craftspeople were replaced by machines. Additionally, urban, industrialized areas were unable to keep pace with the flow of arriving workers from the countryside, resulting in inadequate overcrowded housing and polluted, unsanitary living conditions in which diseases were rampant. Conditions for Britain’s working class began to gradually improve by the later part of the 19th century, as the government instituted various labor reforms and workers gained the right to form trade unions.

The industrial Revolution created the large scale of working zones. Some of the companies also provided housing for long distance workers. This is the earliest form of industrial zones that also included provisions for workers.
It all began with a successful business. Local people around the site will come to work and create a dense area. Building and commercial will be built to meet people's needs, which develop an industrial zone.

Housings and Commercial's growth limited the developing of company. Factories land being taken due to the developing of economy in land used. Industrial zones were getting smaller in order to extend the use of commercial zoning and housing.

Factories were forced to relocate to urban area because of safety and healthy issues. Factories were forced to relocate to urban area because of safety and healthy issues. Factories were forced to relocate to urban area because of safety and healthy issues.

One example of inclusive and mixed-use industrial development was located in Atlanta Ga. The company was established in 1868 and it employed between 100 to 160 workers. Within a few years, Fulton Bag and Cotton Mill Company had outgrown the capacity of the existing buildings. The outgrown of the company has brought the housing and commercial zones around.

The nine bag manufacturing companies were sold in 1956 because of failing business. The company was getting troubled by periods of labor unrest. A Lengthier strike took place in 1914-1915, triggered by management's disapproval of the growing efforts among the workers to join the United Textile Workers. Besides the issue of unionization, the strikers demanded an increase in wages, a 44-hour work week, and a decrease in the use of child labor. They reduced their business size and use the money to rebuild the factory, but it was unsuccessful. The whole company was sold to Allied Products in 1958.

Fulton Bag in Atlanta and Manhattan in Newyork are the examples on how a city develop and how factories being forced to relocate their site.
New York produced more than 50 percent of total national output in 12 lines of manufacturing which turns the whole city into an industrial zone in 1912. The map shows available space for industrial development to boost the city’s profile in the larger business community.

The development turned toward offices and corporate headquarters. Zoning regulations made building more factories difficult. The company was forced to relocate their factories in suburban. The New York city moved most of the factories out of the city by 1980 and completely transferred to a non-industrial zone in 2000. Old industrial space was left empty or turned into commercial projects.

The Shift of the industry was not only inside the country. By the end of the 20th century, Western industry began to relocate their factories to some developing countries due to cheap material, low cost labor, and open policy on the environment.
The relocation of industry strikes Asia country in both positive and negative way. The economy is getting a big boost from foreign companies. However, the infrastructure in Asia was not ready to accommodate the growth. Therefore, the environment and social are currently facing negative impacts.

1.3 INDUSTRIAL REVOLUTION | The Shift

Asia's countries put their green tax at the lowest point so it could attract more company to come and invest the economies. The raw material are recently increasing by limiting the availability of foreign components for processing in the Western United State. In addition, these companies state that the VRAs have limited quality selection, restricted their ability to make capital expenditures, and caused reductions in manufacturing operations. The reduced supply of raw materials for processing by outside facilities has caused Western material's cost increase by 3 times from 2005 to 2010. Cause by wage increases, which are greater than improvements in productivity, wages costs often when unemployment is low and skilled workers become scarce and this can drive pay levels higher.

Caused by wage increase, which are greater than improvements in productivity, wage costs often rise when unemployment is low and skilled workers become scarce and this can drive pay levels higher.
After 2 decades, the growth of industry in China began slowing down due to the rise of minimum wage and people are less favor with items that made in China, which made all the Western companies put their favor in South East Asia and made it becoming the next World’s manufacturing Hub.

List of most fastest growing industry in South East Asia

- Ho Chi Minh city - VIETNAM
- Bangkok city - THAILAND
- Jakarta city - INDONESIA
- Kuala Lumpur city - MALAYSIA
- Phnom Penh city - CAMBODIA

In this station, empty paper squares present for the poor dressed employees, workers, student families. Black concrete blocks and steel rails pull out the images of heavy industries with large factories and giant metal pole.

