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01 - ON THE EDGE
Architecture as Systematic Strategy on Water Crisis

National University of Singapore
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Professor: Aurel von Richthofen
The study's objective was to rethink the nexus of architecture and water in light of sustainable design. By exploring water crisis in different climate zones, we are addressing systematic strategy to regional climate issues.

Kolkata is a water rich city. However, the scarcity of potable water and urban distribution policy left 3 million of the city population who lives in slums inaccessible to steady drinking water source. Exploitation on water are exacerbated over the prevalence of water mafia. By turning the rivers into a buffer zone in processing, storing water in monsoon season and providing alternative water supply in dry seasons, the proposal is exploring low-cost but long-term management practices, in order to provide people with easier access to water, public activities and social justice.
Kolkata is a water rich city. However, the scarcity of potable water for its poor, and life threatening seawater rise and storm surges for those who live along the waterways and coastal areas. The project is proposing a flood-responsive and economy-productive lifestyle in Kolkata, a city whose underdeveloped neighborhood is under direct exposure to severe monsoon season flooding and water pollution.

SEASONAL FLOODING AND IMPOVERISHED COMMUNITIES ON THE EDGE

Kolkata is a city with plain topography thus facing severe monsoon season flooding. Each summer from June to September, giant amount of water flow into West Bengal, causing great damage to facilities in the city. The seasonal flooding is even intensified by the water distribution agreement between India and Bangladesh, that the Farakka Barrage pour excessive water to Hooghly in monsoon season but dries in dry season, making things even worse. While the important part of the city stay usually on the relative high altitude, dense residency still occupied the floodplains along the river and the basement, disturbed by flooding seasonally and steadily.

DILEMMA OF HOOGHLY, SACRED WHILE THE MOST POLLUTED

As an extension of the Ganges, the Hooghly River is regarded as sacred, leading to religious sites and rituals centering around the river. Temples are often located on the river’s edge. However, projects dealing with the river are often blocked by religious groups citing that the river is holy and altering it would be disrespectful. Small scale projects, for example, the ghats, provide erosion control and vertical buffer for flood along the bank. People use ghats as a place of bathing in the holy river and relaxing cremated remains of their loved ones. As a result, the Hooghly is extremely polluted from these religious practices in addition to being contaminated from industries along the river and untreated raw sewage flowing into the river. Salt water backwash from the Sundarbans exacerbated the condition.
WATER POVERTY IN A WATER RICH CITY

The city Kolkata is often described as ‘jungle Abadan’, that the Ganges-Meghna delta beside its western fringe, traditionally huge groundwater reserves and wide wetlands area in its eastern fringe which naturally treats its waste water and turns that as raw water for fishery and agriculture.

Dhruvajyoti Ghosh, former chief environment officer of the state environment department

EXPLOITATION ON WATER - THE ‘WATER MAFIA’

‘It is the state’s failure to properly supply water to those in need.
- head of water mafia

There has long been a diametrical contrast in distributing the limited drinking water in Kolkata. Rich family living in the multi-storey apartment blocks piped their own water but lack of faith in water quality supplied by civic bodies, while the undeveloped areas only receive drinking water through a few stand posts. Access to plumbing remains a privilege for the few.

Although the municipal government abolished the collection of water tax in 2010, the disparity and exploitation of water proceeds in a different way. Free water coverage is lower or even non-existent in the peri-urban areas, limiting people’s access to public water supply, leaving residents in lower-income communities relying on extraction of poor-quality groundwater or through more need-driven arrangements, that they purchase water from the exterior. This generates a big business in and around Kolkata, fueling the middleman and private suppliers who do not have to pay any water tax as city dwellers in center KMC.

Moreover, businesses even collect water by puncturing the pipes of the municipal waterline and sell them to reservoirs like the Salt Lake. But because of the free water tax, the government could do nothing but indulging such condition. Thus only 35% of drinking water reach 2400 household the waterline is supposed to supply, forming a vicious circle. The scrapping of water tax harnessed the revenues of municipal corporation, leaving the cost of producing drinking water unaccounted and making the whole process unsustainable, which only boosted the activities of private water suppliers.

