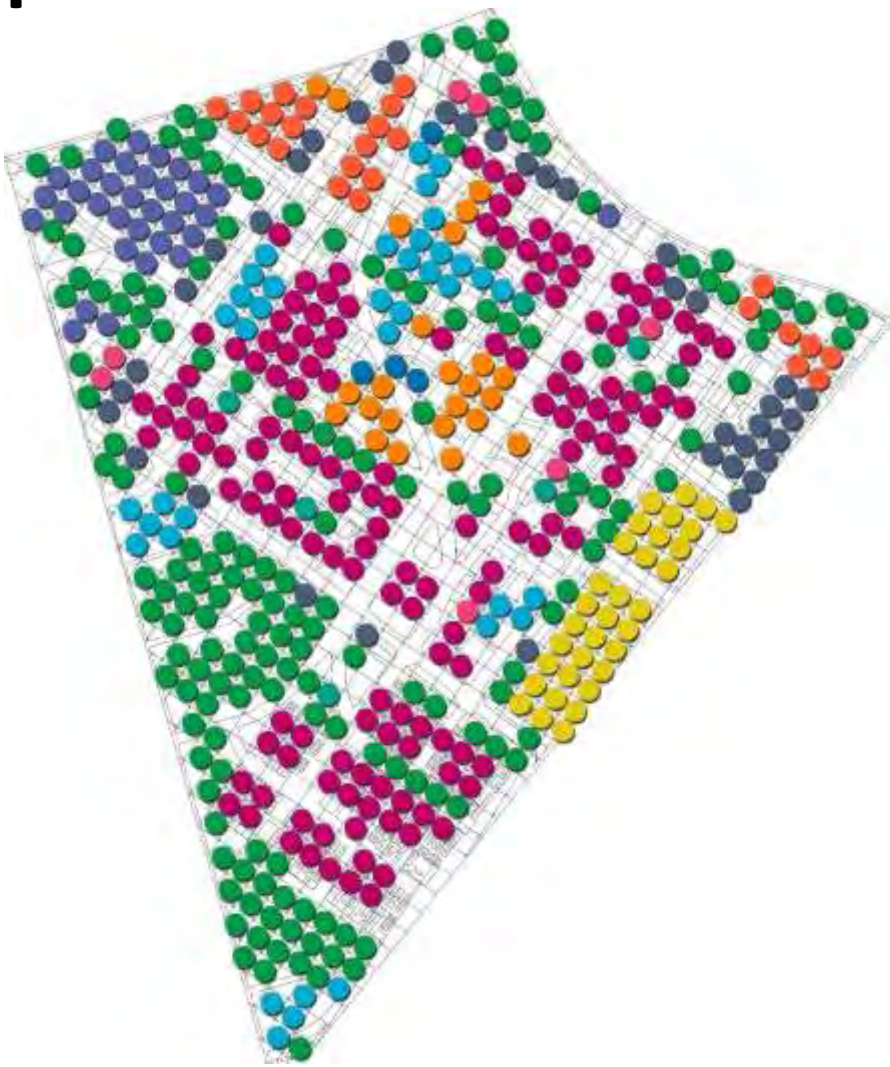
MASDAR CITY ABU DHABI

- Living Residential
- Living Community facilities
- Business Offices
- Business Light Industrial
- Business Research and development
- Public Park and open space
- Public Hotel
- Public Leisure
- Public Education Institutional
- Utilities solar hub
- Utilities other



MASDAR CITY ABU DHABI

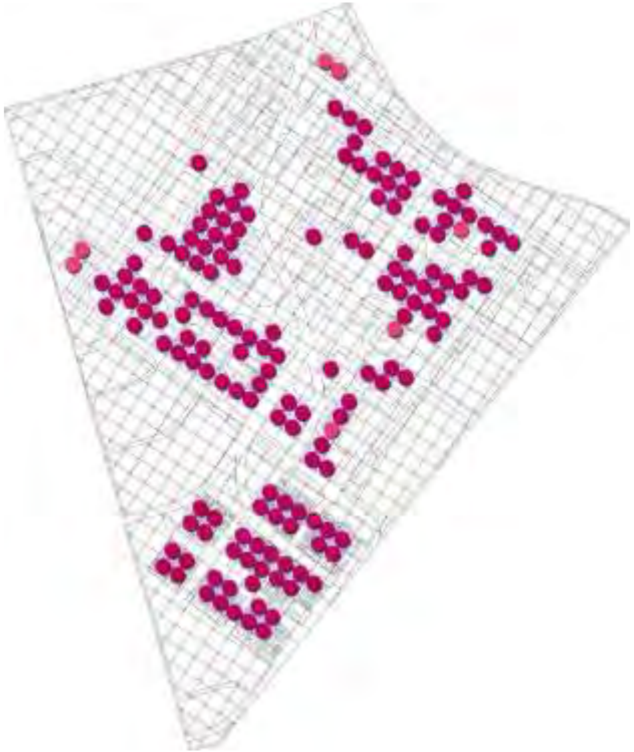
	m2 Footprint	% of total built area
Living Residential	1.565.620	25
Living Community facilities	78.195	1
Business Offices	225.161	4
Business Light Industrial	340.128	6
Business Research and development	258.717	4
Public Park and open space	1.913.031	31
Public Hotel	41.185	1
Public Leisure	731.136	12
Public Education Institutional	444.079	7
Utilities solar hub	360.622	6
Utilities other	181.383	3

MASDAR CITY ABU DHABI

Function Living

	m2 Footprint	% of total built area	% of total area
Living Residential	1.565.620	25	20
Living Community facilities	78.195	1	1

- Estimated 75% of the plot area is dedicated to the footprint of the function Living
- 75% is equal to 7.351m2 of total grid footprint of 9801m2 (platform)
- In Masdar City the estimation of the total footprint for living and community facilities is 1,247.861m2 of the total area



MASDAR CITY ABU DHABI

Function Business

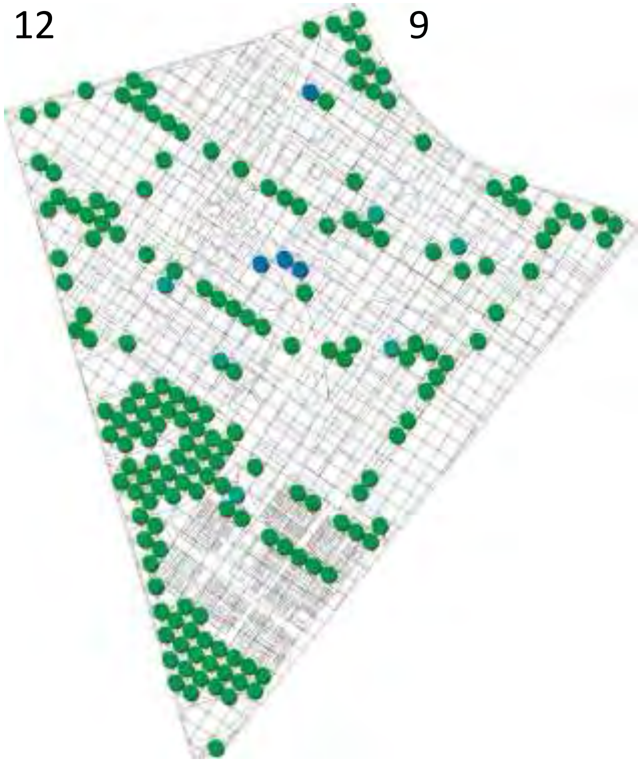
	m2 Footprint	% of total built area	% of total area
Business Offices	2.55.161	4	3
Business Light Industrial	340.128	6	4
Business Research and development	258.717	4	3

- Estimated 21% of the plot area is dedicated to the footprint of the function Business
- 21% is equal to 2.058 m2 of total grid footprint of 9801m2 (platform)
- In Masdar City the estimation of the total footprint for Business is 173.041m2 of the total area

MASDAR CITY ABU DHABI

Function Public

	m2 Footprint	% of total built area	% of total area
Public Park and open space	1.913.031	31	24
Public Hotel	41.185	1	0,5
Public Leisure	731.136	12	9

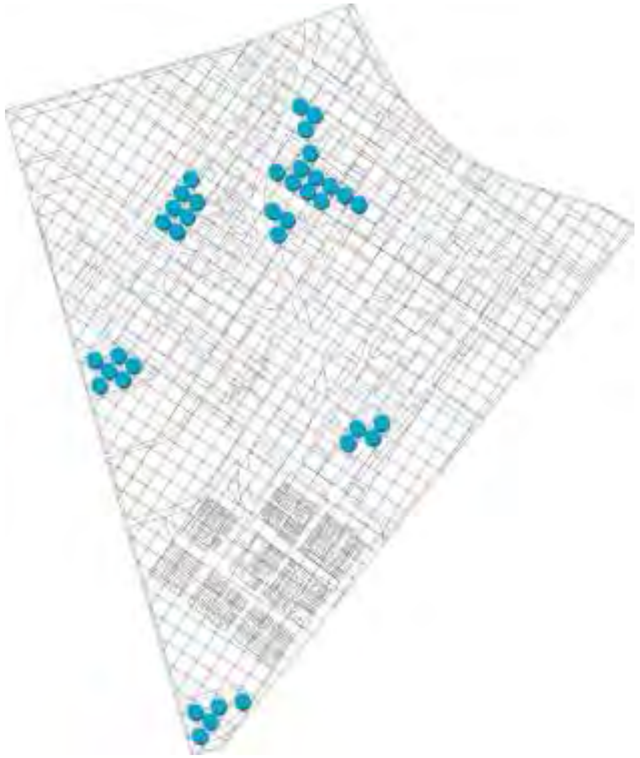


- Estimated 25% of the plot area is dedicated to the footprint is Public area
- 25% is equal to 2.450m2 of total grid footprint of 9801m2 (platform)
- In Masdar City the estimation of the total footprint for public is 2.001.768 m2 of the total area

MASDAR CITY ABU DHABI

Function Educational

	m2 Footprint	% of total built area	% of total area
Public Education Institutional	444.079	7	6



- Estimated 29% of the plot area is dedicated to the footprint is Institutional
- 29% is equal to 2.842m2 of total grid footprint of 9801m2 (platform)
- In Masdar City the estimation of the total footprint for public is 2.322.050 m2 of the total area

MASDAR CITY ABU DHABI

Function Utilities

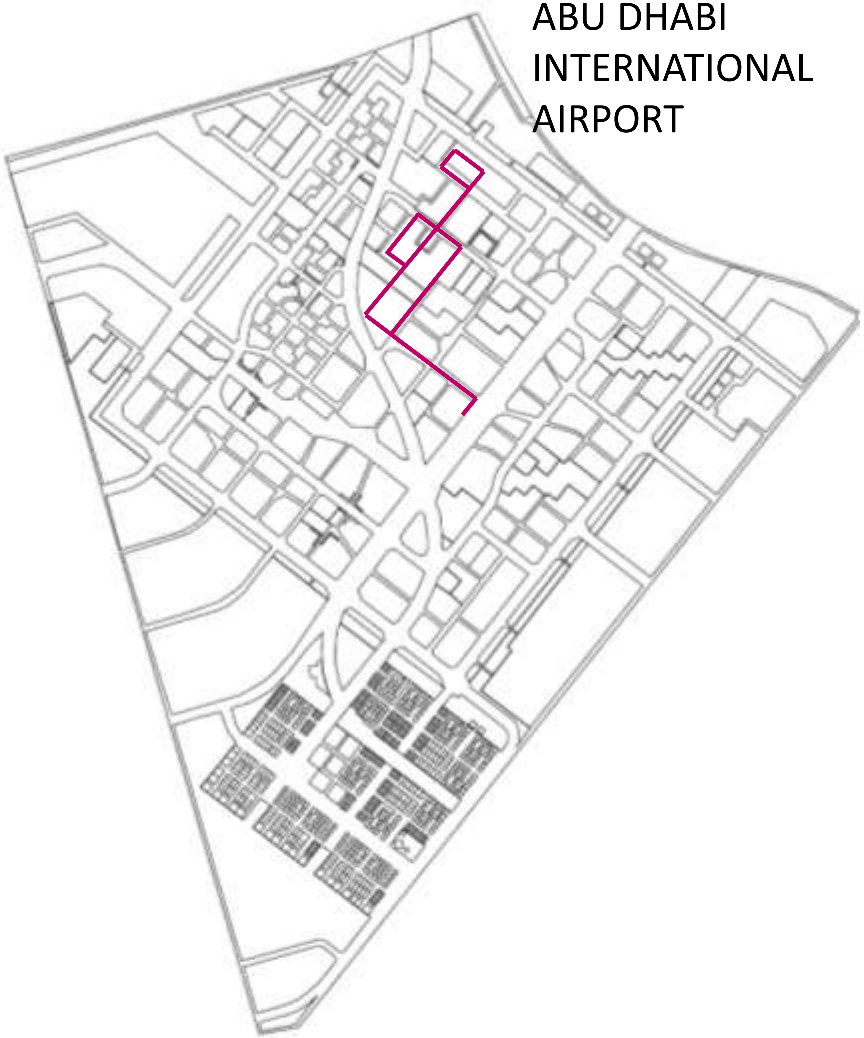
	m2 Footprint	% of total built area	% of total area
Utilities solar hub	360.622	6	4,5
Utilities other	181.383	3	2

- Estimated 18% of the plot area is dedicated to the footprint is Institutional
- 18% is equal to 1.764m2 of total grid footprint of 9801m2 (platform)
- In Masdar City the estimation of the total footprint for public is 1.441.273 m2 of the total area

MASDAR CITY ABU DHABI

Function Connectivity
Personal Rapid Transit

2.8km track



MASDAR CITY ABU DHABI

Function Connectivity
Group Rapid Transit

4.0km track

ABU DHABI
INTERNATIONAL
AIRPORT

MASDAR CITY ABU DHABI

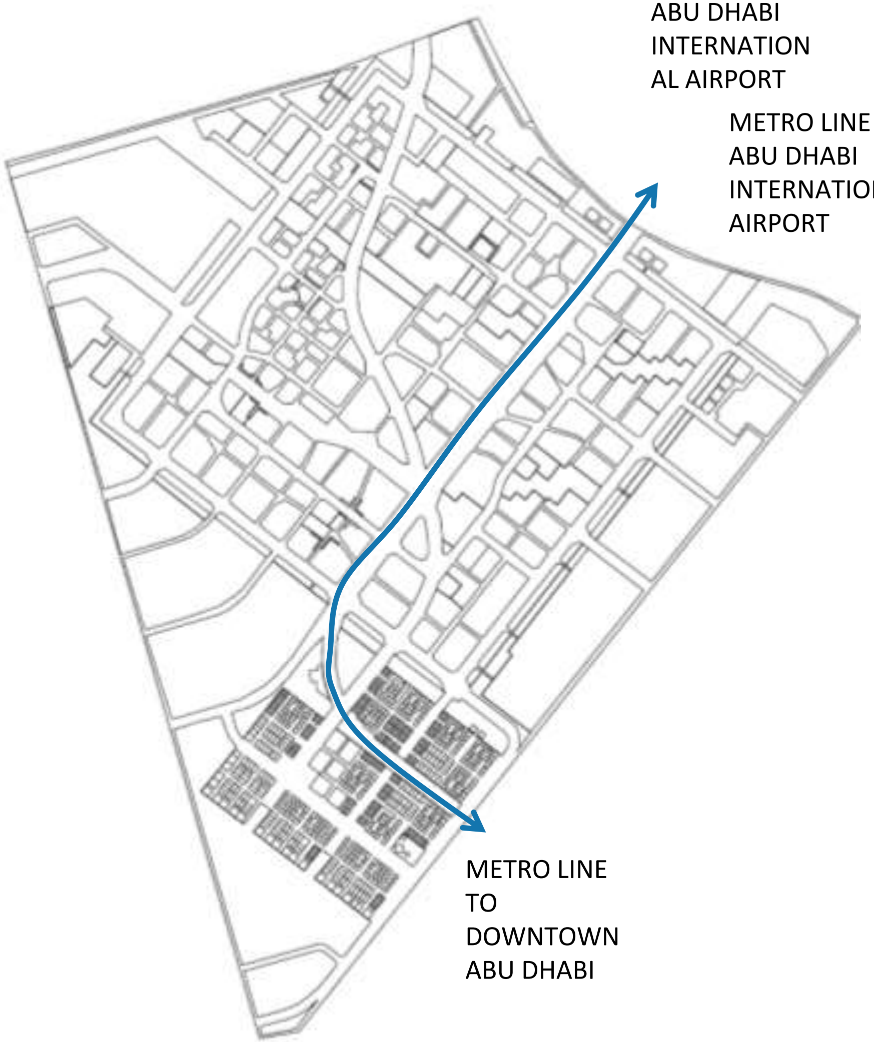
Function Connectivity
Public Bus Route

4.1km track

MASDAR CITY ABU DHABI

Function Connectivity
Metro Line

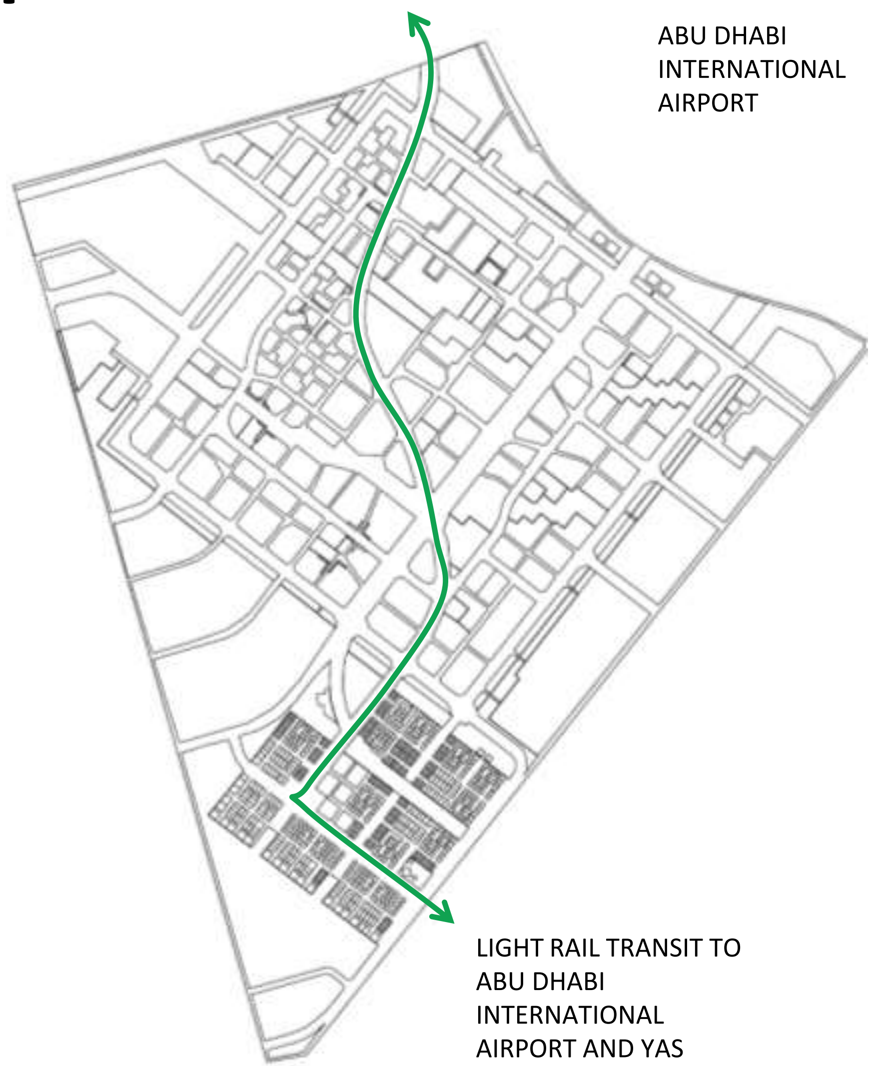
3.1km track



MASDAR CITY ABU DHABI

Function Connectivity
Light Rail Transit

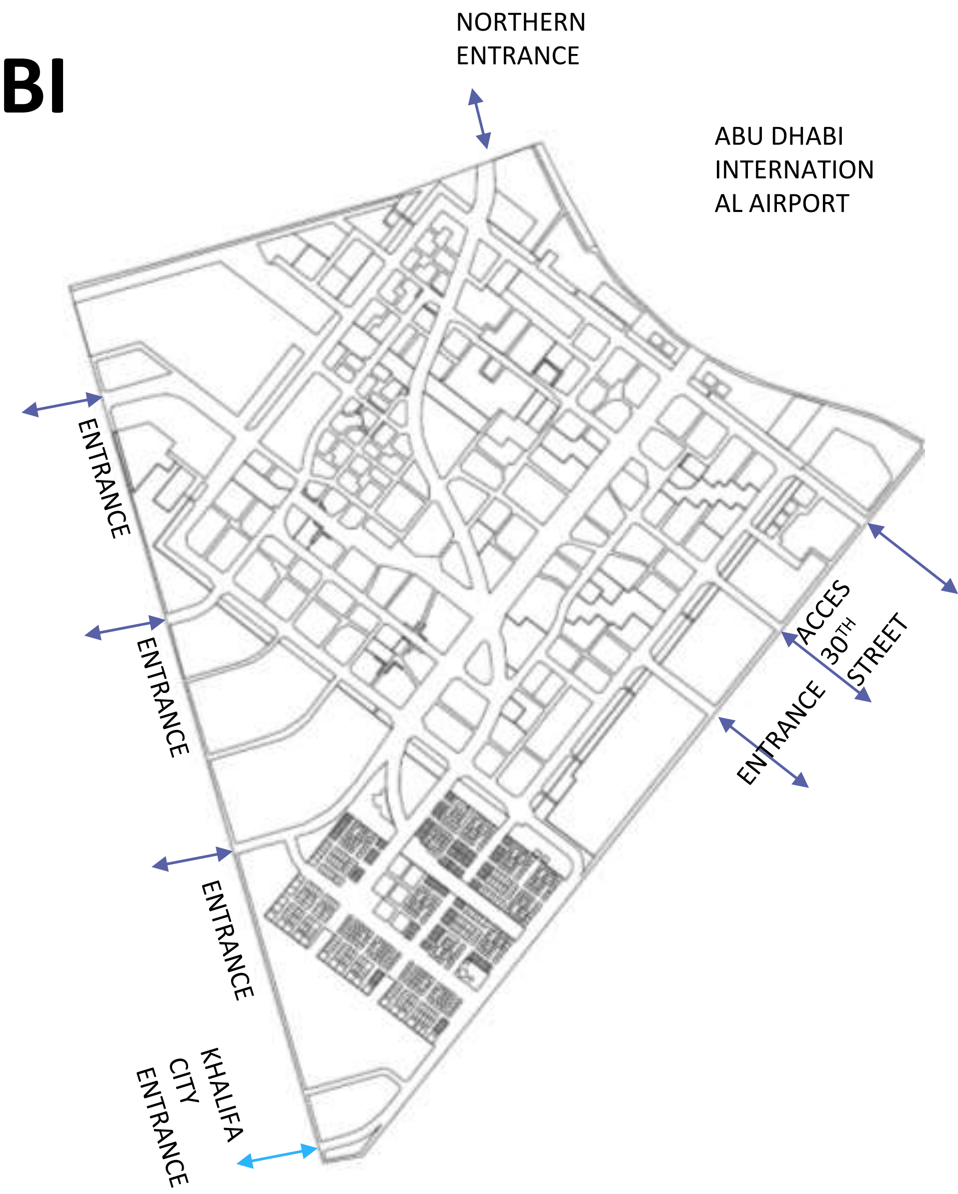
4.2km track



MASDAR CITY ABU DHABI

Function Connectivity
Entrances

8 main entrances



RIJSWIJK

Rijswijk is a city in the coastal area of the Netherlands located next to the city of The Hague.

RIJSWIJK

Subcity

Location and Facts

RIJSWIJK

Subcity

Location and Facts

RIJSWIJK

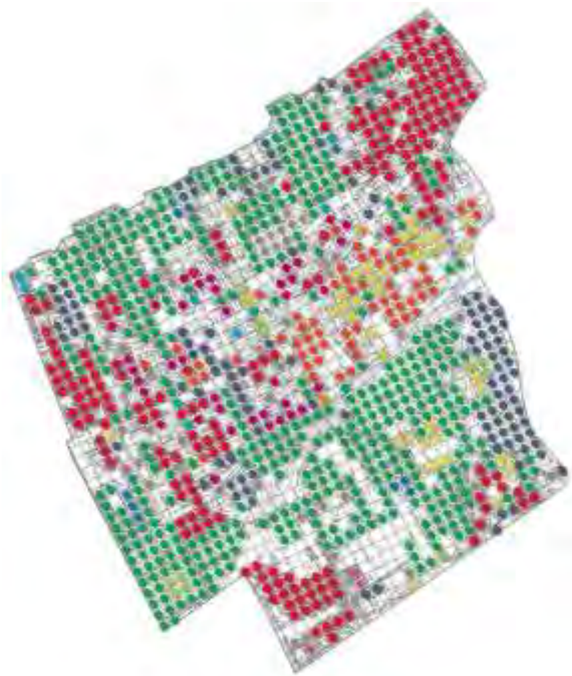
- 51.742 inhabitants

RIJSWIJK

- Living Community Facilities
- Living < 3 layers
- Living > 3 layers
- Business Commercial
- Business Offices
- Business Light Industrial
- Business Agriculture
- Business Catering Industry
- Public Park and open space
- Public Building
- Public Education Institutional
- Public Daily Care
- Utilities
- Water

RIJSWIJK

	m2 Footprint	% of total built area
Living Community Facilities	40.000	1
Living < 3 layers	2.050.000	20
Living > 3 layers	370.000	3
Business Commercial	620.000	6
Business Offices	30.000	1
Business Light Industrial	360.000	4
Business Agriculture	90.000	1
Business Catering Industry	30.000	1
Public Park and open space	4.430.000	44
Public Building	70.000	1
Public Education Institutional	90.000	1
Public Daily Care	30.000	1
Utilities	1.130.000	11
Water	560.000	5



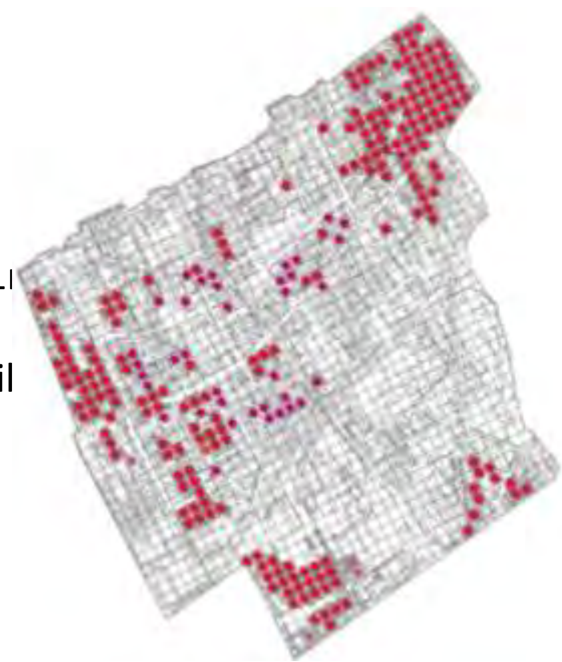
SPACE@SEA

RIJSWIJK

Function Living

	m2 Footprint	% of total built area	% of total area
Living Community facilities	40.000	1	1
Living < 3 layers	2.050.000	20	18
Living > 3 layers	370.000	3	1

- Estimated 23% of the plot area is dedicated to the footprint of the function Living
- 23% is equal to 2.219m2 of total grid footprint of 9801 (platform)
- In Rijswijk the estimation of the total footprint than wil be 565.800m2



RIJSWIJK

Function Business

	m2 Footprint	% of total built area	% of total area
Business Commercial	620.000	6	14
Business Offices	30.000	1	1
Business Light Industrial	360.000	4	2
Business Agriculture	90.000	1	1
Business Catering Industry	30.000	1	1

- Estimated 44% of the plot area is dedicated to the footprint of the function Business
- 44% is equal to 4.312m2 of total grid footprint of 9801m2 (platform)
- In Rijswijk the estimation of the total footprint than will be 497.200m2

RIJSWIJK

Function Business

	m2 Footprint	% of total built area	% of total area
Business Commercial	620.000	6	14
Business Offices	30.000	1	1
Business Light Industrial	360.000	4	2
Business Agriculture	90.000	1	1
Business Catering Industry	30.000	1	1

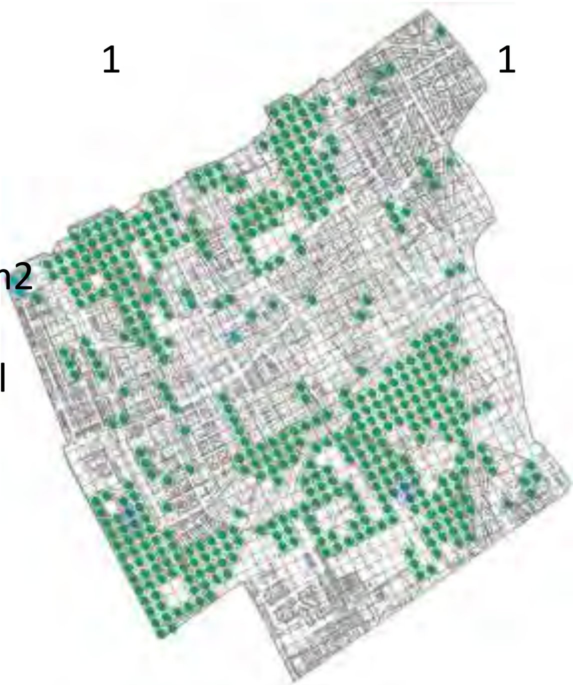
- Estimated 44% of the plot area is dedicated to the footprint of the function Business
- 44% is equal to 4.312m2 of total grid footprint of 9801m2 (platform)
- In Rijswijk the estimation of the total footprint than will be 497.200m2

RIJSWIJK

Function Public

	m2 Footprint	% of total built area	% of total area
Public Park and Open Space	4.430.000	44	35
Public Building	70.000	1	1
Public Education	90.000	1	1
Public Daily Care	30.000	1	1

- Estimated 17% of the plot area is dedicated to the footprint of a public building (excluding the parks and sport facilities area which consist mainly of land)
- 17% is equal to 1678m2 of total grid footprint of 9801m2 (platform)
- In Rijswijk the estimation of the total footprint than will be 32.300m2 (excluding parks and sport facilities)



RIJSWIJK

Function Water

	m2 Footprint	% of total built area	% of total area
Public Park and Open Space	560.000	6	4

RIJSWIJK

Function Connectivity
Main Road Transit

14.7km track

RIJSWIJK

Function Connectivity
Public Bus Transit

8.1km track

RIJSWIJK

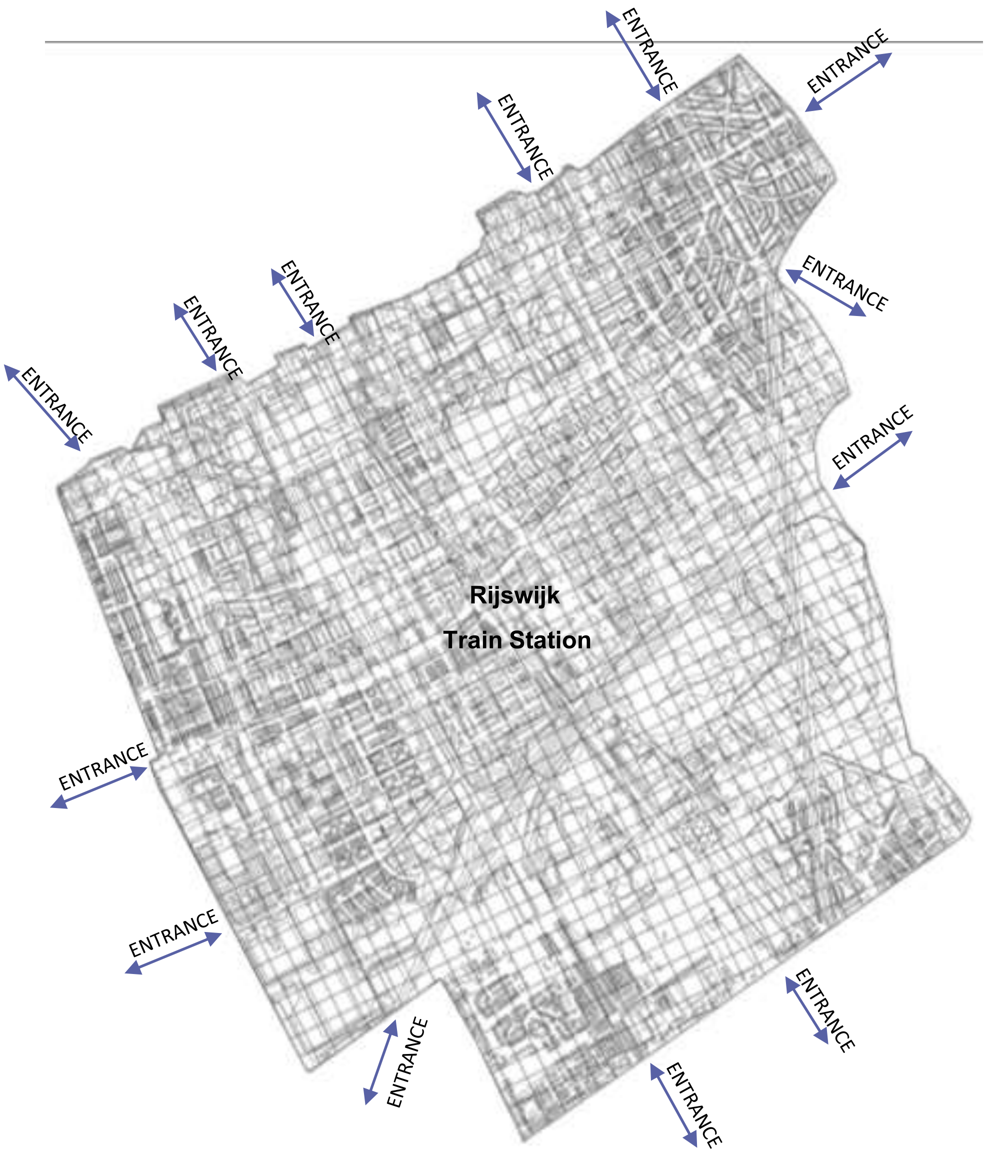
Function Connectivity
Railway

4.5km track

RIJSWIJK

Function Connectivity
Entrances

13 Main entrances



SPACE@SEA

TOLLEBEEK

Tollebeek is founded in 1957 after the land was drained in 1942. The village is located at the east embankment of the Ijselmeer in the province of Flevoland.

TOLLEBEEK

Small Village

Location and Facts

TOLLEBEEK

Small Village

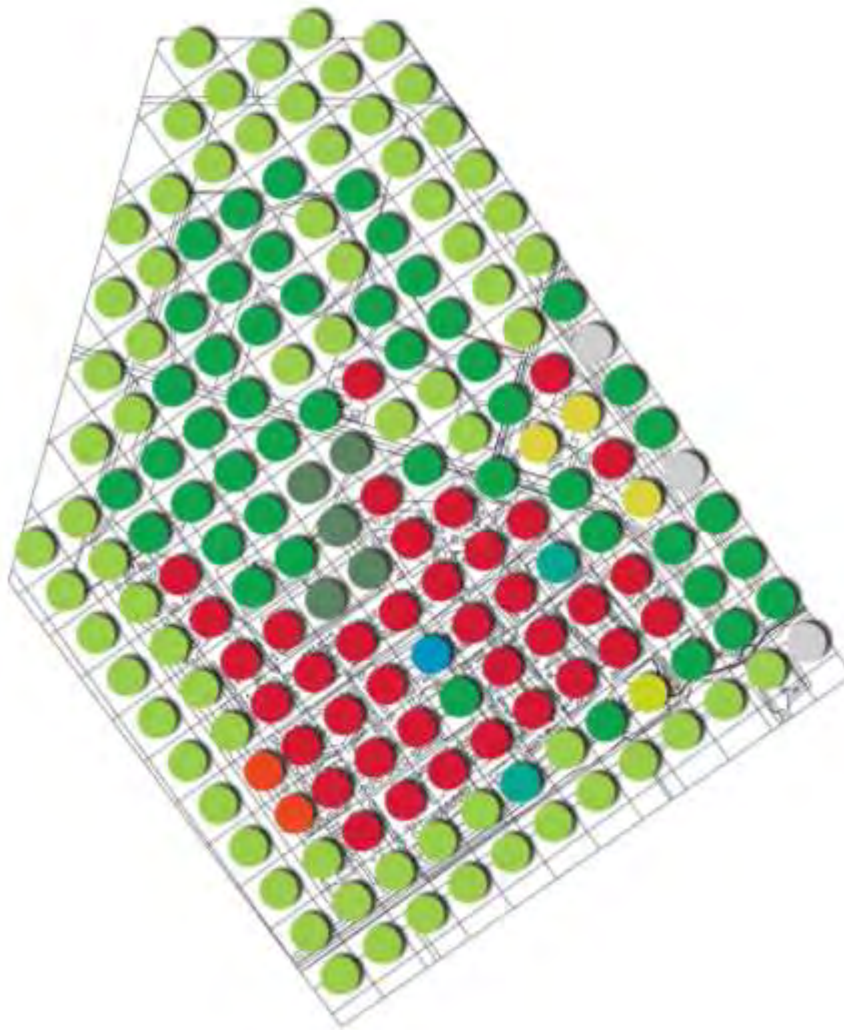
Location and Facts

TOLLEBEEK

- 2.450 inhabitants

TOLLEBEEK

- Living < 3 layers
- Business Commercial
- Business Light Industrial
- Business Agriculture
- Business Catering Industry
- Public Park and open space
- Public Building
- Public Educational Institutional
- Water



TOLLEBEEK

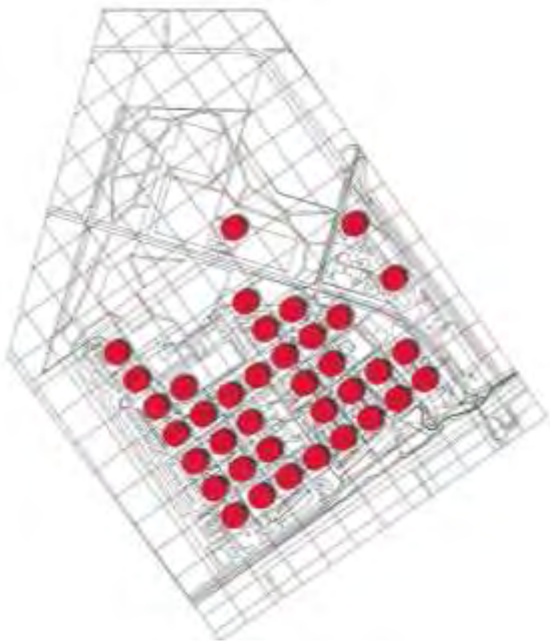
	m2 Footprint	% of total built area
Living < 3 layers	362.637	1
Business Commercial	16.602	20
Business Light Industrial	29.403	3
Business Agriculture	686.070	6
Business Catering Industry	9.801	1
Public Park and open space	460.640	4
Public Building	19.602	1
Public Educational Institutional	9.801	1
Water	29.403	2

TOLLEBEEK

Function Living

	m2 Footprint	% of total built area	% of total area
Living < 3 layers	362.637	22	21

- Estimated 26% of the plot area is dedicated to the footprint of the residential housing
- 26% is equal to 2.468m2 of total grid footprint of 9801m2 (platform)
- In Tollebeek the estimation of the total footprint than will be 164.458m2



TOLLEBEEK

Function Business

	m2 Footprint	% of total built area	% of total area
Business Commercial	19.602	1	1
Business Light Industrial	29.403	3	2
Business Agriculture	686.070	41	39
Business Catering Industry	9.801	1	1

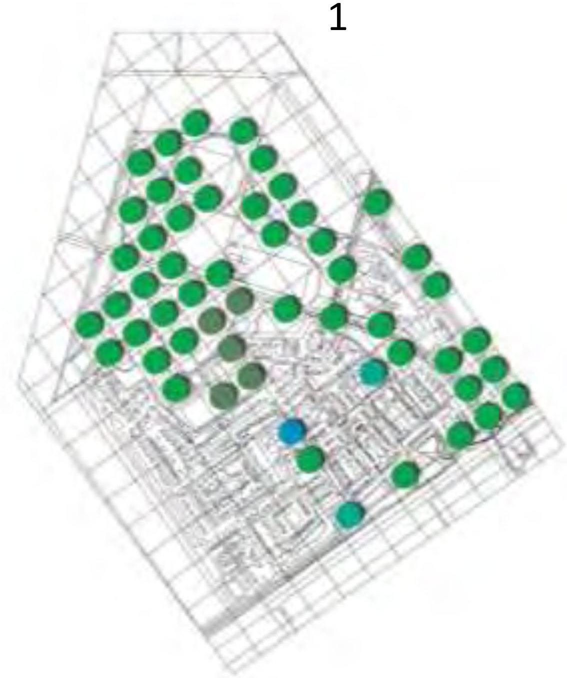
- Estimated 9% of the grid area is dedicated to the footprint of a commercial building (excluding the agricultural area which consist mainly of farmland)
- 9% is equal to 842m2 of total grid footprint of 9801m2 (platform)
- In Tollebeek the estimation of the total footprint than will be 5.052m2

TOLLEBEEK

Function Public

	m2 Footprint	% of total built area	% of total area
Public Park and Open Space	460.647	28	27
Public Building	19.602	1	1
Public Sports	49.005	3	3
Public Education Institutional	9.801	1	1

- Estimated 8% of the plot area is dedicated to the footprint of a commercial building (excluding the parks and sport facilities area which consist mainly of land)
- 8% is equal to 786m2 of total grid footprint of 9801m2 (platform)
- In Tollebeek the estimation of the total footprint than will be 4.716m2 (excluding parks and sport facilities)



TOLLEBEEK

Function Water

	m2 Footprint	% of total built area	% of total area
Water	29.403	2	2

TOLLEBEEK

Function Connectivity
Main Roads Transit

2.0km track

TOLLEBEEK

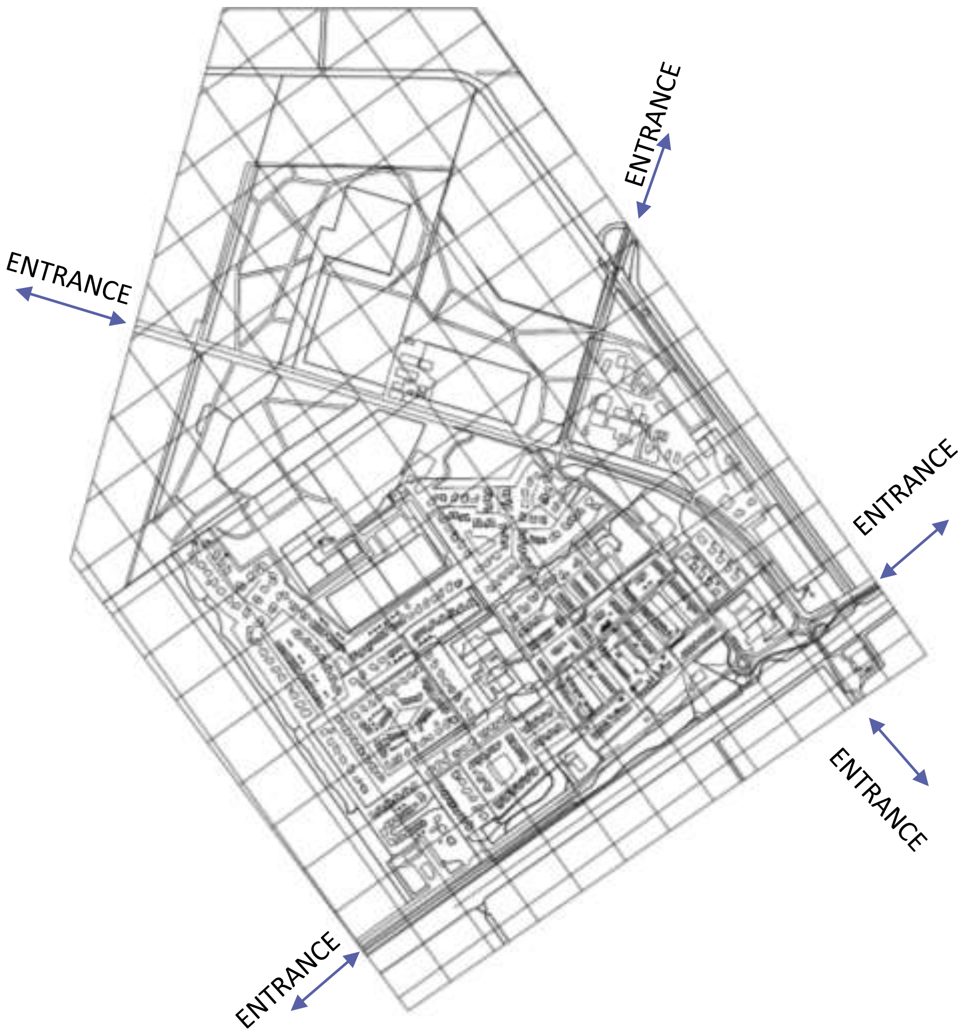
Function Connectivity
Public Bus Transit

1.2km track

TOLLEBEEK

Function Connectivity
Entrances

5 Main Entrances



WRAP UP

% of Built area	Masdar city	Rijswijk	Tollebeek
Living Residential <3 layers	0%	20%	22%
Living>3 layers	25%	3%	0%
Living community facilities	1%	1%	0%
Business Research and Development	4%	0%	0%
Business Offices	4%	1%	0%
Business Light Industrial	6%	4%	3%
Business Catering Industry	0%	1%	1%
Business Agriculture	0%	1%	41%
Business Commercial	0%	6%	1%
Public Hotel	1%	0%	0%
Public Park and Open space	31%	44%	28%
Public Leisure	12%	0%	0%
Public Building	0%	1%	1%
Public Education/Institutional	7%	1%	1%
Public Education daily care	0%	1%	0%
Utilities Solar hub	6%	0%	0%
Utilities Other	3%	11%	0%
Health Hospital	0%	0%	0%
Health Nursery	0%	0%	0%
Water	0	5%	2%
	100%	100%	100%

SPACE@SEA

THE FRAMEWORK PROGRAMME FOR RESEARCH AND INNOVATION

HORIZON 2020

Appendix – 4 Parametric Design and Configuration Study

Table of Contents

HOW –

- Searching of different urban scenarios: A, B, C, D, E, Etc. each with specific characteristics.
- Program selection, of this different urban scenarios.
- Carrying different studies with grasshopper scripts, to obtain outputs and observations based on the rules and parameters.
- Output performance : how well functioned city at comfort, technique, ecology, feasibility.
- Output tuning.

WHY –

Grasshopper

- Grasshopper – computational tool helps to arrive at a design output based on rules and parameters.
- Once we define rules and parameters – the script can be used for any conditions. We will obtain the respective outputs based on our inputs for the rules and parameters.
- We can keep adding new rules – it becomes a cumulative script.
- We can study more outputs in a time frame and produce better results.

Script trials

Introduction

With the studies in our previous presentation. We started generating the city pattern and fabric.

We are defining the space @ sea through scripts in grasshopper.

These scripts will be the source code for the cities in varies condition and senarios. The design methods are approached with systematic algorithmic scripts.

These algorithms will be the data sources for the future – floating cities. This data collection helps us in gathering and measuring information on targeted variables in an established systematic fashion, which then enables one to answer relevant questions and evaluate outcomes.

The algorithms will helps us find a better solution and configuration, based on the flexibility tools. The city could be tuned and will make it adaptable.

Trial -1

Starting with triangular floating platform. In this we are understanding how platform can be eleminated on the need for creating blue spaces for the neighbourhood.

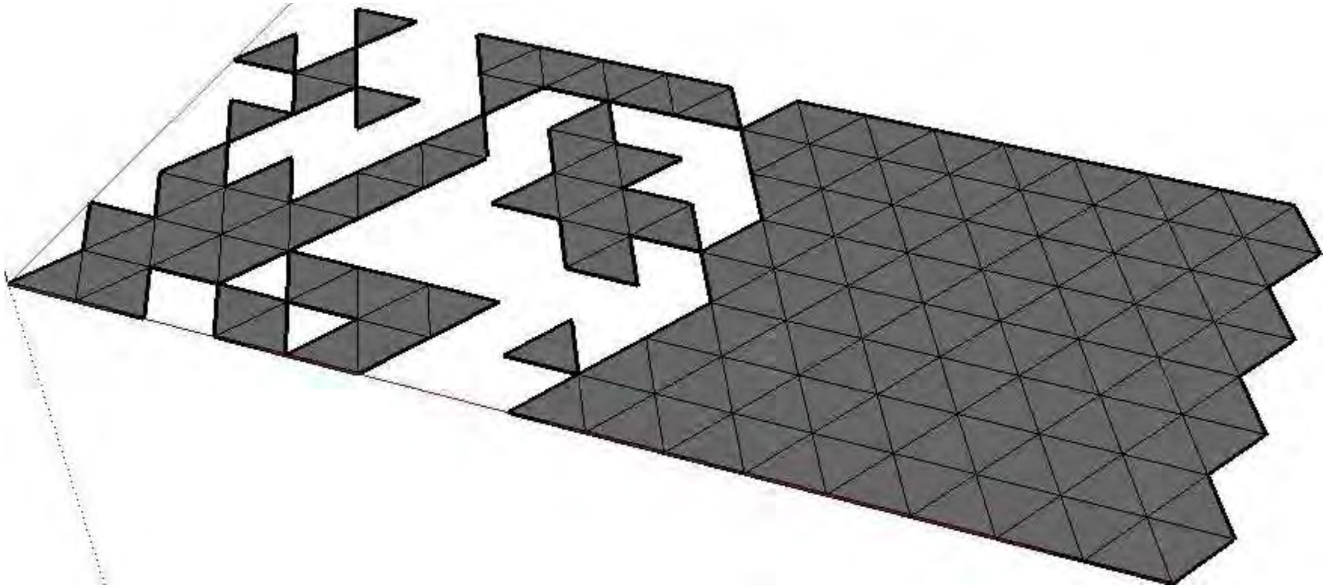
We define the points or we define a path along which blue spaces needs to be created.

Different parameters -

1 - Number of points or points along a path.

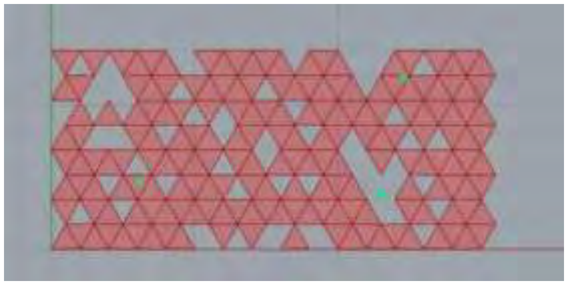
2 - The distance range between them.

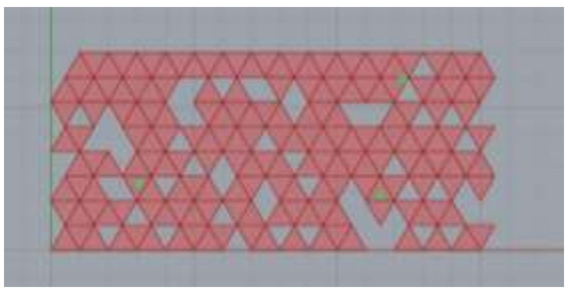
3 - Numbers of units to be eliminated.

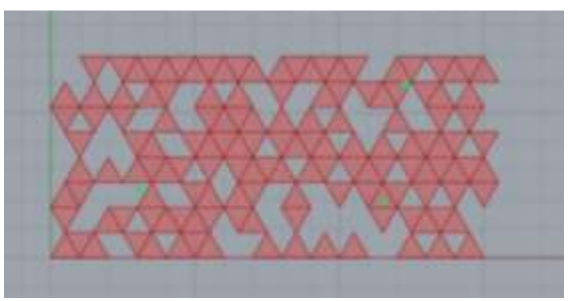


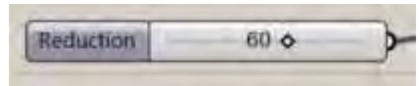
Trial -1

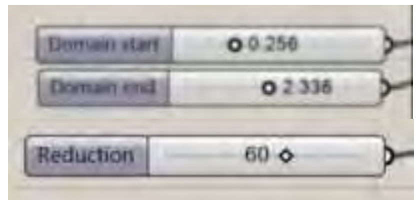
The defined points in the neighbourhood.

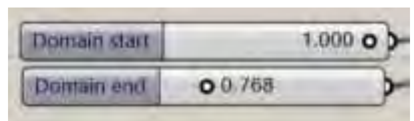


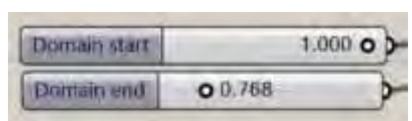












The domain help to group the distance limit from the defined points.

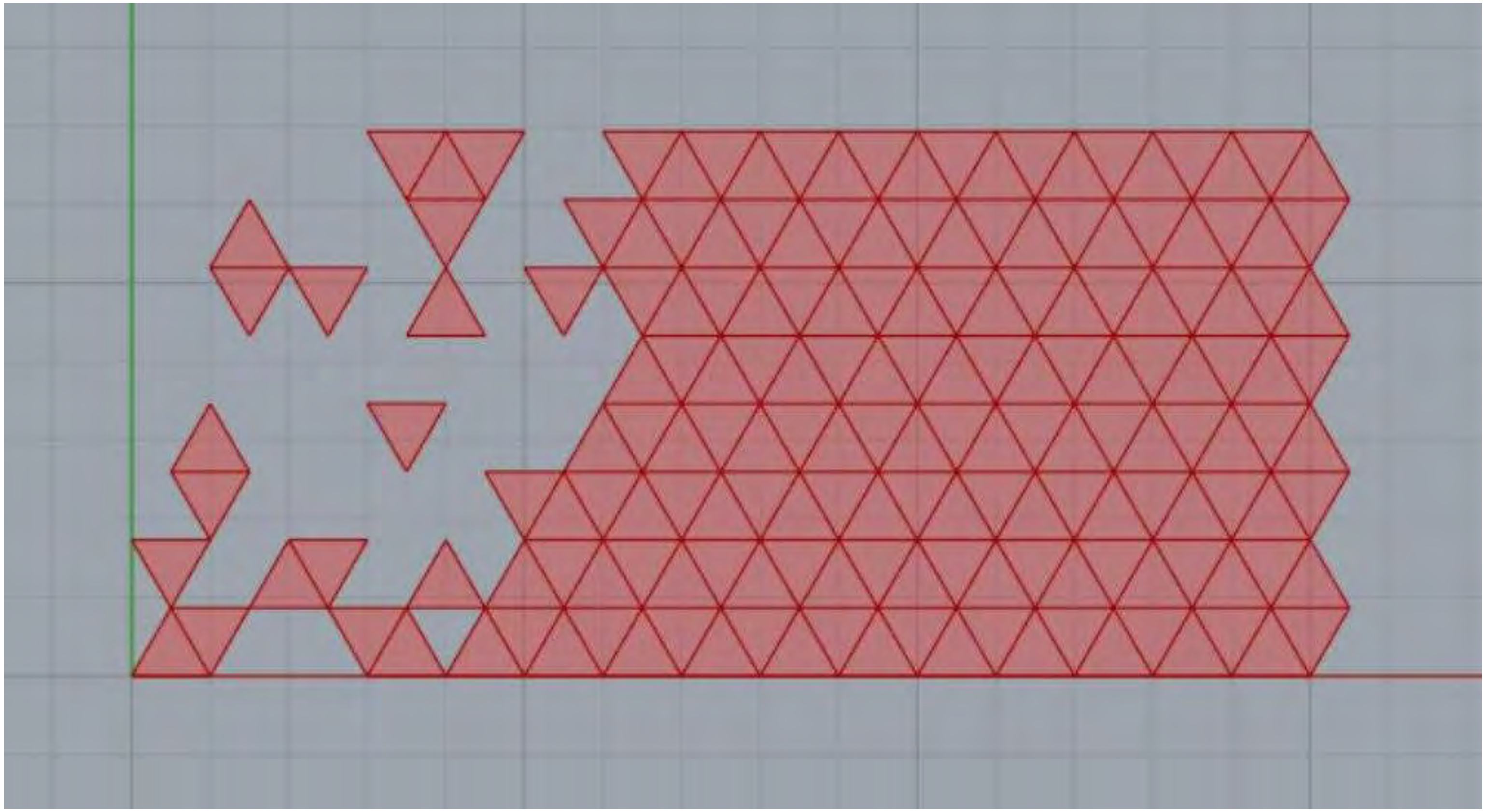
This helps us to set the limit or the distance range, where we want to create blue space.

This helps us to create more open face towards water.

Trial -1

Definition for points along a curve.

This helps in creating more opportunities for functions like dock yards, local recreational spaces, or a transportational terminal.



Trial -2

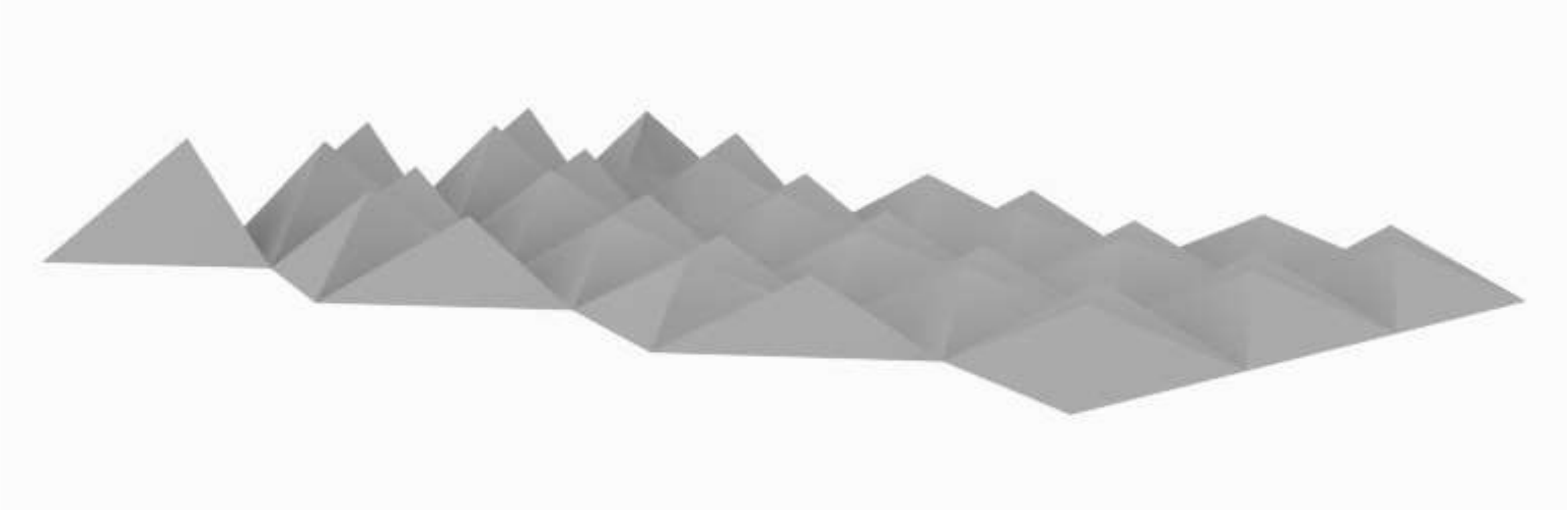
The idea of a built form should respond to the platform profile. So we attempeted to create triangular prymide. Inorder to define it for different functions, we attempted to vary each built forms height.

In this the height of the built form responds to a functional graph. Through this, we also attempted an iteration – if all built form have same height and the functional graph trims the existing form. We got much open space on a higher level, which gives a different perspective of the surrounding.

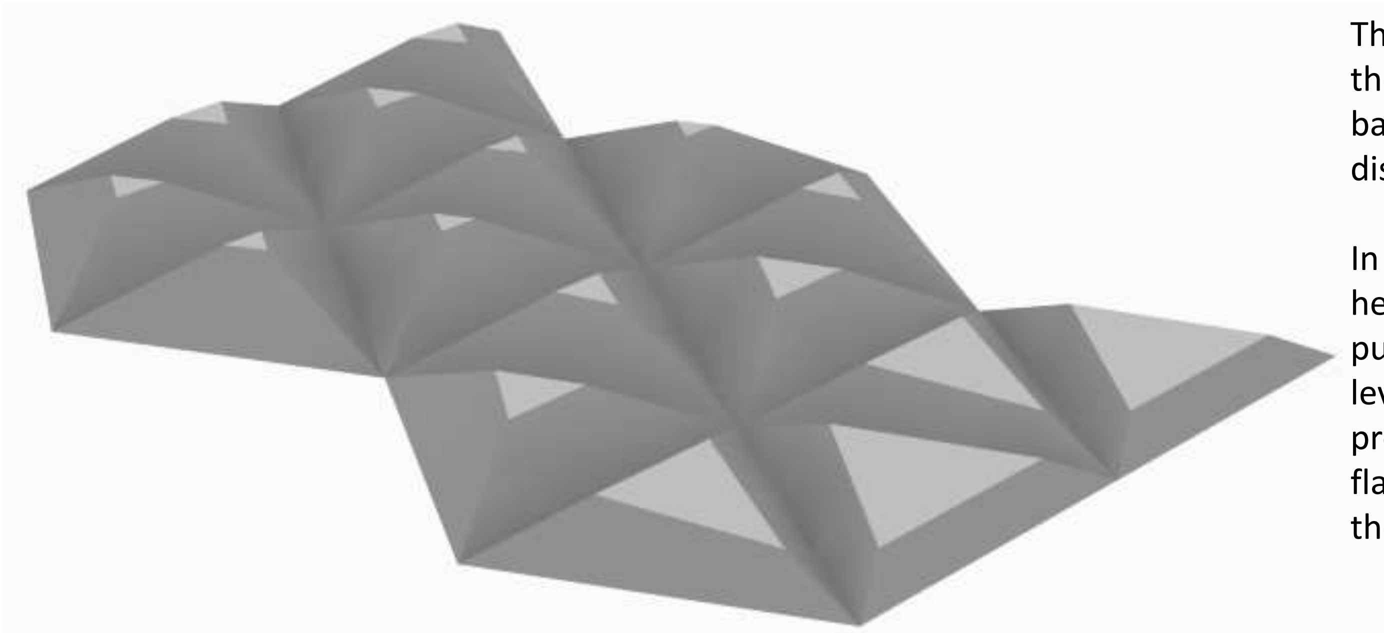
Parameters –

1 - Extrusion value (height).

2 - Graph defining the height based on the functional need.

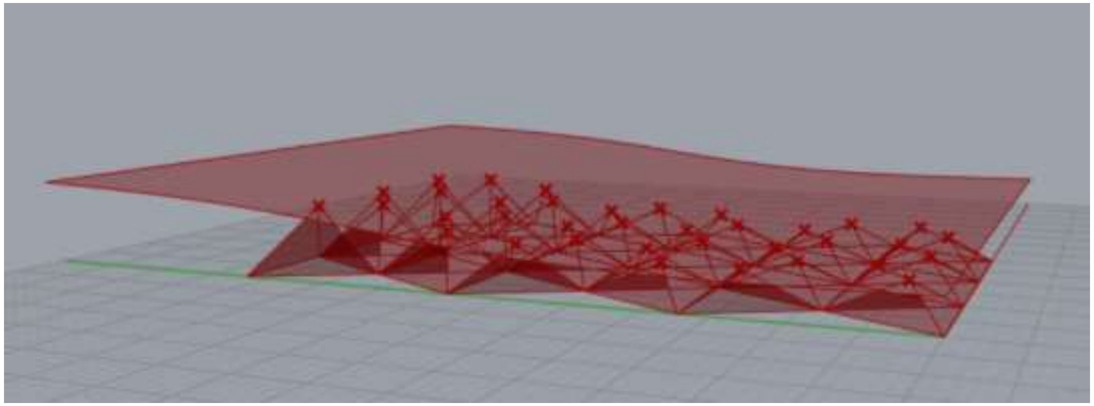


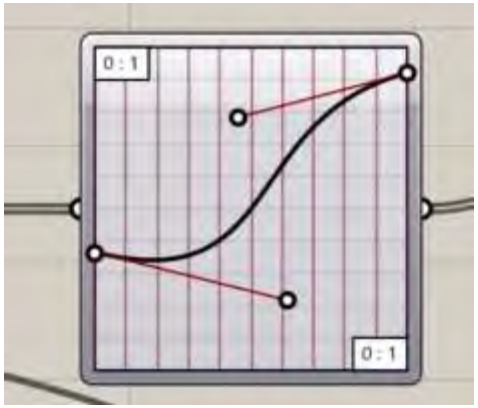
Trial -2



This helps in defining the heights of the form based on the functinal distribution.

In the second iteration it helps us to think about a public space at a higher level and relation / proportion between the flat surface on top with the functional graph.





Trial -3

From the previous attempt,In this we study how relatively the public spaces on higher level can be defined with different massing of each block. Based on the defined form.

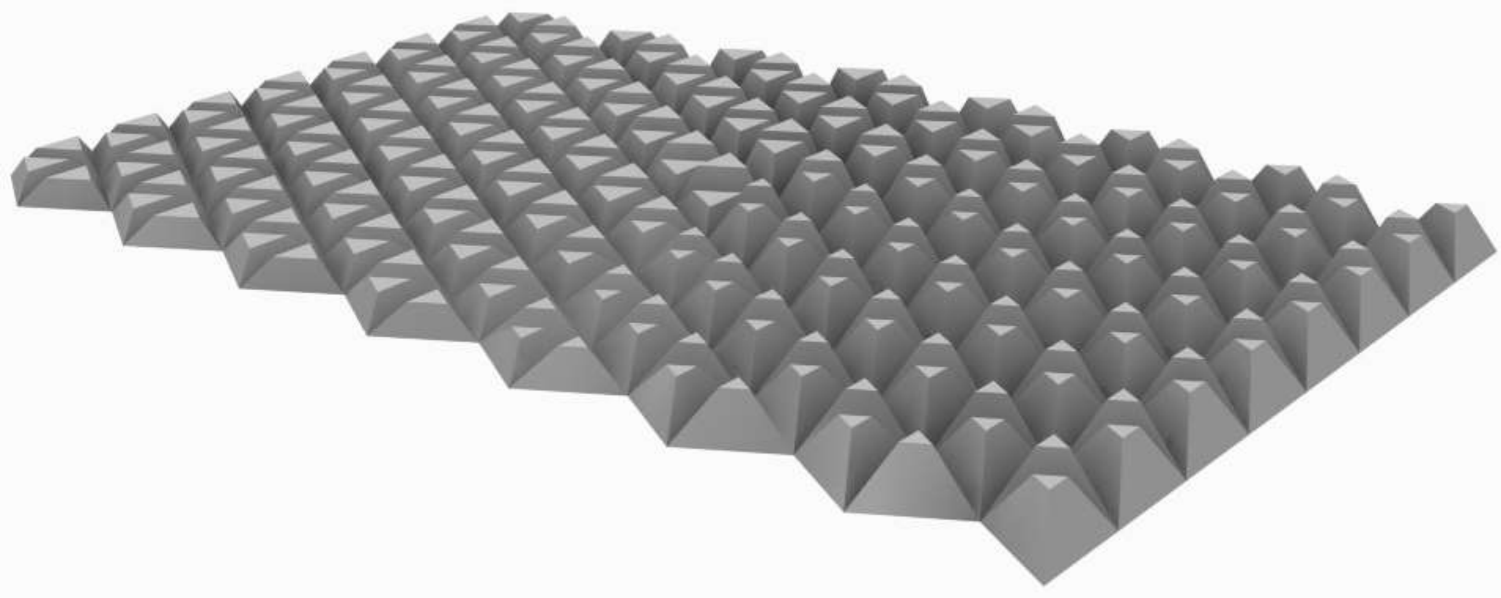
Parameters –

1 - Functional spots / points.

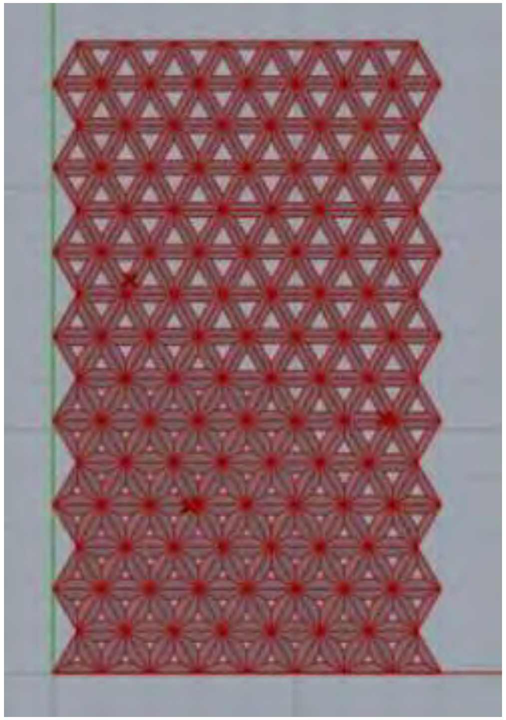
2 - Scale factor for the higher level spaces.

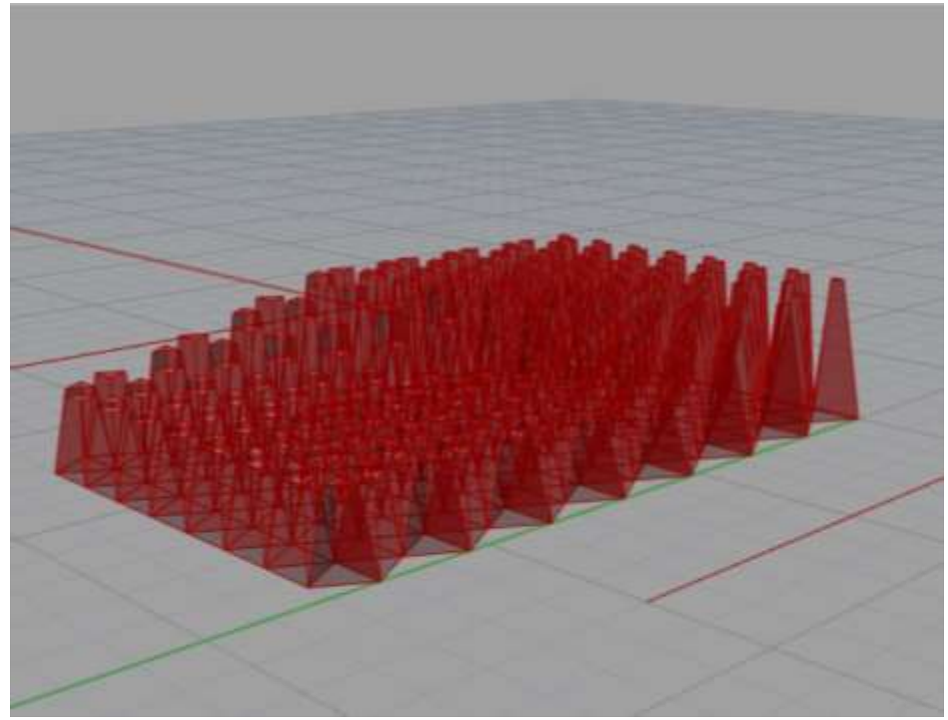
3 - Extrusion value.

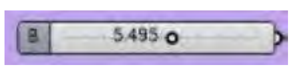
4 – Slope.

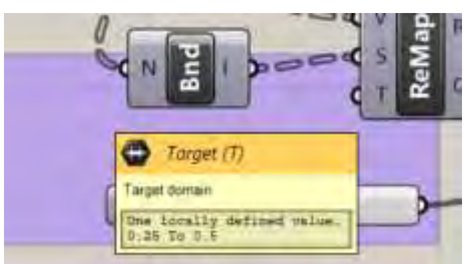


Trial -3







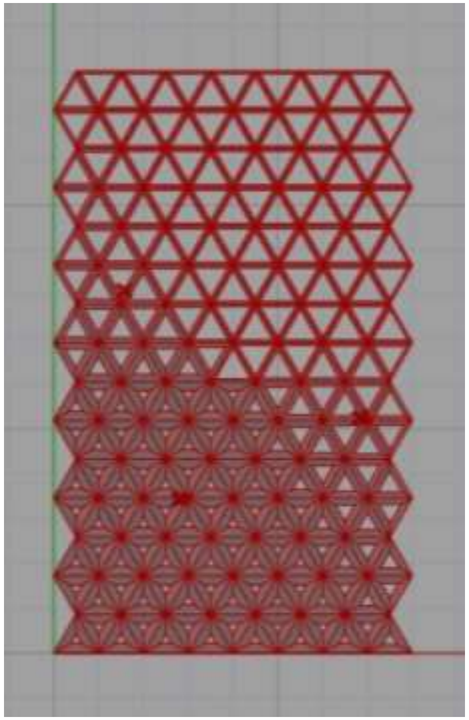


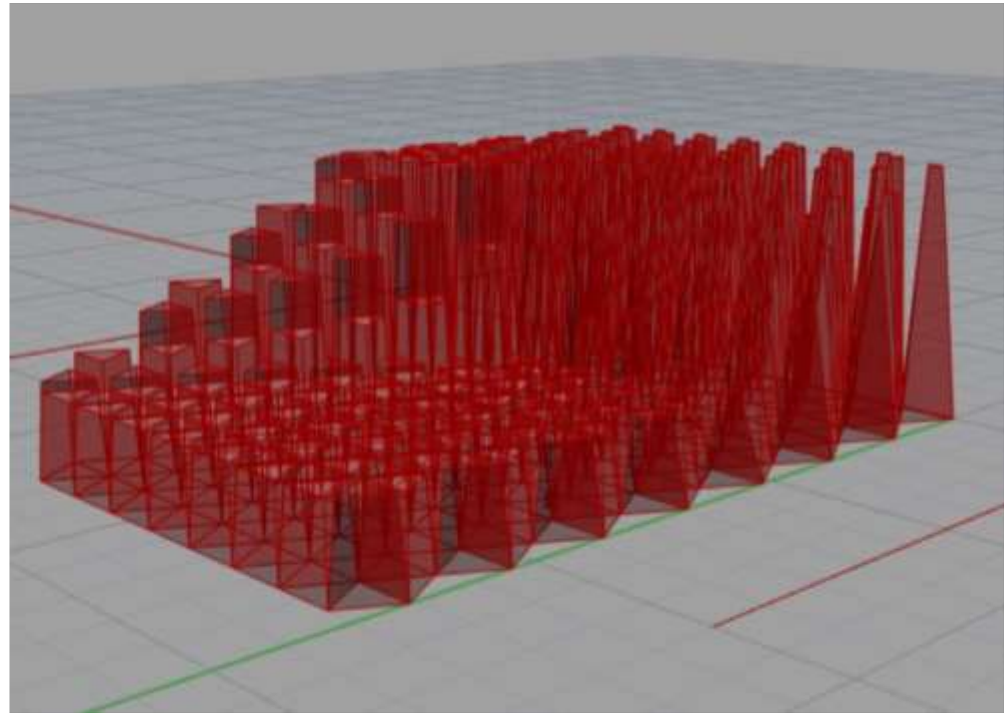
The extrusion factor is fixed.

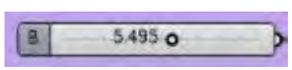
But when the scale factor or the slope factor is varied. This influence the form of the building.

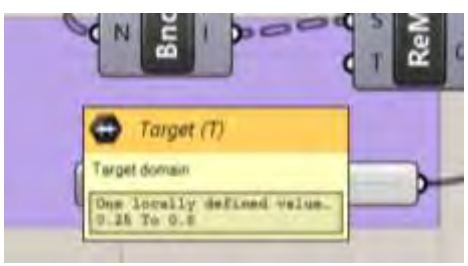
The plan shows the open space on top, in relation to the height.

Trial -3







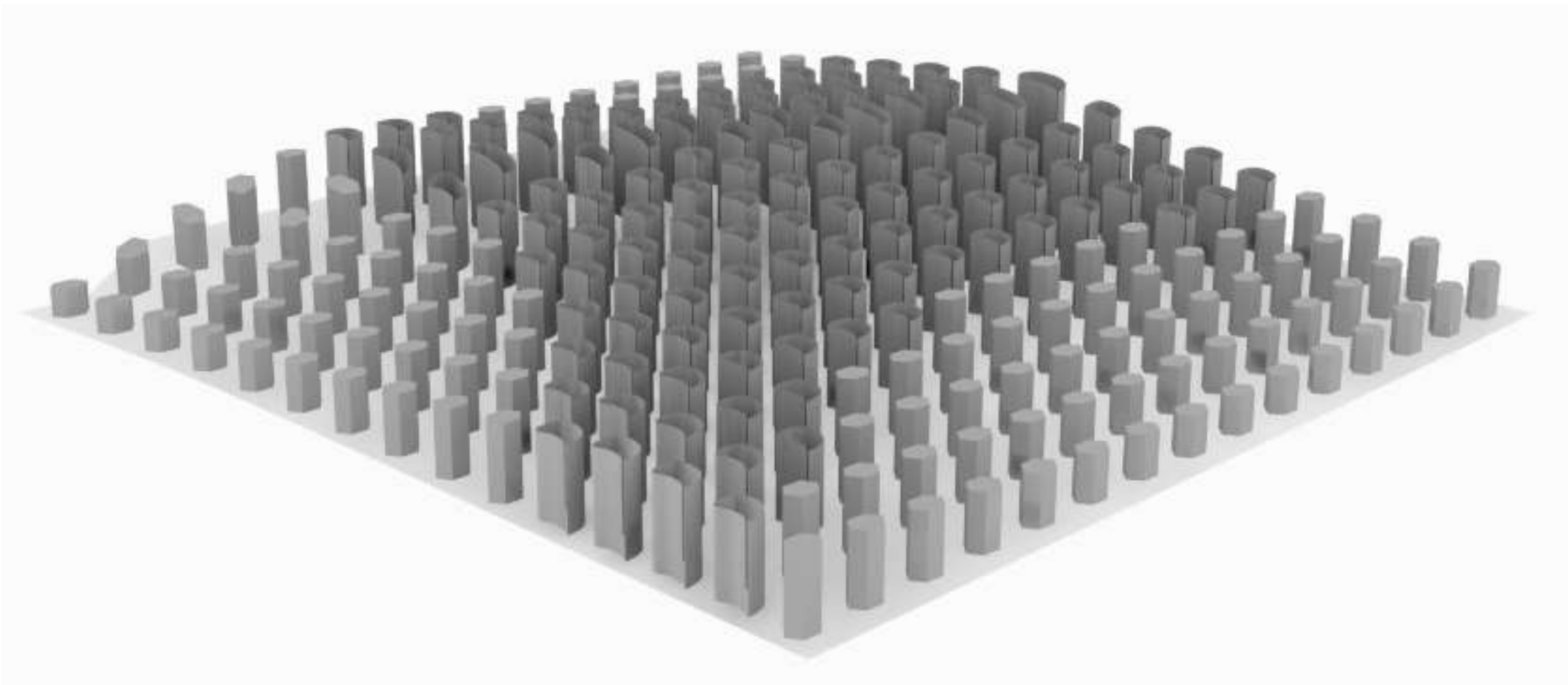


This helps in finding the relation between the flat area on top with the slope of the built form. Also it helps in determining the height factor of the form.

Trial -4

In this we are trying to distribute specific built form, for specific function zones.

Here a grid pattern is used to have grip on the idea of distributing building forms.



Trial -4

The built forms are predefined. Based on the functional points or the nodes, the area is divided based on the influencial region and accordingally the built forms are packed.

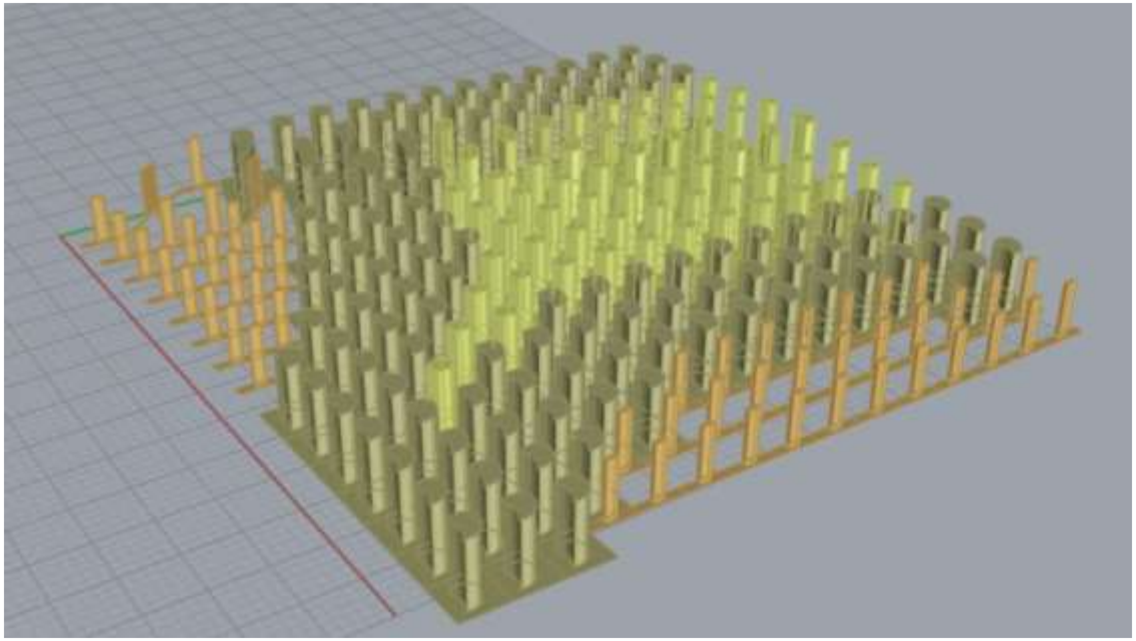
Parameters –

1 - Functional spots / points.

2 - Height for the built form.

3 - Area of influence.

This will help us in organising each building typology based on the functional need.



Conclusion

In the previous session, we tried to get an understanding on relation between the functional nodes and the built form and the platform.

In an urban planning, the built form is mostly dependent on the function, it’s catering. Each function demand its own form but there is a connection or slow transision between two.

The idea of having open public spaces on the higher level will bring in a different spacial quality for the city, with multilevel of different functions performing together. It creates a mixed use pattern – adaptable form.

Trial -5 City growth parameters

In this chapter, we take an attempt to script the city growth pattern.

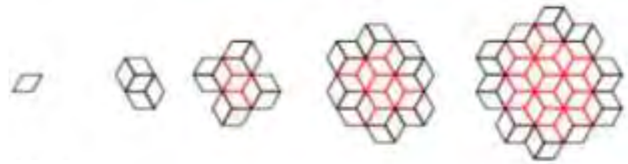
It becomes a necessery tool to study the growth pattern of the floating city. There is no defined boundary conditions or topographical constraints.

A set of rules has to be defined for the floating platform to develop, which is functionaly driven.

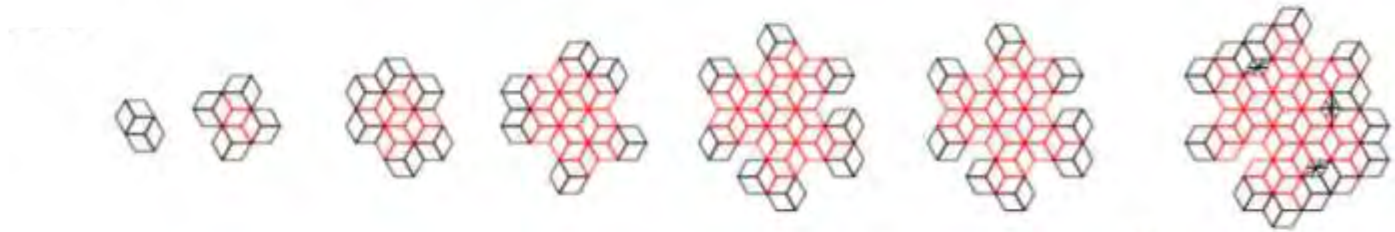
This will help in understanding on orign of a city and dynamics of it’s configurations.

Trial -5 City growth parameters

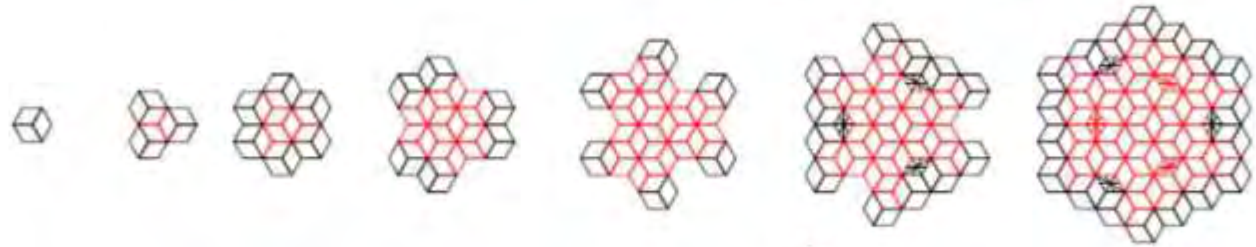
Mirror on all open edge



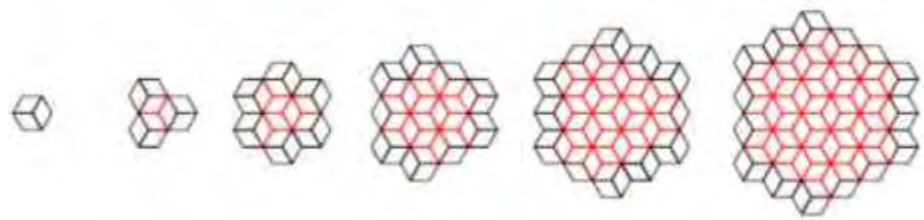
Mirror only when two sides are open



Mirror on all open edges – When 2 edges are open



Mirror on all open edges



Moving along a point

Trial -5 City growth parameters

The growth pattern along the different points of the given base form, gives more flexibility of growth compared to other growth pattern.

This helps us to have more control over the program, functions of the city and the city blocks.

In all other growth pattern- the platform are developed on the periphery.

Being a floating city, it gives us an opportunity to develop from the inner core. The algorithm to move along the points will help in bringing this growth form. Where the shortest open ends will be reconfigured to accommodate new platforms in the central spaces. Which doesn't change original functional configuration and also allows us to easily reorganise functionally, (for adaptability) because of more open ends.

Parameters –

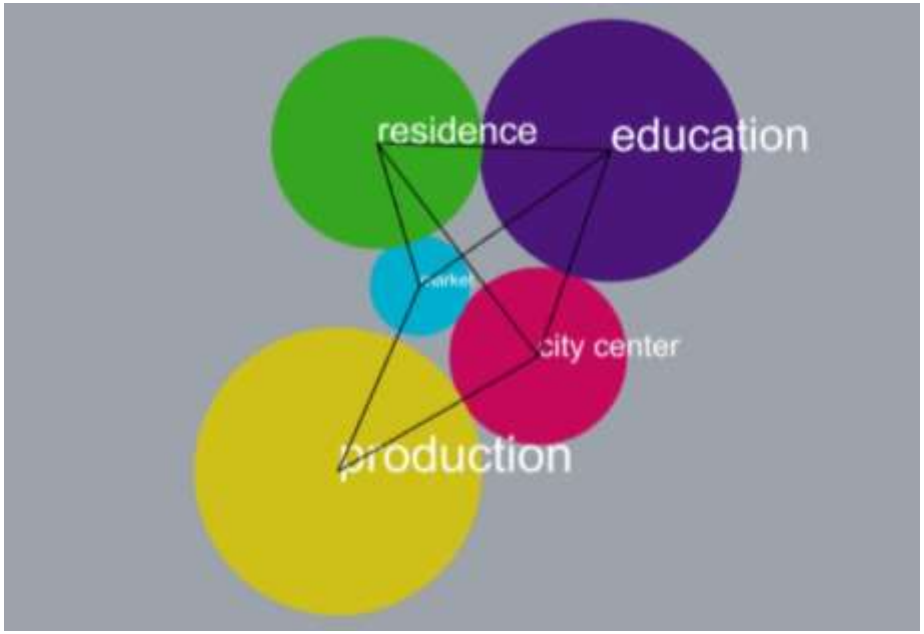
1 - City functions.

2 - Area per.person variable.

3 - Near growth.

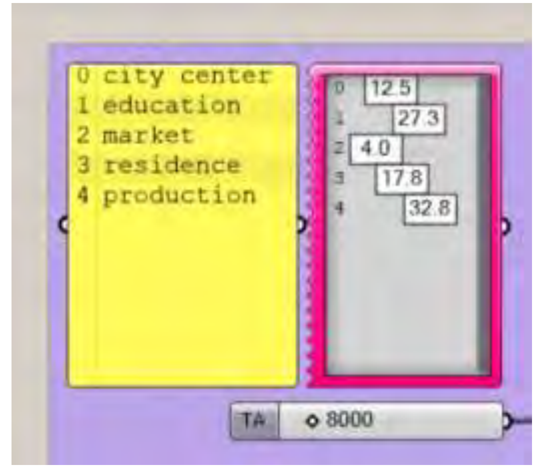
4 - Deform the equilateral triangle.

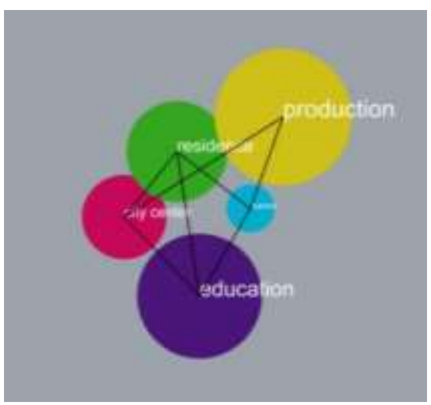
Trial -5 City growth parameters

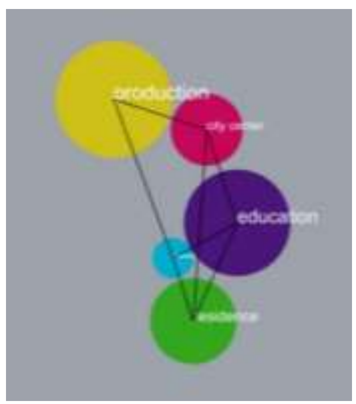


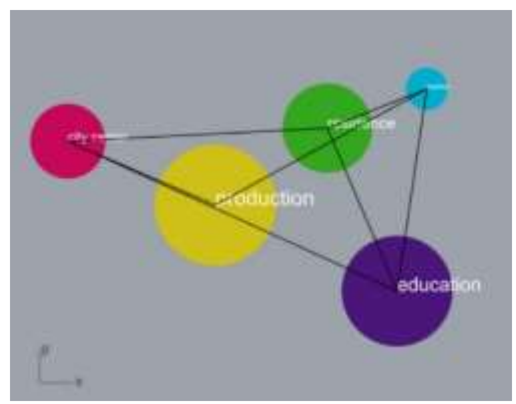
Initial city functions are defined and the best configuration is opted, out of the lot.

The area for each function is also defined.





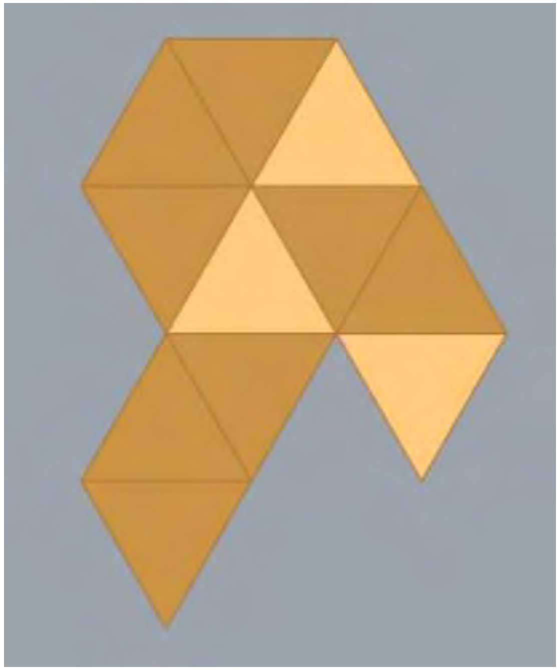




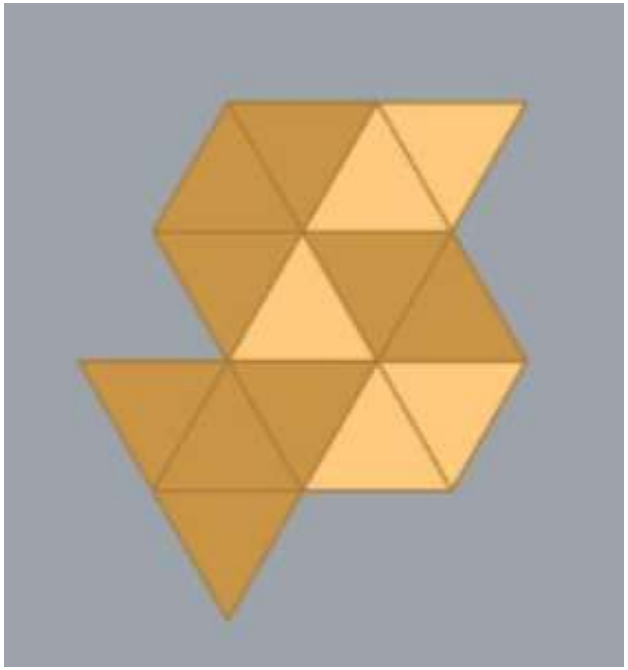
Trial -5 City growth parameters

Initial city structure – with given area and the functions

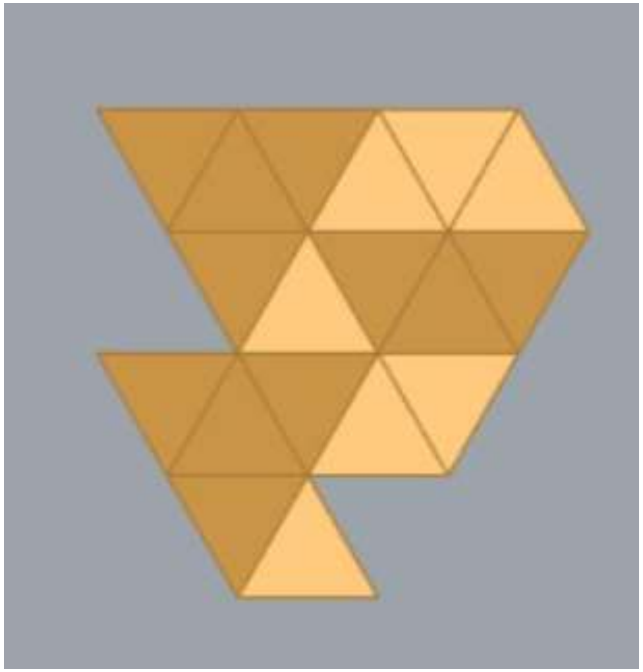
It forms equilateral triangle with 50m as one of its edge.



Initial form



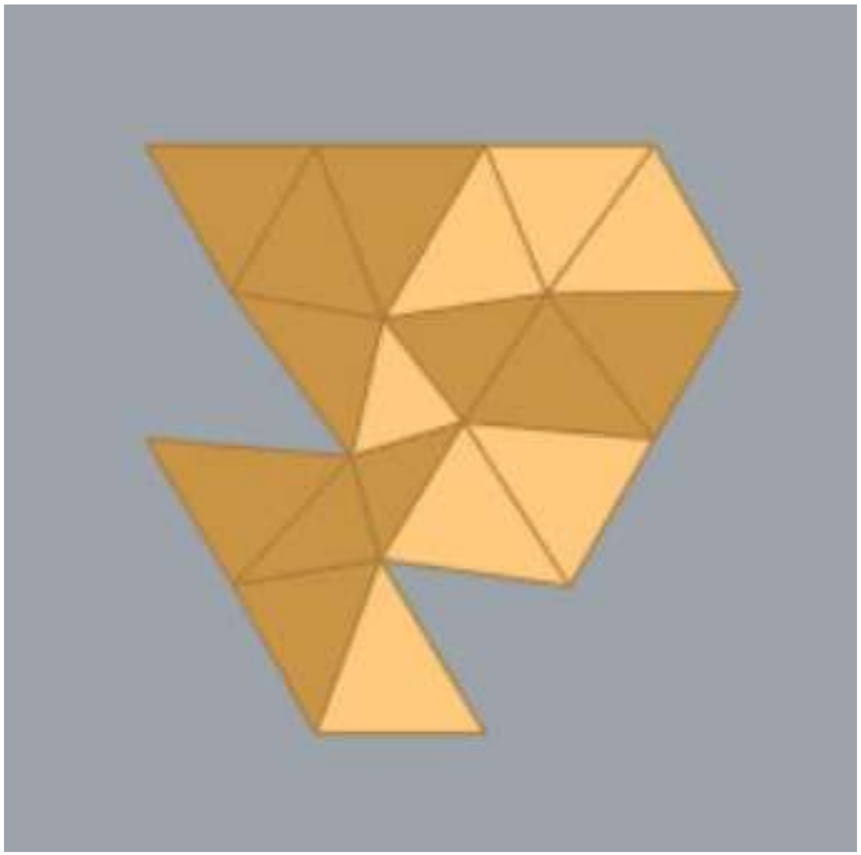
Step -1 increase in per person area

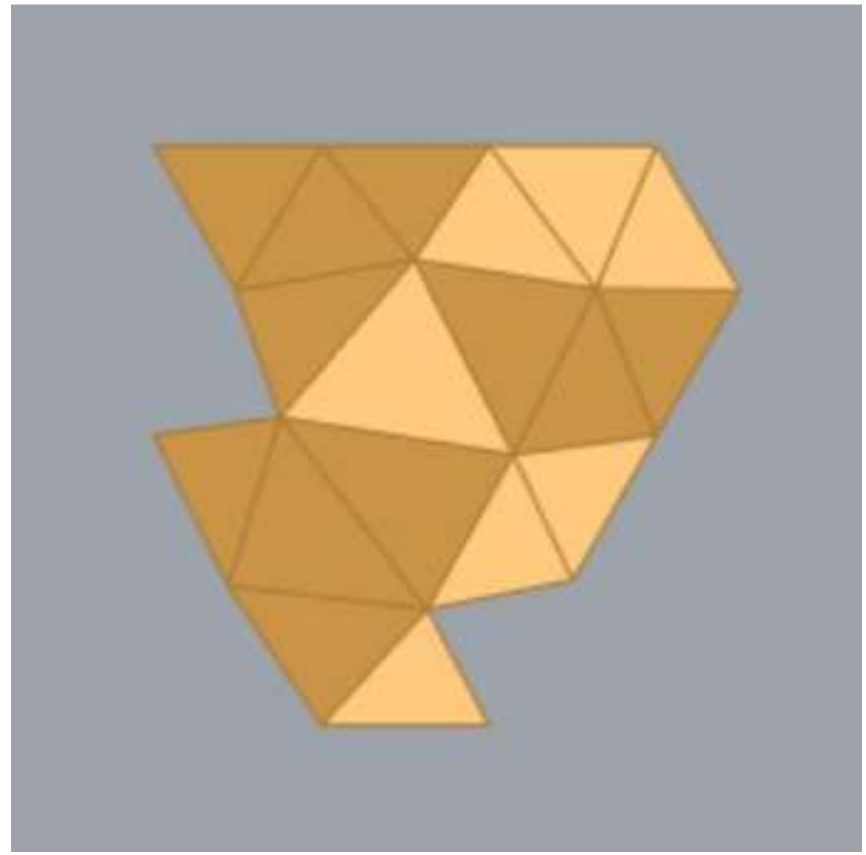


Step -2 increase in per person area

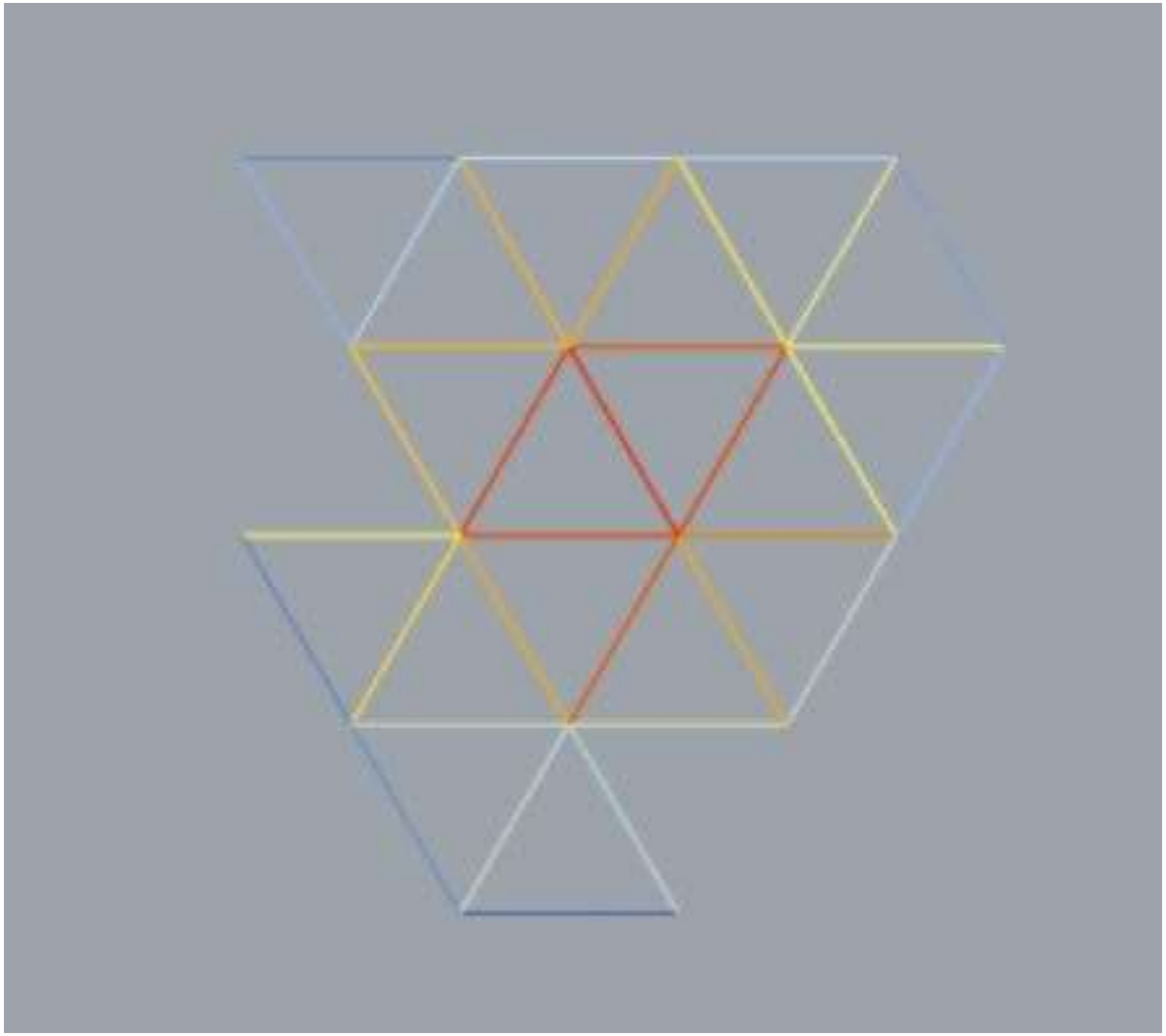
Trial -5 City growth parameters

We start deforming the equilateral platform on the basis of increasing the area or decreasing the areas of platform closer to the functional nodes.





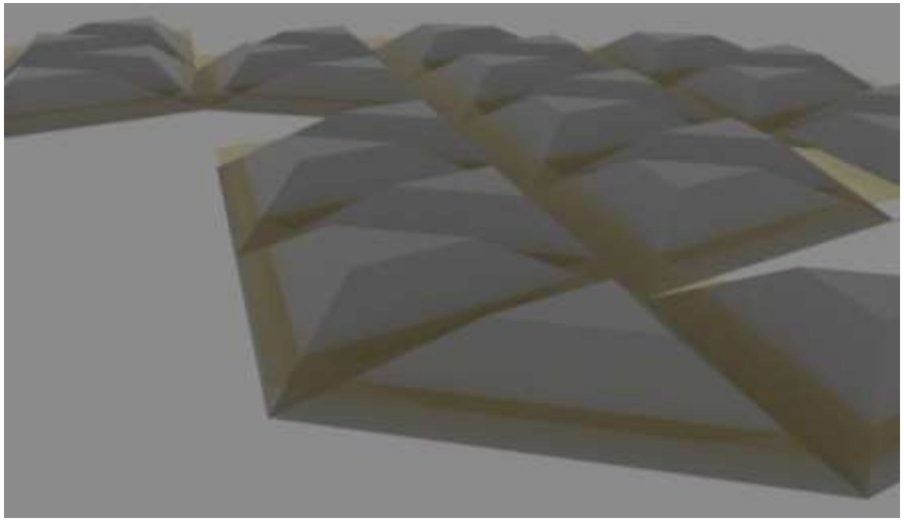
Trial -5 City growth parameters

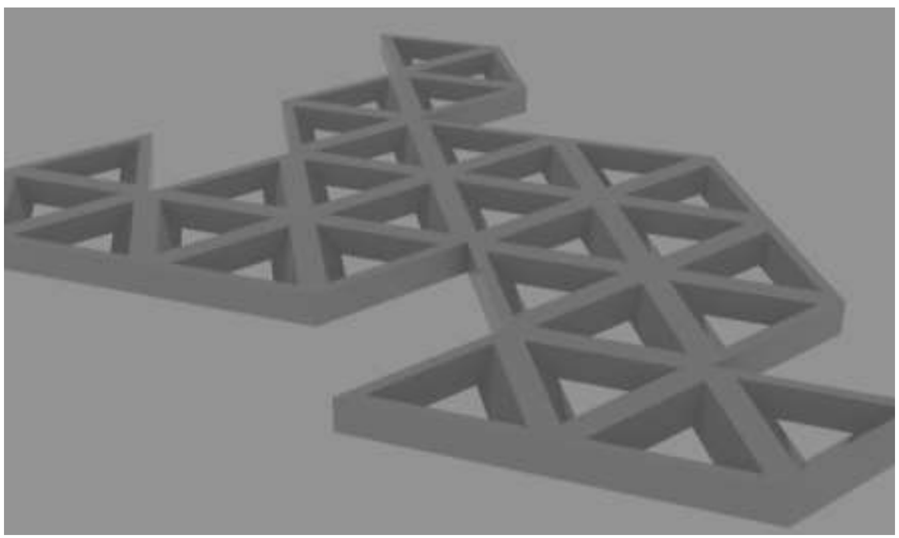


Study on the street movements based on the formed network.

