PEDAL CITY

ALTERNATIVE URBAN SYSTEM
OF MOBILITY AND ACCESSIBILITY TO URBAN SERVICES
FOR SELF-ORGANIZING ECONOMIC ACTIVITIES
IN SLUMS OF LUSAKA, ZAMBIA

ATSUFUMI YOKOI / 1339559

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THESIS FOR THE DEGREE OF MASTER OF SCIENCE

FACULTY OF ARCHITECTURE
TU DELFT / DELFT UNIVERSITY OF TECHNOLOGY
THE NETHERLANDS

27 JUNE 2008

PROBLEM FIELD: PRO-POOR GROWTH

SUSTAINABLE POVERTY REDUCTION **WITH RESPECT TO ECONOMIC GROWTH**
IN A DEVELOPING FRAGMENTED CITY:
TO ENABLE THE POORS TO ENJOY SELF-ORGANIZING ECONOMIC ACTIVITIES


FRAGMENTED CITY
UNSAFETY
FORMAL MARKETS
MULTI-STORY
SAFETY
ON FOOT
BY CAR
INFORMAL MARKETS
UNPAVED
PAVED
DUMPING
WASTE MANAGEMENT

OBJECTIVE / RESEARCH QUESTION:

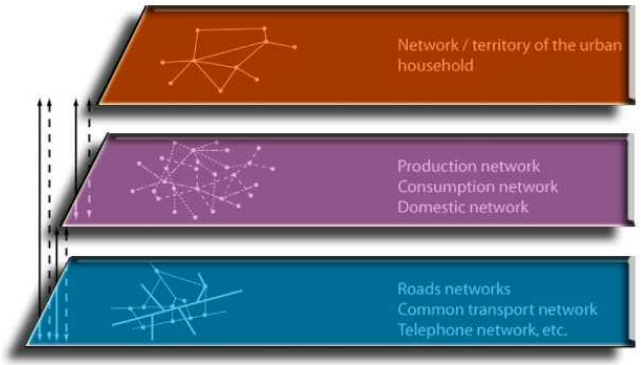
HOW CAN WE ENHANCE **MOBILITY & ACCESSIBILITY** TO URBAN SERVICES
IN SLUMS OF LUSAKA FOR THE PRO-POOR GROWTH
BY IMPLEMENTING **MINIMUM SPATIAL ELEMENTS?**

SUB-QUESTIONS:

HOW CAN WE ENHANCE THE POOR'S **MOBILITY** TO URBAN SERVICES? / MITIGATE THEIR **DAILY TRANSPORTATION TIME?**

HOW CAN WE ENHANCE THEIR **ACCESSIBILITY** TO **CURRENT** URBAN SERVICES? / RESPOND **LOCAL, SOCIAL NEEDS** FOR THEIR DAILY LIFE?

HOW CAN WE IMPROVE THE **ECONOMIC OPPORTUNITIES OF LUSAKA'S POOR** IN THE **FUTURE?** / RESPOND **GLOBAL, ECONOMIC NEEDS** FOR THE STATE?



3rd level: household
household in slums (women & youth)

2rd level: human activity network
future urban services: multi-purpose community telecentre
current urban services: water, market, clinic, school, administration

1st level: road network
bicycle network

DUPUY'S

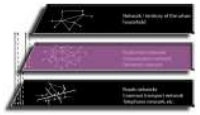
Dupuy's Layer Scheme:
A new opportunity of accessibility in a spatial complexity of slums
A new approach for an socio-spatial integral urban system

CHAPTER 1

1.1 Target group & area: Women & youths in slums
1.2 Social analysis on their mobility and current problems in their daily life

3rd level: household

Social analysis on the Poor's mobility related to their accessibility to current urban services



CHAPTER 2

2.1 Five types of current important urban services for women & youths
2.2 Analysis on their accessibility on the five types of urban services

2nd level: human activity network (current)

Spatial analysis on the Poor's accessibility to current urban services

CHAPTER 3

3.1 How to optimize bicycle routes in a spatial complexity of slums
3.2 How to create an integral bicycle network as a whole

1st level: road network (bicycle network)

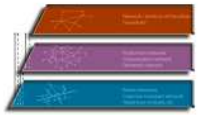
Creating an integral bicycle network in line with five types of current urban services

CHAPTER 4

4.1 How to design links of the bicycle network in detail
4.2 How to design potential nodes of the bicycle network in detail

2nd level: human activity network (future)
1st level: road network (bicycle network)

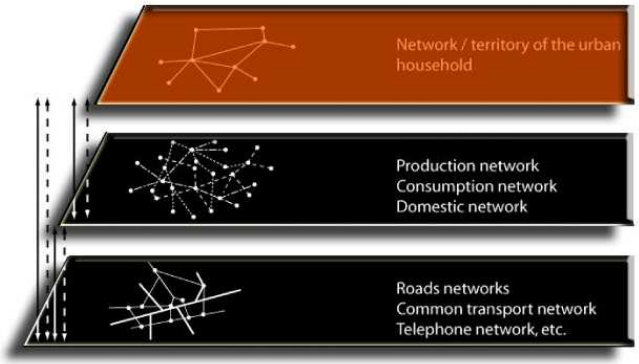
Testing to design links and potential nodes of an integral bicycle network



CHAPTER 5

5.1 How to define its hierarchy of the bicycle network
5.2 How to create a new urban system with future urban services

An alternative integral urban system with future urban services



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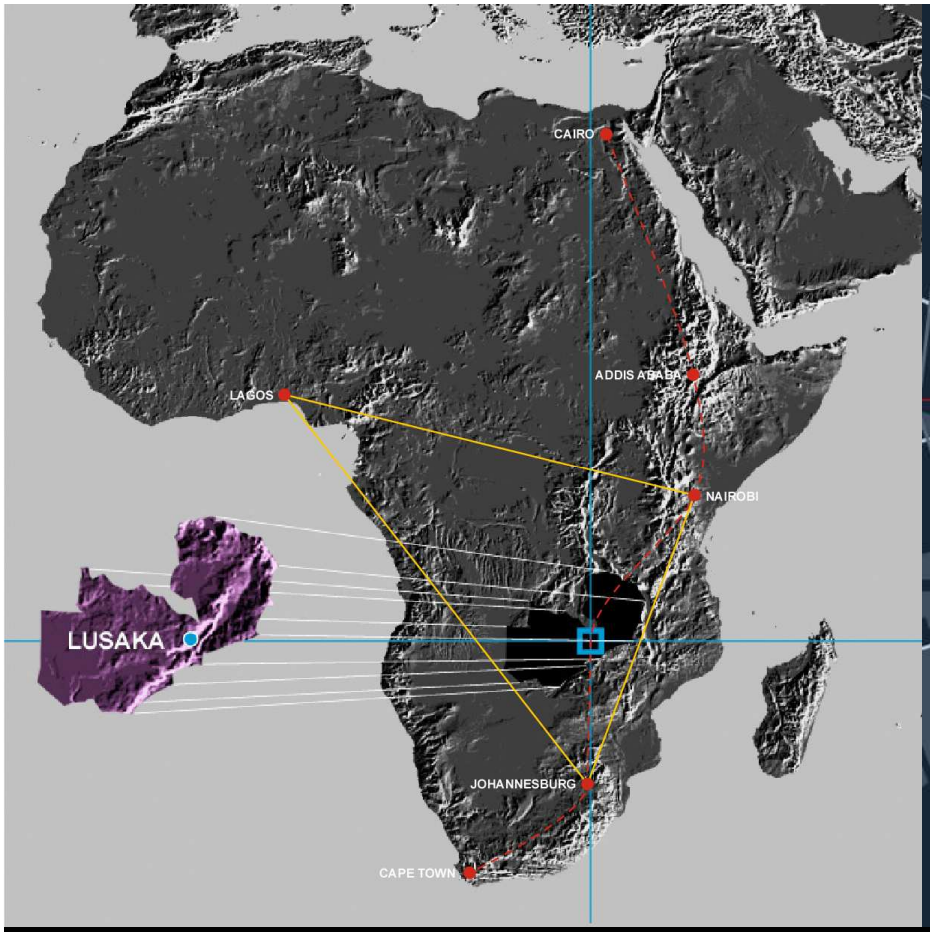
CITY PROFILE



STATUS: Capital City

INDEPENDENCE: 1964 (Established 1935)

AREA: 375 sq. km

ALTITUDE: 1,280 m, Flat land

DEMOCRACY: 1991 (Multiparty, Free trade)

GDP GROWTH: 4.3 %, $7 billion (2005)

IINDUSTRY: Manufacturing, Finance, Retail businesses, Education

POPULATION: 1,267,458 (2005), 32 % of the total urban population

POPULATION GROWTH RATE: 4 % (1994-2004)

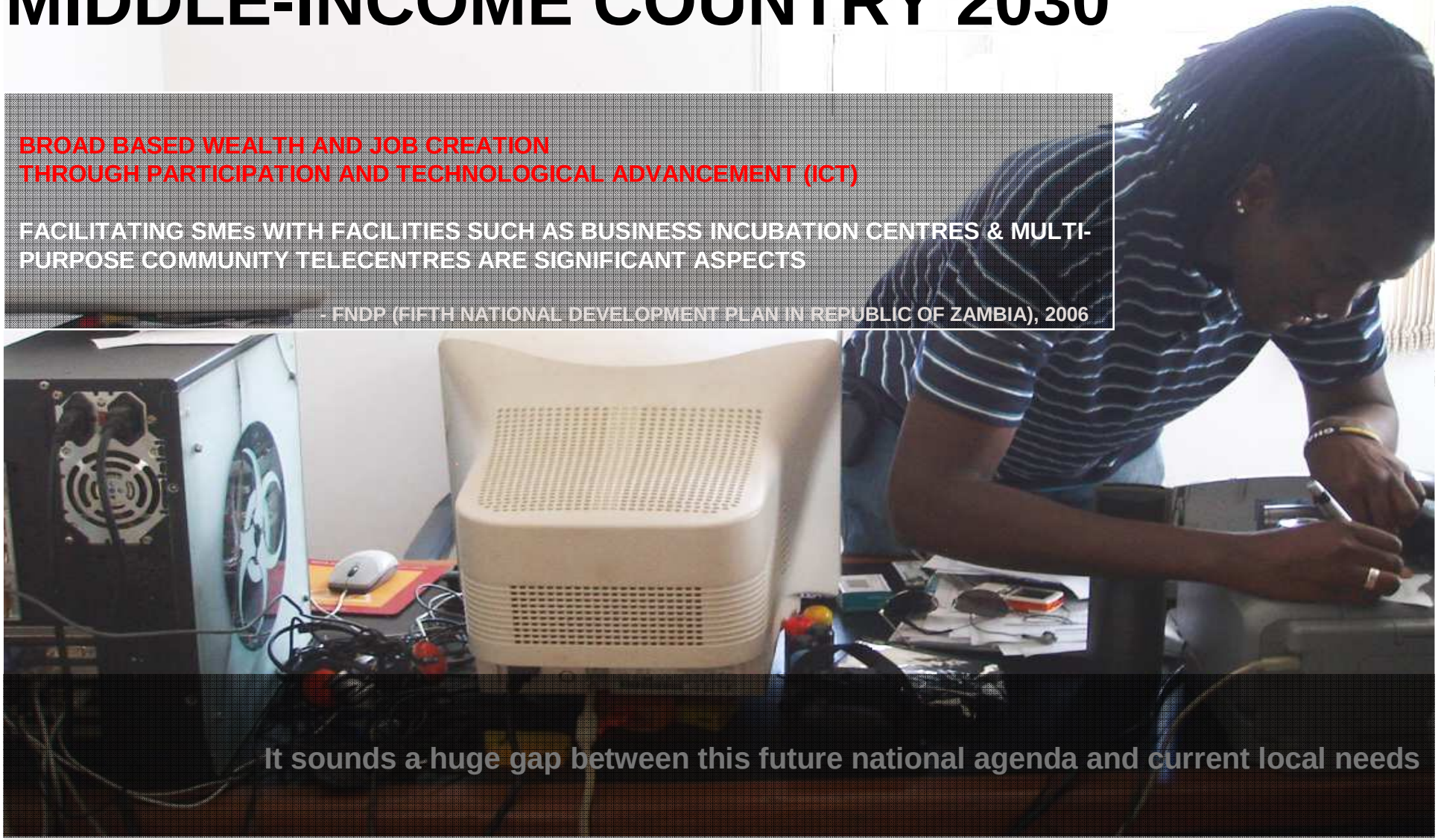
UNEMPLOYMENT: Male: 24.2%, Female 50.0 % (2000)

MIDDLE-INCOME COUNTRY 2030

BROAD BASED WEALTH AND JOB CREATION
THROUGH PARTICIPATION AND TECHNOLOGICAL ADVANCEMENT (ICT)

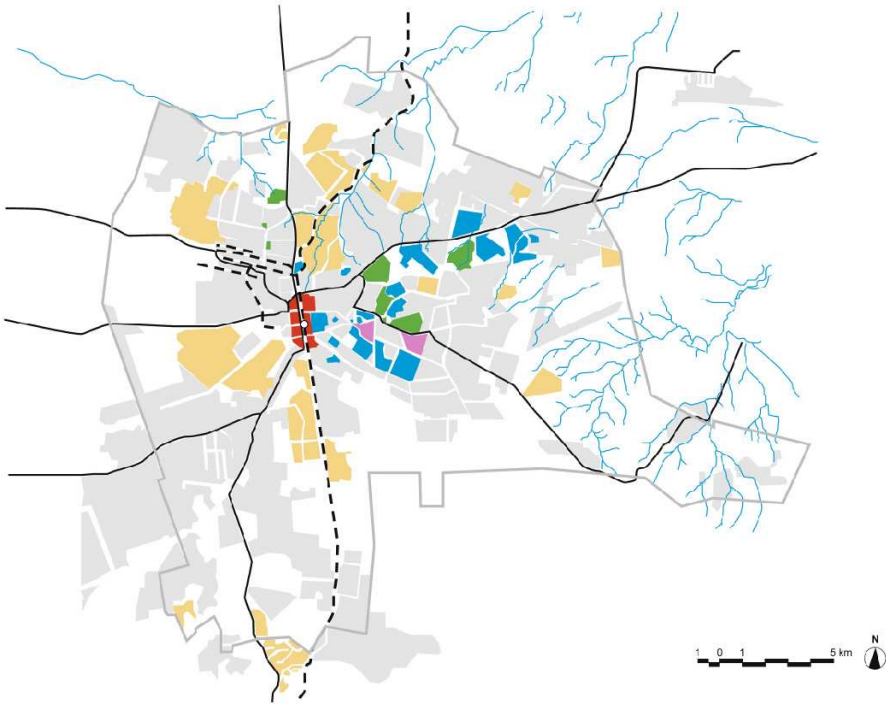
FACILITATING SMEs WITH FACILITIES SUCH AS BUSINESS INCUBATION CENTRES & MULTI-PURPOSE COMMUNITY TELECENTRES ARE SIGNIFICANT ASPECTS

- FNDP (FIFTH NATIONAL DEVELOPMENT PLAN IN REPUBLIC OF ZAMBIA), 2006

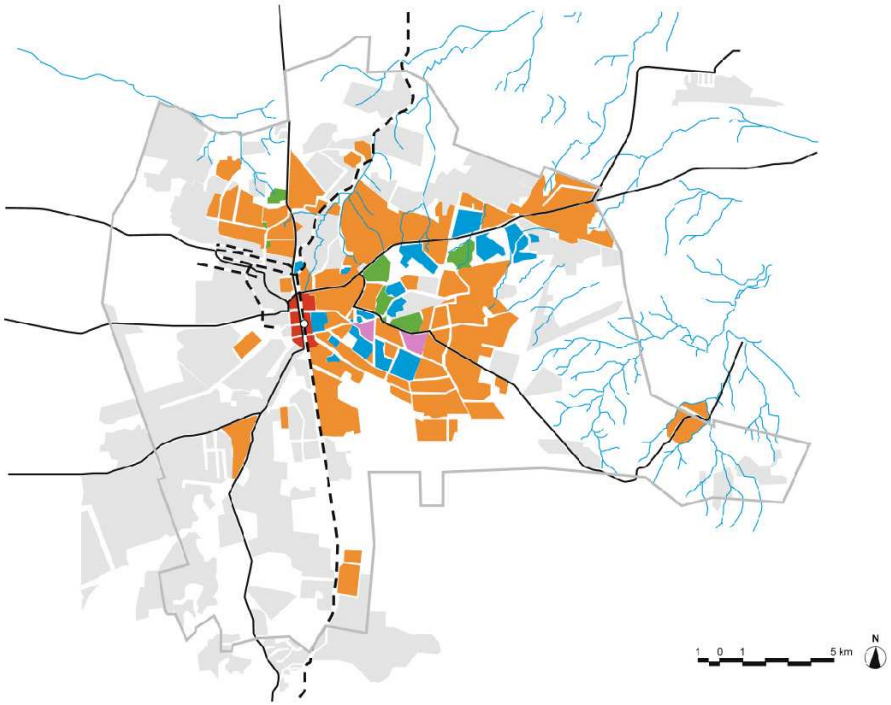


It sounds a huge gap between this future national agenda and current local needs

INFORMAL SETTLEMENT



FORMAL SETTLEMENT



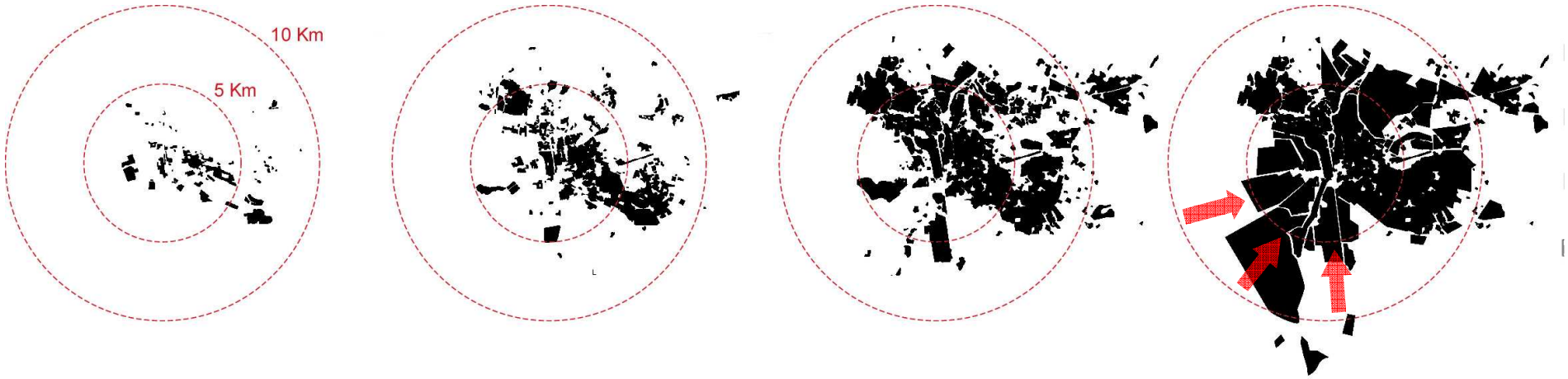
CBD
RAILWAY
ROAD
RIVER
BUILT-UP AREA

BUSINESS
RESIDENCE
INFORMAL SETTLEMENT
INDUSTRY
AGRICULTURE

INSTITUTION
RECREATION
ADMINISTRATION
AIRPORT
CEMESTRY

Spatial segregation between east and west
Most people living in Informal settlements are segregated from the main city functions in the east
They could hardly develop their own daily life

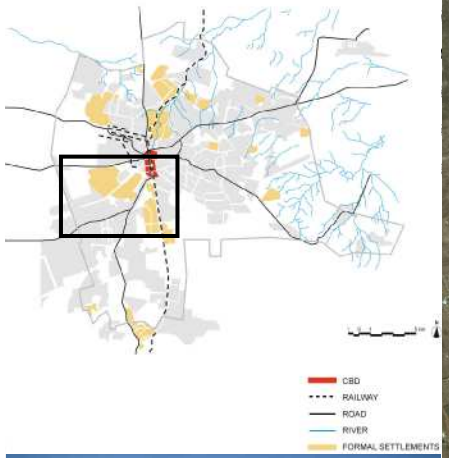
SOURCE: STATUS QUO 1999, P. 5, EDITED

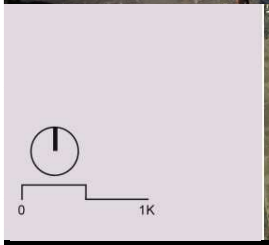


In addition, rapid urbanization with slums have been still ongoing, particularly, in the south-west Over 70 % of its population of Lusaka live in slums, most of whom are women and youth

SOURCE: WILLIAMS, J 1986, LUSAKA AND ITS ENVIRONS
ZAMBIA GEOGRAPHICAL ASSOCIATION HANDBOOK SERIES NO.9, LUSAKA, P. 141-6, EDITED

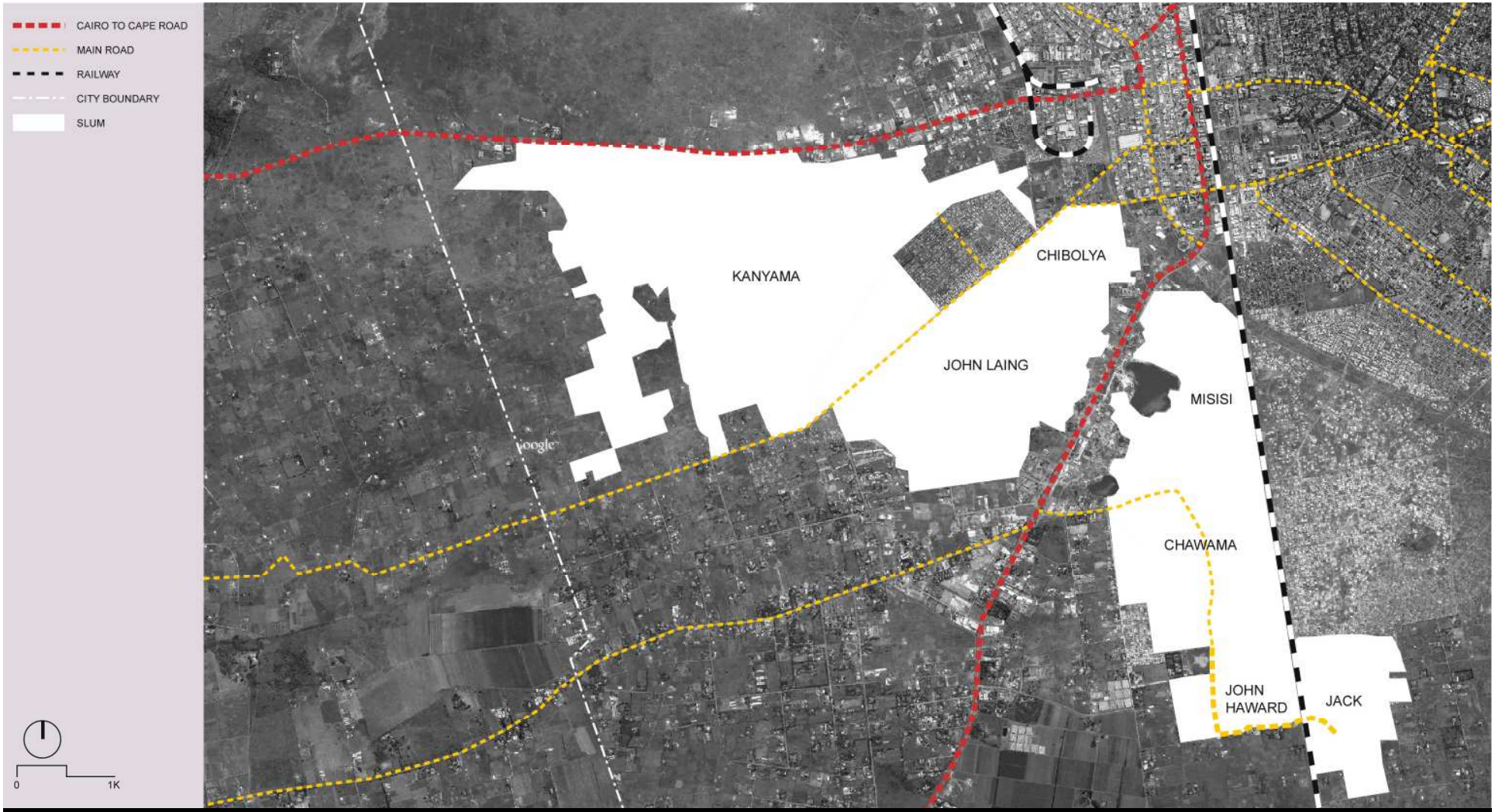
TARGET AREA





Most expanding slums in the city
Women and youth are flooding and stuck in these slums
They have suffered from socio-spatial segregation from main urban services in the east

CITY STRUCTURE IN THE AREA



Slums are located between fingers of a transport network plan
The total population is over 200,000, and its density is about 200 people / ha

LAND USE PLAN IN THE AREA

In particular, the slums are closed to commerce areas and CBD due to their significant workplaces

