DESIGN PROGRAMME

RESILIENT HẺM-SCAPE

RESILIENCE FOR VULNERABLE ALLEYWAY HOUSING IN SAIGON

Figure 1. Aerial photograph of the site in District 8.

8th ICBR Lisbon | Nov 2018
Building 4Humanity DESIGN COMPETITION
Category 3: Resilient Projects (**Student Teams**)

Team Members: *Thanh Tran, Teresa Tran*
Supervisor: *Terri Meyer Boake*
University/School: *University of Waterloo, Canada*
Project Location: *Saigon, Vietnam*

Team Code: **B4H-DC3101**

SAIGON, VIETNAM

Saigon is the largest urbanized area in Vietnam. Saigon's current population is around 8.6 million and is expected to increase to 12 million by 2020.

ABSTRACT: The present and future urban fabric of Saigon's southern expansion is continually at risk of flood damage due to the lack of city planning and uncontrolled development. Short-term responses for flooded districts implemented by the city result in raised roads and alleyways to avoid flood waters. As a result, the impacts to alleyway (hẻm) housing within the city cause risks to daily life, health and culture for residents who are unable to raise their homes at the rate of the city.

The urban design proposal utilizes an interdisciplinary approach of architectural, landscape and soft infrastructural design to regain and extend public spaces and hẻm culture in Saigon. New and existing housing typologies are integrated with resilient flood-strategies appropriate for the spaces resulting from these alleyways.

URBAN PLANNING & EXPANSION

01 Historically, the old city was planned on higher ground adjacent to the Saigon river by French colonizers in 19th century. Before 1975, Ngô Viết Thụ, an architect known for multiple landmarks within the city advised for any expansion of the city to the north and northwest areas where the ground elevation is naturally higher.

However after 1975, the city's rapid population growth, mainly due to migration from rural areas for increased employment opportunities, has led to expansion of the city towards the south and the southwest. This ongoing expansion lacks proper urban planning and is uncontrolled due to the rapid rate of development, property acquisition and selling, as well as corruption.

Developers and informal houses have illegally expanded over areas of natural drainage systems such as canals and riverbanks. Urban planning in Saigon has lacked coordination with the city's accelerated expansion and has disregarded the importance of infrastructure for water-control and drainage from heavy rainfalls. The lower-elevation areas, such as District 8, have experienced heavier flooding of streets and homes due to its rapid expansion in the past decades.

Urban flooding in Saigon: The resultant effects of this expansion combined with the climatic effects have caused increased incidents of flash flooding. Currently, around 1/3 of Saigon's population experiences repeated flooding. Along with the anticipated expansion into lower topographic areas, this population could increase to two-thirds over the next decade.[1] Every year, flooding incurs costs of trillions of dong, crippling the development of the city and heavily affecting vulnerable populations who cannot avoid it.[2]

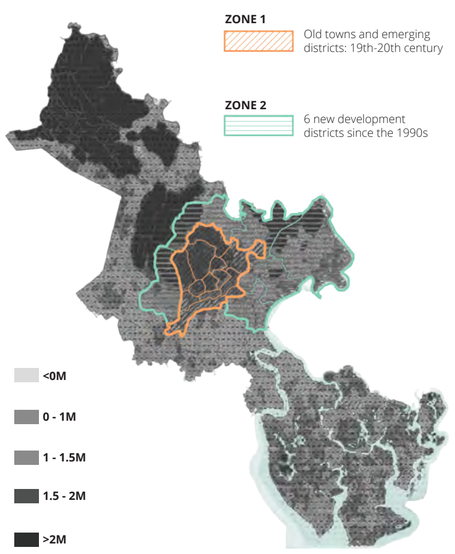


Figure 2. Topography of Saigon, adapted from map of "Urban zones Layered over Topography" by Pham. et al.

Flood statistics from previous years include [2]:

2008
126 inundated points, 85 in central area.
Flood occurrence: 873 times,
duration: 156 minutes avg.
Inundated area: 2,910 square meters.

2013
40 inundated points, 14 in central area.
Flood occurrence: 44 times,
duration: 62 minutes avg.
Inundated area: 1,100 square meters.

2015
27 inundated points, rainfall of 132mm

PREVIOUS RISKS & DISASTERS

02 Floods are becoming less predictable due to the constantly changing urban environment combined with the effects of climate change. Multiple effects that contribute to the severity of floods include the lowered city elevation due to increased subsidence from groundwater use in the region, heavier rainfall cycles from tropical storms contribute to flash flooding scenarios, large extents of impermeable paved surfaces along with over capacitated infrastructure, and the reduction of wetlands and forest areas.

