

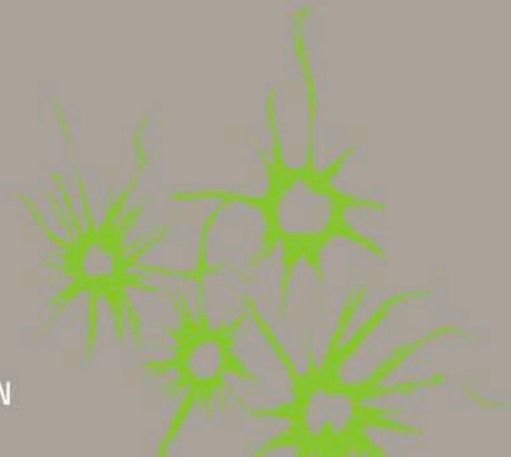
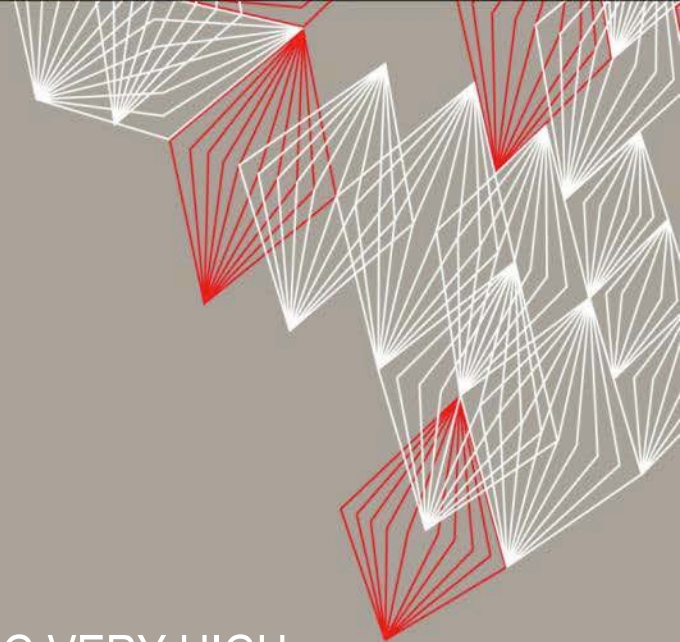


SLUM MAPPING

SOME REFLECTIONS ON METHODS USING VERY HIGH
RESOLUTION IMAGES

RICHARD SLIUZAS

R.SLIUZAS@UTWENTE.NL





OUTLINE

- What is a slum
 - UN-HABITAT's definition
 - Global Slum Ontology
- Slum mapping
 - Purpose
 - Methods – data sources and data acquisition
 - Aerospace (spatial data)
 - Field-based methods
- Current research directions
 - Geo-Object Based Image Analysis (GEOBIA)



SLUM DWELLERS AND SLUMS

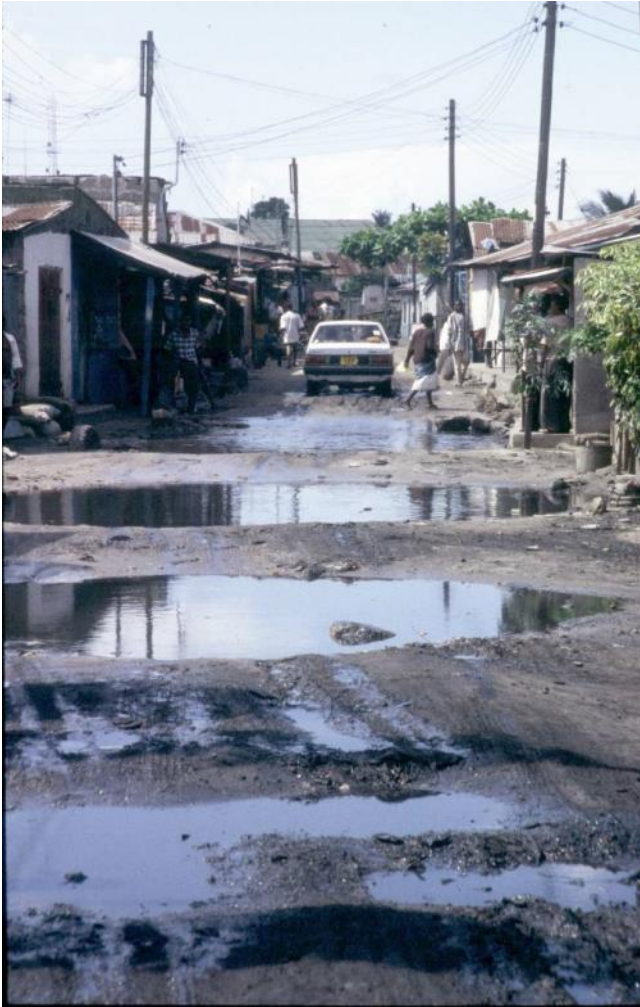
Who are slums dwellers?

- UN 2002: Urban households lacking at least 1 of the following:
 - Adequate water
 - Adequate sanitation
 - Sufficient living space
 - Secure tenure
 - Durable housing (quality of structures & environment – hazards)

www.unhabitat.org



SLUMS: SPATIAL CONCENTRATION OF SLUM DWELLERS - DIVERSITY OF PHYSICAL FORMS AND SETTINGS



Dar es Salaam
Tanzania



Cairo, Egypt



Vizag, India



Libya: can we see the slum areas?