The example in this small scale presentation of a demolished industrial zone compares to small living spaces around. In this marginalized zone, poor people are living in extremely low quality of life - between a lot of Environmental and social issues.
70% percent of the manufacturing industry has failed to meet environmental standards for controlling air pollution. There are more than 4000 companies that have failed the emission test in all over Asia, which leave the entire Asia in the high dangerous state. The pollution by industry has affected all natural elements that are air pollution, water pollution and soil pollution.

A report from CNN estimates that approximately 20,000 people in the region die every year from coal-fired power station emissions, and it projects this number will increase to 70,000 by 2030 if all the proposed power plant projects in the region go ahead.

Another study published in the Proceedings of the National Academy of Sciences of the United States (PNAS) earlier this year found that particulate air pollution “is causing the 500 million residents of Northern China to lose more than 2.5 billion life years of the expectation.”

Industries have been polluting our environment especially since the beginning of the industrial revolution. Coal is the main energy that has been used to make machines work faster, replacing human force. However, Coal is also the most polluted resource which causes the pollution in soil, air and water at the same time. Moreover, the transportation of this energy can be harmful to the environment. At the same time, if the tanker transporting the petrol from its production plant to the place where it will be consumed leaks or sinks, the water will get contaminated. Another research that states out there more than 60 percent of water pollution comes from things like cars leaking oil, fertilizers from farms and gardens, and fishing tramp oils.

The problem is going with the quick growing of the manufacturing industry is the lack of infrastructure. Most factories will provide a place for their workers to live whilst working at the factory and although this is usually very basic. However, the volume of workers has been packed in one room is extremely high. There are up to 20 workers sharing one dorm style room, with an average 5 square foot per person. Health care and benefits have been ignored in those industrial zones. Worker’s live routine are just the repeat of working-sleeping-working-sleeping. If the workers get sick, they will be pushed to leave and get replaced by younger generations. Also, the negative impact also strikes to the second generation. It was happen for children who were born in those industrial zones. They do not have enough playground, fresh air, and education centers are usually take up 50 mins with bus, or 3 hours walking.

China is the top biggest spender to combat with pollution. China Government has spent $277 Billion in the last 5 years to fight the pollution problem but China has developed as a consequence of China’s rapid economic rise. However, pollution is already very costly through health plus economy. The Asian countries are facing a 4% GNP to pollution-related costs. These costs are the cost productivity since factories are shut down on bad days to avoid the dangerous health effects of breathing the dense air.

Relocation industry creates negative impacts in all social, environment and economic. It creates a challenge that threatens human welfare, damages natural and physical capital, and constrains economic opportunities. However, a good architecture program could help to solve more than half of the problems.

Habits and Landscape
Unaffordable areas
Clean air
Pollution in settlement areas
GM (N/NOx/PM10)
SOx emissions
VOC emissions
Noise
Pollution at place or residence
Pollution or protected and recreational area
Living / Land use
Land used for transport
Proportion of transport in the settlement areas

Individually
Opportunity to choose mode of transport
Degree of regulation
Participation

Solidarity
Public Service Obligations or transport per capita
Accessibility of regional centre by public transport
Accessibility of amenities for daily needs by public transport
Accessiblity of house facilities for young people
Consideration of the needs of social groups

Architecture solution

The current picture in Asia can be captured by The Triple Bottom Line of Business of John Elkington. He highlighted that the importance of companies, workers, and the planet need to be balance or one will destroy others. If Asia’s countries only focus on the profit from foreign companies, local people and environment will be destroyed and those companies could not success without social and environment.
Economy, environment, and society could be a measurement of the design because the relocated industry brought both positive and negative effects to Asia. From an economic perspective, understanding who had suffered from the impacts could help to shape the development of new industries. From an environmental standpoint, carbon footprint around the side will help to decide what kind of renewable energy should be applied. On the social front, improving social connection will help workers and people who live in industrial zones has better living condition.

