Minkun Kim

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Rice School of Architecture
6100 Main St, Houston, TX 77005

Resume

Education
- M.Arch candidate (with full scholarship)
:Rice School of Architecture, Houston, USA
(Aug 2012 ~ current)
- Bachelor of Urban Planning
: Hong-ik University, Seoul, South Korea
(Mar 2000 ~ Feb 2008)

Work Experience (Internship at South Korea)
- SH Corporation of the Seoul Metropolitan
(Aug 2007 ~ Sep 2007)
: Summer internship, CAD drawings, ARC-GIS 8.0
analysis, Presentation
- HIMMA Design (Architectural Design studio), Seoul,
South Korea (Dec 2006 ~ Jan 2007)
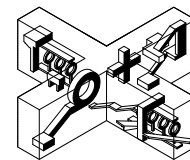: Modeling, CAD drawings

Relevant skills
- Digital
: Rhino, Vray for Rhino, Autocad, Photoshop,
Illustrator, Indesign
- Manual
: Foam-cutting, Laser-cutting, Wood-shop,
print making, hand-drawing
- Language
: English (fluent), Korean (native)

Military Service
- A Guided Missile Operator at the Republic of Korea
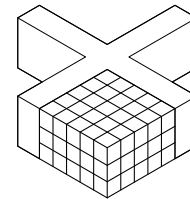Air force (Nov 2001 ~ Aug 2004)

Academic at Rice

A. architectural device (in progress)
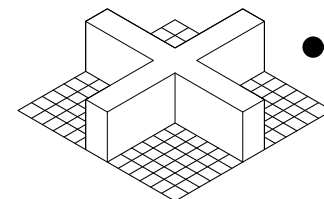
01. envelope: **N.T.S (F 2014)**

02. ....

B. skepticism about OMA's "Congestion Box"

01. congestion plane I: **Inverted Plinth (SP 2014)**

02. congestion plane II: **Effervescent Landscape (SP 2013)**

C. public space = "play-surface for socializing"

01. play-surface I: **The Wall (F 2013)**

02. play-surface II: **The Snake (F 2012)**

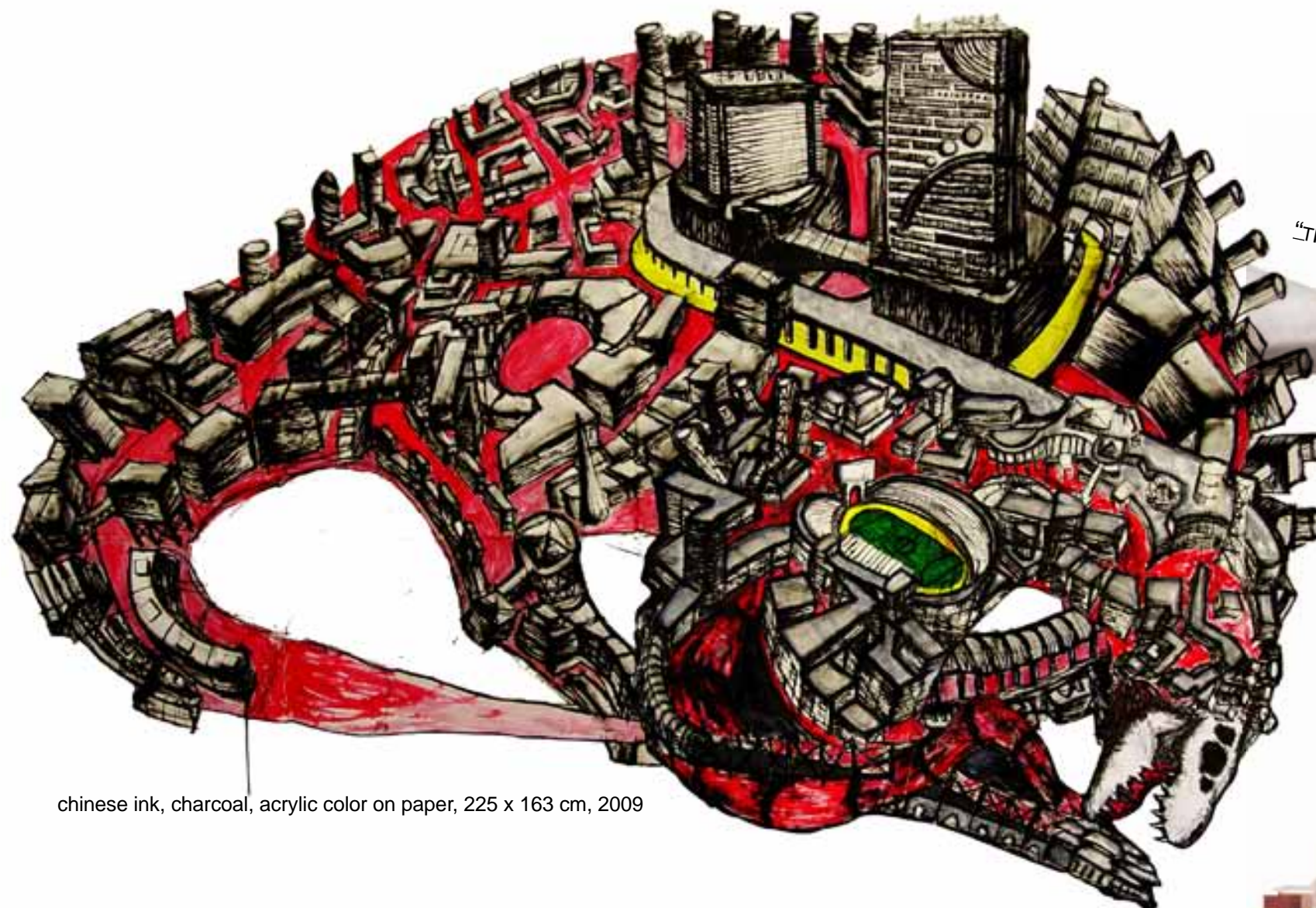# Personal

A. Leviathan City (2011)

leviathan
city

I lived in Seoul. I am one of countless individuals stepping on Seoul. Seoul is a humungous city. With human feet, feeling the city Seoul is almost impossible. Riding an auto on surface is too expensive. But I find subway too stuffed. Whirling around the underground, subways cover the eyes of human looking at Seoul. Only the letters and numbers providing information on where the station is located define Seoul. Covering eyes. Might not have been intended, but it surely dulls us about Seoul. People are tired to be in Seoul.

Shameful reality is that such largeness of Seoul makes us overlook at the spatial sequence of sauntering. And that no matter which subway station one takes off, the neighboring city space is almost indistinguishable and that eventually any space seeming feasible for sauntering are conquered by private buildings. Only the private buildings are glamorous. And those buildings seem to care for the aesthetic value out of human scale.

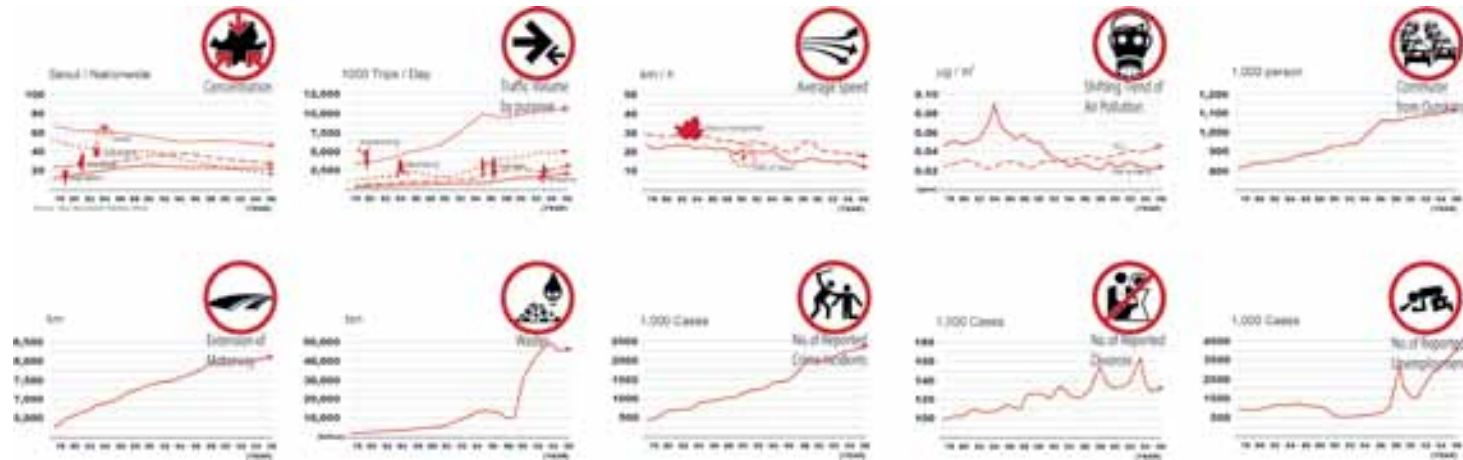## Is Seoul… a place for human?
Or for the Haves?

"ThiS is a fantaSy of three dimensiOnally developing downtown in megalopOlis."

chinese ink, charcoal, acrylic color on paper, 225 x 163 cm, 2009

AREA : 910 ha
POPULATION : 130,000
DENSITY(net) : 175 / ha

67.5 m² is AREA for 1person

SITE : Downtown
THE CENTER OF SEOUL

What's going on?

A dead city means a space that no longer attracts people. It implies the place people wish not to go. The new downtown Gangnam will have to go through the same phase as Junggu, and as time goes by main downtown function will again be transferred to the other district. This way, dead districts will add one by one, resulting in endlessly expanding size of city.

This is the two dimensional development of city. Keeping up the current developmental shape, might lead to the demise of megalopolis Seoul. As dinosaurs, the ancient rulers of the world have all died; megalopolis Seoul will face the same fate when it cannot subdue its own avarice.

Megalopolis Seoul is the main culprit excreting enormous amount of unrecyclable waste. Seoul's domestic wastes are about 4,399,000 tons, a quarter of the nation's total wastes 17,450,000t (National Statistical Office, 2009)
To care for these 4,399,000 t, 14 incinerators of soccer stadium sized American ref-fuel are needed. It makes no sense even to further discuss about the expected harmful effects brought by these wastes.

acrylic color, egg, 20 x 35 x 18 cm, 2010

4,399,000 t / 1year
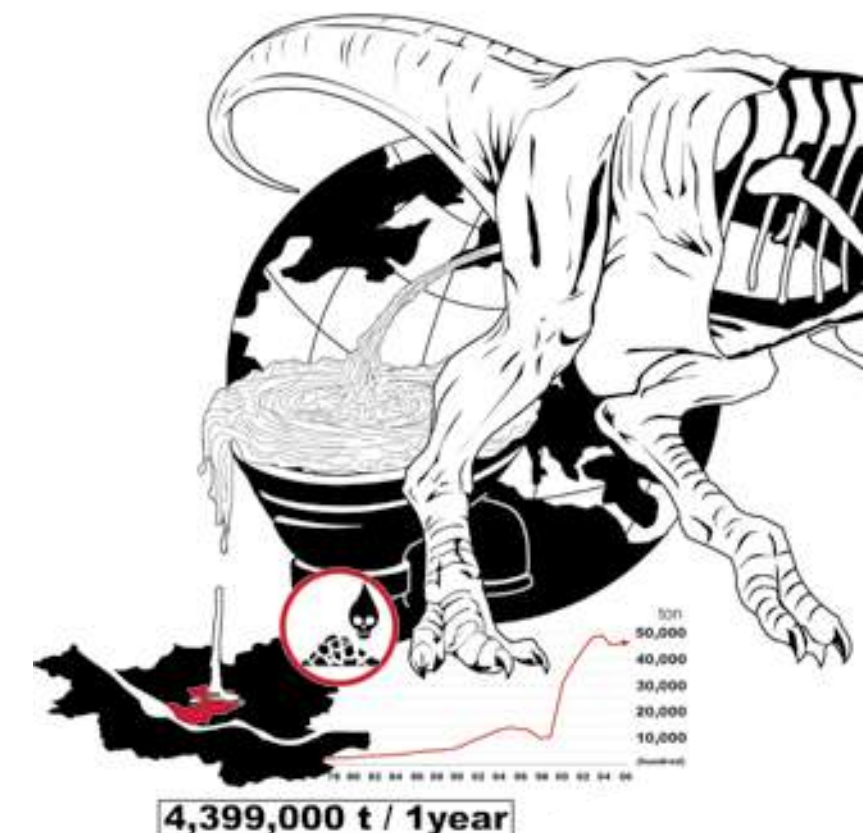
The tragedy is that such expansion of megalopolis is the fruit of human desire for more and that human desire is impossible to be controlled as an innate character.
Looking back at the last century's Seoul expanding, most of the driving force for the change goes back to a simple 'human desire'. Such desire categorizes into five.

Desire1. *Habitus:* Cohesion based on financial similarity
- Due to the desire to form the upper classes' lifestyle,
 local community will frustrate the cooperation
 of regional residents.

Desire2. *Profit-oriented MUTATION*
- Now is the age for the flexible architecture that can adopt to profit driven trends.

Desire3. *Transfix Phenomenon:* Syndrom to precede - Fear for lagging behind
- Comparing to others has standardized tastes for housing, leisure, lifestyle, education, spouse, career, human relations etc. Unfortunately, most of Seoul citizens consider their life priority as real estates, education, job than aesthetic taste, nature, friends.

