# HIGH TECH
# Low Tech
# *('Real Tech Hybrid')*
# *Field Experiments in Data Acquisition and Use*

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***Introduction:*** **HIGH TECH/LOW TECH**

*Mapping* is considered with two phases: information collection and documentation/dissemination – in some cases the two are combined. The examples shown have been used by the SIGUS Group at MIT in the context of rapidly growing urban areas in developing countries, experimenting with both collection and documentation, separate and together. The examples range from aerial photographs, Google Earth and Landsat imagery, drone-captured images, and information mapping generated by users and professionals directly. Examples include Tsunami rebuilding in Banda Aceh through Community Action Planning, Egyptian self-built housing projects in a workshop setting, recent Louisiana coast line experimentation, Ethiopian professional workshops, and ongoing work in Quito comparing two low income communities. Detailed computer analysis drawn from drone aerial images provides additional detailed information and demonstrates the added benefit from 'high tech' tools. A 'low tech' traditional house-to-house survey approach is included which complimented the various 'high tech' collection approaches.

**REINHARD GOETHERT**

Dr. Goethert is Principal Research Associate in the School of Architecture and Planning at MIT and director of SIGUS, a service oriented program targeting the informal sector in developing countries. His interests in urban planning, settlement design and housing, focus on the incremental housing development process.

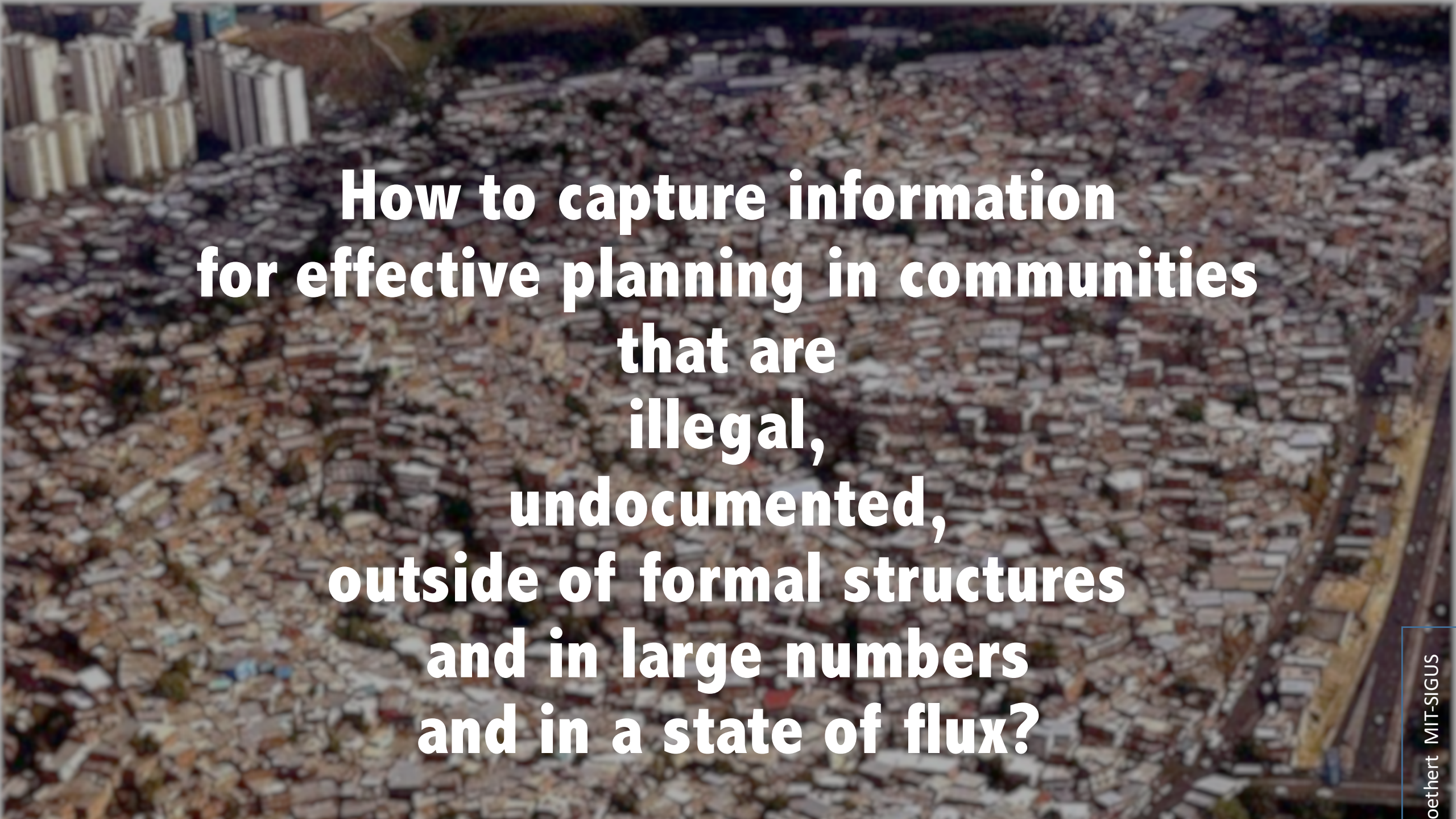
Dr. Goethert was named recipient of the UN Habitat International Scroll of Honour for "outstanding contributions in the development of innovative methodologies, training and field practice in Community Action Planning."

