Rethink Can Tho.

Delft, 27th of January, 2016

DELFT UNIVERSITY OF TECHNOLOGY

Faculty of Architecture and the Built Environment
Master of Architecture, Urbanism and Building Sciences
Discipline: Master track of Architecture
Examiners: Vitner, D., Nottrot, R., Dooren, Ir. E.J.G.C. van
P5 PRESENTATION, Location: BK-IZ P
27th of January, 2016
NGUYEN, HONG HANH

CONTENT

1 Introduction
Flood and water safety
Climate change
Mekong Delta, Vietnam

2 Problem statement

3 Study goal & objectives
Objective 1: Toolbox building level
Objective 2: Neighborhood level
Objective 3: Tube house redesign

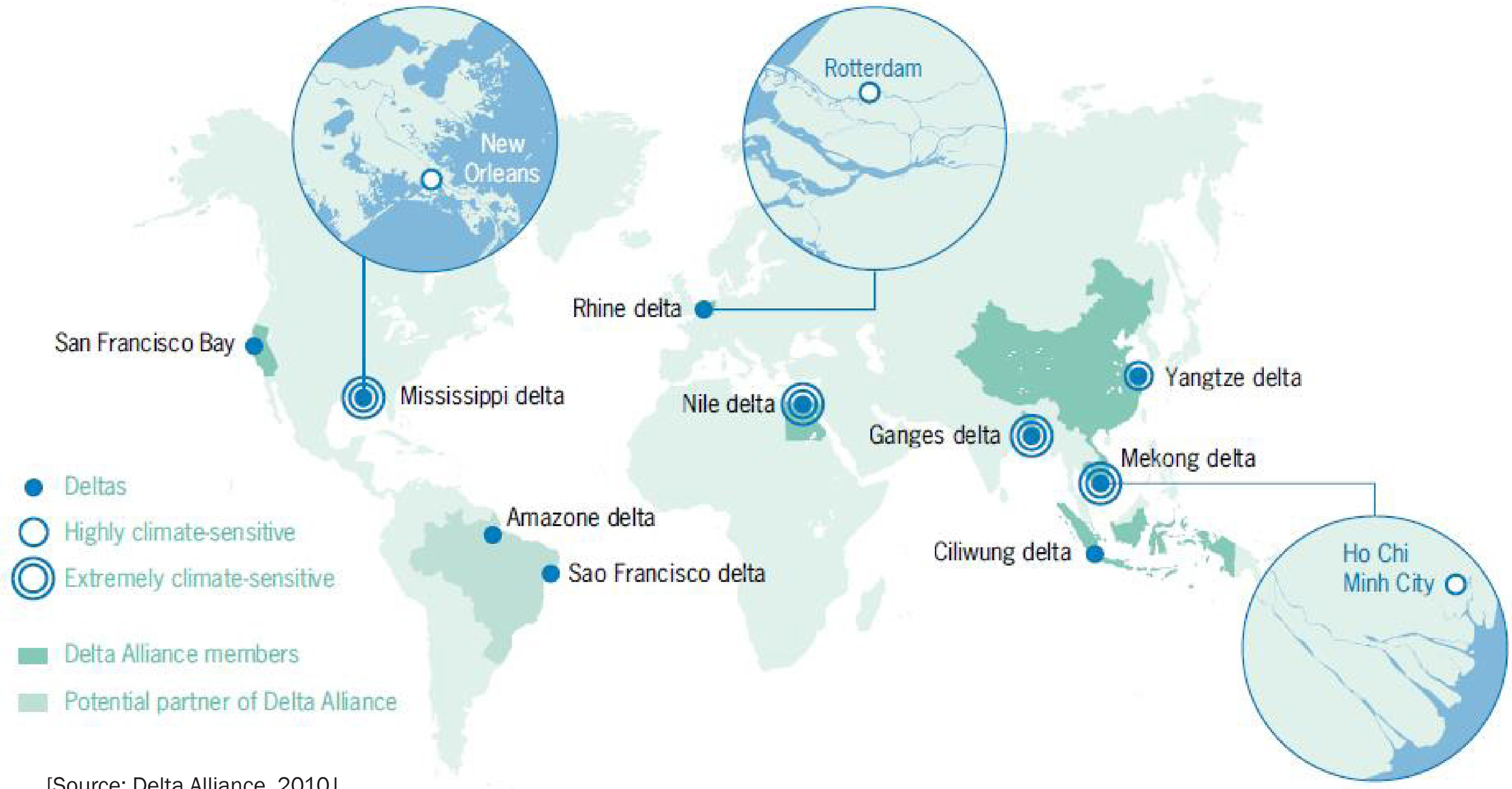
4 Methods & Results

5 Discussion
Reflection on study goal
Study limitations
Future prospects

VIETNAMESE FAMILY

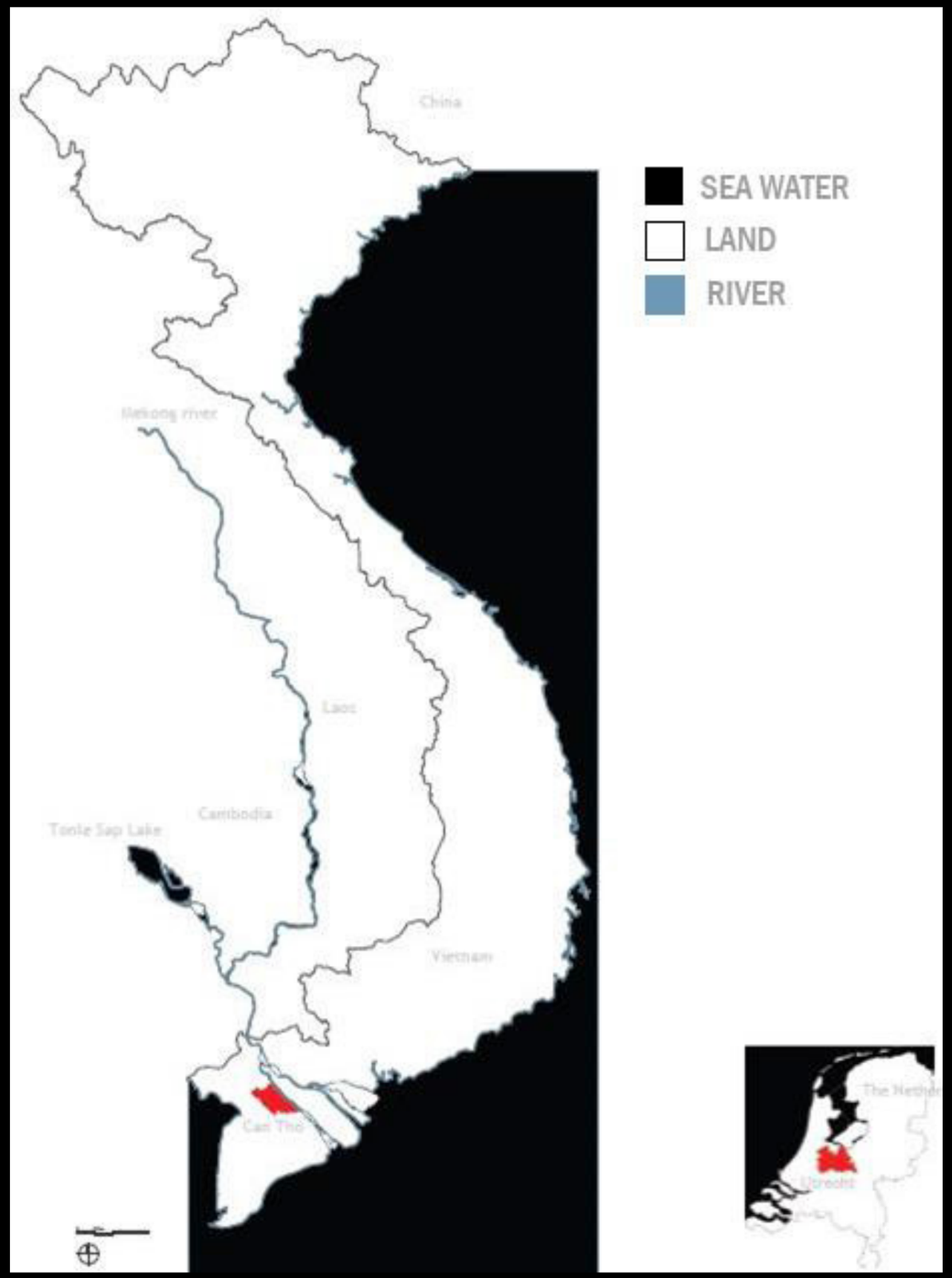
CLIMATE CHANGE

DELTA ALLIANCE AND CLIMATE CHANGE



[Source: Delta Alliance, 2010|

VIETNAM



[Scale comparison with Netherlands, H.H. Nguyen, 2015|

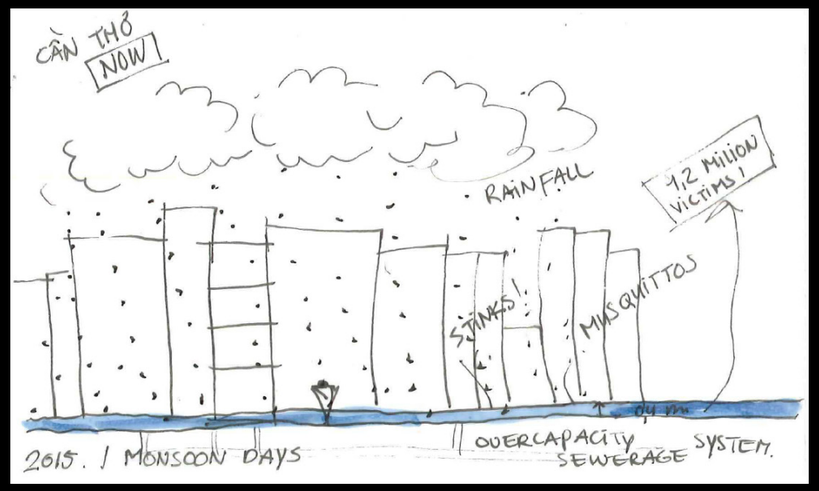
MEKONG DELTA
Scale comparison with Utrecht.