SOURCE: STATUS QUO 1999, P. 5, EDITED

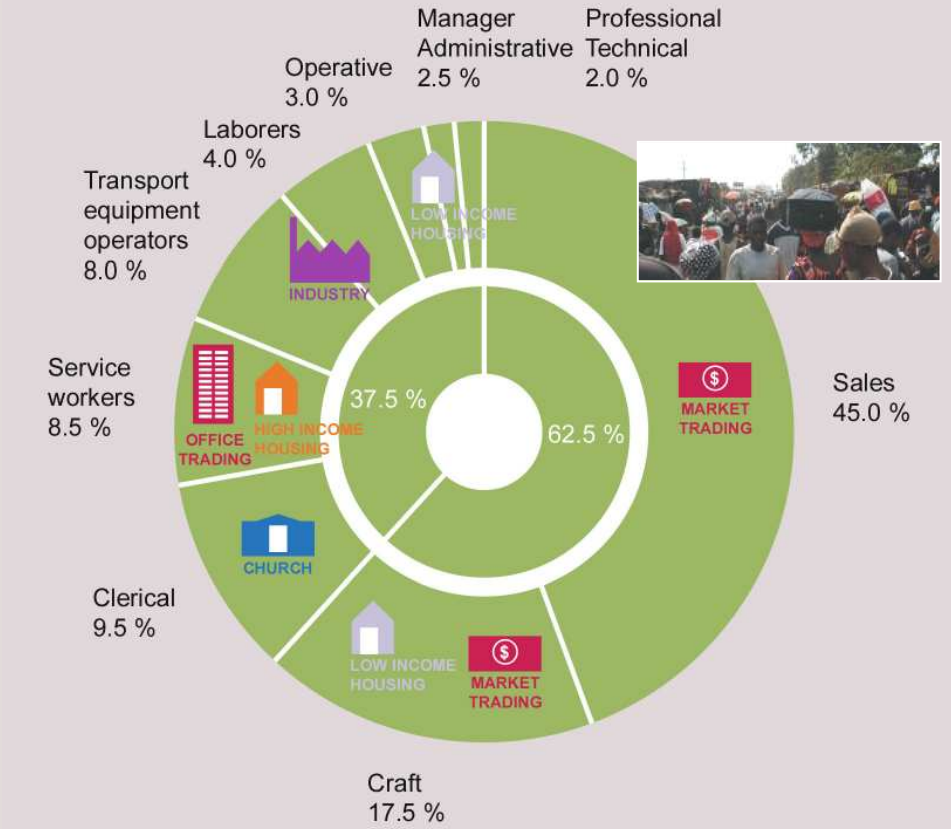
EMPLOYMENT STATUS & WORKPLACE OF THE POOR

EMPLOYMENT AND UNEMPLOYMENT IN SLUMS (CHAWAMA), 1992

	1978	1992
EMPLOYMENT RATE	46.5%	49.9
UNEMPLOYMENT RATE	53.5	50.1

FORMAL AND INFORMAL SECTORS IN SLUMS (CHAWAMA), 1992

	1978	1992
FORMAL	81.2%	47.9
INFORMAL	18.8	52.1



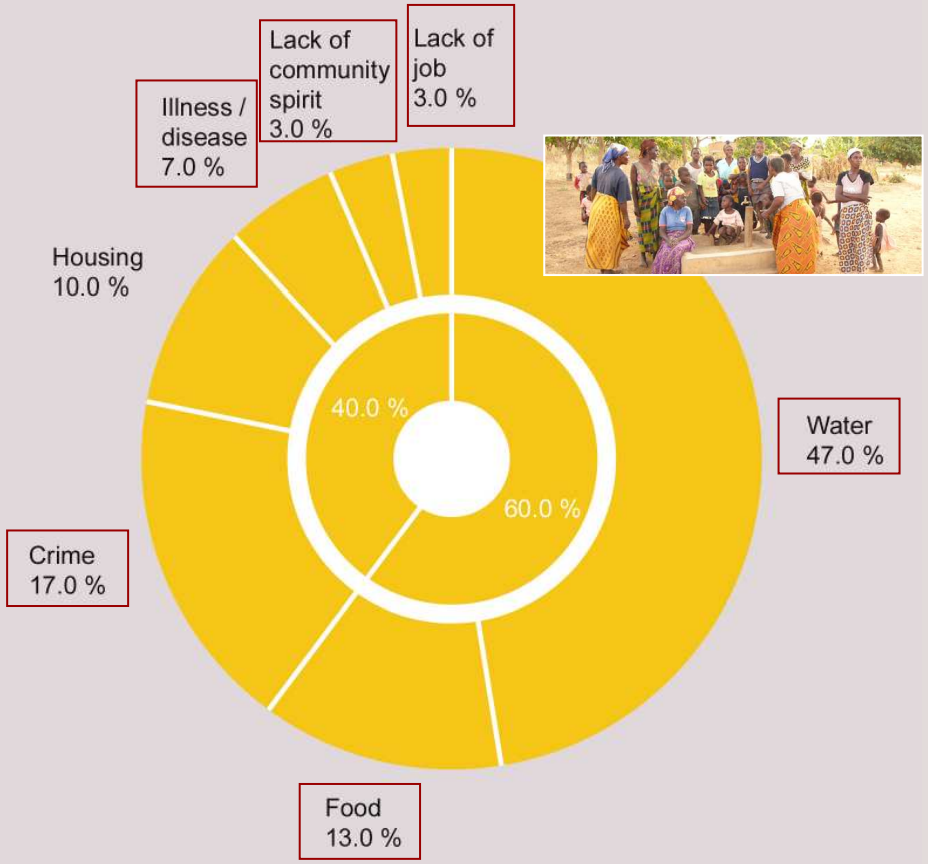
Employment by Occupational Group and Location to Work

In fact, Sales and craft are very popular occupations because the Poor's easily work in home
To sell their products, market areas are crucial workplaces for slum dwellers

SOURCE:WORLD BANK 1997, HOUSEHOLD RESPONSES TO POVERTY AND VULNEDRABILITY
:WORLD BANK 2006, ZAMBIA DATA PROFILE

WOMEN'S PERCEPTIONS OF PRIORITY PROBLEMS IN SLUMS

Ownership of Consumer Durables

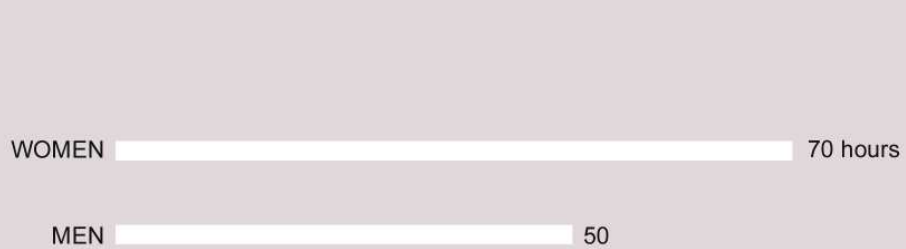


Women's Perceptions of Priority Problems

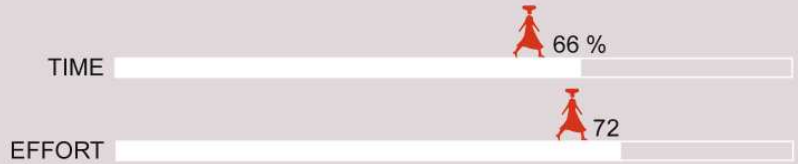
Most of their social problems are strongly related to bad mobility and accessibility
Due to long travel to get water, foods or coals by walking, women are scared to crime
Because of bad mobility, women cannot often go to clinics and community forums without their free time
Also, most women and youths cannot continue their education, which causes lack of jobs

SOURCE:WORLD BANK 1997, HOUSEHOLD RESPONSES TO POVERTY AND VULNEDRABILITY: WORLD BANK 2006, ZAMBIA DATA PROFILE

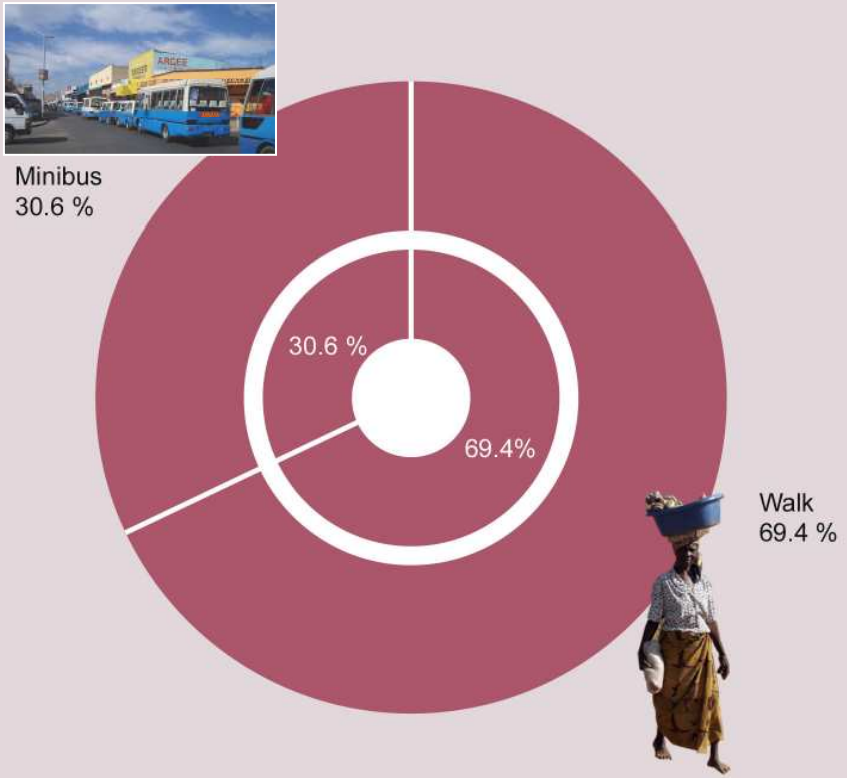
MODE OF ACCESS TO URBAN SERVICES



WOMEN WORK (HOURS / WEEK), CHAWAMA, LUSAKA 1992



WOMEN'S TIME & EFFORT OF TRANSPORT (%), ZAMBIA 1994

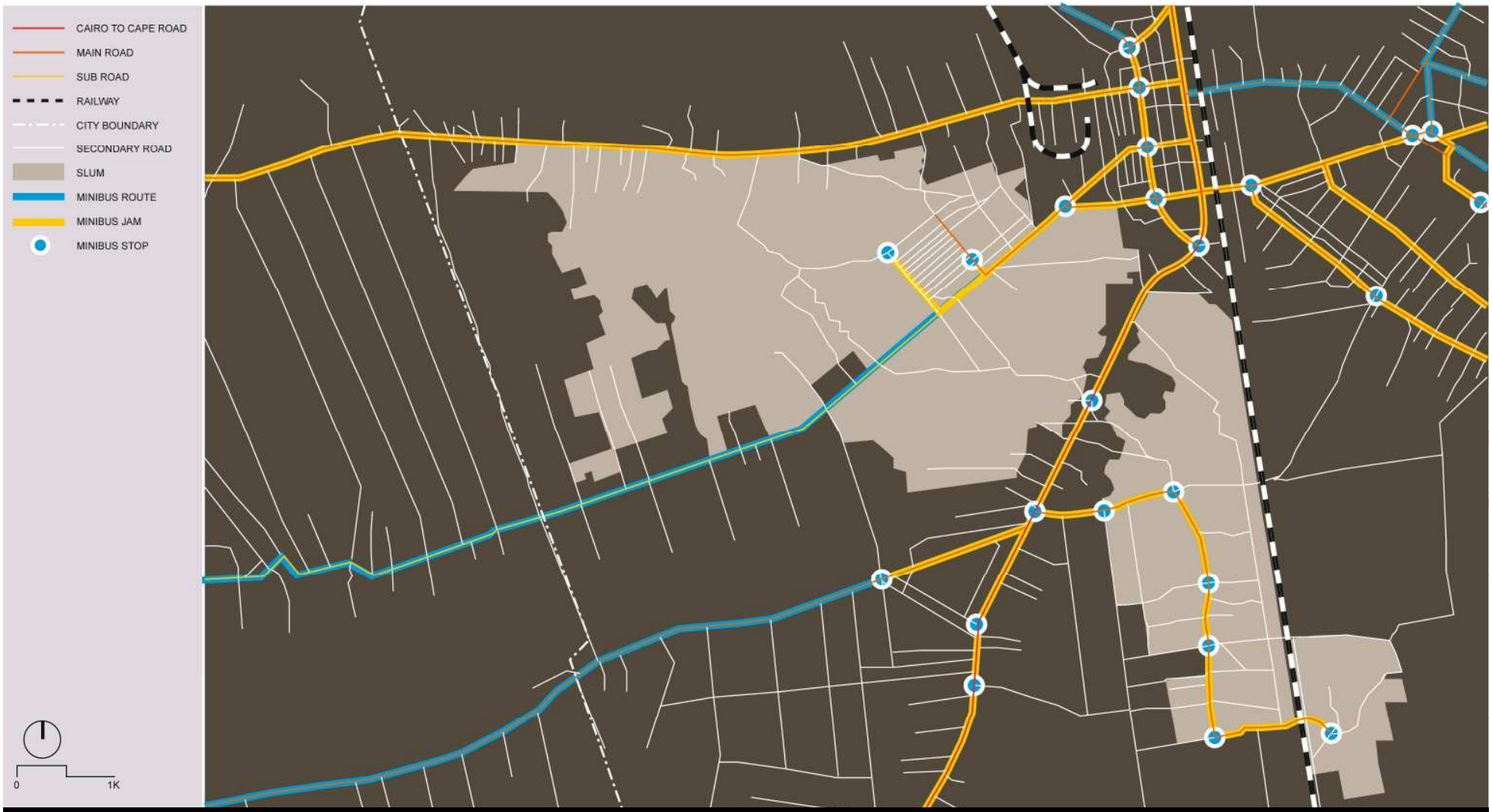


Access to Economic and Social Infra:Transportation

Walking is the major mode of their daily trip
Women are under heavy demands on their daily domestic transport requirements
As a result, this trend seriously affects women's mobility to access socio-economic activities

SOURCE:WORLD BANK 1997, HOUSEHOLD RESPONSES TO POVERTY AND VULNEDRABILITY
:WORLD BANK 2006, ZAMBIA DATA PROFILE

MINIBUS ROUTE & JAM



Too expensive to use it daily for the Poor's
Traffic jams have been brought in the slums areas, which is not a faster mode than expected
Women and youths for their daily trips would become vulnerable than ever

SOURCE: STATUS QUO 1999, P. 55, EDITED

DONATE BICYCLES TO VULNERABLE HOUSEHOLDS IN LUSAKA

Lately, 23,000 bicycles will be provided to vulnerable households in Lusaka
Because of a totally flat land of Lusaka, bicycles have been working out for their mobility
But, without bicycle infrastructure, this trend will create another problem such as traffic accidents
Gender sensitive infrastructure services are urgent issues for the Poor

SOURCE: WBR OFFICIAL WEBSITE, www.worldbicyclerelief.org

OBJECTIVE / RESEARCH QUESTION:

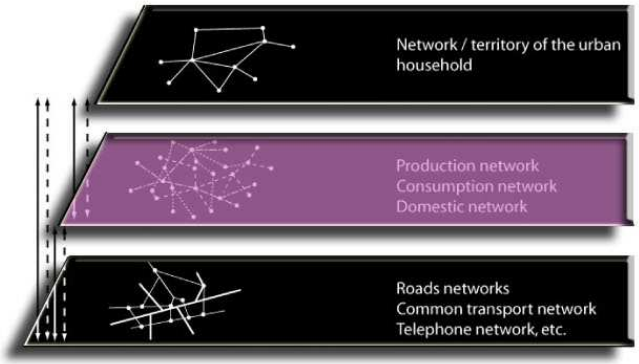
HOW CAN WE ENHANCE **MOBILITY & ACCESSIBILITY** TO URBAN SERVICES IN SLUM AREAS OF LUSAKA FOR PRO-POOR GROWTH?

HYPOTHESIS:

AN ALTERNATIVE URBAN SYSTEM OF MOBILITY & ACCESSIBILITY
TO CURRENT & FUTURE URBAN SERVICES:

POLYCENTRIC INTEGRAL BICYCLE NETWORK

COULD BECOME A PARAMOUNT STRUCTURE IN SLUMS
FOR PRO-POOR GROWTH



3rd level: household

household in slums (women & youth)

2rd level: human activity network

future urban services: multi-purpose community telecentre

current urban services: water, market, clinic, school, administration

1st level: road network

bicycle network

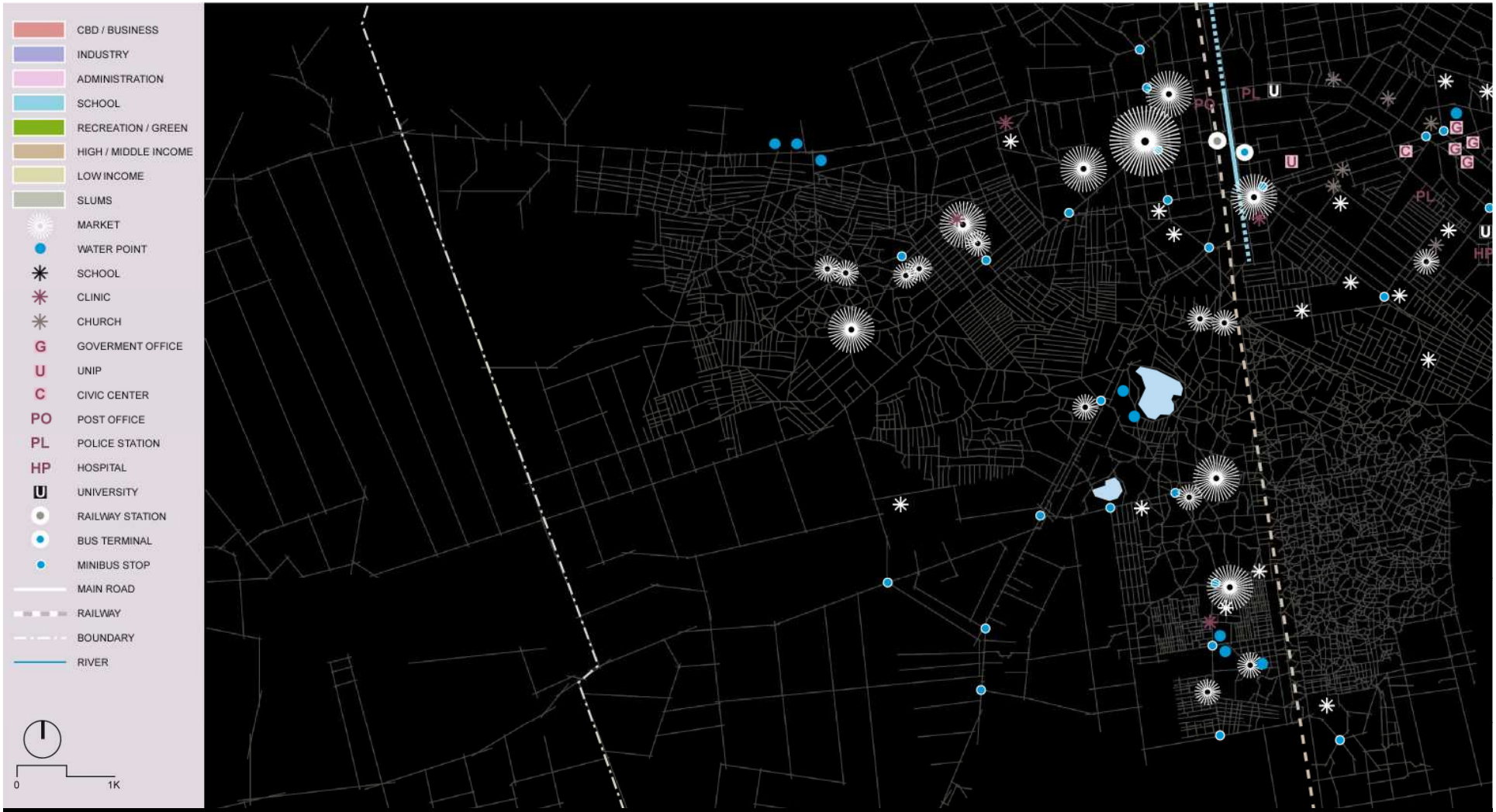
Spatial analysis on the Poor's accessibility to current urban services

CHAPTER 2

2.1 Five types of current important urban services for women and youths in slums

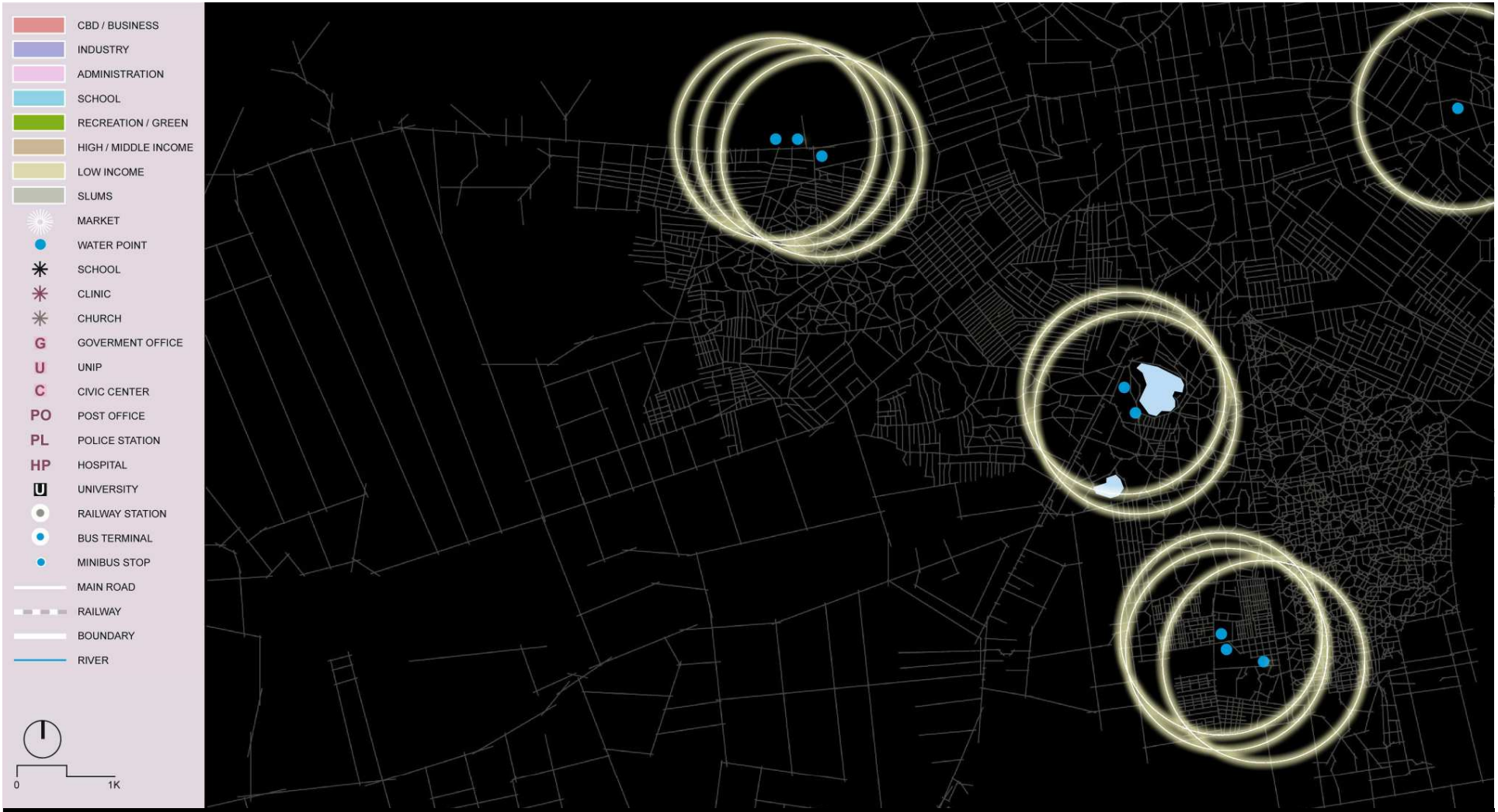
2.2 Spatial analysis on their accessibility on the five types of current urban services

DESTINATIONS TO DECIDE BICYCLE ROUTES



Based on the social analysis on the Poor, five types of urban services are selected as destinations: Water resource point, market, clinic, school and administrative point

DESTINATION 1: WATER RESOURCE POINT (R=15 MINUTES BY WALKING)