POTENTIAL INTERVENTION - FLOOD AS A CHANCE

Officially 16% of crude Kolkata’s water come from groundwater sources, while in reality up to 26% to 30% of the water used in households is groundwater.

A limited supply of treated surface water is supposed to be the point of the problem. Yet 84% of the total rainfall in the Gangetic Basin falls during the monsoon season. The monsoon season water logging, flooding annually to refill the ground water storage, could be viewed as a challenge to public safety but as well as a chance to promote water fairness.

If methods and technology to partly or fully supply the surface water could be applied, the cruel-competition could be mitigated. By training the riverfront into a productive edge in dealing with surface water including river, flood and rainfall, the proposal aiming to provide people with easier access to water, public activities and social justice.
SYSTEM METHODOLOGY - BUFFER ON THE EDGE

A limited supply of treated surface water is supposed to be the point of the water reclamation. Yet 84% of the total rainfall in the Ganges Basin falls during the monsoon season. The monsoon season water logging, flowing annually to refill the ground water storage, could be viewed as the chance to promote water fairness. The Buffer is proposed as an alternative water supply strategy system - by collecting surface water including river, flood and rainfall, processing them and recharging the underground aquifer reservoir in monsoon season, extra water source can be realized in dry seasons. Additional methods such as biowaste and solar still treatment, rainwater harvesting are applied to support the long-term running of the system. By turning the riverfront into a system system of water resources, as well as a productive edge, The Buffer is exploring low-cost but long-term management practices in order to provide people with easier access to water, public activities and social justice.
The storage capacity and elevated floor plan of the buffer unit is formed through Dig & Mount process - excavate the ground and relocate the earth mass onto the fringe. Seaweed buffer unit planted on the bank extends the length of shoreline and also slows down the water flow. Water from both sea and river are processed in the buffer unit. The profile of each buffer tank corresponds to a certain process. Sparks between the tanks is used as a significant role for flood water, and organisms with the ability to water cleaning are cultured. Programs like natural textbox rides and workshops are placed on the raised foundation of the tank with the potential to form a closed-loop resources sharing system. The buffer unit can replicate counteractively alongside the river bank, producing scalable benefit result.
In dry season, the buffer sponge extracts water from the underground reservoir to provide alternative water source to the community. Purification of rannwater and recycled water use are also encouraged in the facility. In monsoon season, the quencher storage is replenished through natural infiltration augmented by the porous landscape and also artificially pumped process including pressurized pump. Circulation inside the buffer zone remained integral due to the mound fringes of each tank edge, until they are totally immerse by rising water level. When a severe flood occurs, the upper floor of the construction will break away from the foundation and become a floating shelter.
ARCHITECTURAL POTENTIAL

Building on the buffer is integrated with the storage system of the buffer. The man-made porous terrain can be used as workshop during dry season and as temporary reservoir during the monsoon season. When severe flood threatens the site, light structures of the second storey floats on the water and act as emergency shelter. Clean water bodies are arranged between the building in a checkerboard pattern, cooling down the semi-outdoor platform with the help of the chimney-shaped roof’s wind extraction effect. They are also creating an intimate access to people in the courtyard.

ID-001
DIG & MOUNT

Bangladeshi people use basically a 'Dig & Mount' strategy to make a self-balanced & mundane intervention to the general landscape, utilizing the topography to manage water infiltration. This can achieve a general lift building site for any coming construction and provided a porous topography which increases flood water capacity.

Site / Location
People / Practice
Tasks / Production
Space / Architecture

ID-002
WATER CHIMNEY

As hot air rises through the channel-shaped roof due to different air flow velocities, air cooled by the water cools and rises more slowly into the channel, creating a chimney effect. This temperature gradient can be further amplified in the local dyeing industry, a process highly sensitive to the thermal environment.