**GABRIEL MUÑOZ MORENO**

Gabriel Muñoz Moreno is a licensed Architect with an Advanced Diploma in Digital Fabrication and candidate for a Master in Design Studies from Harvard University. His work has been awarded internationally and has been exhibited including the Expo Milano 2015. Gabriel has worked internationally at Shigeru Ban Architects in Tokyo and Abalos+Sentkiewicz in Boston.

His research focuses on achieving a sustainable development between the natural and social environment due to the phenomena of urbanization.

# What we worry about



# How to capture information for effective planning in communities that are illegal, undocumented, outside of formal structures and in large numbers and in a state of flux?

# Mapping from aerial photographs was our standard when we started in the 60s

- Used where limited spatial data, and inaccurate/outdated information
- Documented and mapped housing environments in cities around the world (65 housing typologies) All by hand!!!

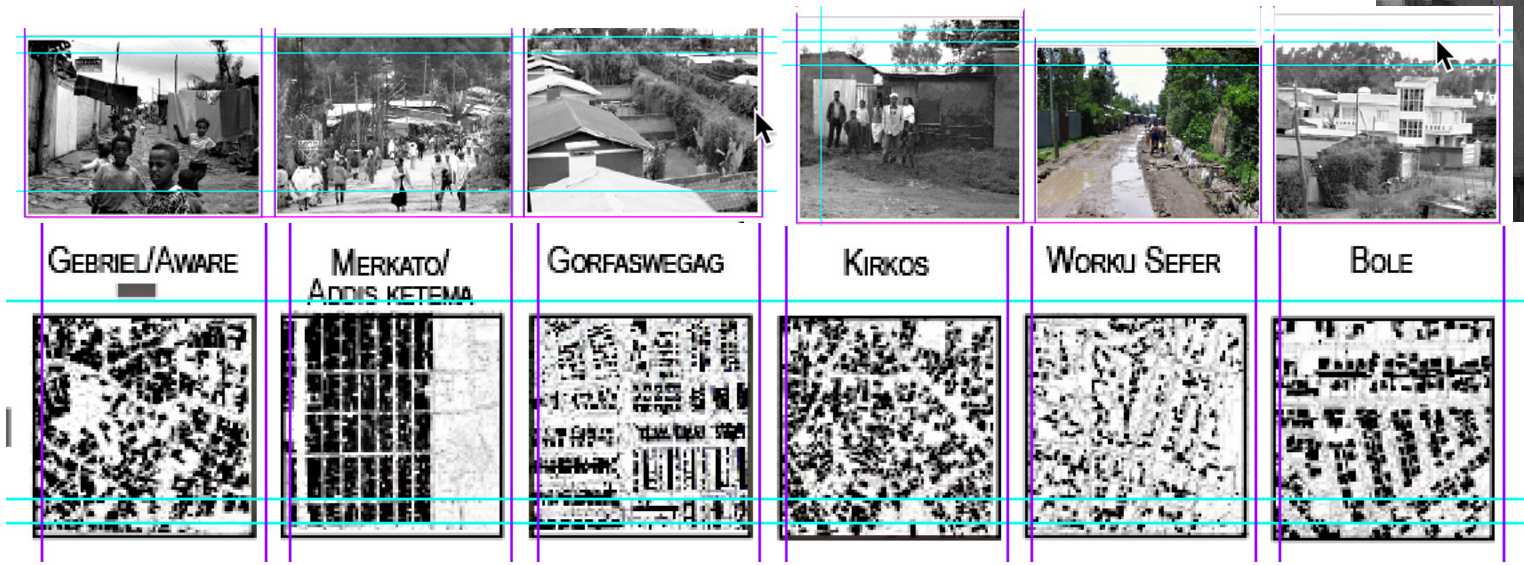

*URBAN DWELLING ENVIRONMENTS*
*Caminos, Turner, Steffian; MIT Press*

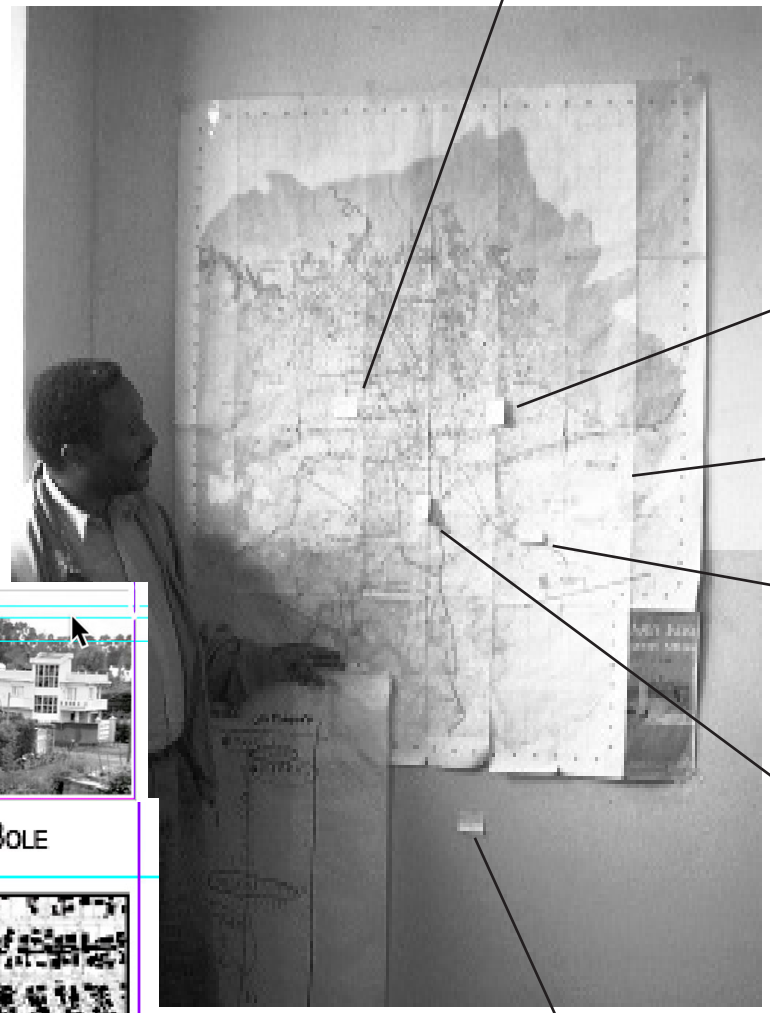
# Maps generated from experts' experience