15 minutes by walking doesn't cover a whole of area

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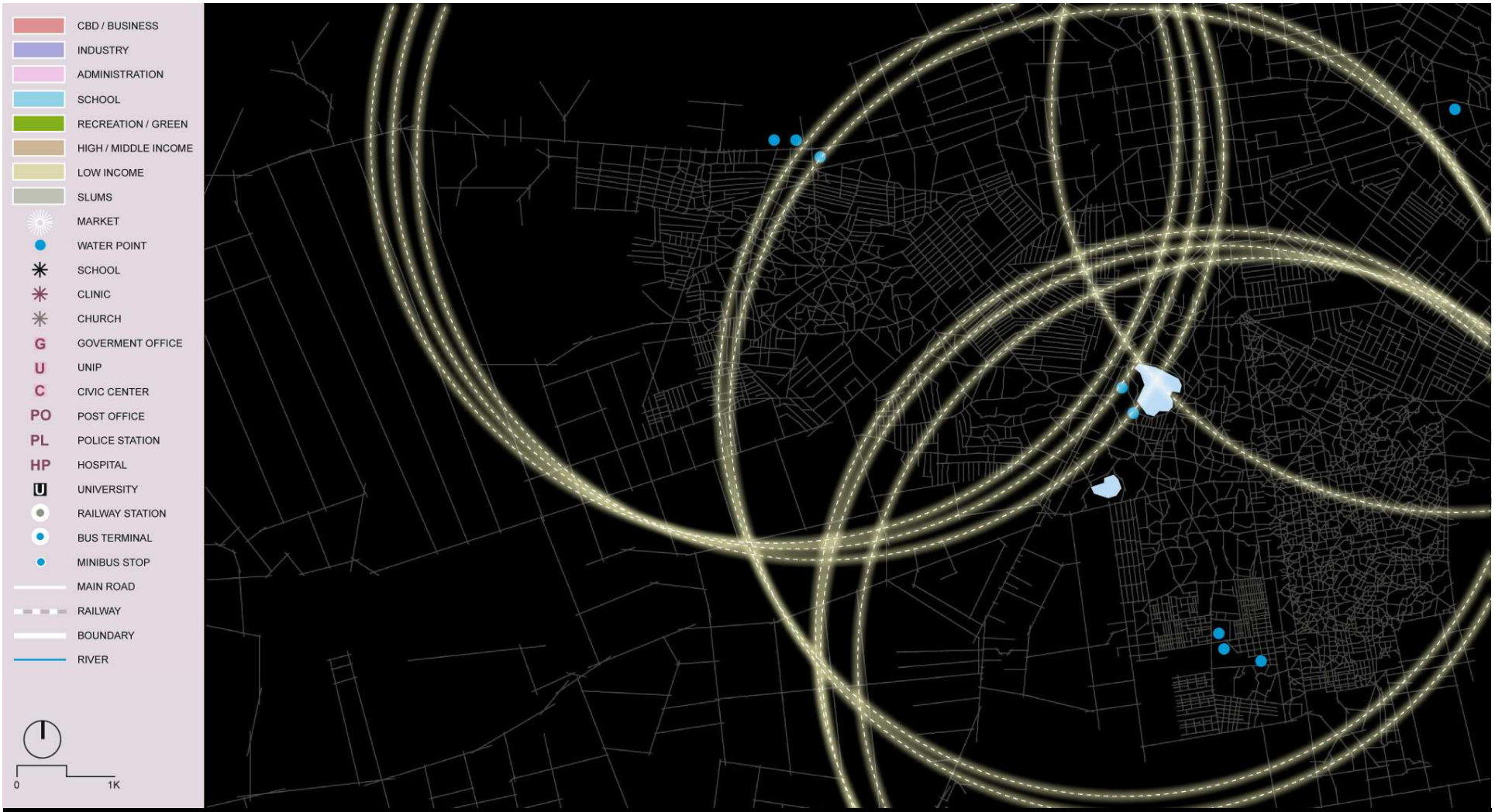
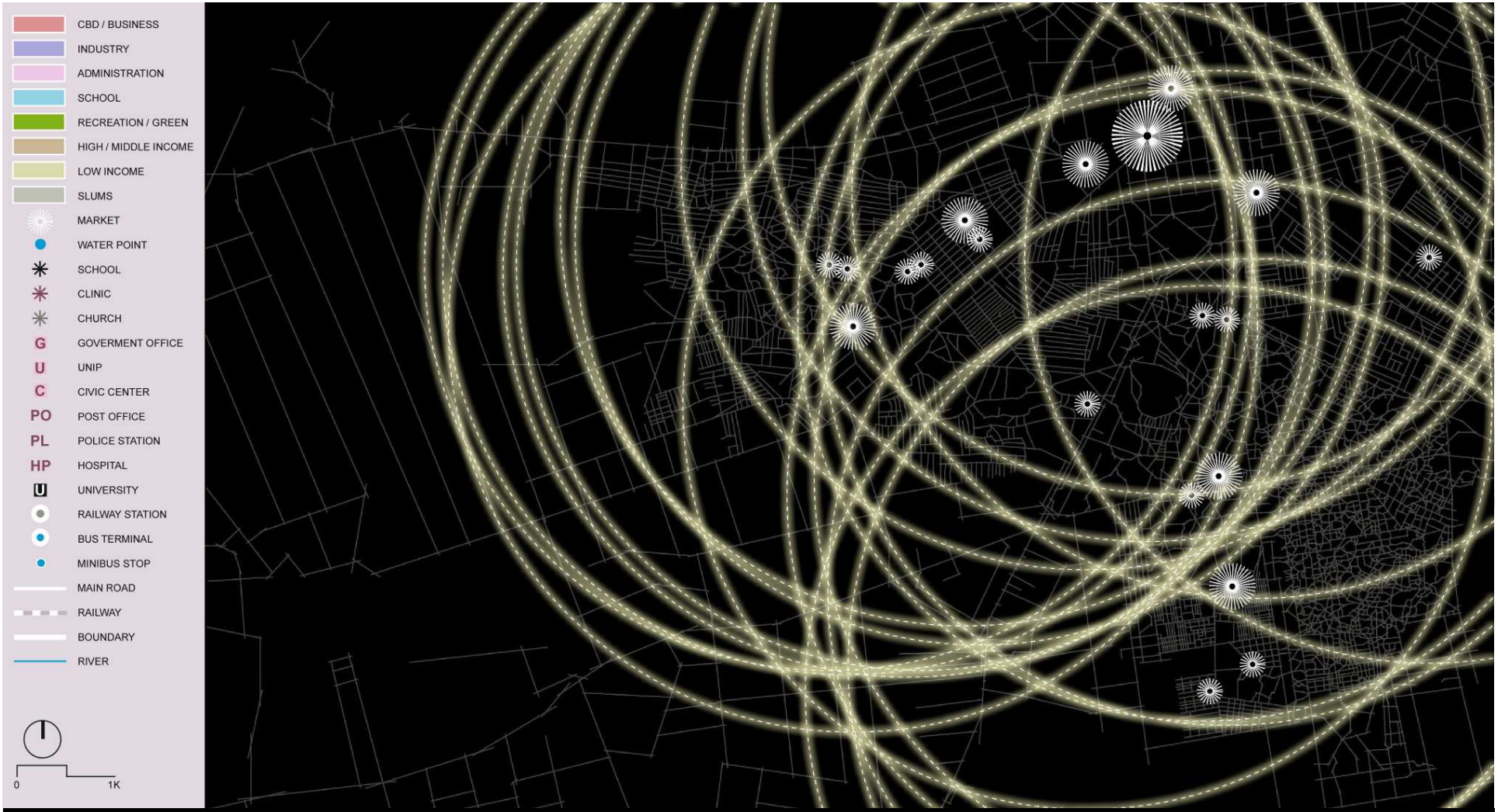


15 minutes by bicycle could cover a whole of area
Its capacity could be double or three times by using bicycle

DESTINATION 2: MARKET (R=15 MINUTES BY WALKING)

15 minutes by walking doesn't cover a whole of area

DESTINATION 2: MARKET (R=15 MINUTES BY BICYCLE)



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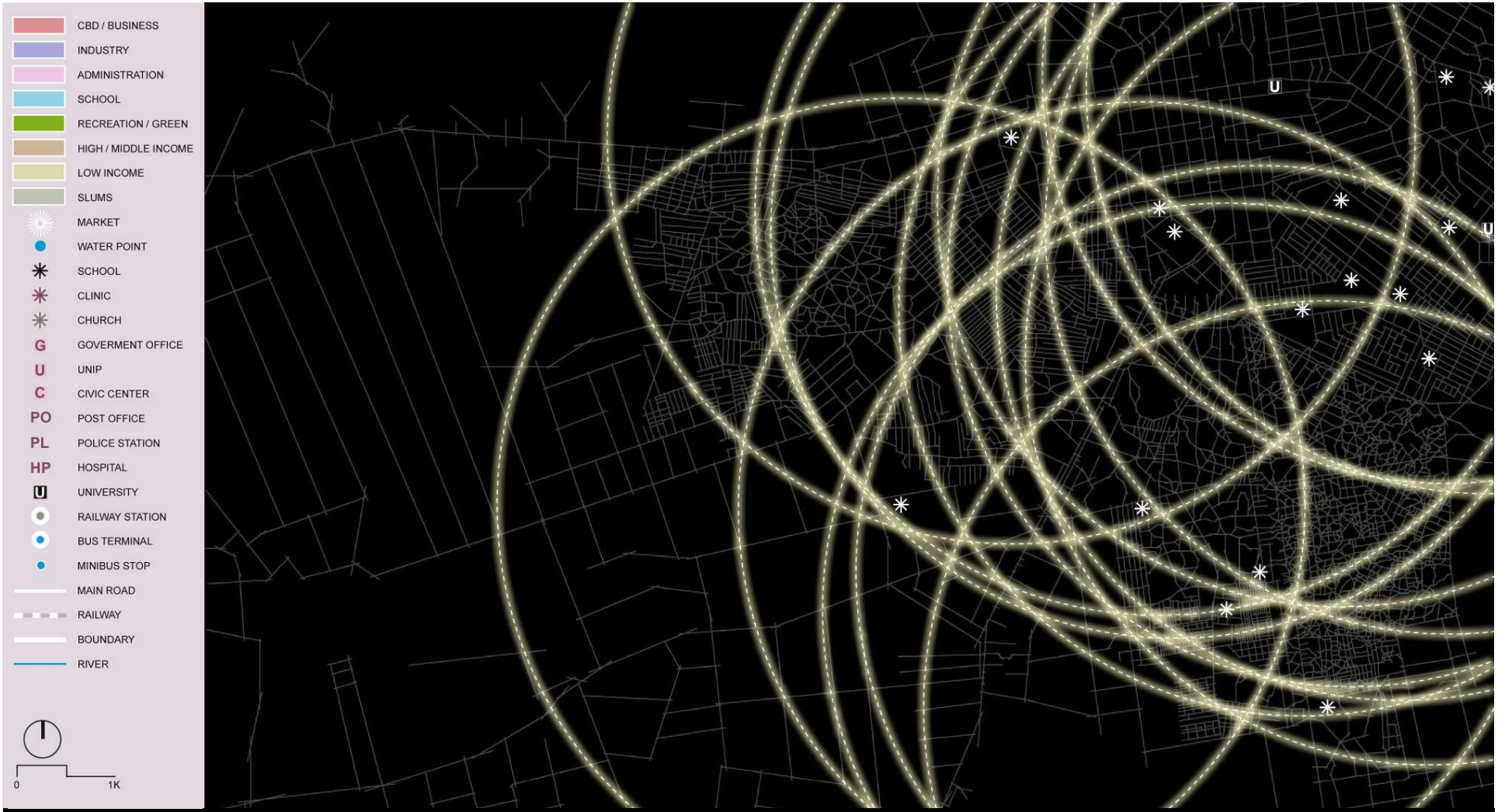
DESTINATION 3: SCHOOL (R=15 MINUTES BY WALKING)

15 minutes by walking doesn't cover a whole of area

DESTINATION 3: SCHOOL (R=15 MINUTES BY BICYCLE)



15 minutes by bicycle could cover a whole of area
Its capacity could be double or three times by using bicycle

DESTINATION 4: CLINIC (R=15 MINUTES BY WALKING)

15 minutes by walking doesn't cover a whole of area

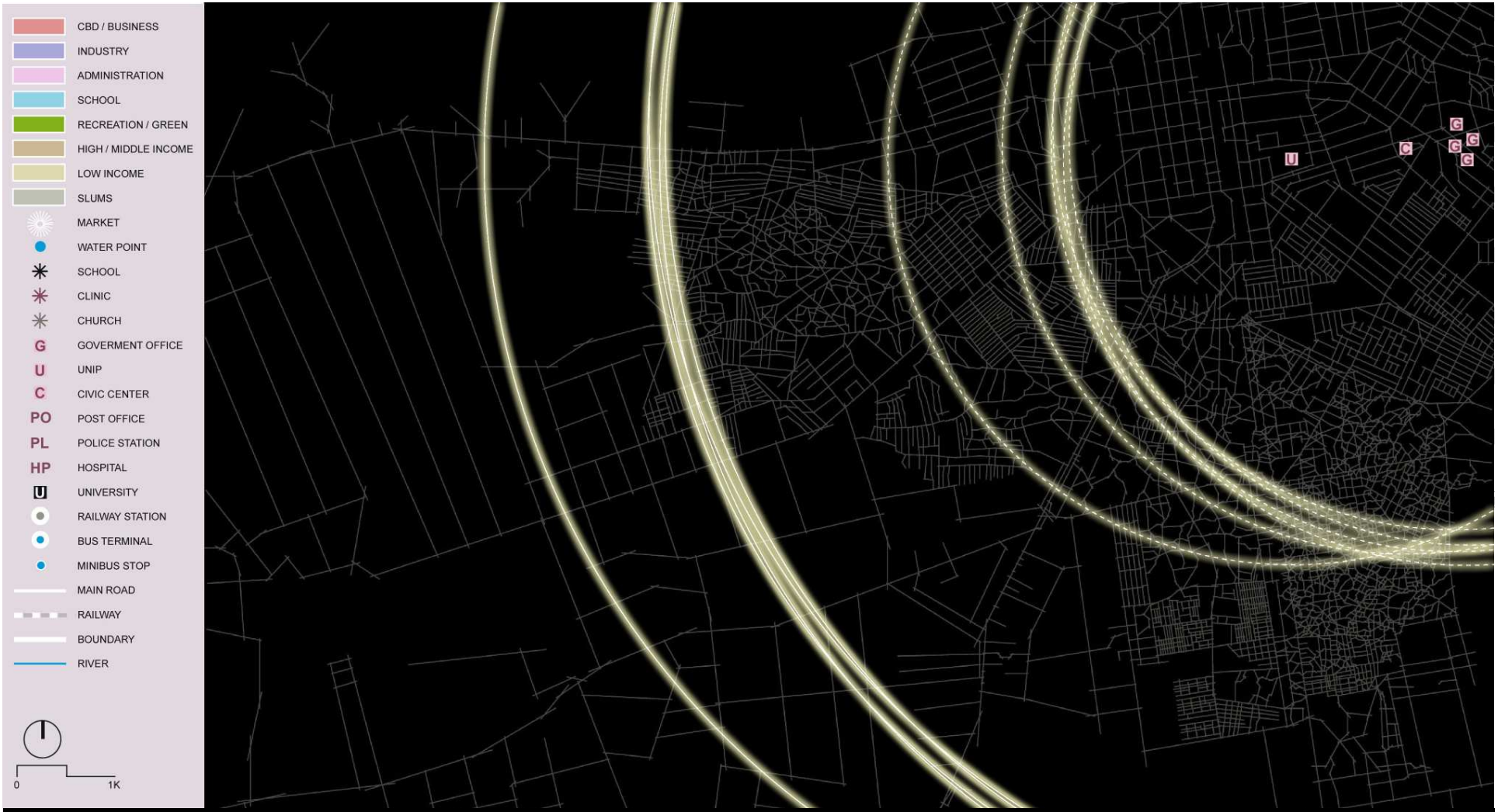
DESTINATION 4: CLINIC (R=15 MINUTES BY BICYCLE)

15 minutes by bicycle could cover a whole of area
Its capacity could be double or three times by using bicycle

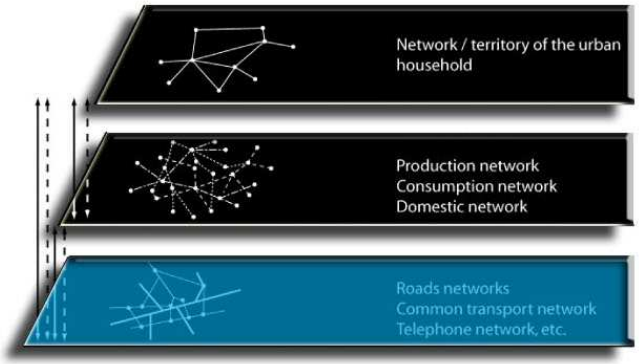
DESTINATION 5: ADMINISTRATIVE POINT (R=15 MINUTES BY WALKING)

15 minutes by walking doesn't cover a whole of area

DESTINATION 5: ADMINISTRATIVE POINT (R=15 MINUTES BY BICYCLE)



15 minutes and 30 minutes by bicycle could cover a whole of area
Because the Poors do not always access to the administrative points daily, 30 minutes by bicycle could be relevant for their accessibility and mobility



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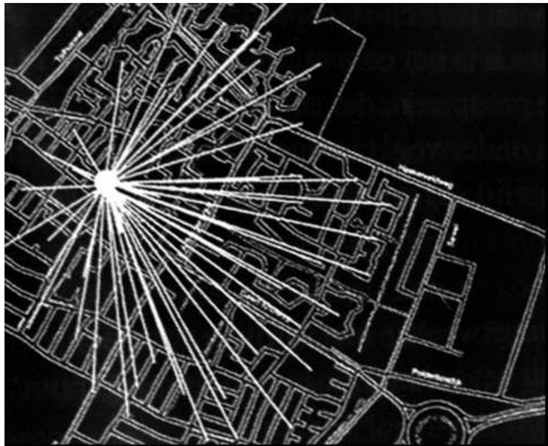
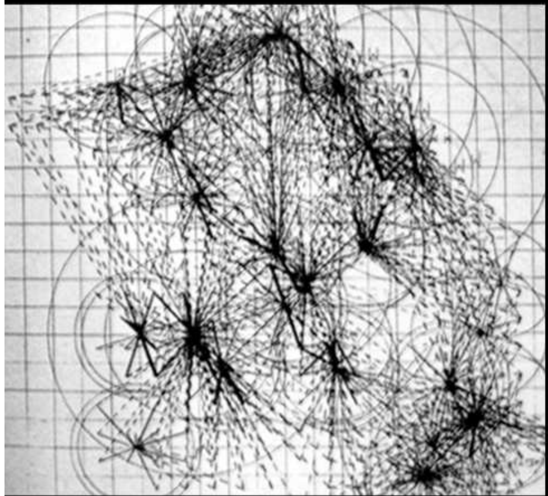


Star Analysis

[Radial patterns for cyclists and pedestrians]

Star Analysis by Bach en Diepens (1988) of potential slow traffic relations in Joure (the Netherlands).

Most cyclists and pedestrians likely take a shortest path or a short cut toward their destinations which means that their mobility patterns would become a star-shape. In this star analysis, it revealed a negligible difference between the generated star-shaped patterns of mobility requirements and real mobility patterns.

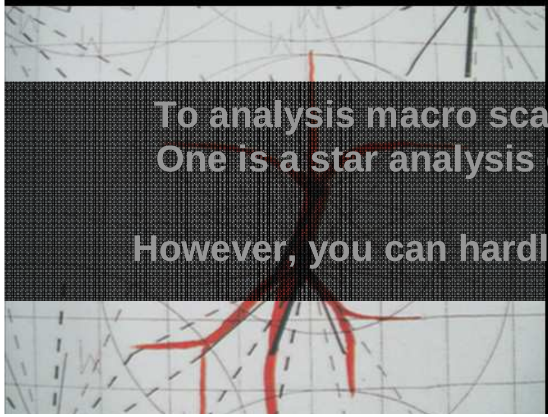


Star Network

[Relationships between low traffic routes and destinations]

Star analysis by Bak and Blom (1982) for Soest and other towns (the Netherlands).

Star-shaped patterns are strongly interconnected one to another in line with destinations, and bocome more dense of patterns in a town scale. In short, a partialy radial network near key destinations is more suitable which creates a star network as a whole.

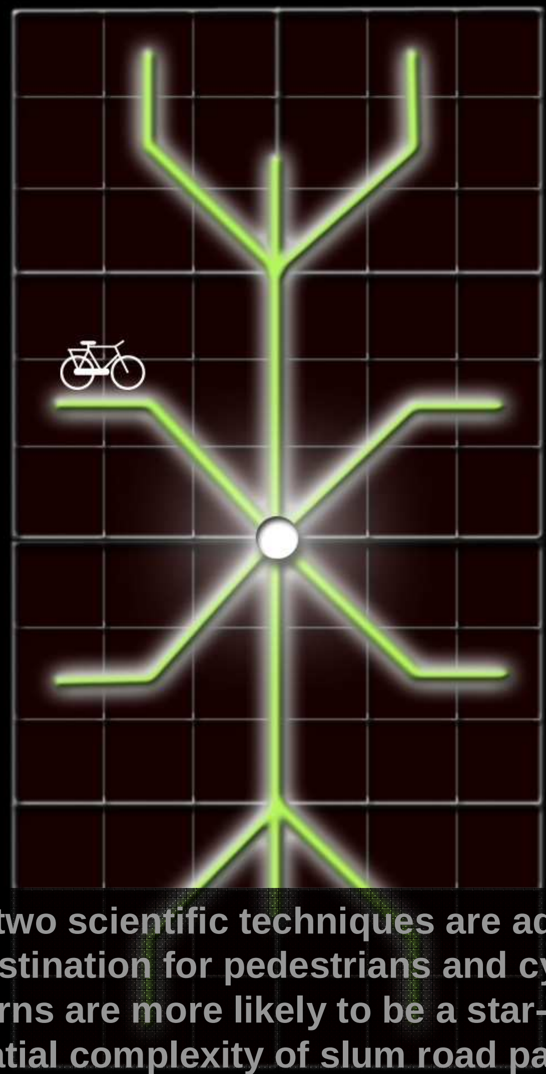


Heterogeneous Star

[Relationships between low traffic routes and clusters]

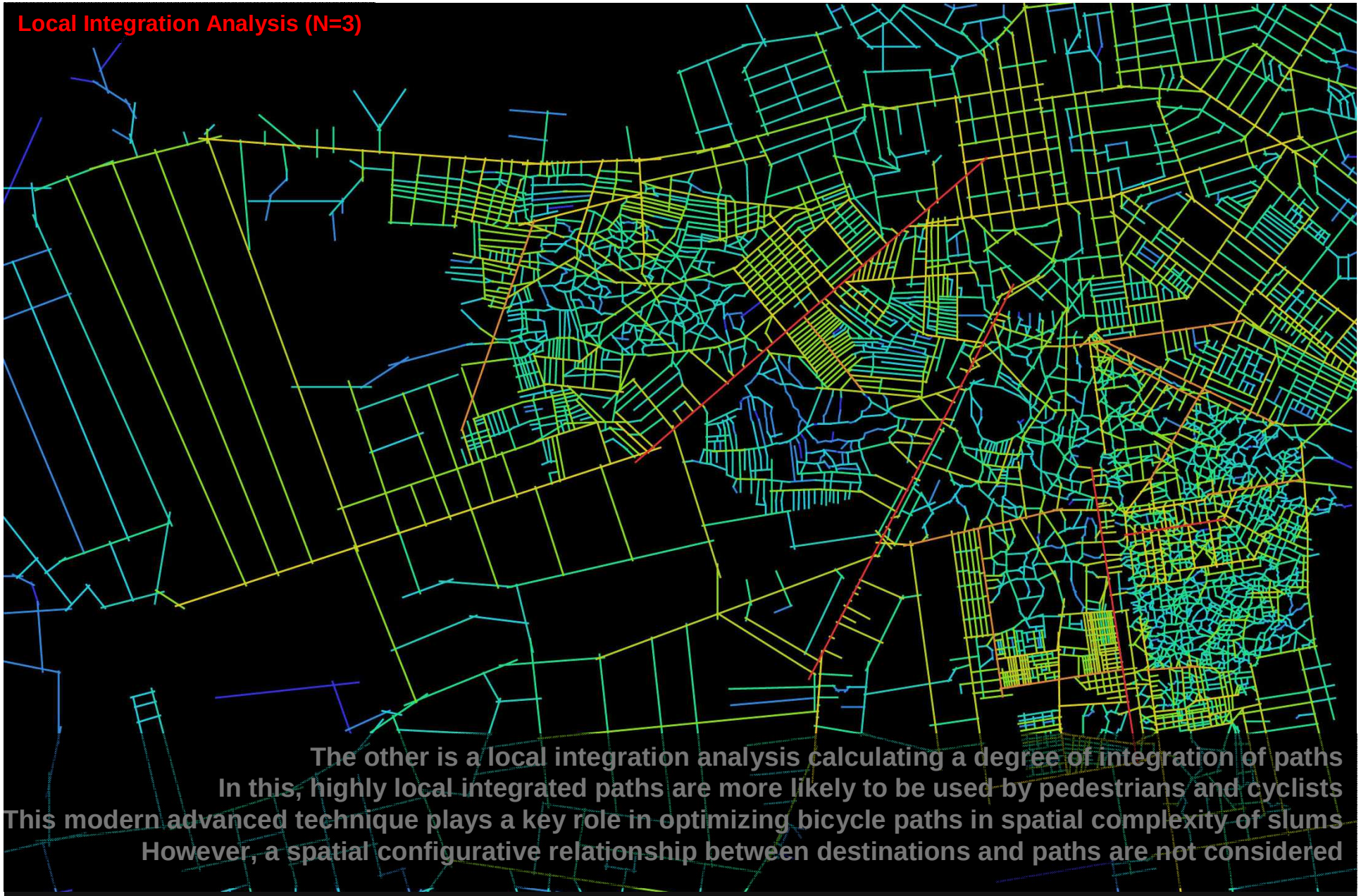
Star analysis by Bak and Blom (1982) for Soest and other towns (the Netherlands).

A suitable star-shaped pattern has been drawn with a red [illegible] the star-shaped network gradually bends: a heterogeneous star which saves cyclists and pedestrians even more time realistically.



