HIGH-DENSITY INCREMENTAL EXPANSION
UN-HABITAT WORLD URBAN FORUM TRAINING SESSION 2012

A special thanks to PRO SAMIM + SUHAB + Gutierrez + Govt + IADB + Concremat + ULBRA + PROFESSOR REINHARD GOETHERT + MIT SCHOOL OF ARCHITECTURE AND PLANNING
USER-INITIATED INCREMENTAL EXPANSION
MANAUS | AMAZONAS | BRAZIL

MANAUS
CURRENT POPULATION: 1.8 MILLION
ANNUAL GROWTH RATE: 4%
INFORMAL POPULATION: 40,000

URBAN RESETTLEMENT
ISSUES AND RESPONSE

PROSAMIM: THE SOCIAL AND ENVIRONMENTAL PROGRAM FOR THE IGARAPES IN MANAUS
THE PROJECT OBJECTIVE IS to help solve the environmental, planning, and social problems affecting the Manaus residents living in the Educandos-Quarenta watershed.

2006 TO PRESENT: 10,000 FAMILIES RELOADED FROM PALAFITAS. THE PROGRAM DEVELOPED TWO HIGH-DENSITY HOUSING TYPOLOGIES IN THE CENTRAL BUSINESS DISTRICT (CBD).

MICRO-LEVEL ISSUES
- LANDSLIDE
- STENCH
- DISEASE
- FLOOD

MACRO-LEVEL ISSUES
- REAL ESTATE DEPRECIATION
- HIGH USE OF TAX DOLLARS ON PALAFITA RELIEF
- INSUFFICIENT INFRASTRUCTURE
- LACK OF GOVERNMENT HOUSING FOR SWOLLEN POPULATIONS

FIG1;2: PALAFITAS: INFORMAL FLOATING URBAN SETTLEMENTS INSIDE CENTRAL BUSINESS DISTRICT OF MANAUS

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UN-HABITAT WORLD URBAN FORUM
RESETLEMENT ORGANIZATIONAL DIAGRAM
MANAUS BRAZIL PUBLIC HOUSING

TYPOLOGY 1

TYPOLOGY 2
RESETLEMENT PROGRAM
HOUSING TYPOLOGIES

TYPOLOGY I
3 Family Unit
Ground Floor Single Family
2nd and 3rd Floor Duplex
54 square meters per unit
Load Bearing Masonry Structure

TYPOLOGY II
6 Family Unit
Single Level Units
46 square meters per unit
Load Bearing Masonry Structure
USER-INITIATED INCREMENTSAL EXPANSION

HOUSING TYPOLOGY I

TYPES OF EXPANSION:
- 62% Home-base Enterprise
- 26% Living Space
- 10% Storage

SETLEMENT TYPOLOGY I

Parque Igarape Manaus
- 64% of buildings display incremental additions

HOUSING TYPOLOGY II

TYPES OF EXPANSION:
- 38% Home-base Enterprise
- 41% Living Space
- 21% Storage

SETLEMENT TYPOLOGY II

Parque Gilberto Mestrinho
- 38% of buildings display incremental additions
STORAGE SPACES
EXPANSION OPPORTUNITIES

PROSAMIM I
TYPOLOGY I - 38% Ground Floor, 28% 1st Floor, 24% 2nd Floor

AREA
Range between 3 to 16 sqm
Secured space

USE
Equipment storage
Comercial storage
Residential storage

MATERIALS
Roof: Corrugated metal
Walls: Welded metal bars,
Concrete, corrugated metal
Floor: Ceramics, Concrete

PROSAMIM II
TYPOLOGY II - 77% Ground Floor, 7% 1st Floor, 16% 2nd Floor

AREA
Range between 1 to 4 sqm
Mix secured and unsecured

USE
Equipment storage
Comercial storage
Residential storage

MATERIALS
Walls: Welded metal bars
Floor: Ceramics, Concrete

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LIVING SPACES
EXPANSION OPPORTUNITIES