1.5 HYPOTHESIS

The relocation of Western industry create 3 main sustainability issues on Asia:

A. INFRASTRUCTURE | Eastern infrastructure could not be accommodated Western industries; daging polluted environments due to the ever load of waste from factories.

B. ECONOMIC | Non-valuable planning costs workers a of time and money for transportation.

C. SOCIAL | People and workers who live in and work in those industrial zones have been suffering in low quality of life, shortage of energy supplies, and polluted environment.

This thesis position itself within the realm of physical relocation of Western industry to propose an architectural and infrastructural response that raises the quality of life and community around these re-appropriated sites.

The solution must be scalar and multi-faceted.

The scalar solution will seek a new mix-used typology for the company and employees. The plan is to design a multiple-used area in a way redevelop Infrastructure, repurpose the use of nature resource, and promote an efficient program.

The overall design strategies will focus on worker’s living condition by encouraging the development of living and working space, so it could become a model and sustainable solution for all.

1.4 THESIS PROPOSED
The first state of research will focus on the existing industrial zone to find out the solution that people have been used to deal with the overload of residential. The research on so take the study on mix-used typology to find the best way to pack all the necessary function in the smallest area.
Combination type: Green architecture + industrial building

2000, the 600-acre, $2 billion Ford Rouge Center near Dearborn, Michigan, underwent major redevelopment laying the groundwork for sustainable manufacturing at one of the World's largest and oldest industrial icons. With William McDonough + Partners as design architects, numerous pilots of advanced environmental concepts were constructed and a new assembly plant with the Nation's largest ecologically inspired living roof was planted on the massive industrial building.

2.1 RIVER ROUGE PLANT 2003

About 454,000 square feet of assembly plant roofing is covered with sedum and other succulent plants. The roof reduces stormwater runoff by holding an inch of rainfall. Also, living plants absorb carbon dioxide as part of photosynthesis, so oxygen is emitted and greenhouse gases are reduced. In 2004, the 10.4 acre Ford Truck Plant green roof was recognized in the Guinness Book of World Records as the world’s largest green roof and helped jumpstart the early North American green roof industry.
Combination type:
Working space + Housing + Commercial

"Quality Circles" were established by Riegel. The very early mix-use industry town in the 19th century, where engaged employees submitted ideas for improvement. They received recognition for valuable input that would save millions.

In this combination, factory becomes a central point, where everything starts and a supporting object. All the streets network are the links to the centre, which provides the most convenient and shortest distance to the factory.

Advantage of function:
Central point function helps to avoid traffic.
Web network usually creates big mess in traffic. However, Pittsburgh City received big supporting from Monogalia and Allegheny river in transportation. Water becomes a biggest part in the way building Pittburgh's industry. It sepaerate the big and small load transportation, which help to extend life span of the road.

Combination type: Commercial + Working space + Housing

Pittsburgh had grown to one of the largest cities in west of Allegheny Mountains. Production of steel began in 1875. By 1881, Pittsburgh was producing half of the nation's steel. Pittsburgh the come the fastest grow city in the west at that time with the need of housing is always at highest point.
Combination types:
Housing + Rental space

The problem of urban density and housing costs is global. As unit types get smaller however, land costs coupled with developer driven profit margins can merely result in a residential type with little social value. By mining the discrepancy between maximum floor area ratios and maximum zoning requirements, Songpa Micro Housing provides a new typology that extends the limits of the housing unit to also include semi-public circulation, balconies, and the thickness of walls. Like the ambiguous get around of a stone pistol, this “fugue” format leverages a soft transition between public, private and internal realms, creating social fabric between neighbors.

Diagrammatic function:

By mining the discrepancy between maximum floor area ratios and maximum zoning requirements, Songpa Micro Housing provides a new typology that extends the limits of the unit to also include semi-public circulation, balconies, and visual extensions.
Combination type: Commercial + Housing

The spatial logic of two existing suburban typologies—the big box store and the single-family developer house—is recombined to generate new programmatic potentials. The store’s grid is to occupy the east horizontal niches of the big box, while the repetitive system of the big box slants upon the structure. All and storage also establishes the linear organization of the houses above. The linear structures extend through the inhabitable roof plane of the big box.