Desire4. *Neurosis for Brevity, Precision, Speed*
- It is the age venerating speed and convenience. The esthetics of slowness is trashed. Economy may have developed more and made us affluent. Yet to point out the value of happiness or composure for life has now become a non sense.
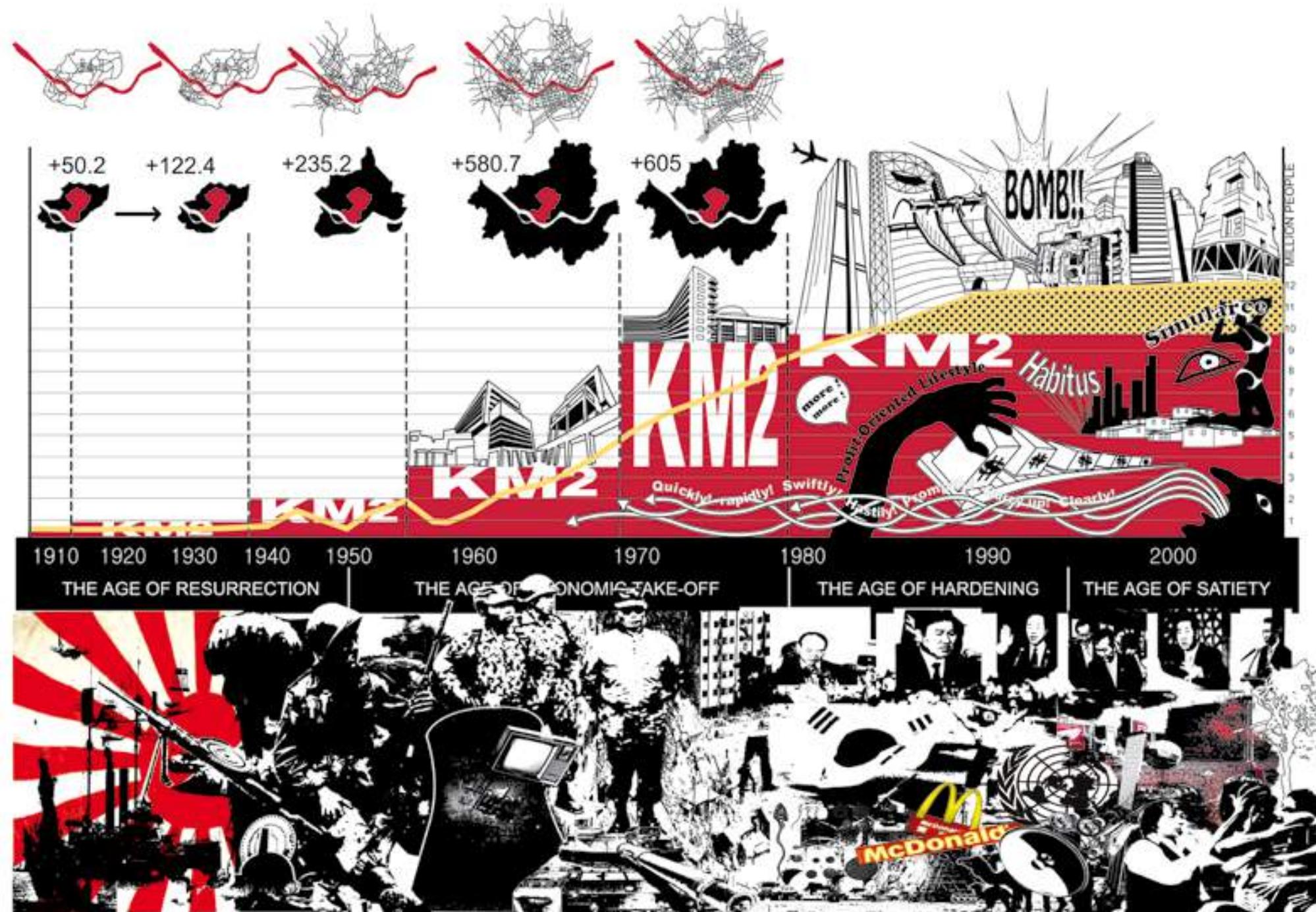
Desire5. *Momentous Indulgence:* preference for simulacre hedonism
- People grow lies owing to the IT technology development. A single entity can now experience multiple character of community online, and also could express numerous 'me'. What these Multi-faced, Style People need is just "Room" to alleviate their pleasure.
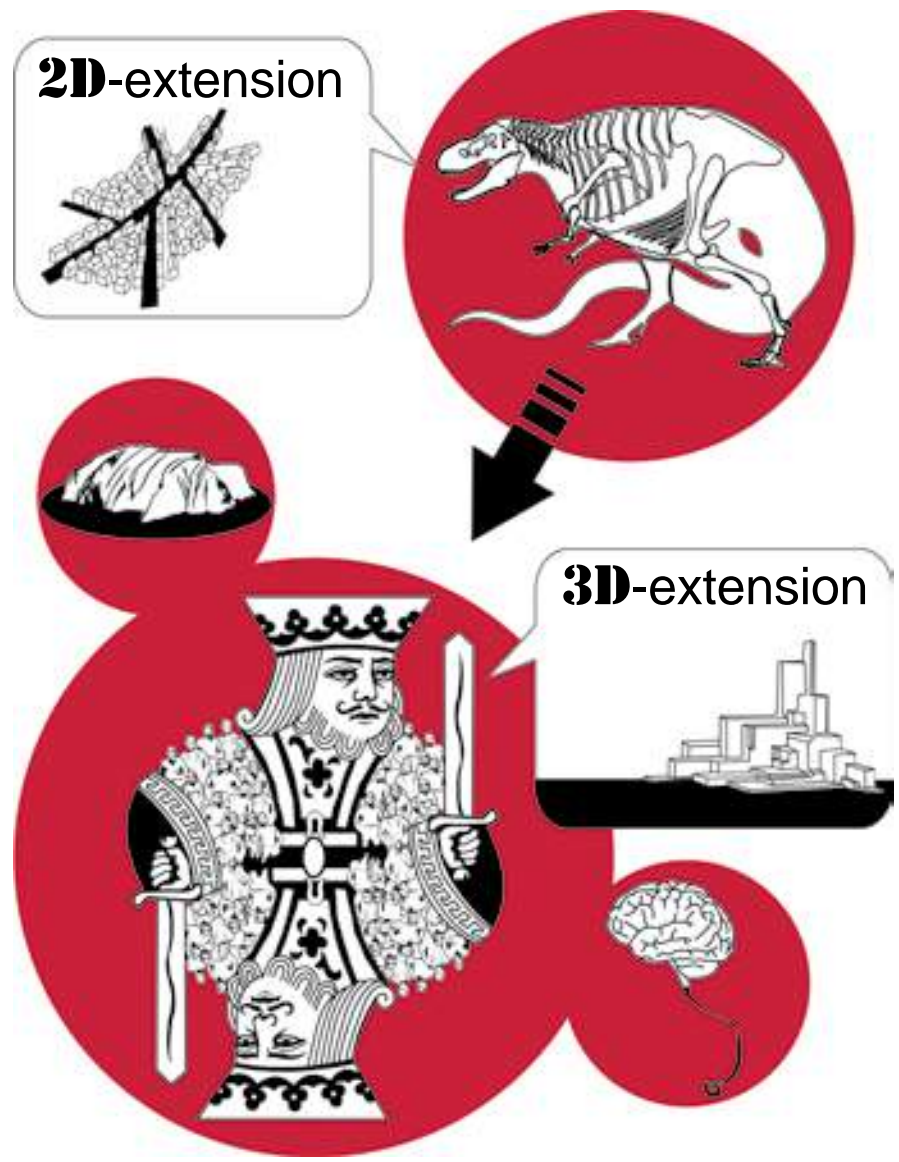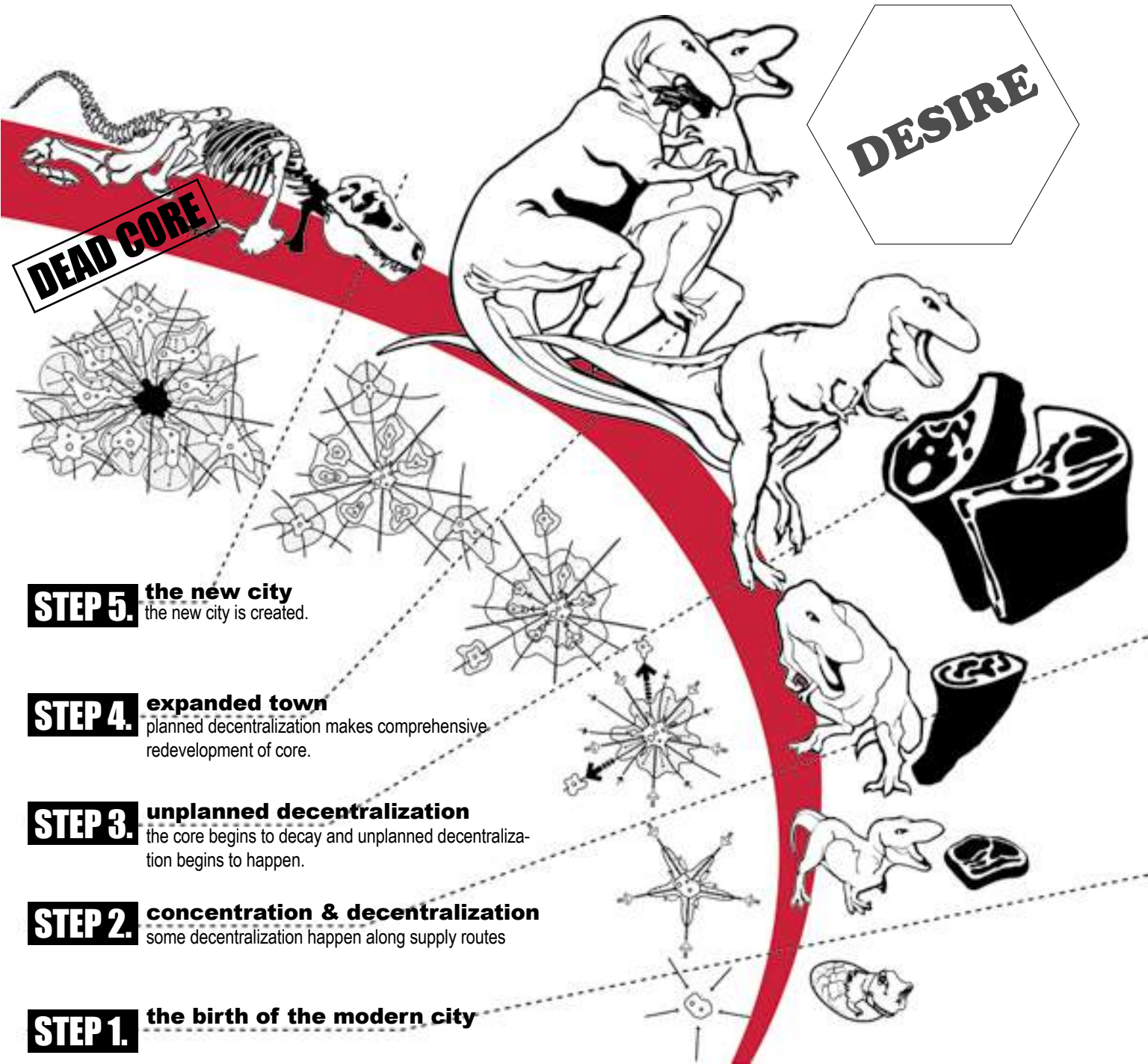
Products of such desires have defined the modern Seoul.

- Demise of Seun Market, collapse of Mapo apartment, birth of 63 building, overwhelming National Tax Service, break-down of Seongsu bridge, Sampoong department store collapse, advent of extreme residential complex community with "Towerpalace" leading…etc.

+50.2   +122.4   +235.2   +580.7   +605

| 1910 | 1920 | 1930 | 1940 | 1950 | 1960 | 1970 | 1980 | 1990 | 2000 |

THE AGE OF RESURRECTION   THE AGE OF ECONOMIC TAKE-OFF   THE AGE OF HARDENING   THE AGE OF SATIETY

2D "Seoul"= a moribund dinosaur
= massive consumer producing enormous excrements.

DESIRE

DEAD CORE

2D-extension

3D-extension

STEP 5. **the new city**
the new city is created.

STEP 4. **expanded town**
planned decentralization makes comprehensive redevelopment of core.

STEP 3. **unplanned decentralization**
the core begins to decay and unplanned decentralization begins to happen.

STEP 2. **concentration & decentralization**
some decentralization happen along supply routes

STEP 1. **the birth of the modern city**

Because when cities grow, it is imperative to construct more roads and parking lots to provide with the capacity for increasing transportation.
The inconvenience of land use planning contributes to the growth of roads as well. In order to make more profits and to ease tax management, it is unavoidable for closely placed city programs to cause more unnecessary transportation growth at the same time and same place. Increasing traffic congestion, car accidents as well as toxic gas emission from enormous amount of traffic are already our realities. It is the downtown area where all these harmful effects unfold so intensively.
Just for the function of transport to be carried out on the massive surface of road, citizens must yield the potentially indispensable areas for them to lead a quality life. Also the funds for the city to provide more affluent life base to the citizens must all be poured into the maintenance of roads.

Then is it so essential to create roads on surface in urban growth? Is it really adequate to apply monotonous land use plan to a megalopolis which went over certain critical point of development?
Is it right to overlook at inversely decreasing amount of greenbelt, against the increasing rate of roads?

In modern cities, if one could not deny that fundamentally roads are constructed to provide access to two dimensionally scattered individual buildings in process of urban development, how about megaforms with zoning envelop? It's a three domensional extension.

Habitus
Despite geographic continuation, separate community or spatial division on age, social strata base is tried. (Dogok Towerpalace, Apgujeoung, Nonhyun, Shinsa, Bangbae, Chungdam, Foreign district, Single Residential District vs. Deteriorated district, poor hillside village, shantytown, silver town, rented apartment)

Profit-oriented MUTATION
Deteriorating architecture encroached the powerful neighboring program network (downtown shopping district encroached by peripheral market), many changeable buildings with nothing meaningful except for the framework.

Transfix Phenomenon
Voluntary mobilization of "World cup Red Devils", 10 million moviegoers without state power enforcement, leisure following age categories, unified hobbies (internet cafe, starcraft, online game, karaoke, korean sauna = not to be left alone), age influenced common goals in head, patterns for the subjects of interest : employment (stable corporate), increasing fake luxury items sales

Neurosis for Speed
Internet, mobile addict, Obsession for knowledge sharing speed (internet speed, ISP popularity), The greatness of big shot which leads to epoch-making change at once (revering jackpot), way to easy change of purpose, architecture except for framework to expect, inner-directed wasteful architecture that disregards the exterior

Preference for simulacre hedonism
Preferring nonsubjects (characters, avatars), Game addict, one-off dates, human relation, seclusive loner, pleasure of consumption
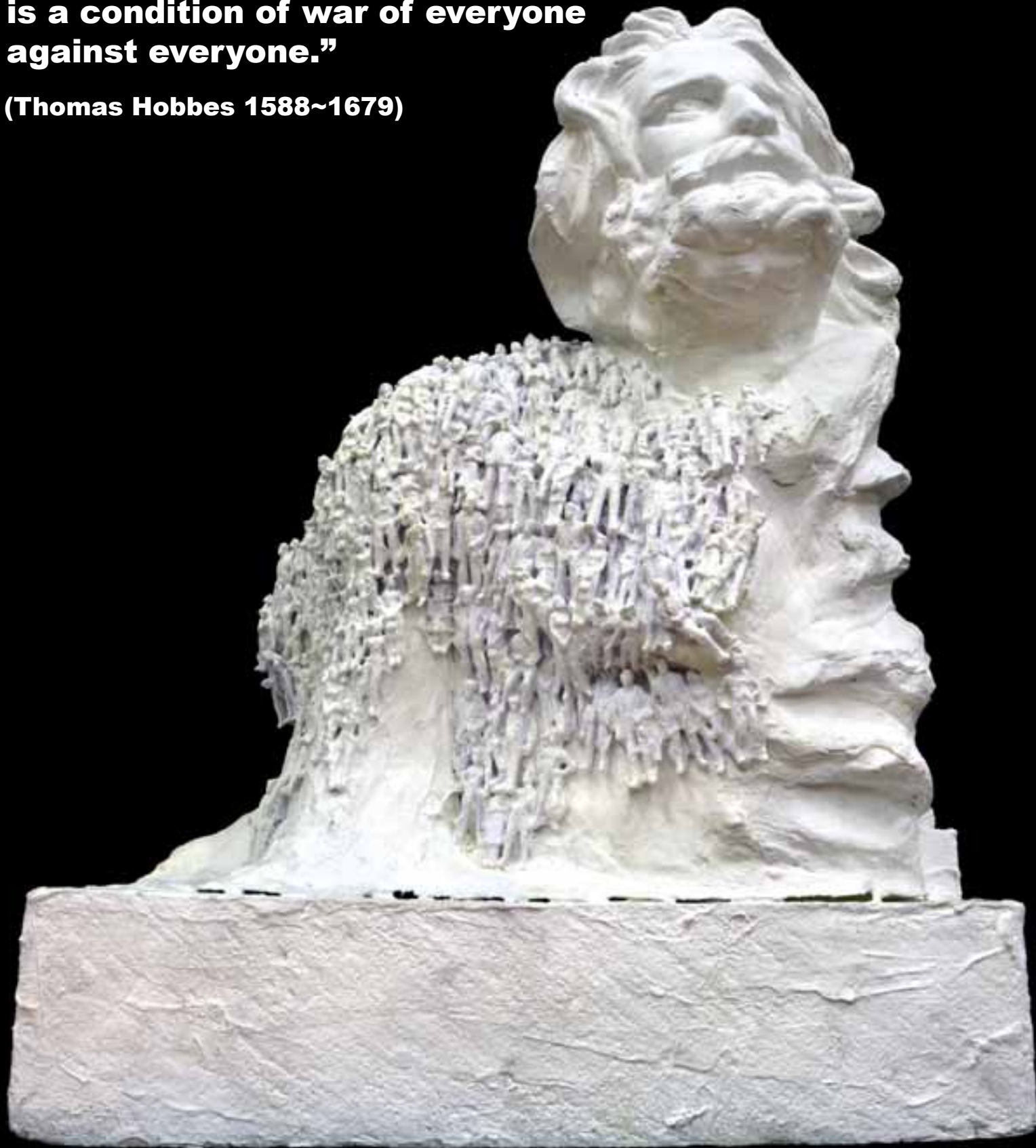
Fundamentally it is impossible to control human avarice. Thereby impossible to hold down the expansion of greed driven city.. it is also true that civilization continues as greed exists.
Then the key to the problem solving might as well be....

"Which form of gigantization?"

mixed media, 51 x 33 cm, 2010

Leviathan !

**"The condition of man . . .
is a condition of war of everyone
against everyone."**

(Thomas Hobbes 1588~1679)

This is not so ideal
but Leviathan, the necessary evil.

Hobbes asserted that in order to prevent unavoidable chaos deriving from human nature to pursue individual desire, individuals should submit own freedom to the 'humane divine', state, as to conclude the "social contract". Let us apply Hobbes' Leviathan to the megalopolis of avarice, Seoul. From the perspective of human society, countless small individuals are gathered to form Leviathan in its architectural revival. This implies all the individual buildings on the surface of Seoul as 3D-megaform. It means the 3D urban expansion or a city within a city, not the 2D urban expansion.