The study is only for the peripheral movement.

Trial -5 City growth parameters





From the formed cluster, we tried different movement pattern and building blocks.

With the triangular pyramid form and a mid layer for network and top layer of open spaces.

An idea of perimeter blocks with central open spaces.

References

Conclusions

The city developes in an organic pattern.

The algorithm defined along the points provides the flexiblity to look for better configurations for both functional nodes and platforms.

Periphral movement and different levels of open space and movement pattern improves the city functions.

Trial -6 Waterfront grid

In this study we are attempting the possiblities of giving additional flexible spaces to the existing city.

This plugin can generate through the existing water channels, or to the city fabric.

This module extends the existing network of movement and adds water ways also. The city blocks gets connected with water canals.

Its opens out more public interactive spaces.

Each block has both faces- one towards the city network and the other to the water – creating different spacial experiences.

Trial -6 Waterfront grid

Initial attempt to work out the combination of spaces. Visual creation.

Trial -6 Waterfront grid

Scripting the visual creation

With the initial visual, we started scripting in grasshopper.

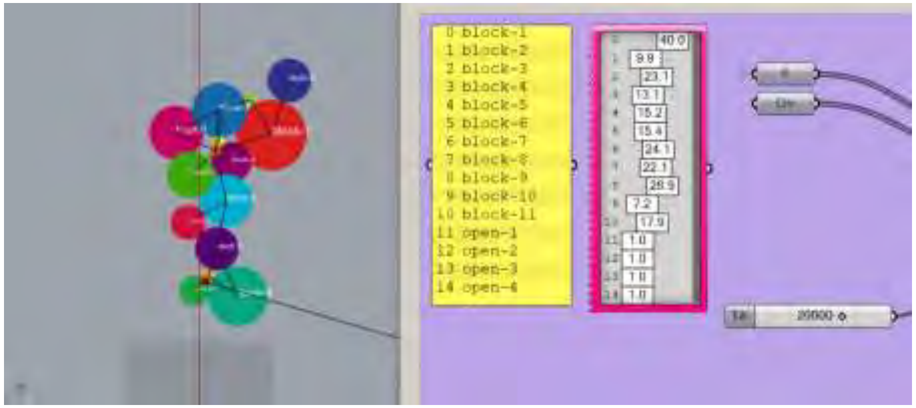
We will be generating a source code which can be tuned to different situations and conditions.

This source code will be the DNA for more waterfront grids system to come up in the future.

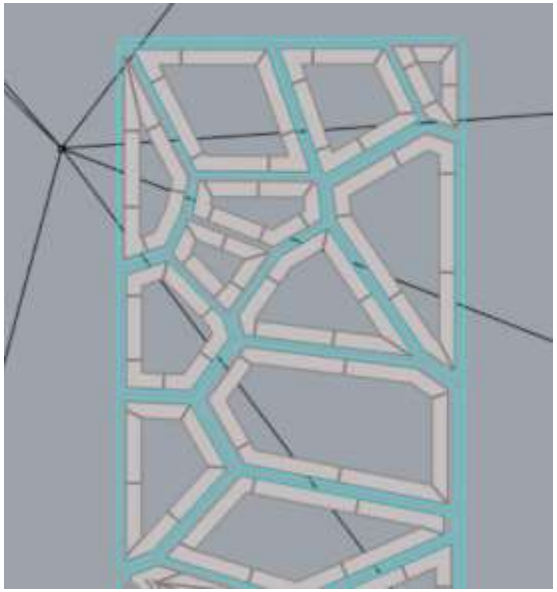
Trial -6 Waterfront grid

Attempt - 1

We started defining it with number of block – we want to create and the connectivity within them.



We generated the city block within a defined region and parallel street networks and internal water network.



Parameters –

1 - Number of blocks.

2 - Areas of each block.

3 - Street width.

4 - Building block width.

5 - space in-between blocks.

6 – blocks height.

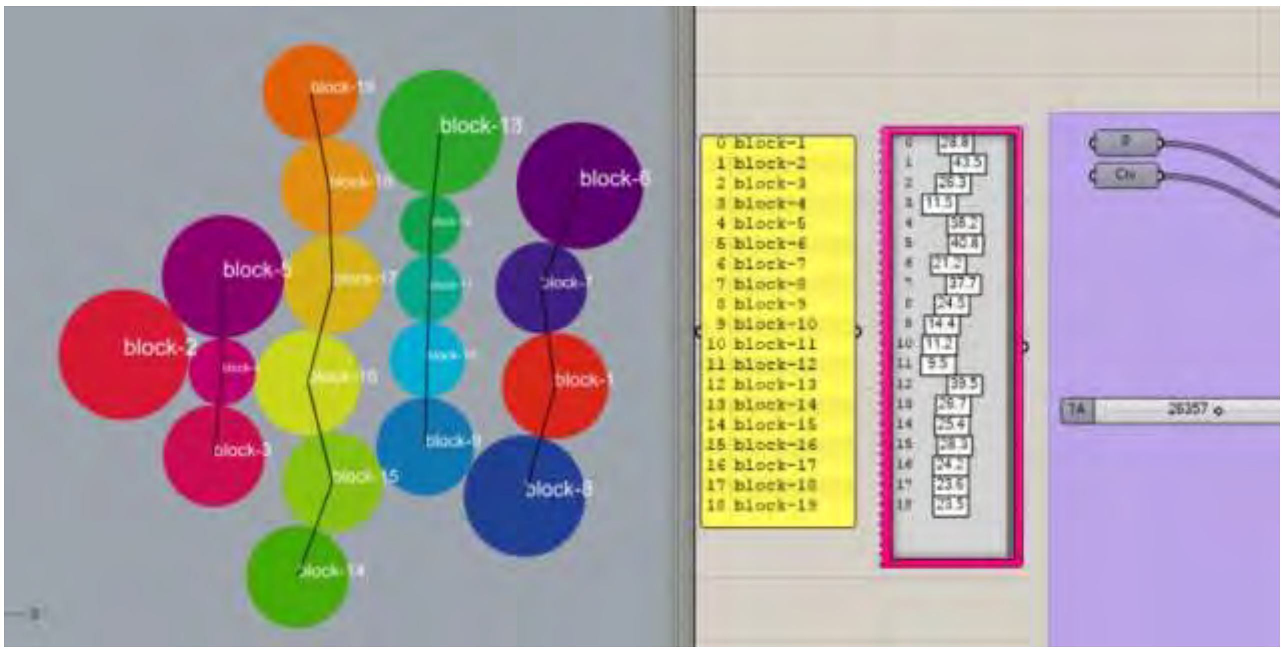
Trial -6 Waterfront grid

Attempt - 2

In this we gave more characters to the sorce code.

Worked out a generative growth factor for the city fabric. Which will enable the city to grow in the near future.

We created more characters to the streets. By opening canals and interconnecting the city network and the water.



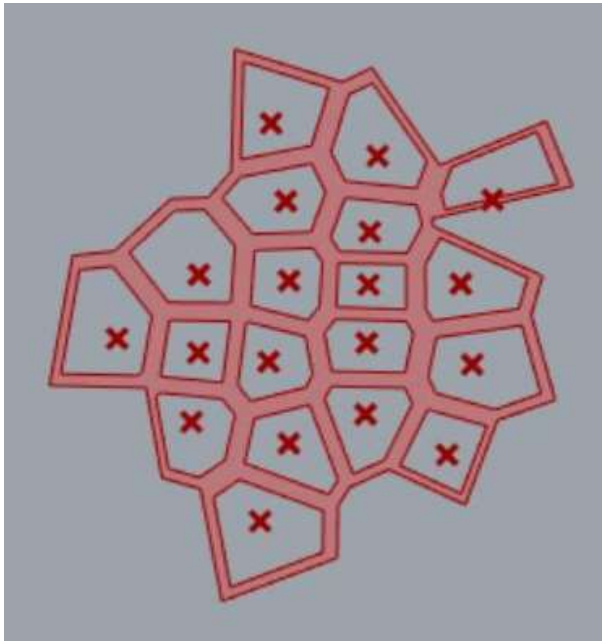
Define the urban blocks and configure the arrangement.

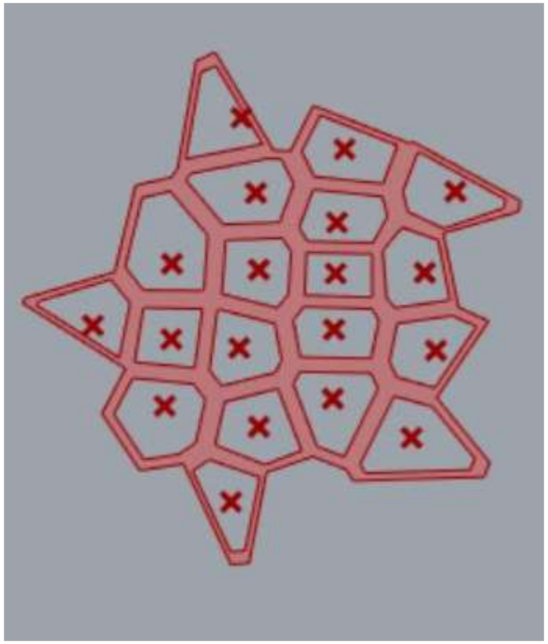
Trial -6 Waterfront grid

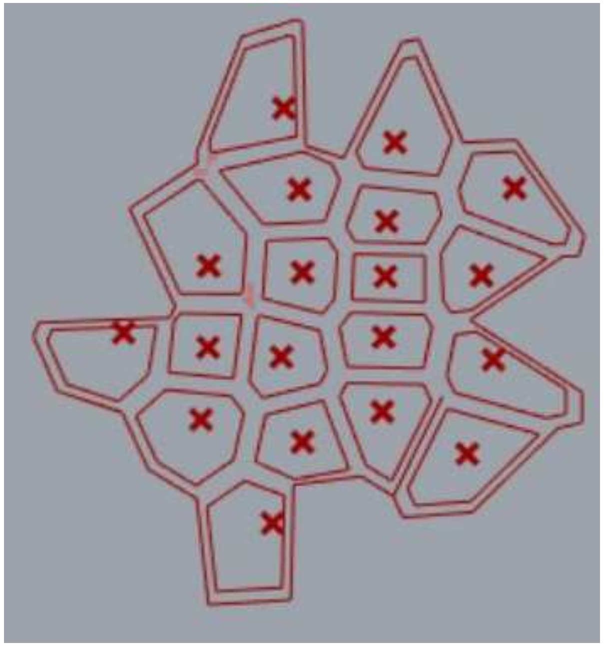
Attempt - 2

With the defined configurations. The script will develop the network of streets, set the limits to get the better peripheral combination.

The extended streets will act as a dock space, later if the city grows this will transform to a block by itself.



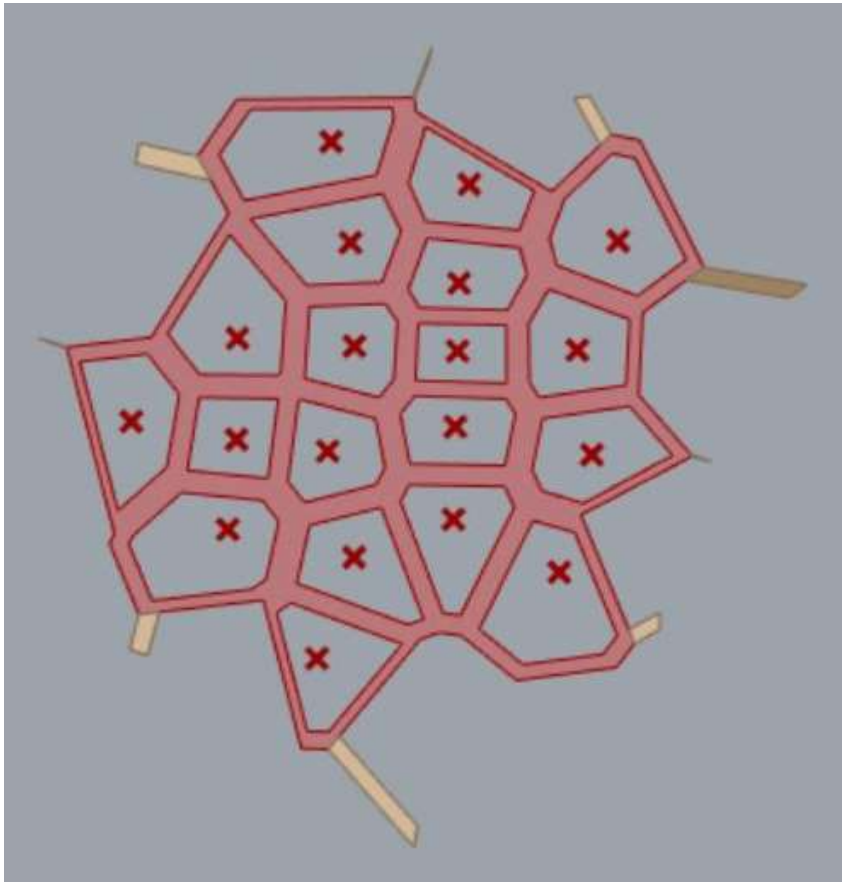


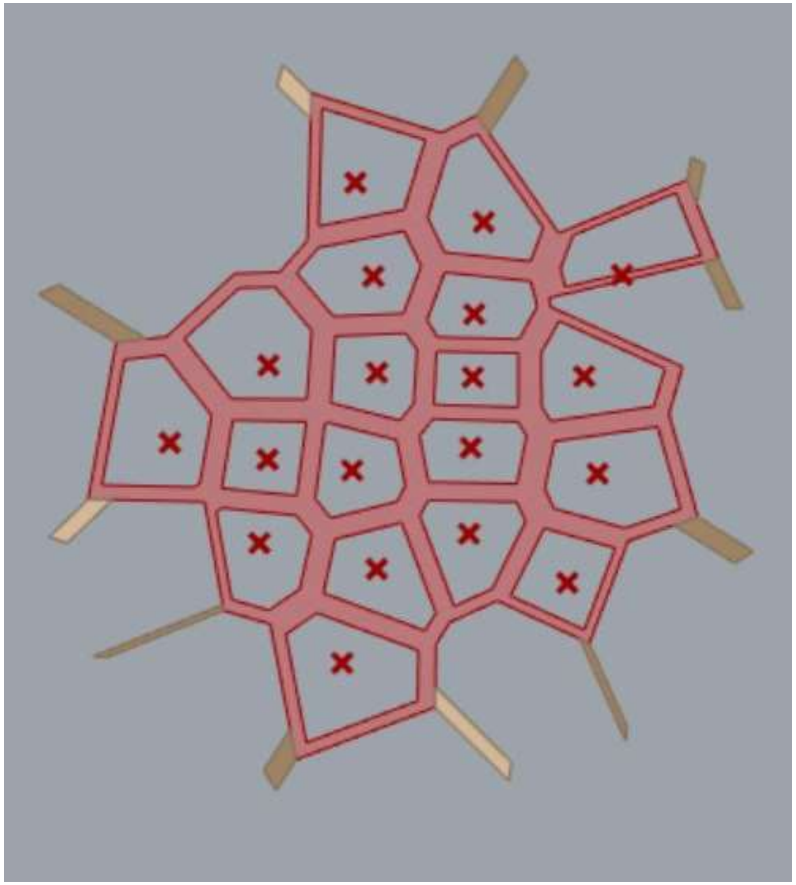


Trial -6 Waterfront grid

Attempt - 2

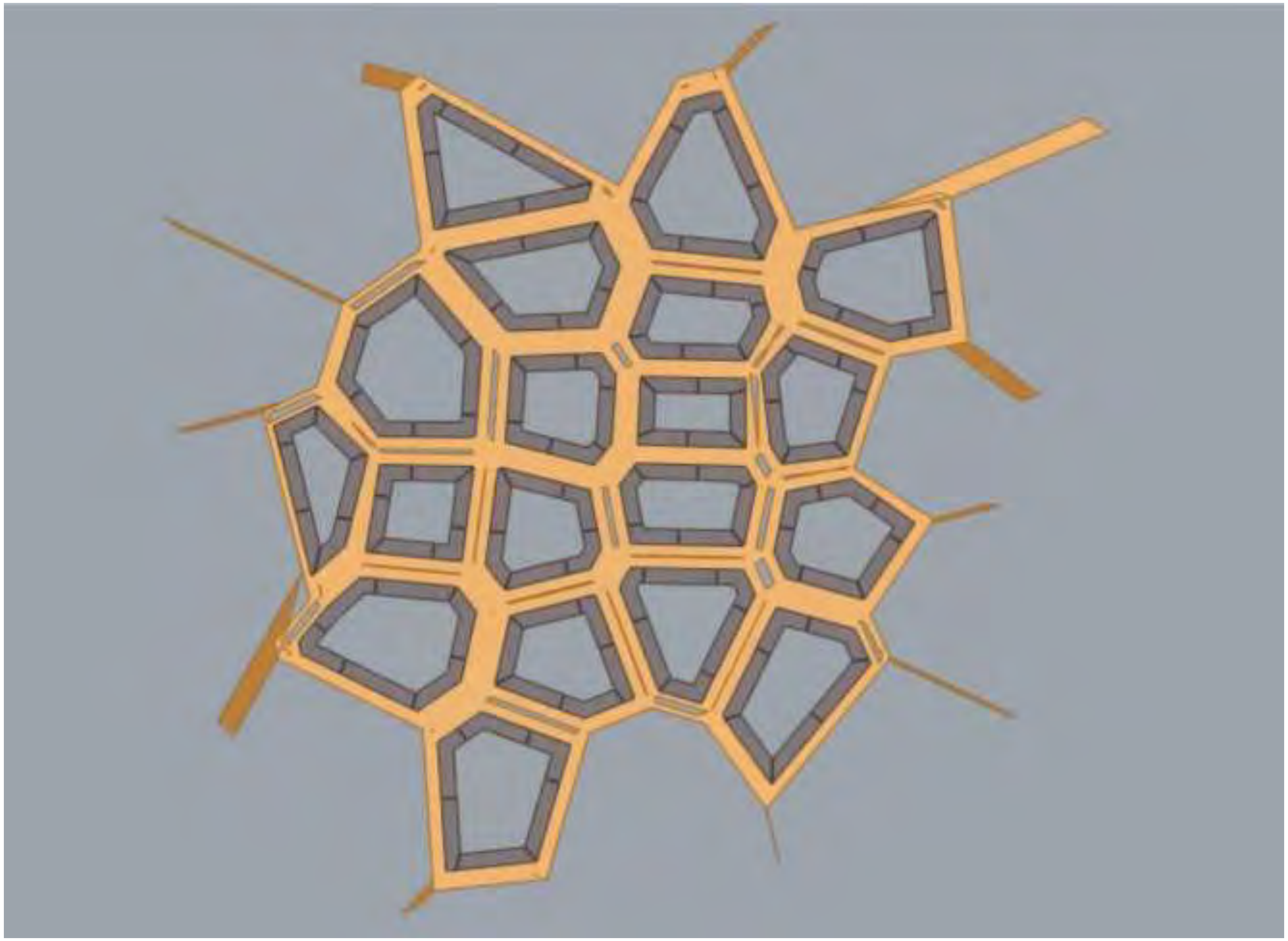
The extended streets will act as a dock space, later if the city grows this will transform to a block by itself.





Trial -6 Waterfront grid

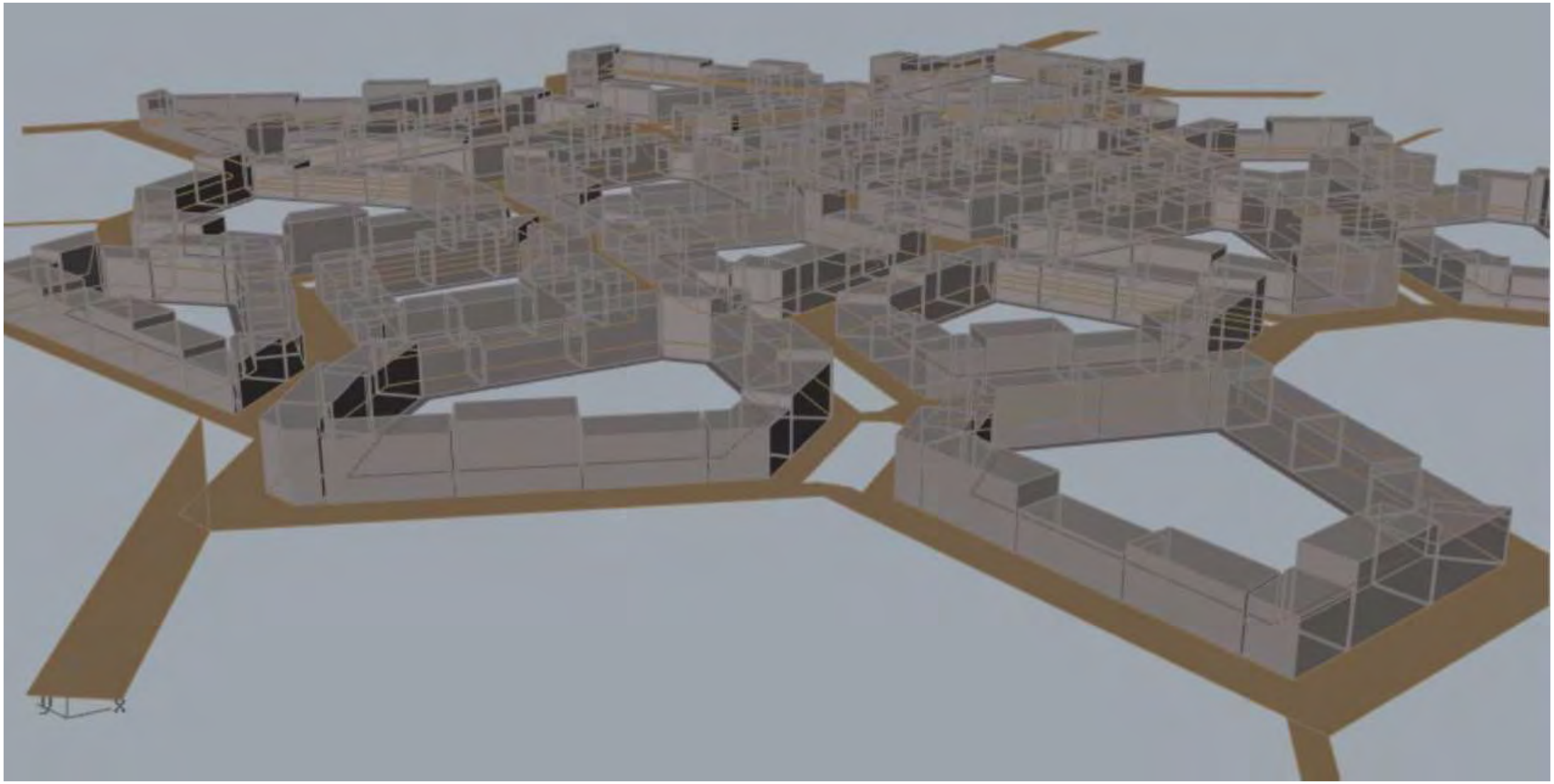
Attempt - 2



Trial -6 Waterfront grid

Attempt - 2

More numbers of building blocks, gives more opportunity for a mixed use function.



Trial -6 Waterfront grid

Attempt - 3

This is an understanding, of the scales between the existing and the new water front grid.

Each existing urban fabric will demand its own proportions of the blocks and urban network.

Conclusions

The previous attempts explain the different spatial experience and the connectivity between water and land. The attempt explains how we could continue carrying the language of the city into water.

The city might demand an organic growth line we have shown in the attempt – 3.

There are cities which will demand regular gird pattern or a radial pattern or an hexagonal grid pattern. Depending on the requirements the scripts can be derived accordingly.

The bigger picture is about how the city is changed to a flexible module with the development in water.

Trial -7 Open Spaces

Green spaces / Open spaces - capacity by flexibility

Increases the connectivity – more local movement (pedestrian)

Increases green space

The platforms can be combined to create interactive spaces.

- open market
- public gatherings – events
- pavilion

Possibilities of increasing urban farming

Water front walkways.

Trial -7 Open Spaces

Attempt -1

Once the site is defined –

With the boundary region we can define the primary street network and define the open space. Forming the network of pedestrian movements.

Parameters-

1 - Number of entry points.

2 - Length of the walkways.

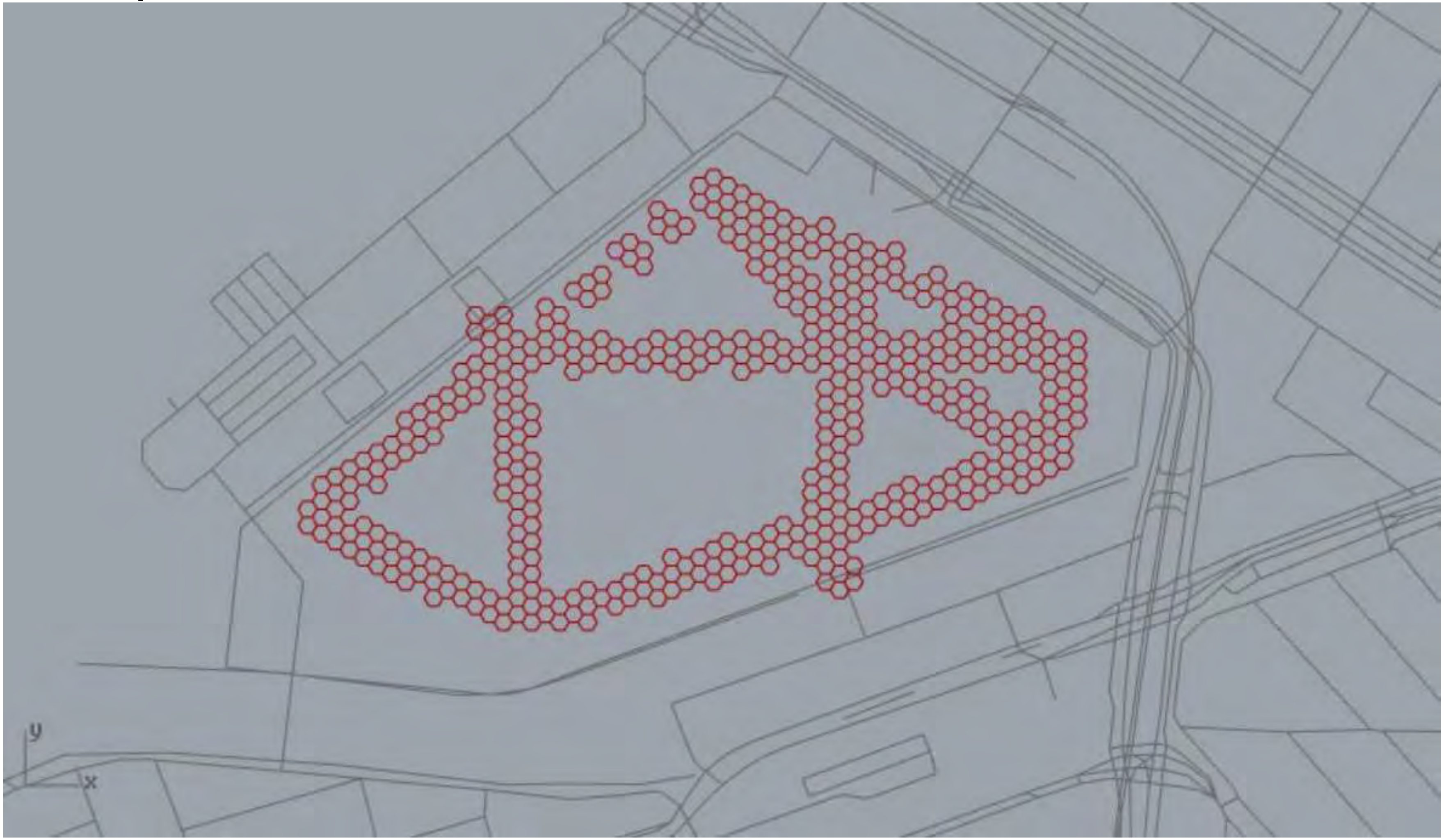
3 - Interconnectivity.

4 - Size of the platforms.

5 - Number of platforms.

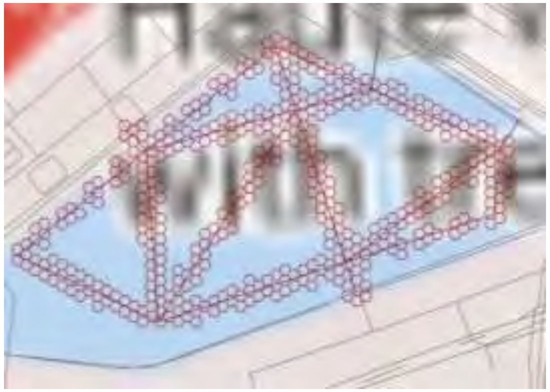
Trial -7 Open Spaces

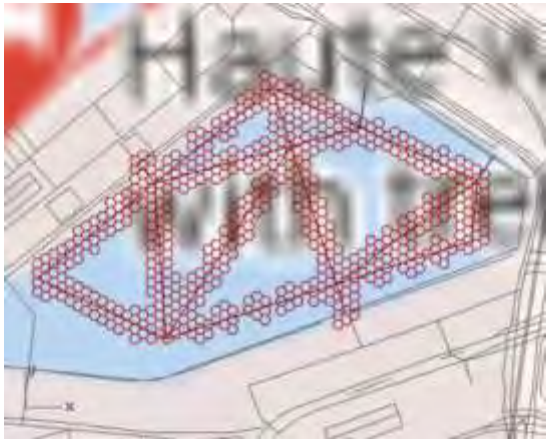
Attempt -1



Trial -7 Open Spaces

Attempt -1





Initial step, the boundary and the access points area defined.

The script then generates the internal network, based on the max. and min. street length provided.

Hexagon modules are used to create the platform. Similarly any quadrant can be created.

Have control over number of modules along the path. Which increases area per person ratio.

Trial -7 Open Spaces

Attempt -2

We cab generate island of open spaces with defined area to occupy.

Parameters –

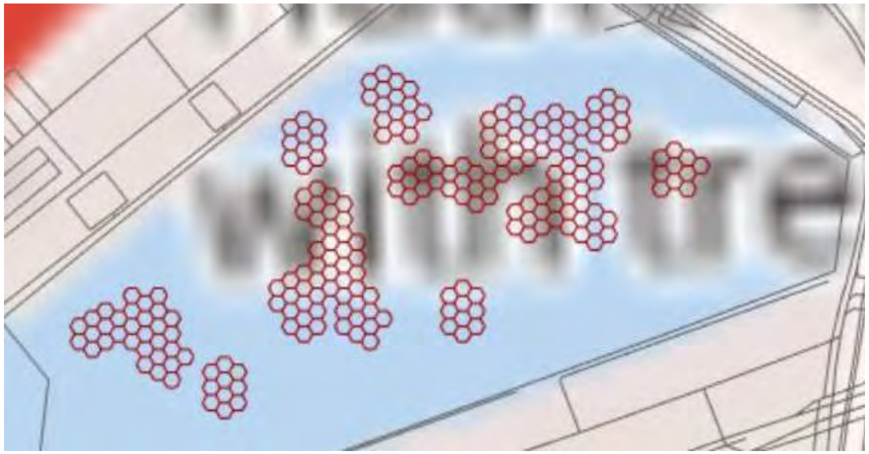
1 - Number of islands to be formed

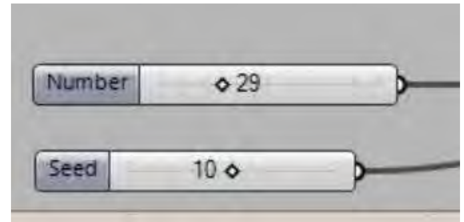
2 - Size of the islands

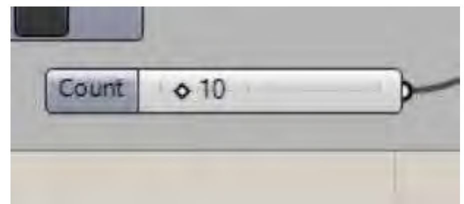
3 - Iterations of different forms.

Trial -7 Open Spaces

Attempt -2

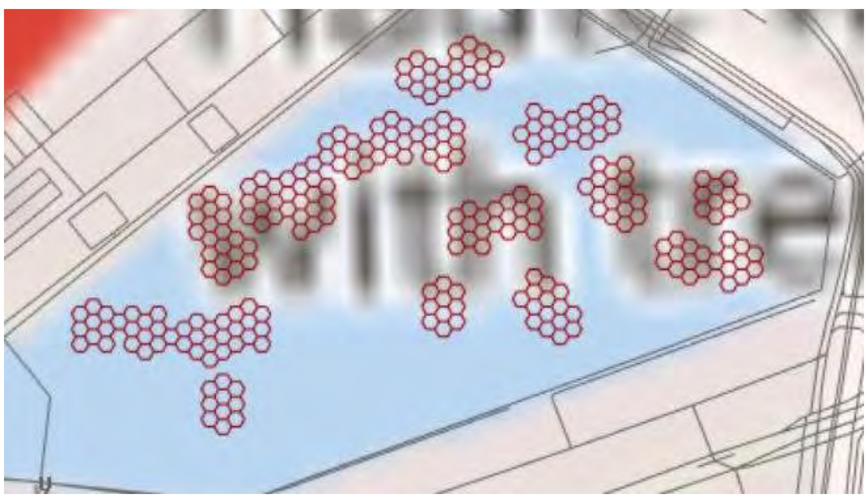


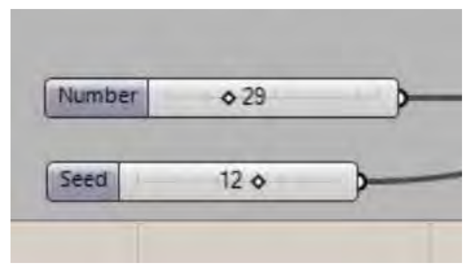


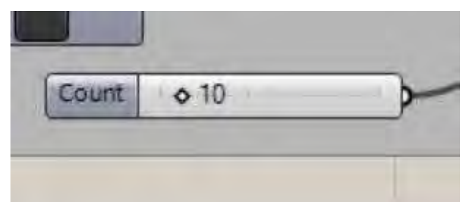


The numbers denote number of islands to be created. The island has constant number of platforms.

Seed – gives us number of iterations based on the required configuration, within the region defined.

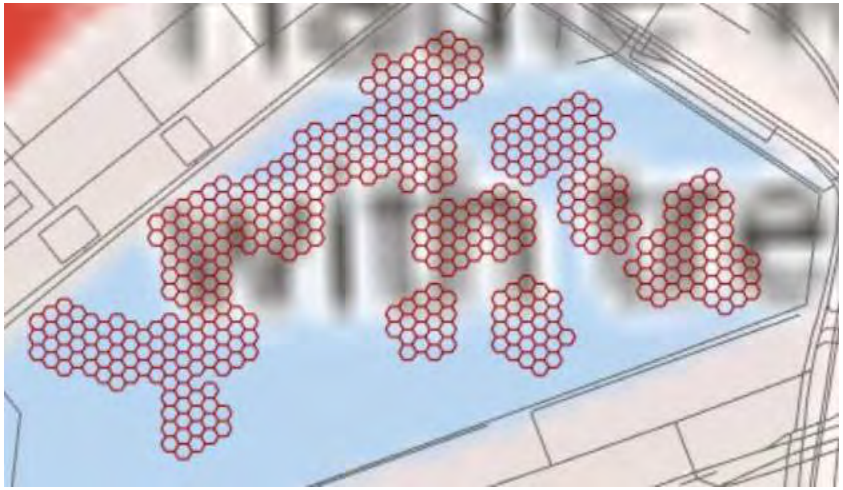


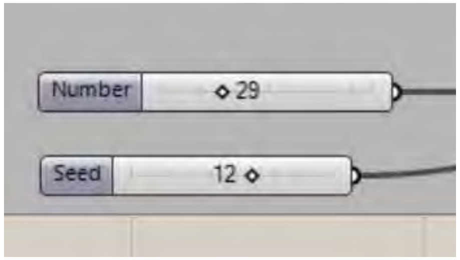


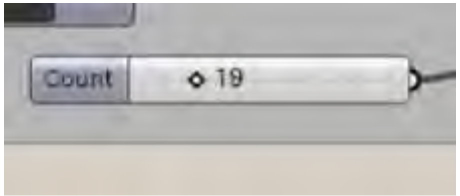


Trial -7 Open Spaces

Attempt -2





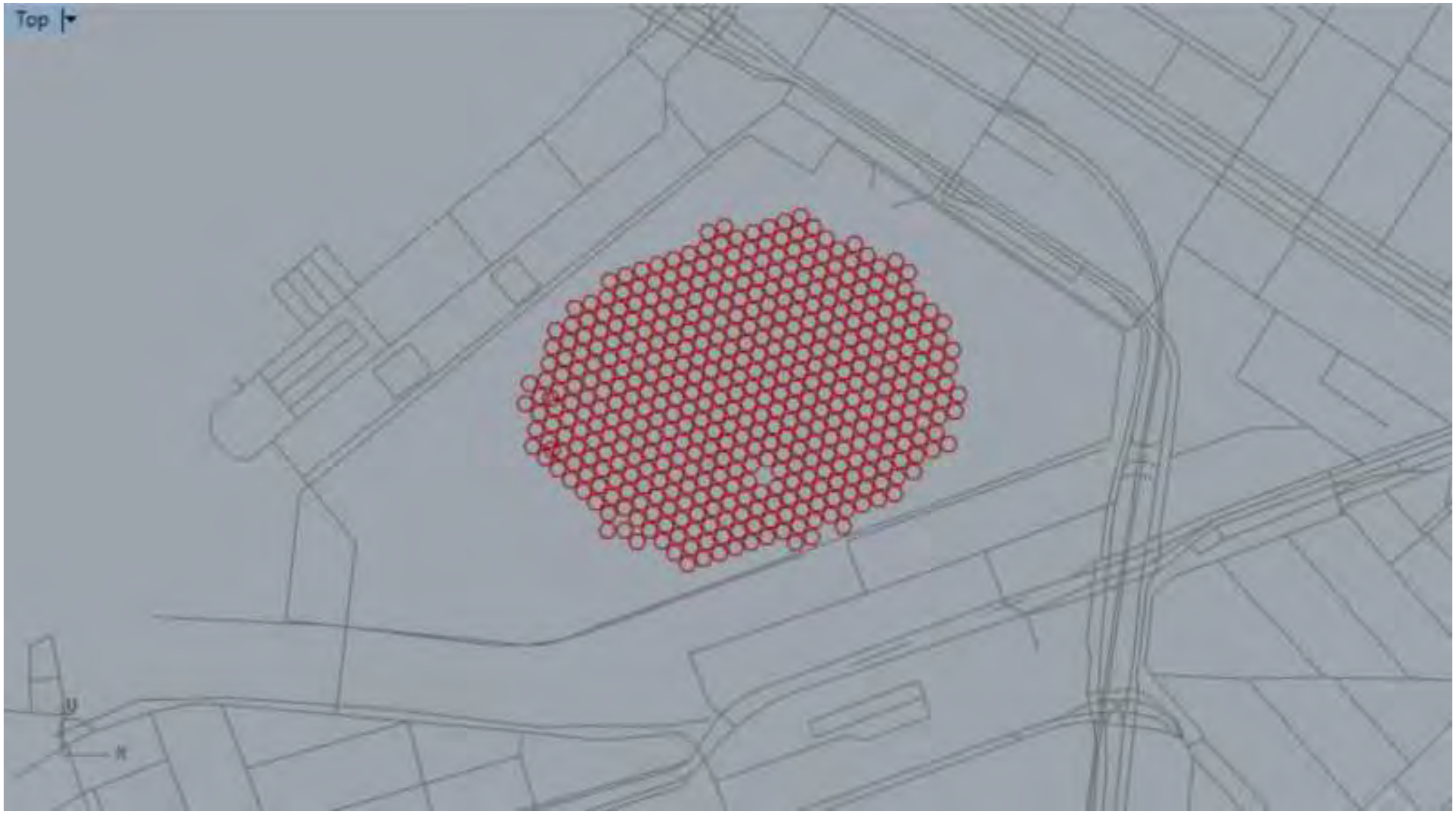


Number of modules per island is increased.

Trial -7 Open Spaces

Attempt -3

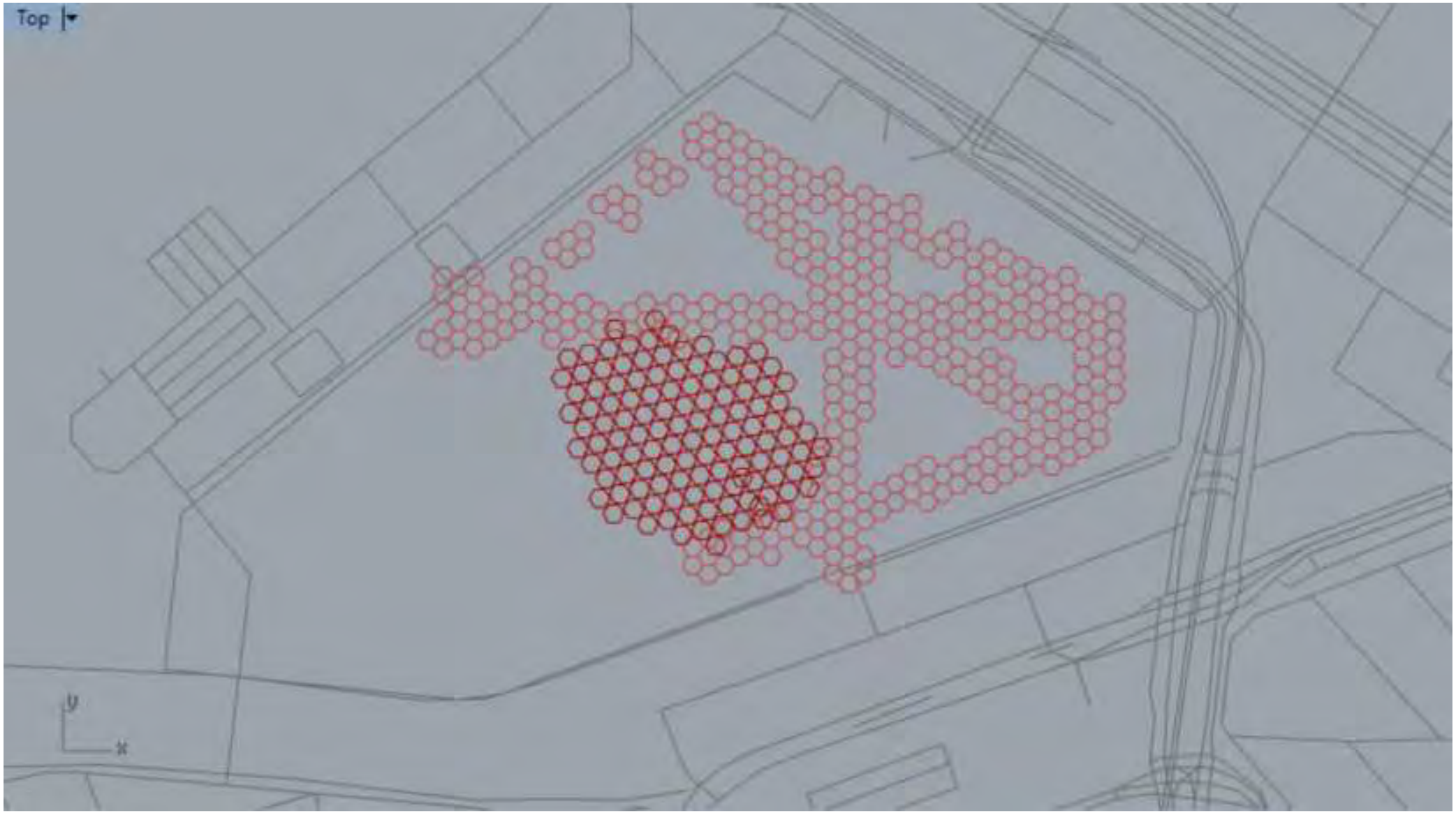
With the set of platforms defined, we can collect all to a point or points or boundary to create gathering spaces.



Trial -7 Open Spaces

Attempt -3

We temporarily collect part of open space and convert to a bigger platform.



Trial -7 Open Spaces

Attempt -4

Walkways using the existing cuboids – 240 X 80 X 80 cm and 80 X 80 X 80 cm

This provides more green space to the neighborhood.

It also connects two end destinations – creating a walkway on water with green and open areas.

Here we define the path and then the script generates the form.

Parameters-

1 - Number of horizontal elements.

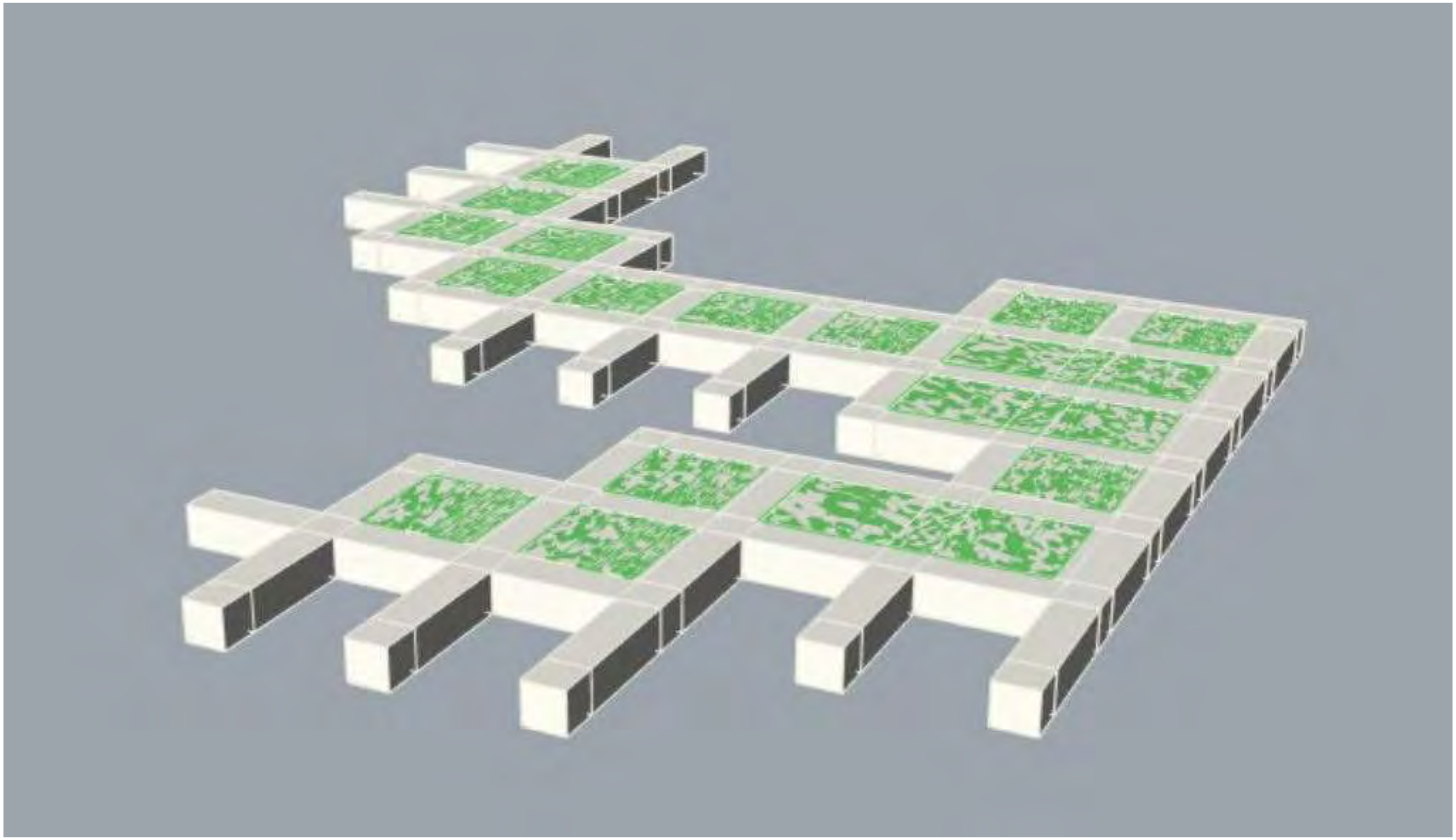
2 - Number of vertical elements.

3 - Combine to form bigger grid area.

4 - Split the square area with percentage.

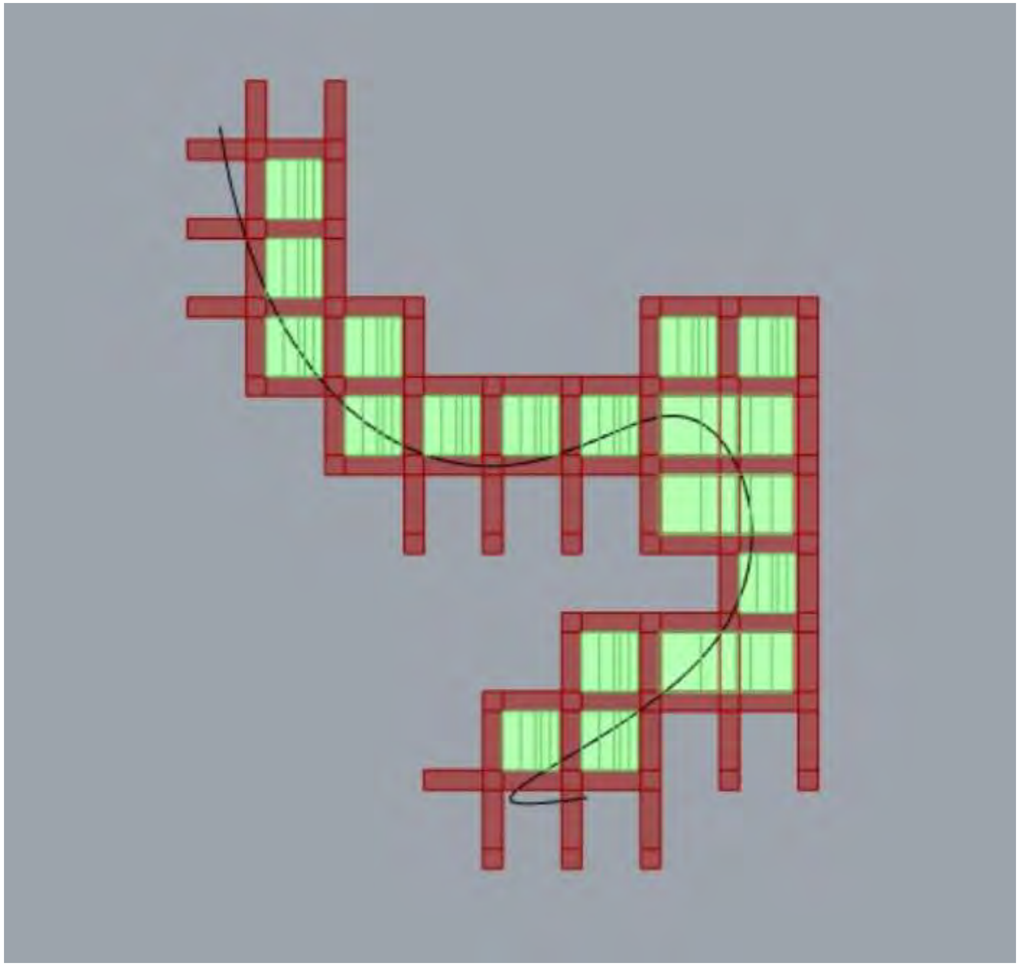
Trial -7 Open Spaces

Attempt -4



Trial -7 Open Spaces

Attempt -4

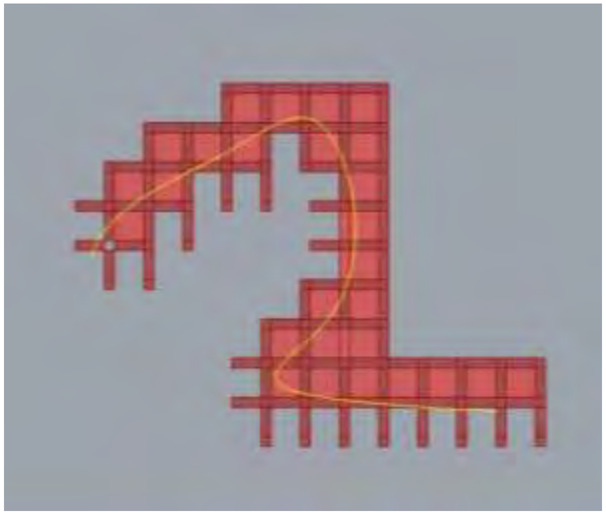


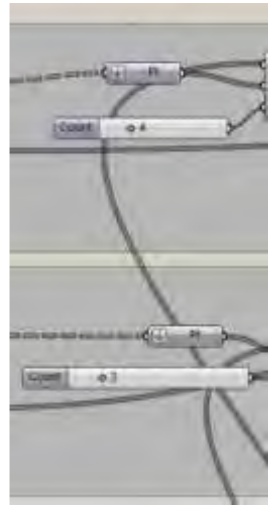
In this part of the script, we can define how each central space can be divided based on different purposes.

It’s possible to combine the central spaces on the requirement.

Trial -7 Open Spaces

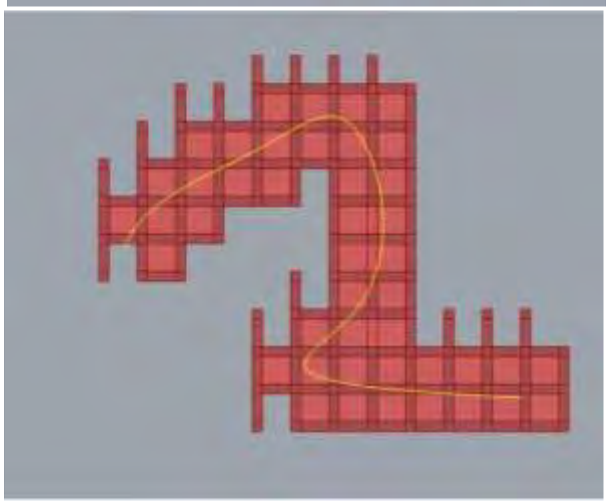
Attempt -4

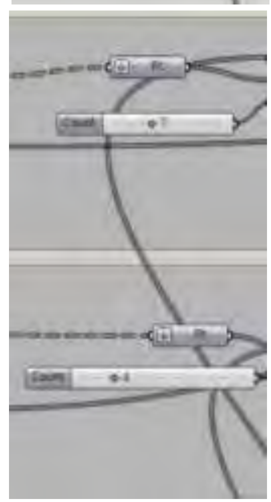




When a new path is defined, the script generates the walkway between the start to end.

We have the flexiblity of determining or increasing the horizontal and vertical members individually based on our needs.





Trial -8 Affordable Housing

Attempt -1

From the script made for waterfront grid – an attempt to see the organic growth of the residential spaces.

Trial -8 Affordable Housing

Attempt -2

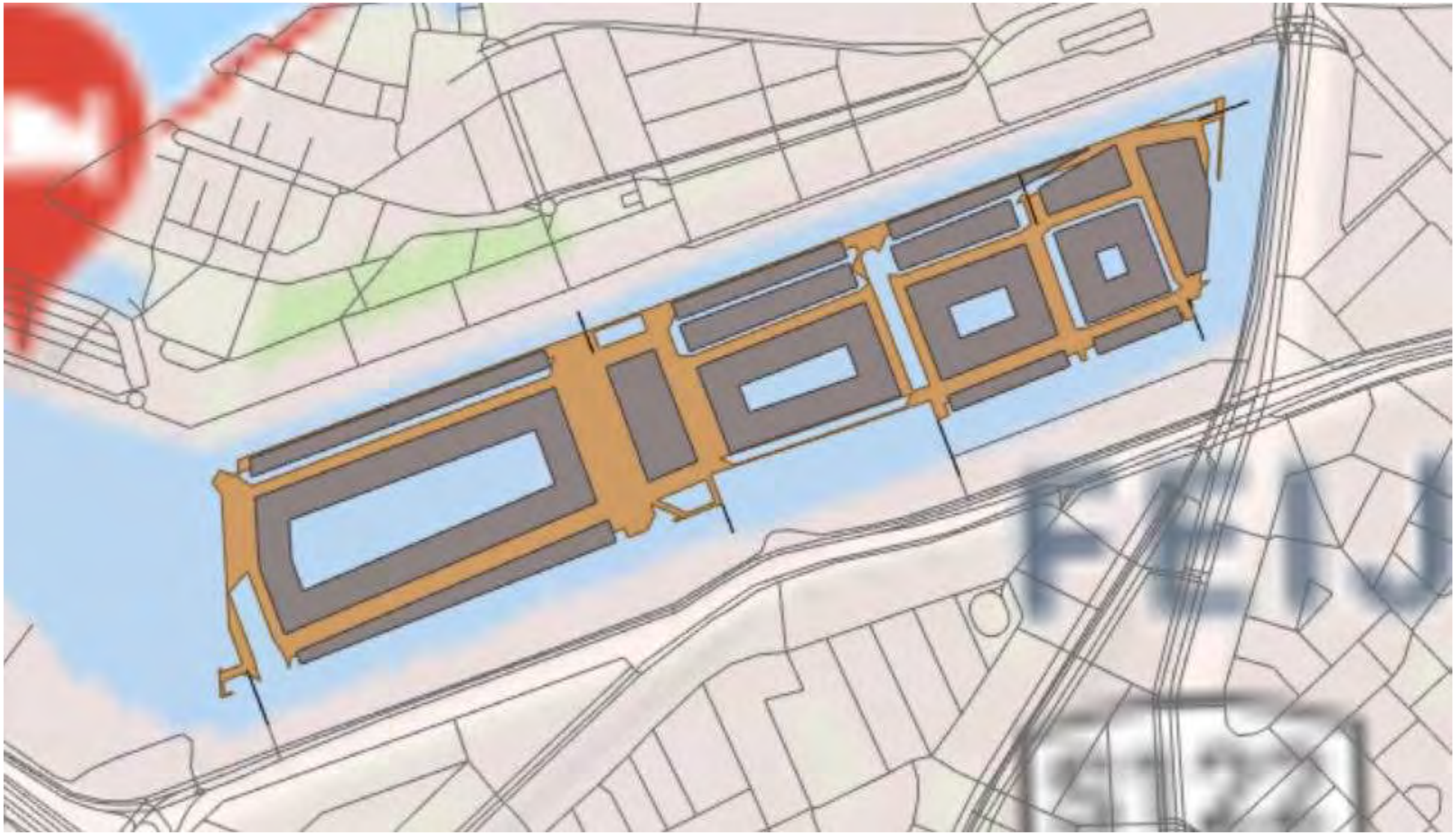
In this we have tried to maintain the grid pattern in the waterfront grid. The access points are defined.

With the access points – the internal network is defined and the perimeter block system is carried out.

Trial -8 Affordable Housing

Attempt -2

This approach addresses the existing urban language.



Conclusions

In the initial studies – we have created an understanding on how the platforms can configure with respect to the function based on the need.

The flexibility is, it can reconfigure the platforms based on the other criteria's.

The open spaces responds to this flexibility - they can be a walkway for a particular period of time and can reorganize to form huge area for public market and event spaces.

The change period of each function on a public space is maximum scaled on weekly basis.

The change period for a work space or a residential space, maximum scaled for 1-2 years.

So, the built form also, with the platform should be able to reconfigure, without disturbing the urban fabric.

Defining Parameters

- Platform.
- Height for the built form.
- Density distribution.
- Program / Functional distribution.
- Under water spaces.
- Open area and Built area.
- Geometry of the built form.
- Functional modules – typologies.
- Reconfiguration.
- City mobility – interconnectivity and mode of travel.
- Alignment of built form – wind factor.
- Open surface for energy – sunlight orientation.
- Weight.
- Growth factor of the city.
- Sustainability – key sustainable elements.

Capacity by flexibility

The flexible approach to urban planning should enable variability in the totality and particulars of urban functions because it is the only way to adapt to the changes that are difficult to predict (Knežević, 1980)

Contemporary practice of design and planning should target the flexibility and transformability.

All the existing city constantly work on adaptable spaces and minor components of flexible space with the built form.

We are looking into the possibilities on how we increase the capacity of flexibility.

The system will permit the generation of alternative solutions to respond to changes in the context during the legal lifespan of the plan, while maintaining the same ordering principles and aesthetic coherence.

Capacity by flexiblity

The impact of accelerating change on the physical form of the city is radical.

Architecture that responds to change.

Functional architecture that is moveable, adaptable, transformable, and capable of disengagement and reassembly – multiple activities in one space.

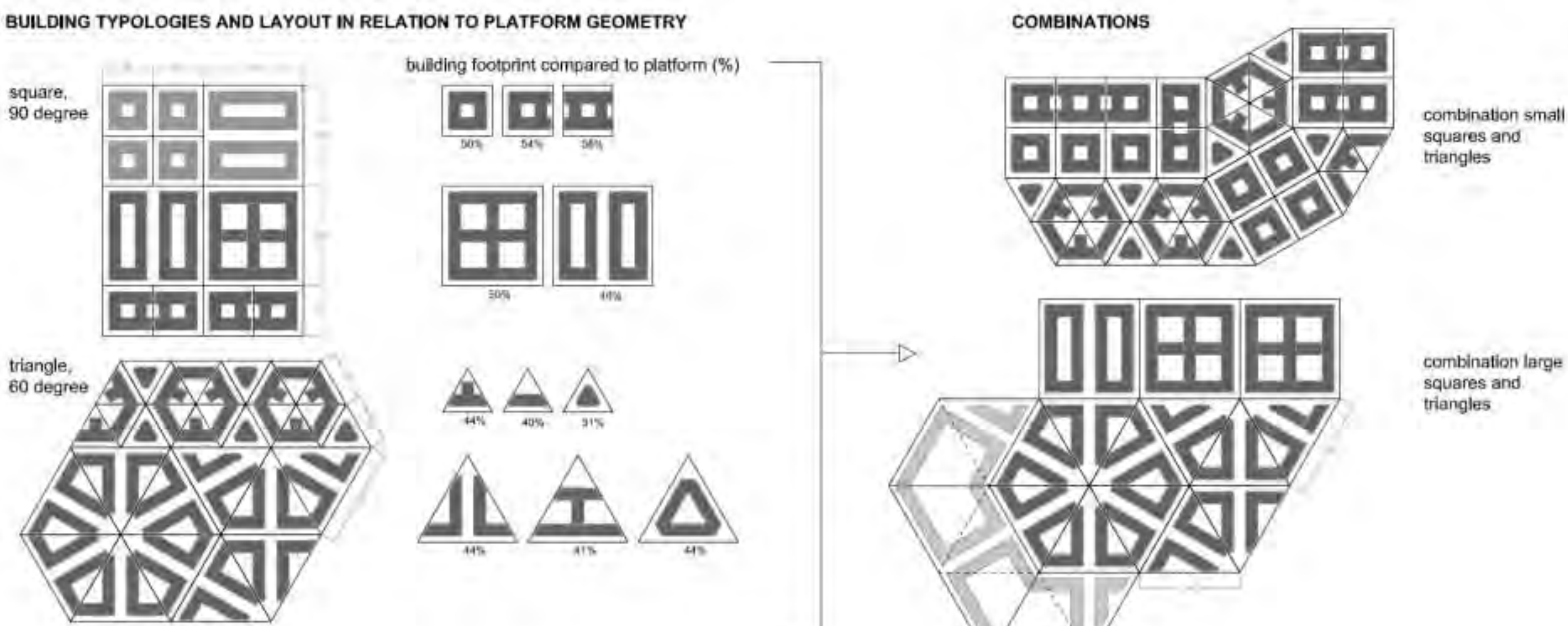
Flexible master planning,

Flexible building design,

Flexible building management.

Comparison of platform geometries (1/2)

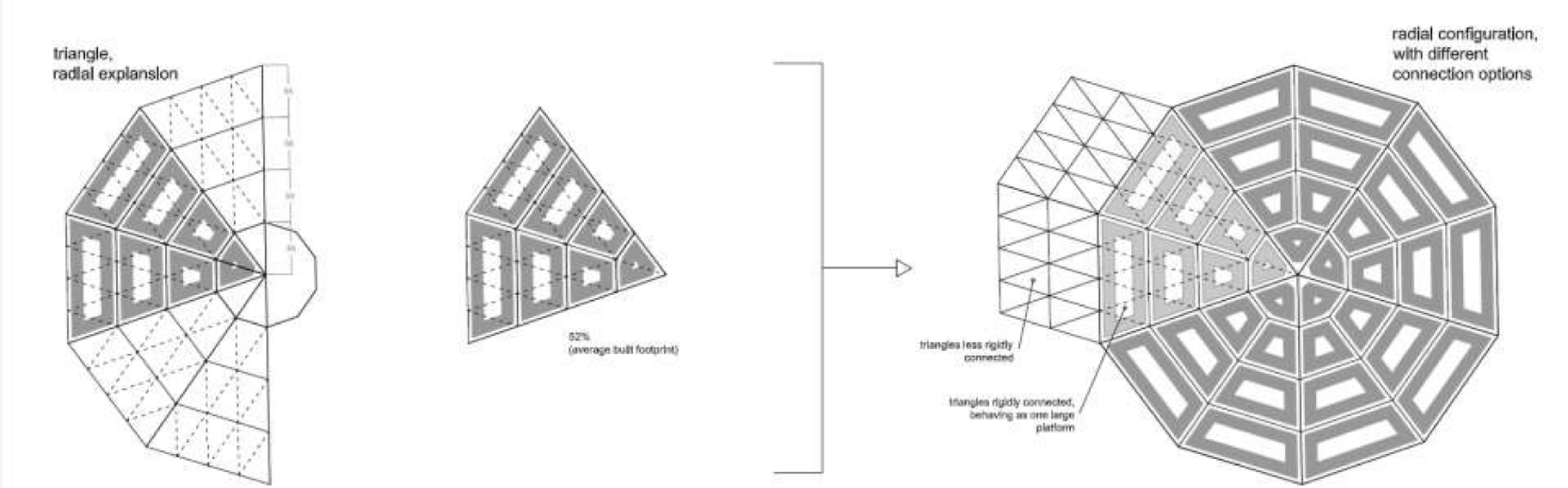
Square and equilateral triangle



Dotted line: platforms rigidly connected

Comparison of platform geometries (2/2)

Isosceles triangle, radial expansion

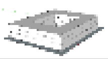
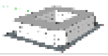
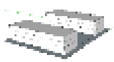


Dotted line: platforms rigidly connected

Comparison of platform geometries: evaluation

- **Using triangular platforms, 20% less building footprint is achieved compared to square platforms** with equal building depth and road width -> less opportunity for real estate space from the start.
- **Choosing for triangular platforms leads to building with pointy and difficult corners**. Such corners are not only difficult to solve in floorplan but also make construction more complicated.
- **With larger triangles it is easier to create perimeter blocks and optimize the built space on the platform.** However, there is a limit to the size of platforms we can build. A possible way to circumvent having a large amount of pointy buildings and to make more efficient use of the space on the platform is to connect multiple triangular platforms in a rigid way, so that they behave as one large platform

Comparison of platform geometries: evaluation

	Platform			Open space		Building(s)							Spacematrix			Land use %									
	Polygon sides #	Side m	Area m²	Road m²	Green m²	Block length m	Floors #	Building depth m	Courtyard side m	Built-up area m²	Gross floor area (GFA) m²	Net floor area (NFA) m²	Floor area Ratio FAR or FSI	Gross Space Index GSI	Spaciousness OSR	Buildings %	Road %	Green %	Total %	Apartments #	Residents #	Density ap./ha	Built volume m³	Façade surface m²	S/V
	4	50	2500	651	529	43	3	10	23	1320	3960	2772	1.58	0.53	0.30	52.8%	26.0%	21.2%	100%	44.00	88.0	176.0	13,200	2640	0.40
ers 	4	50	2500	701	529	43	3	10	23	1270	3810	2667	1.52	0.51	0.32	50.8%	28.0%	21.2%	100%	42.3	84.7	169.3	12,700	2523	0.40
	4	50	2500	651	817	43	3	12	19	1032	3096	2167	1.24	0.41	0.47	41.3%	26.0%	32.7%	100%	34.4	68.8	137.6	10,320	2200	0.41
	3	50	1082.5	461	45	38	3	8	10	576	1729	1211	1.60	0.53	0.29	53.3%	42.6%	4.1%	100%	19.2	38.4	177.5	5,765	1441	0.45

PLATFORM DESIGN

Concept

- A parallel analysis was done on the built typologies on the triangle platform.
- Through this we get inputs for the script, the built percentages, density analysis etc.
- Also comparisons between 50m platform and 100m platform.

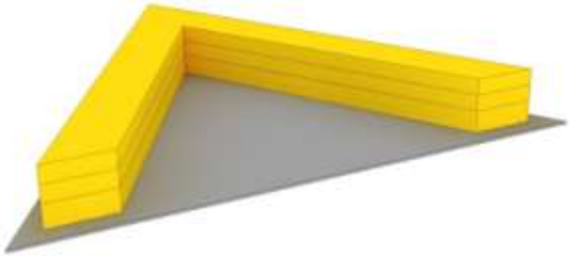
PLATFORM DESIGN

Concept   100m

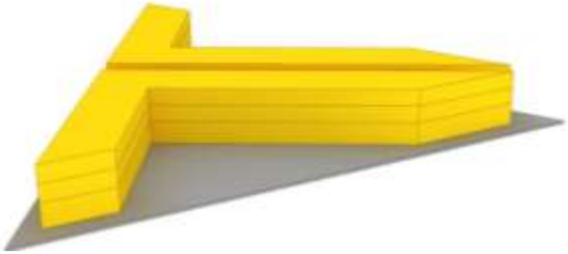
Triangular courtyard

Triangular courtyard
Chamfered corners

Triangular courtyard
Split in two



Triangular courtyard
Open side



Triangular courtyard
Split in two and open side

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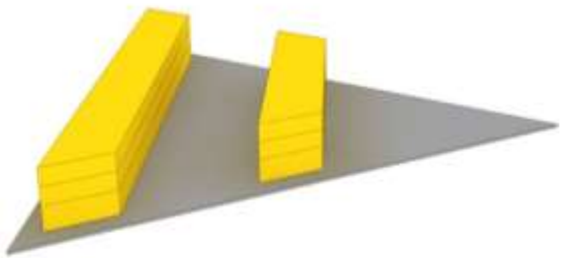
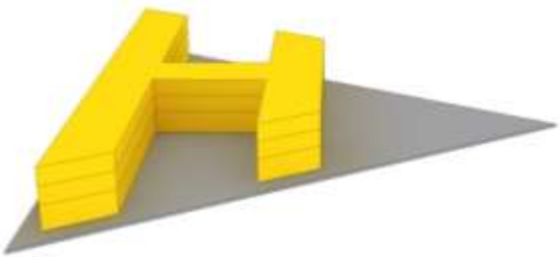
PLATFORM DESIGN

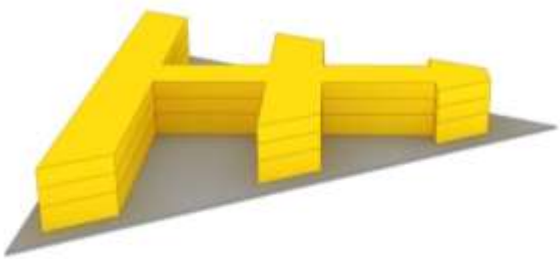
Concept 100m



Linear blocks
Two linear blocks



Linear blocks
Two linear blocks
With connecting block

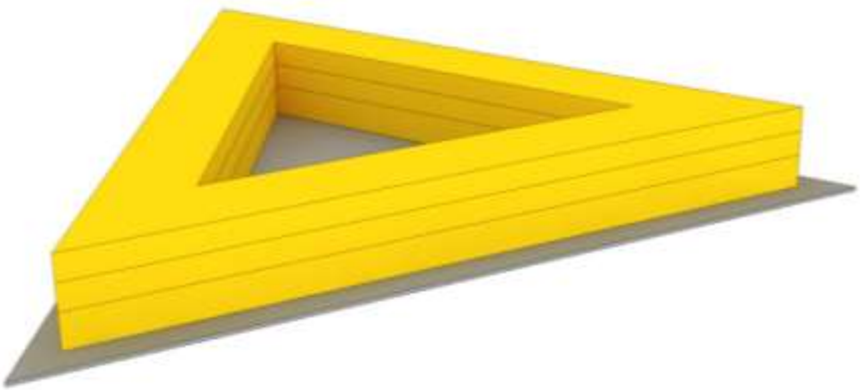


Linear blocks
Three linear blocks
With connecting block

PLATFORM DESIGN

Concept   100m

Triangular Courtyard



Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
3	**100**	**4330**	**986**	**1228**	88	3	10	53	**2116**	6348	4444	1,47	0,49	0,35	**48,9%**	**22,8%**	**28,4%**	100%	70,5	141,1	162,9	1270	-42	70,5	21.160

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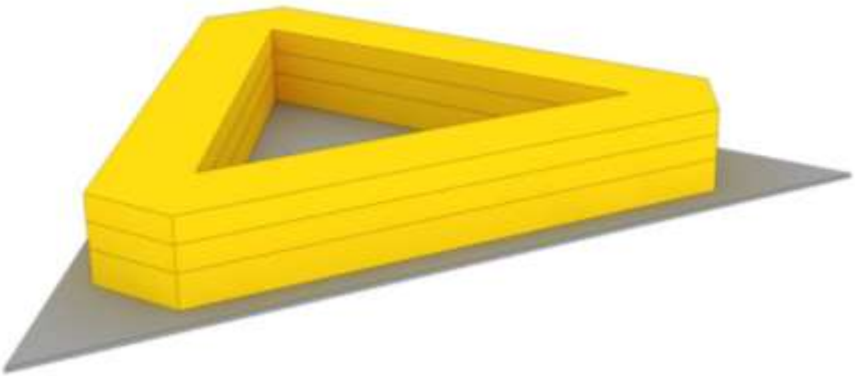
PLATFORM DESIGN

Concept 100m
Triangular Courtyard with Chamfered Corners



Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
3	100	4330	1160	1227	88	3	10	53	1943	5802	4061	1,34	0,45	0,41	44,9%	26,8%	28,3%	100%	64,5	128,9	148,9	1160	67	64,5	19.430

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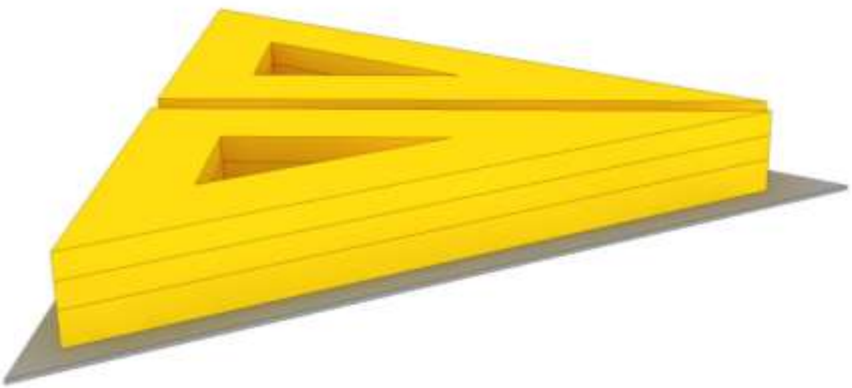
PLATFORM DESIGN

Concept   100m

Triangular Courtyard Split in Two



Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
3	**100**	**4330**	**1247**	**383**	**88x73x42**	**3**	**10**	**25**	**2700**	**8100**	**5670**	**1,87**	**0,62**	**0,20**	**62,4%**	**28,8%**	**8,8%**	**100%**	**90,0**	**180,0**	**207,9**	**1620**	**-1237**	**90,0**	**27.000**

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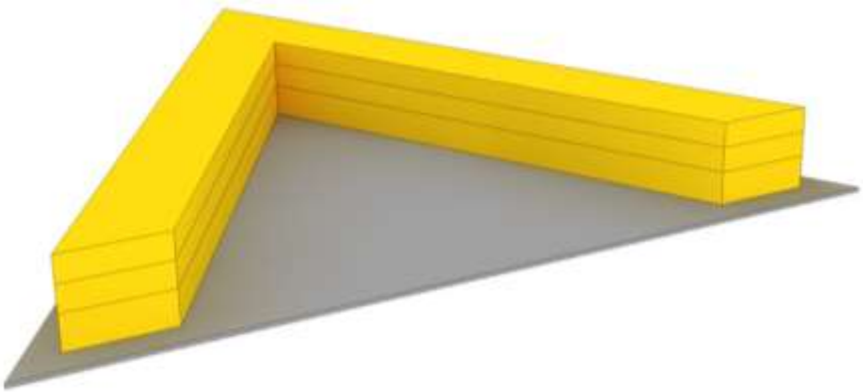
PLATFORM DESIGN

Concept 100m

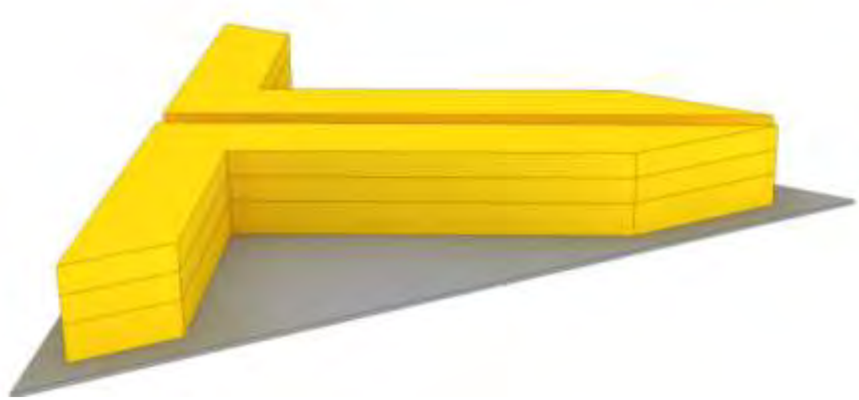
Triangular Courtyard Open Side



Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
3	**100**	**4330**	**986**	**1818**	**88**	**3**	**10**	**53**	**1526**	**4578**	**3205**	**1,06**	**0,35**	**0,61**	**35,2%**	**22,8%**	**42,0%**	**100%**	**50,9**	**101,7**	**117,5**	**916**	**902**	**50,9**	**15.260**

PLATFORM DESIGN

Concept 100m
Triangular Courtyard Split in Two and Open Side

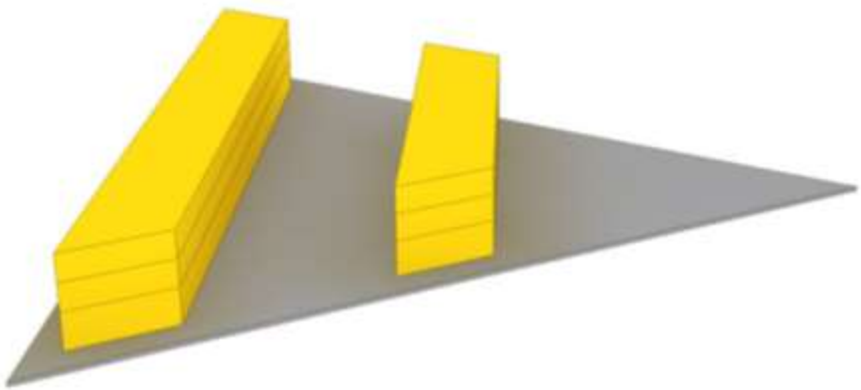


Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
3	100	4330	1247	1209	73x42	3	10	46	1874	5622	3935	1,30	0,43	0,44	43,3%	28,8%	27,9%	100%	62,5	124,9	144,3	1124	85	62,5	18.740

PLATFORM DESIGN

Concept 100m

Linear Blocks Two Linear Blocks



Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
3	100	4330	1579	1456	88 & 53	3	10	20	1295	3885	2720	0,90	0,30	0,78	29,9%	36,5%	33,6%	100%	43,2	86,3	99,7	777	679	43,2	12.950

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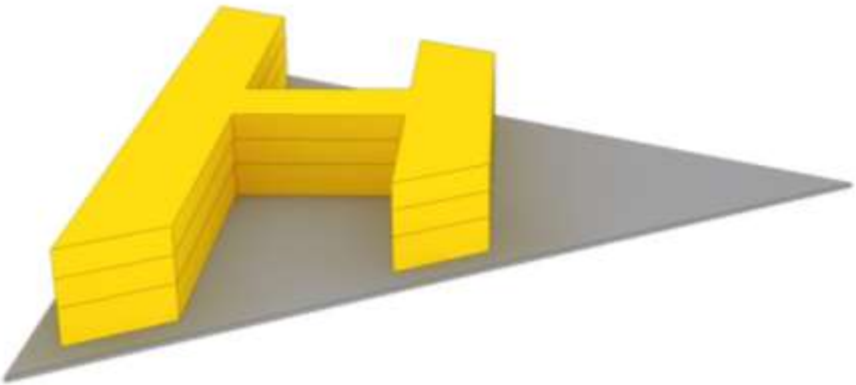
PLATFORM DESIGN

Concept 100m

Linear Blocks Two with Connecting Block

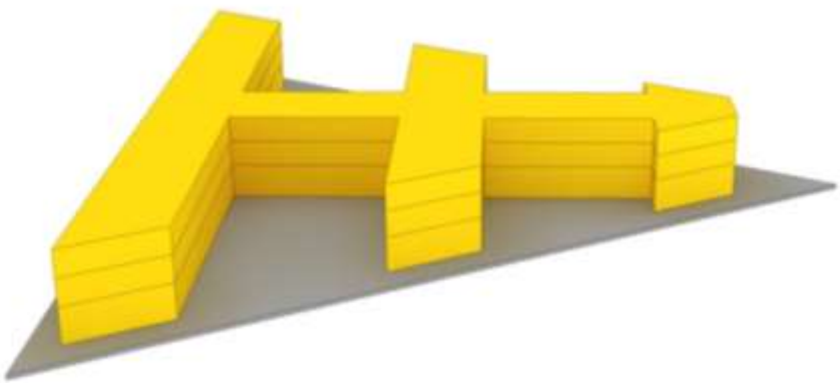


Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
3	**100**	**4330**	**1600**	**1235**	**88&53**	**3**	**10**	**20**	**1495**	**4485**	**3140**	**1,04**	**0,35**	**0,63**	**34,5%**	**37,0%**	**28,5%**	**100%**	**49,8**	**99,7**	**115,1**	**897**	**338**	**49,8**	**14.950**

PLATFORM DESIGN

Concept 100m

Linear Blocks Three Linear Blocks with Connecting Block



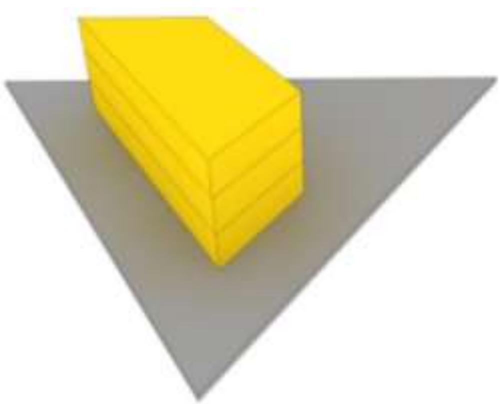
Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
3	**100**	**4330**	**1693**	**814**	**88&53&19**	**3**	**10**	**20**	**1823**	**5469**	**3828**	**1,26**	**0,42**	**0,46**	**42,1%**	**39,1%**	**18,8%**	**100%**	**60,8**	**121,5**	**140,3**	**1094**	**-280**	**60,8**	**18.230**

PLATFORM DESIGN Concept 100m - Wrap up

		Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
		Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Building	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
Building typology	Variation	#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
Triangle courtyard		3	100	4330	986	1228	88	3	10	53	2116	6348	4444	1,47	0,49	0,35	48,9%	22,8%	28,4%	100%	70,5	141,1	162,9	1270	-42	70,5	21.160
Triangle courtyard	chamfered corners	3	100	4330	1160	1227	88	3	10	53	1943	5802	4061	1,34	0,45	0,41	44,9%	26,8%	28,3%	100%	64,5	128,9	148,9	1160	67	64,5	19.430
Linear blocks	2-linear blocks	3	100	4330	1579	1456	88 & 53	3	10	20	1295	3885	2720	0,90	0,30	0,78	29,9%	36,5%	33,6%	100%	43,2	86,3	99,7	777	679	43,2	12.950
Linear blocks	2-linear blocks with a connecting block	3	100	4330	1600	1235	88&53	3	10	20	1495	4485	3140	1,04	0,35	0,63	34,5%	37,0%	28,5%	100%	49,8	99,7	115,1	897	338	49,8	14.950
Linear blocks	3-linear blocks with a connecting blocks	3	100	4330	1693	814	88&53&19	3	10	20	1823	5469	3828	1,26	0,42	0,46	42,1%	39,1%	18,8%	100%	60,8	121,5	140,3	1094	-280	60,8	18.230
Triangle courtyard	open structure	3	100	4330	986	1818	88	3	10	53	1526	4578	3205	1,06	0,35	0,61	35,2%	22,8%	42,0%	100%	50,9	101,7	117,5	916	902	50,9	15.260
Triangle courtyard	splited in two	3	100	4330	1247	383	88x73x42	3	10	25	2700	8100	5670	1,87	0,62	0,20	62,4%	28,8%	8,8%	100%	90,0	180,0	207,9	1620	-1237	90,0	27.000
Triangle courtyard	spited and two with open side	3	100	4330	1247	1209	73x42	3	10	46	1874	5622	3935	1,30	0,43	0,44	43,3%	28,8%	27,9%	100%	62,5	124,9	144,3	1124	85	62,5	18.740

PLATFORM DESIGN

Concept 50m



Triangular block
Chamfered corners

Linear block

Linear block
Two elements combined

PLATFORM DESIGN

Concept 50m

Triangular block, Chamfered corners

Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
3	**50**	**1083**	**712**	**34**	**20**	**3**	**10**	**0**	**337**	**1011**	**708**	**0,93**	**0,31**	**0,74**	**31,1%**	**65,7%**	**3,1%**	**100%**	**11,2**	**22,5**	**103,7**	**202**	**-168**	**11,2**	**3.370**

PLATFORM DESIGN

Concept 50m

Linear block

Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
3	**50**	**1083**	**712**	**174**	29	3	10	0	**197**	591	414	0,55	0,18	1,50	**18,2%**	**65,7%**	**16,1%**	100%	6,6	13,1	60,6	118	56	6,6	1.970

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PLATFORM DESIGN

Concept 50m

Wrap up

		Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
		Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Building	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
Building typology	Variation	#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
Trianglar block	chamfered corners	3	50	1083	712	34	20	3	10	0	337	1011	708	0,93	0,31	0,74	31,1%	65,7%	3,1%	100 %	11,2	22,5	103,7	202	-168	11,2	3.370
Linear block		3	50	1083	712	174	29	3	10	0	197	591	414	0,55	0,18	1,50	18,2%	65,7%	16,1%	100 %	6,6	13,1	60,6	118	56	6,6	1.970
lLinear block two	element combined	3	50	1083	712	88	29	3	10	0	283	849	594	0,78	0,26	0,94	26,1%	65,7%	8,1%	100 %	9,4	18,9	87,1	170	-82	9,4	2.830

PLATFORM DESIGN

Concept for 100m and 50m platforms

- The built form is majorly effected with road % based on what dimension we pick for their width – depends on what type of transport system we choose.
- We maintain a peripheral transport system so not to effect the built form.
- On average the built% on each platform is 42,65 % for 100m and 41 % for 50m.
- We have more options with 100m platform than 50m because of the its size is 4 times bigger and the possibilities of built forms are many.

STUDIES

By the use of grasshopper scripts, we carry out certain studies to understand and have a grip on city designs. We understand the rules and parameters, which helps in creating a script for various situations.

STUDIES

The studies always overlap each other in various stages. Each study outputs and understand helps improving a step ahead on the final output. The script is an integrated DNA.

Study - 1 – One to one translation of a city from land to water. In this we compare various stands on how we can translate an existing city and the result outputs based on our stands. The functions location remains same.

Study - 2 – Density comparison with 50m platforms and 100m platforms.

Study - 3 – How transportation network effect the arrangements of the platform and its effect on the density and other stands.

Study - 4 – How we arrive at a planning layout based on the rules and the connectivity between each functions. How functions are organized to each other and where its placed.

Study - 5 – Update any parameter or new rule into to path of the script – e.g. - change in the platform shape.

WHY

- We build our study from comparing a city form land to water.
- On land, a city is defined by its topography – which defines its boundary.

    In water the boundary is defined by the platform shape, size, analytical data's of the waters, etc.
- Most of the cities are program driven – they address a particular function and rest all functions build around it.
- We cannot depict exact city planning strategies and layout for a floating city, it has to develop its own typologies and planning strategies. Due to various factors like cost, feasibility, natural constrains like depth of waters.
- The easy availability of land helps city to easily develop on land for future.

    For floating cities the expansion has to be strategically planned as we are building it artificially from the bottom line

STUDIES

- We analyzed three cities: Masdar City, Rijswijk and Tollebeek.
- By adding gaps between the platforms, the existing city boundary scales up.

Platforms are without slope edge.

For 100m equilateral triangle platform

Distance between	Scaling factor
2.5 meters	1.0433
5 meters	1.0866
7.5 meters	1.1299

For 50 mequilateral triangle platform

Distance between	Scaling factor
2.5 meters	1.0866
5 meters	1.1732
7.5 meters	1.2598

STUDIES

With the grasshopper script prepared we can consider situations with the platform having sloped edges

This table helps in quickly arrive to an idea how big the city is going to be with a set of condition, on distance between the platforms with an existing scale on land.

Scaling table –
Platform between distance 2.5 meters

Size – 50 m equilateral triangle

Depth in --------mts. / Angle Deg.	1	1.5	2	2.5	3	3.5	4	4.5	5	5.5	6	6.5	7	7.5	8	8.5	9	9.5	10
0	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866	1.0866
5	1.878497	2.274446	2.670395	3.066343	3.462292	3.85824	4.254189	4.650138	5.046086	5.442035	5.837984	6.233932	6.629881	7.025829	7.421778	7.817727	8.213675	8.609624	9.005573
10	1.479518	1.675977	1.872436	2.068895	2.265354	2.461813	2.658272	2.854731	3.05119	3.247649	3.444108	3.640567	3.837026	4.033484	4.229943	4.426402	4.622861	4.81932	5.015779
15	1.345164	1.474446	1.603728	1.73301	1.862292	1.991574	2.120856	2.250138	2.37942	2.508702	2.637984	2.767266	2.896548	3.02583	3.155113	3.284395	3.413677	3.542959	3.672241
20	1.276951	1.372126	1.467302	1.562477	1.657652	1.752828	1.848003	1.943179	2.038354	2.13353	2.228705	2.32388	2.419056	2.514231	2.609407	2.704582	2.799757	2.894933	2.990108
25	1.235176	1.309464	1.383752	1.458039	1.532327	1.606615	1.680903	1.755191	1.829479	1.903767	1.978055	2.052343	2.126631	2.200918	2.275206	2.349494	2.423782	2.49807	1.572358
30	1.2066	1.2666	1.3266	1.3866	1.4466	1.5066	1.5666	1.6266	1.6866	1.7466	1.8066	1.8666	1.9266	1.9866	2.0466	2.1066	2.1666	2.2266	2.2866
35	1.185545	1.235017	1.28449	1.333962	1.383435	1.432907	1.48238	1.531852	1.581325	1.630797	1.68027	1.729742	1.779215	1.828687	1.87816	1.927632	1.977105	2.026577	2.07605
40	1.169167	1.210451	1.251734	1.293018	1.334301	1.375585	1.416868	1.458152	1.499436	1.540719	1.582003	1.623286	1.66457	1.705853	1.747137	1.78842	1.829704	1.870988	1.912271
45	1.155882	1.190523	1.225164	1.259805	1.294446	1.329087	1.363728	1.398369	1.43301	1.467651	1.502292	1.536933	1.571574	1.606215	1.640856	1.675497	1.710138	1.744779	1.77942
50	1.144735	1.173802	1.202869	1.231936	1.261004	1.290071	1.319138	1.348205	1.377273	1.40634	1.435407	1.464474	1.493542	1.522609	1.551676	1.580743	1.609811	1.638878	1.667945
55	1.135112	1.159368	1.183624	1.20788	1.232135	1.256391	1.280647	1.304903	1.329159	1.353415	1.377671	1.401927	1.426183	1.450439	1.474694	1.49895	1.523206	1.547462	1.571718
60	1.1266	1.1466	1.1666	1.1866	1.2066	1.2266	1.2466	1.2666	1.2866	1.3066	1.3266	1.3466	1.3666	1.3866	1.4066	1.4266	1.4466	1.4666	1.4866
65	1.118907	1.13506	1.151213	1.167367	1.18352	1.199674	1.215827	1.23198	1.248134	1.264287	1.28044	1.296594	1.312747	1.328901	1.345054	1.361207	1.377361	1.393514	1.409667
70	1.111817	1.24425	1.137033	1.149641	1.16225	1.174858	1.187466	1.200075	1.212683	1.225291	1.2379	1.250508	1.263116	1.275724	1.288333	1.300941	1.313549	1.326158	1.338766
75	1.105164	1.114446	1.123728	1.13301	1.142292	1.151574	1.160856	1.170138	1.17942	1.188702	1.197984	1.207266	1.216548	1.22583	1.235113	1.244395	1.253677	1.262959	1.272241
80	1.098816	1.104924	1.111033	1.117141	1.123249	1.129357	1.135465	1.141573	1.147681	1.15379	1.159898	1.166006	1.172114	1.178222	1.18433	1.190438	1.196547	1.202655	1.208763
85	1.092611	1.095692	1.098723	1.101753	1.104784	1.107815	1.110846	1.113876	1.116907	1.119938	1.122968	1.125999	1.12903	1.13206	1.135091	1.138122	1.141153	1.144183	1.147214

STUDIES

Platform

Triangle size

- 50m platforms.
- 100m platforms.

Space in between

- 2,5 meters.
- 5 meters.
- 7,5 meters.

Scripts help to constantly compare the output of what the size of the city will be with the settings of the used parameters and rules

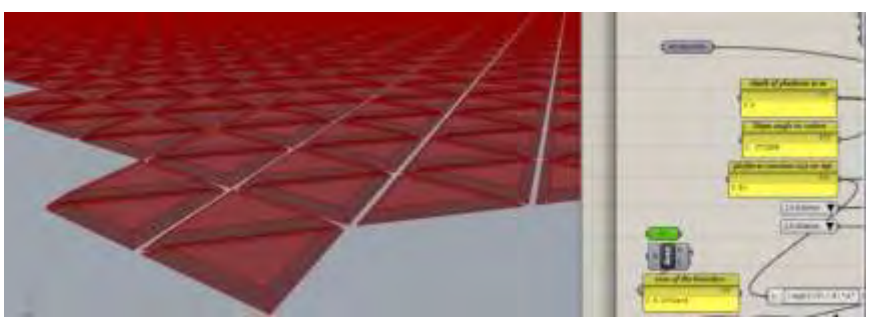
PLATFORM

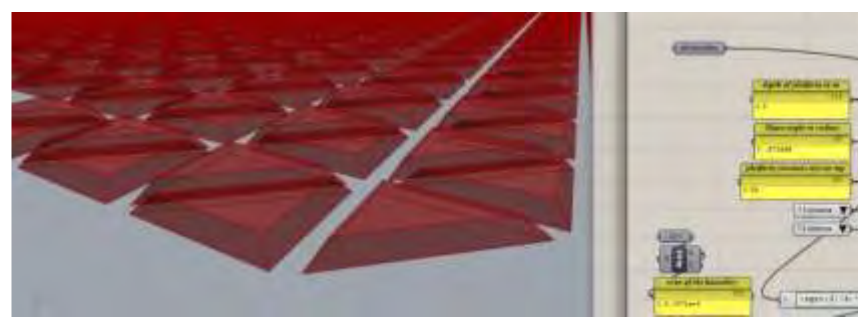
PARAMETERS

- Depth of platform
- Slope in radian
- Distance between each platform
- Platform constant size on top

RULES

- Top face is always constant area
- Set boundary or obtain boundary





STUDIES

Conclusion

- Due to the gap between the platforms, the city boundary will occupy more space compared to land
- The gaps can be efficiently used for recreational purposes and water transportation network

We start with Tollebeek to get a grip on the script.
The list of functions are specific and this can be used as a basic model. The next step will be to change the conditions of the script and derive output for other cities.