The combination provides a given energy for generating waste heat from the store and to boil the water which could provide free hot water for top residential cross-need to produce overkit盼望 social and spatial relationships in continued pursuit of the American Dream to exploit the logic of suburbanization.
COMBINATION 1
Generating the heat waste from factory to provide free hot water for workers. The idea is to maximize the use of waste energy, which also support employee’s lives by lowering energy supplies cost.

2.6 STUDY OUTCOME

COMBINATION 2
Similar with the function form. Pittsburgh city industrial zone function could become a zone with a web of housing and commercial, which could save cut the shorter the distance from place to place.
Ho Chi Minh city as site

As discussed on 1.5 Negative Impact Ho Chi Minh city is one of the fastest growing industry in Asia, which is a perfect example to choice for serving as the testing ground for new typology of industry. By addressing the current issue of Ho Chi Minh industrial zone, this study will provide a solution for the impact of industry to environment, social and economics.

3.1 SITE SELECTION
HISTORY OF DEVELOPMENT

Saigon was originally part of the kingdom of Cambodda and, until the 17th century, it served as the capital of the Khmer empire. In 1569, it was captured by Vietnamese soldiers and became the base for the Vietnamese in the Mekong Delta.

Saigon was captured by the French in 1859, and named the capital of Cochinchina a few years later. The city served as the capital of the Republic of Vietnam from 1956 until 1975, when it fell to advancing North Vietnamese forces and was renamed Ho Chi Minh City by the Hanoi government.

Ho Chi Minh City is the biggest city in Vietnam, which is leading in all major aspects such as economy, population, income, education, and also includes the number of industrial zones.

Under the strategy of Vietnam’s government for industrial development to 2020 and the vision for 2025, HCM City is expected to become an industrial city by 2020 and play the role as an economic driver of the southern focal financial zone and the entire country, contributing 29.1% GPD and national production for the country. By 2025, the total land area for industrial development will be 14,900ha, including 7,000ha for industrial parks and export zones. The investment for industrial development will be 35-44% of the total investment.

ARCHITECTURE OF HO CHI MINH CITY

The architecture of Ho Chi Minh City is a splendid mix of Vietnamese historical heritage, from French colonial villas to modern steel and glass monuments since the country has gone through 3 wars: China (1788), France (1851), America (1955).

The architecture in Ho Chi Minh City changed from the colonial time, over the period of South Vietnam and the reunification until today. The high rise buildings are being built, modern monuments are in the planning and in the construction. Architecture in the Ho Chi Minh City is somehow just glass, concrete and steel.

HISTORY | TIMELINE

- Vietnamese capture Saigon in 1569
- French capture Saigon in 1859
- Independence from France in 1954
- Ho Chi Minh City named after Ho Chi Minh in 1956
- Reunification of Vietnam in 1975

The country’s main goal is to transfer from agriculture to industry by 2025.
Ho Chi Minh City gets full support from Saigon River and DongNai River which are the main transportation for heavy load products for industrial zones near the rivers.

Main River:
- **Đồng Nai River**: Length: 364 miles, Drainage basin: 14,910 mi²
- **Sài Gòn River**: Length: 159 miles, Drainage basin: 5,000 mi²

Streams and Canals:
More than 300 short streams and canals around Ho Chi Minh city with 0.5 to 2 miles length and 8 to 40 feet width.

Transportation:
Ho Chi Minh City has 10 harbours and more than 300 small ports, which transport more than 100 million tons of products per year and make up 30% of total transportation in HoChiMinh city city and the country.

Large Parks:
- **Tan Son Nhat park**: 150,000 sq m
- **Đàm Sen park**: 500,000 sq m with 20% water surface and 80% green park
- **Tân Sơn Nhất golf park**: 150,000 sq m

Small Parks:
80% of Ho Chi Minh City has more than 10 small and community parks with the approximate 18 million visitors every year.

The development of greenspace in Hochiminh City city.