Immediate Impacts & Consequences: Without proper resolution for the issues at hand, flooding has become a common occurrence in the city that residents have been forced to live with. The damaging effects of flooding include direct and indirect effects on economy, health and livelihoods of households in the city. These effects on households include:
- Damaged houses, furniture and possessions and cost for repairs
- Health risks and water-related diseases due to water pollution caused by industrial and domestic wastes during flooding [1]
- Disrupted businesses and income for households
- Inconvenience for transportation and reparations

Infrastructure has been limited in capacity due to lack of planning for long-term development. Drainage and sewage systems are insufficient in proportion to the area's population density. Current ongoing infrastructure projects do not address the root causes of flooding; an example of smaller scale projects that temporarily address the issue of flooding are the elevation of existing roads within the city. These roads range from main streets to smaller alleyways, directly affecting the immediate households within these neighbourhoods.

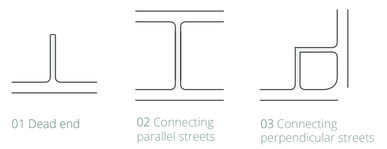
Figure 3: A flooded street in Saigon in the summer of 2017.

Figure 4. A flooded Hẻm in 2015.

Figure 5. A house lower than the street level in District 6.

SAIGON'S ALLEYWAY HOUSING

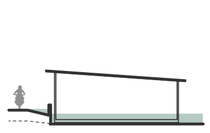
03 **Saigon's Alleyway Housing:** Hẻm, literally means alleyway, is a common type of road in Saigon that is typically 2.5m wide and loaded with houses on both sides. It is an informal road that gives access to properties that are located further away from the main streets. A hẻm is usually not planned by the city, but rather develops over time based on how the sites are divided from a larger piece of land.



Several types of hẻm

Hẻm is an important type of road and neighborhood, because it is common throughout the city. Hẻm are typically mixed neighbourhoods with a range of incomes and storefront opportunities for households. Storefront businesses can range from restaurants, variety stores, cafes, tailor services etc. Within the hẻm, incomes can range from poor households to wealthier households. Hẻm provides a range of social benefits, including close neighbourhood interactions with shared spaces for weddings, funerals, religious celebrations, and parties.

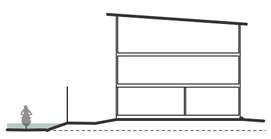
Hẻm deal with flooding due to lower elevations compared the main roads. As a short-term solution, main roads are typically raised by the city to prevent flooding, while hẻm are usually raised less often. The raising of elevation of hẻm is often funded by local municipalities, or sponsored by wealthier households within the neighborhoods. As a result, many houses are not able to be raised and their ground floors usually end up below the street level. Inundation from flooding in the street ends up causing more damage to lower homes that are unable to rebuild.



01 **Existing Flooded Homes Left Behind**

Raised roads leave lower houses behind, causing flooding in their ground level.

Figure 6. Interior view of a home left below the street level.



02 **Existing Paved Yards and Raised Homes**

Large amounts of impermeable paving cover the roads and yards of the urban area, contributing to runoff and overcapacitated combined stormwater systems.

Figure 7. Walls built in front of houses to limit flood water.

Competing for Higher Ground: With a lack of local zoning and building code regulations, costly and ineffective temporary solutions have been carried out, failing to reduce the overall impact of flooding. One of the most common solutions implemented is the raising of the elevation of a hẻm, an act resulting in significantly higher roads than the ground floor of many houses. The hẻm is temporarily protected from flooding, however houses will consequently be much lower compared to the level of the hẻm causing accessibility challenges. Most of the time, when a hẻm is raised, rainwater will be logged at lower elevations and slowly infiltrate into houses.

In some cases, functions of a house are rendered useless because it is not feasible to raise the houses. Consequently, daily lives and businesses are badly disrupted, and people are forced to sell their houses and move elsewhere. Other residents are left with little choice but to raise the ground floors of their houses, inevitably partaking in the competition for higher ground.