Source: J. Turkstra UN-HABITAT

DURABLE HOUSING

- Principle research focus is on building a robust method to map and monitor *durable housing* as an indicator of slums
- House is a physical asset – visible and (generally) immovable
- Link to land occupation and tenure
- Occupants (owners/tenants) can be spatial registered via house
- Building quality: building materials, state of repair (roofs) and some building standards (size, location aspects perhaps)
- Also include Neighbourhood quality: (adjusted) planning standards for neighbourhood development – open space, road access (widths, pattern, connectivity)
- Hazards: natural and technological – not always visible, often high degree of spatial-temporal variability (e.g. floods, landslides, industrial accidents)

GLOBAL SLUM ONTOLOGY (PHYSICAL)



Environs

Location

Neighborhood
Characteristics

Settlement

Shape
Spatial order

Density

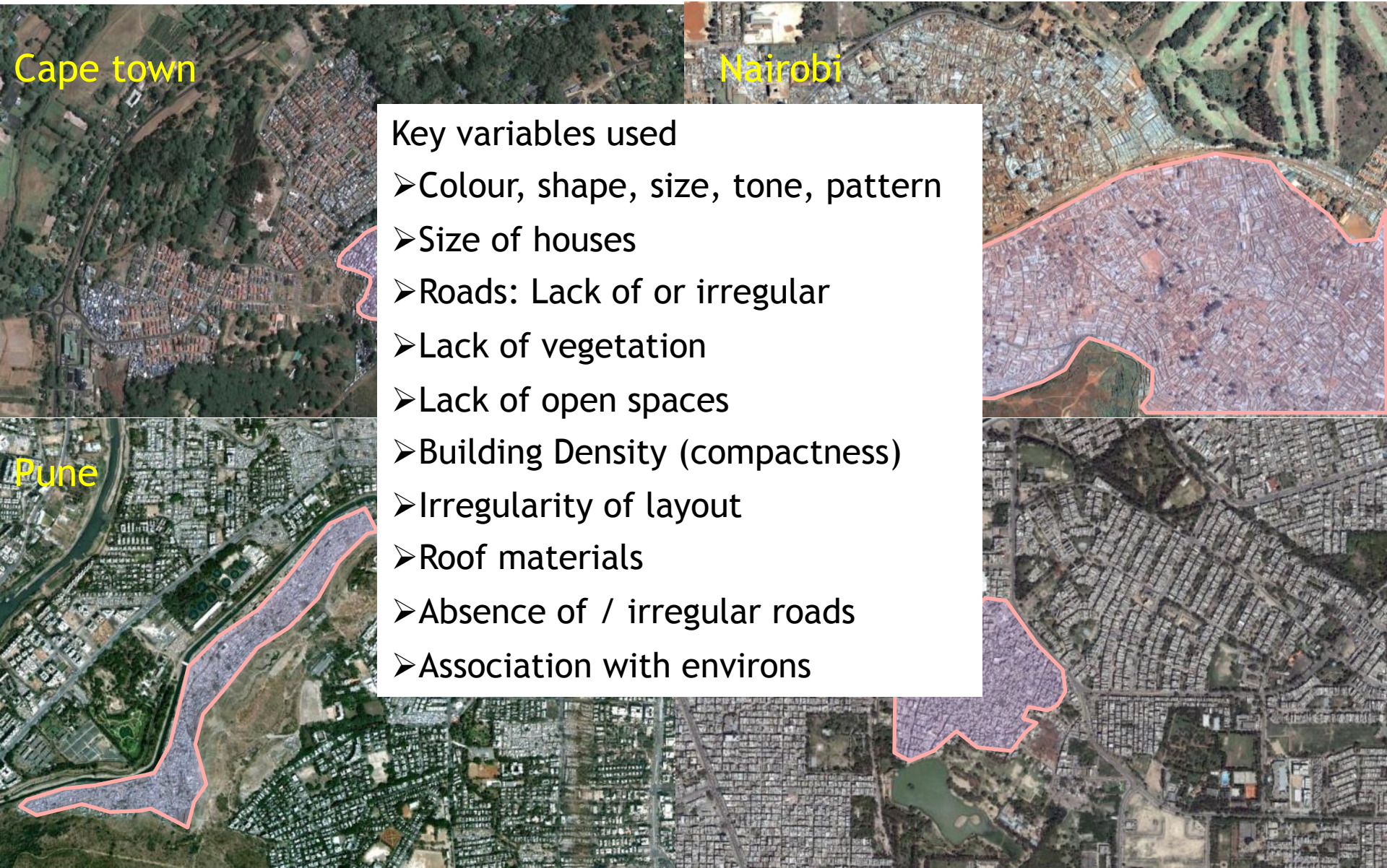
Object

Road Layout

Building Characteristics

Kohli, D., Sliuzas, R. V., Kerle, N., & Stein, A. (2012). An ontology of slums for image-based classification. *Computers, Environment and Urban Systems*, 36(2), 154-163.

Aerial views of slums in different contexts with visual interpretation



Cape town

Nairobi

Pune

Key variables used

- Colour, shape, size, tone, pattern
- Size of houses
- Roads: Lack of or irregular
- Lack of vegetation
- Lack of open spaces
- Building Density (compactness)
- Irregularity of layout
- Roof materials
- Absence of / irregular roads
- Association with environs



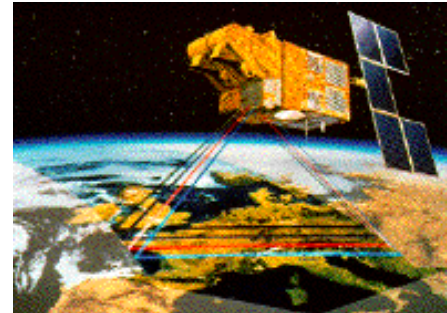
OUTLINE

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 - UN-HABITAT's definition
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- Current research directions
 - Geo-Object Based Image Analysis (GEOBIA)
 - Some emerging tools for urban (slum) monitoring

PURPOSE

Aspect	Slum settlement level	City wide level
Spatial level	Object – settlement	Settlement-environs-city
Spatial resolution	Very high (< 1m)	Medium – Very high
Temporal resolution	Annual or more frequent e.g. upgrading projects	1-5 years depending on growth rates and capacity
Spectral resolution etc.	Generally optical (possibly also oblique or terrestrial, LIDAR)	Optical VHR Radar (DLR)
Applications	Regularization of tenure Settlement upgrading Vulnerability assessment	Urban (slum) policy and strategic planning Monitoring (modelling) Topographic mapping Urban growth monitoring Vulnerability assessment

EARTH OBSERVATION (REMOTE SENSING)



