# COLLEGO

Participatory Design Game for Urban Slum Upgrading in the Context of Addis Ababa

MSc Architecture, Urbanism and Building
Sciences, TU Delft
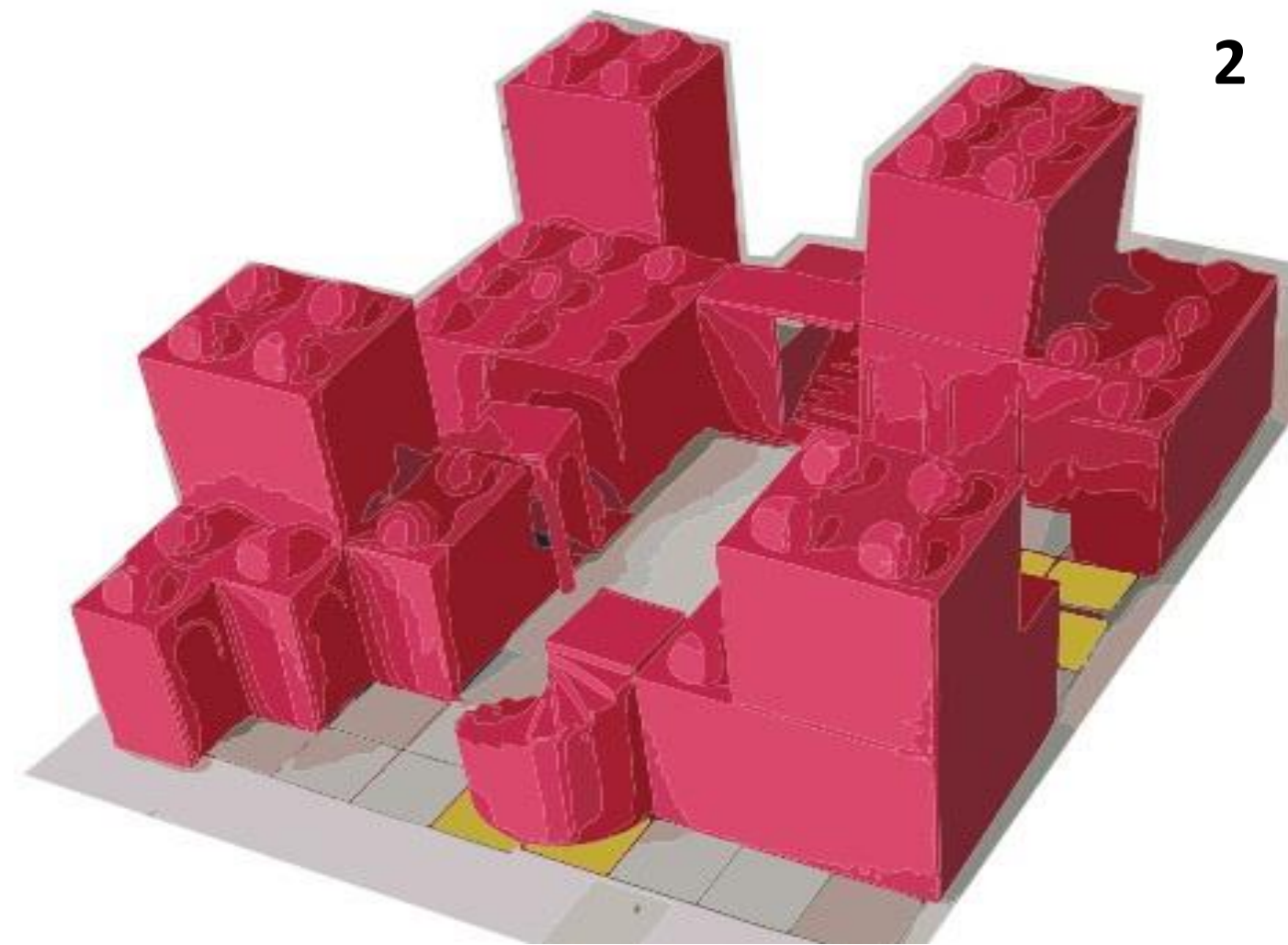Track: Building Technology

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: Prof.ir. Dick van Gameren

Delegate of the Board of Examiners:
Dr. Giorgio Agugiaro

CONTENT

Research →	**Literature review** →	**Design Developement** →	**The Game**
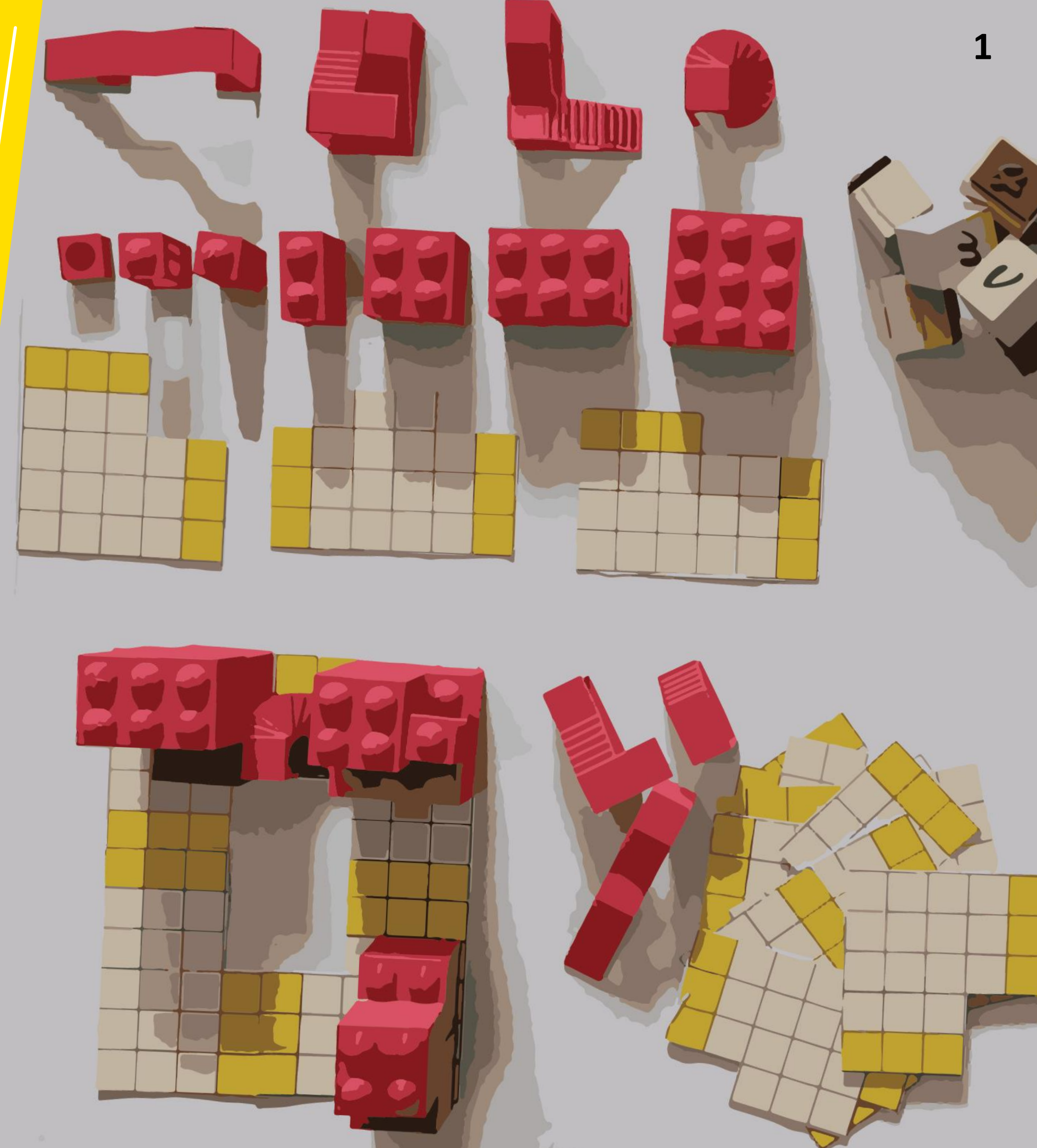
- Problem statement
- Research Question
- Research Method
- Research Objective

- Participation and games
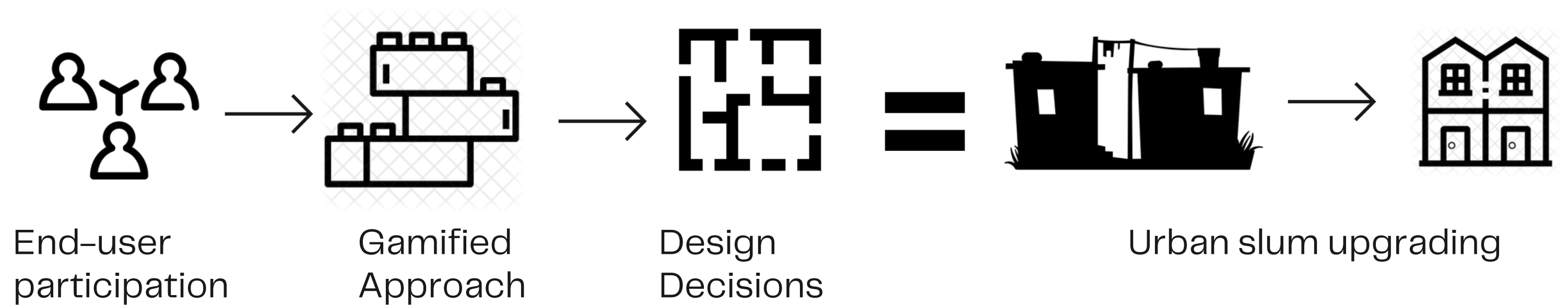- Open building concept and Modularity
- Contextual study: Addis Ababa

- Design Brief
- Modular Coordination
- Space Budget
- Patterns of Habitation

- Game Elements
- Game rules
- Game demo
- Application

INTRODUCTION

End-user
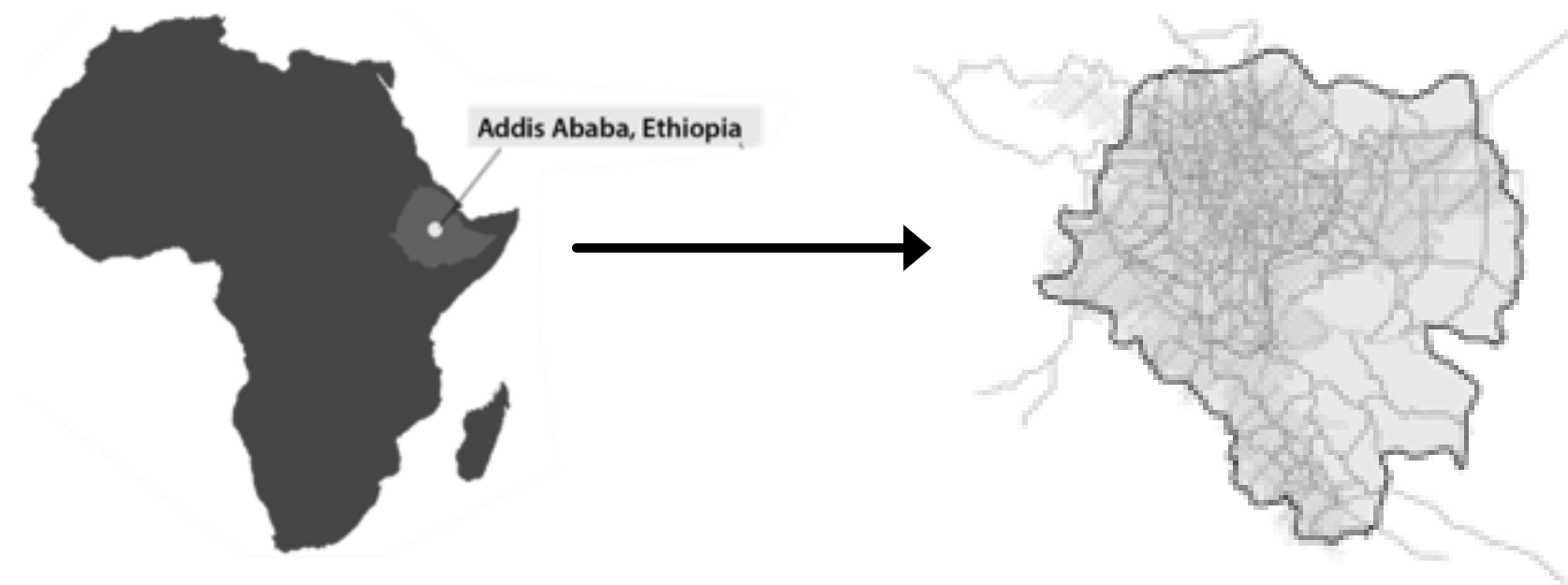participation

Gamified
Approach

Design
Decisions

Urban slum upgrading

A design methodology that allows end-users to make design decisions using a gamified approach.

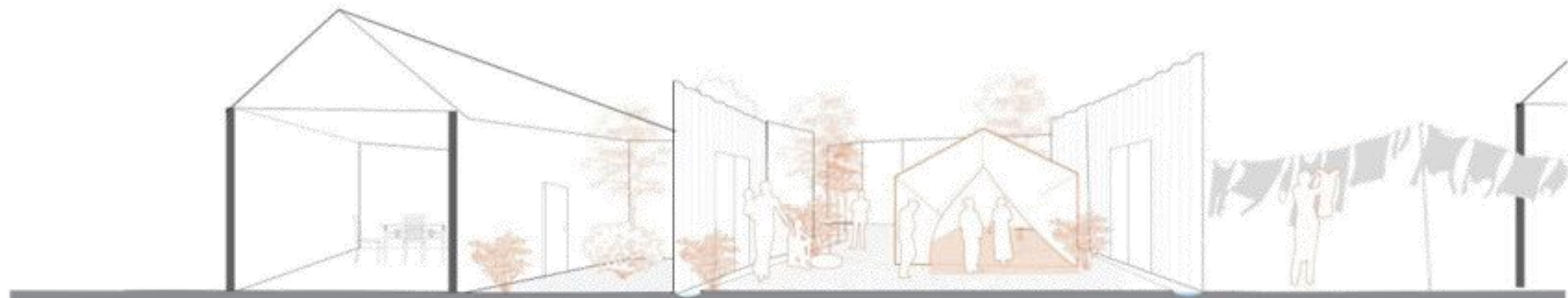Developed in a form of a board game where end-users can take part in co-creating designs for urban slum upgrading.
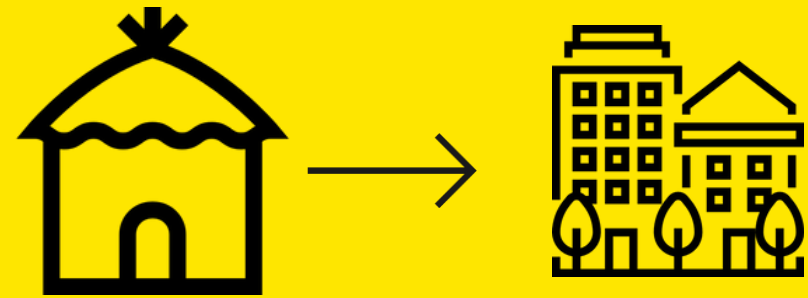
BACKGROUND

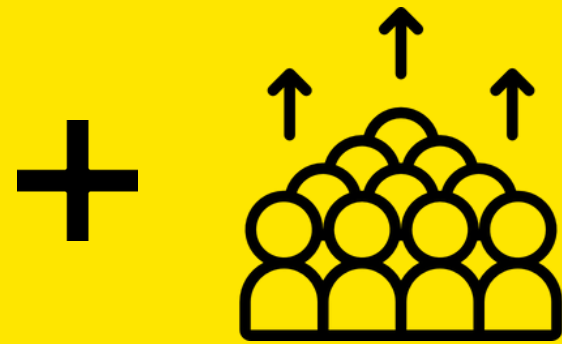Addis Ababa, Ethiopia

Addis Ababa's Neighborhoods

- Historical events
- Planned interventions
- Self actualizations by the community

BACKGROUND

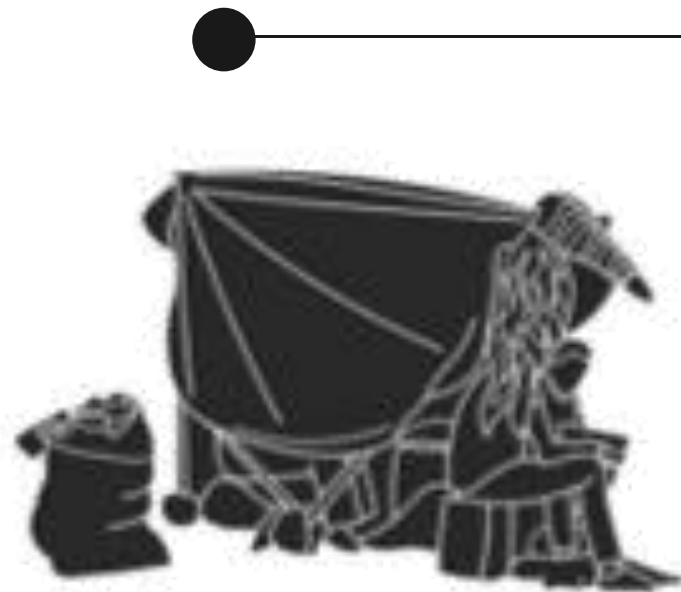Rural–Urban migration + Population increase → Housing deficit → Informal settlements Characteristically slum neighborhoods

Multi–purpose

1 Commercial Activities

2 Production Activities

3 Domestic Activities

4 Social Activities

WHY?

Problem Statement

While there is a high demand for affordable housing solutions; research shows affordable mass housing projects in Addis Ababa fail to engage end-users in meaningful participation in the planning and design process leading to a disconnect between the proposed solutions and the needs of the low-income dwellers in the slum neighbourhoods.
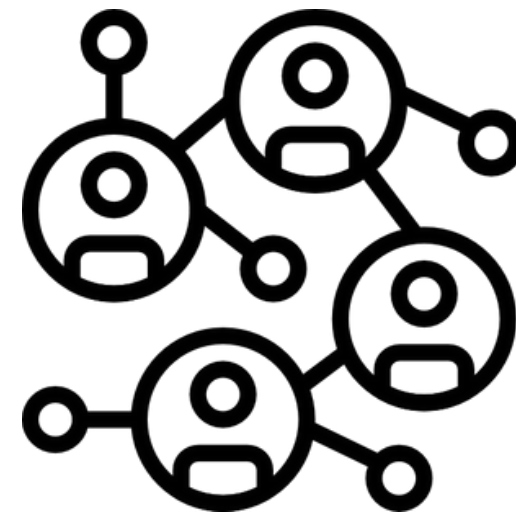
Strong socio–economic and spatial ties with the space they inhabit

It is essential to develop participatory design methodologies that **preserve** and perhaps enhance the **socio–economic** and **spatial values** embedded within the existing community.

loss of locational advantage

loss of socio–economic network

loss of home–based income generating activities

not need responsive typology

not affordable for low–income dwellers

HOW?

Research Question

*The main research question of the study is, how can the spatial values be **abstracted** and **embedded** into a **design game** that allows end-users to **participate** in the design decision-making process using **pre-defined modules**, **configuration rules** and a sequence of **stakeholder inputs**?*

Abstract spatial values
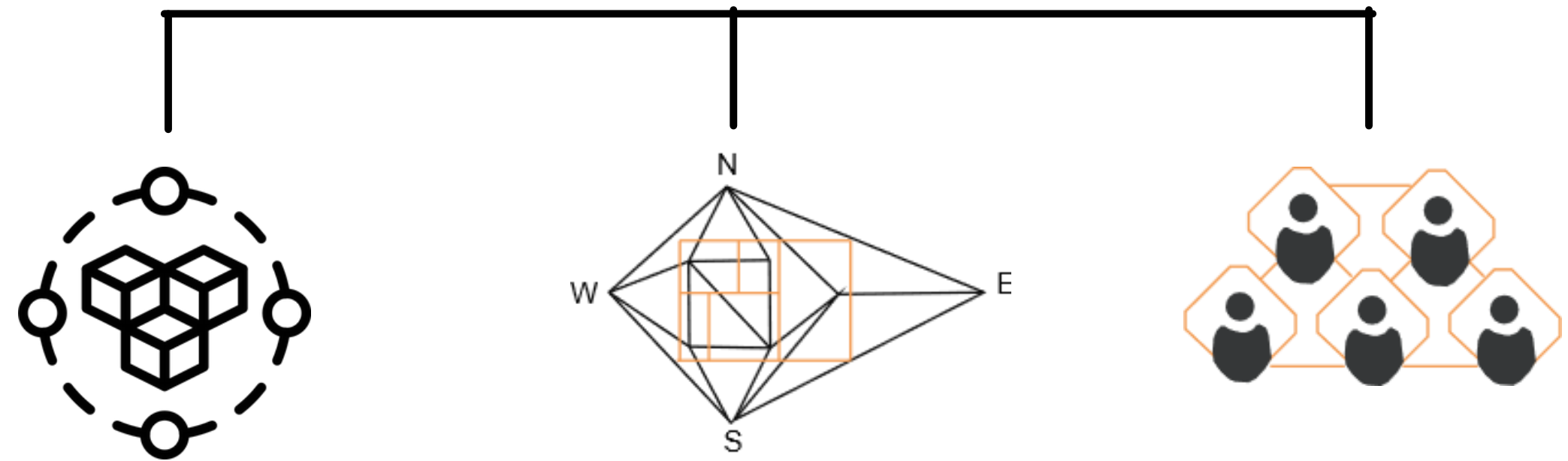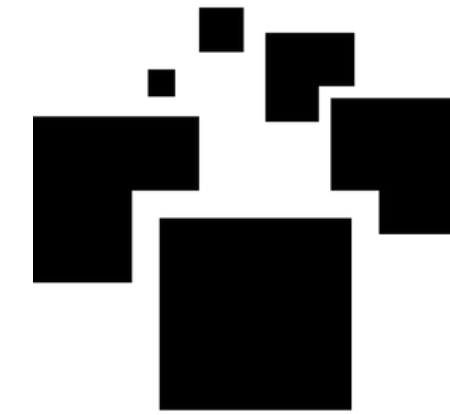
Pre–defined Modules

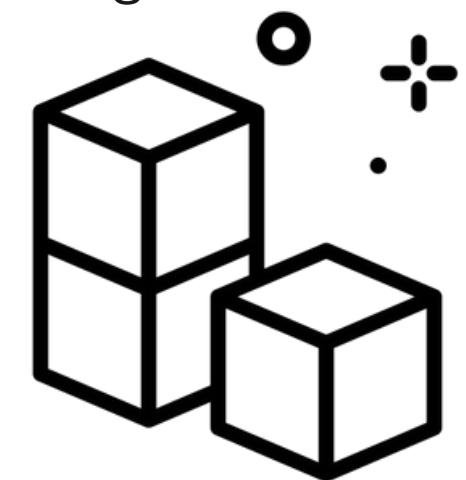Configuration Rules

Stakeholder Input

What?

Research Objective

The objective of the research is to develop a tangible and visual participatory design methodology where end-users can interactively configure spaces and co-create designs based on a set of modules and game rules derived from studies of the multi-layer structure and complexity of the slum neighbourhoods or 'Sefers' of Addis Ababa.
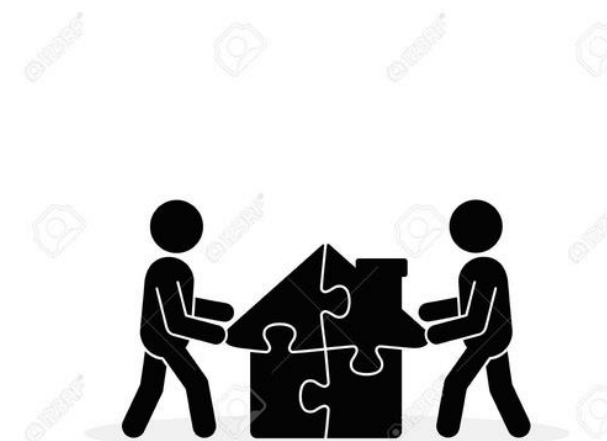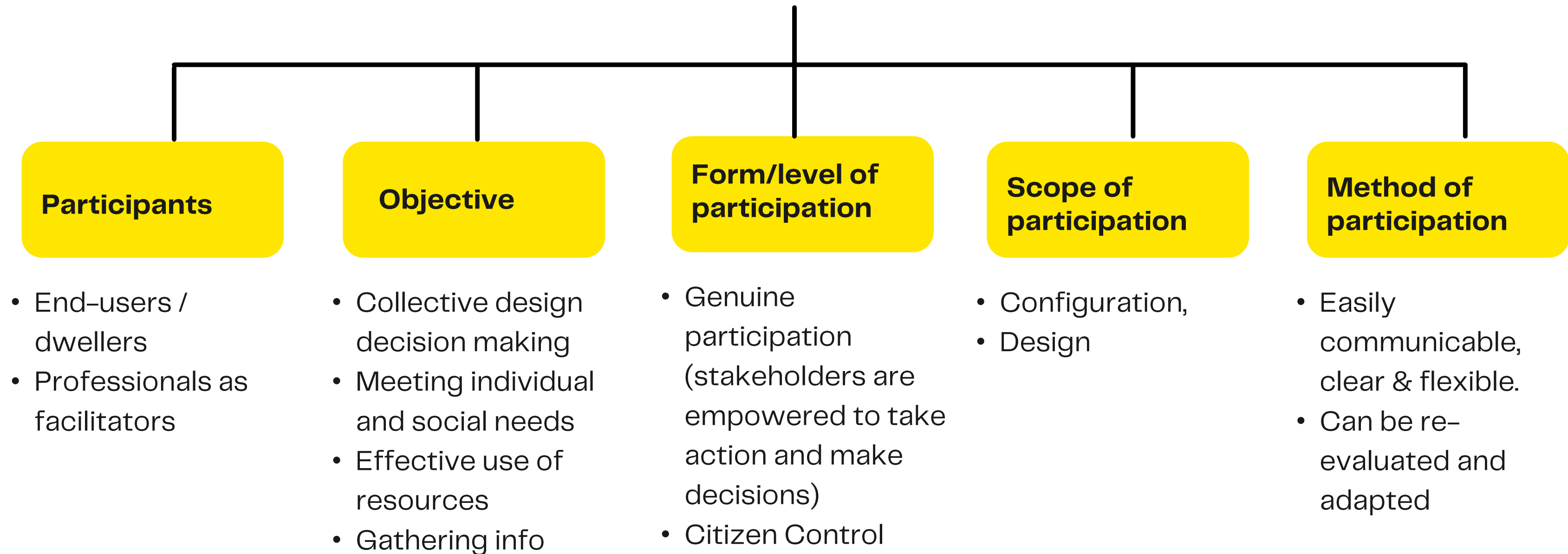
Visual
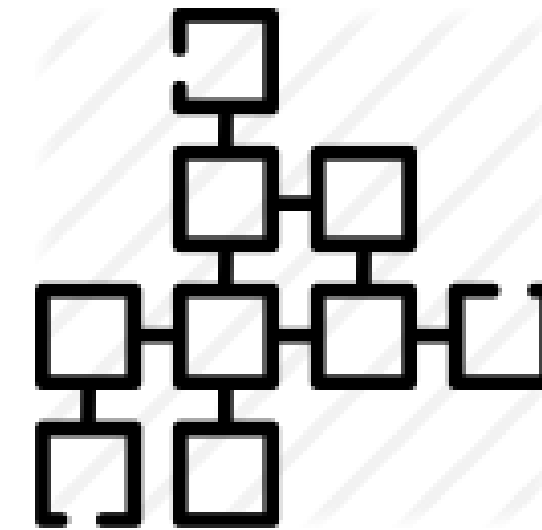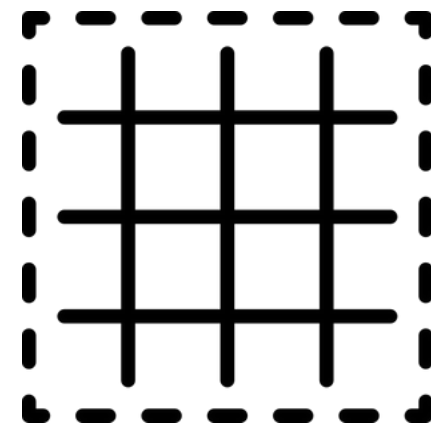
Tangible

Interactively configure spaces

Co-create designs

Literature review

PARTICIPATION

Participants	**Objective**	**Form/level of participation**	**Scope of participation**	**Method of participation**

- End–users / dwellers
- Professionals as facilitators

- Collective design decision making
- Meeting individual and social needs
- Effective use of resources
- Gathering info

- Genuine participation (stakeholders are empowered to take action and make decisions)
- Citizen Control

- Configuration,
- Design

- Easily communicable, clear & flexible.
- Can be re-evaluated and adapted

Literature review

Serious Games

–GAME MECHANICS – GAME RULES   - GAME PLAY

- Abstract real–time situations/problems

- Understanding the design problem

- Collaboratively Ideate designs

- Elicit user needs and express individual and personal values .

