From CAMP to CITY

A long term housing solution for refugee camps using a digitally fabricated building system
OUTLINE OF THE PRESENTATION

• INTRODUCTION
  Problem statement
  Objective
  Scenario
  Scale levels

• (THEORETICAL) BACKGROUND
  How can you make a camp into a city?
  Concept

• THE DESIGN
  S  The building system
  M  The dwelling
  L  The neighborhood
  XL The camp

• CONCLUSION
  Applicability to other locations
  Q&A
• INTRODUCTION

• (THEORETICAL) BACKGROUND

• THE DESIGN

• CONCLUSION
Highest number of displaced people since WW2

Problem statement

<table>
<thead>
<tr>
<th>Year</th>
<th>Number</th>
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<tbody>
<tr>
<td>2005</td>
<td>37.5 million</td>
</tr>
<tr>
<td>2006</td>
<td>39.5 million</td>
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<tr>
<td>2007</td>
<td>42.7 million</td>
</tr>
<tr>
<td>2008</td>
<td>42.0 million</td>
</tr>
<tr>
<td>2009</td>
<td>43.3 million</td>
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<tr>
<td>2010</td>
<td>43.7 million</td>
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<tr>
<td>2011</td>
<td>42.5 million</td>
</tr>
<tr>
<td>2012</td>
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<td>2013</td>
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</tr>
<tr>
<td>2014</td>
<td>59.5 million</td>
</tr>
<tr>
<td>2015</td>
<td>??? million</td>
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</table>
Global problem

Problem statement

Forcibly displace persons
Large share of these people end up in planned refugee camps
Camps are designed to be temporary

CAMP'S LIFECYCLE

- Origin: Camp set up
- Growth
- Population unknown
- Durability unknown
- Decay
- Death: Closure of the camp
INTRODUCTION

Problem statement

Situations become protracted

Protracted refugee situations

Duration of refugee situation

Number of situations

0 2 4 6 8 10 12 14

30+ years 20-29 years 10-19 years <10 years
INTRODUCTION • Objective

Building system that can facilitate incremental growth
INTRODUCTION

Scenario

global problem

generic solution that can adapt to different locations

specific location

specific solution

other locations

part generic part specific solution
INTRODUCTION

Scenario

Chosen location

Dadaab refugee camp
Dadaab, Kenya

ETHIOPIA
SOMALIA
KENYA
Indian Ocean
Equator
Indian Ocean

Dadaab refugee camp
Dadaab, Kenya

Nairobi
Dhoobley
Kismayo
Mogadishu
Mogadishu
Dadaab
Kismayo
Indian Ocean

Chosen location
DABAAB village
Population in 1989: 15,000
Population in 2015: 148,000
Location of UNHCR and aid organizations

KAMBIOOS ref. camp
Population: 20,748
Founded in: 2011

HAGADERE ref. camp
Population: 84,565
Founded in: 1992

IFO 2 ref. camp
Population: 87,963
Founded in: 1992

IFO ref. camp
Population: 52,356
Founded in: 2011
Ifo 2 refugee camp
The different scale levels

- **S**
  - Building System
  - Focus of the design

- **M**
  - Dwelling
  - 2 - 10 people

- **L**
  - Neighborhood
  - 100 people

- **XL**
  - Camp
  - 50,000 people
• INTRODUCTION

• (THEORETICAL) BACKGROUND

• THE DESIGN

• CONCLUSION
THEORETICAL BACKGROUND • How can you make a camp into a city?
Family of five as the norm
Family of five as the norm
Family of five as the norm
Family of five as the norm
Clustering in communities

Legend

- Latrine
- Water tap
- Shower
- Refuse container
- Family dwelling on family plot
- Road surface / Water drainage

HOLLOW SQUARE PLAN

STAGGERED SQUARE PLAN

COMMUNITY ROAD PLAN
Separation of functions

How can you make a camp into a city?

**LEGEND**
- Residential
- Facilities
- Main road
- Camp entrance

DOMIZ REFUGEE CAMP, Iraq
LARGO REFUGEE CAMP, Sierra Leone
HAGADERA REFUGEE CAMP, Kenya
(THEORETICAL) BACKGROUND • How can you make a camp into a city?

More differentiation:

- Adaptable and Customisable to personal needs
- Different housing types
- Different type of neighborhoods
- Different areas: commercial, residential, agricultural
(Theoretical) Background • How can you make a camp into a city?

Universal shelter in most of the situations
(THEORETICAL) BACKGROUND • How can you make a camp into a city?

More location specific:

- S: Flexible system
- M: More suitable for local climate and context
- L: More suitable for local climate and context
- XL: More suitable for local climate and context
(THEORETICAL) BACKGROUND • How can you make a camp into a city?
THEORETICAL BACKGROUND • How can you make a camp into a city?

CAMP

DEPENDENT ON AID

BECOME MORE SELF-SUSTAINABLE

INDEPENDENT

CITY

Recourses:
- More efficient use of resources
- More efficient use of resources
- More efficient use of resources
Flows and resources

- How can you make a camp into a city?