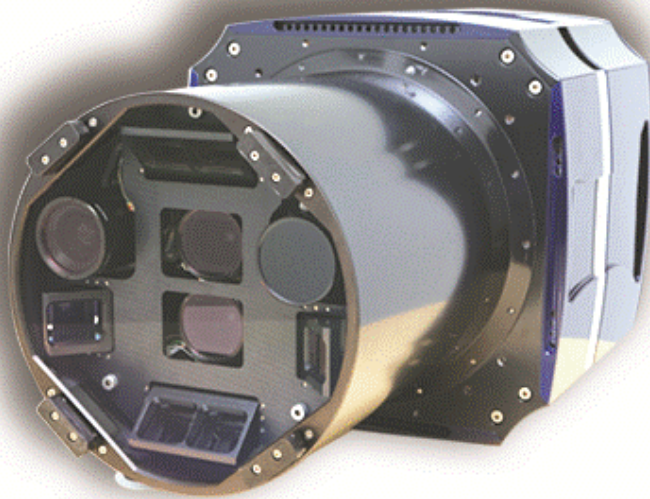
TRADITIONAL AERIAL MAPPING TECHNIQUES



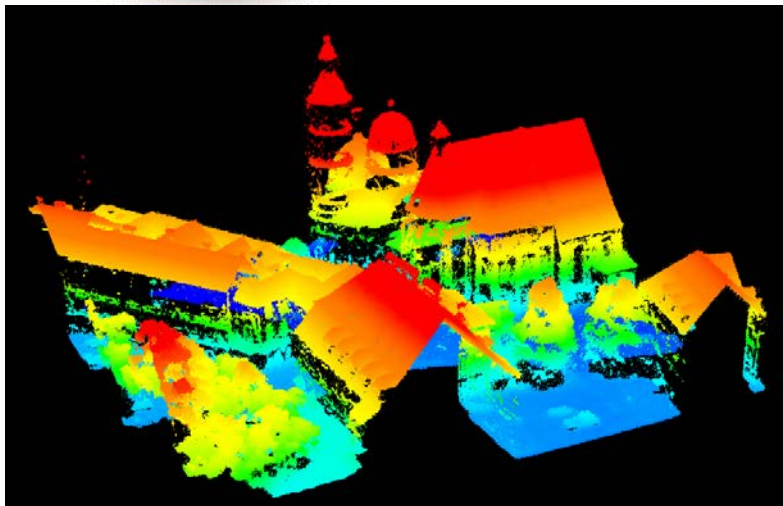
Topographic maps various scales



MODERN DIGITAL CAMERA E.G. ULTRACAM



- Simultaneous vertical and oblique images, Infra red
- Suitable for 3d city model generation via photogrammetry techniques



AIBOTIX HEXACOPTER MICRO AERIAL VEHICLE



- Dense image matching
- Point cloud generation
 - 5 cm GSD

Issues:

- Security clearance
- Safety

VHR images in participatory mapping for problem scoping, analysis and planning



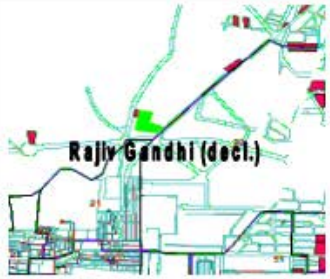






NGO-CBO PARTNERSHIPS

E.G. SHELTER ASSOCIATES, SANGLI – MURAD-KUPWAD INDIA

The screenshot displays the Shelter Associates website. At the top, the logo 'SHELTER ASSOCIATES' is visible, along with a navigation menu: Home, Who we are, What we do, Slum Data Maps, Info, Contact us, Cloth Bags, and Donate. The main content area is titled 'Electoral Ward No.1'. Below this, it states: 'Govardhan Nagar, Rajivgandhi Nagar is the only two slum in this electoral ward. The area of this electoral ward is 4.57 square kilometers (By Google Earth)'. It lists the 'Elected Representative' as Ms. Hipparkar Vimal Pandurang (Vikas Mahaaghadhi) with her mobile number +91 9421127294. The 'Municipal Administrative Ward' is identified as 'SMKMC Administrative Ward No.1'. A satellite map shows the location of 'Rajivgandhi nagar JunaBudhgaonRaod' in Sangli. Below the map, there are two text blocks: one for 'Rajivgandhi nagar JunaBudhgaonRaod' (established in 1985, 6049 sq. mts, 1125 residents) and one for 'Govardhan nagar' (established in 1996, 1103.93 sq. mts, 150 residents). On the right side, there are two sidebar boxes: 'Recent Blog Posts' with a list of articles and 'Contact Shelter' with phone numbers (+91 020-2444 0363 and +91 020-2448 2046) and an email address (info@shelter-assodates.org). A Facebook logo is also present. The footer contains the same navigation menu and 'Credits Privacy Policy'.

SLUM MAPPING AND ENUMERATION RESULTS SANGLI GANDHI NAGAR.

Sangli-Miraj-Kupwad Municipal Corporation (SMKMC) Slum Surveys 2001
Rajiv Gandhi Nagar, Ward No. 1 Survey No. 133, 134

<p>ADDRESS</p> 	<p>Off Juna Budhgaon Road, Near Sangli Tasgaon Bypass, Sangli</p>		<p>TOILETS</p>	
<p>LOCATION</p>	<p>HAZARDS</p>		<p>1 block- 4stalls for women and 4 stalls for men</p>  <p>Earlier the toilet was washed once a week but now it is irregular. The open fields are also used for defecation as the facility is inadequate. Also the approach road to the toilet is very bad and the area around is perpetually slushy. There is no electricity or water storage facility in the toilet block.</p>	
<p>GARBAGE</p> <p>Waste is dumped in and around the slum and no clearance systems.</p> 	<p>PAVING</p> <p>There are paved lanes within the slum but outside its slushy.</p> 	<p>NEARBY AMENITIES</p> <p>Nearest Hospital Dr.Patil Hospital, Dr. Suryavanshi Hospital</p> <p>Nearest Bus Stop RTO office</p> <p>Nearest School/Colleges Shantiniketan Lok Vidyapeeth in the slum</p> <p>Nearest Telephone Vishrambaug Police Station</p> <p>Nearest Police Station Shivaji Market</p> <p>Nearest Market none</p> <p>NGO in slum none</p> <p>Credit/Other savings none</p>		<p>DRAINAGE</p> <p>Drain water flows down from the slum into the fields. All gutters are open.</p> 
<p>HOUSES/POPULATION</p> <p>app. No of house-225 approx. Population 1125 Kuccha houses made of tin and wood</p>	<p>WATER</p> <p>There are two taps in the settlement and water is available from 5hours in a day There are also two hand pumps which provide water 24 hours.</p>  		<p>ELECTRICITY</p> <p>There are 18 electric poles cum light poles within the settlement but no telephone poles.</p>	