Urban expansion by megaform will ultimately be the only solution to save the megalopolis Seoul, reaching its atrophying limit while accommodating human desire.
In any society, megaform is not much welcomed. It owes to the ignoring look of dehumanization. But in megalopolis Seoul, the space to respect human scale is already gone now, isn't it?
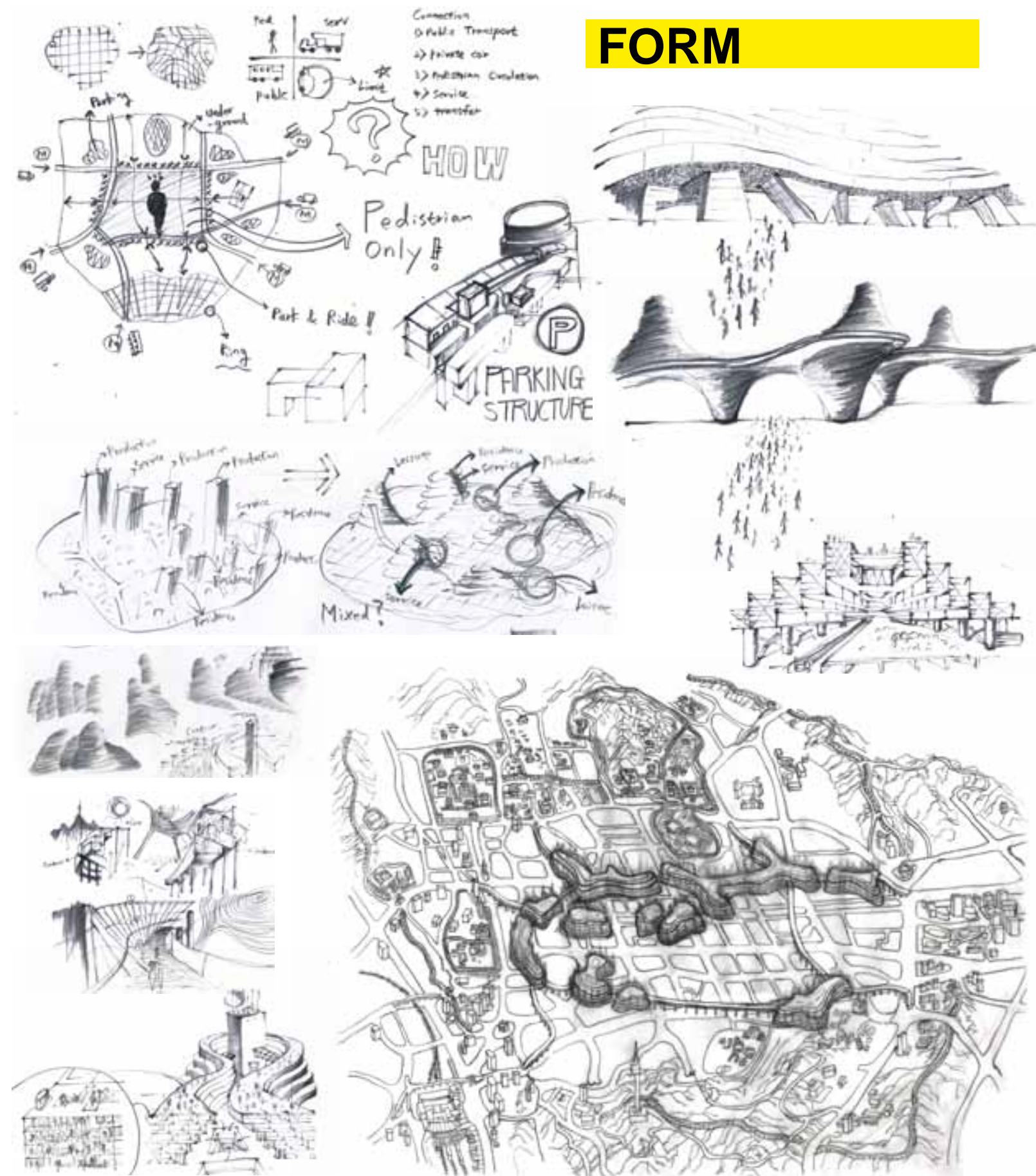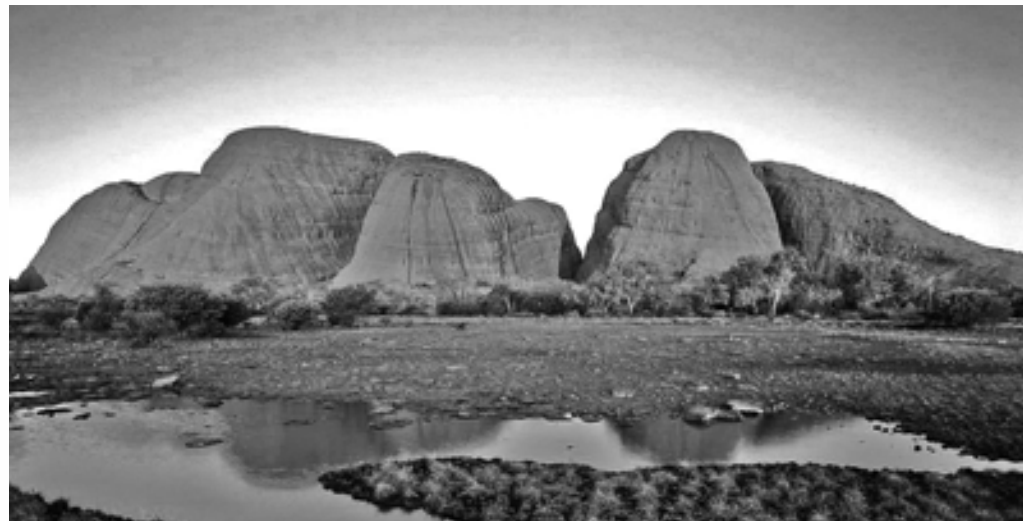
plastic figure, wire, pvc, 22 x 35 cm, 2009

FORM

Uluru is one of Australia's most recognisable natural icons. The world-renowned sandstone formation stands 348 m (1,142 ft) high (863 m/2,831 ft above sea level) with most of its bulk below the ground, and measures 9.4 km (5.8 mi) in circumference. Uluru is sacred to the Pitjantjatjara and Yankunytjatjara, the Aboriginal people of the area. It has many springs, waterholes, rock caves and ancient paintings. Uluru is listed as a World Heritage Site.

If…countless masters of modern city are integrated into "Massiveness"
  1. Reduce the surface required for access
  2. Simple function zoning will connect scattered programs, enabling proper urban activities.
  3. Privatized public city in capitalism

Uluru's megaform sets the premise as the demise of urbanity, the worst case scenario in the site.


wood, corrugated card board, 98 x 67 x 28 cm, 2010

Mega-core enables "internalization of urban spaces" in Uluru's megaform.

In terms of megaform copied from Uluru, megacore, the centre of pedestrian flow is an independent building with massive floor plan of 100m x 100m as average size.

Japanese architect Hitoshi and Masashige suggested the standard for the new office form. In terms of program elements that take up the building's huge and free floor plan of 1 hectare, it was the idea to escape from vertically limited planning to able horizontal yet strategic arrangement. Mega-core accommodates this idea. Because if a megaform means to combine the common internalization of architecture and the urban space, the floor plan should at least provide the citizens in the building with the urbanity. Programmatic masses composing the contour have about 6m story height and 5 stories as basics. In terms of circulation, this huge form of programmatic masses contour are mainly supported by the mega core, connected with deck type masses. The underground of mega core should directly be provided by the downtown traffic access and the floating population must compose the connection between the underground circulations.

Mentioning again, this work is a framework for the architectural urban planning.
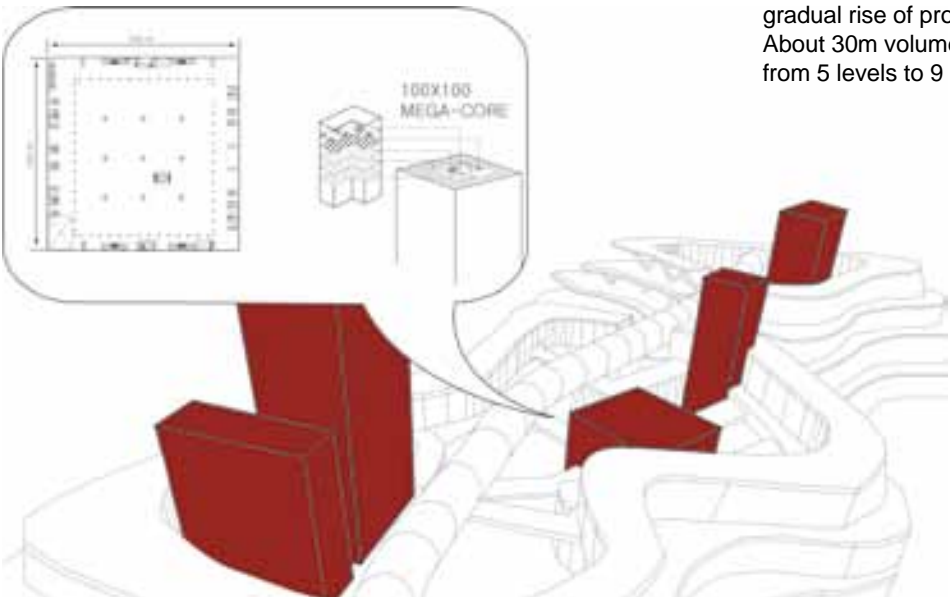
The "ground sector mass" planned directly onto the surface, shall aptly be separated in order to guarantee the pedestrian flow of the ground as well as the tram flow and it will mainly be used for the commercial purpose. Since it is the ground for mounting up the contour type masses, it requires structural firmness.

The process to construct the megaform must start with the arrangement of mega core and flyover. On this base gradual rise of programmatic masses will take place. About 30m volume contour masses will have extensions from 5 levels to 9 levels.

100X100 MEGA-CORE

Megastructure accumulated by the contour type programmatic masses, might face difficulties with lighting. Contour masses per se form the exterior of structure, therefore it needs its own technological solution. To add, the highest structure should be opened to let the inner core receive the natural lighting.

Through the megastructure, access, terminal service and passing traffic segregation are led by the flyover. It should separate from the mega core and the significance lies in its fundamental structural system of technology and strategy to help out the internal transportation depending on needs.
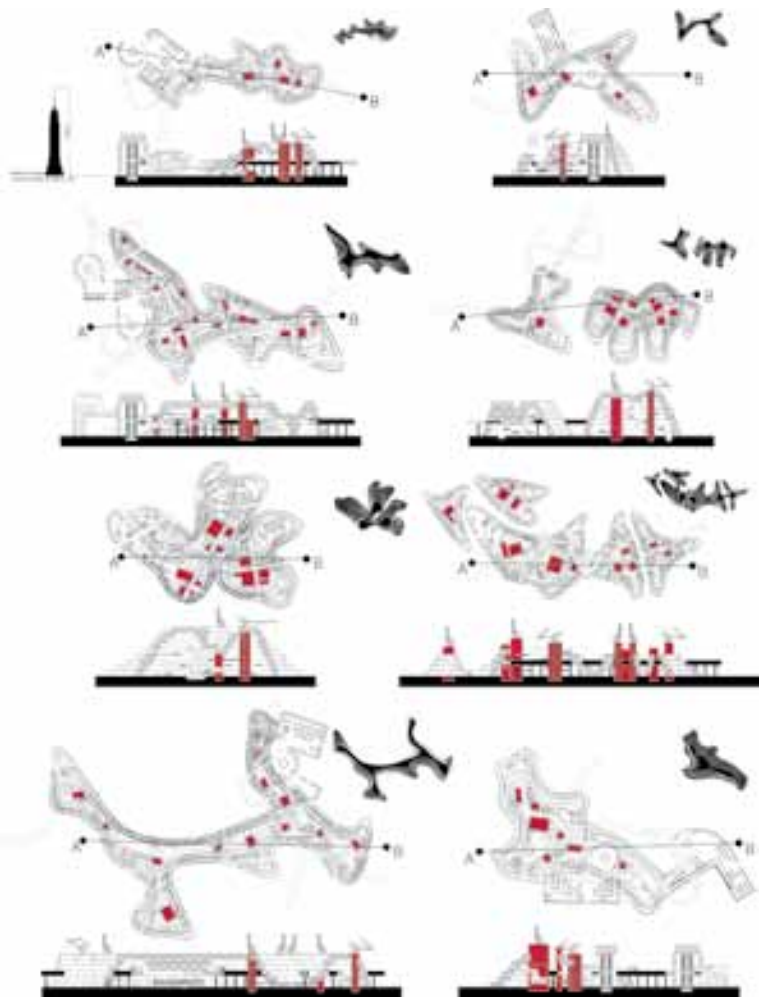
pen, acrylic on paper, 65 x 48 cm, 2010
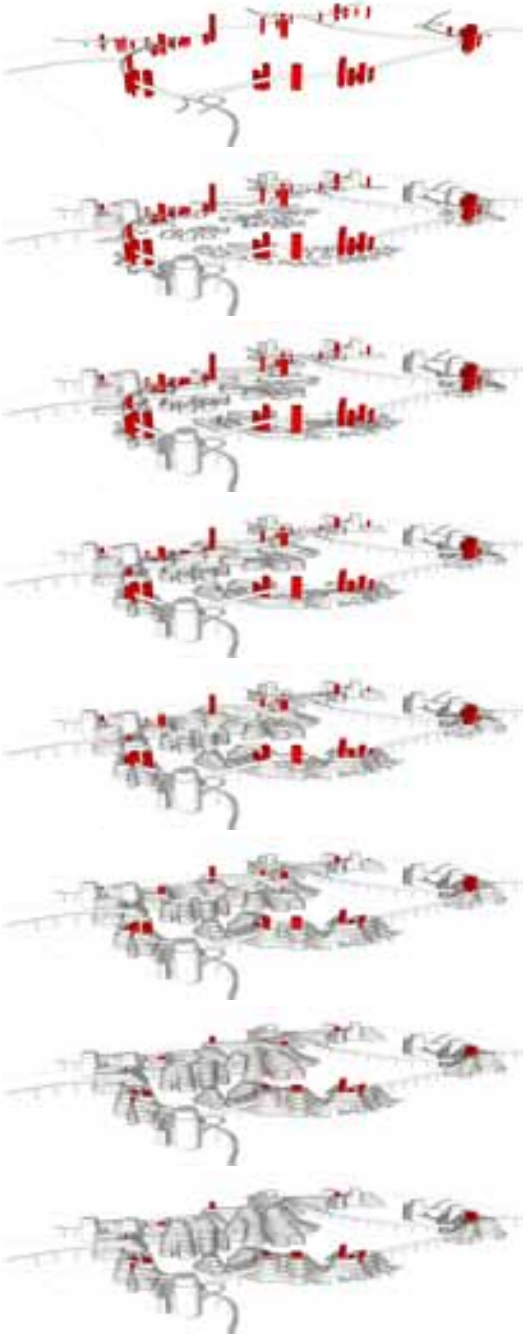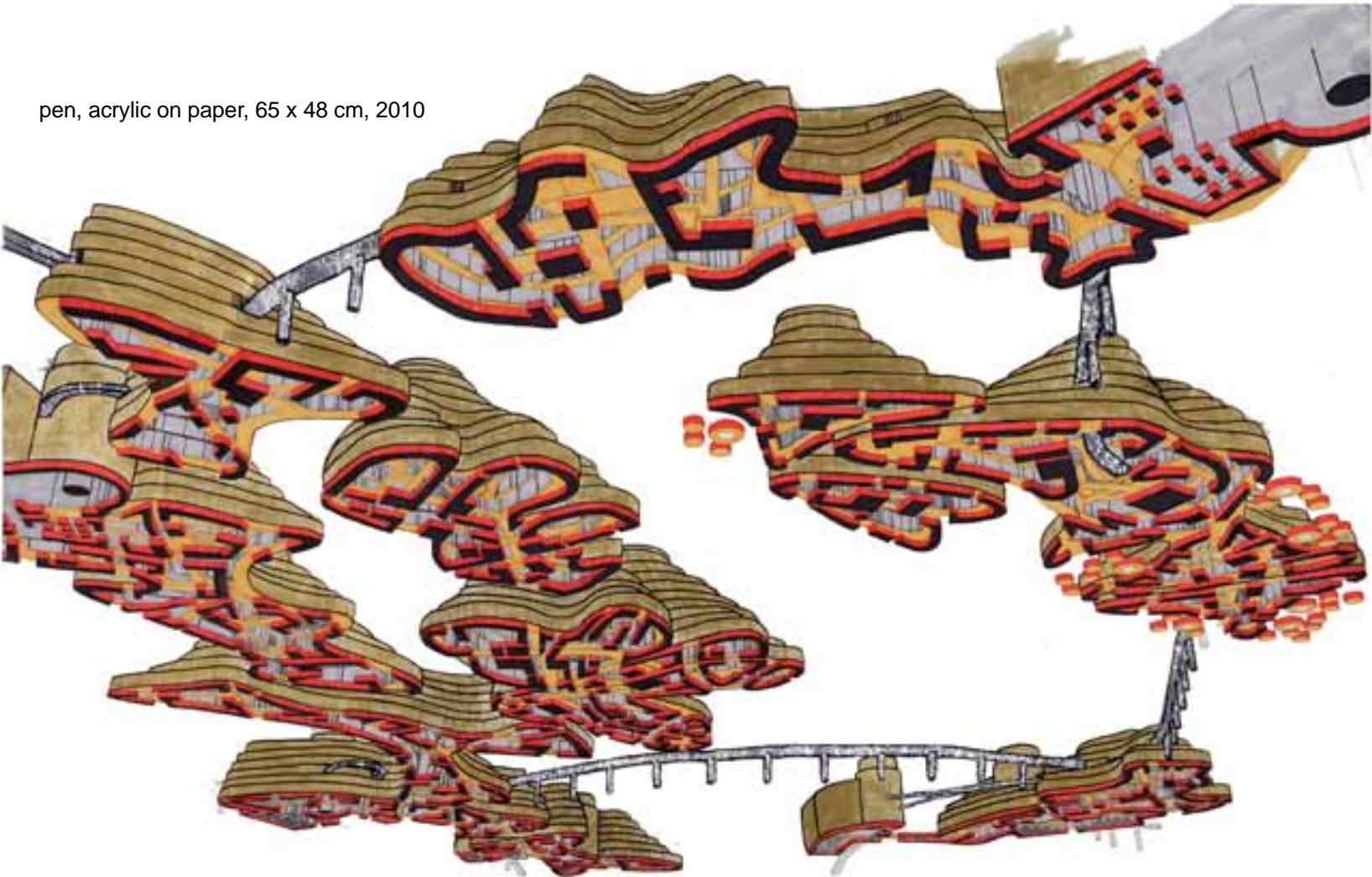
Flyover

The main function of flyover is to filter passing traffic of the site and separate them.