**Green Space**.
Ho Chi Minh city has 2 main traffic lines, which are main streets and support streets. Main streets have from 5 to 6 lines for all types of vehicles. Support streets usually have 1 to 2 lines (depending on the density of the residential area). Support streets are used to serve pedestrians, motorbikes, and bikes.

**Vehicle**
- Bus: 2736 buses which transfer 400 million passengers every year
- Water: 4 million – 60% transportation
- Bike: 500,000 bikes – 0% transportation
- Car: 1 million – 10% transportation

**Peak hour**
- Ho Chi Minh city only has 1 working hour (including schools, companies, universities, and government). Traffic repeats everyday at the same time.

3.2 SITE ANALYSIS | TRAFFIC

Phu My is a west land of Ho Chi Minh city. It is the highest density area of industrial zones with more than 120 companies. The Dong Nai river plays a big role in this industrial zone because 75% of transportation go through this river. Local infrastructure could not accommodate with the rapid rising traffic. As a result, workers see the industrial area of lacking fresh air, energy, and social networks.

15 years after the first industrial and processing park was established, 34,960 acres out of a total of 50,000 acres in 19 parks are in use. The City’s plan is to expand the industrial area to 199,000 acres in 2050 and leasing up to 2.5 million workers.

300 is the number of companies that are currently active in the Phu My city. Most of them are local companies but 13% foreign companies. The Phu My economy is very diverse. Local companies have small scale, which start from 1 to 30 people while foreign companies go between 100 to 3000 workers in one location. Most of the foreign companies came to the city for manufacturing because of cheap labor and open policy.

1,500,000 is a current number of workers who live and work in industrial zones in the city. Housing in these industrial zones could divide into 2 big groups: Young generation comes from countryside and enter the industry with the change dream. The old generation who have worked all their lives but have not had enough money to move out.
Ho Chi Minh city has more than 10,000,000 populations. Most density areas locate around the Tan Son Nhat airport and center district. Because of very high density in the center so Ho Chi Minh city usually has flood around fall. The city is currently building many residential zones 15 miles from the center for future development and balancing the population density.

The model is a summary of terrible truth in the process of an industry. Polluted environment is what left behind an exploited period. Poisoned land is where poor and old generation workers live because they do not have enough money to get out of the industrial zone.
Most of the industrial zones are located next to Sai Gon River because of the convenience in transportation. Residential areas quickly grow to support workers and their families. However, local current infrastructure could not accommodate the growth rate of industry, which causes many issues for social and environment and creates lots of slums. Ho Chi Minh City is trying to drag the development to the west side of the river (Thu Thiem). There are currently 10 developing projects and 10 other future projects on the table. Nonetheless, nobody wants to face the current issue on the east side of the river.
Thousands of households are living in temporary and dilapidated houses near Saigon River in HCM City.
The living condition in area 1 and 2 shown in map are very similar. Industrial zones are surrounded by slums. Workers and families are living in terrible conditions with polluted environment, lack of energy, and space. Area will be chosen as a testing site for the design strategies based on 3 sustainable measures mentioned before: Environment, Society, and Economy.
The design strategies will be proposed in 15 years design process within 3 phases, so local people could adapt the changes step by step.

**PHASE I**
**INFRASTRUCTURE**
- In the next 3-5 years, we will build a new infrastructure (Resource Hub) in the relocated zone, which will combine drainage systems, water filtration, energy park and community gardens.
- Next, we will provide them with a *river cleaning system* for their current environment. By doing this, we will build up a belief on social people that the project will change their lives in a better way.

**Design proposed:**
- River Cleaning System
- Resource Hubs

**PHASE II**
**EDUCATION**
- Within a few years after the infrastructure has been built, the city can educate people from slums area to the new relocated zone (*Sustainability house*).
- This will help the government take back the control and close up environmental issue in polluted cities.
- After the future education, the current slums will turn into wet space, which will be used in Phase III.