Voluntary Geo-Information (VGI)

<http://mapkibera.org/>

MAP KIBERA

citizen mapping | citizen media

Kibera in Nairobi, Kenya, was a blank spot on the map until November 2009, when young Kiberans created the first free and open digital map of their own community. Map Kibera has now grown into a complete interactive community information project.



programs

Mapping

Voice of
Kibera

Kibera News
Network

get involved

Wiki
all our plans

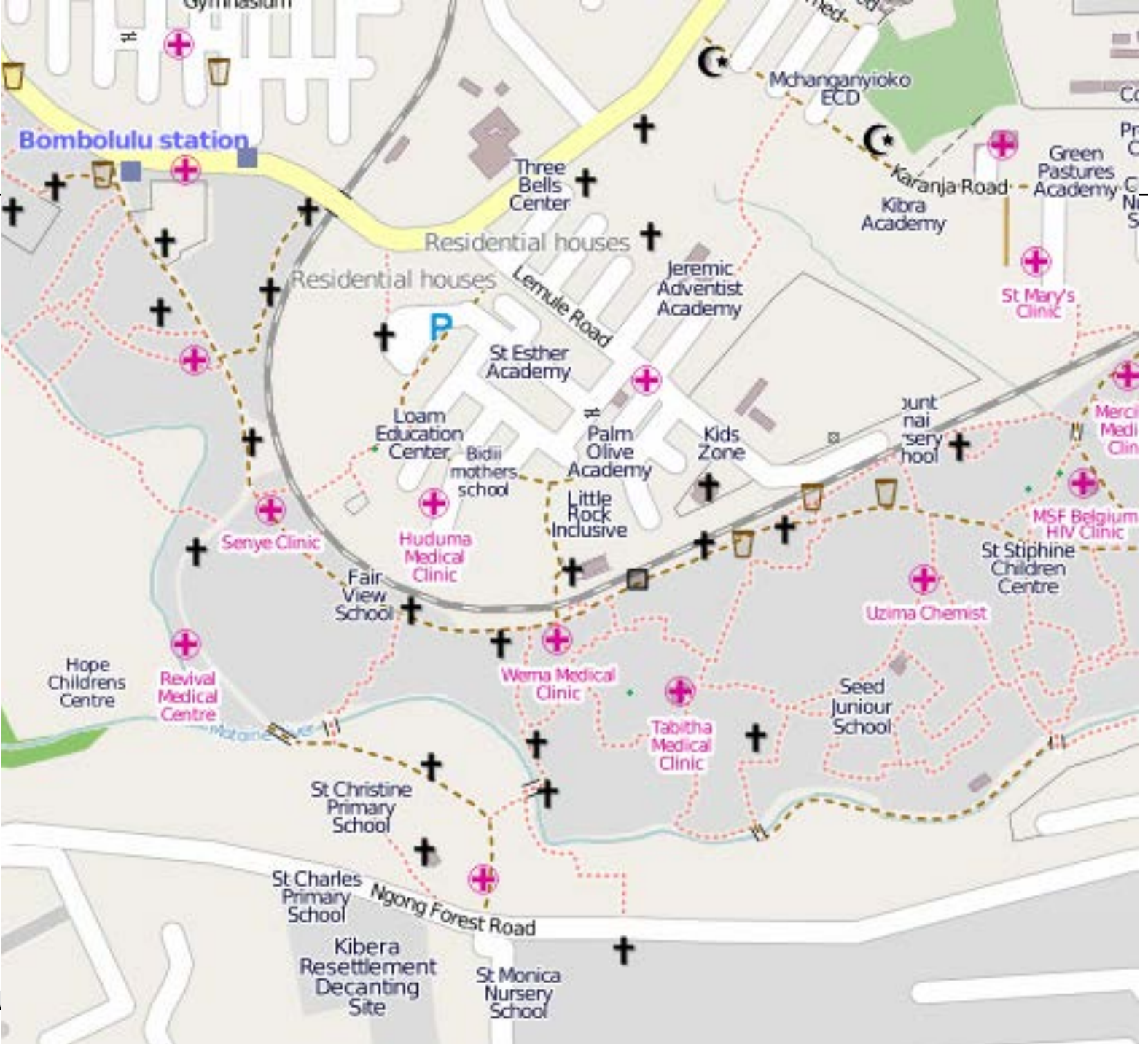
Discuss
on the [Google Group](#) and
[Facebook](#)

Download
get data

Contact
Want to learn more about
Map Kibera? Thinking
about doing similar work?