Flyover has the image of disparate organization in Uluru's megastructure, and it arranges in the shape of recurring loop to pass through the structure. Therefore it carries the potential for the circulating function of transportation within the mega structure. Not only the passing traffics but also the air borne terminal service and access could be provided in its close position to the mega core. 8 lane scales capacitates about million passing traffic every day.
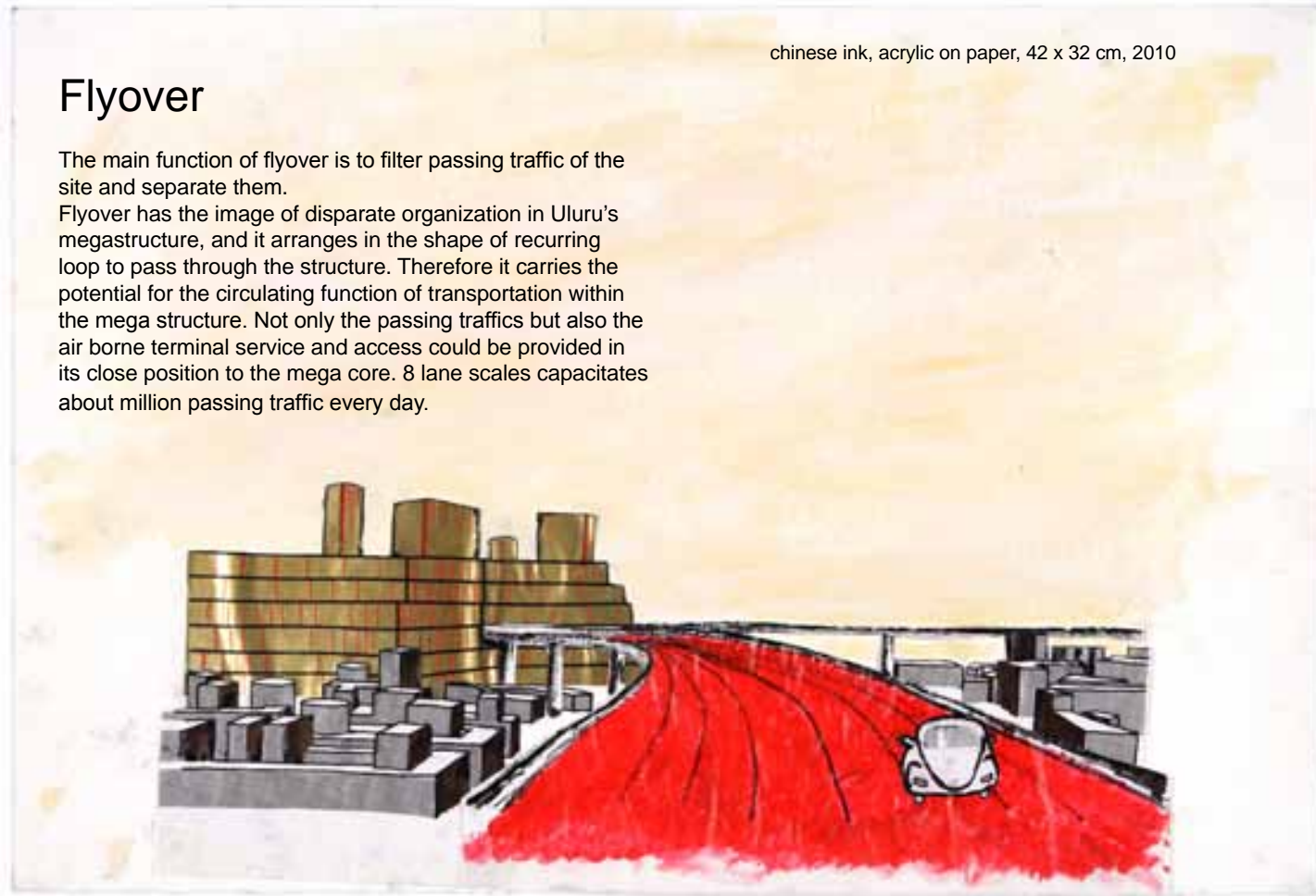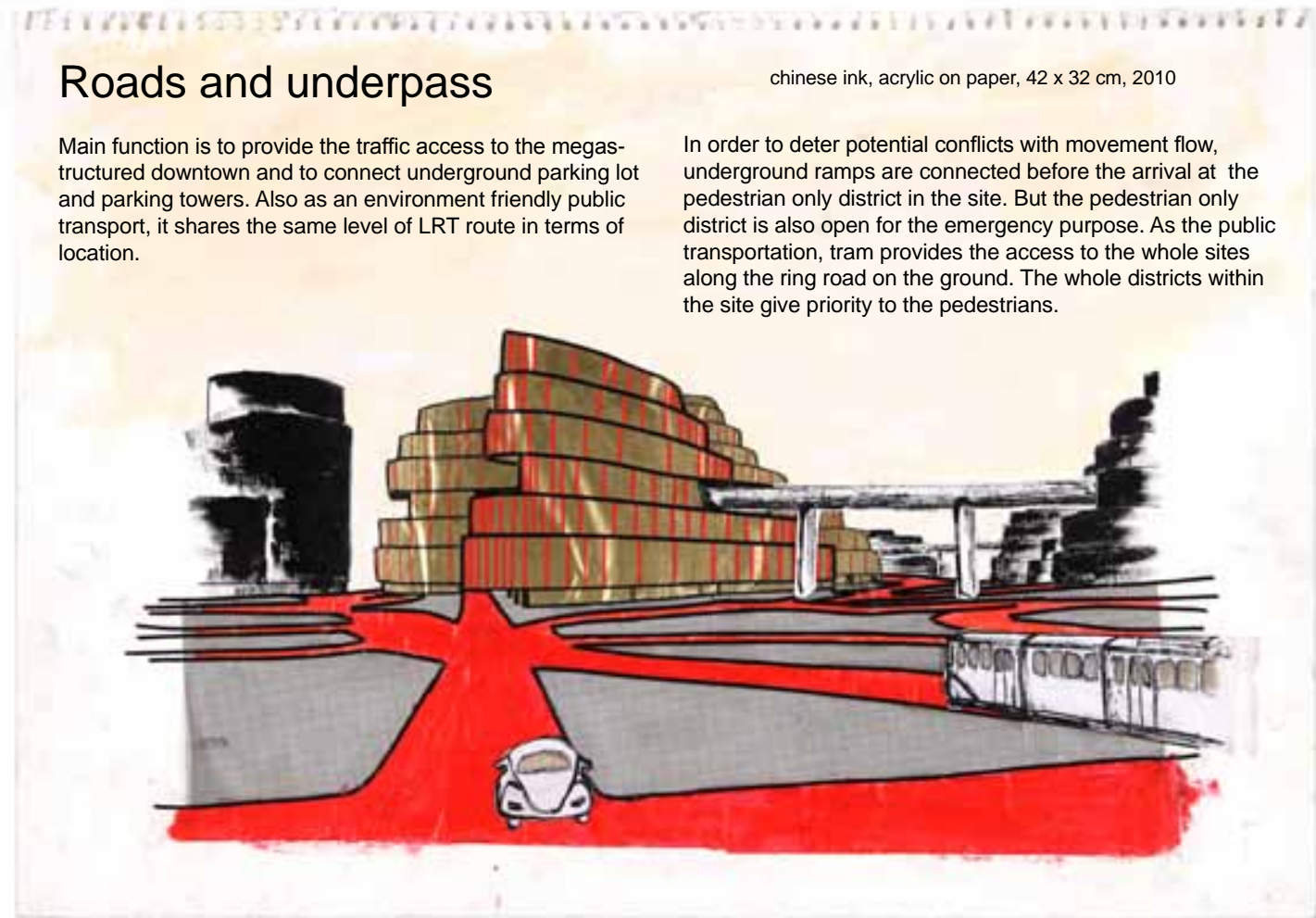
Roads and underpass

Main function is to provide the traffic access to the megastructured downtown and to connect underground parking lot and parking towers. Also as an environment friendly public transport, it shares the same level of LRT route in terms of location.

In order to deter potential conflicts with movement flow, underground ramps are connected before the arrival at the pedestrian only district in the site. But the pedestrian only district is also open for the emergency purpose. As the public transportation, tram provides the access to the whole sites along the ring road on the ground. The whole districts within the site give priority to the pedestrians.

Seoul, South Korea

The target area is the core of Seoul "Junggu". Assuming the worst case scenario deprived of the core function, the project will be carried out.

I have imagined the pollution, congestions, scars of war that lead to incongruity as residential environment, most businesses moving to the other core, and low competitiveness in existing tourism infrastructure and the deficit in urban management cost.

From "Tabula Rasa" circumstances, restructuring of urban structure and flow movement created by Japanese colonial period and made for colonial convenience, will be tried for new utopia.

This project assumes the entire redevelopment, but I assert the continuity of unique urban programs that represented the local character from the programmatic perspective.
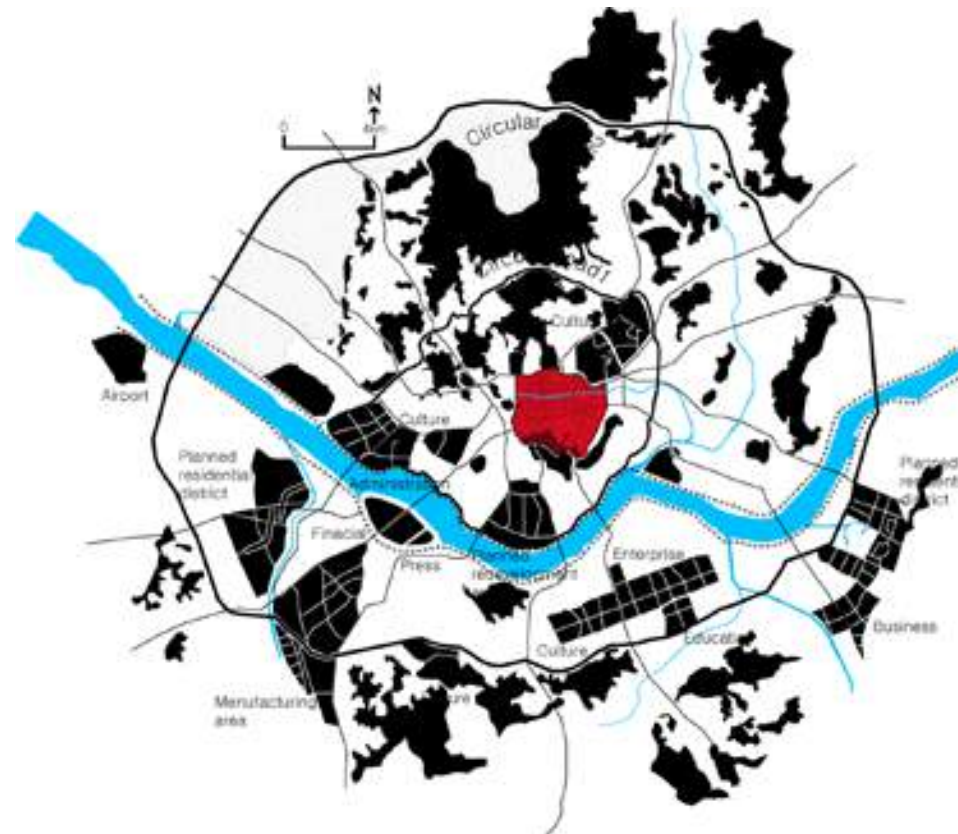

In the pursuit of superficial urban program set-up, a series of methodology should take place to decide rather realistic and specific programs. Because Junngu, has been accumulating hundreds years long urban program and they are all mixed up.

This project is an exemplary framework to solve the existent problems of the core districts and to start a new core programs. And it also is an urban organizational proposal to formulate iconic landscape.

Following the program, demanded space per person will be the criteria to expect the user population and plan the size of the surface. The surface size of each program will be redistributed on the planned land of concepts and purposes.