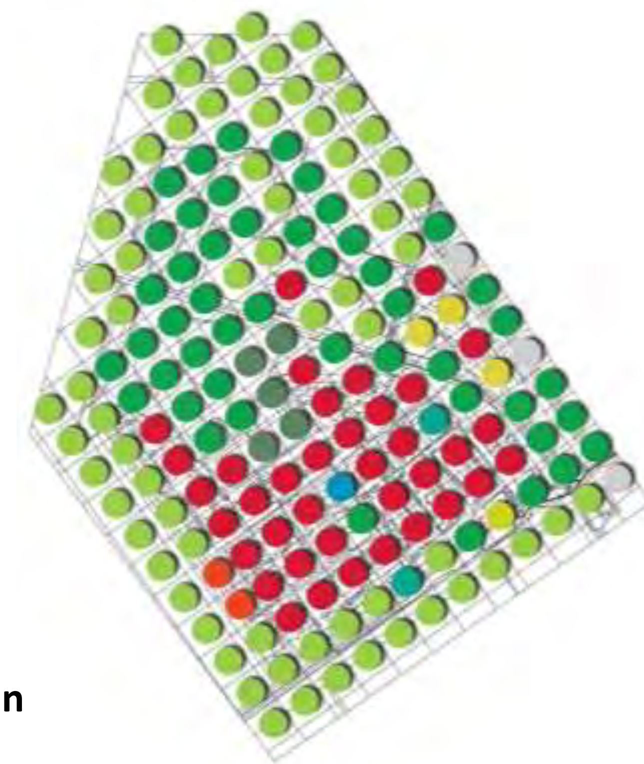
STUDIES

Tollebeek

Study on the existing city on land
This shows the distribution of functions

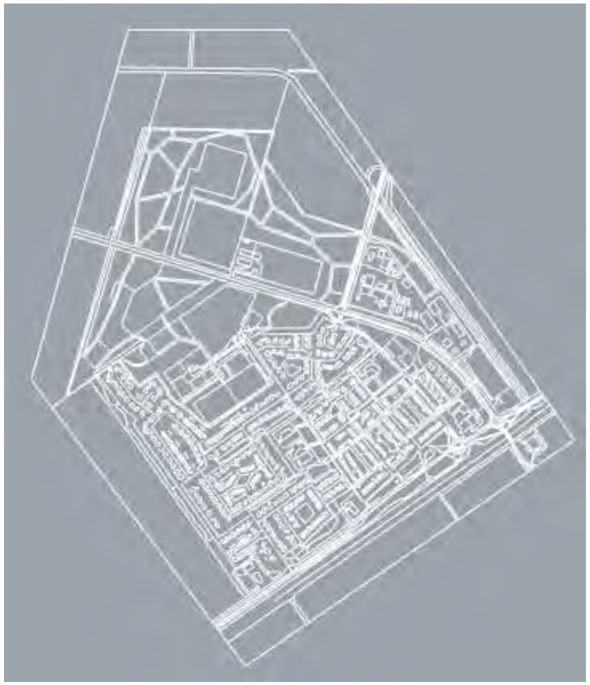
Function	Area	Percentage on Boundary area
Living Residential	362.637	20.8
Business Commercial	19.602	1.1
Business Light Industrial	29.403	1.6
Business Agriculture	686.070	39.4
Business Catering Industry	9.801	0.6
Public Park and open space	460.647	26.4
Public Building	19.602	1.1
Public Sports	49.005	2.8
Public educational Institute	9.801	0.6
Water	29.403	1.6
Total area	**1.675.971 m2**	**96**
Total boundary area:	**1.740.240 m2**	

4 % is unused or doesn't have any specific functional distribution

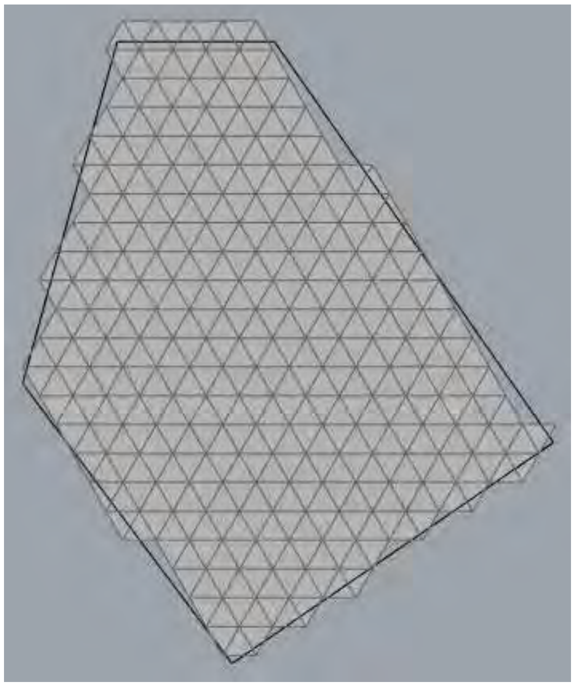


STUDIES

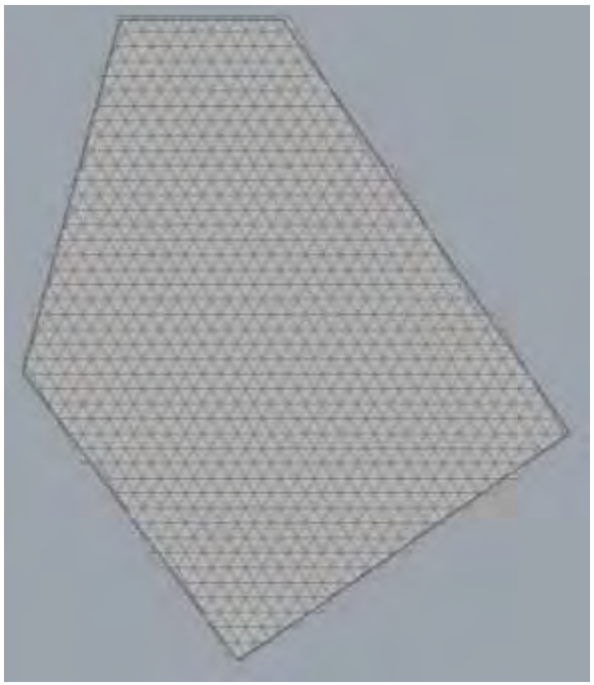
Considering without gaps between the platform gives an exact picture on the number of platforms. (literal translation from land to water)



On land
Total boundary area:
1.740.240 m2



Platform size	100 m
Total boundary area:	1.745.000 m2
Total platform area	1.745.000 m2
Scaling factor 1.06955	
Total number of platforms	403 units

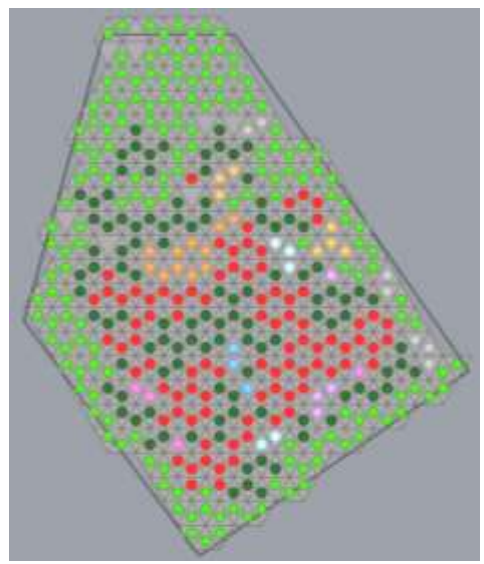


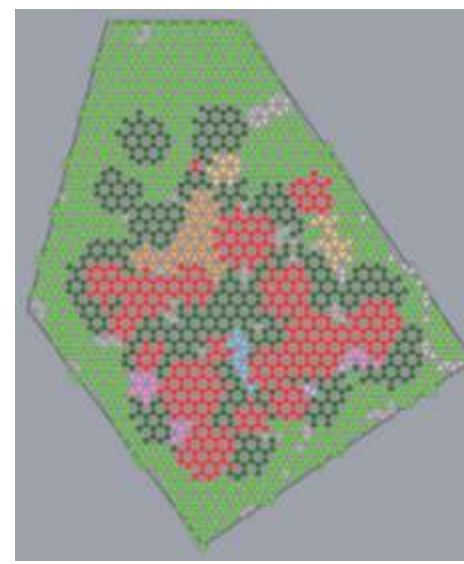
Platform size	50 m
Total boundary area	1.741.800 m2
Total platform area	1.741.800 m2
Scaling factor	1.03620
Total number of platforms	1609 units

STUDIES

Platform with no gap between platforms

Function	Number of units required 100 m platform	Number of units required 50 m platform
Living Residential	87	350
Business Commercial	5	19
Business Light Industrial	7	27
Business Agriculture	165	660
Business Catering Industry	2	9
Public Park and open space	110	442
Public Building	5	19
Public Sports	12	46
Public educational Institute	3	10
Water	7	27
Total	**403**	**1609**

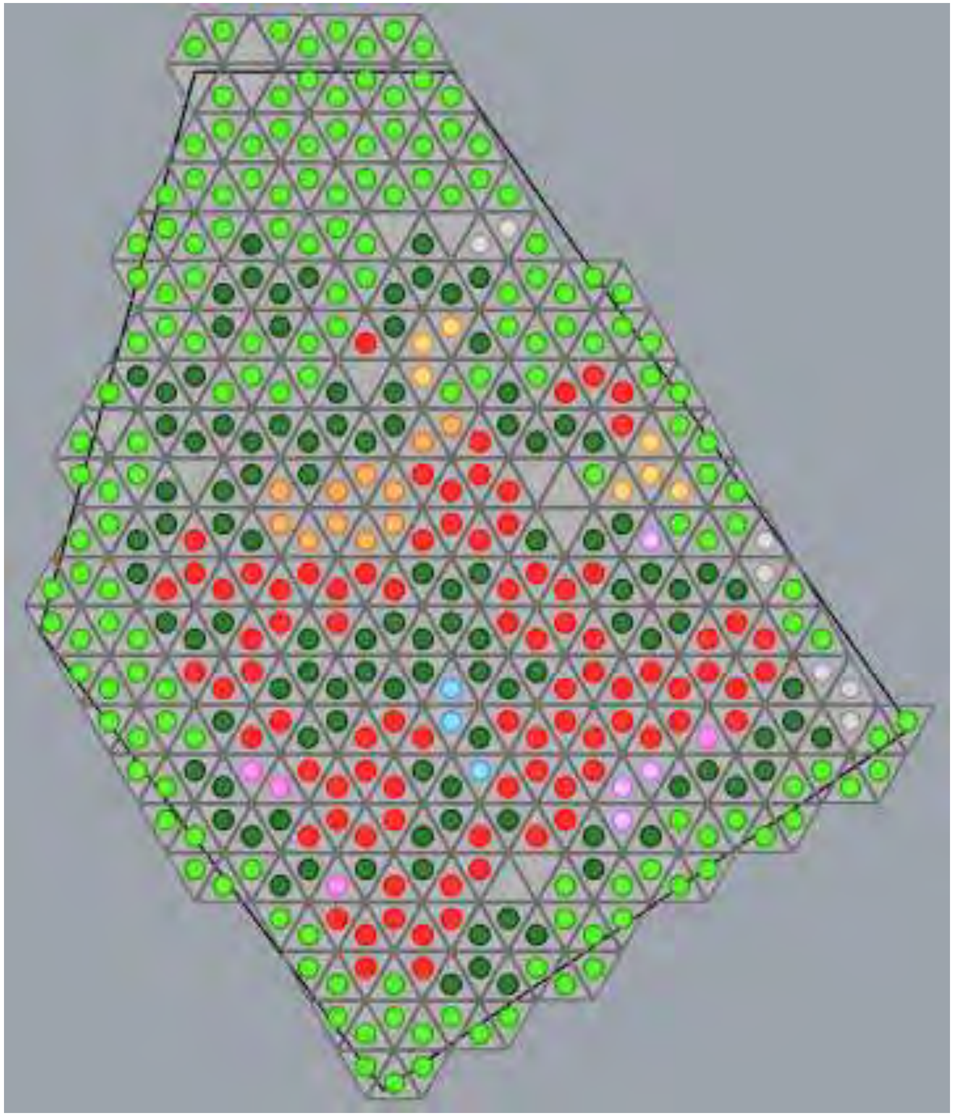




STUDIES

Rules

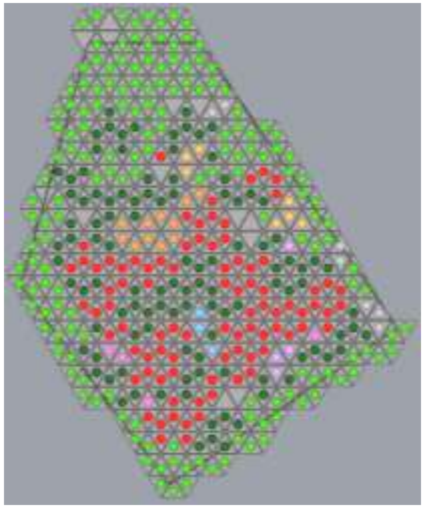
Platform	100 m
Platform depth	4 m
Slope of platform	0
Gap between	2.5 m
Area occupied on water	1.899.400 m2
Total area of platforms	1.745.000 m2
Scaling of boundary	1.1159
Scaling of program	1.0433

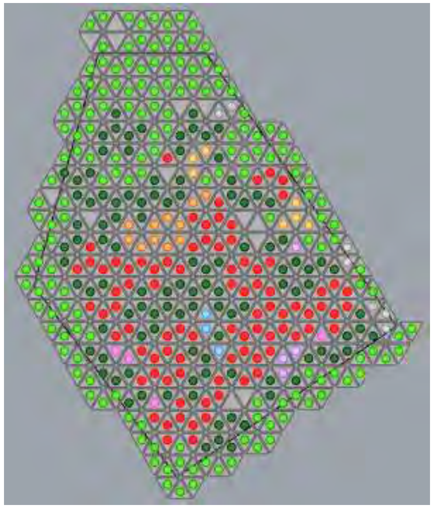


STUDIES

Rules

	Gap of 5.0m	Gap of 7.5m
Platform	100m	100m
Platform depth	4m	4m
Slope of platform	0	0
Gap between platforms	5.0m	7.5m
Area occupied on water	2.060.400m2	2.227.800m2
Total area of platforms	1.745.000m2	1.745.000m2
Scaling of boundary	1.1622	1.2085
Scaling of program	1.0866	1.1299

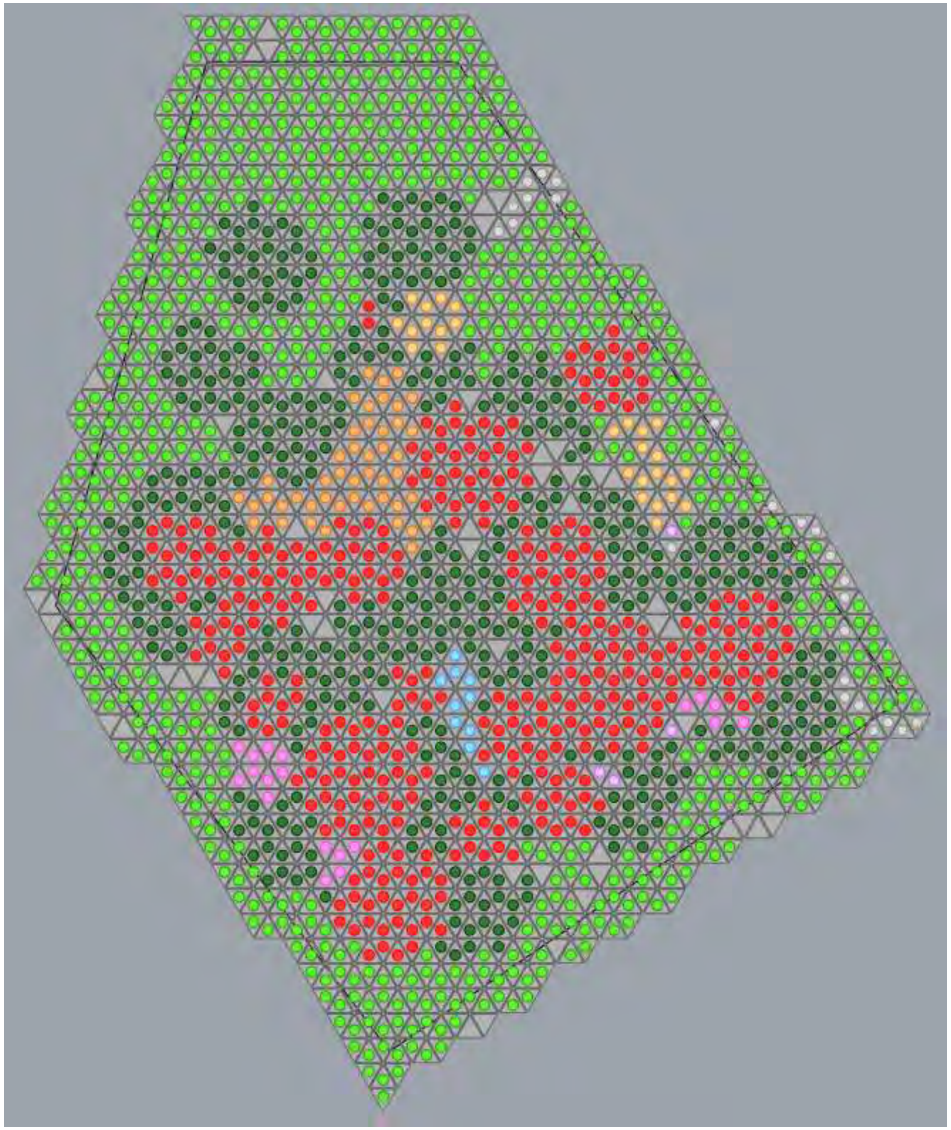




STUDIES

Rules

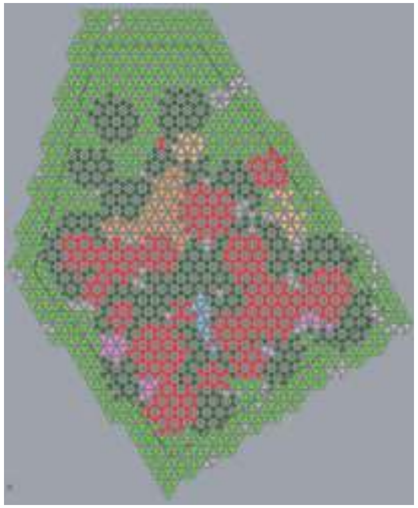
Platform	50 m
Platform depth	4 m
Slope of platform	0
Gap between	2.5 m
Area occupied on water	2.056.500 m2
Total area of platforms	1.741.800 m2
Scaling of boundary	1.126
Scaling of program	1.0866

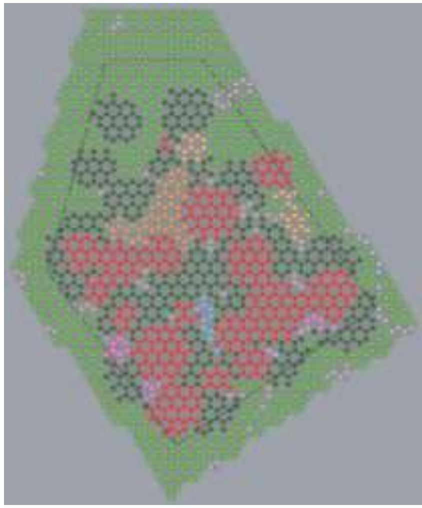


STUDIES

Rules

	Gap of 5.0m	Gap of 7.5m
Platform	50m	50m
Platform depth	4m	4m
Slope of platform	0	0
Gap between platforms	5.0m	7.5m
Area occupied on water	2.397.400m2	2.764.400m2
Total area of platforms	1.741.800m2	1.741.800m2
Scaling of boundary	1.2165	1.306
Scaling of program	1.1732	1.2598





Number of platforms dedicated to a particular function remains the same
We see a constant change on the area occupied on water based on the rules

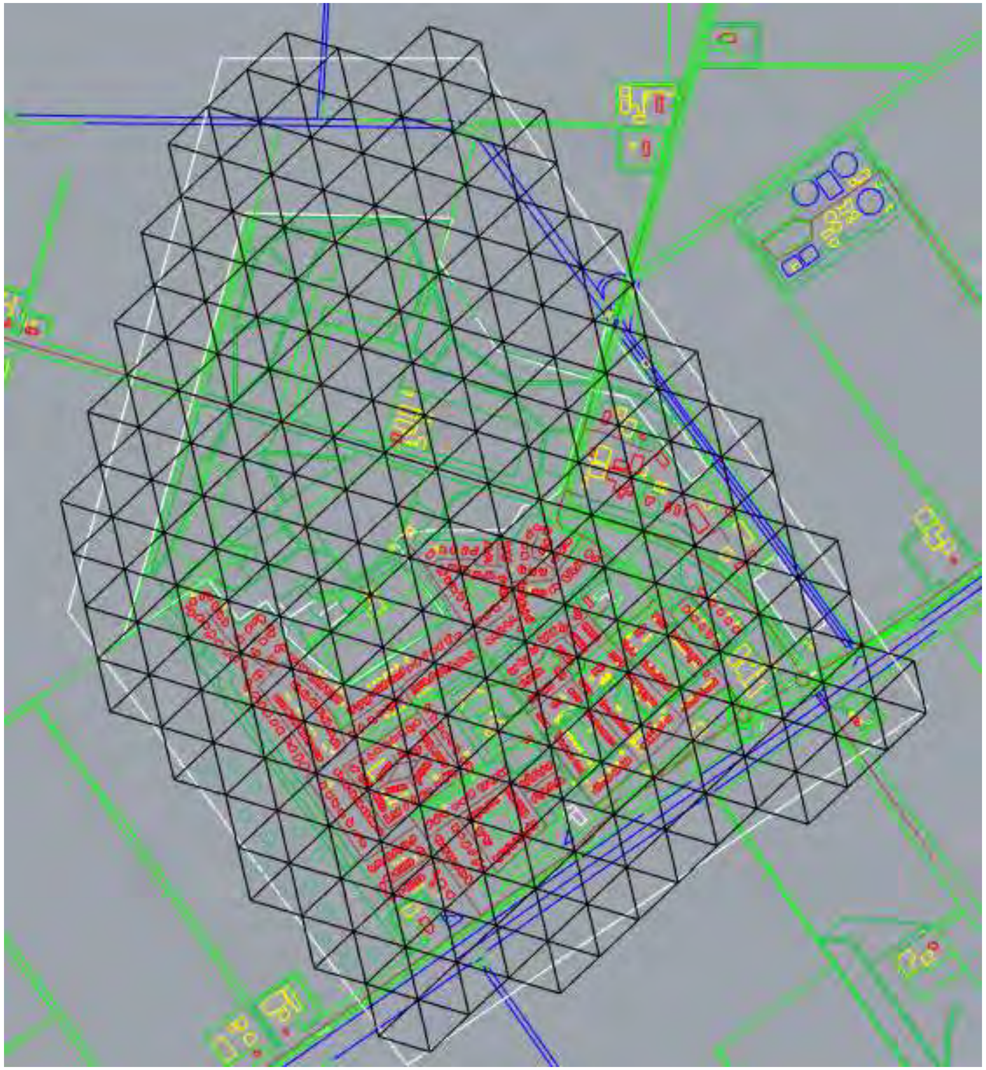
STUDIES

To study the built area on a platform

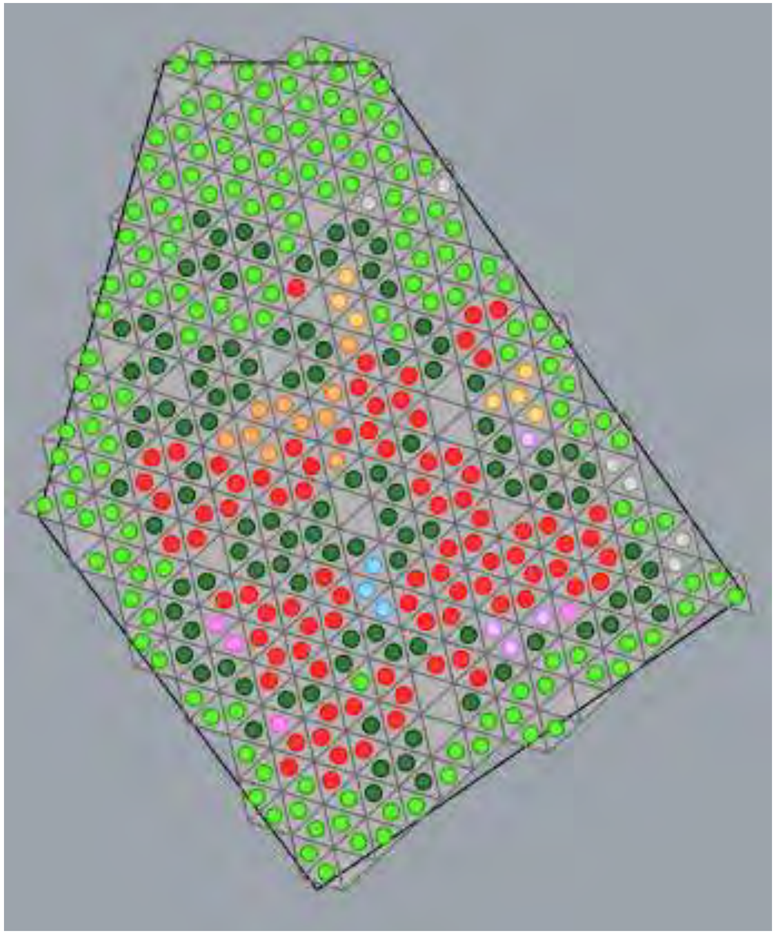
The platforms are aligned to the road network
The platform size is 100 m

With this, we studied the built area of each platform.
And the proportion to the transportation system etc.,.

This is a parallel to study 3. trying to understand how we can replicate a same network from land to water.



STUDIES



Basic ideation on how primary transport network can work.

STUDIES

Functions

Residential	less then 3 layers	
	21 – 25 % built	
	15 % road	
	53 – 57 % open and lawn area	
Commercial	21 – 25 % built	
	60 % open and lawn area	
Light Industry	35% built	
	55 % open and road	
Agriculture	type1	100% agri land
	type 2	12-15% road or walk ways
		balance agri land
	type 3	10 % water
		10% open or green

.

Catering	30 % built
	open green lawn
Park	6-10 % pedestrian
Public	15% built
	open and green area
	road
Sports	15 % built
	45 % sports field
Education	15 % built

We have to efficiently redefine the space – because we have lot of open spaces on land.
When we look in terms of exact footprint of a particular function we can reduce number of platforms.
And we can redefine number of platforms towards a function.
Each function can have different occupancy percentage on each platforms.

SPACE@SEA

STUDIES

Function	Area (m2)	Footprint (m2)
Living Residential	362.637	55.248
Business Commercial	19.602	13.596
Business Light Industrial	29.403	14.074
Business Agriculture	686.070	561.210
Business Catering Industry	9.801	3.520
Public Park and open space	460.647	571.705
Public Building	19.602	4.821
Public Sports	49.005	20.284
Public educational Institute	9.801	1.375
Water	29.403	74.225
Total area	**1.675.971 m2**	**1.320.058 m2**

- We can see a drop in numbers when we just consider exact required footprint.
- Also the road network and the sizes vary from the existing (in land), to the triangle grid system, so its better to begin with exact foot print.
- We try to optimize on number of platforms.

STUDIES

Now we know the exact amount of foot print to be addressed for.
We have already done studies on different types of built form on a triangle platform.

With those studies we get the set of outputs.
These analysis becomes a toolbox to the script, we define things based on this analysis

Toolbox

Type	1	2	3	4	5	6	6	7
Side	100 m	100 m	100 m	100 m	100 m	100 m	100 m	100 m
Area	4330 m2	4330 m2	4330 m2	4330 m2	4330 m2	4330 m2	4330 m2	4330 m2
Land use %								
Buildings	48,9%	44,9%	62,4%	35,2%	43,3%	29,9%	34,5%	42,1%
Road	22,8%	26,8%	28,8%	22,8%	28,8%	36,5%	37%	39,1%
Green	28,3%	28,3%	8,8%	42%	27,9%	33,6%	28,5%	18,8%

Manual calculations to understand the difference in number of platform when a particular type is picked.

STUDIES

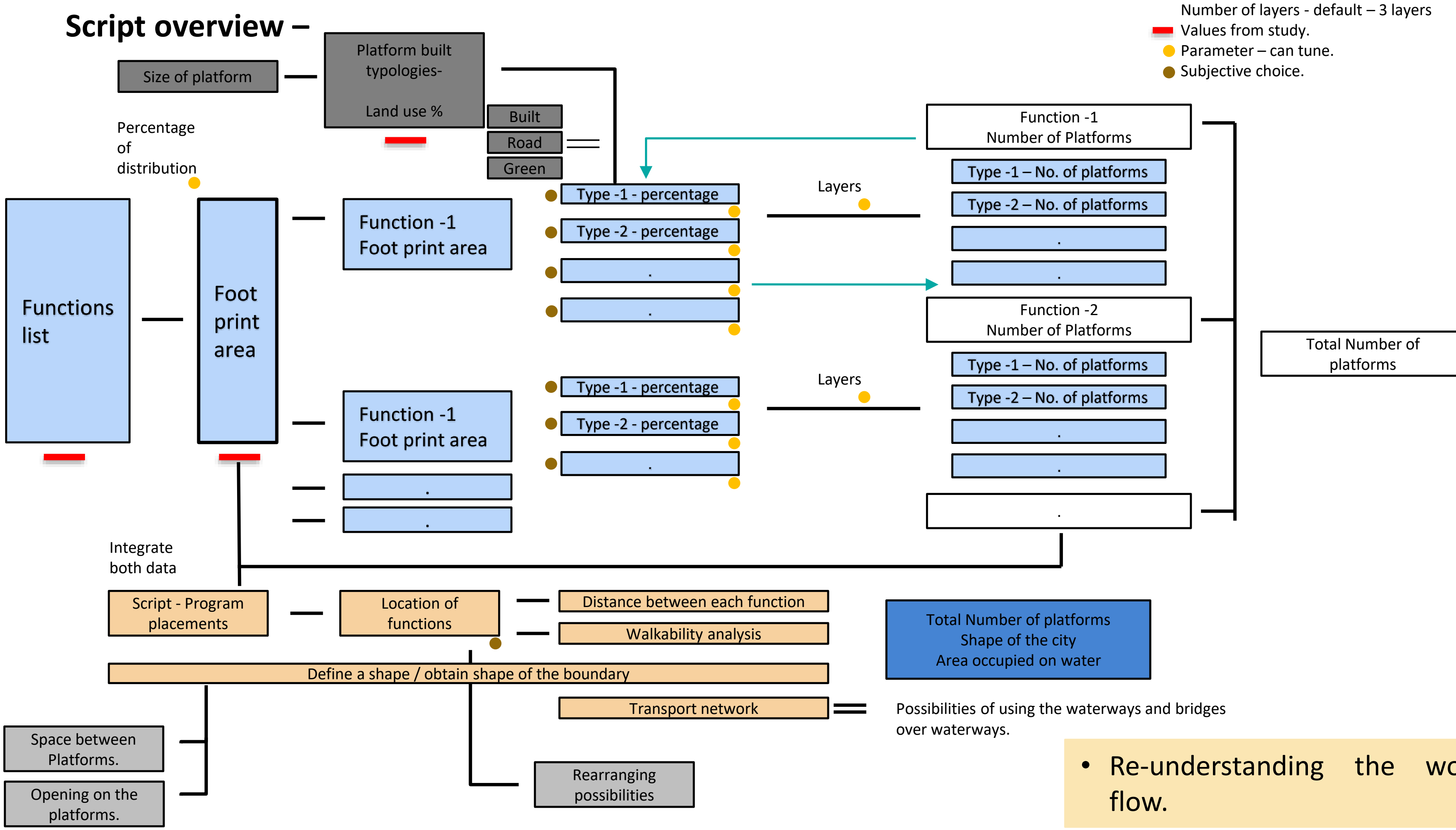
Remodeling the city

Total area of all built structure	111.170	Forest	325.726
Grass	245.979	Agriculture	561.210
Total	**1.244.085**		

	Type 1 **100 m** size	Type 3 **100 m** size	Type 7 **100 m** size	Type 1 **50 m** size
Built-up area	2116	2700	1495	576
Green	1230	383	1234	45
Road	984	1247	1602	461
Agriculture – Platform	3346 + 984	3680	3680	920
Number platform	**168**	**153**	**153**	**610**
Built Number	**53**	**42**	**75**	**193**
Green utilized	65190	16086	92550	8685
Balance green and forest	506515	555619	571705	563020
15% for walkways	650	650	650	
Number walkway	**138**	**151**	**156**	**612**
Total number	**359**	**346**	**384**	**1415**

STUDIES

Script overview –



- Re-understanding the work flow.

STUDIES

Scenario 1 –

Function	Foot print	platform typology	Percentage	Built-%	Road-%	Green-%	blue or cut on platform-%	No. Of layers	Number of platforms	Total Platform
Living Residential	**55248**	Type -7	60	42,1	39,1	18,8		4	14	
		Type -6	40	29,9	36,5	33,6		3	17	**31**
Business Commercial	**13596**	Type -7	100	42,1	39,1	18,8		3	7	**7**
Business Light Industrial	**14074**	Type -7	100	42,1	39,1	18,8		3	8	**8**
Business Agriculture	**561210**		100	85	10	5			152	**152**
Business Catering Industry	**3520**	Type -7	100	42,1	39,1	18,8		3	2	**2**
Public Park and open space	**571705**		100	92	8	0			121	**121**
Public Building	**4821**	Type -7	100	42,1	39,1	18,8		4	2	**2**
Public Sports	**20284**	Type -7	20	42,1	39,1	18,8		3	2	
			80	100	0	0			4	**6**
Public educational Institute	**1375**	Type -7	100	42,1	39,1	18,8		3	1	**1**
Water	**74225**		100	0	0	4	96		18	**18**
	1320058									**348**

Platform size – 100 m.

- Idealy if we pick different type and compare. For the required amount of footprint we get the exact number of platforms. Still transportation has to be integrated.

SPACE@SEA

STUDIES

Comparatively studying the results with 2 different sets of typologies of built form on the platform.
One function is considered and the exact same foot print is evaluated for both the sets.

Set 1 –

Type -1

Type -2

In this scheme the road transportation is not considered. The dimension for the road is 3,5 meters – accommodating complete pedestrian – walkability.

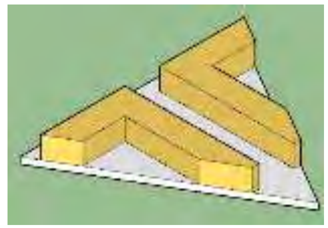
- Picking which typology is going to be used in what proportions.

STUDIES

Set – 2

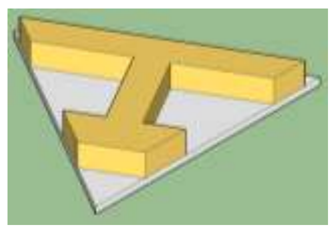
Type -1

Platform	– 100 m.	
Area	– 4330 m2	
Built	– 1891 m2	– 43,7 %
Road	– 1773 m2	– 41 %
Green	– 666 m2	– 15,3 %



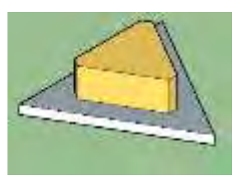
Type – 2

Platform	– 100 m	
Area	– 4330 m2	
Built	– 1925 m2	– 44,4%
Road	– 788 m2	– 18,6 %
Green	– 1617 m2	– 37 %



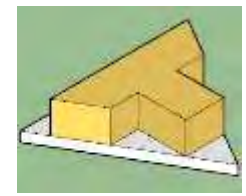
Type -3

Platform	– 50 m	
Area	– 1083 m2	
Built	– 358 m2	– 33 %
Road	– 725 m2	– 67 %



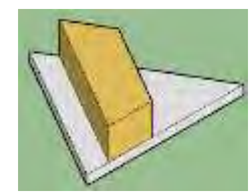
Type-4

Platform	– 50 m	
Area	– 1083 m2	
Road	– 279 m2	– 25,7 %
Built	– 613 m2	– 56,6 %
Green	– 191 m2	– 17,6 %

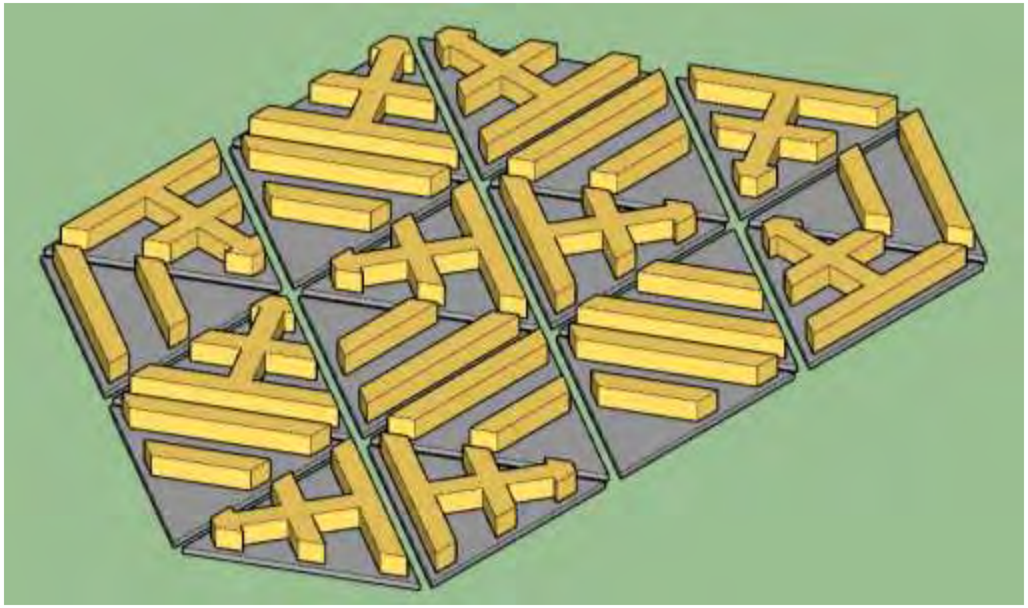


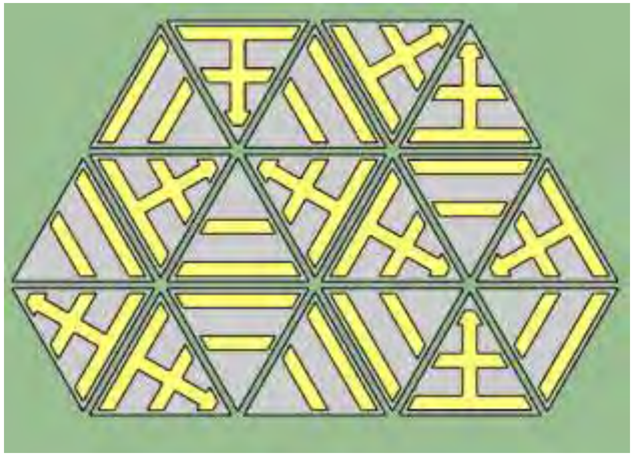
Type-5

Platform	– 50 m	
Area	– 1083 m2	
Road	– 279 m2	– 25,7 %
Built	– 434 m2	– 40 %
Green	– 370 m2	– 34,1 %



STUDIES

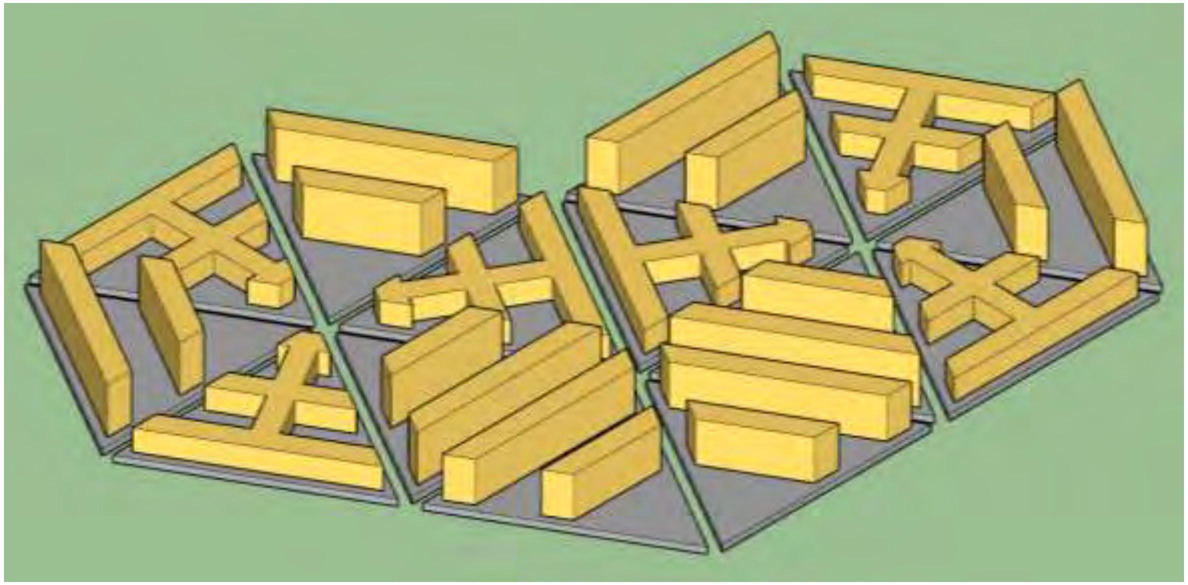


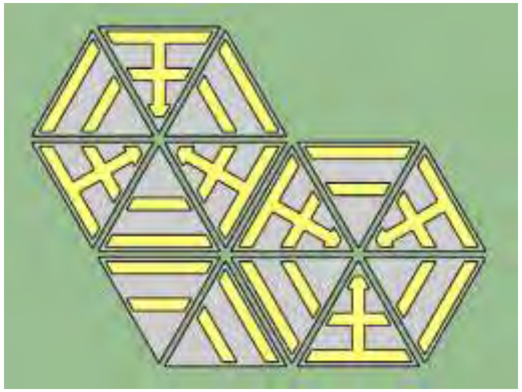


Function	Foot print	platform typology	Percentage	Built-%	Road-%	Green-%	blue or cut on platform-%	No. Of layers	Number of platforms	Total Platform
Living Residential	**29535**	Type -1	60	42,1				3	10	
		Type -2	40	29,9				3	9	**19**

- By changing the percentage of a type and the number of layer - we can control the density.

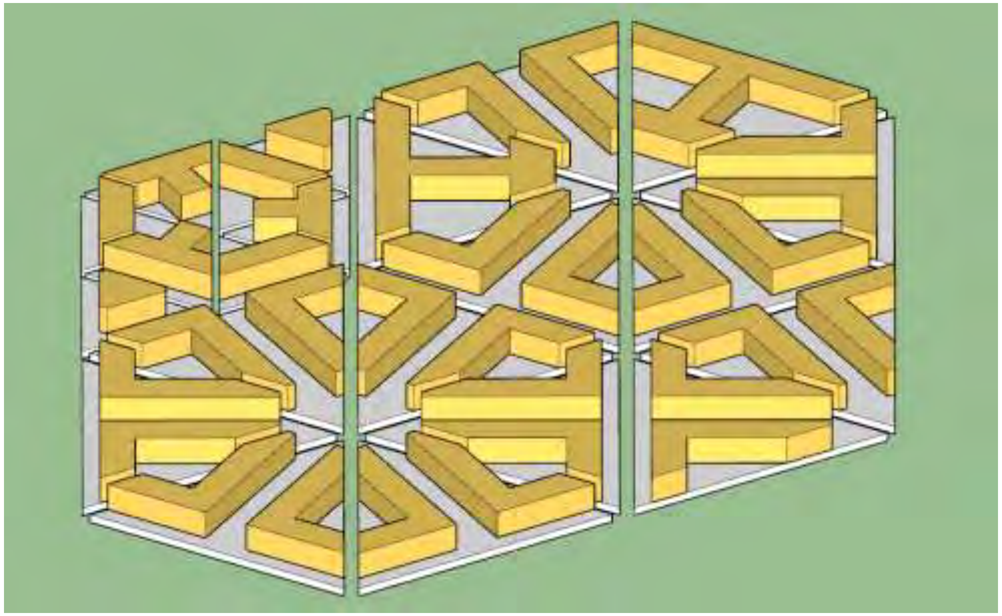
STUDIES

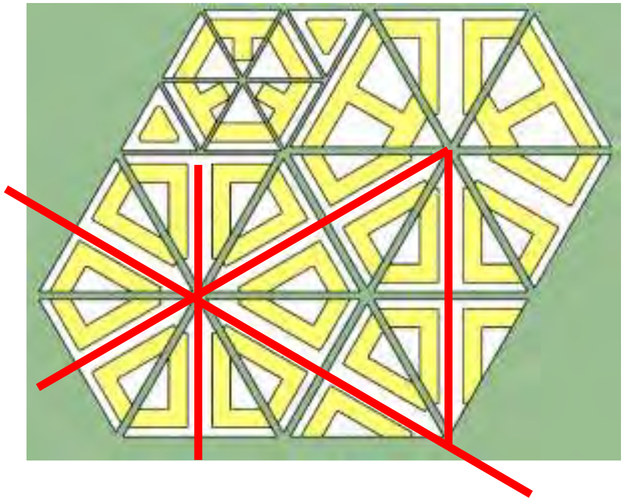




Function	Foot print	platform typology	Percentage	Built-%	Road-%	Green-%	blue or cut on platform-%	No of layers	Number of platforms	Total Platform
Living Residential	**29535**	Type -1	40	42,1				3	6	
		Type -2	60	29,9				6	8	**14**

STUDIES

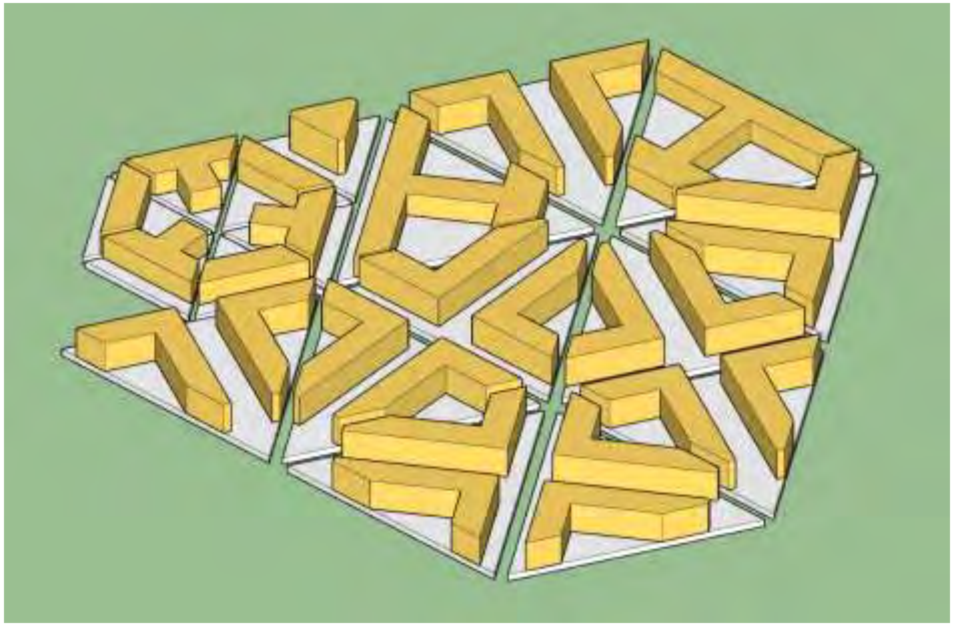


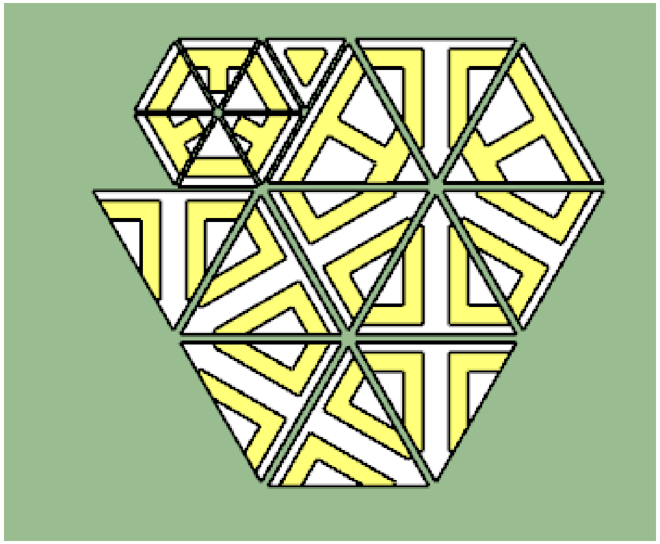


Function	Foot print	platform typology	Percentage	Built-%	Road-%	Green-%	blue or cut on platform-%	No of layers	Number of platforms	Total Platform
Living Residential	**29535**	Type -1	74	43,7				3	12	
		Type -2	13	44,4				3	2	
		Type -3	2,4	33				3	2	
		Type -4	6,2	56,6				3	3	
		Type -5	4,4	40				3	3	**22**

- In this the transportation is integrated.

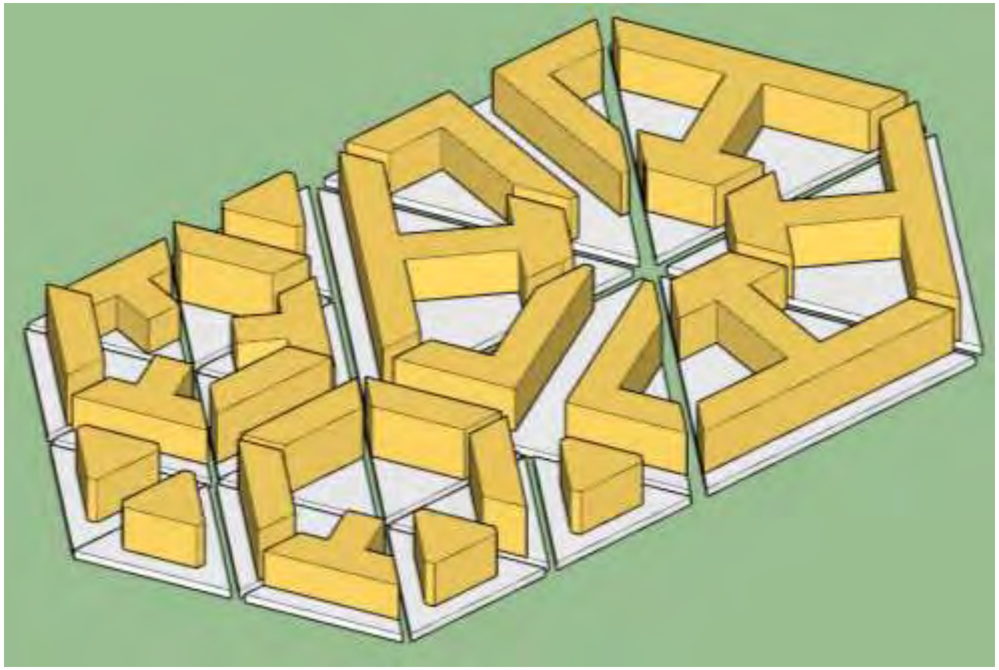
STUDIES

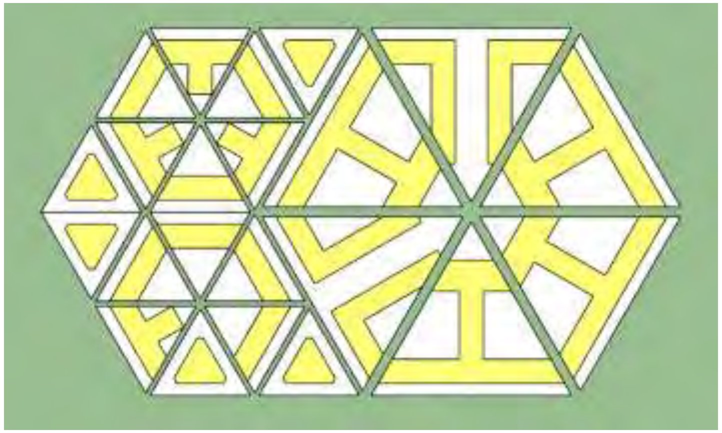




Function	Foot print	platform typology	Percentage	Built-%	Road-%	Green-%	blue or cut on platform-%	No of layers	Number of platforms	Total Platform
Living Residential	**29535**	Type -1	74	43,7				4	9	
		Type -2	13	44,4				3	2	
		Type -3	2,4	33				5	1	
		Type -4	6,2	56,6				3	3	
		Type -5	4,4	40				3	3	**18**

STUDIES





- With variables in percentage and the number of layers based on the type, we can keep optimizing number of platforms and density required.

Function	Foot print	platform typology	Percentage	Built-%	Road-%	Green-%	blue or cut on platform-%	No of layers	Number of platforms	Total Platform
Living Residential	**29535**	Type -1	20	43,7				5	2	
		Type -2	40	44,4				5	4	
		Type -3	10	33				5	5	
		Type -4	10	56,6				4	4	
		Type -5	20	40				6	7	**22**

STUDIES

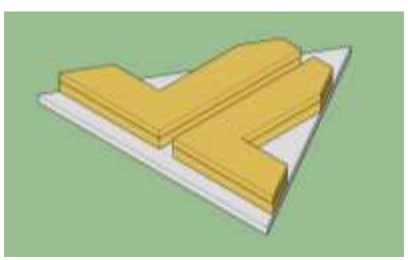
Now we will just try out with one single typology. Compare it with both the type of platform. The given function is constant in both conditions.

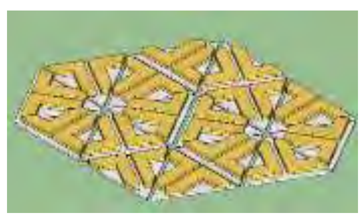
Conditions -
Given foot print – 40,000 m2.
Average initial layers – 2
Total gross area – 80,000 m2.
Per unit size – 90m2

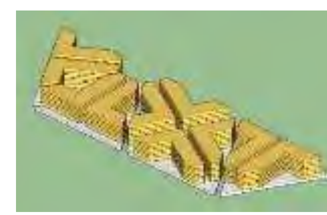
	Scenario -1	Scenario -2	Scenario -3
Platform	– 100 m.	– 100 m.	– 100 m.
Area	– 4330 m2	– 4330 m2	– 4330 m2
Built	– 57,8 %	– 57,8 %	– 57,8 %
No. of Layers	– 2	– 4	– 6
No. of Platforms	– 16	– 8	– 5
Actual built ground cover	– 39808 m2	– 19904 m2	– 12440 m2
Gross area per platform	– 4976 m2	– 9952 m2	– 14928 m2
Density (No of units per platform)	– 55,2	– 110,5	– 166

Selected type.

Size	- 100 m
Built	- 2488 m2
Built %	- 57,8 %
Road % (walkways)	- 26,7 %
Green %	- 15,5%
Water transportation.	







- We can optimize the number of platform but the distance between the block is too narrow, so the built % sholud be reduced to find a better spacing between the blocks.

STUDIES

Conditions -
Given foot print – 40,000 m2.
Average initial layers – 2
Total gross area – 80,000 m2.
Per unit size – 90m2

Selected type.

Size	- 100 m
Built	- 2119 m2
Built %	- 48,9 %
Road % (walkways)	- 26,7 %
Green %	- 24,4 %
Water transportation.	

Scenario -1

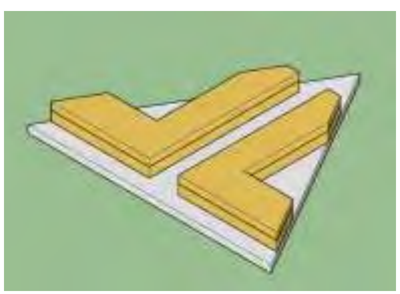
Platform	– 100 m.
Area	– 4330 m2
Built	– 48,9 %
No. of Layers	– 2
No. of Platforms	– 19
Actual built ground cover	– 40261 m2
Gross area per platform	– 4238 m2
Density (No of units per platform)	– 47

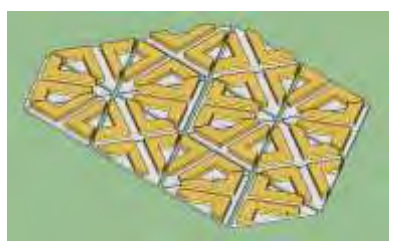
Scenario -2

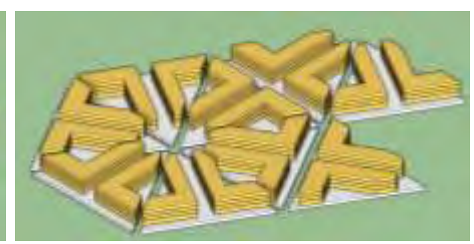
Platform	– 100 m.
Area	– 4330 m2
Built	– 48,9 %
No. of Layers	– 4
No. of Platforms	– 9
Actual built ground cover	– 19071 m2
Gross area per platform	– 8476 m2
Density (No of units per platform)	– 94

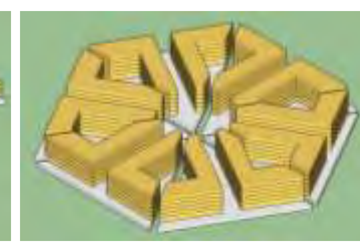
Scenario -3

Platform	– 100 m.
Area	– 4330 m2
Built	– 48,9 %
No. of Layers	– 6
No. of Platforms	– 6
Actual built ground cover	– 12714 m2
Gross area per platform	– 12714 m2
Density (No of units per platform)	– 141









- Space between the block is increased to have better conditions. – day light etc.

STUDIES

Conditions -
Given foot print – 40,000 m2.
Average initial layers – 2
Total gross area – 80,000 m2.
Per unit size – 90m2

Selected type.

Size	- 100 m
Built	- 1891 m2
Built %	- 43,6 %
Road %	- 41,1 %
Green %	- 15,3 %

With roads transportation.

Scenario -1

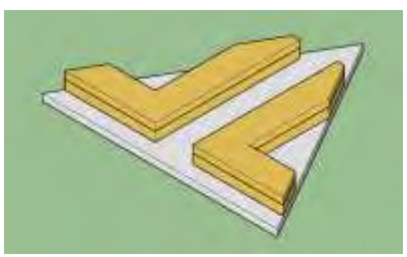
Platform	– 100 m.
Area	– 4330 m2
Built	– 43,6 %
No. of Layers	– 2
No. of Platforms	– 21
Actual built ground cover	– 39711 m2
Gross area per platform	– 3782 m2
Density (No of units per platform)	– 42

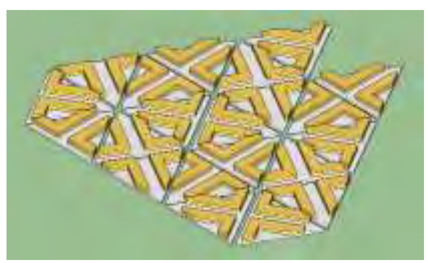
Scenario -2

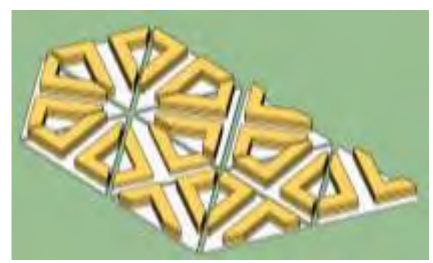
Platform	– 100 m.
Area	– 4330 m2
Built	– 43,6 %
No. of Layers	– 4
No. of Platforms	– 11
Actual built ground cover	– 20801 m2
Gross area per platform	– 7564 m2
Density (No of units per platform)	– 84

Scenario -3

Platform	– 100 m.
Area	– 4330 m2
Built	– 43,6 %
No. of Layers	– 6
No. of Platforms	– 7
Actual built ground cover	– 13237 m2
Gross area per platform	– 11346 m2
Density (No of units per platform)	– 126







- In this we have incorporated the road way transport system, the road width is 16m. We obtain a primary road network.

- We can check the optimization, there is not enough space for road network. So the built % has to be reduced.

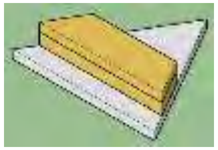
STUDIES

Conditions -
Given foot print – 10,000 m2.
Average initial layers – 2
Total gross area – 20,000 m2.
Per unit size – 90m2 – for density calculation
Gap between platform – 5 m
With pedestrian

Platform -1

Built % - 51,4 %
Road % (walkway) - 26 %
Green % - 22,6 %

Platform -2

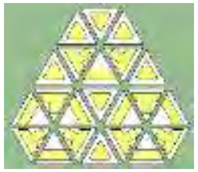


Built % - 40 %
Road % (walkway) - 26 %
Green % - 34%

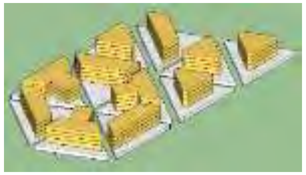
Platform -3

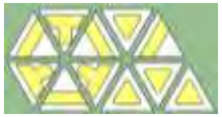
Built % - 33 %
Road % (walkway) - 67 %
Green % - 0

Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	1083	41,2	557	51,4	2	8	1114	12
2	1083	32,2	434	40	2	7	868	9,6
3	1083	26,5	358	33	2	7	716	8

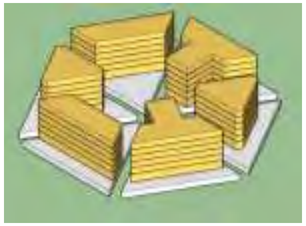


Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	1083	41,2	557	51,4	4	3	2228	25
2	1083	32,2	434	40	4	4	1736	19
3	1083	26,5	358	33	4	4	1432	16





Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	1083	41,2	557	51,4	6	2	3342	37
2	1083	32,2	434	40	6	2	2604	29
3	1083	26,5	358	33	6	2	2148	24

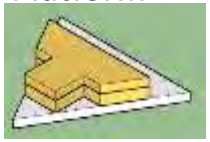


SPACE@SEA

STUDIES

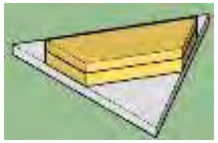
Conditions -
Given foot print – 10,000 m2.
Average initial layers – 2
Total gross area – 20,000 m2.
Per unit size – 90m2 – for density calculation
Gap between platform – 5 m
With road transportation.

Platform -



Built % - 47 %
Road % - 40,8 %
Green % - 12,2 %

Platform -

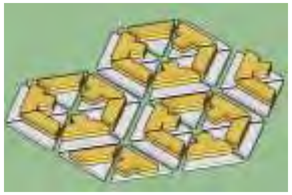


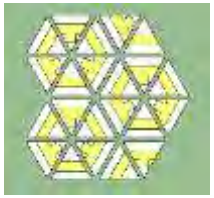
Built % - 34,9%
Road % - 40,8 %
Green % - 24,3 %

Platform -

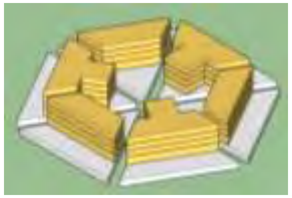
Built % - 0
Road % - 91 %
Green % - 9 %

Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	1083	57,3	509	47	2	11	1018	11,3
2	1083	42,7	378	34,9	2	11	756	8,4
3	1083	0	0	0	2	0	0	0

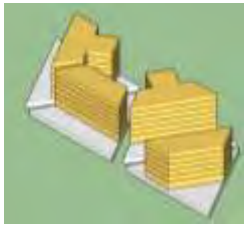


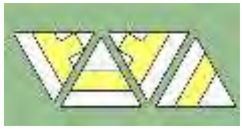


Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	1083	57,3	509	47	4	6	2036	22,6
2	1083	42,7	378	34,9	4	6	1512	16,8
3	1083	0	0	0	4	0	0	0



Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	1083	57,3	509	47	6	4	3054	34
2	1083	42,7	378	34,9	6	4	2268	25,2
3	1083	0	0	0	6	0	0	0





STUDIES

Assuming we have same amount of built % for both 50 m and 100 m platforms. Having same amount of distribution.

Comparison study on density –

Given foot print – 50,000 m2.
Average initial layers – 2
Total gross area – 100,000 m2.
Per unit size – 90m2 – for density calculation
Gap between platform – 5 m

Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	1083	41,2	557	51,4	2	37	1114	12,3
2	1083	32,2	434	40	2	37	868	9,6
3	1083	26,5	358	33	2	37	716	8

Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	4330	41,2	2226	51,4	2	9	4452	49,4
2	4330	32,2	1732	40	2	9	3464	38,4
3	4330	26,5	1429	33	2	9	2858	31,7

STUDIES

Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	1083	41,2	557	51,4	4	19	2228	24,7
2	1083	32,2	434	40	4	19	1736	19,2
3	1083	26,5	358	33	4	19	1432	16

Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	4330	41,2	2226	51,4	4	5	8904	99
2	4330	32,2	1732	40	4	5	6928	77
3	4330	26,5	1429	33	4	5	5716	63,5

Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	1083	41,2	557	51,4	6	12	3342	37
2	1083	32,2	434	40	6	12	2604	29
3	1083	26,5	358	33	6	12	2148	23,8

Platform	Area (m2)	Percentage distribution	Built (m2)	Built %	No. Of Layers	No of Platforms	Gross area per platform (m2)	Density
1	4330	41,2	2226	51,4	6	3	13356	148,4
2	4330	32,2	1732	40	6	3	10392	115,4
3	4330	26,5	1429	33	6	3	8574	95,2

STUDIES

Output from the studies –

- Platforms with just pedestrian network has got higher density comparing to the one with road transport network.
- 100 m platform has got 4 times the values compered with one 50 m platform.
- In proportion 100 m platform workes fine with better outputs – we can compare one 100 m platform with 2 layers – to a 50 m platform with 8 layers – we get a same amount of density.

STUDIES

Now we are reflecting the study on the density and the transport system on Tollebeek to test results.

Function	Foot print (m2)
Living Residential	55.248
Business Commercial	13.596
Business Light Industrial	14.074
Business Agriculture	561.210
Business Catering Industry	3.520
Public Park and open space	571.705
Public Building	4.821
Public Sports	20.284
Public educational Institute	1.375
Water	74.225

With this data – we will study it in 4 condition –

- **50 m platform with pedestrian walkways and water transport.**
- **50 m platform with road transport.**
- **100 m platform with pedestrian walkways and water transport.**
- **100 m platform with road transport.**

Same types of platforms area going to be used as in previous studies.
We are comparing it, all with 2 layers.

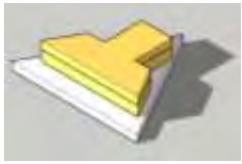
STUDIES

Same boundary profile as Tollebeek.

Condition – 1

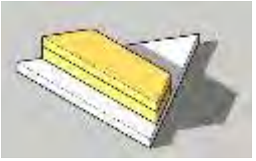
Platform	- **50 m**
Slope on Platform edge	- 0
Platform area	- 1083 m2
Platform depth	- 3 m
Gap between platform	- **5 m**

Platform -1



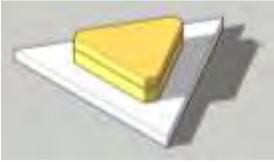
Built % - 51,4 %
Road % (walkway) - 26 %
Green % - 22,6 %

Platform -2



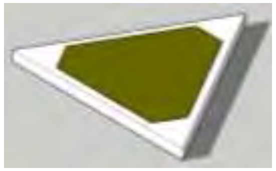
Built % - 40 %
Road % (walkway) - 26 %
Green % - 34%

Platform -3



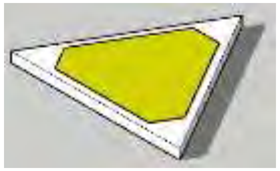
Built % - 33 %
Road % (walkway) - 67 %
Green % - 0

Platform -4

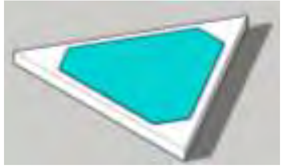


Park and open space

Built % - 0
Road % (walkway) - 33 %
Green % - 67 %



Agriculture



Water

Park –
571705 – 46588 =
525117

STUDIES

Same boundary profile as Tollebeek.

Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	55248	1	41,3	2	41	**123**
		2	32,2	2	41	
		3	26,5	2	41	
Business Commercial	13596	1	41,3	2	10	**30**
		2	32,2	2	10	
		3	26,5	2	10	
Business Light Industrial	14074	1	41,3	2	10	**30**
		2	32,2	2	10	
		3	26,5	2	10	
Business Agriculture	561210	4	100	1	773	**773**
Business Catering Industry	3520	1	41,3	2	3	**9**
		2	32,2	2	3	
		3	26,5	2	3	
Public Park and open space	525117	4	100	1	724	**724**
Public Building	4821	1	41,3	2	4	**12**
		2	32,2	2	4	
		3	26,5	2	4	
Public Sports	20284	1	20	2	7	**22**
		4	80	1	15	
Public educational Institute	1375	1	41,3	2	1	**3**
		2	32,2	2	1	
		3	26,5	2	1	
Water	74225	4	100	1	102	**102**

Total – 1828

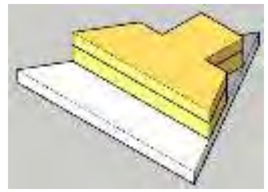
STUDIES

Same boundary profile as Tollebeek.

Condition – 2

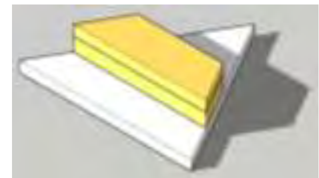
Platform	- **50 m**
Slope on Platform edge	- 0
Platform area	- 1083 m2
Platform depth	- 3 m
Gap between platform	- **5 m**

Platform -1



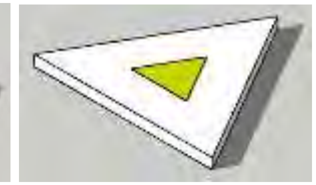
Built % - 47 %
Road % - 40,8 %
Green % - 12,2 %

Platform -2



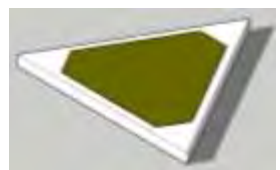
Built % - 34,9%
Road % - 40,8 %
Green % - 24,3 %

Platform -3

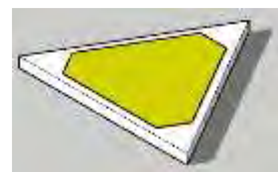


Built % - 0
Road % - 91 %
Green % - 9 %

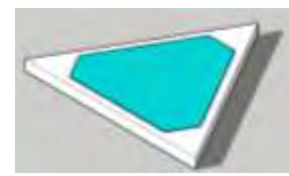
Platform -4



Park and open space



Agriculture



Water

Built % - 0
Road % (walkway) - 33 %
Green % - 67 %

Park –
571705 – 41080 =
530625

STUDIES

Same boundary profile as Tollebeek.

Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	55248	1	57,3	2	62	**124**
		2	42,7	2	62	
Business Commercial	13596	1	57,3	2	15	**30**
		2	42,7	2	15	
Business Light Industrial	14074	1	57,3	2	16	**32**
		2	42,7	2	16	
Business Agriculture	561210	4	100	1	773	**773**
Business Catering Industry	3520	1	57,3	2	4	**8**
		2	42,7	2	4	
Public Park and open space	530625	4	100	1	731	**731**
Public Building	4821	1	57,3	2	5	**10**
		2	42,7	2	5	
Public Sports	20284	1	20	2	8	**23**
		4	80	1	15	
Public educational Institute	1375	1	57,3	2	2	**4**
		2	42,7	2	2	
Water	74225	4	100	1	102	**102**

Total – 1837

SPACE@SEA

STUDIES

Same boundary profile as Tollebeek.

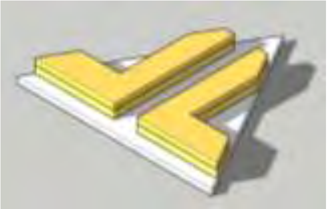
Condition – 3

Platform	- **100 m**
Slope on Platform edge	- 0
Platform area	- 4330 m2
Platform depth	- 3 m
Gap between platform	- **5 m**

Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	55248	1	100	2	26	**26**
Business Commercial	13596	1	100	2	6	**6**
Business Light Industrial	14074	1	100	2	7	**7**
Business Agriculture	561210	2	100	1	206	**206**
Business Catering Industry	3520	1	100	2	2	**2**
Public Park and open space	518879	2	100	1	179	**179**
Public Building	4821	1	100	2	2	**2**
Public Sports	20284	1	20	2	2	**6**
		2	80	1	4	
Public educational Institute	1375	1	100	2	1	**1**
Water	74225	2	100	1	27	**27**

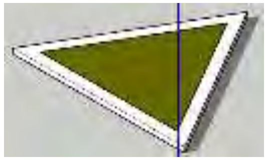
Total – 462

Platform -1

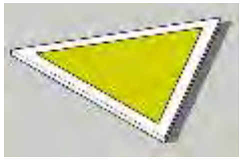


Built %	- 48,9 %
Road %	- 26,7 %
Green %	- 24,4 %

Platform -2



Park and open space



Agriculture

Built %	- 0
Road % (walkway)	
Green %	- 63 %

Water

Park –
571705 – 52826 = 518879

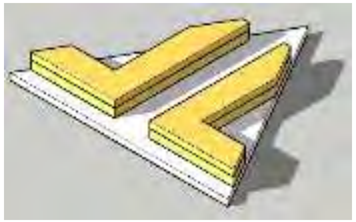
STUDIES

Output from the studies –
- We get high numbers in agriculture and green and open spaces from the previous demarked boundary.
- To have an effective study we re-map boundary and check the output results.

Condition – 4

Platform - **100 m**
Slope on Platform edge - 0
Platform area - 4330 m2
Platform depth - 3 m
Gap between platform - **5 m**

Platform -1

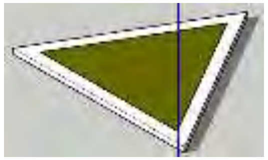


Built % - 43,6 %
Road % - 41,1 %
Green % - 15,3 %

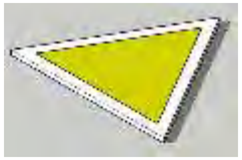
Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	55248	1	100	2	29	**29**
Business Commercial	13596	1	100	2	7	**7**
Business Light Industrial	14074	1	100	2	7	**7**
Business Agriculture	561210	2	100	1	206	**206**
Business Catering Industry	3520	1	100	2	2	**2**
Public Park and open space	538581	2	100	1	197	**197**
Public Building	4821	1	100	2	3	**3**
Public Sports	20284	1	20	2	2	**6**
		2	80	1	4	
Public educational Institute	1375	1	100	2	1	**1**
Water	74225	2	100	1	27	**27**

Total – 485

Platform -2



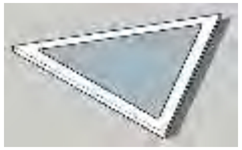
Park and open space



Agriculture

Built % - 0
Road % (walkway)
Green % - 63 %

Park –
571705 – 33124 =
538581



Water

Same boundary profile as Tollebeek.

SPACE@SEA

Just for comparison no –built form type is prepared in the same area.

STUDIES

Condition – 3a

Platform - 100 m
Slope on Platform edge - 0
Platform area - 4330 m2
Platform depth - 3 m
Gap between platform - 5 m

Platform -1

Built % - 51,4 %
Road % (walkway) - 26 %
Green % - 22,6 %

Platform -2

Built % - 40 %
Road % (walkway) - 26 %
Green % - 34%

Platform -3

Built % - 33 %
Road % (walkway) - 67 %
Green % - 0

Platform -4

Park and open space | Agriculture | Water

Built % - 0
Road % (walkway) - 33 %
Green % - 67 %

Park –
571705 – 46588 = 525117

Total – 461

Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	55248	1	41,3	2	10	30
		2	32,2	2	10	
		3	26,5	2	10	
Business Commercial	13596	1	41,3	2	3	9
		2	32,2	2	3	
		3	26,5	2	3	
Business Light Industrial	14074	1	41,3	2	3	9
		2	32,2	2	3	
		3	26,5	2	3	
Business Agriculture	561210	4	100	1	193	193
Business Catering Industry	3520	1	41,3	2	1	3
		2	32,2	2	1	
		3	26,5	2	1	
Public Park and open space	525117	4	100	1	181	181
Public Building	4821	1	41,3	2	1	3
		2	32,2	2	1	
		3	26,5	2	1	
Public Sports	20284	1	20	2	2	6
		4	80	1	4	
Public educational Institute	1375	1	41,3	2	0	1
		2	32,2	2	1	
		3	26,5	2	0	
Water	74225	4	100	1	26	26

Just for comparison no –built form type is prepared in the same area.

STUDIES

Condition – 4a

Platform	- 100 m
Slope on Platform edge	- 0
Platform area	- 4330 m2
Platform depth	- 3 m
Gap between platform	- 5 m

Platform -1

Built %	- 47 %
Road %	- 40,8 %
Green %	- 12,2 %

Platform -2

Built %	- 34,9%
Road %	- 40,8 %
Green %	- 24,3 %

Platform -3

Built %	- 0
Road %	- 91 %
Green %	- 9 %

Platform -4

Park and open space Agriculture Water

Built %	- 0
Road % (walkway)	- 33 %
Green %	- 67 %

Park –
571705 – 47400 = 524305

Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	55248	1	57,3	2	16	**32**
		2	42,7	2	16	
Business Commercial	13596	1	57,3	2	4	**8**
		2	42,7	2	4	
Business Light Industrial	14074	1	57,3	2	4	**8**
		2	42,7	2	4	
Business Agriculture	561210	4	100	1	773	**193**
Business Catering Industry	3520	1	57,3	2	1	**2**
		2	42,7	2	1	
Public Park and open space	524305	4	100	1	181	**181**
Public Building	4821	1	57,3	2	1	**2**
		2	42,7	2	1	
Public Sports	20284	1	20	2	2	**6**
		4	80	1	4	
Public educational Institute	1375	1	57,3	2	1	**1**
		2	42,7	2	0	
Water	74225	4	100	1	26	**26**

Total – 459

STUDIES

Function	Area (m2)
Living Residential	225.423
Business Commercial	19.602
Business Light Industrial	9.801
Business Catering Industry	9.801
Public Building	9.801
Public Sports	29.403
Public educational Institute	9.801
Public forest	137.214
Public grass land	147.015

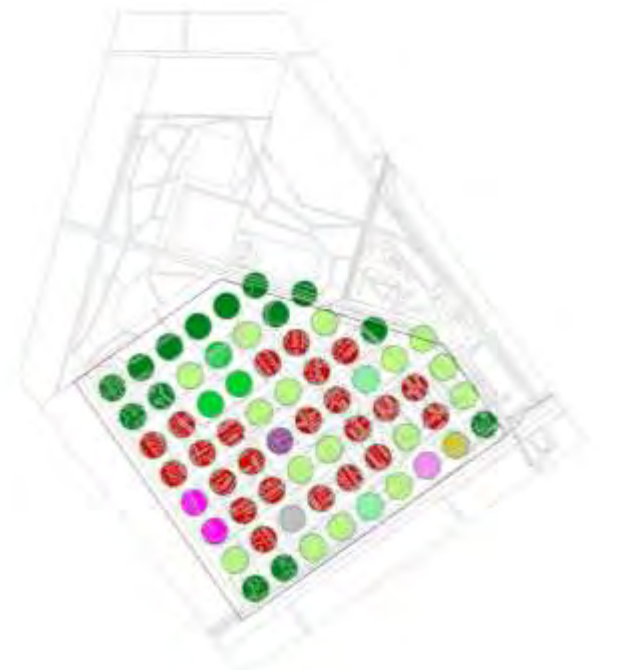
Total area **597.861 m2**

Total boundary area – 641.974 m2

- Re-mapping the functions and the boundary

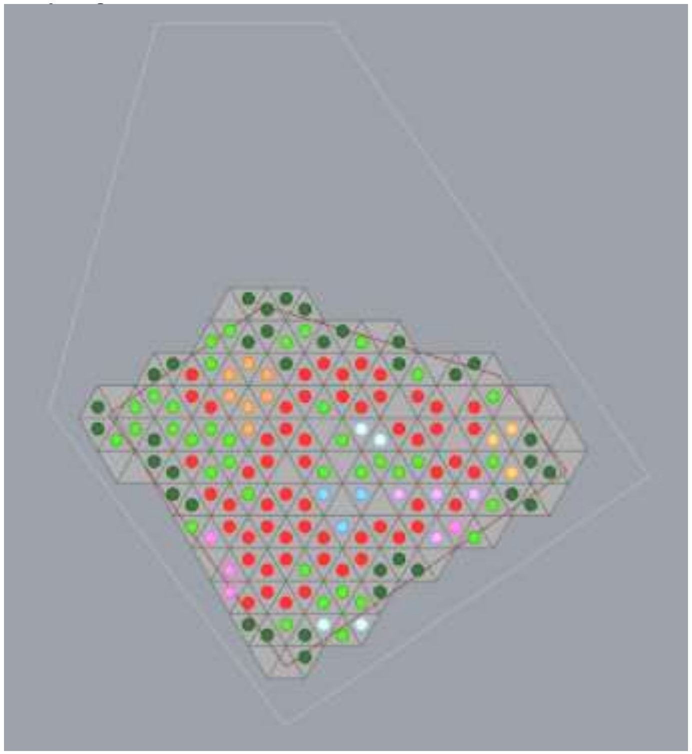
STUDIES

Function	Foot print (m2)
Living Residential	53.936
Business Commercial	7.706
Business Light Industrial	3.059
Business Catering Industry	580
Public Building	4.821
Public Sports	20.284
Public educational Institute	1.375
Public forest	113.347
Public grass land	114.372
Total area	**319.480 m2**

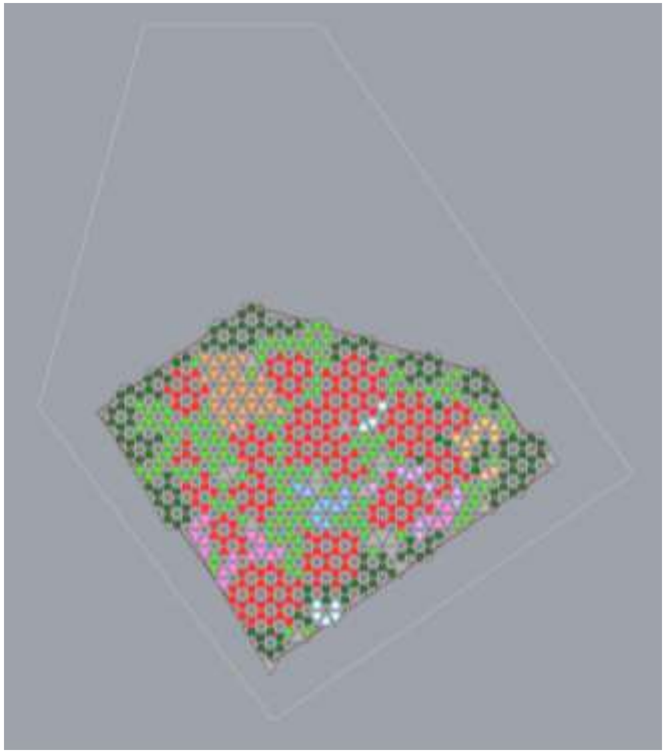


STUDIES

The distribution of the functions on triangle



100 meter platform.



50 meter platform.

- Distribution of functions based on the total area. So to see how functions are placed.

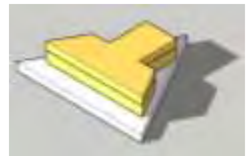
STUDIES

Same boundary profile as Tollebeek.

Condition – 1

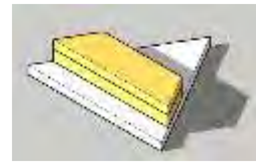
Platform	- **50 m**
Slope on Platform edge	- 0
Platform area	- 1083 m2
Platform depth	- 3 m
Gap between platform	- **5 m**

Platform -1



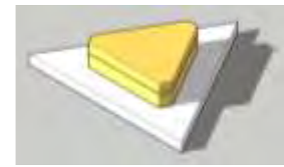
Built % - 51,4 %
Road % (walkway) - 26 %
Green % - 22,6 %

Platform -2



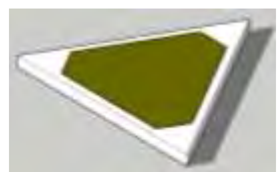
Built % - 40 %
Road % (walkway) - 26 %
Green % - 34%

Platform -3

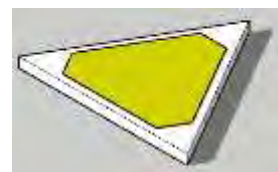


Built % - 33 %
Road % (walkway) - 67 %
Green % - 0

Platform -4



Forest



Grass Land

Built % - 0
Road % (walkway) - 33 %
Green % - 67 %

Grass Land –
114372 – 33715 =
80657

STUDIES

Same boundary profile as Tollebeek.

Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	53936	1	41,3	2	40	**120**
		2	32,2	2	40	
		3	26,5	2	40	
Business Commercial	7706	1	41,3	2	6	**18**
		2	32,2	2	6	
		3	26,5	2	6	
Business Light Industrial	3059	1	41,3	2	2	**6**
		2	32,2	2	2	
		3	26,5	2	2	
Business Catering Industry	580	1	41,3	2	1	**1**
		2	32,2	2	0	
		3	26,5	2	0	
Public Building	4821	1	41,3	2	4	**12**
		2	32,2	2	4	
		3	26,5	2	4	
Public Sports	20284	1	20	2	7	**22**
		4	80	1	15	
Public educational Institute	1375	1	41,3	2	1	**3**
		2	32,2	2	1	
		3	26,5	2	1	
Public forest	113347	4	100	1	156	**156**
Public Grass land	80657	4	100	1	111	**111**

Total – 449

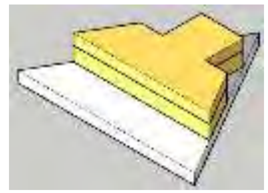
STUDIES

Same boundary profile as Tollebeek.

Condition – 2

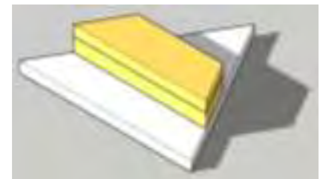
Platform	- **50 m**
Slope on Platform edge	- 0
Platform area	- 1083 m2
Platform depth	- 3 m
Gap between platform	- **5 m**

Platform -1



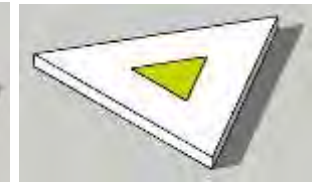
Built %	- 47 %
Road %	- 40,8 %
Green %	- 12,2 %

Platform -2



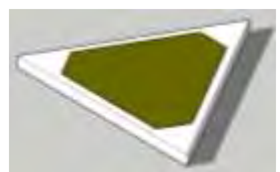
Built %	- 34,9%
Road %	- 40,8 %
Green %	- 24,3 %

Platform -3

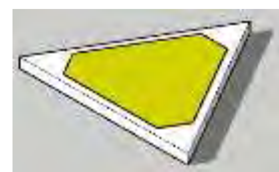


Built %	- 0
Road %	- 91 %
Green %	- 9 %

Platform -4



Forest



Grass land

Built %	- 0
Road % (walkway)	- 33 %
Green %	- 67 %

Grass Land –
114372 – 33180 =
81192

STUDIES

Same boundary profile as Tollebeek.

Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	53936	1	57,3	2	61	
		2	42,7	2	61	
						122
Business Commercial	7706	1	57,3	2	9	
		2	42,7	2	9	
						18
Business Light Industrial	3059	1	57,3	2	3	
		2	42,7	2	3	
						6
Business Catering Industry	580	1	57,3	2	1	
		2	42,7	2	1	
						2
Public Building	4821	1	57,3	2	5	
		2	42,7	2	5	
						10
Public Sports	20284	1	20	2	8	**23**
		4	80	1	15	
Public educational Institute	1375	1	57,3	2	2	
		2	42,7	2	2	
						4
Public forest	113347	4	100	1	156	**156**
Public Grass land	81192	4	100	1	112	**112**

Total – 453

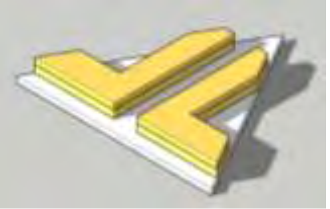
STUDIES

Condition – 3

Platform - **100 m**
Slope on Platform edge - 0
Platform area - 4330 m2
Platform depth - 3 m
Gap between platform - **5 m**

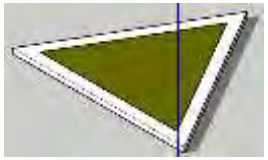
Same boundary profile as Tollebeek.

Platform -1

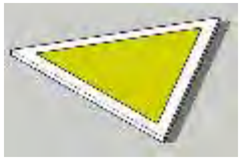


Built % - 48,9 %
Road % - 26,7 %
Green % - 24,4 %

Platform -2



Forest



Grass Land

Built % - 0
Road % (walkway) - 37 %
Green % - 63 %

Grass land – 114372 – 35881 = 78491

Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	53936	1	100	2	25	25
Business Commercial	7706	1	100	2	4	4
Business Light Industrial	3059	1	100	2	1	1
Business Catering Industry	580	1	100	2	1	1
Public Building	4821	1	100	2	2	2
Public Sports	20284	1	20	2	2	6
		2	80	1	4	
Public educational Institute	1375	1	100	2	1	1
Public Forest	113347	2	100	1	42	42
Public Grass Land	78491	2	100	1	29	29

Total – 111

STUDIES

Condition – 4

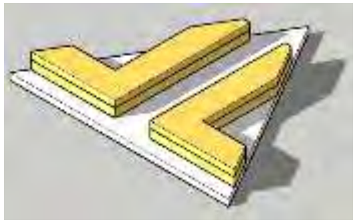
Platform - **100 m**
Slope on Platform edge - 0
Platform area - 4330 m2
Platform depth - 3 m
Gap between platform - **5 m**

Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	53936	1	100	2	29	**29**
Business Commercial	7706	1	100	2	4	**4**
Business Light Industrial	3059	1	100	2	2	**2**
Business Catering Industry	580	1	100	2	1	**1**
Public Building	4821	1	100	2	3	**3**
Public Sports	20284	1	20	2	2	**6**
		2	80	1	4	
Public educational Institute	1375	1	100	2	1	**1**
Public Forest	113347	2	100	1	42	**42**
Public Grass Land	86548	2	100	1	32	**32**

Total – 122

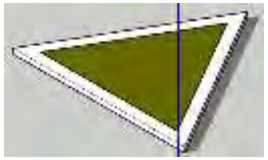
Same boundary profile as Tollebeek.

Platform -1

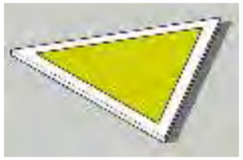


Built % - 43,6 %
Road % - 41,1 %
Green % - 15,3 %

Platform -2



Forest



Grass land

Built % - 0
Road % (walkway) - 37 %
Green % - 63 %

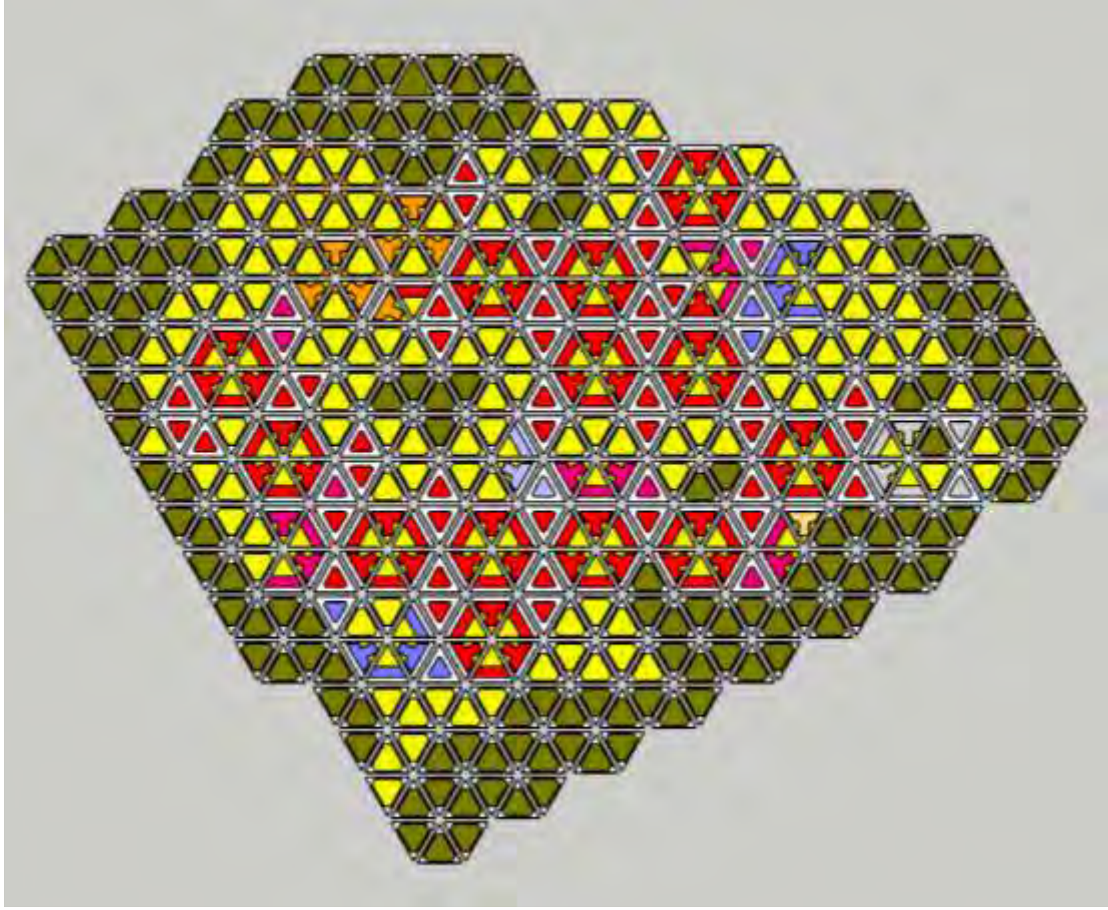
Grass land – 114372 – 27824 = 78491

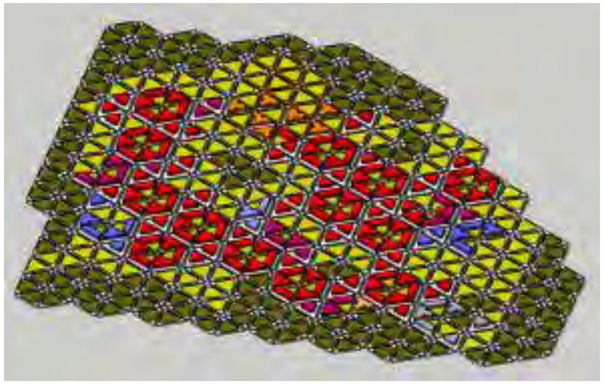
- As we keep changing the parameters- the outputs are constantly changing.
- Through this we can compare and opt a better results.

STUDIES

Condition – 1

Output –



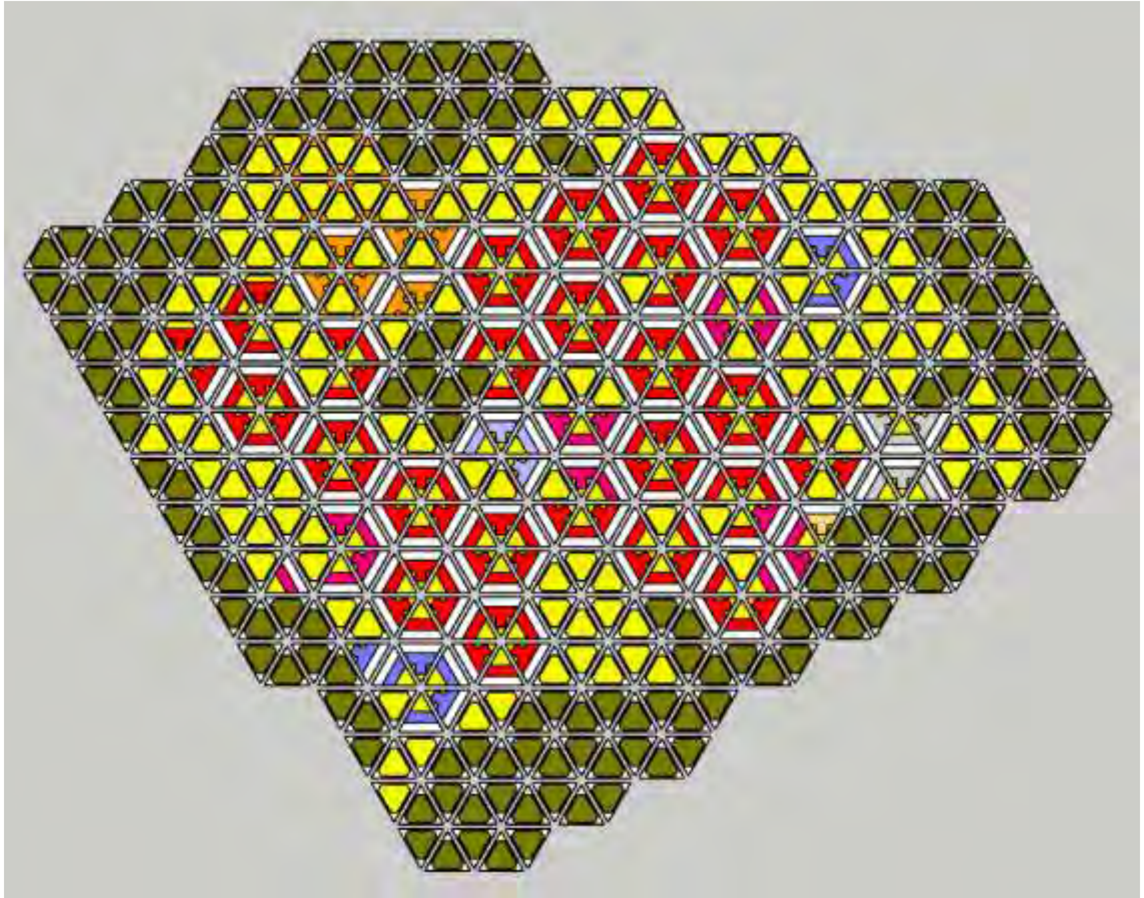


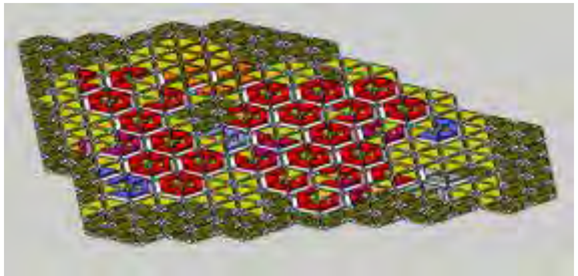
- This output is based on the exact placement of functions as in Tollebeek study and the number of platforms as we got in the previous output.

STUDIES

Condition – 2

Output –

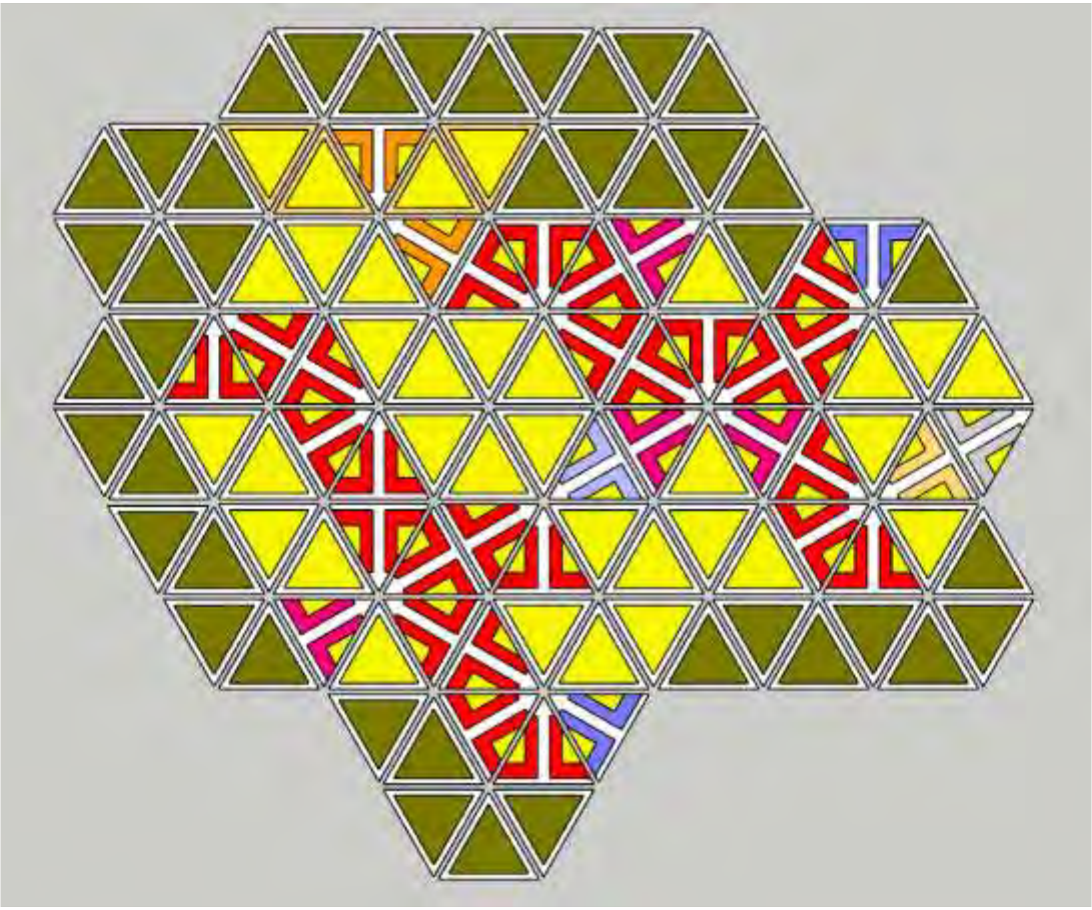


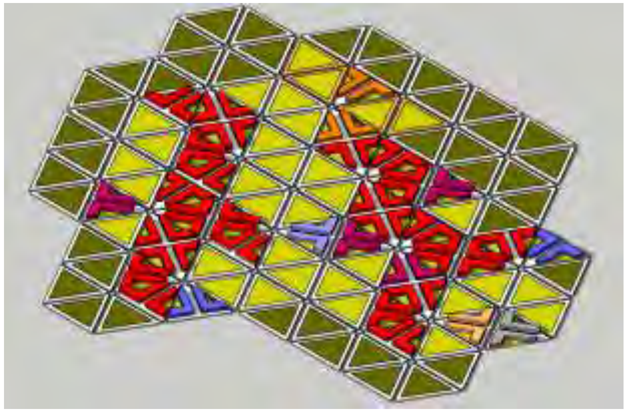


STUDIES

Condition – 3

Output –

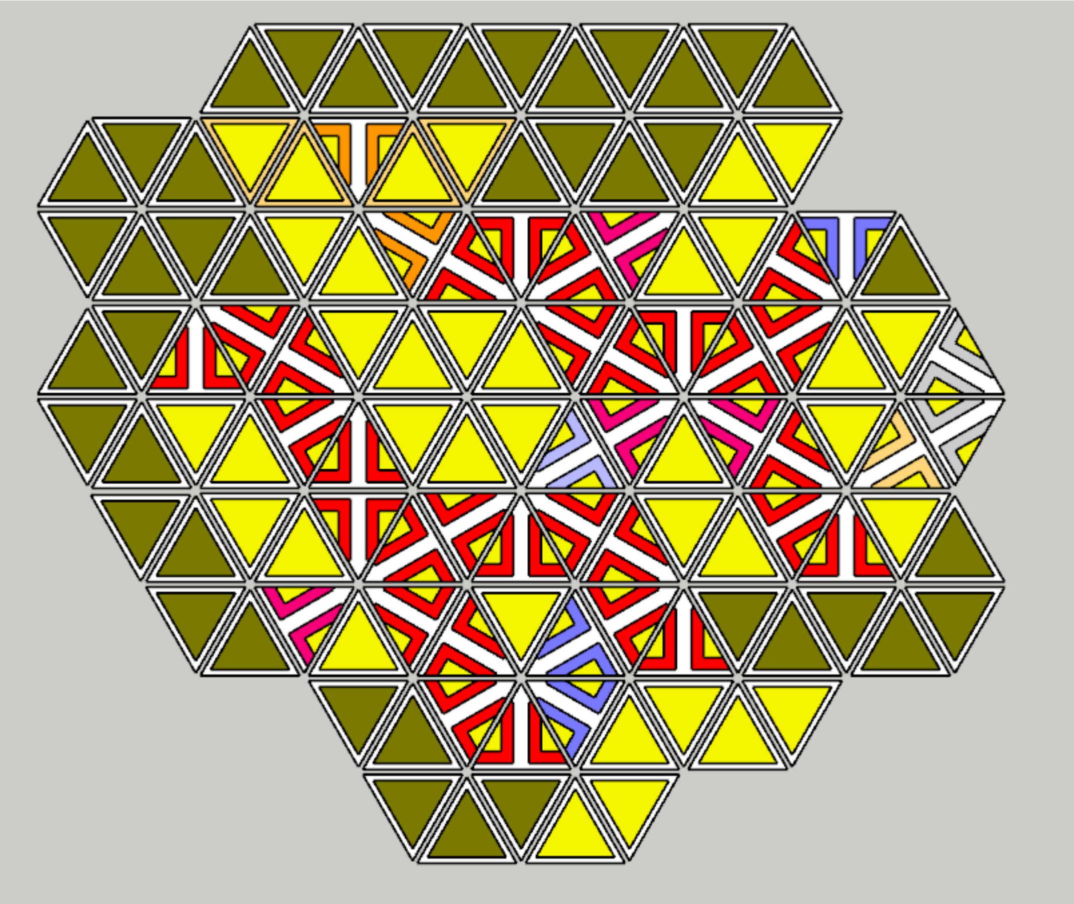


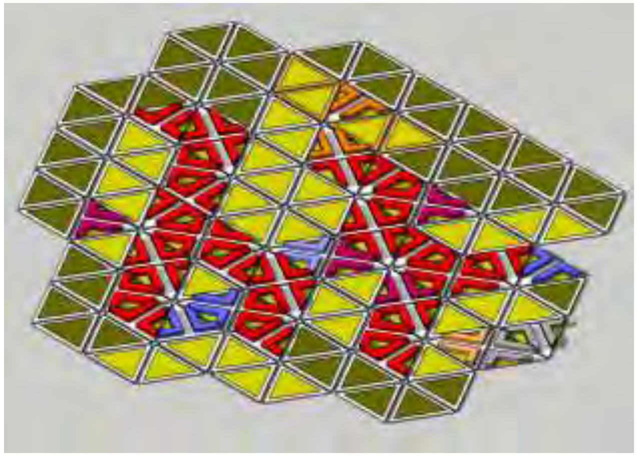


STUDIES

Condition – 4

Output –

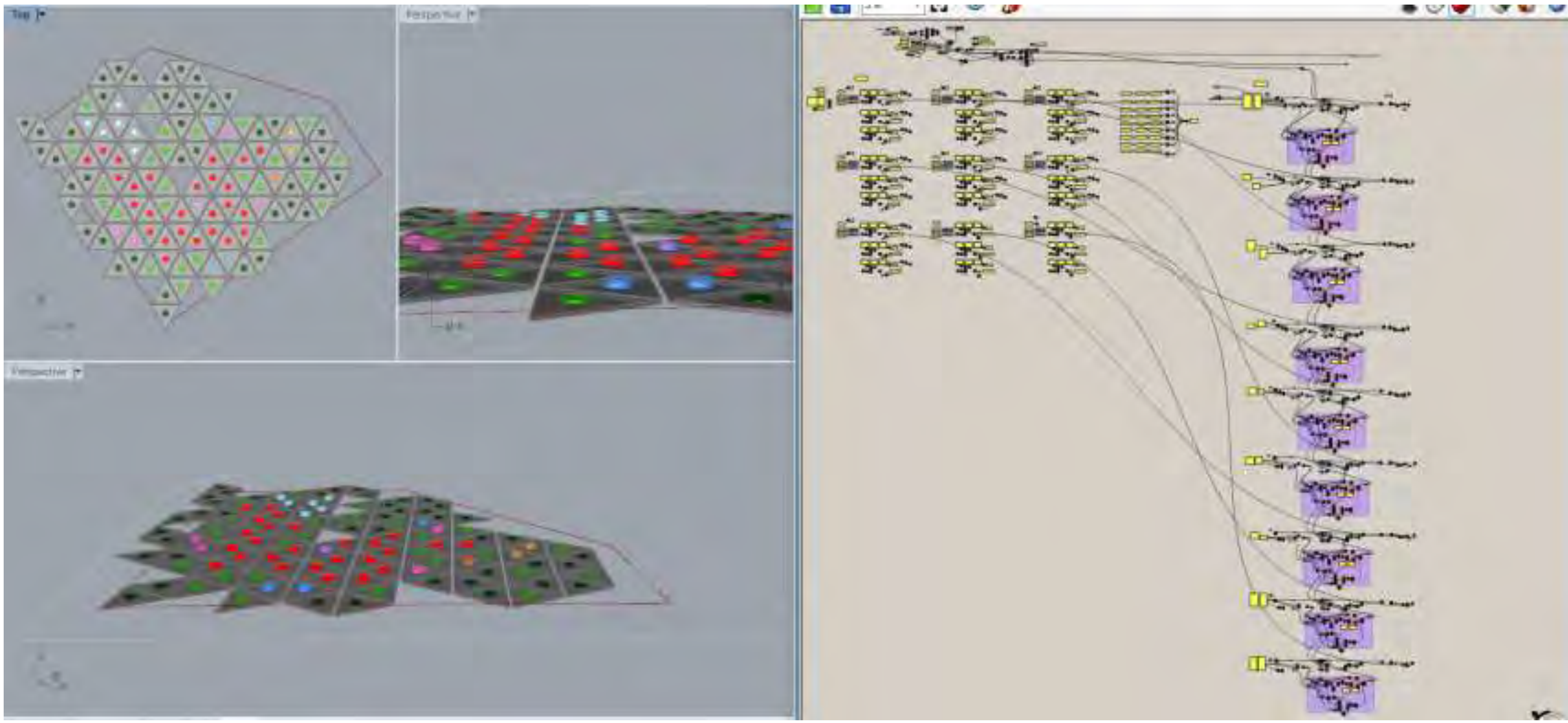




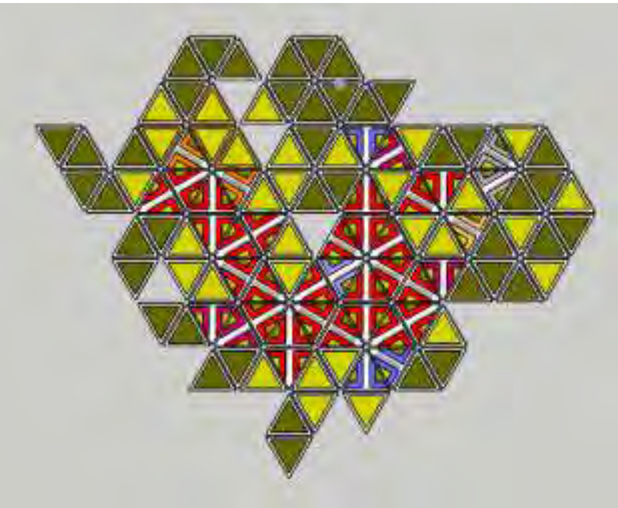
- Now with this we can further rearrange the platforms to match with entry points to the city by road networks.