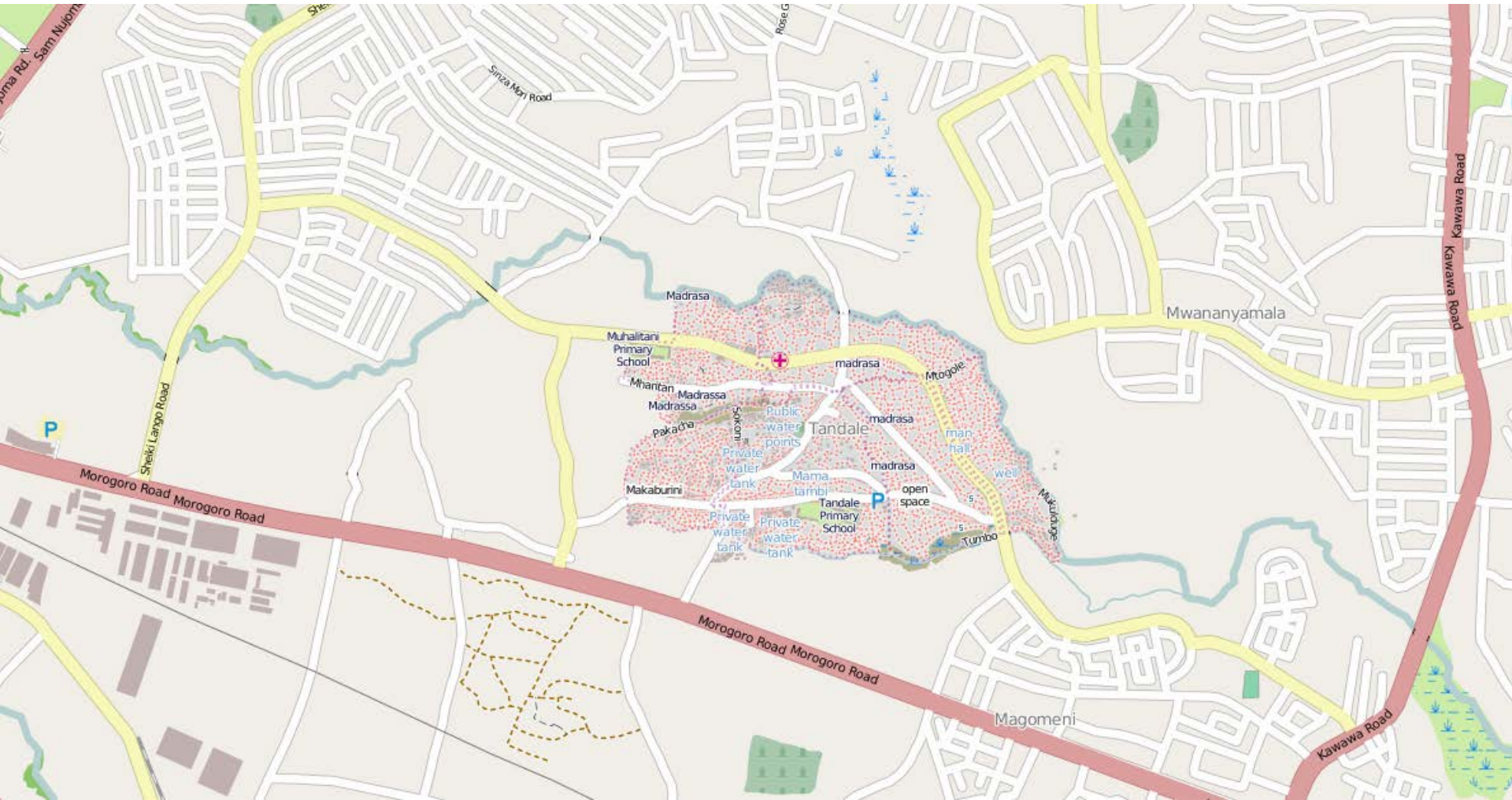
[mapkibera blog](#)