- Envision new solutions or alternatives different from the conventional.

Steps to follow

1: Define Problem/challenge/objective of the game

2: Define the stakeholders/players

3: Define resources

4: Define rules and actions

5: Define Validation method
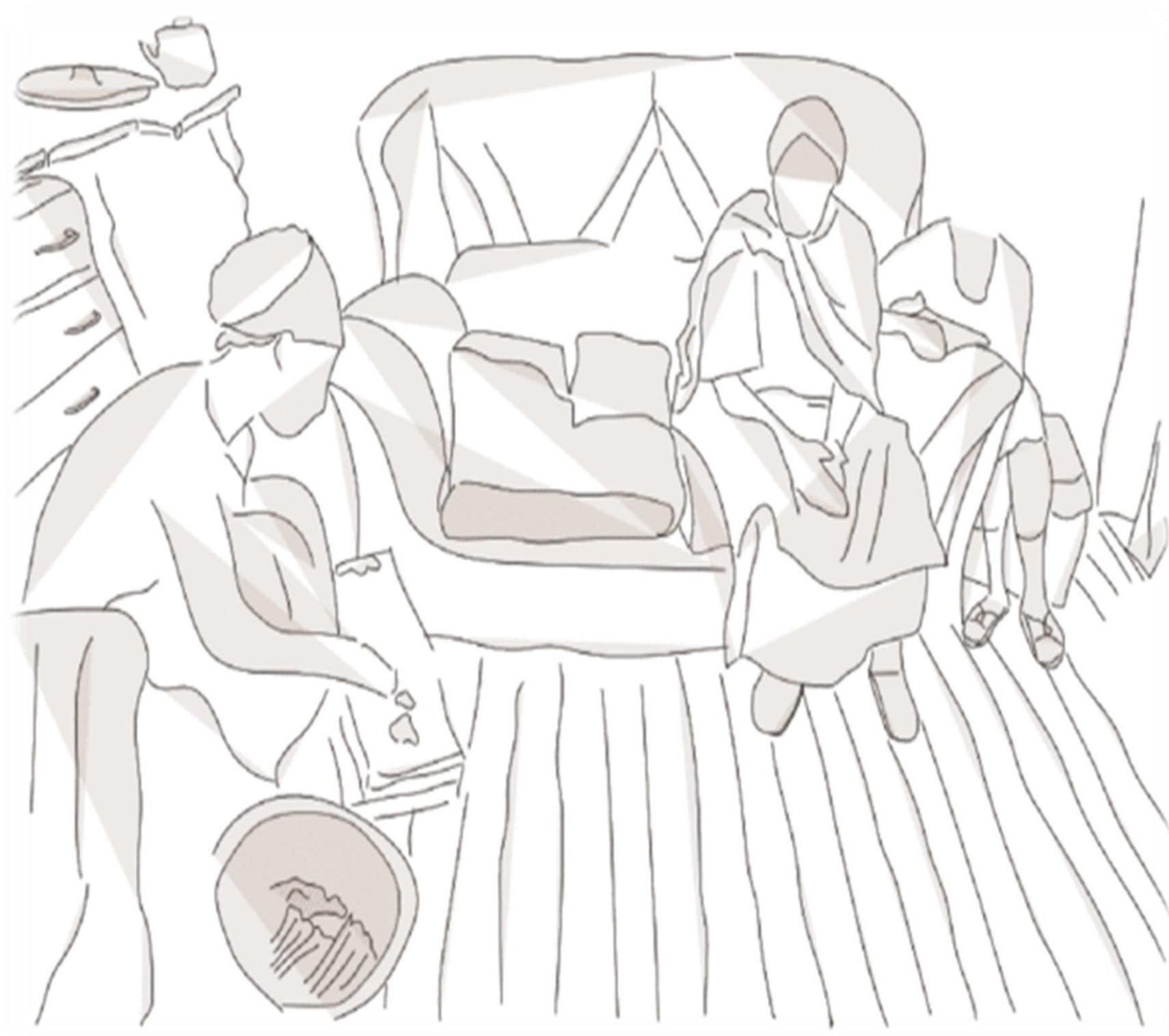
6: Prototype

7: Test & Modify

Literature review

Context : Addis Ababa

Kebele houses

–Government–owned subsidized rental housings administered by the Kebele.

–Mostly single–unit rooms within a compound.

–Shared facilities including courtyard space, kitchen, and toilets.

Literature review

Context : Addis Ababa

Multi–Purpose

Flexible use of a single spaces to serve multiple purposes

Literature review

Context : Addis Ababa

Importance of courtyard

Use of courtyard space as an extension of home for domestic and commercial activities.

Literature review

Within the Dwelling unit

Context : Addis Ababa

Income generation

Home–based income–generating activities and locational advantage.

–Within the dwelling unit

–Courtyard based

–Street Adjacent

Literature review

Context : Addis Ababa

Incremental Growth

Incremental development according to user's need and financial capacity.

Horizontal: if space available

Vertical: addition of attic spaces

Literature review

Idir
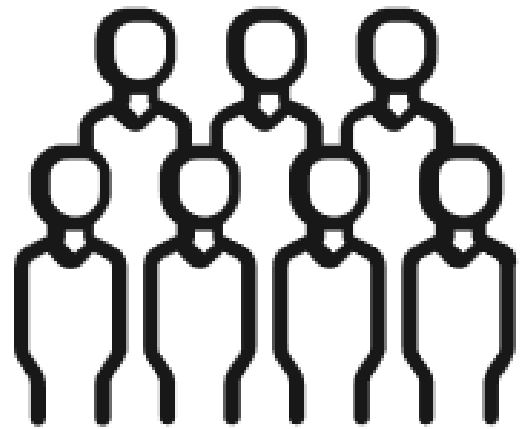
Funeral/burial support association

Iqub

Financial support association

Mahiber
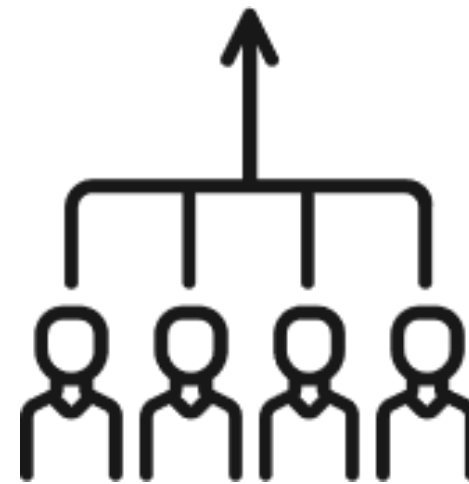
Mutual Interest association

Context : Addis Ababa

Social Network

Low-income communities rely on social networks and mutual cooperation. Kebele house inhabitants have a higher degree of socio-economic interdependence. There are several social associations formed within the neighbourhood community.

Literature review

Slum

Multi–storey mass housing

Current

- Affordable mass housing: mismatch between users needs and proposal

- Loss of locational advantage (relocation)
- Loss of socio–economic network
- Typology for low–income (studio and one bed room) doesn't meet the needs large household sizes
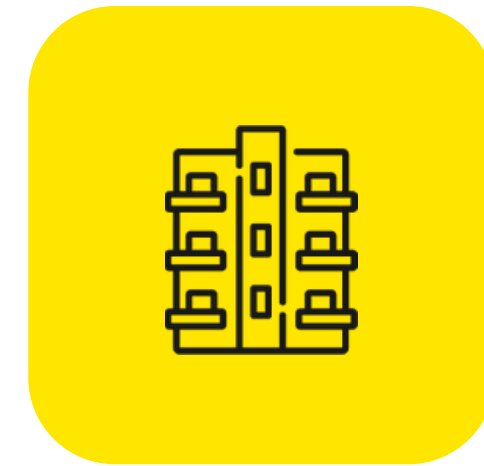
- Loss of incremental character
- Loss of use of courtyard as an extension of home
- Loss of flexibility and multi–purpose character
- Loss of home–based income generation

Literature review

Slum

Courtyard based low–rise incremental housing

Proposed

- Low–rise incremental housing : maintaining existing density.

- Preserve existing social networks
- Preserve locational advantage
- Keep incremental nature
- Preserve home–based income generating activities
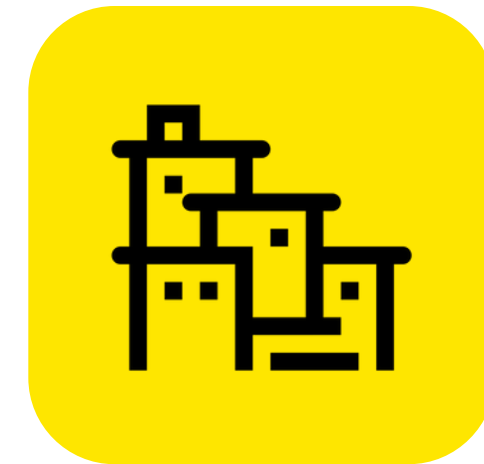
- Flexibility and Variation in configuration of spaces according to users needs
- Preserve the use of courtyard spaces as extensions of homes.

Design Development

Design Brief

Abstract and simplify low–rise courtyard–based incremental housing design into a system of simple configurational rules and design elements that allows the stakeholders to easily engage in the design process.

Configuration Rules
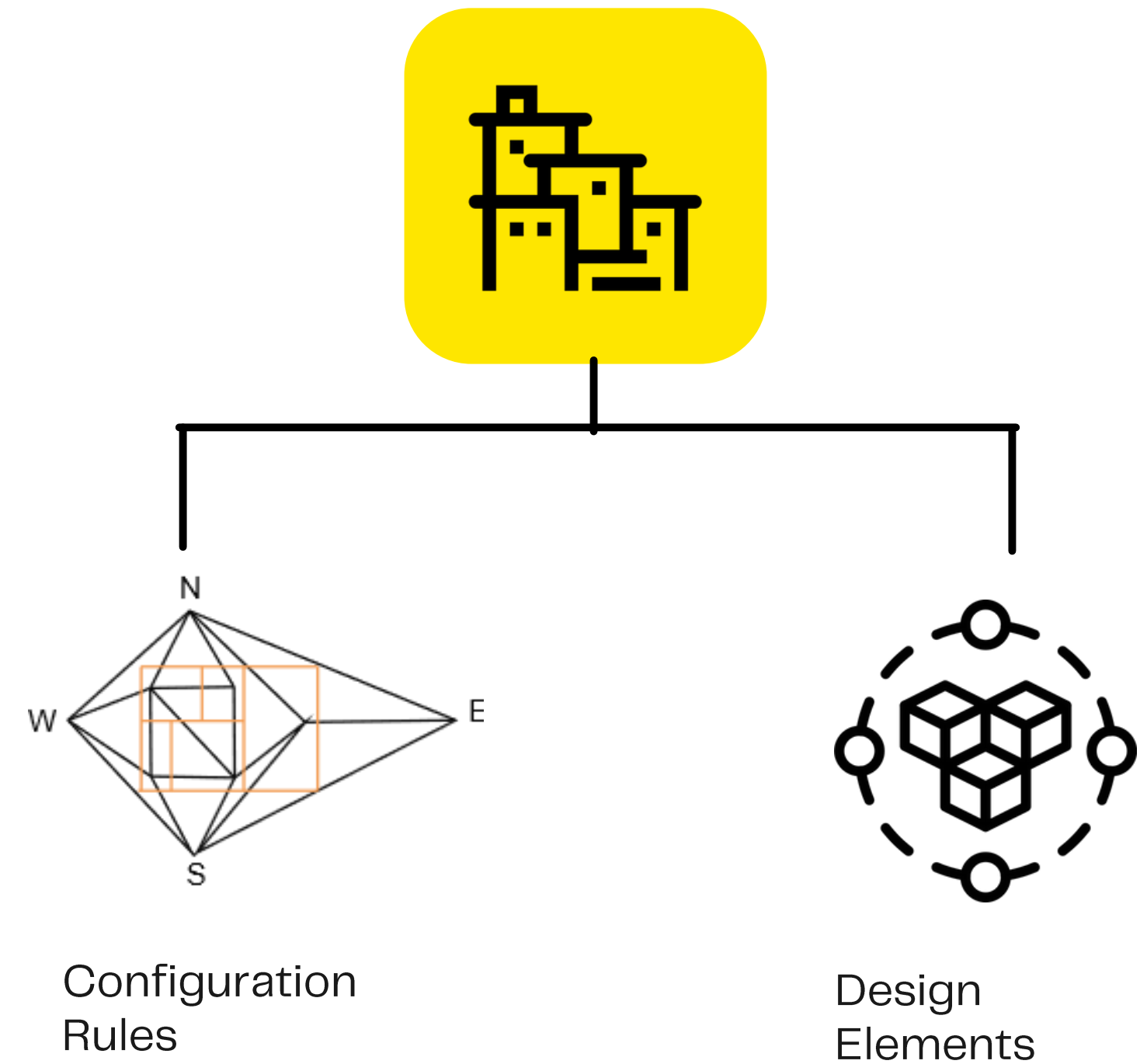
Design Elements

Design Development

Design Brief

A tangible and visual method for eliciting the shareholder's spatial needs.

A modular co-ordination system based upon a tartan grid.

Game elements (boards, modules, activity cards & tokens)+ defined game rules.

To identify and weigh different domestic and commercial spaces, functions and sizes

Form a configuration of hierarchic spatial framework and shared spaces.
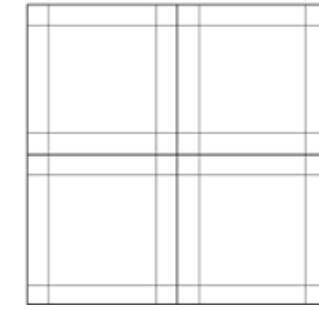
Tartan Grid
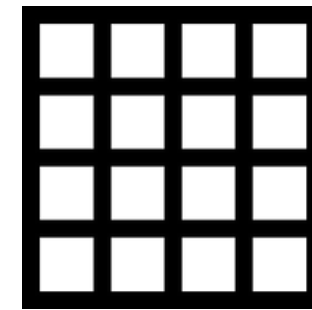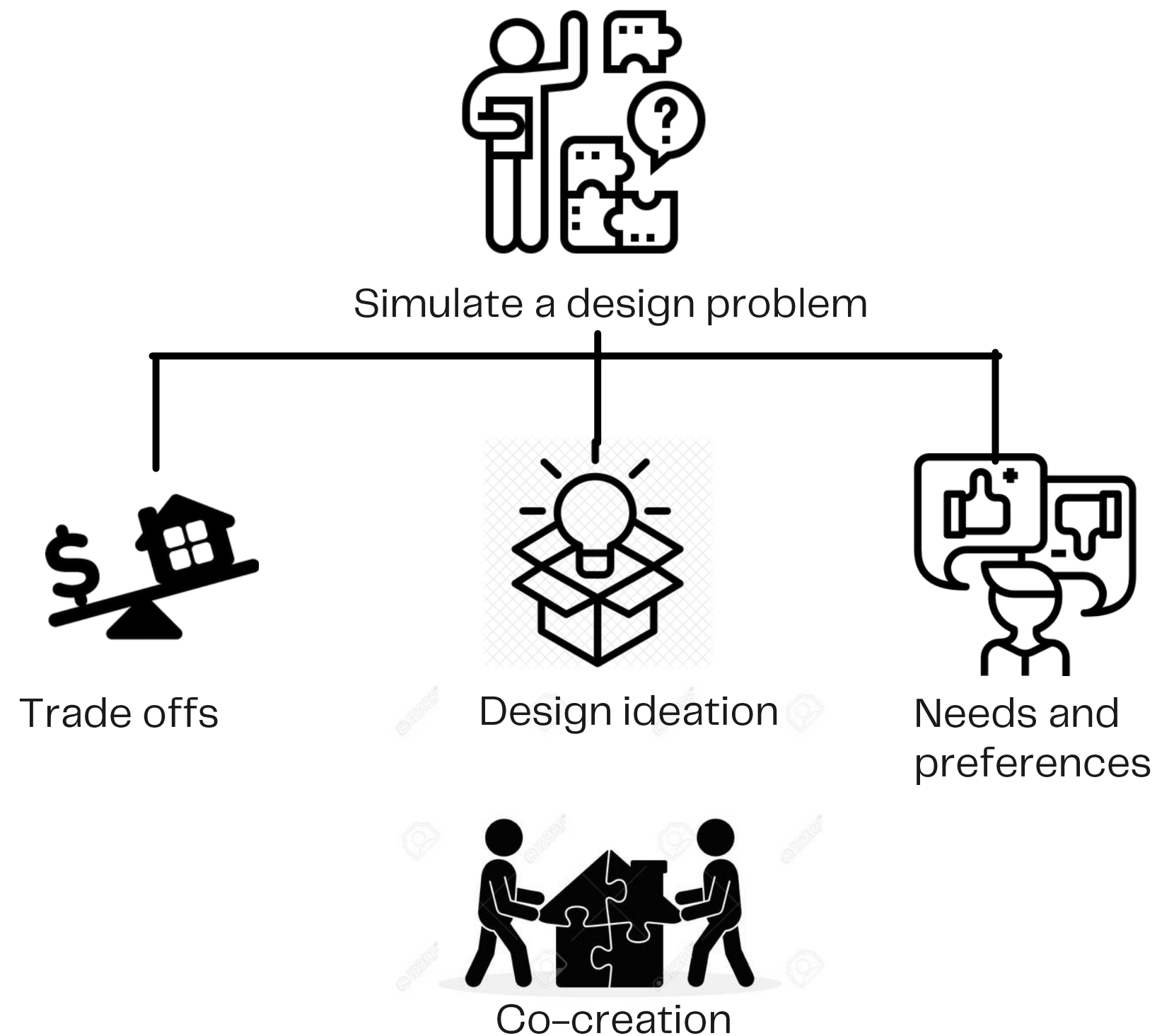
Board
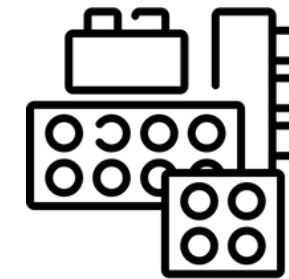
Modules
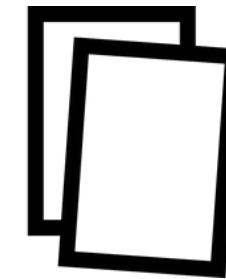
Activity cards
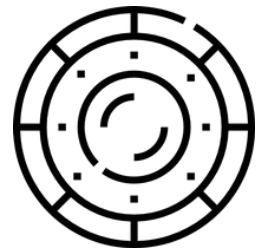
Tokens

Domestic spaces

Comercial spaces

Design Development

Design Brief

The game will serve as a simulation of a design problem that facilitates trade-offs, design ideation, projection of stakeholder needs and preferences, and co-creation.
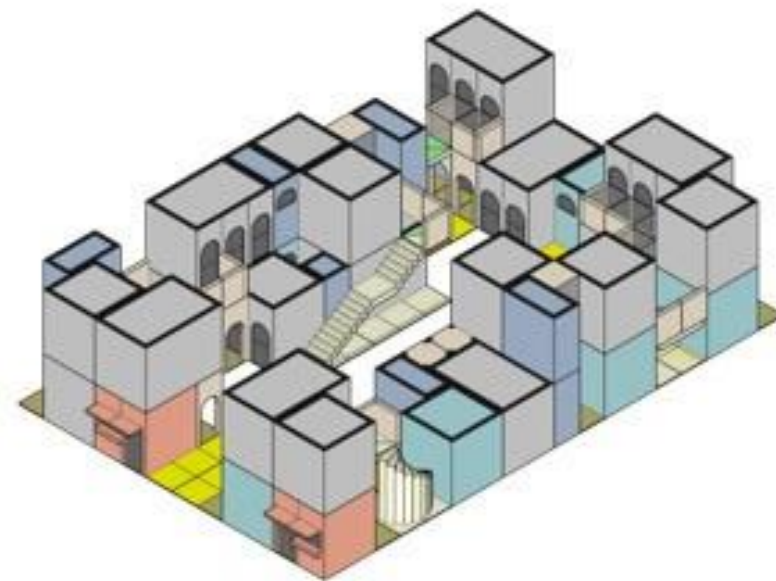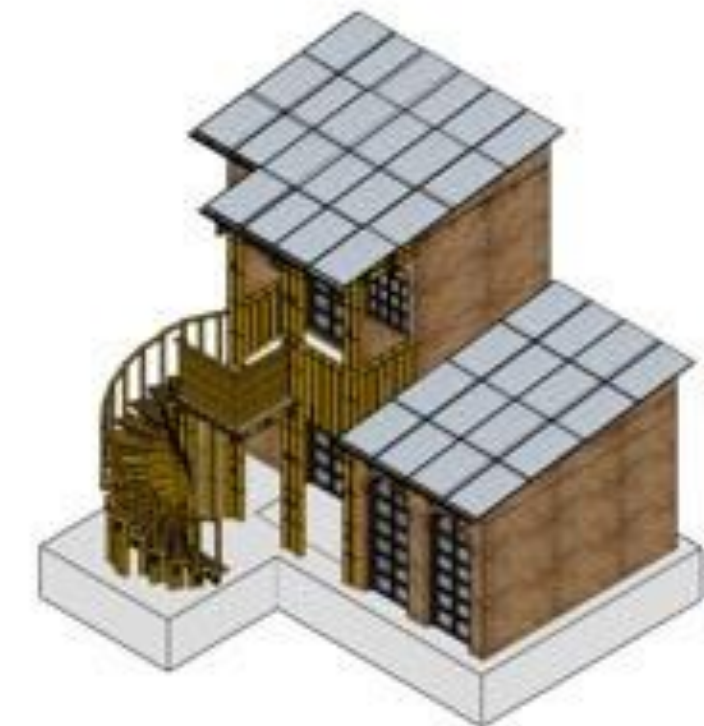
Simulate a design problem

Trade offs

Design ideation

Needs and preferences

Co-creation

Design Development

Planning the Design game
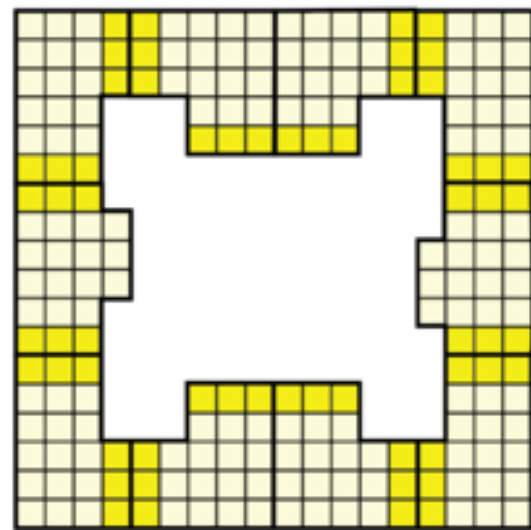
Cluster Level

Clustering of the houses in a way that the courtyard is central

Configuration Level

Configure their houses and shared spaces using a set of predefined modules according to their needs and preference

Formation & Materialization Level

Based on the hosen building system and material, the players can select the wall, opening and roof type of their configured space.
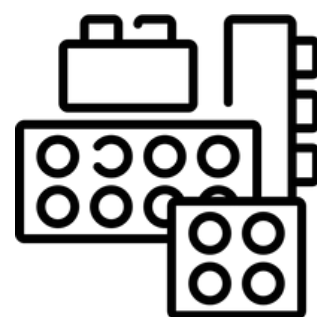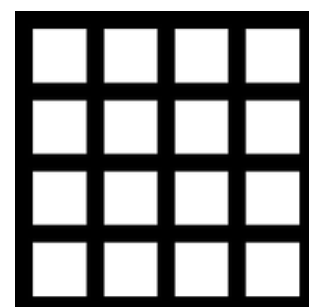
Design Development

Game Components

Module

volumetric representation of functional spaces

Tokens

Acquire modules and can be equated to real life value (cost)