CAN THO
Capital
1401,6 km2 [Rahmanti, 2009]
Ninh Kieu: District Centre [VARCC, 2009]
Area: 129.2257 km2
Inhabitants: 209.274

CLIMATE
Tropical Climate Seasons [Ky, 2014]
Monsoon (Rainy Season):
May- November
Off Monsoon (Dry Season):
December- April
Average Temperature 27° Celcius

HOUSING TYPOLOGIES

CURRENT PROBLEMS



[Drawings: H.H. Nguyen, 2016

Annual floods
Due to high water discharge of Mekong rivers [Ky, 2014]

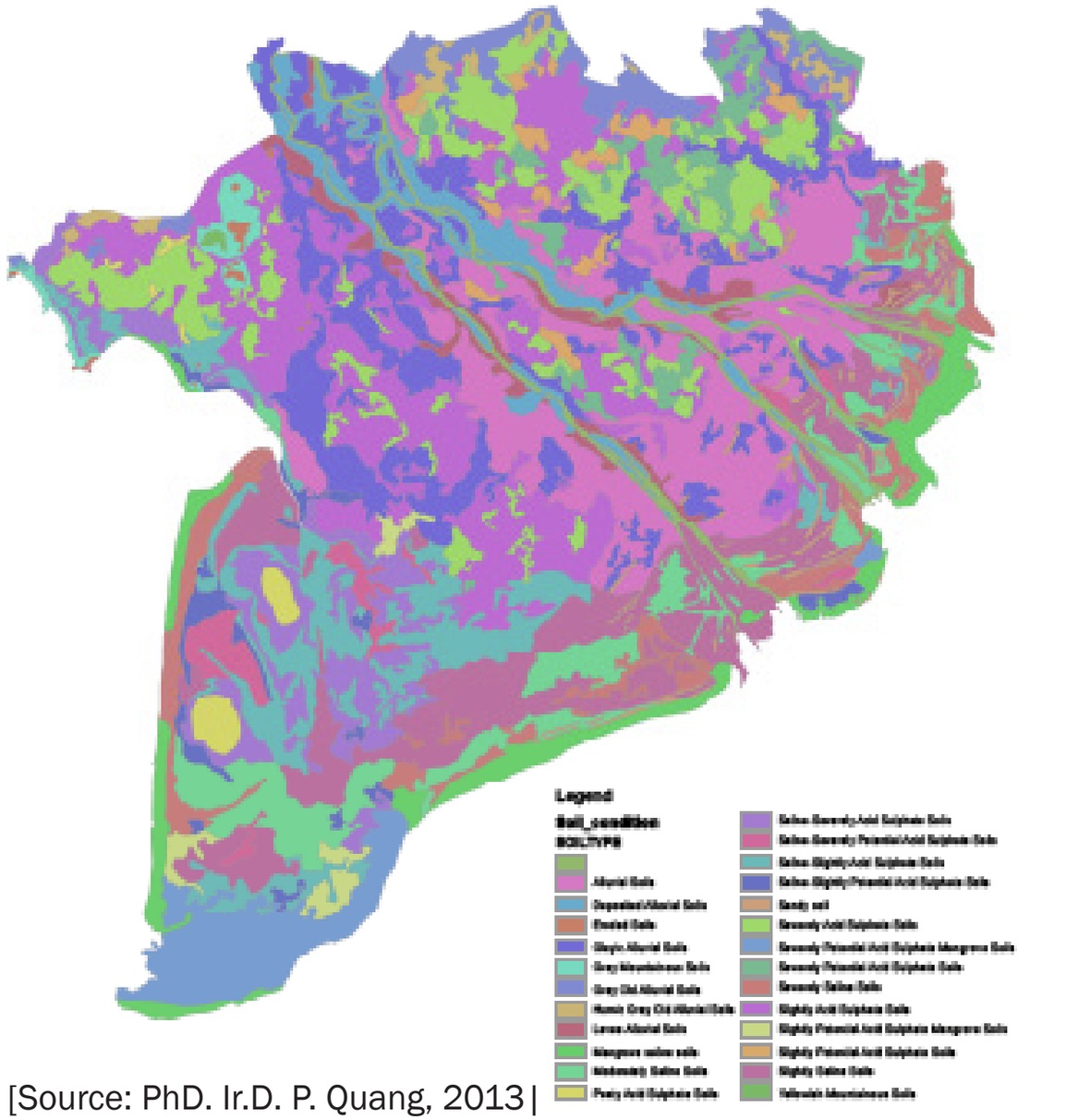
Inundation of water levels
Most extreme up to 30-40 cm (60 days) [Ky, 2014]

Increasing numbers of heavy rainfaills
Heavy rainfalls (≥50 mm) doubled in 20 years [KNMI, 2011] [Shannon, 2008]
Average monsoon rainfaill is 64 mm. [Phi, 2007]

Overcharged sewerage system

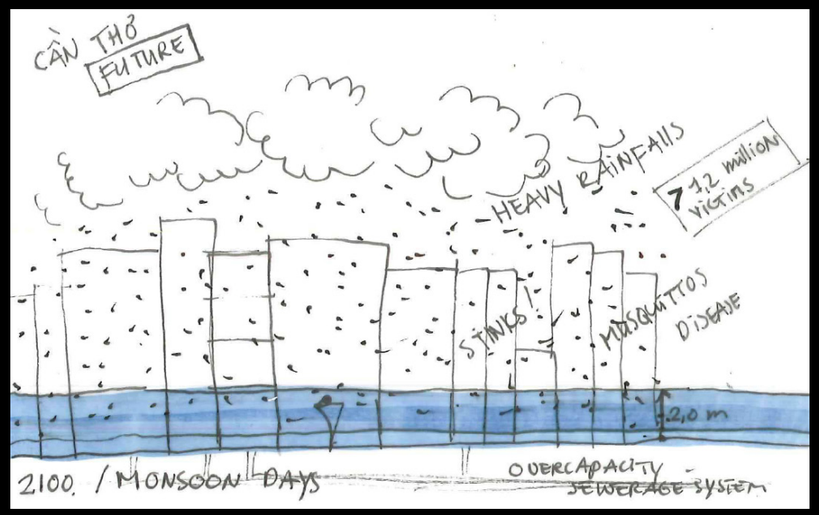
Soil subsidence
Due to drinking water production from groundwater

SOIL MAP



[Source: PhD. Ir.D. P. Quang, 2013|

EXPECTED PROBLEMS ANNO 2100



[Drawings: H.H. Nguyen, 2016

Increased inundation water level height
100-300 cm (6 months a year) [VARCC, 2009]

Increased sea level rise
60% faster than predicted [Amesz, 2013]

Highly risk of diseases
Due uprising temperatures (up 40° Celcius) [VARC, 2009]

THESIS SCOPE

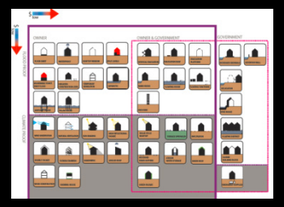
Main goal:
Which design solutions at a building level will help Can Tho adapt to the climate related flooding problems?

Study objectives:

1 To create a toolbox with climate adaptive and particularly waterrobust solutions on a building level for the design process of houses in delta areas.

2 To propose a sustainable climate adaptive solution on a neighborhood level with particular attention to the existing tube houses in Ninh Kieu (District Centre) for the year 2100.

3 To propose a climate adaptive and waterrobust architectural re-design for the tube houses in Ninh Kieu (District Centre for the year 2100.



1: Toobox

2: Neighborhood waterplan

3: Water storage House

OBJECTIVE 1: TOOLBOX

1 **DEVELOPING THE TOOLBOX**
1.1. BRAINSTORMING WALL & PARTICIPATION WORKSHOP

2 **COLLECTING MEASURES**
2.1 WHICH MEASURES CAN BE USED IN CAN THO?

3 **CATEGORIZATION MATRIX & PARAMETERS**
3.1 HABITANT OR GOVERNMENT RESPONSIBILITY?

DEVELOPING THE TOOLBOX

SYMPSOSIUM
De oogst van de Proeftuinen“, Den Haag.

Data from the Dutch Delta

[Symposium de oogst van de proeftuinen, Den Haag, 10-10-2013]

DEVELOPING THE TOOLBOX

DATE	ORGANISATION	INTERVIEW QUESTIONS	CÂU HỎI PHỎNG VẤN KẾ HOẠCH TỔ CHỨC
1 Thursday Thứ năm 20/03	CAN THO CITY UNIVERSITY Architecture department TRƯỜNG ĐẠI HỌC CẦN THƠ CITY bộ phận kiến trúc	1. What are the duty of your office in flood control? 2. Are there floor plans + section drawings available in detail (1:20, 1:50, 1:100, 1:200, 1:500, 1:1000) about streets in Ninh Kieu 3. Height maps available from Ninh Kieu in detail (1:50) 4. Flooded area's 5. Sky pictures recent floodings 6. Historical maps can tho city (morphological development can tho city) 7. Standard Architectural typology Ninh Kieu (map) 8. Architectural flood proof measures, Materials, Building construction (books available) 9. Section and floor plan drawing, street- building connection (connection between private zone- public zone) 10. What is the characteristic of the different typologies? How do private zones and public zones work? 11. Are there existing Flood proof measures in Can Tho City 12. What are the costs of houses? Cost scale? Of different housing typologies? 13. Income of Can Tho City citizen. Lower- class, middle- class, high- class incomes map? 14. Map of leveled dwelling, high- rise dwelling, low level dwelling, why no high rise? (In China they wish to be in touch with the ground (dat) and in touch with the sky (troi). Is that the same as Vietnam? How much does religion traditions norms and values influence the architectural standard dwellings? 15. What is the income of middle- class income? 16. Does the value of the houses and ground floor prices increase? How much does one m2 costs approximately in Ninh Kieu? 17. Do people build their own house or only illegal people are building their own? 18. Or do local craftsmen architects and engineers build? 19. Analysis map from most vulnerable till less vulnerable location? 20. What are the main roads? For SAVING- vehicles? (ambulance, police, cabs) 21. What are the main roads for GARBAGE? Where does it go? 22. Does your organisation has a long- term vision plan (for the next 5,10, 15, 20 years)? 23. How does this this plan looks like? What is most important? What are the priorities?	1. Nhiệm vụ của văn phòng của bạn trong kiểm soát lũ lụt là gì? 2. Có kế hoạch sản + phần bản vẽ có sẵn trong chi tiết (1:20, 1:50, 1:100 , 1:200 , 1:500 , 1:1000) về đường phố ở Ninh Kiều 3. Bản đồ ở trên không có sẵn của Ninh Kiều chi tiết (01:50) 4. Của khu vực bị ngập lụt 5. Bầu trời phác họa floodings gần đây 6. Bản đồ lịch sử của thành phố Cần Thơ (phát triển hình thái can tho thành phLoại hình kiến trúc tiêu chuẩn Ninh Kiều (bản đồ) 7. Các biện pháp chống lũ kiến trúc, vật liệu , Xây dựng công trình (sách có sẵn) 8. Kết nối phần và sản nhà kế hoạch vẽ , đường phố xây dựng (kết nối giữa khu vực khu công tư nhân) 9. Đặc tính của thống các loại hình khác nhau là gì? Làm thế nào để khu tư nhân và khu vực công cộng làm việc? 10. Các biện pháp hiện có để chống lũ trong thành phố Cần Thơ 11. Chi phí nhà ở là gì? Quy mô chi phí ? Typologies nhà ở khác nhau? 12. Thu nhập của công dân thành phố Cần Thơ . Cấp thấp hơn, tầng lớp trung lưu ,thương lưu và bản đồ minh hoạ ? 13. Bản đồ của nhà ở san bằng , cao tầng ở, nhà ở mức thấp , tại sao không tăng cao ? (Ở Trung Quốc họ muốn có những nhà trọc trời . Đó có phải là tương tự như Việt Nam ? 14. Bao nhiêu tôn giáo truyền thống chỉ tiêu và các giá trị ảnh hưởng đến nhà ở tiêu chuẩn kiến trúc ? 15. Thu nhập của tầng lớp trung lưu? 16. Giá trị của nhà ở và giá nhà đất tăng ? Khoảng bao nhiêu một m2 ở Ninh Kiều ? 17. Người ta xây dựng nhà riêng của họ hoặc chỉ có những người bất hợp pháp đang xây dựng của riêng mình? 18. Hoặc kiến trúc sư địa phương và kỹ sư xây dựng? 19. Bản đồ phân tích từ dễ bị tổn thương nhất cho đến vị trí ít bị tổn thương ? 20. Những con đường chính là gì? Cho TIẾT KIỆM - xe ? (xe cứu thương, cảnh sát , xe taxi) 21. Các tuyến đường chính cho RÁC là gì? Nó đi như thế nào? 22. Tổ chức của ông/bà có một kế hoạch tầm nhìn dài hạn (cho 5, 10, 15, 20 năm tới) không? 23. Kế hoạch này thì như thế nào? Cái gì quan trọng nhiều nhất? Các điểm, các phần nào được ưu tiên?