**WATER**
- Rainwater collection
- Solar panel
- Borehole
- Wetlands

**FOOD / ORGANIC**
- Personal food production
- Livestock
- (Organic) waste collection

**MATERIAL**
- Inhabitants
- Anaerobic filter

**ENERGY**
- Bio gas
- Storage

**(THEORETICAL) BACKGROUND**
- Humanitarian food production
- Fab lab
- Market
GOALS:
- Less pressure on local resources
- Less dependency on humanitarian organisations for transport of water
- Reuse of waste water
- Provide extra water needed for food production
Food / Organic

GOALS:
Become less dependent on humanitarian food aid.
Goals:
Provide more sustainable housing and offer better options for the upgrading of the refugee homes.
GOALS:
Provide local, off-grid energy solutions for aid organisations, host communities and households.
(THEORETICAL) BACKGROUND • How can you make a camp into a city?

- **CAMP**
  - DEPENDENT ON AID

- **CITY**
  - INDEPENDENT

**Become more self-sustainable**

**Economic:**
- Dwelling should facilitate livelihood activities
- Create more jobs and opportunities
Refugee camp economy

- Host Policy
- Isolation
- Institutional Environment
- Market Outcomes
- Humanitarian Assistance
- Refugee Composition
- Nature of Conflict

(THEORETICAL) BACKGROUND • How can you make a camp into a city?
Refugee camp economy

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(THEORETICAL BACKGROUND) How can you make a camp into a city?
Refugee camp economy

image to show where jobs are created in the resources diagram

+ where trade is encouraged
(THEORETICAL) BACKGROUND • How can you make a camp into a city?

CAMP

FIRST EXPLOSIVE GROWTH, THEN STAGNATION

TEMPORARY

CITY

MORE GRADUAL GROWTH

PERMANENT
(THEORETICAL) BACKGROUND • How can you make a camp into a city?

- **CAMP**
  - First Explosive Growth, then Stagnation
  - Temporary

- **CITY**
  - More Gradual Growth
  - Permanent

Initial standard shelter, should facilitate growth over time. Added quality increases permanence.
Standard shelter, which is better suited for the location in the beginning, people pay later for their own upgrades.

Pay by jobs and trade mentioned earlier, but also by:
- agricultural production
- own businesses
- outside remittances
- lending
- humanitarian aid

Houses have to be seen as investments and can contribute to identity building.
Digital manufacturing

what is digital manufacturing?
Why digital manufacturing?

° design data is production data, design can easily be adapted and changed
° production on site
° friction fit connections, no tools needed for construction, so people can easily construct and adapt their houses
Place FabLab's in the camp

- Concept
- CNC Milling Machine
- Generator
Production on-site

RAW MATERIAL

PRODUCTION IN LOCAL FABLAB’s

BUILDING PARTS FOR BASIC SHELTER

$$$$

UNHCR
Production on-site

RAW MATERIAL

PRODUCTION IN LOCAL FABLAB’S

BUILDING PARTS FOR UPGRADES AND EXTENSIONS

THE REFUGEES

THEORETICAL BACKGROUND • Concept
The building system

THEORETICAL BACKGROUND

Concept
The building system

(THEORETICAL) BACKGROUND

- Concept

- Section

- Complete Construction

- Floors and Roof

- Facade
The building system

- Concept
  - ADD FLOOR
  - RAISED FLOOR
  - BALCONY
  - VERANDA
  - STANDARD SHEDER
  - EXTENSION X-DIRECTION
  - EXTENSION Y-DIRECTION
• INTRODUCTION

• (THEORETICAL) BACKGROUND

• THE DESIGN

• CONCLUSION
The nodes

- The building system
The nodes
The beams

The building system
The floors

- The building system
The columns

• The building system
The upper nodes and beams
The roof structure
The facade

• The building system
The facade

The building system
The basic shelter

impression

foto model
The different housing types

SINGLES
(BEGIN SITUATION)

FAMILIES
(BEGIN SITUATION)

EXTENDED FAMILIES
(BEGIN SITUATION)
Building technology

VENTILATION

SHADING

RAIN WATER COLLECTION
The upgrading process

Our old home!

The Ahaan family

**Jamaal Ahaan**
Age: 34  
Occupation: Taxi driver

**Samira Ahaan**
Age: 30  
Occupation: Maid / cook

**Yasin Ahaan**
Age: 1

**Isir Ahaan**
Age: 5

**Jamila Ahaan**
Age: 7
The upgrading process
The upgrading process
The upgrading process
The upgrading process
The upgrading process
The upgrading process
The neighbourhood

SINGLES

Linear (street)

FAMILIES

Central (shared courtyard)

EXTENDED FAMILIES

Clustered (private compounds)

focused on:

PLAN

PLAN

PLAN
Title header
DESIGN • The neighbourhood
DESIGN • The neighbourhood
Schematic plan

DESIGN

The camp

Community

Main road

Main centre

Secondary centre

FACILITIES:
- Medical
- Feeding centre
- Market
- Workshops
- Administrative

FACILITIES:
- Schools
- Distribution points
- Recreation
- FabLabs

Commercial

Residential

Agricultural

Dusty wind

Warm wind

facilities placed in the dust.
• INTRODUCTION

• (THEORETICAL) BACKGROUND

• THE DESIGN

• CONCLUSION
CONCLUSION • Applicability to other locations
CONCLUSION • Applicability to other locations
Questions?