Tartan Grid

modular coordination system for the game pieces
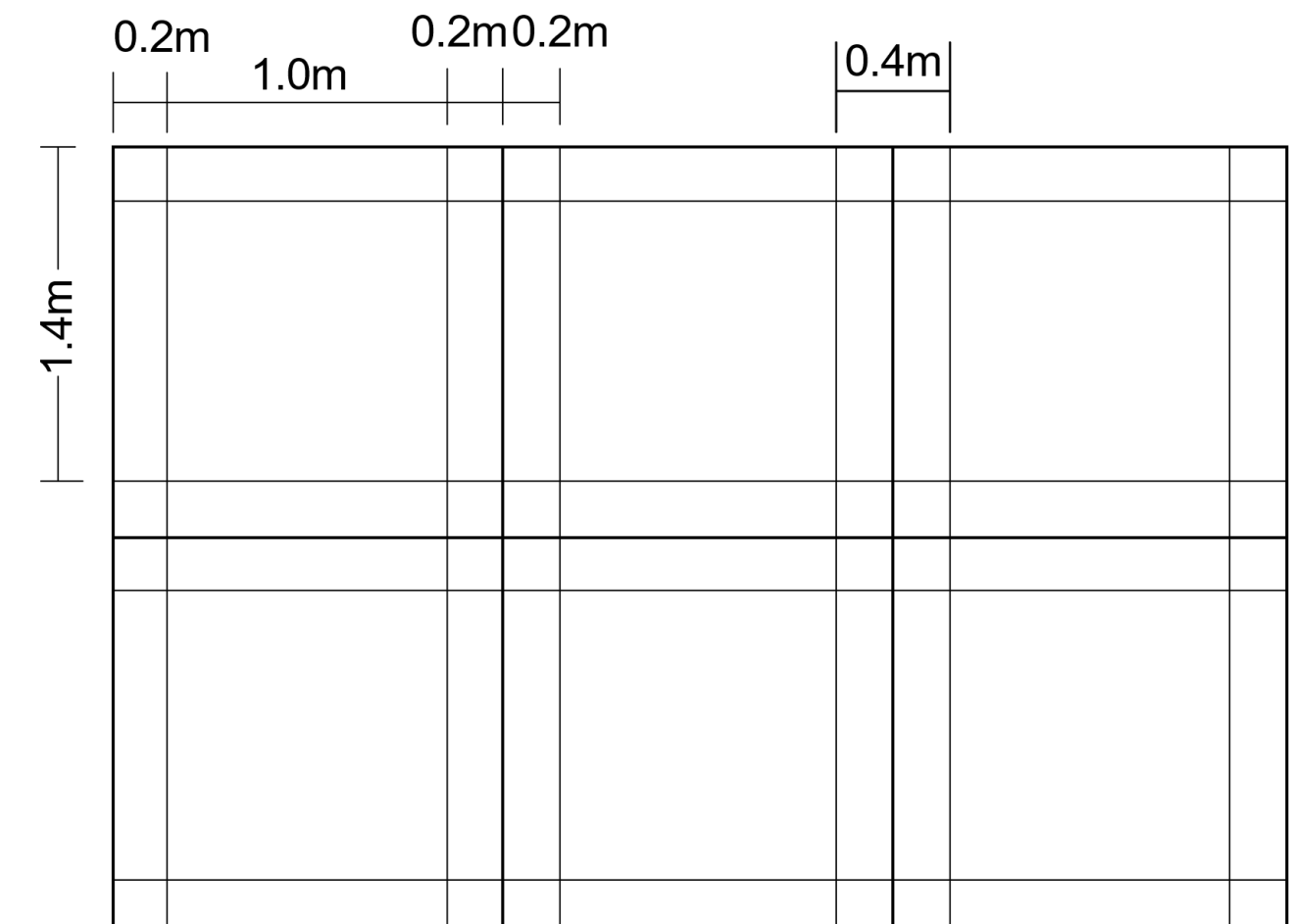
Board

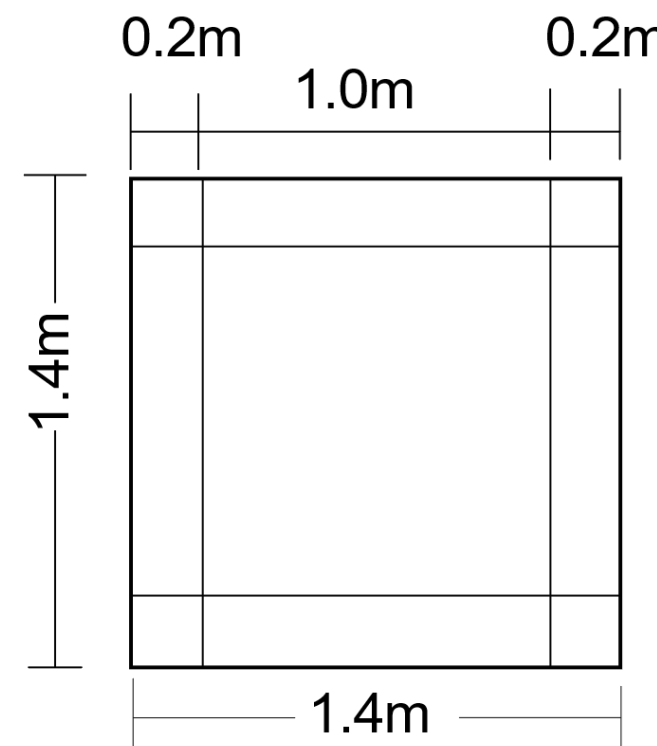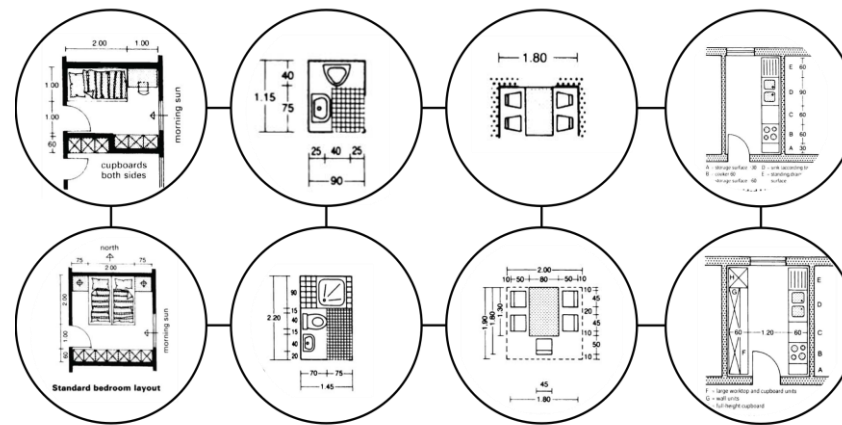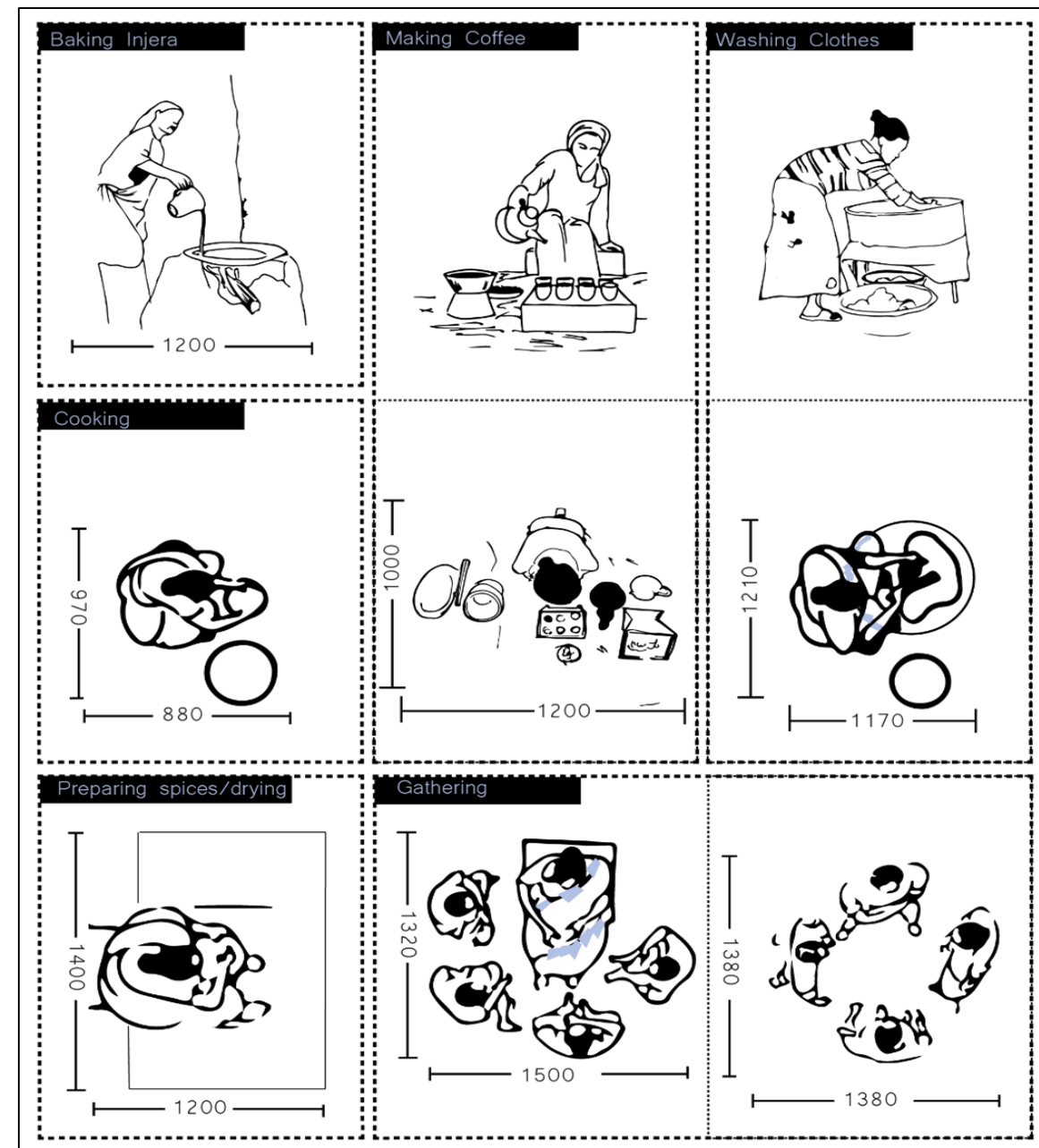The space budget for each player
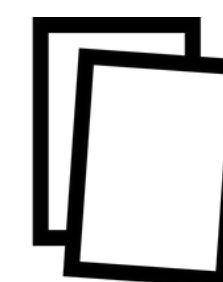
Activity Cards

Activities that players can select to take place in the shared courtyard space

Design Development

Definition of the Grid

The meta game is based on a modular system where by the defined modules are based on a 3–dimentional grid.
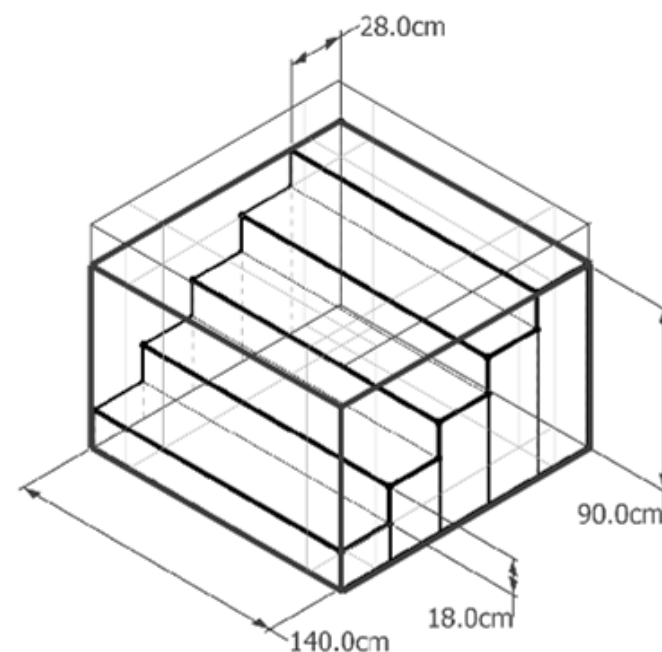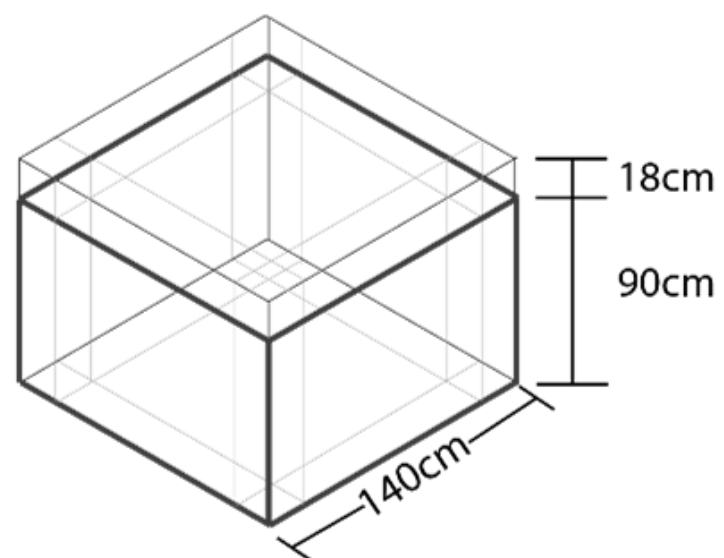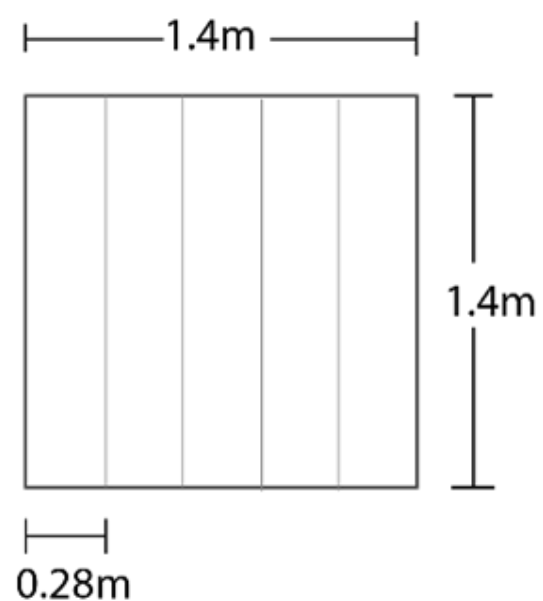
The definition of the grid is proposed in such a way that it allows for flexibility in accommodating different sizes of modules and their related function
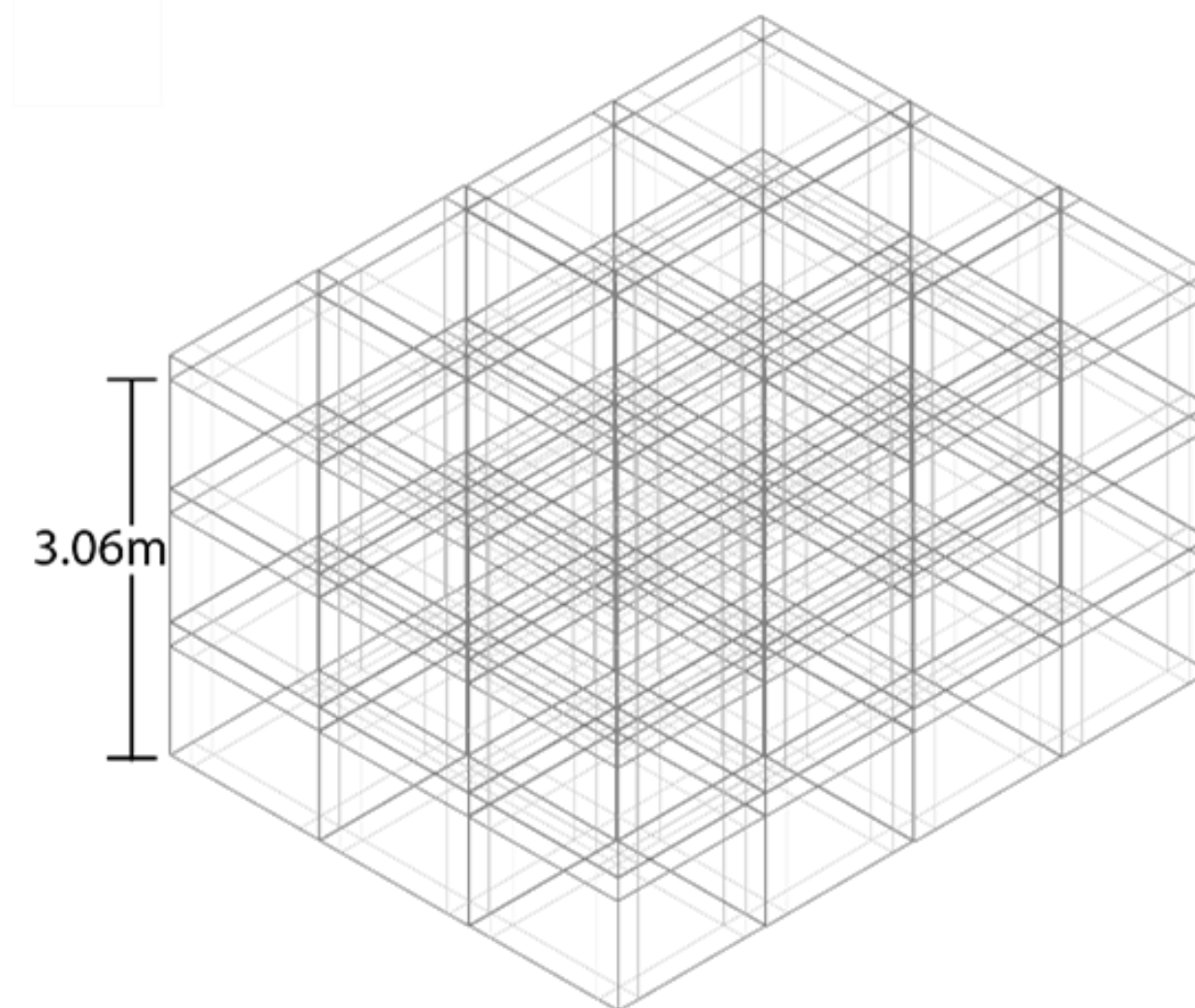
Design Development

Definition of the Grid

The 3-dimentional definition of the grid is also considered using the dimensions of the vertical circulation.

2 risers + 1 Thread = 63–65   **2 (18cm) + 1 (28cm) = 64**

Design Development

Definition of the Space Budget/ Game Board
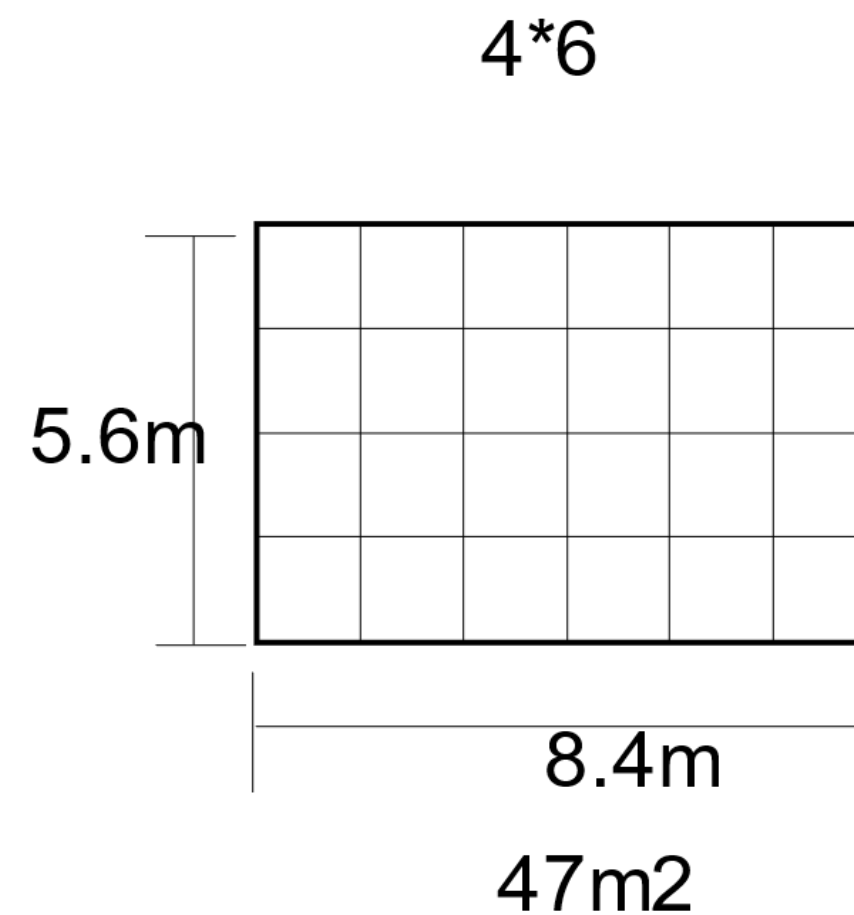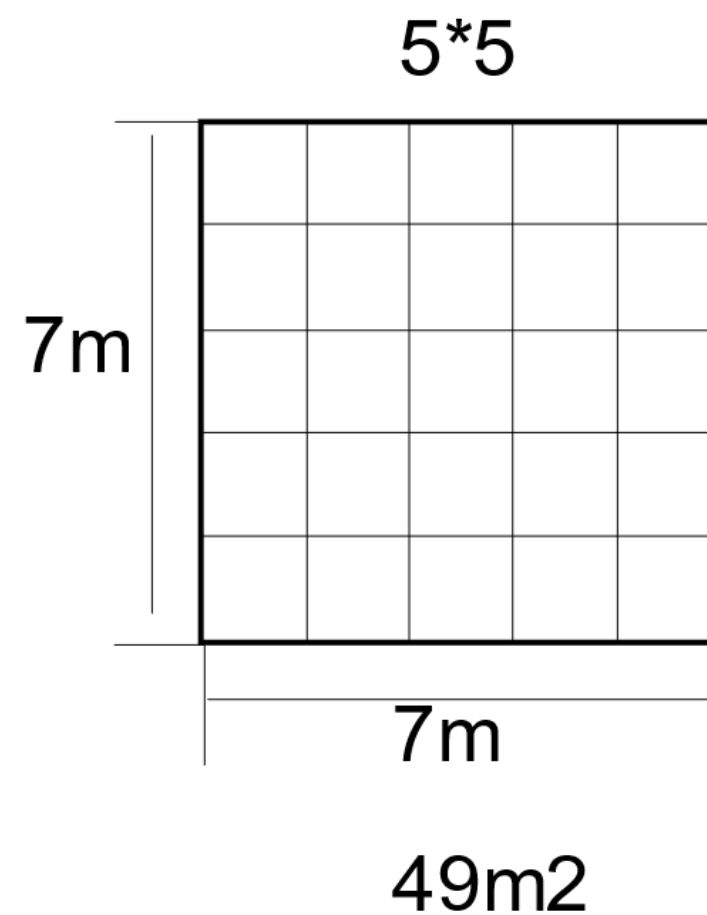
In the meta game, the space budget is translated into a game board divided into tiles on which players can place modules to configure their spaces.

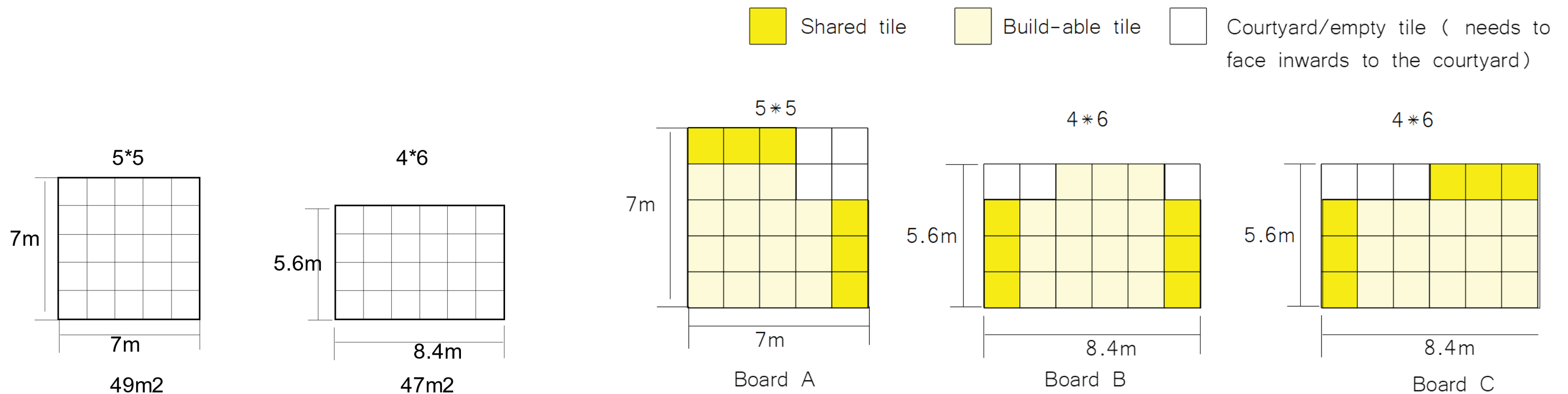First the space budget is approximated using tiles (1.4m *1.4m) derived from the grid definition.