**Design proposed:**
- *Sustainability house*

**PHASE III**
**CONNECTION**
- In the last step, used space will be used to create a street network which can provide transportation, public space, and energy storage for local workers.
- It will also be connected to infrastructure in Phase II.
- We believe this will create a complete solution for industrial issues.

**Design proposed:**
- Street Network
PHASE I
INFRASTRUCTURE

In the next 2-3 years, we will build a new infrastructure. Resource Hubs is the relocated zone, which will combine drainage system, water filtration, energy parks and community gardens. We will propose them a river cleaning. For this, we will build a belief on local people that this project will change their life in a better way.

Design proposed:
River Cleaning System
Resource Hubs
PHASE 1 | PRECEDENCE

The Inner Harbor Water Wheel, or ‘Mr. Trash Wheel’ to locals, combines old and new technology to harness the power of water and sunlight to collect litter and debris floating down the Jones Falls River.

The inner cylinder provides power to turn the water wheel, which filters trash and debris from the water and deposits it into a dumper barge. When there isn’t enough water current, a solar panel array provides additional power to keep the machine running. When the dumper is full, it is towed away by truck, and a new dumper is put in place.

MR. Trash | Inner Harbor, Maryland USA

Bundalong Litter Trap | Australia

Bundalong Litter TrapTM is designed to float in waterways in order to capture litter before it flows further downstream by using the current to guide debris into the trap. This performance Floatable control technology continuously operates 365 days a year without any mechanical assistance to capture floating litter. The Bundalong is a proven, cost-effective solution for floatables control and is the answer to the growing problem of litter in our waterways. The Bundalong Litter Trap is the ideal in-stream solution for floatables where combined sewer overflows are concerned. The Bundalong (Litter Trap) has been cleaning waterways in Australia and Asia for more than 15 years.
Under the PCL project, waste water treatment plants are also being planned for five wet markets in the city. The solid waste from wet markets will be trapped at the static screen inlet chambers and removed periodically,” he said.

Tan said 20 tonnes of litter was collected every day and this does not include water hyacinth (better known as himbang) from flood retention ponds.
The strategies is to design a linking box system, where it can guide all the trash to the trash collect, and create a clean water zone for people. Moreover, the system also use the sunlight and water on the river to produce extra vegetable for slums area.
**PHASE 1 | DESIGN STRATEGIES**

**DIAGRAM**

The Movement of Water

- Soft soil
- Hard soil
- Flood plant

The Movement of Trash

- Mixed frame
- Soil box
- Plants cover
- Storming garbage

**MODEL**

Model of the design strategies showing the movement of water and trash.
End of Phase I (3-5 years), river are getting cleaner and people can begin to interact with the river. It also build up a belief on people about Phase II and Phase
PHASE I | CRITICAL ISSUE ADDRESS IN PHASE 1

RELOCATION: RESOURCE HUB

- Climate
  - Protect from landslide
  - Emissions of greenhouse gases

- True costs
  - Level to which operations costs are covered
  - The system can be maintained by local people

- Safety
  - Safe outdoor play

- Solidarity
  - Accessibility of leisure facilities for young people
  - Consideration of the needs of social groups

- Social

- Environment
  - Habitats and landscape
  - Unfragmented areas
  - Clean air
    - Pollution in settlement areas
    - Cleaning the river
    - Prevent trash stuck in residential area.

- Economic
  - Living/Land use
    - Proportion of transport
    - Playground and community space
    - Improving the view of the city

- Viable
- Sustainable
- Equitable

PHASE II

- 5-10 years

Within a few years after the infrastructure has been built, the city can relocate people from slums areas and create a more vibrant and healthy environment. This will help the government take back the control and clean up the environment issues in polluted areas. After the future relocation, the current slums will turn into void space, which will be used in Phase II.

Design proposed: Resource Hubs
Resource Hub will be placed near canal (50-150 feet) so it could access the water. The estimated site of the Resource Hub is around 325 feet radius.
Site condition

The 30-foot contour marks the edge of the regulated wetland boundary. From a current regulatory standpoint, low and high tide coming from 2 directions of Sai Gon’s river have created a unique condition for the site. Most of the site are covered by turf and dryland with heavy soils while the edge is covered by fens, lowland swamp, and Riverland with mud. Over time these wetlands will be renovated to remove invasive species and create more diverse.