Hẻm-scape: *Inclusive of all qualities and characteristics that compose of a hẻm with the addition of flood-resilience*

Figure 8. Google Maps Aerial of chosen site. 10°43'28.7"N 106°39'23.6"E

The Site: A Hẻm in District 8: The site is located in District 8, a lower-elevation area that has rapidly developed in the past 15 years. The district experiences severe flooding during the rainy season, exposing residents to severe health risks from the combined sewage system. One hẻm off of the regional road has used as a case study for possible resilient interventions that allow for flood-resilience from the bottom-up, allowing hẻm culture to inform design and be preserved at the same time.

4 common types of houses:
- One storey with front yard
- One storey without front yard
- Multiple storeys with front yard
- Multiple storeys without front yard

Figure 9. Typical 2-storey houses loaded on both sides of the hẻm.

Figure 10. Single-storey houses within the site.

Figure 11. Leftover greenspace from hydropower developments within the site.

04a New and Existing Buildings

Existing homes have the potential to use flood-adaptive systems and soft infrastructure within their yards to reduce the impacts of flooding. Designs must be low-cost and reasonable enough for a homeowner to adapt their lot.

New homes can be designed in response to urbanization and urban flooding to increase resilience individually and communally. When new houses are constructed higher than the hẻm, rainwater tends to flood the hẻm, leaving lower houses with submerged floors in flood water. New homes require adaptable designs that contribute to alleviating the flood conditions.

04b Hẻm-Scape

Hẻm lacks green space and public space and therefore must deal with the urban flood through community building programs such as recreation, markets, seating and soft infrastructural areas to tackle the concerns of the site and public spaces.

The design of a public space should consider existing elements of scale, materiality and spaces unique to the hẻm conditions. It prioritizes the preservation of hẻm culture and erases the boundaries caused by flooding and insecurity.

DESIGN PROPOSED FOR RESILIENCE

04 Design for these situations should take into consideration the unique local interactions between the users and visitors to the hẻm. These interactions take place in an existing complex urban fabric composed of a hybridized man-made landscape that has naturally outgrown itself over time.

The urban fabric of the hẻm consists of different typologies of homes that react to their situation different. Raising of homes creates unbalanced street elevations, creating larger thresholds between the hẻm and the homes. Minimized these thresholds allows for fewer gaps, thus regaining the hẻm's former communal qualities. In order to retain the characteristics and culture of the hẻm, the design proposes different systems and approaches for existing homes to be modified and new homes to be built with resilient strategies.

Citations:

[1] Long, Hai Yen, and Ngoc Anh Thi Nguyen. "Urban Flooding in Ho Chi Minh City." ADPC. Accessed June 15, 2018. https://www.adpc.net/igo/contents/iPrepare/iprepare-news_id.asp?ipid=235.

[2] Vietnamnet.vn. "HCM City's Flooding Map Is Redrawn - News VietNamNet." Vietnamnet NEW. Accessed June 15, 2018. http://english.vietnamnet.vn/fms/environment/159924/hcm-city-s-flooding-map-is-redrawn.html.