5*5

7m

7m

49m2

4*6

5.6m

8.4m

47m2

Design Development

Definition of the Space Budget/ Game Board

Types of boards and tiles

The boards are used to form clusters in a courtyard. Each board corresponds to the space budget for one household.
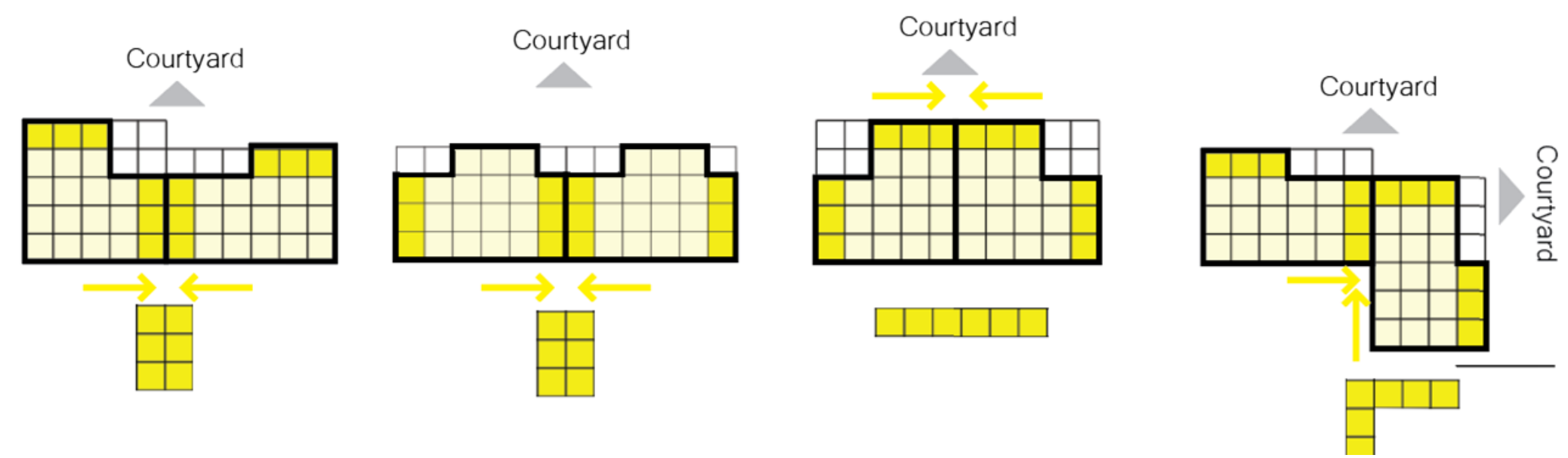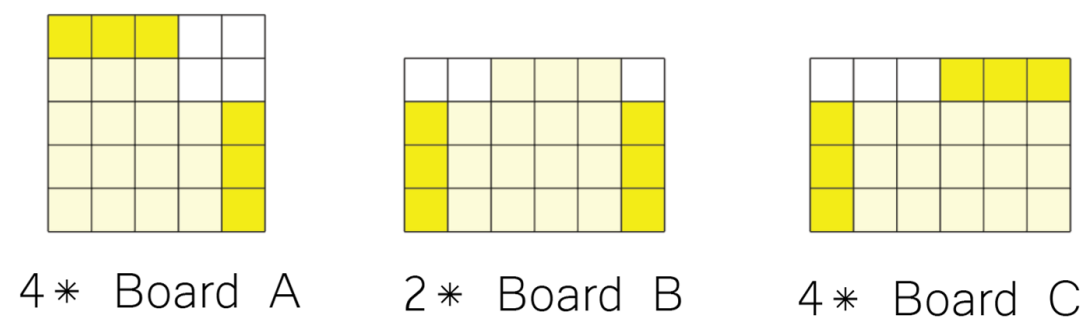
The different types of tiles are: a shared space tile, where shared modules can be placed. The buildable tile, where room modules can be placed. And a courtyard tile, which should always face towards the central courtyard.
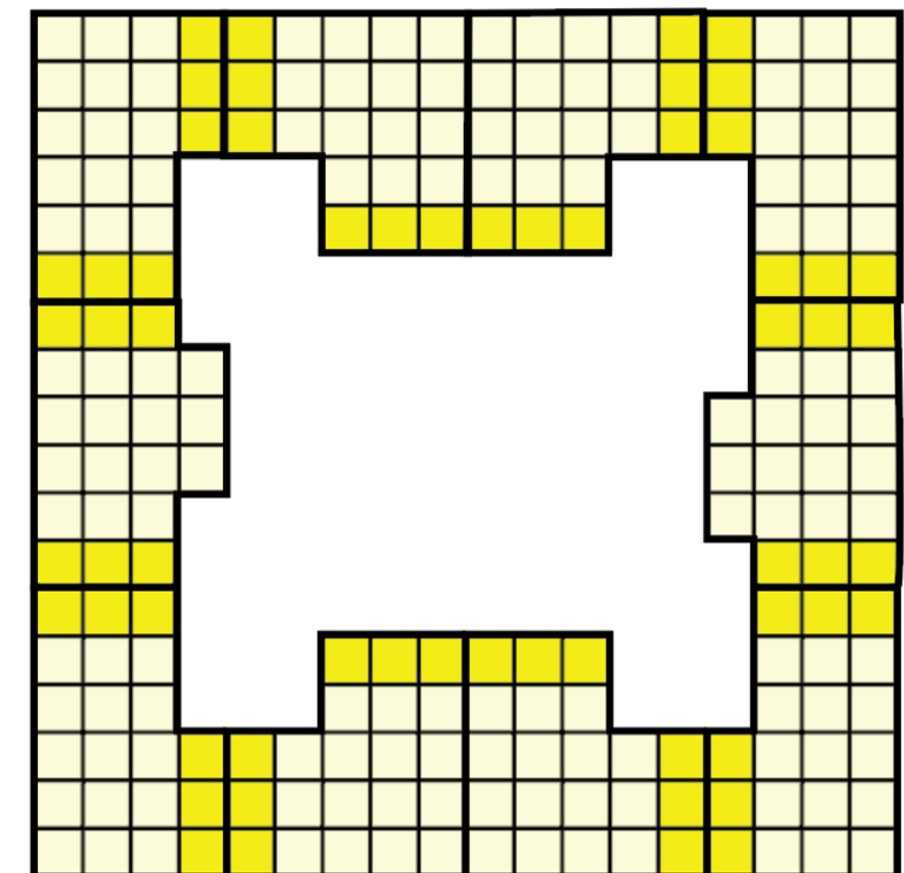
■ Shared tile ■ Build-able tile □ Courtyard/empty tile (needs to face inwards to the courtyard)

5*5
7m
7m
49m2

4*6
5.6m
8.4m
47m2

5*5
7m
7m
Board A

4*6
5.6m
8.4m
Board B

4*6
5.6m
8.4m
Board C

Design Development

Definition of the Space Budget/ Game Board

Forming a Cluster
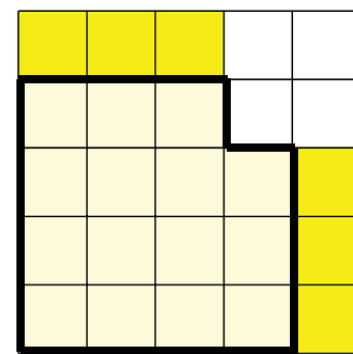
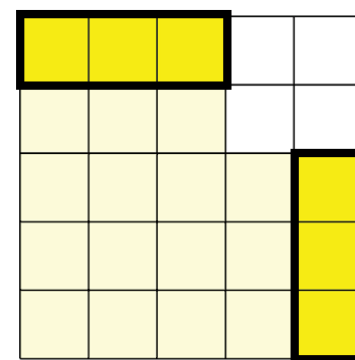By connecting the shared space tiles of the boards, different clusters can be formed based on the number of households.

4 ∗ Board A 2 ∗ Board B 4 ∗ Board C

Courtyard

Courtyard

Courtyard

Courtyard

Courtyard

Design Development

Definition of the Space Budget/ Game Board

Adding a board type

1. The board size must be an approximation of the space budget abstracted by the use of tiles.
2. A board must include 15 Buildable tiles connected to each other.
3. The buildable tiles must be connected, and can accommodate the room modules.
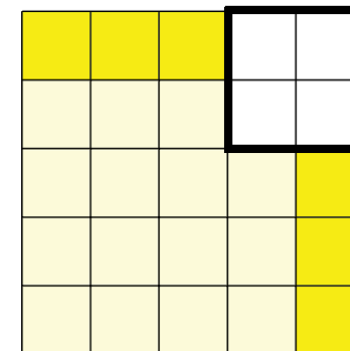4. There must be 6 tiles for shared spaces, placed on the edges.
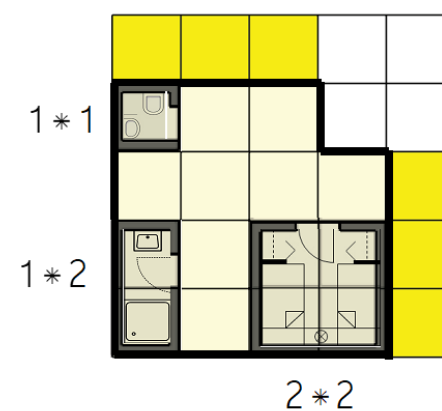5. There must be 3-4 courtyard tiles.
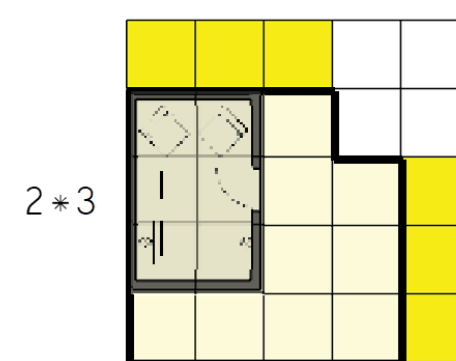

15 buildable tiles

6 shared tiles

3-4 courtyard tiles

1*1

1*2

2*2

2*3
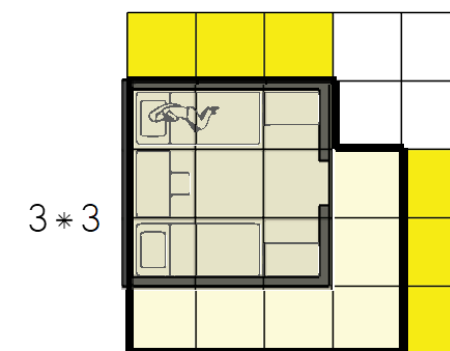
3*3

Different size of modules placed on the buildable tiles.

Design Development

Definition of the Modules

1*1 — Balcony, Corridor, Toilet
2*1 — Bathroom, Kitchenette
2*2 — Kitchen, Commercial

2*2, 3*2, 3*3 — Multi-purpose room
2*2, 3*2, (3*1)+(3*1), 5*1 — Stairs

Corridor/Balcony
Circulation/Stair
Multi-purpose Room
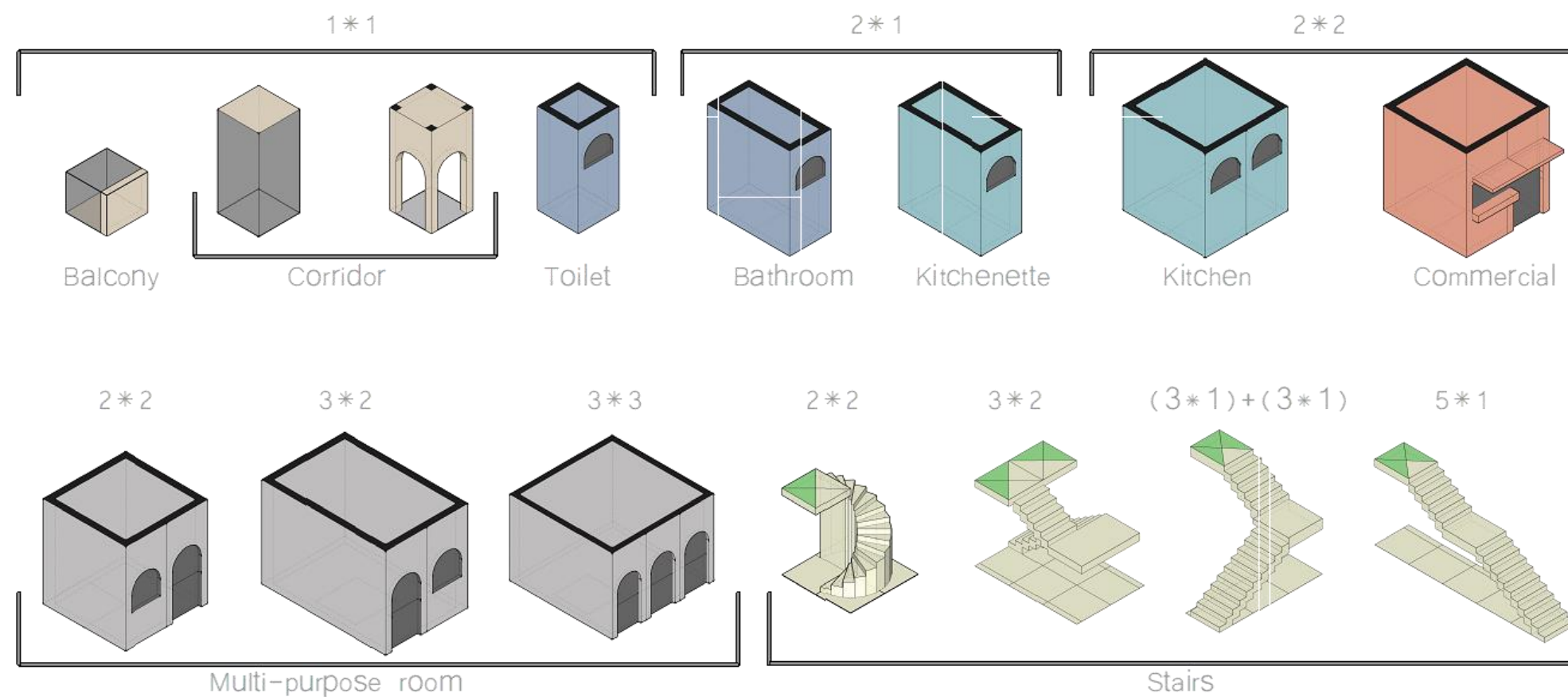Street
Courtyard
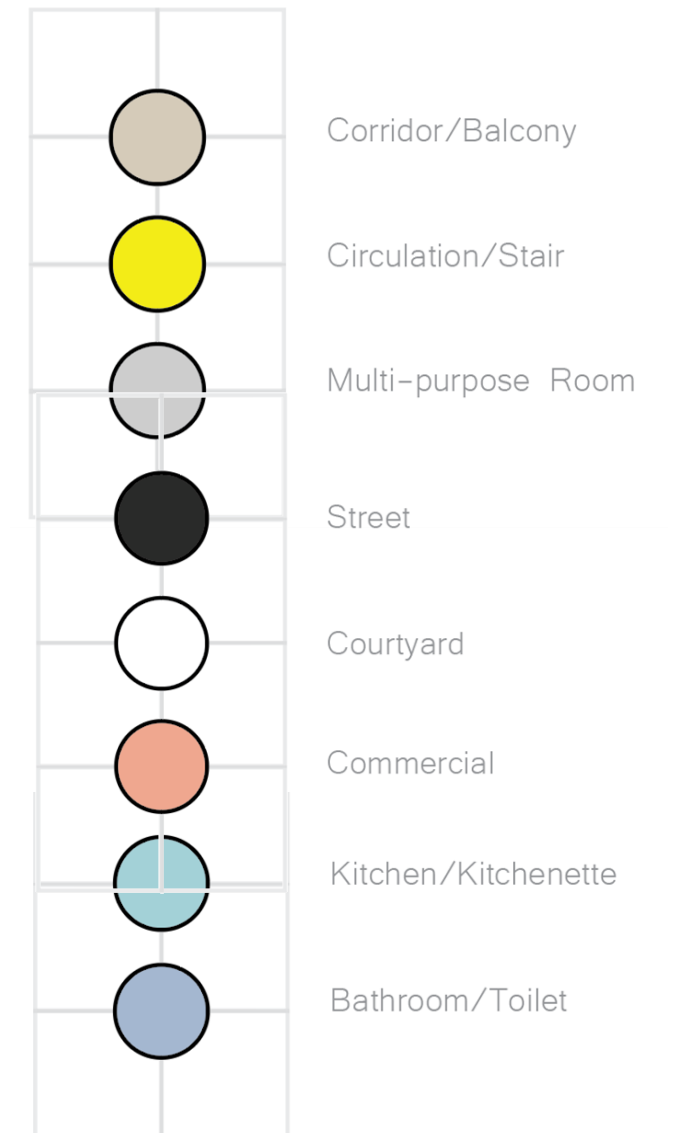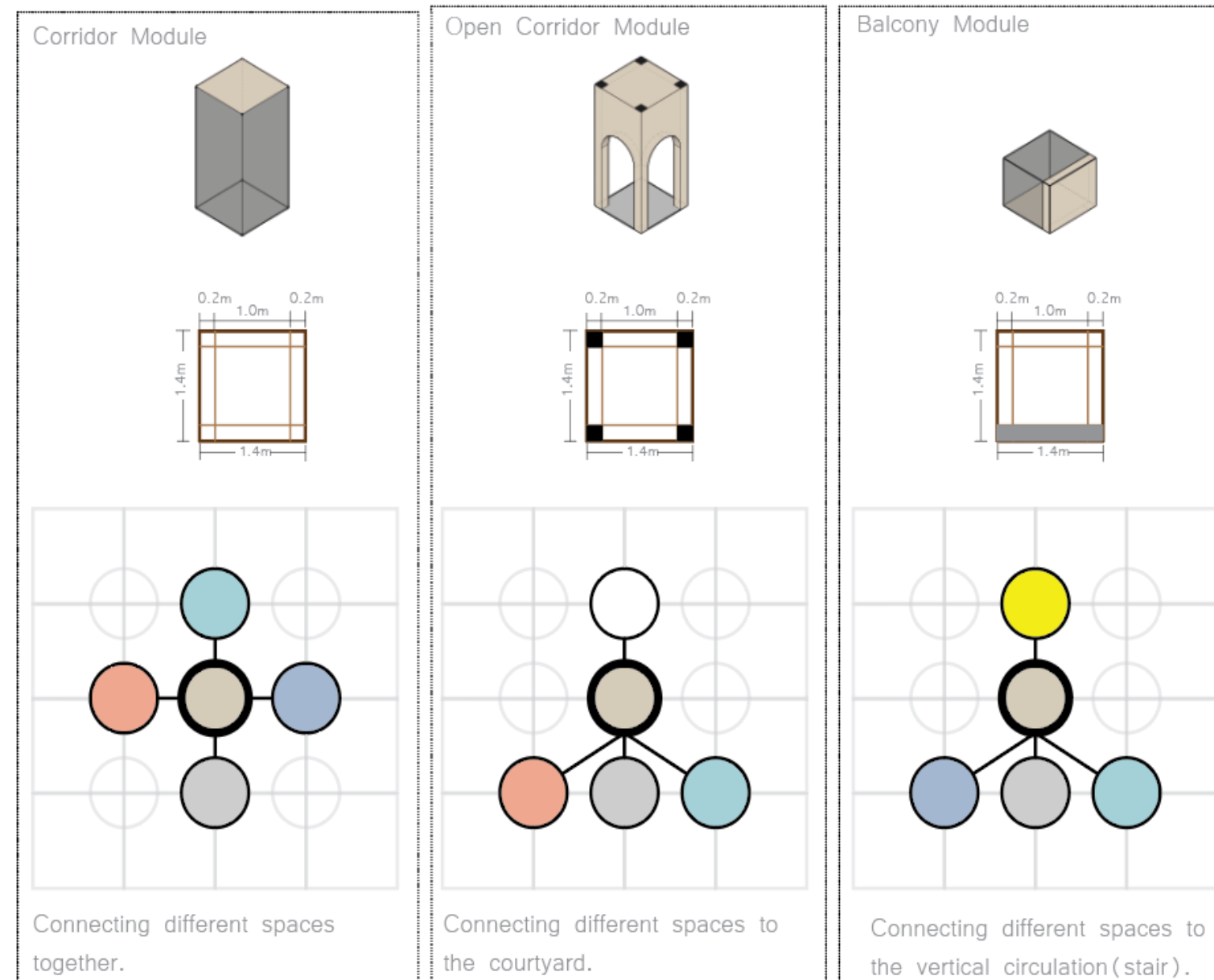Commercial
Kitchen/Kitchenette
Bathroom/Toilet
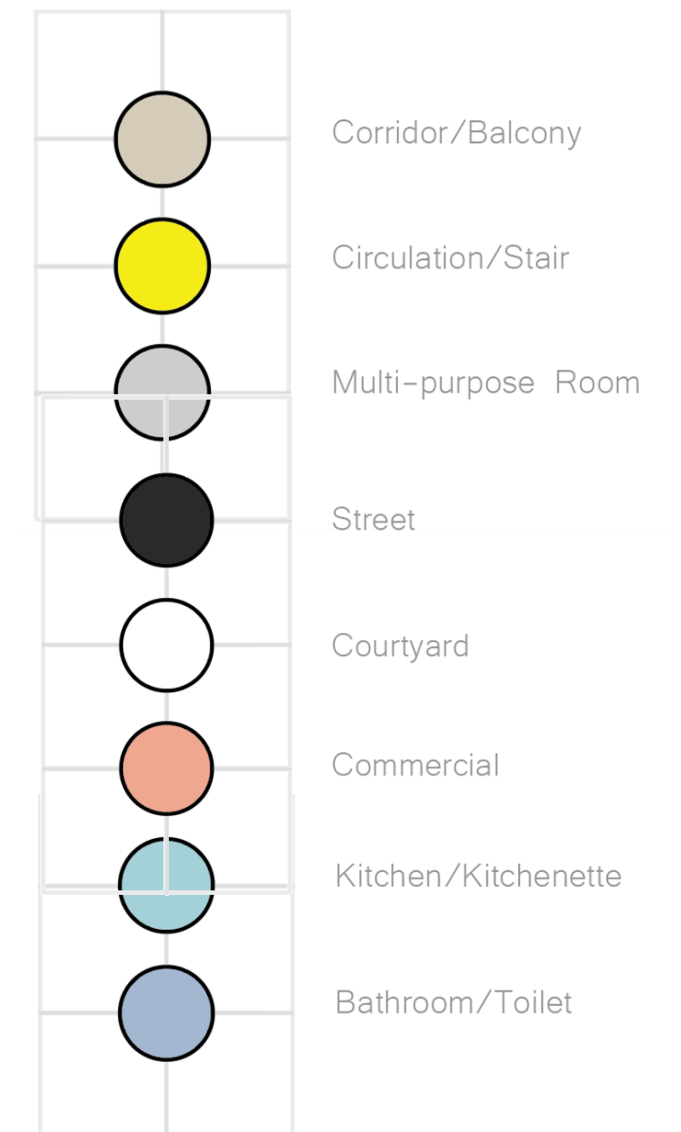
The modules defined in the meta game are abstracted volumetric representation of spaces. The modules are all based on tiles of 1.4m*1.4m.

Design Development

Definition of the Modules

Horizontal circulation

Corridor Module

0.2m 1.0m 0.2m
1.4m
1.4m

Connecting different spaces together.

Open Corridor Module

0.2m 1.0m 0.2m
1.4m
1.4m

Connecting different spaces to the courtyard.

Balcony Module

0.2m 1.0m 0.2m
1.4m
1.4m

Connecting different spaces to the vertical circulation (stair).