## Addis Ababa technical workshop defining and analyzing housing typologies

A complete typology of housing options – from low to high income – was quickly developed in a 1-week workshop based on local expert's experience. Type, area, key characteristics were identified.

The basic information generated became the basis for planning strategies for the city, tailored to different types of communities.




*Exploring Sustainable Land Planning and Development Addis Ababa, Ethiopia 1996*

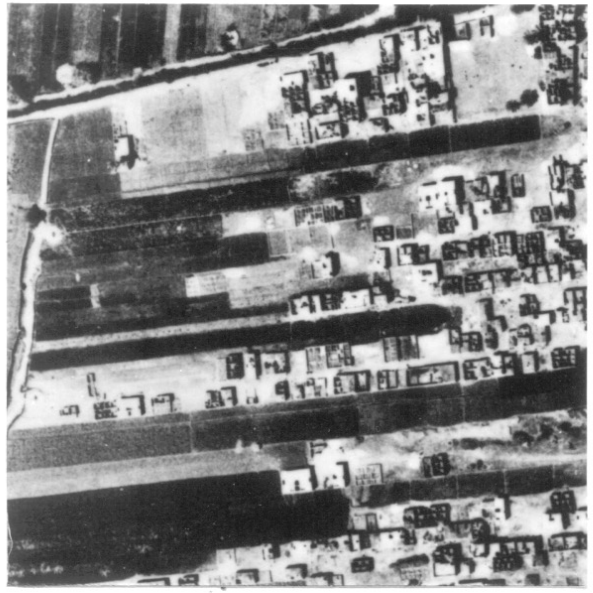
# *In Egypt*
# Photographs provided Evidence for effective planning

SQUATTER SETTLEMENTS = 80% of all new housing in Cairo

How do the vast informal areas develop? Time series key mapping resource.

(Difficult to secure photos, military security concerns continual problem)

**Settlement** **Consolidation** **Densification** *Aprox. 10 year intervals*



See:
Kairo –Zur Leistungsfahigkeit inoffizieller Stadtrandentwicklung
Politik und Planung 17
1986 Verlag W. Kohlhammer GmbH
RWTH Aachen

# And then came LANDSAT – *Free!*

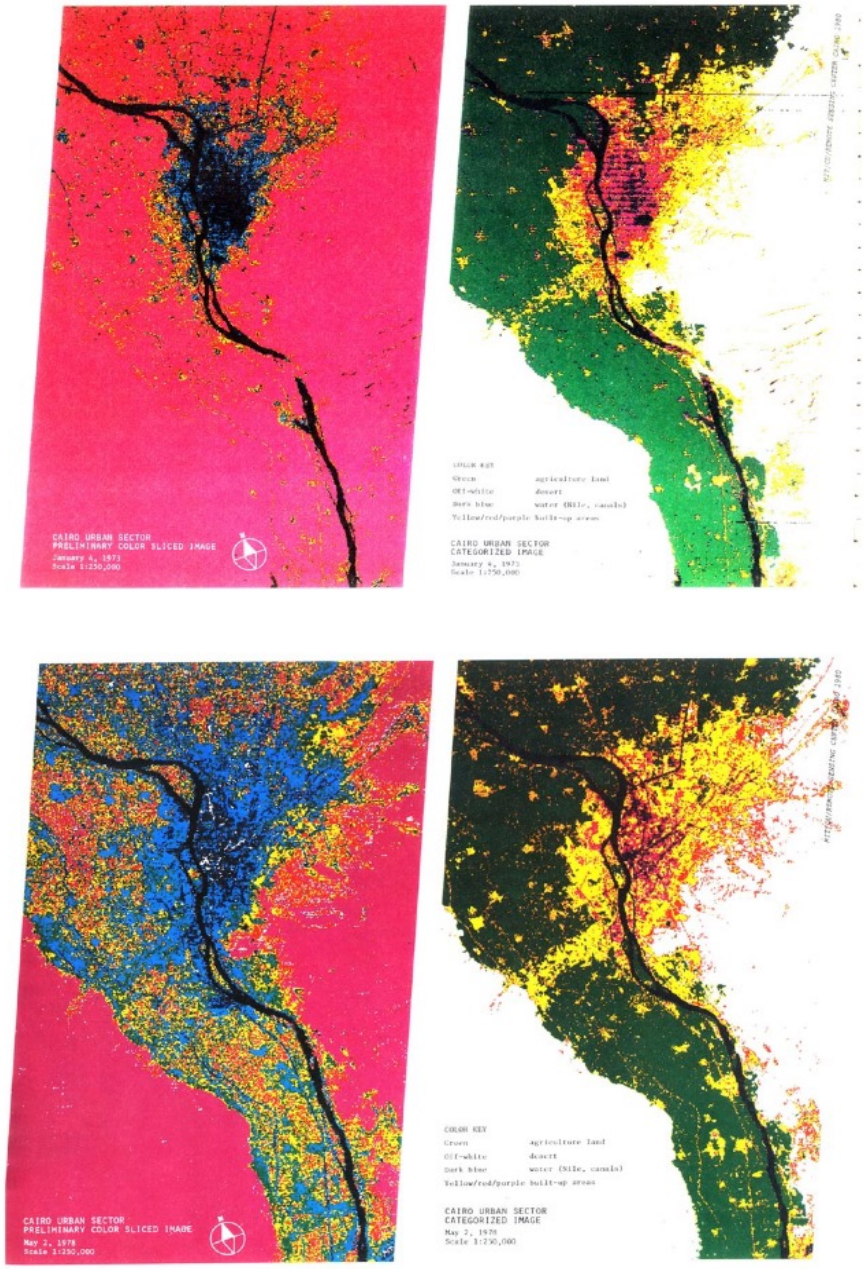
# We asked:

# "*How many squatters in Cairo?*

- *If informal (squatter) growth is:*
  *5% not to worry*
  *25% worry, take action*
  *50% really worry, take serious action*
- *And is it growing or stable?*

- In Cairo we used categorized Landsat images to settle size dispute of growth around urban areas previously based on 'windshield' surveys *(mid 1970s)*

*Landsat seen as fantastic mapping resource, but President Reagen changed the 'free' resource to cost recovery, putting it out of reach of many and stifling experimentation.*




***Yellow = informal squatters = Exploding!!!***

# Then the GOOGLE EARTH FAMILY!
# (*Superseded photographs?)*

***= Major change in our way of working!***

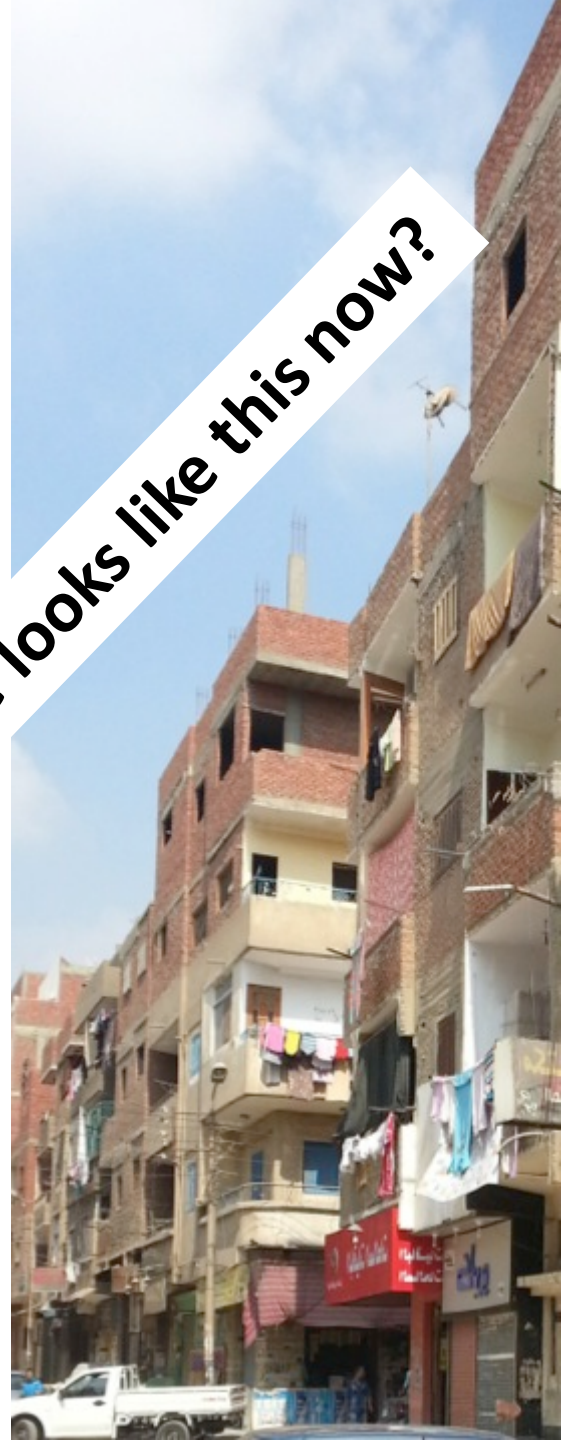
***OFFERED THREE TOOLS:***

- 2D image, limited 3D – Google Earth
- Street view
- Historical Imagery – ‘Slider’

# We use *Google Earth* Images in Unsafe Areas

- In **Egypt** to track incremental changes of **8 innovative site and services projects built in 60s-70s**
- Inability to do field surveys – security risk!
- Used large scale Google Earth images
- Limited success – coverage OK, but very limited detail (height = density)

# We wondered…..


*One of the eight innovative Incremental DIY housing projects Imposed on Egypt by the shift from the East Bloc to the West.*

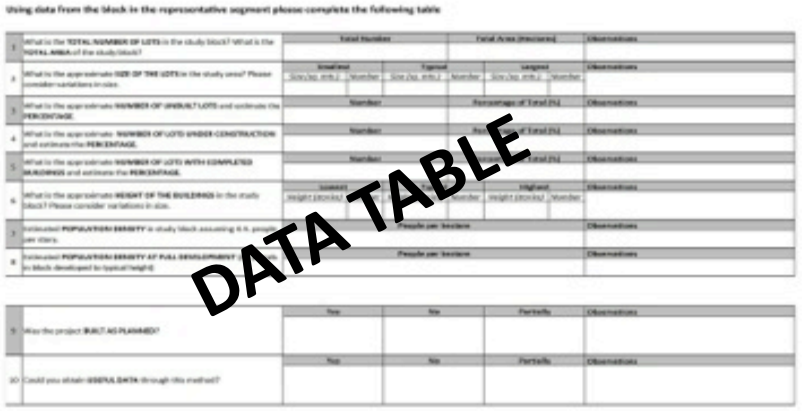
# Used Participatory Workshop to determine viability from Google Imagery

- Selected 500m x 500m reference sample. Determined basic data from sample image.