Junggu is about 910ha big / population of 130,000/ population density of 175 per ha
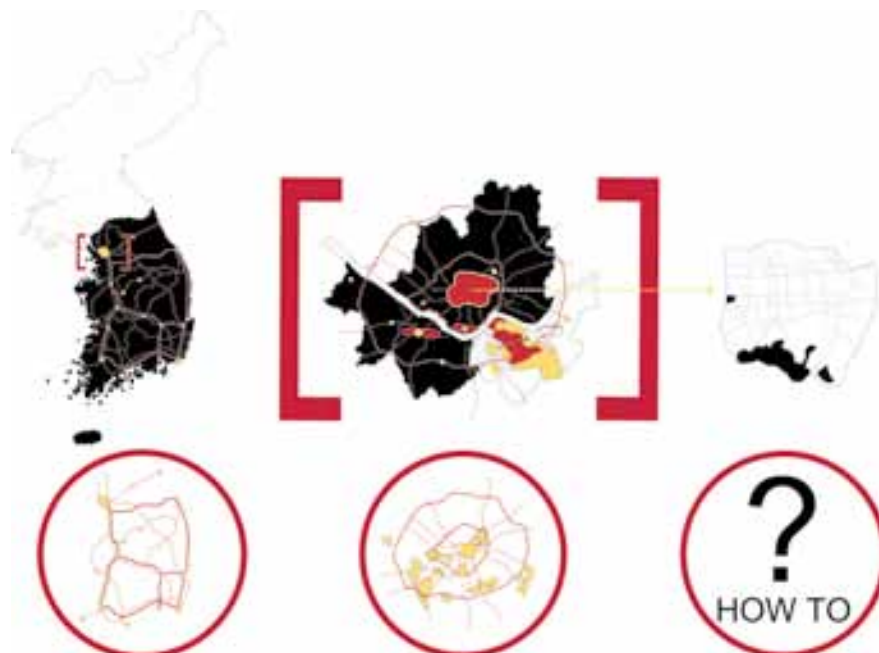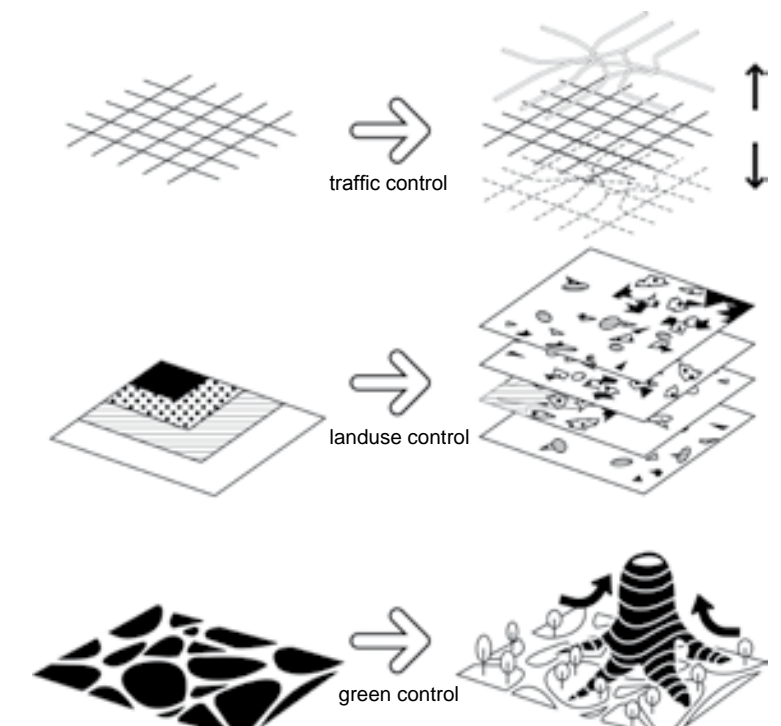

HOW TO LINK?
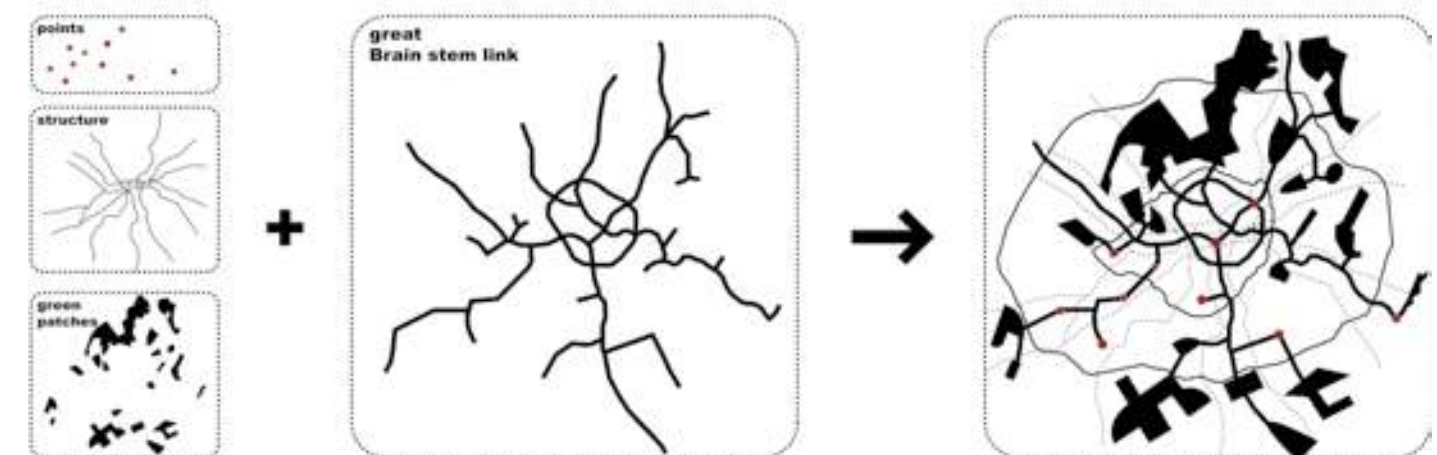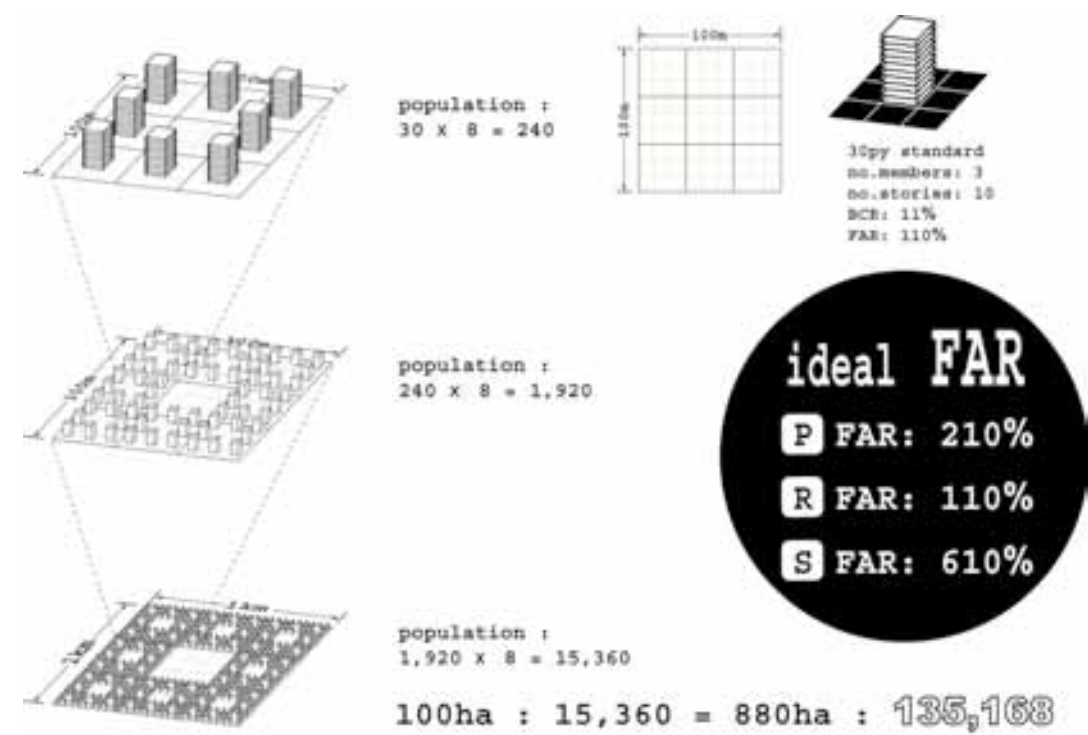

There are several components to plan this in Seoul.

1 dot: Downtowns for offering the service to main residential district(Candidates for Leviathan city)
2 line: exclusive linear space to the existing road networks shaped like the spokes of a wheel + linear shaped natural organization
3 surface: relatively huge green patch

"Brain stem link" should basically be immersed in those core districts. And it should also evade the physical effects of road networks. Scattered green spaces of the cores should also be connected to secure ecosystemic health. "Line" will be the standard to connect the dots and surfaces to form the Brain Stem Link in Seoul.
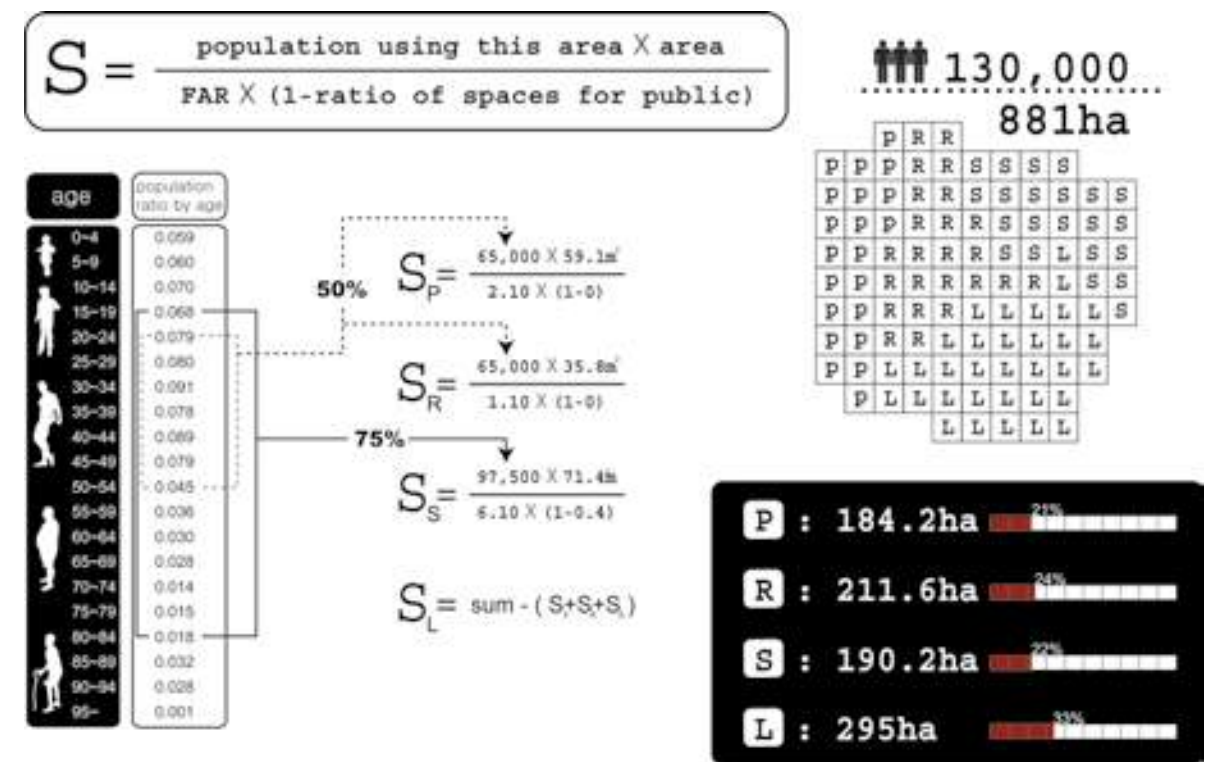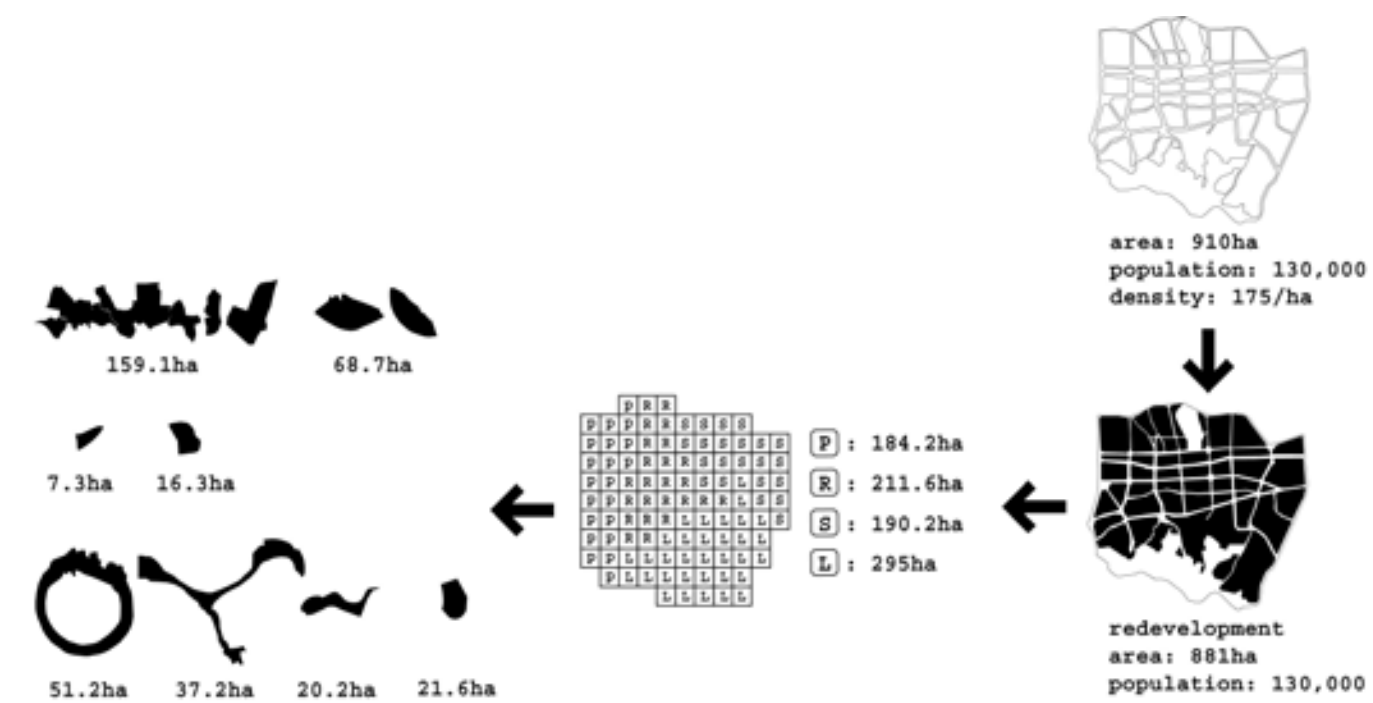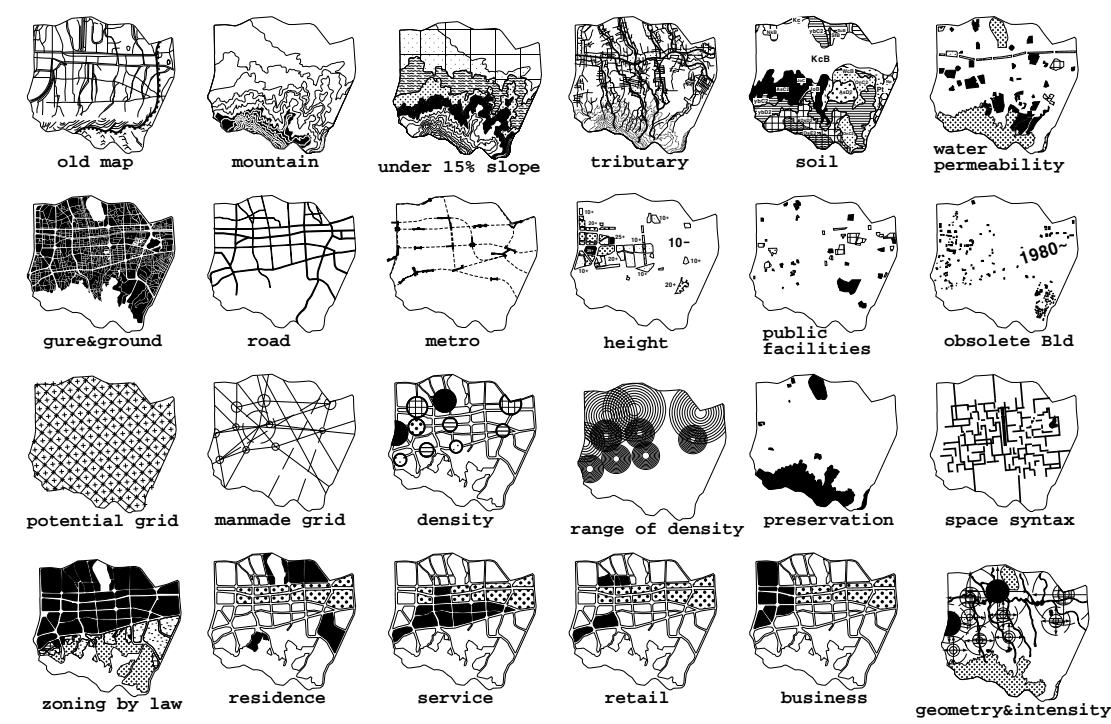
then?

traffic control

landuse control

green control

"FAR" calculation for this project (module: 15,000/100ha)