Site / Location
People / Practice
Tasks / Production
Space / Architecture

ID-003
BIO-CYCLE

The chemistry-dyeing industry creates loads of toxic emissions, while the traditional natural dying is a self-recycling system. Both route water through a closed loop system, which is further enhanced by leaching interactions procedure can be balanced by the cooling and refreshing process of Indigo plants. It can be expected to structure more waste material if calculated accordingly.

Site / Location
People / Practice
Tasks / Production
Space / Architecture

ID-004
COOLING FACADE

Heat exchange happens when surfaces of different temperature meet, and the longer this period maintains, the bigger both energy and temperature difference. The larger the difference, the better will be offset. Water can be used as each kind of intermediary for having relative bigger heat capacity (the same material amount).

Site / Location
People / Practice
Tasks / Production
Space / Architecture
02 - LEAPING THROUGH
Transportation Alteration and Urban Cutting

Annual Excellent Student Work, Tongji CAUP
Fall 2007
Professor: Lan Lee, Yong Chen

The urban design project is seeking renovation to outdated Hongkou Port, exploring spatial logic through the development of urban environment. Ability to articulate and update public space system is emphasized during the project.

With water transportation industry degenerating in Hongkou Port today, four roads crossing the port got widened over time. The river-led traffic direction got reversed into road-led direction, and public space system were then cut into pieces. By implanting skywalks and riverwalks above and below the highway bridge, we tried to re-connect the fragmented site alongside Chengji Road.

Specific programs are situated in-between the transportation system according to cultural memory of the venue. Because of potential similarity of crowds and activities between now and then, memory of the old port seems to have returned.
FRAGMENTED LIFE IN OLD PORT

Mapping of historical waterfront system and contemporary road widening

Hongkou Port is among the few remaining tributaries that extends from Huangpu River, the main river channel in Shanghai. Before Shanghai City was established, there used to be a typical Jiangnan water town - transportation system consists both river network and the road. At the beginning of 20th century, Hongkou Port was the main transit point between the northern and southern water transportation in Yangtze River. Merchants replaced new vessels and stored goods here, bringing promotion to business, service industry, light industry and real estate around the port. Broadway Cinema Road, Harbours Row, Churches School, Bars and Stacks stationed along the river.

Shallow water level of this inland river became gradually unable to fit freight demand of modern times, thus the entire port industrial and commercial system and lifestyle decayed until completely vanished. Today, a large number of historical buildings degraded into low-level residential, or offices for small company and municipal facility has the Stone Grid. Historically, wedging along the waterfront was the dominant spatial sequence of this region. Yet during the process of broadening the four horizontal roads, original street front buildings were dismantled, the old interfaces were masked, and interior of residential blocks were exposed. Large-scale modern transportation cut the vertical waterfront system into islands, and flood control walls were built along the Huangpu River, making the entire old district lower than the elevated roads and urban planes, as if it is sinking.

Waterway in southern China is designed suitable for driving vessels with sharp bottom, while the straightened waterway is shallow and suitable for those with flat bottom. Merchants of running shipments in between used to change their ships in Shanghai, Hongkou Port was one of the major quays.
ROAD WIDENING AND FRAGMENTED RIVERFRONT

While the water transportation industry degenerates, four roads that crossed the port got widened over time. The river-fed traffic direction get reversed into road-fed direction, and public space system were then cut into pieces. Small and intimate scaled traditional alleys and the urbanized scaled wide roads are juxtaposed rigidly and roughly together. Crossing the road becomes such a troublesome affair. The living and leisure circle for residents is framed in the remaining small street area. Effective public space on the ground comes quite limited.

Roads of higher traffic capacity require larger viaducts to the bridge when crossing the river. Negative corner space and narrow passages formed out of height difference between these slopes and the original building base. The fragile on-ground floor is no longer directly open to the street but rather sinks below the base of the road. Street interfaces therefore become negative. Quality of the public spaces along the river has declined, which gradually degraded and was occupied by closed units of small companies and municipal facilities.

