KING MONGKUT'S UNIVERSITY OF TECHNOLOGY THONBURI - THAILAND

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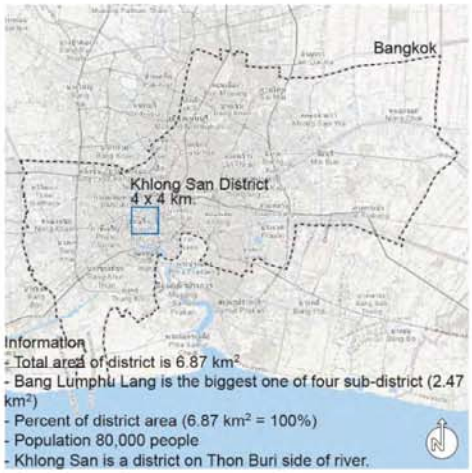


Project Area: 4 x 4 km.

Khlongsan Innovation District:
Transportation choices during flood

The effects of climate change ,sea-level rise and the increase of the tropical storms and typhoons, and rapid urbanization, land subsidence, might turn Bangkok flooding from occasional to permanent.

The work provide Bangkok scenarios' view using specific Klongsan zone as strategic test site. Proposal deal with the transformation of the waterfront central city taking into consideration the pre-existing activities, urban tissues, cultural assets, infrastructure and communities.

Sub - District Area
1 = 1.16km² (17%)
2 = 1.49km² (22%)
3 = 1.75km² (25%)
4 = 2.47km² (36%)

Project Introduction

Metres Above Sea Level (MASL)

- The right side of district has the lowest MASL value of -1 m.

Area at Risk of Flood
-1 m. = 4 (Severe)
0 m. = 3 (Critical)
+0.5 m.= 2 (Moderate)
+2.5 m.= 1 (Low)

Area Altitude

Major Assumptions and Innovations

GLOBAL 2035/2050 9 SEA LEVELS WILL RISE

Requirements by 2050

Raised pathway will connect all building from 3rd or 4th floor to existing elevated rail, drone, and boat station.

Light weight vehicles such as scooter, bicycle, motorcycle, electric bicycle, transportation drone, and small boat is suitable for raised path network.

Station for drone, boat and vehicle renting spots in every connection node is needed.

Building on stiles with entrance/exit on the 3rd-4th floor, open space on ground need developed.

The scenario plan need innovation adopted

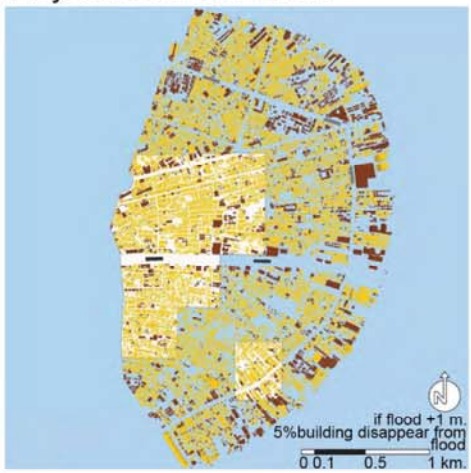
Electric bicycle for all age to connect people to mass transit using raised pathway.

Electric water taxi provide choices to transport

Air taxi as emergency choices.

Sustainable energy infrastructure should be built into the new network, ie. Solar energy bike, water taxi & rail station

TRA 2035 11 WATER TAXI FLYING ABOVE THE SURFACE OF THE WAVES
TRA 2035/2050 12 THE AUTONOMOUS REVOLUTION RISES TO THE SKY
TRA 2035 13 REDEFINE BIKING WITH BIKESHARES AND E-BIKES□TRA 2035 20 ALTERNATIVE WAYS OF TRANSPORTATION: CANAL PATH
MIX 2035 1 SHARING ECONOMY
MIX 2035 12 INNOVATION DISTRICTS



Existing Situation: 2020

Early Adopter: 2035

Early Adopter: 2050

Early Adopter Scenario

2020 Scenario (if flood + 1 m.)

- 1 m, 24.6% of district, need 2nd floor to survive
+ 0 m, 24.6% of district, if the house built above road level 1 m.
+0.5m, 40.4% of district,if the house built above road level 0.5m.
+ 2.5 m, 26.4% of district, " No flood "

2035 Scenario (if flood + 3 m.)

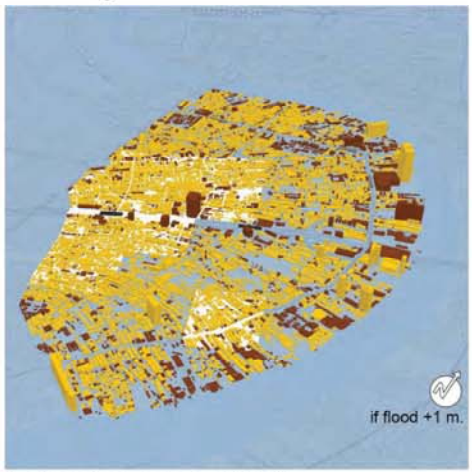
-1 m,24.6% of district, need 3rd floor to survive
+ 0&+0.5m, 49 % of district, need 2nd floor to survive
+ 2.5 m, 26.4% of district, "No flood"