To analysis macro scale spatial conditions on bicycle routes, two scientific techniques are adapted
One is a star analysis describing a shortest path towards a destination for pedestrians and cyclists
In this, their mobility patterns are more likely to be a star-shape
However, you can hardly optimize bicycle paths because of spatial complexity of slum road patterns

SOURCE: CROW 2006, NOURBAN DESIGN AND TRAFFIC
– A SELECTION FROM BACH'S TOOLBOX, CROW, AMSTERDAM

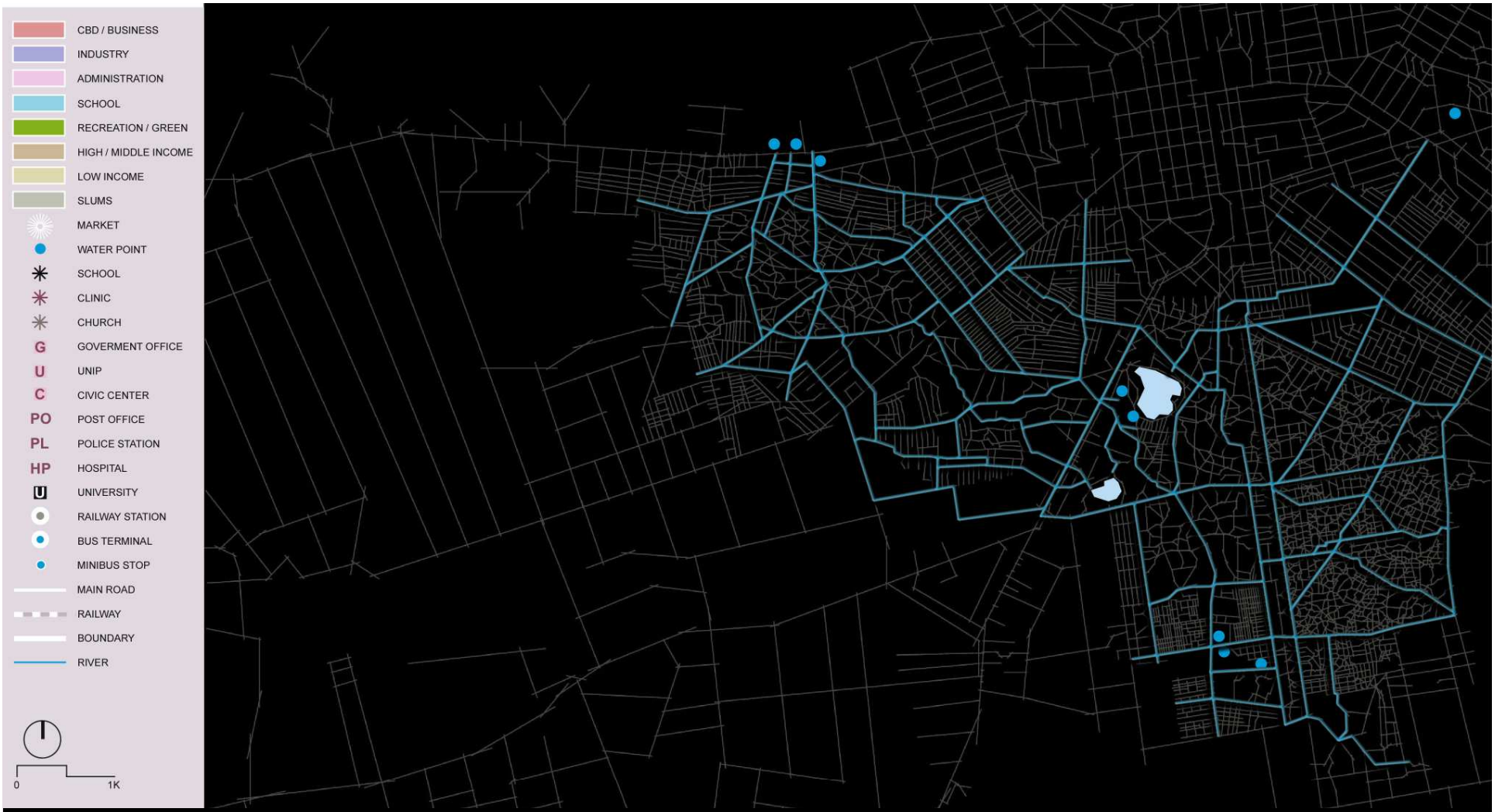


The other is a local integration analysis calculating a degree of integration of paths
In this, highly local integrated paths are more likely to be used by pedestrians and cyclists
This modern advanced technique plays a key role in optimizing bicycle paths in spatial complexity of slums
However, a spatial configurative relationship between destinations and paths are not considered

WAY TO DECIDE BICYCLE ROUTES BY COMBINING TRADITIONAL WITH MODERN ANALYSIS

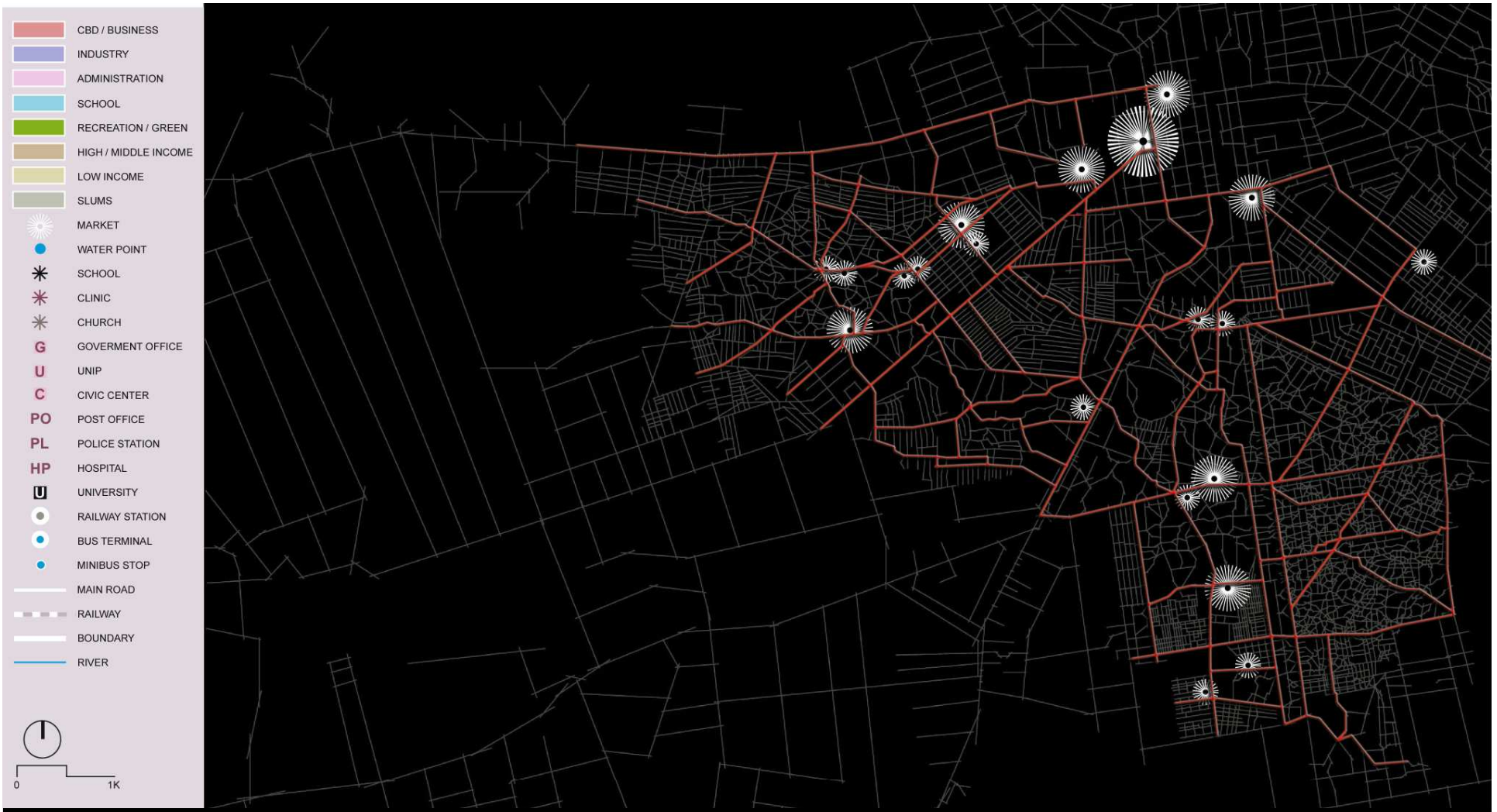
Therefore, the combination between the two will contribute to optimization of bicycle paths in line with destinations
We could draw bicycle routes with respect to highly local integrated paths and the ‘star-shape’

BICYCLE ROUTE 1: WATER RESOURCE POINT



The form of the bicycle routes for water resource points takes a V-shape based on their locations
The bicycle routes just penetrate through John Laing between water resource points

BICYCLE ROUTE 2: MARKET



The form of the bicycle routes for markets takes a L-shape based on their locations
Because of many markets, the bicycle routes involve in a variety of small radial network patterns

BICYCLE ROUTE 3: SCHOOL

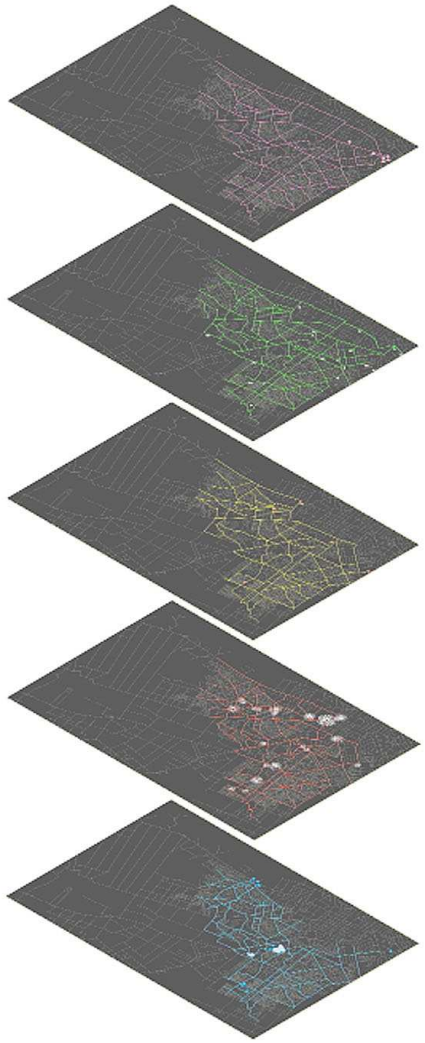
The form of the bicycle routes for schools takes a T-shape based on their locations
Because of many schools located in the east, the bicycle routes stretch more to the east

BICYCLE ROUTE 4: CLINIC

The form of the bicycle routes for clinics takes a heterogeneous T-shape based on their locations
Because of a few clinics outside slums, the bicycle routes just penetrate through the area

BICYCLE ROUTE 5: ADMINISTRATIVE POINT

The form of the bicycle routes for administrative points takes a T-shape based on their locations
Because of the locations in the east, the form of bicycle routes is similar as that of schools

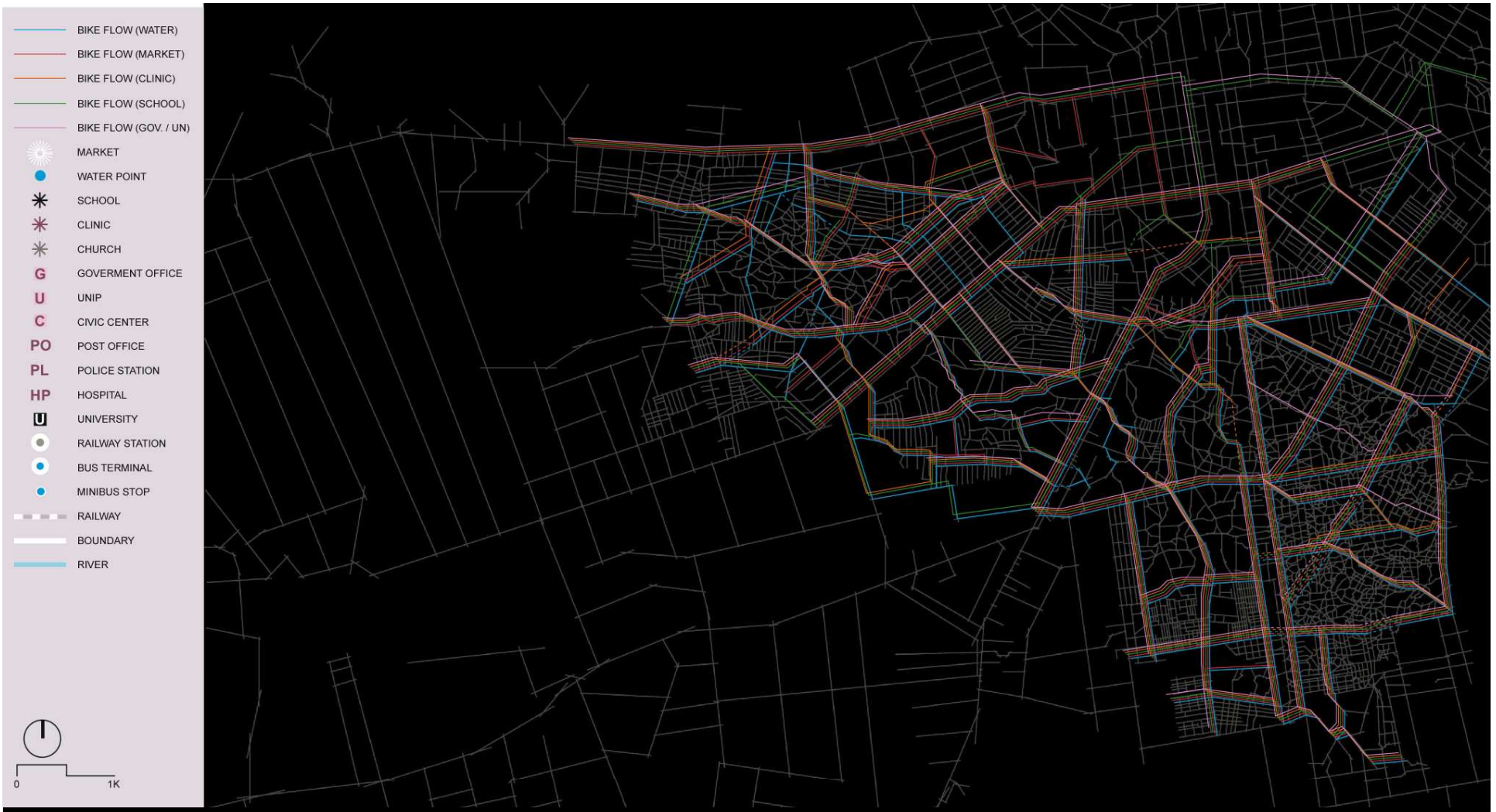


In order to create a bicycle network as a whole, all of the 5 bicycle networks are superimposed

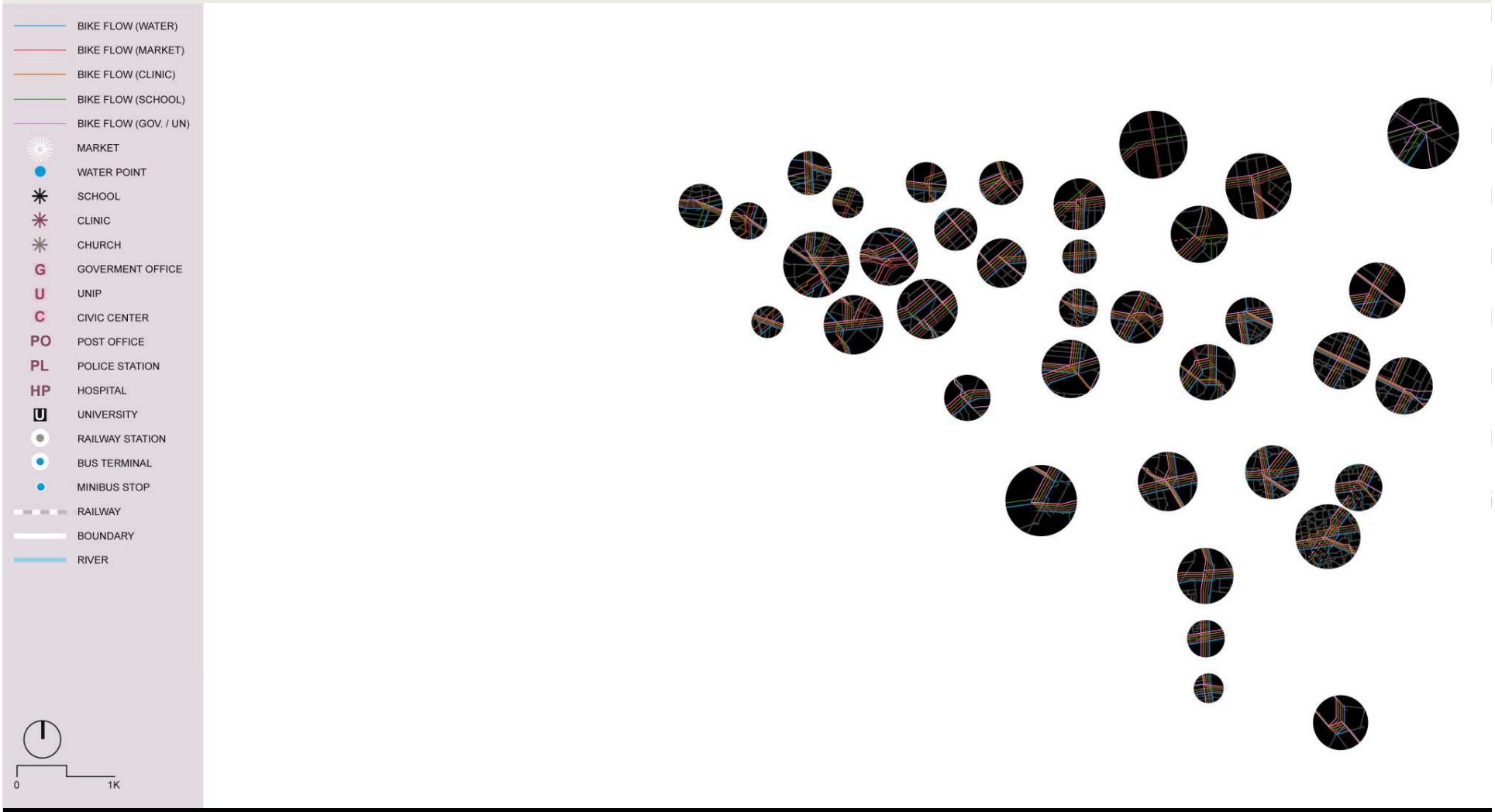
INTEGRAL BICYCLE NETWORK WITH DESTINATIONS

The integral bicycle network is to mitigate their transportation time and to enhance accessibility to current, highly urgent five types of urban services for Women and Youths

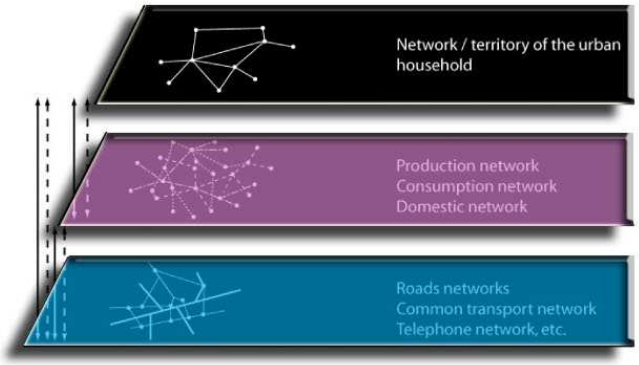
INTEGRAL BICYCLE NETWORK: LINKS



Dependent on paths, the number of superimposed bicycle routes are different one another
In other words, we could discover its hierarchy of this integral bicycle network



The integral bicycle network has many potential nodes with small radial network patterns
These potential nodes could be serving for future urban services



3rd level: household
household in slums (women & youth)

2rd level: human activity network
future urban services: multi-purpose community telecentre
current urban services: water, market, clinic, school, administration

1st level: road network
bicycle network

Testing to design links and potential nodes of an integral bicycle network by minimum spatial elements

CHAPTER 4

4.1 How to design links of the integral bicycle network in detail
4.2 How to design potential nodes of the integral bicycle network in detail

TESTING AREA TO DESIGN LINKS & NODES IN DETAIL: CONDITION 1 (ALTERNATIVE ROUTE)

To design links and nodes of the integral bicycle network in detail, a testing area is selected
The red line could be an alternative route for a city road
This alternative route has a lot of markets, closed to water resource points and schools and clinics
Therefore, the red line could be a friendly path for cyclists, which means a good testing area

TESTING AREA TO DESIGN LINKS & NODES IN DETAIL: CONDITION 2 (MINIBUS JAM)

Additionally, the city road is affected by a minibus jam
Again, this alternative route could be livable for cyclists, as well as pedestrians

MAIN SCHEME IN THE TESTING AREA: RELATIONSHIP BETWEEN MAIN ROADS AND CORRIDORS

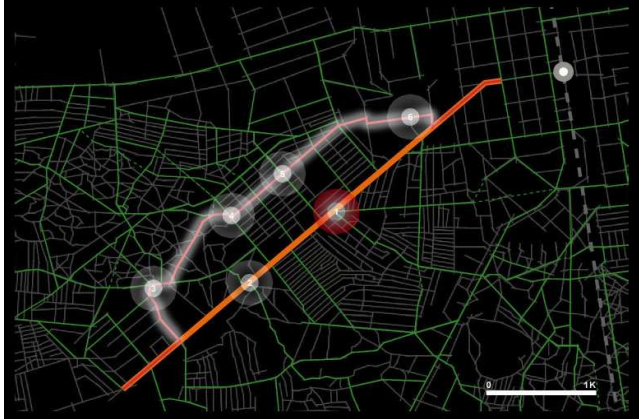
Based on the locations of urban services, I could define three corridors: market corridor, water corridor, and school corridor

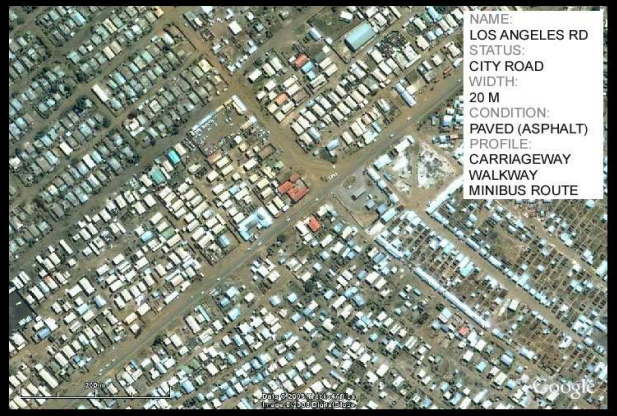
These three corridors could be alternative and interconnecting routes for city roads with traffic jams

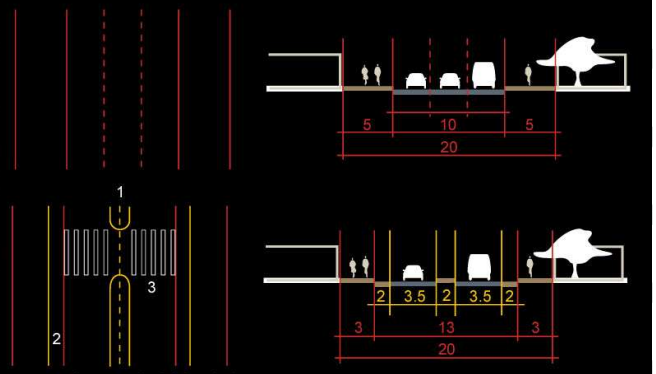
MAIN SCHEME IN THE TESTING AREA: RELATIONSHIP BETWEEN CORRIDORS

The idea is that an intersection will be a potential node for future urban services: community telecentres
A junction of the school corridor and the market corridor would, therefore, serve a new node

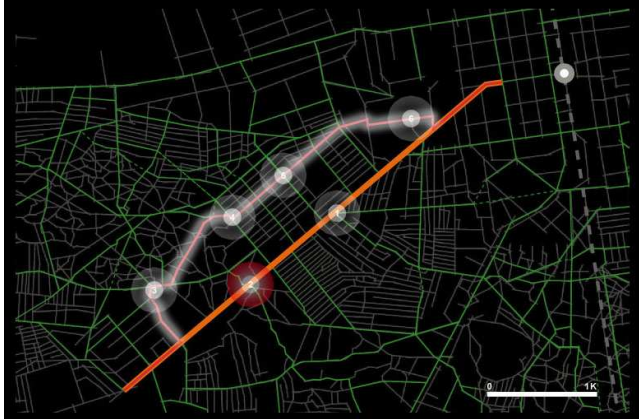
DESIGNING BICYCLE PATHS: BEFORE AND AFTER

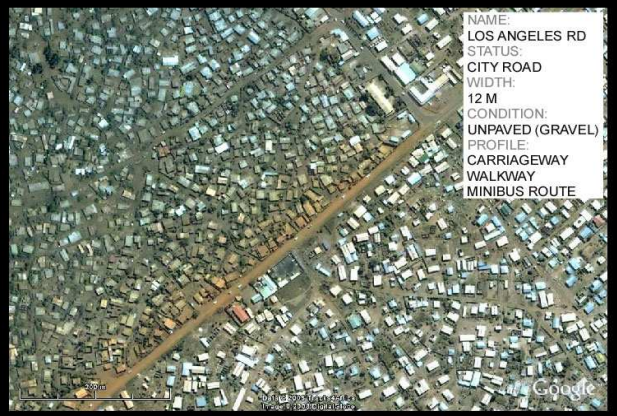


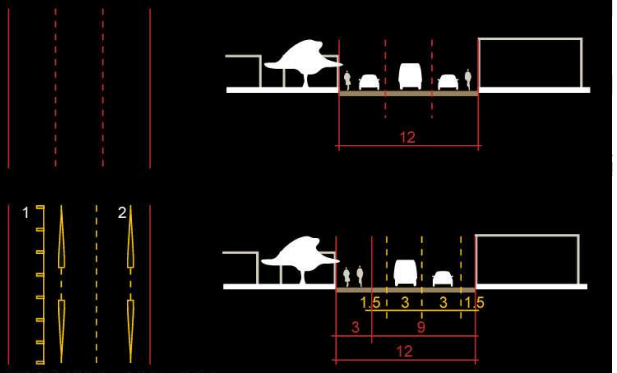




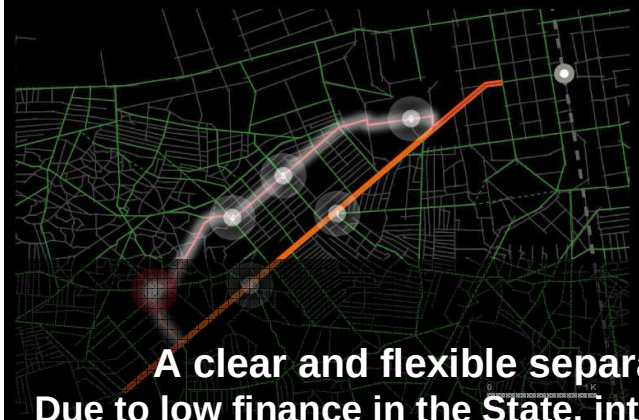
1: PEDESTRIAN CROSSING ISLAND, W 2.0m L 10-15m
2: BICYCLE LANE, W 1.5m COMPACTED MURRAM
3: RAISED ZEBRA CROSSING, 100 PAVING BLOCKS

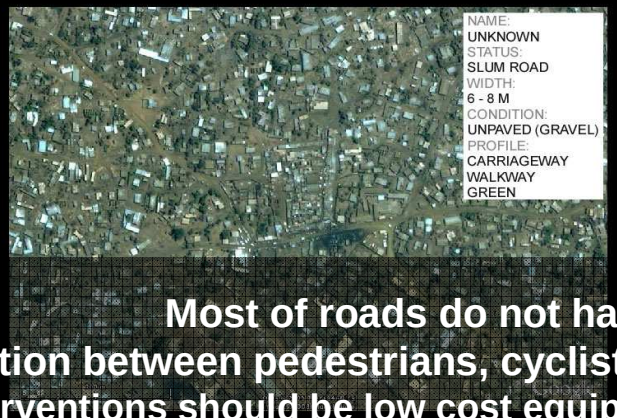






1: T-BLOCK, W 0.5m L 0.6m H 0.4m
2: BICYCLE SLIPS, W 0.8m L 8-10m



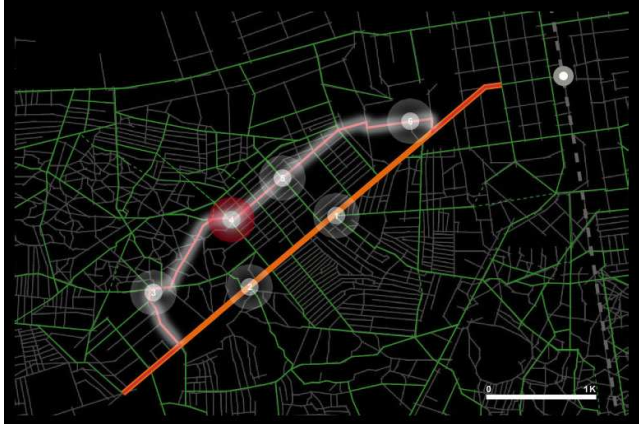


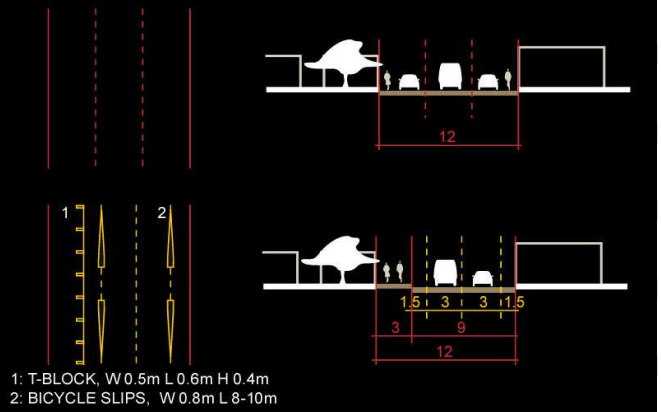
Most of roads do not have any strong capacity and width

A clear and flexible separation between pedestrians, cyclists and cars should be considered