Changshi Road Widening

In order to build Bund tunnel before 2010 EXPO, streetfront houses were largely demolished. Lalong housing and its surrounding shophouses get removed, leaving the interior resilience building exposed directly to the road. The entire Changshi road lost its scale while people built new fence walls to protect perimeter. The once important commercial street of the part is now a dull blank.
PROPOSED STRATEGY - 3D LINKAGE

By implanting skyscrapers and rivewals above and below the highway bridge, we tried to re-connect the fragmented site alongside Changshu Road.

After evaluating the retention value of old buildings and the flow around the Port, we re-organized and connected between nodes with the potential to be activated. One of the main pedestrian systems, the winding expressway, linked the upper layers, leaping through all public nodes, providing scenics views from multi-perspective. Along with the renovated waterfront corridors, both walks creates several intersections within the site, where we plant new public facilities. New business formats are carefully attached into this Three-Dimensional system, including innovation park, office building, theater, museum, library as well as homestay within old houses. This, corridors and dominate buildings guarantee the community's close connection with the outside world, which is promising to make this colorful site more visible and accessible to fresh blood, while at the same time creating opportunity for former residents.
ARCHITECTURAL DEVELOPMENT

Specific programs are stitched in between the skywalk and riverside according to cultural memory of the venue. While retaining the structure, material and geophones of old buildings, we adjust and adapt its function to the modern times.

Former site of Changhe Cinema transferred into cultural complex of filming with multiple indoor and outdoor projection surfaces, former site of the Commercial Union became a new sharing workspace, Ping An was reorganized as short-term rental units, and waterfront business remerged. Because of potential similarity of crowds and activities between now and then, memory of the old port seems to have returned.
The multi-layer transportation helped re-link the broken site. A new gate pump built nearby keeps the water level stable, thus the waterfront space can be re-opened, forming a coherent public belt flowing under Changsha Road Bridge. The new Changsha Cinema is facing the river with dynamic levies screen, while the other new buildings are planted humbly as a background of old buildings. Memories of the past and people of the present coexist here.
03 - SHANGHAI BESIEGED

Residential Experiment in a City with a thousand leasing walls

Fall 2017
Professor: Yong Chen
Teammate: Jiating Ni

The course was in response to an emerging policy calling to ‘open up’ over-sized residential blocks - those with enclosed lengths over one kilometer - to increase traffic capacity and allow the city’s vibrancy to penetrate. During the process, we looked into the unseen living situation on the site.

Walls, as marker of private domains, as facility by-product, or as passive barrier of modern megablocks, are everywhere in Hongkou District. Decorated or not, technical advanced or not, intentional or unintentional, these walls create isolation and passiveness. Roads are degraded into pure transportation nodes.

Between tangible and intangible gaps and the polarized forms of dwelling in this area, we are proposing an outgoing and productive community, with the potential to sew up the splited classes and social interactions on the site by more positive intentions. We delved into the living pattern of Shikumen, trying to deconstruct Shikumen life in contrast to life in megablocks today and to explain the contemporary significance of Shikumen community in promote neighbourhood communication.
After the 1978 Reform and Opening Up and the 1995 reforms of housing distribution systems, houses were no longer afforded by working units and could be purchased freely. Real estate market gradually took off in China, and the residential community with closed environment developed.

Extreme efficiency was no longer emphasised, new social environment recognized the value of individuals, and spatial configuration became obvious. Residential areas of different grades used fences to protect their resource superiority. As the independent kindergarten facilities at each house had been partitioned, and the neighbors were no longer familiar colleagues, community coasts were significantly reduced, people gradually came to only rely on their families.