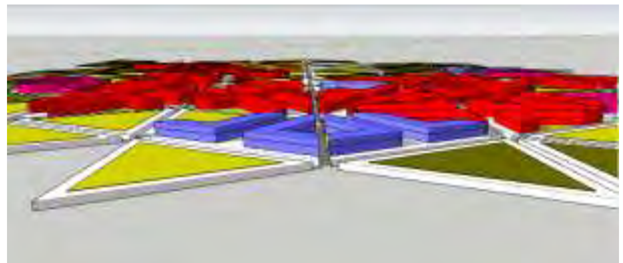
STUDIES

The integrated script till the previous studies.
In up coming slides - shown the outputs of **condition -3, when we tune the parameters.**



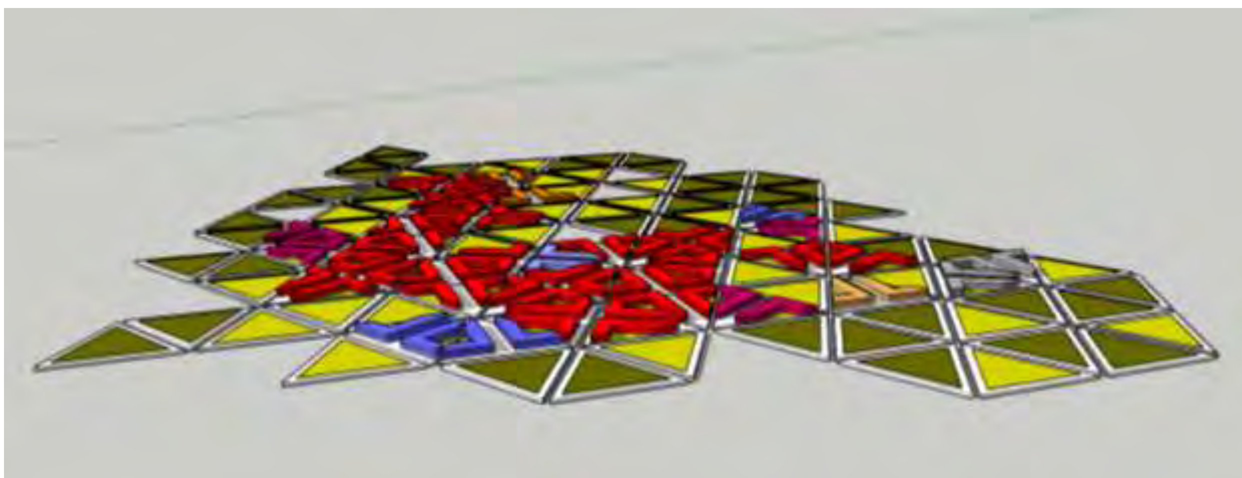
STUDIES

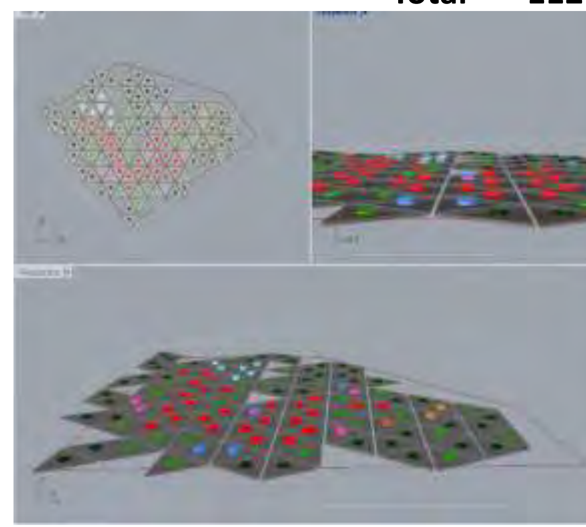




Function	Type	No of Layers	Total Platforms
Living Residential	1	2	**26**
Business Commercial	1	2	**4**
Business Light Industrial	1	2	**2**
Business Catering Industry	1	2	**1**
Public Building	1	2	**3**
Public Sports	1	2	**6**
	2	1	
Public educational Institute	1	2	**1**
Public Forest	2	1	**42**
Public Grass Land	2	1	**27**

Total – 112

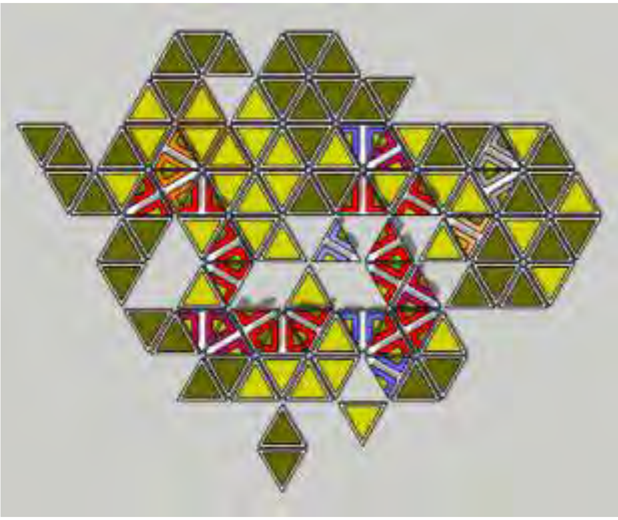


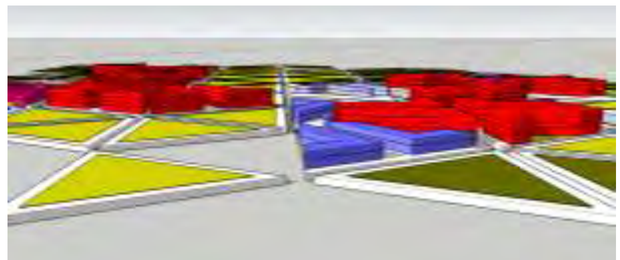


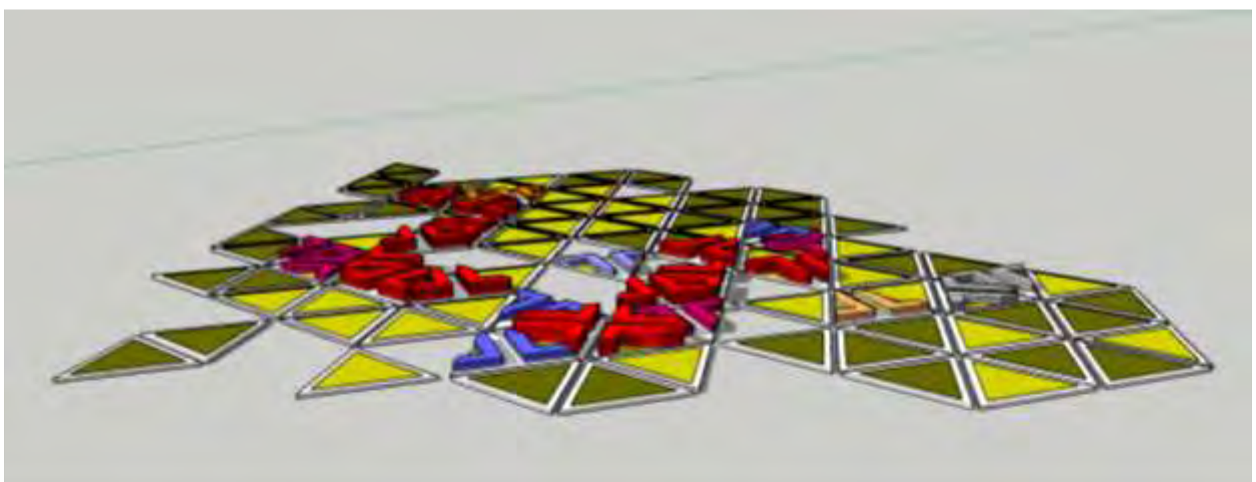
STUDIES

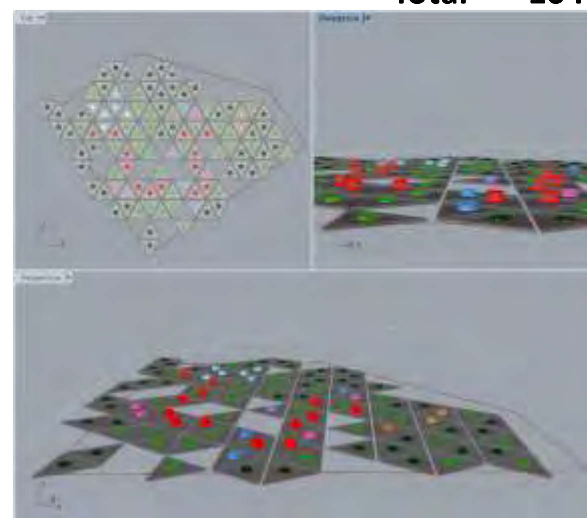
Function	Type	No of Layers	Total Platforms
Living Residential	1	4	**13**
Business Commercial	1	2	**4**
Business Light Industrial	1	2	**2**
Business Catering Industry	1	2	**1**
Public Building	1	2	**3**
Public Sports	1	2	**6**
	2	1	
Public educational Institute	1	2	**1**
Public Forest	2	1	**42**
Public Grass Land	2	1	**32**

Total – 104





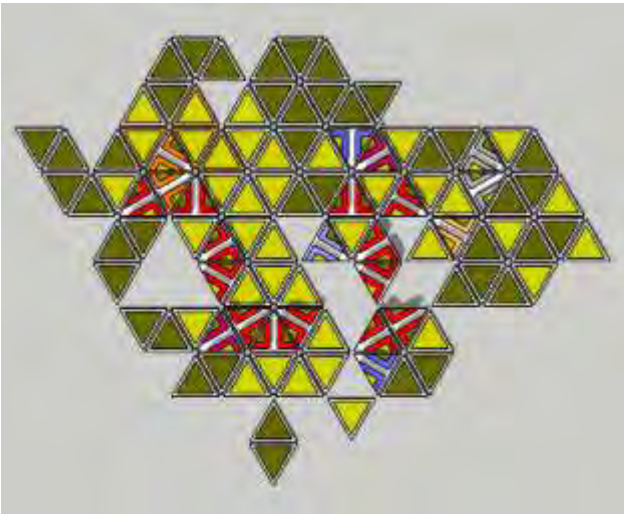


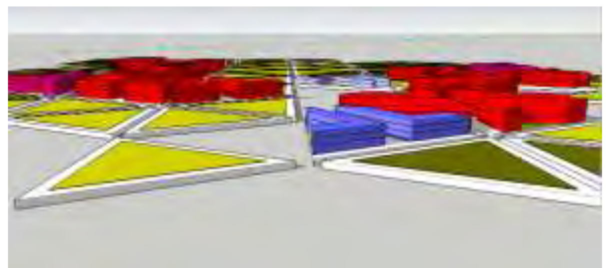


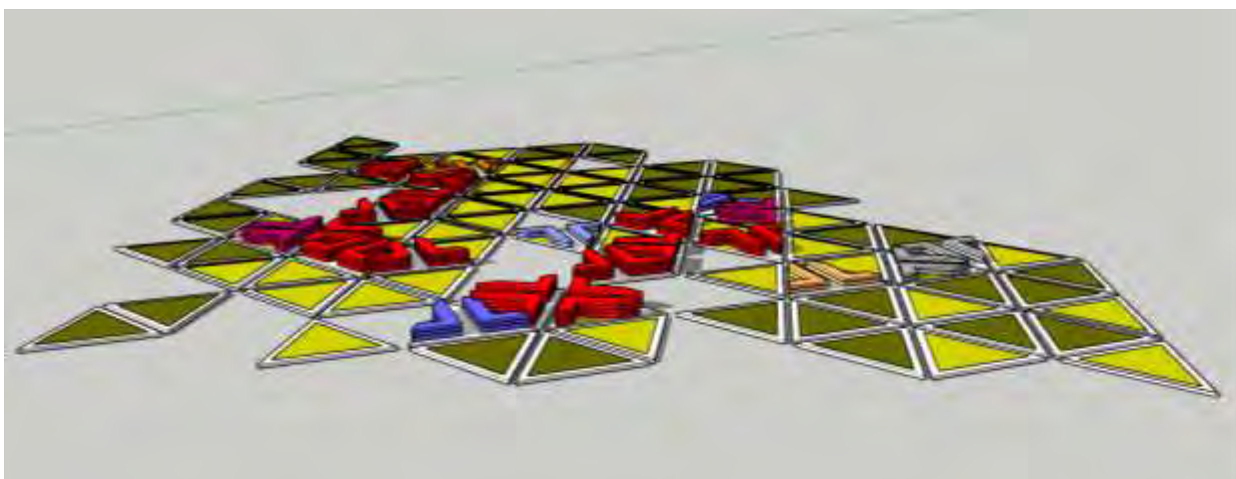
STUDIES

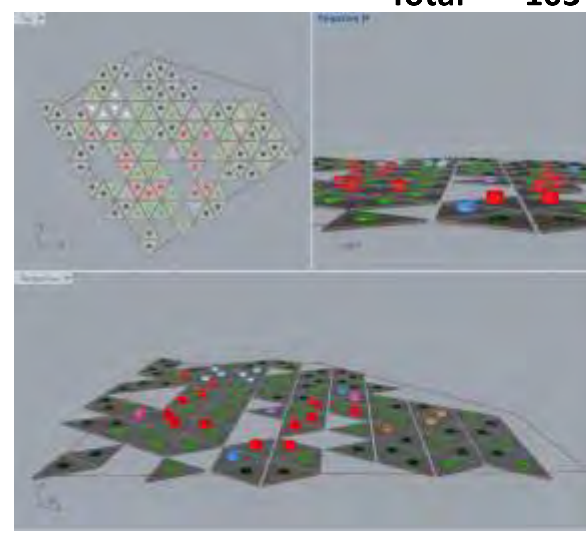
Function	Type	No of Layers	Total Platforms
Living Residential	1	4	**13**
Business Commercial	1	4	**2**
Business Light Industrial	1	2	**2**
Business Catering Industry	1	2	**1**
Public Building	1	3	**2**
Public Sports	1	2	**6**
	2	1	
Public educational Institute	1	2	**1**
Public Forest	2	1	**42**
Public Grass Land	2	1	**34**

Total – 103

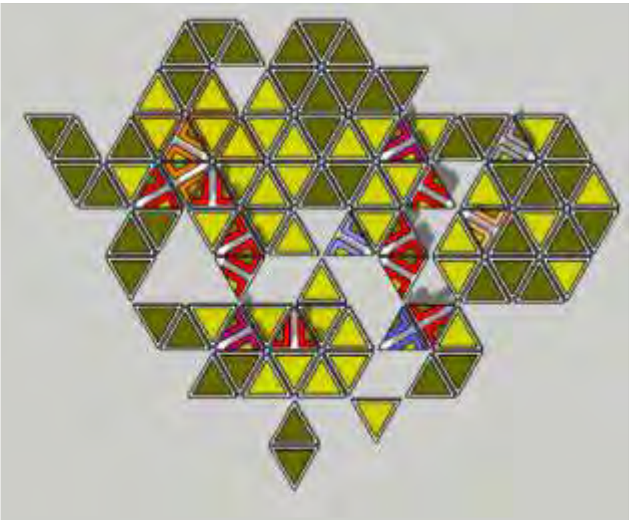


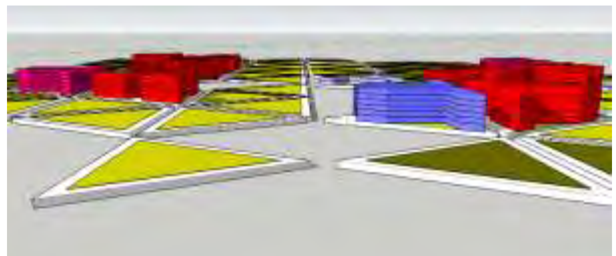






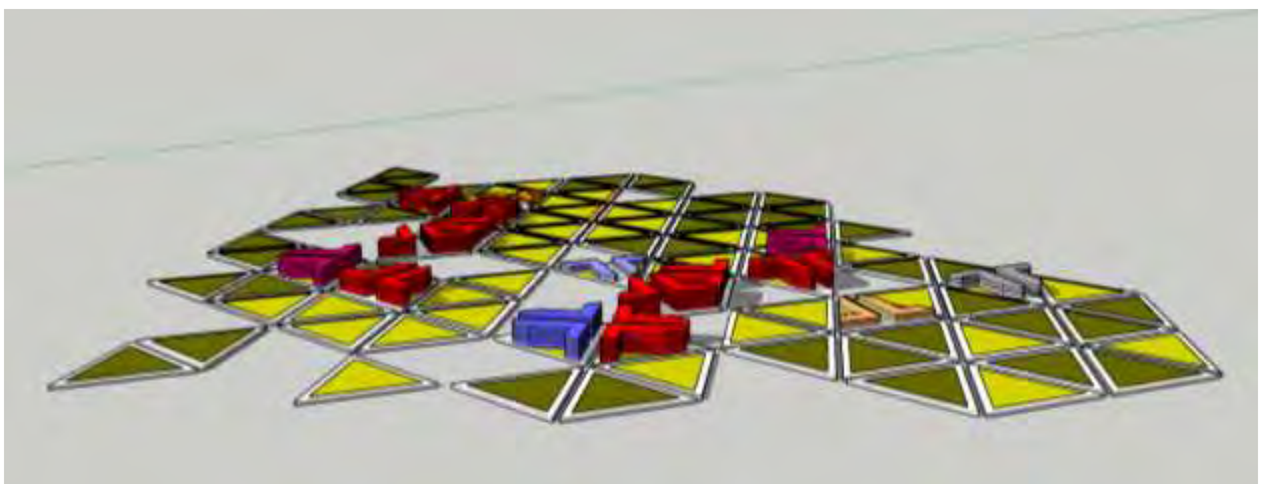
STUDIES

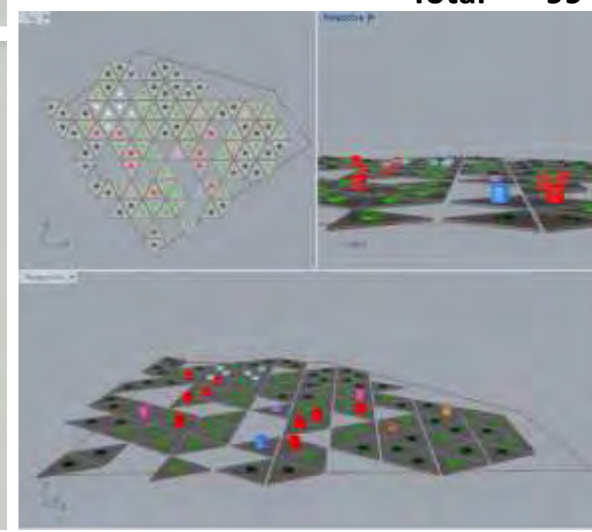




Function	Type	No of Layers	Total Platforms
Living Residential	1	6	**9**
Business Commercial	1	6	**2**
Business Light Industrial	1	4	**1**
Business Catering Industry	1	2	**1**
Public Building	1	6	**1**
Public Sports	1	2	**6**
	2	1	
Public educational Institute	1	2	**1**
Public Forest	2	1	**42**
Public Grass Land	2	1	**36**

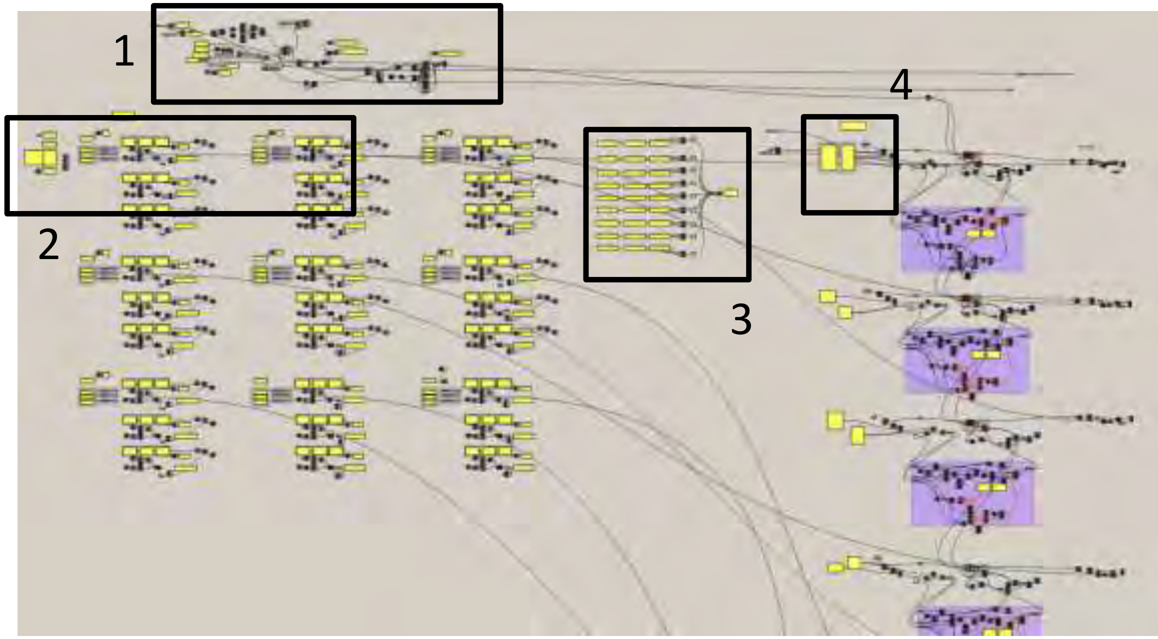
Total – 99





STUDIES

Pictures showing the works flow of the script -

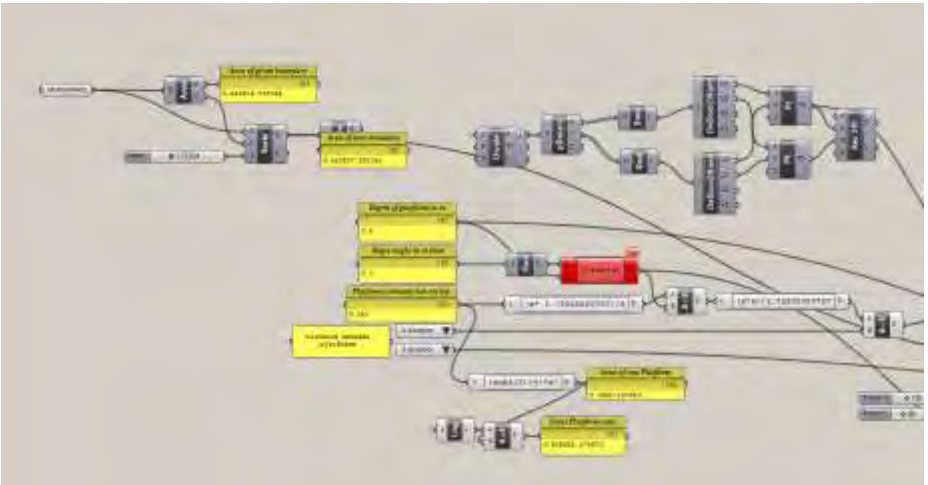


PARAMETERS

Size of the Platforms	Depth of the Platforms	Distance between platforms
Number of typologies	Distribution of typologies	No. Of layers per typology
No. Of Blocks	Proportion of each Block	Slope on edge of Platforms

STUDIES

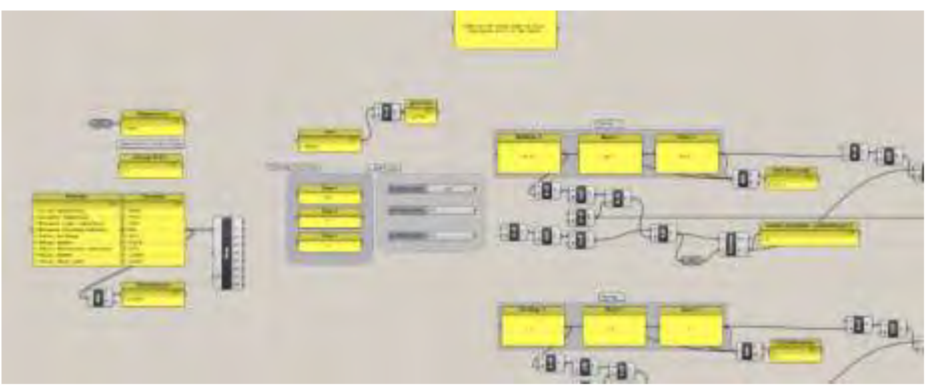
1- Assign the boundary and set the conditions for the platform.

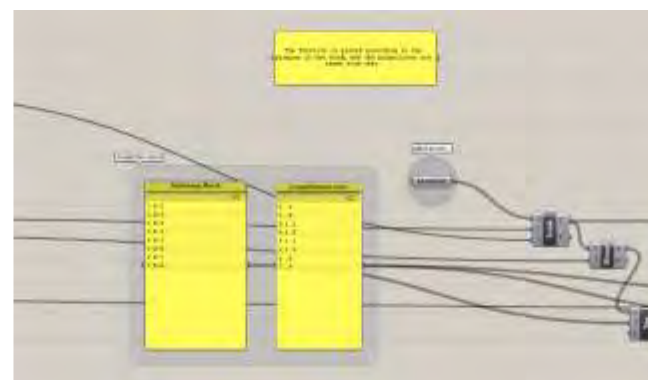


2 – From the study pick the typology and fill in the data and combinations.

3- Once we assign the combinations – we get number of platforms. Then based on this we decide number of blocks we need per function, then define them.

4- Place/define the function locations – we get a output on how the function is place and the density diagram.





STUDIES

Observations –

- We can optimize the number of platforms, based on the density and the typology we use.
- We can define number of typologies and can see their combinations also.
- After arriving at a better results and combination, we can reorganize the platforms- to bring a compact organization.
- The road network is defined in the typologies. For main network if a separate typology needed, can be integrate with script or we can add extra platforms for this purpose.
- Water network doesn’t effect much, we just have to widen the space between the platforms along the route.

STUDIES

Observations –

- Till now we have placed the function in position with the existing one on Tollebeek, also the boundary – due to which we get blank space in between because the functions are not moving relatively when the density increases.
- Next step is to attempt on this issue.

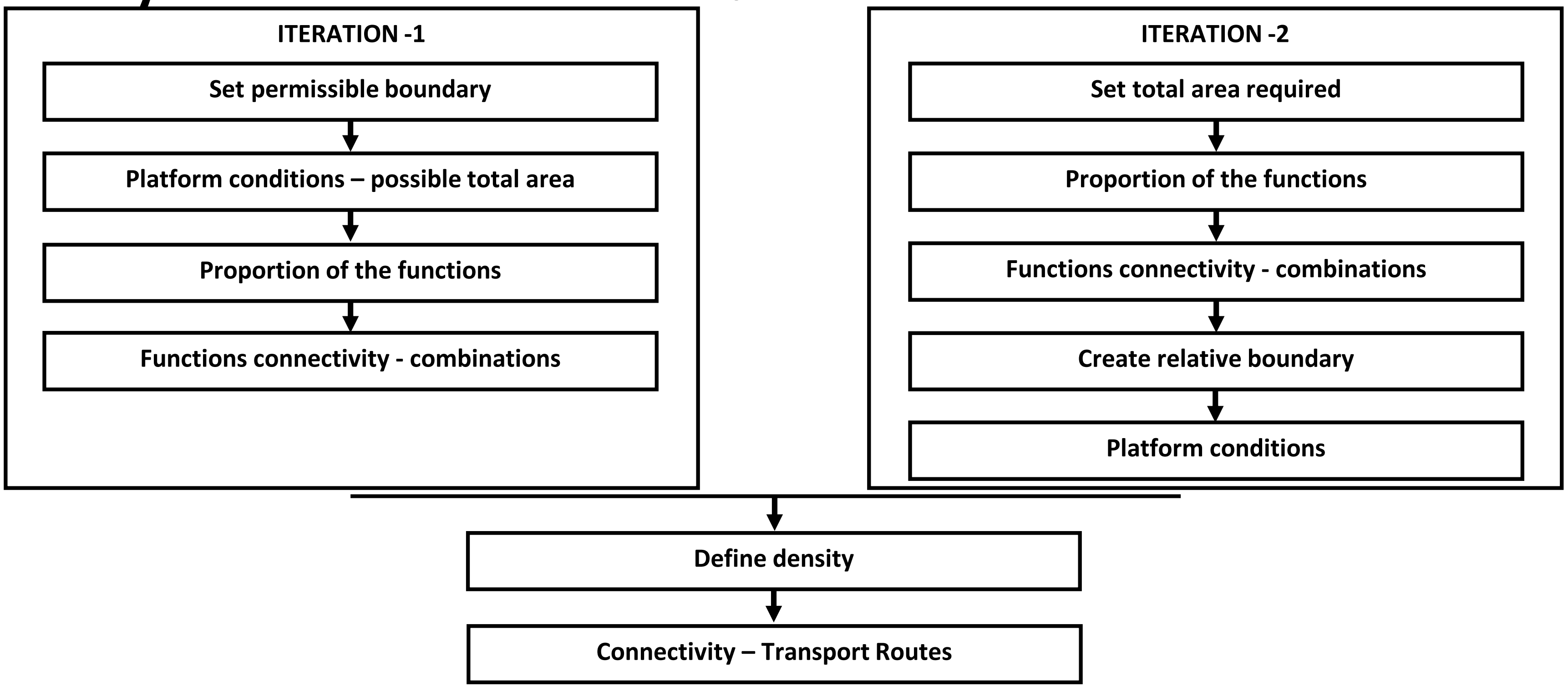
In our study -4

- We attempt to understand how functions can organize themselves based on the connectivity which we define. Also it can create its own boundary based on the organizations.

STUDIES

Study – 4

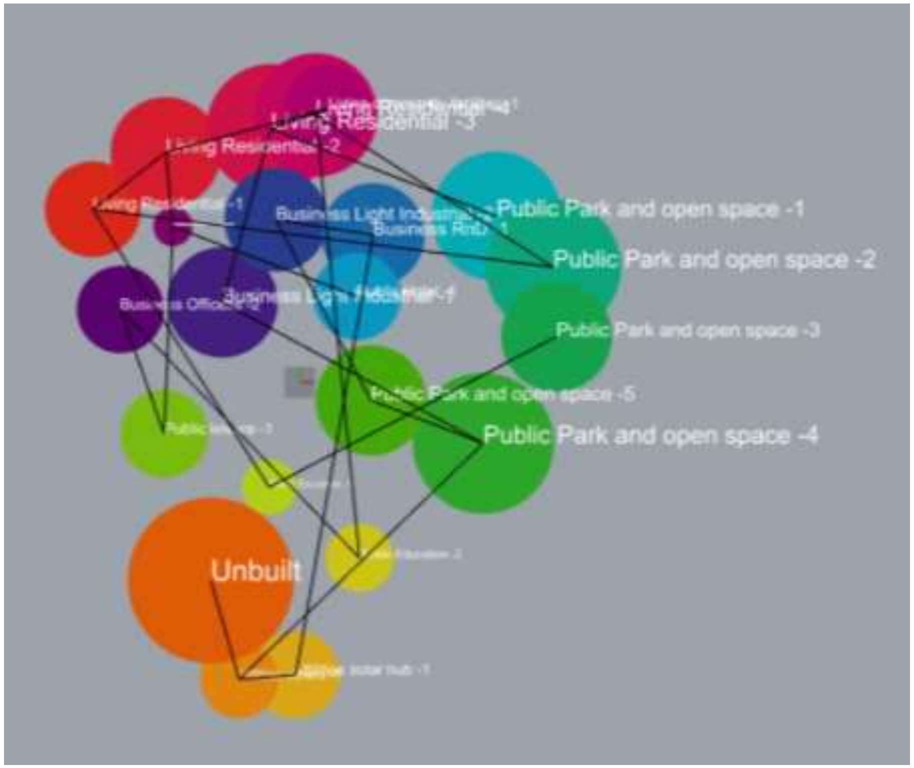
Script work flow

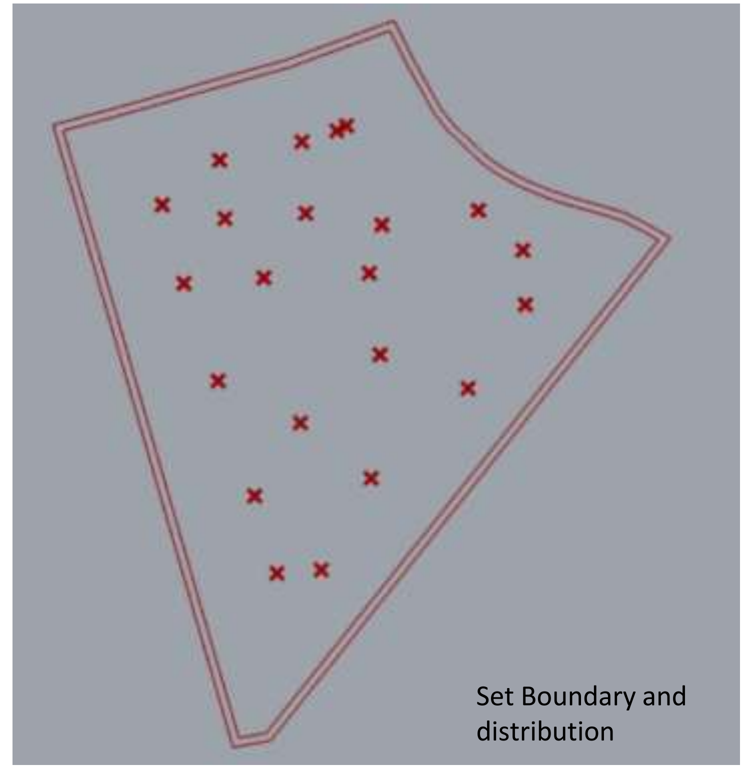


- This is the study – 4, where we test how to arrange the function in a defined boundary or create its own boundry.
- There is two possible approach. This is tested with Masdar City data.
- This script was attempted paralley. Now we try to merge both the scripts.

STUDIES

Trial -1

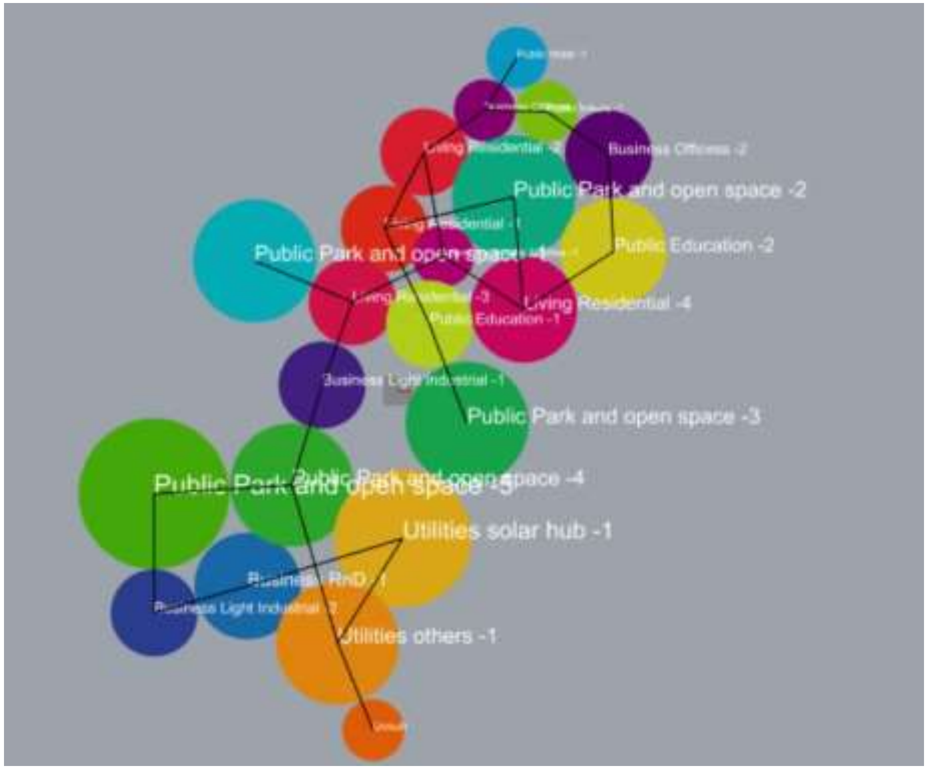


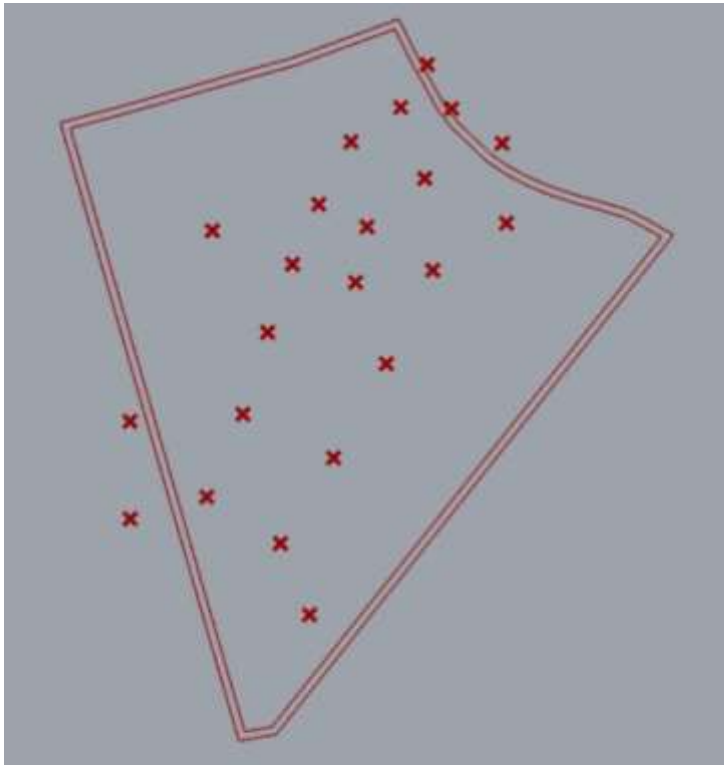


Set Boundary and distribution

Understanding the program connectivity within the set boundary.

STUDIES



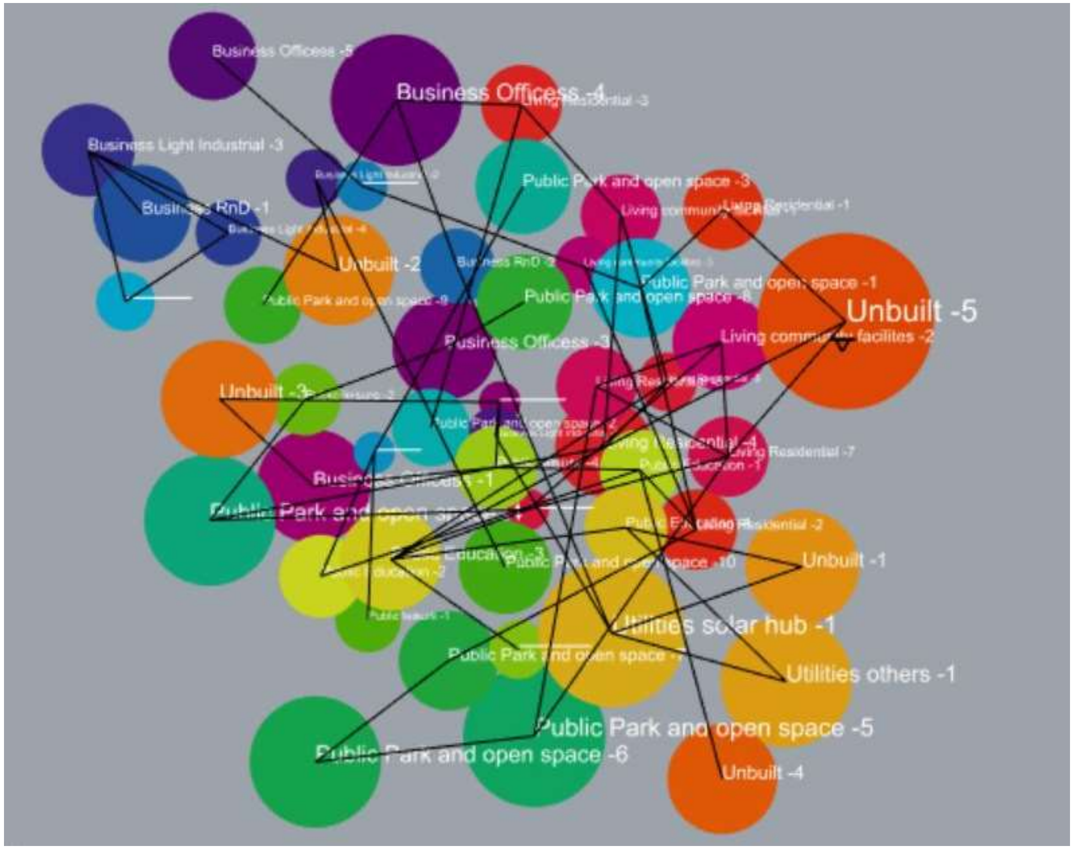


The buildable area is far lesser compared to the boundary area – based on the platform conditions.

The program combinations were limited – because of the boundary. Re-configuring with in same boundary was limited.

STUDIES

Trial -2



The possibilities of function combination is more.
We can change the function connectivity to re-configure.

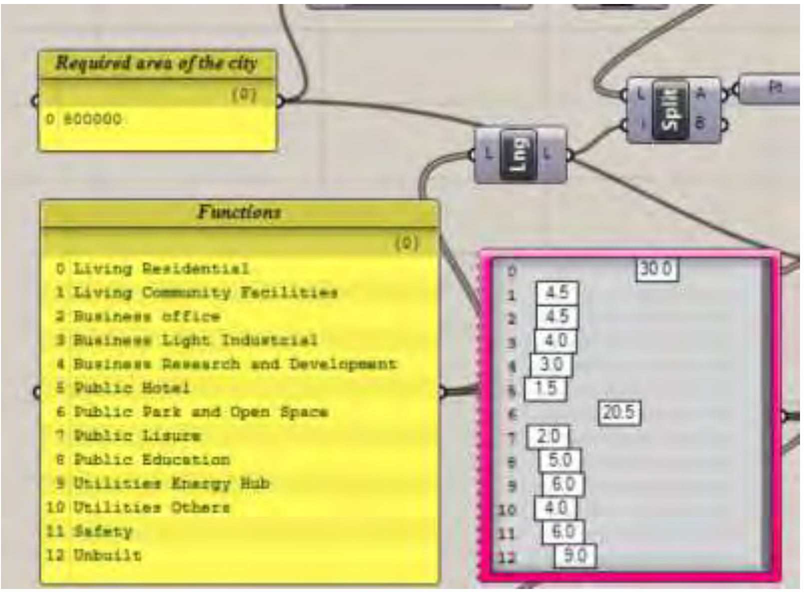
The boundary is set based on the distribution.

The number of functions and proportions has to be redefined to get a better defined layout.

Redefining the script to accommodate the function and its distribution.

STUDIES

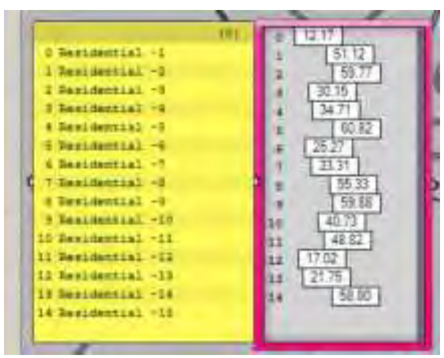
Script Definition -



The functions are listed based on the case study-

The area proportions.

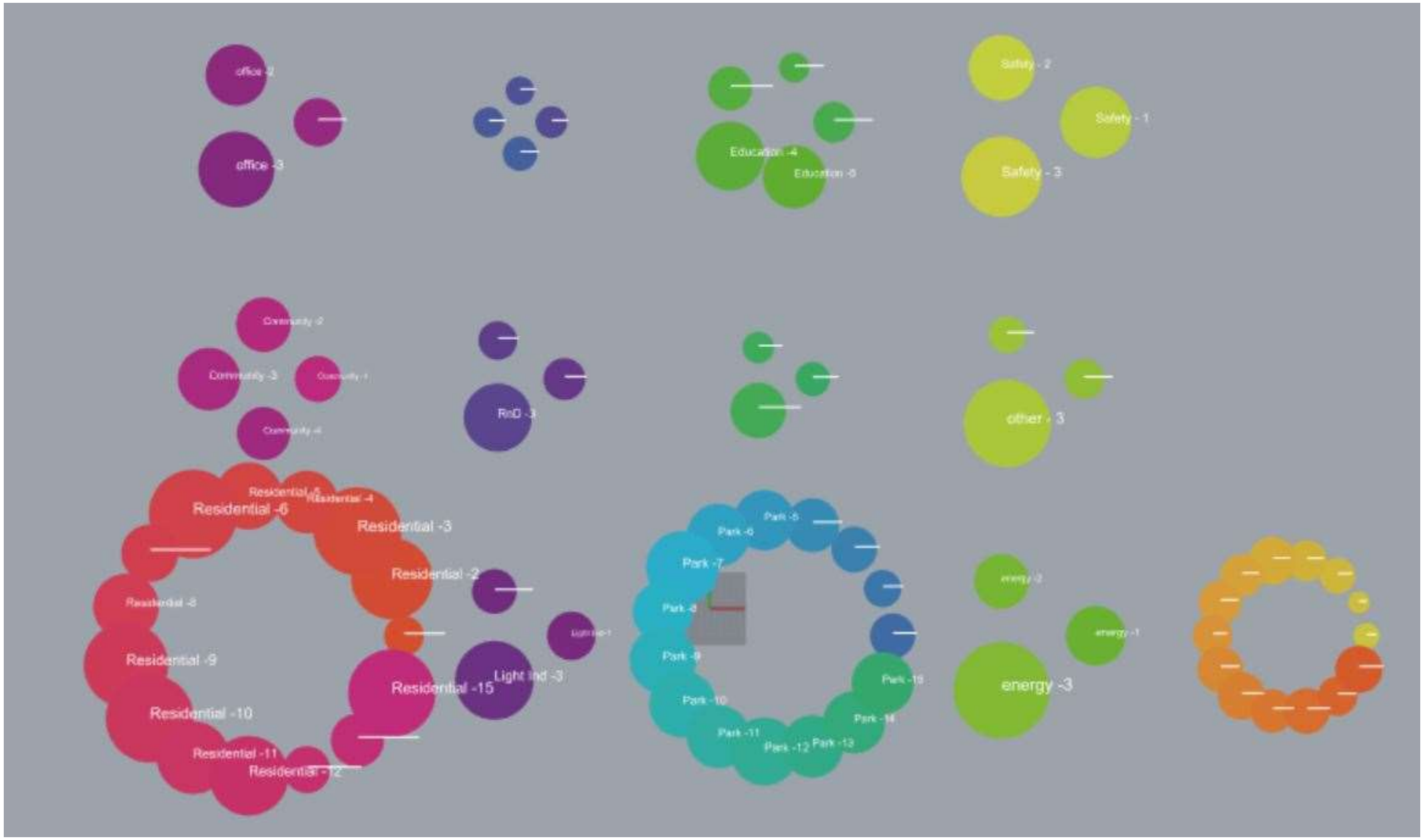
It s 10% of Masdar city area.



Further splitting the functions - to URBAN BLOCKS, get a grip on defining the connectivity.

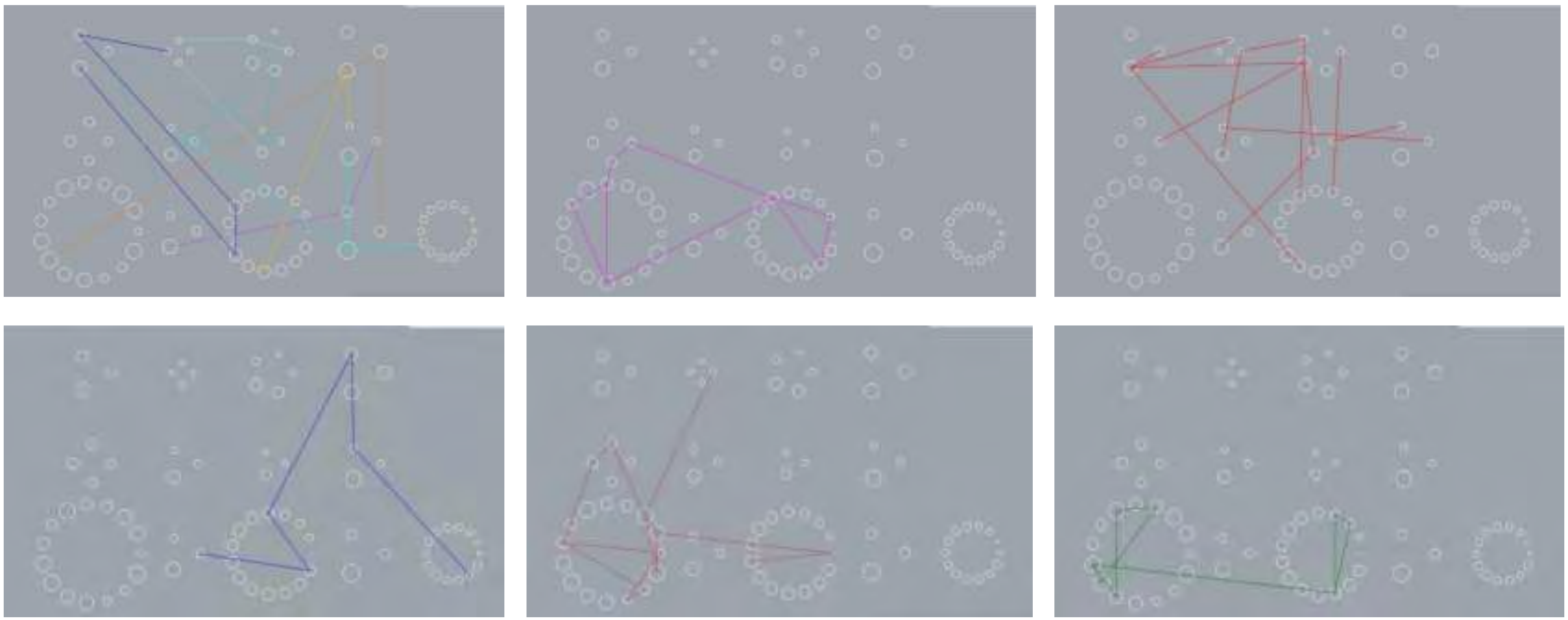
STUDIES

List of functions defined and the proportionate area – URBAN BLOCKS



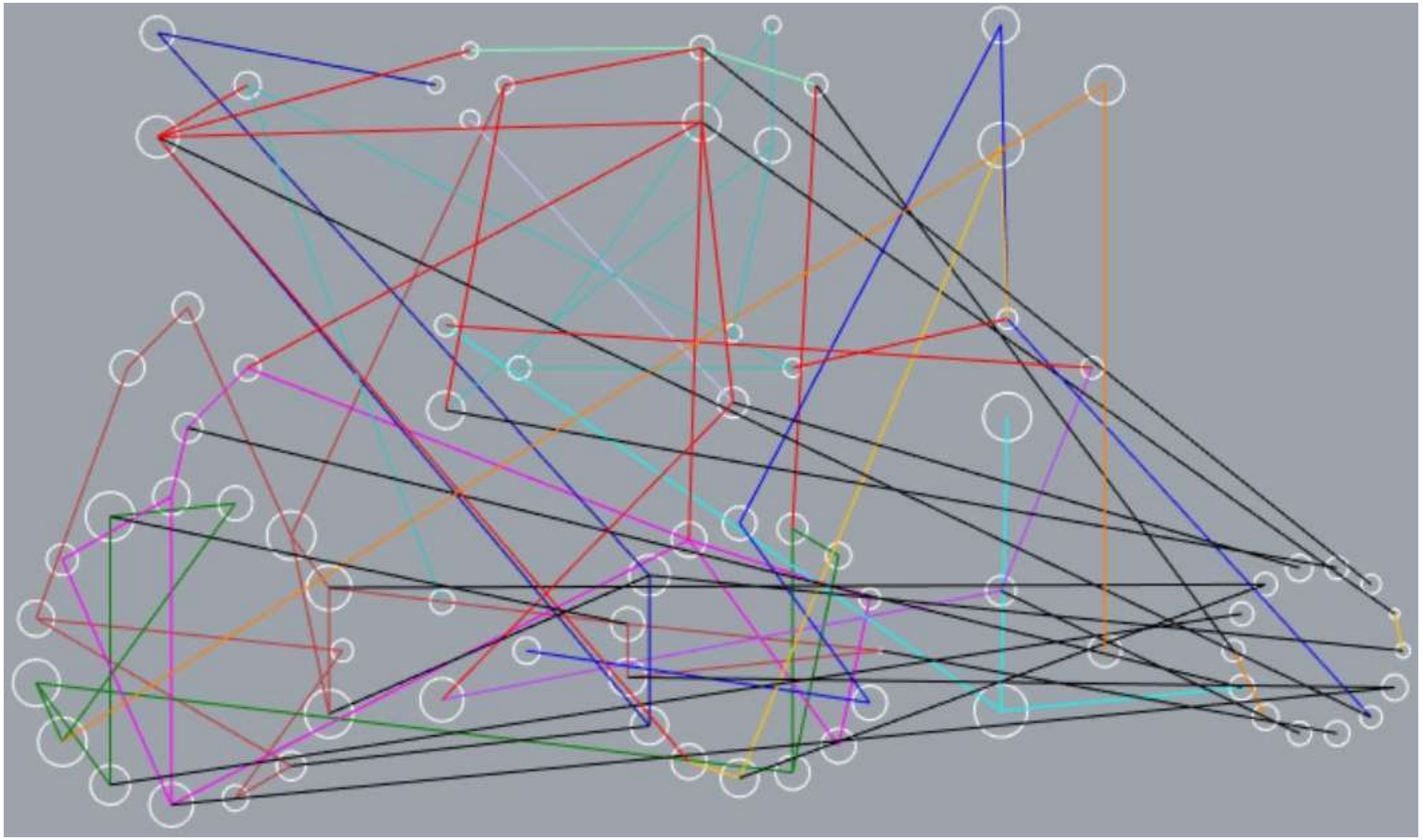
STUDIES

Defining connectivity between functions -



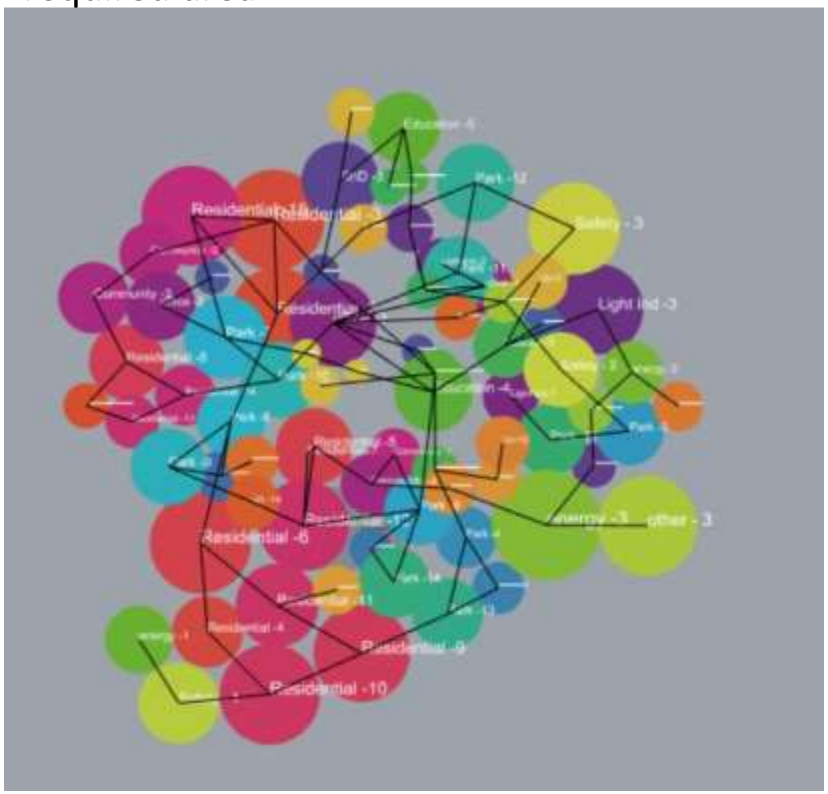
STUDIES

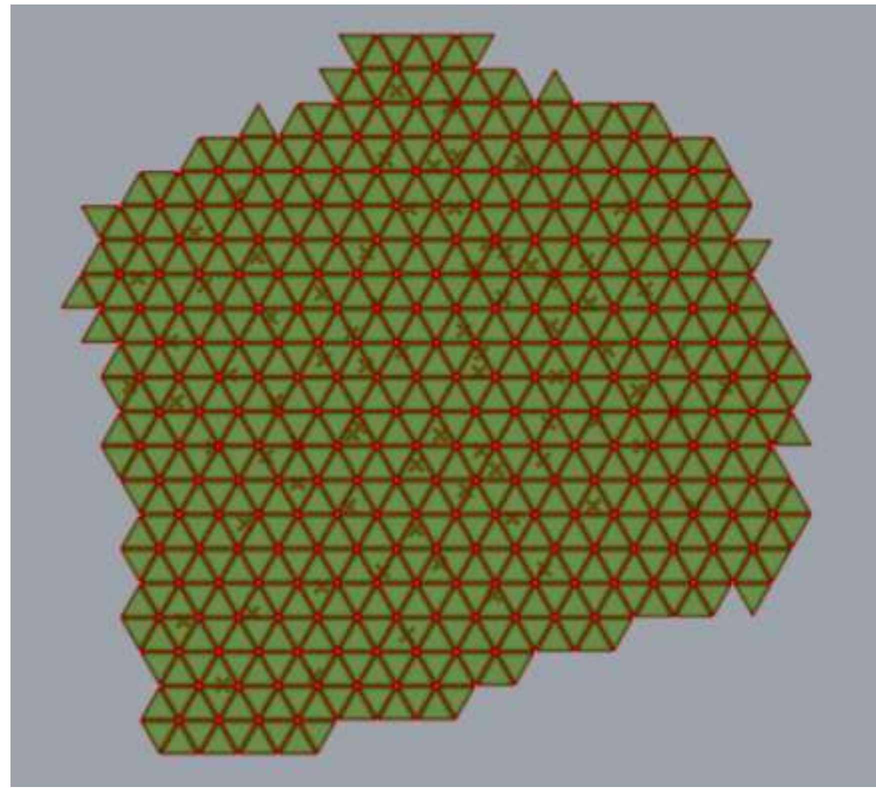
All connectivity -



STUDIES

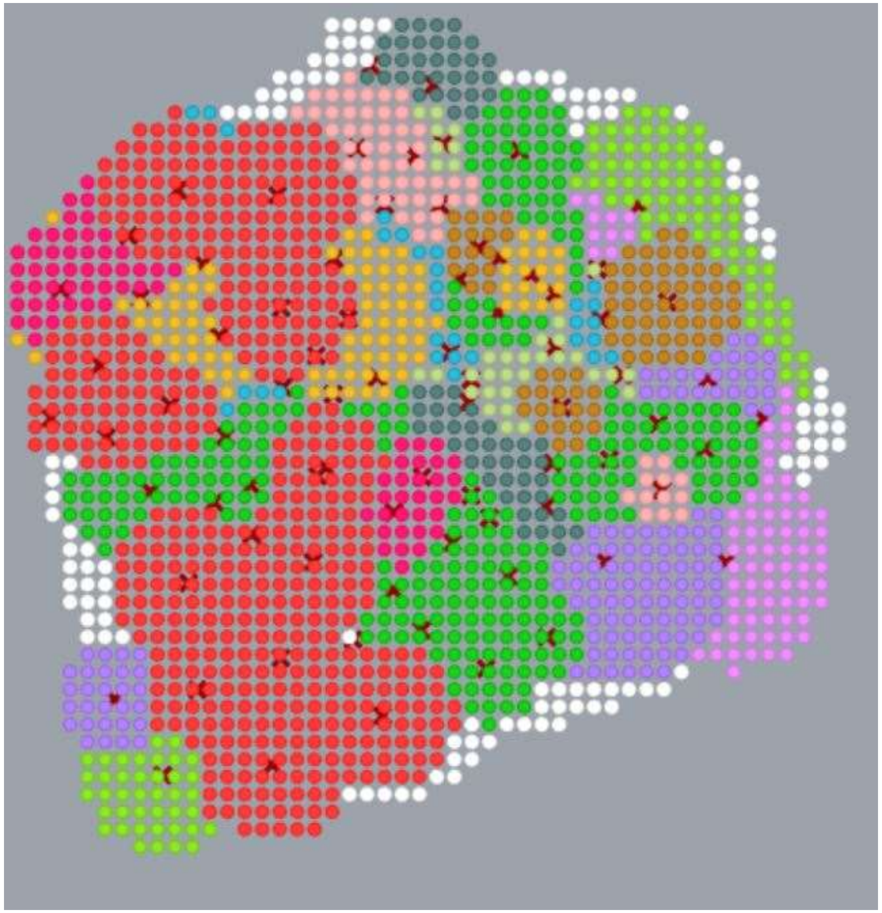
Configuration based on the connectivity of functions and the platforms formed based on the required area -





STUDIES

Representation of program distribution -

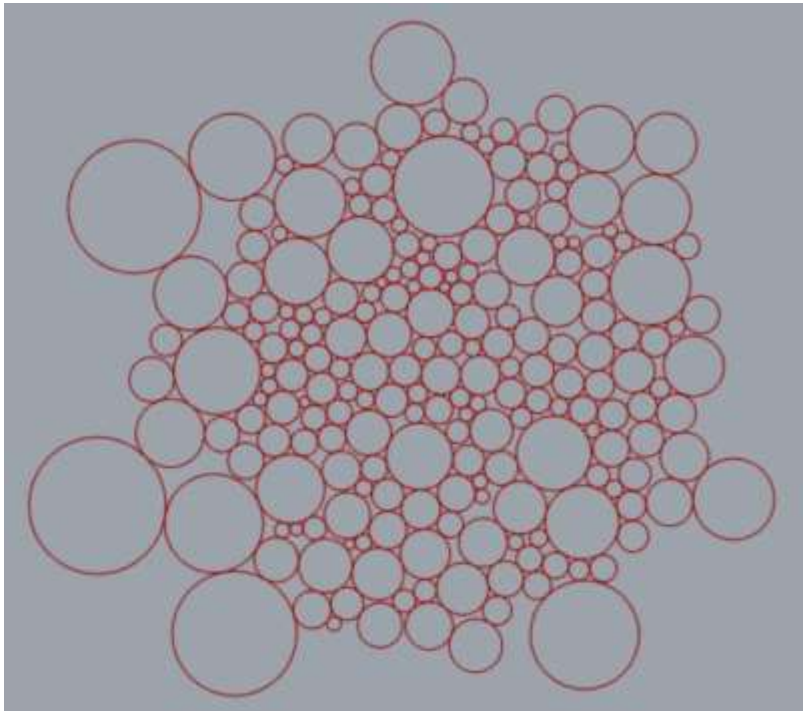


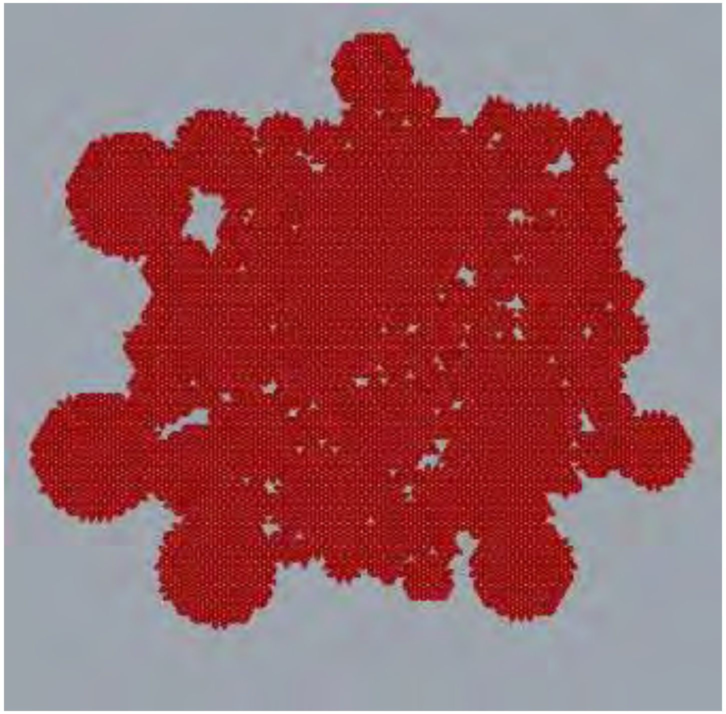
- So we get equal number of platforms which is almost equal to the previous study data.
- We can still break down the functions and address it to the level of city blocks, so we get a grip on the connectivity between each blocks or the functions.

STUDIES

Trial – 3

No boundary rule – the function proportion remains same.





The functions are placed without overlapping and the scaling factor is proportional to the gaps between the platform.
We get a better solution.

STUDIES

- With the study -4 now, we integrate it with existing script, so to attempt and see the program organize based on the connectivity between each of them.

- In this, we don't initially set the boundary. So we define the function and the foot print. Pick the typology and fill in the distributions. We will get the total number of platform.

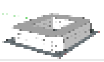
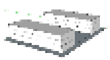
- Now we define the blocks based on the outputs, by using Space Syntax tool – we organize the blocks based on the connectivity. We get various outputs based on the input iterations. Which will give out the platforms and the function organization, with density details. Then the new shape- its not constrained inside a defined boundary.

STUDIES

- An attempt is done parallel to check the outputs when we change a step in the path.
- We try it with changing the triangle platform with a square one.
- We get almost the same analysis when we tried to define certain typologies.
- So now we update the script and check the results with the analysis report.

PLATFORM DESIGN

Concept – 50 m

	Platform			Open space		Building(s)							Spacematrix			Land use %									
	Polygon sides #	Side m	Area m²	Road m²	Green m²	Block length m	Floors #	Building depth m	Courtyard side m	Built-up area m²	Gross floor area (GFA) m²	Net floor area (NFA) m²	Floor area Ratio FAR or FSI	Gross Space Index GSI	Spaciousness OSR	Buildings %	Road %	Green %	Total %	Apartments #	Residents #	Density ap./ha	Built volume m³	Façade surface m²	S/V
ers 	4	50	2500	651	529	43	3	10	23	1320	3960	2772	1.58	0.53	0.30	52.8%	26.0%	21.2%	100%	44.00	88.0	176.0	13,200	2640	0.40
corners 	4	50	2500	701	529	43	3	10	23	1270	3810	2667	1.52	0.51	0.32	50.8%	28.0%	21.2%	100%	42.3	84.7	169.3	12,700	2523	0.40
cks 	4	50	2500	651	817	43	3	12	19	1032	3096	2167	1.24	0.41	0.47	41.3%	26.0%	32.7%	100%	34.4	68.8	137.6	10,320	2200	0.41
	3	50	1082.5	461	45	38	3	8	10	576	1729	1211	1.60	0.53	0.29	53.3%	42.6%	4.1%	100%	19.2	38.4	177.5	5,765	1441	0.45

SPACE@SEA

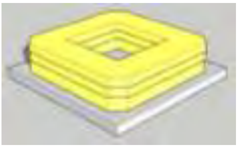
STUDIES

Condition – 1 – Pedestrian and Water transport

Platform - **50 m - Square**
Slope on Platform edge - 0
Platform area - 2500 m2
Platform depth - 3 m
Gap between platform - **5 m**

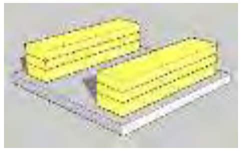
Same boundary profile as Tollebeek.

Platform -1



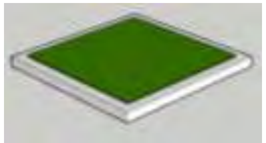
Built % - 50,8 %
Road % (walkway) - 28 %
Green % - 21,2 %

Platform -2

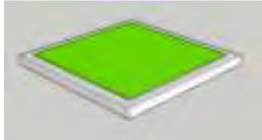


Built % - 41,3 %
Road % (walkway) - 26 %
Green % - 32,7%

Platform -3



Forest



Grass Land

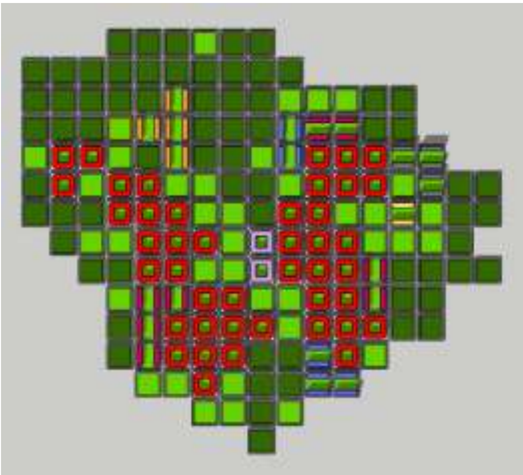
Built % - 0
Road % (walkway) - 26 %
Green % - 74 %

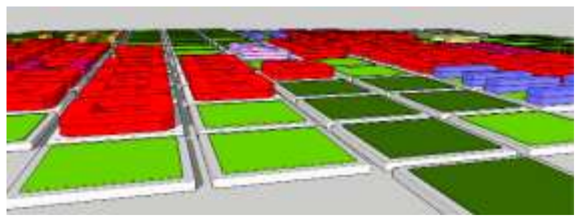
Function	Foot Print (m2)	Type	Percentage Distribution	No of Layers	No of Platforms	Total Platforms
Living Residential	53936	1	50,8	2	43	**43**
Business Commercial	7706	2	41,3	2	8	**8**
Business Light Industrial	3059	2	41,3	2	3	**3**
Business Catering Industry	580	2	41,3	2	1	**1**
Public Building	4821	2	41,3	2	5	**5**
Public Sports	20284	2	20	2	4	**11**
		3	80	1	7	
Public educational Institute	1375	1	50,8	2	2	**2**
Public forest	113347	3	100	1	62	**62**
Public Grass land	73354	3	100	1	40	**40**

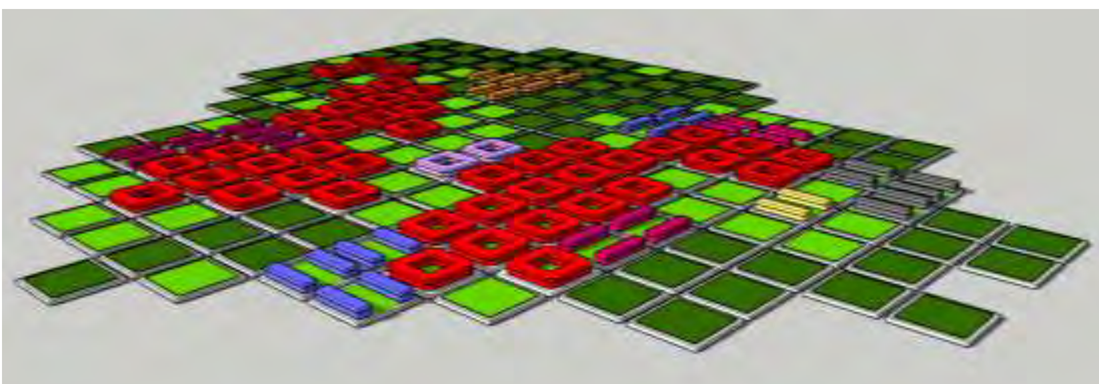
Total – 175

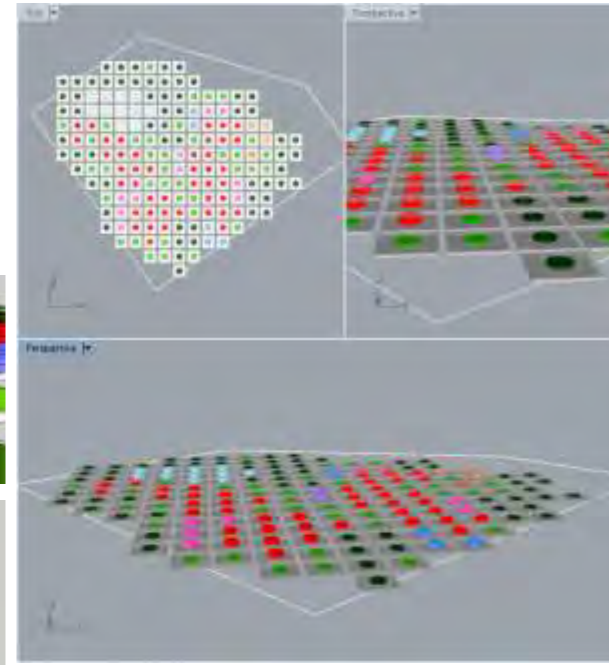
- When we compare it with the triangle platforms, its almost half the number of platforms .
- Now we can compare this situation with cost per platform between triangle and square and the density.

STUDIES









- We can continue to study various built typologies with 50m and 100m platform.
- Analyse the outputs and keep tuning until we get an optimal number of platforms.

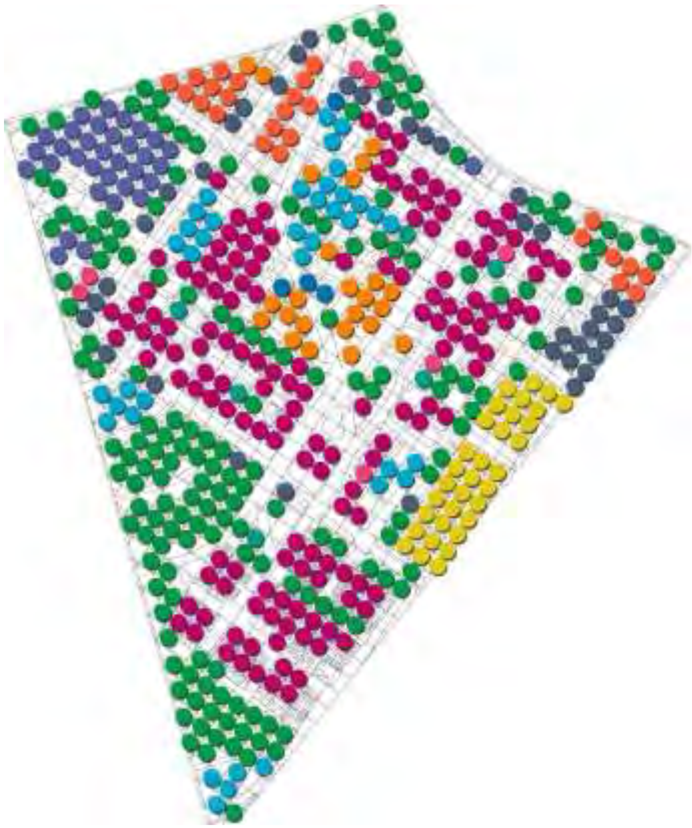
STUDIES

We continue to extend our studies on this, and adding new modules to the script – so it becomes easy to obtain a master plan based on the rules and parameters.

STUDIES

Masdar City Abu Dhabi

Function	Area (m2)	Percentage on boundary area
Living Residential	1.565.620	20
Living Community facilities	78.195	1
Business Offices	225.161	3
Business Light Industrial	340.128	4
Business Research and Development	258.718	3
Public Hotel	41.185	0.5
Public Park and open space	1.913.031	24
Public leisure	731.136	9
Public Education Institutional	444.079	6
Utilities Solar hub	360.622	4.5
Utilities Others	181.383	2

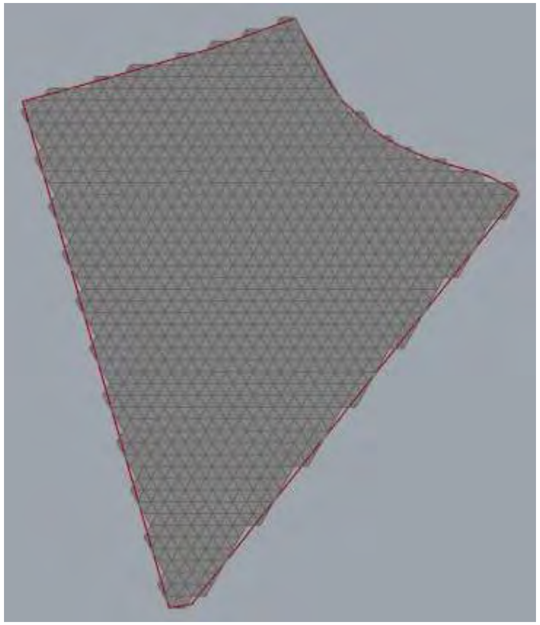


Total area **6.139.258 m2**
Total boundary area – 8.007.072 m2

This show the distribution of function.
23 % is unused or doesn't have any specific functional distribution.

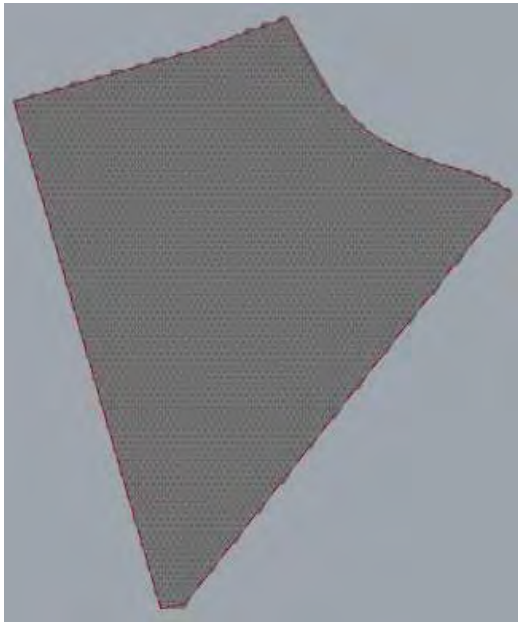
STUDIES

On land -
Total boundary area – 8.007.072 m2



On water - Without any gap between the platforms.

Platform size – 100 m
Total boundary area – 8.006.400 m2
Total platform area – 8.006.400 m2
Scaling factor – 1.0365
Total number of platforms - **1849** units

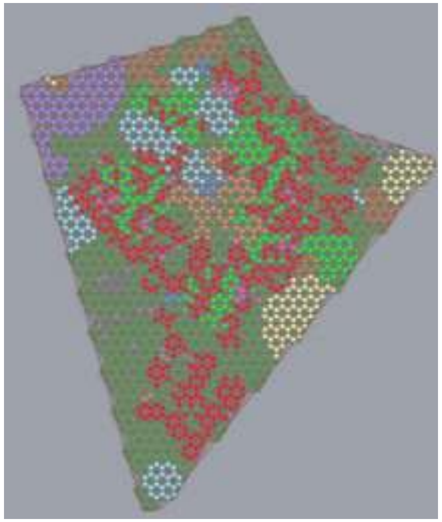


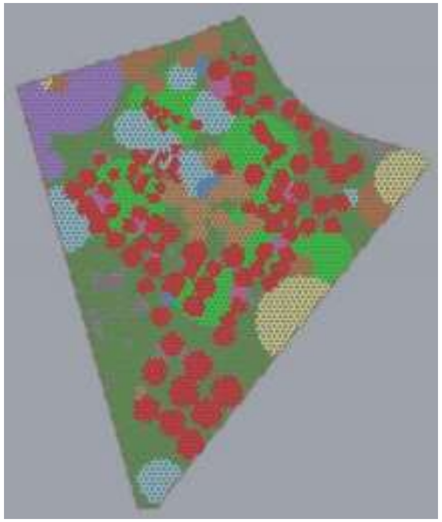
Platform size – 50 m
Total boundary area – 8.007.500 m2
Total platform area – 8.007.500 m2
Scaling factor – 1.0179
Total number of platforms - **7397** units

STUDIES

Platform with no gap between -

Function	Number of units required if 100 m platform	Number of units required if 50 m platform
Living Residential	480	1920
Living Community facilities	24	96
Business Offices	72	288
Business Light Industrial	97	384
Business Research and Development	72	288
Public Hotel	13	48
Public Park and open space	576	2307
Public leisure	216	864
Public Education Institutional	144	577
Utilities Solar hub	107	433
Utilities Others	48	192
Total	**1849**	**7397**





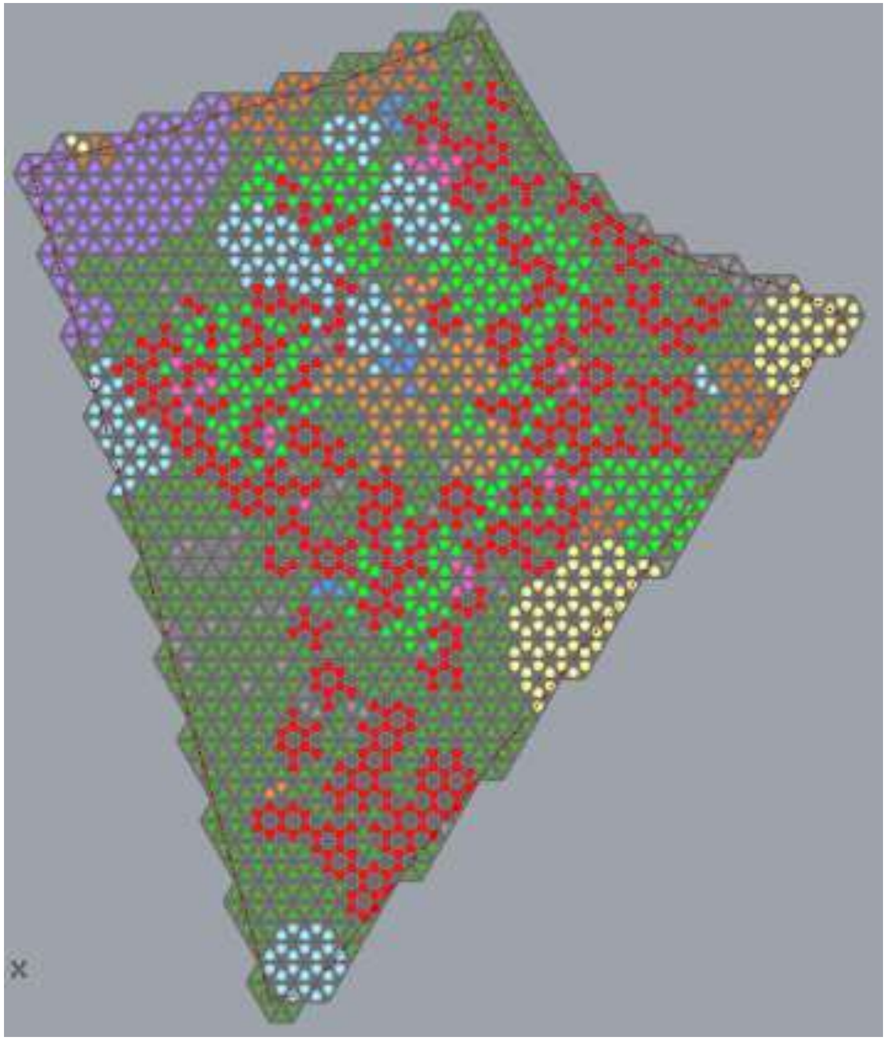
STUDIES

Rules –

Platform – **100 m**
Platform depth – 4 m
Slope of platform – 0
Gap BTW. – **2.5 m**

Area occupied on water – 8.714.800 m2
Total area of platforms – 8.006.400 m2

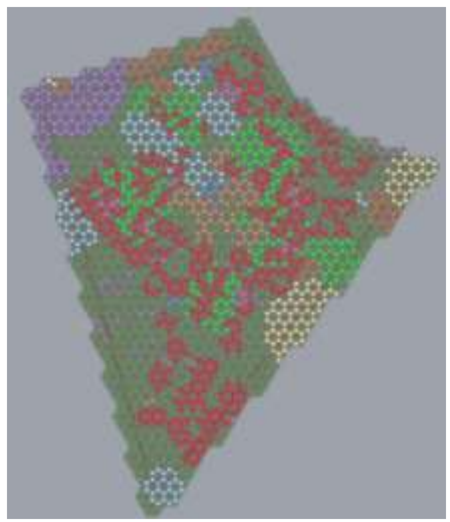
Scaling of boundary – 1.0812
Scaling of programs – 1.0433

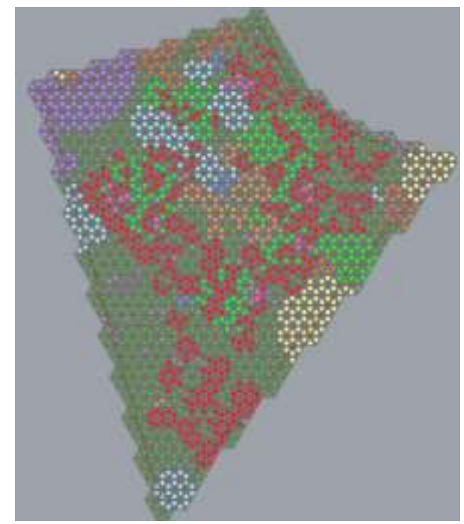


STUDIES

Rules –

Platform	**100 m**	**100 m**
Platform depth	4 m	4 m
Slope of platform	0	0
Gap BTW.	**5 m**	**7.5 m**
Area occupied on water	9.453.200 m2	10.222.000 m2
Total area of platforms	8.006.400 m2	8.006.400 m2
Scaling of boundary	1.126	1.171
Scaling of programs	1.0866	1.1299





SPACE@SEA

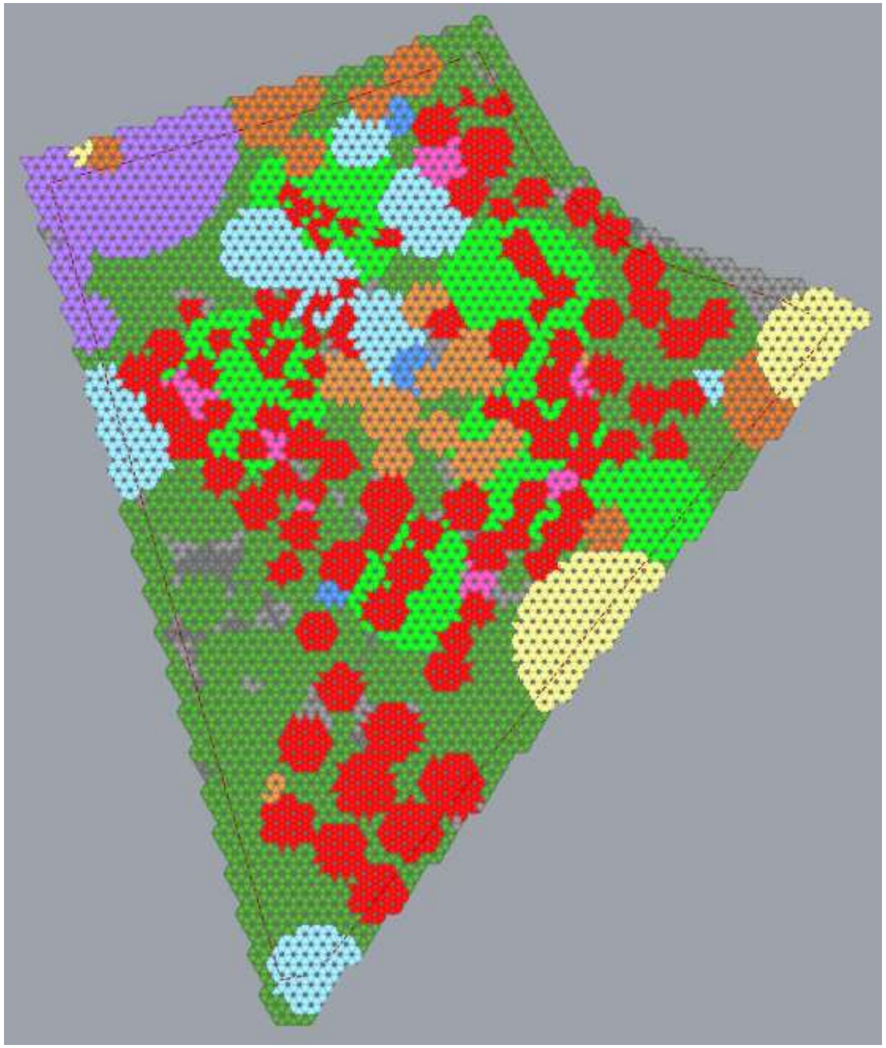
STUDIES

Rules –

Platform – **50 m**
Platform depth – 4 m
Slope of platform – 0
Gap BTW. – **2.5 m**

Area occupied on water – 9.454.400 m2
Total area of platforms – 8.007.500 m2

Scaling of boundary – 1.106
Scaling of programs – 1.0866

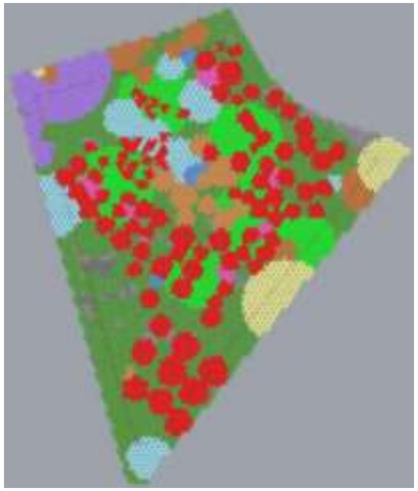


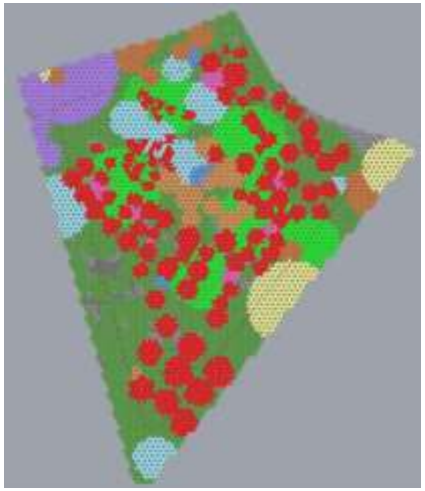
SPACE@SEA

STUDIES

Rules –

Platform	**50 m**	**50 m**
Platform depth	4 m	4 m
Slope of platform	0	0
Gap BTW.	**5 m**	**7.5 m**
Area occupied on water	11.021.000 m2	12.709.000 m2
Total area of platforms	8.007.500 m2	8.007.500 m2
Scaling of boundary	1.1944	1.2825
Scaling of programs	1.1732	1.2598





STUDIES

Function	Area (m2)	Percentage on total area	Number of units required if 100 m platform	Number of units required if 50 m platform
Living Residential	1.565.620	25.5	362	1441
Living Community facilities	78.195	1	15	56
Business Offices	225.161	4	55	228
Business Light Industrial	340.128	5.5	77	312
Business Research and Development	258.718	4	59	227
Public Hotel	41.185	1	14	57
Public Park and open space	1.913.031	31	438	1756
Public leisure	731.136	12	171	680
Public Education Institutional	444.079	7	100	398
Utilities Solar hub	360.622	6	85	341
Utilities Others	181.383	3	42	168
		100	**1418**	**5664**

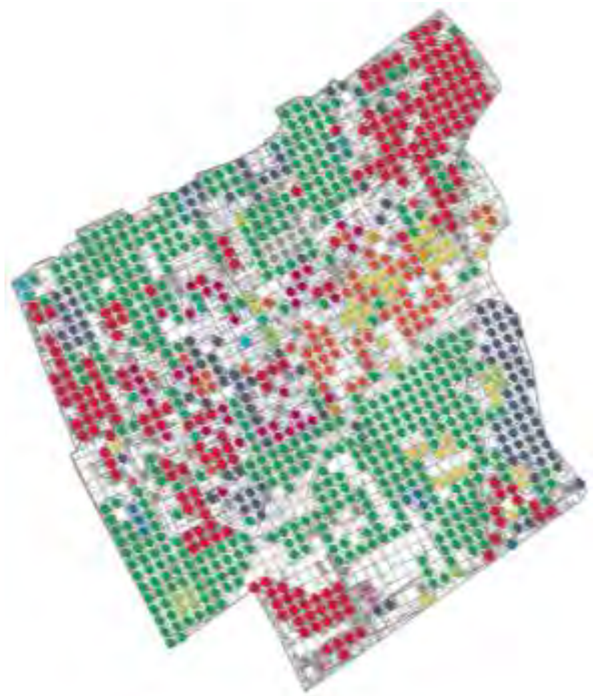
Total area **6.139.258 m2**

In this iteration – 23% unused space is majorly for transport network.

STUDIES

Rijswijk

Function	Area (m2)	Percentage on boundary area
Living Community	40.000	2.7
Living <3 layers	2.050.000	14.3
Living >3 Layers	370.000	2.6
Business Commercial	620.000	4.3
Business office	30.000	0.2
Business Light Industrial	360.000	2.5
Business Agriculture	90.000	0.6
Business Catering Industry	30.000	0.2
Public Park and open space	4.430.000	30.9
Public Building	70.000	0.5
Public educational Institute	90.000	0.6
Public Daily Care	30.000	0.2
Utility	1.130.000	8
Water	560.000	4

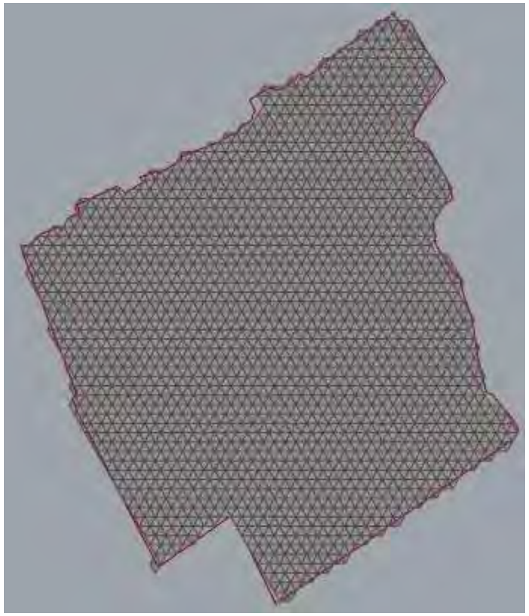


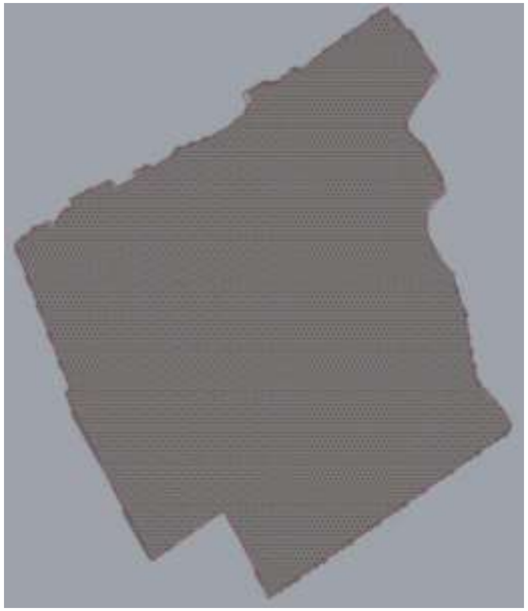
Total area	**9.900.000 m2**
Total boundary area	14.335.323 m2

This show the distribution of function. 28.4 % is unused or doesn't have any specific functional distribution.

SPACE@SEA

STUDIES





On land -
Total boundary area – 14.335.323 m2

On water - Without any gap between the platforms.

Platform size – 100 m
Total boundary area 14.333.000 m2
Total platform area 14.333.000 m2
Scaling factor 1.02820
Total number of platforms **3310** units

Platform size – 50 m
Total boundary area 14.336.000 m2
Total platform area 14.336.000 m2
Scaling factor 1.01402
Total number of platforms **13243** units

STUDIES

Platform with no gap between -

Function	Number of units required if 100 m platform	Number of units required if 50 m platform
Living Community	124	500
Living <3 layers	658	2644
Living >3 Layers	125	480
Business Commercial	199	797
Business office	9	36
Business Light Industrial	114	465
Business Agriculture	28	110
Business Catering Industry	9	36
Public Park and open space	1423	5725
Public Building	25	90
Public educational Institute	27	111
Public Daily Care	9	36
Utility	368	1479
Water	179	745
Total	**3297**	**7397**

SPACE@SEA

STUDIES

Function	Foot print (m2)
Living Community	16.000
Living <3 layers	823.633
Living >3 Layers	244.303
Business Commercial	183.314
Business office	24.000
Business Light Industrial	190.000
Business Agriculture	40.000
Business Catering Industry	11.000
Public Park and open space	2.976.000
Public Building	15.827
Public educational Institute	30.519
Public Daily Care	25.399
Utility	205.887
Water	650.400
Total	**5.436.282**

PARAMETRIC MODELING

How and why –

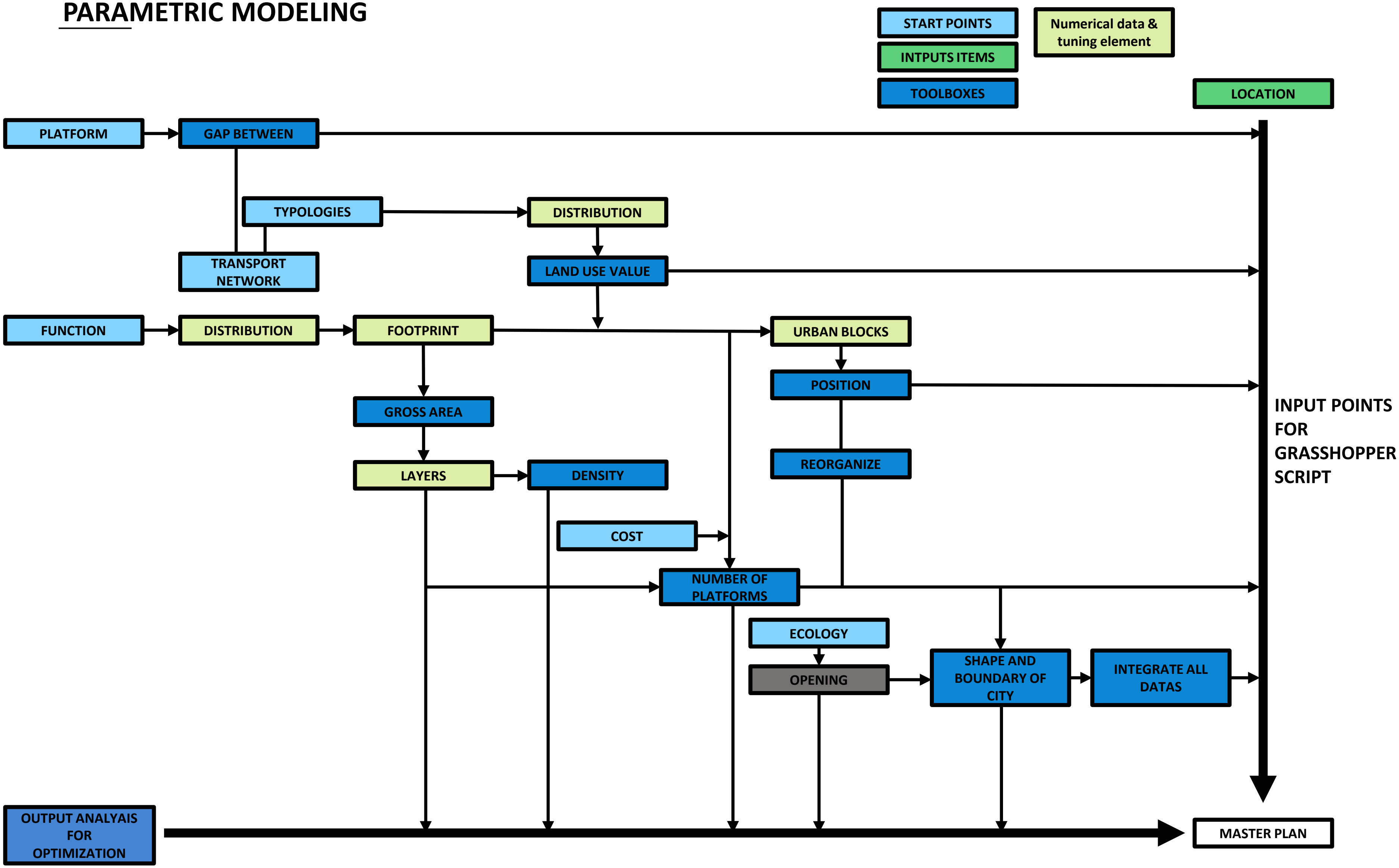
- We build our study from comparing a city form land to water.
- On land, a city is defined by its topography – which defines its boundary.

In water the boundary is defined by the platform shape, size, analytical data's of the waters, etc.

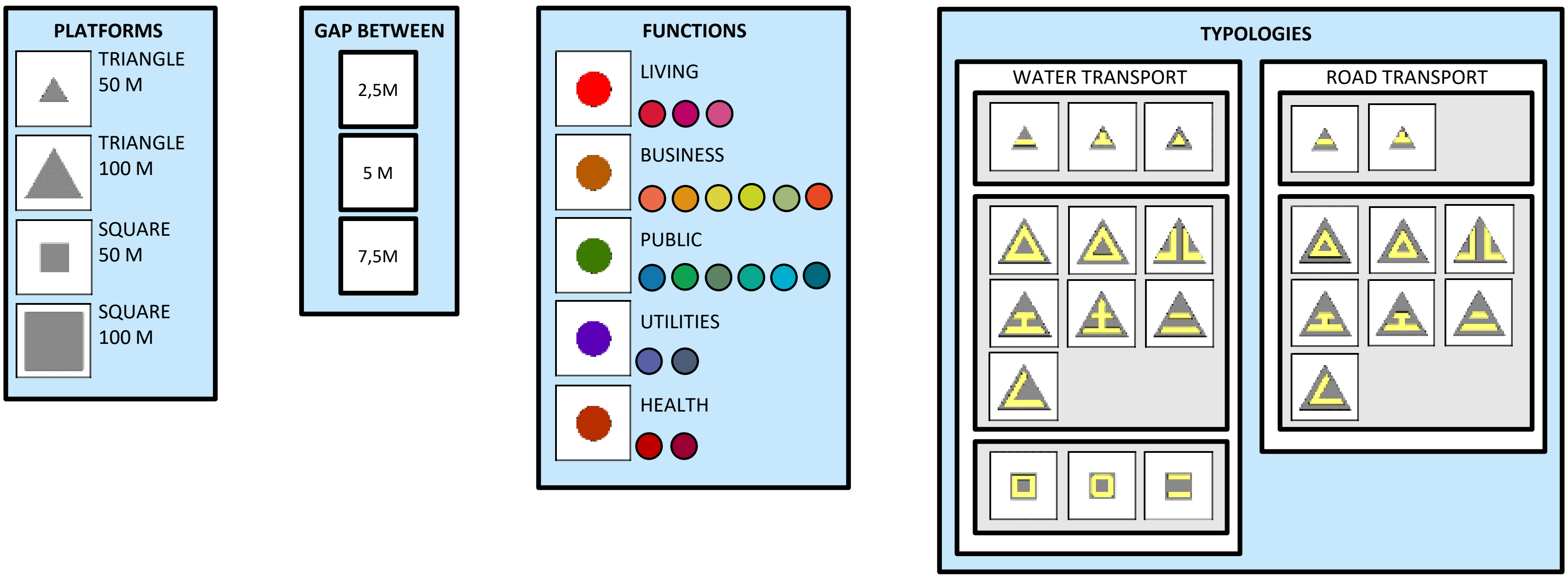
- Most of the cities are program driven – they address a particular function and rest all functions build around it.
- We cannot depict exact city planning strategies and layout for a floating city, it has to develop its own typologies and planning strategies. Due to various factors like cost, feasibility, natural constrains like depth of waters.
- The easy availability of land helps it to easily develop in future.

For floating cities the expansion has to be strategically planned as we are building it artificially from the bottom line.

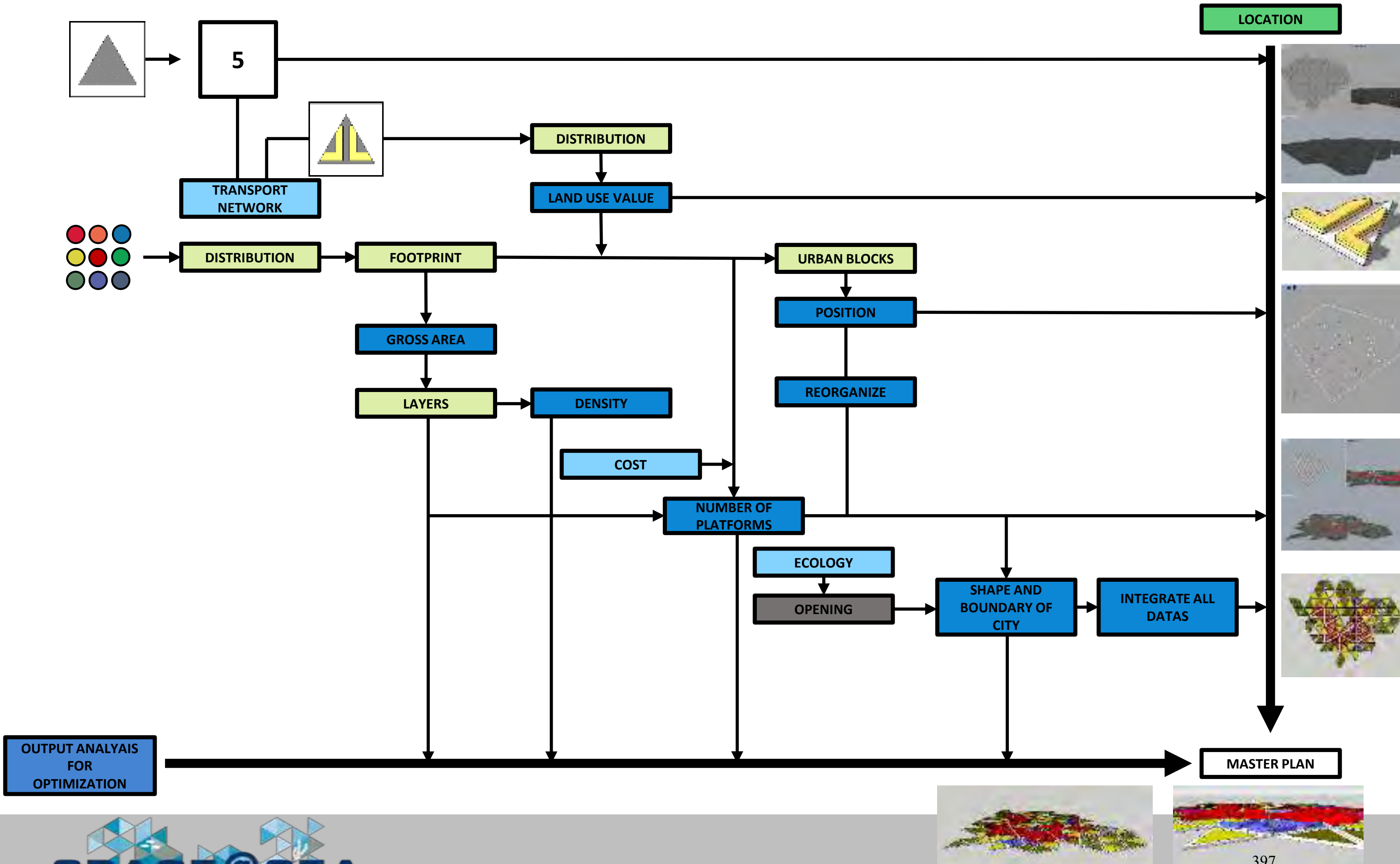
PARAMETRIC MODELING



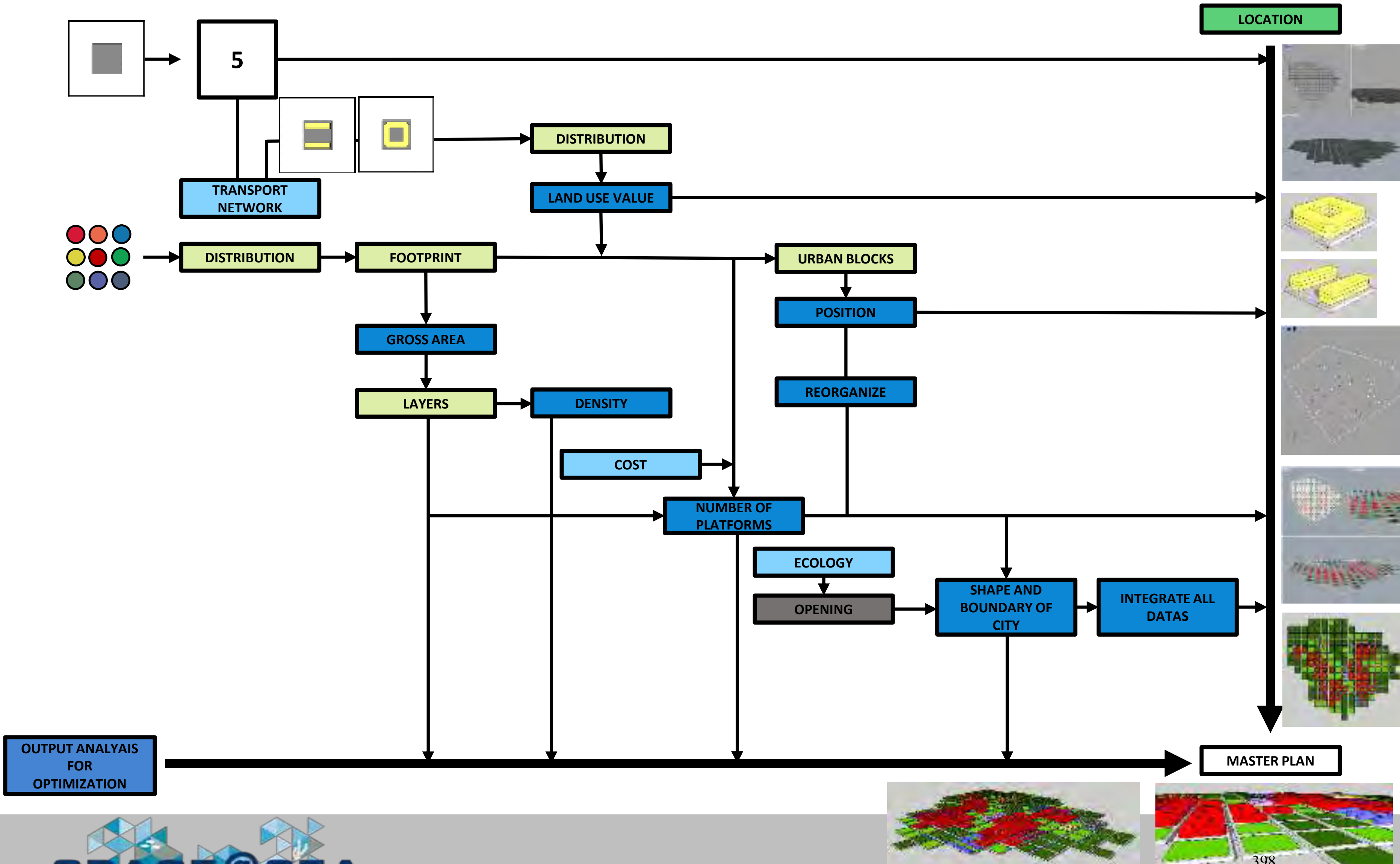
TOOLBOXES


PLATFORMS
TRIANGLE 50 M
TRIANGLE 100 M
SQUARE 50 M
SQUARE 100 M
GAP BETWEEN
2,5M
5 M
7,5M
FUNCTIONS
LIVING
BUSINESS
PUBLIC
UTILITIES
HEALTH
TYPOLOGIES
WATER TRANSPORT
ROAD TRANSPORT

PARAMETRIC MODELING



PARAMETRIC MODELING



SPACE@SEA

PARAMETRIC MODELING

ANALYSIS

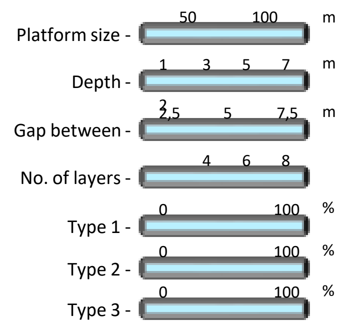
Function	Foot print (m2)
Living Residential	53.936
Business Commercial	7.706
Business Light Industrial	3.059
Business Catering Industry	580
Public Building	4.821
Public Sports	20.284
Public educational Institute	1.375
Public forest	113.347
Public grass land	114.372
Total area	**319.480 m2**

With this data – we will study it in 4 condition –

- **50 m platform with pedestrian walkways and water transport.**
- **50 m platform with road transport.**
- **100 m platform with pedestrian walkways and water transport.**
- **100 m platform with road transport.**

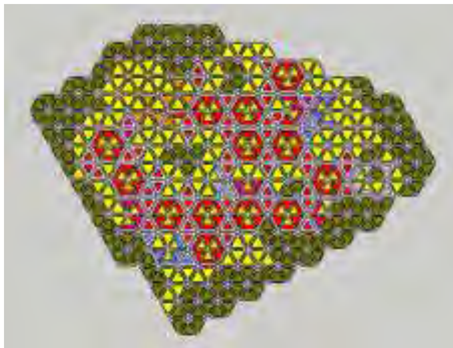
Same types of platforms area going to be used as in previous studies.
We are comparing it, all with 2 layers.