*Comference: Responsive Urbanism in Informal Areas*
*Cairo University 25-27 November 2014*

HELWAN CITY HOUSING PROJECT


Google/Bing Image. 2014



# Their Turn! The Workshop challenge:
## *What can you learn from Google images?*

**Datasheet for roundtable workshop**

Using data from the block in the representative segment please complete the following table

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1 | What is the **TOTAL NUMBER OF LOTS** in the study block? What is the **TOTAL AREA** of the study block? | **Total Number** | | | **Total Area (Hectares)** | | | **Observations** |
| | | | | | | | | |
| 2 | What is the approximate **SIZE OF THE LOTS** in the study area? Please consider variations in size. | **Smallest** | | **Typical** | | **Largest** | | **Observations** |
| | | *Size (sq. mts.)* | *Number* | *Size (sq. mts.)* | *Number* | *Size (sq. mts.)* | *Number* | |
| | | | | | | | | |
| 3 | What is the approximate **NUMBER OF UNBUILT LOTS** and estimate the **PERCENTAGE.** | **Number** | | | **Percentage of Total (%)** | | | **Observations** |
| | | | | | | | | |
| 4 | What is the approximate **NUMBER OF LOTS UNDER CONSTRUCTION** and estimate the **PERCENTAGE.** | **Number** | | | **Percentage of Total (%)** | | | **Observations** |
| | | | | | | | | |
| 5 | What is the approximate **NUMBER OF LOTS WITH COMPLETED BUILDINGS** and estimate the **PERCENTAGE.** | **Number** | | | **Percentage of Total (%)** | | | **Observations** |
| | | | | | | | | |
| 6 | What is the approximate **HEIGHT OF THE BUILDINGS** in the study block? Please consider variations in size. | **Lowest** | | **Typical** | | **Highest** | | **Observations** |
| | | *Height (stories)* | *Number* | *Height (stories)* | *Number* | *Height (stories)* | *Number* | |
| | | | | | | | | |
| 7 | Estimated **POPULATION DENSITY** in study block assuming 4.4. people per story. | **People per hectare** | | | | | | |
| | | | | | | | | |
| 8 | Estimated **POPULATION DENSITY AT FULL DEVELOPMENT** (All parcels in block developed to typical height) | **People per hectare** | | | | | | |
| | | | | | | | | |
| 9 | Was the project **BUILT AS PLANNED**? | **Yes** | | **No** | | **Part** | | |
| | | | | | | | | |
| 10 | Could you obtain **USEFUL DATA** through this method? | **Yes** | | **No** | | **Part** | | |
| | | | | | | | | |

# Then the INVALUABLE Google ‘slider’! used extensively in tracking rate of change

- Shows: Trends, growth, densification
- But limited years, with varying degrees of resolution



*(Google Earth Images 2006 – 2014)*

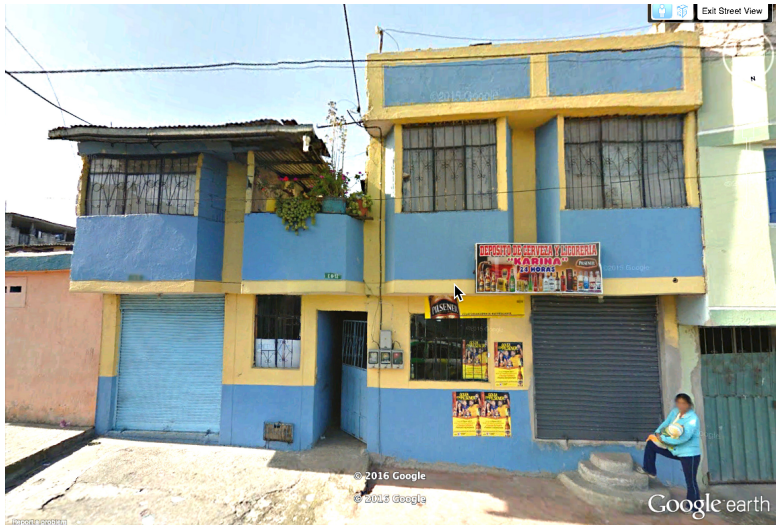



Georgetown, Guyana

# And Google STREET VIEW – Even in squatter areas!!!!

## (Do we still need to go there first hand? *= changes the way we do research?)*

- Detailed house by house views with address
- Excellent, but limited
- Approaching individual house survey information