FROM SHARED TO SHIELDED
Mapping of fence wall and residential development

Housing is not only the physical shelter, but also the materialization of ideology and social context. In China, it is also an important indicator of personal assets and social status. In the recent 150 years since modern times in Shanghai, four residential prototypes have once taken dominant positions. From Shikumen to peripheral apartments, to workers' new villages, and to today's gated high-rise residential communities, the morphology and degree of openness of those communities changed dramatically. Growth of social wealth and the gradual uneven distribution make communities change from Shikumen (one house, which is highly dependent on shared facilities, to the closed communities using fence wall to defend their privacy or facility and the achievement of its environment. In Hongkou District, communities closer surrounded by walls are everywhere, and the urban environment is therefore individual.
A CITY WITH THOUSAND WALLS

Walls, as marker of private domain, as facility by-product, or as passive border of modern megastructures, are everywhere on the site. Decorated or not, technical advanced or not, intentional or not-intentional, these walls prove isolation and passiveness. Roads are degraded into parking transportation vehicles.
THE FORTRESS BESIEGED

"Those who are outside want to get in, and those who are inside want to get out."

The fortress is used as a metaphor by Chi’en Ch’u-ch’i to express the conflicts between the two major patterns of dwellings left today in Shanghai: old Shikumen lane houses and modern gated megablocks. Megablocks kept eroding the remaining Shikumen area, while they also wrapped themselves tightly with barrier walls, resisting the world outside. Who is the trapped one? People from both ends seek solution from the other.

In terms of housing, horizontal class transfer means class falling. Housing in Shanghai experienced four major stages over the past 100 years. In each process of selection, political or economically disadvantaged groups could only be trapped in old dwellings. The form of housing gradually became the index for judging people’s class, while class isolation is taken by the wall standing everywhere, between stratified residential areas.

Since 1990s, great demolition and reconstruction brought about ramatic changes of urban texture in less than 20 years. High-rise as well as megablocks kept popping up in Hongkou district.

Additional construction, occupied & privatized dorms and negative spaces alongside the fence wall took the vast majority of vacant space on the site. Although the regional-level greenland, the North District cover a large area, its accessibility is weak. Only limited street space is truly active in social life, with positive interface and living facilities. Those small-scale alleys, however, are on disappearing with the removal of the low house.
PROPOSED STRATEGY - EXTROVERTED COMMUNITY

Living in-between

Between tangible and intangible gaps and the potential forms of dwelling in this area, we are proposing an outgoing and productive community, with the potential to sew up the split ends and social interactions on the site by more positive intensities.

An open community will not only promote the neighborhood activities within the community, but also be a hub for the surrounding communities in this region. Greater value could be sought through interaction rather than keeping isolated and defensive.

Deconstruct Shikumen Life

Life in Shikumen has long been cherished as a paradigm for ideal community interaction. We derived into the living pattern of Shikumen, trying to deconstruct Shikumen life in contrast to life in megablocks today and to explore the contemporary significance of Shikumen community in promote neighborhood communication. We believe the necessity for residents to share facility, the playground integrated with traffic space, assemblage of varied groups and the organized openness, are the key to promote a interlocked and activated community.

STRATEGY DEVELOPMENT - THE INTERLOCK

Generation Process in axonometry

a. adapt new road structure
b. activate activity from main road - pocket zone
c. shape block by void
d. interlock to create visual sense of enclosure
e. cut volume through shading analysis
f. calm traffic and create pocket playground
g. plant facility and stores around the road/playground
h. shape interface toward city
ARCHITECTURAL DEVELOPMENT

By bundling the outline of the main street, we expand the positive border, and a series of pocket-shaped gardens derived from the slow-speed traffic lanes provide playgrounds for the community, including celebration squares, micro forests, and outdoor basil laws. The triangular shape guarantees that these small squares have sufficient facilities and commercial support, as well as full sight orientation to ensure that there are no blind corners or community surveillance. Meanwhile, sense of privacy in side secondary blocks are achieved by visual manipulations.