[Fieldtrip interview H.H. Nguyen, 2014]

Data from the Mekong Delta

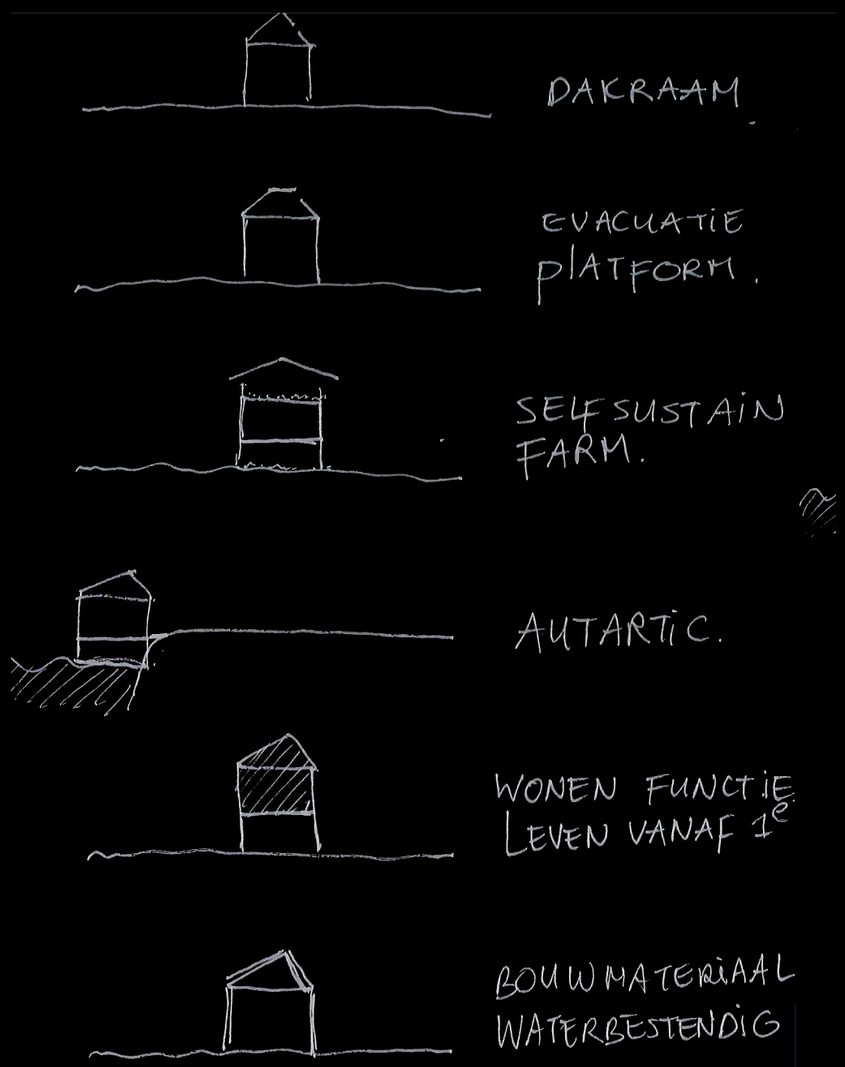
Contacted Vietnamese governmental organisations

Contacted and visitited local inhabitants

Bilingual Interviews

Site observations

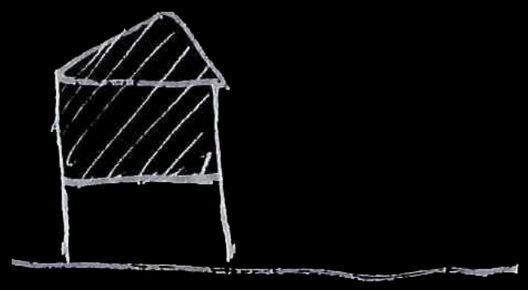
SKETCHING CLIMATE MEASURES



[Drawings: H.H. Nguyen, 2016

SKETCHING CLIMATE MEASURES

WATER IN ATRIUM.



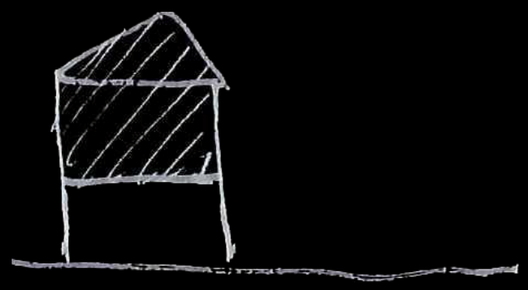
WONEN FUNCTIE
LEVEN VANAF 1e

TRAPPEN

[Drawings: H.H. Nguyen, 2016

SKETCHING CLIMATE MEASURES

WATER IN ATRIUM.



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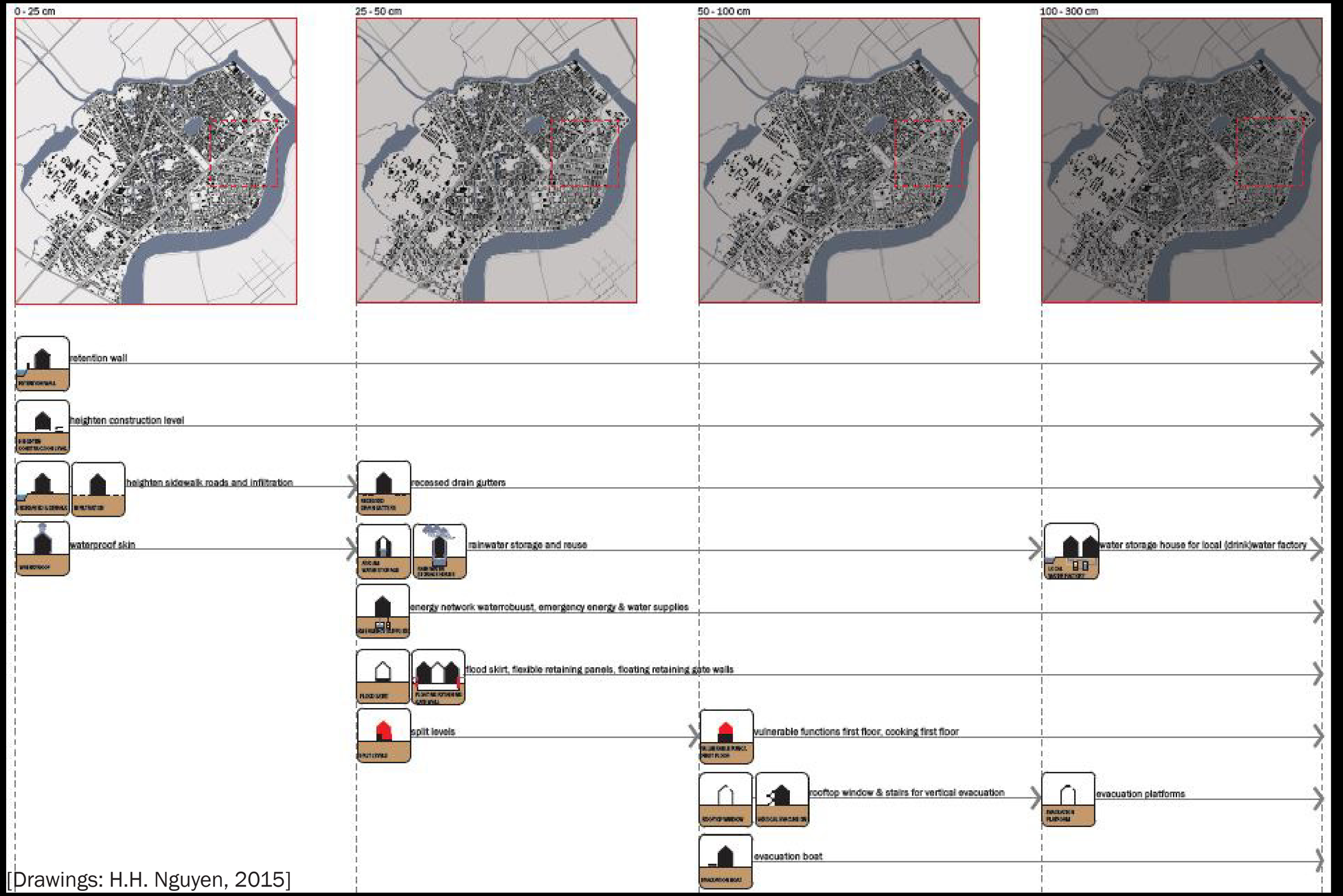
TRAPPEN

[Drawings: H.H. Nguyen, 2016

TOOLBOX FOR CLIMATE STRATEGY



[Drawings: H.H. Nguyen, 2015]