Corridor/Balcony

Circulation/Stair

Multi-purpose Room

Street

Courtyard

Commercial
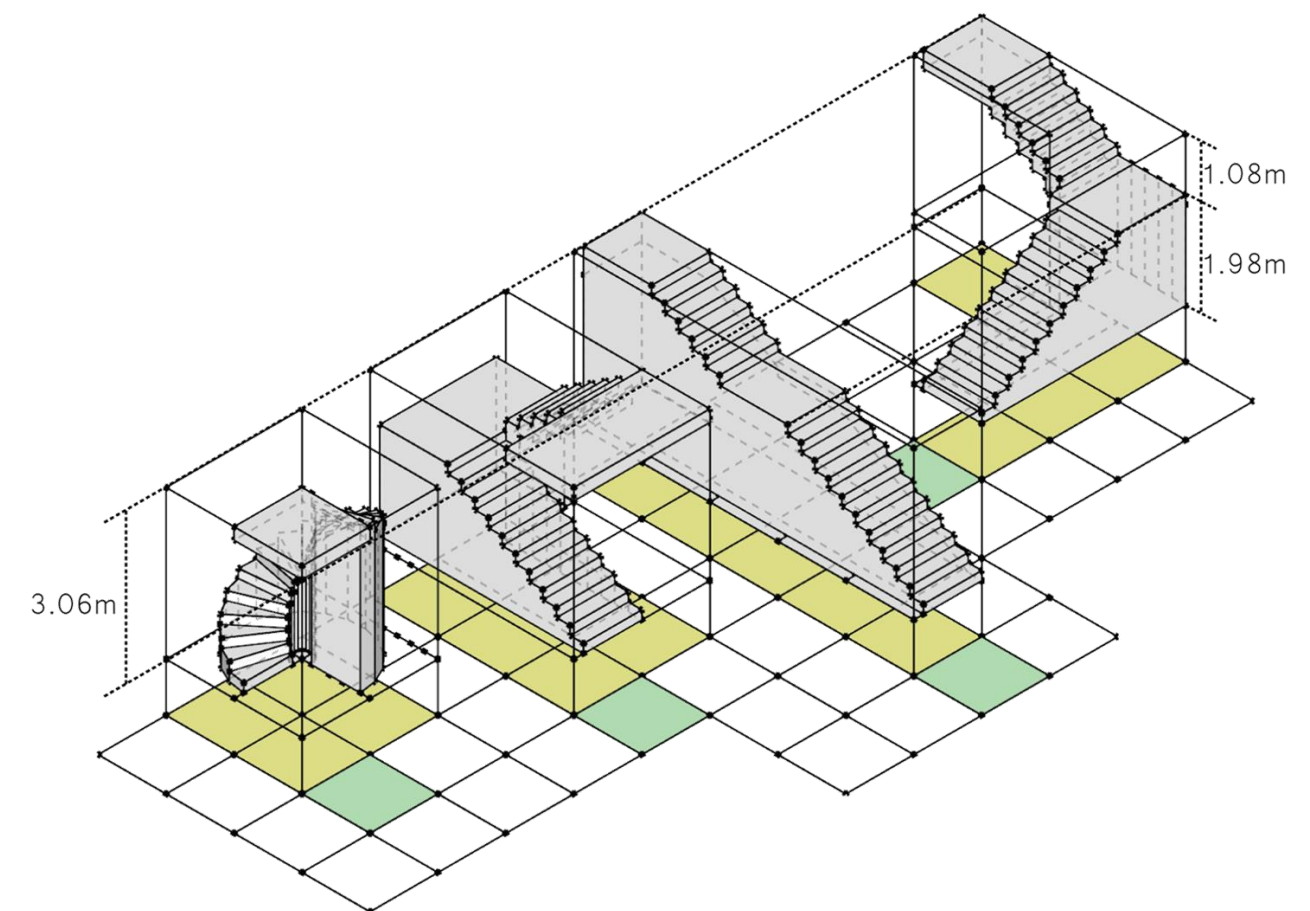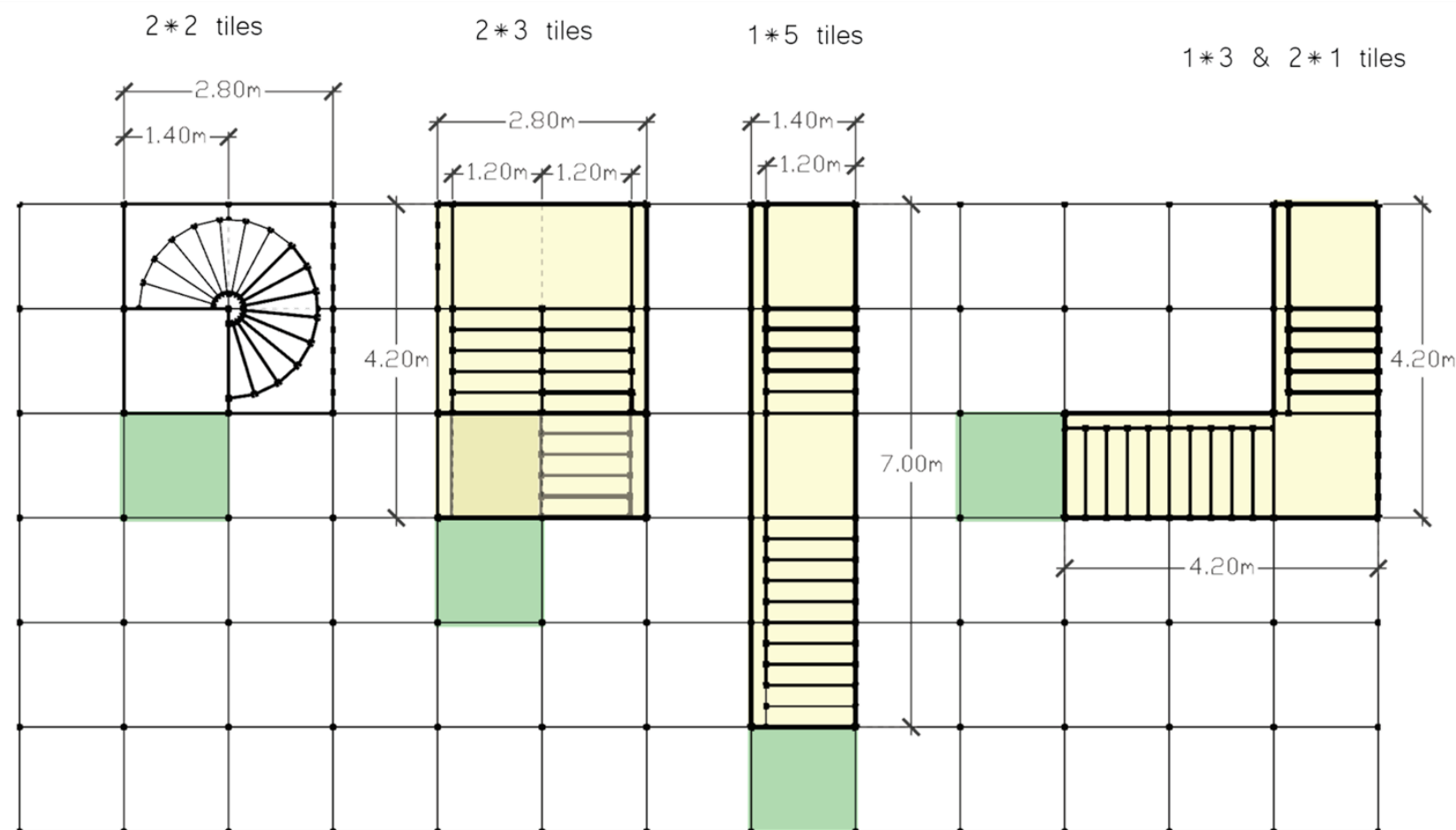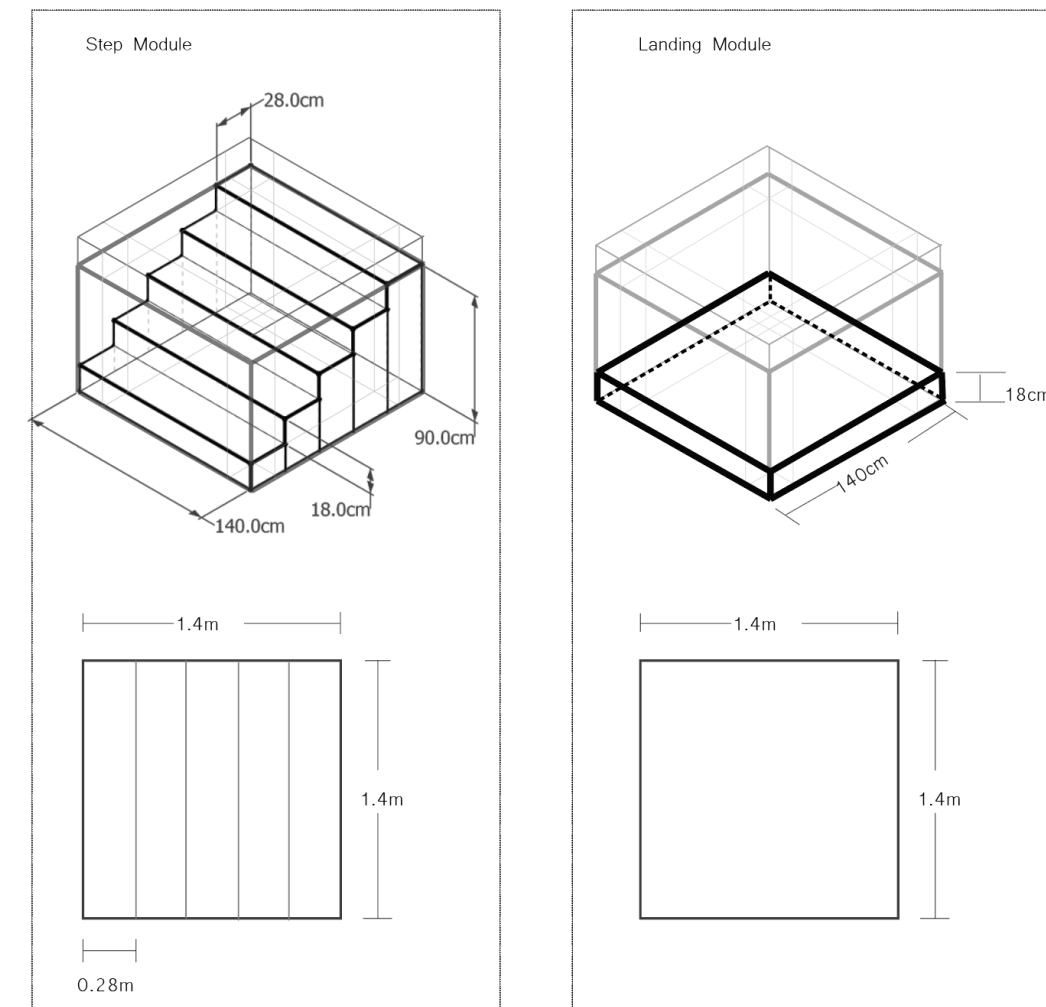
Kitchen/Kitchenette

Bathroom/Toilet

Connect spaces horizontally.

Design Development

Definition of the Modules

Vertical circulation

Design Development

Definition of the Modules

Multi-purpose room

Multi-purpose room

2*2   3*2   3*3

1.4m
1.4m
2.8m
4.2m
4.2m

2.8m

2.8m   4.2m

1.4m

1.4m

Corridor/Balcony

Circulation/Stair

Multi-purpose Room

Street

Courtyard

Commercial

Kitchen/Kitchenette

Bathroom/Toilet
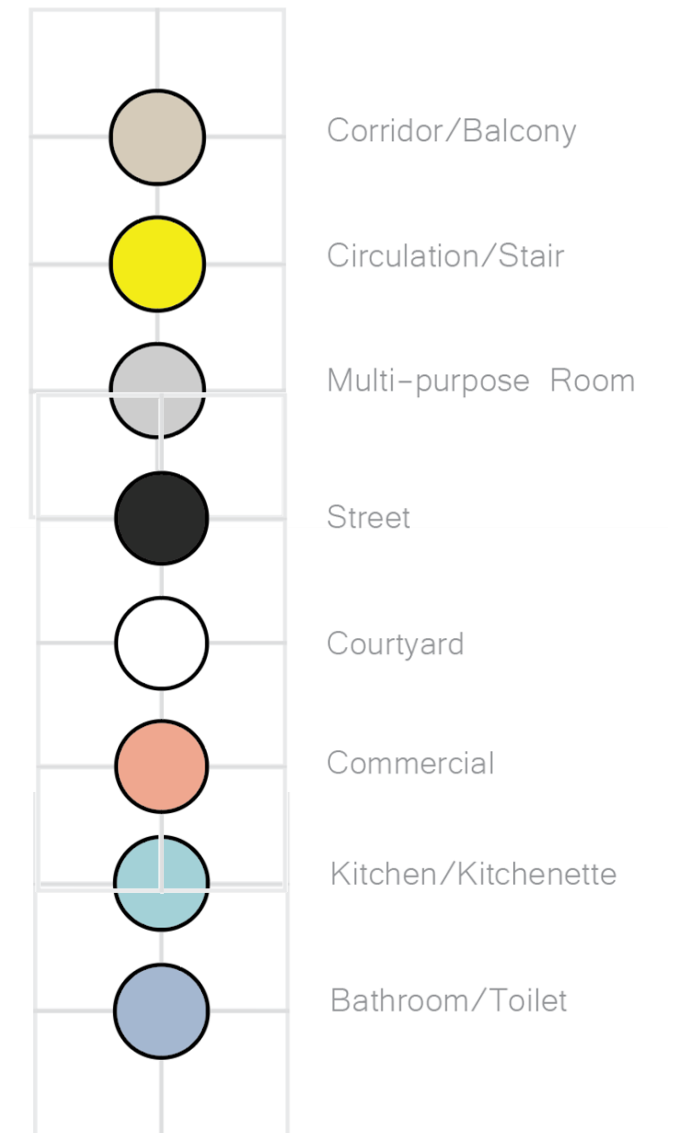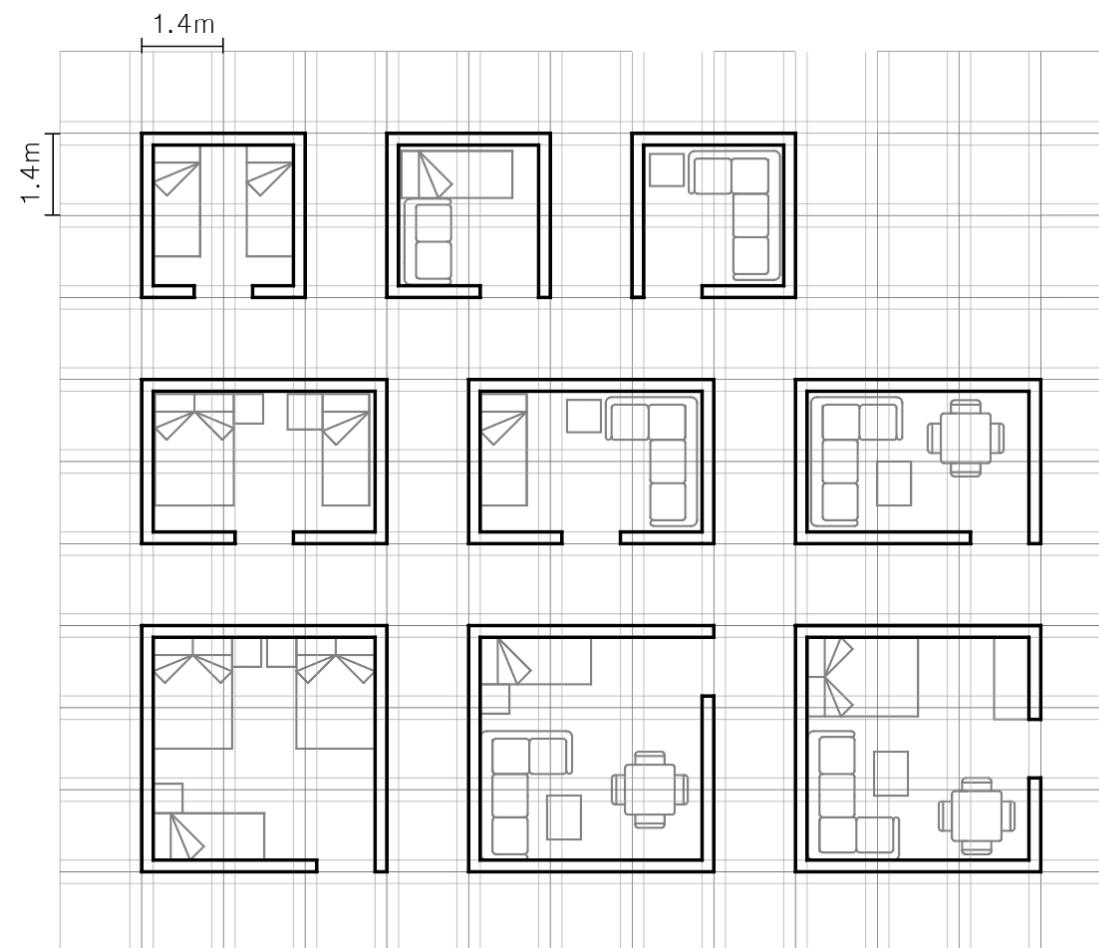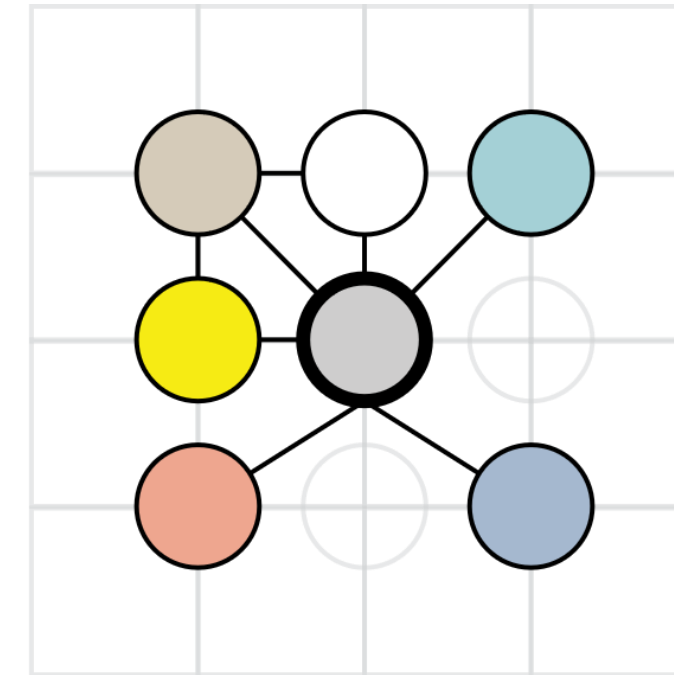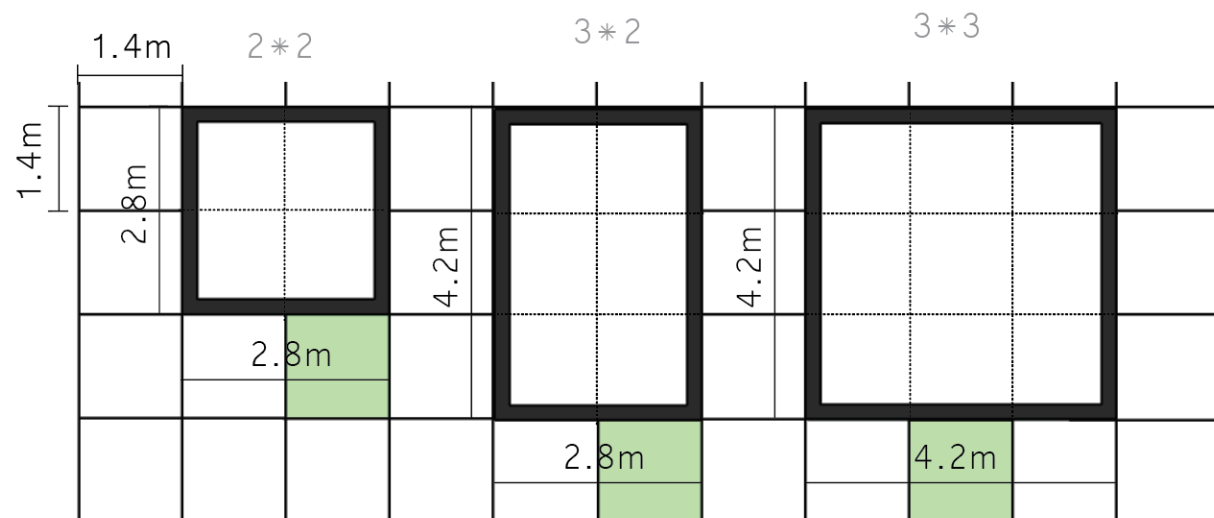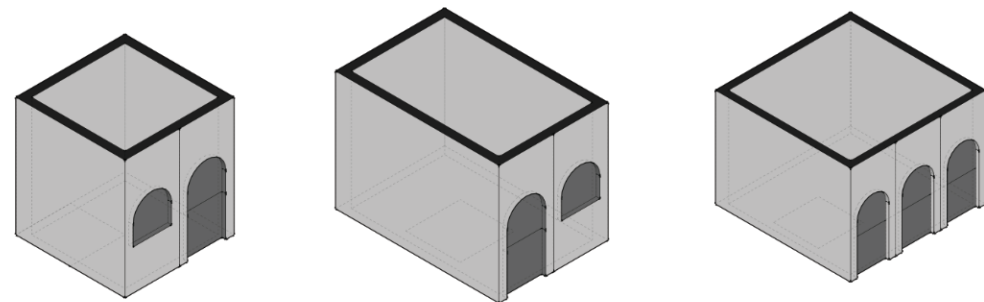
The multi-purpose room module is a volumetric space that allows players to assign multiple functions to the room.

Design Development

Definition of the Modules

Kitchenette and Kitchen Module

Corridor/Balcony

Circulation/Stair

Multi-purpose Room

Street

Courtyard

Commercial

Kitchen/Kitchenette

Bathroom/Toilet

2 * 1 tiles

2 * 2 tiles

Kitchenette

Kitchen

1.4m

1.4m
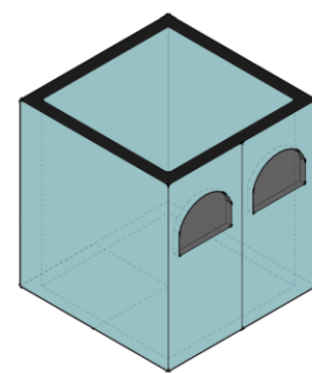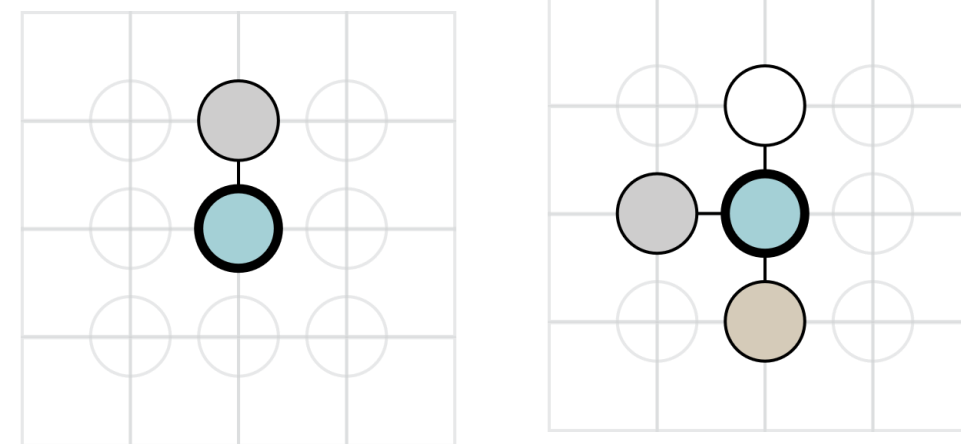
The kitchenette module is used as a space extender of the multipurpose room.

The kitchen module is a 2*2 tile module. This module can be accessed from either a courtyard, a multi-purpose room or from a corridor module.

Design Development

Definition of the Modules

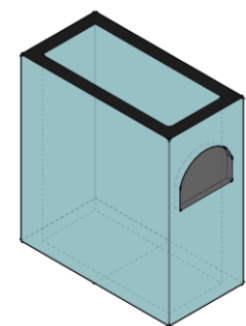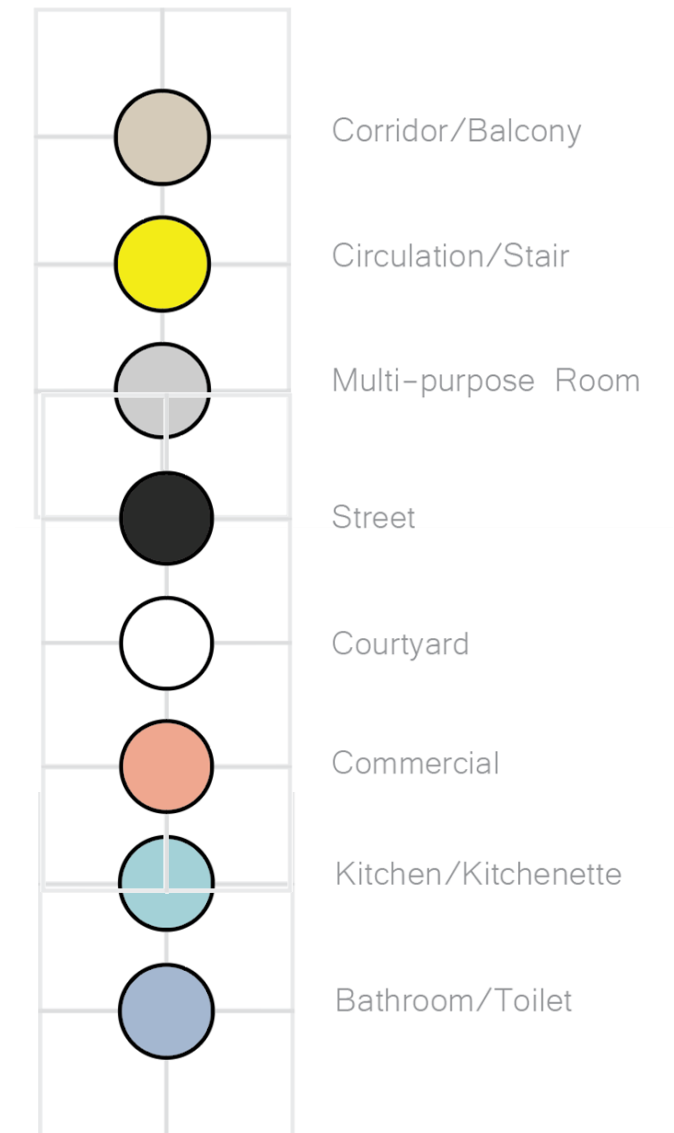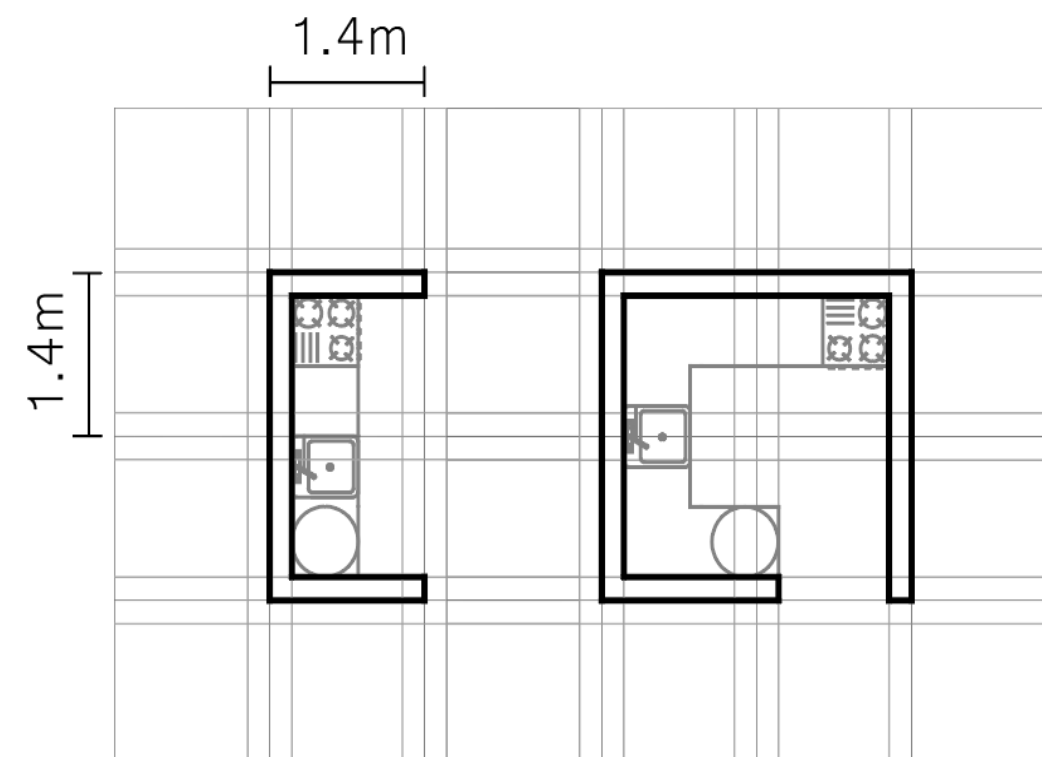**Bathroom and Toilet module**

1 * 1 tiles

2 * 1 tiles

Toilet

Bathroom

1.4m

1.4m

Corridor/Balcony

Circulation/Stair

Multi-purpose Room

Street

Courtyard

Commercial

Kitchen/Kitchenette
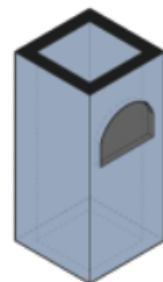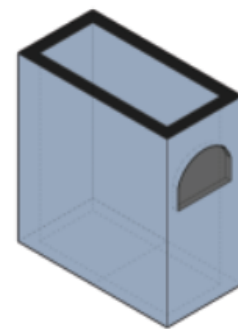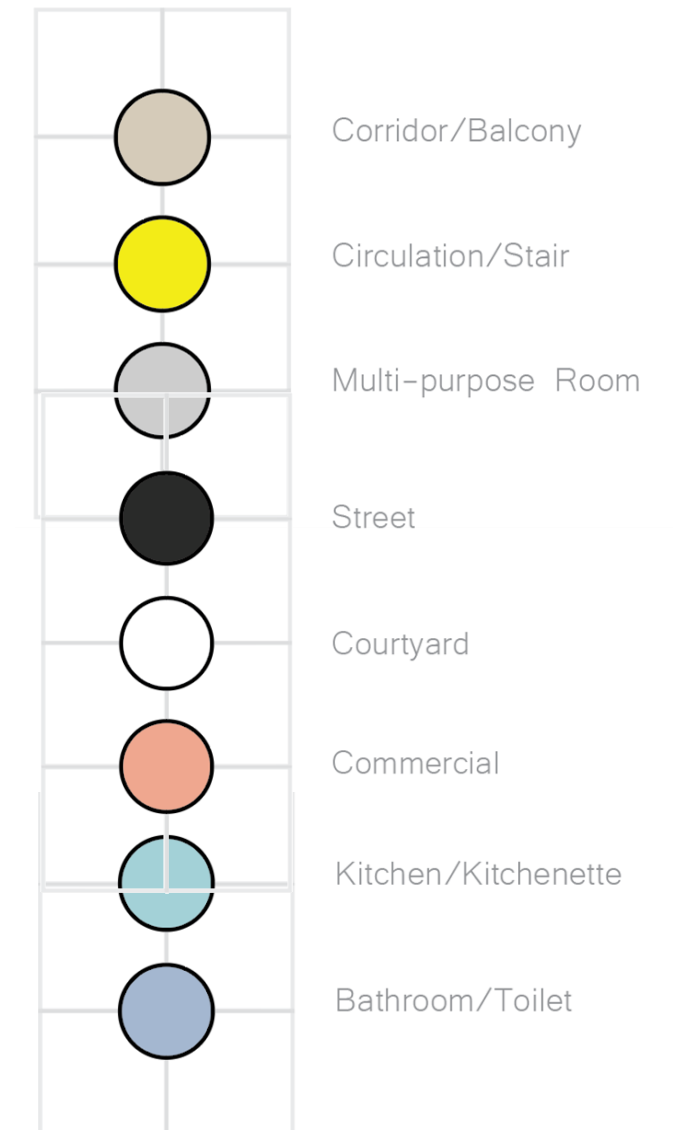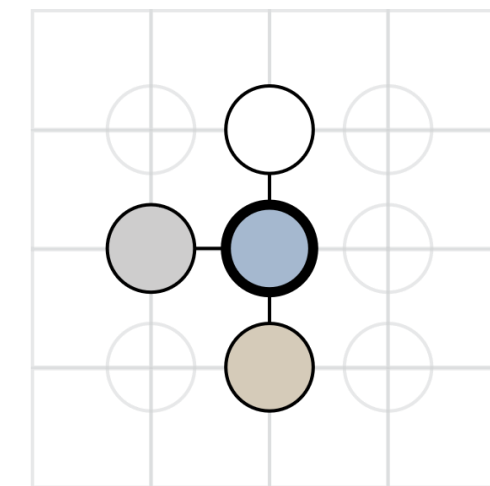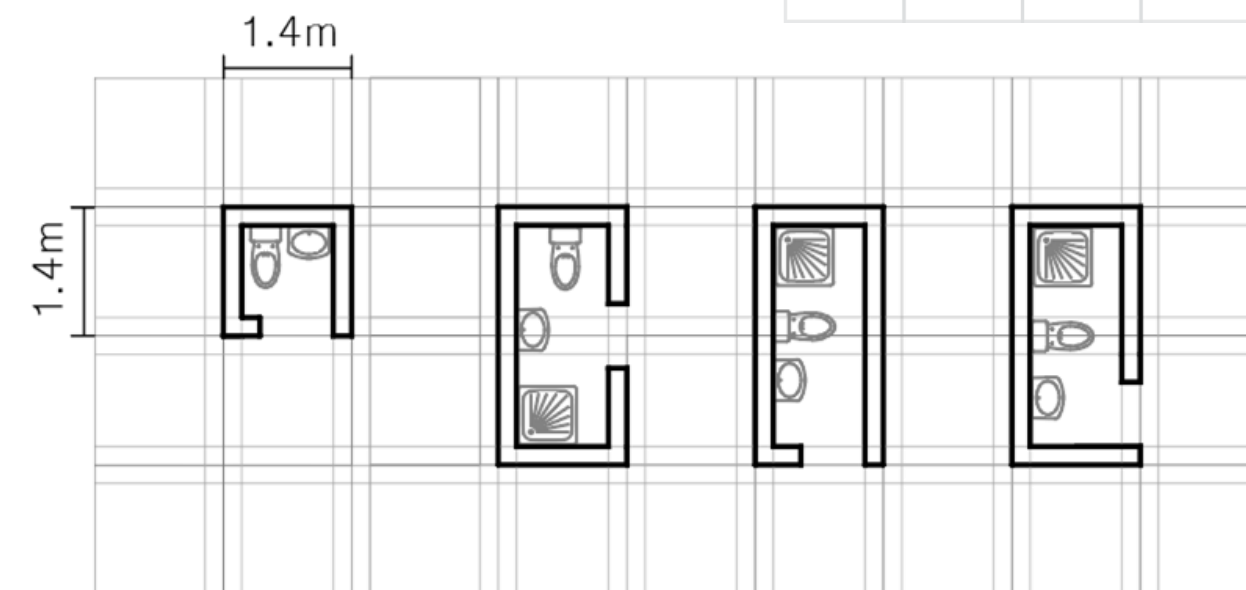
Bathroom/Toilet

The toilet module is made up of one tile and the bathroom module is made up of 1*2 tile.