2050 Scenario (if flood + 5 m.)

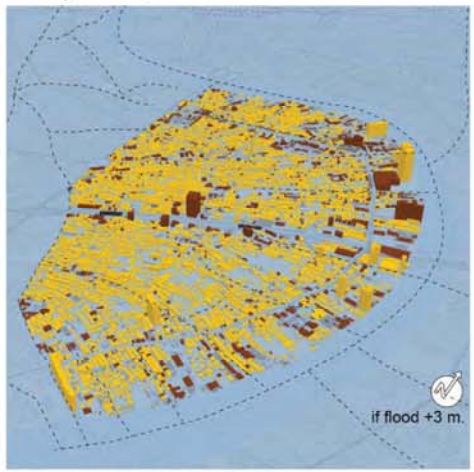
-1 m,24.6% of district, need 4th floor to survive
+ 0&+0.5m, 49 % of district, need 2nd floor to survive
+ 2.5 m, 26.4% of district, need 2nd floor to survive

Conclusion

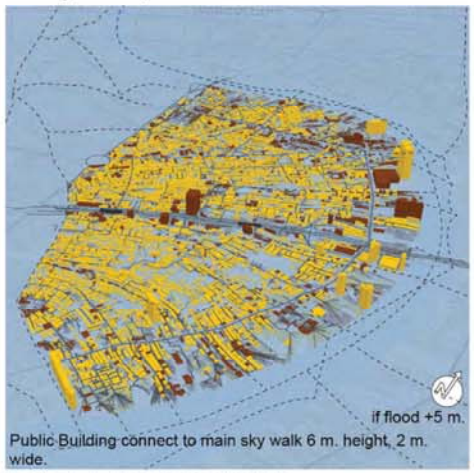
-1 m. zone is the flood area from +1 m. water level.
+ 0&+0.5m. zone need at least 3 story or more to survive.
+ 2.5 m. zone is the highest and safest zone compare to others (safe until +5 m. water level, most of the house with 2nd floor survive).



Later Adopter: 2020



Later Adopter: 2035



Later Adopter: 2050

Later Adopter Scenario

Later Adopter: 2035

- Every Building should be at least 3story high and providing entrance/exit on the 3rd floor.

All House: Structure

1. Prevent water leaking into houses, water prove wall or open ground floor plan in case of flood.
2. Need stronger structure reinforcement for wall and column.
3. If let the water flood the house, people survive on 3rd floor
4. Prepare boat for travel to the closest public building

Publice Building

1. 3,495 building prepare to connect with main 2nd road layer on the 3rd floor

Publice Transportation

1. Sky train (BTS) prepare to connect with 2nd road layer and pier.

Later Adopter: 2050

Second layer of transportation linkage will continue city functioning in flood situation.

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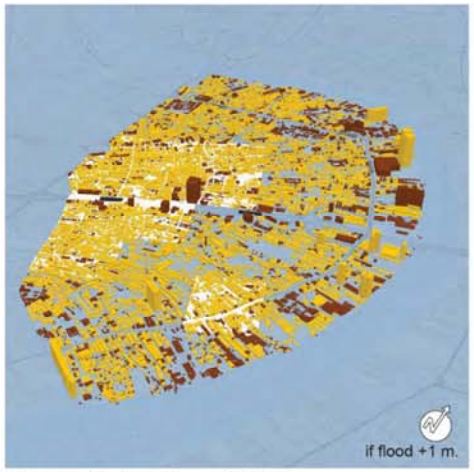
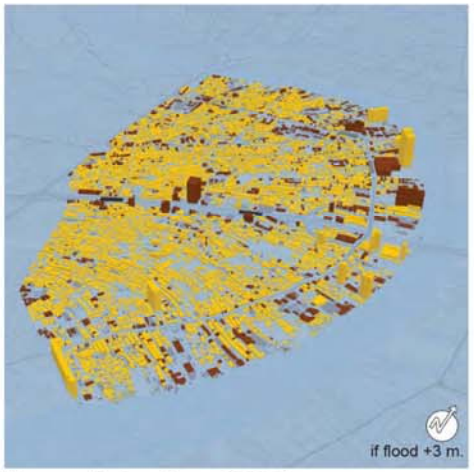
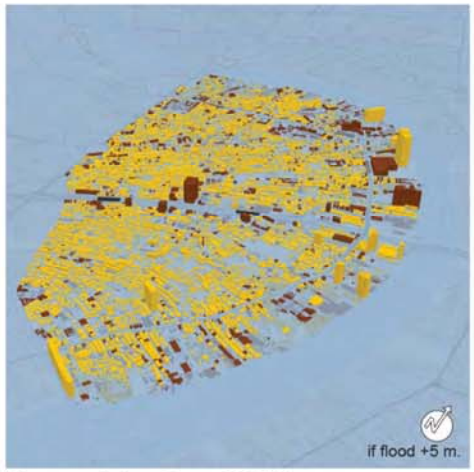