Parameters



PARAMETRIC MODELING

ANALYSIS

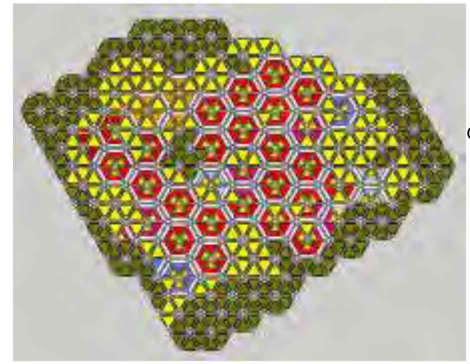


Given boundary – Fixed program position

Platform size - (50 – 100 m)
Depth - (1, 3, 5, 7 m)
Gap between - (2,5, 5, 7,5 m)
No. of layers - (2, 4, 6, 8)
Type 1 - (0 – 100 %)
Type 2 - (0 – 100 %)
Type 3 - (0 – 100 %)

Total no. of platform -
449

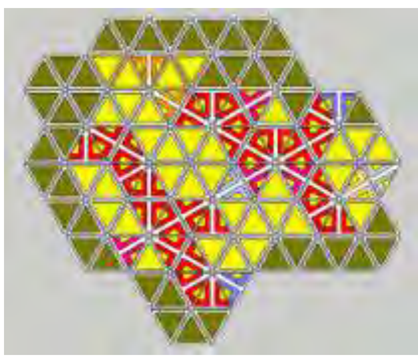
	Condition – 1	Condition – 2
Type -1 -		
Built %	- 51,4 %	47 %
Road %	- 26 %	40,8 %
Green %	- 22,6 %	12,2 %
Type -2 -		
Built %	- 40 %	34,9 %
Road %	- 26 %	40,8 %
Green %	- 34%	24,3 %
Type -3 -		
Built %	- 33 %	
Road %	- 67 %	
Green %	- 0	



Given boundary – Fixed program position

Platform size - (50 – 100 m)
Depth - (1, 3, 5, 7 m)
Gap between - (2,5, 5, 7,5 m)
No. of layers - (2, 4, 6, 8)
Type 1 - (0 – 100 %)
Type 2 - (0 – 100 %)
Type 3 - (0 – 100 %)

Total no. of platform -
453

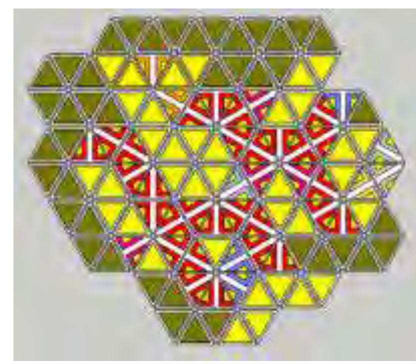


Given boundary – Fixed program position

Platform size - (50 – 100 m)
Depth - (1, 3, 5, 7 m)
Gap between - (2,5, 5, 7,5 m)
No. of layers - (2, 4, 6, 8)
Type 1 - (0 – 100 %)
Type 2 - (0 – 100 %)
Type 3 - (0 – 100 %)

Total no. of platform -
112

	Condition – 3	Condition – 4
Type -1 -		
Built %	- 48,9 %	43,6 %
Road %	- 26,7 %	41,1 %
Green %	- 24,4 %	15,3 %



Given boundary – Fixed program position

Platform size - (50 – 100 m)
Depth - (1, 3, 5, 7 m)
Gap between - (2,5, 5, 7,5 m)
No. of layers - (2, 4, 6, 8)
Type 1 - (0 – 100 %)
Type 2 - (0 – 100 %)
Type 3 - (0 – 100 %)

Total no. of platform -
122

PARAMETRIC MODELING

ANALYSIS

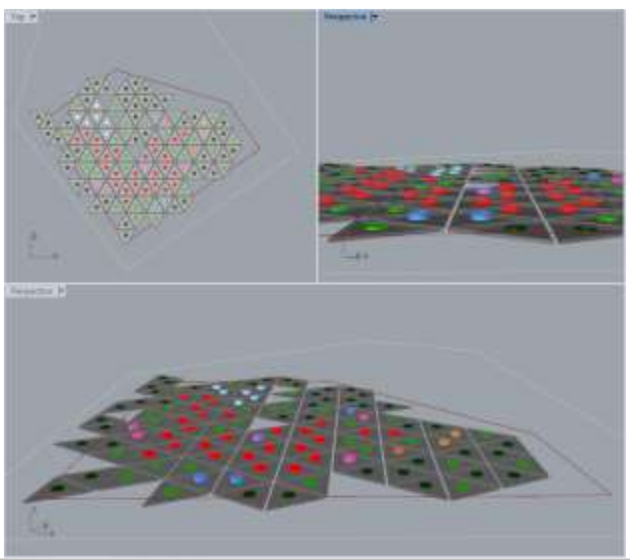
Condition - 3

Platform size - 50 100 m
Depth - 1 3 5 7 m
Gap between - 2,5 5 7,5 m
No. of layers - 2 4 6 8

Type 1 - 0 100 %
Type 2 - 0 100 %
Type 3 - 0 100 %

Total no. of platform -
112

Given boundary – Fixed program position

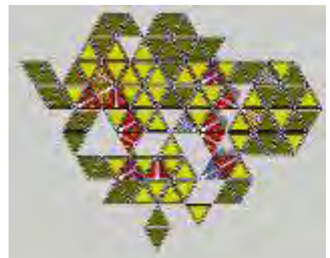


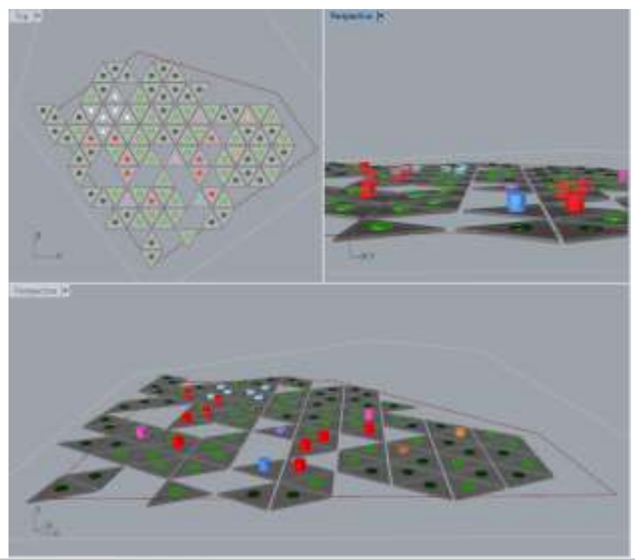
Platform size - 50 100 m
Depth - 1 3 5 7 m
Gap between - 2,5 5 7,5 m
No. of layers - 2 4 6 8

Type 1 - 0 100 %
Type 2 - 0 100 %
Type 3 - 0 100 %

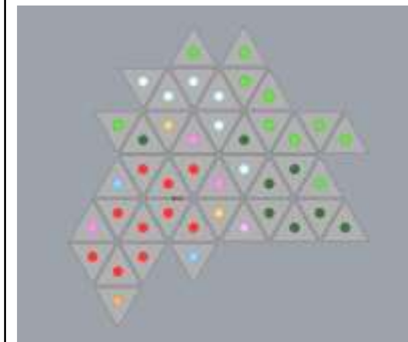
Total no. of platform -
99

Given boundary – Fixed program position

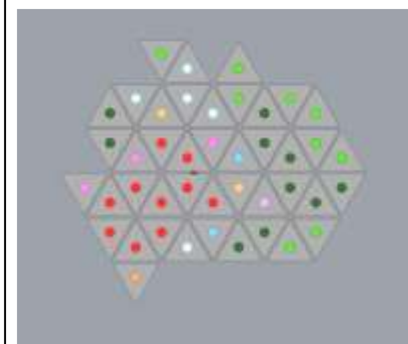




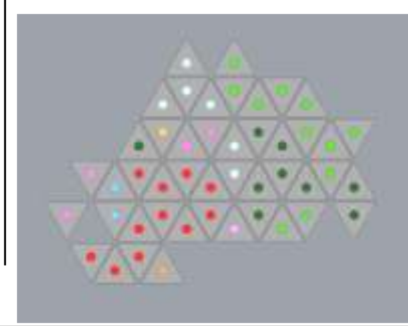
Reorganizing – on going analysis



Iteration - 25



Iteration - 50



Iteration - 75

PARAMETRIC MODELING

ANALYSIS

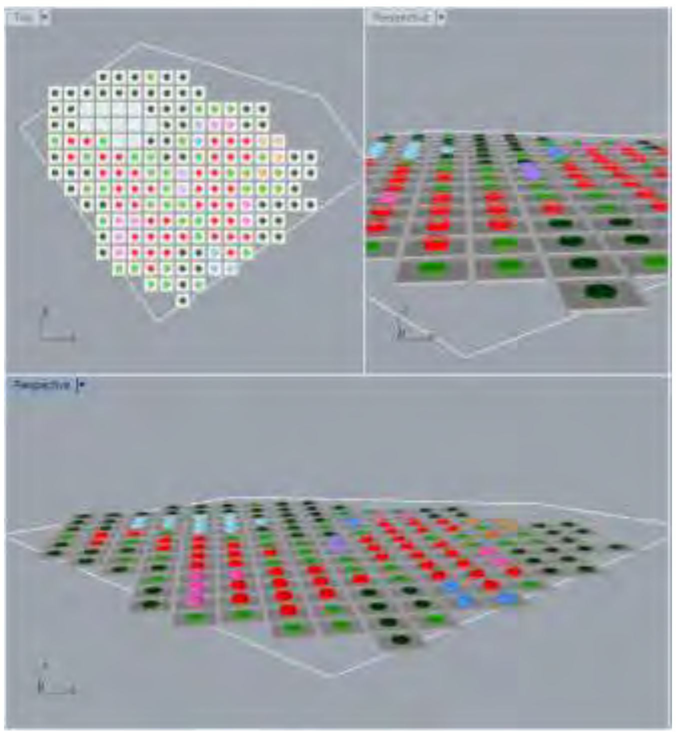
WITH SQUARE PLATFORM

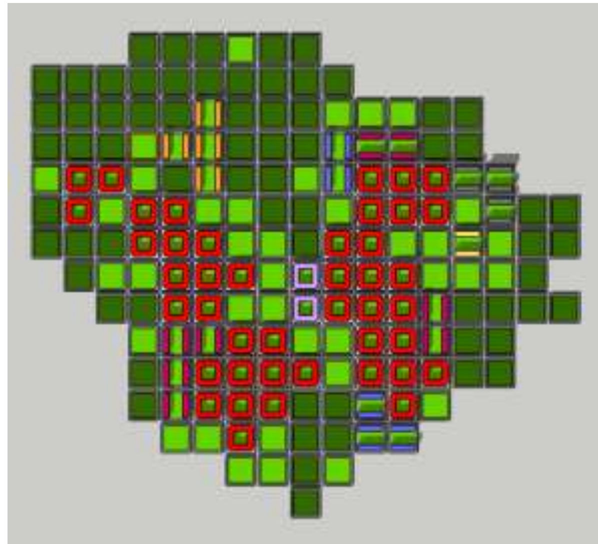
Platform size - 50 100 m
Depth - 1 3 5 7 m
Gap between - 2,5 5 7,5 m
No. of layers - 2 4 6 8

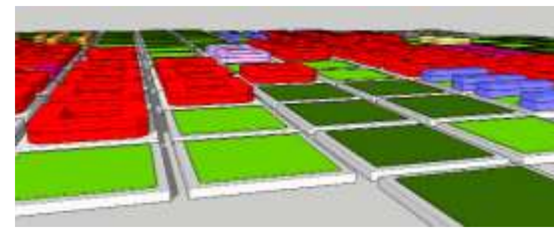
Type 1 - 0 100 %
Type 2 - 0 100 %
Type 3 - 0 100 %

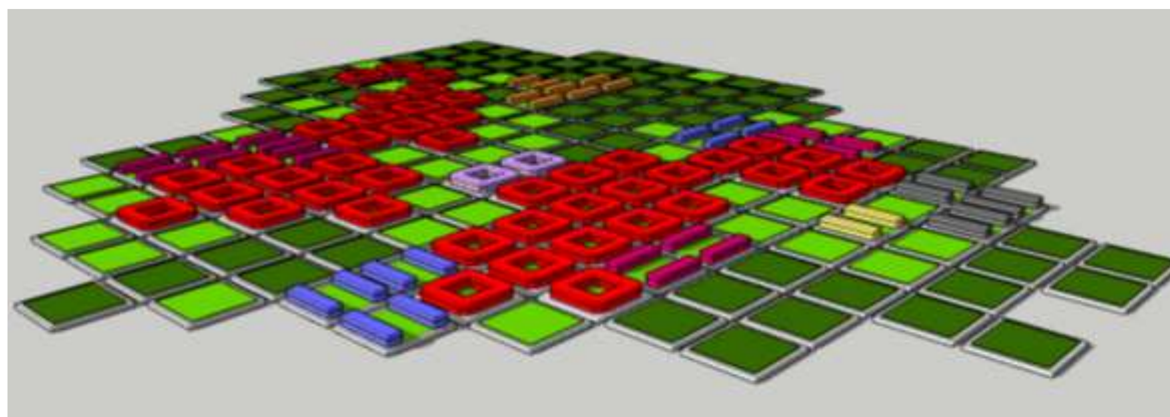
Total no. of platform - **175**

Given boundary – Fixed program position



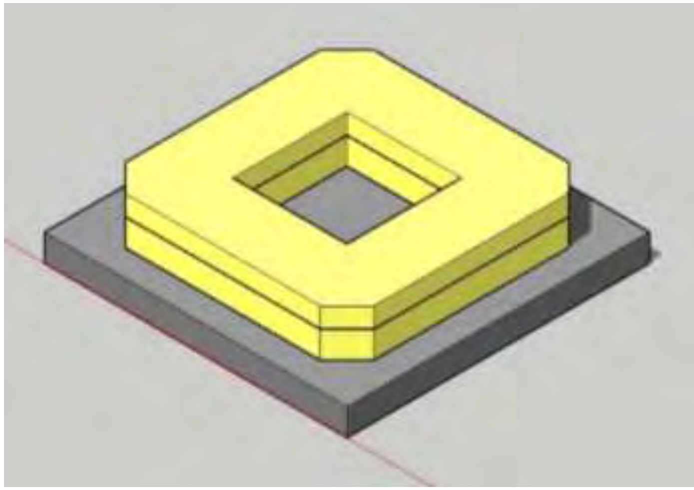






PLATFORM DESIGN

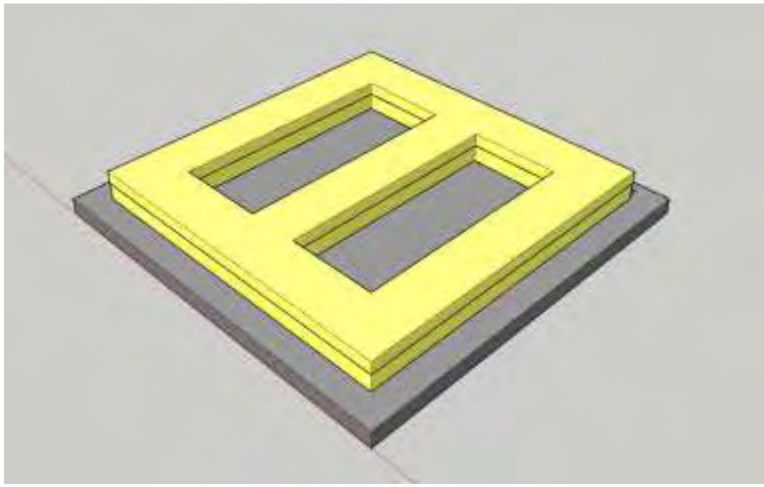
CONCEPT



Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
4	**45**	**2025**	**688**	**289**		**2**	**10**		**1048**																

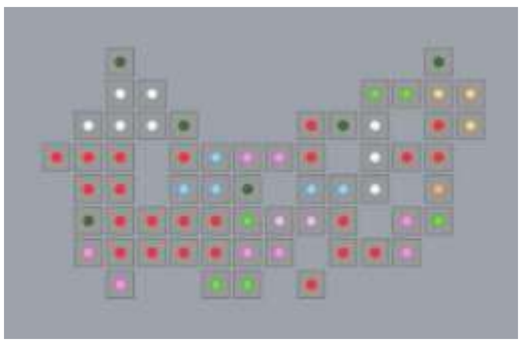
PLATFORM DESIGN

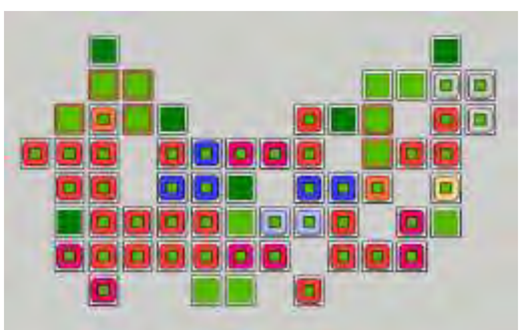
CONCEPT



Platform			Open space		Building(s)							Spacematrix			Land use %							Standards			
Polygon sides	Side	Area	Road	Green	Block length	Floors	Building depth	Courtyard side	Built-up area	Gross floor area (GFA)	Net floor area (NFA)	Floor area Ratio	Gross Space Index	Spaciousness	Buildings	Road	Green	Total	Apartments	Residents	Density	Green	Green deficit/surplus	Parking	Built volume
#	m	m²	m²	m²	m	#	m	m	m²	m²	m²	FAR or FSI	GSI	OSR	%	%	%	%	#	#	ap./ha	m²	m²	#	m³
4	**90**	**8100**	**2016**	**2268**		**2**	**12**		**3816**																

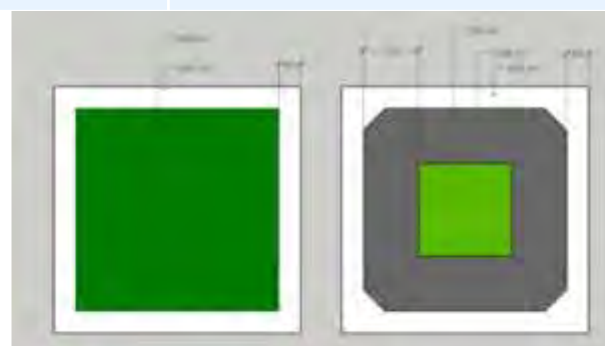
Function	Required footprint – m2	No. of platforms
Living Residential	23.334	23
Business Commercial	7.706	8
Business Light Industrial	3.059	3
Business Catering Industry	580	1
Public Building	4.821	5
Public Sports	10.000	8
Public educational Institute	1.375	2
Public forest	7.264	6
Public grass land	7.264	6
		62



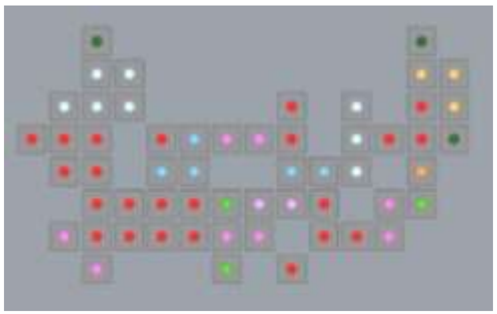


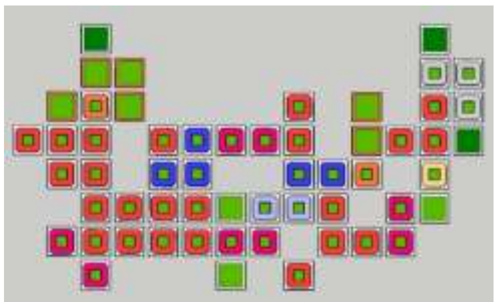
Shape	Square	
Size	45 meters	
Gap between	7,5 meters	
Depth of platform	4 meters	
Inhabitants	2,000	
Built typologies	Type – 1	
	Built %	51,75
	Green %	14,27
	Transport %	33,98
	Levels	2
Green - in total	23.21 %	13% + 14,27% (each platform)
Per unit Size	70 m2	3 inhab per unit avg.
Total Platforms	62	
Boundary Condition		
Cost		
Ecology		

13% * 55875 = 7264 + 7264
Gross required – 2000 / 3 = 666,66 . * 70 = 46666,66



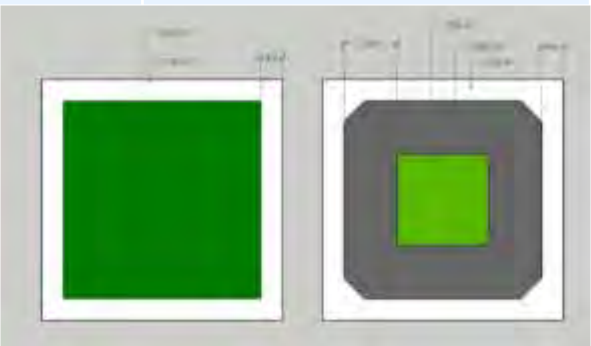
Function	Required footprint – m2	No. of platforms
Living Residential	23.334	23
Business Commercial	7.706	8
Business Light Industrial	3.059	3
Business Catering Industry	580	1
Public Building	4.821	5
Public Sports	10.000	8
Public educational Institute	1.375	2
Public forest	3.632	3
Public grass land	3.632	3
		56



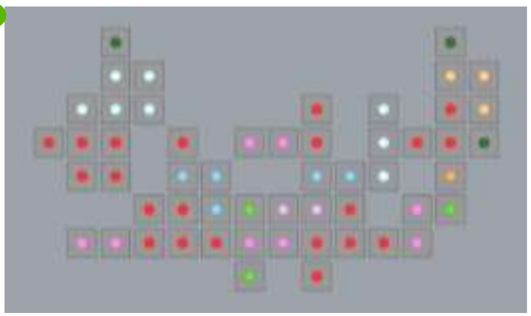


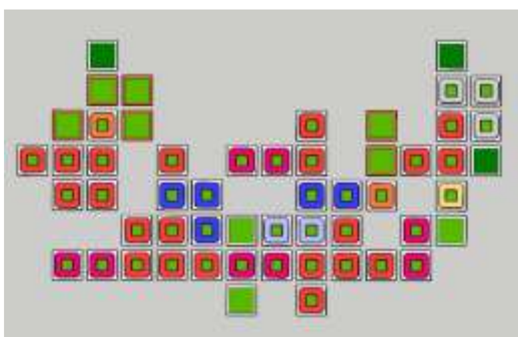
Shape	Square	
Size	45 meters	
Gap between	7,5 meters	
Depth of platform	4 meters	
Inhabitants	2,000	
Built typologies	Type – 1	
	Built %	51,75
	Green %	14,27
	Transport %	33,98
	Levels	2
Green - in total	**18.45 %**	13% + 14,27% (each platform)
Per unit Size	70 m2	3 inhab per unit avg.
Total Platforms	56	
Boundary Condition		
Cost		
Ecology		

13% * 55875 = 7264
Gross required – 2000 / 3 = 666,66 . * 70 = 46666,66



Function	Required footprint – m2	No. of platforms
Living Residential	21.667	21
Business Commercial	7.706	8
Business Light Industrial	3.059	3
Business Catering Industry	580	1
Public Building	4.821	5
Public Sports	10.000	8
Public educational Institute	1.375	2
Public forest	3.199	3
Public grass land	3.199	3
		54

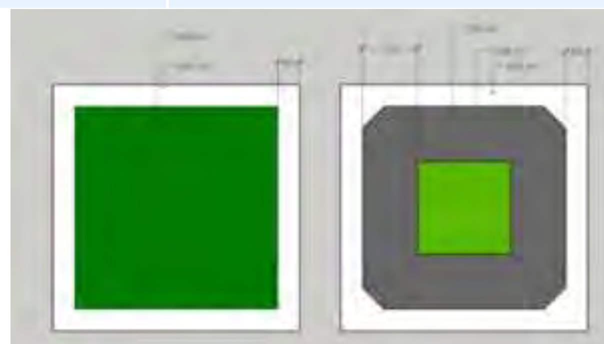




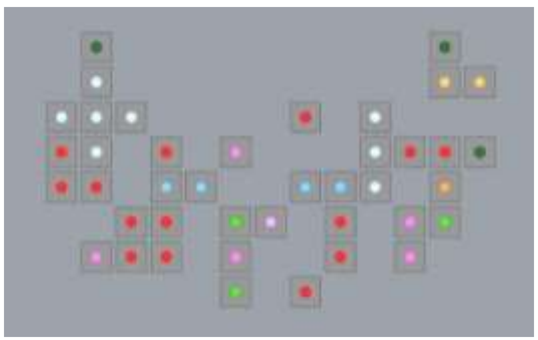
Shape	Square		
Size	45 meters		
Gap between	7,5 meters		
Depth of platform	4 meters		
Inhabitants	2,000		
Built typologies	Type – 1		
	Built %	51,75	
	Green %	14,27	
	Transport %	33,98	
	Levels	2	
Green - in total	18,61 %	13% + 14,27% (each platform)	
Per unit Size	**65 m2**	3 inhab per unit avg.	
Total Platforms	54		
Boundary Condition			
Cost			
Ecology			

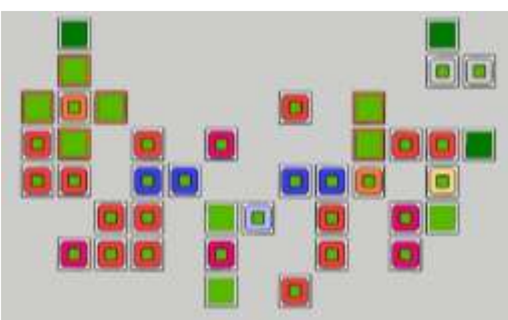
13% * 49208 = 6397

Gross required – 2000 / 3 = 666,66 . * 65 = 43333



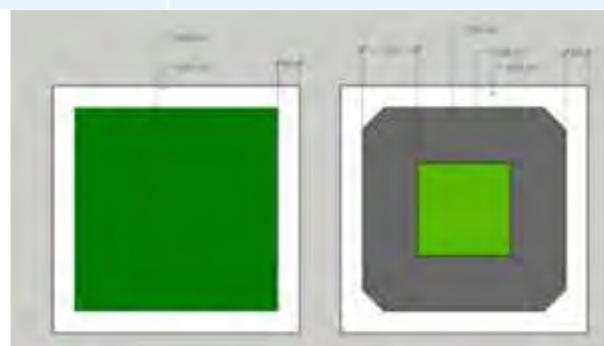
Function	Required footprint – m2	No. of platforms
Living Residential	21.667	14
Business Commercial	7.706	5
Business Light Industrial	3.059	2
Business Catering Industry	580	1
Public Building	4.821	4
Public Sports	10.000	8
Public educational Institute	1.375	1
Public forest	3.199	3
Public grass land	3.199	3
		41



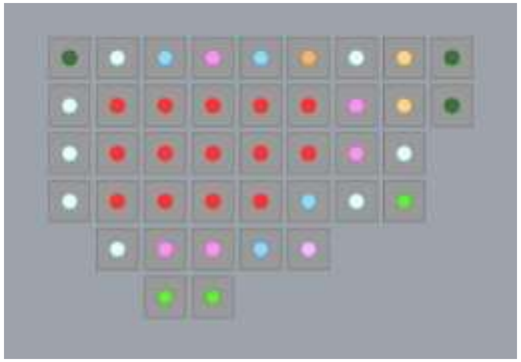


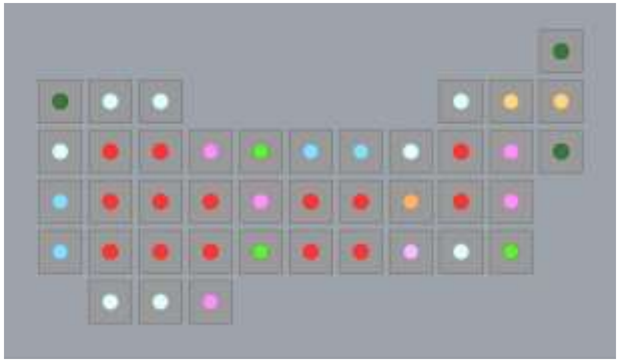
Shape	Square	
Size	45 meters	
Gap between	7,5 meters	
Depth of platform	4 meters	
Inhabitants	2,000	
Built typologies	Type – 1	
	Built %	51,75
	Green %	14,27
	Transport %	33,98
	Levels	**3**
Green - in total	19.98 %	13% + 14,27% (each platform)
Per unit Size	65 m2	3 inhab per unit avg.
Total Platforms	41	
Boundary Condition		
Cost		
Ecology		

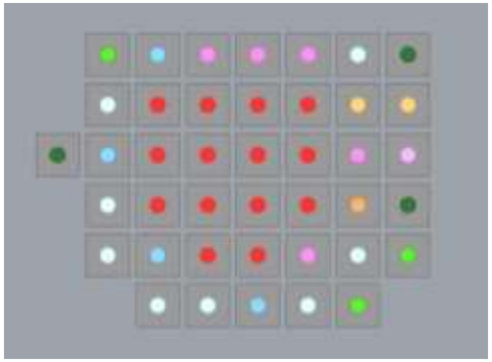
13% * 49208 = 6397
Gross required – 2000 / 3 = 666,66 . * 65 = 43333

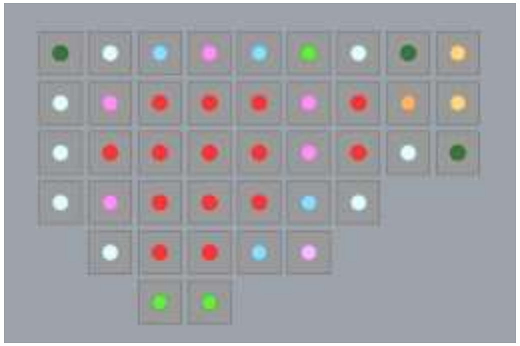


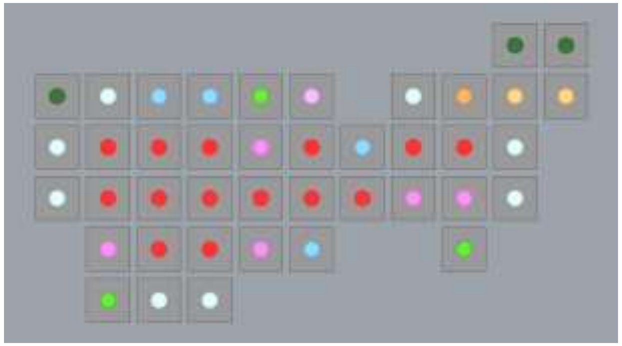
Boundary Conditions options –





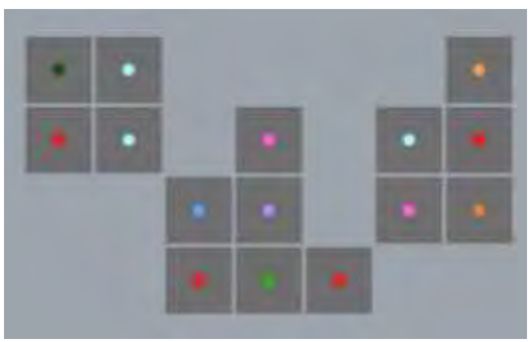






Now the configurations have the built in the middle and the green area outside.
Need your inputs to choose one condition.

Function	Required footprint – m2	No. of platforms
Living Residential	21.667	4
Business Commercial	7.706	2
Business Light Industrial	3.059 580	1 1
Business Catering	4.821	1
Industry	10.000	3
Public Building	1.375	1
Public Sports	3.199	1
Public educational Institute	3.199	1 **15**
Public forest		
Public grass land		

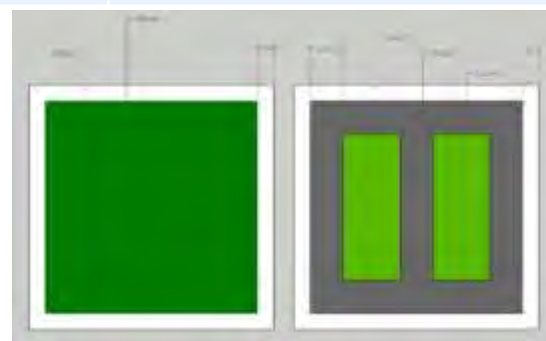


Shape	Square	
Size	90 meters	
Gap between	7,5 meters	
Depth of platform	4 meters	
Inhabitants	2,000	
Built typologies	Type – 1	
	Built %	47,1
	Green %	28
	Transport %	24,9
	Levels	3
Green - in total	30,53 %	13% + 28% (each platform)
Per unit Size	65 m2	3 inhab per unit avg.
Total Platforms	15	
Boundary Condition		
Cost		
Ecology		

13% * 49208 = 6397

Gross required – 2000 / 3 = 666,66 .

* 65 = 43333



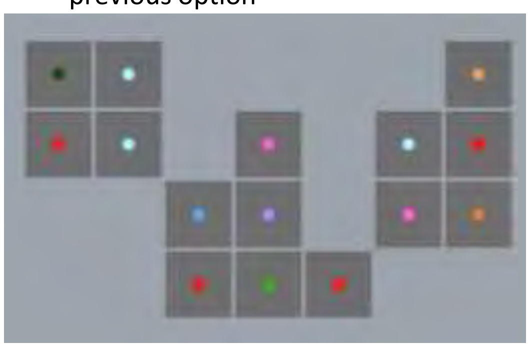
Function	Required footprint – m2	No. of platforms
Living Residential	21.667	4
Business Commercial	7.706	2
Business Light Industrial	3.059 580	1 1
Business Catering	4.821	1
Industry	10.000	3
Public Building	1.375	1
Public Sports	3.199	1
Public educational Institute	3.199	1
		15
Public forest		
Public grass land		

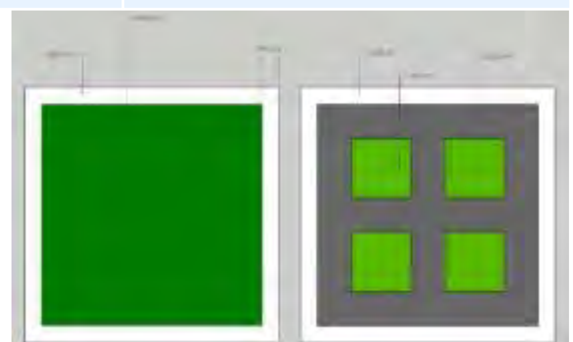
Shape	Square	
Size	90 meters	
Gap between	7,5 meters	
Depth of platform	4 meters	
Inhabitants	2,000	
Built typologies	Type – 1	
	Built %	53,33
	Green %	21,77
	Transport %	24,9
	Levels	3
Green - in total	25,97 %	13% + 21,77% (each platform)
Per unit Size	65 m2	3 inhab per unit avg.
Total Platforms	15	
Boundary Condition		
Cost		
Ecology		

13% * 49208 = 6397

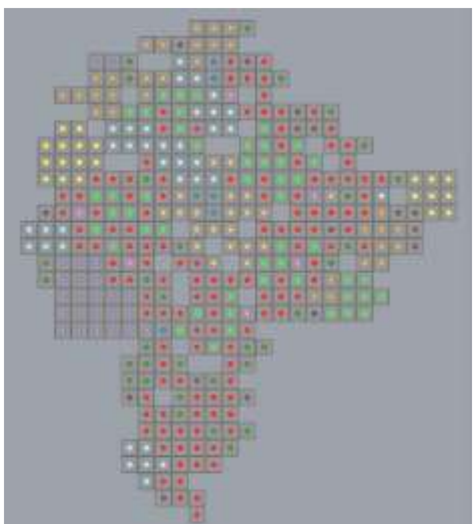
Gross required – 2000 / 3 = 666,66 . * 65 = 43333

Gross area is more compared to previous option



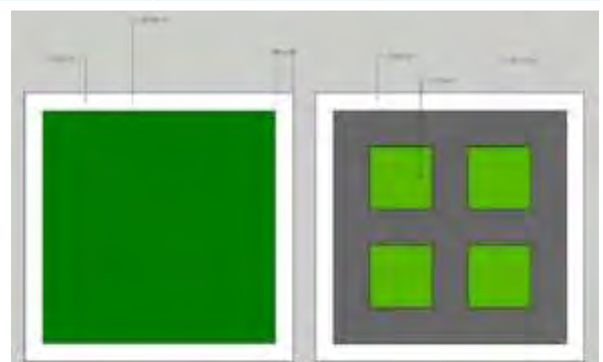


Function	Required footprint – m2	No. of platforms
Living Residential	541667	126
Living Community facilities	21667	6
Business Offices	86668	21
Business Light Industrial	86668	21
Business Research and	130002	31
Development	21667	6
Public Hotel	190082	32
Public Park and open space	260004	49
Public leisure	151669	36
Public Education Institutional	130002	24
Utilities Solar hub	65001	16
Utilities Others		
		368

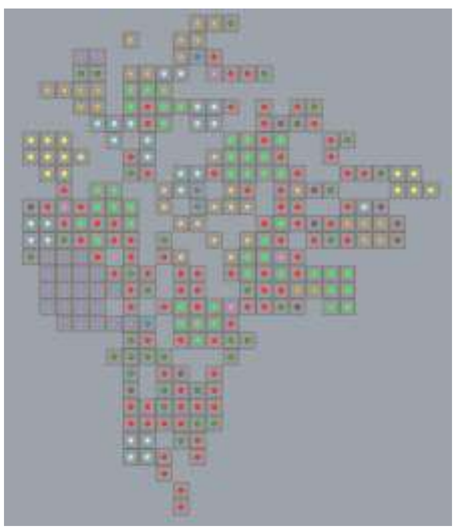


Shape	Square	
Size	90 meters	
Gap between	7,5 meters	
Depth of platform	4 meters	
Inhabitants	50,000	
Built typologies	Type – 1	
	Built %	53,33
	Green %	21,77
	Transport %	24,9
	Levels	2
Green - in total	24,29	
Per unit Size	65 m2	3 inhab per unit avg.
Total Platforms	368	
Boundary Condition		
Cost		
Ecology		

Gross required – 50000 / 3 = 16,666 . * 65 = 1,083,333

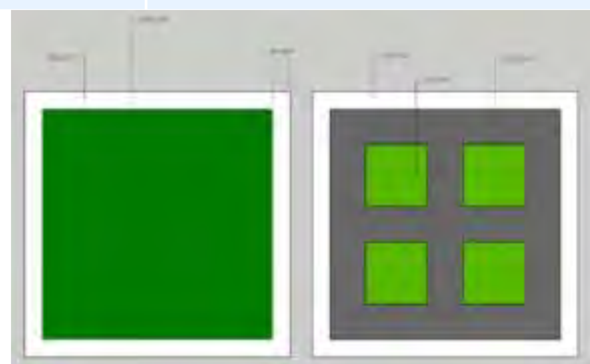


Function	Required footprint – m2	No. of platforms
Living Residential	541667	84
Living Community facilities	21667	4
Business Offices	86668	14
Business Light Industrial	86668	14
Business Research and	130002	21
Development	21667	4
Public Hotel	190082	32
Public Park and open space	260004	44
Public leisure	151669	24
Public Education Institutional	130002	23
Utilities Solar hub	65001	11
Utilities Others		
		275



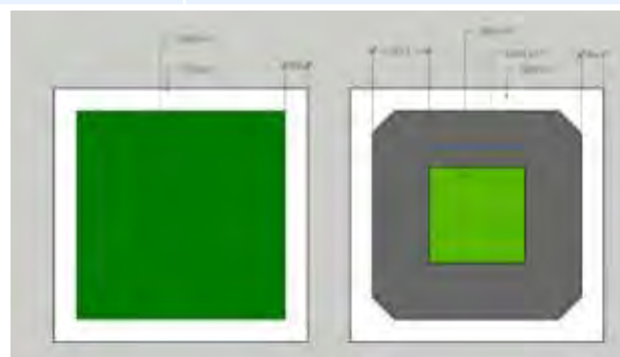
Shape	Square	
Size	90 meters	
Gap between	7,5 meters	
Depth of platform	4 meters	
Inhabitants	50,000	
Built typologies	Type – 1	
	Built %	53,33
	Green %	21,77
	Transport %	24,9
	Levels	**3**
Green - in total	24,87	
Per unit Size	65 m2	3 inhab per unit avg.
Total Platforms	275	
Boundary Condition		
Cost		
Ecology		

Gross required – 50000 / 3 = 16,666 . * 65 = 1,083,333

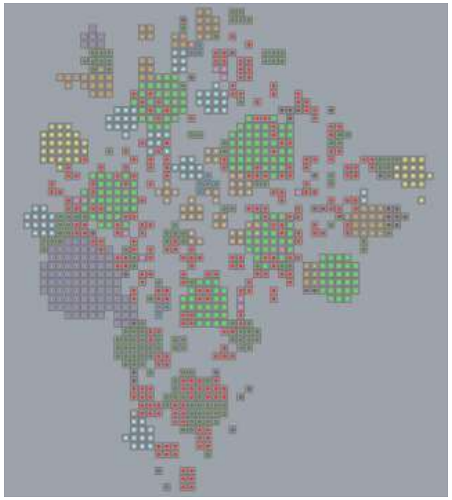


Function	Required footprint – m2	No. of platforms
Living Residential	541667	345
Living Community facilities	21667	14
Business Offices	86668	56
Business Light Industrial	86668	56
Business Research and	130002	83
Development	21667	14
Public Hotel	190082	143
Public Park and open space	260004	188
Public leisure	151669	97
Public Education	130002	97
Institutional	65001	42
Utilities Solar hub		
Utilities Others		**1135**

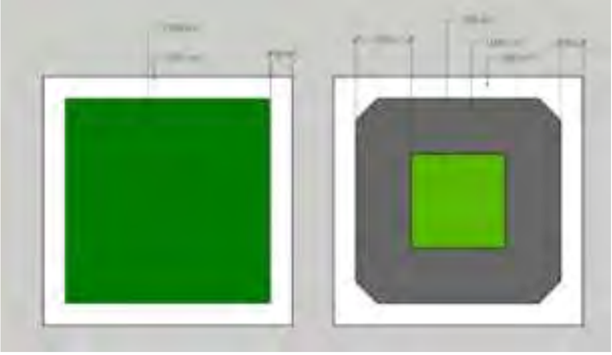
Shape	Square	
Size	45 meters	
Gap between	7,5 meters	
Depth of platform	4 meters	
Inhabitants	50,000	
Built typologies	Type – 1	
	Built %	51,75
	Green %	14,27
	Transport %	33,98
	Levels	**3**
Green - in total	18,54 %	
Per unit Size	65 m2	3 inhab per unit avg.
Total Platforms	1135	
Boundary Condition		
Cost		
Ecology		



Function	Required footprint – m2	No. of platforms
Living Residential	541667	259
Living Community facilities	21667	11
Business Offices	86668	42
Business Light Industrial	86668	42
Business Research and	130002	63
Development	21667	11
Public Hotel	190082	143
Public Park and open space	260004	178
Public leisure	151669	73
Public Education Institutional	130002	95
Utilities Solar hub	65001	32
Utilities Others		
		949



Shape	Square	
Size	45 meters	
Gap between	7,5 meters	
Depth of platform	4 meters	
Inhabitants	50,000	
Built typologies	Type – 1	
	Built %	51,75
	Green %	14,27
	Transport %	33,98
	Levels	4
Green - in total	19,24 %	
Per unit Size	65 m2	3 inhab per unit avg.
Total Platforms	949	
Boundary Condition		
Cost		
Ecology		



Discussions –

The optimized outputs for Living @ sea –

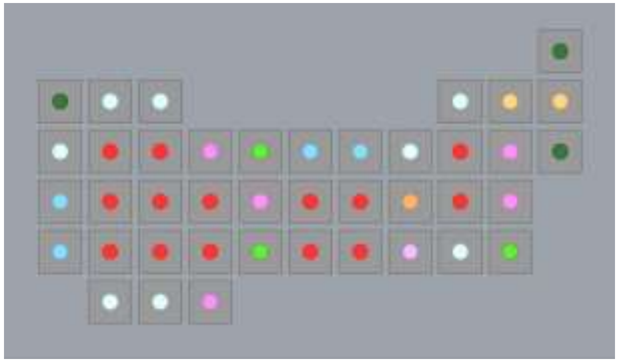
For 2,000 inhabitants –

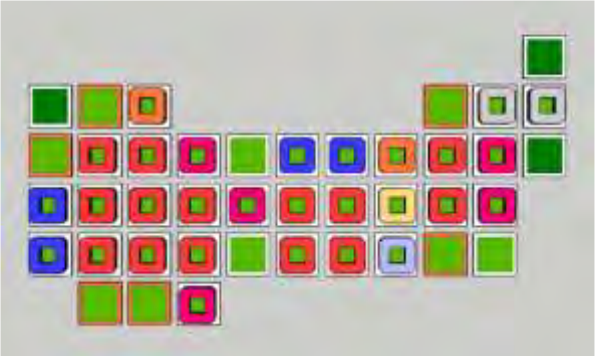
Square	45 m platform	42	7.5m
gap	3 levels		
Square	90 m platform	15	7.5m
gap	3 levels		

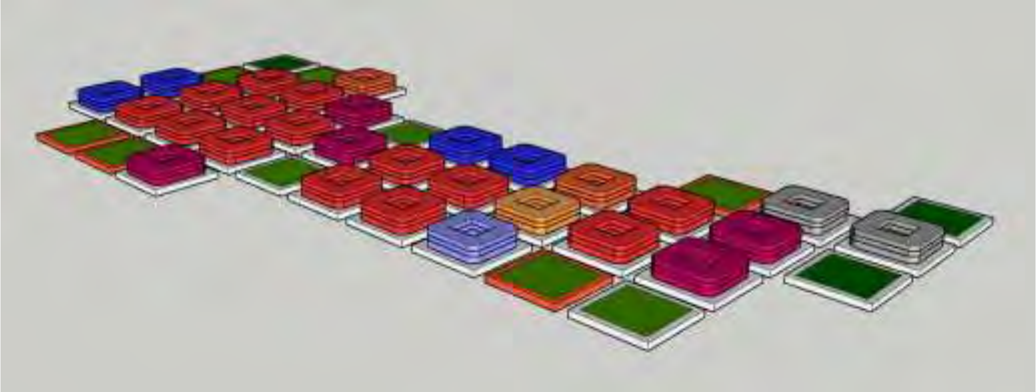
For 50,000 inhabitants –

Square	45 m platform	949	7.5m
gap	4 levels		
Square	90 m platform	275	7.5m
gap	3 levels		

We have taken outputs for different configurations for the first case.
We want inputs on how the configurations to be assigned based on your studies.

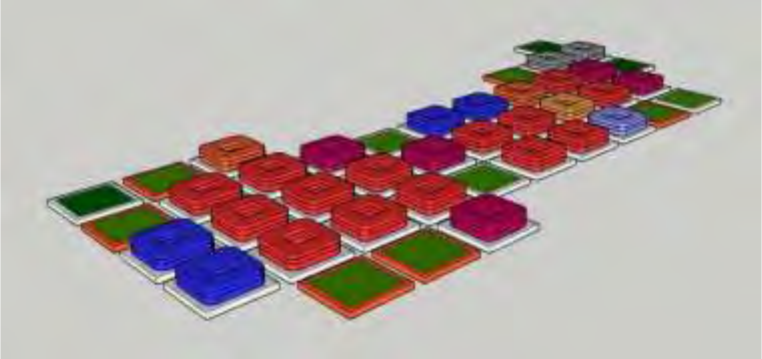






Estimated load for 3 layers –(G+2) building
205 pound / sq.ft – 275 pound / sq.ft
Built area in a platform – 1048 m2
Gross area = 3114 m2
On average – 240 pound / sq.ft = 1172 kg / sq.m

Load = 3,684,768 kg



Reference link – for load values

- http://old.seattletimes.com/html/asktheexpert/2002122968_homehay19.html

Amended table –

For 2,000 Inhabitants			45m Platform	
Gross Floor Area / Apartment			75m2	
Residents			3/ apartment	
Green			20%	
Built			51.75%	
Transport			33.98%	
Total Platforms			41	
Road width for pedestrian access			4m	
Function List	**Percentage distribution of total (%)**	**Plot Area (m)**	**Gross Area (m2)**	**No. Platforms**
Living Residential	34	28,229	44016	-
Business Commercial	12	9,963	15720	-
Business Light Industrial	5	4,151	6288	-
Public Catering Industry	2.5	2,075	3144	-
Public Building	10	8,302	12576	-
Public Sports	10	8214	8214	-
Public Educational Institute	2.5	2,075	3144	-
Public Forest	7	5,811	5811	-
Public Grass Land	7	5,811	5811	-
Solar/ Waste Water Treatment	10	8,000	8,000	-
TOTAL	100	82631	112724	

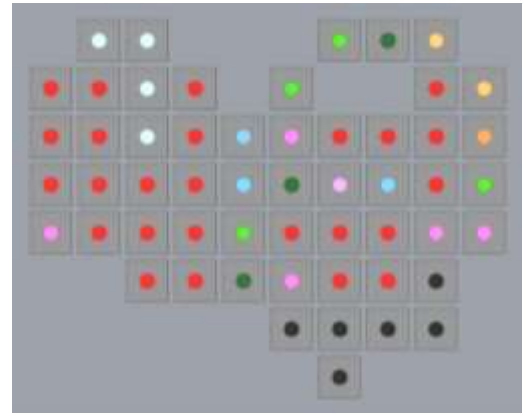
Optimum Platform numbers -

Assumption and discussion – for Logistics @ Sea			
LOCATION	North sea		
PROGRAMS		Distribution percentages %	
	Living Residential		41
	Business Commercial		8
	Business Light Industry		3
	Business Catering Industry		2
	Public Buildings		5
	Public Sports		9
	Public Educational Institute		2
	Public Forest		7
	Public Grassland		10
	Solar / Waste-Water Treatment		13
		Total	100
TRANSPORT SYSTEM	Within City – Pedestrian, cycling and waterways Axis to city from mainland – waterways	Primary channel width Secondary channel width	12 m 7.5 m

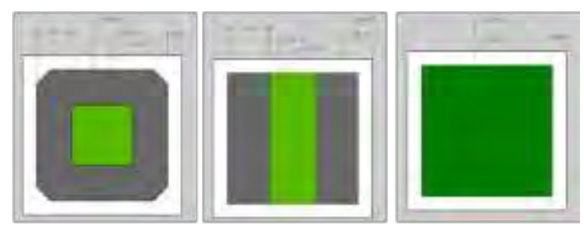
Number of platforms –
Option 1.a -

Shape	Square	No. Of inhabitant per apartment	2
Size	45 meters	Per apartment unit size	75 m2
Gap between	7,5 meters	No. Of levels	3 - (G+2)
Depth of platform	4 meters	Green percentage	20,39
Inhabitants	2,000		

Programs	**Percentage distribution**	**FootPrint area – m2**	**Gross Area – m2**	**No. Of . Platform**
Living Residential	41	25.399	76.196	25
Business Commercial	8	5.240	15.719	5
Business Light Industrial	3	2.096	6.288	2
Business Catering Industry	2	1.048	3.144	1
Public Building	5	3.144	9.431	3
Public Sports	9	5.476	5.476	4
Public educational Institute	2	1.048	3.144	1
Public forest	7	4.562	4.562	3
Public grass land	10	6.083	6.083	4
Solar / w.w.t	13	8.213	8.213	6
Total	**100**	**62.309**	**138.256**	**54**



	Built Typologies		No. Of platform
Typology -1	Built %	51,75	32
	Green %	14,27	
	Transport %	33,98	
Typology -2	Built %	43,85	5
	Green %	23,75	
	Transport %	32,4	
Typology -3	Built %	0	17
	Green %	67,6	
	Transport %	32,4	
		Total	54

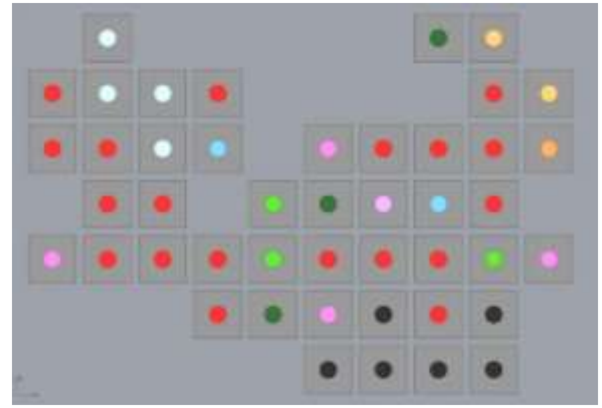


Typology -1 Typology -2 Typology -3

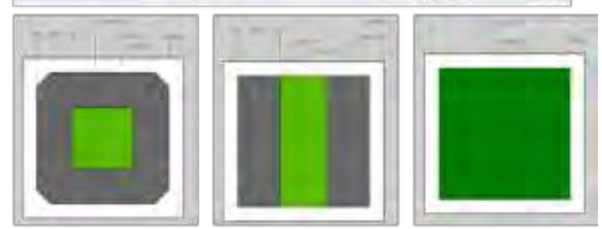
Option 1.b -

Shape	Square	No. Of inhabitant per apartment	2
Size	45 meters	Per apartment unit size	75 m2
Gap between	7,5 meters	No. Of levels	4 - (G+3)
Depth of platform	4 meters	Green percentage	20,05
Inhabitants	2,000		

Programs	**Percentage distribution**	**FootPrint area – m2**	**Gross Area – m2**	**No. Of . Platform**
Living Residential	37	19.271	77.084	19
Business Commercial	8	4192	16.767	4
Business Light Industrial	4	2096	8.384	2
Business Catering Industry	2	1048	4.192	1
Public Building	4	2096	8.384	2
Public Sports	10	5476	5.476	4
Public educational Institute	2	1048	4.192	1
Public forest	9	4562	4.562	3
Public grass land	9	4562	4.562	3
Solar / w.w.t	15	8213	8.213	6
Total	**100**	**52.564**	**141.816**	**45**



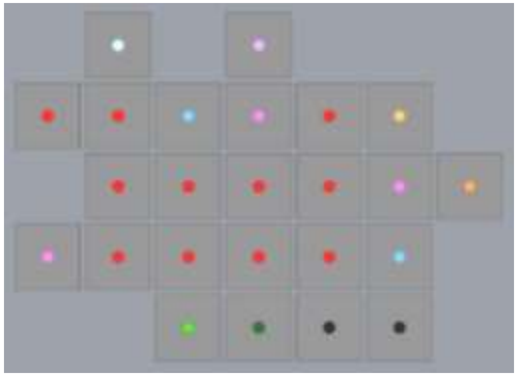
	Built Typologies		No. Of platform
Typology -1	Built %	51,75	25
	Green %	14,27	
	Transport %	33,98	
Typology -2	Built %	43,85	4
	Green %	23,75	
	Transport %	32,4	
Typology -3	Built %	0	16
	Green %	67,6	
	Transport %	32,4	
		Total	45



Typology -1 Typology -2 Typology -3

Option 2.a -

Shape	Square	No. Of inhabitant per apartment	2
Size	90 meters	Per apartment unit size	75 m2
Gap between	7,5 meters	No. Of levels	2 – (G+1)
Depth of platform	4 meters	Green percentage	30
Inhabitants	2,000		



Programs	Percentage distribution	FootPrint area – m2	Gross Area – m2	No. Of . Platform
Living Residential	39	38.929	77.857	11
Business Commercial	11	11.445	22.891	3
Business Light Industrial	4	3.815	7.630	1
Business Catering Industry	4	3.815	7.630	1
Public Building	8	7.630	15.260	2
Public Sports	6	6.083	6.083	1
Public educational Institute	4	3.815	7.630	1
Public forest	6	6.083	6.083	1
Public grass land	6	6.083	6.083	1
Solar / w.w.t	12	12.166	12.166	2
Total	**100**	**93.781**	**169.263**	**24**

	Built Typologies		No. Of platform
Typology -1	Built %	47,1	16
	Green %	28	
	Transport %	24,9	
Typology -2	Built %	34,6	3
	Green %	40,5	
	Transport %	24,9	
Typology -3	Built %	0	5
	Green %	75,1	
	Transport %	24,9	
		Total	24

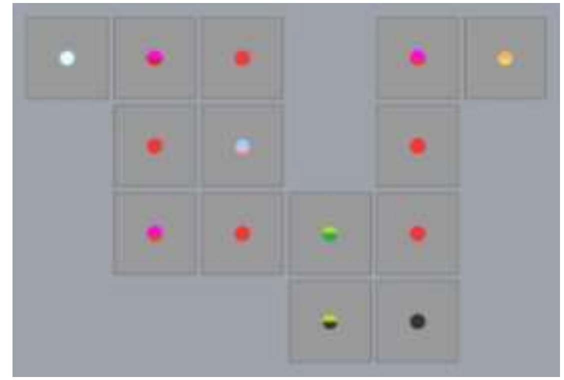
Typology -1

Typology -2

Typology -3

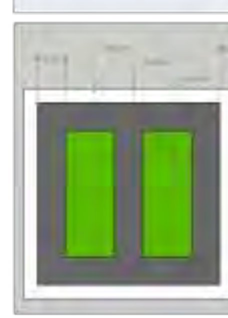
Option 2.b -

Shape	Square	No. Of inhabitant per apartment	2
Size	90 meters	Per apartment unit size	75 m2
Gap between	7,5 meters	No. Of levels	3 – (G+2)
Depth of platform	4 meters	Green percentage	20
Inhabitants	2,000		



Programs	Percentage distribution	FootPrint area – m2	Gross Area – m2	No. Of . Platform
Living Residential	49	30.520	75.000	8
Business Commercial			22.891	
Business Light Industrial	6	3.815	11.445	1
Business Catering Industry				
Public Building	10	3.815	11.445	1
Public educational Institute				
Public Sports	6	6.083	6.083	1
Public forest	29	5.000	5.000	3
Public grass land		5.000	5.000	
Solar / w.w.t		8.249	8.249	
Total	**100**	**62.482**	**145.113**	**14**

	Built Typologies		No. Of platform
Typology -1	Built %	47,1	10
	Green %	28	
	Transport %	24,9	
Typology -2	Built %	0	4
	Green %	75,1	
	Transport %	24,9	
		Total	**14**



Typology -1

Typology -2

Assumption and discussion – for Living @ Sea

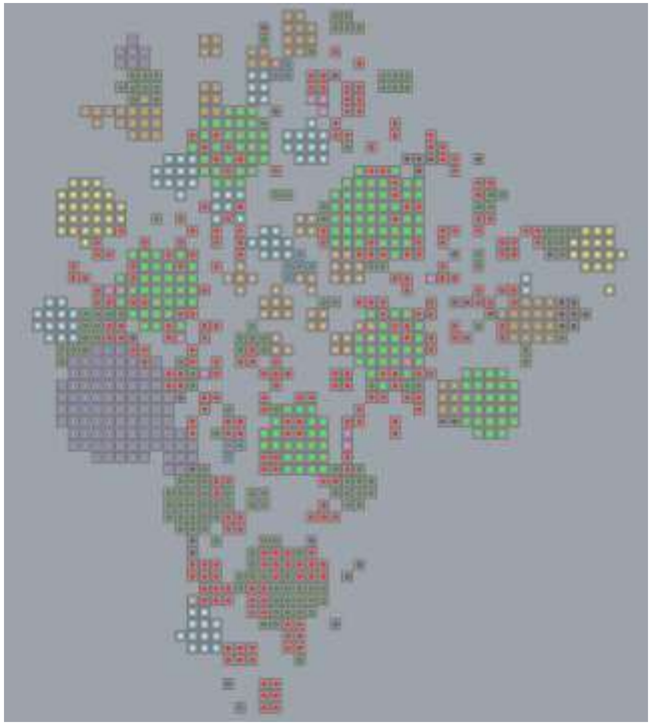
LOCATION	Rostock Den Haag Malmö Copenhagen Stockholm Dublin Tallinn		
PROGRAMS		Distribution percentages %	
	Living Residential		32
	Living Community facilities		1.5
	Business Offices		5
	Business Light Industrial		5
	Business Research and Development		8
	Public Hotel		1.5
	Public Park and open space		11
	Public leisure		15
	Public Education Institutional		9
	Utilities Solar hub		8
	Utilities Others		4
		Total	100
TRANSPORT SYSTEM	Within City – Pedestrian, cycling and waterways Axis to city from mainland – waterways	Primary channel width Secondary channel width	12 m 7.5 m

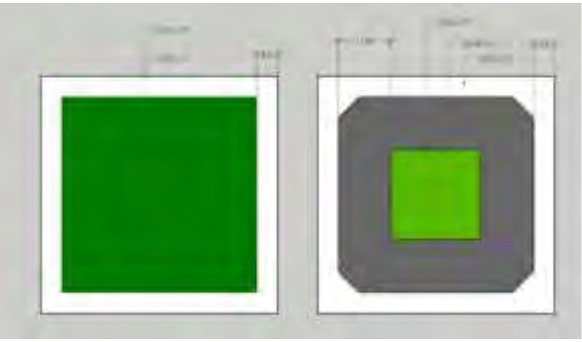
Number of platforms –

Option 1.a -

Shape	Square	No. Of inhabitant per apartment	3
Size	45 meters	Per apartment unit size	65 m2
Gap between	7,5 meters	No. Of levels	4 - (G+3)
Depth of platform	4 meters	Green percentage	19.24
Inhabitants	50,000		

Programs	Percentage distribution	FootPrint area – m2	Gross Area – m2	No. Of . Platform
Living Residential	32	541.667		256
Living Community facilities	1.5	21.667		11
Business offices	5	86.668		42
Business Light Industrial	5	86.668		42
Business Research and Development	8	130.002		63
Public Hotel	1.5	21.667		11
Public Park and open space	11	190.082		143
Public Leisure	15	260.004		178
Public educational Institute	9	151.669		73
Utility Solar	8	130.002		95
Utility Others	4	65.001		32
Total	**100**	**1.685.097**		**949**



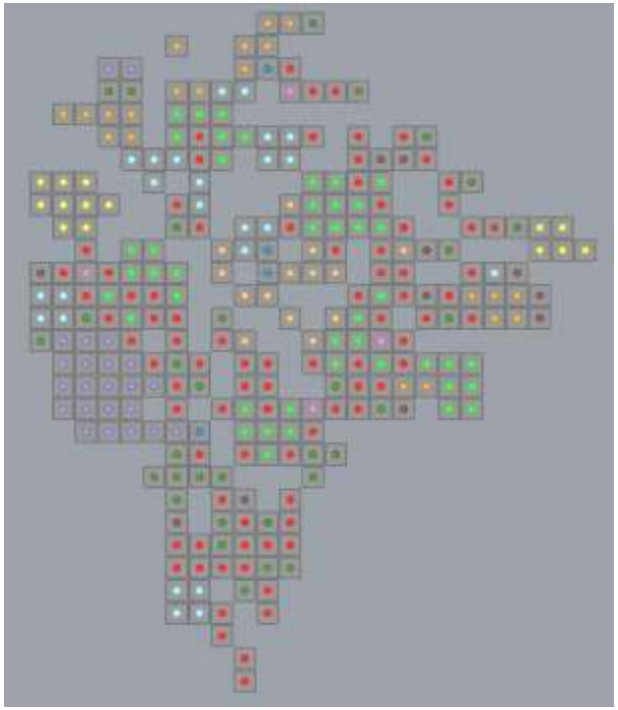


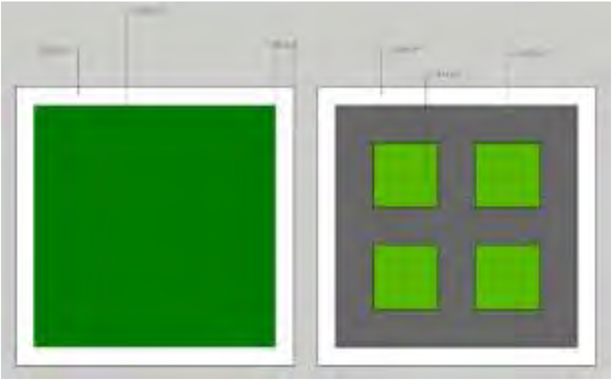
Number of platforms –

Option 2.a -

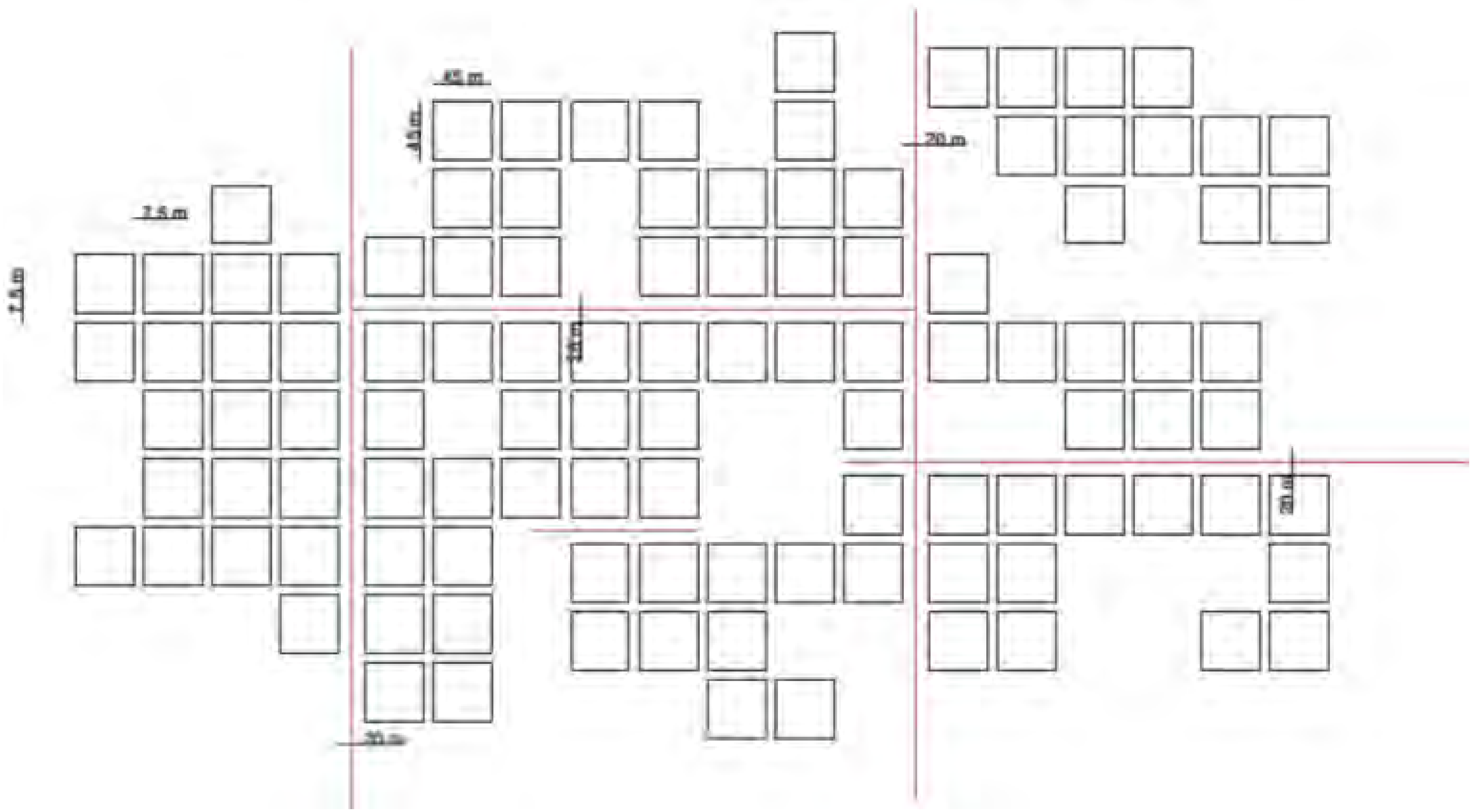
Shape	Square	No. Of inhabitant per apartment	3
Size	90 meters	Per apartment unit size	65 m2
Gap between	7,5 meters	No. Of levels	3 - (G+2)
Depth of platform	4 meters	Green percentage	24.87
Inhabitants	50,000		

Programs	**Percentage distribution**	**FootPrint area – m2**	**Gross Area – m2**	**No. Of . Platform**
Living Residential	32	541.667		84
Living Community facilities	1.5	21.667		4
Business offices	5	86.668		14
Business Light Industrial	5	86.668		14
Business Research and Development	8	130.002		21
Public Hotel	1.5	21.667		4
Public Park and open space	11	190.082		32
Public Leisure	15	260.004		44
Public educational Institute	9	151.669		24
Utility Solar	8	130.002		23
Utility Others	4	65.001		11
Total	**100**	**1.685.097**		**275**





Input for simulation –



- 100 platforms was ideal situations to test various edge conditions.
- Water ways is considered as the primary transport system.

Primary waterways transport network

Total – 108 platforms

Configuration Concepts -

Overview –

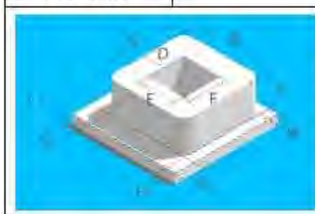
- This document is an overview of potential configurations explored for the application of logistics at sea.
- These configurations were designed with consideration of the following criteria;
- Residential Proximity e.g to Green Space, Amenities, Public Functions and Parking Facilities.
- % Green Space
- Floor Space Index
- Protection from motions (edge)
- Water Accessibility
- Platform Accessibility
- Spatial Integration (Functional relationships e.g Having a School next to a library & Public Sports area).
- Zoning (Area character e.g Public Zone, Industrial Zone, Academic Zone).
- Public Space Distribution e.g central core vs distributed
- Boat Mooring Facilities
- Wind Protection (Tunnelling)

Typologies –

Category	Residential	Function	Low Density
Shape	Courtyard Block	No of Storeys	3
A width (m)	33.75	B width (m)	33.75
C width (m)	10.90	D width (m)	10
E width (m)	13.75	F width (m)	13.75
G width (m)	7.5	H width (m)	3.25
I width (m)	4	GFA per block (m²)	2850
Interior Void (m²)		Independent Platform	✓

Distribution	(m²)	(%)
Total Plot	2025	100
Built	950	46
Green	189	10
Accessibility	886	44

Category	Residential	Function	Medium Density
Shape	Courtyard Block	No of Storeys	4
A width (m)	33.75	B width (m)	33.75
C width (m)	14.10	D width (m)	9
E width (m)	15.75	F width (m)	15.75
G width (m)	7.5	H width (m)	3.25
I width (m)	4	GFA per block (m²)	3564
Interior Void (m²)		Independent Platform	✓



Distribution	(m²)	(%)
Total Plot	2025	100
Built	891	44
Green	248	12
Accessibility	886	44

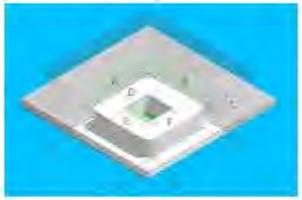
Category	Residential	Function	High Density
Shape	L Block	No of Storeys	5
A width (m)	75	B width (m)	75
C width (m)	17.20	D width (m)	10
E width (m)	13.75	F width (m)	55
G width (m)	7.5	H width (m)	5
I width (m)	4	GFA per block (m²)	8375
Interior void (m²)		Independent Platform	×

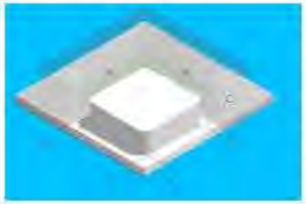
Distribution	(m²)	(%)
Total Plot	5160	100
Built	1675	32
Green	1323	27
Accessibility	2162.5	42

Category	Residential	Function	High Density
Shape	Courtyard Block	No of Storeys	5
A width (m)	41.25	B width (m)	41.25
C width (m)	17.20	D width (m)	12
E width (m)	17.25	F width (m)	17.25
G width (m)	5	H width (m)	7.5
I width (m)	4	GFA per block (m²)	7020
Interior void (m²)		Independent Platform	×

Distribution	(m²)	(%)
Total Plot	2940	100
Built	1404	48
Green	298	10
Accessibility	1238	42

Typologies –

Category	Business Catering Industry	Function	Hotel	
Shape	Courtyard Block	No of Storeys	3	
A width (m)	41.25	B width (m)	41.25	
C width (m)	10.90	D width (m)	12	
E width (m)	17.25	F width (m)	17.25	
G width (m)	5	H width (m)	7.5	
I width (m)	4	GFA per block (m²)	4212	
Interior void (m²)		Independent Platform	×	
		Distribution	(m²)	(%)
		Total Plot	2940	100
		Built	1404	48
		Green	298	10
		Accessibility	1238	42

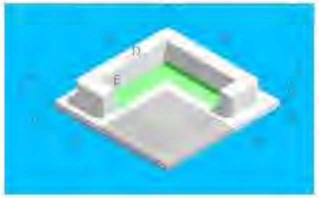
Category	Public Educational Institute	Function	Library & Learning Centre	
Shape	Square	No of Storeys	4	
A width (m)	41.25	B width (m)	41.25	
C width (m)	14.10	D width (m)	5	
E width (m)	7.25	F width (m)	4	
Interior void (m²)	108	GFA per block (m²)	6700	
Independent Platform	×			
		Distribution	(m²)	(%)
		Total Plot	2940	100
		Built	1702	58
		Green	0	0
		Accessibility	1238	42

Category	Public Education Institute	Function	Library & Learning Centre	
Shape	Square	No of Storeys	4	
A width (m)	33.75	B width (m)	33.75	
C width (m)	14.10	D width (m)	7.5	
E width (m)	3.25	F width (m)	4	
Interior Void (m²) *	108	GFA per block (m²)	4452	
Independent Platform	✓			
		Distribution	(m²)	(%)
		Total Plot	2025	100
		Built	1140	56
		Green	0	0
		Accessibility	885	44

Category	Public Education Institute	Function	High School	
Shape	Square	No of Storeys	2 - 4	
A width (m)	33.75	B width (m)	33.75	
C width (m)	10	D width (m)	23.75	
E width (m)	14.10	F width (m)	10.90	
Interior Void (m²) *	248	GFA per block (m²)	4146	
Independent Platform	✓			
		Distribution	(m²)	(%)
		Total Plot	2025	100
		Built	1093	54
		Green	0	0
		Accessibility	932	46

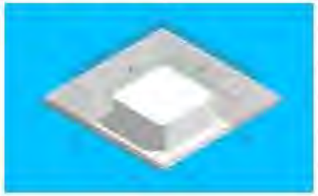
Typologies –

Category	Business Commercial	Function	Offices L Block
Shape	L- Block	No of Storeys	4
A width (m)	75	B width (m)	75
C width (m)	14.10	D width (m)	10
E width (m)	13.75	F width (m)	55
G width (m)	7.5	H width (m)	5
I width (m)	4	GFA per block (m²)	6700
Interior Void		Independent Platform	×



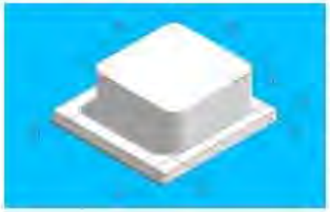
Distribution	(m²)	(%)
Total Plot	5160	100
Built	1675	32
Green	1323	27
Accessibility	2126.5	42

Category	Public Community	Function	Cultural Centre
Shape	Square	No of Storeys	4
A width (m)	41.25	B width (m)	41.25
C width (m)	14.10	D width (m)	5
E width (m)	7.25	F width (m)	4
Internal Void (m²) *	36	GFA per block (m²)	6772
Independent Platform	×		



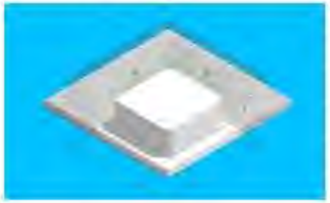
Distribution	(m²)	(%)
Total Plot	2940	100
Built	1702	32
Green	0	0
Accessibility	1238	42

Category	Public Community	Function	Cultural Centre
Shape	Square	No of Storeys	4
A width (m)	33.75	B width (m)	33.75
C width (m)	14.10	D width (m)	7.5
E width (m)	3.25	F width (m)	4
Interior Void (m²) *	36	GFA per block (m²)	4524
Independent Platform	✓		



Distribution	(m²)	(%)
Total Plot	2025	100
Built	1140	56
Green	0	0
Accessibility	885	44

Category	Public Community	Function	Theatre
Shape	Square	No of Storeys	4
A width (m)	41.25	B width (m)	41.25
C width (m)	14.10	D width (m)	5
E width (m)	7.25	F width (m)	4
Interior Void (m²) *	1200	GFA per block (m²)	5608
Independent Platform	×		



Distribution	(m²)	(%)
Total Plot	2940	100
Built	1702	32
Green	0	0
Accessibility	1238	42

Typologies –

Category	Public Community	Function	Theatre
Shape	Square	No of Storeys	4
A width (m)	33.75	B width (m)	33.75
C width (m)	14.10	D width (m)	7.5
E width (m)	3.25	F width (m)	4
Interior Void (m²) *	1200	GFA per block (m²)	3360
Independent Platform	✓		

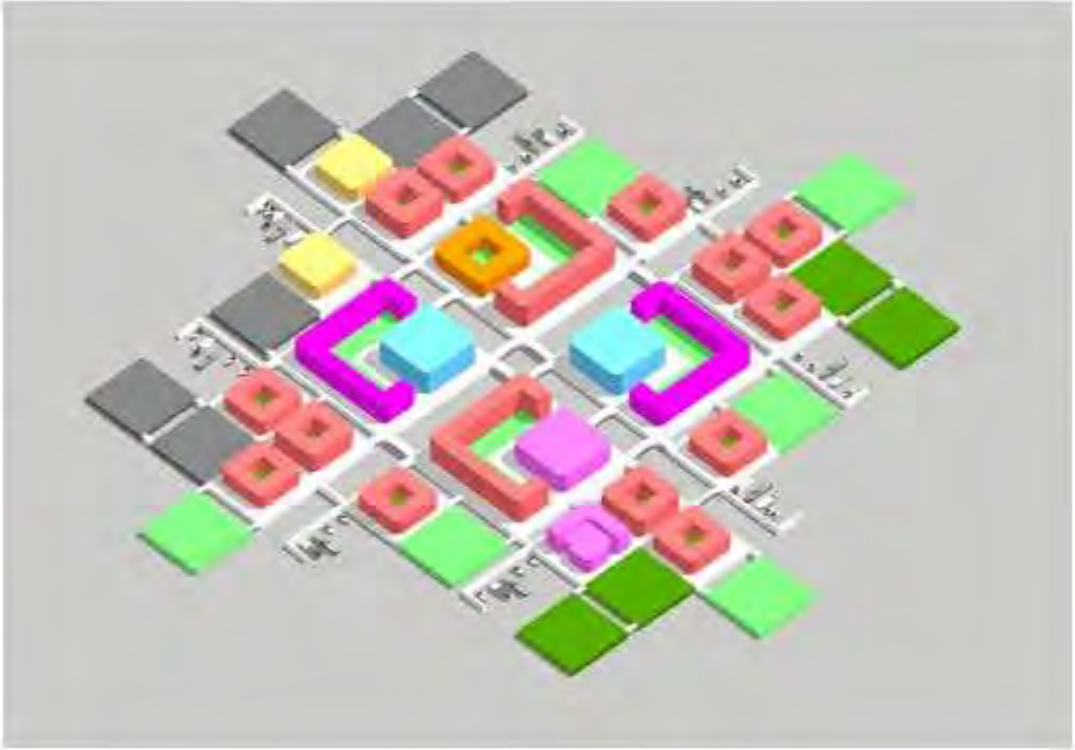
Distribution	(m²)	(%)
Total Plot	2025	100
Built	1140	56
Green	0	0
Accessibility	885	44

Category	Business Light Industry	Function	Warehouse
Shape	Square	No of Storeys	3
A width (m)	33.75	B width (m)	33.75
C width (m)	10.90	D width (m)	7.5
E width (m)	3.25	F width (m)	4
Interior Void (m²) *	-	GFA per block (m²)	3420
Independent Platform	✓		

Distribution	(m²)	(%)
Total Plot	2025	100
Built	1140	56
Green	0	0
Accessibility	885	44

Concept -1

Function	Plot Area (m²)
Green	28,533
Built	28,697
Accessibility	27,820
Utilities	12,150
Total Floor Area:	97,200
Gross Floor Area (m²)	104,344
Floor Space Index	1.0734
Green Space (%)	29.35
Accessibility Space (%)	28.62
Built Space (%)	29.52
Utilities Space (%)	12.5



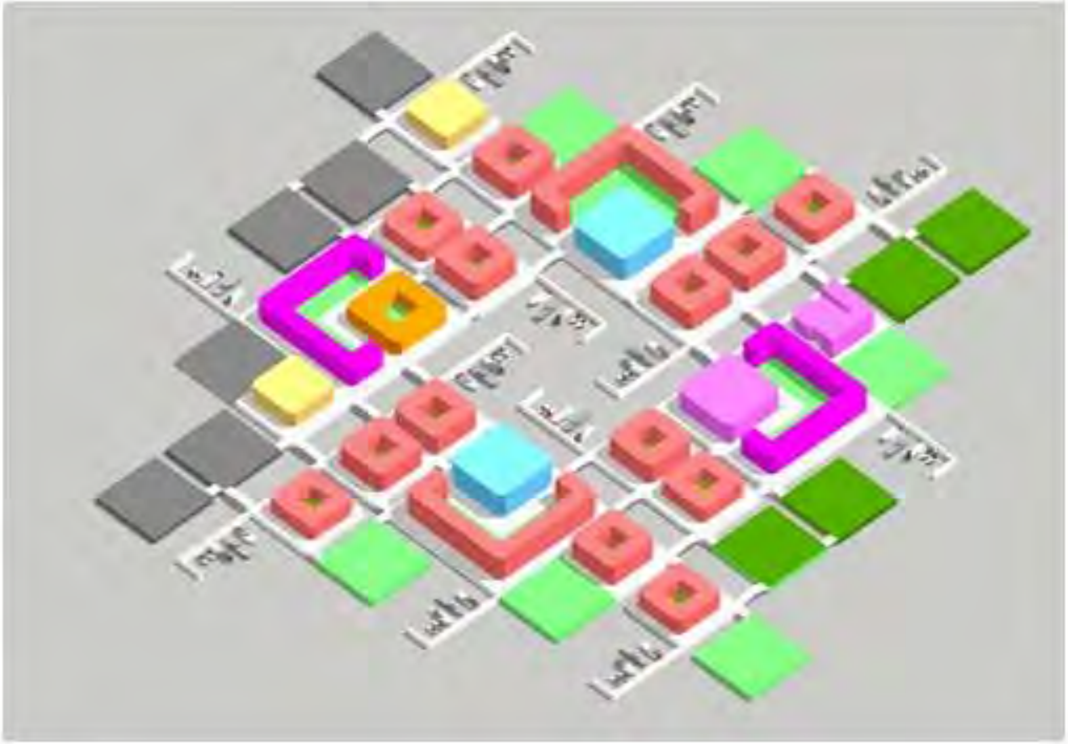
Function Distribution Concept -1

Function	Type	Percentage Distribution of GFA (%)	Total Plot Area excluding accessibility (m²)	Total Building Plot Area (m²)	Gross Floor Area (m²)	No. of Platforms	No. of Levels
Residential	Low Density	18.76	10,251	8,550	25,650	9	3
	Med Density	10.43	4,536	3,564	14,256	4	4
	High Density (L)	12.25	5,995	3,350	16,750	6	5
Business Commercial	Offices L-Block	9.80	5,995	3,350	13,400	6	4
Business Light Industry	Warehouse	5.00	2,280	2,280	6,840	2	3
Business Catering Industry	Hotel	3.08	1,404	1,404	4,212	1	3
Public Community Facilities	Cultural Centre	4.95	1,702	1,702	6,772	1	4
	Theatre	4.10	1,702	1,702	5,608	1	4
Public Educational Institute	Library and Learning Centre	4.90	1,702	1,702	6,700	1	4
	School	3.03	1,093	1,093	4,146	1	4
Public Sports		5.92	8,100	-	-	4	-
Public Green Space		8.89	12,150	-	-	6	-
Utilities		8.89	12,150	-	-	6	-
TOTAL		100	69,080	28,697	104,344	48	-

SPACE@SEA

Concept -2

Function	Plot Area (m²)
Green	28,533
Built	28,697
Accessibility	27,820
Utilities	12,150
Total Floor Area:	97,200
Gross Floor Area (m²)	104,344
Floor Space Index	1.0734
Green Space (%)	29.35
Accessibility Space (%)	28.62
Built Space (%)	29.52
Utilities Space (%)	12.5



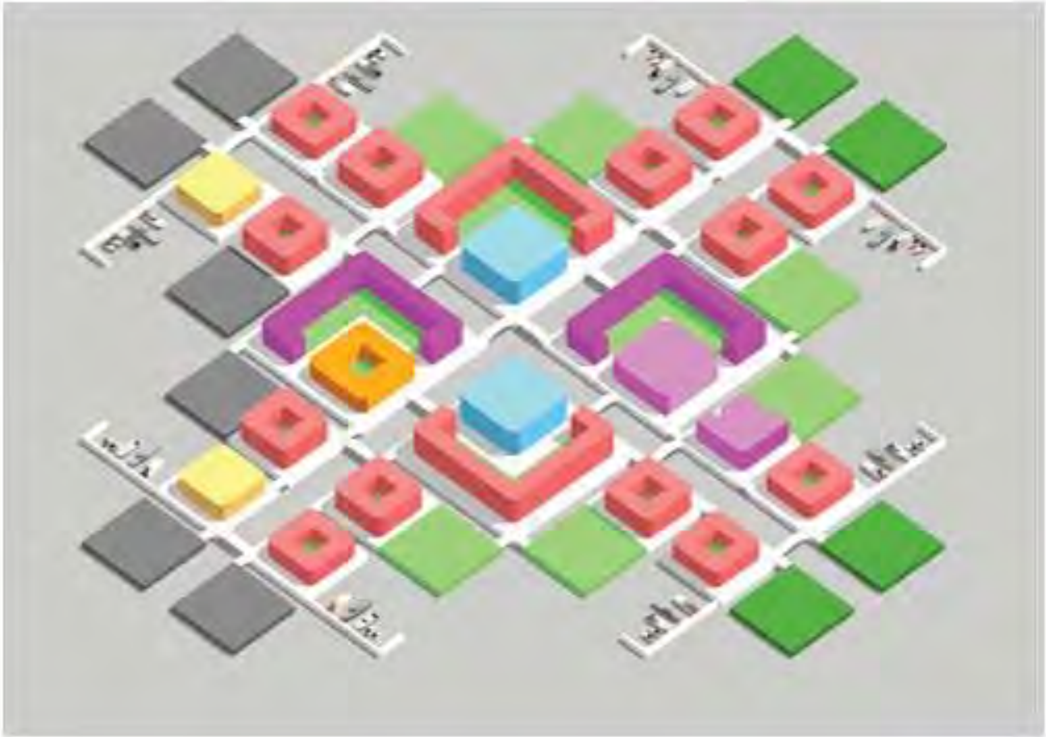
Function Distribution Concept -2

Function	Type	Percentage Distribution of GFA (%)	Total Plot Area excluding accessibility (m²)	Total Building Plot Area (m²)	Gross Floor Area (m²)	No. of Platforms	No. of Levels
Residential	Low Density	18.76	10,251	8,550	25,650	9	3
	Med Density	10.43	4,536	3,564	14,256	4	4
	High Density	12.25	5,995	3,350	16,750	6	5
Business Commercial	Offices	9.80	5,995	3,350	13,400	6	4
Business Light Industry	Warehouse	5.00	2,280	2,280	6,840	2	3
Business Catering Industry	Hotel	3.08	1,404	1,404	4,212	1	3
Public Community Facilities	Cultural Centre	4.95	1,702	1,702	6,772	1	4
	Theatre	4.10	1,702	1,702	5,608	1	4
Public Educational Institute	Library and Learning Centre	4.90	1,702	1,702	6,700	1	4
	School	3.03	1,093	1,093	4,146	1	4
Public Sports		5.92	8,100	-	-	4	-
Public Green Space		8.89	12,150	-	-	6	-
Utilities		8.89	12,150	-	-	6	-
TOTAL		100	69,080	28,697	104,344	48	-

SPACE@SEA

Concept -3

Function	Plot Area (m²)
Green	28,710
Built	28,556
Accessibility	27,784
Utilities	12,150
Total Floor Area:	97,200
Gross Floor Area (m²)	106,467
Floor Space Index	1.095
Green Space (%)	29.54
Accessibility Space (%)	28.58
Built Space (%)	29.37
Utilities Space (%)	12.5

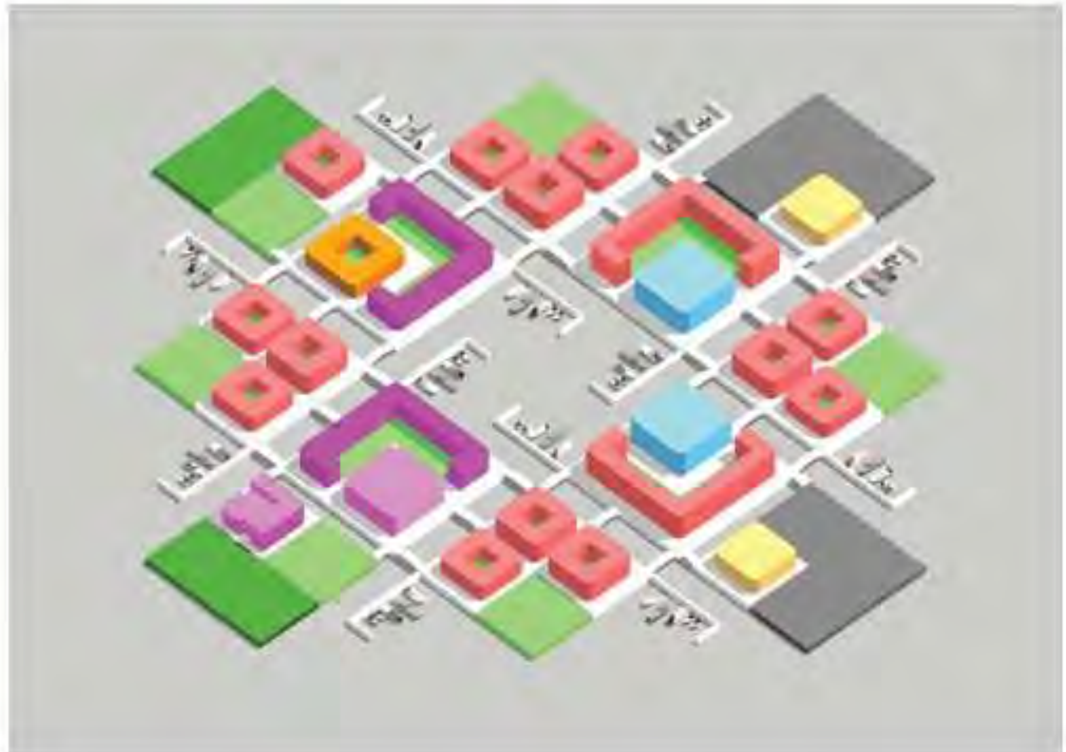


Function Distribution Concept -3

Function	Type	Percentage Distribution of GFA (%)	Total Plot Area excluding accessibility (m²)	Total Building Plot Area (m²)	Gross Floor Area (m²)	No. of Platforms	No. of Levels
Residential	Low Density	12.31	6,834	5,700	17,100	6	3
	Med Density	17.97	7,973	6,273	24,948	7	4
	High Density	12.06	5,995	3,350	16,750	6	5
Business Commercial	Offices	9.65	5,995	3,350	13,400	6	4
Business Light Industry	Warehouse	4.92	2,280	2,280	6,840	2	3
Business Catering Industry	Hotel	3.03	1,404	1,404	4,212	1	3
Public Community Facilities	Cultural Centre	4.88	1,702	1,702	6,772	1	4
	Theatre	4.04	1,702	1,702	5,608	1	4
Public Educational Institute	Library and Learning Centre	4.82	1,702	1,702	6,700	1	4
	School	2.99	1,093	1,093	4,146	1	4
Public Sports		5.83	8,100	-	-	4	-
Public Green Space		8.75	12,150	-	-	6	-
Utilities		8.75	12,150	-	-	6	-
TOTAL		100	69,080	28,556	106,476	48	-

Concept -4

Function	Plot Area (m²)
Green	28,233
Built	28,697
Accessibility	28120
Utilities	12,150
Total Floor Area:	97,200
Gross Floor Area (m²)	104,344
Floor Space Index	1.074
Green Space (%)	29.04
Accessibility Space (%)	29.52
Built Space (%)	28.93
Utilities Space (%)	12.5

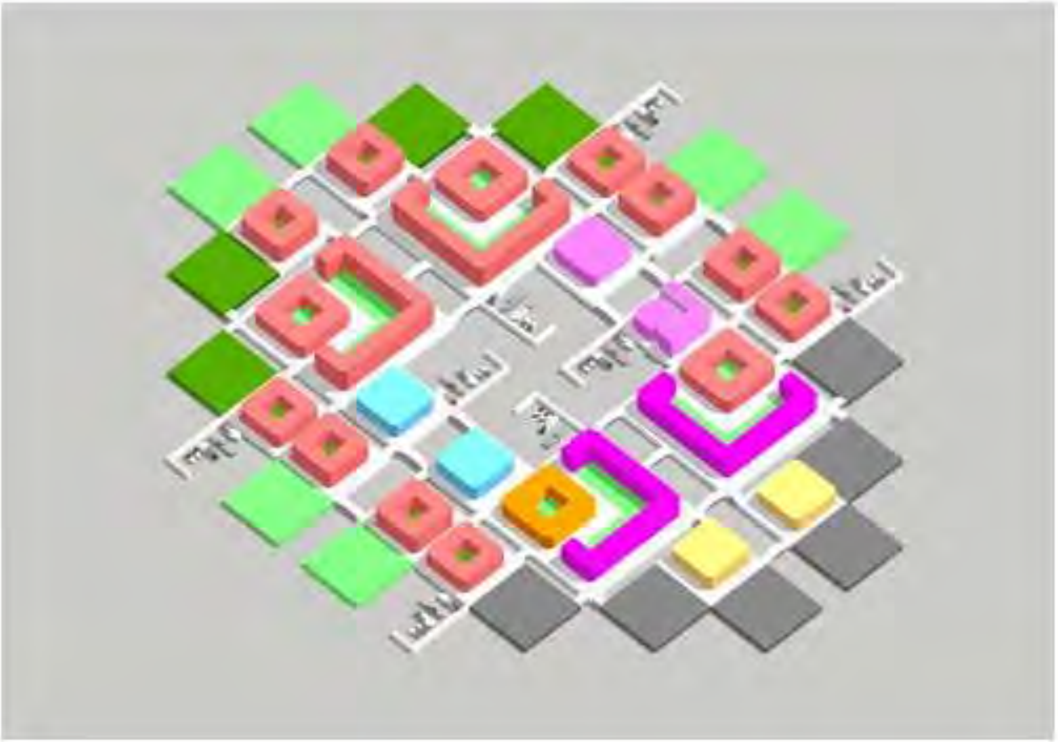


Function Distribution Concept -4

Function	Percentage Distribution of GFA (%)	Function	Total Plot Area excluding accessibility (m²)	Total Building Plot Area (m²)	Gross Floor Area (m²)	No. of Platforms (45x45m)	No. of Levels
Residential	41.44	Low Density Housing	10,251	8,550	25,650	9	3
		Med Density Housing	4,536	3,564	14,256	4	4
		High Density Housing (L)	5,995	3,350	16,750	6	5
Business Commercial	9.80	Offices	5,995	3,350	13,400	6	4
Business Light Industry	5.00	Warehouse	2,280	2,280	6,840	2	3
Business Catering Industry	3.08	Hotel	1,404	1,404	4,212	1	3
Public Community Facilities	9.05	Cultural Centre	1,702	1,702	6,772	1	4
		Theatre	1,702	1,702	5,608	1	4
Public Educational Institute	7.93	Library	1,702	1,702	6,700	1	4
		School	1,093	1,093	4,146	1	4
Public Sports	5.92		8,100	-	-	4	-
Public Green Space	8.89		12,150	-	-	6	-
Utilities	8.89		12,150	-	-	6	-
TOTAL	100		69,080	28,697	104,334	48	-

Concept -5

Function	Plot Area (m²)
Green	28,978
Built	28,255
Accessibility	27,817
Utilities	12,150
Total Floor Area:	97,200
Gross Floor Area (m²)	101,132
Floor Space Index	1.04
Green Space (%)	29.82
Accessibility Space (%)	28.62
Built Space (%)	29.01
Utilities Space (%)	12.5



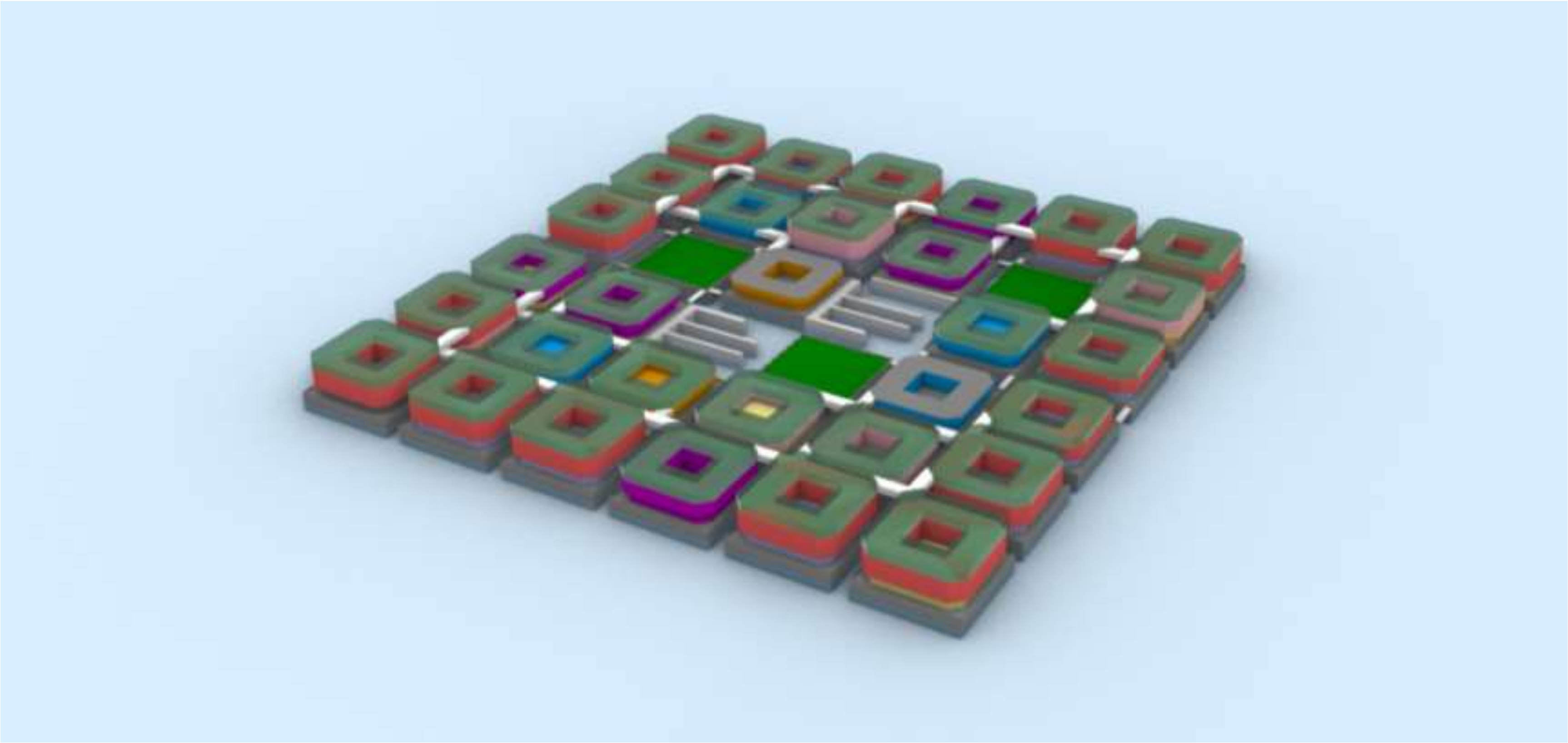
Function Distribution Concept -5

Function	Type	Percentage Distribution of GFA (%)	Total Plot Area excluding accessibility (m²)	Total Building Plot Area (m²)	Gross Floor Area (m²)	No. of Platforms	No. of Levels
Residential	Low Density	8.55	4,556	3,800	11,400	4	3
	Med Density	11.38	6,834	5,346	15,200	6	4
	High Density (L)	12.54	5,995	3,350	16,750	6	5
	High Density (C)	12.62	5,106	4,212	16,848	3	5
Business Commercial	Offices	10.03	5,995	3,350	13,400	6	4
Business Light Industry	Warehouse	5.12	2,280	2,280	6,840	2	3
Business Catering industry	Hotel	3.15	1,404	1,404	4,212	1	3
Public Community Facilities	Cultural Centre	3.39	1,140	1,140	4,524	1	4
	Theatre	2.52	1,140	1,140	3,360	1	4
Public Educational Institute	Library and Learning Centre	3.33	1,140	1,140	4,452	1	4
	School	3.10	1,093	1,093	4,146	1	4
Public Sports		6.07	8,100	-	-	4	-
Public Green Space		9.10	12,150	-	-	6	-
Utilities		9.10	12,150	-	-	6	-
TOTAL		100	69,083	28,255	101,132	48	-

Appendix – 5 City Design – Square shape platform

Table of Contents

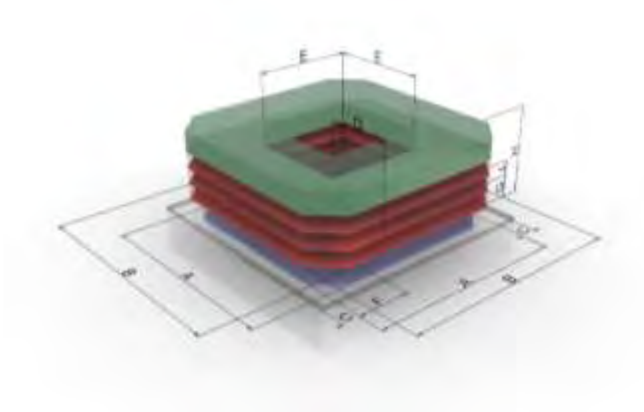
1 - 45m PLATFORM



1.1 - Typologies –

Type -1

Category	Residential	**Function**	Residence and amenities
Shape	Courtyard Block	**No of Storeys**	5
A width (m)	38.50	**B width (m)**	42.50
C width (m)	3.25	**D width (m)**	12
E width (m)	18.50	**F width (m)**	10
G width (m)	4.50	**H width (m)**	17.50
I width (m)	3	**GFA per block (m²) without terrace**	5364
Terrace green (m²)	1414	**Independent Platform**	✓