Due to low finance in the State, interventions should be low cost equipments and labor intensive methods

DESIGNING BICYCLE PATHS: BEFORE AND AFTER





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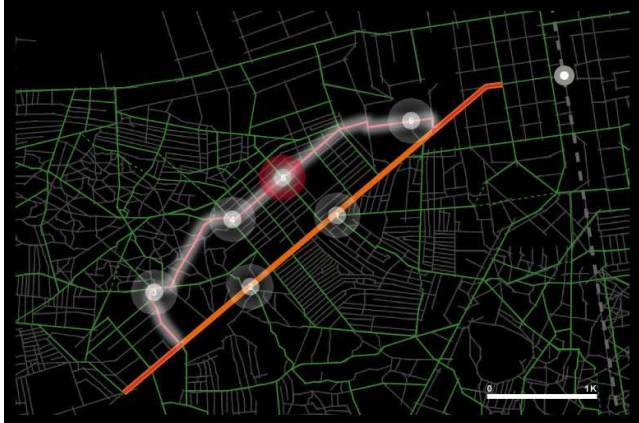

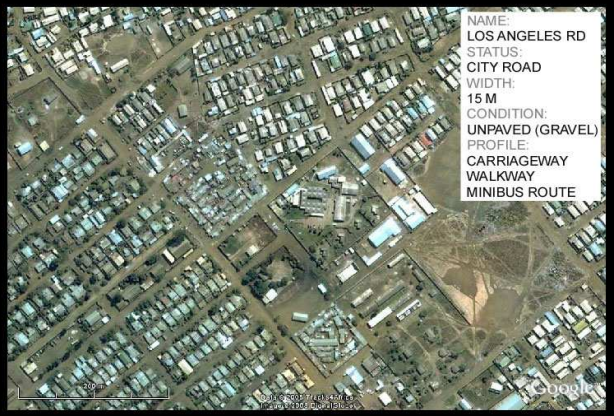

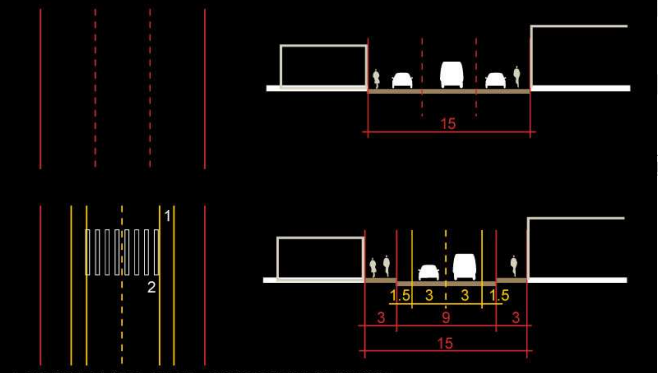

1: BICYCLE LANE, W 1.5m COMPACTED MURRAM
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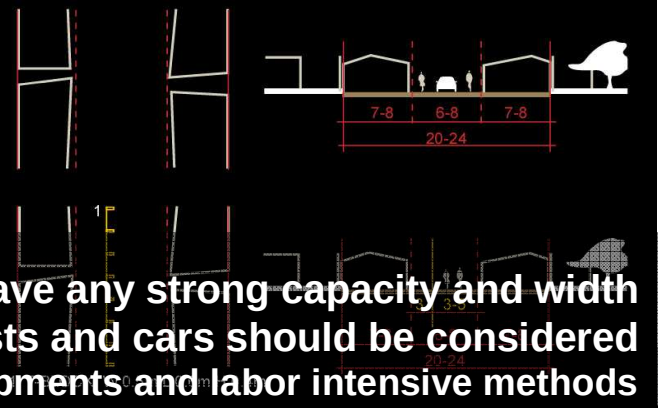

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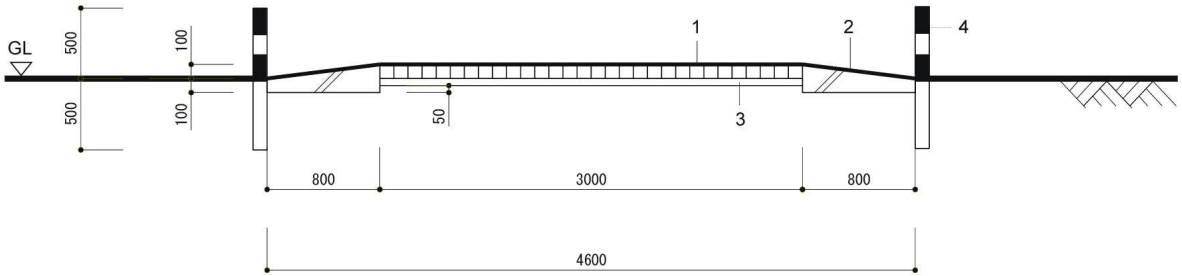
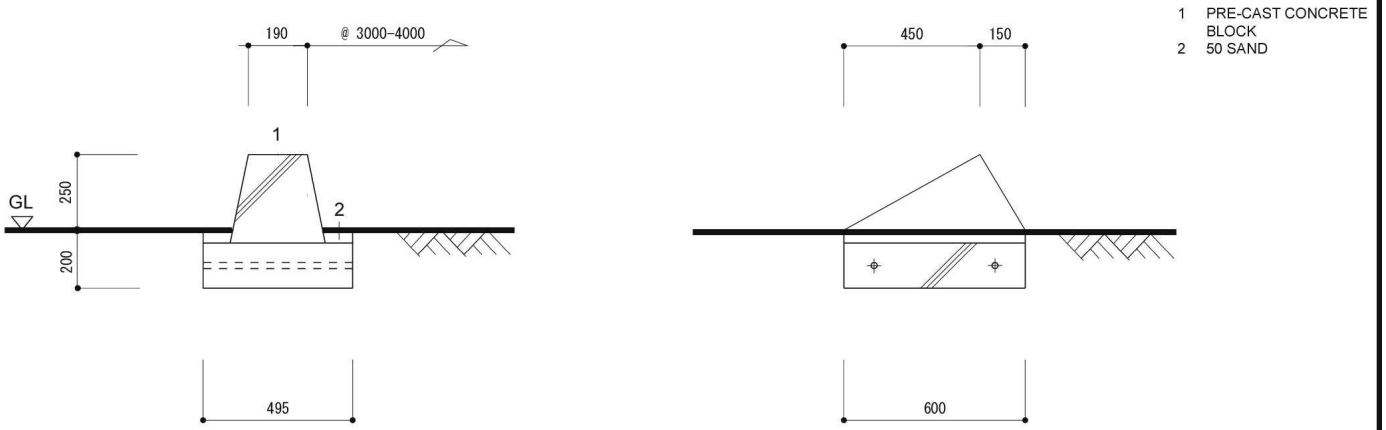
Due to low finance in the State, interventions should be low cost equipments and labor intensive methods



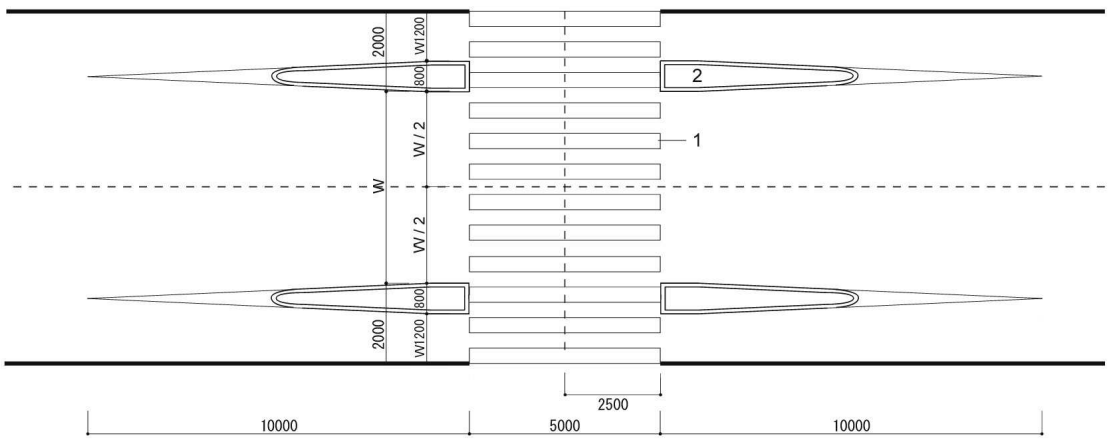
01 **RAISED ZEBRA CROSSING**
DIM: [mm]



02 **T - BLOCK PRODUCTION**
DIM: [mm]

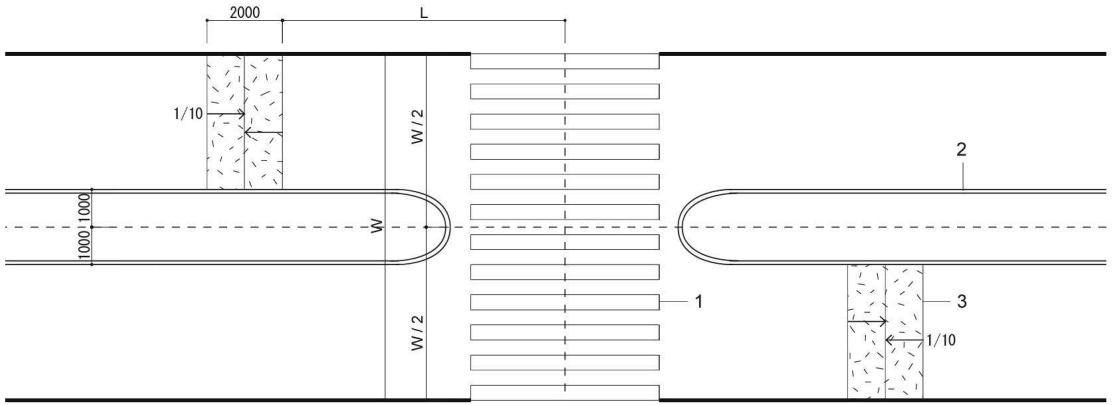
The main functions of these interventions is to promote a slow-down traffic, to create a crossing point for pedestrians and cyclists, and to make a flexible separation between cars and cyclist

EDITED BY AUTHOR, SOURCE: WORLD BANK 2005, NON MOTORIZED TRANSPORT IN AFRICAN CITIES -LESSON FROM EXPERIENCE IN KENYA AND TANZANIA, WORLD BANK, SSATP WORKING PAPER NO.80



1 ZEBRA CROSSING
W: 400 L: 5000
THERMOPLASTIC PAINT
2 BICYCLE SLIPS
W: 800 L: 10,000
@400,000
CONCRETE
THERMOPLASTIC PAINT

03 **BICYCLE SLIPS**
DIM: [mm]



1 ZEBRA CROSSING
W: 400 L: 5000
THERMOPLASTIC PAINT
2 CROSSING ISLAND
W: 2000 L: 10,000-15,000
PRE-CAST CONCRETE
3 SPEED BUMPS
W: 2000 H: 100
SLOPE 1 / 10
ASPHALT CONCRETE

04 **PEDESTRIAN CROSSING ISLAND**
DIM: [mm]

The main functions of these interventions is to promote a slow-down traffic, to create a crossing point for pedestrians and cyclists, and to make a flexible separation between cars and cyclist

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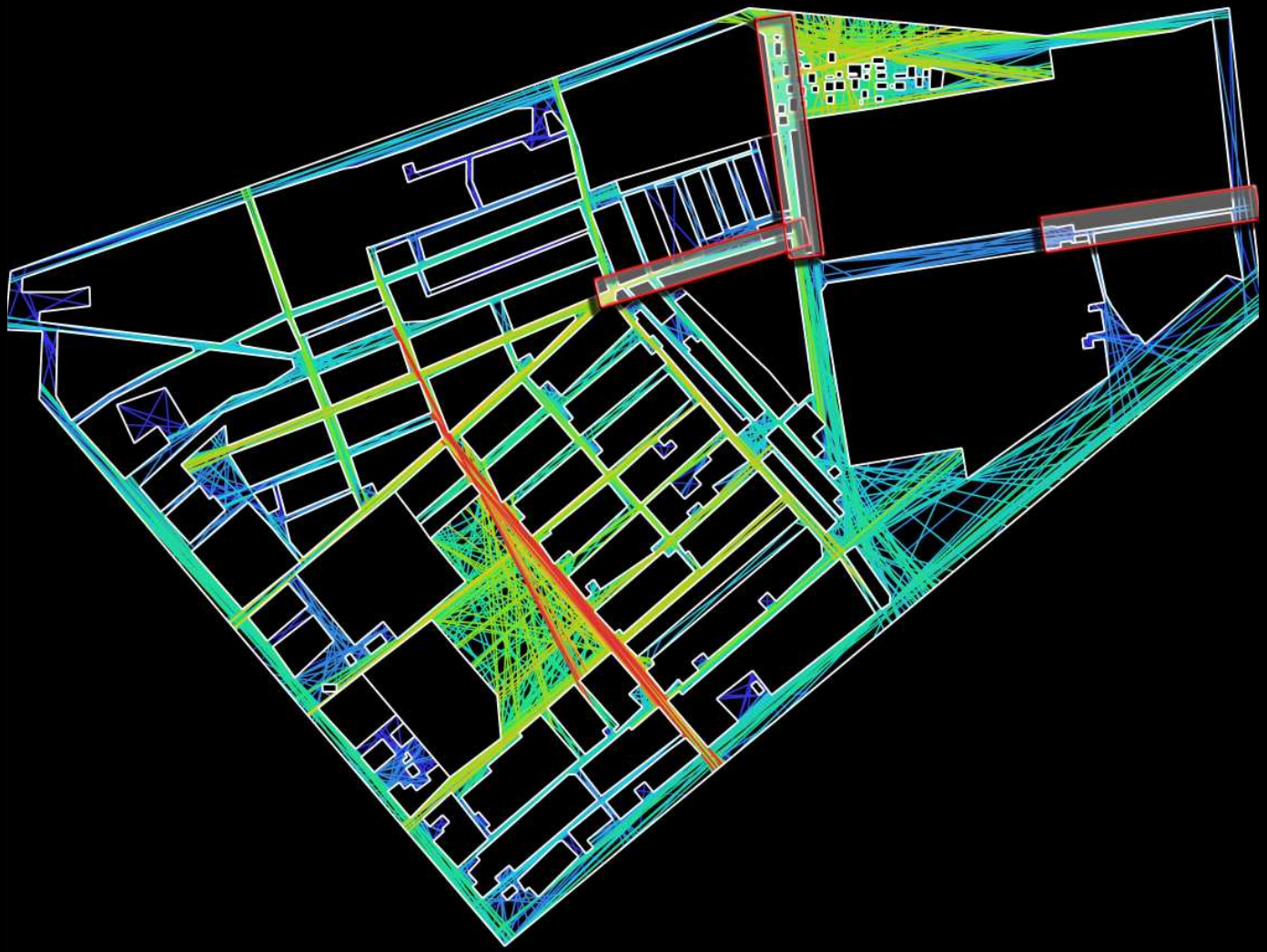
DESIGNING A POTENTIAL NODE: COMMUNITY GARDEN

INTER-VISIBILITY (PEDESTRIAN VISIBILITY) ANALYSIS: CURRENT

Attention should be paid to interdependence between the macro and the micro scale conditions on bicycle routes
Therefore, to analysis micro scale spatial conditions on bicycle routes, inter-visibility analysis is adapted
Inter-visibility means pedestrian visibility in which highly visibility space is more likely to be used by low traffics
Visibility graph model is calculated saying that market & school corridors and potential nodes have low visibility

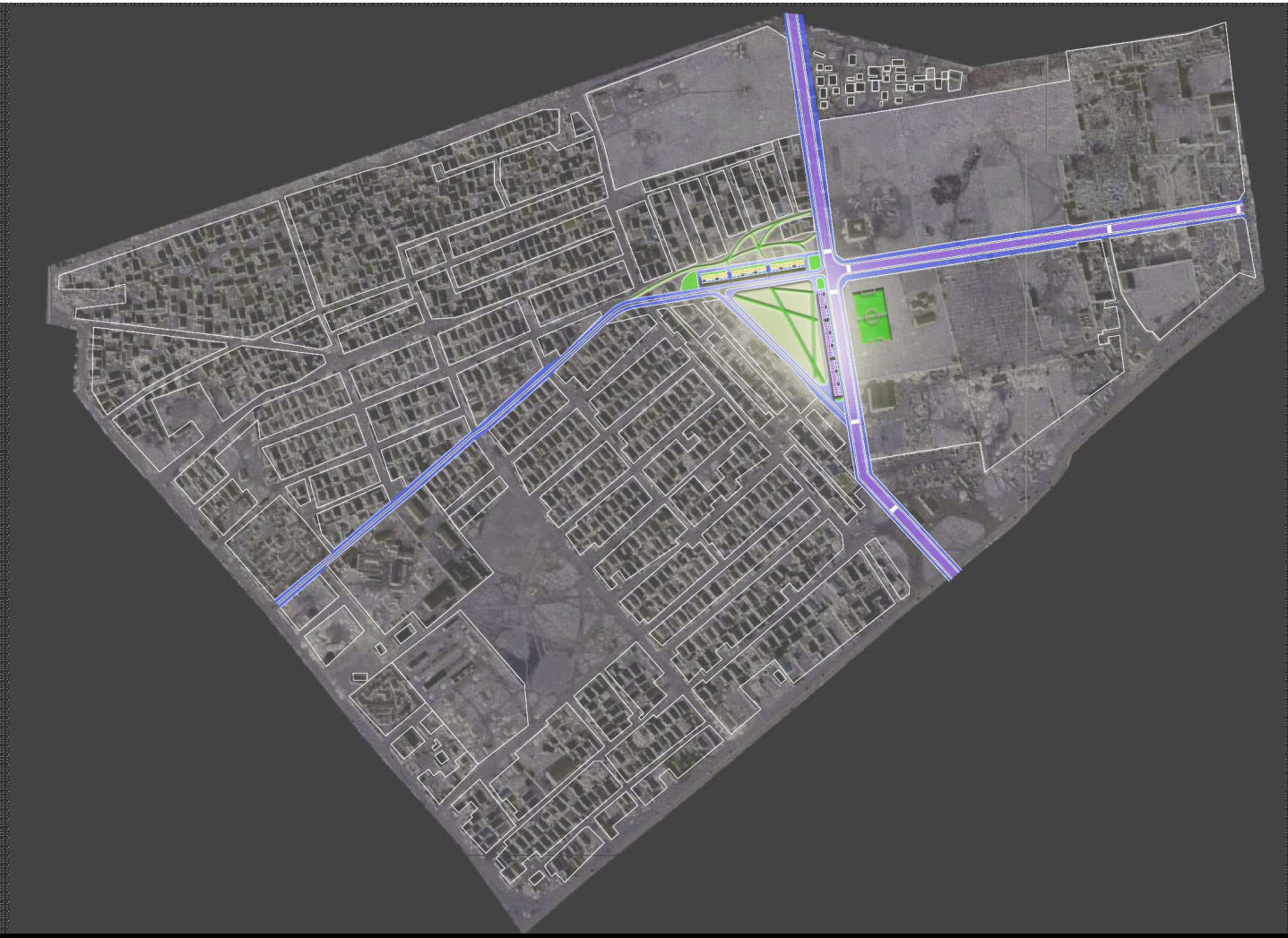


There are three problems around the market & school corridors and the potential node
First, some housings have occupied streets which are forced to be narrowed
Second, some street vendors also have occupied streets in a market in the east
Lastly, some fence has surrounded the empty pocket of land

INTER-VISIBILITY (PEDESTRIAN VISIBILITY) ANALYSIS: FUTURE

Some housings and street vendors are relocated and integrated into the potential node
The potential node has, therefore, two function blocks: housing and community garden with street vendors
Because of serving some space for multi-playground, the two blocks could be located around the node
Based on the analysis, these two blocks could be a linear and slender to make them more inter-visible

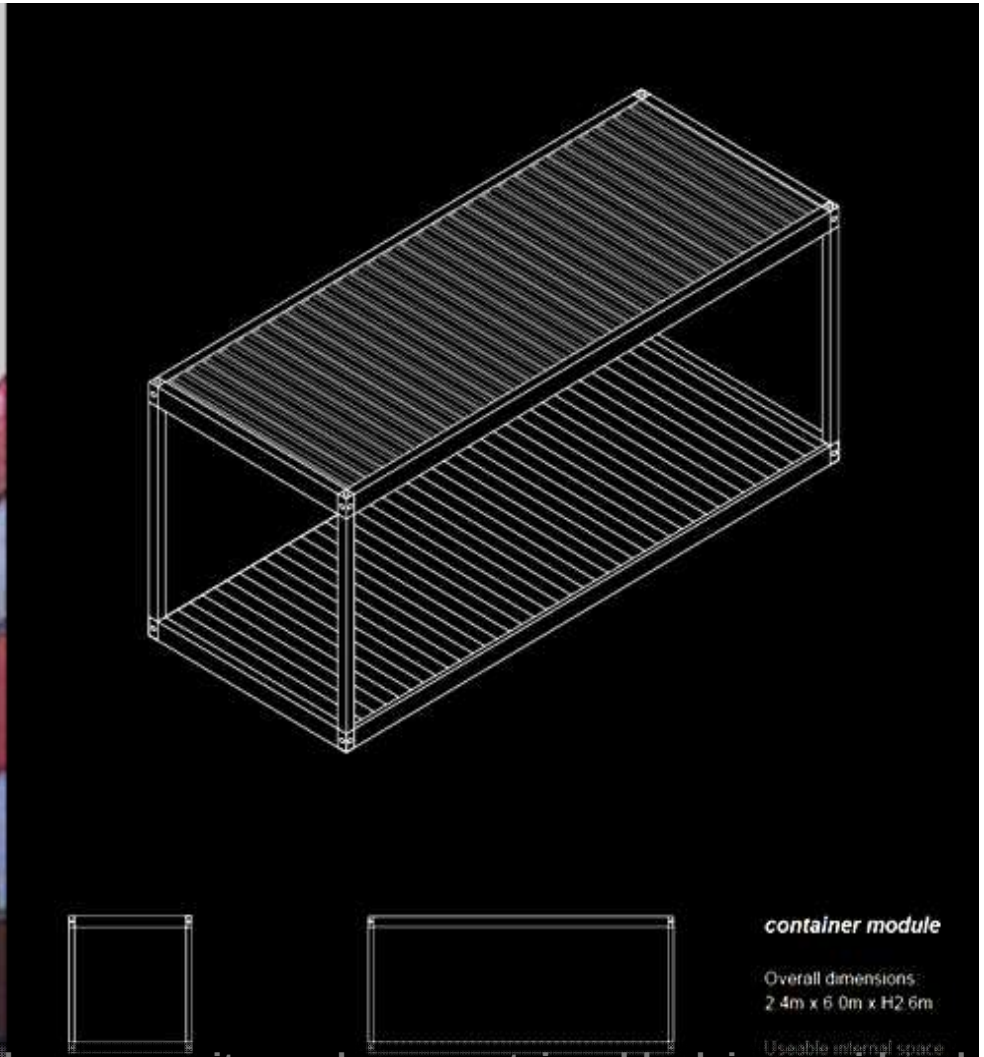
SOLUTION FOR A POTENTIAL NODE: COMMUNITY GARDEN



As a result, the market corridor from the west to east could become a more clear segment than ever
The confliction around the node derived from two different urban typologies could be also solved

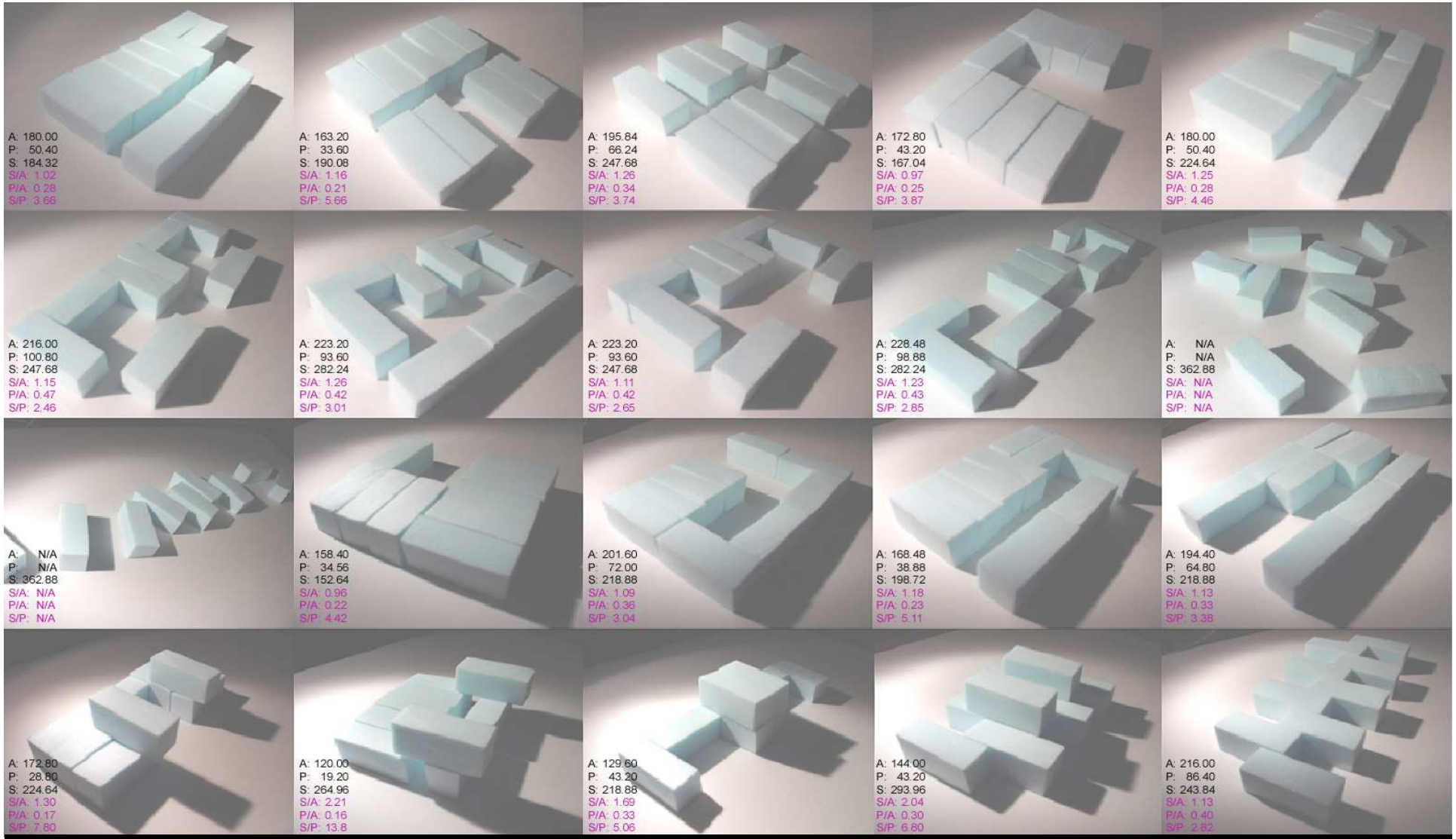
SOLUTION FOR A POTENTIAL NODE: COMMUNITY GARDEN

A residential block in the north and a community garden block in the west are proposed
Each block has a street vendor unit along the main streets
A multi-playground between the blocks to empower community for the local people
An open space between the residential blocks and existing housings is provided to empower community



