GOALS
RESILIENCE
Adapt to extreme events.
Sea level rise
Thermal comfort
Food supply
Energy supply

COST
Balance financial costs and benefits.
Cost-benefit analysis

HEALTH
Create a healthy neighborhood.
Develop urban analog to 9 Foundations of a healthy building

1foundations.forhealth.org (TH Chan School of Public Health, Harvard)
RESILIENCE

COST

HEALTH

CARBON EMISSIONS

ENERGY

DAYLIGHT

WALKABILITY

COST

URBAN AGRICULTURE
URBAN STRATEGIES
OVERALL SITE EXISTING CONTEXT

SITE

650M
PROTOBLOCK OPTIONS
DESIGN BY COMMITTEE!
OVERALL SITE NEIGHBORHOOD DESIGN

60m

30m

N
OVERALL SITE NEIGHBORHOOD DESIGN UPGRADE
NEW PROTOBLOCK (3) INFO

Floor Area: 17,670 sqm
FAR: 3.7
WWR: 40%
SDA: 46
NEW PROTOBLOCK (3) INFO

Floor Area: 12,285 sqm
FAR: 2.5
WWR: 40%
SDA: 48
NEW PROTOBLOCK (3) INFO

Floor Area: 9,705 sqm
FAR: 2
WWR: 40%
SDA: 51
NEW PROTOBLOCK (3) INFO

Floor Area: 14,443 sqm
FAR: 3
WWR: 40%
SDA: 45
NEIGHBORHOOD INFO - MAIN STREET
Residential Area: 210,454 sqm
Occupants: 6,916
Green Space Areas: 126,238 sqm
Connection to WaterFront Revitalization
ROOFTOP STRATEGIES
RADIATION ANALYSIS

- Photovoltaic arrays
- Rooftop greenhouses
- Occupiable green roofs
NEIGHBORHOODPV FARM
HARVEST
HARVEST GOAL

RESILIENCE
Maximize crop yield

COST
Maximize profit

HEALTH
Maximize jobs
HARVEST YIELD

Local food production

27%
93/343 t/year

Water Use
(for farming)

Profit
(vs. baseline)

Carbon Savings
(vs. baseline)

Jobs created

4,112
m3/year

56
k$/year

27
tCO2eq/year

43
workers
OPERATIONAL ENERGY
PROTOBLOCK OPERATIONAL ENERGY ANALYSIS

*Site EUI – The Site Energy Use divided by the property square meters (EPA’s Target Finder calculator)
EMBODIED CARBON EMISSION
Doubling the insulation while installing more efficient windows and lighting provides a 12% emissions reduction.
Total embodied emissions represent about 7.5 years worth of operational energy emissions.
DISTRICT ENERGY SYSTEMS + ENERGY SUPPLY
District Energy System: Cost vs. Environmental Impact

- Baseline: 79% Emissions, 18% Cost
- All Electric: 18% Emissions, 79% Cost

Graph showing emissions and cost comparison between Baseline and All Electric systems.
District Energy System: Implications for Residents

- Cost: Baseline + $120/Occ
- Emission: Baseline + 0.56 tCO2/Occ
NEIGHBORHOOD PV FARM

= 2,355 sqm
COST
Cost-Benefit Analysis

- **Installation**
- **Operation**
- **Carbon**
- **Yield**

<table>
<thead>
<tr>
<th>NPV ($/m²)</th>
<th>IRR (%)</th>
<th>First payback year</th>
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<tr>
<td><strong>BIPV</strong></td>
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WALKABILITY + AMENITIES
WALKABILITY + AMENITIES

To Ferry terminal

Entertainment
Shopping
Education
Bank
Grocery Store
Restaurant
Coffee
PV rooftop
Greenhouse rooftop
Garden rooftop
WALKABILITY + AMENITIES

To Ferry terminal

- Entertainment
- Shopping
- Education
- Bank
- Grocery Store
- Restaurant
- Coffee
- PV rooftop
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- Garden rooftop
STREET DESIGN
One Way (Main Axis) St with bus
One Way St

3 m Sidewalk
1 m
1 m 0.5 m 1.5 m 1 m
3 m Drive lane
1 m 1.5 m 0.5 m 1 m
5 m Sidewalk

Made with Streetmix
UTCI
Thermal Comfort Heatmap - Unprotected/Unshaded

- Extreme heat stress
- Very strong heat stress
- Strong heat stress
- Moderate heat stress
- Slight heat stress
- No thermal stress
- Slight cold stress
- Moderate cold stress
- Strong cold stress
- Very strong cold stress
- Extreme cold stress
Thermal Comfort Heatmap - Protected/Shaded

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<th>Category</th>
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<td>Car transit</td>
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<td>Smoke free</td>
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<td>Noise</td>
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<td>Green rooftops</td>
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Overall Score: 91 /100
THANK YOU