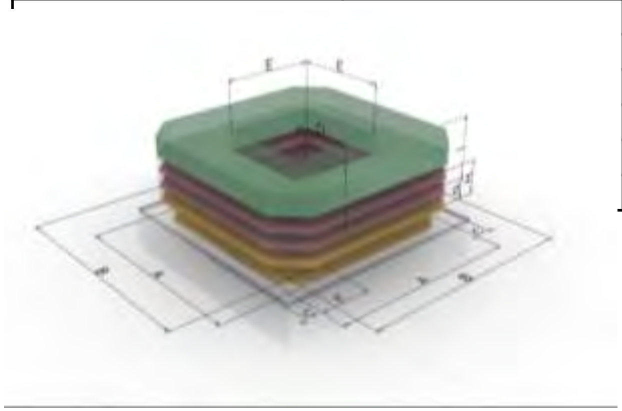


Distribution	**(m²)**	**(%)**
Total Plot	2025	100
Built	1123	55.50
Green	342	16
Accessibility	560	28.50

1.1 - Typologies –

Type -2

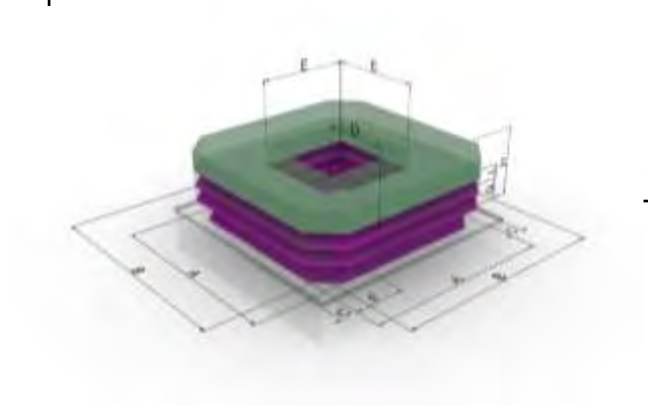
Category	Mixed Use	**Function**	Business, Community and Educational	
Shape	Courtyard Block	**No of Storeys**	4	
A width (m)	38.50	**B width (m)**	42.50	
C width (m)	3.25	**D width (m)**	12	
E width (m)	18.50	**F width (m)**	10	
G width (m)	4.50	**H width (m)**	17.50	
I width (m)	3	**GFA per block (m²) without terrace**	5364	
Terrace green (m²)	1414	**Independent Platform**	✓	
		Distribution	**(m²)**	**(%)**
		Total Plot	2025	100
		Built	1123	55.50
		Green	342	16
		Accessibility	560	28.50



1.1 - Typologies –

Type -3

Category	Mixed Use	**Function**	Business, Community and Educational
Shape	Courtyard Block	**No of Storeys**	4
A width (m)	38.50	**B width (m)**	42.50
C width (m)	3.25	**D width (m)**	12
E width (m)	18.50	**F width (m)**	10
G width (m)	4.50	**H width (m)**	14.50
I width (m)	3	**GFA per block (m²) without terrace**	3950
Terrace green (m²)	1414	**Independent Platform**	✓

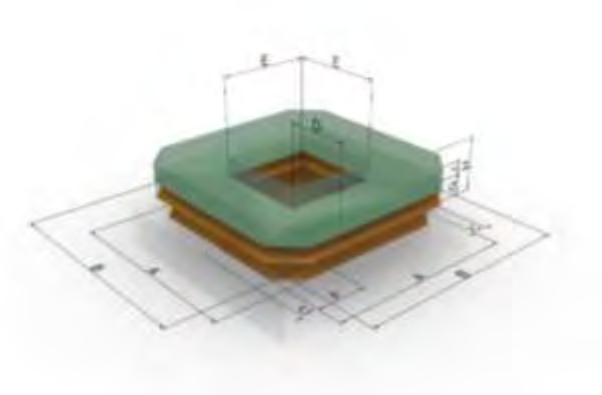


Distribution	**(m²)**	**(%)**
Total Plot	2025	100
Built	1123	55.50
Green	342	16
Accessibility	560	28.50

1.1 - Typologies –

Type -4

Category	Mixed Use	**Function**	Business, Community and Educational
Shape	Courtyard Block	**No of Storeys**	3
A width (m)	38.50	**B width (m)**	42.50
C width (m)	3.25	**D width (m)**	12
E width (m)	18.50	**F width (m)**	10
G width (m)	4.50	**H width (m)**	11.50
I width (m)	3	**GFA per block (m^2) without terrace**	2536
Terrace green (m^2)	1414	**Independent Platform**	✓

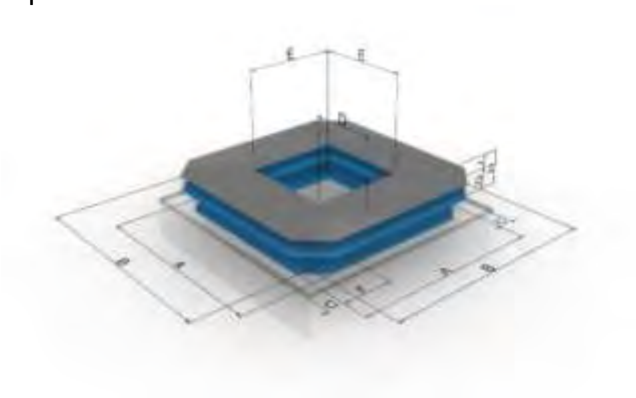


Distribution	**(m^2)**	**(%)**
Total Plot	2025	100
Built	1123	55.50
Green	342	16
Accessibility	560	28.50

1.1 - Typologies –

Type -5

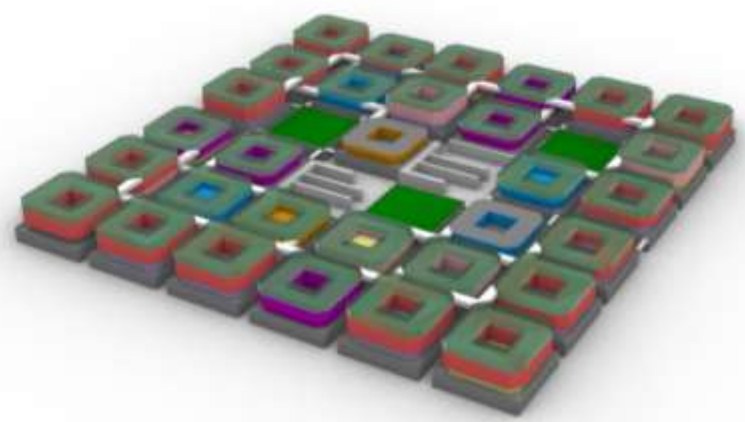
Category	Mixed Use	**Function**	Business, Community and Educational
Shape	Courtyard Block	**No of Storeys**	2
A width (m)	38.50	**B width (m)**	42.50
C width (m)	3.25	**D width (m)**	12
E width (m)	18.50	**F width (m)**	10
G width (m)	4.50	**H width (m)**	7.50
I width (m)	3	**GFA per block (m²) without terrace**	2536
Terrace green (m²)	-	**Independent Platform**	✓



Distribution	**(m²)**	**(%)**
Total Plot	2025	100
Built	1123	55.50
Green	342	16
Accessibility	560	28.50

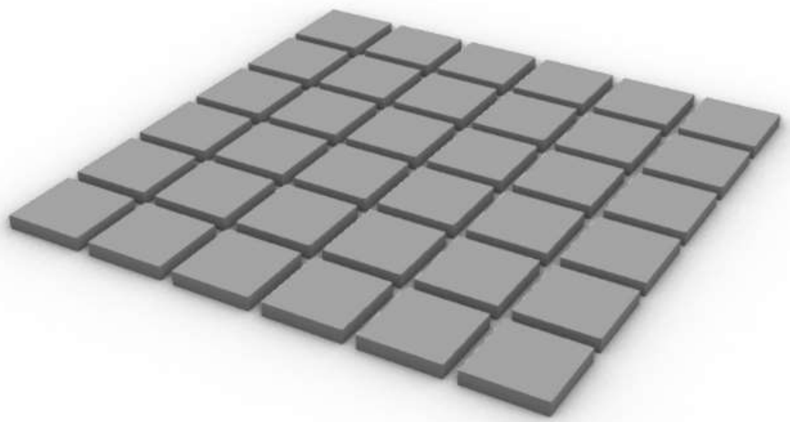
1.2 - Functional Distribution –

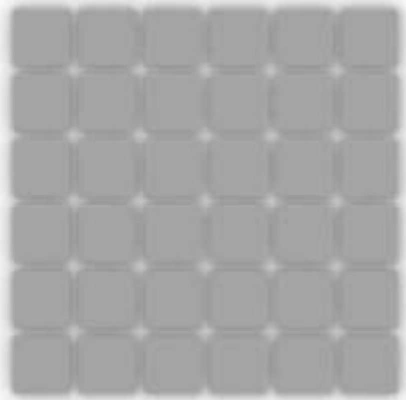
Function	Type	Percentage Distribution of GFA (%)	Gross Floor Area (m^2)	
Residential	Med Density	44	65,290	
Business Commercial	Offices	9	13,317	
Business Light Industry	Warehouse	4,5	6,718	
Business Catering Industry	Hotel	3,5	5,417	
Public Community Facilities	Cultural Centre	5	6,831	
	Theatre	3,5	5,417	
Public Educational Institute	Library and Learning Centre	5	7,070	
	School	3,5	5,364	
Public Sports		5	7,335	
Public Green Space		4	6,075	
Public Terrace Green		-	-	41,006
Public Amenities		6	8,802	
Utilities		7	10,210	
TOTAL		100	147,846	



1.3 - Organization of the city (land-use map) –

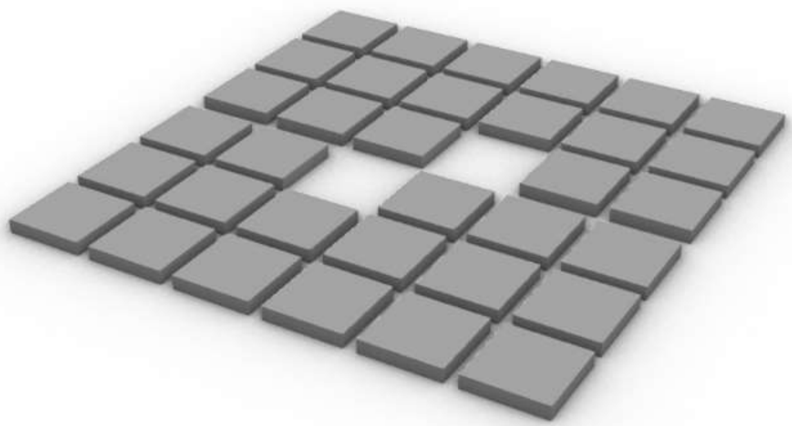
Assigning the grid pattern

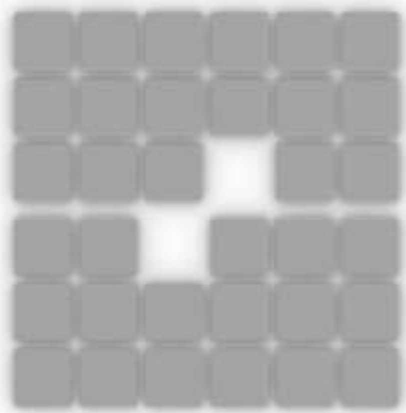




1.3 - Organization of the city (land-use map) –

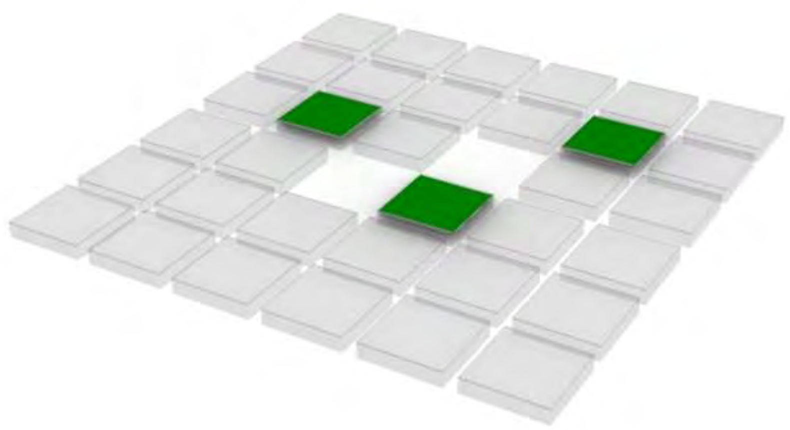
Water transport network

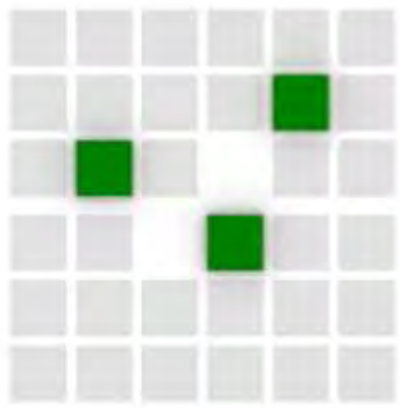




1.3 - Organization of the city (land-use map) –

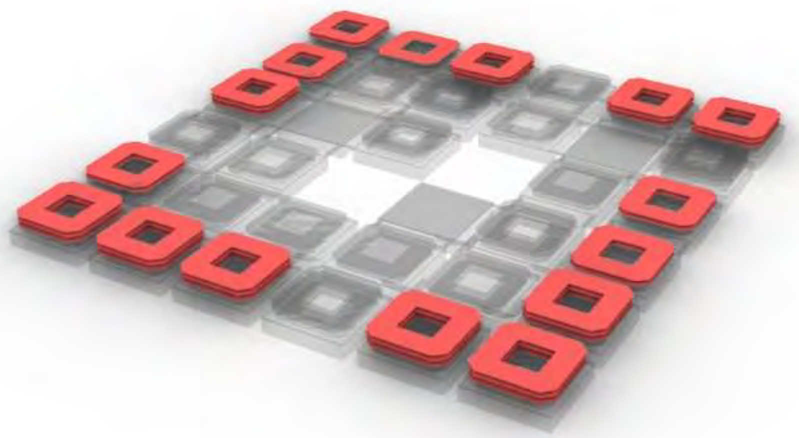
Green Spaces

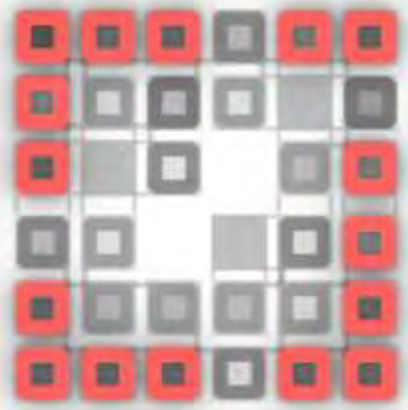




1.3 - Organization of the city (land-use map) –

Residential



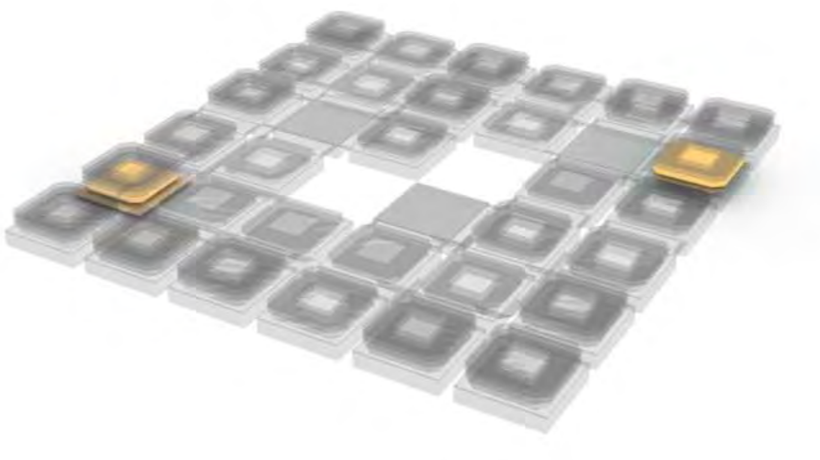


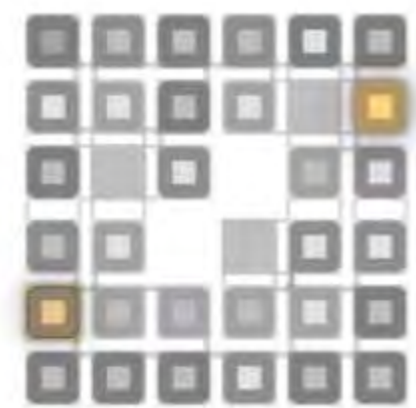
1.3 - Organization of the city (land-use map) –

Business Commercial

1.3 - Organization of the city (land-use map) –

Business Light Industry





1.3 - Organization of the city (land-use map) –

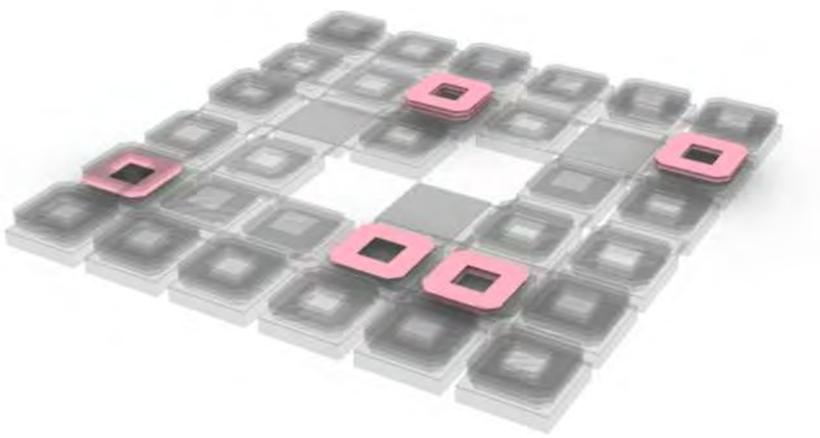
Business Catering Industry

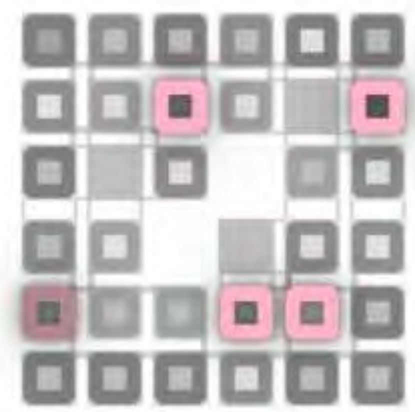
1.3 - Organization of the city (land-use map) –

Public Community Facilities

1.3 - Organization of the city (land-use map) –

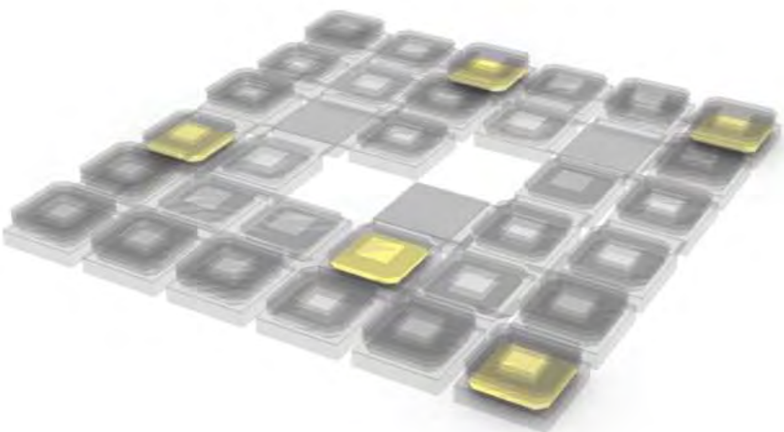
Public Educational Institute

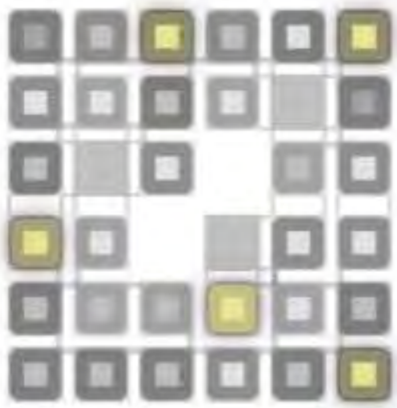




1.3 - Organization of the city (land-use map) –

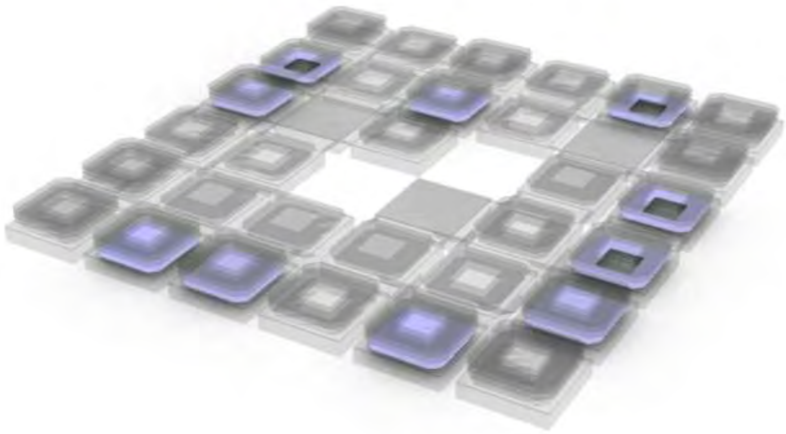
Public Sports – Indoor Spaces





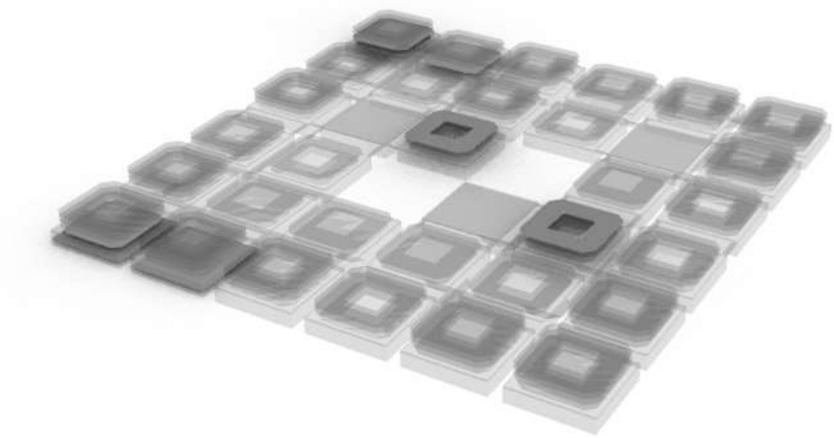
1.3 - Organization of the city (land-use map) –

Public Amenities



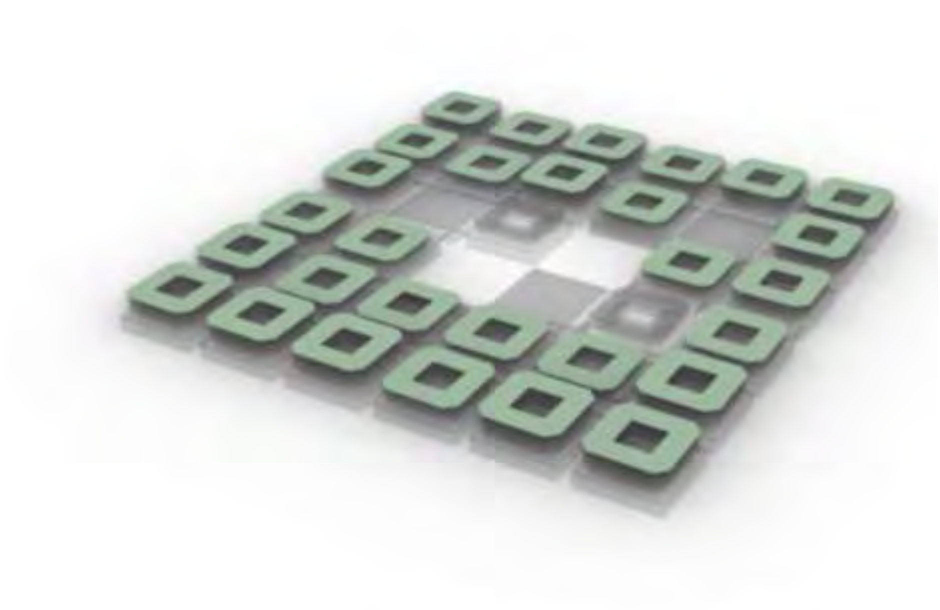
1.3 - Organization of the city (land-use map) –

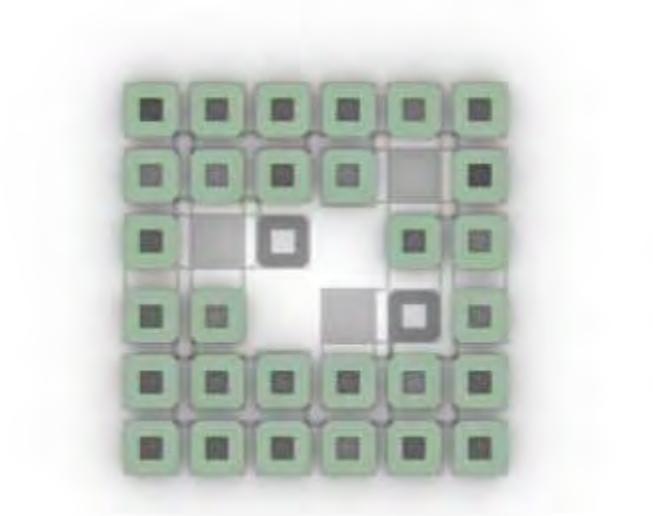
Utilities



1.3 - Organization of the city (land-use map) –

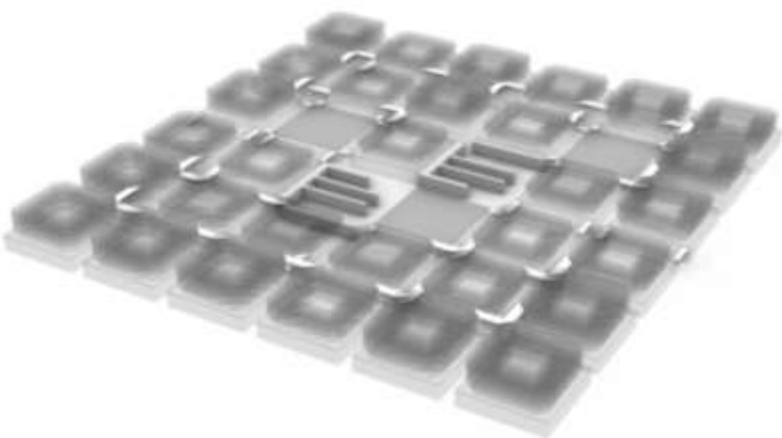
Public Terrace Green





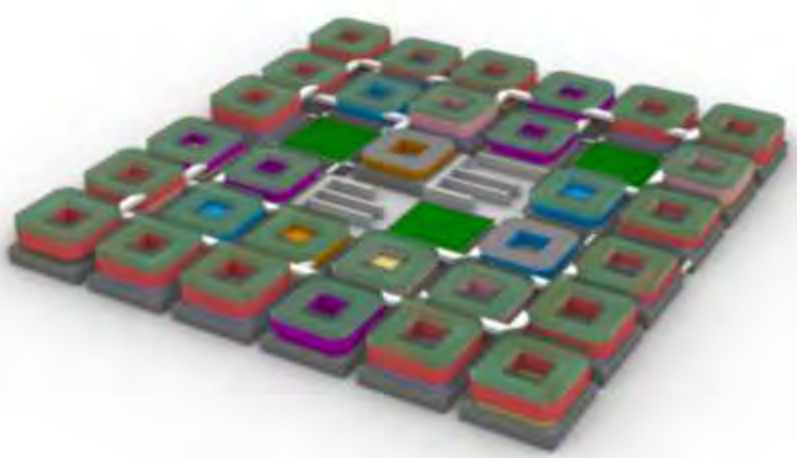
1.3 - Organization of the city (land-use map) –

Bridges connecting blocks at higher level.



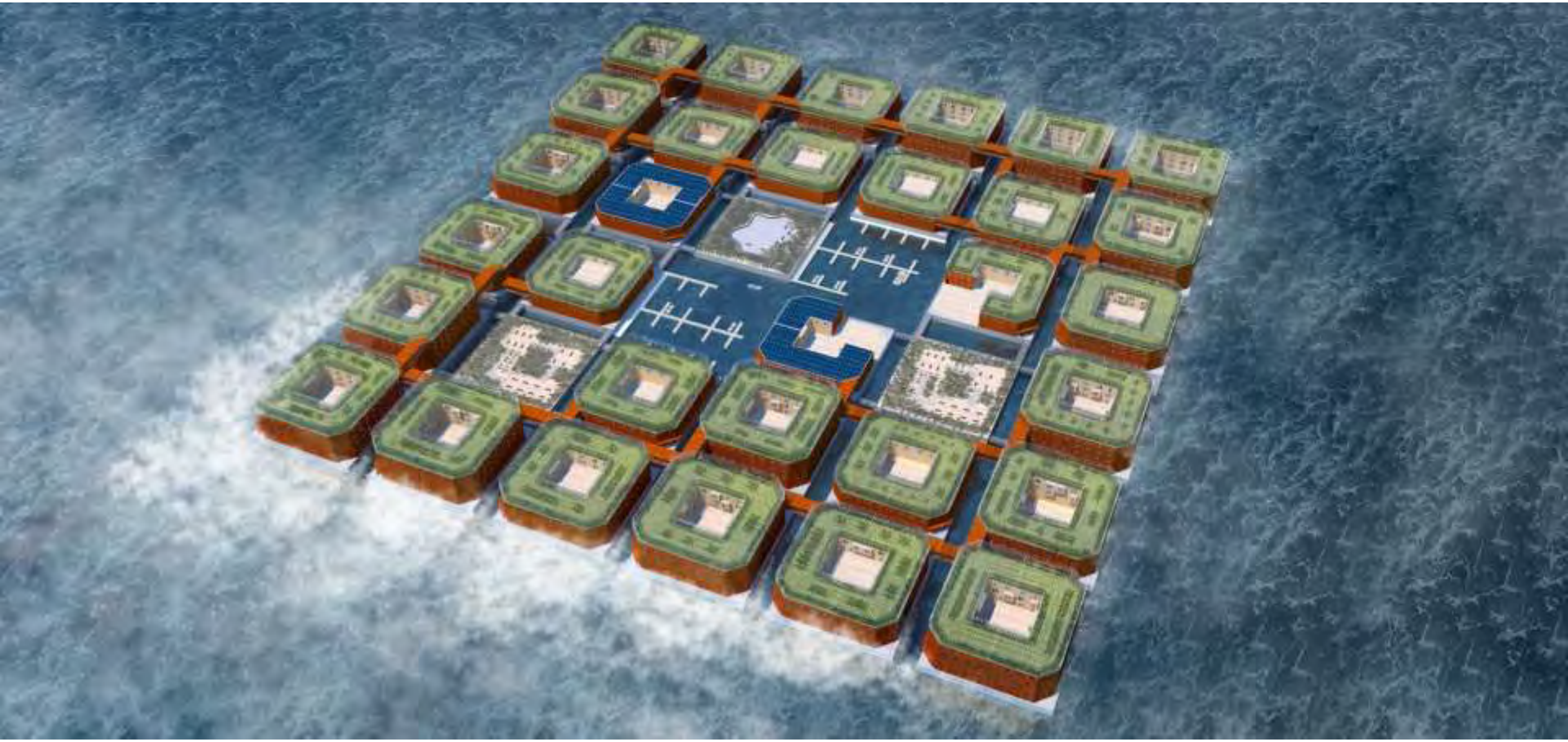
1.3 - Organization of the city (land-use map) –

City layout



1.4 - Visualizations –

Aerial view



1.4 - Visualizations –

Canal view

1.4 - Visualizations –

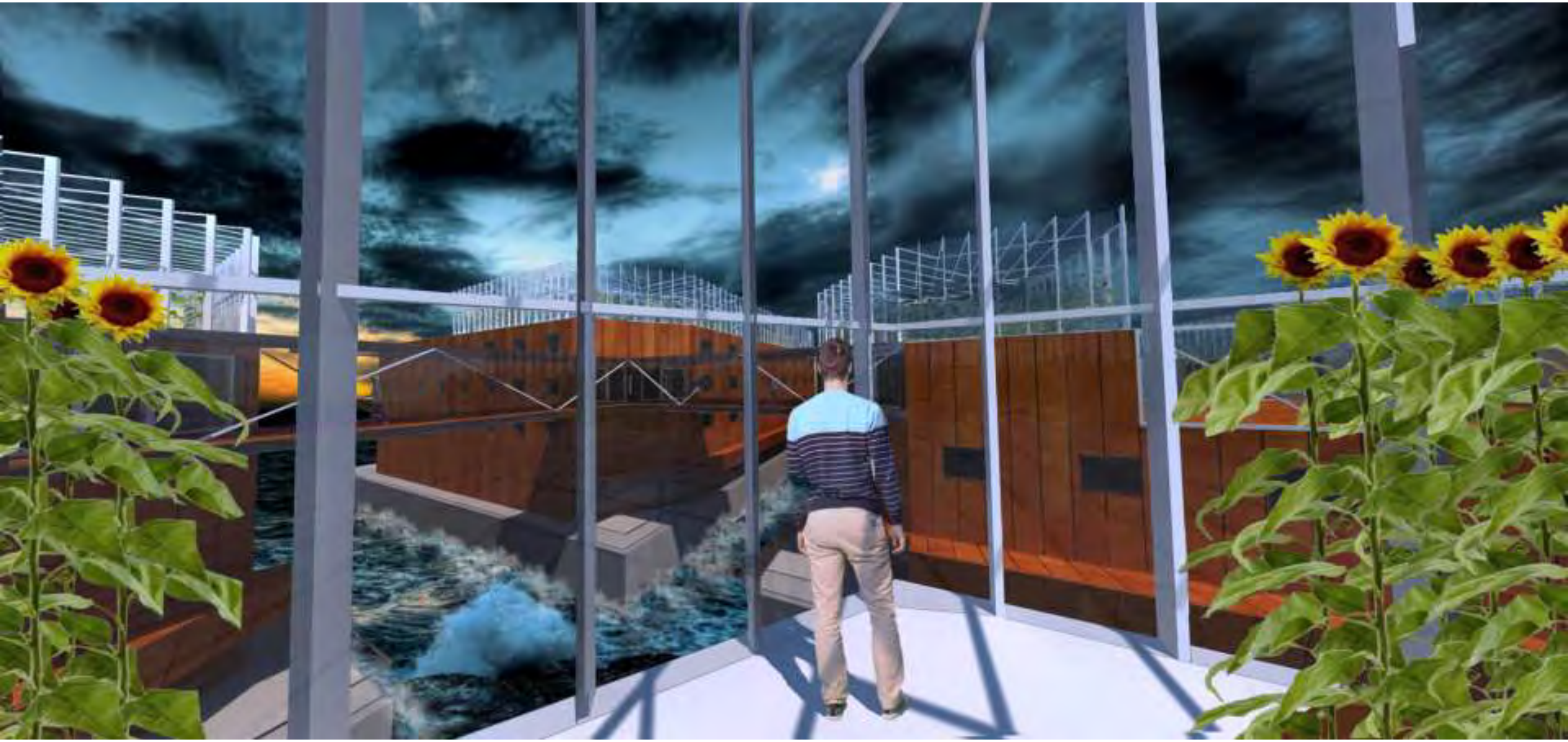
Center Courtyard

1.4 - Visualizations –

Roof terrace

1.4 - Visualizations –

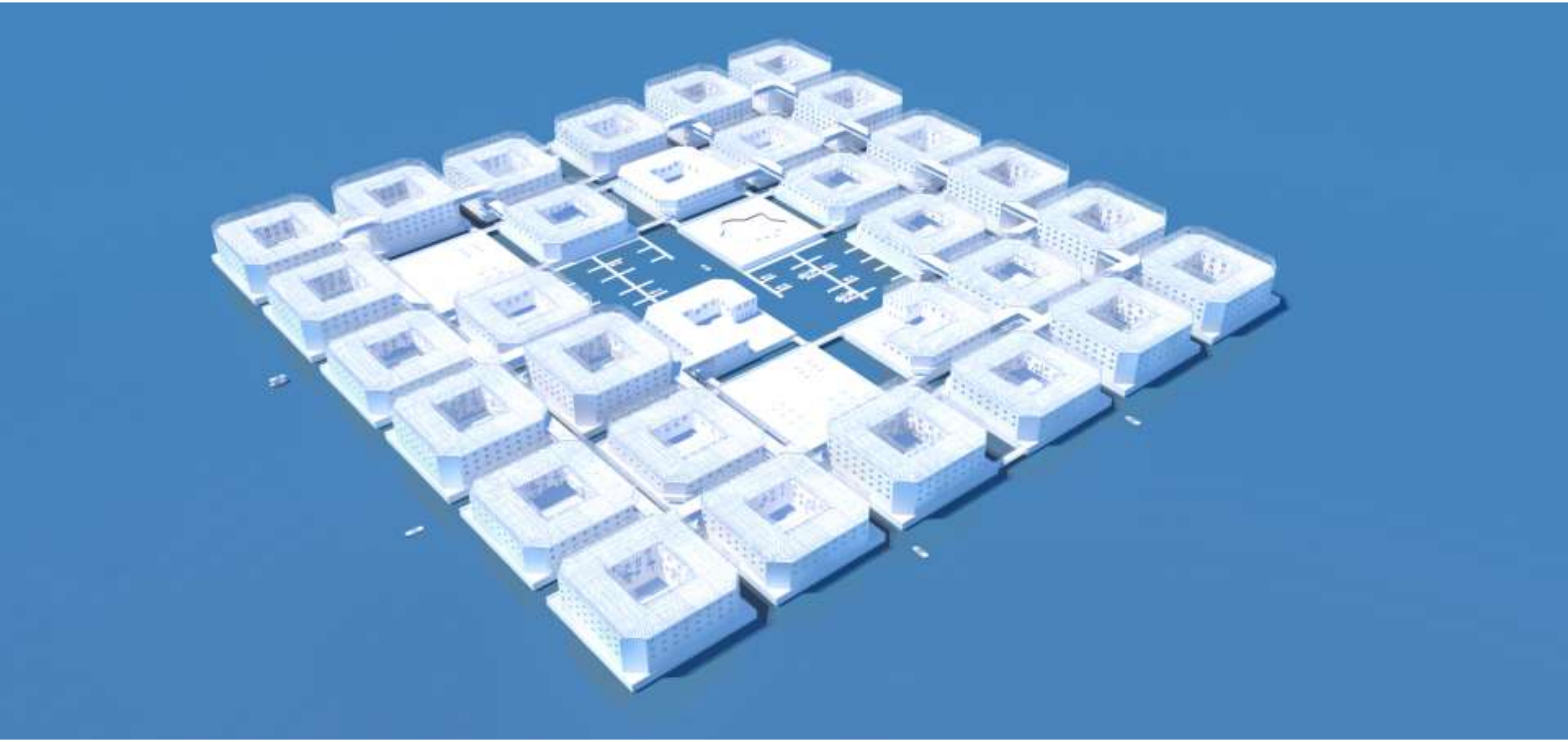
Roof terrace and bridge junction



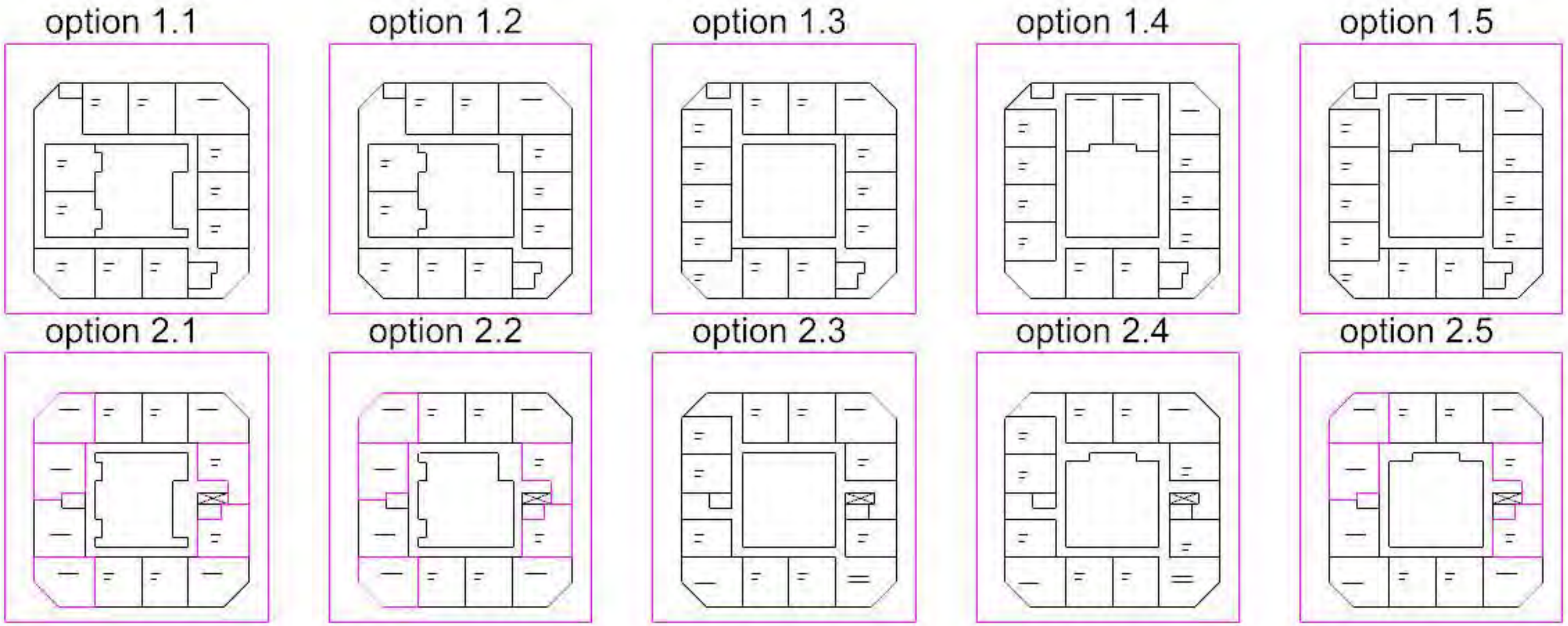
1.4 - Visualizations –

Dock and open space

1.5 - Mock-up model –



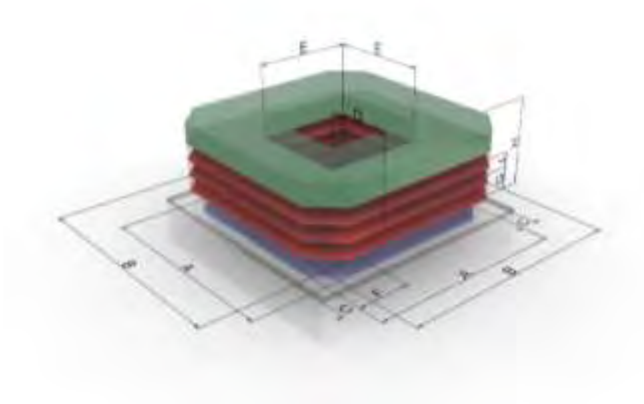
1.6 – Options for planning layout of blocks –



1.7 - Planning layout of blocks –

Typology -1

Category	Residential	**Function**	Residence and amenities
Shape	Courtyard Block	**No of Storeys**	5
A width (m)	38.50	**B width (m)**	42.50
C width (m)	3.25	**D width (m)**	13.25
E width (m)	16	**F width (m)**	11.25
G width (m)	4	**H width (m)**	18.10
I width (m)	3.20	**GFA per block (m²) without terrace**	5708
Terrace green (m²)	1500	**Independent Platform**	✓

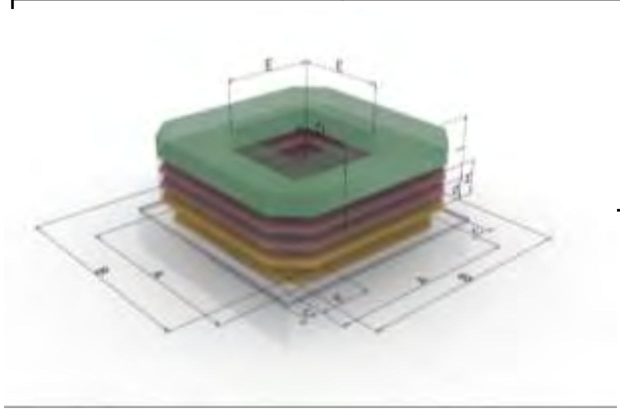


Distribution	**(m²)**	**(%)**
Total Plot	2025	100
Built	1208	59.65
Green	256	12.60
Accessibility	560	27.25

1.7 - Planning layout of blocks –

Typology -2

Category	Mixed Use	**Function**	Business, Community and Educational
Shape	Courtyard Block	**No of Storeys**	4
A width (m)	38.50	**B width (m)**	42.50
C width (m)	3.25	**D width (m)**	13.25
E width (m)	16	**F width (m)**	11.25
G width (m)	4	**H width (m)**	18.10
I width (m)	3.20	**GFA per block (m²) without terrace**	5708
Terrace green (m²)	1500	**Independent Platform**	✓

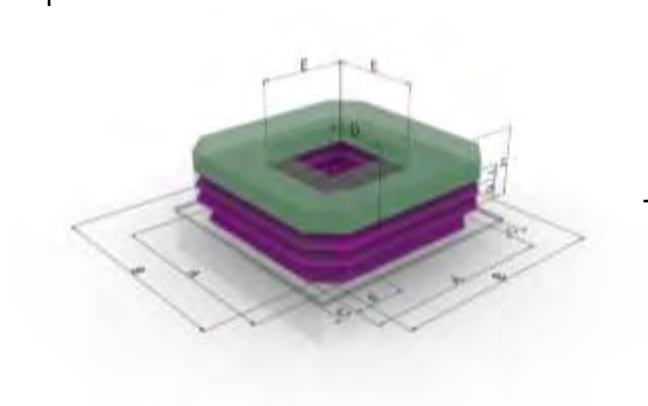


Distribution	**(m²)**	**(%)**
Total Plot	2025	100
Built	1208	59.65
Green	256	12.60
Accessibility	560	27.25

1.7 - Planning layout of blocks –

Typology -3

Category	Mixed Use	**Function**	Business, Community and Educational
Shape	Courtyard Block	**No of Storeys**	4
A width (m)	38.50	**B width (m)**	42.50
C width (m)	3.25	**D width (m)**	13.25
E width (m)	16	**F width (m)**	11.25
G width (m)	4	**H width (m)**	14.90
I width (m)	3.20	**GFA per block (m²) without terrace**	4208
Terrace green (m²)	1500	**Independent Platform**	✓

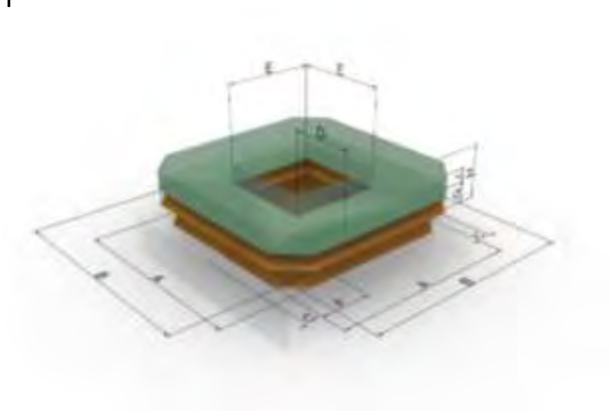


Distribution	**(m²)**	**(%)**
Total Plot	2025	100
Built	1208	59.65
Green	256	12.60
Accessibility	560	27.25

1.7 - Planning layout of blocks –

Typology -4

Category	Mixed Use	**Function**	Business, Community and Educational
Shape	Courtyard Block	**No of Storeys**	3
A width (m)	38.50	**B width (m)**	42.50
C width (m)	3.25	**D width (m)**	13.25
E width (m)	16	**F width (m)**	11.25
G width (m)	4	**H width (m)**	11.70
I width (m)	3.20	**GFA per block (m^2) without terrace**	2708
Terrace green (m^2)	1500	**Independent Platform**	✓

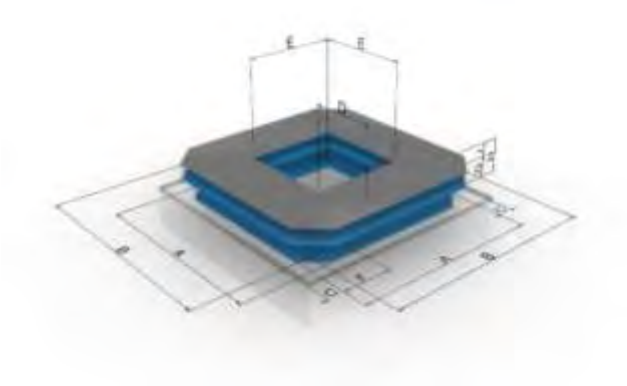


Distribution	**(m^2)**	**(%)**
Total Plot	2025	100
Built	1208	59.65
Green	256	12.60
Accessibility	560	27.25

1.7 - Planning layout of blocks –

Typology -5

Category	Mixed Use	**Function**	Business, Community and Educational
Shape	Courtyard Block	**No of Storeys**	2
A width (m)	38.50	**B width (m)**	42.50
C width (m)	3.25	**D width (m)**	13.25
E width (m)	16	**F width (m)**	11.25
G width (m)	4	**H width (m)**	7.20
I width (m)	3.20	**GFA per block (m^2) without terrace**	2708
Terrace green (m^2)	-	**Independent Platform**	✓



Distribution	**(m^2)**	**(%)**
Total Plot	2025	100
Built	1208	59.65
Green	256	12.60
Accessibility	560	27.25

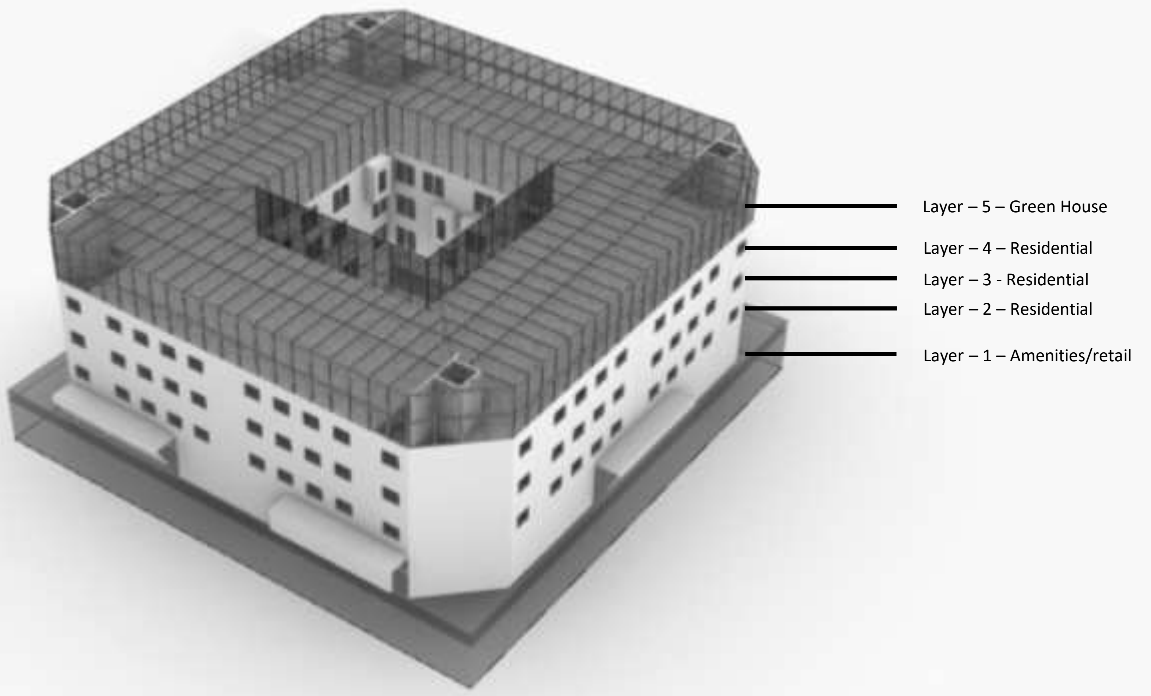
1.7 - Planning layout of blocks –

Funcional distribution -

Function	Type	Percentage Distribution of GFA (%)	Gross Floor Area (m^2)		Floor Type – Area (m^2)				
					1208	1500.25	1464.25	1756.25	2025
Residential	Med Density	44.5	69,342		4	43			
Business Commercial	Offices	9	13,833		4	6			
Business Light Industry	Warehouse	4.5	7,002				1	2	1
Business Catering Industry	Hotel	3.5	5,672		1	2	1		
Public Community Facilities	Cultural Centre	4.5	6,917		2	3			
	Theatre	3.5	5,928			2	2		
Public Educational Institute	Library and Learning Centre	5	7,208		1	4			
	School	4	6,001			4			
Public Sports		5	7,321				5		
Public Green Space		4	6,075						3
Public Terrace Green		-	-	43,507		29			
Public Amenities		4.5	6,809		2		3		
Utilities		8	13,199			2	3	1	2
TOTAL		100	155,307						

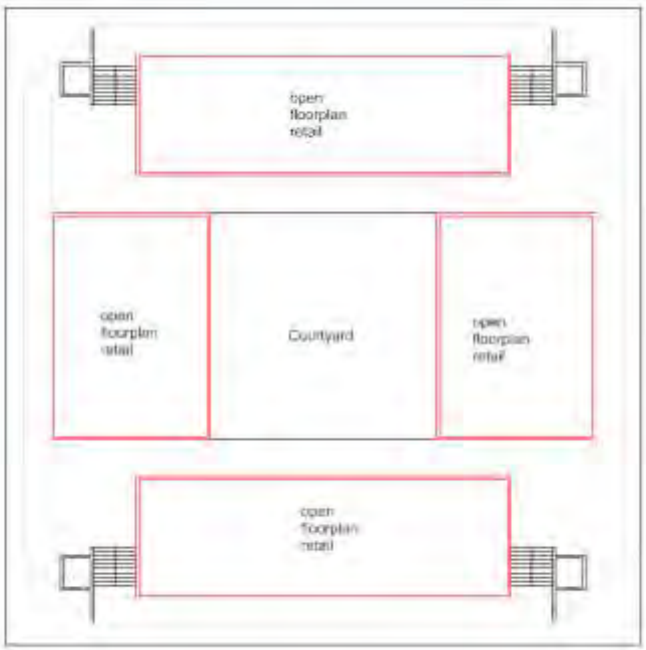
1.7 - Planning layout of blocks –

Residential Block -

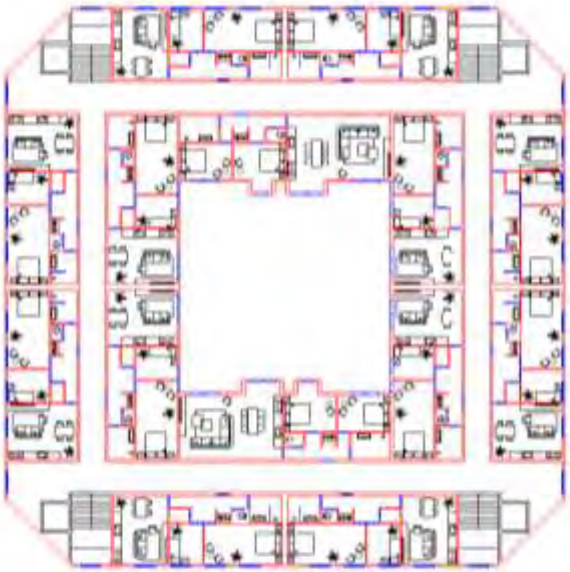


1.7 - Planning layout of blocks –

Residential Block -



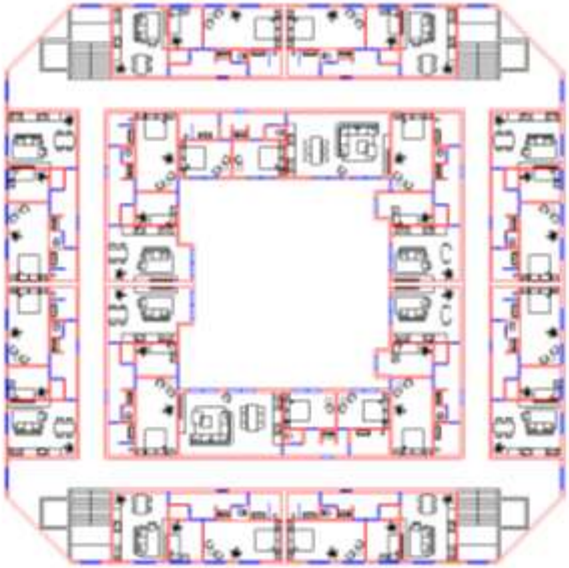
Layer - 1



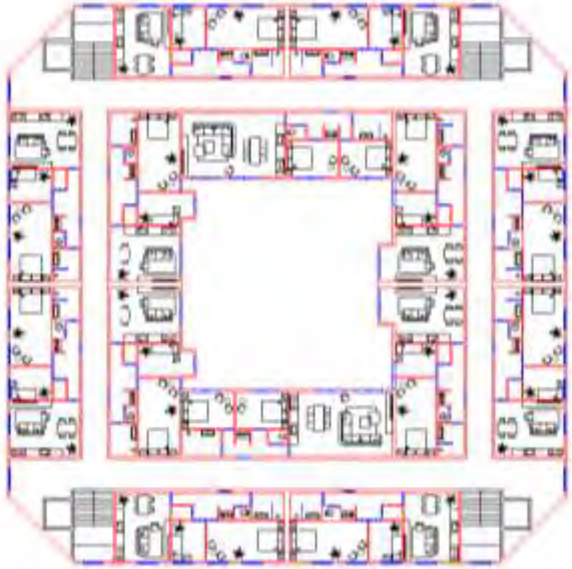
Layer - 2

1.7 - Planning layout of blocks –

Residential Block -



Layer - 3

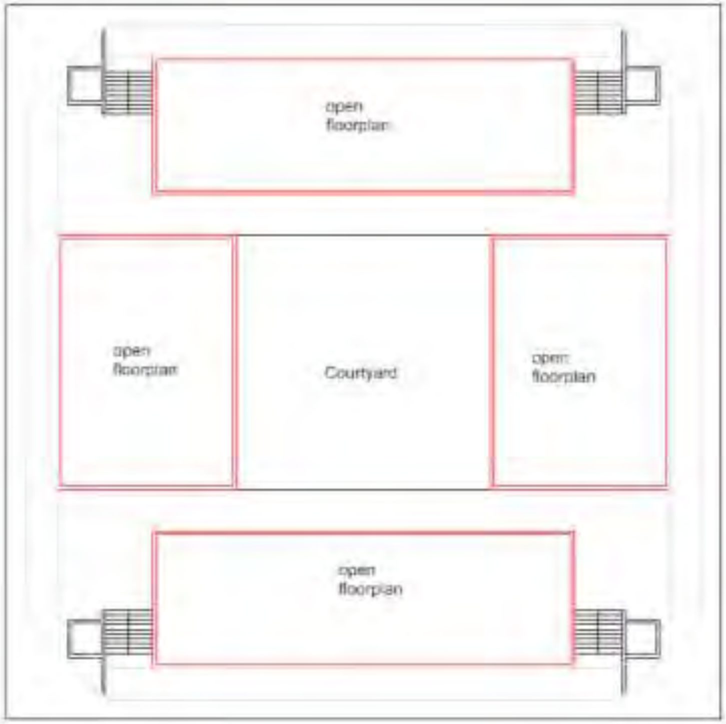


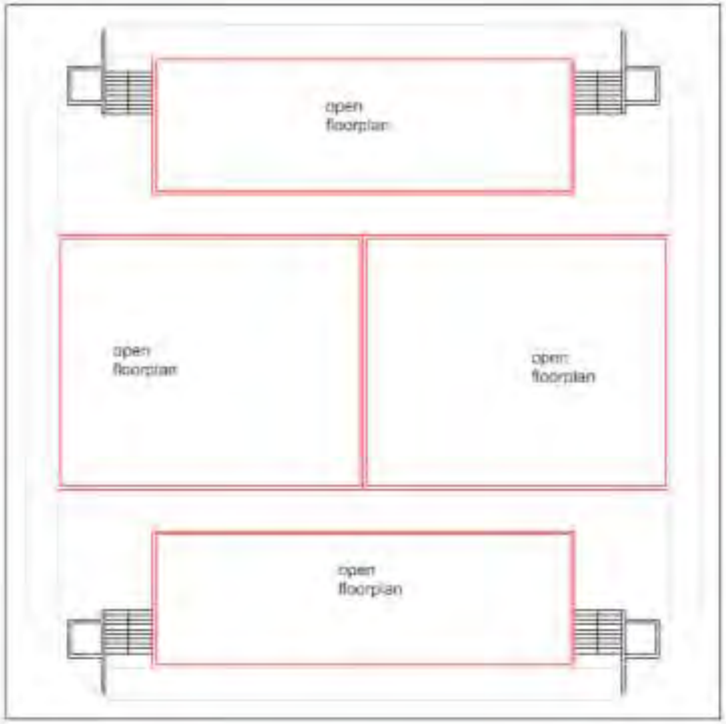
Layer - 4

Every floor layer has 14 units.
12 units - 74.50 m2 each
2 units - 86 m2 each
The 3 layouts can be mixed in different combinations to get different projections in the courtyard space.

1.7 - Planning layout of blocks –

Other Blocks -

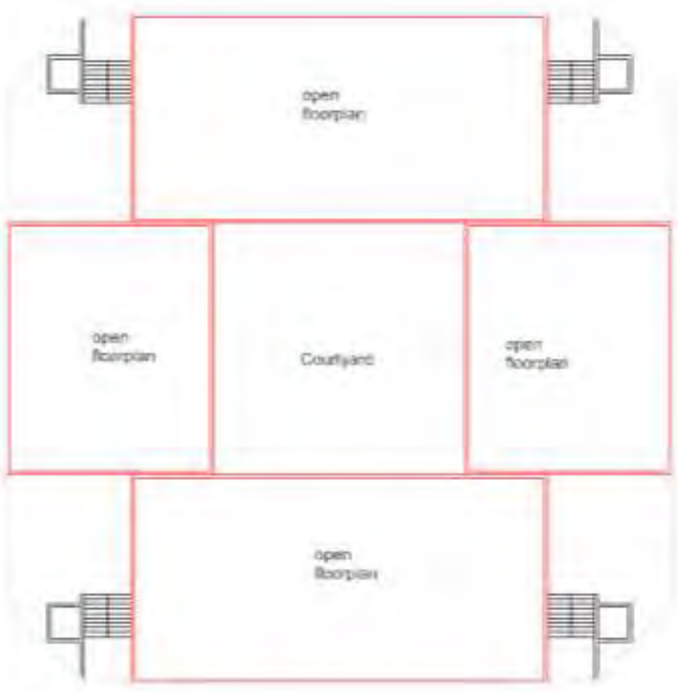


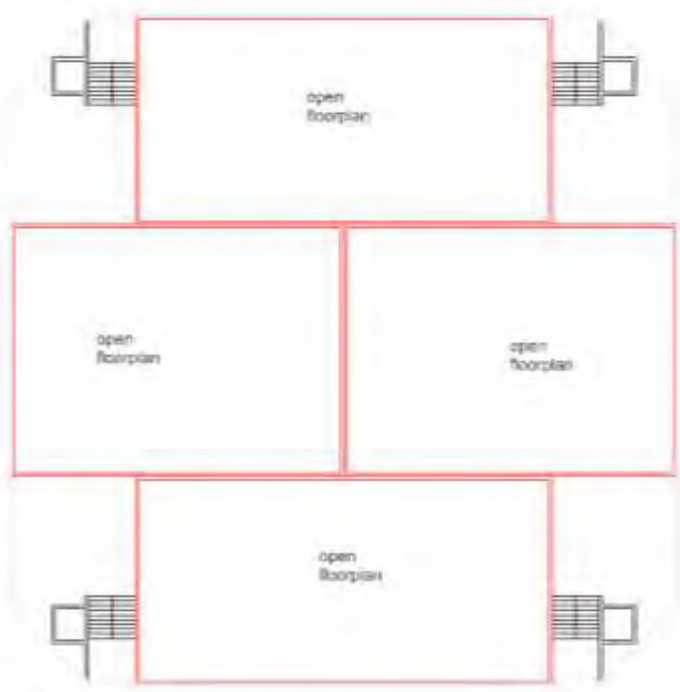


Options for layer -1 (different functions)

1.7 - Planning layout of blocks –

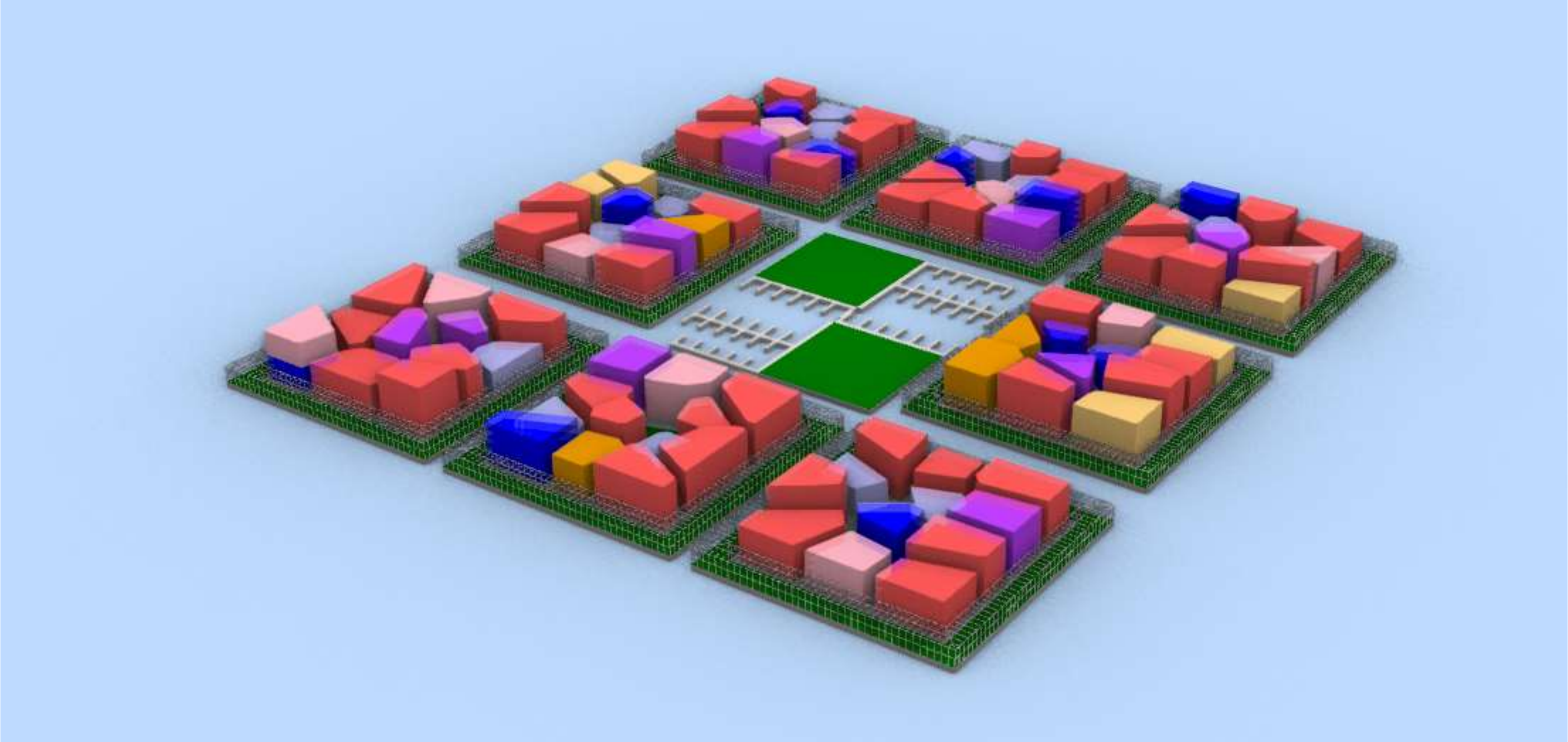
Other Blocks -





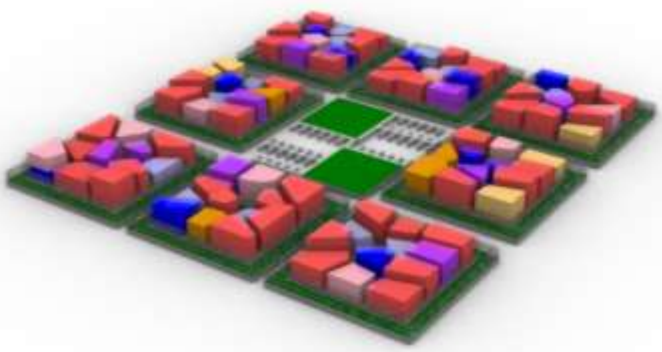
Options for other layers – (different functions)

2 - 90m PLATFORM



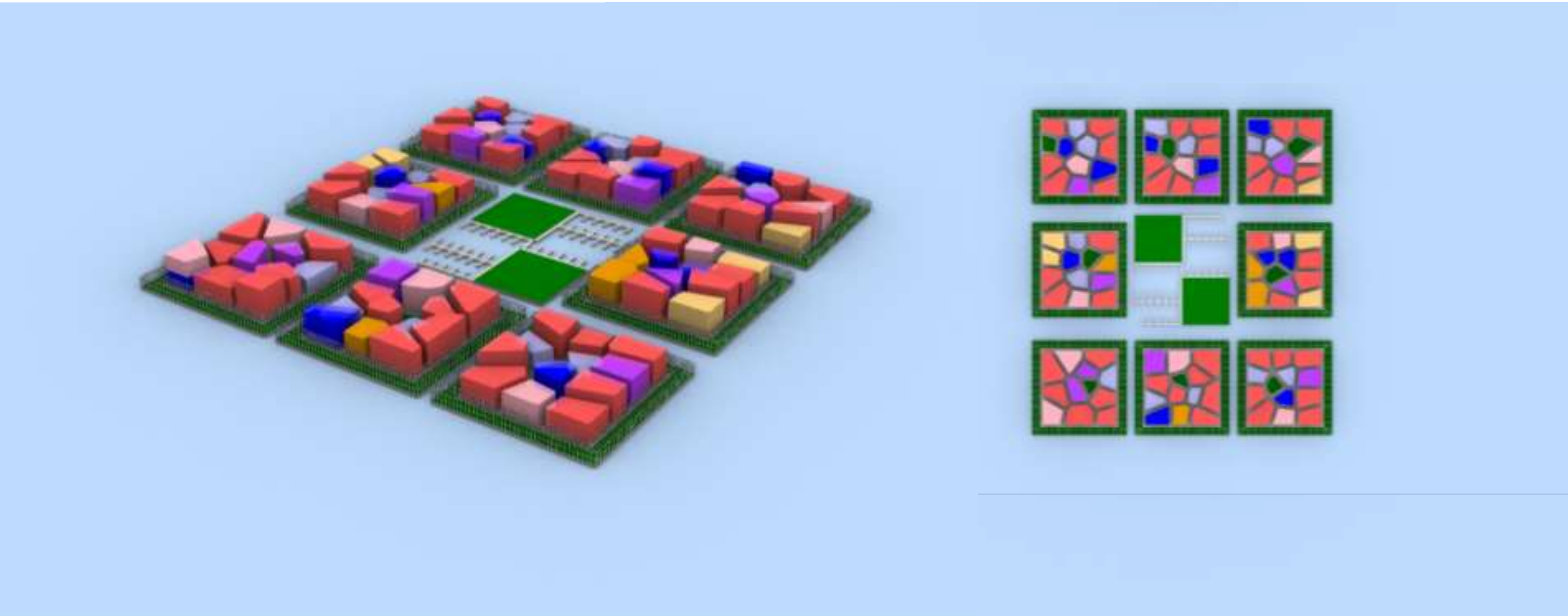
2.1 - Functional Distribution –

Function	Type	Percentage Distribution of GFA (%)	Gross Floor Area (m²)	
Residential	Med Density	49	68,462	
Business Commercial	Offices	9	13,093	
Business Light Industry	Warehouse	5	6,450	
Business Catering Industry	Hotel	4	5,247	
Public Community Facilities	Cultural Centre Theatre	9	11,959	
Public Educational Institute	Library and Learning Centre School	8	11,263	
Public Green Space		4	5,458	
Public Peripheral Green				21,000
Public Amenities		6	8,834	
Utilities		6	8,100	
TOTAL		100	138,866	



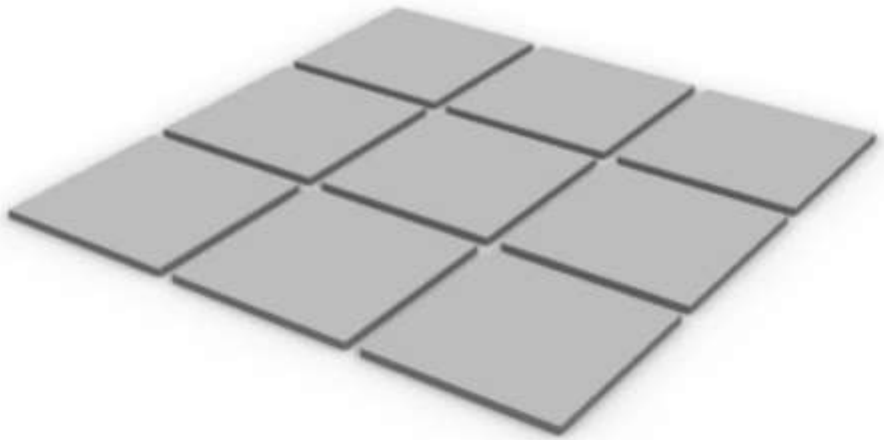
2.2 - Organisation of the city (land-use map) –

City layout



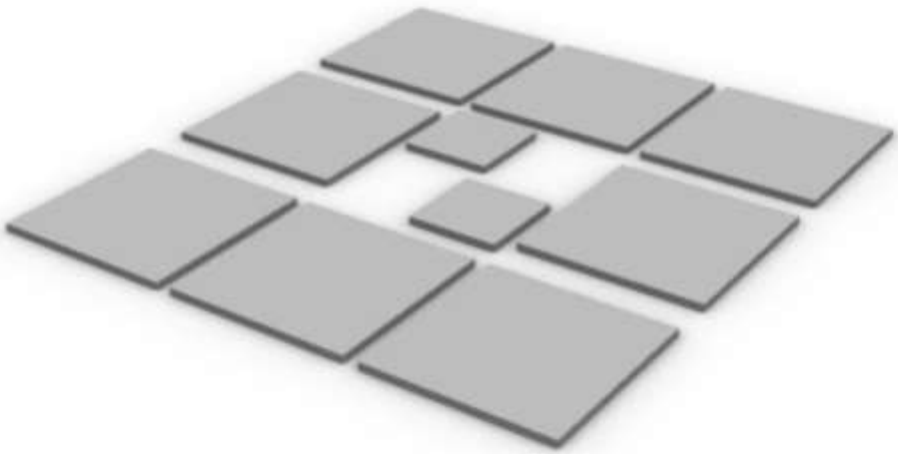
2.2 - Organisation of the city **(land-use map) –**

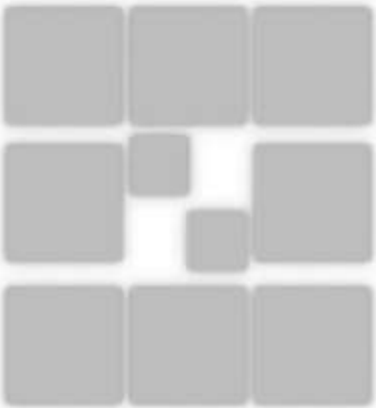
Assigning the grid pattern



2.2 - Organisation of the city (land-use map) –

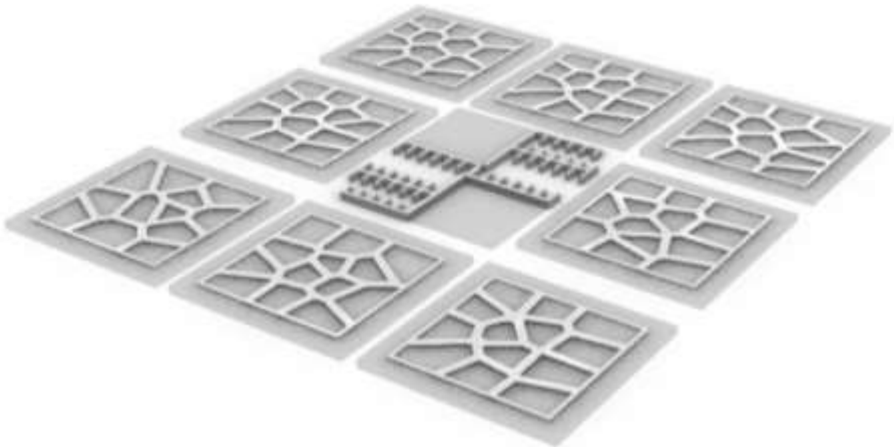
Water transport network

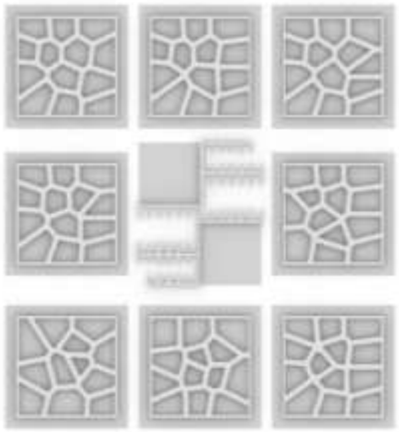




2.2 - Organisation of the city (land-use map) –

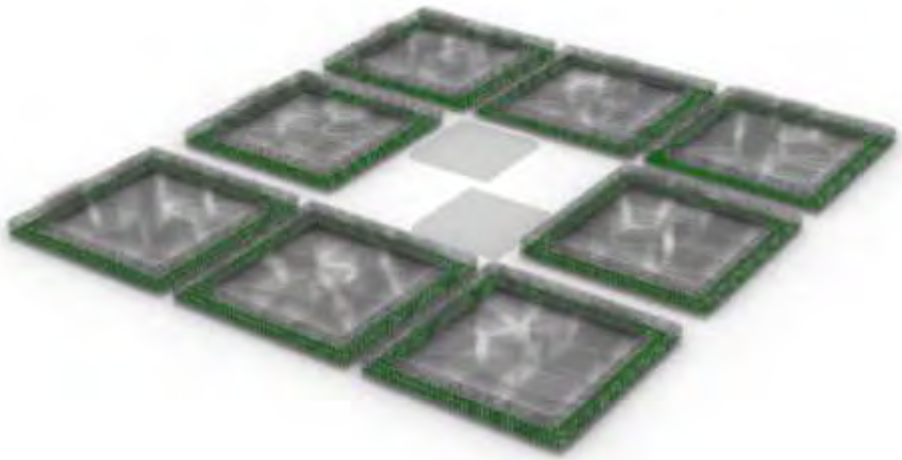
Accessibility and Dock

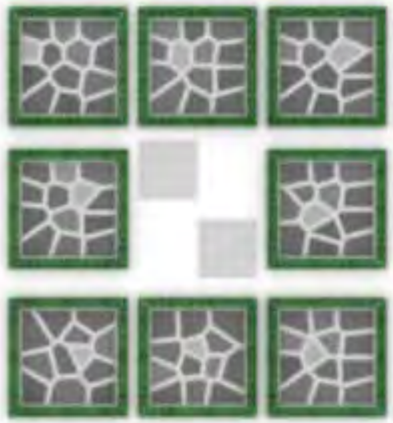




2.2 - Organisation of the city (land-use map) –

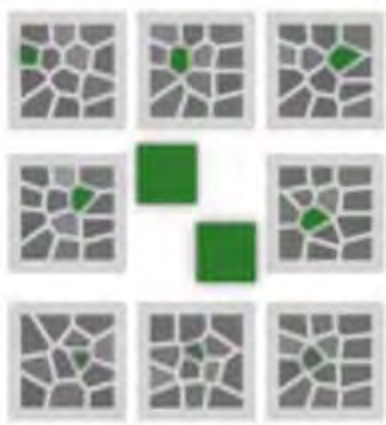
Public Peripheral Green





2.2 - Organisation of the city (land-use map) –

Public Green Space

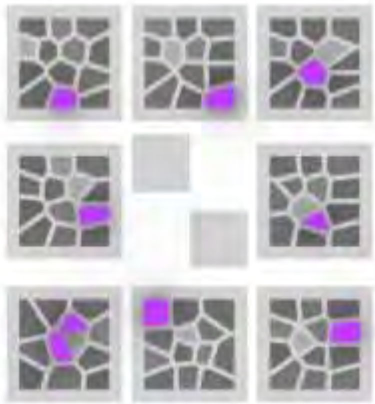


2.2 - Organisation of the city (land-use map) –

Residential

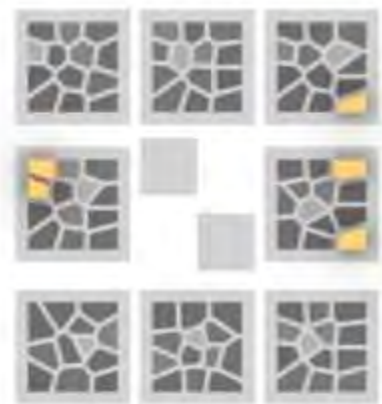
2.2 - Organisation of the city (land-use map) –

Business Commercial



2.2 - Organisation of the city (land-use map) –

Business Light Industry

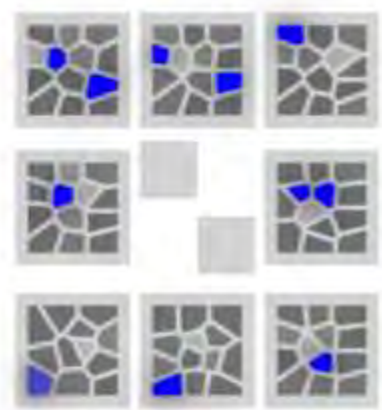


2.2 - Organisation of the city (land-use map) –

Business Catering Industry

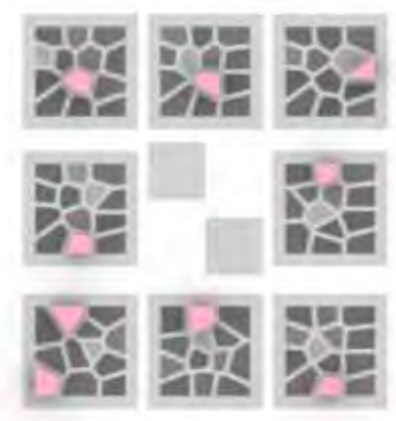
2.2 - Organisation of the city (land-use map) –

Public Community Facilities



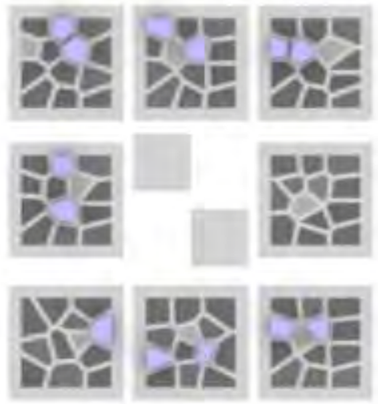
2.2 - Organisation of the city (land-use map) –

Public Educational Institute



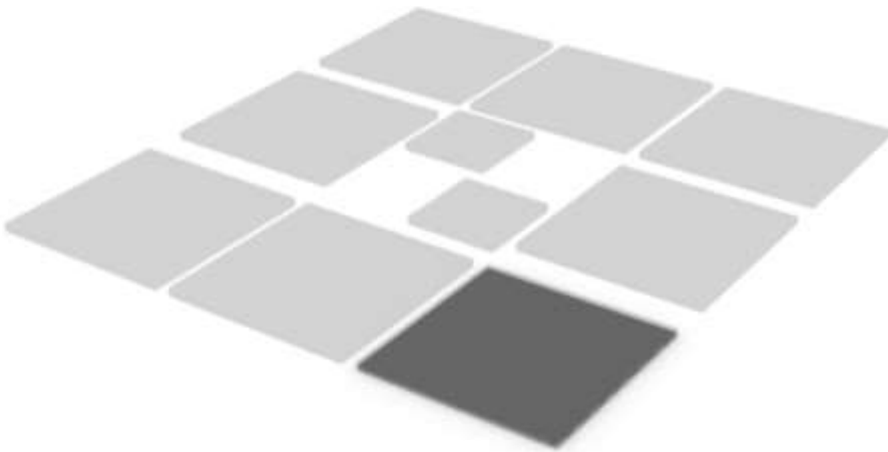
2.2 - Organisation of the city (land-use map) –

Public Amenities



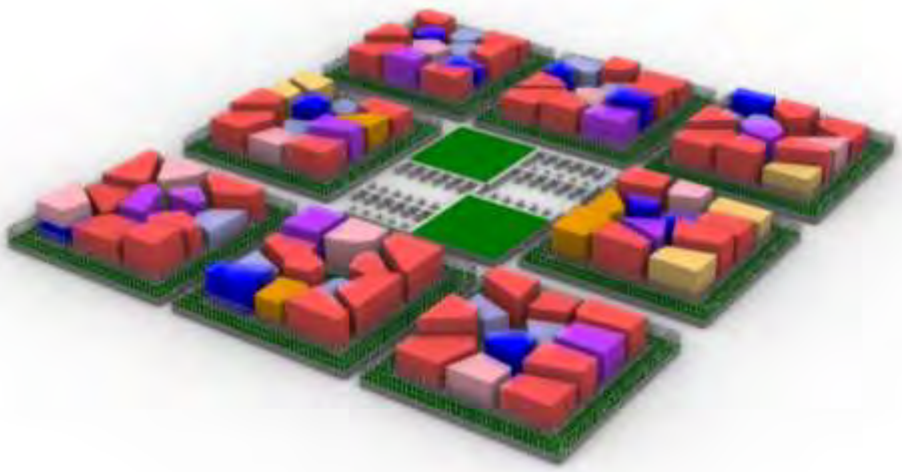
2.2 - Organisation of the city (land-use map) –

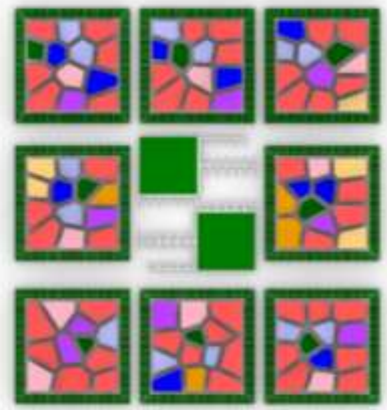
Utilities



2.2 - Organisation of the city (land-use map) –

City Layout





Appendix – 6 Energy hub@Sea

Table of contents

1.1 Concept 1&3 :
Offshore Platform

Create a concept for a new Offshore Platform, based on the document (Space@Sea – WP6, List of requirements of the O&M hub), for two different scenarios:

- North Sea
- Mediterranean Sea

The requirements are compared with regulations of residential functions on land and with the preferences of offshore workers collected during interviews (D7.1 report).

Based on regulations and offshore worker's preferences, a new design brief is proposed.

1.1 Concept 1&3 :
Offshore Platform

Requirements are reviewed according to the information included in the following documents:

- “Space@Sea – WP6, List of requirements of the O&M hub”.
- Bouwbesluit (Dutch Building Code)for the comparison with regulations of residential functions on land.
- D7.1 report, for understanding offshore worker’s wishes.

1.2 Concept 2&4 :
Floating Platform

Create a concept for a new Floating Platform, based on the documents and interviews, for different scenarios.

Many of the interviewees (offshore workers) expressed the preference to increase the living space and also the possibility to receive family visits.

Therefore, the new requirements include a higher number of people and more living space per person. Flats of 35 m^2 circa are envisioned, which could accommodate 1 or 2 people. Additionally, more space for outdoor activities and for leisure facilities is included in the overview.

1.2 Concept 2&4 :
Floating Platform

Requirements are reviewed according to the information included in the following documents:

- “Space@Sea – WP6, List of requirements of the O&M hub”
- Bouwbesluit (Dutch Building Code)for the comparison with regulations of residential functions on land
- D7.1 report, for understanding offshore worker’s wishes

2. References:

O&M HUB Design

According to the document “List of requirements of the O&M hub”, the Bouwbesluit (Dutch Building Code) and the D7.1 report, for understanding offshore worker’s wishes the building consists of the following parts:

- Basic Module
- Storage hall and quay
- Accommodation building
- Columns

The platform shape is triangular, with equal sides. Each side is 50m.

On top of the platform, a building is constructed. Around the building, a 4m wide quay is present. The side of the building on top of the platform is circa 36m and it is footprint is approximately 566sqm.

2. References:

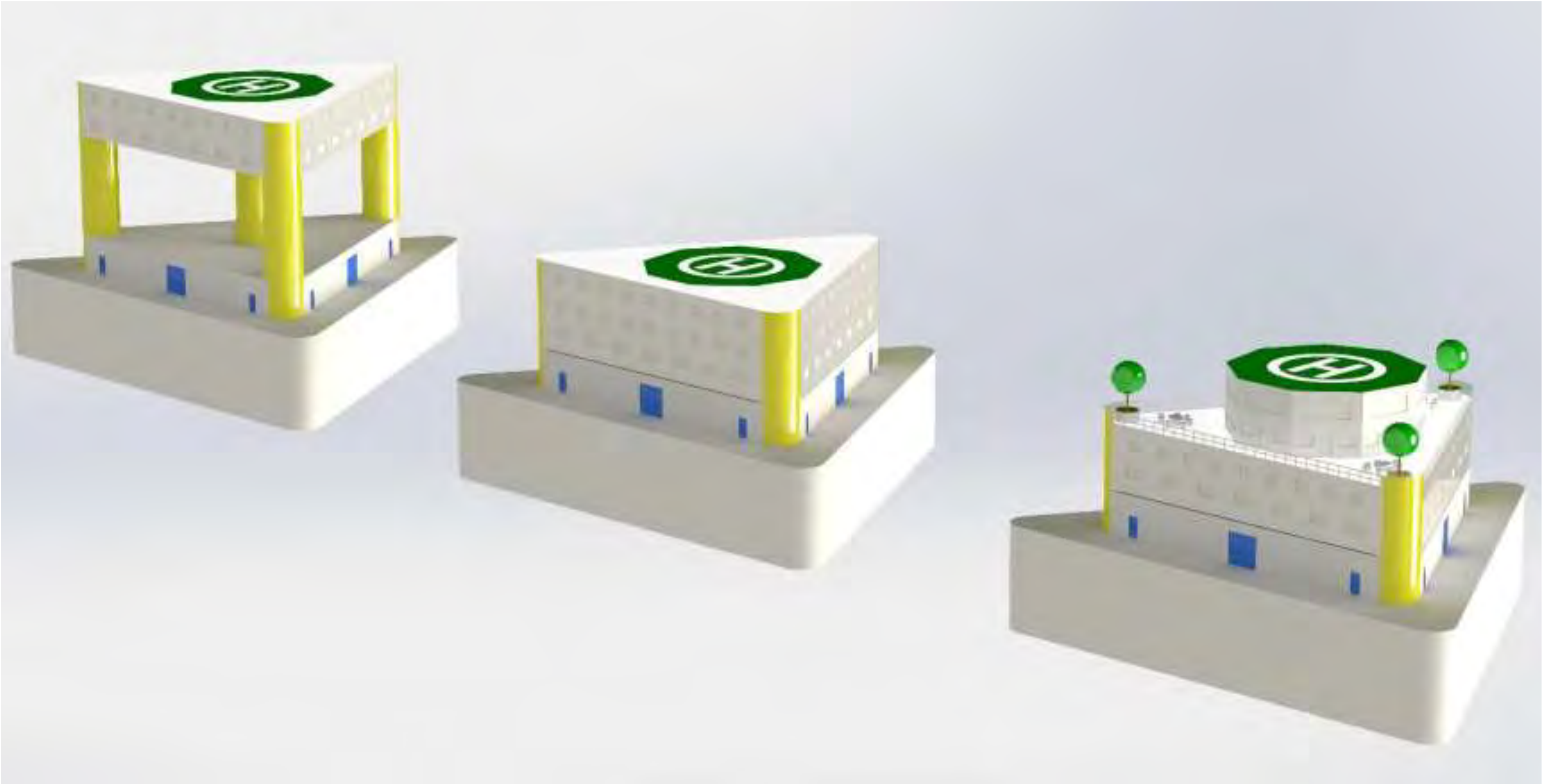
O&M HUB Design

Building Example

Basic module	The standardized floating structure
Storage hall and quay	For maintenance use, storage and logistic
Accommodation building	Accommodation, house technics, supply of crew, office
Columns	Stairways, lifts for material and persons, power and supply lines

2. References:
O&M HUB Design

Figure 1, from left to right: North Sea, Baltic Sea and Mediterranean Sea version



2. References:

O&M HUB Design

Depending on the context where the platform will be built, different configurations are possible.

- Configuration #1 has 2 floors
- Configuration #2 and #3 have 3 and 4 floors
- The additional floor space created in configuration #2 and #3 allow more room for functions. The 3th design has an integration of green elements

3. Concept 1

Offshore Triangular Based Platform

- 3.1: Program of Demands
- 3.2: Initial compositional scheme
- 3.3: Concept 1.A Mediterranean Sea
- 3.4: Concept 1.B North Sea

3. Concept 1:
Offshore Platforms

Program of Demands

Functional requirements for accommodation building

- The document "List of requirements of the O&M hub", is referred to a platform that provides enough space (rooms and services) for 32 workers

3. Concept 1:

Offshore Platforms

Program of demands

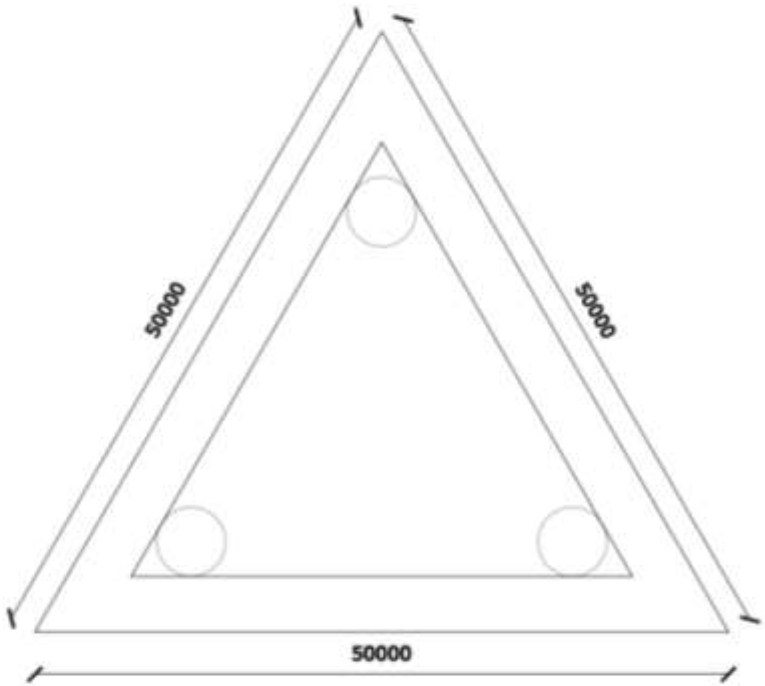
	m^2 (NFA)	Description
Single rooms	400	min. $12m^2$ each - windows to the outside - bath with toilet and shower - desk, chairs, wardrobe - heating, air condition, ventilation
Corridors	200	no daylight necessary - heating, air condition, ventilation
Kitchen + canteen	150	kitchen with stoves, ovens, air exhaust systems, refrigerators, freezers, boards, dishwashers - canteen for 32 persons with counters, heated wells, dishwashers, cupboards, windows to outside - sanitary rooms - heating, air condition, ventilation
Food storage	100	storage rooms for food with a capacity of 30 days - refrigeration chamber with a capacity of 30 days - house service room with storage of cleaning agents and other consumables, vacuum cleaner - laundry with washing machines, tumble dryers, linen cupboards, with ventilation
Offices	20	
Conference	25	
Health room	15	
Social rooms	30	gym etc.
Total, accommodation building	**940**	

3.2 Concept 1

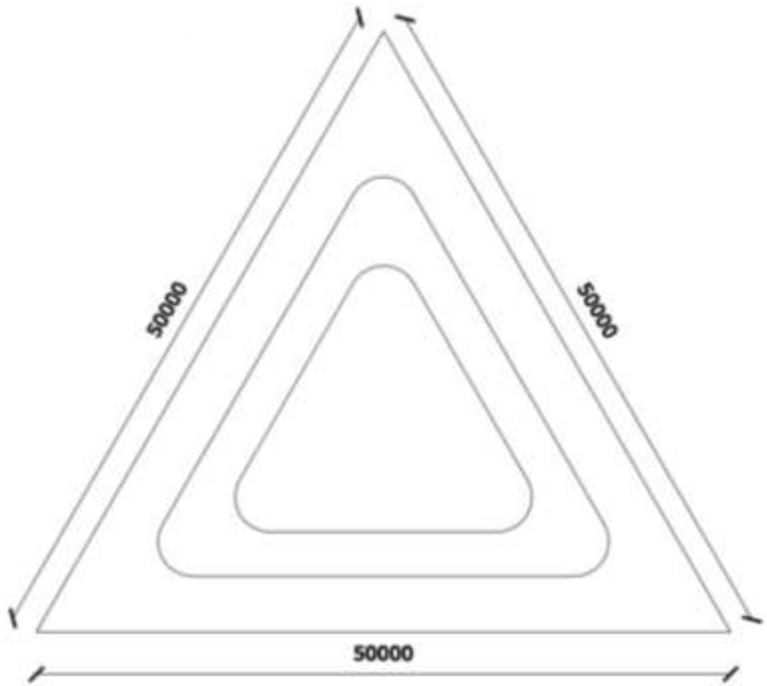
Initial compositional scheme

The concept of the floorplans started from the study of a triangular platform with sides of (50x50x50)m.

The plans have been studied to answer the requirements mentioned in the List of requirements of the O&M hub.