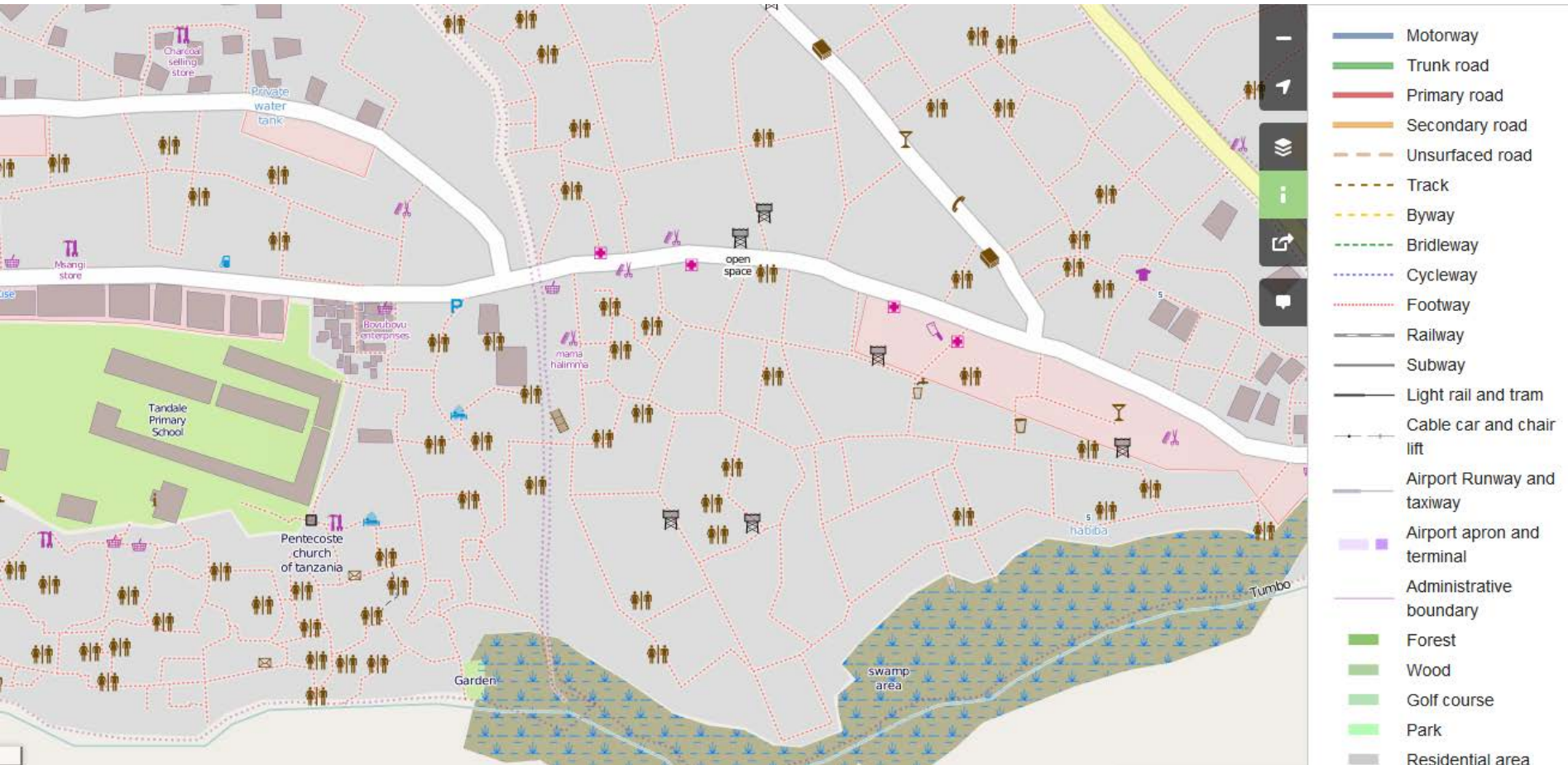


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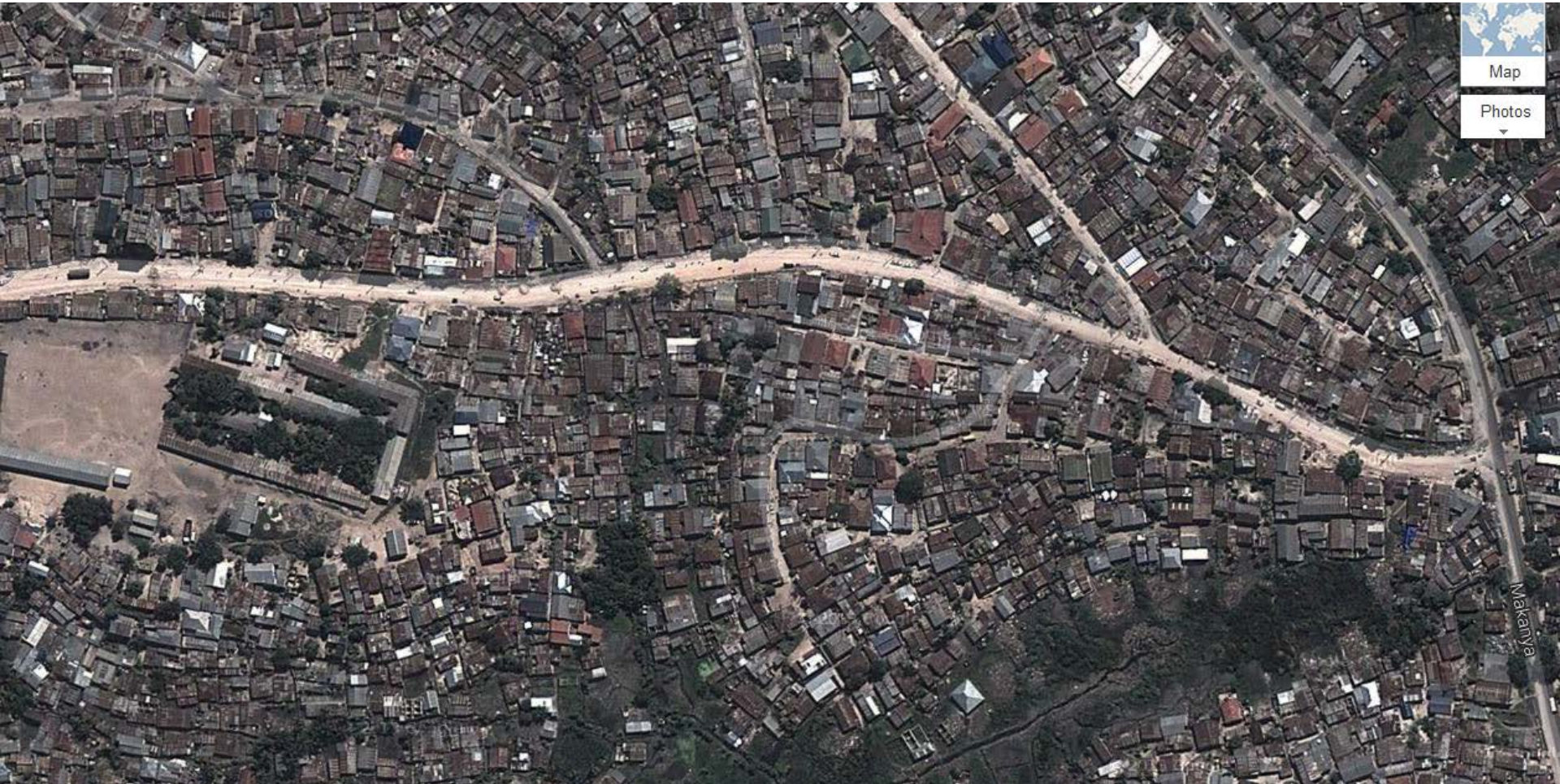
Open Street Map Tandale, Dar es Salaam Tanzania.



Tandale – detailed view 13 Nov 2013.



Google Earth: Tandale. Most objects and features have not been digitized on OSM in Tandale.



ARDHI Ministry, Tanzania DELINEATION AND DIGITISATION OF PROPERTIES FOR RESIDENTIAL LICENCING



CREATION OF DATABASE



Shape	Polygon
Pid	2/88
PARCELID	KND/MNY/KKP2/88
Wamiliki	Nicholaus Celestine Mtei
Municipali	KINONDONI
Location	KWAKOPA
Ward	MWANANYAMALA
Street	KWAKOPA
Proptaxno	MNY/KKP/20
Houseno	20
Plotdevelo	Jengo Kamilifu
Families	1
Occupants	8
Bedrooms	3
Incomeeam	1
Polutantas	Hapana
Residentst	Mwenye Nyumba
Lrentpermo	0.000000
Landuse	Biashara
Developmen	Jengo Kamilifu
Buildingsv	100000000.000000
Access	Barabara Kuu
Watersourc	Bomba Binafsi
Telephone	Ndiyo
Electricit	Ndiyo
Wastetreat	Zinazolewa na kampuni binafsi
Wastetreat	Zinazolewa na kampuni binafsi
Wastecostp	500.000000

RESIDENTIAL LICENSE

LAND Form N0.74

HALMASHAURI YA MANISPAA YA KINONDONI

SHERIA YA ARDHI YA 1999,
(NA 4 YA 1999)

LESENI YA MAKAZI NA. KND000001

(Chini ya fungu la 23&179)

Ardhi Na. KND/MZS/KMN5/36

Kata MANZESE

Mtaa KILIMANI

Makisio ya ukubwa wa Ardhi ni 340 m²

Halmashaari ya MANISPAA YA KINONDONI kwa leseni hii inatoa KIBALI
CHA MAKAZI kwa: Bibi WEMBO SHABANI MARIJANI

juu ya ardhi kama inavyofafanuliwa kwenye leseni hii kwa masharti
yafuatayo:

1. Muda wa leseni ni miezi/mwaka /miaka m/wili (2)
kuanzia tarehe 9 mwezi Mei mwaka 2005
hadi tarehe 8 mwezi Mei mwaka 2007
2. Kodi ya Ardhi ya shilingi 2,720,00 italipwa kila mwaka, chini ya
kifungu cha 23(3) (c). Kiwango hiki kinaweza kubadilishwa na
Kamishna wa Ardhi kwa mujibu wa Sheria.
3. Matumizi ni Makazi na shughuli nyingine zozote ambazo zinaendana
na makazi na hazitaathiri majirani kimazingira.
4. Ujenzi wowote juu ya ardhi hii au umegaji wa ardhi lazima upate
kibali cha Manispaa kupitia Kamati ya Mtaa ambayo ndiyo
itasimamia kwa karibu utekelezaji wa masharti haya na maendeleo
ya ardhi ya eneo hili.
5. Mmiliki/wamiliki wataheshimu na kuhifadhi haki za njia zilizopo.
6. Muda wa leseni hii unaweza kuongezwa.

Inetolewa leo tarehe 9 mwezi Mei mwaka 2005 na Halmashaari ya
MANISPAA YA KINONDONI.

Lalini/Mfaloni

Jina kamili

Saini.....

Cheo.....

Tarehe.....



Mmiliki/Wamiliki

Jina/Majina

Saini au Dole gumba

(1) Bibi WEMBO SHABANI MARIJANI

(2).....

3).....



IMENAJILIWA TAREHE SAA.....

MUHURI

Kuongeza Muda (Renewal) hadi tarehe:-

1.

2.

3.

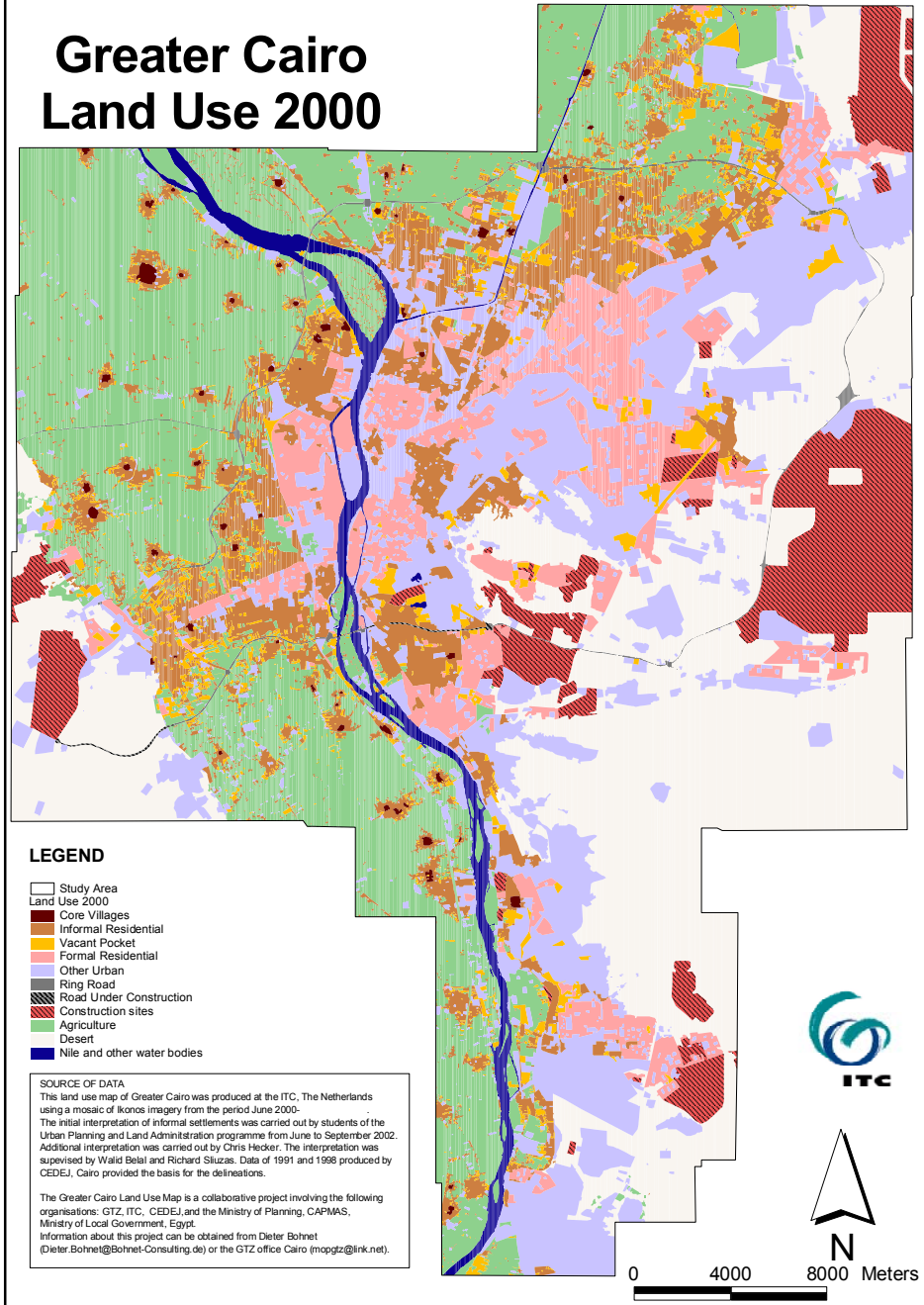
Main land use and informal settlement map Cairo 2000