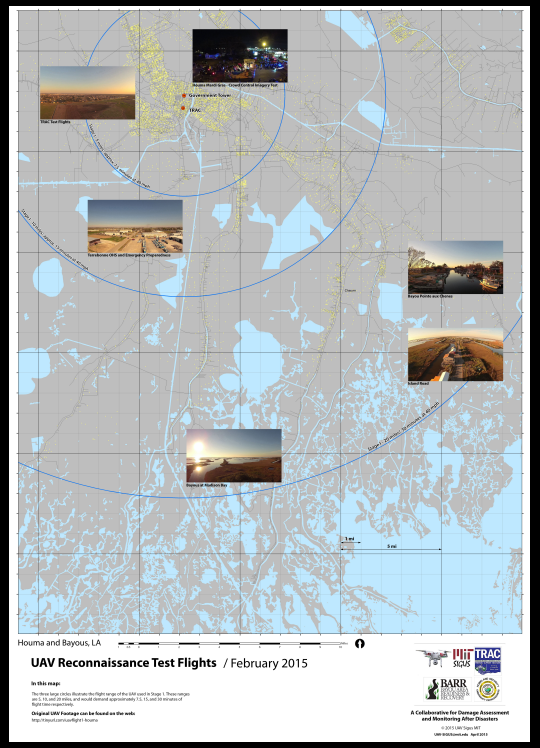

*Street Views: Lucha former squatter settlement, Quito, Ecuador*

# AND NOW DRONES!
# GREAT IN DISASTERS IN ALL PHASES

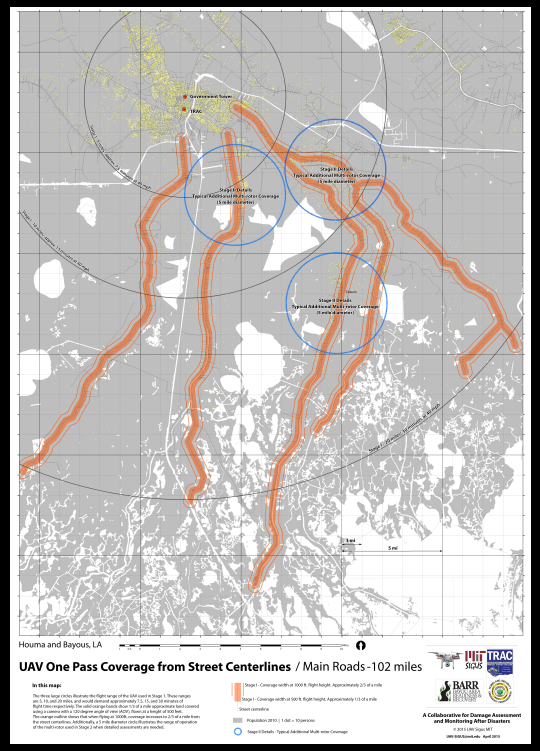

- In **Assessment phase**:
  - Rapid feedback
  - Supplants walk-through house by house evaluation? Drone fly through
  - (Tests in Louisiana, Medellin) = Technology not limitation
- **First Response phase**
  - Delivery of medicines, food
- In **Recovery phase**:
  - Tracks change, timely provision of support, materials

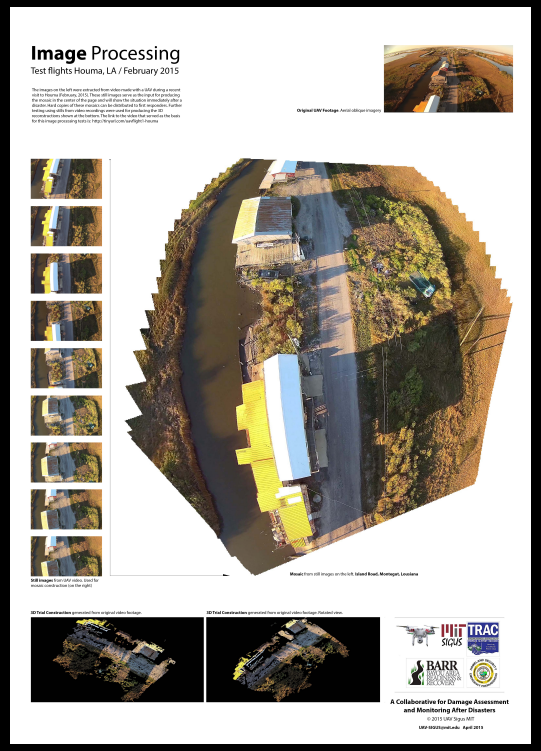
# An ideal partner? – Drones in Disasters

## Offers mapping resource, engagement with communities AND a tool in recovery








Developed in a Collaborative Workshop with agencies in Louisiana

SIGUS

TRAC
TERREBONNE READINESS & ASSISTANCE COALITION
PREPARE. SUPPORT. RECOVER.
Serving Louisiana Since 1992

BARR
BAYOU AREA READINESS & RECOVERY

# COMMUNITY ACTION PLANNING in Disaster Recovery Banda Aceh

## *Experiments with data inputs*

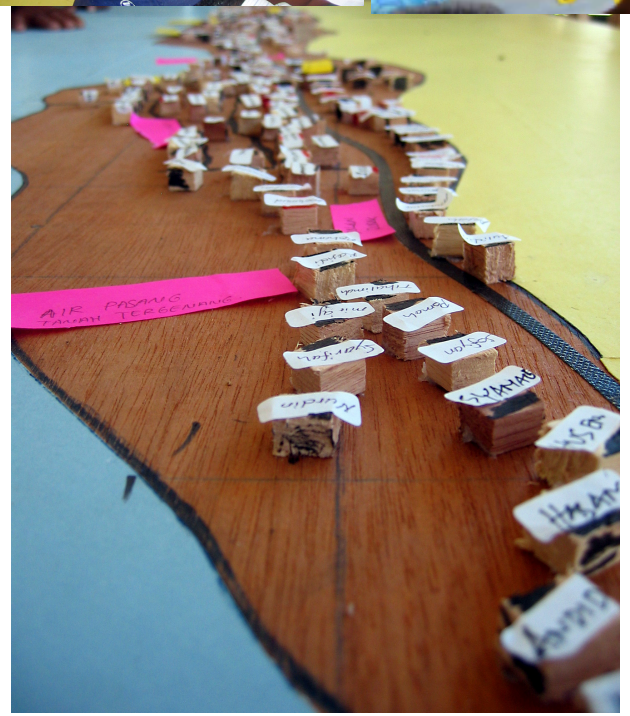
- **Community led mapping** and design
- **Model of main road framework** of community provided base
- Tested 3 inputs in the field for generating spatial frame:
    - **Manual rapid plane table survey**
    - **Aerial photo**
    - **Landsat**