Phase 1

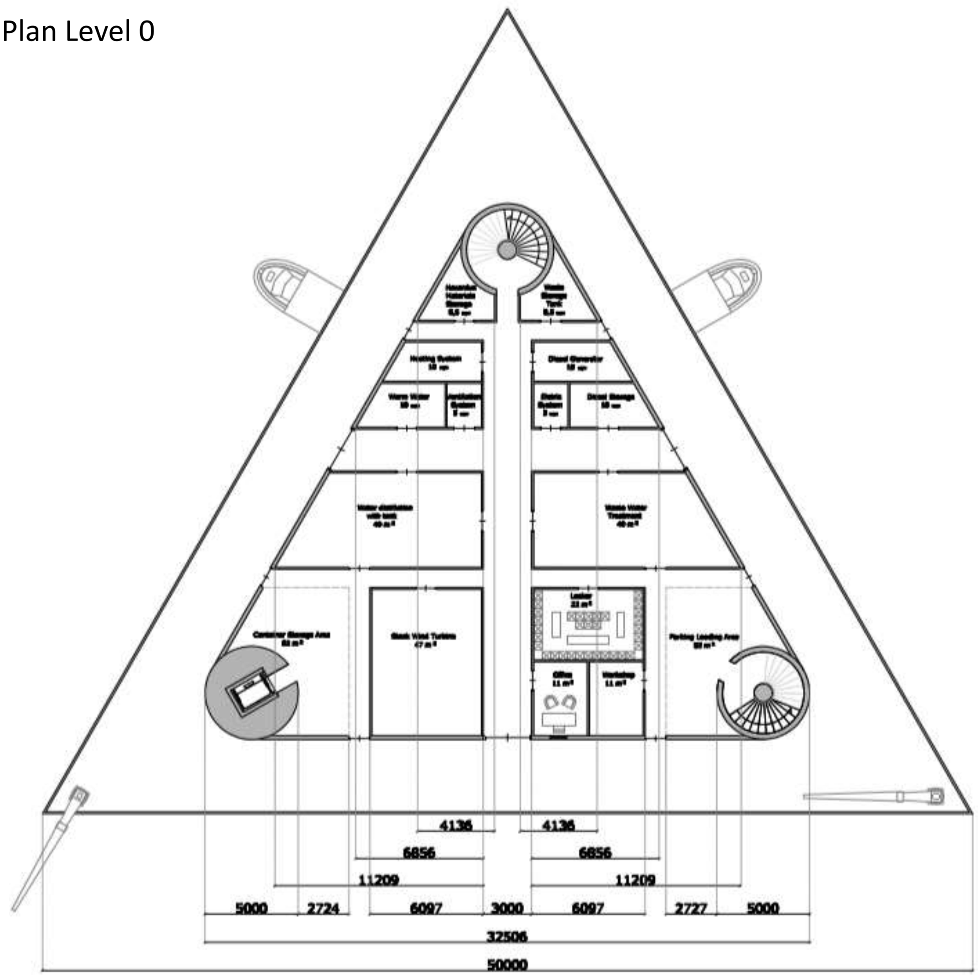


Phase 2

3.3 Concept 1.A:

Mediterranean Sea

Plan Level 0



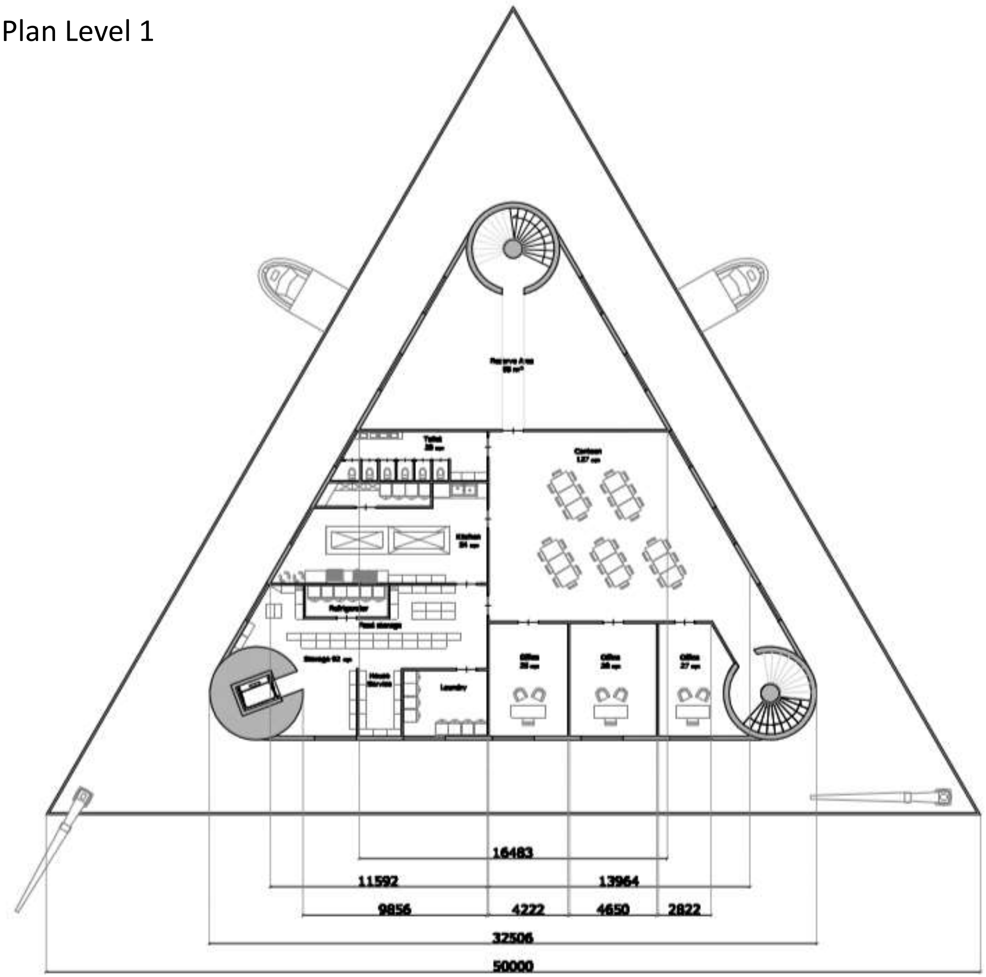
Storage, hall and quay

Area index	
2 doors and 3x3m hall door on each side	
Turbines stock area	47 sqm
Parking, loading area	82 sqm
Transport paths	141 sqm
Container storage area	33 sqm
Locker room	22 sqm
Office	11 sqm
Workshop	11 sqm
Hazardous materials storage	8,5 sqm
Waste storage tank	8,5 sqm
Water distillation reserve	49 sqm
Waste water treatment	49 sqm
Heating system	10 sqm
Warm water	10 sqm
Diesel Generator station	10 sqm
Ventilation System	5 sqm
Diesel storage	10 sqm
Electric system	5 sqm

3.3 Concept 1.A:

Mediterranean Sea

Plan Level 1



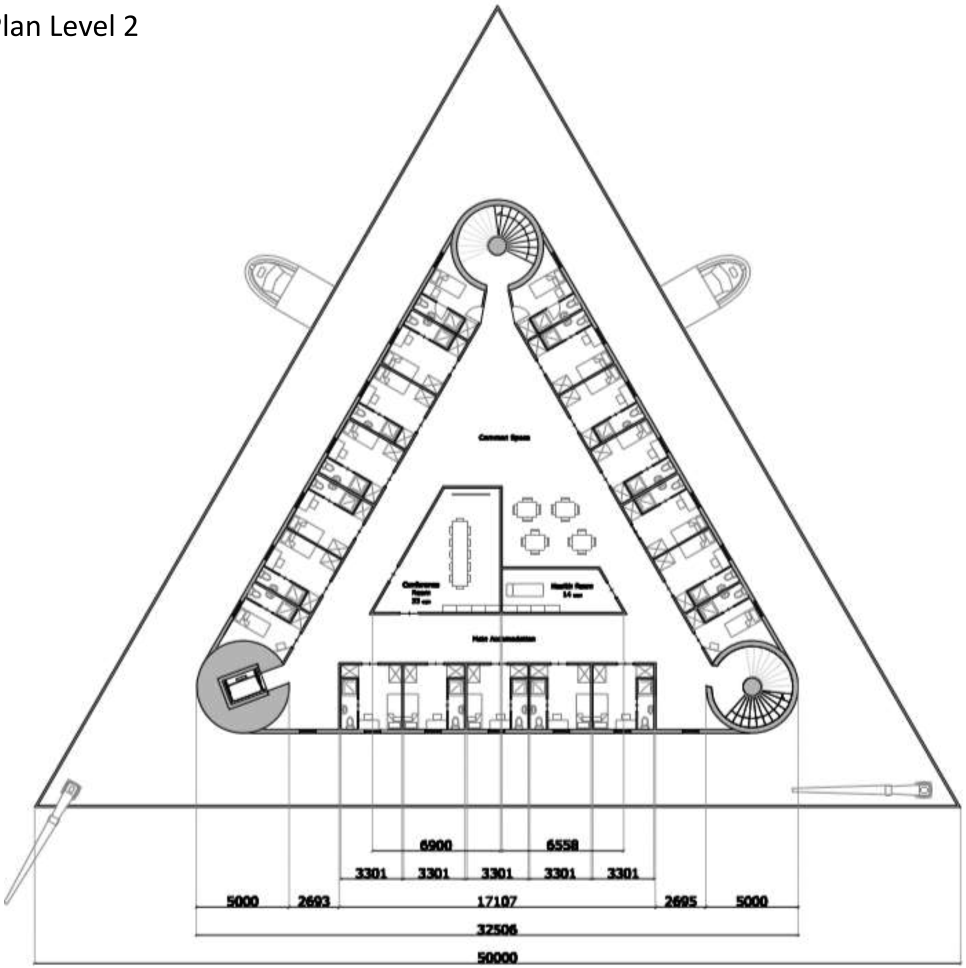
Storage, restaurant, offices

Area index	
Reserve area	95 sqm
Kitchen	52 sqm
Canteen	127 sqm
Food storage and house service	92 sqm
Office 1	25 sqm
Office 2	28 sqm
Office 3	27 sqm

3.3 Concept 1.A:

Mediterranean Sea

Plan Level 2



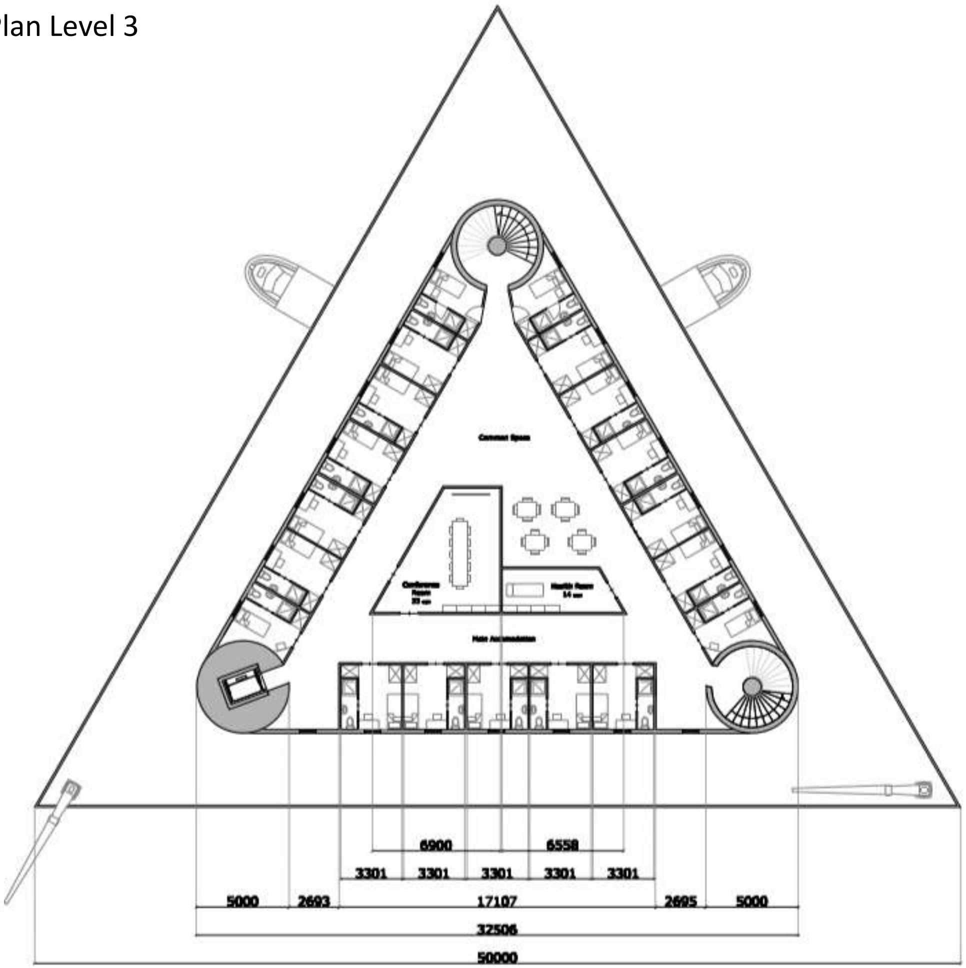
Bedrooms,conference,health room

Area index	Accommodation for 19 people
Bedrooms x 19 (12 sqm each)	228 sqm
Conference Room	33 sqm
Health Room	15 sqm

3.3 Concept 1.A:

Mediterranean Sea

Plan Level 3



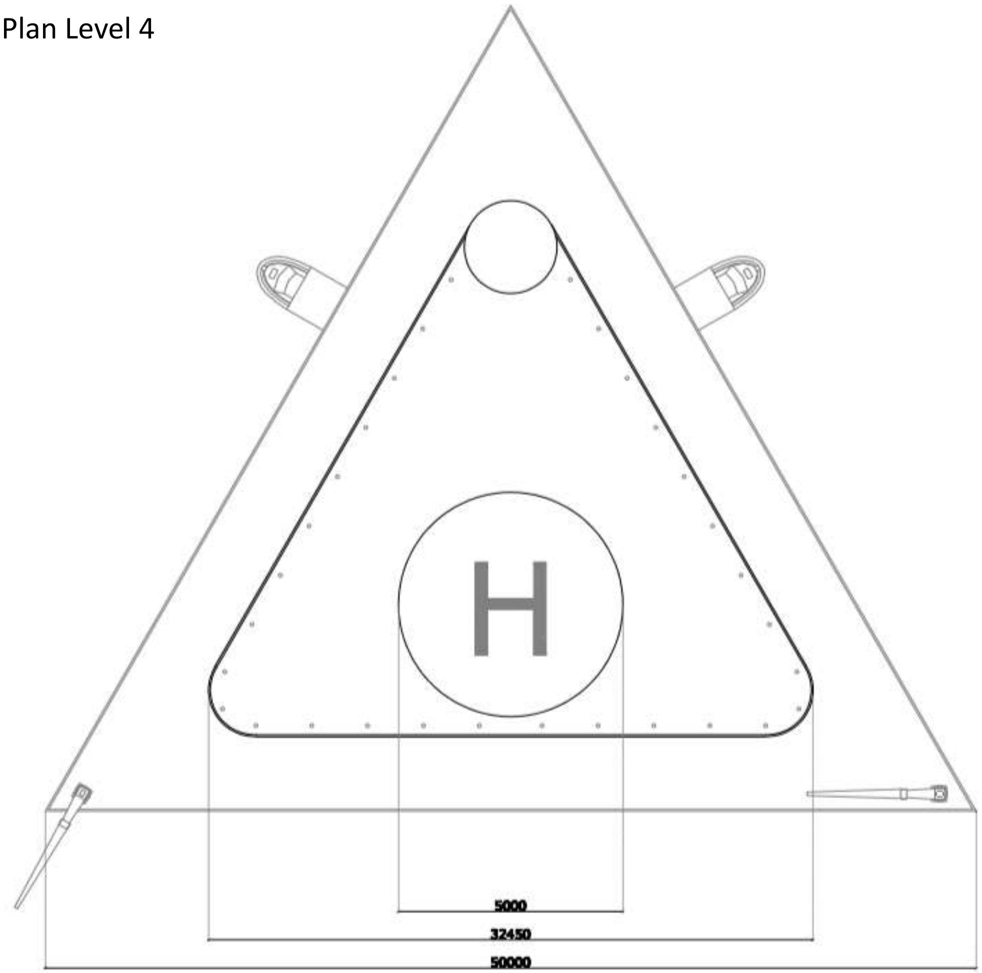
Bedrooms, common areas

Area index	Accommodation for 14 people
Bedrooms x 19 (12 sqm each)	168 sqm
Gym	60 sqm
Common space	245 sqm

3.3 Concept 1.A:

Mediterranean Sea

Plan Level 4

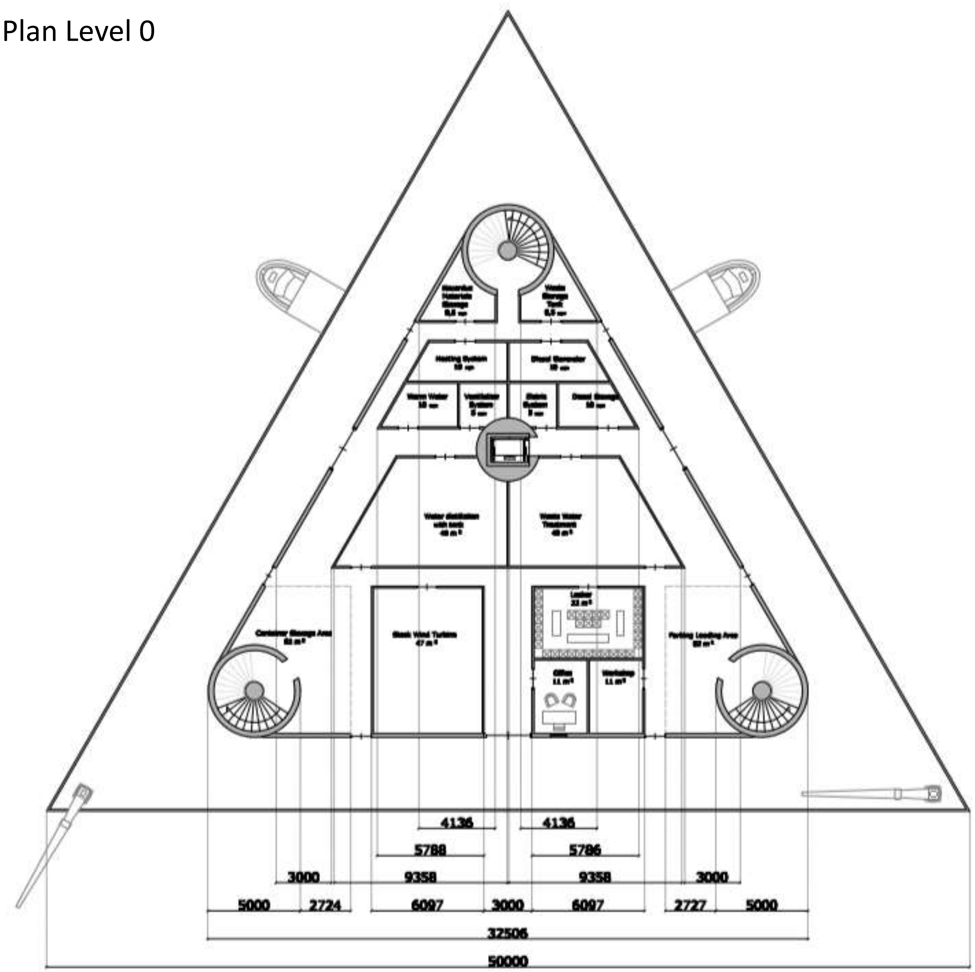


Rooftop

3.4 Concept 1.B:

North Sea

Plan Level 0



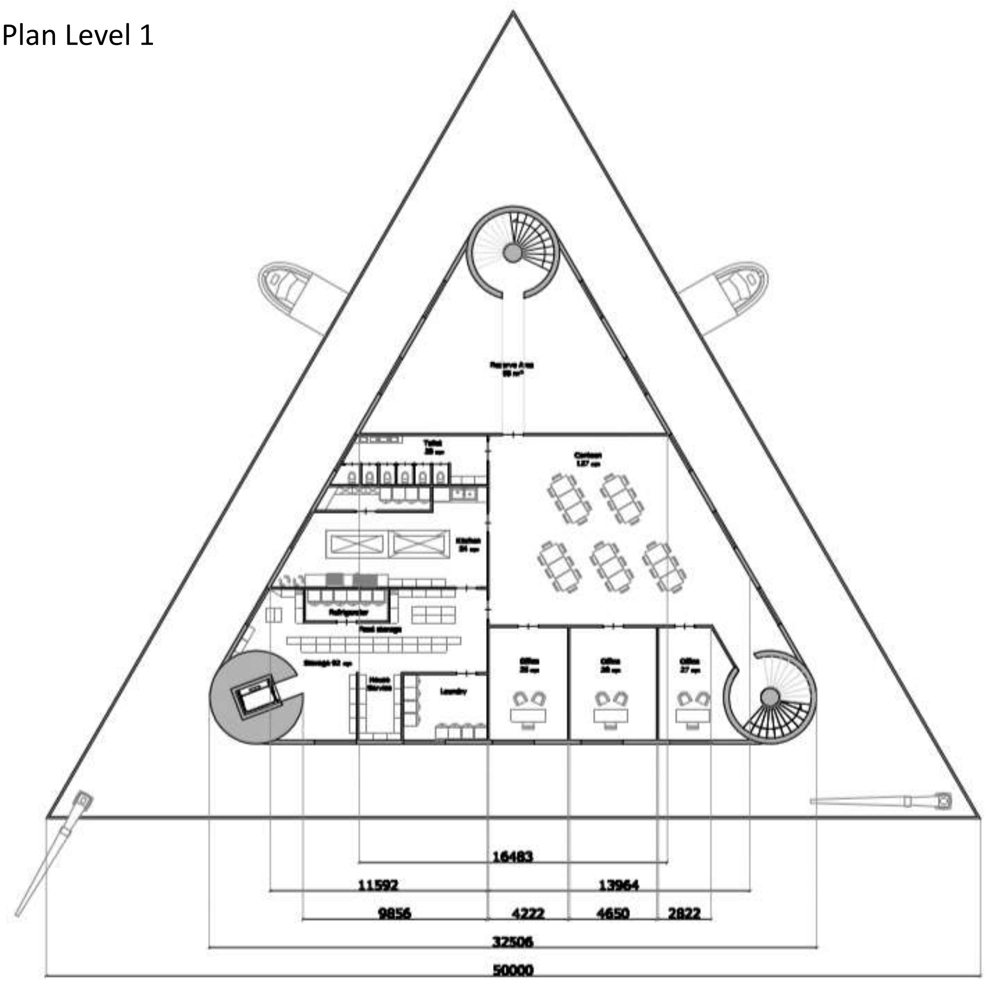
Storage, hall and quay

Area index	
2 doors and 3x3m hall door on each side	
Turbines stock area	47 sqm
Parking, loading area	82 sqm
Transport paths	141 sqm
Container storage area	33 sqm
Locker room	22 sqm
Office	11 sqm
Workshop	11 sqm
Hazardous materials storage	8,5 sqm
Waste storage tank	8,5 sqm
Water distillation reserve	44 sqm
Waste water treatment	44 sqm
Heating system	10 sqm
Warm water	10 sqm
Diesel Generator station	10 sqm
Ventilation System	5 sqm
Diesel storage	10 sqm
Electric system	5 sqm

3.4 Concept 1.B:

North Sea

Plan Level 1



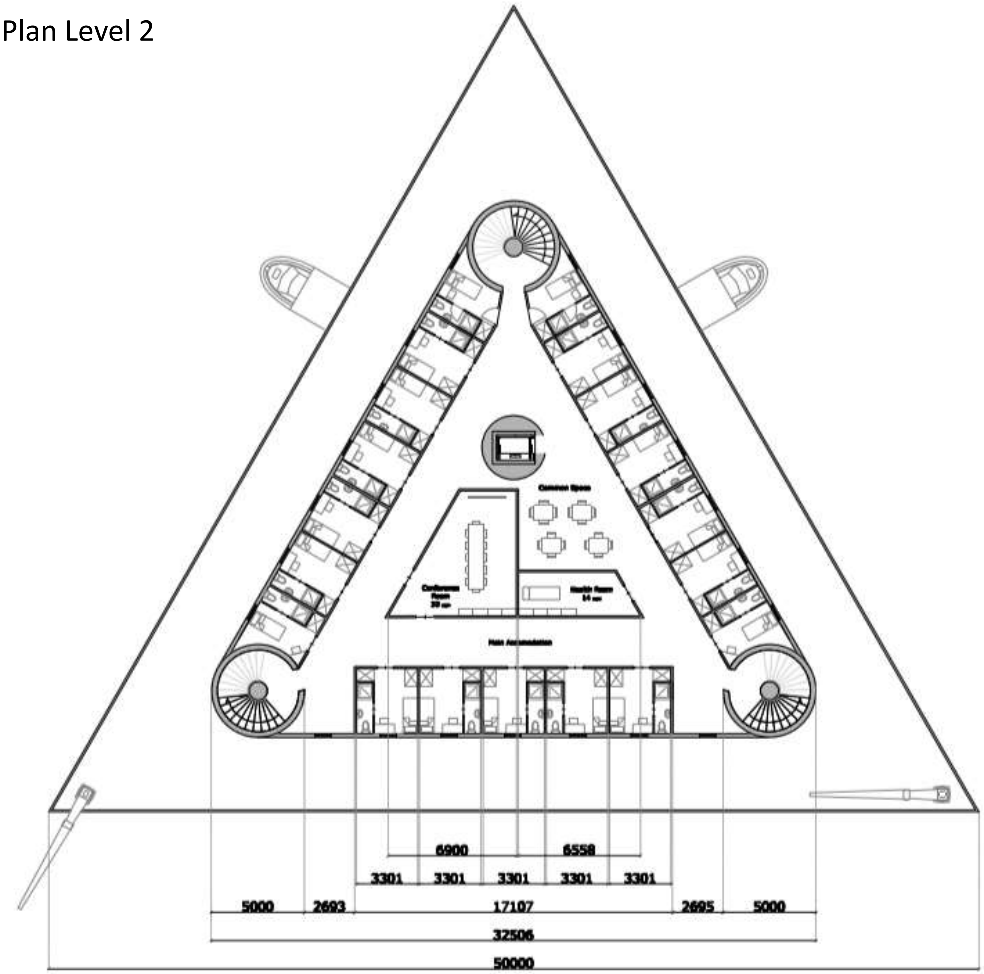
Storage, restaurant, offices

Area index	
Reserve area	95 sqm
Kitchen	52 sqm
Canteen	127 sqm
Food storage and house service	92 sqm
Office 1	25 sqm
Office 2	28 sqm
Office 3	27 sqm

3.4 Concept 1.B:

North Sea

Plan Level 2



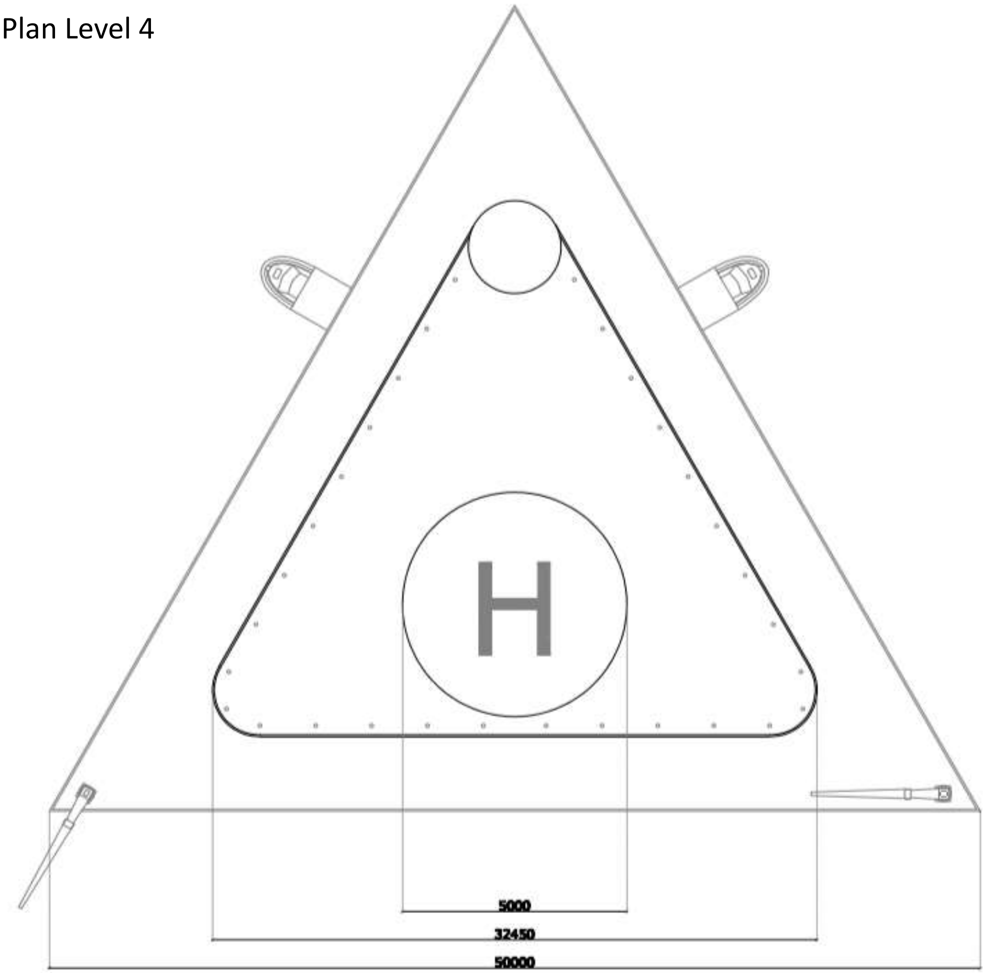
Bedrooms,conference,health room

Area index	Accommodation for 19 people
Bedrooms (19 of 12 sqm each)	228 sqm
Conference Room	33 sqm
Health Room	14 sqm

3.4 Concept 1.B:
North Sea

Plan Level 4

Rooftop



4. Concept 2

Triangular Based Floating Platform

- 4.1: Program of Demands
- 4.2: Initial compositional scheme
- 4.3: Concept 2.A Triangular Based Floating Tower
- 4.4: Concept 2.B Triangular Based Floating City

4.1 Concept 2:
Program of Demands

Program of demands

Functional requirements for accommodation building based on:

- The interview (D7.1 report) at offshore workers, that expressed the preference to increase the living space and also the possibility to receive family visits
- Necessity of 32 apartments at list
- The Bouwbesluit (Dutch Building Code).

4.1 Concept 2:

Program of Demands

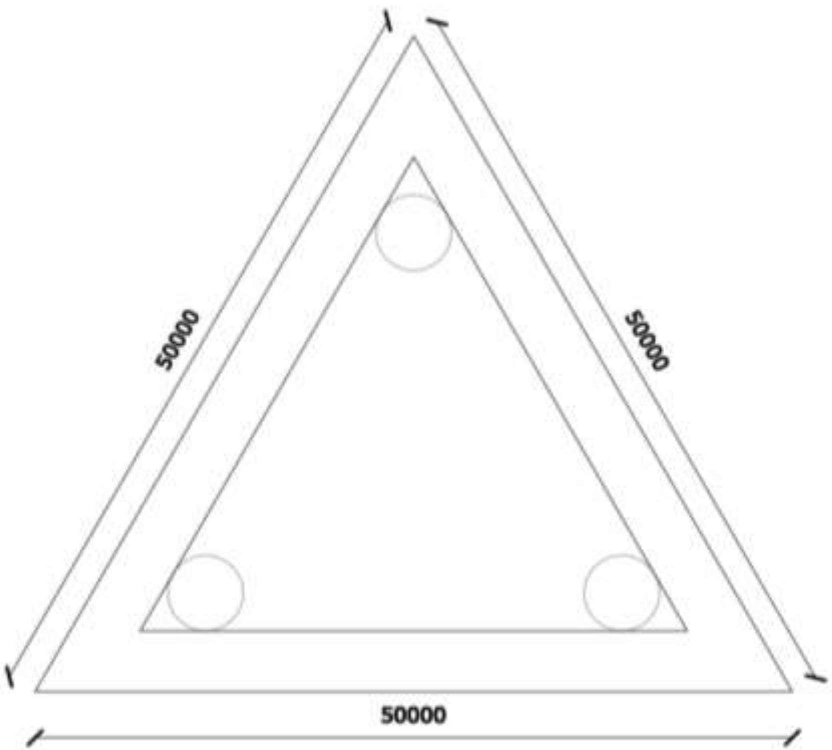
	m² (NFA)	Description
Mini Flats	1120	35 m² each - windows to the outside - bathroom with toilet and shower - separation between living and sleeping area - kitchen - heating, air condition, ventilation
Corridors/Stairs	480	no daylight necessary - heating, air condition, ventilation
Kitchen + canteen	240	kitchen with stoves, ovens, air exhaust systems, refrigerators, freezers, boards, dishwashers – canteen for 30 persons with counters, heated wells, dishwashers, cupboards, windows to outside - sanitary rooms - heating, air condition, ventilation
Food storage (Small Supermarket)	130	storage rooms for food with a capacity of 30 days - house service room - laundry with washing machines
Social Room	176	fitness, sauna/ showers, game room (pool, table, lounge)
Offices	64	
Conference	40	
Health room	15	
Outdoor space	250-500 (depending on the platform)	Green (180-360 m², based on 9m² p.p.) with plants and bushes, should be accessible most of the time and should be safe, accessible without addition safety measures.
Total, accommodation building	**940**	

4.2 Concept 2

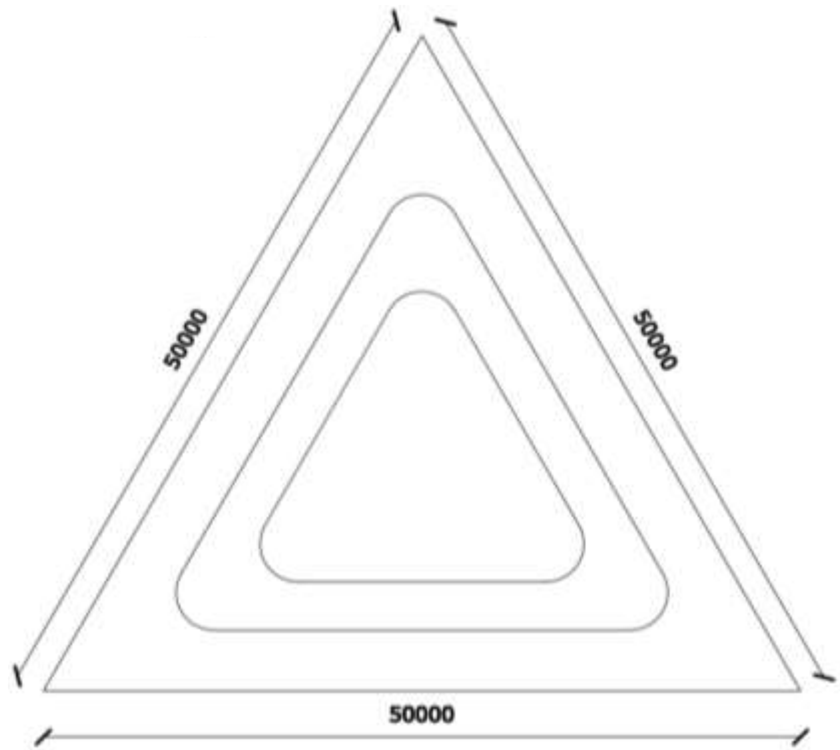
Initial compositional scheme

As for the (50x50x50)m triangular offshore building schemes, the same studies been made for the floating platform systems.

The projects are designed to satisfy a program of demands based on the interview at offshore workers, that expressed the preference to increase the living space and also the possibility to receive family visits.



Phase 1



Phase 2

4.3 Concept 2.A:
Triangular Based Floating Tower

This floating tower is designed to accommodate a minimum of 32 families to a maximum of 36 families. The first two levels are for common activities and facilities, above these levels there are 6 other levels, which are equipped with 6 apartments of 37sqm each.

4.3 Concept 2.A:

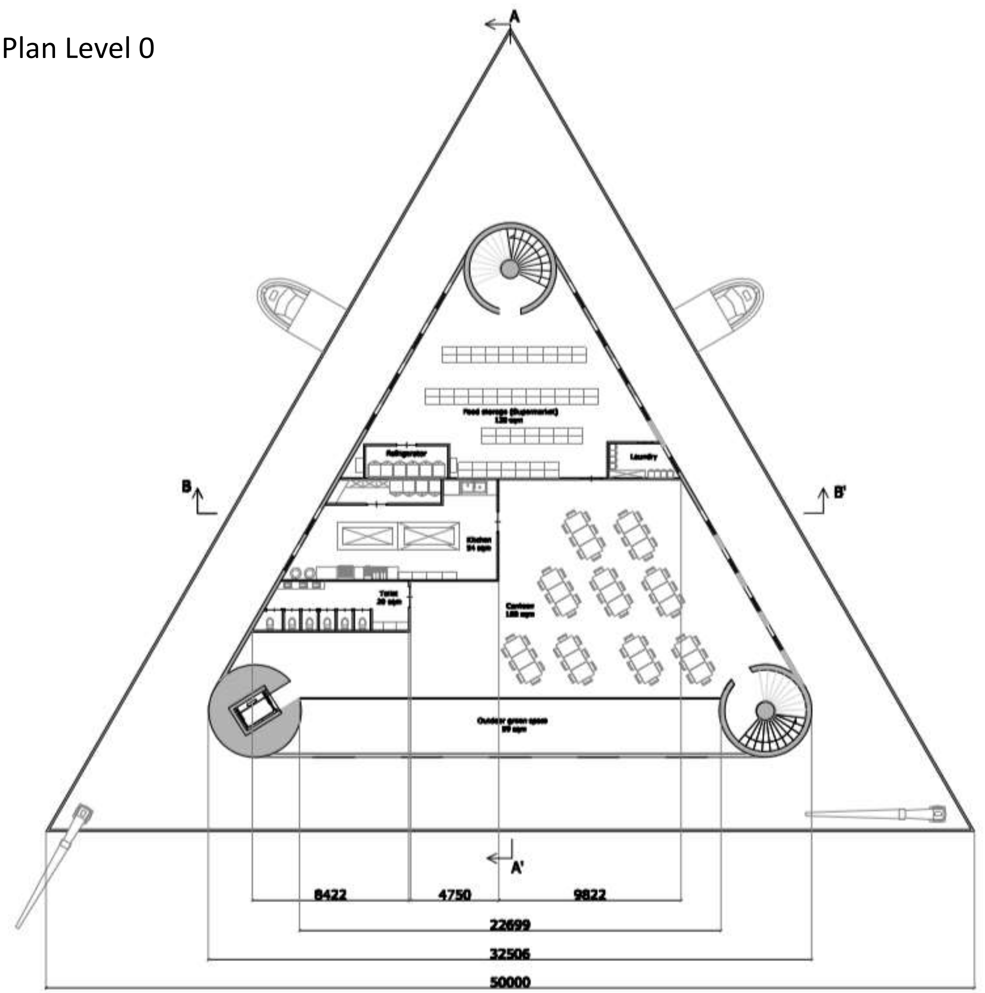
Triangular Based Floating Tower

This floating tower is designed to accommodate a minimum of 32 families to a maximum of 36 families. The first two levels are for common activities and facilities, above these levels there are 6 other levels, which are equipped with 6 apartments of 37sqm each.

4.3 Concept 2.A:

Floating Tower

Plan Level 0



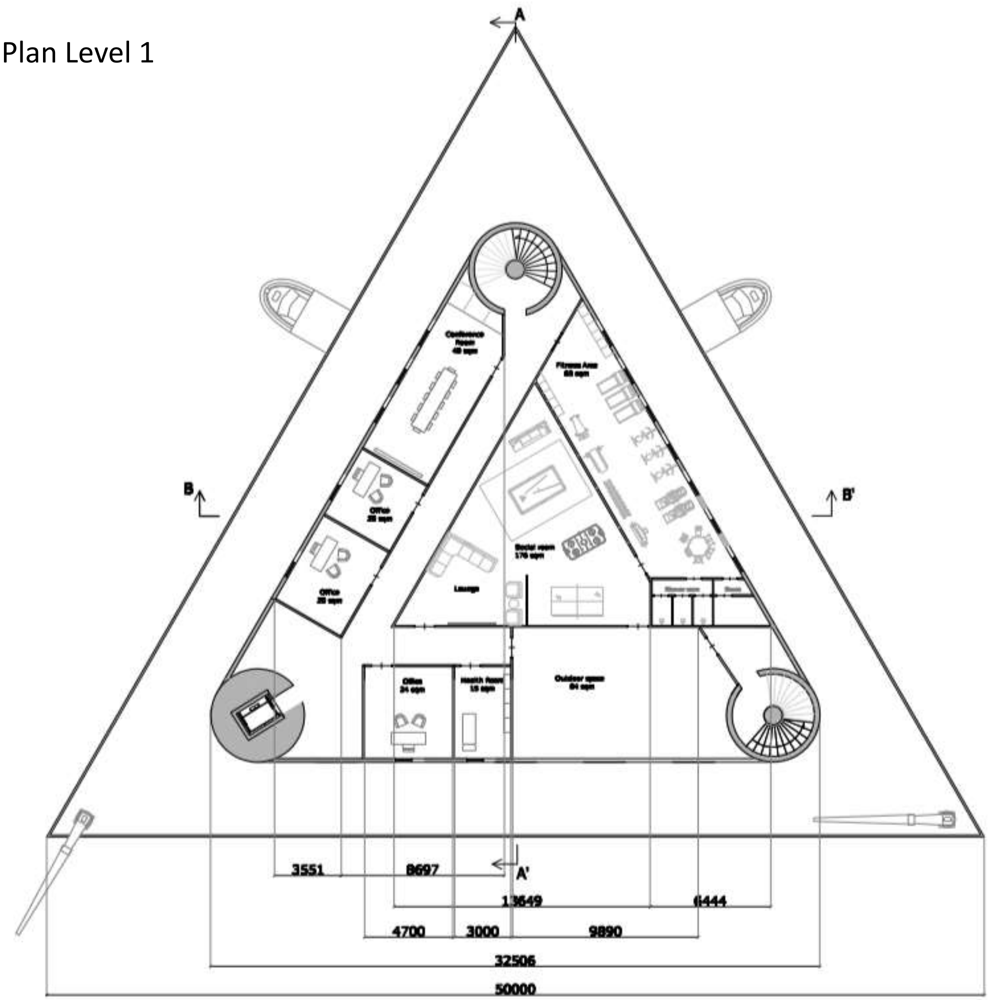
Storage, Restaurant, Outdoor Green

Area index	
Outdoor Common Green	59 sqm
Kitchen	54 sqm
Canteen	168 sqm
Food storage and Supermarket	130 sqm
Toilet	20 sqm
Laundry	7 sqm
Refrigerator	8 sqm

4.3 Concept 2.A:

Floating Tower

Plan Level 1



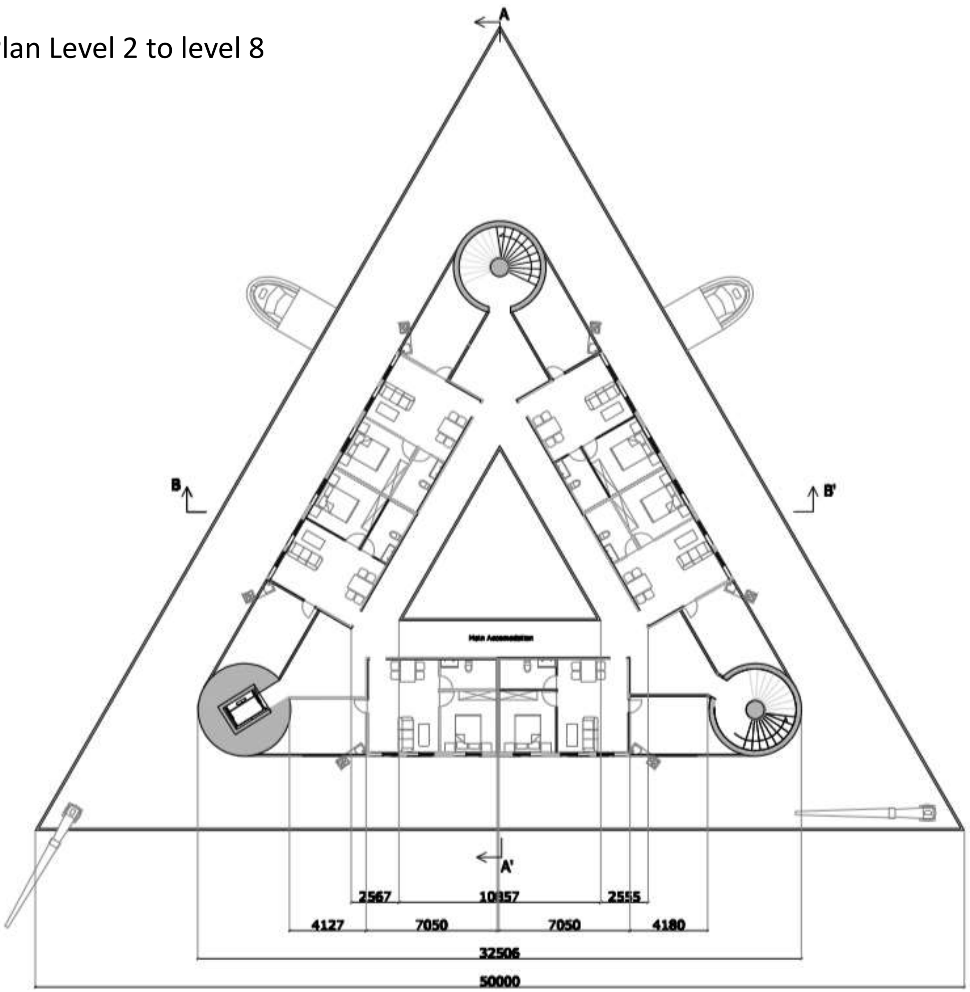
Offices, social, outdoor space

Area index	
Outdoor Space	84 sqm
Social (game + lounge)	76 sqm
Fitness	63 sqm
Conference	40 sqm
Heath Room	15 sqm
Office 1	20 sqm
Office 2	20 sqm
Office 3	24 sqm

4.3 Concept 2.A:

Floating Tower

Plan Level 2 to level 8



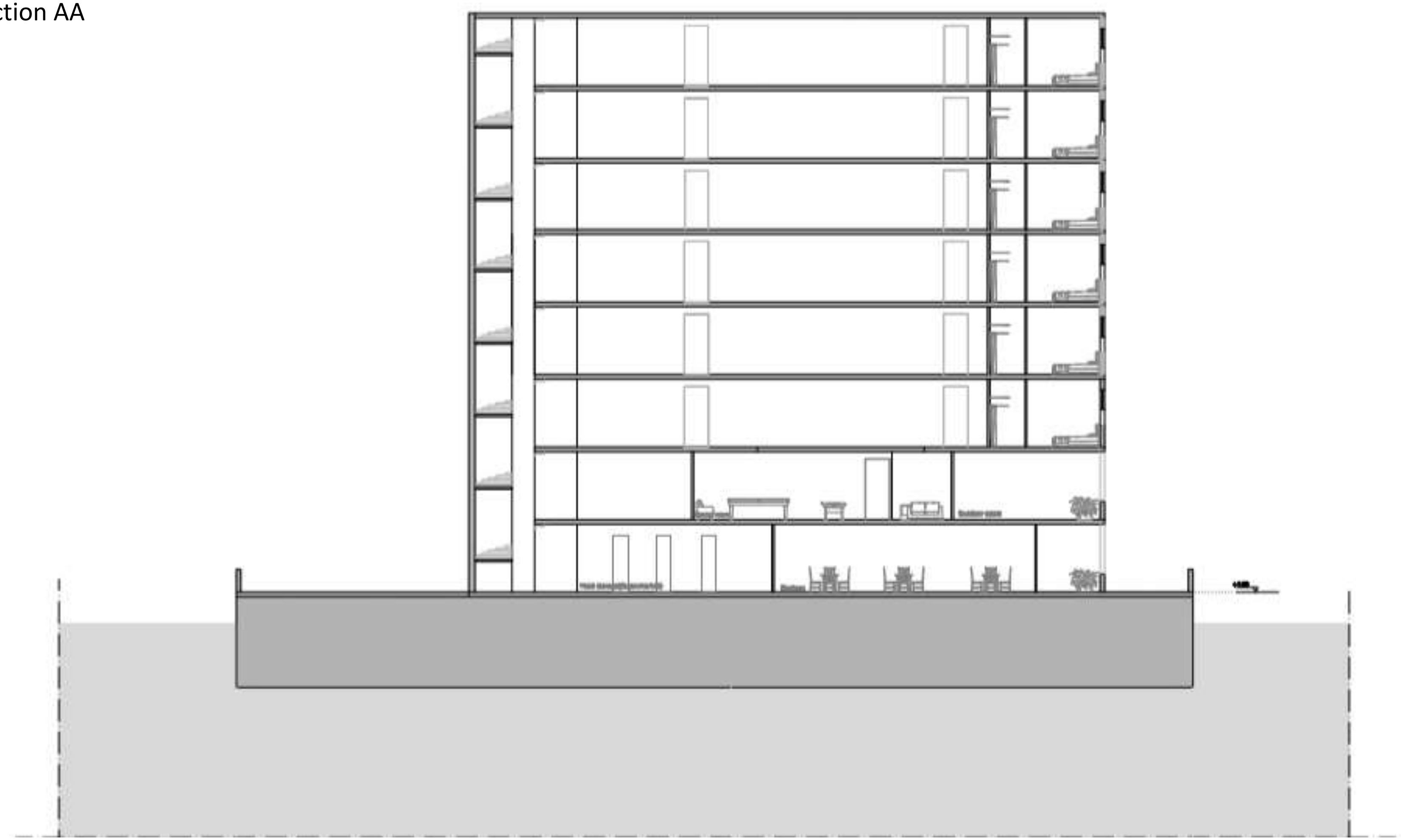
Apartments

Area index	
Apartments (6/floor 37 sqm each) Private Garden (1/ap. 15 sqm each)	222 sqm 90 sqm

4.3 Concept 2.A:

Floating Tower

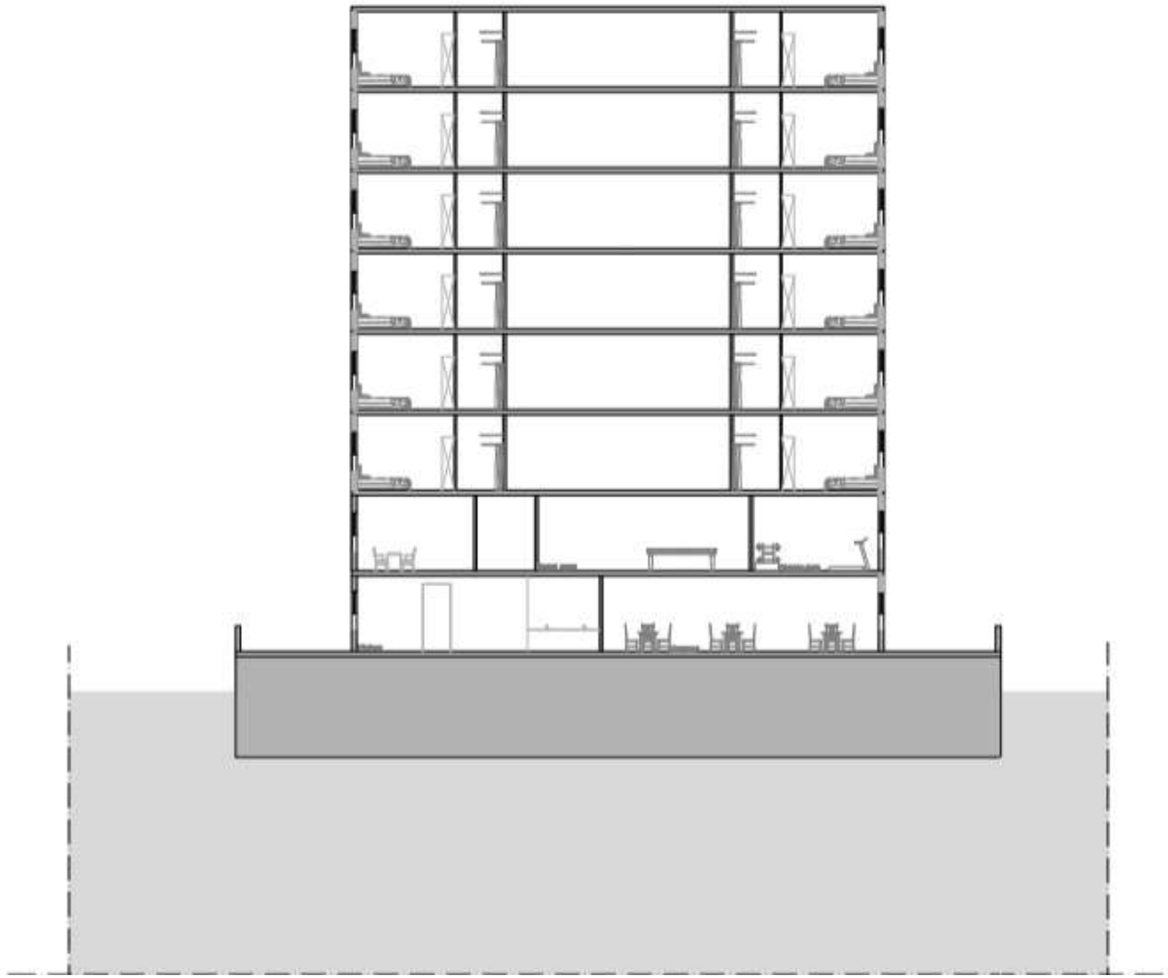
Section AA



4.3 Concept 2.A:

Floating Tower

Section BB



4.4 Concept 2.B:

Triangular Based Floating city

PLANAR SOLUTION

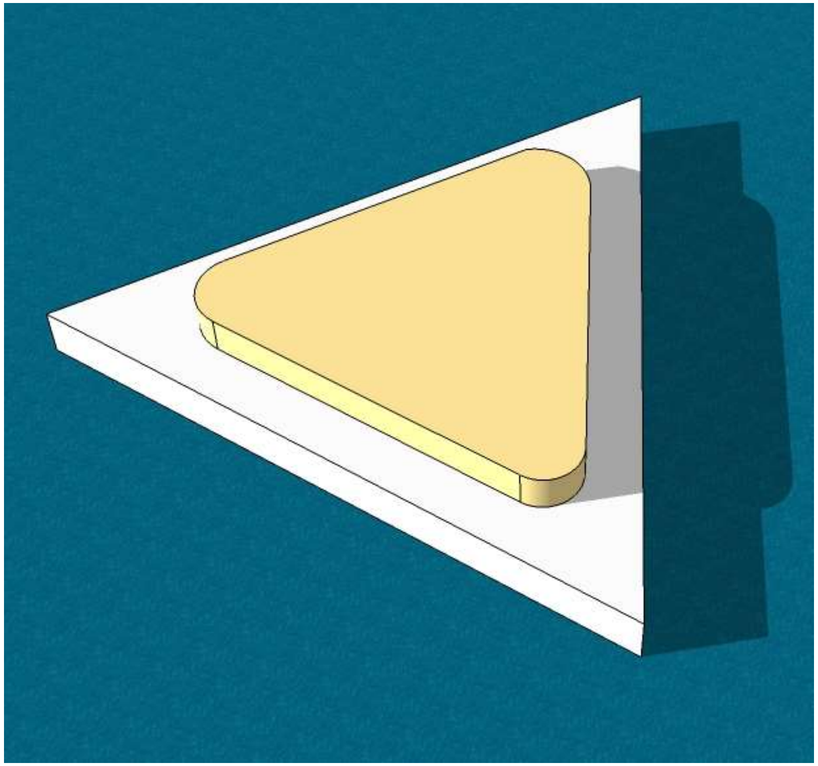
Study started at the triangular module platform of (50X50X50)m

4.4 Concept 2.B:

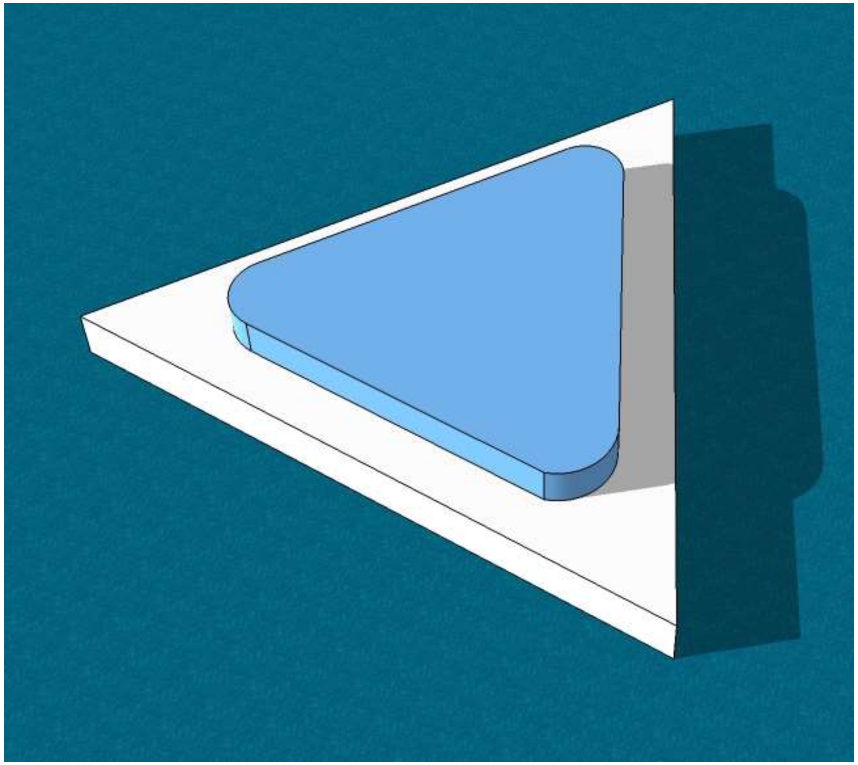
Compositive Schemes

BASIC MODULES

The solutions are made by two main functions: accommodation and facilities. The two modules can combined into different configurations



Accommodation



Facilities

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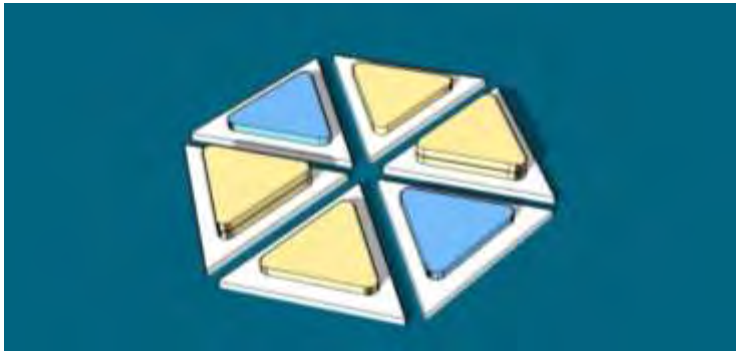
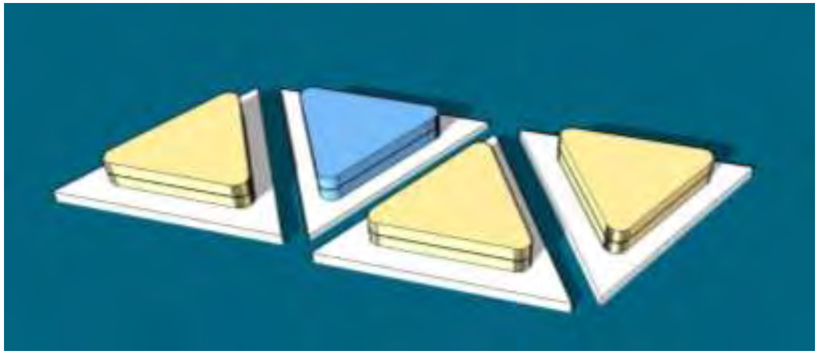
4.4 Concept 2.B:

INITIAL CONFIGURATION

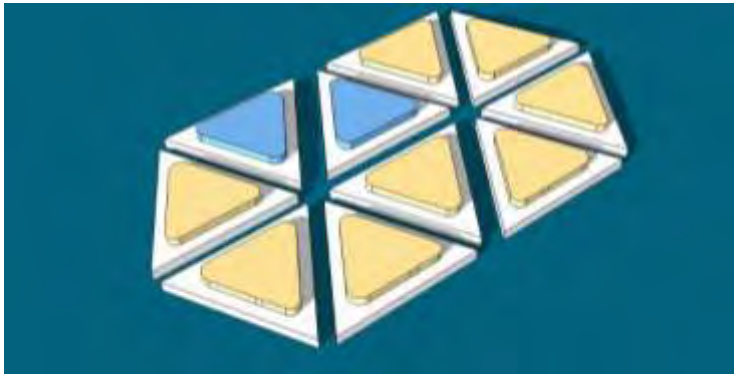
Each solution is made to answer the requirements of 32 families.



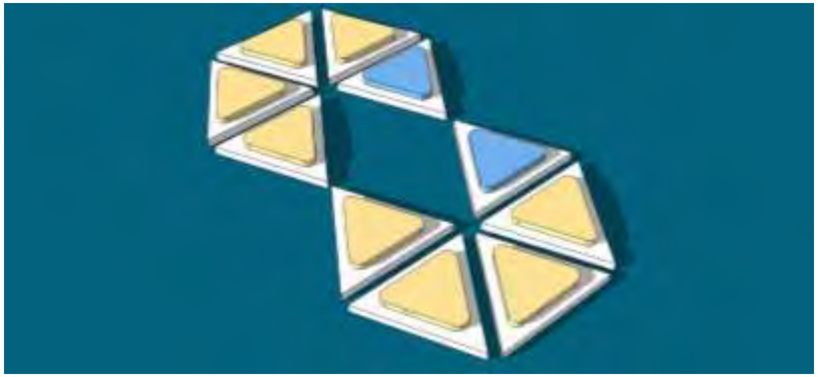
Layout 1



Layout 2



Layout 3



Layout 4

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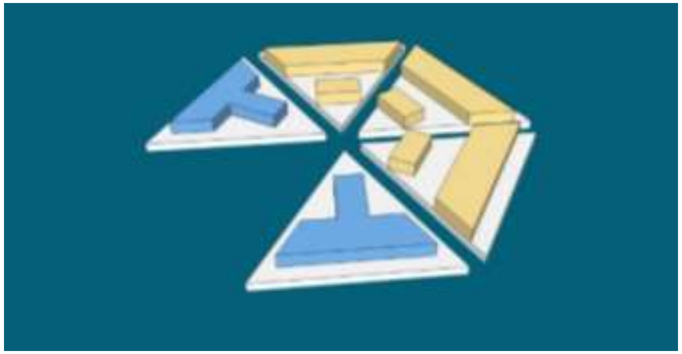
4.4 Concept 2.B1:

32 Apartments Floating City

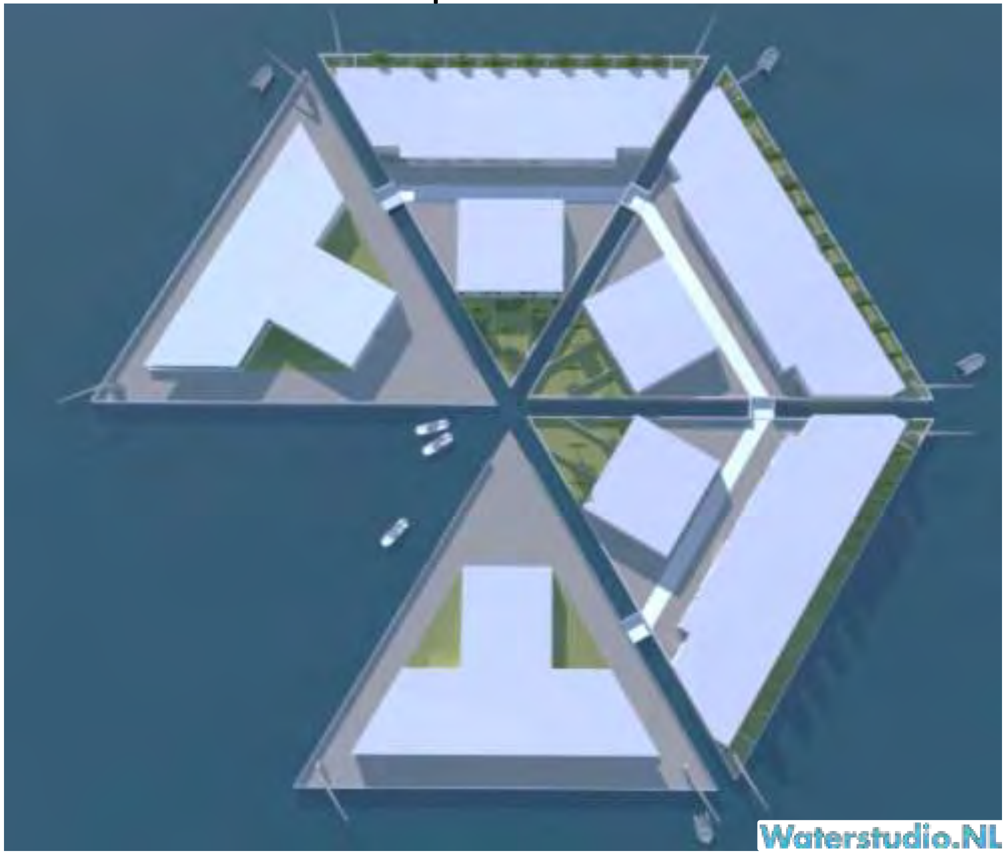
SCHEME 1: 3 accommodation blocks (11 apartments/platform) + 2 facility blocks

Basic Scheme



Side View

Top View

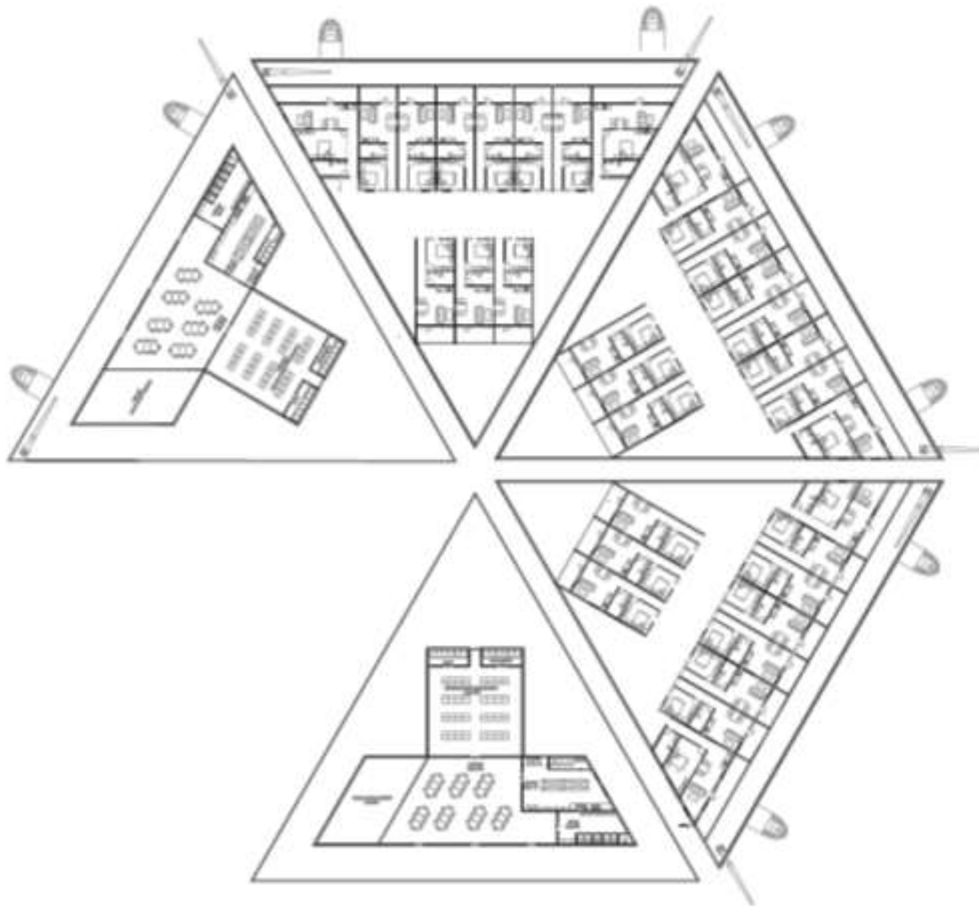


4.4 Concept 2.B1:

32 Apartments Floating City

SCHEME 1: 3 accommodation blocks (11 apartments/platform) + 2 facility blocks

Master plan



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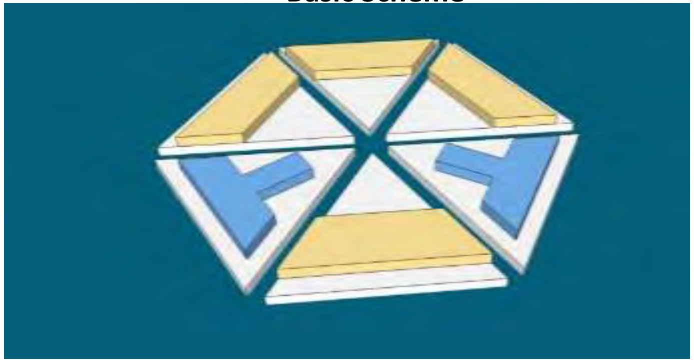
4.4 Concept 2.B2:

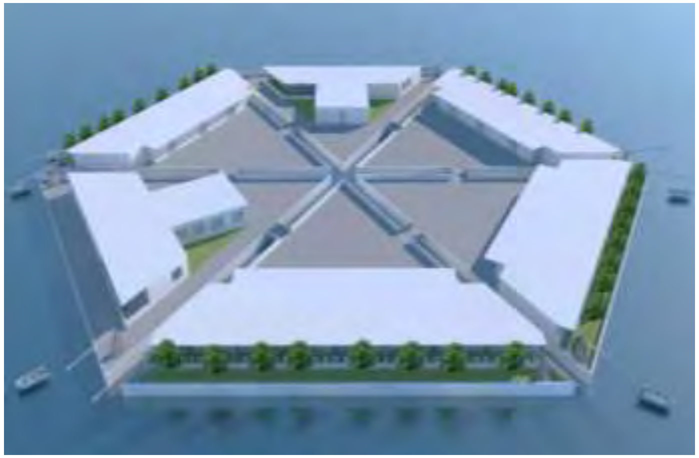
32 Apartments Floating City

SCHEME 2: 4 accommodation blocks (8 apartments/platform) + 2 facility blocks

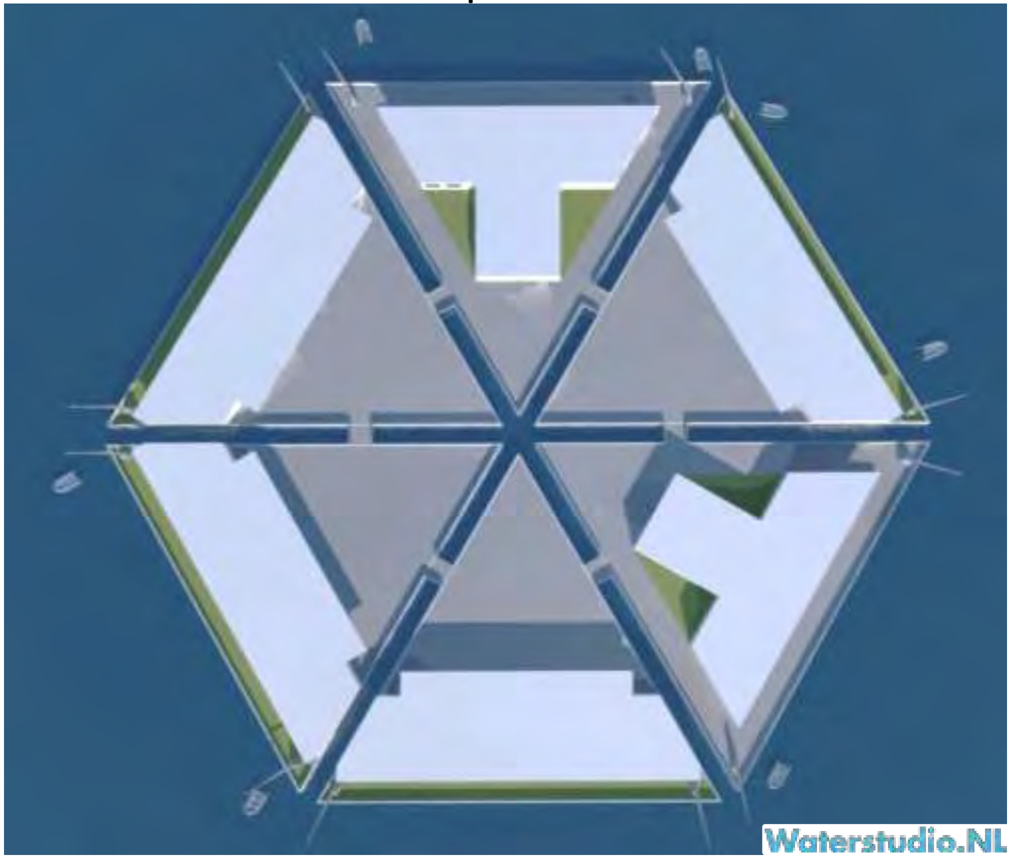
Basic Scheme



Side View



Top View

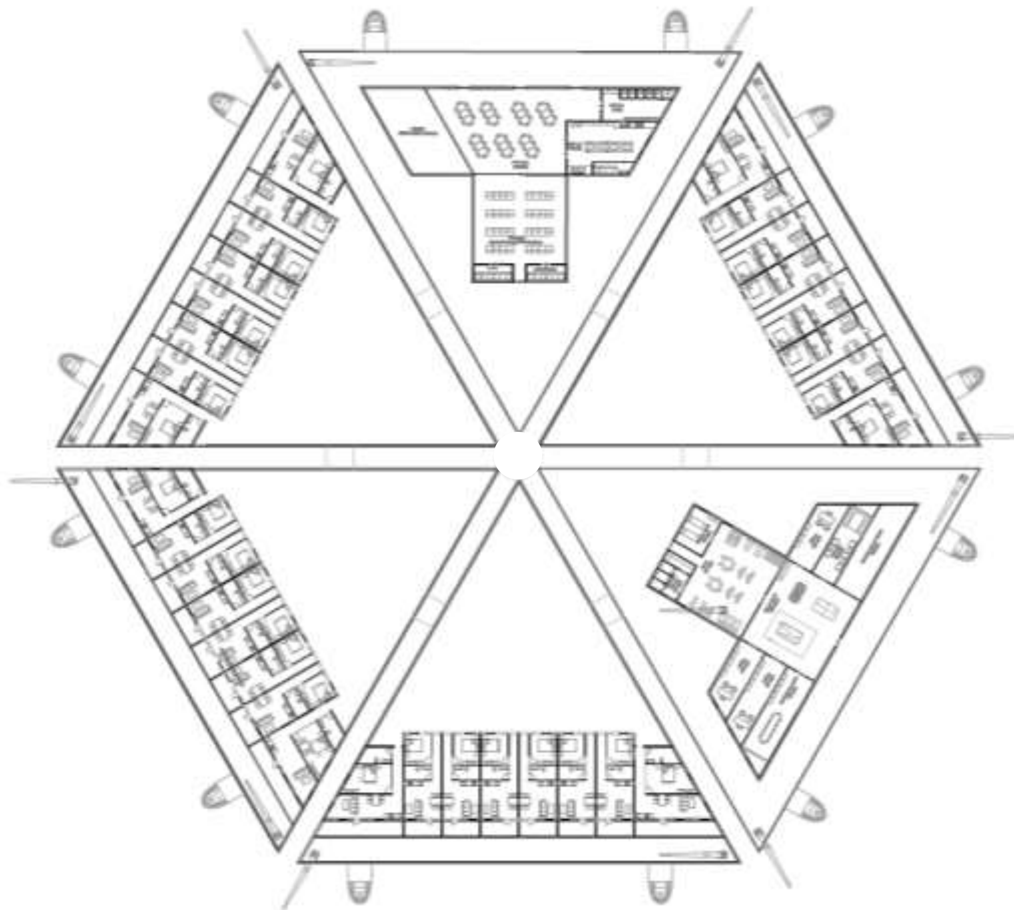


4.4 Concept 2.B2:

32 Apartments Floating City

SCHEME 2: 4 accommodation blocks (8 apartments/platform) + 2 facility blocks

Master plan



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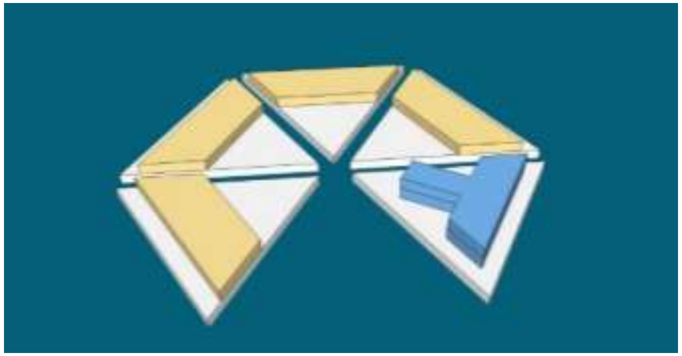
4.4 Concept 2.B3:

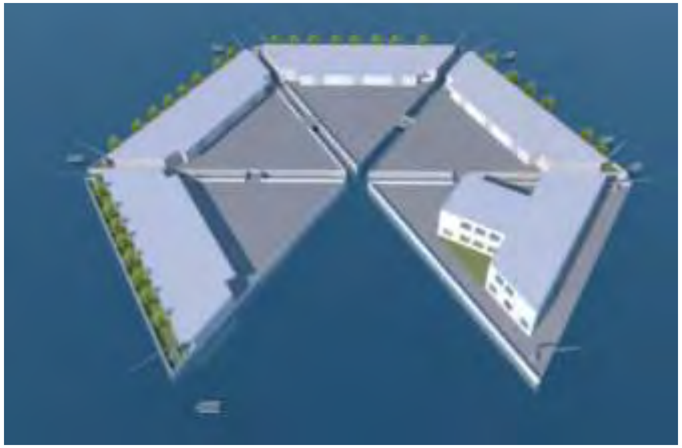
32 Apartments Floating City

SCHEME 3: 4 accommodation blocks (8 apartments/platform) + 1 facility block

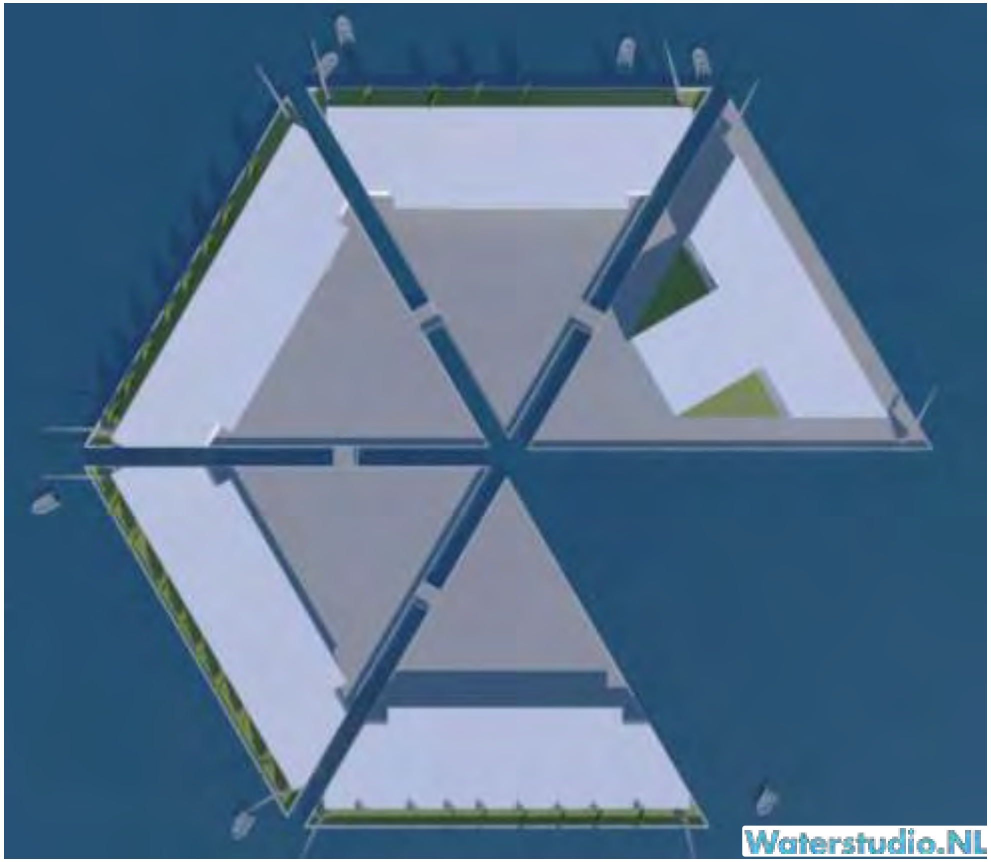
Basic Scheme



Side View



Top View



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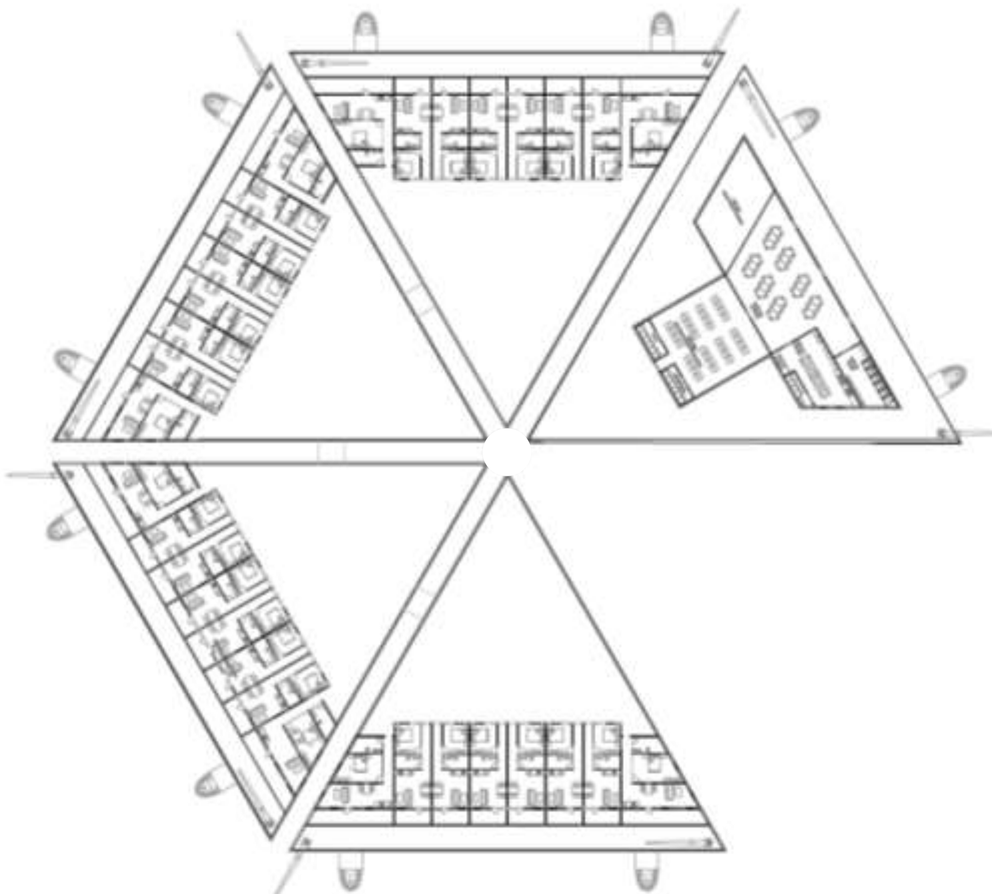
4.4 Concept 2.B3:

32 Apartments Floating City

SCHEME 3: 4 accommodation blocks (8 apartments/platform) + 1 facility block

Master plan



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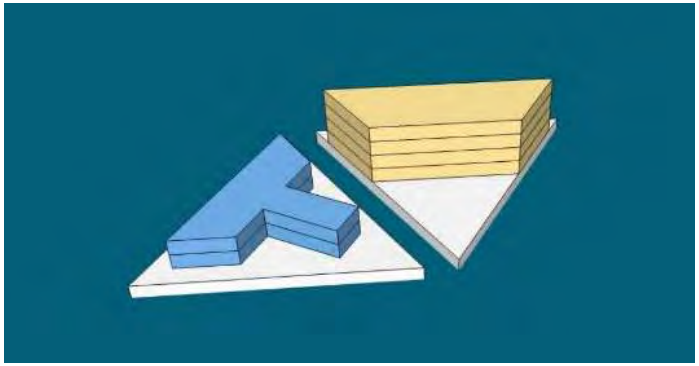
4.4 Concept 2.B4:

32 Apartments Floating City

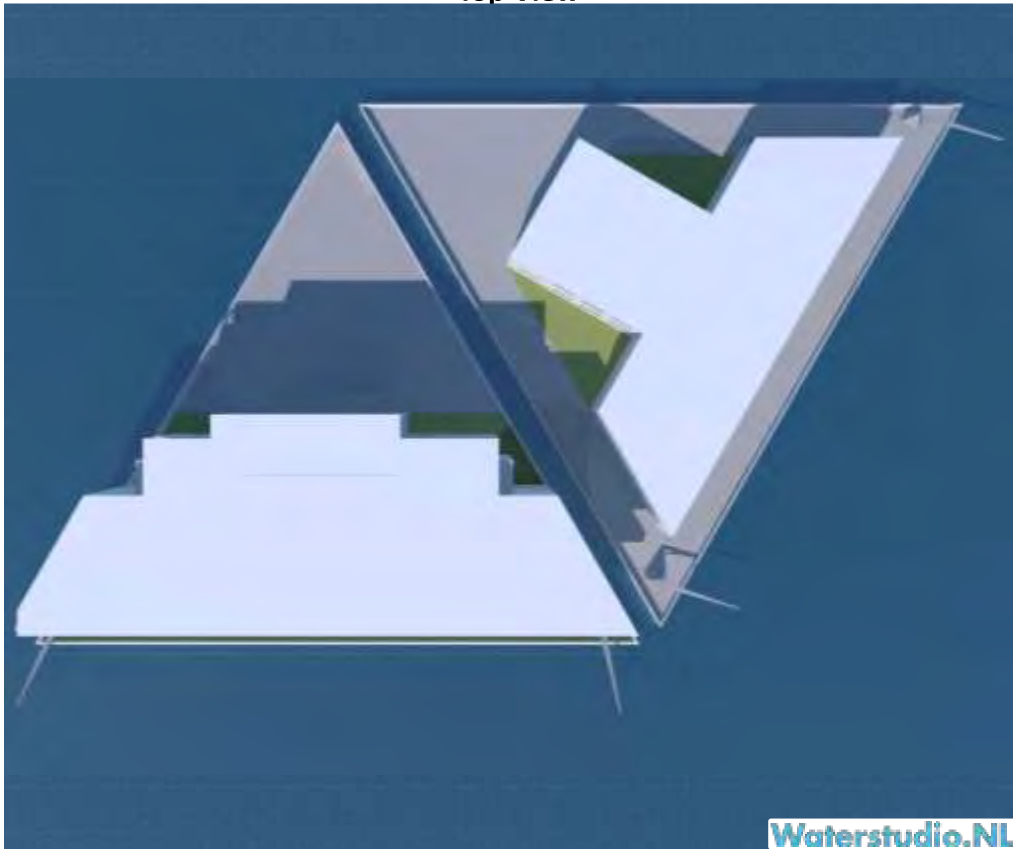
SCHEME 4: 1 accommodation blocks (32 apartments/platform) + 1 facility block

Basic Scheme



Side View

Top View

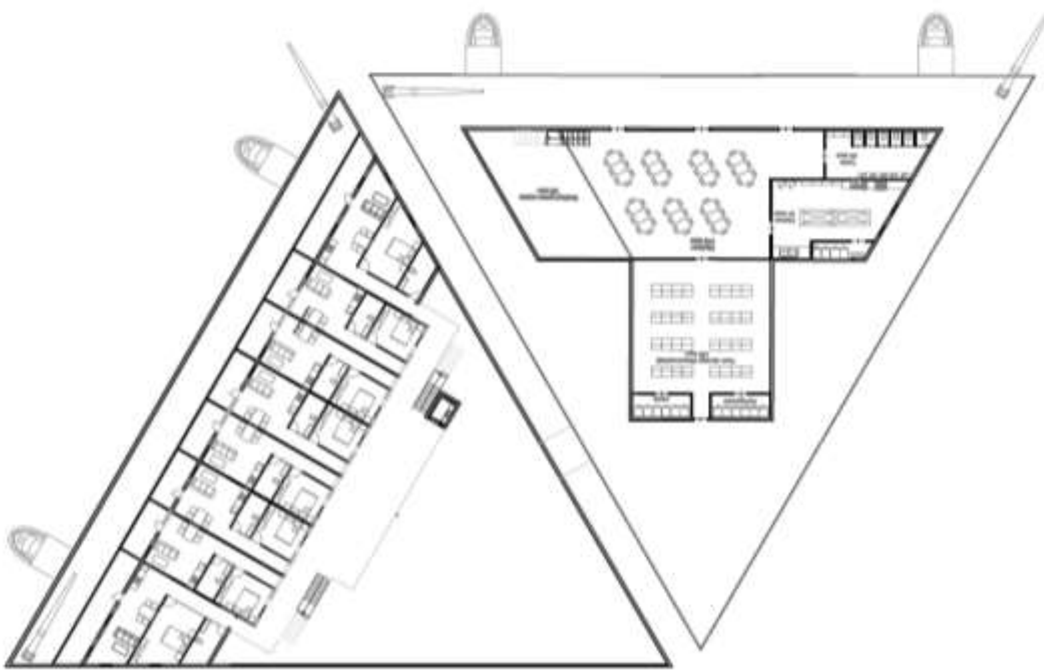


4.4 Concept 2.B4:

32 Apartments Floating City

SCHEME 4: 1 accommodation blocks (32 apartments/platform) + 1 facility block

Master plan



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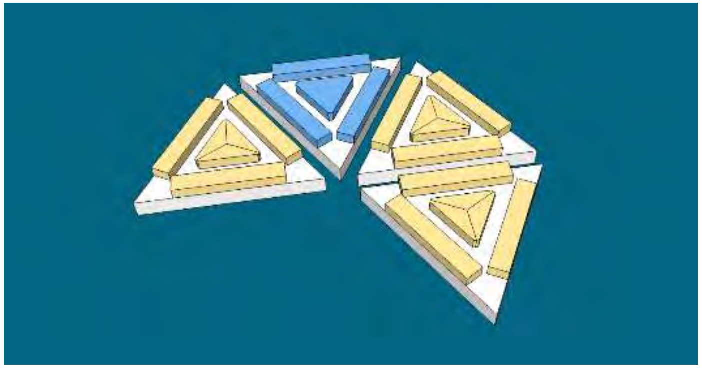
4.4 Concept 2.B5:

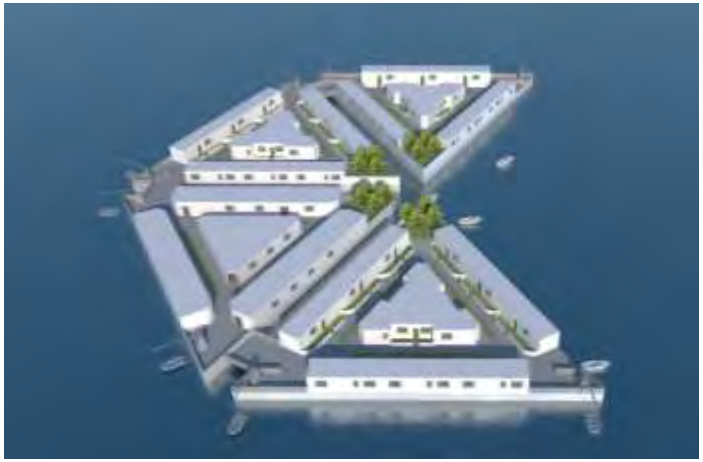
32 Apartments Floating City

SCHEME 5: 3 accommodation blocks (12 apartments/platform) + 1 facility block

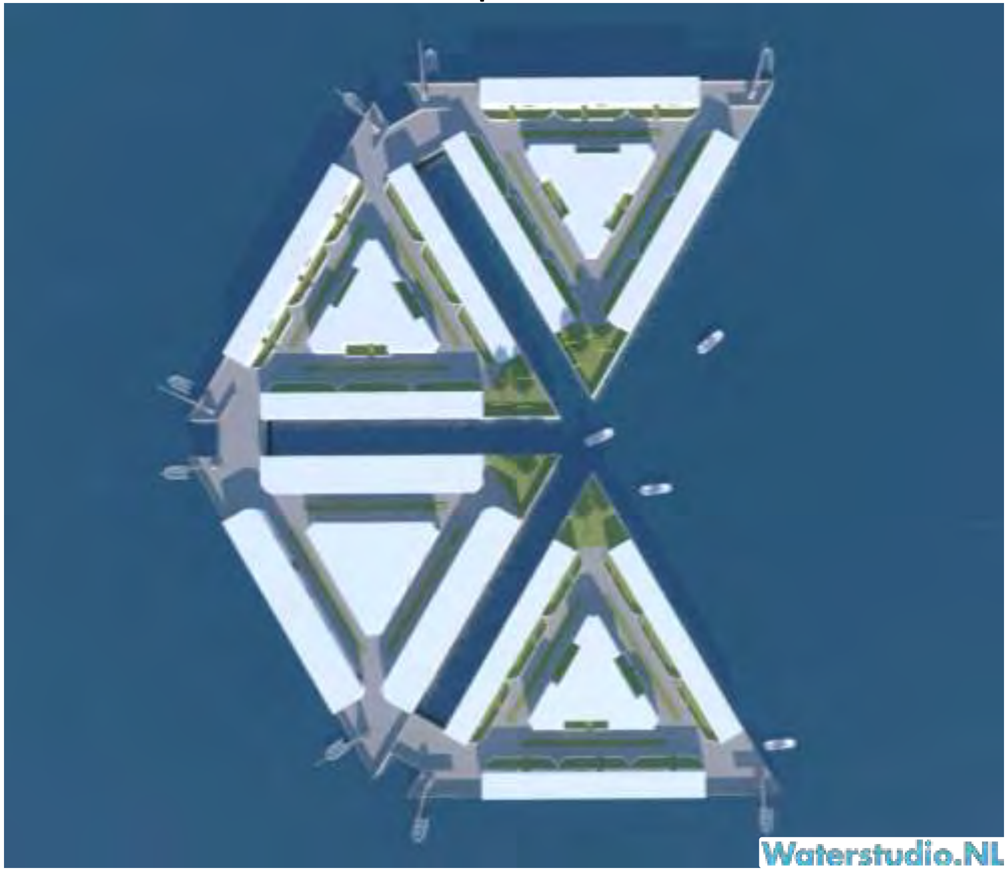
Basic Scheme



Side View



Top View

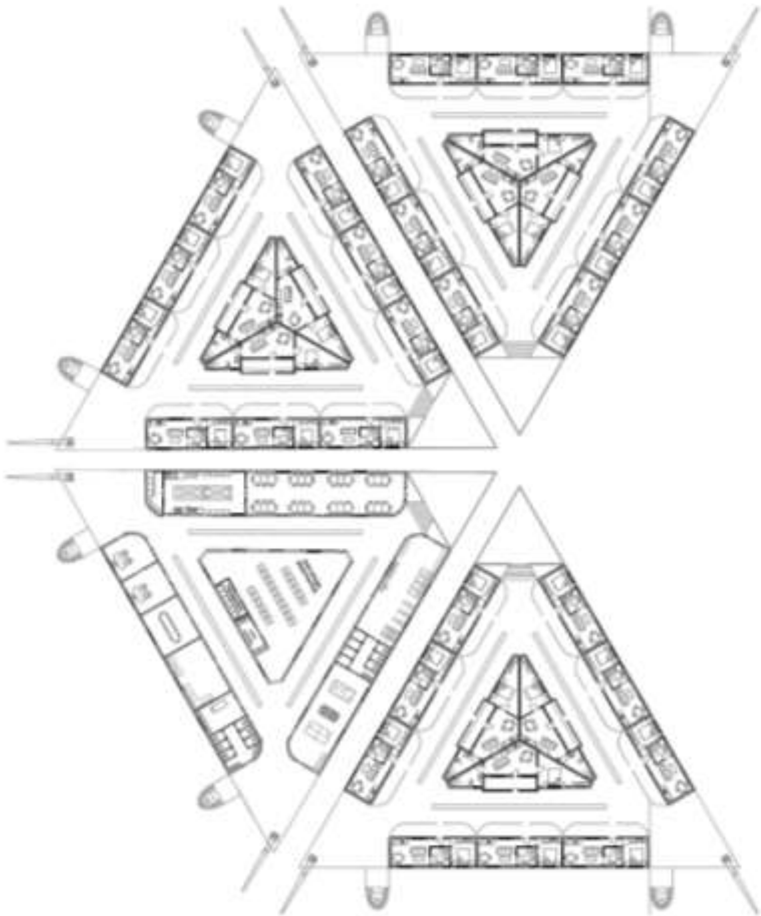


4.4 Concept 2.B5:

32 Apartments Floating City

SCHEME 5: 3 accommodation blocks (12 apartments/platform) + 1 facility block

Master plan



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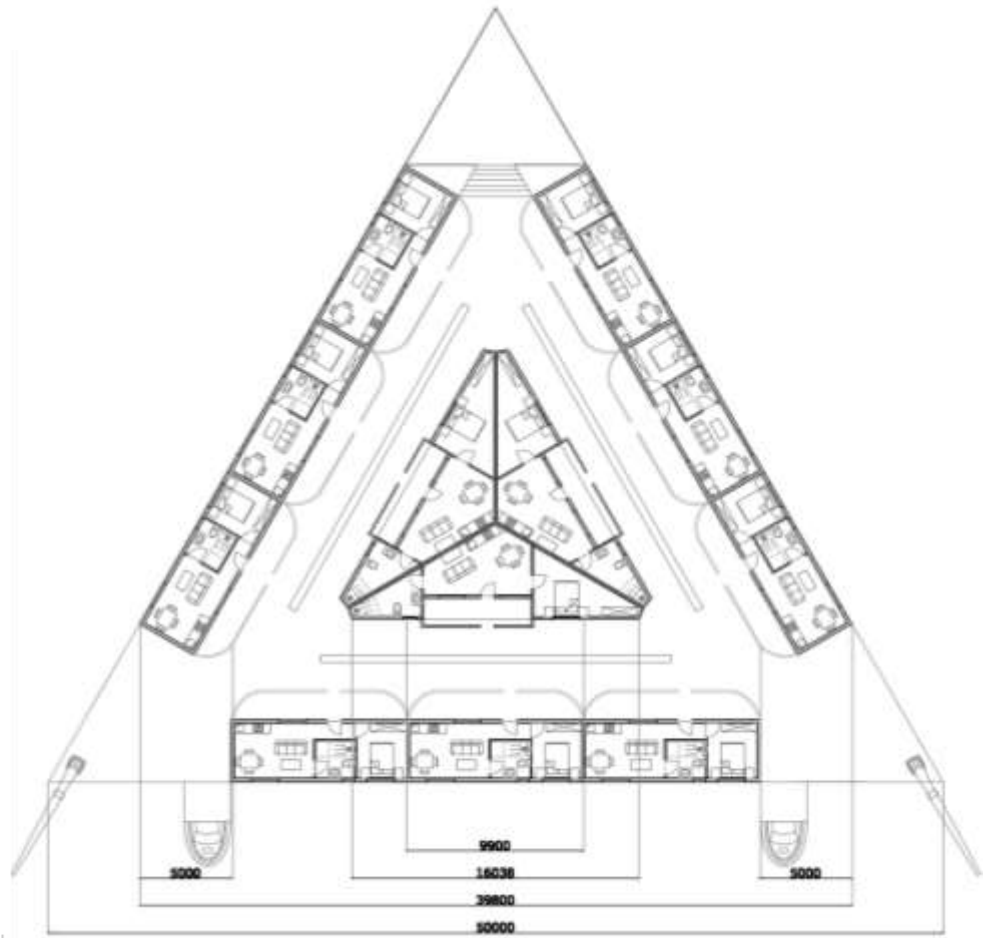
4.4 Concept 2.B5:

32 Apartments Floating City

Plan accommodations



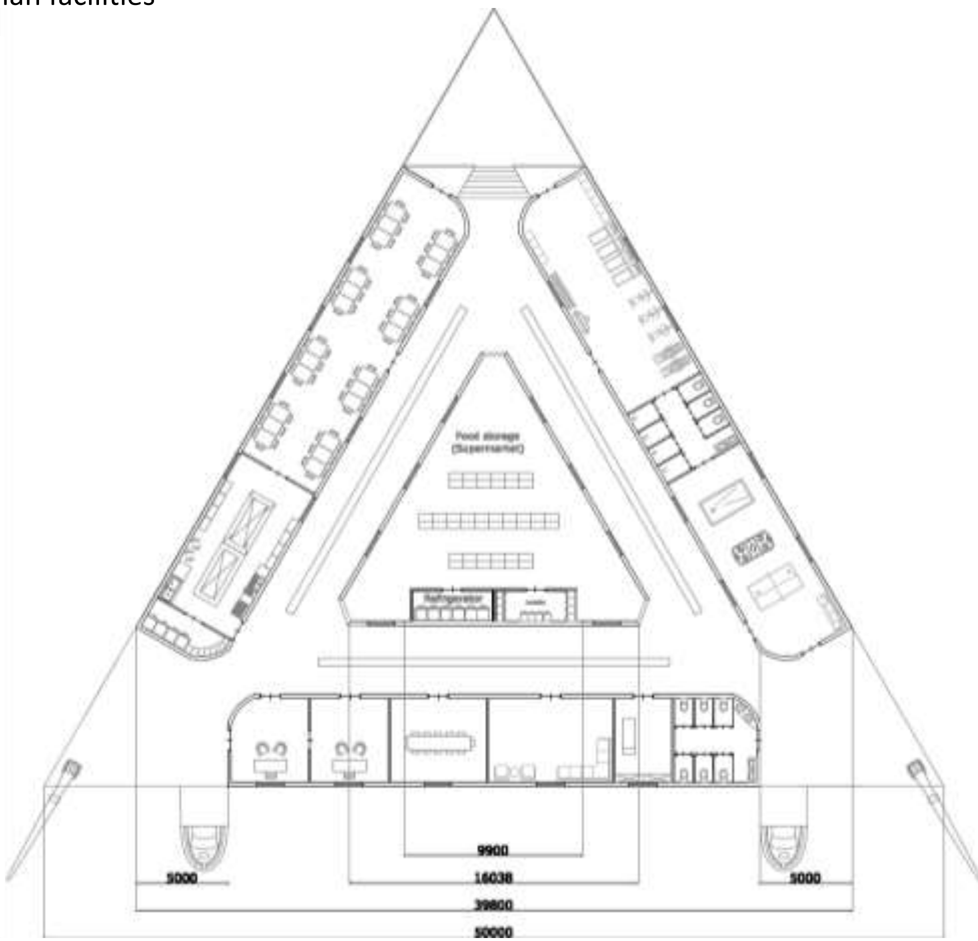
Apartments

Area index	
Apartments (9/block of 35 sqm)	315 sqm
Apartments (3/block of 50 sqm)	150 sqm

4.4 Concept 2.B5:

32 Apartments Floating City

Plan facilities



Offices, social, outdoor space

Area index	
Outdoor Space	84 sqm
Social (game + lounge)	76 sqm
Fitness	63 sqm
Conference	40 sqm
Heath Room	15 sqm
Office 1	20 sqm
Office 2	20 sqm
Office 3	24 sqm

4.4 Concept 2.B5:

32 Apartments Floating City

Side view

4.4 Concept 2.B5:

32 Apartments Floating City

IMPRESSION

View From the green area

5. Concept 3 :

Offshore Square Based Platform

- 5.1: Program of Demands
- 5.2: Initial compositional scheme
- 5.3: Concept 1.A Mediterranean Sea Option
- 5.4: Concept 1.B North Sea Option

5. Concept 1:
Offshore Platforms

Program of demands

Functional requirements for accommodation building

- In the document “List of requirements of the O&M hub”, a list of requirements that includes space for 32 people is proposed.

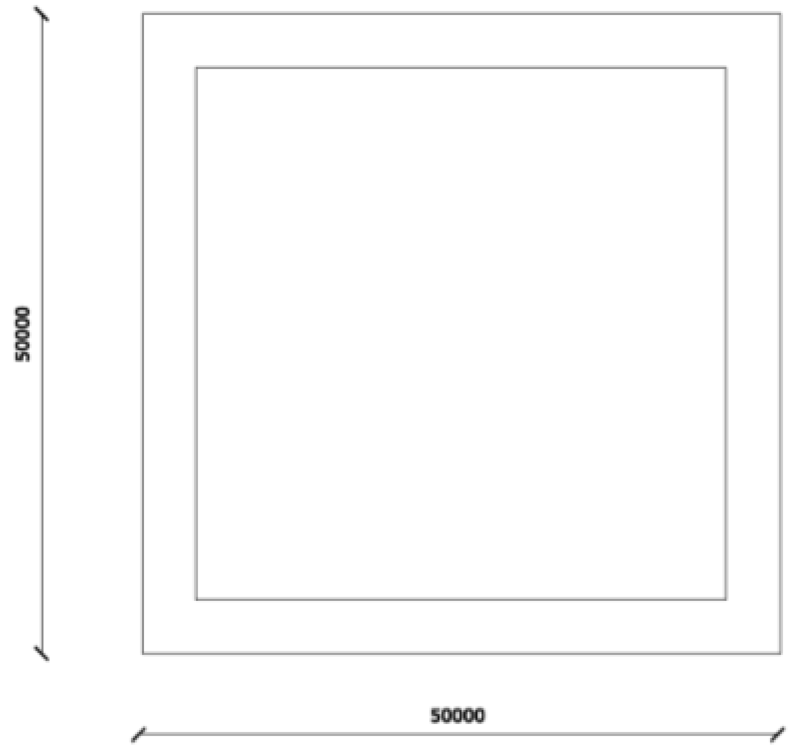
5.1 Concept 1:

Program of demands

Program of demands	m² (NFA)	Description
Single rooms	400	min. 12m² each - windows to the outside - bath with toilet and shower - desk, chairs, wardrobe - heating, air condition, ventilation
Corridors	200	no daylight necessary - heating, air condition, ventilation
Kitchen + canteen	150	kitchen with stoves, ovens, air exhaust systems, refrigerators, freezers, boards, dishwashers - canteen for 32 persons with counters, heated wells, dishwashers, cupboards, windows to outside - sanitary rooms - heating, air condition, ventilation
Food storage	100	storage rooms for food with a capacity of 30 days - refrigeration chamber with a capacity of 30 days - house service room with storage of cleaning agents and other consumables, vacuum cleaner - laundry with washing machines, tumble dryers, linen cupboards, with ventilation
Offices	20	
Conference	25	
Health room	15	
Social rooms	30	gym etc.
Total, accommodation building	**940**	

5.2 Concept 3:
Initial compositional scheme

This concept is based on a square shaped floating platform, L: 50.
The plans have been studied to answer to the requirements mentioned in the program of demands.