Each branch also has its own characteristics, such as food court, express stack, domestic service and logistics. Small blocks are view-oriented and crowd-oriented according to their location, thus realizing a community where varied age groups and multiple consumer groups are organically mixed.
04 - SPACE +

Commercial Complex in Digital Age

Spring 2017
Professor: Guanglu Sun
Teammates: Chengrui Zhu

The studio's objective was to build capability in coordinating articulated complex space systems. After field study, we decided to plant future-oriented programs and spaces to the design, and tried to think about the potential of physical environment when the business form is dramatically innovating today.

North Sichuan Road is among one of the most prestigious commercial streets in the memory of old Shanghai. In almost every passing period, North Sichuan Road had its business constantly adapt to the ethnic context and mercantile background, and showed a continuous vitality and prosperity. Since 2000, however, enormous pressure of homogenized competition and the rising Internet shopping trend push physical business off this street into downfall.

By comparing historical commercial pattern to online shopping, we explored the cooperation of online and offline systems. We are proposing an integrated strategy for a smart shopping center in Net Age 2.0, where augmented physical space and on-screen life could be mutual promoting. Architecturally, we plant a multi-layered transportation system and use multimedia devices as theme of the shopping center and the source of vitality.
FALLING OF TRADITIONAL COMMERCIAL STREET

Mapping of past and present commercial highlights and cultural context

North Sichuan Road is among the most prestigious commercial streets in the memory of old Shanghai. It is located in the Platinum Triangle of downtown Shanghai. Being once the birthplace of Shanghai’s and even the Chinese film screening industry, Guangdong immigrants and Japanese military colony and left-wing literati settlement, in almost every passing period, North Sichuan Road had its business constantly adapt to the ethnic context and industrial background, and showed a continuous vitality and prosperity.

Since 2000, however, with the degradation and ultimate disappearance of those cultural symbols, the commercial form of North Sichuan Road has become homogeneous. Newly built commercial buildings are close to each other while qualities of which don’t vary much. Quality of the old-fashioned street shops is meanwhile declining. Continuous pressure of homogenous competition and the rising Internet shopping trend push physical business of this street into dilemma, and the commercial atmosphere is weakened. Never can people see the grand venues of those golden years.
SHOPPING - FROM SPACE TO NON-SPACE

With the change of information interface, people's experience of commercial space evolved from centralized focus decided by vendors to a three-dimensional immersion in complex spaces. However, although the information surface expanded, business forms became more interconnected and diversified. In the complex era, the spatial climax of a shopping mall is the large interior atrium, and the outdoor space degraded into a pure ornamental. Even since 2006 boom in commercial complex construction, the commercial interface in East Nanjing North Road gradually changed from an open street space to the dull boundary of large-scale complexes, and the commercial atmosphere in the street therefore went thinner.

Pattern

Interface

COMMERCIAL PATTERN

URBAN MORPHOLOGY

Distribution

online interaction

non-spatial distribution

divide & conquer

'HYPER' SPACE

The retail industry in East Nanjing North Road suffered a heavy blow, with either closed or low-quality stores, negative effects on the many complexes occupying most part of the street:

- street shop
- shopping center
- grand views
- permeable facade
- negative facade
- rail line
- multifunction
- congregation point

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FROM COMMODITY TO PLACE-MAKING

Apart from being the only access to commodities, the category of shopping center expanded into a multi-dimensional service system catering to people's new consumption needs - places, environments, services and offline activities. By combining online and offline dimensions, we are proposing an integrated strategy for a smart shopping center in Net Age 2.0, where augmented physical space and on-screen life could be mutual promoting.

DEVICE & SPATIAL STRATEGY

According to the characteristics of different customer groups interior or exterior to the region, we plan a multi-layered transportation system adapting to varied speed requirements, and use multimedia device The Belt as a connection and prompt symbol winding around the transportation system - which makes customers on different circulations can sense and switch to each other. The ever-changing interactive screens is the theme of the shopping center and the source of vitality. It can be used as a medium for product promotion, art exhibitions and live broadcasts.

Circulation underground is a pedestrian-vehicle mixed system allowing for grab-and-go services and offline pickup. By encouraging local residents to use the complex as daily routines, we are building a sticky customer group.