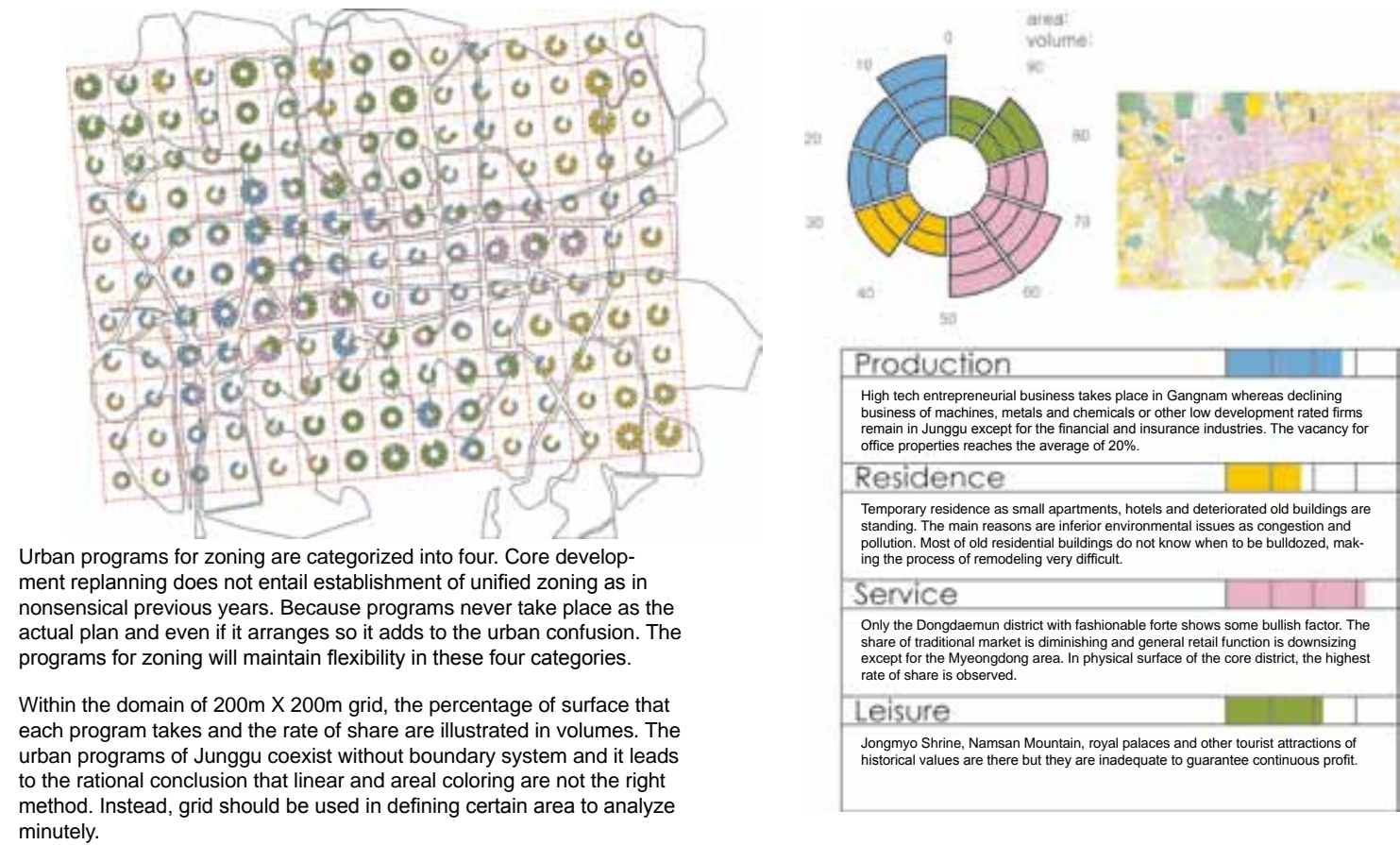**"AREA" calculation for this project**

population :
30 x 8 = 240

30py standard
no.members: 3
no.stories: 10
BCR: 11%
FAR: 110%

population :
240 x 8 = 1,920

ideal **FAR**

P FAR: 210%
R FAR: 110%
S FAR: 610%

population :
1,920 x 8 = 15,360

100ha : 15,360 = 880ha : 135,168

$$S = \frac{\text{population using this area} \times \text{area}}{\text{FAR} \times (1 - \text{ratio of spaces for public})}$$

130,000
881ha

age | population ratio by age
0-4 | 0.059
5-9 | 0.060
10-14 | 0.070
15-19 | 0.068
20-24 | 0.079
25-29 | 0.080
30-34 | 0.091
35-39 | 0.078
40-44 | 0.089
45-49 | 0.079
50-54 | 0.045
55-59 | 0.036
60-64 | 0.030
65-69 | 0.028
70-74 | 0.014
75-79 | 0.015
80-84 | 0.018
85-89 | 0.032
90-94 | 0.028
95- | 0.001

50% $S_P = \dfrac{65,000 \times 59.1 m^2}{2.10 \times (1-0)}$

$S_R = \dfrac{65,000 \times 35.8 m^2}{1.10 \times (1-0)}$

75% $S_S = \dfrac{97,500 \times 71.4 m^2}{6.10 \times (1-0.4)}$

$S_L = \text{sum} - (S_P + S_R + S_S)$

P : 184.2ha
R : 211.6ha
S : 190.2ha
L : 295ha

Site Conditions

old map | mountain | under 15% slope | tributary | soil | water permeability

gure&ground | road | metro | height | public facilities | obsolete Bld

potential grid | manmade grid | density | range of density | preservation | space syntax

zoning by law | residence | service | retail | business | geometry&intensity

area: 910ha
population: 130,000
density: 175/ha

159.1ha   68.7ha

7.3ha   16.3ha

P : 184.2ha
R : 211.6ha
S : 190.2ha
L : 295ha

51.2ha   37.2ha   20.2ha   21.6ha

redevelopment
area: 881ha
population: 130,000

B. strategy for structuring

Urban programs for zoning are categorized into four. Core development replanning does not entail establishment of unified zoning as in nonsensical previous years. Because programs never take place as the actual plan and even if it arranges so it adds to the urban confusion. The programs for zoning will maintain flexibility in these four categories.

Within the domain of 200m X 200m grid, the percentage of surface that each program takes and the rate of share are illustrated in volumes. The urban programs of Junggu coexist without boundary system and it leads to the rational conclusion that linear and areal coloring are not the right method. Instead, grid should be used in defining certain area to analyze minutely.

area:
volume:

Production
High tech entrepreneurial business takes place in Gangnam whereas declining business of machines, metals and chemicals or other low development rated firms remain in Junggu except for the financial and insurance industries. The vacancy for office properties reaches the average of 20%.

Residence
Temporary residence as small apartments, hotels and deteriorated old buildings are standing. The main reasons are inferior environmental issues as congestion and pollution. Most of old residential buildings do not know when to be bulldozed, making the process of remodeling very difficult.

Service
Only the Dongdaemun district with fashionable forte shows some bullish factor. The share of traditional market is diminishing and general retail function is downsizing except for the Myeongdong area. In physical surface of the core district, the highest rate of share is observed.

Leisure
Jongmyo Shrine, Namsan Mountain, royal palaces and other tourist attractions of historical values are there but they are inadequate to guarantee continuous profit.

step 1.

Making frames!

200m X 200m grid analysis outcome regarding the land use will select the most dense area. The relevant program for the selected area will be the pivot to standardize frame analysis. These parts naturally locate the boundaries of frame, enabling overlapping analysis to increase the precision of the result deduction.
When random frame is set, the user citizens of typical urban activities are extracted. For this, the regions' infrastructure will be the standard to create the pool of diversity. The citizens pertinent to the highest density category will be the evidence for extracting new program. They are the masters within the district.
The chosen citizens can map the urban activities patterns.
Patterns of using limited space, have the focus in using footpath. Citizens show their own numerous patterns of actions yet when compared, there ought to exist the program with the highest share. This program certainly is the combination of countless activities. The combination of this activity will be the frame analysis outcome.
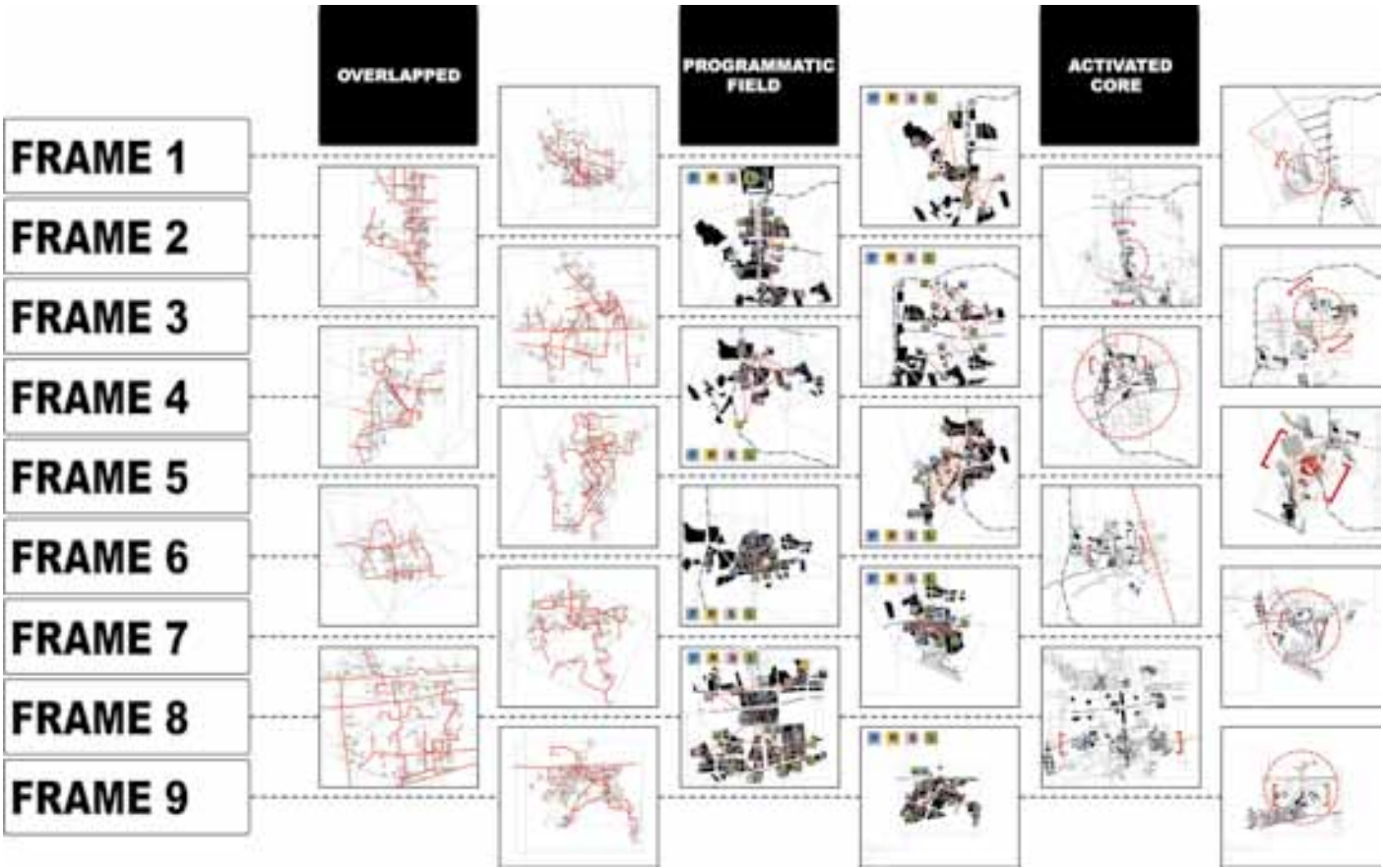Subjectifying each citizen, combination of the extracted activities of highest share will overlap. The purpose is to find the area of the highest density and extract the program of the area. The peculiarity of the regions' intuitive expectation based on experience, cannot be compared to the degree of precision extracted by these mappings and overlapping. If this place inevitably disappears, the best way to find the local character would be the mapping and overlapping in my opinion.
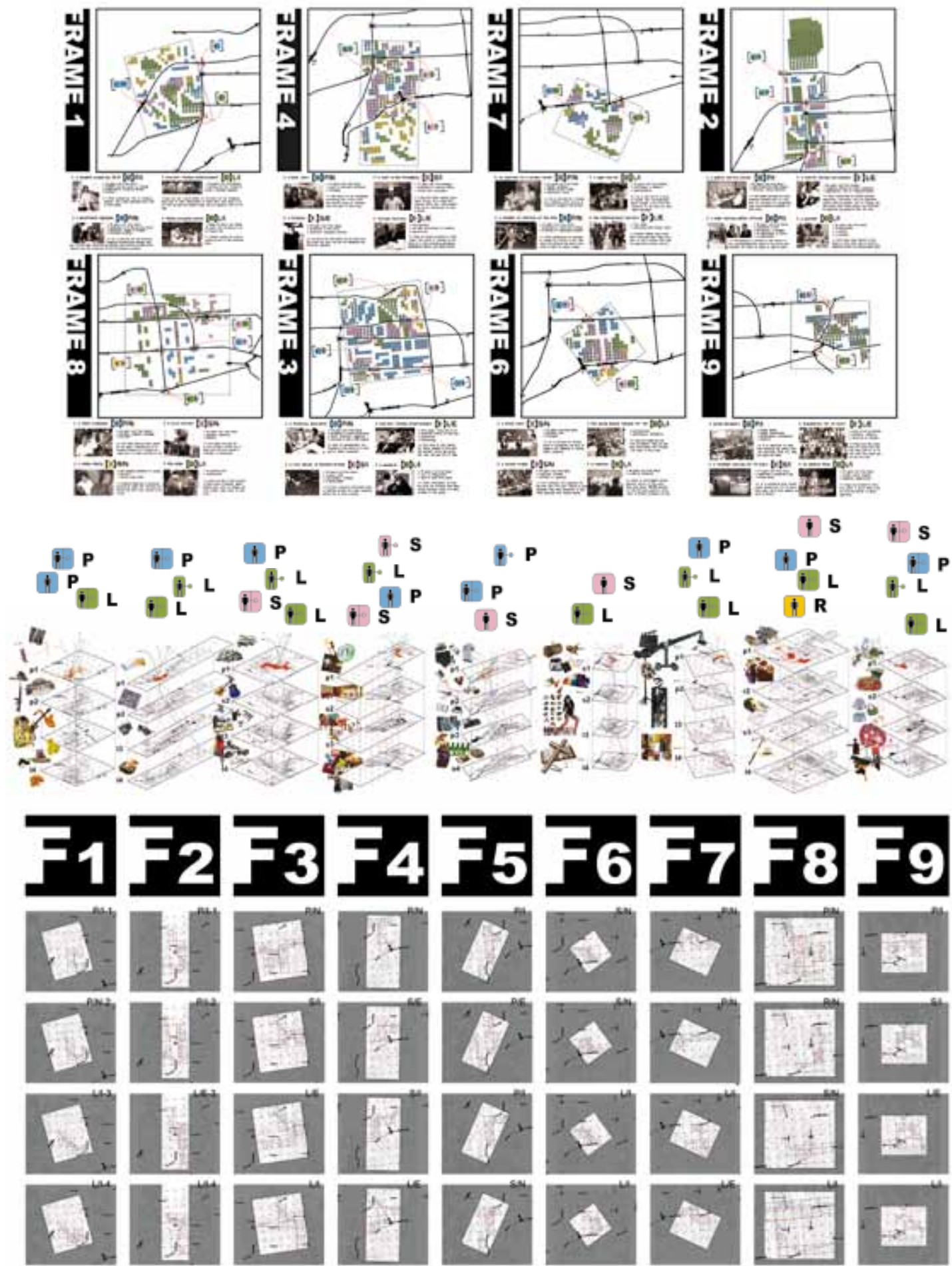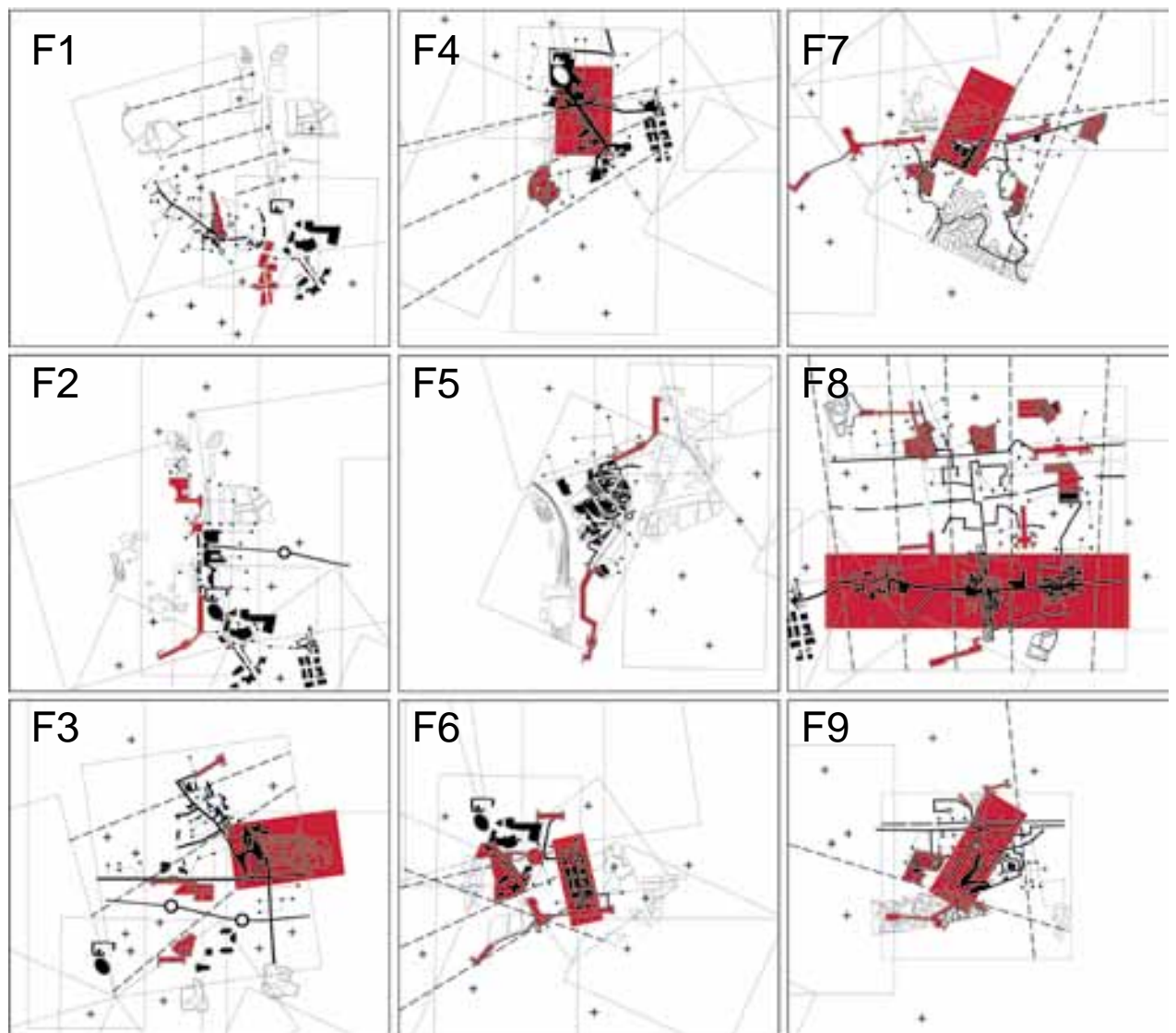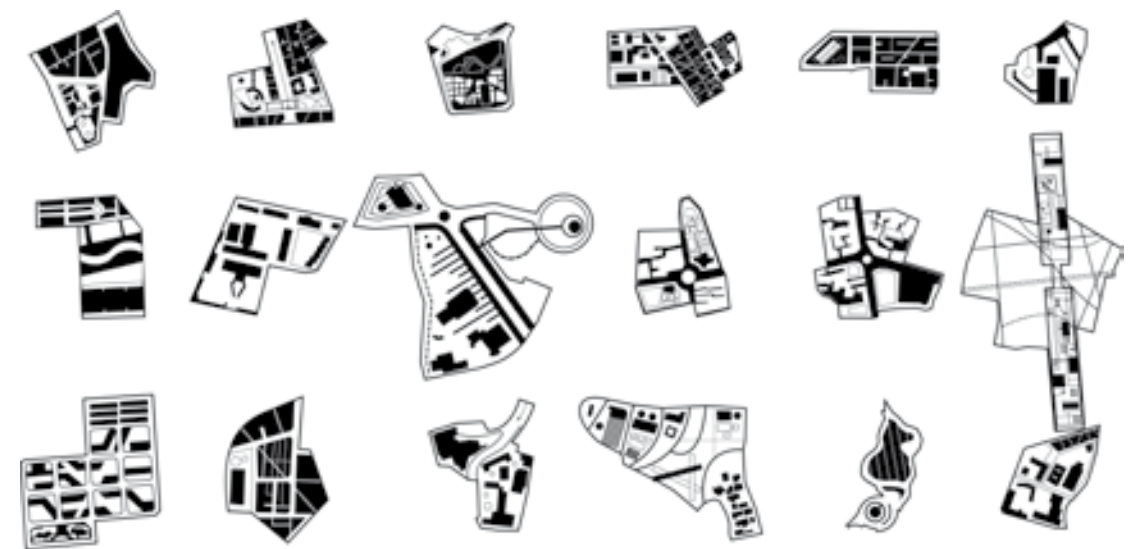
Messenger extraction!