# Recovery – with Community Action Planning

- Empowering communities through rapid workshop format.
- Community charged with mapping and designing their community

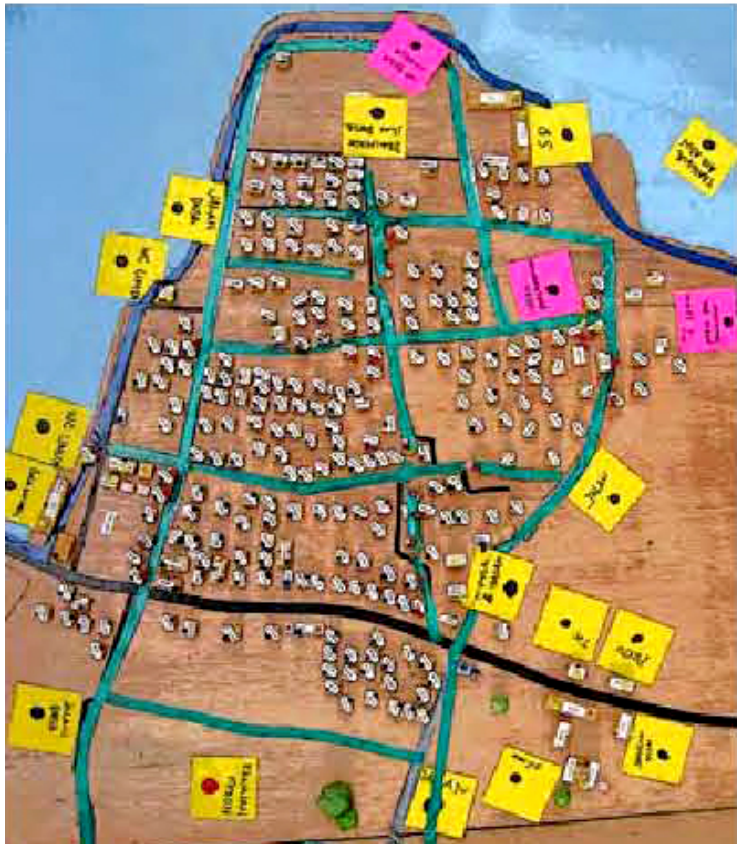

*Survivors met in partially destroyed schools and mosques.*

# 1 MODEL of community site built WITH MAIN STREETS ONLY



# 3 MODEL PHOTOGRAPHED

**(Provided instant 'accurate' damage and spatial status)**



# 2 FAMILIES LOCATE THEIR HOUSE

**and mark as:**

- **Destroyed**
- **Partial destroyed**
- **Intact**

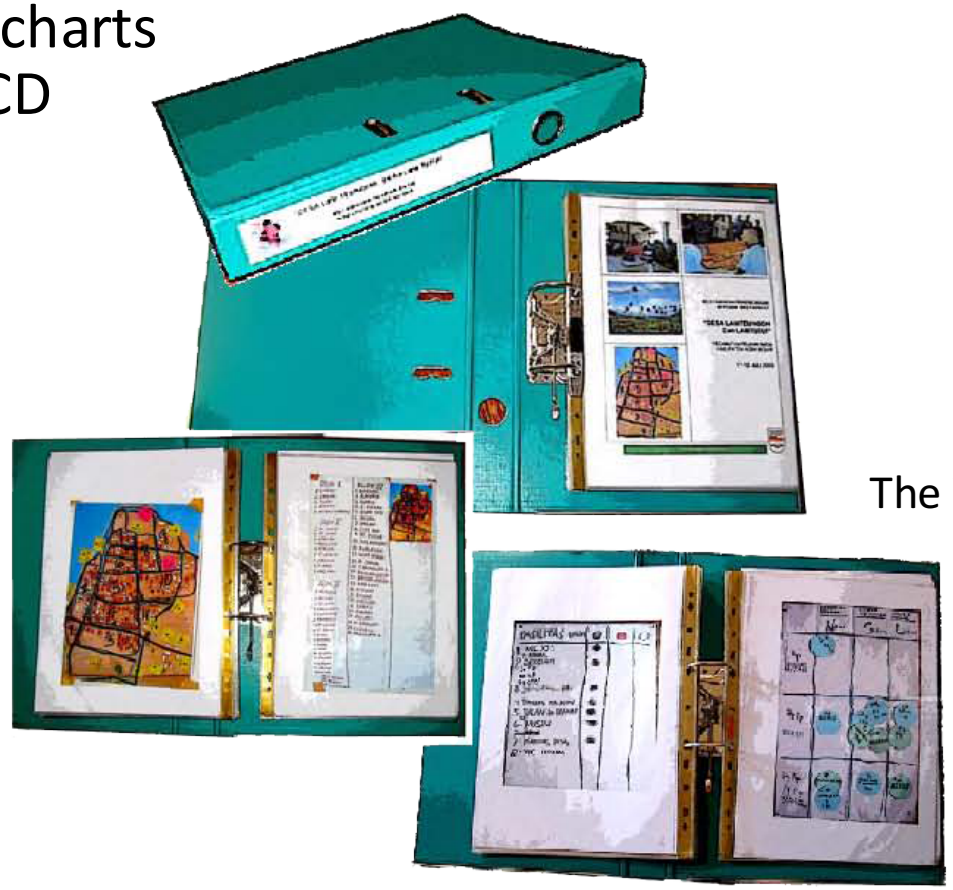

*And kids sketch what they remember*

# BUT THE MOST IMPORTANT OUTCOME OF THE WORKSHOP?

**A *Workshop Report of priorities GENERATED AND HELD* by community (very low tech)**

**= A 'MAP' of priorities, community task teams, and spatial situation**

- All workshop activities/charts
- English summary with CD

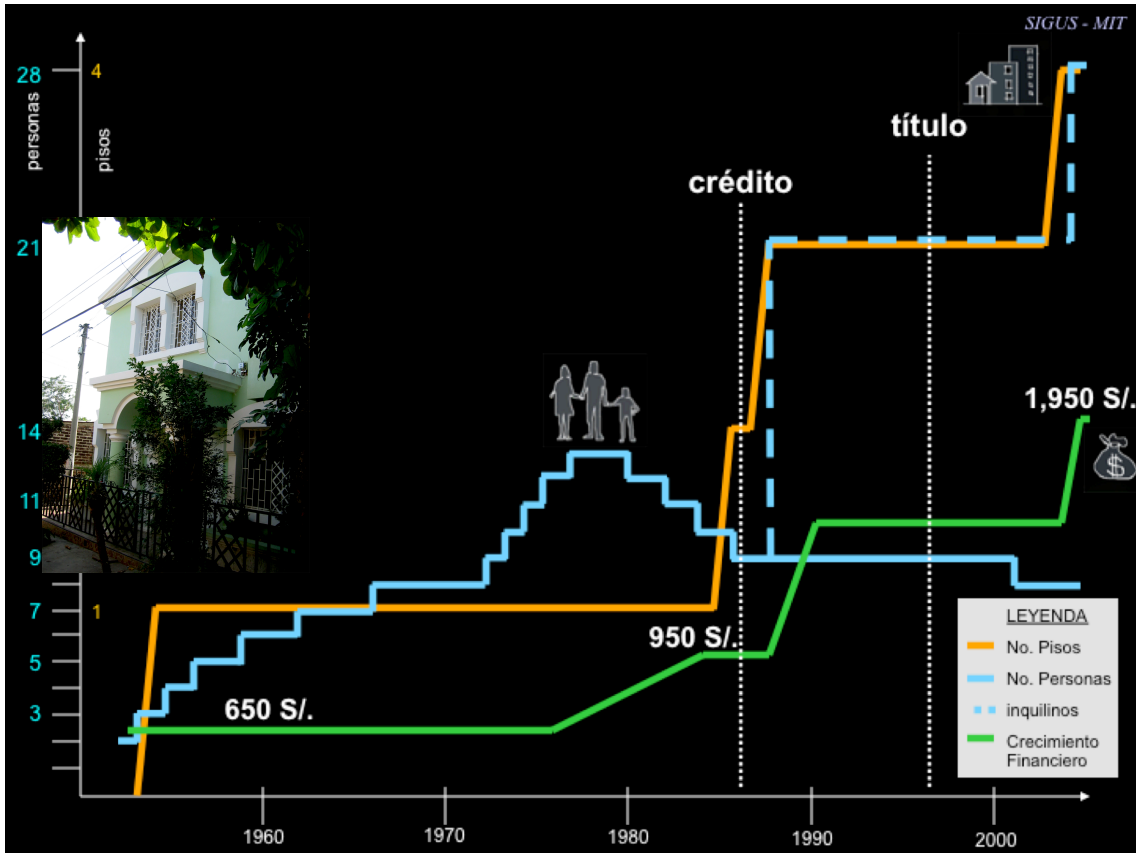


The Workshop *binder*