These modules can be accessed from either a courtyard, a corridor or a multi-purpose room.

Design Development

Definition of the Modules

Commercial module

2*2 tiles

Commercial

1.4m

1.4m

Corridor/Balcony

Circulation/Stair

Multi-purpose Room

Street

Courtyard

Commercial

Kitchen/Kitchenette

Bathroom/Toilet
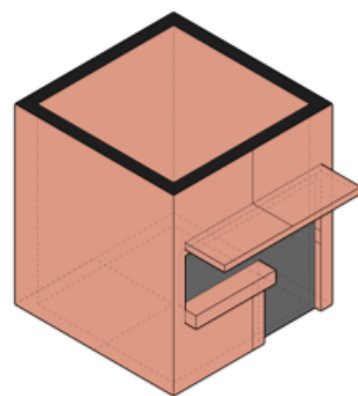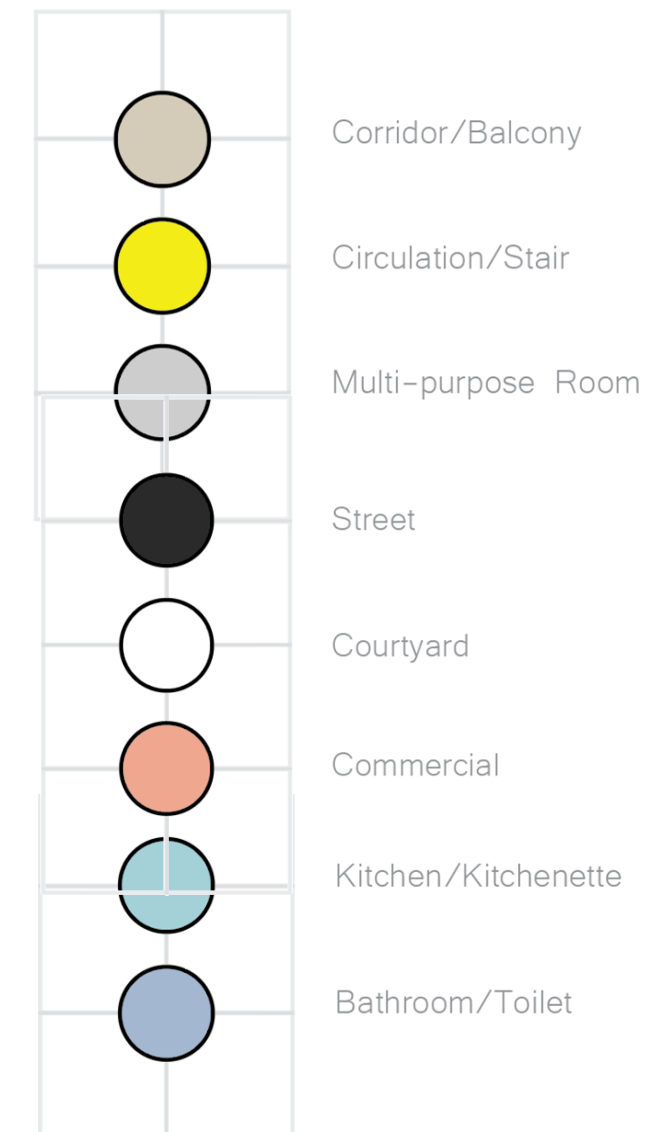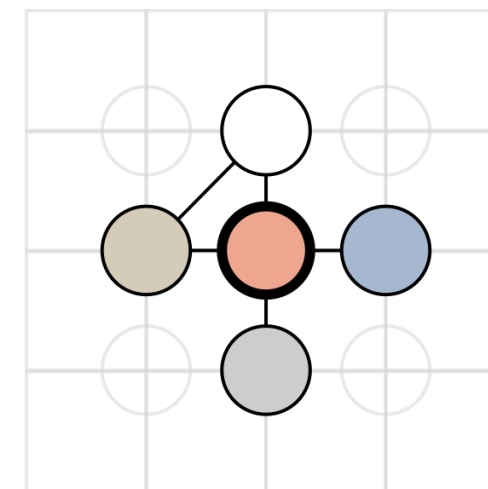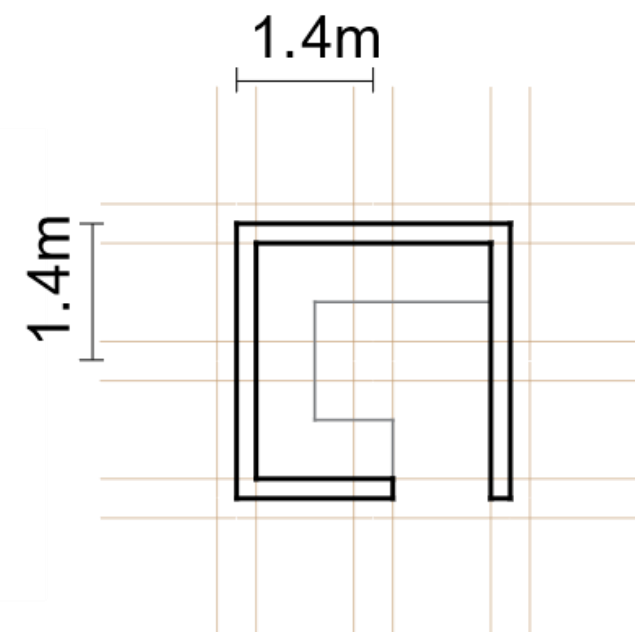
The commercial module is made up of 2*2 tile. This module needs direct access from the street, in addition it can be connected to a courtyard, a corridor module, a multi-purpose room and toilet module.

Design Development

Definition of the Modules

Summary of Modules

1*5

1*1

2*1

2*2

2*3

3*3

1*3
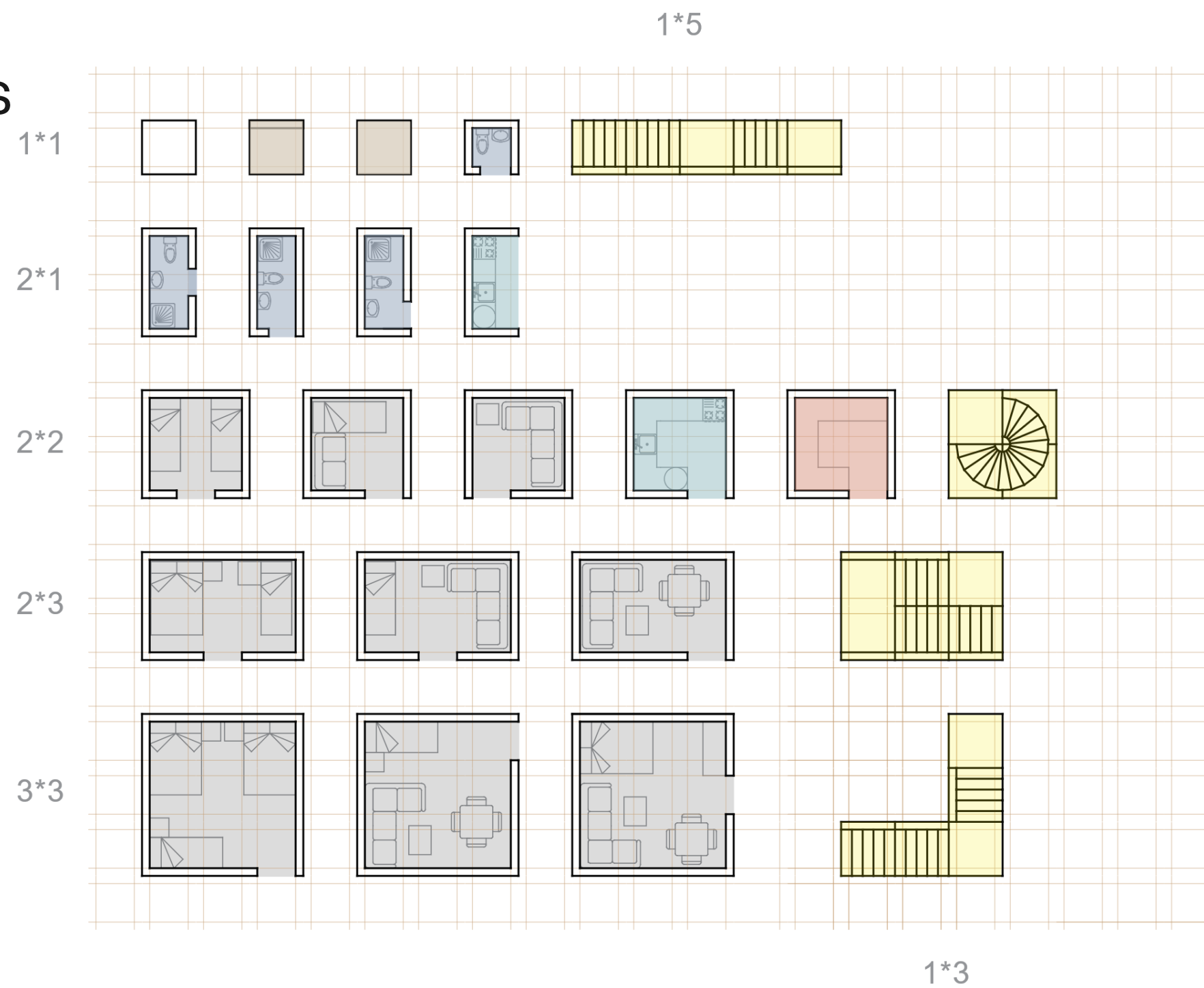
Design Development

Definition of the Modules

Roof Modules
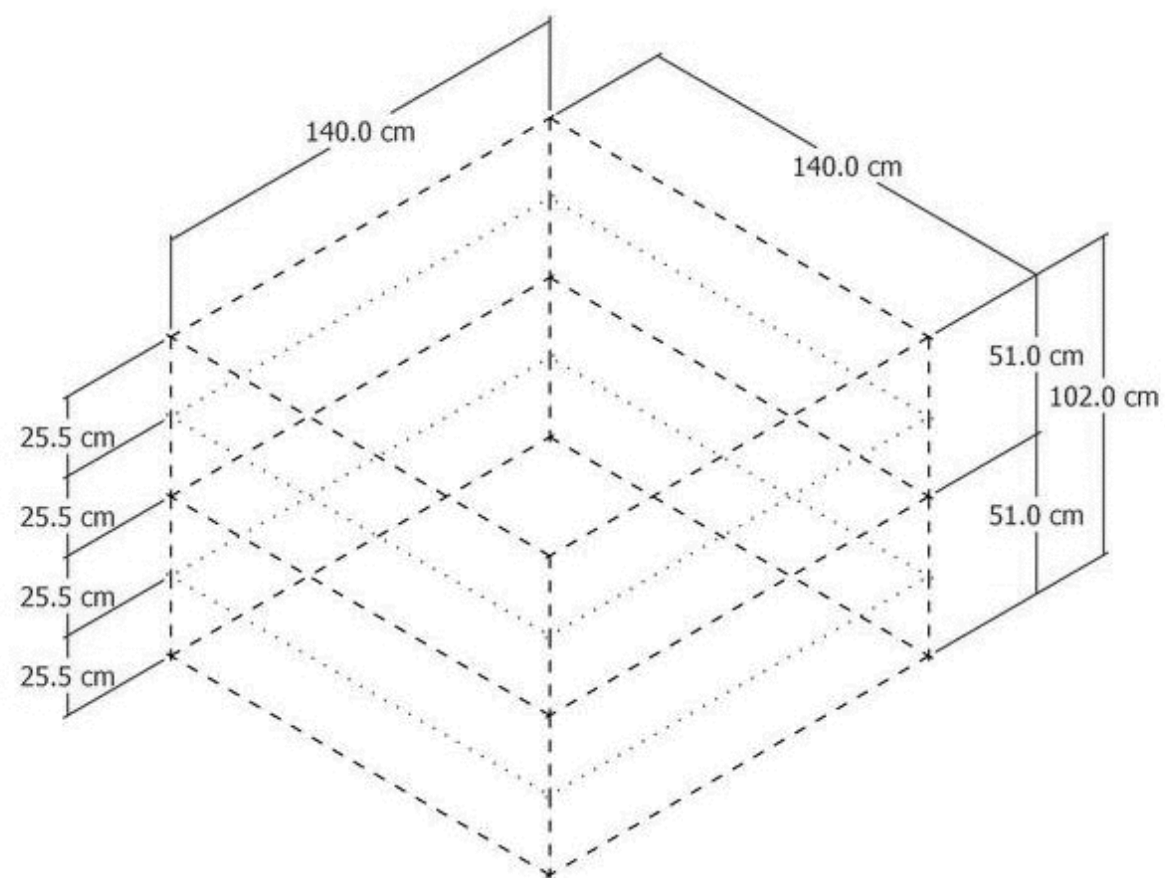
Design Development

Definition of the Modules

Wall Module with Opening rules
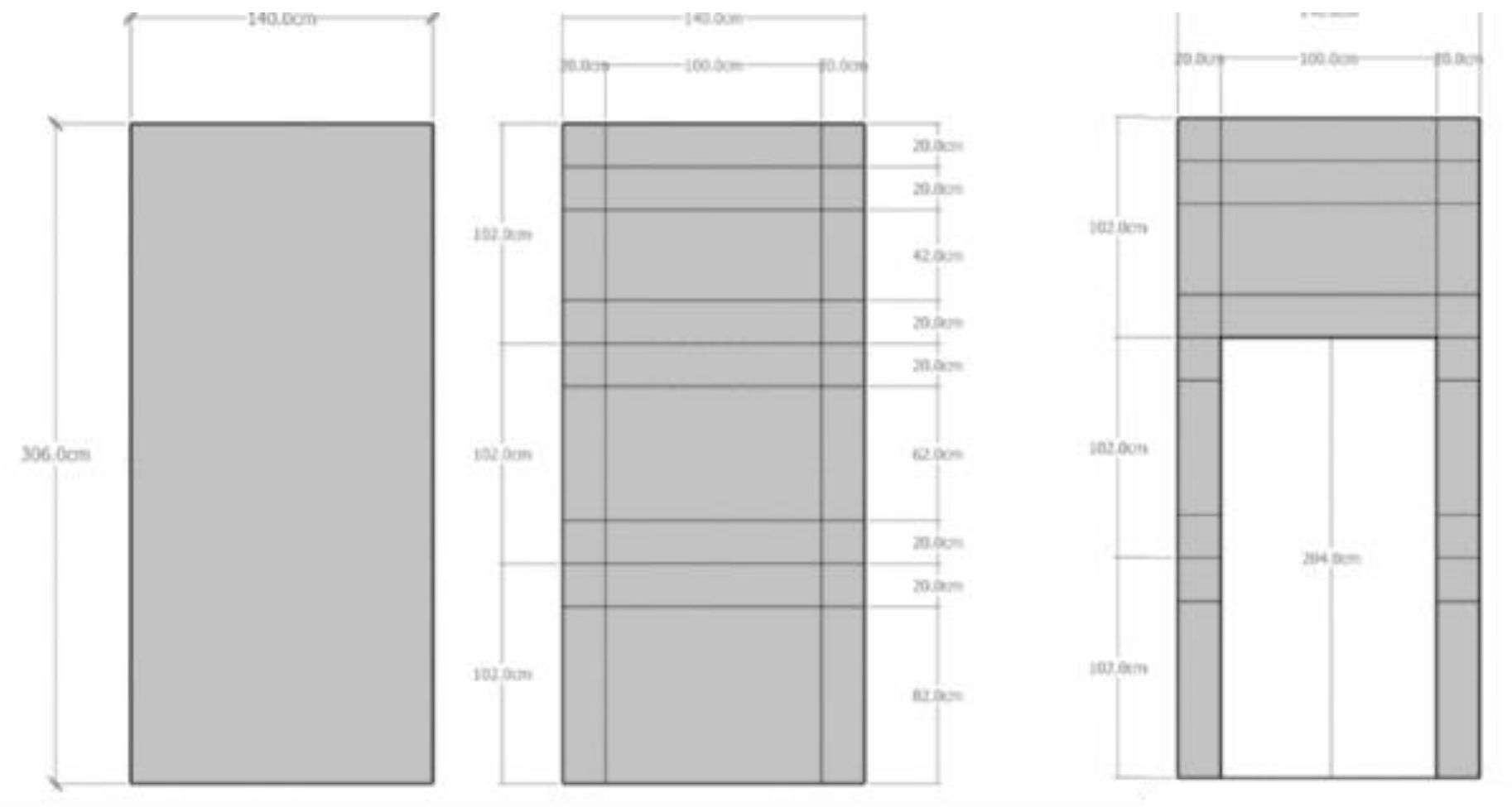
Design Development

Tokens

Tokens are used to acquire modules in the game.
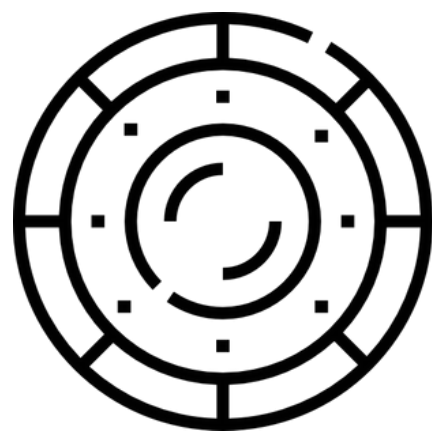
Token
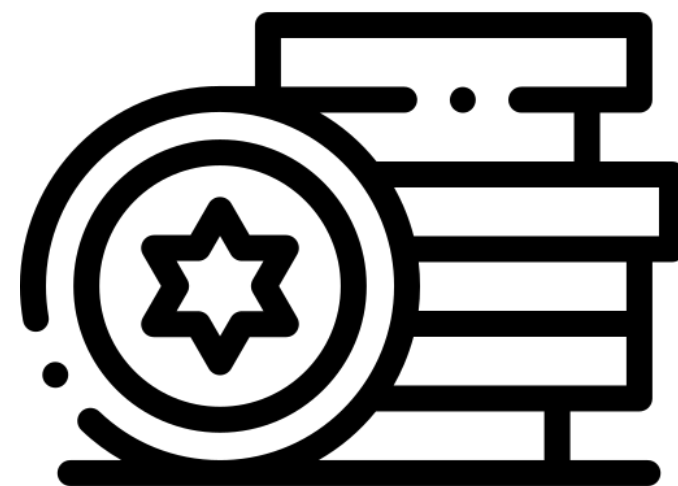
Token Pool

Token pool: the token pool is inspired by the iqub.

The token pool is when players agree to each contribute a fixed amount of token and the total collected token can be used by each player to acquire more modules.

This is considered like a loan system, where the player couldn't immediately afford to pay for a module but can pay for it over a longer period of time.

Design Development

Activity Cards

Activity cards denote activities that can take place in the shared courtyard space.

Washing

Air Drying

Rearing Livestock

Slaughtering Livestock

Preparing Food

Open Fire Cooking

The number of activity cards a player can select will be determined at the beginning of the game play based on the number of households and courtyard size.

The minimum of activity card one player can select is set to three.

Design Development

Activity Cards

Activity cards denote activities that can take place in the shared courtyard space.

Washing

Air Drying

Rearing Livestock

Cancel Activity

Slaughtering Livestock

Preparing Food

Open Fire Cooking
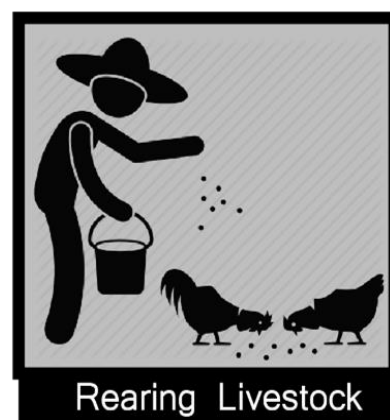
If the players need an activity card that is not part of the deck, the player can request the game master to include it.

For every three activity cards a player can select, the player gets one cancel card that can be used to disapprove of an activity card selected by another player.

If half or more of the players decide to cancel the same activity, that activity will be removed and cannot be practiced inside the courtyard space.

Game Play

Role of the game master
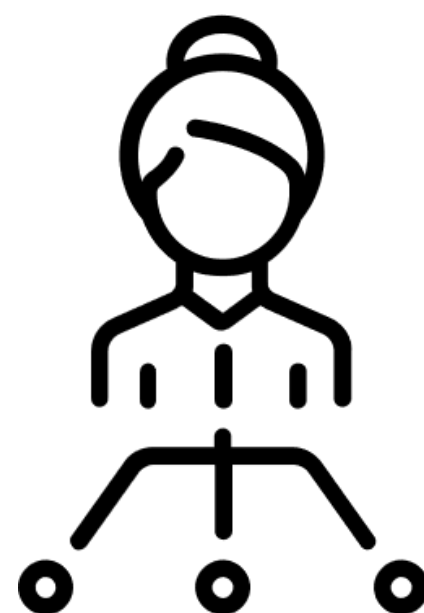
Prepares the game session

Explains the play rules and required Player decisions
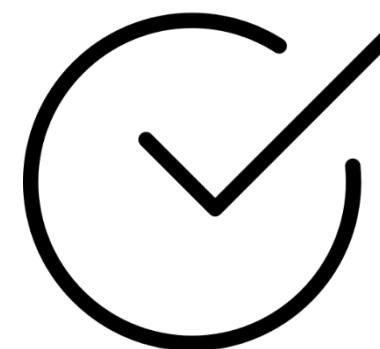
Checks the validity Of the configured space

The gamemaster prepares the game session for the players and describes the events taking place.

The game master acts as a facilitator by explaining the game play rules, the game elements and required players' decisions.

The game master oversees the play process, and checks the validity of the players' configurations.