**PROSAMIM I**
TYPOLGY I - 42% Ground Floor, 34% 1st Floor, 24% 2nd Floor

**USE**
Leisure / Socializing
Private Garden / Solarium
Clothes Washing
Outdoor Play Space

**AREA**
Range between 5 to 25 sqm

**MATERIALS**
Roof: Corrugated metal
Walls: Welded metal bars, Concrete, corrugated metal
Floor: Ceramics, Concrete

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**PROSAMIM II**
TYPOLGY II- 77% Ground Floor, 14% 1st Floor, 7% 2nd Floor

**USE**
Leisure / Socializing
Private Garden / Solarium
Clothes Washing
Outdoor Play Space

**AREA**
Range between 3 to 15 sqm

**MATERIALS**
Roof: Fabric
Walls: Welded metal bars
Floor: Ceramics, Concrete

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UN-HABITAT WORLD URBAN FORUM
HOME-BASED ENTERPRISES
EXPANSION OPPORTUNITIES

**PROSAMIM I**
TYPOLOGY I- 63% Ground Floor, 29% 1st Floor, 18% 2nd Floor

- **AREA**: Range between 3 to 25 sqm
- **USE**: Grocery / Fresh Vegetables, Restaurant / Bars, Hairdresser / Nails / Massage, Entertainment
- **MATERIALS**: Roof: Corrugated metal, Walls: Welded metal bars, Concrete, corrugated metal, Floor: Ceramics, Concrete

**PROSAMIM II**
TYPOLOGY II- 92% Ground Floor, 5% 1st Floor, 3% 2nd Floor

- **AREA**: Range between 0 and 6 sqm
- **USE**: Grocery / Fresh Vegetables, Restaurant / Bars, Hairdresser / Nails / Massage, Entertainment
- **MATERIALS**: No added materials

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UN-HABITAT WORLD URBAN FORUM
DEMAND FOR INCOME GENERATION

DESIGN CONCLUSIONS
DESIGN EXERCISE

DESIGNING FOR TRANSFORMATION: HOW CAN THESE ELEMENTS SUPPORT INCREMENTAL PROJECTS?

CONSIDER THE DESIGN ELEMENTS ABOVE. HOW WOULD YOU DESIGN A 3-STORY 3-FAMILY INCREMENTALLY EXPANDABLE BUILDING USING A BASE SIZE OF 60 SQUARE METERS PER FAMILY?

WHAT ELEMENTS SHOULD BE PROVIDED BY THE GOVERNMENT AND WHAT ELEMENTS COULD BE INCREMENTALY ADDED BY THE FUTURES USERS?
**INCREMENTAL DESIGN PROCESS**

**PARAMETERS**

**FORM:**
- 3-STORY VERTICAL STACK
- LIMITED OPPORTUNITY FOR EXPANSION
- ROTATION / SHIFT CREATING PORCHES AND OVERHANGS
- INFILL EXTERIOR SPACES ARE INCREMENTALLY INFILLED OVER TIME TO CREATE ADDITIONAL SPACE
- VERTICAL EXPANSION POSSIBILITY FOR VERTICAL EXPANSION OVER TIME

**PLAN:**
- WHAT SHOULD THE SIZE BE? DETERMINE FOR YOUR CONTEXT THE MINIMUM MAXIMUM SIZE APPROPRIATE PER FAMILY / UNIT
- WHAT IS ESSENTIAL? WHAT ELEMENTS OF THE PLAN NEED TO BE THERE FROM DAY 1 OF OCCUPANCY AND WHAT CAN BE LEFT FOR EXPANSION?
- WHAT SUPPORT IS ESSENTIAL? VERTICAL AND HORIZONTAL CIRCULATION, LOCATE STAIRS ACCESS, UTILITIES, DAYLIGHTING AND NATIONAL VENTILATION.
- SUPPORTING GROWTH? HOW CAN YOU SUPPORT INCREMENTAL GROWTH? CONTRACTOR CONSULTING, MATERIAL SUBSIDY, TRAINING.