Figure 1: *Tran, Thanh. Aerial photograph of the site in District 8. Photograph. July 2018.*
Figure 2: *Topography of Saigon adapted from map of 'Urban zones layered over topography'*, Pham, Duy Nguyen et al. "Increasing Vulnerability to Floods in New Development Areas: Evidence from Ho Chi Minh City." Emeraldinsight. Accessed June 15, 2018. https://www.emeraldinsight.com/doi/full/10.1108/IJCCSM-12-2016-0169.
Figure 3: *A flooded street in Saigon in the summer of 2017*, Báo Giao Thông. "TP.HCM Công Bố 40 điểm Ngập Nước Trên Bảng Thông Tin điện Tử | Báo Giao Thông." Baogiaothong.vn. Accessed June 15, 2018. http://www.baogiaothong.vn/tphcm-cong-bo-40-diem-ngap-nuoc-tren-bang-thong-tin-dien-tu-d209081.html.
Figure 4: *A flooded Hẻm in 2015*, G.Minh, Tin-ảnh: "Sau Mưa 2 Ngày Nước Vẫn Ngập, Dân Bỏ Tiền Xây Cống." Https://nld.com.vn. October 25, 2015. Accessed June 15, 2018. https://nld.com.vn/thoi-su-trong-nuoc/sau-mua-2-ngay-nuoc-van-ngap-dan-bo-tien-xay-cong-20151025163917972.htm.
Figure 5: *A house lower than the street level in District 6*, PLO.VN. "Nhà Trũng, Thấp Do Nâng đường được Hỗ Trợ Tiền." PLO. December 05, 2016. Accessed June 15, 2018. http://plo.vn/bat-dong-san/nha-trung-thap-do-nang-duong-duoc-ho-tro-tien-669466.html.
Figure 6: *Nhà dân thấp hơn một đường trên đường Phan Văn Hân (P.17, Q.Bình Thạnh, TP.HCM). "TNhà dân thấp hơn đường ở TP.HCM do lỗi quy hoạch" BÁO MỚI. Accessed August 20, 2018. https://baomoi.com/nha-dan-thap-hon-duong-o-tp-hcm-do-loi-quy-hoach/c/22534315.epi.*
Figure 7: *Walls that are built in front of houses to limit flood water. "Tin Trong Ngày: Trời Nắng 40 độ C, Người Dân Sài Gòn Khổ Sở Tìm Cách Chống Ngập Nước Tràn Nhà - Tin Trong Nước." Thời Báo. Accessed August 20, 2018. http://thoibao.today/paper/tin-trong-ngay-troi-nang-40-do-c-nguoi-dan-sai-gon-kho-so-tim-cach-chong-ngap-nuoc-tran-nha-tin-trong-nuoc-1952837.*
Figure 8: *Google Maps Aerial of choosen site,* Google Earth Pro V 7.3.1.4507 (February 06, 2018). Saigon, Vietnam. 10°43'28.62"N, 106°39'23.63"E, Eye alt 250 m. *DigitalGlobe 2018. http://www.earth.google.com [June 15, 2018].*
Figure 9: *Tran, Thanh. Typical 2-storey houses loaded on both sides of the hẻm. Photograph. July 2018.*
Figure 10: *Tran, Thanh. Single-storey houses within the site. Photograph. July 2018.*
Figure 11: *Tran, Thanh. Leftover greenspace from hydropower developments within the site. Photograph. July 2018.*

DESIGN PROPOSAL

8th ICBR Lisbon | Nov 2018
Building 4Humanity DESIGN COMPETITION
Category 3: Resilient Projects (**Student Teams**)

Team Members: *Thanh Tran, Teresa Tran*
Supervisor: *Terri Meyer Boake*
University/School: *University of Waterloo, Canada*
Project Location: *Saigon, Vietnam*
Team Code: **B4H-DC3101**

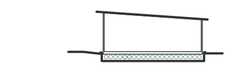
RESILIENT **HẺM-SCAPE**

RESILIENCE FOR VULNERABLE ALLEYWAY HOUSING IN SAIGON

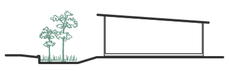
DIAGRAM OF DESIGN PROPOSAL FOR DIFFERENT CONDITIONS

SHORT TERM: **1-2 YEARS**

Short-term solutions include modifications to existing homes at the highest level of risk. Existing homes have the potential to use flood-adaptive systems and soft infrastructure within their yards to reduce the impacts of flooding.



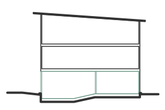
Amphibious ground floor



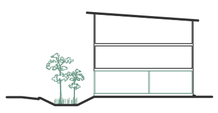
Modified front yard

LONG TERM: **5-10 YEARS**

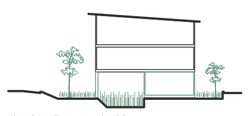
Long-term solutions include modifications to lower risk homes and resilient strategies applied to new-build homes.



Modified ground floor



Modified yard



Flood resilient new build

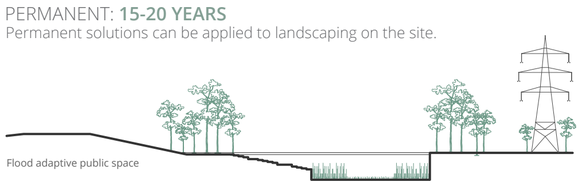
EXISTING CONDITIONS

Hẻm lacks green space and public space and therefore must deal with the urban flood through methodologies that should involve benefits for the community.