Game Play

Product Design: game modules
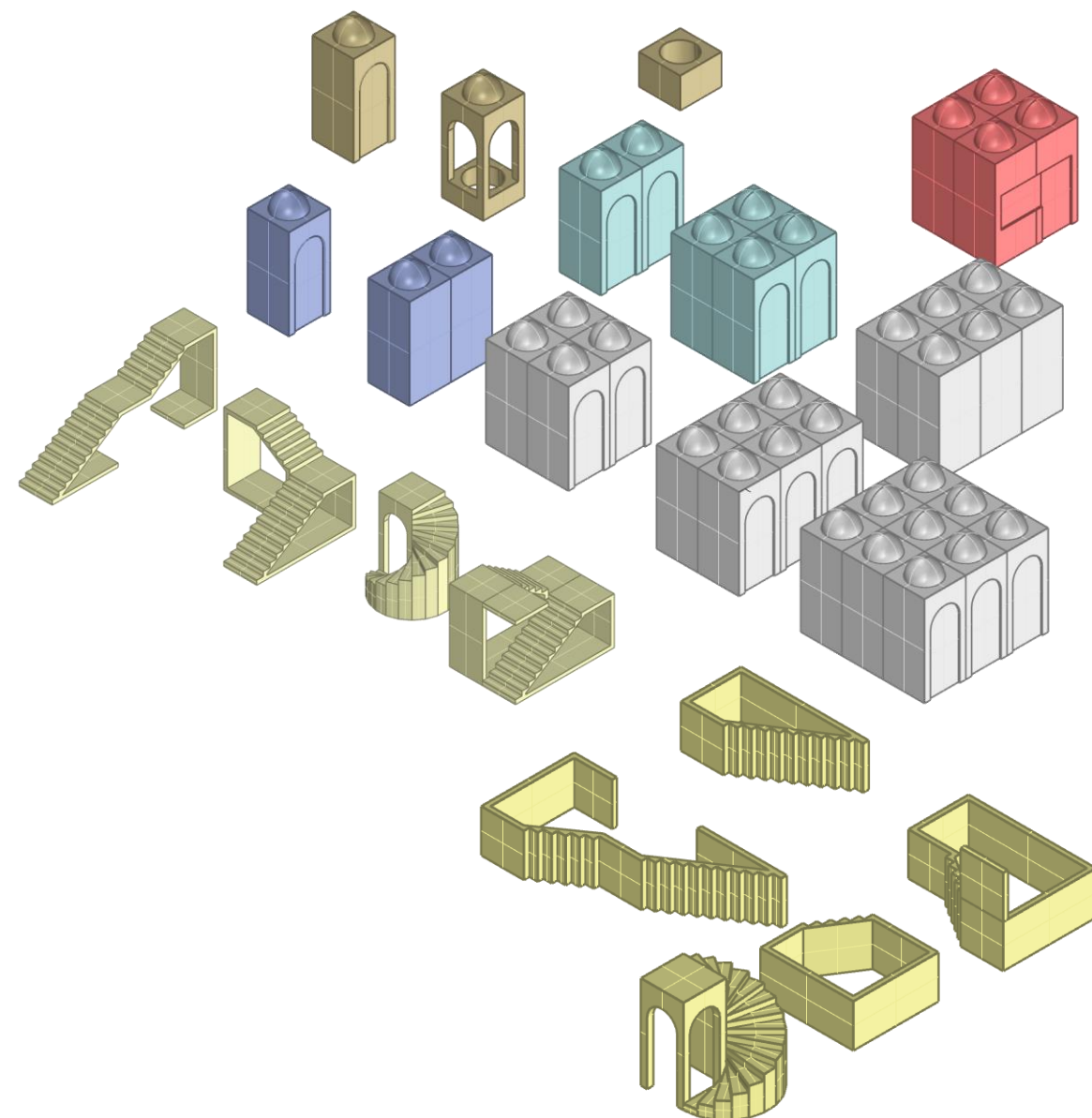
The modules are modeled in rhino at a 1:100 scale and 3D printed so they can be used as physical props representing volumetric spaces in the game play.

The room modules are modeled like a Lego, where they can be stalked vertically.

Game Rules

Level 1: The Cluster

Input:

: Plot max length & max width

: Number of houses in a compound

The challenge is to form a cluster using the 3 different types of boards (Board A, Board B and Board C). The created cluster must have the same number of boards as the number of houses in a compound

Shared tile   Build-able tile   Courtyard/empty tile (needs to face inwards to the courtyard)

5∗5

7m

7m

Board A

4∗6

5.6m

8.4m

Board B

4∗6

5.6m

8.4m

Board C

Courtyard

Board A   Board A
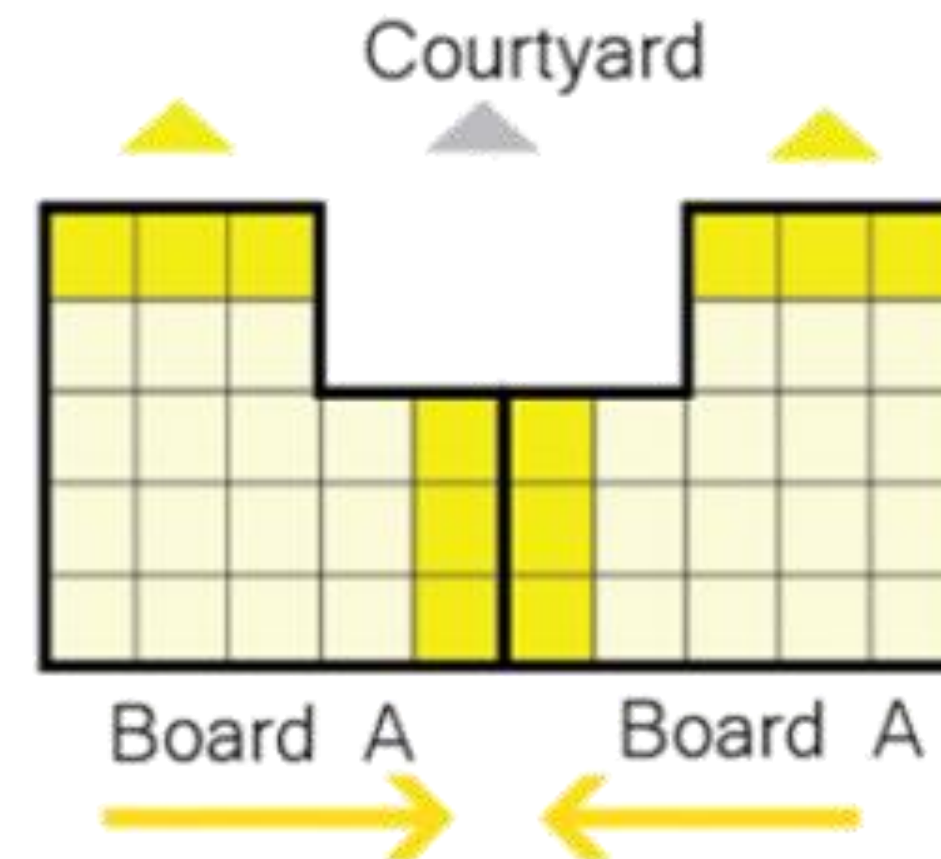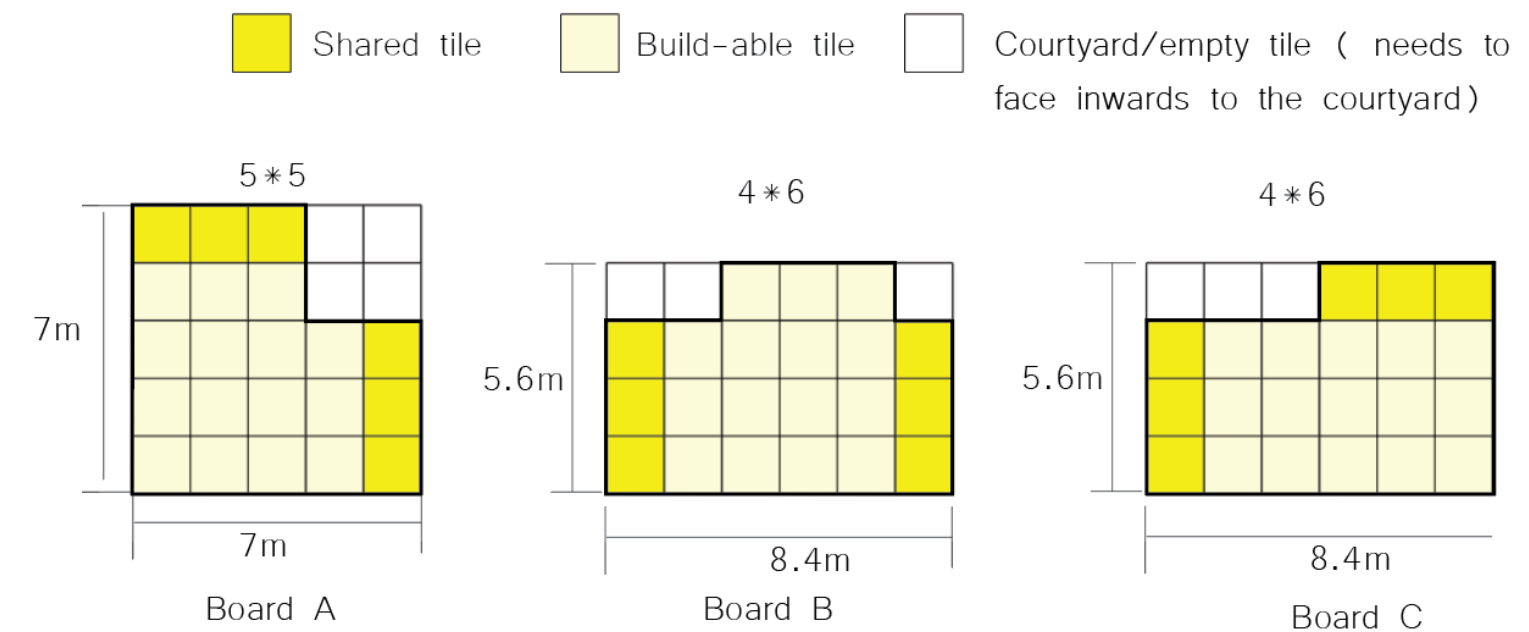
Game Rules

Level 1: The Cluster

The player adjacent to the street on the right side of the entrance into the compound starts the play and the play continues in a counter-clockwise manner.

Game Rules

Level 2: The Configuration

Shared Kitchen
for House 4 & 5
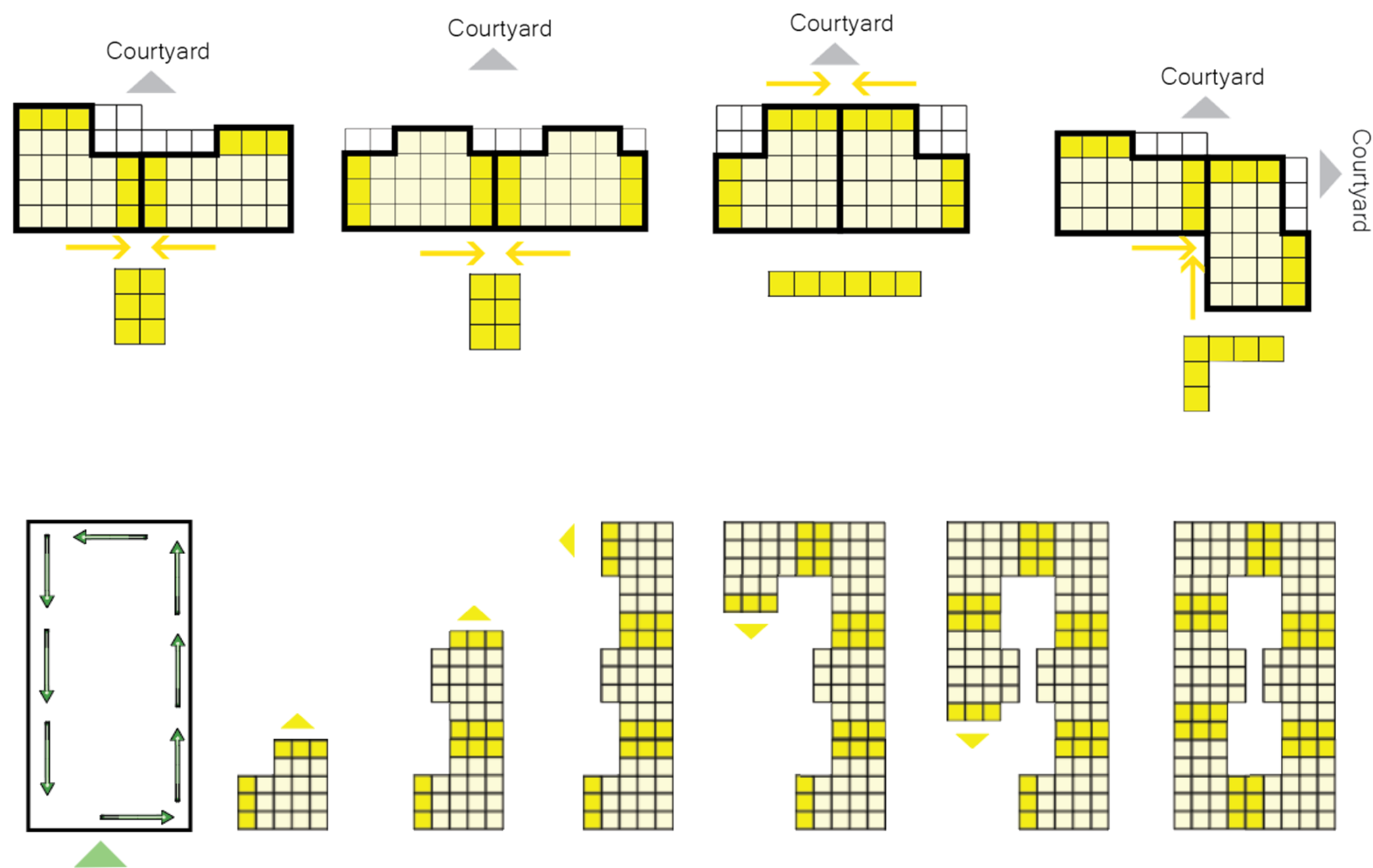
Placing Modules:

The first play in the configuration is to place vertical circulation modules and shared modules. Here neighboring players can decide if they want to place a shared a stair, a private stair, shared modules or leave the space open to allow for light, ventilation and/or access.
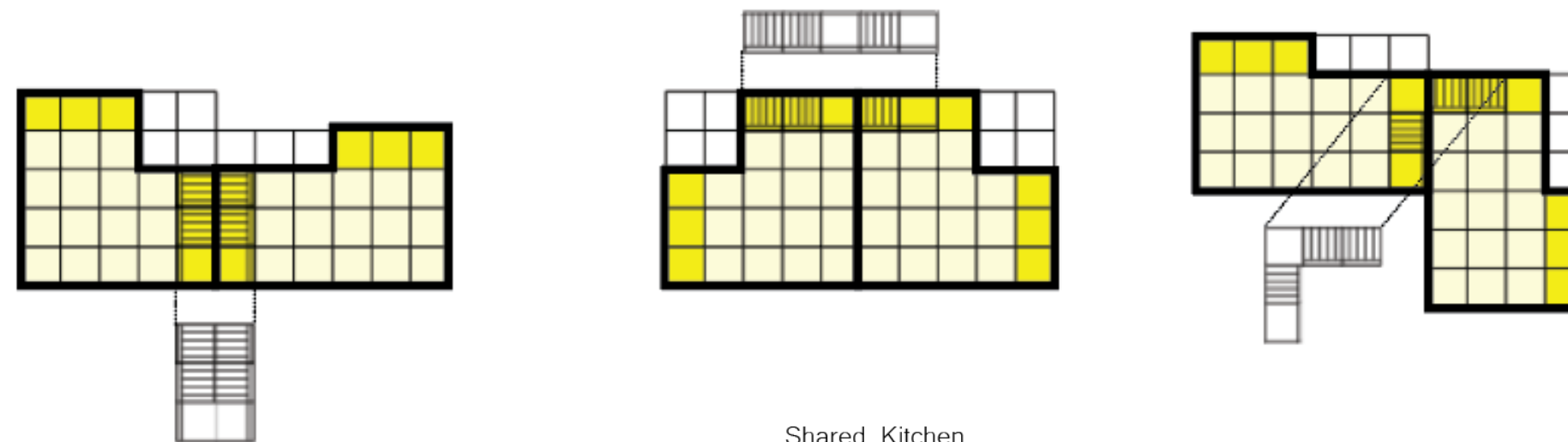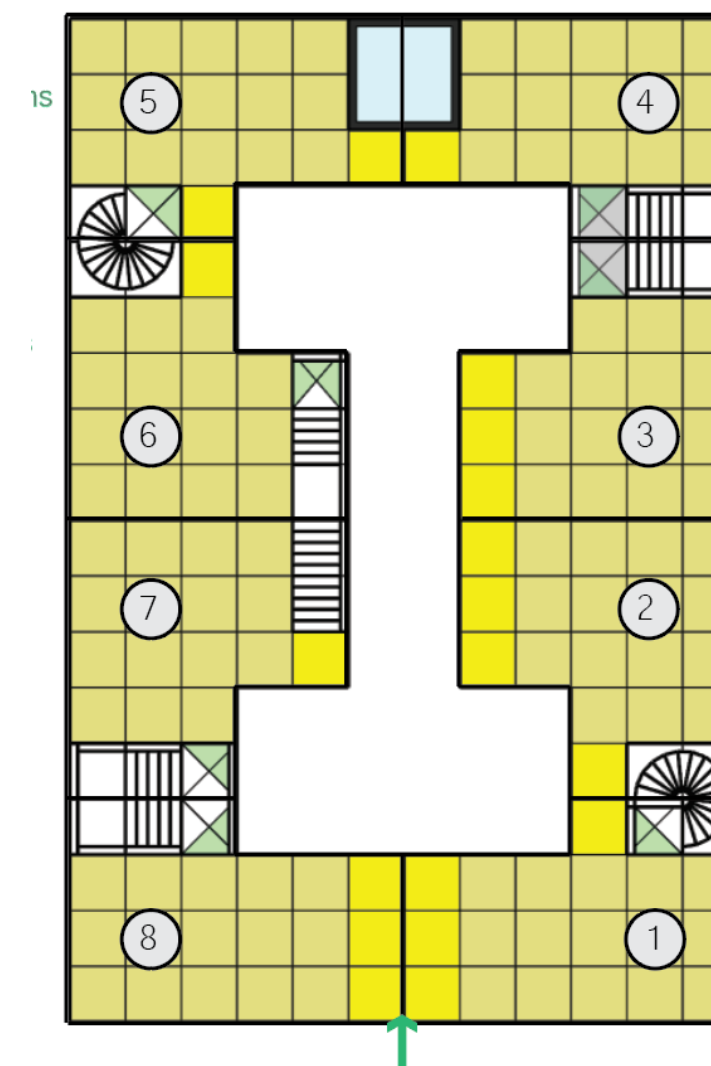
Game Rules

Level 2: The Configuration

Placing Modules:

A. All the room modules need to have one tile open in-front for light, ventilation and/or access

While placing the modules there should be at-least one opening visible for each module and an open access tile for the stairs.
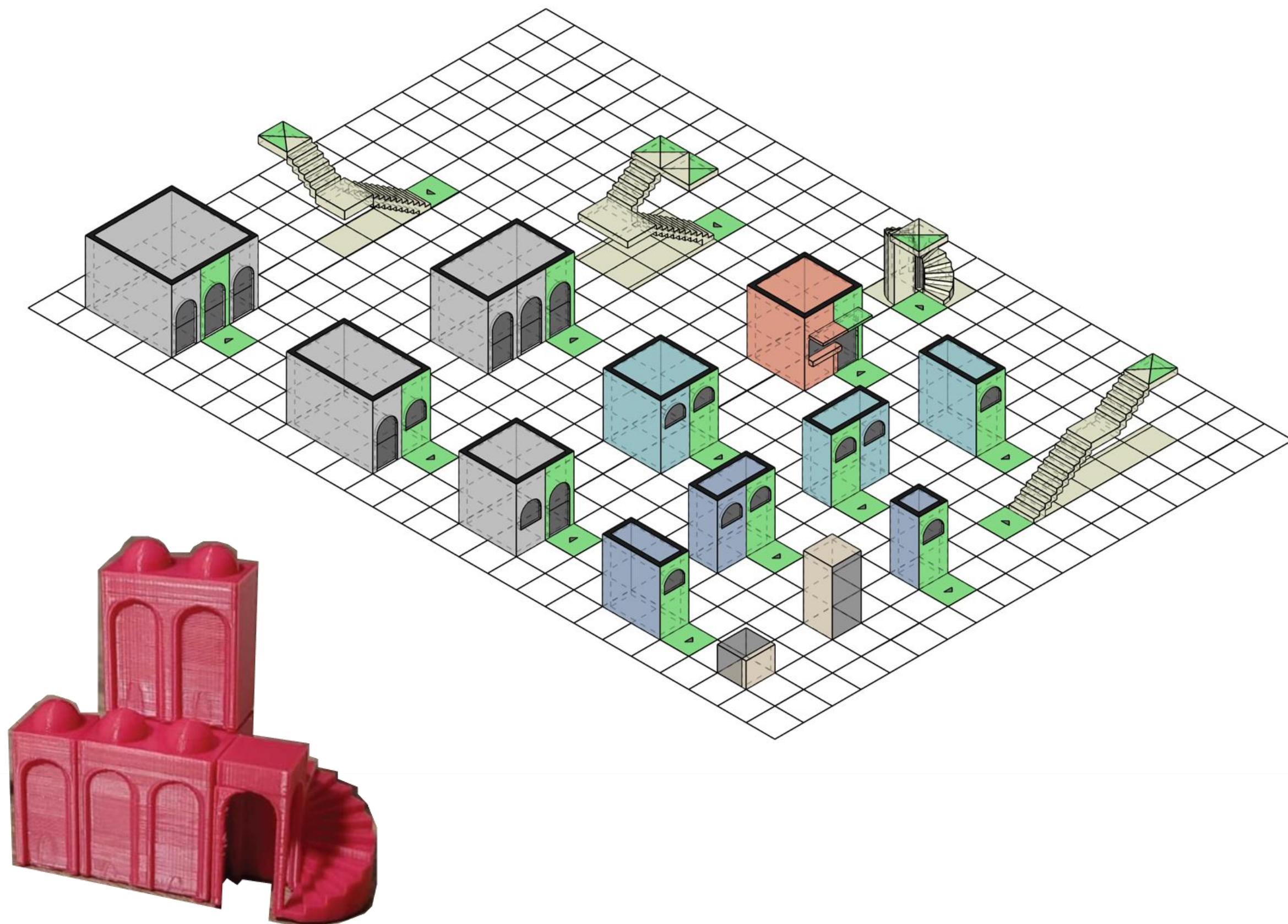
Game Rules

Level 2: The Configuration

Placing Modules:

B. Circulation modules
- The balcony module can be connected to a stair module or another balcony module.
- The corridor module can be placed adjacent to any module and is used to connect different modules.
- The open corridor module should be placed facing the courtyard in-front of the entrance to a Multi-purpose room module.
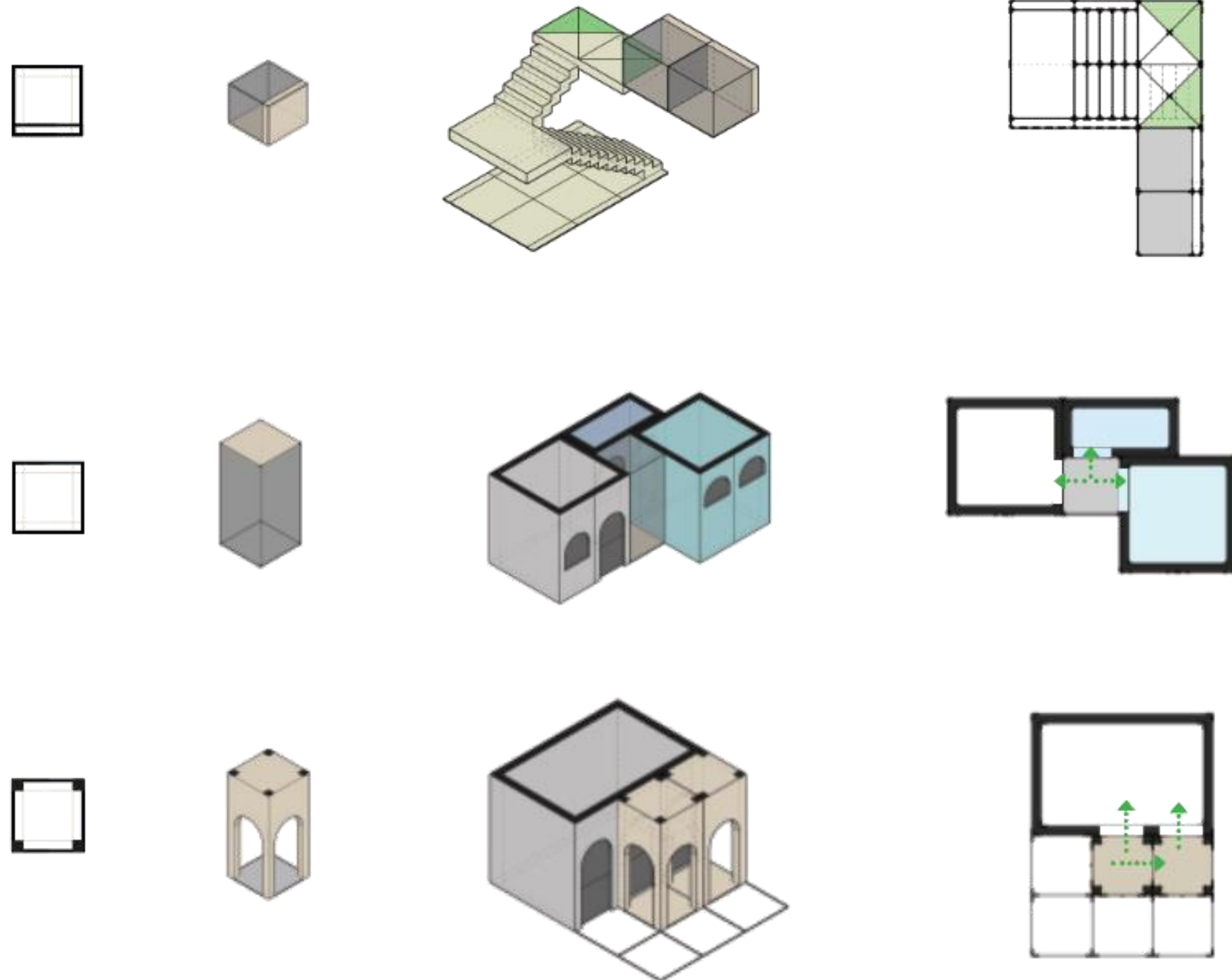
Game Rules

Level 2: The Configuration

Placing Modules:

C. Multi-purpose room modules

- The Multi–purpose rooms should be placed with access from either the courtyard or a horizontal circulation module.
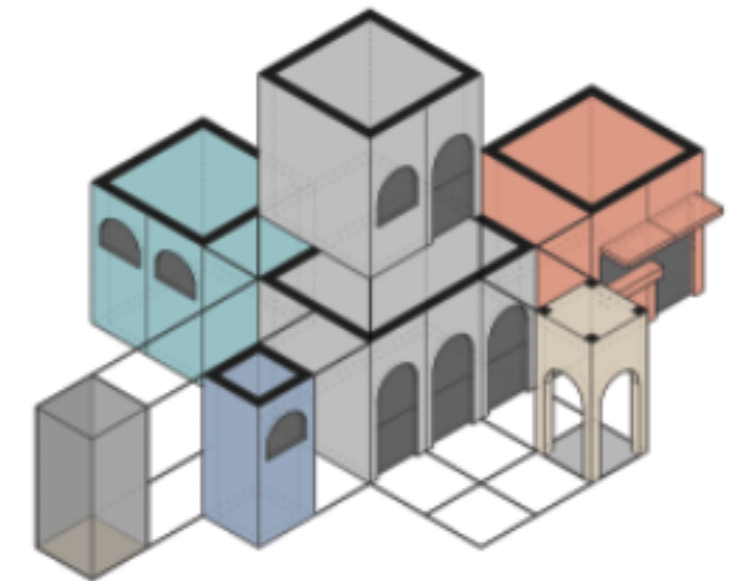- All modules can be placed adjacent to a multi–purpose room module.
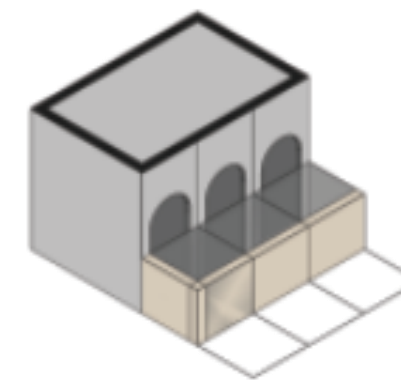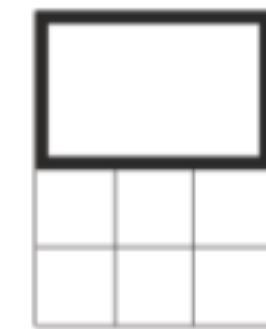
Game Rules