OBJECTIVE 2: NEIGHBORHOOD

1 ANALYSIS

1.1. ENTREPRENEURAL DO- IT- YOURSELF- CULTURE

2 CONCLUSIONS

2.1 EVACUATION (WATER SAFETY) ZONES CITY HEART

2.2 CONTINUATION ACTIVITIES DURING FLOODS

2.3 MAXIMASING SELF- SUSTAINABILITY

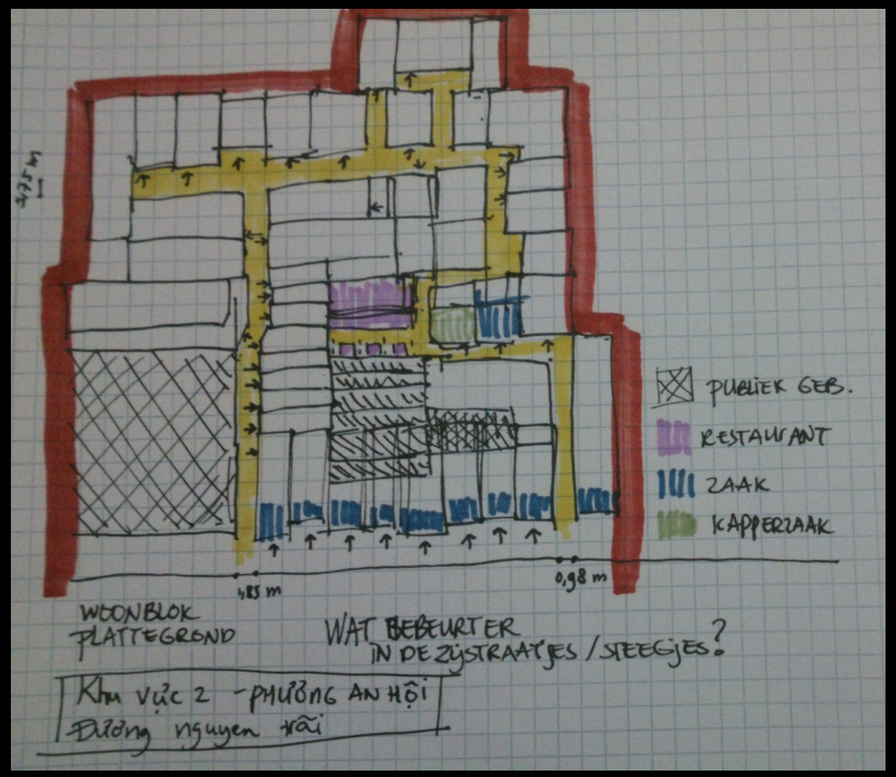
2.4 DRINKING WATER FACTORY

2.5 SELLING ENERGY

3 RE- DESIGN

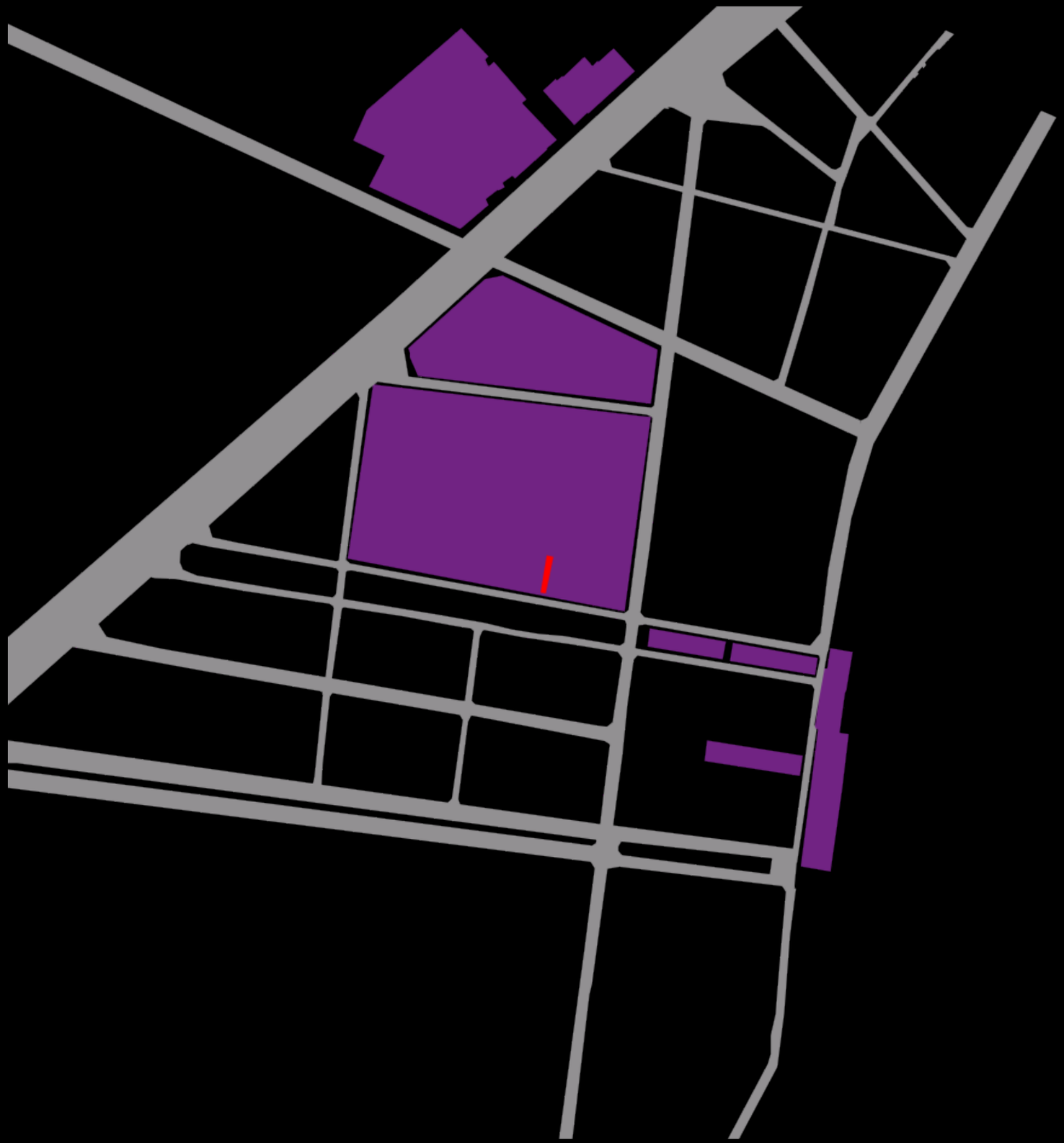
3.1 EVACUATION ISLANDS CITY HEART

OBJECTIVE 2: ENTREPRENEURS ATTITUDE

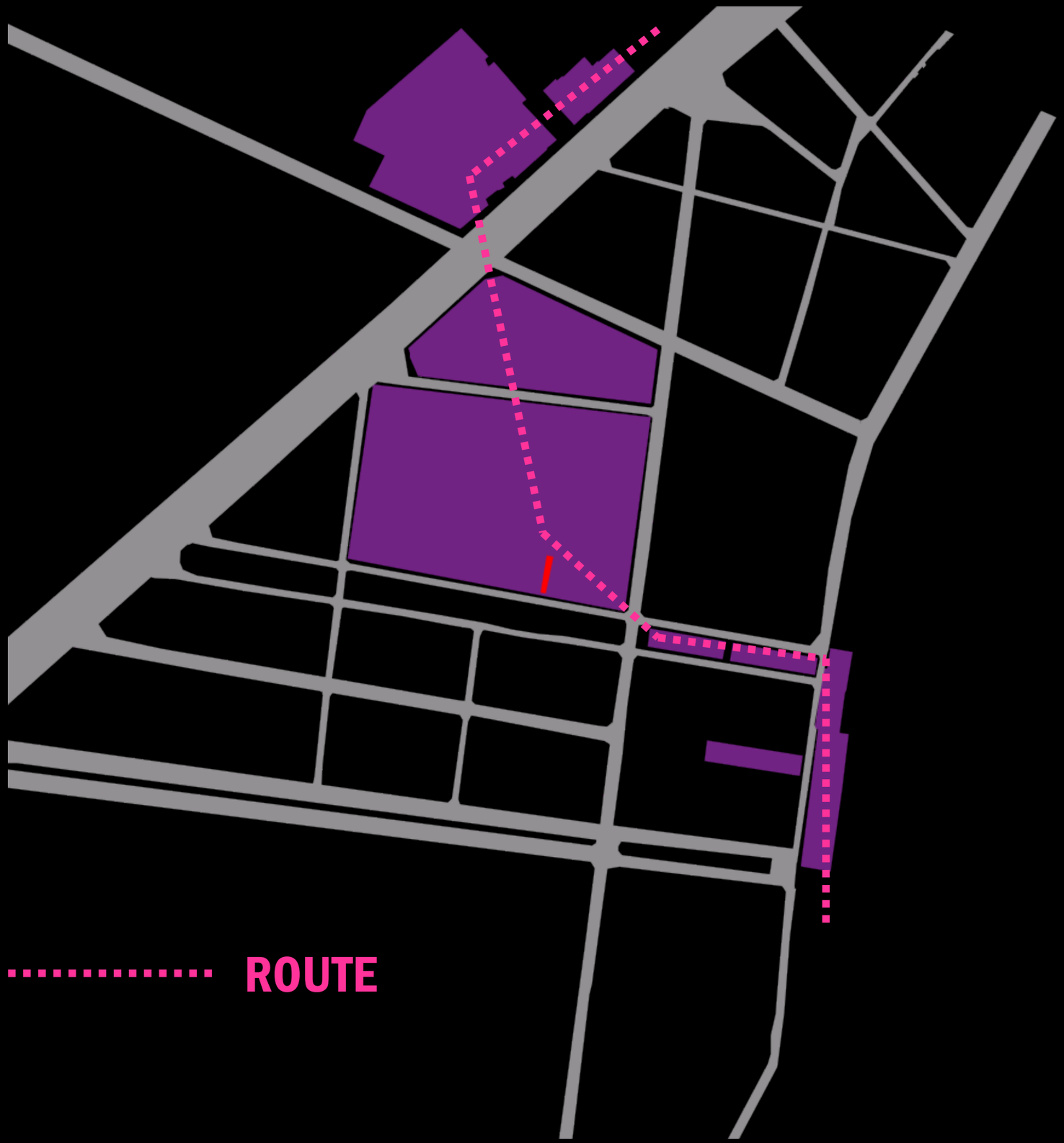


[Fieldtrip sketch: H.H. Nguyen, 2014]