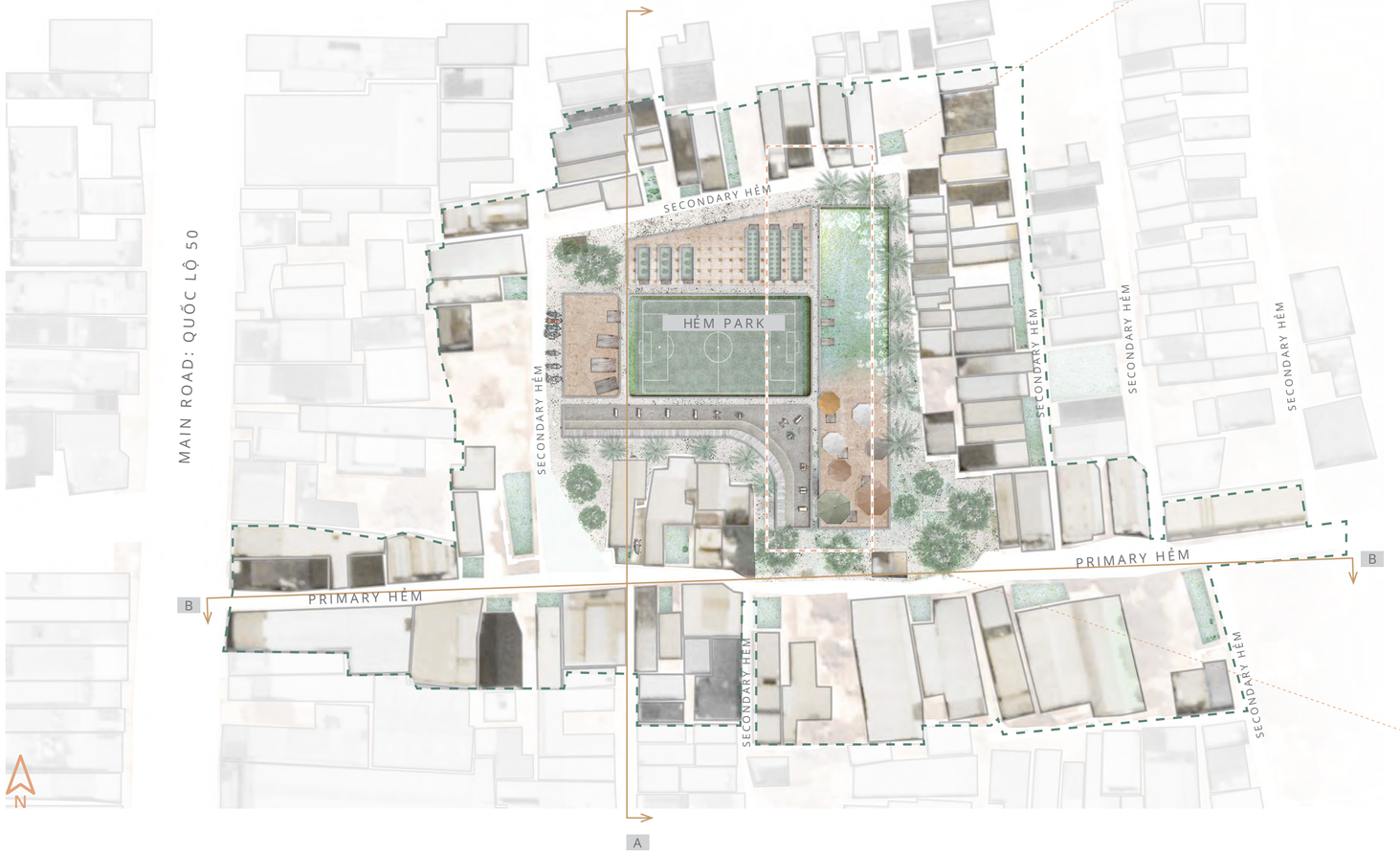
Existing unused green zone

PERMANENT: **15-20 YEARS**

Permanent solutions can be applied to landscaping on the site.