Non - Adopter: 2020



Non - Adopter: 2035



Non - Adopter: 2050

Non - Adopter Scenario

If there is unplanned development, the flood only getting worse, flooding cause millions of baht of damage, ruin economic, cause people life, and many become homeless.

Scenario 2020

5% of the area flood = 0.3 km^2
3,000/80,000 people become temporary homeless

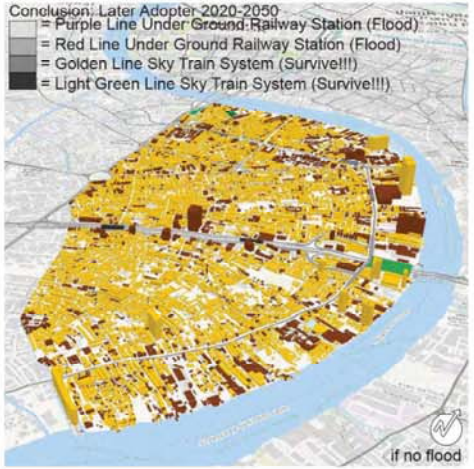
Scenario 2035

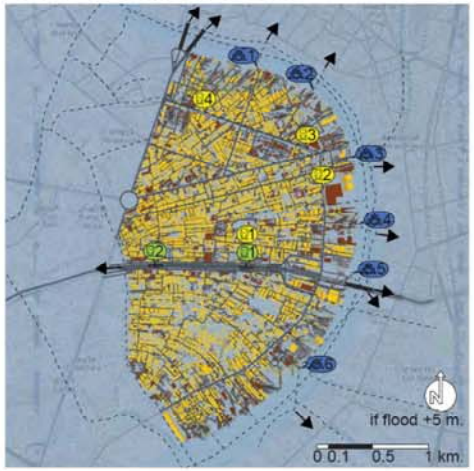
25% of the area flood = 1.7 km^2
17,000/80,000 people become temporary homeless

Scenario 2050

35% of the area flood = 2.4 km^2
24,000/80,000 people become temporary homeless

Now: No Flood Condition





2050: Connection During Flood

Transportation

Pier

1. Tha Din Dang Pier
2. Wat Thong Dhama Chart Pier
3. Khlong San Pier
4. Wat Suwan Pier
5. Pepsi Pier
6. Wat Sawed Thrachat Pier

BTS Silom Line (Sky Train)

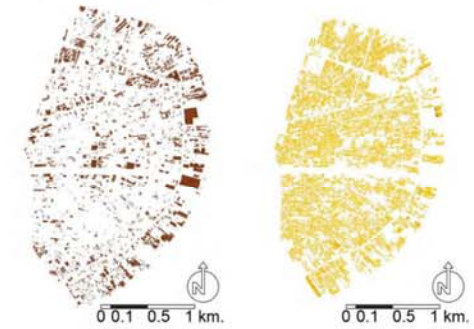
1. Khrung Thon Buri Station
2. Wongwianyai

BTS Charoen Nakhon Line(Sky Train)

1. Interchange with Khrung Thon Buri Station
2. Charoen Nakhon Station
3. Khlong San Station
4. Prajadhipok Station

Drone and Pier Station

- They can locate at the center of 908 node of connection between pubic building and 2nd road layer.



Public Building

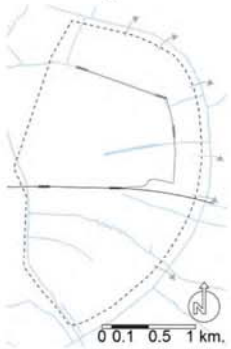
Residential Building

Public Building and Resident Information

- Public = 3,495 Buildings
- Resident = 23,537 Buildings
- Total building = 27,032 Building
- Area of public building to all building = 0.67 km2/2.36 km2
- Percentage of public building to all building = 28%
- 28.15% of Public building is in -1 m. MASL zone
- 12.64% of Public building is in 0 m. MASL zone
- 37% of Public building is in +0.5 m. MASL zone
- 22.21% of Public building is in +2.5 m. MASL zone
- Population/km2 = 10,000/km2
- Node of connection = 908 places

Node of Connection

2nd Road Layer& Sky Train



Pier and Sky Train Line

Paticipants

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Building of Khlong San

Transportation of Khlong San