**STRUCTURE:**
- STRUCTURAL TYPE? LOAD BEARING WALL VS INDEPENDENT STRUCTURE WITH INFILL PANELS. BOTH OFFER STRATEGIES AT LIMITING AND ENHANCING EXTENSION.
- HOW TO REDUCE COST? BY UTILIZING AN INDEPENDENT STRUCTURE THERE IS AN OPPORTUNITY TO REMOVE NON-STRUCTURAL ELEMENTS AND ACCEPT USER MATERIALS.
- POTENTIAL FOR HYBRID? BY CROSS BREEDING TWO OR MORE TYPES OF STRUCTURE YOU CAN BETTER ARTICULATE RESPONSES OVER TIME.

**INCOME GENERATION:**
- **CORE** $ FOR RENT $ HORIZONTAL EXPANSION OFTEN THE FIRST ADDITIONS ARE RENTAL UNITS AND PROVIDE INCOME FOR FAMILIES TO SUPPORT FUTURE GROWTH
- **CORE** $ COMMERCIAL $ HORIZONTAL EXPANSION EXPANSION SPACE OFTEN BECOMES A COMMERCIAL SPACE FOR THE FAMILY TO OFFER LOCAL GOODS AND CREATE INCOME

**LAND VALUE / SCARCITY:**
- HOW CAN WE AFFORD CENTER CITY LAND? BY AGGREGATING IN MULTI-STORY YOU CAN REDUCE THE AMOUNT OF LAND NEEDED TO ACHIEVE THE SAME DENSITIES.
- **SINGLE LEVEL SINGLE FAMILY** 3 LEVEL MULTI-FAMILY

**UTILITIES:**
- IS UTILITY PLANNING IMPORTANT? BY DESIGNING FOR CONSOLIDATION OF UTILITY YOU CAN REDUCE INITIAL COST AS WELL AS MAINTENANCE, MONITORING AND UPGRADING OVER TIME.
- MULTI-STORY VENTILATION? AN ADVANTAGE OF MULTI-STORY HOUSING IS THE ABILITY TO INTEGRATE VERTICAL SHAFTS FOR “STACK EFFECT” NATURAL VENTILATION
**DESIGN PROTOTYPE I:**
3 FAMILY MULTI-STORY HOUSING - 80% GOVERNMENT COST / 20% USER COST

- **EXT.FINISH**
  - Shared exterior elements such as roofing, safety railing, stairs, etc to be provided initially to ensure code compliance, safety and performance
  - 10% OF TOTAL COST

- **INT.FINISH**
  - Structure provided as a "shell" to be upgraded and customized by the individual user which is critical in creating identity, pride and ownership
  - 5% OF TOTAL COST

- **FOUNDATION**
  - Foundation depth variation based on different loading conditions of heavier load bearing masonry vs lighter structural infill system in anticipation of future expansion
  - 15% OF TOTAL COST

- **SERVICE CORE**
  - Consolidated vertical distribution of all services (plumbing, electrical, natural ventilation, etc).
  - Controlled access provided at each level for future maintenance, monitoring and upgrading.
  - 20% OF TOTAL COST

- **HYBRID STRUCTURE**
  - "Core" structure is masonry load bearing to prevent alteration to core utilities. Extension areas are designed with a structural frame to accept future infill.
  - 35% OF TOTAL COST

- **INFILL WALLS**
  - By separating the structure and the wall assembly this design allows for individualized solutions to be upgraded over time and the acceptance of a wide variety of finish materials (brick, concrete, glazing, ceramics, wood, advanced materials, etc)
  - 15% OF TOTAL COST

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**Structure provided as a “shell” to be upgraded and customized by the individual user which is critical in creating identity, pride and ownership.**

**Foundation depth variation based on different loading conditions of heavier load bearing masonry vs lighter structural infill system in anticipation of future expansion.**

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MULTI-STORY INCREMENTAL PROPOSAL
MANAUS PROTOTYPE: HOW COULD THIS BE ADAPTED TO YOUR COUNTRY???