Certain places with peculiarity extracted in each frame are called "messenger". The place of messenger is not only iconic but also it influences the other surroundings with common values. Then it implies that perfect copy of the messenger place could provide the evidence of software at least. Although physical restoration of the peculiarity may not be as easy, but the combination of those peculiar programs would be the ultimate fruit this project requires. Seoul is originally based on the dry environment, unlike agora oriented sequence of western cities. And the patterns of Seoul citizens never stagnate, but constantly move around. In Seoul, not the landmark but the programmatic comfort and convenience are the citizens attracting elements. These are the reasons to focus on the programs of box shaped buildings than the urban shape of physical space.

	OVERLAPPED	PROGRAMMATIC FIELD	ACTIVATED CORE	
FRAME 1				
FRAME 2				
FRAME 3				
FRAME 4				
FRAME 5				
FRAME 6				
FRAME 7				
FRAME 8				
FRAME 9				

To maximize the degree of precision in results, I ignored the ranging concept of the site and included all the parts available for further survey. Eventually, frames with the messengers extracted are 3, 4, 6, 7, 8, 9... these 6 of them. These messengers are the representative core of Seoul's downtowns with iconic assembly of 'memories'.

F1 F4 F7

F2 F5 F8

F3 F6 F9

# Adapting new messengers onto new urban structural bodies!

Uluru masses are the new adapter of urban structural bodies to digest the extracted messengers.

Uluru masses formulate the city's new landscape, which might be a little radical. They are fats. Programs composing the extracted messengers will make them meaningful. Considering the policy extent, these programs will be distributed into each cubical mass. In terms of urban planning, its use must be limited. After the messenger's programs have settled, certain programs of the past will fit into the same patterns within Uluru structure depending on the interrelations with other programs. From the beginning, Seoul's programmatic activities crowded not to depend on physical space but to depend on the correlation between programs.
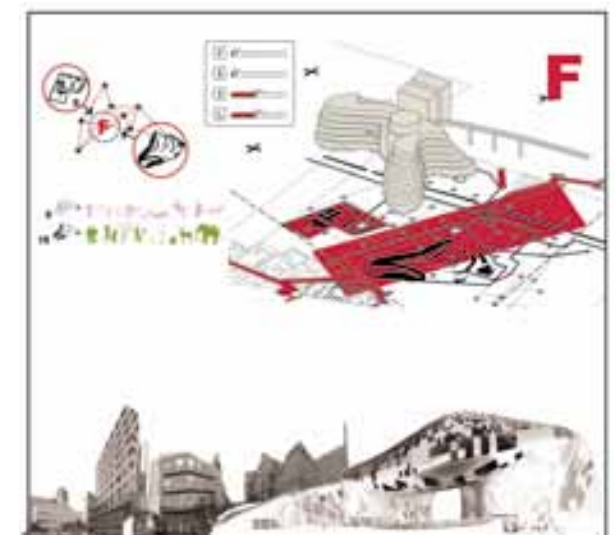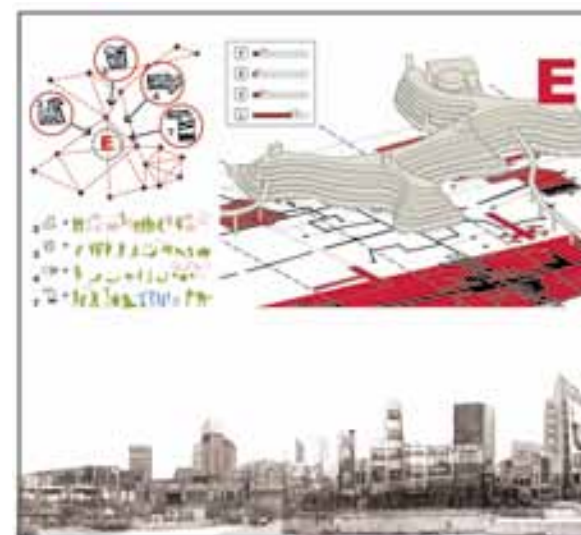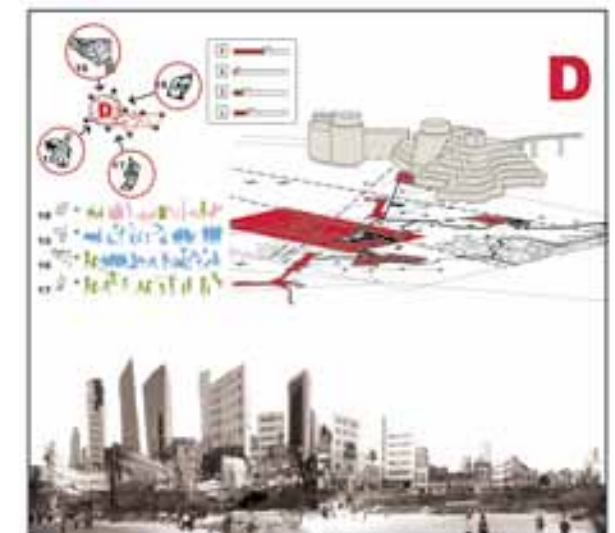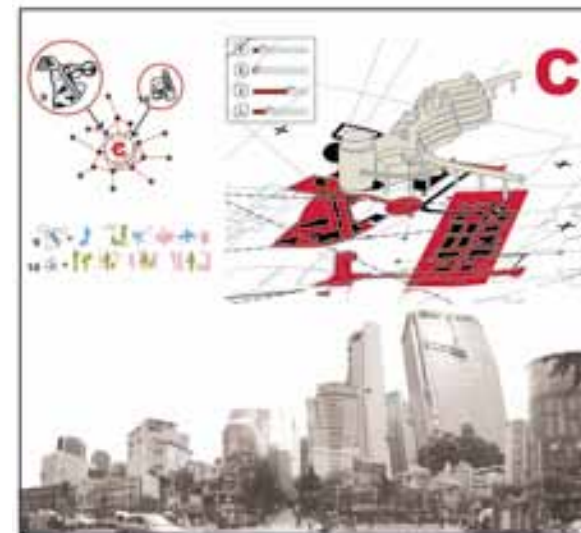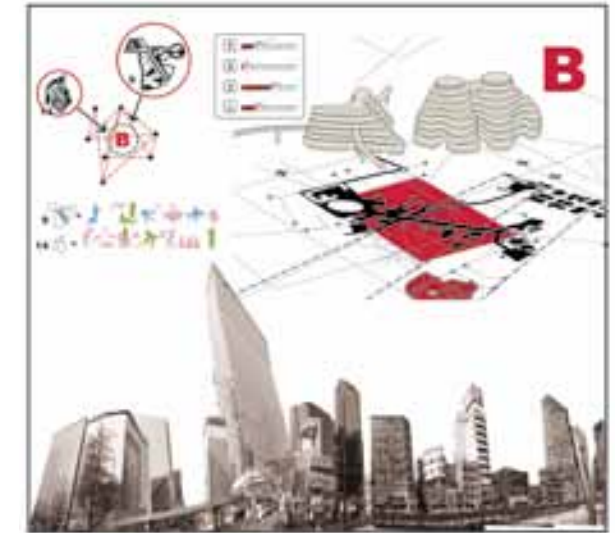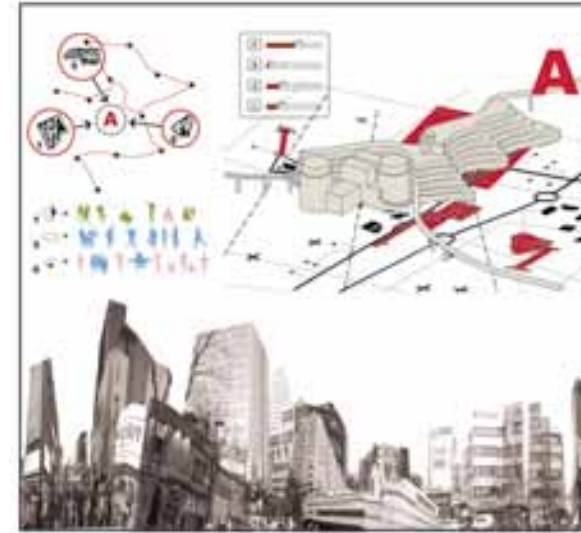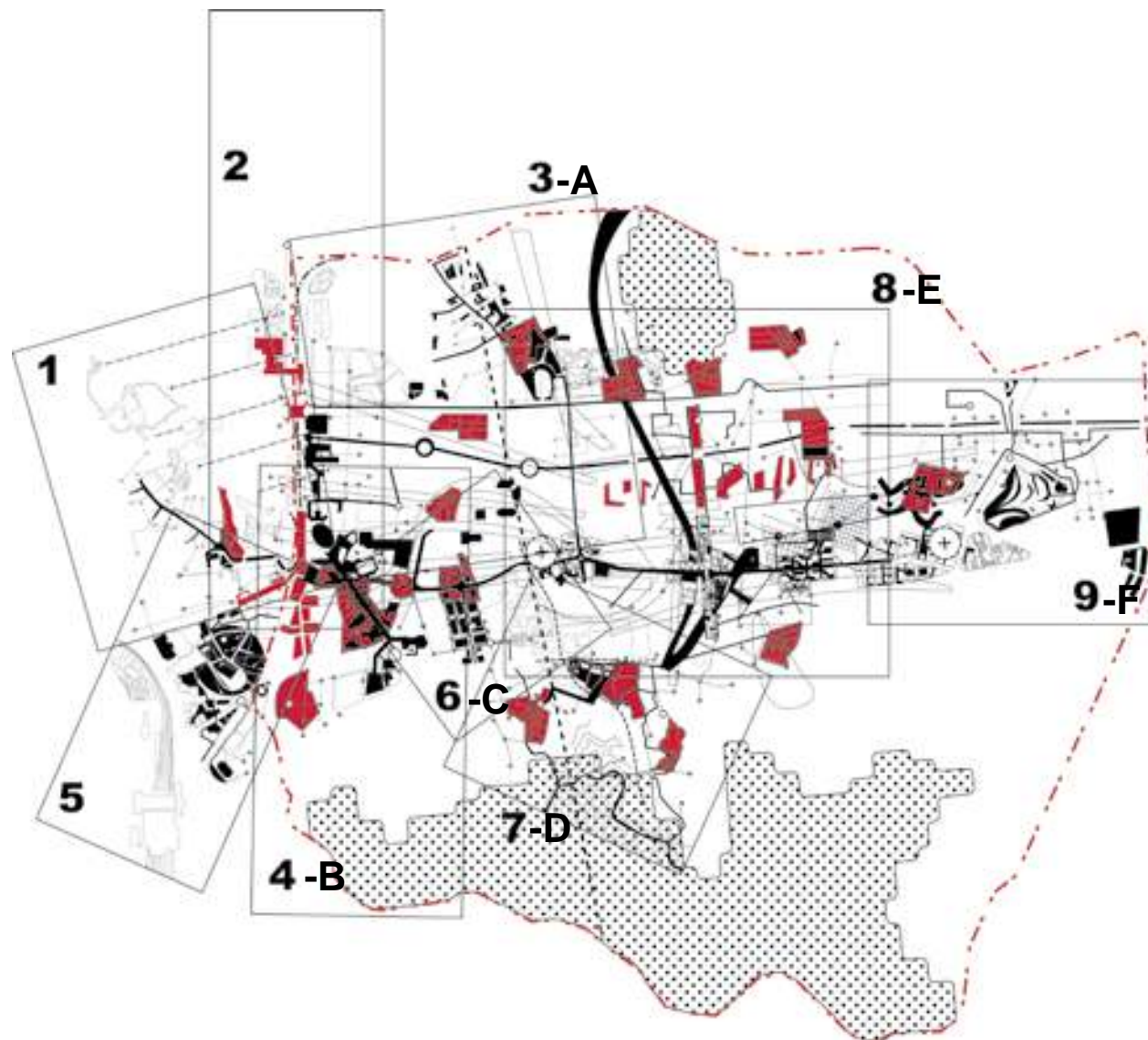
Urban Structure Studies: node connection pattern
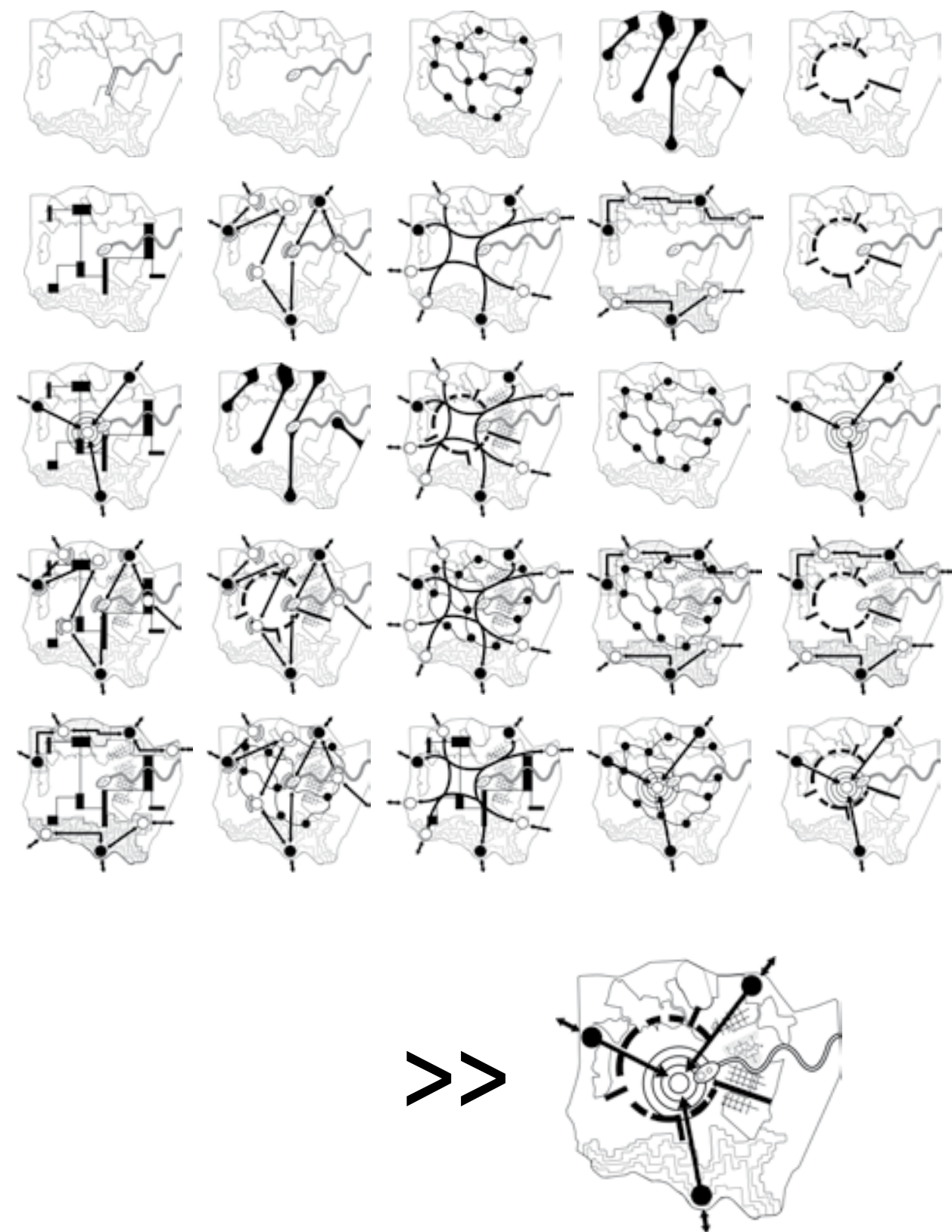
Urban Landscape