Geology And Soil
Main characteristics of the sediment class are hilly terrain, with a depth range of three to 25 meters, and oscillation in the southwestern direction. Due to the combined effects of natural factors, including creatures, climate, time and human activities, and erosion and decomposition, the sediment class has developed into grey soil. Grey soil makes up 45,000 hectares or 23.4% of the city’s total soil area.

Ground type:
Typical of Low tide and High tide creates 2 zones for the land: Safezone for contraction with heavy soil, and unstable land with mud cover.
PHASE 2 | CRITICAL THINKING

5.2 PRECEDENCE

These compact, visible knees are not your ordinary plants, they have reserves filled underground which are constantly fed from the adjacent water table. Much like the colonies of ants, if you are looking for a productive and reliable growing system that doesn’t require you to transplant your plants all the time, then this system is apt for you. The time and effort you invest will eventually reward you with economical auditing and higher yields. To top it all, they are easy to carry around and transport in an easy to according to the changing weather.

The use of these bottles can be recycled for function as a mini garden in your home. You probably also have plants that are actually growing in your garden and your home. The use of this material will encourage people to collect plastic bottles around the site and put it in a good way of use.
ECOLOGICAL SEWAGE TREATMENT

An ecological sewage treatment plant known as a ‘Living Machine’ at the Redburn community near Forres, Scotland. Effluent flows through a series of tanks. It bifurcates successively with vegetation, algae, bacteria and fish. In order to clean them, the ‘Living Machine’ concept was implemented in collaboration with the University of Essex and was developed by Arup and Hasley & Mock of Ocean Arks International.

LIVING MACHINE

An animation shows the Living Machine System raises the tillaratory process. First, water is pumped into a tank where additives run with and degrade. Then it is flowed into an equilibration tank that determines the release of high and low ‘holy’ and ‘holy’ air, which stabilize the tank. A two stages aerobic different sludge waste with different organisms that ‘kill’ and purely the stock water.

LIVING MACHINE

A founding member of the Ecosphere Institute at Redburn who was present when the Living Machine was built, the systems that form the critical component of this project is divided into two stages: a 1,000-millimeter thick clay tank and a 1,500-millimeter thick clay tank. The two tanks are connected by a series of pipes, which transport the effluent to an aerobic state. The introduction of oxygen kills anaerobic bacteria, giving off oxygen; this is then filtered out to prevent odours.

PHASE 2 | DESIGN STRATEGIES

Current condition is just an unplanned land with random trees and bushes.

We will build the rainage system to collect water and reconstitute the land.
Using the water from rainage system to support the public garden. Turning unplanning plant into a community space.

After the Resource park is done, relocated residential can be built around and connect to the park.
PHASE 2 | DESIGN PROPOSED

SECTION CUT BB

SELF-WATERING GARDEN

WATER FILTRATION
Water filter seasonal well water and rain water

COMMUNITY GARDEN

PUMPS

VALVES

TRASH FILTER

RENDER
Resource Hub will change the whole ecology system on the site overtime in a positive way.

**CURRENT CONDITION**
- Grass
- Water
- Wild flowers
- Muddy
- Mixed hard surface, plastic
- Perennial plants
- Marine mollusks
- Tree
- Small seaside trees
- Rocks

**PHASE I**
- Beach
- Fish
- Seaweed
- Marine organisms
- Beach
- Seaweed
- Marine mollusks
- Tree
- Small seaside trees
- Rocks

**PHASE II**
- Beach
- Fish
- Seaweed
- Marine organisms
- Beach
- Seaweed
- Marine mollusks
- Tree
- Small seaside trees
- Rocks

**PHASE III**
- Beach
- Fish
- Seaweed
- Marine organisms
- Beach
- Seaweed
- Marine mollusks
- Tree
- Small seaside trees
- Rocks

**ECOLOGICAL ASPECT**
MODEL 5.3 PHASE 2 | DESIGN PROPOSED
End of Phase II, The Resource Hub is improving the ecological on the site. Expecting 30% population on the slums will relocate in the next 5 years.
In Phase 3, we will build up the new housing system for relocated people. The houses will place near Resource Hubs so people can interact with the hub and maximize the profit from the projects.