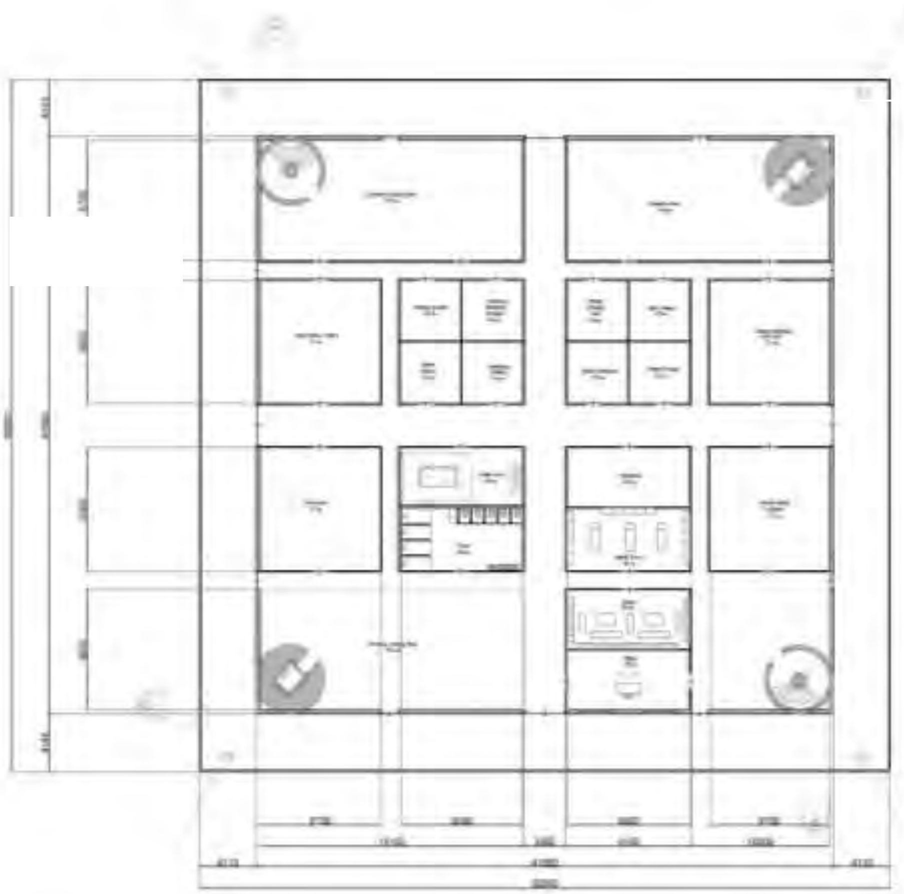


Phase 1

5.3 Concept 3.A:

Mediterranean Sea

Plan Level 0



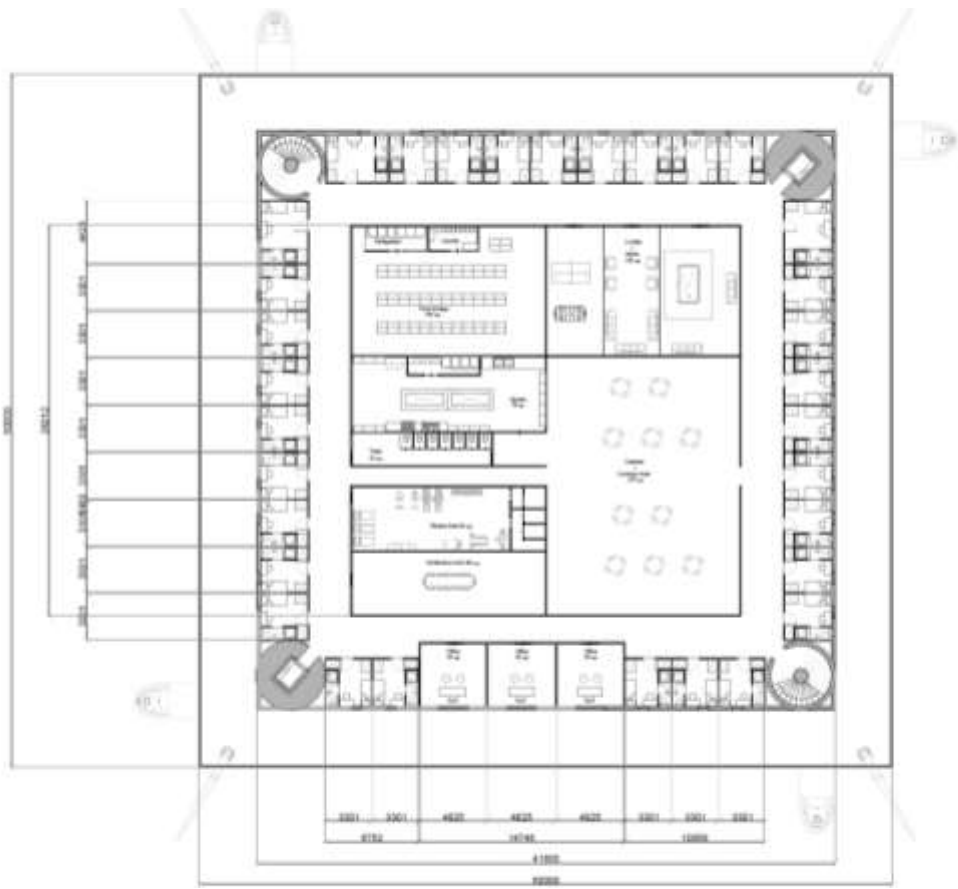
Storage, hall and quay

Area index	
2 doors and 3x3m hall door on each side	
Turbines stock area	47 sqm
Parking, loading area	82 sqm
Container storage area	33 sqm
Locker room	38 sqm
Office	38 sqm
Toilet	38 sqm
Reserve Area	140 sqm
Workshop	38 sqm
Hazardous materials storage	20 sqm
Waste storage tank	20 sqm
Water distillation reserve	77 sqm
Waste water treatment	77 sqm
Heating system	20 sqm
Warm water	20 sqm
Diesel Generator station	20 sqm
Ventilation System	20 sqm
Diesel storage	20 sqm

5.3 Concept 3.A:

Mediterranean Sea

Plan Level 1



Storage, restaurant, offices accommodation

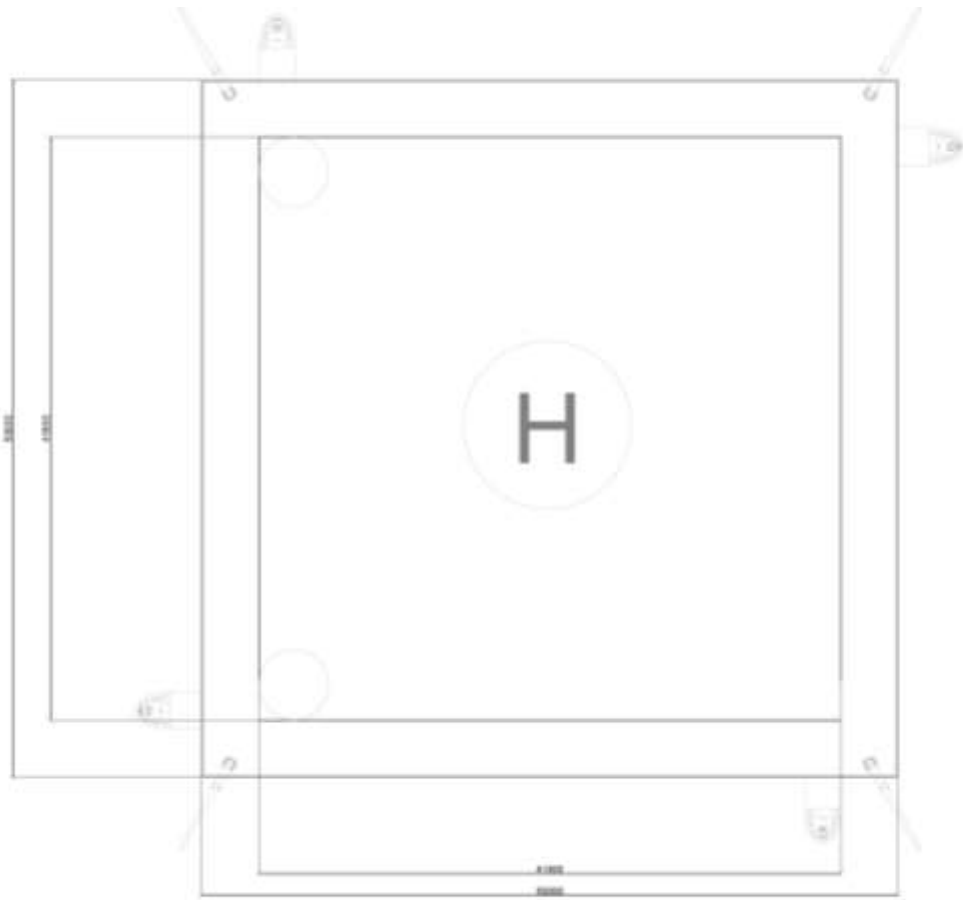
Area index		
Rooms 12 sqm x n.32	384	sqm
Kitchen	75	sqm
Canteen + Common Area	270	sqm
Food storage and house service	130	sqm
Office 22 sqm x n.3	66	sqm
Toilet	23	sqm
Relax area	130	sqm
Fitness	60	sqm
Conference	60	sqm

5.3 Concept 3.A:

Mediterranean Sea

Plan Level 2

Rooftop



5.4 Concept 3.B:

North Sea

Plan Level 1

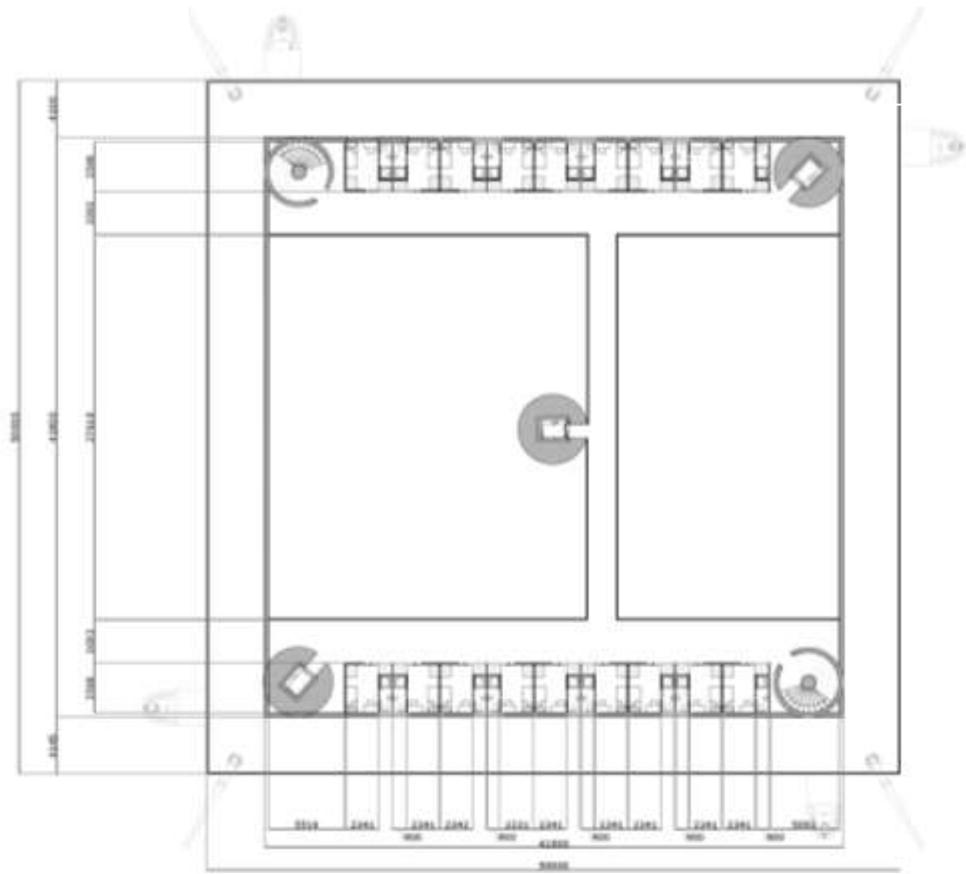
Storage, hall and quay, facilities

Area index	
2 doors and 3x3m hall door on each side	
Turbines stock area	38 sqm
Parking, loading area	150 sqm
Container storage area	88 sqm
Locker room	37 sqm
Office	10 sqm
Workshop	10 sqm
Hazardous materials storage	11 sqm
Waste storage tank	11 sqm
Water distillation reserve	38 sqm
Waste water treatment	38 sqm
Heating system	10 sqm
Warm water	10 sqm
Diesel Generator station	10 sqm
Ventilation System	5 sqm
Diesel storage	10 sqm
Electric system	5 sqm

5.4 Concept 3.B:

North Sea

Plan Level 1



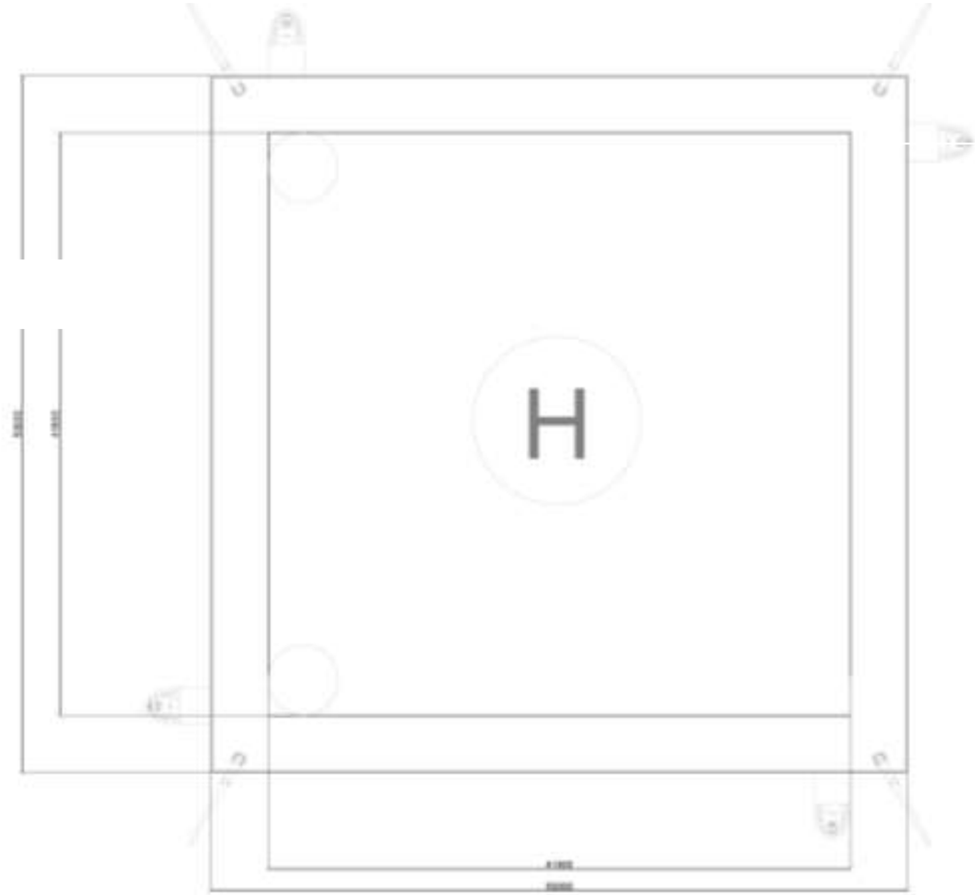
Rooms

Area index	
Rooms 18 (19sqm/ap)	342 sqm

5.4 Concept 3.B:

North Sea

Plan Level 2



Rooftop

6. Concept 4:

Square Based Floating Platform

- 6.1: Program of Demands
- 6.2: Initial compositional scheme
- 6.3: Concept 4.A Square Based Floating Tower
- 6.4: Concept 4.B Square Based Apartments Floating City

6.1 Concept 4:

Program of demands

Functional requirements for accommodation building based on:

- The interview (D7.1 report) at offshore workers, that expressed the preference to increase the living space and also the possibility to receive family visits
- Necessity of 32 apartments at list
- The Bouwbesluit (Dutch Building Code).

6.1 Concept 4:

Program of demands

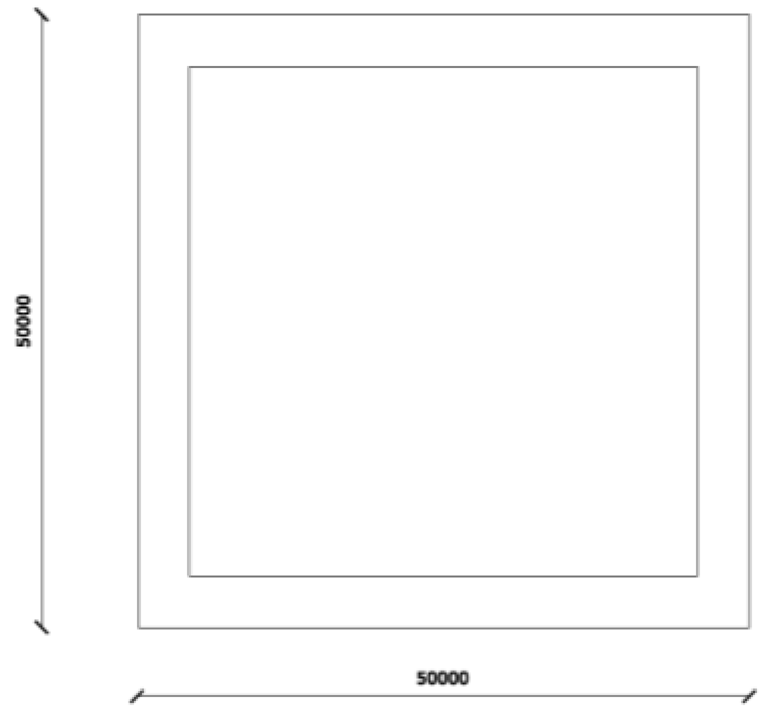
	m² (NFA)	Description
Mini Flats	1120	~ 35 m² each - windows to the outside - bathroom with toilet and shower - separation between living and sleeping area - kitchen - heating, air condition, ventilation
Corridors/Stairs	480	no daylight necessary - heating, air condition, ventilation
Kitchen + canteen	240	kitchen with stoves, ovens, air exhaust systems, refrigerators, freezers, boards, dishwashers – canteen for 30 persons with counters, heated wells, dishwashers, cupboards, windows to outside - sanitary rooms - heating, air condition, ventilation
Food storage (Small Supermarket)	130	storage rooms for food with a capacity of 30 days - house service room - laundry with washing machines
Social Room	176	fitness, sauna/ showers, game room (pool, table, lounge)
Offices	64	
Conference	40	
Health room	15	
Outdoor space	250-500 (depending on the platform)	Green (180-360 m², based on 9m² p.p.) with plants and bushes, should be accessible most of the time and should be safe, accessible without addition safety measures.
Total, accommodation building	**940**	

6.2 Concept 4:

Initial compositional scheme

This concept is based on a square shaped Floating platform, L: 50. Inside of it the plans are designed to satisfy a program of demand based on the interview at offshore workers, that expressed the preference to increase the living space and also the possibility to receive family visits.

Phase 1



6.3 Concept 4.A:

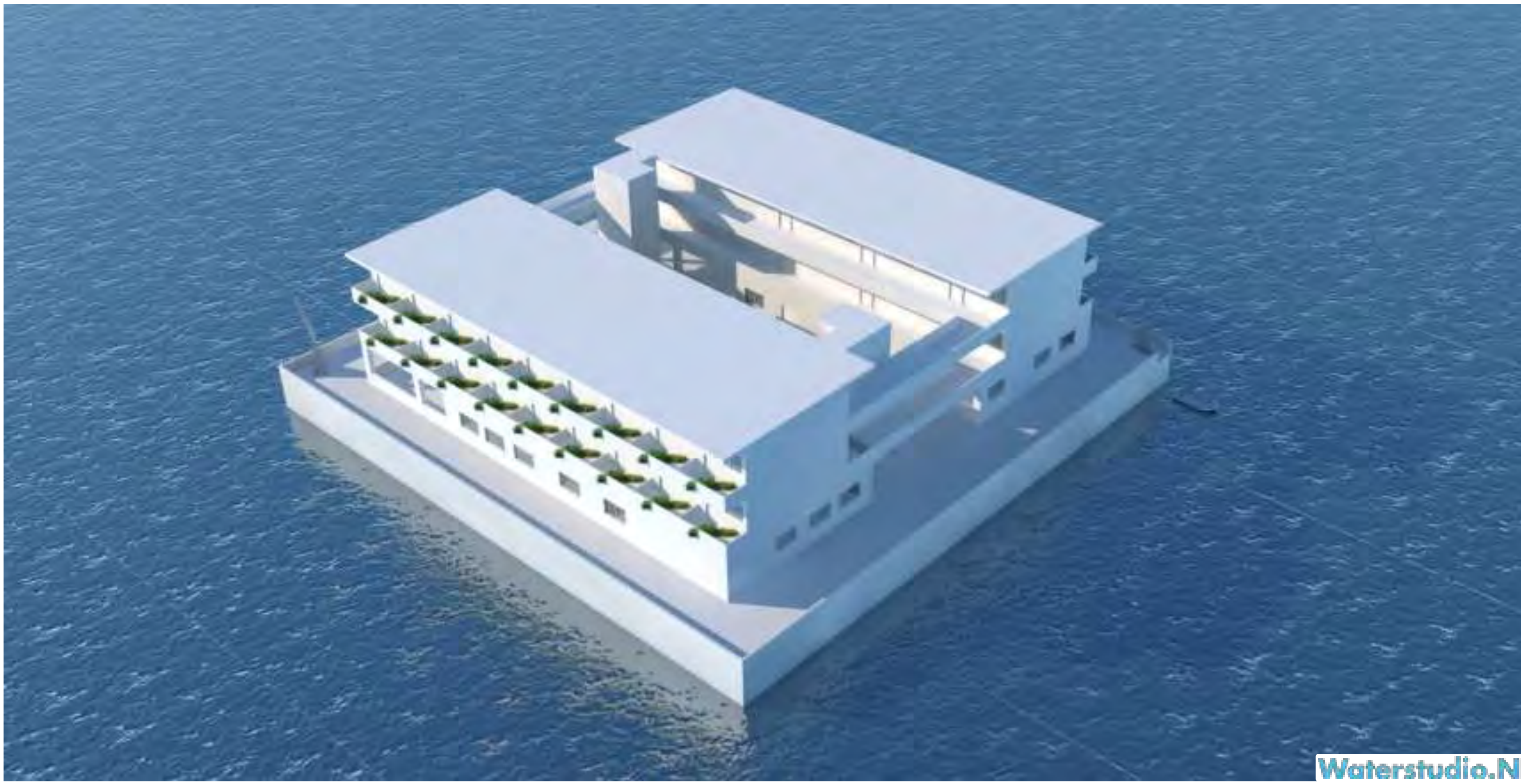
Square Based Floating Tower

This floating tower is designed to accommodate 36 families. The first level is for common activities and facilities, the other two levels, are each provided with 18 apartments of 40 sqm per apartment.

6.3 Concept 4.A:

Square Based Floating Tower

Each apartment is provided with its own green exterior area.



6.3 Concept 4.A:

Square Based Floating Tower

Plan Level 0

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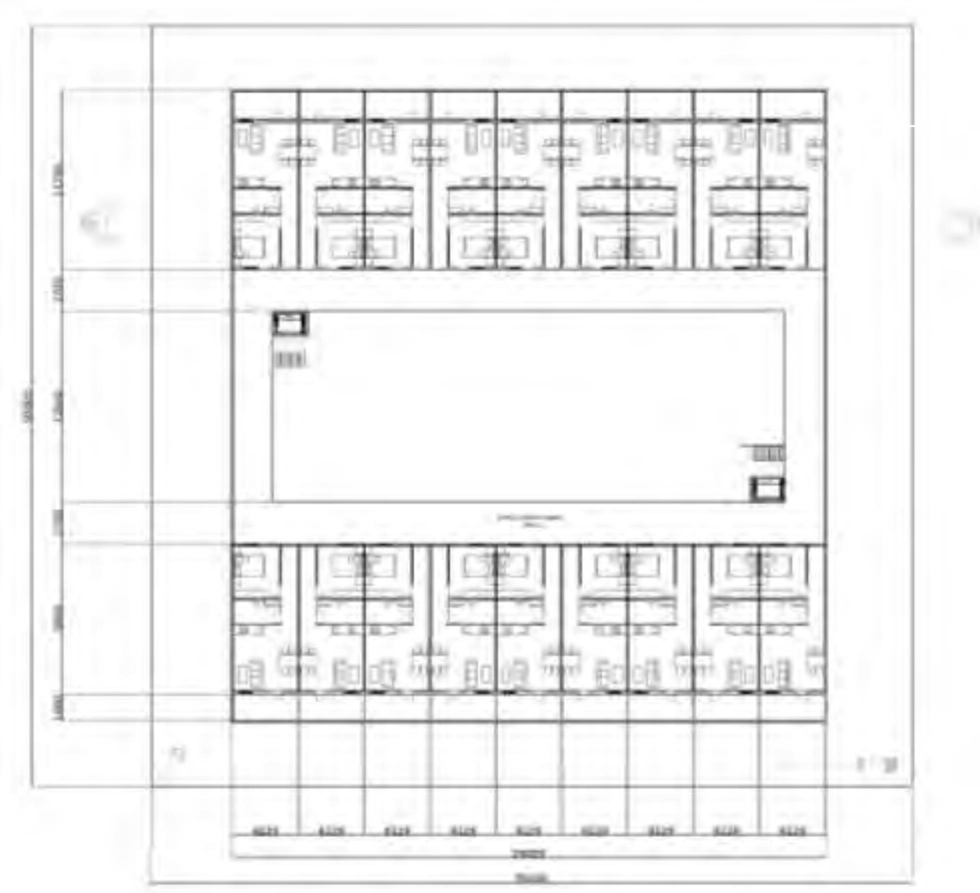
Storage, Restaurant, Outdoor Green

Area index	
Indoor Common Area	330 sqm
Outdoor Common Area	470 sqm
Kitchen	54 sqm
Canteen	168 sqm
Food storage and Supermarket	130 sqm
Toilet	20 sqm
Laundry	7 sqm
Refrigerator	8 sqm
Office room	64 sqm
Conference room	40 sqm
Health room	15 sqm
Social room	176 sqm
Fitness area	52 sqm

6.3 Concept 4.A:

Square Based Floating Tower

Plan Level 1 and 2



Apartments and outdoor space

Area index	
Outdoor Space Apartments (18 of 40sqm each)	280 sqm 720 sqm

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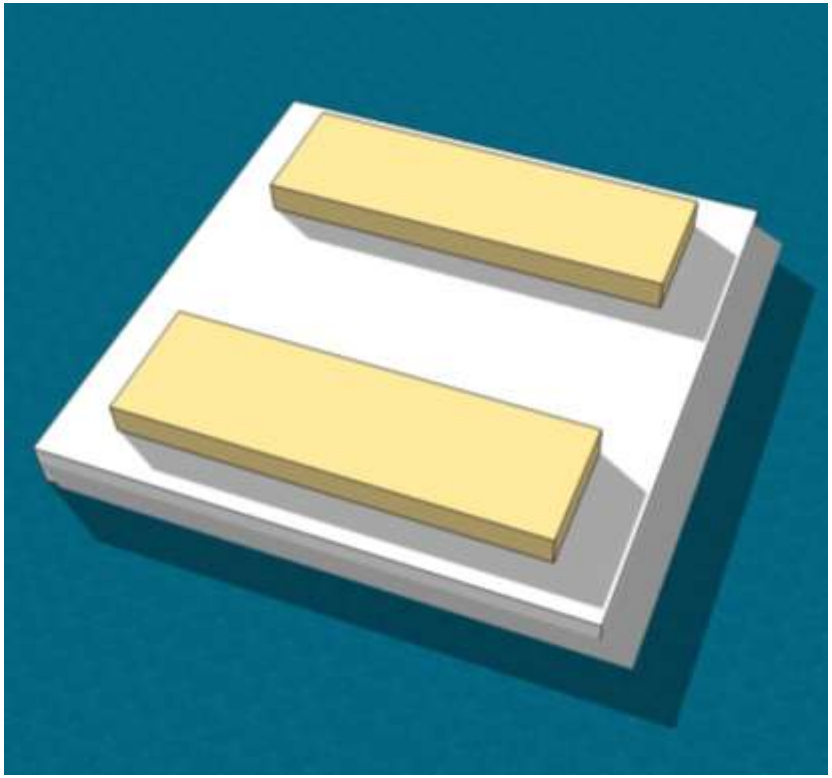
6.4 Concept 4.B:

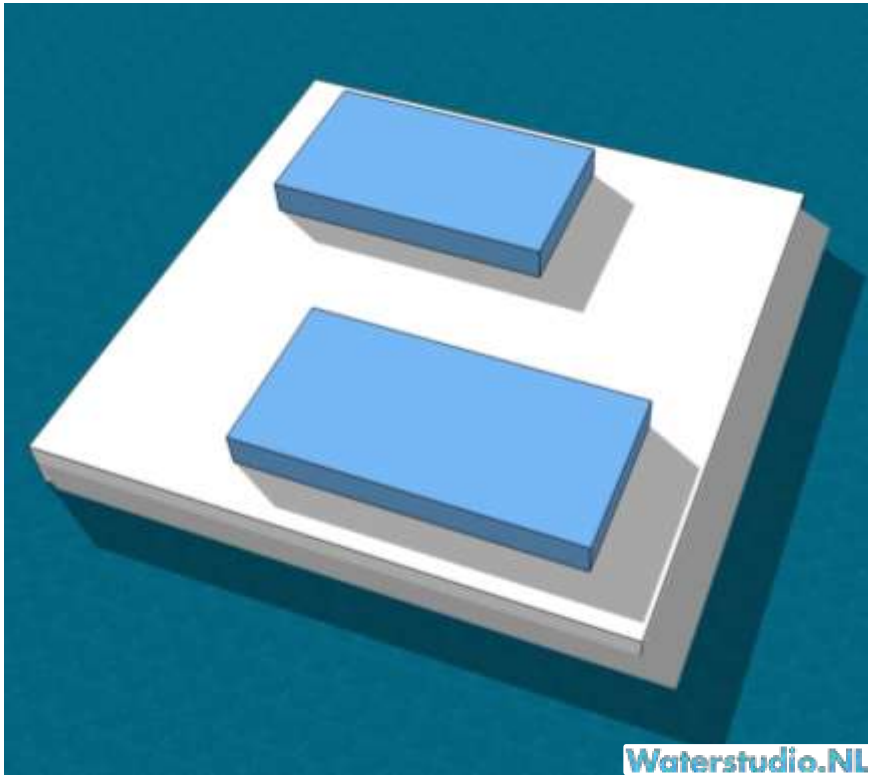
Compositive schemes

BASIC MODULES
The solutions are made by two main functions: accommodation and facilities. The two modules can be combined in different configurations.

Accommodation



Facilities

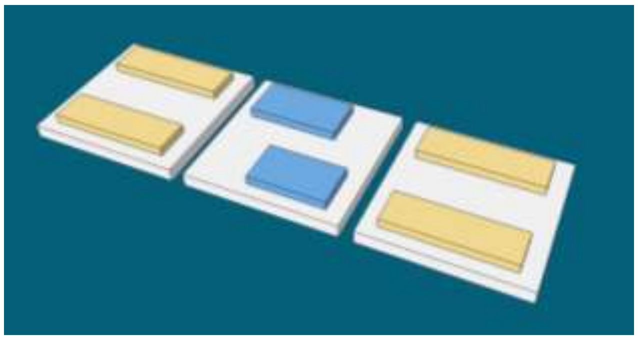


6.4 Concept 4.B1:

32 Apartments Floating City

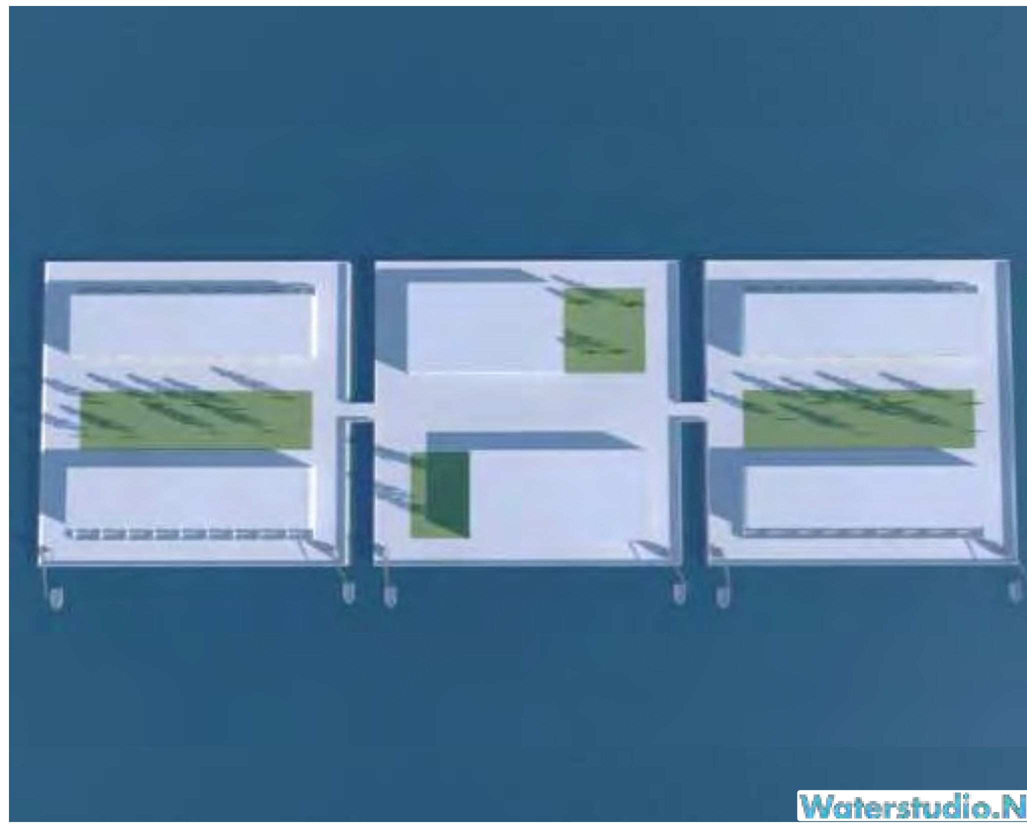
SCHEME 1: 2 accommodation blocks (18 apartments/platform) + 1 facility block

Basic Scheme



Side View

Top View



6.4 Concept 4.B1:

32 Apartments Floating City

SCHEME 1: 2 accommodation blocks (18 apartments/platform) + 1 facility block

Master plan

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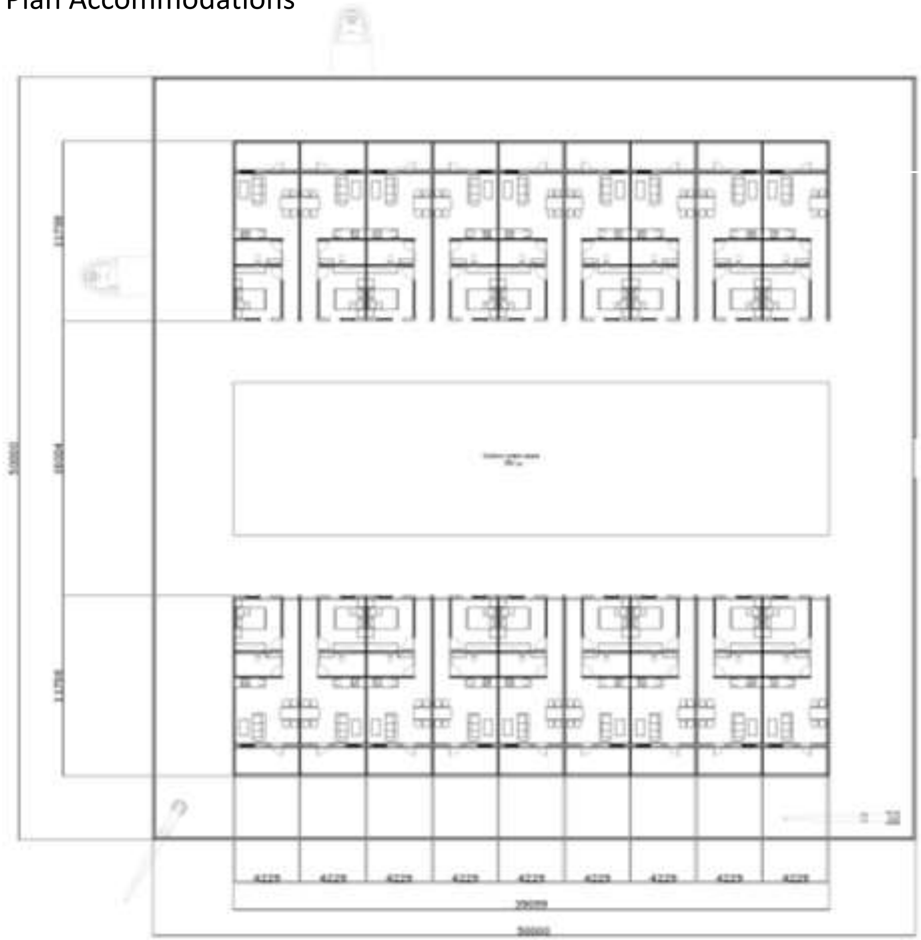
6.4 Concept 4.B1:

32 Apartments Floating City

Plan Accommodations



Apartments and outdoor space

Area index	
Outdoor Space	1557 sqm
Apartments (18 of 40sqm each)	720 sqm

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SPACE@SEA

6.4 Concept 4.B1:

32 Apartments Floating City

Plan Facilities

Storage, Restaurant, Outdoor Green

Area index	
Outdoor Common Green	138 sqm
Kitchen	54 sqm
Canteen	168 sqm
Food storage and Supermarket	130 sqm
Toilet	20 sqm
Laundry	7 sqm
Refrigerator	8 sqm
Office room	64 sqm
Conference room	40 sqm
Health room	15 sqm
Social room	176 sqm
Fitness area	52 sqm

6.4 Concept 4.B1:

32 Apartments Floating City

IMPRESSION

Aerial View

6.4 Concept 4.B1:

32 Apartments Floating City

IMPRESSION

View From the green area

Appendix 7 - Performance Requirements

The following performance requirements was determined by findings of task 7.2: Research current and future inhabitants and other stakeholders. These requirements shall be met in the final design outcome of this work task.

Comfort

- Increase of the platform's stability.
- Minimisation of industrial noises and odours in housing spaces.
- Soundproof rest areas.
- Filter for odours or airlocks including lockers for working clothes.

Availability

- Provision of passenger traffic back to the mainland in a fast, frequent, safe, cost efficient and unproblematic way. If that can be achieved, the distance to the mainland becomes irrelevant.
- Mail and delivery services inside of the platform and from the outside world.

Working Conditions

- Same working hours as on the mainland.
- Work-life balance

Design of residential space

- Assurance of privacy.
- Sizes of flats should equal flats' sizes onshore. Size of flat is depending on the size of the household. In relation to the household size, number and size of rooms can be determined.
- Private and spacious bathroom including a shower and/or a bathtub as well as an own kitchen with a full range of kitchen equipment.
- Different options concerning the design of the living space (e.g. flooring material) and individual furniture.
- Large windows in living quarters.
- Elaborate and appealing design / self-influence on the design
- Enhancing the feeling of being at home.

Communication

- Provision of high-powered, safe and cost-efficient internet access for the inhabitants' use.

Design of Outdoor Areas

- Adequate amount of space for outdoor activity.
- Extensive green area (a park or a small forest) including animals.

  Barbecue area.

Social life

- Adequate amount of people to increase the probability to make friends, but also to be able to avoid each other. Minimal size of a group: approximately 20 families.
- Recruitment not only in relation to occupational competence, but also with regard to social and intercultural abilities.
- Fostering private contacts.
- Possibility of bringing the family to the island.

- Permission for taking pets to the island.
- Visits from the mainland.
- Work opportunities for the significant other (dual career concept).
- Childcare.

Leisure Facilities

- Many and appealing leisure facilities for people of all ages.
- Sport: fitness rooms with equipment adequate in amount and quality, sports fields and/or sports halls for all sorts of ball games, in- and outdoors swimming pool.
- Wellness- and sauna area.
- Restaurants, pubs, bars, clubs.
- Cultural offers: cinemas, theatres, concerts.
- Possibilities for further education and a variety of courses (language classes, music lessons, dance classes etc.).

Shopping Facilities

- Food shopping (same kind of shopping like onshore, large and many offers, fresh products).
- Shopping (clothes, everyday needs).
- Online shopping: assurance of delivery services.

Safety

- Assurance of health care.
- Examination of the adherence to security rules.
- Examination of safety drills' quality.

Waste and Electricity Generation

- Ecologically friendly waste disposal.
- Environmentally friendly power generation: wind power, water turbines or solar power.
- Environmentally friendly water treatment and wastewater treatment.
- Decent thermal insulation.
- Minimisation of private electric power consumption.

Appendix 8 - Technical, comfort & safety requirements

The following requirements were determined from the findings of Task 7.3: technical comfort and safety requirements. These requirements shall be met in the final design outcome of this work task.

General

- Utilisation of space (building area, parking area, public area, green area, etc.)
- Topography (size, shape and levels, etc.)
- Accessibility and boundaries (space and width for roads, walls, fences, etc.)
- Resource demands (water, energy, food)
- Adaptability (Incorporation of elements to assist with future expansion
- Practicability (Dimensions of rooms, ceiling heights, accessibility etc.)

External Environment and Acts of Nature

- Protection against external environment: (outdoor areas, vehicular access, waste, hazardous substances, etc.)
- Protection against acts of nature, in particular extreme weather (strong wind, torrential downpour, flooding, storm surge, etc.)

Safety

- Structural stability (Foundations, structure, interior finishes, live and dead loads etc.)
- Structural safety (personal, material, material falls, falls from structures, collision with structures, lightning, etc.)
- Fire safety (load bearing capacity and stability in case of fire and explosion, extinguishing, escape, rescue, etc.)
- Layouts and routes (entrance, communication routes, rooms, storage, building components, dock, etc.)
- Construction & maintenance safety. (On site hazard control, access for machinery tools, materials, etc.)

Environment, Health & Comfort

- Air quality (ventilation, etc.)
- Indoor thermal climate (conduction, radiation, etc.)
- Sound and vibrations (soundproofing, room acoustics, noise from technical installations, etc.)
- Natural lighting and views (lighting levels, visual amenity, etc.)
- Weather resistance (Moisture ingress and vapour diffusion).
- Wet space (moisture in the buildings, rooms with water installation, surface water, precipitation, etc.)

Utility Space

- Energy supply and efficiency
- Heating and/or cooling installation
- Indoor water and drainage installation
- Outdoor water supply and sewerage installation
- Lifting equipment
- Service maintenance and accessibility (hoisting equipment, window cleaning access).

Appendix 9 - Intact Stability Calculation - GHS Report

WEIGHT and DISPLACEMENT STATUS
Baseline draft: 7.279 @ Origin
Trim: Aft 0.81 deg., Heel: Stbd 1.10 deg.

Part	Weight(MT)	LCG	TCG	VCG
Outdoor (Ground floor)	1.97	22.500f	0.000	11.900
Level 4 Interior Outfitti	25.52	22.500f	0.000	27.545
Level 1, 2 & 3 Apartment	36.37	22.500f	0.000	18.697
Technical Equipment & Out	1,917.35	22.500f	0.000	2.100
Hull (Connectors)	4,924.80	22.500f	0.000	7.517
Hull (Technical)	2,748.00	22.500f	0.000	1.040
Bulkwark	35.05	22.500f	0.000	10.497
Stairs & Lifts	201.87	22.500f	0.150s	18.485
(Level0) Walls	204.35	22.552f	0.000	11.900
Level 1 (Floor)	635.87	22.490f	0.000	14.030
(Level1) Walls	252.99	22.501f	0.000	15.500
Level 1 (Windows)	141.85	22.533f	0.000	15.500
Level 2 (Floor)	674.02	21.538f	1.314s	17.230
(Level2) Walls	252.63	22.681f	0.000	18.701
Level 2 (Windows)	165.06	16.776f	7.754s	18.966
Level 3 (Floor)	674.02	21.196f	0.953s	20.430
(Level3) Walls	251.90	22.545f	0.046p	21.901
Level 3 (Windows)	170.21	14.886f	5.603s	22.160
Level 4 (Floor)	635.70	22.510f	0.000	23.630
Level 4 (Walls)	7.94	22.500f	0.000	27.331
Level 4 (Windows)	474.54	22.500f	0.000	27.545
PAX	19.80	22.500f	0.000	18.500
Total Weight-------->	14,451.81	22.244f	0.262s	9.555

	SpGr	Displ(MT)	LCB	TCB	VCB	RefHt
HULL	1.025	14,451.82	22.159f	0.464s	3.488	-7.277

Righting Arms:	0.000	0.087s
External Arms:	0.000	0.087s
Residual Righting Arms:	0.000	0.000s

Distances in METERS.

A X I S 0

RESIDUAL RIGHTING ARMS vs HEEL ANGLE
LCG = 22.244f TCG = 0.262s VCG = 9.555

Origin Depth	Degrees of Trim	Heel	Displacement Weight(MT)	Residual Arms in Trim	in Heel	Res. Area	Flood Pt Height
7.278	0.81a	0.82s	14,452	0.000	-0.087	0.0000	0.713(5)
7.277	0.81a	1.10s	14,452	0.000	0.000	-0.0002	0.633(5)
7.269	0.81a	2.89s	14,452	0.000	0.569	0.0087	-0.000(6)
7.255	0.80a	4.69s	14,452	0.000	1.146	0.0357	50% DeckImm
7.238	0.80a	6.10s	14,452	0.000	1.598	0.0693	9.593(2)
7.170	0.84a	11.10s	14,452	0.000	3.215	0.2791	7.583(2)
7.131	0.89a	16.10s	14,452	0.000	4.677	0.6246	5.435(2)
7.022	1.05a	21.10s	14,452	0.000	6.002	1.0916	3.275(2)
6.750	1.38a	26.10s	14,452	0.000	6.720	1.6511	1.221(2)
6.603	1.69a	29.01s	14,453	0.000	6.847	1.9971	-0.002(2)
6.552	1.81a	30.03s	14,452	0.000	6.855	2.1183	-0.430(2)
6.509	1.98a	31.10s	14,452	0.000	6.846	2.2464	-0.891(2)
6.389	3.00a	36.10s	14,452	0.000	6.615	2.8368	-3.113(2)
6.616	5.03a	41.10s	14,453	0.000	6.139	3.3951	-5.579(2)
7.966	10.14a	46.10s	14,452	0.000	5.380	3.8998	-8.767(2)
11.186	20.74a	51.10s	14,453	0.000	4.066	4.3160	-12.956(2)
13.684	30.14a	56.10s	14,452	0.000	2.679	4.6109	-16.209(2)
14.934	36.16a	61.10s	14,455	0.000	1.642	4.7968	-18.370(2)

```
  15.496  40.04a  66.10s      14,453     0.000    0.880    4.9048 -19.941(2)
  15.670  42.15a  70.00s      14,453     0.000    0.407    4.9481 -20.933(2)
  Distances in METERS.----Specific Gravity = 1.025.-----------Area in m.-Rad.
                                   +
  Note:  The Residual Righting Arms shown above are in excess of the
         wind heeling arms derived from these moments (in m.-MT):
                  Stbd heeling moment = 1251.35 (constant)
                                   +
  Note: Angle of MaxRA refers to the absolute Righting Arm curve.
                                   +
            Critical Points----------------------LCP-----TCP-----VCP
        (2) c2                        FLOOD   7.000f 21.250  19.100
        (5) c5                        TIGHT   0.000  16.827   8.235
        (6) c6                        TIGHT   5.673f 22.500   8.335
LIM-------------------STABILITY CRITERION-----------Min/Max--------Attained
(1) Abs Area from Equ0 (no moments) to MaxRA0      >  0.0800 m.-Rad 2.1624 P
(2) Angle from Equ. to abs 70 deg to 50% Dk Imm.   >    0.00  deg    68.90 P
(3) Angle from Equilibrium to RAzero or Flood      >   20.00  deg    27.92 P
(4) Absolute Area from Equ0 (no moments) to Flood  >  0.0800 m.-Rad 2.0397 P
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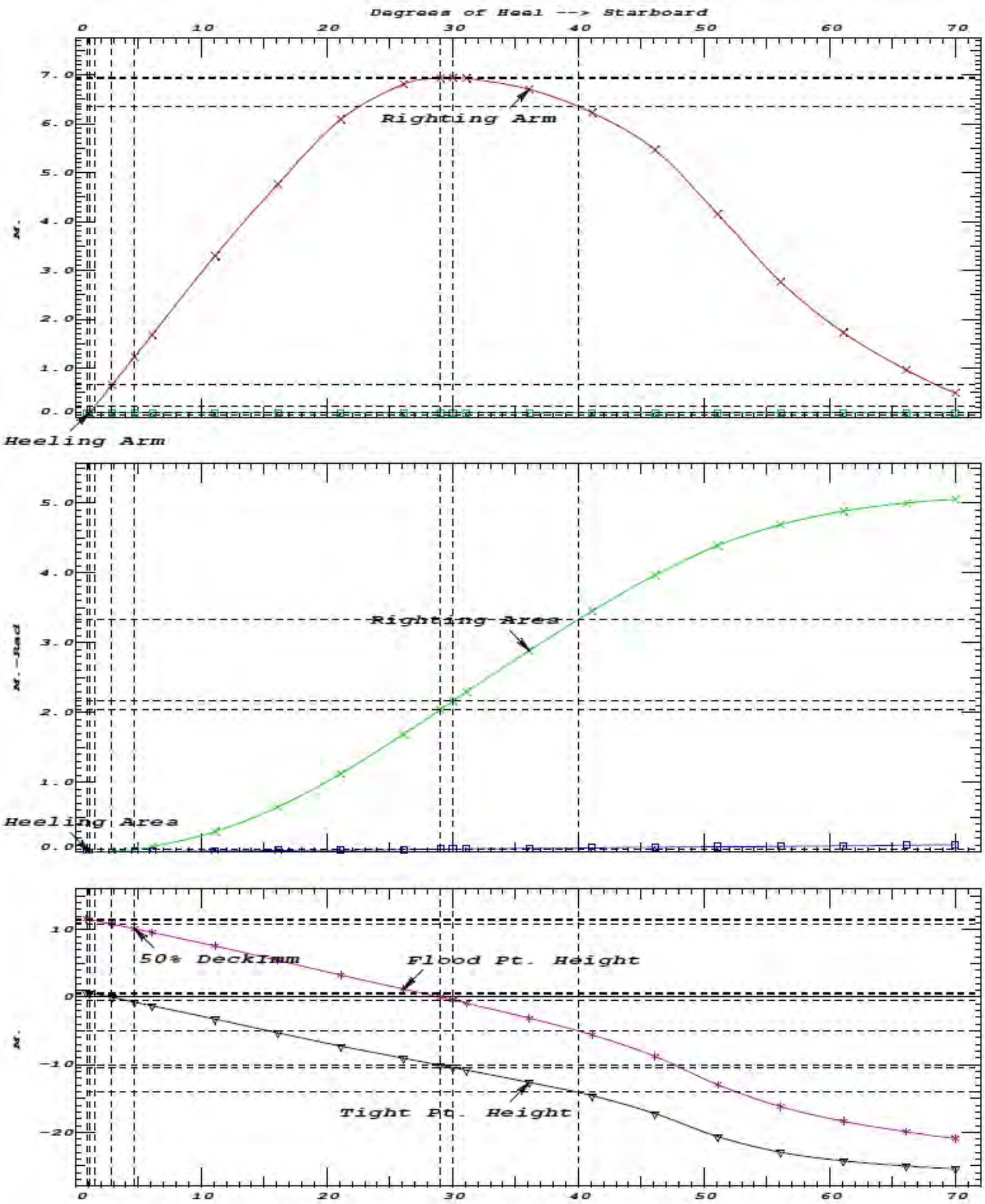


A X I S   15

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

LCG = 22.244f TCG = 0.262s VCG = 9.555

Inclination axis rotated 15.00 degrees CW

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Residual Arms in Trim	Residual Arms in Heel	Res. Area	Flood Pt Height
7.278	0.57a	1.01s	14,452	0.000	-0.087	0.0000	0.713(5)
7.304	0.57a	1.27s	14,452	0.000	-0.003	-0.0002	0.612(5)
7.451	0.56a	2.79s	14,452	0.000	0.479	0.0061	-0.000(6)
7.566	0.56a	4.01s	14,452	0.000	0.869	0.0205	50% DeckImm
7.770	0.56a	6.27s	14,452	0.000	1.596	0.0691	9.292(2)
8.236	0.66a	11.27s	14,452	0.000	3.171	0.2773	6.979(2)
8.730	0.87a	16.27s	14,452	0.000	4.636	0.6187	4.547(2)
9.203	1.42a	21.27s	14,454	0.000	5.806	1.0765	2.107(2)
9.655	2.37a	25.55s	14,452	0.000	6.340	1.5333	0.003(2)
9.738	2.57a	26.27s	14,452	0.000	6.386	1.6128	-0.352(2)
10.121	3.57a	29.48s	14,452	0.000	6.470	1.9727	-1.954(2)
10.351	4.21a	31.27s	14,452	0.000	6.443	2.1746	-2.857(2)
11.051	6.32a	36.27s	14,452	0.000	6.155	2.7266	-5.399(2)
11.872	9.01a	41.27s	14,452	0.000	5.623	3.2423	-7.965(2)
12.810	12.29a	46.27s	14,452	0.000	4.909	3.7031	-10.511(2)
13.782	15.99a	51.27s	14,452	0.000	4.072	4.0959	-12.950(2)
14.638	19.67a	56.27s	14,452	0.000	3.186	4.4129	-15.181(2)
15.273	22.93a	61.27s	14,452	0.000	2.321	4.6531	-17.153(2)
15.655	25.62a	66.27s	14,452	0.000	1.512	4.8199	-18.870(2)
15.780	27.21a	70.00s	14,450	0.000	0.951	4.8999	-20.003(2)

Distances in METERS.----Specific Gravity = 1.025.-----------Area in m.-Rad.

+

Note: The Residual Righting Arms shown above are in excess of the wind heeling arms derived from these moments (in m.-MT):

Stbd heeling moment = 1251.35 (constant)

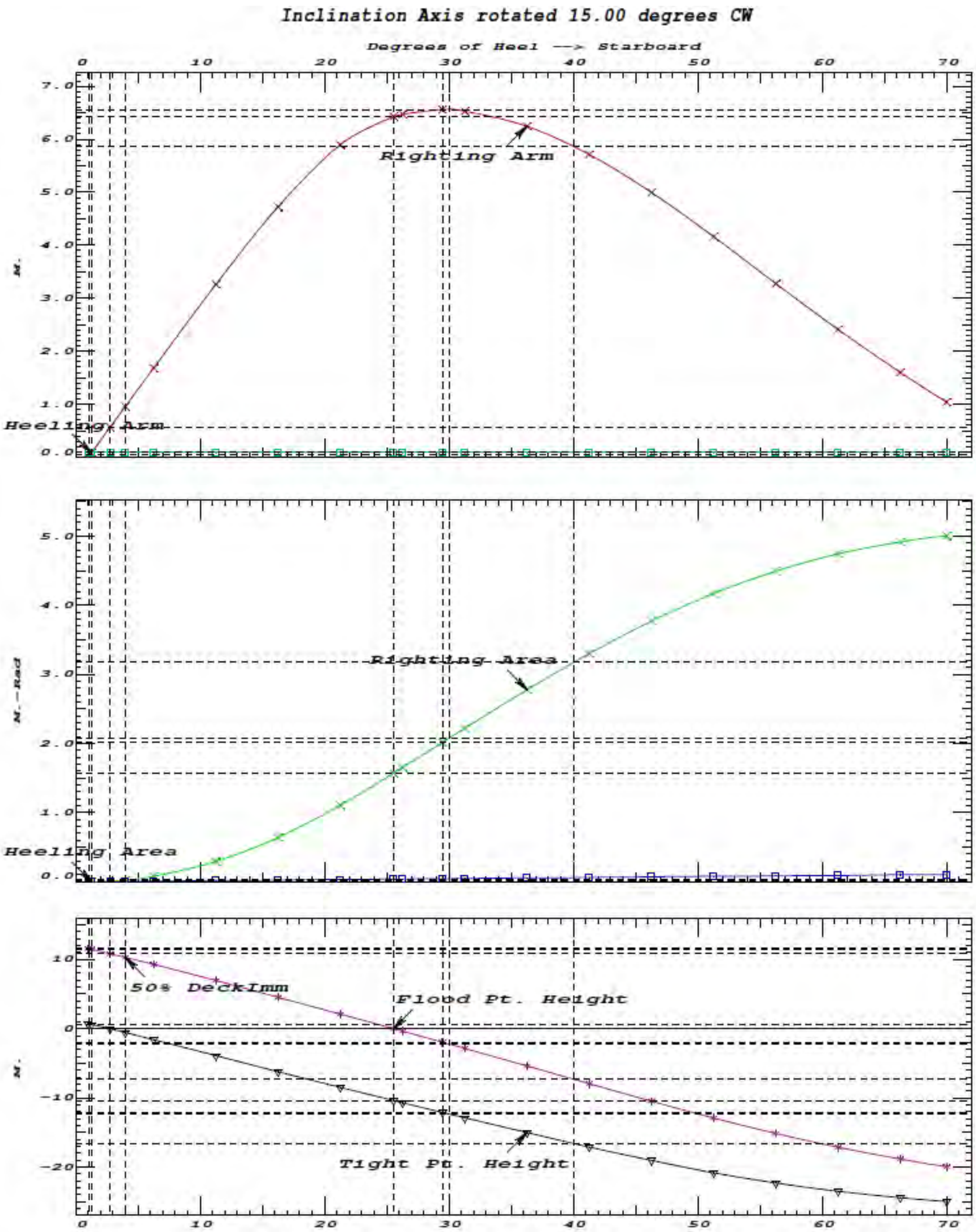
+

Note: Angle of MaxRA refers to the absolute Righting Arm curve.

+

Critical Points			LCP	TCP	VCP
(2)	c2	FLOOD	7.000f	21.250	19.100
(5)	c5	TIGHT	0.000	16.827	8.235
(6)	c6	TIGHT	5.673f	22.500	8.335

LIM	STABILITY CRITERION		Min/Max		Attained	
(1)	Abs Area from Equ0 (no moments) to MaxRA0	>	0.0800	m.-Rad	2.0157	P
(2)	Angle from Equ. to abs 70 deg to 50% Dk Imm.	>	0.00	deg	68.73	P
(3)	Angle from Equilibrium to RAzero or Flood	>	20.00	deg	24.28	P
(4)	Absolute Area from Equ0 (no moments) to Flood	>	0.0800	m.-Rad	1.5704	P



A X I S   30

RESIDUAL RIGHTING ARMS vs HEEL ANGLE
LCG = 22.244f   TCG = 0.262s   VCG =   9.555
Inclination axis rotated 30.00 degrees CW

Origin Depth	Degrees of Trim	Heel	Displacement Weight(MT)	Residual Arms in Trim	in Heel	Res. Area	Flood Pt Height
7.278	0.29a	1.12s	14,452	0.000	-0.087	0.0000	0.713(5)
7.324	0.29a	1.35s	14,452	0.000	-0.012	-0.0002	0.607(5)
7.331	0.29a	1.39s	14,452	0.000	0.000	-0.0002	0.590(5)
7.581	0.29a	2.70s	14,452	0.000	0.415	0.0045	0.001(5)
7.772	0.29a	3.70s	14,452	0.000	0.736	0.0146	50% DeckImm
8.262	0.28a	6.35s	14,452	0.000	1.588	0.0684	9.154(2)
9.190	0.36a	11.35s	14,452	0.000	3.129	0.2746	6.706(2)
10.108	0.53a	16.35s	14,452	0.000	4.535	0.6100	4.177(2)
10.938	0.96a	21.35s	14,452	0.000	5.565	1.0534	1.703(2)

```
  11.498   1.46a  24.83s      14,452     0.000    5.944    1.4042  -0.001(2)
  11.740   1.72a  26.35s      14,452     0.000    6.033    1.5632  -0.745(2)
  12.237   2.33a  29.54s      14,452     0.000    6.101    1.9007  -2.298(2)
  12.512   2.71a  31.35s      14,452     0.000    6.079    2.0934  -3.178(2)
  13.242   3.87a  36.35s      14,452     0.000    5.845    2.6155  -5.582(2)
  13.918   5.19a  41.35s      14,451     0.000    5.418    3.1083  -7.937(2)
  14.532   6.63a  46.35s      14,451     0.000    4.854    3.5575 -10.221(2)
  15.066   8.16a  51.35s      14,451     0.000    4.193    3.9530 -12.411(2)
  15.500   9.71a  56.35s      14,451     0.000    3.464    4.2875 -14.483(2)
  15.810  11.19a  61.35s      14,451     0.000    2.692    4.5564 -16.419(2)
  15.974  12.52a  66.35s      14,451     0.000    1.899    4.7569 -18.206(2)
  15.992  13.34a  70.00s      14,451     0.000    1.316    4.8592 -19.412(2)
  Distances in METERS.----Specific Gravity = 1.025.-----------Area in m.-Rad.
                                     +
  Note:  The Residual Righting Arms shown above are in excess of the
         wind heeling arms derived from these moments (in m.-MT):
                  Stbd heeling moment = 1251.35 (constant)
                                     +
  Note: Angle of MaxRA refers to the absolute Righting Arm curve.
                                     +
            Critical Points----------------------LCP-----TCP-----VCP
        (2) c2                       FLOOD   7.000f 21.250  19.100
        (5) c5                       TIGHT   0.000  16.827   8.235
LIM--------------------STABILITY CRITERION------------Min/Max--------Attained
(1) Abs Area from Equ0 (no moments) to MaxRA0      >   0.0800 m.-Rad 1.9437 P
(2) Angle from Equ. to abs 70 deg to 50% Dk Imm.   >     0.00  deg    68.61 P
(3) Angle from Equilibrium to RAzero or Flood      >    20.00  deg    23.44 P
(4) Absolute Area from Equ0 (no moments) to Flood  >   0.0800 m.-Rad 1.4401 P
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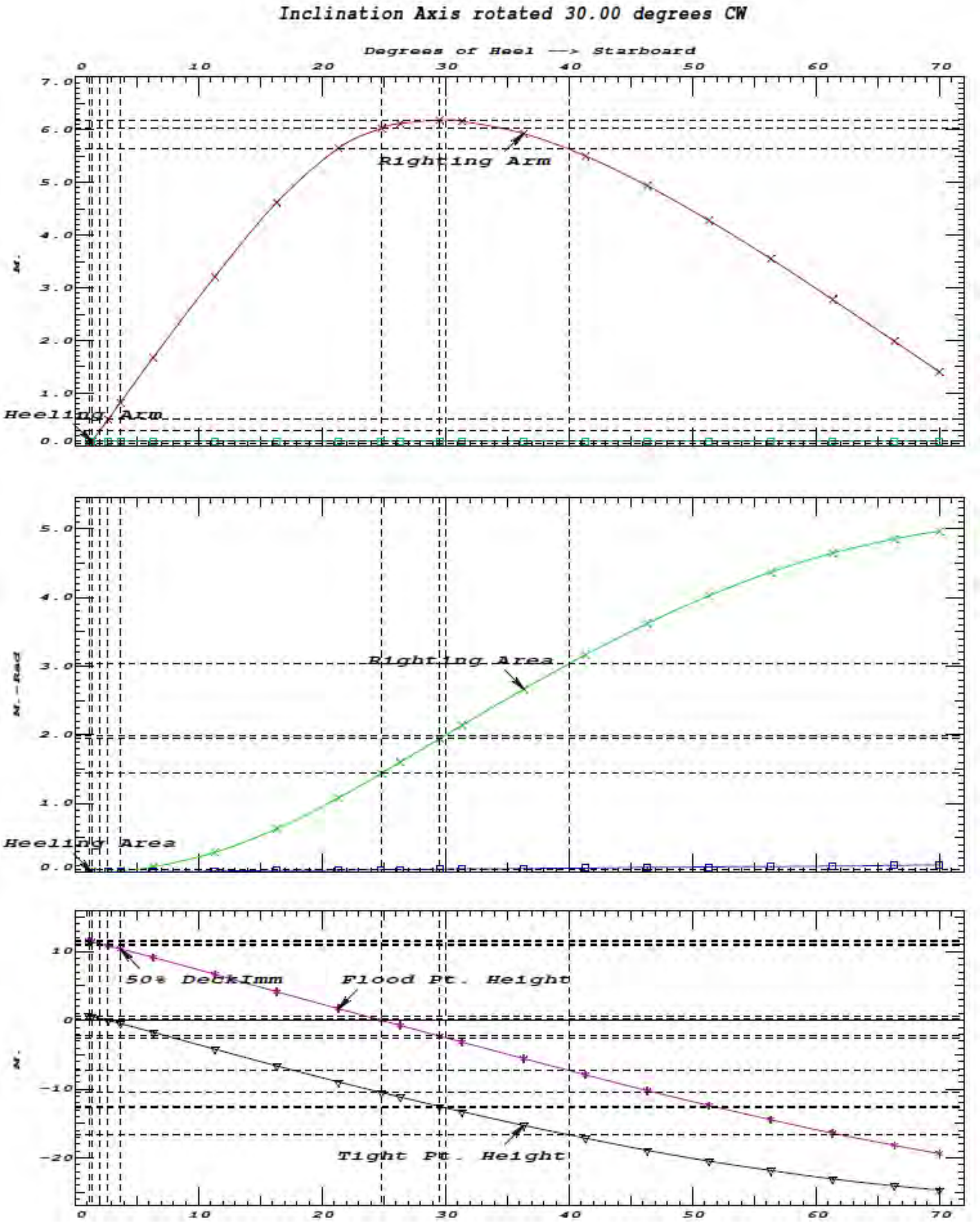

A X I S   45

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

LCG = 22.244f   TCG = 0.262s   VCG = 9.555

Inclination axis rotated 45.00 degrees CW

Origin Depth	Degrees of Trim	Heel	Displacement Weight(MT)	Residual Arms in Trim	in Heel	Res. Area	Flood Pt Height
7.278	0.01s	1.15a	14,452	0.000	-0.087	0.0000	0.713(5)
7.331	0.01s	1.35a	14,452	0.000	-0.025	-0.0002	0.619(5)
7.353	0.01s	1.43a	14,452	0.000	0.000	-0.0002	0.581(5)
7.680	0.01s	2.62a	14,452	0.000	0.380	0.0038	-0.000(5)
7.948	0.01s	3.62a	14,452	0.000	0.697	0.0131	50% DeckImm
8.675	0.01s	6.35a	14,452	0.000	1.574	0.0672	9.189(2)
9.983	0.01s	11.35a	14,452	0.000	3.103	0.2718	6.757(2)
11.232	0.01s	16.35a	14,452	0.000	4.484	0.6039	4.256(2)
12.296	0.01s	21.35a	14,452	0.000	5.466	1.0409	1.821(2)

```
  13.008   0.01s  25.14a      14,452     0.000    5.843    1.4168  -0.002(2)
  13.221   0.01s  26.35a      14,452     0.000    5.907    1.5407  -0.581(2)
  13.769   0.01s  29.66a      14,452     0.000    5.975    1.8847  -2.164(2)
  14.028   0.01s  31.35a      14,452     0.000    5.957    2.0599  -2.963(2)
  14.721   0.01s  36.35a      14,452     0.000    5.749    2.5724  -5.314(2)
  15.297   0.02s  41.35a      14,452     0.000    5.363    3.0585  -7.620(2)
  15.753   0.02s  46.35a      14,452     0.000    4.849    3.5050  -9.865(2)
  16.087   0.02s  51.35a      14,452     0.000    4.238    3.9022 -12.032(2)
  16.297   0.02s  56.35a      14,452     0.000    3.555    4.2428 -14.107(2)
  16.382   0.02s  61.35a      14,452     0.000    2.815    4.5211 -16.072(2)
  16.341   0.02s  66.35a      14,452     0.000    2.032    4.7329 -17.915(2)
  16.232   0.02s  70.00a      14,452     0.000    1.441    4.8437 -19.175(2)
  Distances in METERS.----Specific Gravity = 1.025.-----------Area in m.-Rad.
                                     +
  Note:  The Residual Righting Arms shown above are in excess of the
         wind heeling arms derived from these moments (in m.-MT):
                   Aft heeling moment = 1251.35 (constant)
                                     +
  Note: Angle of MaxRA refers to the absolute Righting Arm curve.
                                     +
            Critical Points----------------------LCP-----TCP-----VCP
        (2) c2                       FLOOD   7.000f 21.250  19.100
        (5) c5                       TIGHT   0.000  16.827   8.235
LIM--------------------STABILITY CRITERION------------Min/Max--------Attained
(1) Abs Area from Equ0 (no moments) to MaxRA0      >   0.0800 m.-Rad 1.9278 P
(2) Angle from Equ. to abs 70 deg to 50% Dk Imm.   >     0.00  deg    68.57 P
(3) Angle from Equilibrium to RAzero or Flood      >    20.00  deg    23.71 P
(4) Absolute Area from Equ0 (no moments) to Flood  >   0.0800 m.-Rad 1.4530 P
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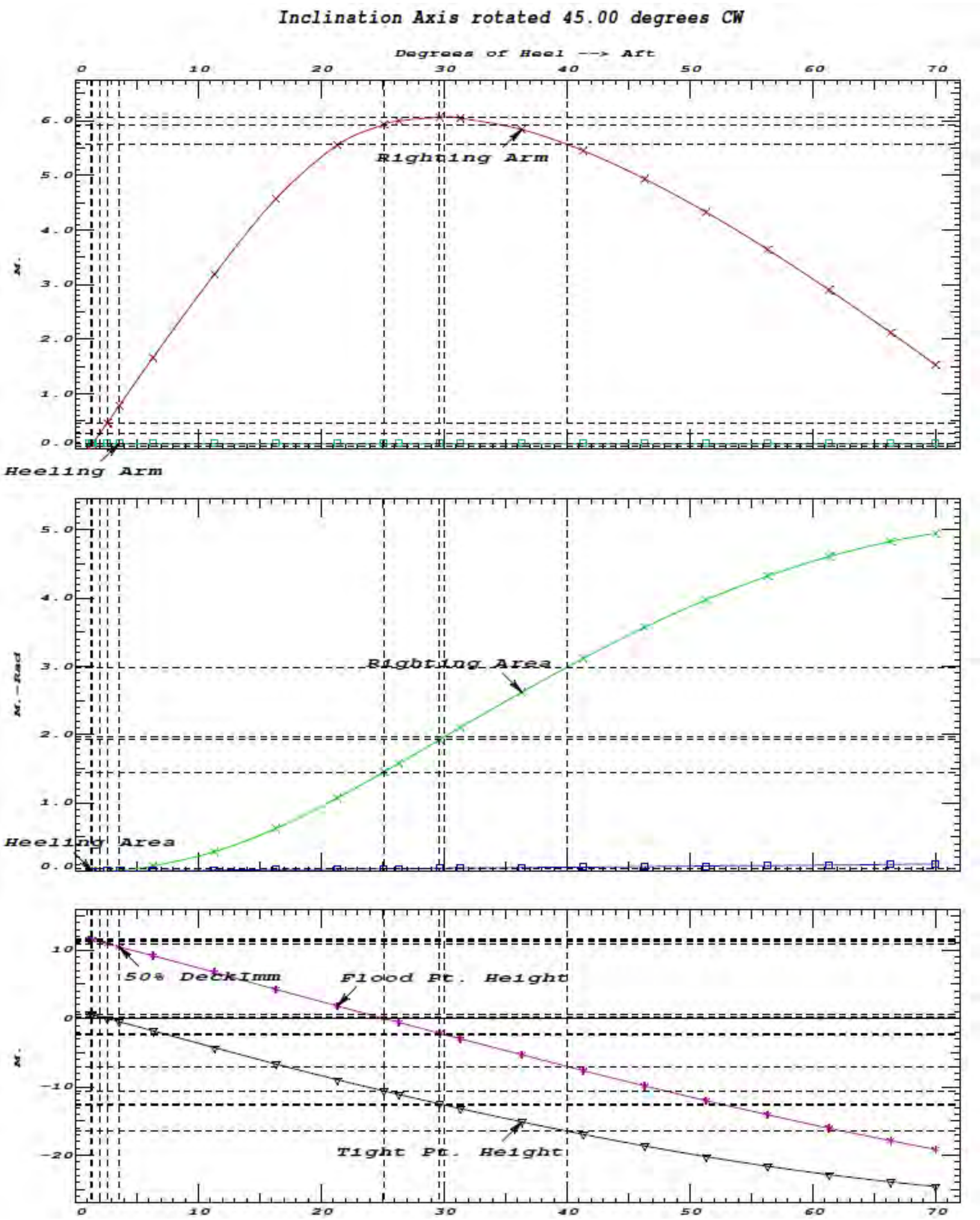

A X I S 60

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

LCG = 22.244f TCG = 0.262s VCG = 9.555

Inclination axis rotated 60.00 degrees CW

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Residual Arms in Trim	Residual Arms in Heel--->	Res. Area	Flood Pt Height
7.278	0.31s	1.11a	14,452	0.000	-0.087	0.0000	0.713(5)
7.324	0.31s	1.25a	14,452	0.000	-0.043	-0.0002	0.647(5)
7.370	0.31s	1.38a	14,452	0.000	0.000	-0.0002	0.580(5)
7.770	0.31s	2.57a	14,452	0.000	0.379	0.0037	-0.000(5)
8.145	0.31s	3.70a	14,452	0.000	0.737	0.0147	50% DeckImm
8.981	0.31s	6.25a	14,452	0.000	1.556	0.0656	9.204(1)
10.581	0.38s	11.25a	14,452	0.000	3.099	0.2691	6.758(1)
12.105	0.55s	16.25a	14,450	0.000	4.511	0.6021	4.231(1)
13.390	0.98s	21.25a	14,452	0.000	5.550	1.0438	1.754(1)

```
  14.166   1.49s  24.83a      14,452     0.000    5.944    1.4048  -0.001(1)
  14.446   1.73s  26.25a      14,452     0.000    6.029    1.5528  -0.694(1)
  15.041   2.35s  29.54a      14,452     0.000    6.101    1.9016  -2.300(1)
  15.319   2.71s  31.25a      14,452     0.000    6.081    2.0828  -3.127(1)
  16.018   3.87s  36.25a      14,452     0.000    5.852    2.6054  -5.532(1)
  16.540   5.19s  41.25a      14,450     0.000    5.429    3.0990  -7.887(1)
  16.889   6.64s  46.25a      14,454     0.000    4.866    3.5492 -10.176(1)
  17.058   8.17s  51.25a      14,451     0.000    4.206    3.9457 -12.366(1)
  17.066   9.72s  56.25a      14,451     0.000    3.478    4.2815 -14.441(1)
  16.929  11.20s  61.25a      14,451     0.000    2.708    4.5518 -16.380(1)
  16.674  12.53s  66.25a      14,451     0.000    1.915    4.7536 -18.169(1)
  16.421  13.38s  70.00a      14,452     0.000    1.315    4.8594 -19.412(1)
  Distances in METERS.----Specific Gravity = 1.025.-----------Area in m.-Rad.
                                     +
  Note:  The Residual Righting Arms shown above are in excess of the
         wind heeling arms derived from these moments (in m.-MT):
                   Aft heeling moment = 1251.35 (constant)
                                     +
  Note: Angle of MaxRA refers to the absolute Righting Arm curve.
                                     +
            Critical Points----------------------LCP-----TCP-----VCP
        (1) c1                         FLOOD   1.250f 15.500  19.100
        (5) c5                         TIGHT   0.000  16.827   8.235
LIM--------------------STABILITY CRITERION------------Min/Max--------Attained
(1) Abs Area from Equ0 (no moments) to MaxRA0      >   0.0800 m.-Rad 1.9445 P
(2) Angle from Equ. to abs 70 deg to 50% Dk Imm.   >     0.00  deg    68.62 P
(3) Angle from Equilibrium to RAzero or Flood      >    20.00  deg    23.45 P
(4) Absolute Area from Equ0 (no moments) to Flood  >   0.0800 m.-Rad 1.4406 P
-----------------------------------------------------------------------------
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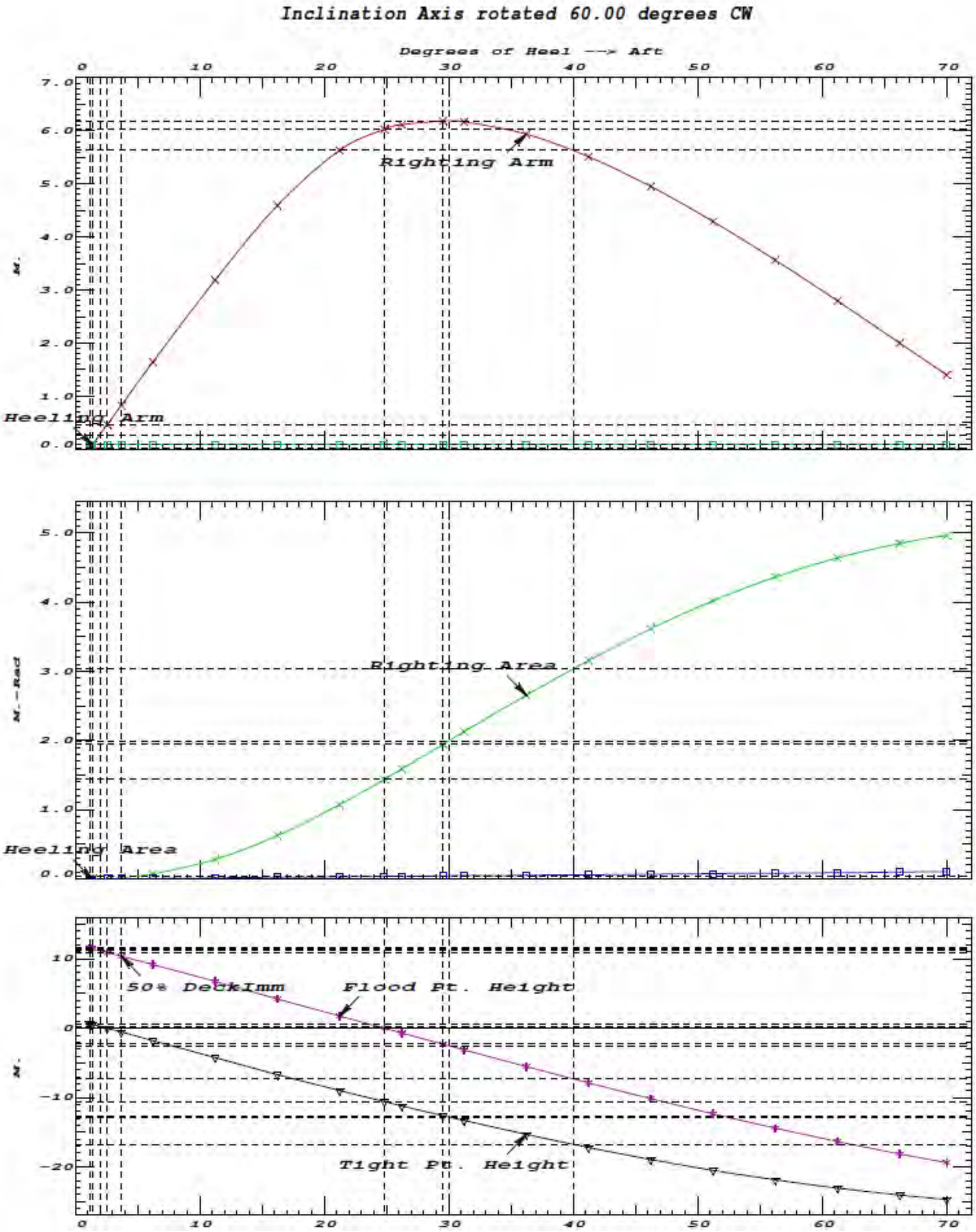

A X I S   75

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

LCG = 22.244f   TCG = 0.262s   VCG = 9.555

Inclination axis rotated 75.00 degrees CW

Origin Depth	Degrees of Trim	Degrees of Heel	Displacement Weight(MT)	Residual Arms in Trim	Residual Arms in Heel--->	Res. Area	Flood Pt Height
7.278	0.59s	0.99a	14,452	0.000	-0.087	0.0000	0.713(5)
7.305	0.59s	1.06a	14,452	0.000	-0.064	-0.0001	0.681(5)
7.381	0.59s	1.27a	14,452	0.000	0.000	-0.0002	0.589(5)
7.866	0.59s	2.56a	14,452	0.000	0.411	0.0044	-0.000(5)
8.402	0.59s	4.00a	14,452	0.000	0.871	0.0206	50% DeckImm
9.159	0.59s	6.06a	14,452	0.000	1.533	0.0638	9.380(1)
10.952	0.67s	11.06a	14,452	0.000	3.114	0.2667	7.074(1)
12.697	0.88s	16.06a	14,452	0.000	4.583	0.6033	4.644(1)
14.231	1.41s	21.06a	14,452	0.000	5.771	1.0571	2.205(1)

```
  15.368   2.39s  25.55a      14,452     0.000    6.342    1.5342   0.003(1)
  15.486   2.54s  26.06a      14,452     0.000    6.376    1.5914  -0.254(1)
  16.212   3.59s  29.45a      14,452     0.000    6.471    1.9725  -1.947(1)
  16.523   4.16s  31.06a      14,452     0.000    6.449    2.1543  -2.758(1)
  17.339   6.26s  36.06a      14,452     0.000    6.172    2.7050  -5.299(1)
  17.898   8.93s  41.06a      14,450     0.000    5.649    3.2225  -7.864(1)
  18.162  12.20s  46.06a      14,452     0.000    4.940    3.6859 -10.414(1)
  18.121  15.88s  51.06a      14,452     0.000    4.106    4.0815 -12.858(1)
  17.830  19.57s  56.06a      14,452     0.000    3.220    4.4015 -15.098(1)
  17.393  22.86s  61.06a      14,452     0.000    2.353    4.6445 -17.080(1)
  16.882  25.57s  66.06a      14,452     0.000    1.542    4.8140 -18.805(1)
  16.463  27.26s  70.00a      14,451     0.000    0.950    4.8994 -20.003(1)
  Distances in METERS.----Specific Gravity = 1.025.-----------Area in m.-Rad.
                                     +
  Note:  The Residual Righting Arms shown above are in excess of the
         wind heeling arms derived from these moments (in m.-MT):
                   Aft heeling moment = 1251.35 (constant)
                                     +
  Note: Angle of MaxRA refers to the absolute Righting Arm curve.
                                     +
            Critical Points----------------------LCP-----TCP-----VCP
        (1) c1                       FLOOD   1.250f 15.500  19.100
        (5) c5                       TIGHT   0.000  16.827   8.235
LIM--------------------STABILITY CRITERION------------Min/Max--------Attained
(1) Abs Area from Equ0 (no moments) to MaxRA0      >   0.0800 m.-Rad 2.0155 P
(2) Angle from Equ. to abs 70 deg to 50% Dk Imm.   >     0.00  deg    68.73 P
(3) Angle from Equilibrium to RAzero or Flood      >    20.00  deg    24.28 P
(4) Absolute Area from Equ0 (no moments) to Flood  >   0.0800 m.-Rad 1.5713 P
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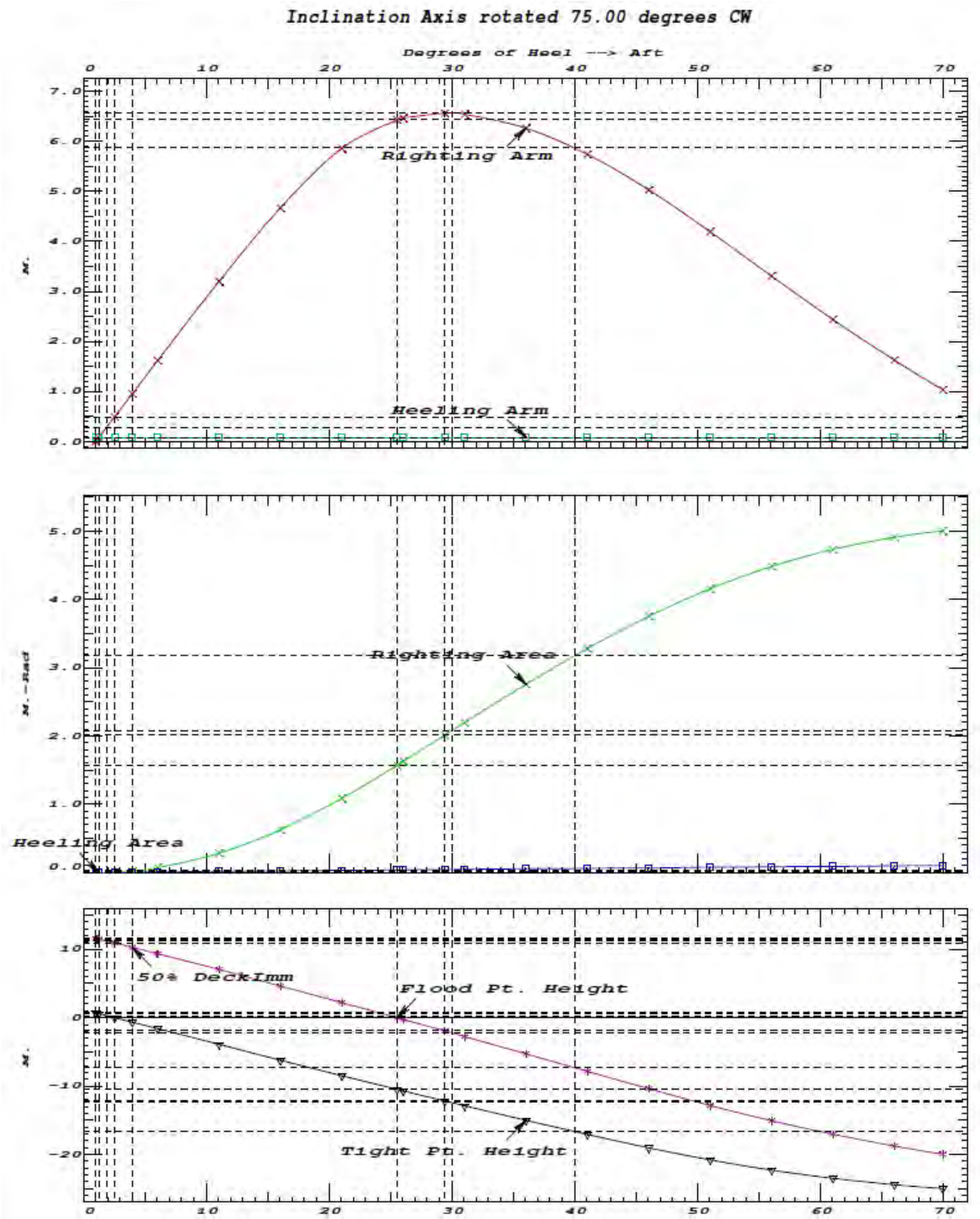

A X I S   90

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

LCG = 22.244f   TCG = 0.262s   VCG = 9.555

Inclination axis rotated 90.00 degrees CW

Origin Depth	Degrees of Trim	Heel	Displacement Weight(MT)	Residual Arms in Trim	in Heel	Res. Area	Flood Pt Height
7.278	0.82s	0.81a	14,452	0.000	-0.087	0.0000	0.713(5)
7.384	0.82s	1.08a	14,450	0.000	0.000	-0.0002	0.607(5)
7.984	0.82s	2.62a	14,452	0.000	0.490	0.0064	-0.001(5)
8.776	0.82s	4.68a	14,453	0.000	1.148	0.0358	50% DeckImm
9.203	0.82s	5.81a	14,453	0.000	1.509	0.0619	9.701(1)
11.063	0.85s	10.81a	14,453	0.000	3.132	0.2642	7.701(1)
12.914	0.91s	15.81a	14,452	0.000	4.596	0.6026	5.556(1)
14.619	1.06s	20.81a	14,454	0.000	5.944	1.0633	3.390(1)

```
  16.026   1.38s  25.81a      14,452     0.000    6.701    1.6193   1.336(1)
  16.842   1.71s  28.99a      14,454     0.000    6.850    1.9975   0.001(1)
  17.086   1.85s  30.01a      14,450     0.000    6.859    2.1185  -0.431(1)
  17.280   1.95s  30.81a      14,453     0.000    6.853    2.2143  -0.773(1)
  18.389   2.96s  35.81a      14,452     0.000    6.638    2.8061  -2.990(1)
  19.325   4.92s  40.81a      14,451     0.000    6.175    3.3670  -5.438(1)
  19.938   9.80s  45.81a      14,451     0.000    5.435    3.8756  -8.575(1)
  19.627  20.22s  50.81a      14,452     0.000    4.145    4.2976 -12.749(1)
  18.584  29.78s  55.81a      14,452     0.000    2.744    4.5991 -16.068(1)
  17.595  35.94s  60.81a      14,450     0.000    1.690    4.7900 -18.265(1)
  16.798  39.91s  65.81a      14,453     0.000    0.916    4.9017 -19.863(1)
  16.228  42.20s  70.00a      14,450     0.000    0.405    4.9493 -20.931(1)
  Distances in METERS.----Specific Gravity = 1.025.-----------Area in m.-Rad.
                                   +
  Note:  The Residual Righting Arms shown above are in excess of the
         wind heeling arms derived from these moments (in m.-MT):
                   Aft heeling moment = 1251.35 (constant)
                                   +
  Note: Angle of MaxRA refers to the absolute Righting Arm curve.
                                   +
            Critical Points----------------------LCP-----TCP-----VCP
        (1) c1                         FLOOD   1.250f 15.500  19.100
        (5) c5                         TIGHT   0.000  16.827   8.235
LIM--------------------STABILITY CRITERION------------Min/Max--------Attained
(1) Abs Area from Equ0 (no moments) to MaxRA0      >   0.0800 m.-Rad 2.1626 P
(2) Angle from Equ. to abs 70 deg to 50% Dk Imm.   >     0.00  deg    68.92 P
(3) Angle from Equilibrium to RAzero or Flood      >    20.00  deg    27.92 P
(4) Absolute Area from Equ0 (no moments) to Flood  >   0.0800 m.-Rad 2.0401 P
-----------------------------------------------------------------------------
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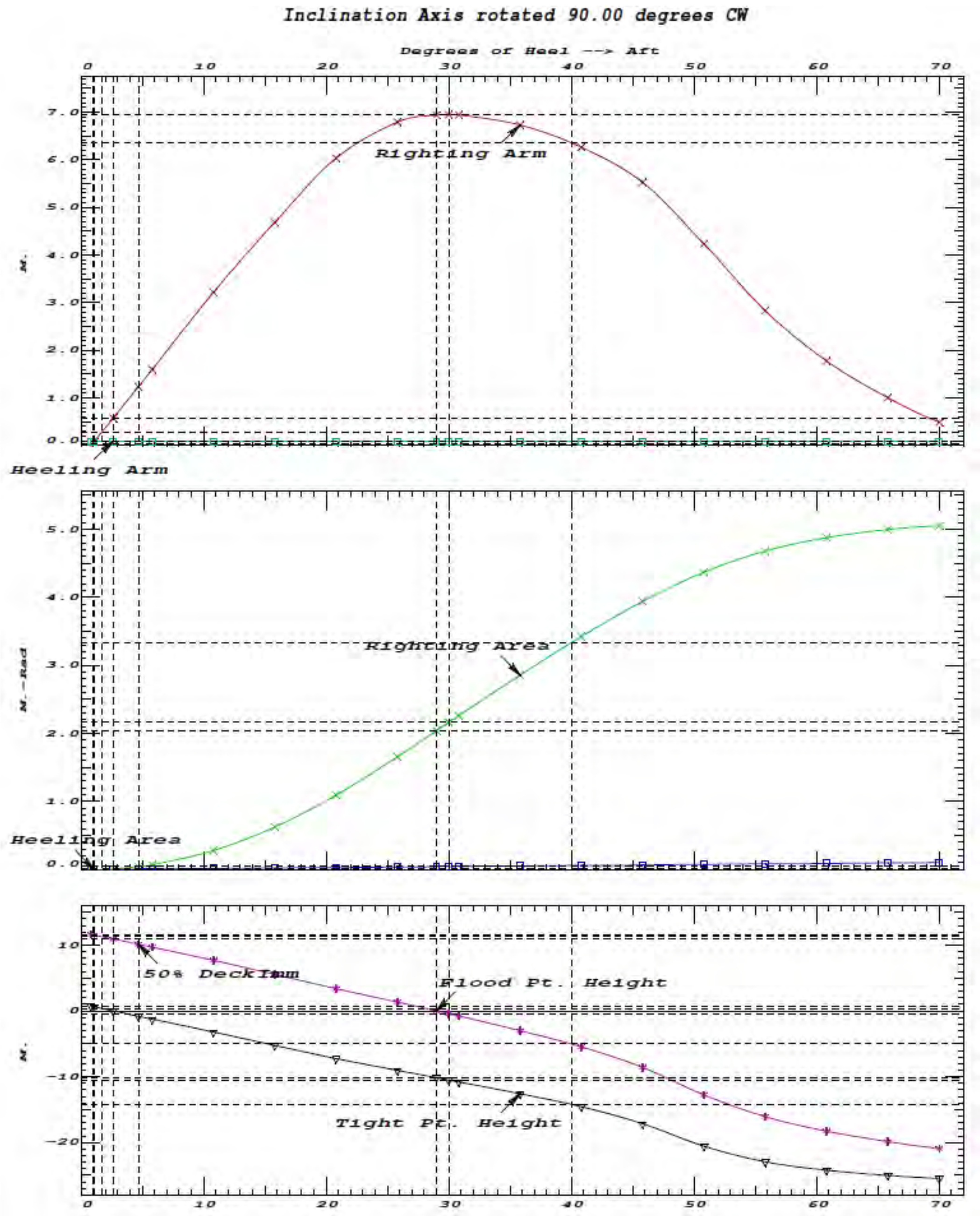

A X I S   105

RESIDUAL RIGHTING ARMS vs HEEL ANGLE
LCG = 22.244f   TCG = 0.262s   VCG = 9.555
Inclination axis rotated 105.00 degrees CW

Origin Depth	Degrees of Trim	Heel	Displacement Weight(MT)	Residual Arms in Trim	in Heel	Res. Area	Flood Pt Height
7.251	1.01s	0.49a	14,452	0.000	-0.109	0.0000	11.623(2)
7.278	1.01s	0.57a	14,452	0.000	-0.087	-0.0001	0.713(5)
7.381	1.01s	0.84a	14,452	0.000	0.000	-0.0003	0.630(5)
8.158	1.00s	2.91a	14,452	0.000	0.658	0.0116	0.001(5)
8.730	1.00s	4.45a	14,452	0.000	1.151	0.0359	50% DeckImm
9.112	1.00s	5.49a	14,452	0.000	1.485	0.0599	9.896(1)
10.908	0.97s	10.49a	14,452	0.000	3.098	0.2597	7.618(1)
12.683	0.87s	15.49a	14,452	0.000	4.566	0.5952	5.204(1)

```
  14.287   0.57s  20.49a      14,452     0.000    5.851    1.0510   2.774(1)
  15.608   0.14p  25.49a      14,454     0.000    6.573    1.5972   0.388(1)
  15.800   0.29p  26.30a      14,452     0.000    6.631    1.6904   0.002(1)
  16.592   1.01p  29.83a      14,452     0.000    6.732    2.1026  -1.689(1)
  16.733   1.17p  30.49a      14,452     0.000    6.728    2.1812  -2.012(1)
  17.682   2.50p  35.49a      14,451     0.000    6.522    2.7625  -4.441(1)
  18.424   4.32p  40.49a      14,452     0.000    6.074    3.3138  -6.909(1)
  18.895   6.91p  45.49a      14,450     0.000    5.442    3.8177  -9.429(1)
  19.032  10.41p  50.49a      14,452     0.000    4.650    4.2592 -11.972(1)
  18.808  14.54p  55.49a      14,450     0.000    3.743    4.6262 -14.413(1)
  18.339  18.58p  60.49a      14,452     0.000    2.802    4.9121 -16.609(1)
  17.765  21.95p  65.49a      14,452     0.000    1.904    5.1171 -18.501(1)
  17.236  24.28p  70.00a      14,452     0.000    1.154    5.2369 -19.973(1)
  Distances in METERS.----Specific Gravity = 1.025.-----------Area in m.-Rad.
                                     +
  Note:  The Residual Righting Arms shown above are in excess of the
         wind heeling arms derived from these moments (in m.-MT):
                   Aft heeling moment = 1251.35 (constant)
                                     +
  Note: Angle of MaxRA refers to the absolute Righting Arm curve.
                                     +
            Critical Points----------------------LCP-----TCP-----VCP
        (1) c1                       FLOOD   1.250f 15.500  19.100
        (2) c2                       FLOOD   7.000f 21.250  19.100
        (5) c5                       TIGHT   0.000  16.827   8.235
LIM--------------------STABILITY CRITERION------------Min/Max--------Attained
(1) Abs Area from Equ0 (no moments) to MaxRA0      >   0.0800 m.-Rad 2.1469 P
(2) Angle from Equ. to abs 70 deg to 50% Dk Imm.   >     0.00  deg    69.16 P
(3) Angle from Equilibrium to RAzero or Flood      >    20.00  deg    25.46 P
(4) Absolute Area from Equ0 (no moments) to Flood  >   0.0800 m.-Rad 1.7294 P
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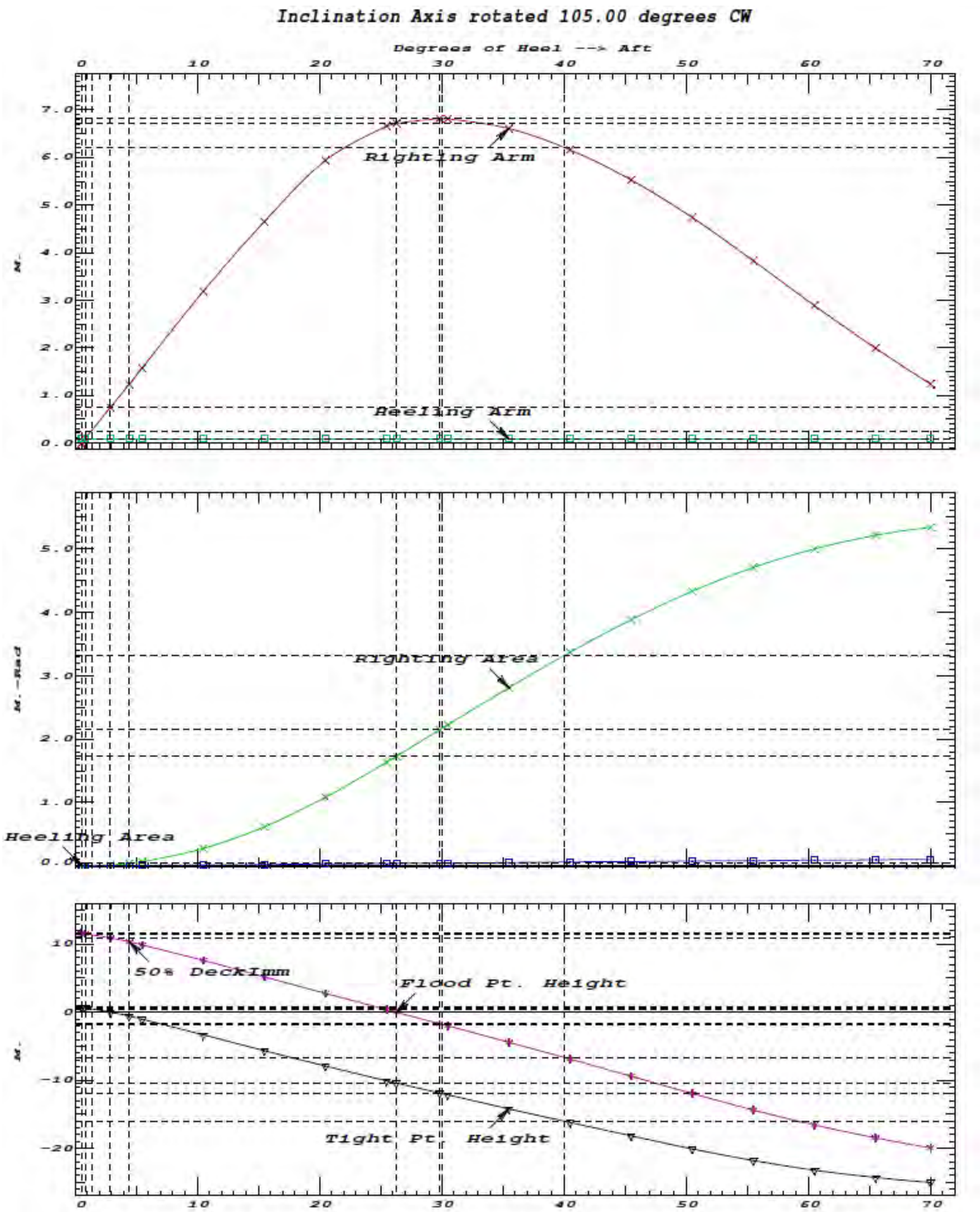

A X I S 120

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

LCG = 22.244f TCG = 0.262s VCG = 9.555

Inclination axis rotated 120.00 degrees CW

Origin Depth	Degrees of Trim	Heel	Displacement Weight(MT)	Residual Arms in Trim	in Heel--->	Res. Area	Flood Pt Height
7.232	1.12s	0.15a	14,452	0.000	-0.130	0.0000	11.618(2)
7.278	1.12s	0.29a	14,452	0.000	-0.087	-0.0003	0.713(5)
7.370	1.12s	0.56a	14,452	0.000	0.000	-0.0005	0.660(5)
8.105	1.12s	2.74a	14,452	0.000	0.694	0.0128	-0.000(5)
8.486	1.12s	3.89a	14,452	0.000	1.059	0.0303	50% DeckImm
8.901	1.12s	5.15a	14,452	0.000	1.462	0.0580	9.794(1)
10.509	1.08s	10.15a	14,452	0.000	3.045	0.2547	7.378(1)
12.073	0.96s	15.15a	14,452	0.000	4.493	0.5846	4.854(1)

```
  13.435   0.66s  20.15a      14,452     0.000    5.657    1.0296   2.361(1)
  14.525   0.11s  24.98a      14,452     0.000    6.261    1.5355  -0.000(1)
  14.561   0.09s  25.15a      14,452     0.000    6.273    1.5541  -0.084(1)
  15.397   0.59p  29.52a      14,452     0.000    6.413    2.0398  -2.207(1)
  15.509   0.70p  30.15a      14,452     0.000    6.410    2.1108  -2.514(1)
  16.292   1.64p  35.15a      14,452     0.000    6.234    2.6652  -4.920(1)
  16.910   2.73p  40.15a      14,454     0.000    5.845    3.1938  -7.290(1)
  17.350   3.96p  45.15a      14,451     0.000    5.305    3.6813  -9.597(1)
  17.614   5.32p  50.15a      14,451     0.000    4.652    4.1166 -11.826(1)
  17.702   6.77p  55.15a      14,451     0.000    3.917    4.4911 -13.953(1)
  17.629   8.23p  60.15a      14,451     0.000    3.126    4.7989 -15.955(1)
  17.418   9.61p  65.15a      14,451     0.000    2.301    5.0359 -17.813(1)
  17.110  10.76p  70.00a      14,451     0.000    1.484    5.1963 -19.469(1)
  Distances in METERS.----Specific Gravity = 1.025.-----------Area in m.-Rad.
                                     +
  Note:  The Residual Righting Arms shown above are in excess of the
         wind heeling arms derived from these moments (in m.-MT):
                   Aft heeling moment = 1251.35 (constant)
                                     +
  Note: Angle of MaxRA refers to the absolute Righting Arm curve.
                                     +
            Critical Points----------------------LCP-----TCP-----VCP
        (1) c1                         FLOOD   1.250f 15.500  19.100
        (2) c2                         FLOOD   7.000f 21.250  19.100
        (5) c5                         TIGHT   0.000  16.827   8.235
LIM--------------------STABILITY CRITERION------------Min/Max--------Attained
(1) Abs Area from Equ0 (no moments) to MaxRA0      >   0.0800 m.-Rad 2.0843 P
(2) Angle from Equ. to abs 70 deg to 50% Dk Imm.   >     0.00  deg    69.44 P
(3) Angle from Equilibrium to RAzero or Flood      >    20.00  deg    24.42 P
(4) Absolute Area from Equ0 (no moments) to Flood  >   0.0800 m.-Rad 1.5730 P
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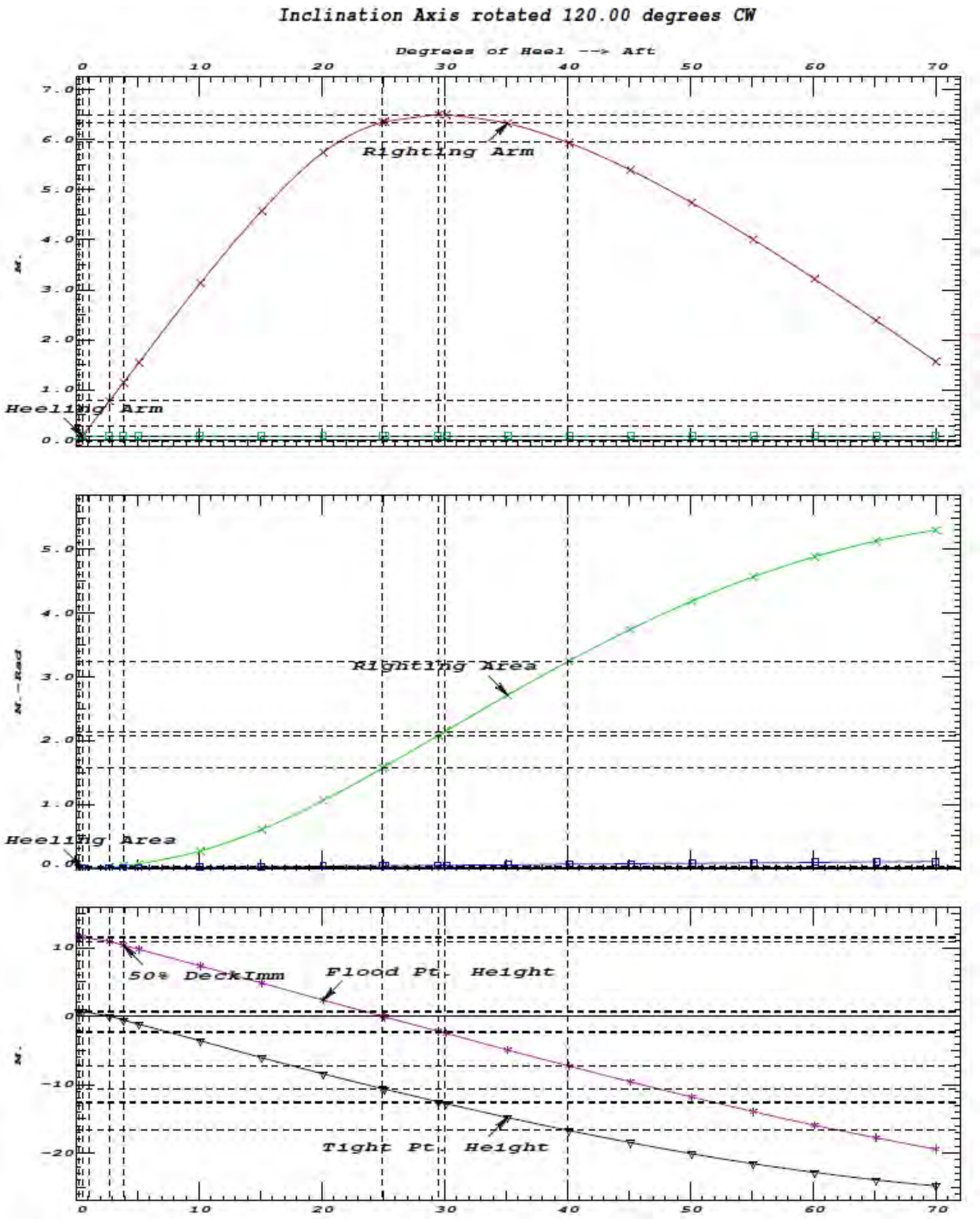

A X I S 135

RESIDUAL RIGHTING ARMS vs HEEL ANGLE

LCG = 22.244f TCG = 0.262s VCG = 9.555

Inclination axis rotated 135.00 degrees CW

Origin Depth	Degrees of Trim	Heel	Displacement Weight(MT)	Residual Arms in Trim	in Heel	Res. Area	Flood Pt Height
7.224	1.15s	0.21f	14,452	0.000	-0.148	0.0000	0.727(5)
7.278	1.15s	0.01f	14,452	0.000	-0.087	-0.0004	0.713(5)
7.354	1.15s	0.26a	14,452	0.000	0.000	-0.0006	0.694(5)
7.956	1.15s	2.45a	14,452	0.000	0.696	0.0127	-0.000(5)
8.271	1.15s	3.62a	14,452	0.000	1.066	0.0306	50% DeckImm
8.586	1.15s	4.79a	14,452	0.000	1.443	0.0564	9.839(1)
9.898	1.15s	9.79a	14,452	0.000	3.014	0.2510	7.444(1)
11.185	1.16s	14.79a	14,452	0.000	4.444	0.5774	4.946(1)

12.315	1.19s	19.79a	14,452	0.000	5.567	1.0164	2.487(1)
13.292	1.25s	24.79a	14,452	0.000	6.153	1.5317	0.076(1)
13.322	1.25s	24.95a	14,452	0.000	6.164	1.5488	-0.000(1)
14.079	1.32s	29.31a	14,452	0.000	6.293	2.0242	-2.085(1)
14.159	1.33s	29.79a	14,452	0.000	6.292	2.0778	-2.318(1)
14.917	1.44s	34.79a	14,452	0.000	6.135	2.6225	-4.687(1)
15.563	1.57s	39.79a	14,452	0.000	5.778	3.1438	-7.016(1)
16.093	1.71s	44.79a	14,452	0.000	5.277	3.6272	-9.289(1)
16.503	1.85s	49.79a	14,452	0.000	4.670	4.0620	-11.489(1)
16.788	1.99s	54.79a	14,452	0.000	3.982	4.4402	-13.601(1)
16.945	2.12s	59.79a	14,452	0.000	3.231	4.7554	-15.607(1)
16.973	2.23s	64.79a	14,451	0.000	2.433	5.0029	-17.493(1)
16.874	2.35s	69.79a	14,452	0.000	1.599	5.1790	-19.246(1)
16.869	2.36s	70.00a	14,452	0.000	1.564	5.1847	-19.315(1)

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  Distances in METERS.----Specific Gravity = 1.025.-----------Area in m.-Rad.
                                        +
  Note:  The Residual Righting Arms shown above are in excess of the
         wind heeling arms derived from these moments (in m.-MT):
                   Aft heeling moment = 1251.35 (constant)
                                        +
  Note: Angle of MaxRA refers to the absolute Righting Arm curve.
                                        +
            Critical Points----------------------LCP-----TCP-----VCP
        (1) c1                       FLOOD   1.250f 15.500  19.100
        (5) c5                       TIGHT   0.000  16.827   8.235
LIM--------------------STABILITY CRITERION------------Min/Max--------Attained
(1) Abs Area from Equ0 (no moments) to MaxRA0      >   0.0800 m.-Rad 2.0689 P
(2) Angle from Equ. to abs 70 deg to 50% Dk Imm.   >     0.00  deg    69.74 P
(3) Angle from Equilibrium to RAzero or Flood      >    20.00  deg    24.69 P
(4) Absolute Area from Equ0 (no moments) to Flood  >   0.0800 m.-Rad 1.5869 P
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