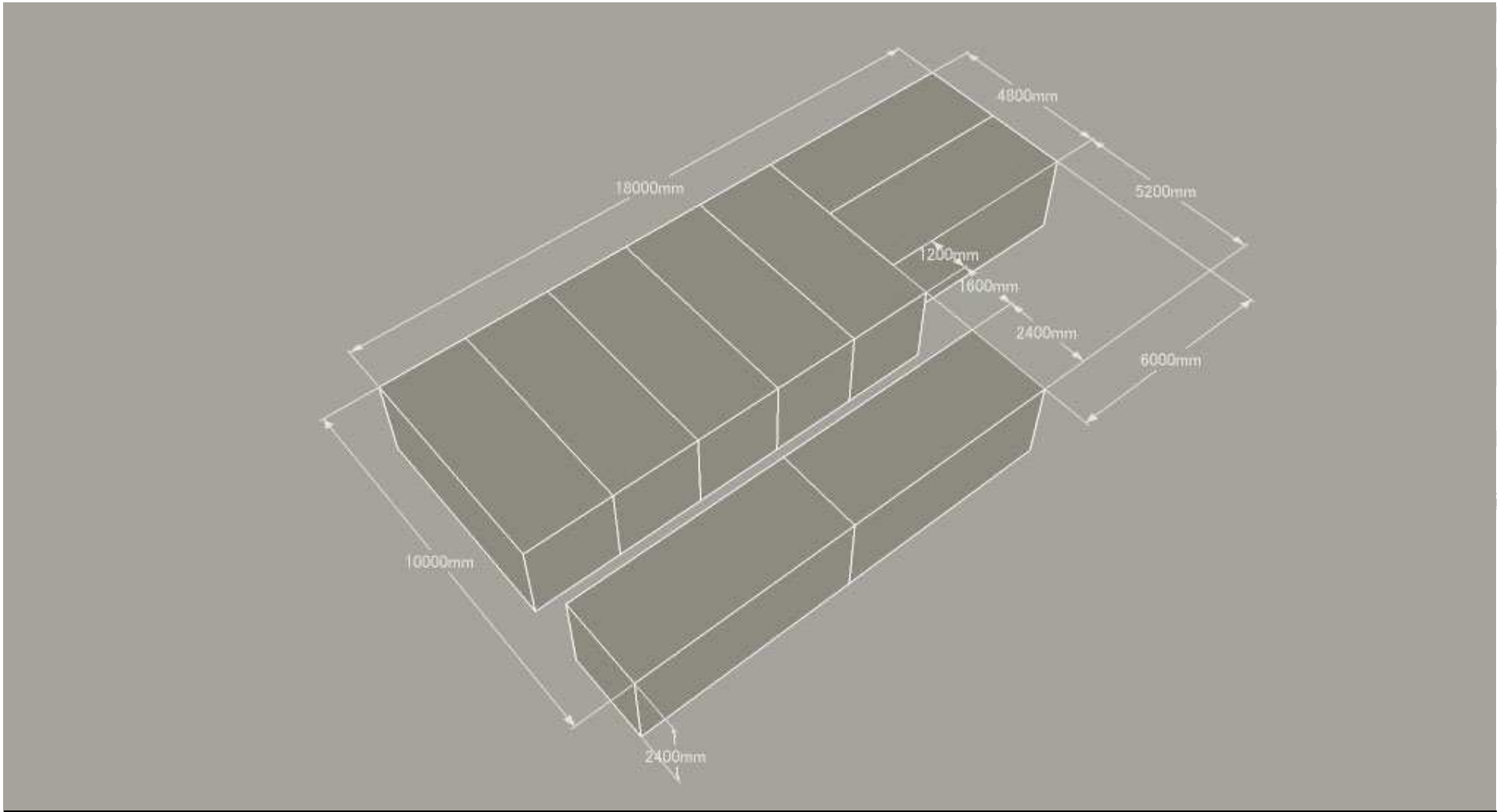
As for a building material of the community garden, a container block is considered
From self-construction point of view, this material is advantageous due to clear module and structure
This material is ecological because of recycling retired container blocks
This target area is closed to an industrial area and a mining city, Copperbelt to recycle container blocks
Some world organizations have also donated retired container blocks to Africa for new community facilities

STUDY MODEL OF A MINIMUM UNIT FOR A COMMUNITY GARDEN



Due to a tropical climate, a ratio of surface of perimeter to area (S/A) should be considered
To keep air flow into an interior of building, a ratio of public open space to area (P/A) should be considered

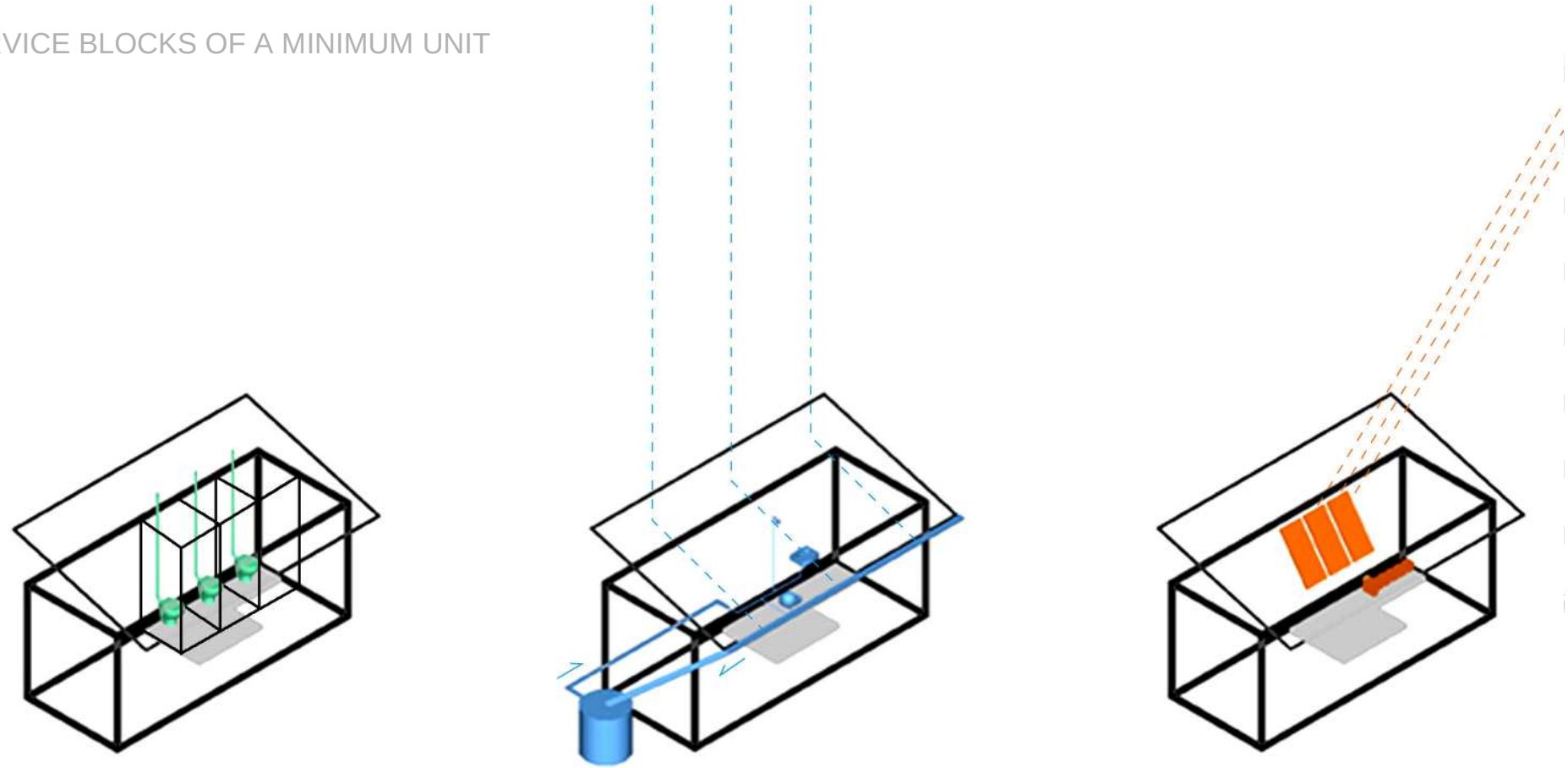
SOURCE: UNITED NATIONS 2006, ECO-HOUSE GUIDELINES FOR TROPICAL REGIONS, UN, BANGKOK, THAILAND



This unit has a good score of S/A, and its area is one of the minimized models in the study
Most of doors of container blocks could be easily used without operations
This public open space could create a good connection between blocks and units one to another
From a mixed functions point of view, this friendly separation in a unit could be usable

Main functions of the minimum unit are divided into three parts:
Street trade blocks, community garden blocks and service units blocks

The public open space is divided into two parts
The first one is a passage to interconnect between blocks and halls
The second one is a hall to interact streets with blocks, and to serve a place for events and meetings



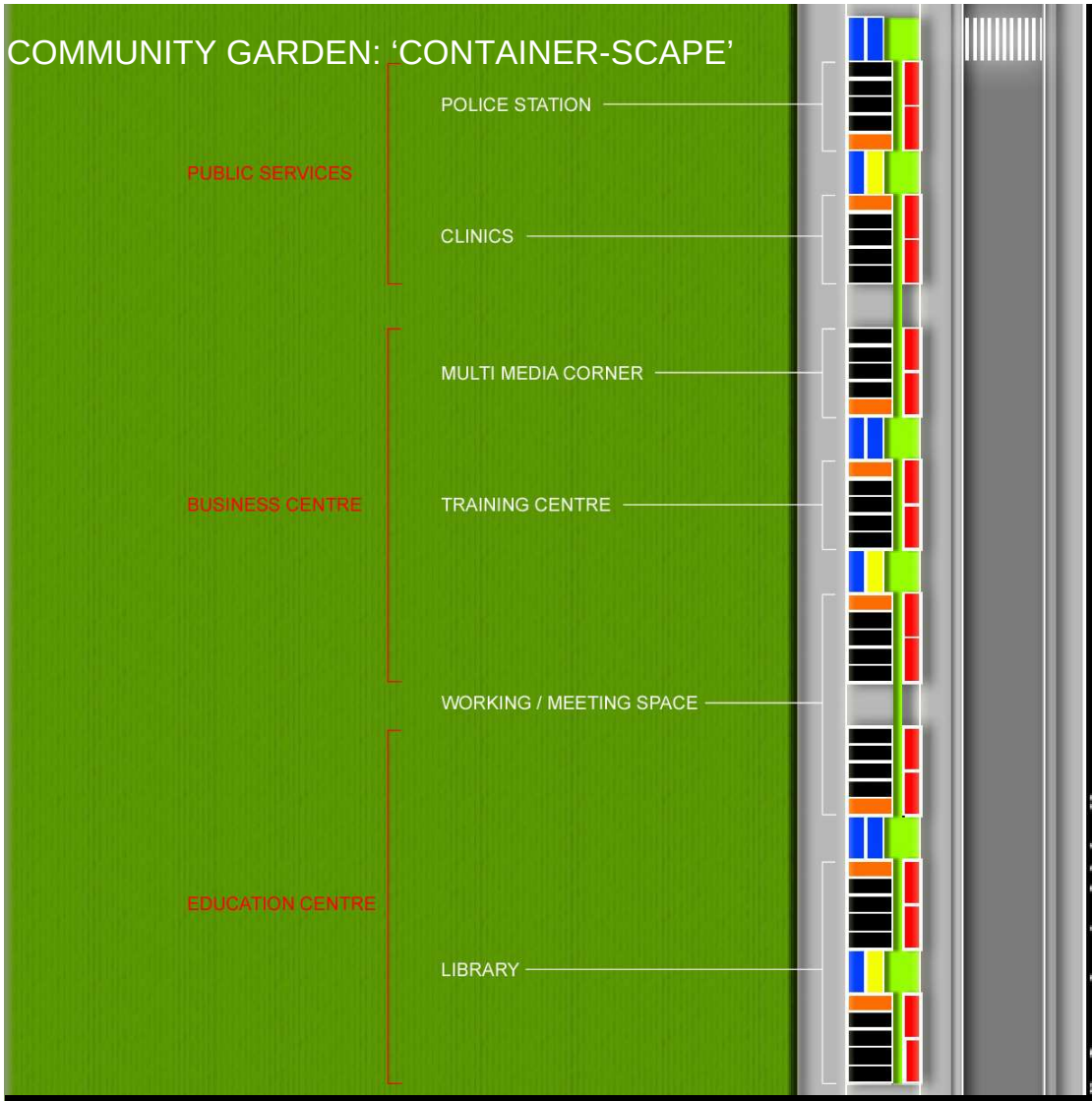
The service blocks are divided into three parts
A toilet block is to provide a waterless toilet with powers from solar panels to recycle organic wastes
A water collector is to make use of rain water and to stock in a tank
A electric block is to make use of solar powers to provide energy for the toilet and for the others

COMMUNITY GARDEN: ‘CONTAINER-SCAPE’

PUBLIC SERVICES
- POLICE STATION
- CLINICS

BUSINESS CENTRE
- MULTI MEDIA CORNER
- TRAINING CENTRE
- WORKING / MEETING SPACE

EDUCATION CENTRE
- LIBRARY



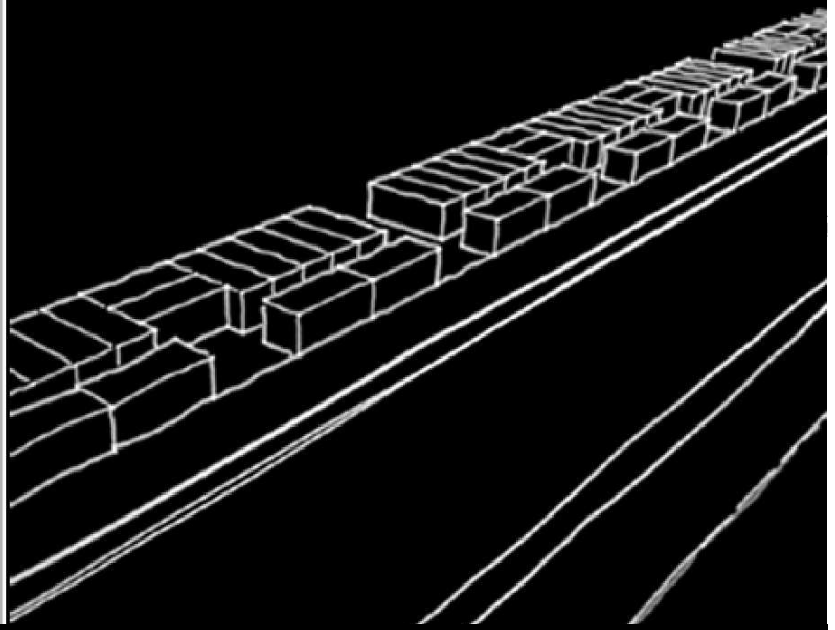
DATA:

FACILITY:
COMMUNITY CENTRE

FLOOR SPACE:
BUILDING
1,065.6 M2
- TRADE BLOCK: 230.4 M2
- NEW FUNCTION BLOCK: 547.2 M2
- SERVICE BLOCK: 288.0 M2

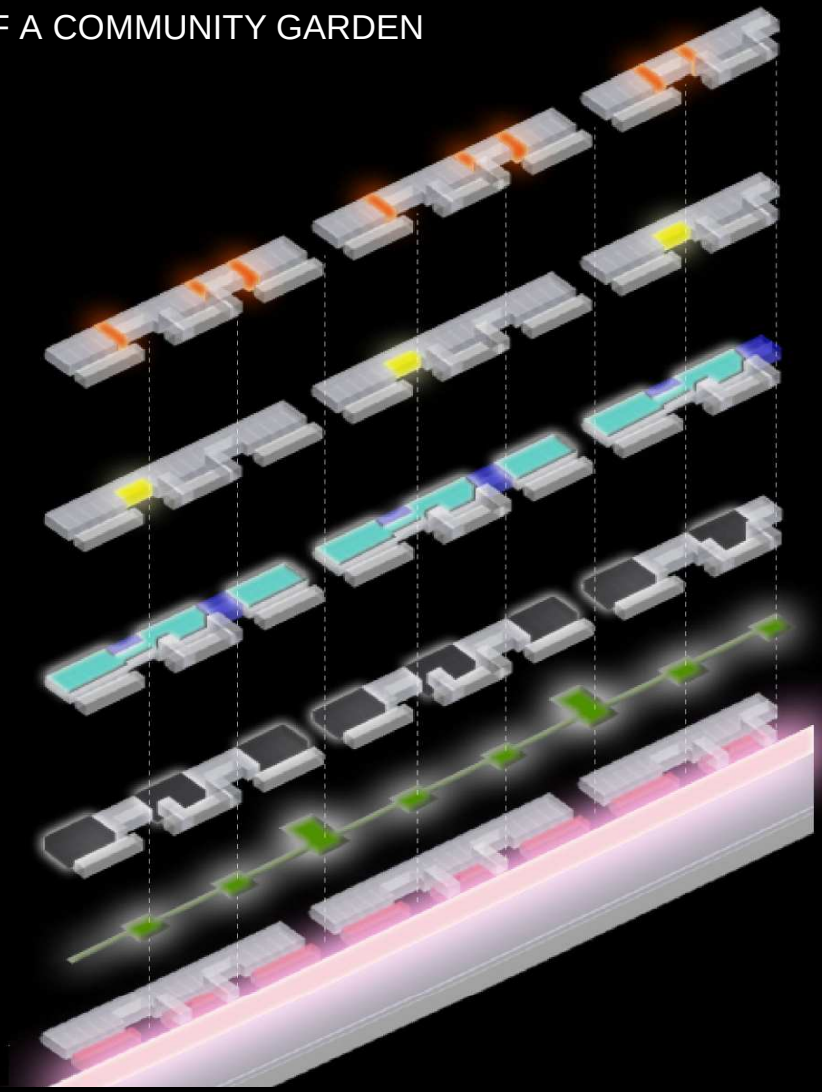
PUBLIC SPACE (IN BLOCKS)
340.8 M2

STRUCTURE:
STEEL (CONTAINER BLOCK)
1 FL ABOVE (2 FL IN PARTS OF BLOCKS)



A community garden is created by simply expanding the minimum unit: a new ‘container-scape’
A community garden is divided into three parts, based on the concept of multi-purpose community centre

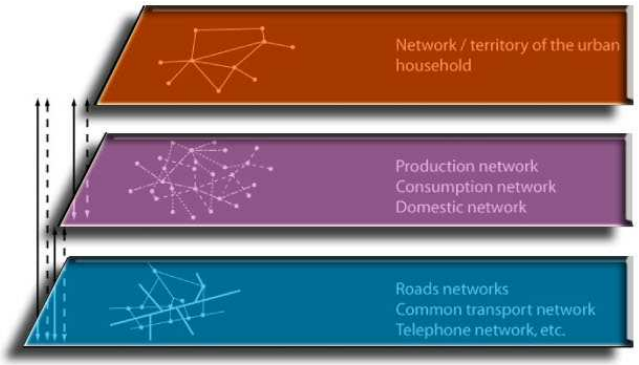
SUPERIMPOSED FUNCTIONS OF A COMMUNITY GARDEN



All of functions of the minimum unit are simply transformed into functions in a larger scale
The passage & hall could become a friendly back street together
The water collector could create a ‘big roof’ to collect rain water
The waterless toilet block could recycle a mass of organic wastes


Women for Change
KEEP THE PROMISE!
PROMOTE GENDER EQUALITY IN
THE FIGHT AGAINST HIV/AIDS
celtel


Women for change
KEEP THE PROMI
PROMOTE GENDER EQUA
THE FIGHT AGAINST HIV



3rd level: household
household in slums (women & youth)

2rd level: human activity network
future urban services: multi-purpose community telecentre
current urban services: water, market, clinic, school, administration

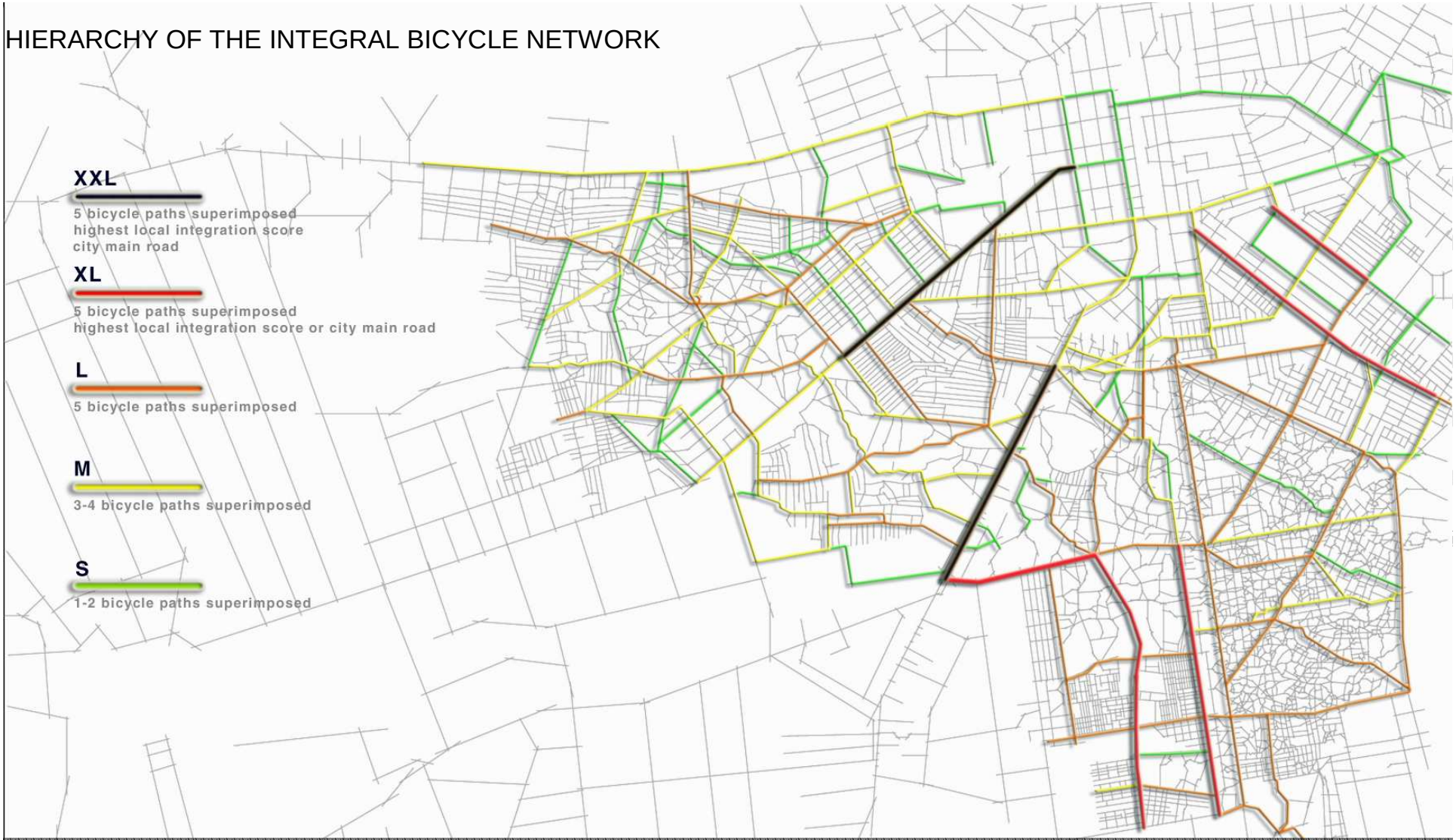
1st level: road network
bicycle network

An alternative integral urban system with future urban services

CHAPTER 5

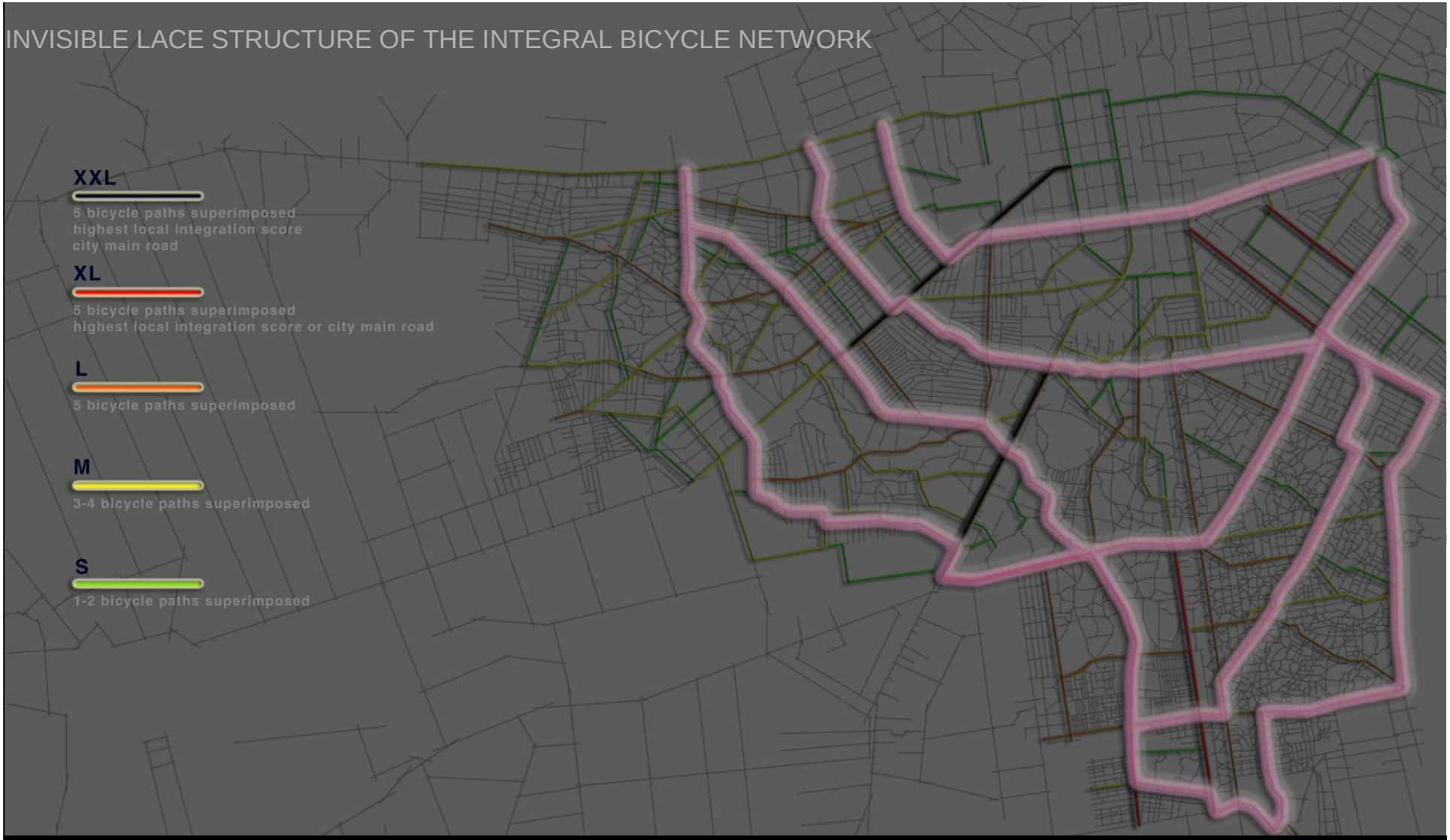
5.1 How to define its hierarchy of the integral bicycle network
5.2 How to create an alternative integral urban system