>>

The Ring

Another programmatic space that Brain Stem Link provides to the Leviathan city is the "node", enormous surrounding space for Uluru mega structure. This is the first space for urban leisure only, as well as the subsistence for ecosystem. Outdoor gallery, Outdoor swimming pool, eat out alleys, diverse sports, outdoor party space, botanical garden, theme park will be released in the huge scale leisure centre composite, with the shape of donut. Maximizing the most frequent leisure among the urban programs will equip citizens with random communication through a variety of leisure activities. The architecture arranged here will mostly be the instant buildings that can easily be established and also pulled down. The reason considers the programmatic character of urban 'leisure' to fundamentally satisfy human amusement.

Other than these functions, Node of Brain Stem Link defines the general form and ground scale of the Leviathan city. The shape of ring signifies the circulation and control. The structural body of the ring secures the continuity and also the limitation of the ring could control the 2D extension scale.

Excluding Junggu, there are about 9 downtowns that show the characters of core district in Seoul. Yeongdengpo, Yoido, Sadang, Gangnam, Jamsil, Cheonho, Wangsimni, Mia, Shinchon are those. They have urban programming of their own but except for Gangnam the level is much polarized. What if all of them grow into the downtown of the same hierarchy as Junggu? Along the principle of proximity, own life zone will formulate. Overloading distributed. Then how could the boundaries among them be controlled? The integrating system simultaneity is the "Brain Stem Link"
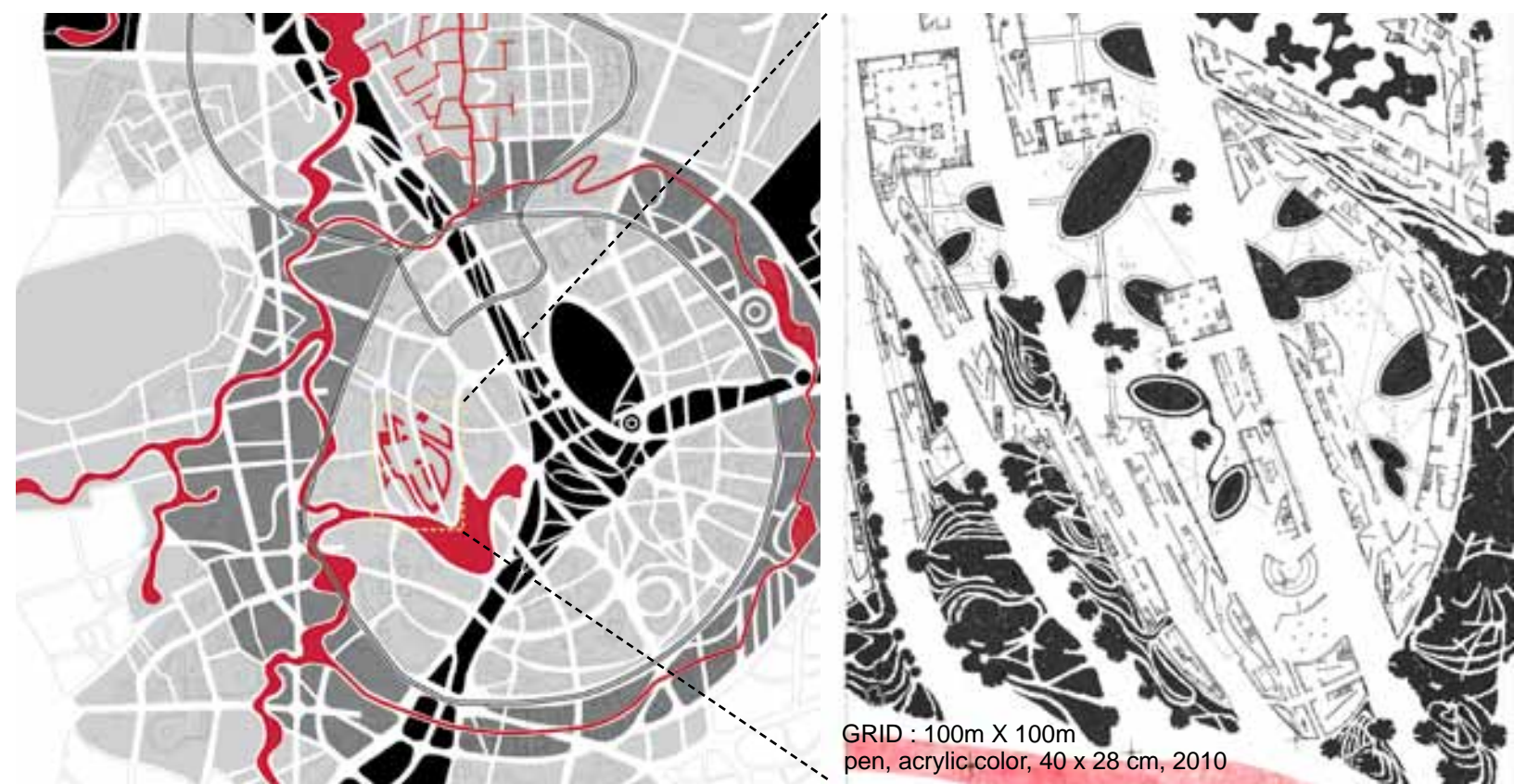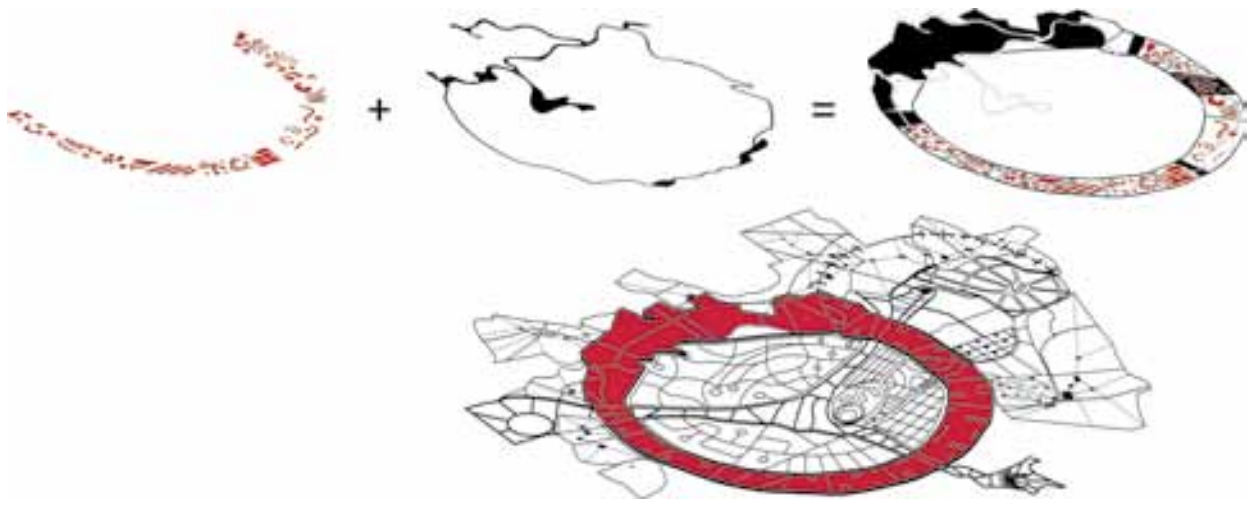
GRID : 100m X 100m
pen, acrylic color, 40 x 28 cm, 2010

landuse

production   residence

service   leisure

underground

pedestrian paths   underground parking

common duct   water & sewage

mobility

low speed   service-1

tram   emergency
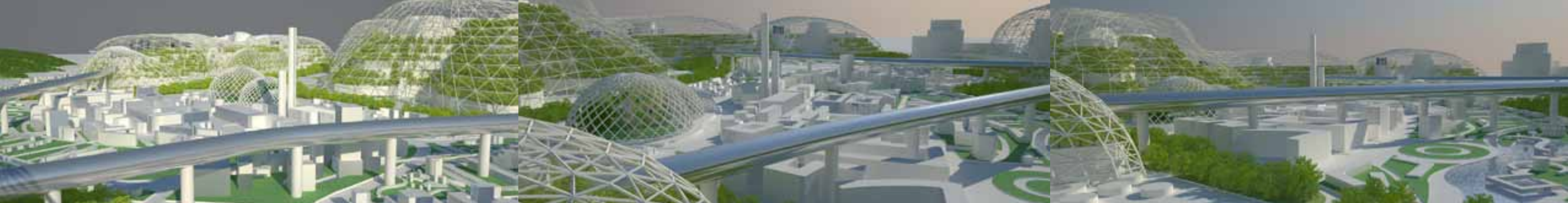
ground components

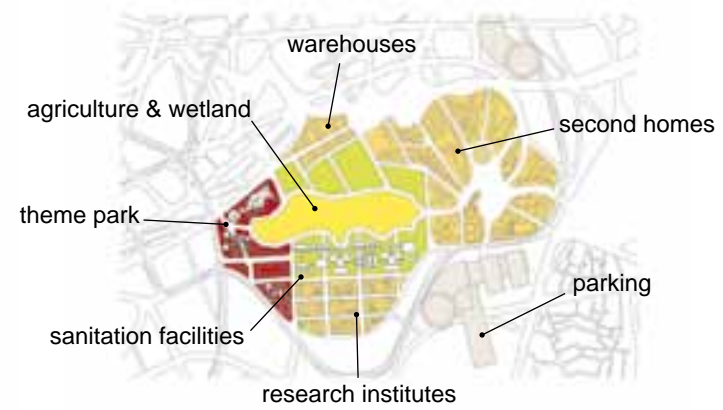megastructure   human-scale
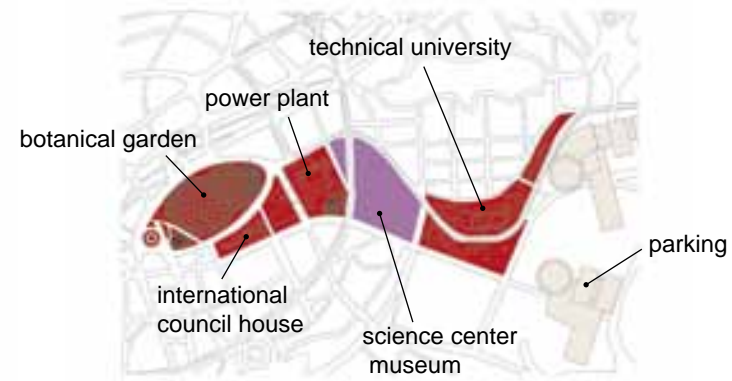
low density-green   high density-green

Food Processing

- warehouses
- agriculture & wetland
- second homes
- theme park
- parking
- sanitation facilities
- research institutes

R&D, Science Complex

- technical university
- power plant
- botanical garden
- parking
- international council house
- science center museum

Compact town

- second homes
- street arts
- medical center
- resort complex
- community center
- culinary arts
- 24h dancing pub
- eco tourism
- fishing

usage & density

	area (ha)	ratio (%)	building coverage ratio(%)	floor area ratio(%)	AVE NO. stories	residential units
program band (ring)	51.2	5.6	40	200	5	
program band (triangle)	37.2	4	20	100	5	
program band (sperm)	20.2	2.2	40	400	10	
program band (paddy)	21.6	2.3	40	400	10	1600
maxmix block	7.3	0.8	40	400	10	2240
block 2	16.3	1.8	20	500	25	750
block for uluru	159.1	17.4	20	800	30	16577
block for tower	68.7	8	20	800	40	10334
ped- network	20	2.1				
motor- network	9	0.9				
ecology & environment	199.4	21.9				
ETC	300	33	20	120	6	
total	881(-29)	100				

distribution

	P (ha)	R (ha)	S (ha)	L (ha)
program band (ring)	6 B 2 C 3 E	7 F 3 G 2 N 2 L 1 M	7 N 3 O 1 P 10 N 9.2 P 4 R Q	
program band (triangle)			7 P	2 N 4 Q 25.2 S
program band (sperm)	2 B 1 C 6 E 6 E		1 J 1 N	4 O 2.2 R
program band (paddy)	6.2 D 3.2 E	3.2 F	1 J 1 N	3 O 4 R
maxmix block		4 F	1.3 J 2 K	
block 2	2 C	10.3 F	1 H 1 J 1 K	
block for uluru	30 A 10 B 2 C 2 D 30 E	13.4 G	10 H 5 I 5 J 5 K 10 L 1 M 3 H 6 K 5 M	
block for tower	21 A 5 B 1 C 1 D 10 E	7.5 G	3 H 10 I 1 J 12 K 1 L 1 M 19 P 2 K 1 M	2 N 2 P 2 R 4 R
ped- network				
motor- network				
ecology & environment				199.4 S
ETC	4.8 C 23 E	173.2 F	77 H 9 L 6 M	7 N
total	184.2	211.6	190.2	295

Early ideas