OBJECTIVE 2: EVACUATION ISLANDS CITY HEART



OBJECTIVE 2: EVACUATION ISLANDS CITY HEART



ROUTE

OBJECTIVE 2: ELEVATED ROAD

ELEVATED PATHWAYS

USER SPACE,
CONNECTS CITY HEARTS
DURING FLOODS

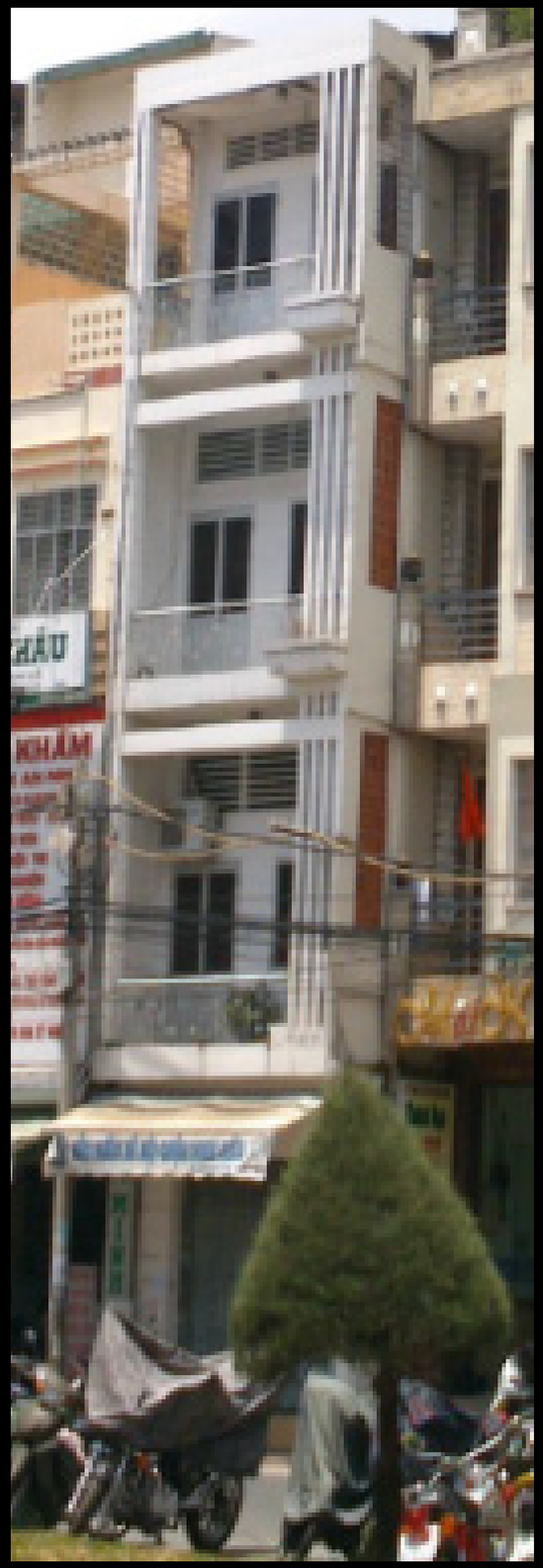
OBJECTIVE 3: TUBE HOUSE

1 ANALYSIS CURRENT TUBE HOUSE
1.1 MULTI GENERATIONS FAMILY HOUSE

2 CONCLUSIONS
2.1 ENTREPRENEURAL DO- IT- YOURSELF- CULTURE

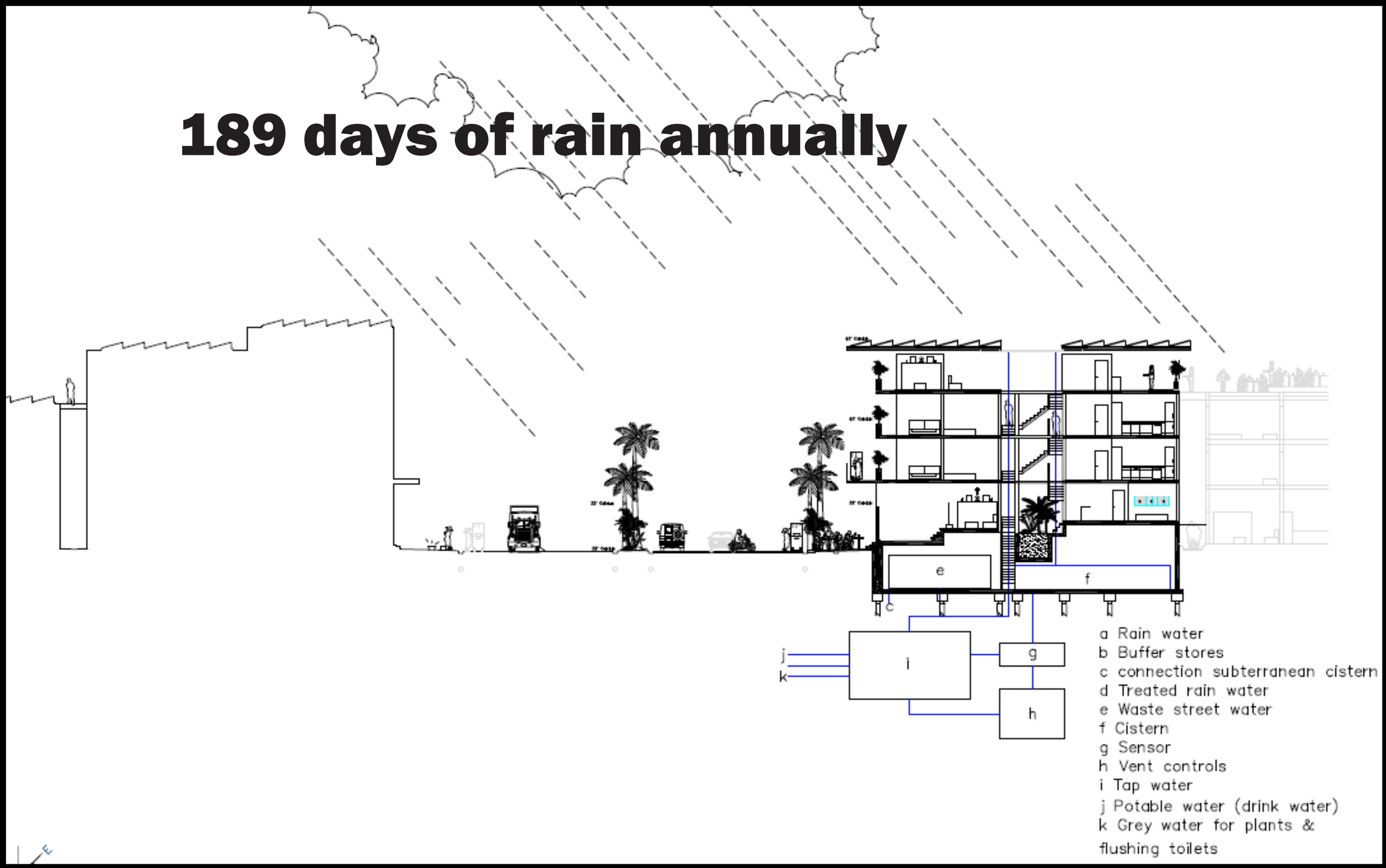
3 RE- DESIGN
3.1 PROFIT PERSPECTIVE/ VIETNAMESE MENTALITY

OBJECTIVE 3: CURRENT TUBE HOUSE



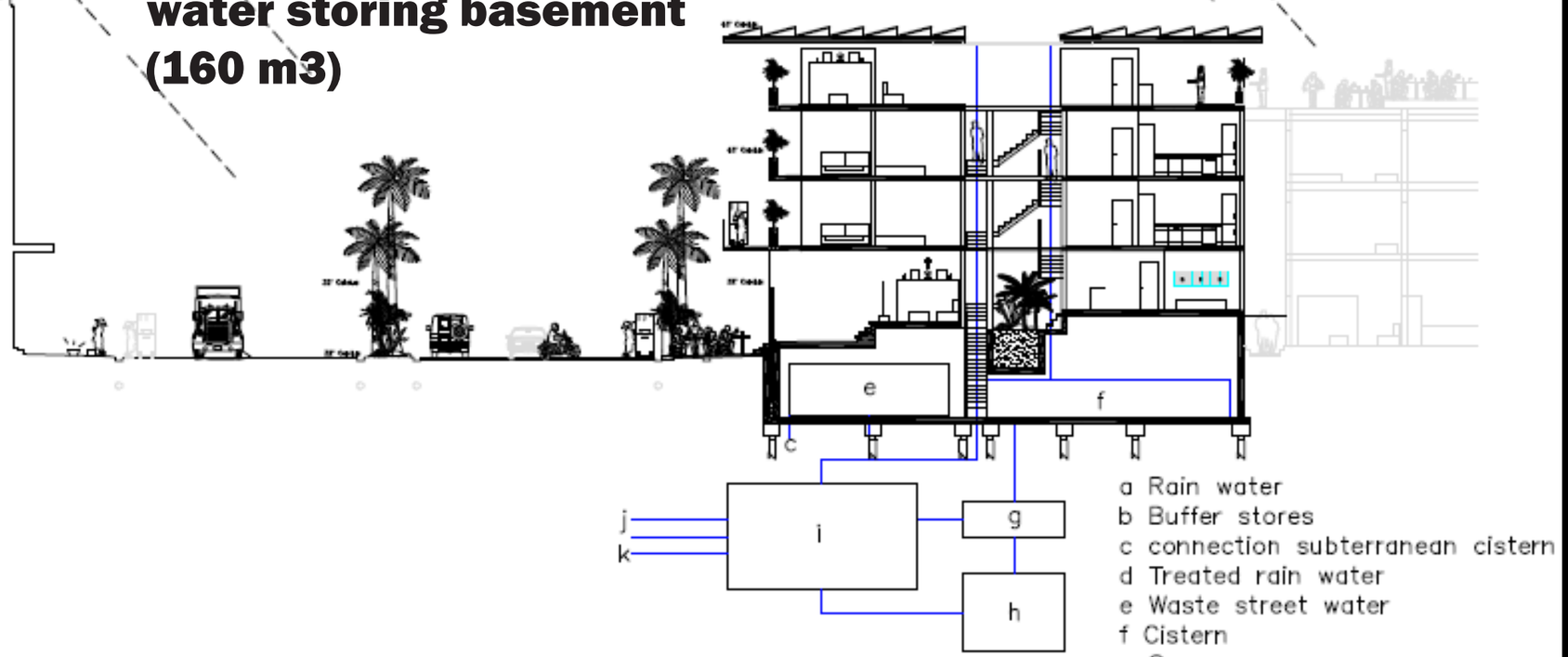
OBJECTIVE 3: RAIN WATER STORAGE HOUSE

189 days of rain annually



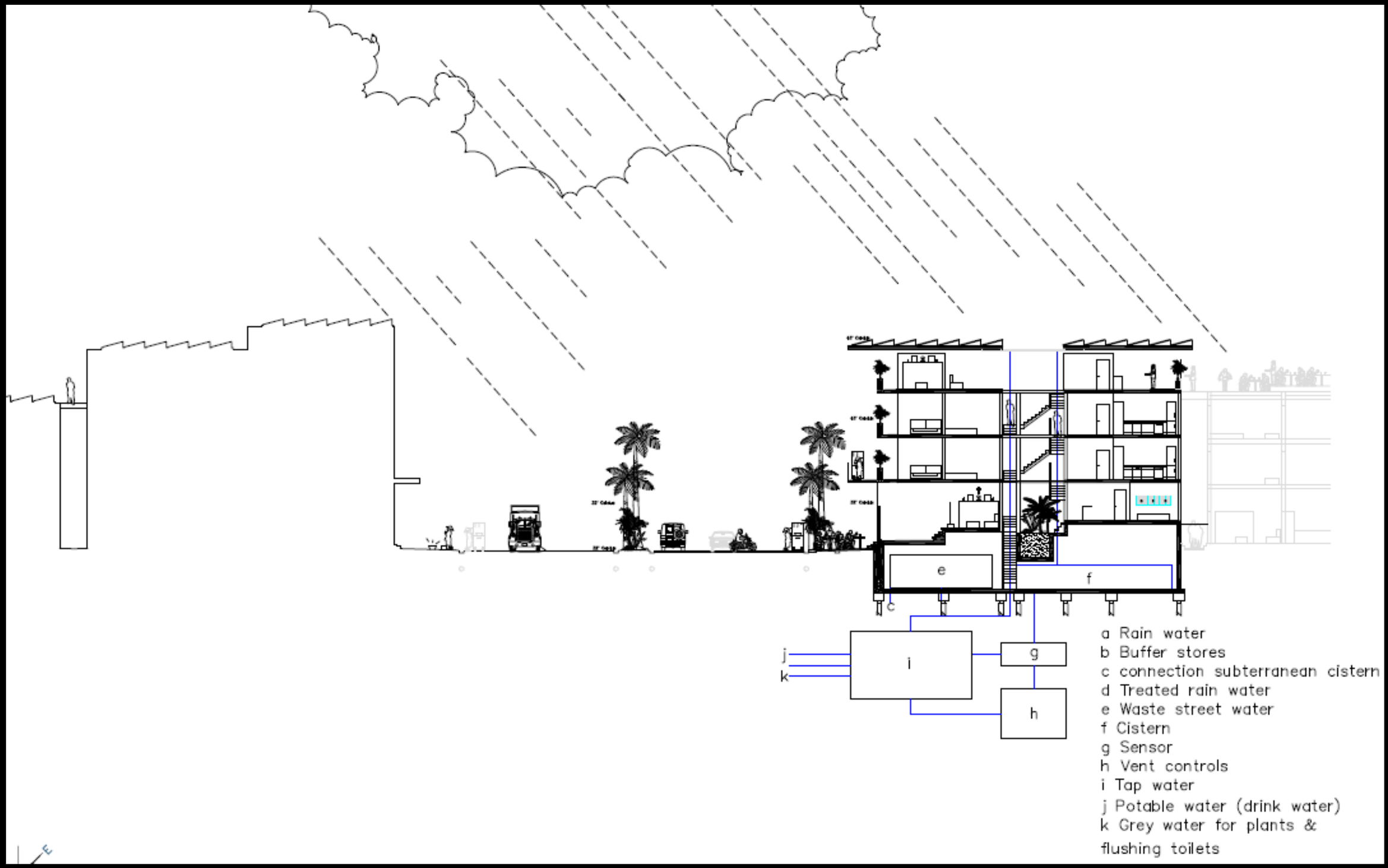
OBJECTIVE 3: RAIN WATER STORAGE HOUSE

Water stored on rooftops and pipelines connect to the water storing basement (160 m3)



a Rain water
b Buffer stores
c connection subterranean cistern
d Treated rain water