HIERARCHY OF THE INTEGRAL BICYCLE NETWORK

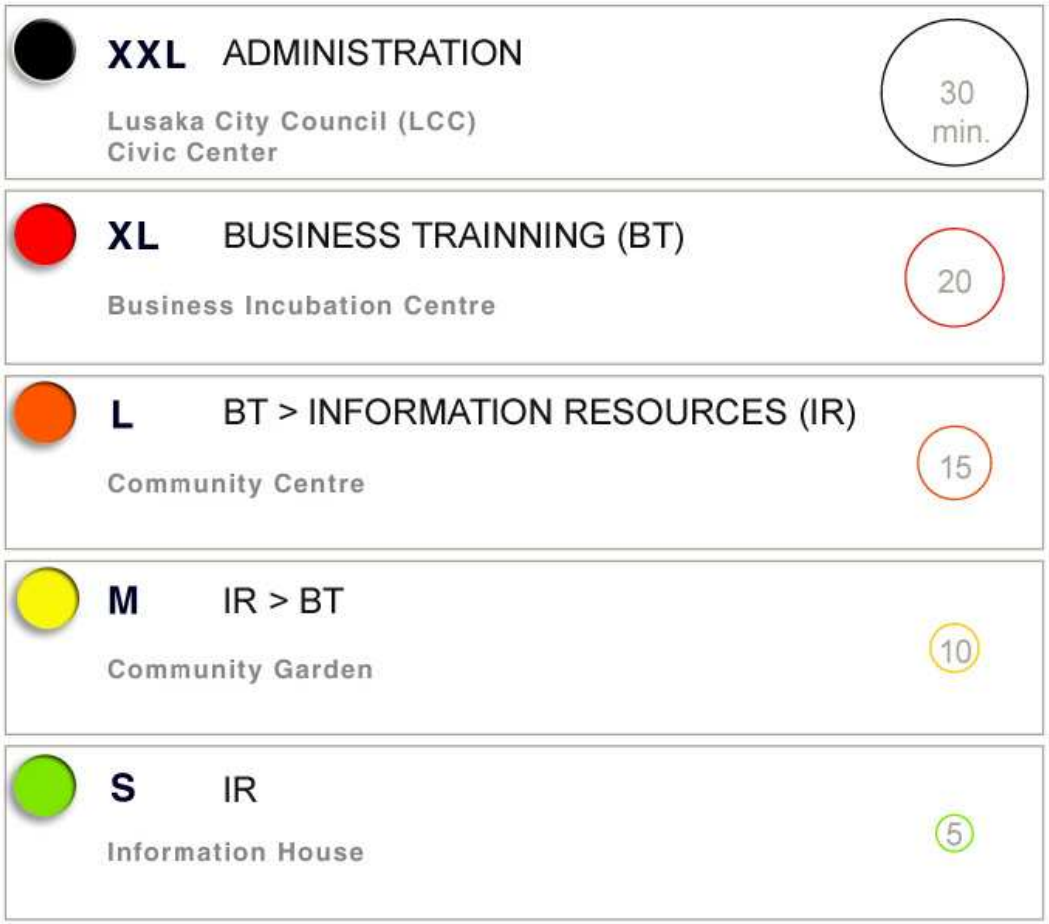


A new integral bicycle network has its hierarchy based on the number of superimposed bicycle routes

INVISIBLE LACE STRUCTURE OF THE INTEGRAL BICYCLE NETWORK



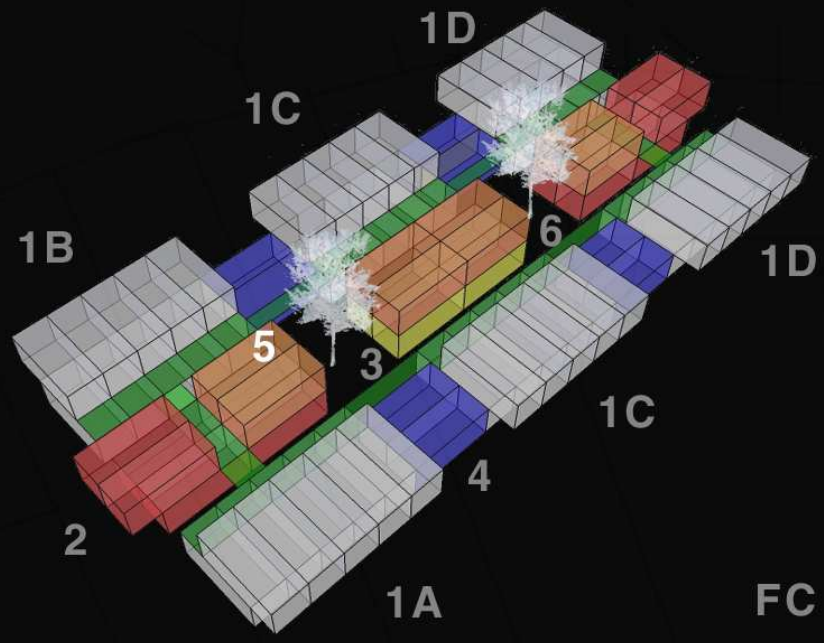
With considerations of higher function paths, we could discover a lace structure from east to west
The lace structure should be respected to allocate future urban services



According to its agenda from the State, community telecentres would be provided
Based on literature studies, community telecenters have a hierarchy from social to economic levels

XL

BUSINESS INCUBATION CENTRE



VENDOR
COMMUNITY FUNCTION
TOILET
WATER
ELECTRICITY

1: NEW FUNCTION BLOCKS
- 1A & 1B: PUBLIC SERVICES
  - POLICE STATION (1A)
  - CLINIC STATION (1B)
- 1C & 1D: BUSINESS CENTRE
  - MULTI MEDIA BLOCK (1C) (TV, PHONE, FAX & INTERNET)
  - TRAINNING CENTRE (1D)
- 1E: INCUBATION HOUSE
  - RENTAL OFFICE SPACE (1E)

2: TRADE BLOCKS

3: WATERLESS TOILET

4: WATER COLLECTOR

5: SOLAR POWER SYSTEM

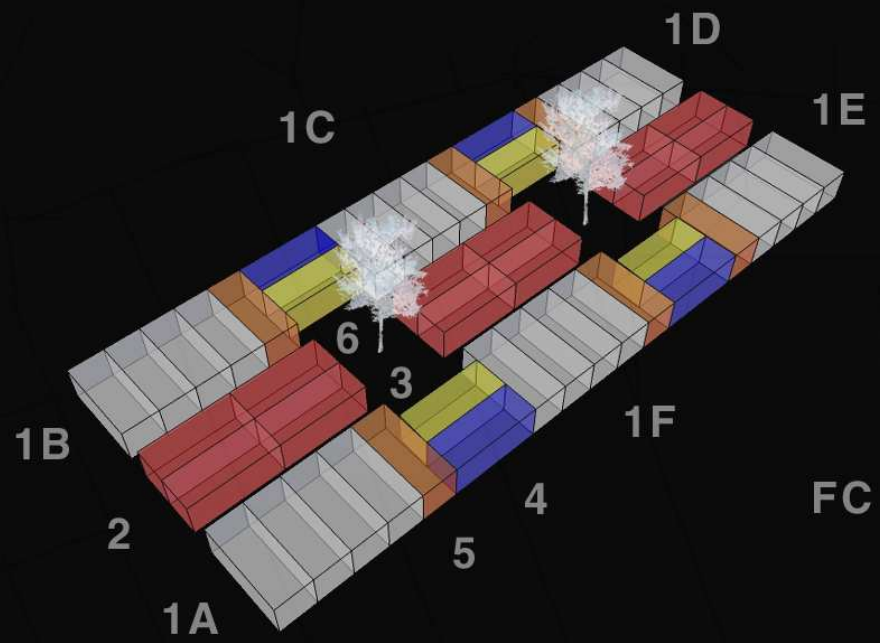
6: HALL (EVENT & MEETING PLACE)

FC: FOOTBALL COURT

'XL', a business incubation centre serves applications in the economic levels
The main function is to provide the Poor with business trainings and job opportunities practically

L

COMMUNITY CENTRE



VENDOR
COMMUNITY FUNCTION
TOILET
WATER
ELECTRICITY

1: NEW FUNCTION BLOCKS

1A & 1B: PUBLIC SERVICES

- POLICE STATION (1A)
- CLINIC STATION (1B)

1C & 1D: BUSINESS CENTRE

- MULTI MEDIA BLOCK (1C) (TV, PHONE, FAX & INTERNET)
- TRAINNING CENTRE (1D)

1E & 1F: EDUCATION CENTRE

- WORKING & MEETING SPACE
- LIBRARY (1F)

2: TRADE BLOCKS

3: WATERLESS TOILET

4: WATER COLLECTOR

5: SOLAR POWER SYSTEM

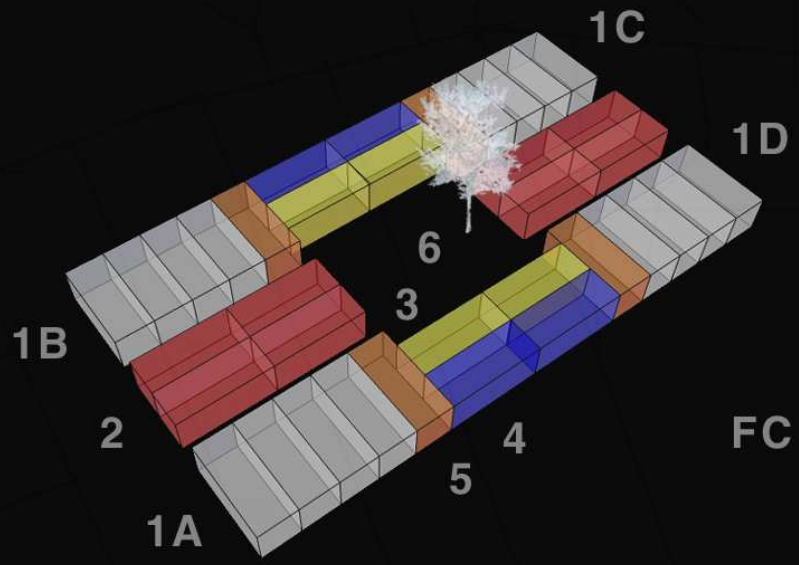
6: HALL (EVENT & MEETING PLACE)

FC: FOOTBALL COURT

'L', a community centre serves applications in the more economic levels than social ones
The main function is to provide basic business training, communication resources and educational services

M

COMMUNITY GARDEN



VENDOR
COMMUNITY FUNCTION
TOILET
WATER
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1: NEW FUNCTION BLOCKS
- 1A: PUBLIC SERVICES
  - POLICE STATION
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  - MULTI MEDIA BLOCK (TV, PHONE, FAX & INTERNET)
  - TRAINNING CENTRE
- 1C: WORKING & MEETING SPACE
- 1D: EDUCATION CENTRE
  - CLASS ROOM
  - LIBRARY

2: TRADE BLOCKS
3: WATERLESS TOILET
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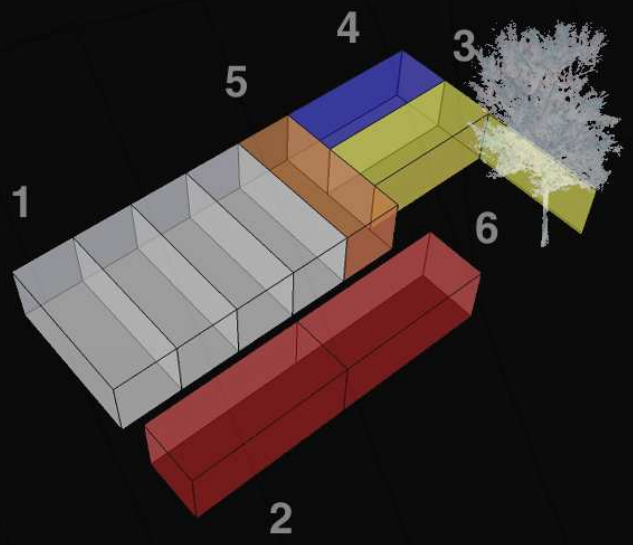
6: FOOTBALL COURT

'M', a community garden serves applications in more social levels than economic ones
The main function is to provide communication resources, educational services and basic business training

S

I-HOUSE



1: NEW FUNCTION BLOCKS
- A: MULTI MEDIA BLOCK (TV, RADIO & PHONE)
- B: LIBRARY BLOCK
- C: SUB CLINIC STATION
- D: SUB POLICE STATION

2: TRADE BLOCKS

3: WATERLESS TOILET

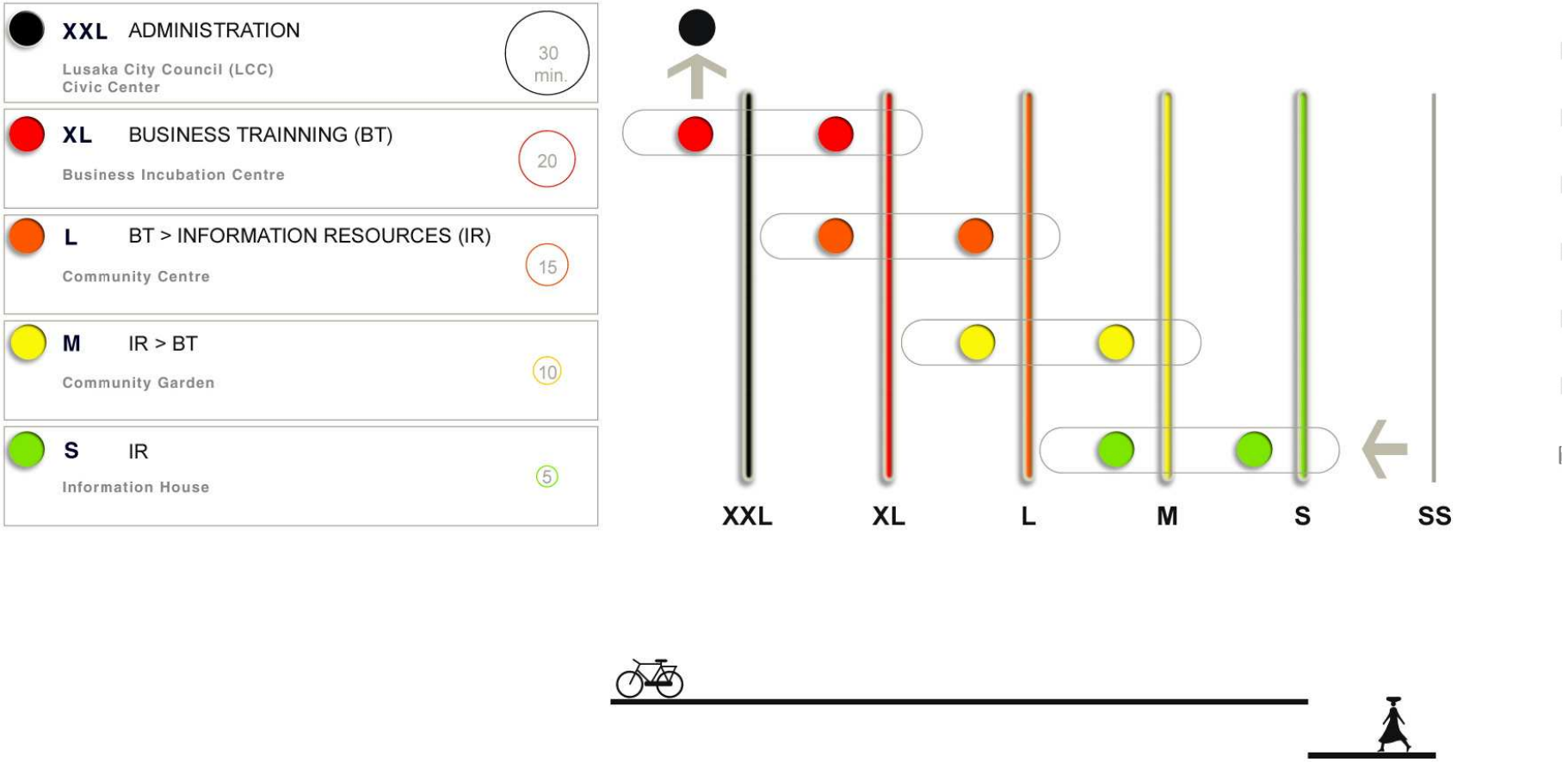
4: WATER COLLECTOR

5: SOLAR POWER SYSTEM

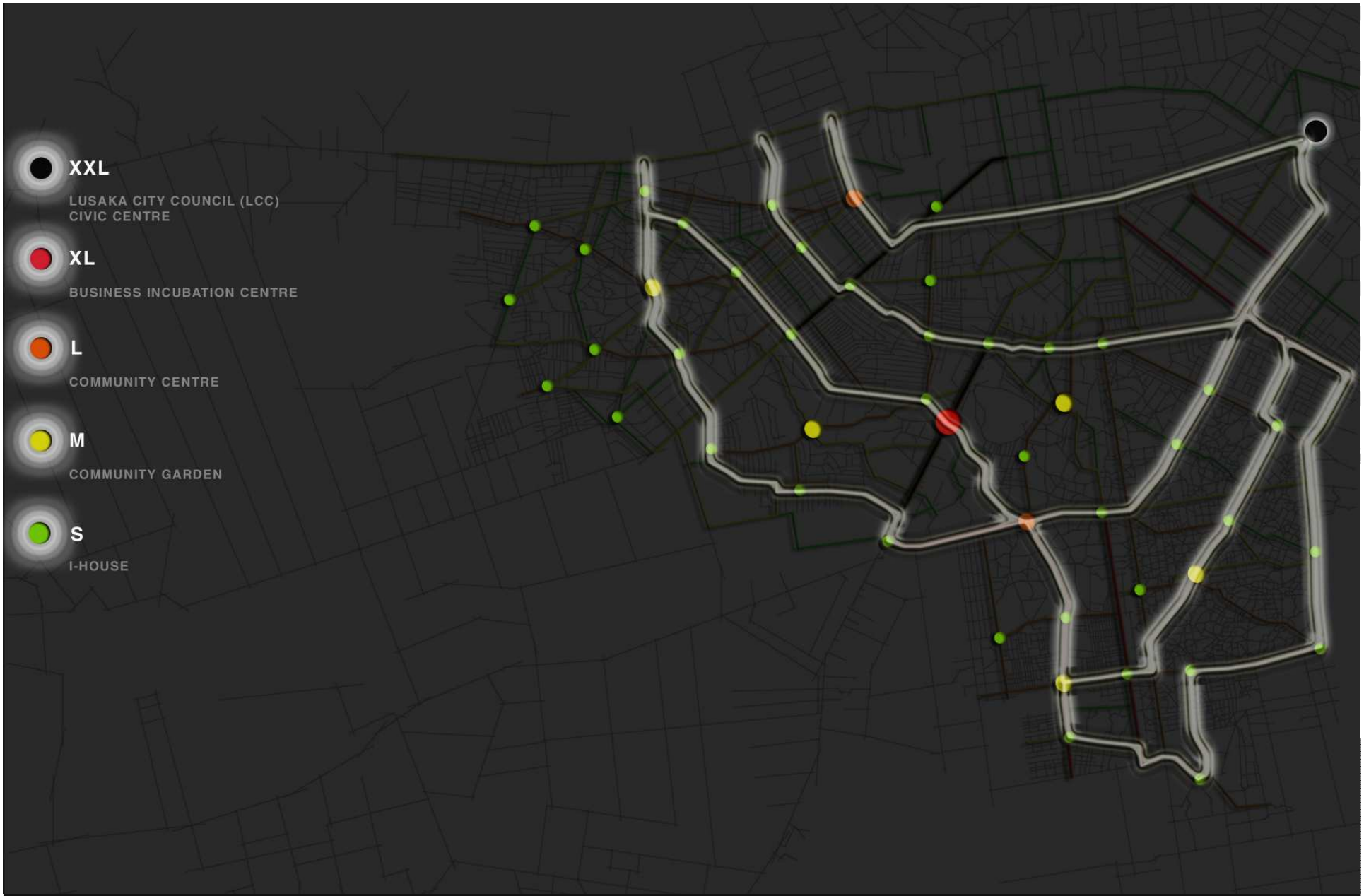
6: HALL (EVENT & MEETING PLACE)

VENDOR
COMMUNITY FUNCTION
TOILET
WATER
ELECTRICITY

'S', an i-House serves applications in social levels providing communication resources
The main function is to provide communication resources and places to empower their community

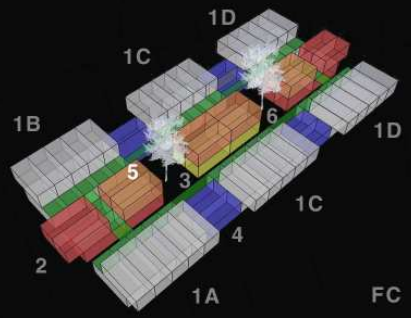


The socio-economic hierarchy of future urban services could follow the spatial hierarchy


XXL
LUSAKA CITY COUNCIL (LCC)
CIVIC CENTRE
XL
BUSINESS INCUBATION CENTRE
L
COMMUNITY CENTRE
M
COMMUNITY GARDEN
S
I-HOUSE

XL

BUSINESS INCUBATION CENTRE



1E (2F)

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- 1A & 1B: PUBLIC SERVICES
  - POLICE STATION (1A)
  - CLINIC STATION (1B)
- 1C & 1D: BUSINESS CENTRE
  - MULTI MEDIA BLOCK (1C) (TV, PHONE, FAX & INTERNET)
  - TRAINNING CENTRE (1D)
- 1E: INCUBATION HOUSE
  - RENTAL OFFICE SPACE (1E)

2: TRADE BLOCKS

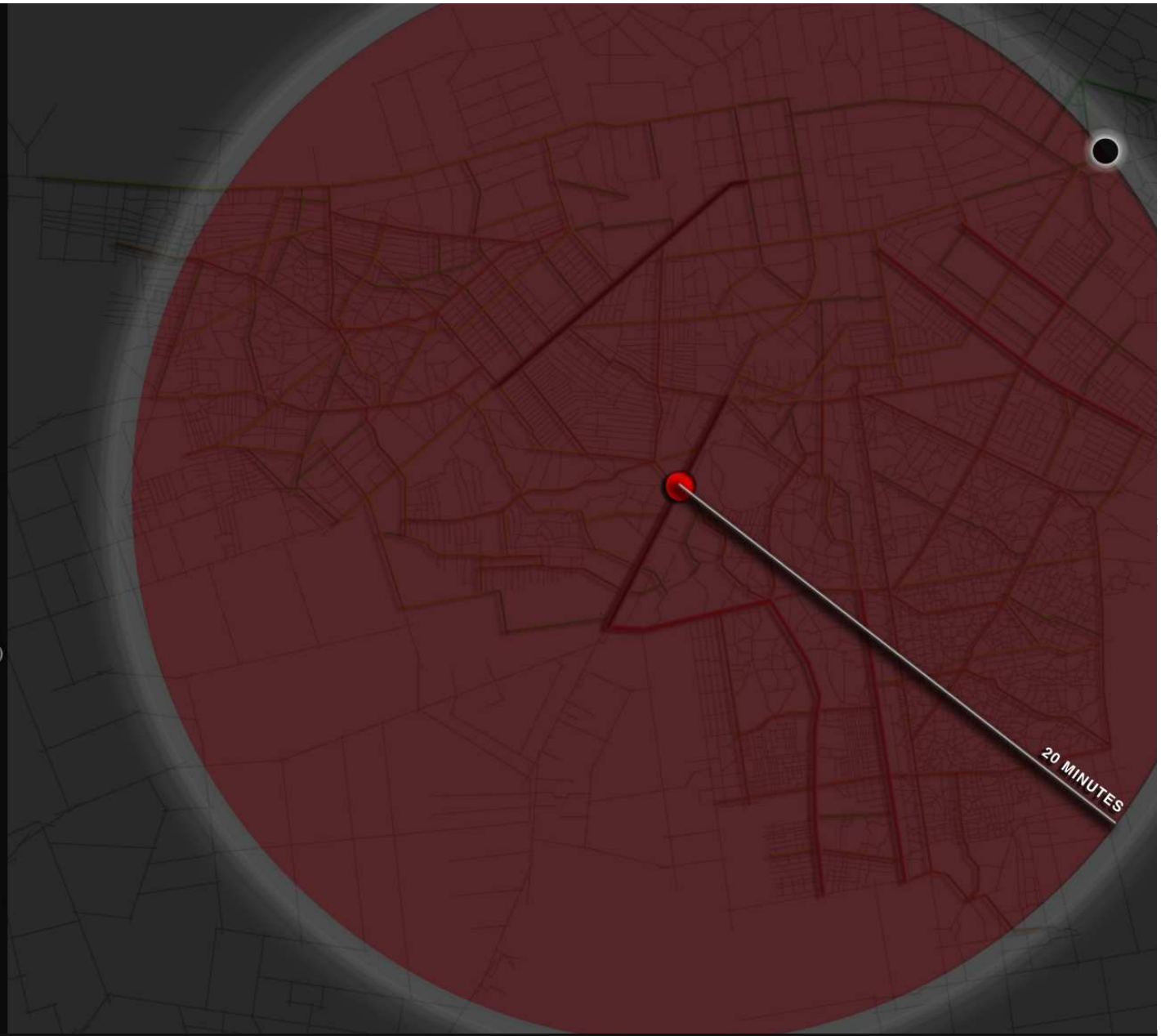
3: WATERLESS TOILET

4: WATER COLLECTOR

5: SOLAR POWER SYSTEM

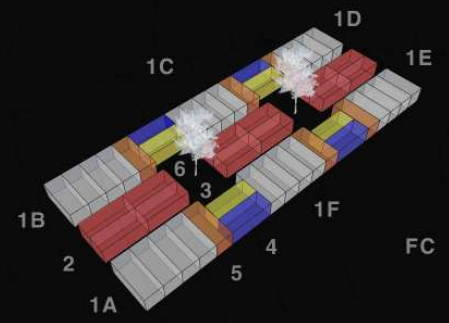
6: HALL (EVENT & MEETING PLACE)