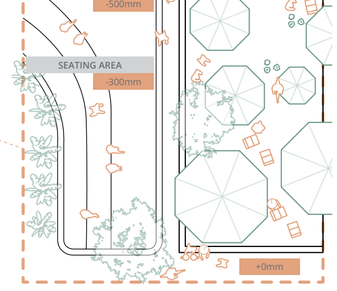


Flood adaptive public space



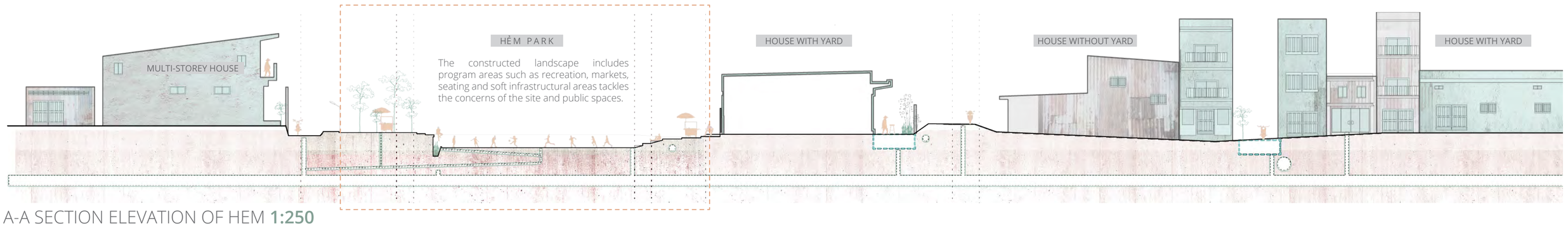
SITE PLAN OF HEM **1:750**

0 15 30 45 75m

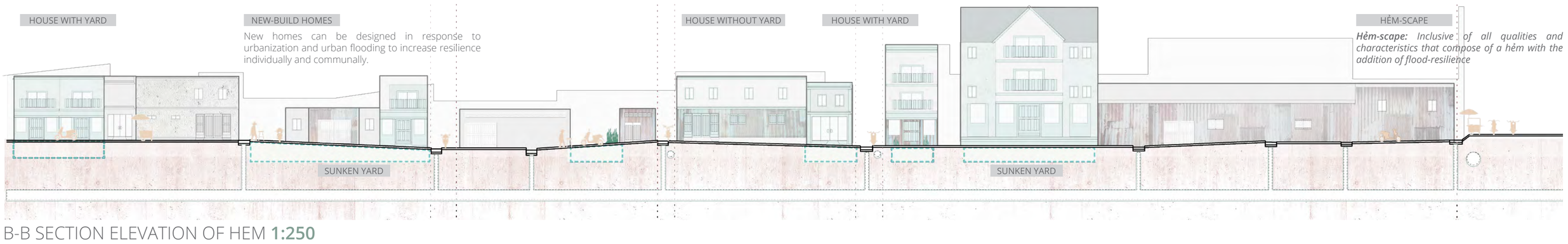


PLAN DETAIL **1:250**

0 5 10 15 25m



A-A SECTION ELEVATION OF HEM **1:250**

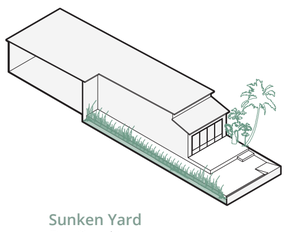


B-B SECTION ELEVATION OF HEM **1:250**

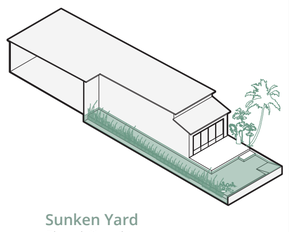
Flood Retention - Sunken Yards

This design proposes the lowering of the front yard as opposed to raising it. The ground floor has varying elevations to accommodate flood waters at different levels.

Lots should be altered so that they have a lowered area to temporary store rain water, relieving the stormwater system from being over-capacitated.



Sunken Yard
Dry Conditions



Sunken Yard
Flood Conditions

SUNKEN GARDEN PLANTS

Saccharum Spontaneum
Reed, typically located along shores and edges.

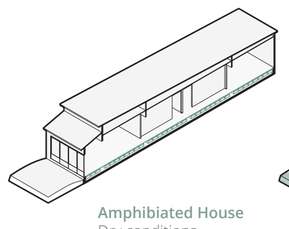
Lotus
Can be harvested and sold along with community garden crops.

Duckweed
Floats on the surface of the water.

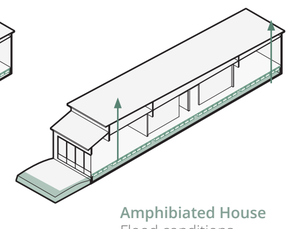
FLOATING MATERIALS

Barrels and Jugs
Used to store water in the dry season, and used to float in the rainy season.

Other Buoyancy Elements
Plastic bottles, polystyrene, containers, etc.



Amphibiated House
Dry conditions



Amphibiated House
Flood conditions

Resisting the Competition for Higher Ground through Amphibiation

Homeowners currently believe that they should raise the ground floor and their front yard several metres above the road to resist the flooding. Existing homes can be retrofitted with floating elements to float when water levels increase. Floors will be designed to lift when water levels increase to protect the ground level from damage and reduce inconvenience for residents.

0 1 2 3 5m

SECTION PERSPECTIVE OF RESILIENT HOUSES **1:50**