***An offense/defense against NGOs!***

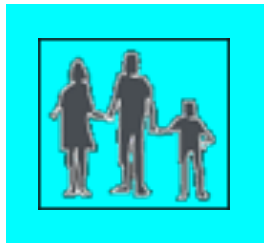
# Regardless of HIGH TECH attractions
# Ultimately we need LOW TECH information as supplement!

***Trigger points*** *a key to underst anding process*




EXPANSION
By Rooms


INCOME
Household



NUMBER IN
HOUSEHOLD

## We capture process in a longitudinal diagrammatic house-to-house survey

# FROM OUR EXPERIENCES

**HYBRID BEST**

**The WHY – Low Tech**

- Detailed information best house to house (but *'higher tech'* methods getting better: ex: cell phone surveys)

**The WHAT – High Tech**

- Large area data best with remote methods, but limited detailed information

**'TOOLS' BEST IF SIMPLE, NOT COMPLICATED,**
**EASY TO LEARN AND USE AND AVAILABLE FOR ALL**

**NO NEED TO GO INTO THE FIELD IN FUTURE?**
**THE END OF 'LOW TECH'?**
**'HIGH TECH' WILL PROVIDE MORE THAN ENOUGH DATA?**

'Street view'; Google, drone + computer analysis sufficient?
New cell phone technology is adequate for house-to-house inputs?