PHASE III
SUSTAINABLE HOUSE

Within a few years after the infrastructure has been built, the city can relocate people from slums and the social welfare fund can be used to expand the production of sustainable housing. This will help the government take back the control and clean up the environment issue in polluted zones.

Design proposed: Sustainability House

LOCATION
The new typology housing will be placed at 2 places. First, it will fill out the voidspace, where 30% of relocating people left over in phase 1. New typology housing will also be placed around the resource hubs in phase 2 so people from new typology housed can have access to free garden, park, community space.
Most of the people in the slum are poor workers who work different kinds of companies in the industrial zone along the river. They live in houses which are built from pieces of corrugated iron and cardboard boxes. The houses are often flooded during the rainy season. Moreover, high flood tides bring rubbish to the bank, causing a terrible odour for the slum residents. Those houses are the combination of local and cheap materials. Because of that reason, the house structure’s lifespan are only last few years. At that time, people will replace the foundation columns, renovate the roof and cover leaking holes by plastic sheets.

Slums, the dark side of urbanization
People who live in this zone have better income and most of them are in middle class. They usually maximize family’s income by letting people rent the front house for shop, restaurant, or service. Construction of the houses are built with concrete blocks, and cover with compound. Kitchen and living room are always located on first floor, while bedroom and family room are upstairs. In some cases, people also use their extra space on second floor for garden or drying clothes.
**DESIGN STRATEGIES | ENERGY**

### Solar

- Panel produces 1100 kWh/day
- 10 kW system

### Water

- Total collection: 1000 x 110 = 110,000 liters
- Water stored per Household: 210 liters

### Food

- With 40 sqf garden, provides enough food vegetables for 2-3 families.

### Network

- Providing free will for the area to connect people and improving quality of life.

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**DESIGN STRATEGIES | ENERGY**

- Fix: 2.5 x 10 for 3 hours per day
- Water: 500 liters per day
- Main Light: 800 watts for 30 hours per day
- Solar panels: 10 kW system

**Table:**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Energy Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fix</td>
<td>2.5 x 10</td>
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<tr>
<td>Water</td>
<td>500 liters</td>
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<tr>
<td>Main Light</td>
<td>800 watts</td>
</tr>
<tr>
<td>Solar Panels</td>
<td>10 kW</td>
</tr>
</tbody>
</table>

**Diagram:**

- House will need around 200W per day
- Bath: 1.5 hours per day
5.4 CRITICAL ISSUES ADDRESSED IN PHASE III

Habitat and landscape
Unfragmented areas
Living/Land use
Proportion of transport, playground and community
Improving the view of the city
Participation
Connect Phase I & Phase II

Sustainability
Environmental impact
Economic viability

Social
Desirable
Economic

True costs
Lead to which operations costs are covered
The system can be maintained by local people
Rain collection system

Safety
Safe outdoor play
Circulation for river view
Accessibility of leisure facilities for young people
Consideration of the needs of social groups

Solidarity

Community space

NEW TYPOLOGY HOUSE | RENDER

103

5.3 NEW TYPOLOGY HOUSE | RENDER

103

102
Condition before Phase I: The uncontrollable growth of manufacturing industrial zones are creating a lot of problems for the environment, social fabric, and infrastructure. People and workers who live and work under industrial zones are surviving in low-quality of life, the shortage of energy supplies and polluted environment.

New Condition at the end of Phase III: Polluted river has been controlled by Trash collection system in Phase I. Relocated people can benefit from community gardens in Phase II and live in sustainable houses in Phase III. The quality of life in industrial zones has been improving over 3 Phase. The architecture solution has been used to target society, economy, and environment problems from Industry are successfully achieved. This could become the world-wide solution for all the industrial issues in the developing countries.

CONCLUSION
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