e Waste street water
f Cistern
g Sensor
h Vent controls
i Tap water
j Potable water (drink water)
k Grey water for plants & flushing toilets

OBJECTIVE 3: RAIN WATER STORAGE HOUSE



OBJECTIVE 3: RAIN WATER STORAGE

Water Storage Capacity House

189 days of rain annually

Annual rainfall Can Tho per day 240mm [liter/m2]

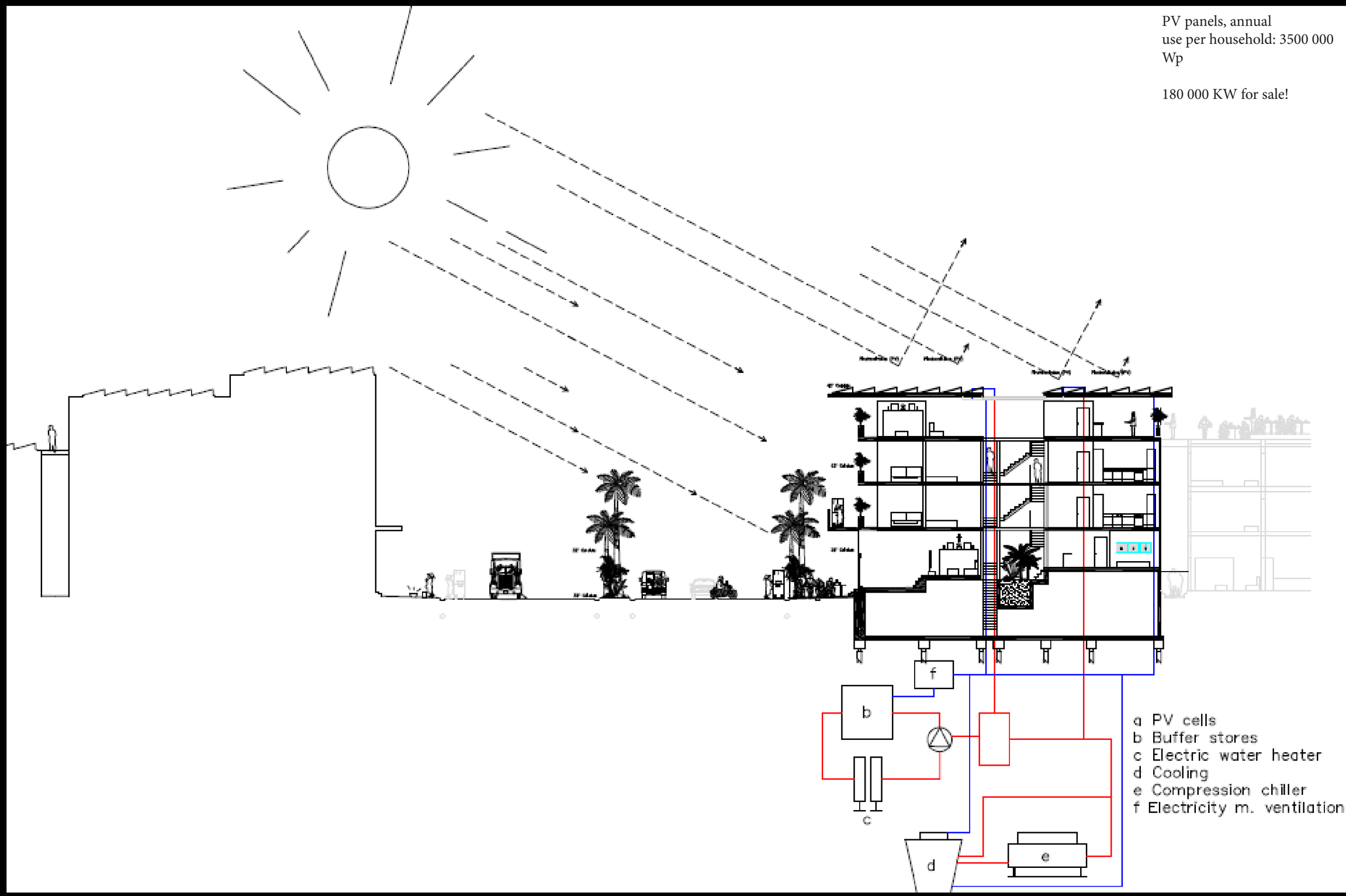
Annual capacity of water storage tube house ca. 160m^3

Conclusion for dimensions water storing basement with a floorplan of Ca. 80m2 needs a height of > 2.0m

OBJECTIVE 3: SELLING ENERGY

PV panels, annual
use per household: 3500 000 Wp

180 000 KW for sale!

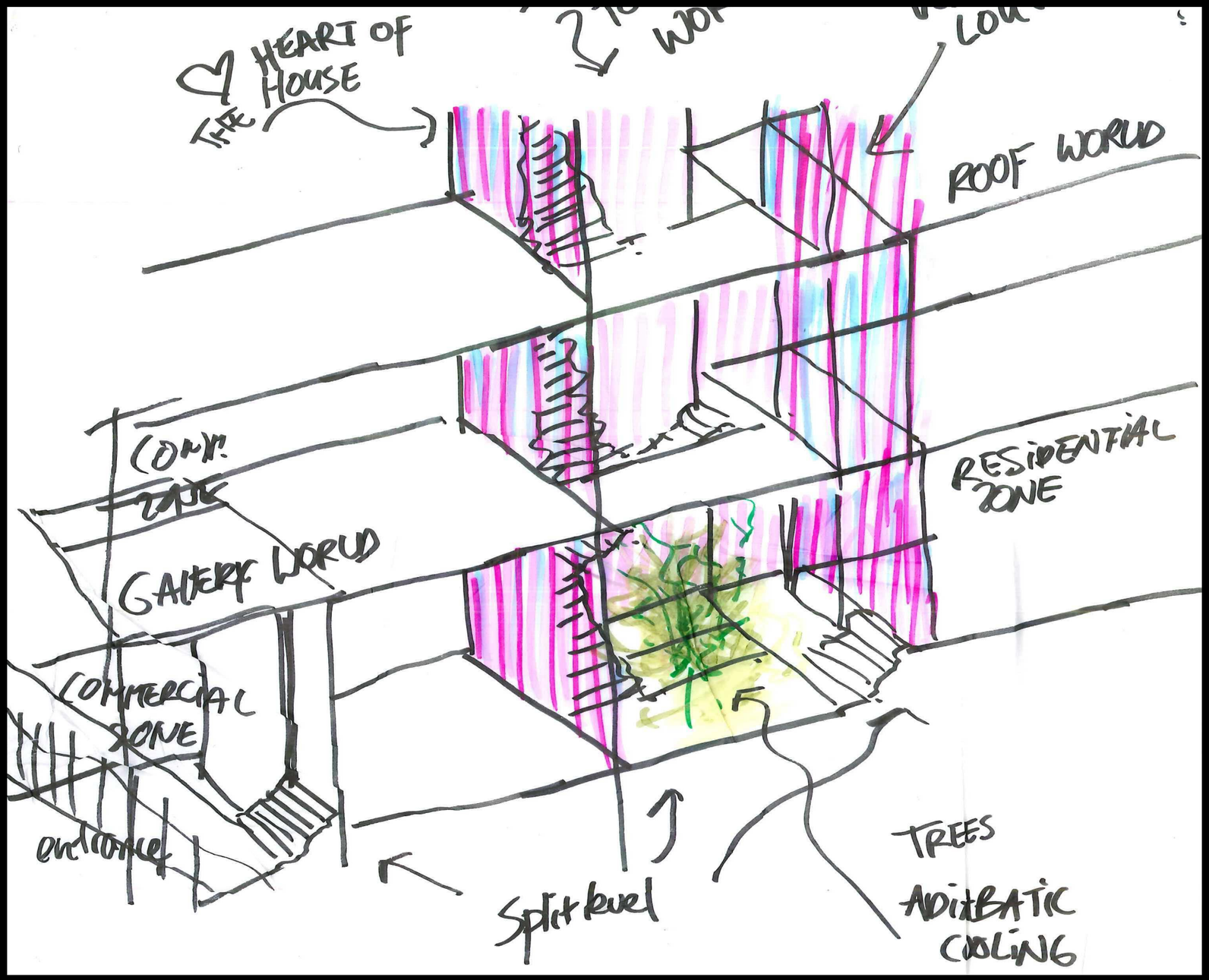


OBJECTIVE 3: ENERGY

Photovoltaic roof provides renewable electricity per household
Annual yield: 181700 000 Wp (One Household, 8 persons)
Annual use per household: 3500 000 Wp
Annual electricity for sale: 178200 000 Wp