FC: FOOTBALL COURT



L

COMMUNITY CENTRE



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- 1E & 1F: EDUCATION CENTRE
  - WORKING & MEETING SPACE
  - LIBRARY (1F)

2: TRADE BLOCKS

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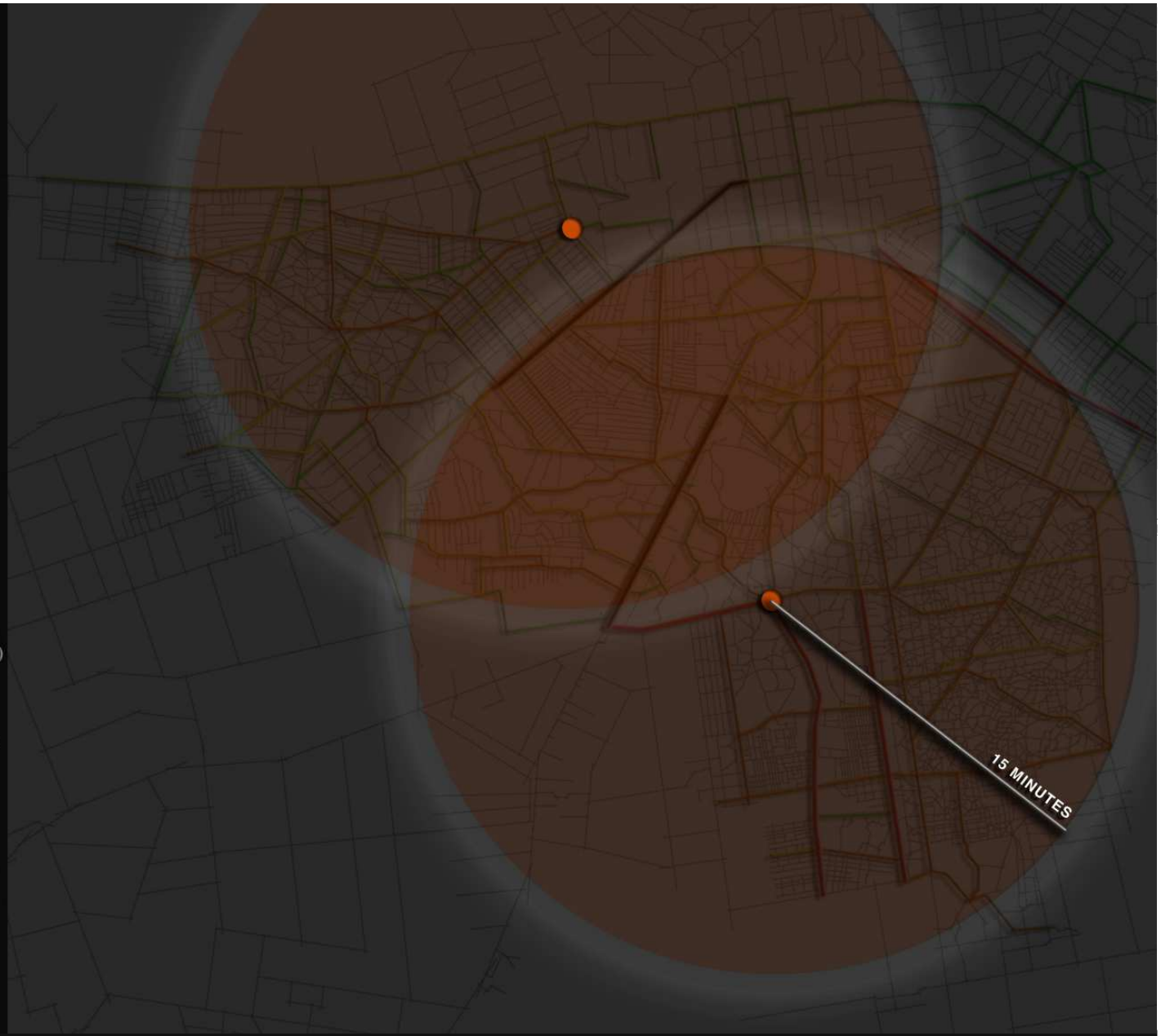
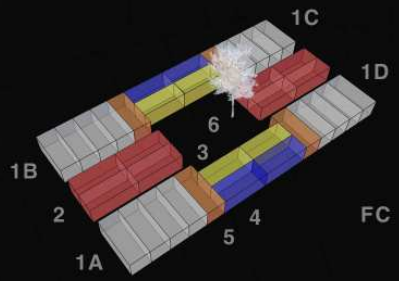


M

COMMUNITY GARDEN



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- 1B: BUSINESS CENTRE
  - MULTI MEDIA BLOCK (TV, PHONE, FAX & INTERNET)
  - TRAINNING CENTRE
- 1C: WORKING & MEETING SPACE
- 1D: EDUCATION CENTRE
  - CLASS ROOM
  - LIBRARY

2: TRADE BLOCKS

3: WATERLESS TOILET

4: WATER COLLECTOR

5: SOLAR POWER SYSTEM

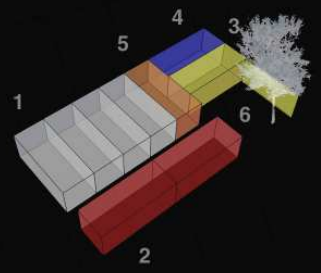
6: HALL (EVENT 6 MEETING PLACE)

FC: FOOTBALL COURT

S: i-HOUSE (INFORMATION / INCUBATION HOUSE)

S

I-HOUSE



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2: TRADE BLOCKS

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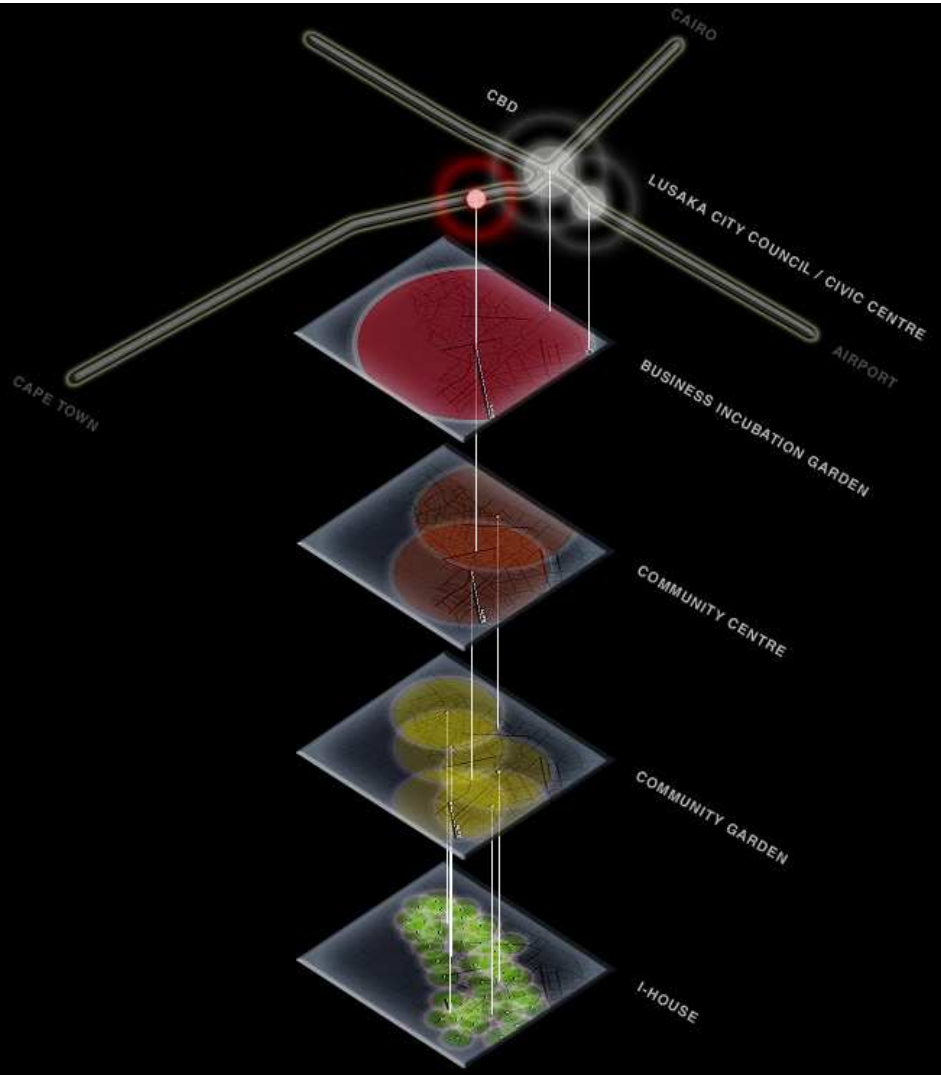
4: WATER COLLECTOR

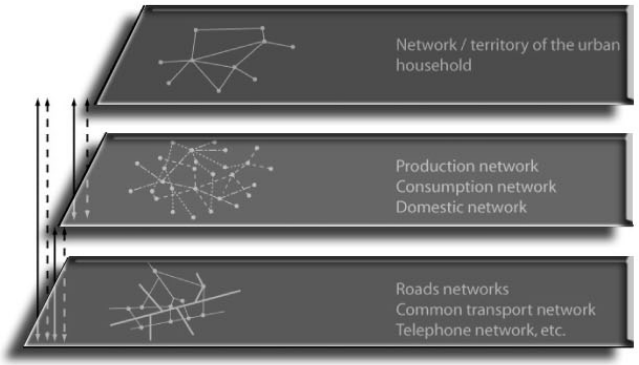
5: SOLAR POWER SYSTEM

6: HALL (EVENT & MEETING PLACE)

STRUCTURE OF THE ALTERNATIVE URBAN SYSTEM FOR THE PRO-POOR GROWTH



Structure of a new urban system follow the theory of the pro-poor growth:
A coherent scenario from social to economic levels, from local needs to global needs
and from current needs to future needs as a whole
for the poverty reduction in a developing fragmented cities



3rd level: household
household in slums (women & youth)

2rd level: human activity network
future urban services: multi-purpose community telecentre
current urban services: water, market, clinic, school, administration

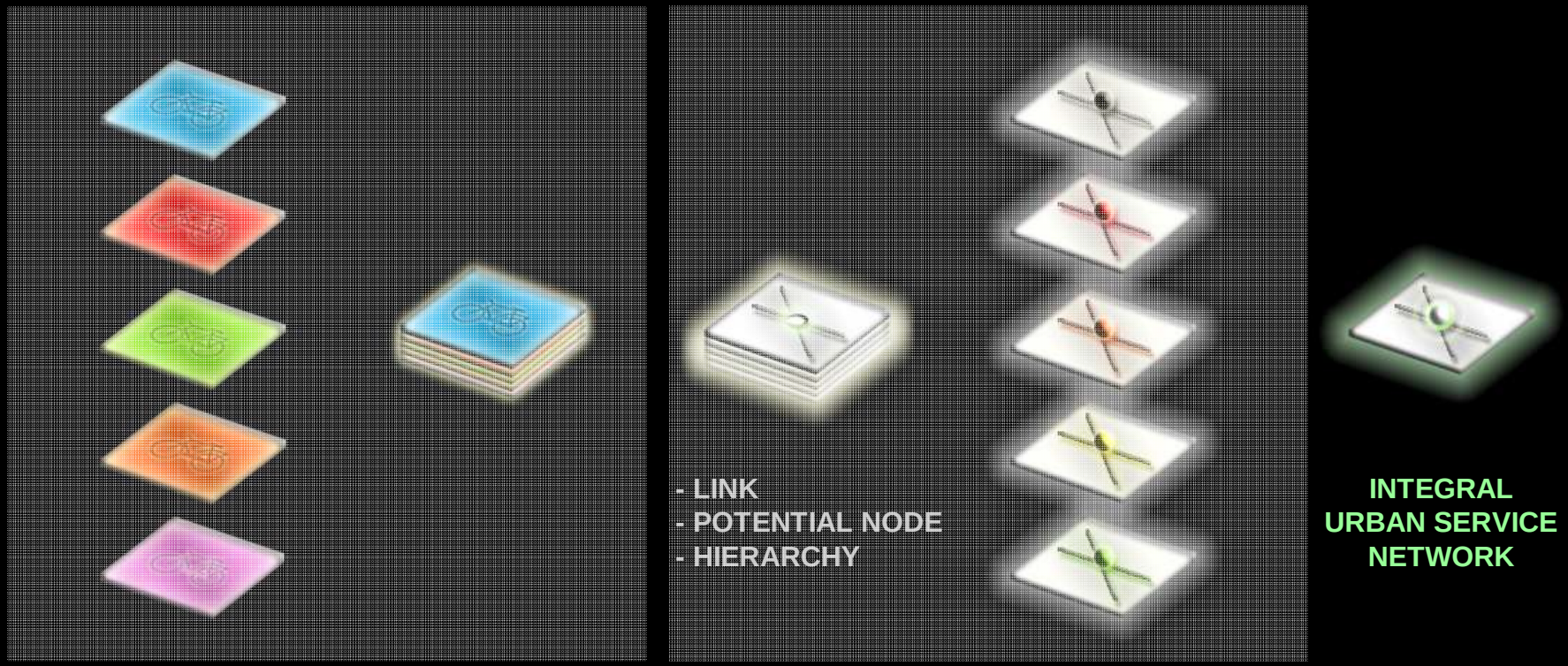
1st level: road network
bicycle network

CHAPTER 6

6.1 Conclusions
6.2 Recommendations

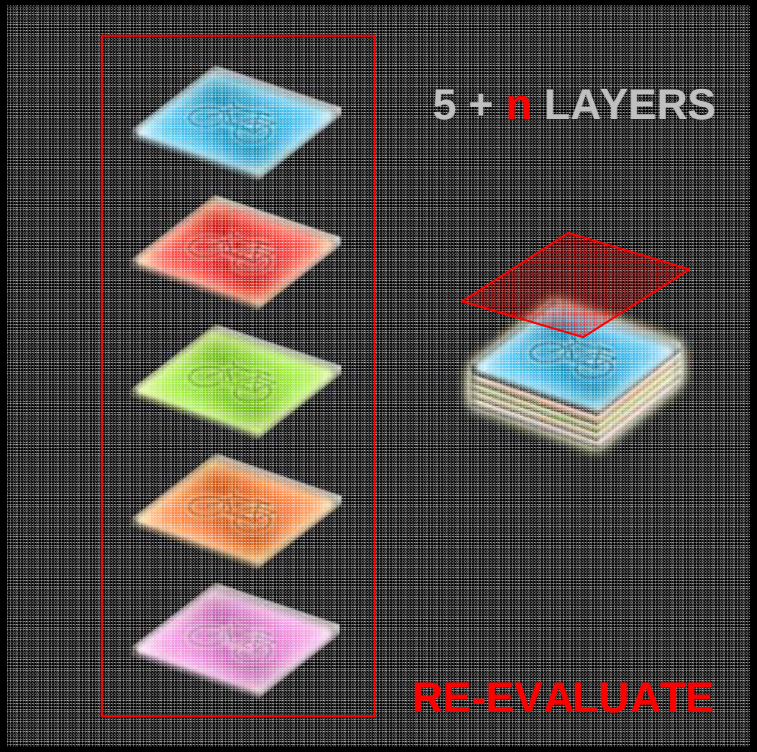
ENHANCE **MOBILITY & ACCESSIBILITY**
TO CURRENT URBAN SERVICES

IMPROVE **ECONOMIC OPPORTUNITIES**
OF LUSAKA'S POORS IN THE FUTURE

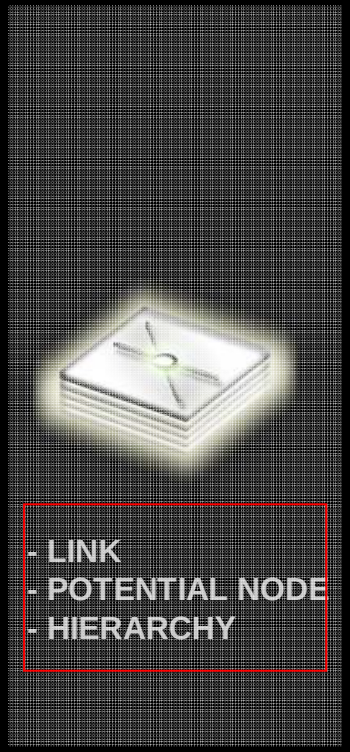


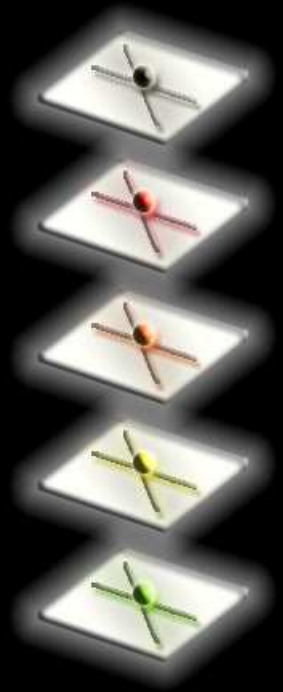
By adapting the integral bicycle network in line with current urgent urban services for the Poor, their daily transportation time is mitigated, in which their daily timetable is improved
In this, the Poor can put more time into socio-economic activities than ever before
By proposing the integral urban service network with future urban services, the Poor could enjoy self-organizing economic activities now and future; thereby, the middle-income society could be feasible

FLEXIBLE SYSTEM TO FUTURE CHANGES



ADAPTABLE ELEMENTS





INTEGRAL
URBAN SERVICE
NETWORK

To adapt to future changes such as urbanization growth and social needs, monitoring is indispensable
In line with these future changes, bicycle network layers are additionally superimposed, or re-evaluated
In this, the elements of the integral bicycle network such as links, nodes and hierarchies could be changed
The alternative integral urban service network could become a sustainable layered product for the Pro-poor growth

QUESTIONS & ANSWERS

A FIELD TRIP TO LUSAKA, ZAMBIA, SPRING SEMESTER OF 2007

THANK YOU FOR YOUR ATTENTION!

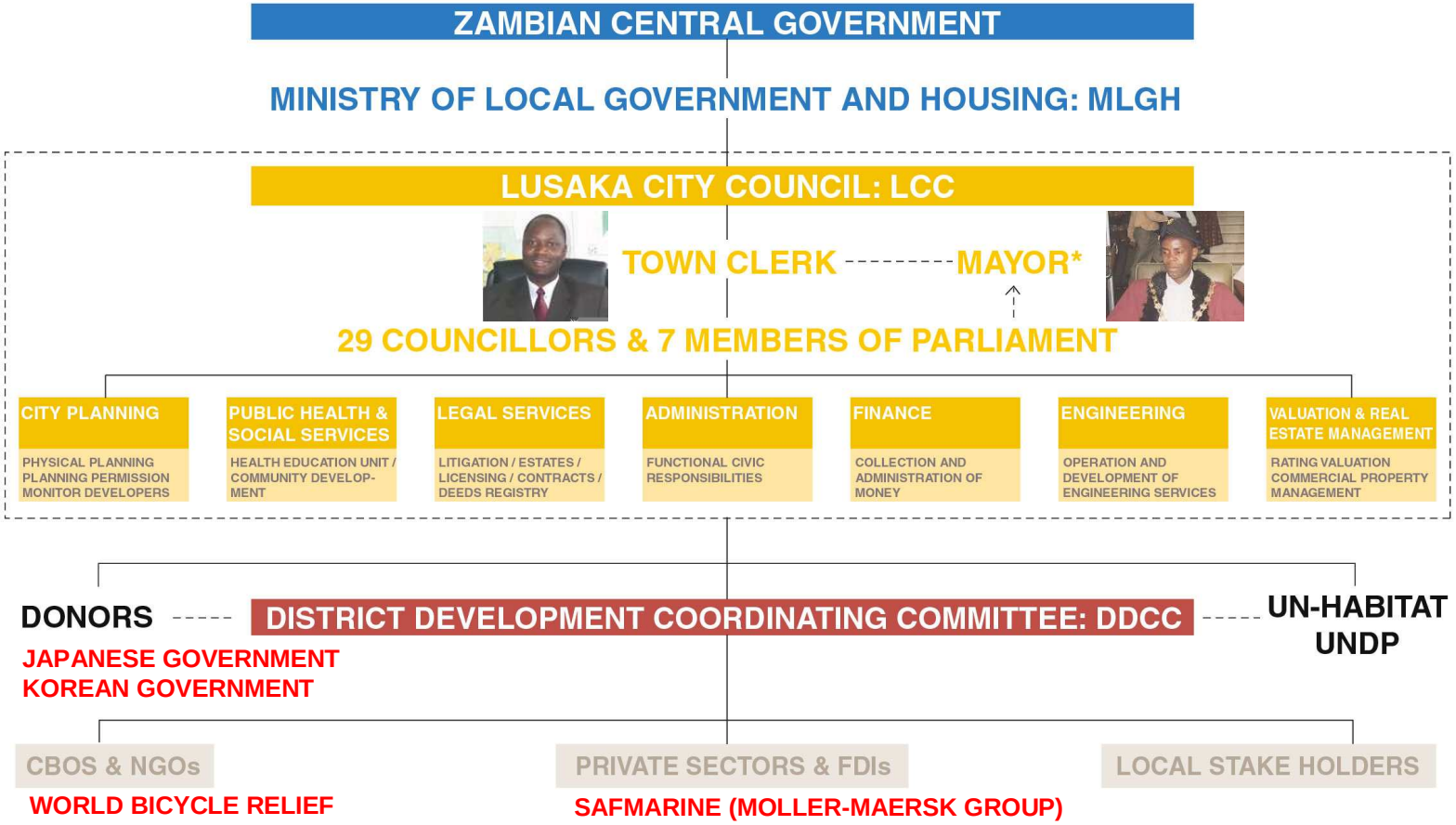
IMPLEMENTATION PHASES

2010-2015: implementing bicycle networks

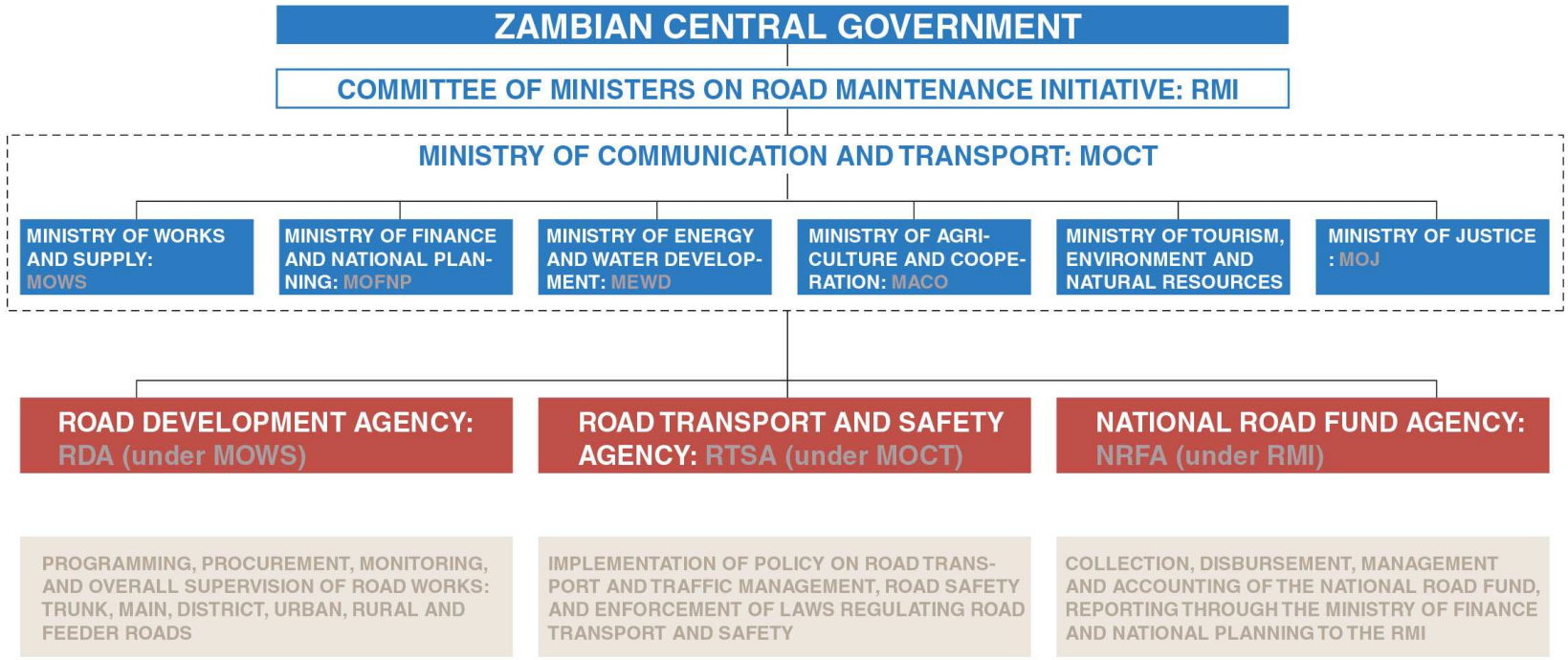
2015-2020: providing i-houses and completing bicycle networks

2020-2025: providing community gardens and completing i-houses

2025-2030: providing community centres & the business incubation centre



SOURCE: UN-HABITAT 2007, ZAMBIA: LUSAKA-URBAN SECTOR PROFILE, NAIROBI, KENYA



Road & Traffic Policy in Zambia

SOURCE: ENGINEERING AND CONSULTING FIRMS ASSOCIATION (ECFA), 2006
ZAMBIA-REPORT OF THE STUDY ON NATIONAL DEVELOPMENT, ECFA, JAPAN