Prepared from Ikonos satellite images

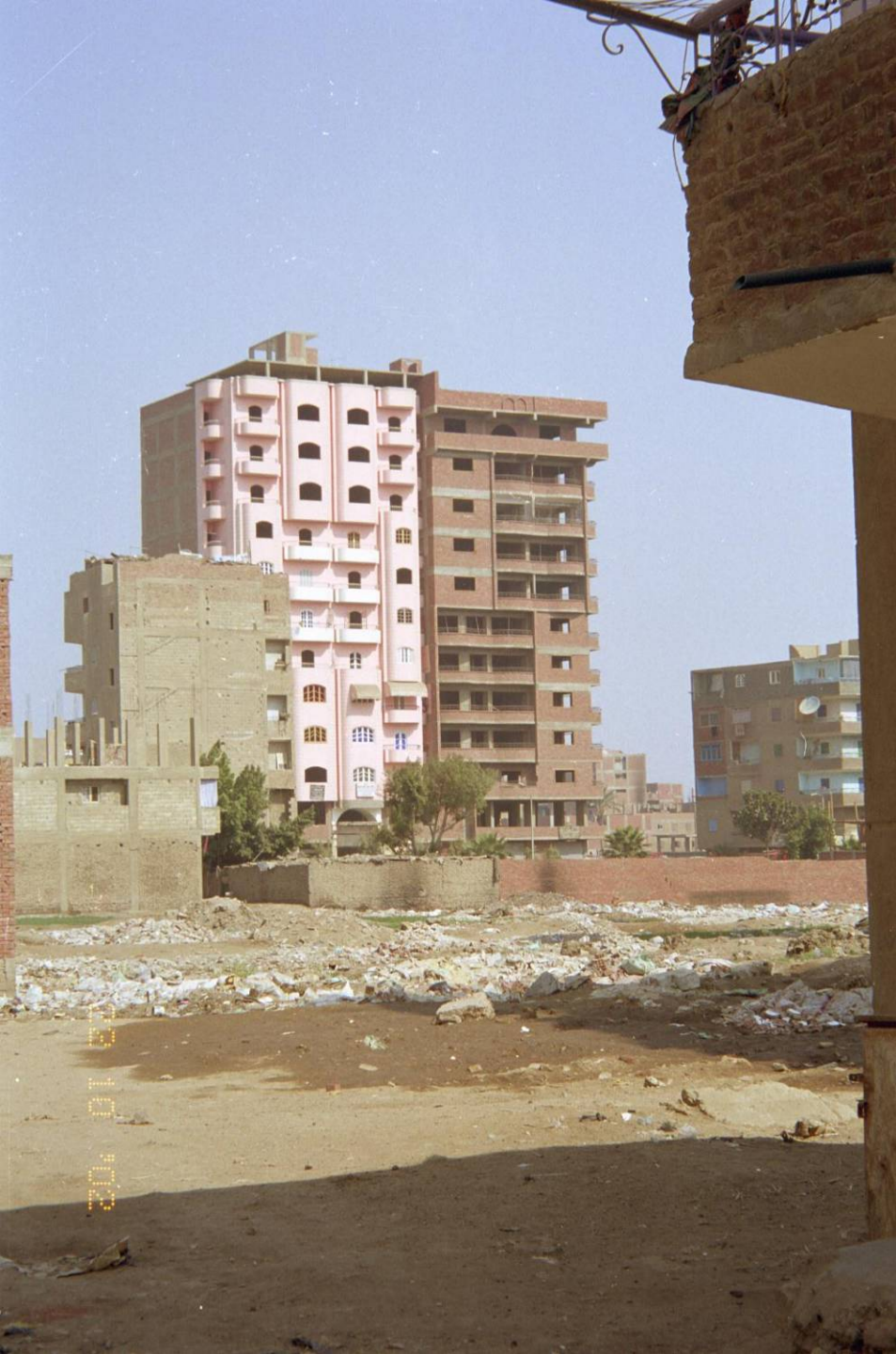
Partners:

- Ministry of Planning Egypt
- GTZ
- Governorates of Cairo
- CAPMAS

Greater Cairo Land Use 2000



UNIVERSITY OF TWENTE.

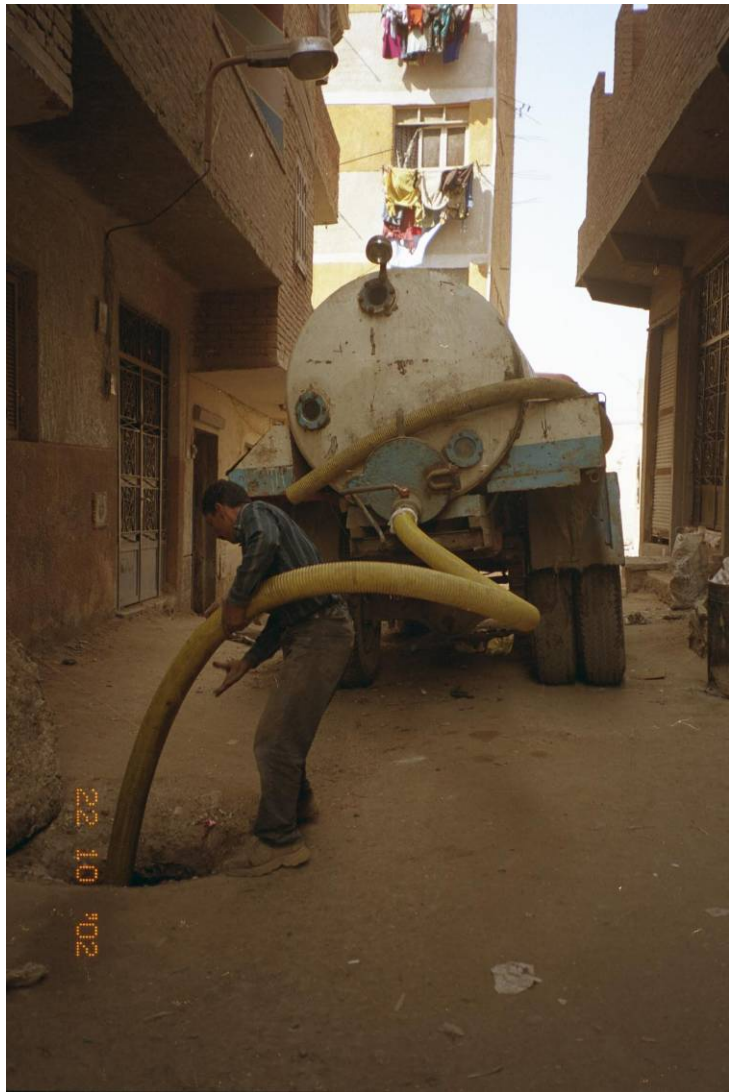


Examples from Cairo (Ikonos)

**Multi-storey high density informal development
without proper sanitation & services**



Former Agricultural land



**Cairo land use key
for Ikonos Interpretation
Rules and procedures for group interpretation
Training programme
Quality control**