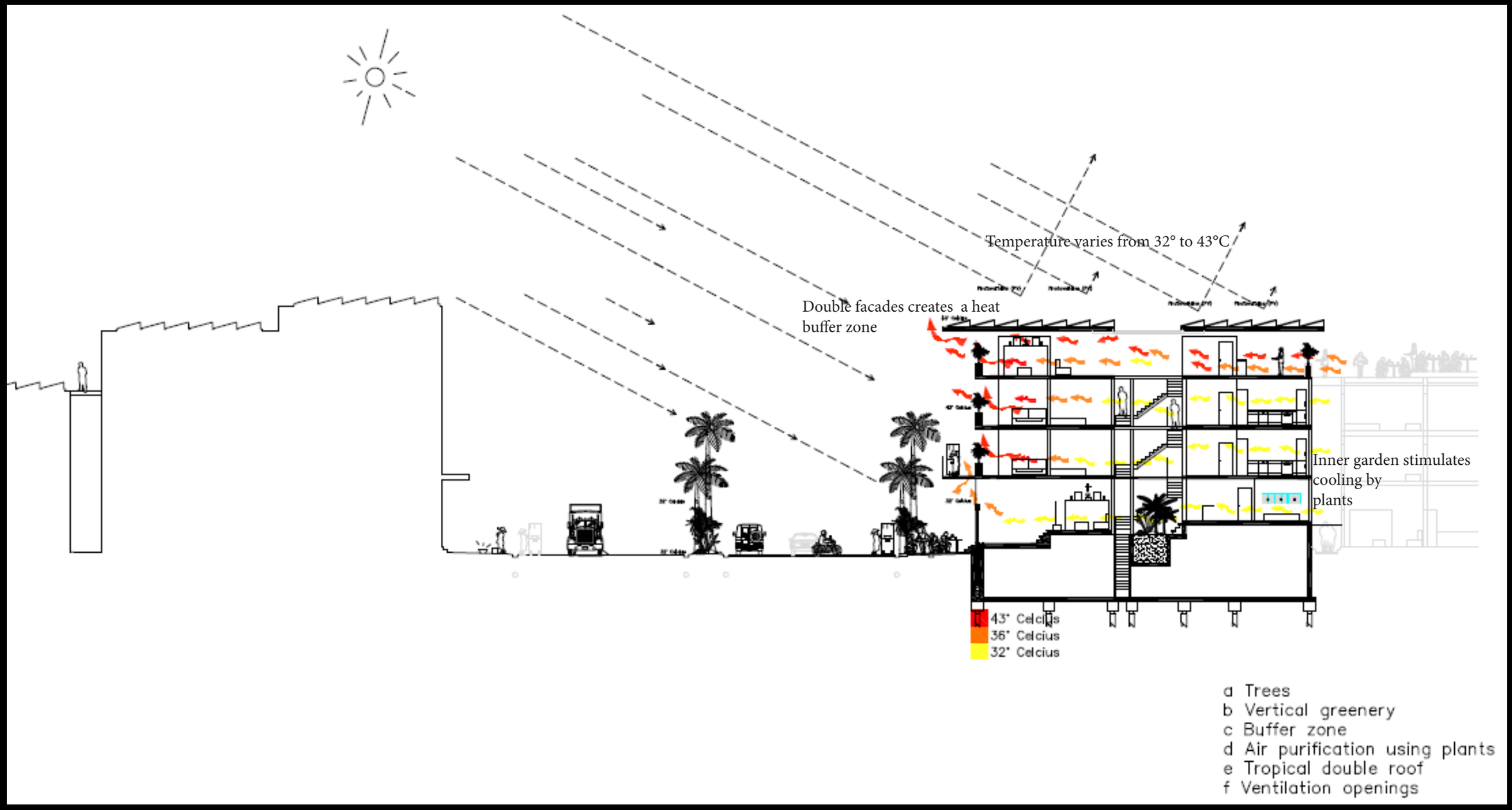
Thus annual proceeds for solar electricity for sale per household:
180 000KW

OBJECTIVE 3: ADIABATIC COOLING

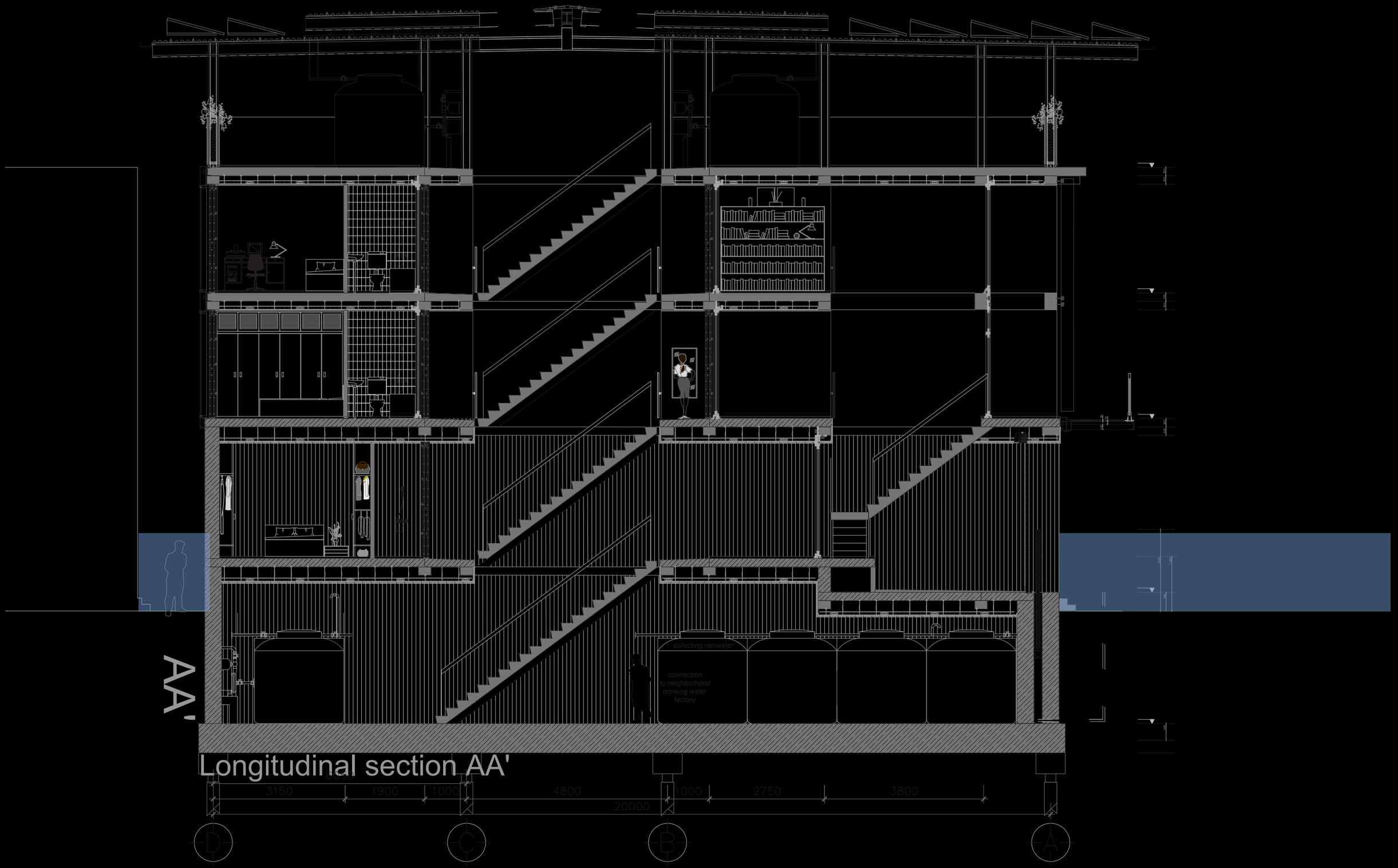


[Sketch, vertical evacuation zone, generations family gathering : H.H. Nguyen, 2015]

OBJECTIVE 3: ADIABATIC COOLING

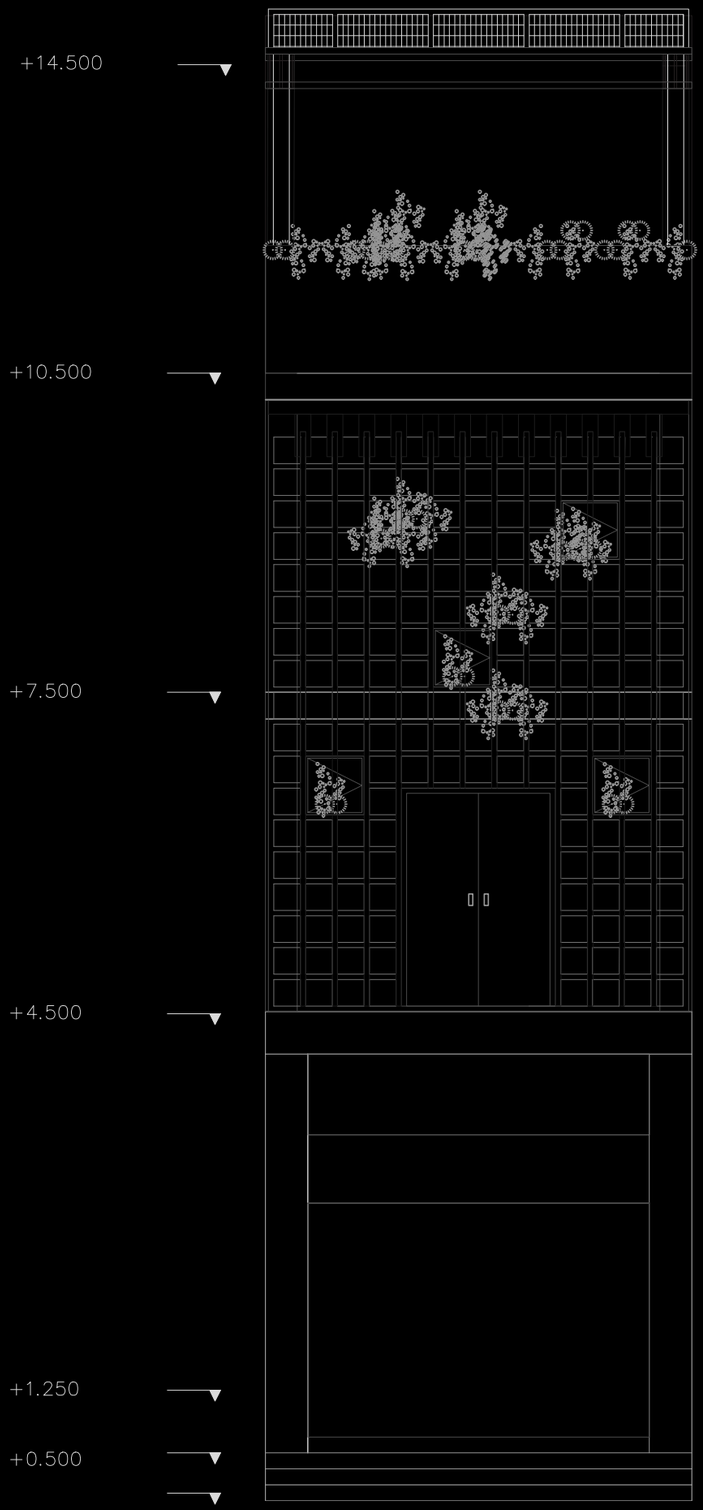


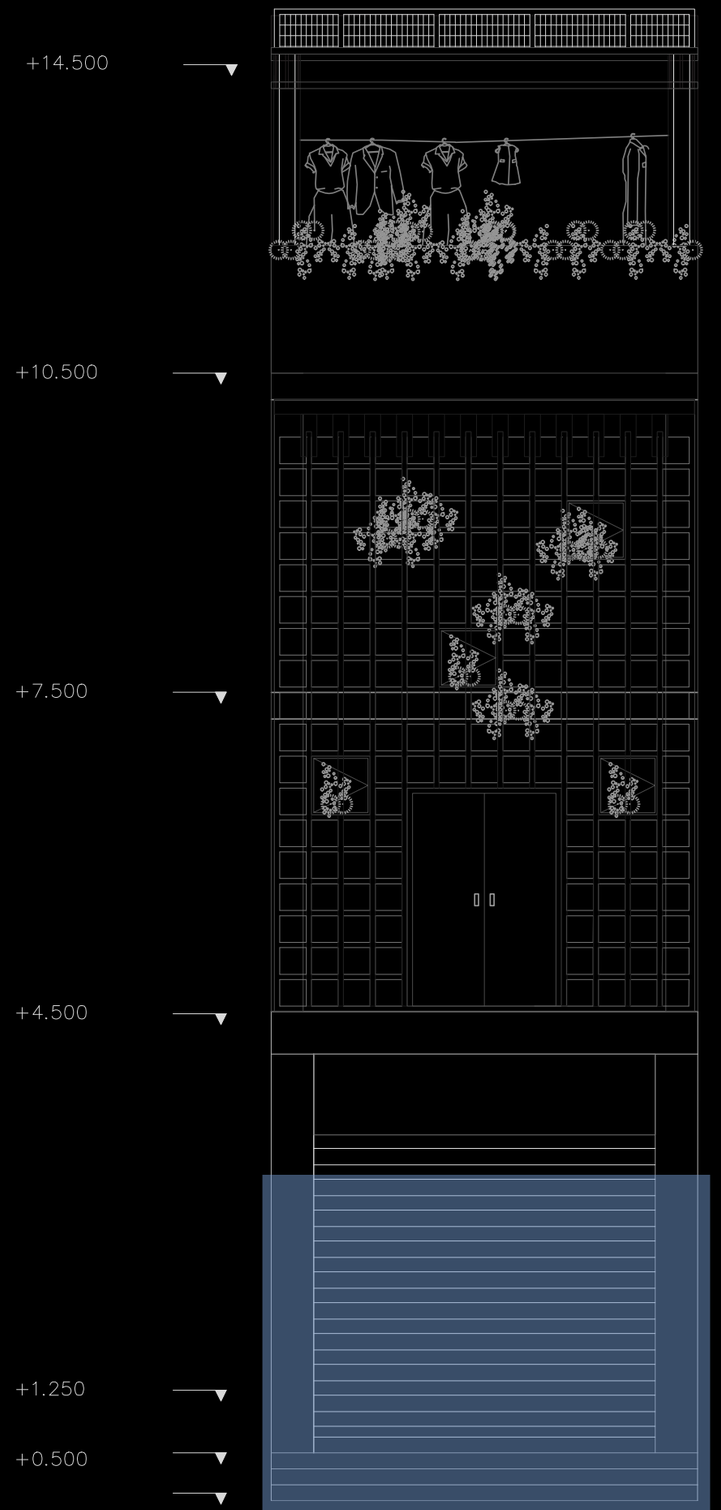
OBJECTIVE 3: SECTION RE- DESIGN



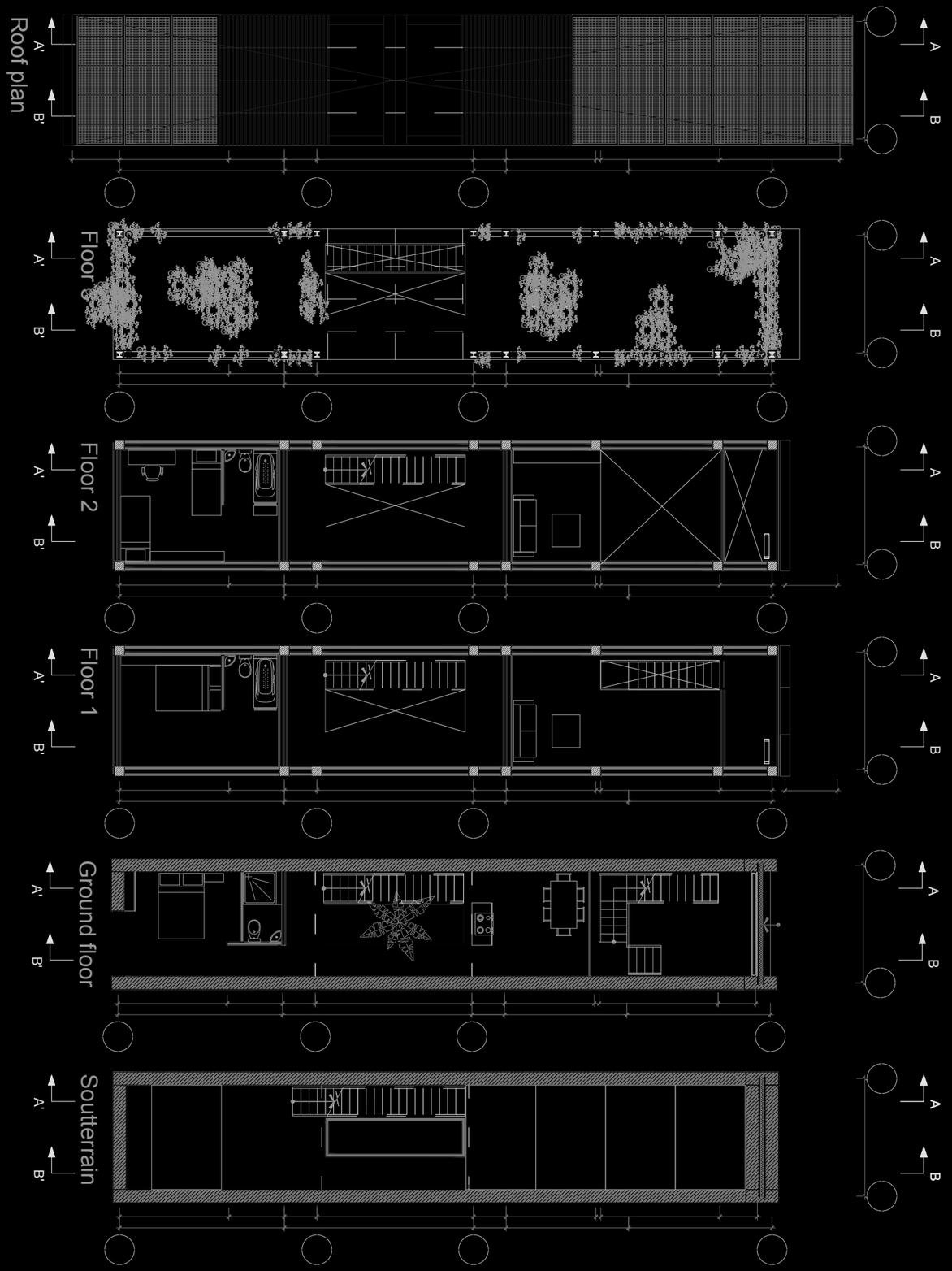
Longitudinal section AA'

OBJECTIVE 3: SECTION RE- DESIGN





OBJECTIVE 3: PLANS



OBJECTIVE 3: VOID CONNECTS ELEVATED ROAD

Connection inner (shop) space and elevated street

Floating retaining wall selfsustain

Reflection on study goal

Main goal:
Which design solutions at a building level will help Can Tho adapt to the climate related flooding problems?

Reflection on main goal:
Several design solutions have been reported in the thesis. The main solution to adapt to the climate related flooding problems, with particular attention to the tube houses of Ninh Kieu, are living and functioning from the 1st floor.

Study objectives:
To create a toolbox with climate adaptive and particularly waterrobust solutions on a building level for the design process of houses in delta areas.
To propose a sustainable climate adaptive solution on a neighborhood level with particular attention to the existing tube houses in Ninh Kieu (Disrict Centre of Can Tho) for the year 2100.
To propose a climate adaptive and waterrobust architectural re-design for the tube houses in Ninh Kieu (District Centre of Can Tho) for the year 2100.

Reflection on study objectives
A startup solution toolbox for the design process of houses in delta areas includes a collection of pre-existing measures from the Netherlands and Vietnam and own proposed innovative measures.
Problem analysis and climate adaptive solutions on a neighborhood level are proposed.
A conceptual re-design and prototype on how to use this toolbox is proposed.

Limitations and future prospects

Measures on greater scale required

Besides architectural housing measures, measures on a greater scale (e.g. urban or public building) are necessary to overcome the climate related flooding problems.

Expand solution toolbox
In order to optimize the toolbox, solutions from other delta area's can be added and more prototypes using this toolbox are required to evaluate and improve the toolbox.

Business plan
Although Vietnam is a rapidly developing country, a business plan needs to be made to map the possible costs and funding for these projects to meet the demand for climate adaptive architecture.

Perception of local inhabitants
A survey to evaluate the perception of local inhabitants to the proposed new lifestyle (on the 1st floor) needs to be conducted.

THE END.

Thank you for your attention!

More info? Please contact Hanh Nguyen.

E hanh_nguyen@live.nl
M +31 6 4891 9907

http://linkd.in/1hsQtfs

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NGUYEN, HONG HANH

PRELIMINARY LITERATURE

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