Level 2: The Configuration

Placing Modules:

D. Toilet/ bathroom modules

- The toilet/bathroom module should be placed adjacent to a corridor module or a multi–purpose room module.
- This module can only be placed above another bathroom module or kitchen module. Collection of services by making one side of this module adjacent to a kitchen module results in better design.
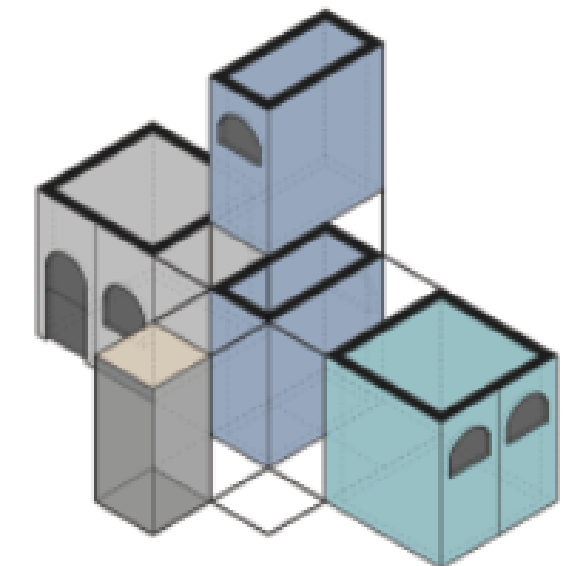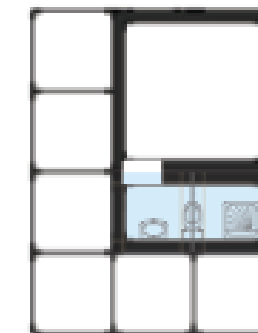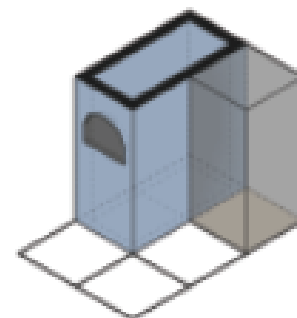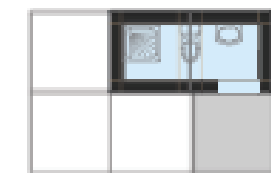
Game Rules

Level 2: The Configuration

Placing Modules:

E. Kitchenette and kitchen modules

- The kitchenette module can only be placed adjacent to a multi–purpose room module. The kitchen module should be placed adjacent to a corridor module or a multi–purpose room module.
- This module can only be placed above another bathroom module or kitchen module.
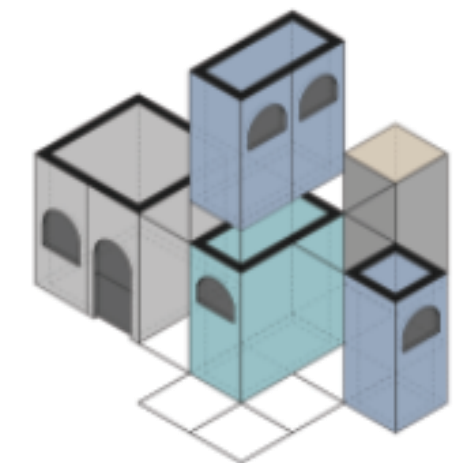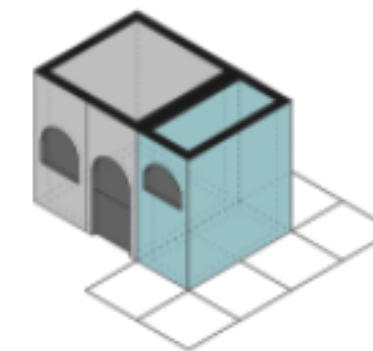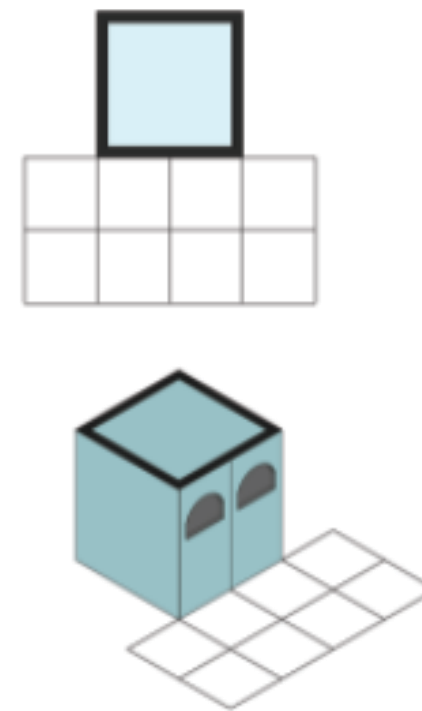
Game Rules

Level 2: The Configuration

Placing Modules:

F. Commercial module

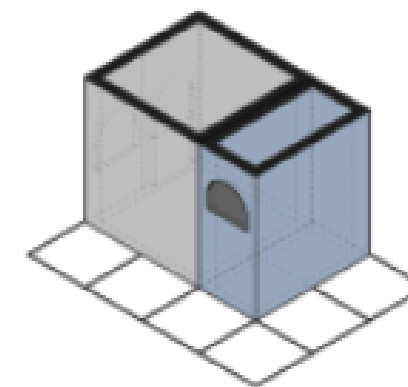- One side of the commercial module must always be placed facing the street. All other modules can be placed adjacent to the commercial module.

Street

Street

Street
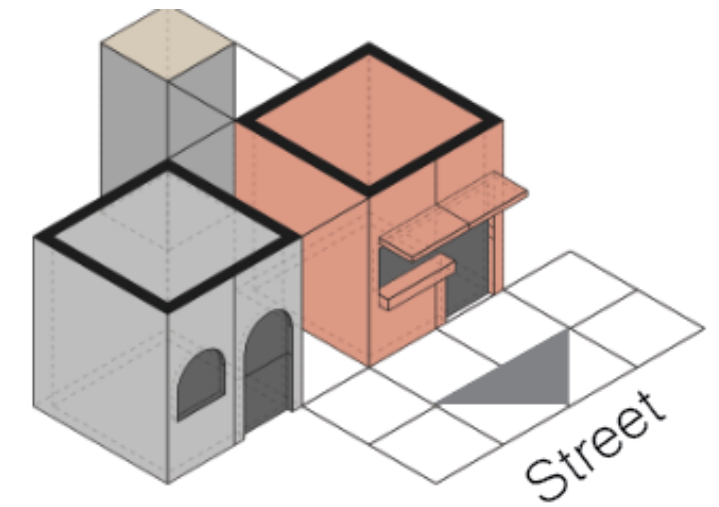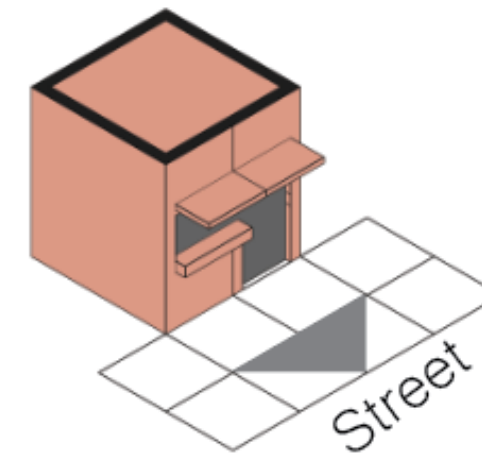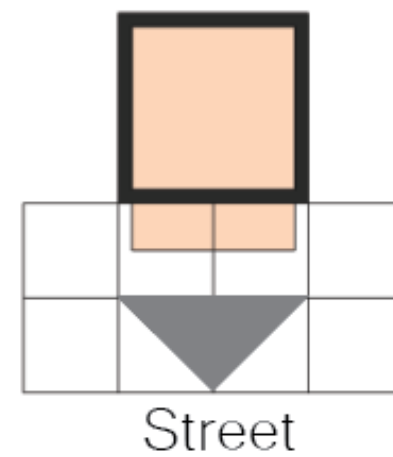
Game Rules

Level 2: The Configuration

Token Pool

- If players want to acquire modules that they currently can't afford, they can enter the token pool. The players each contribute a fixed number of tokens (determined by the players) and the total amount of tokens collected can be used by each player to acquire more modules.
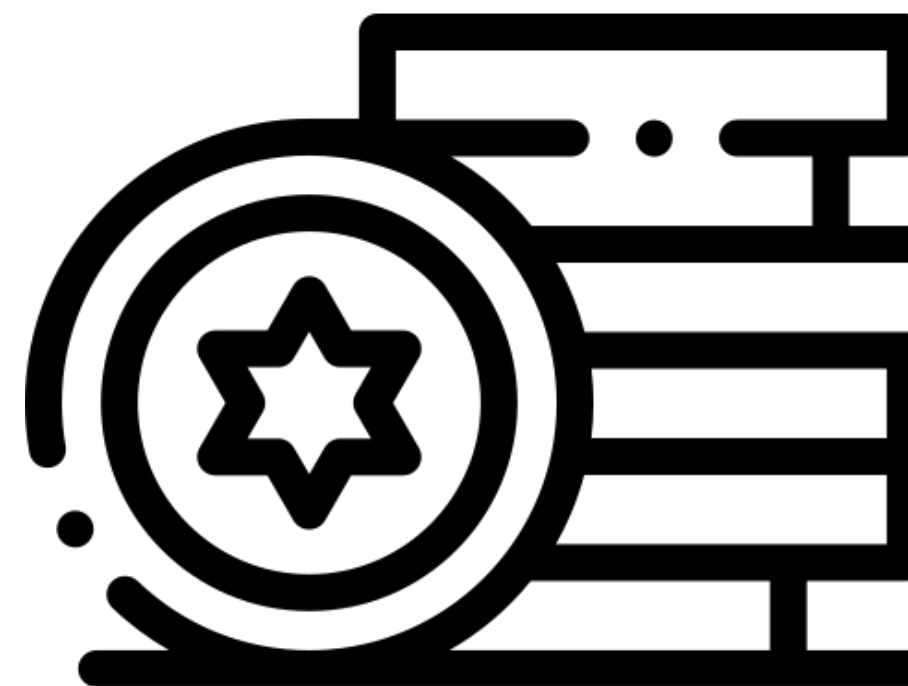
Game Rules

Level 2: The Configuration

Choosing activity cards

- Once the players have configured their space. They can choose activity cards (minimum of 3, Maximum to be set at the start of the game) based on which activities they would like to do in the courtyard space. Each player gets one 'cancel activity' card per three activity cards they select. If half the players cancel the same activity, then that activity will be removed.

Washing | Air Drying | Rearing Livestock

Slaughtering Livestock | Preparing Food | Open Fire Cooking

Cancel Activity

Washing | Air Drying | Rearing Livestock

Slaughtering Livestock | Preparing Food | Open Fire Cooking

Game Rules

Level 3: Forming & Materalization

- Once the configuration is complete, the players can select the type, size and position of walls and openings from the wall modules. They can select the type of roof they would like to use from the roof modules.

Validity Check

- The cluster is formed by connecting the shared tiles of the boards (Board A, B and C).

- Shared modules and stairs are only placed on the shared tiles of the boards.

- The multi–propose room is either directly accessed from the courtyard or from a horizontal circulation module.

- The number of boards forming a cluster is the same as the number of houses in a compound.

- Every room module has at–least one face tile with an opening for light, ventilation and/or access.

- Bathroom/toilet and kitchen modules can only be placed above another bathroom/toilet/ or kitchen module.

- The size of the formed cluster is within or it is the closest approximation to the maximum length and width of the plot.

- Open corridor modules should be placed facing the courtyard.

- The Commercial module is placed facing the street.

Game Play Demo
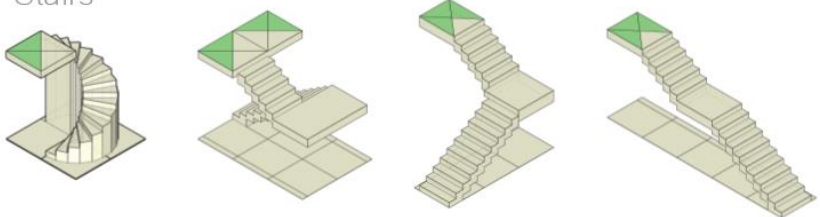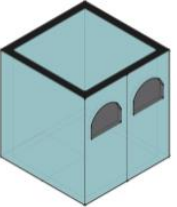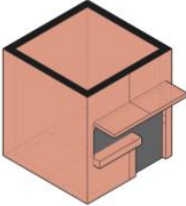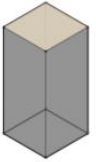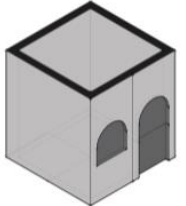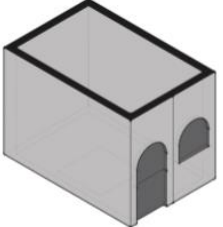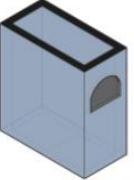
Defining the Test Case

For the purpose of the study a kebele house with 8 households located in Kirkos sub–city, woreda 4, kebele 38 was studied. The size of the households' range between 4–6 people

Game Play Demo

Defining the Modules

Stairs	6 tokens	Kitchen	12 tokens
Balcony	1 token	Commercial	12 tokens
Corridor — Corridor	1 token	Multi-purpose room	8 tokens
Toilet	2 tokens	Multi-purpose room	12 tokens
Bathroom — Kitchenette	6 tokens	Multi-purpose room	18 tokens

For the purpose of this play the following values are given to the modules.

 Assigning value to the modules creates a trade-of where the players will have to select modules that they need that is within their financial capability.

 The values assigned below is for the purpose of the demo, this value is a variable that can be changed in a different play.

Game Play Demo

Assigning tokens to players

	Tokens		Tokens
Player 1	58	**Player 5**	58
Player 2	30	**Player 6**	62
Player 3	62	**Player 7**	50
Player 4	64	**Player 8**	61

Game Play Demo

Level 1: Clustering

Plot dimentions

17m

26m

Play sequence
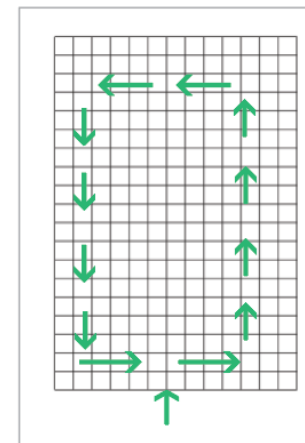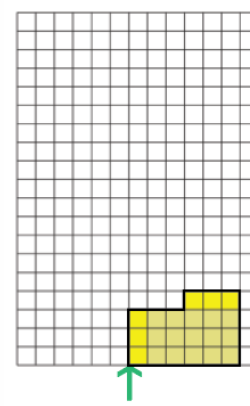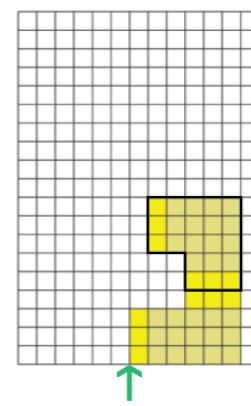
Player 1   Player 2   Player 3   Player 4
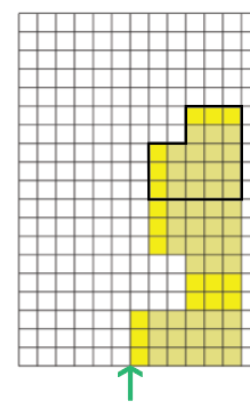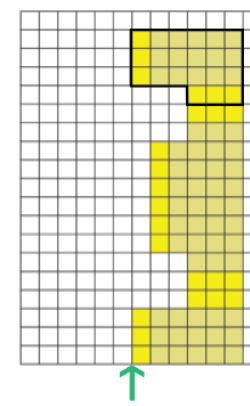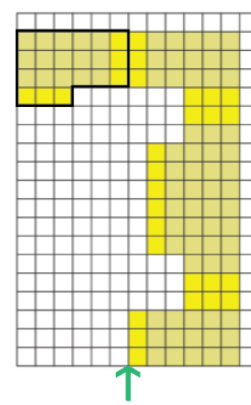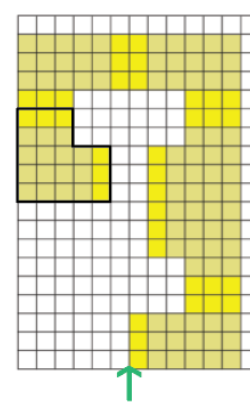
Player 5   Player 6   Player 7   Player 8
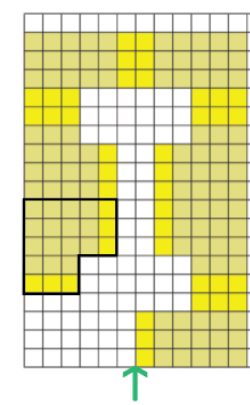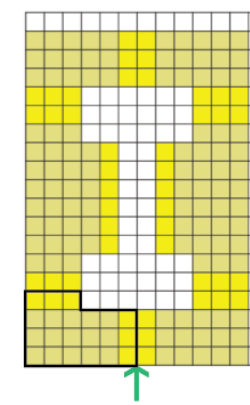
Board C   Board A   Board A   Board C

Input:
Number of households: 8
Plot: 17m * 26m

The players form a cluster of eight using the boards A, B, and C.

The player on the right side of the entrance to the courtyard starts the play and the play continues in counter clockwise direction to form the cluster.

Game Play Demo

Level 2 : Configuration

Shared Kitchen for House 4 & 5

Player 5: -15 tokens

Player 4: -9 tokens

Private stair for household 5

Shared stair for House 3 & 4

Player 6: -6 tokens

Private stair for household 6

Player 3: -3 tokens

Player 7: +_0 tokens

Player 2: +3 tokens

Shared stair for House 7 & 8

Private stair for House 1

Player 8: -3 tokens

Player 1: -9 tokens
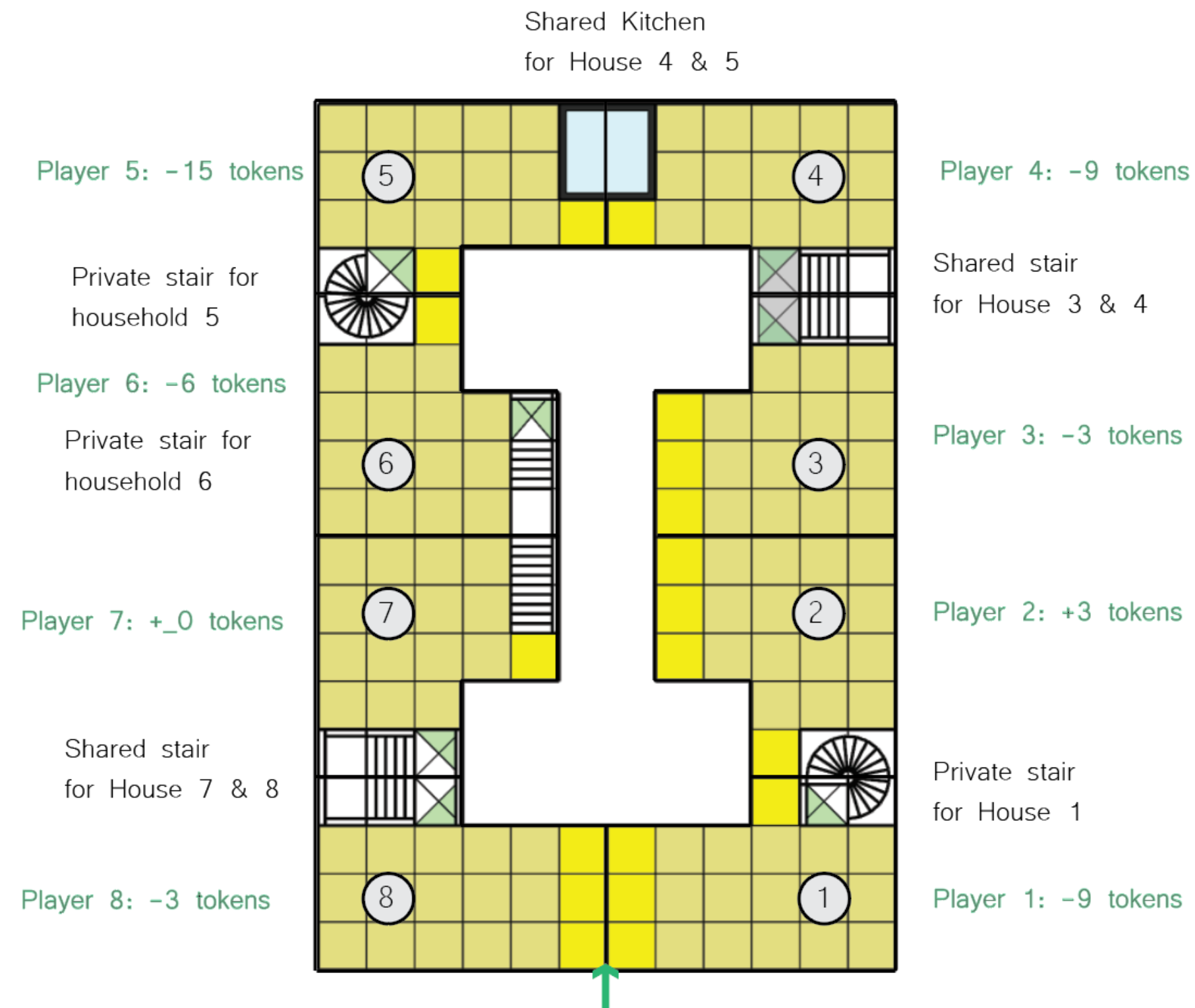
The first play in this configuration is to place shared modules.

Neighboring households decide whether they would like to share a module.

Players that choose to play shared modules, split the cost of the shared module.

Game Play Demo

Level 2 : Configuration
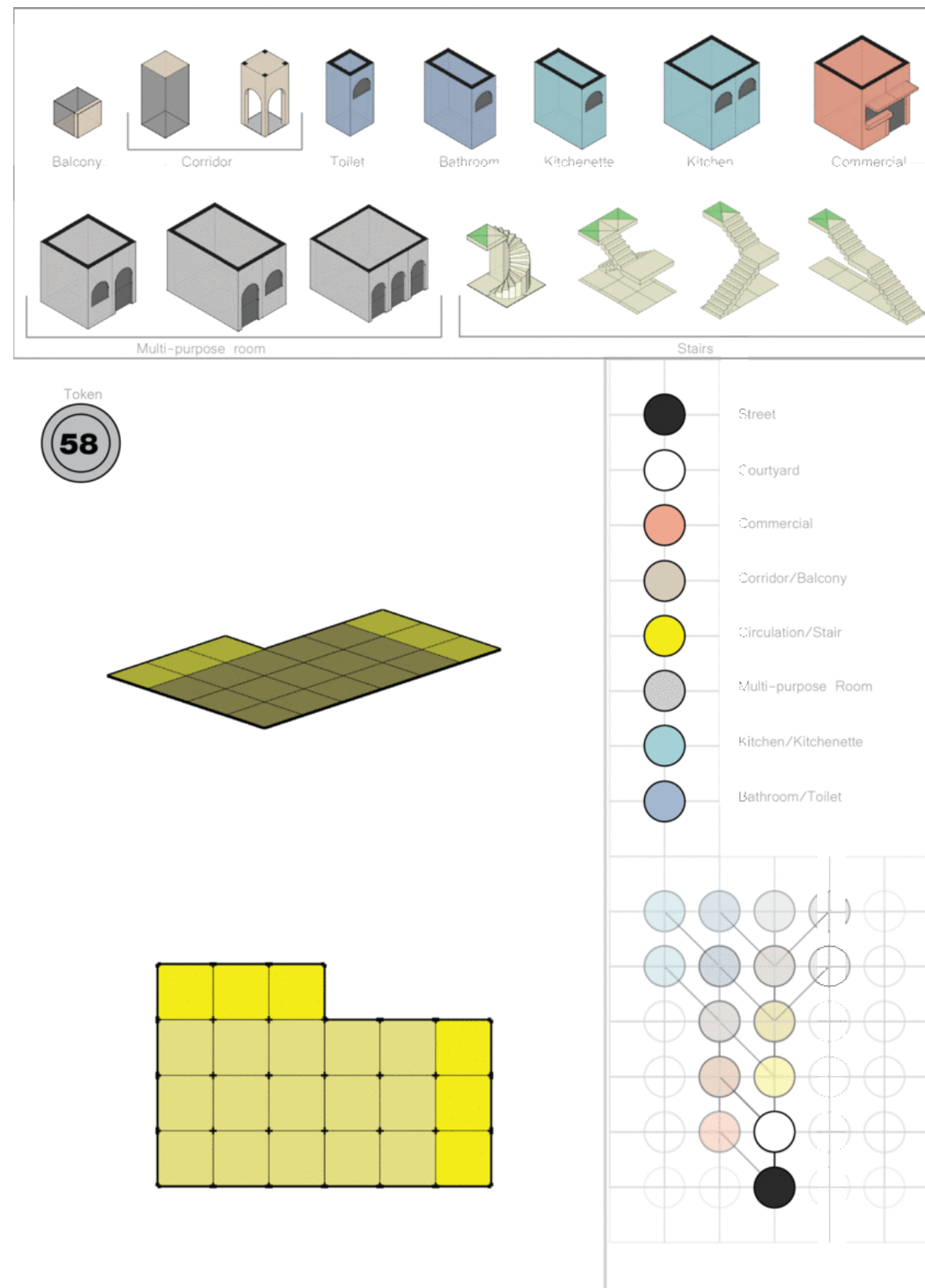
Once the shared modules are placed, the players use their tokens to get room modules and configure their space.

Game Play Demo

Level 2 : Configuration
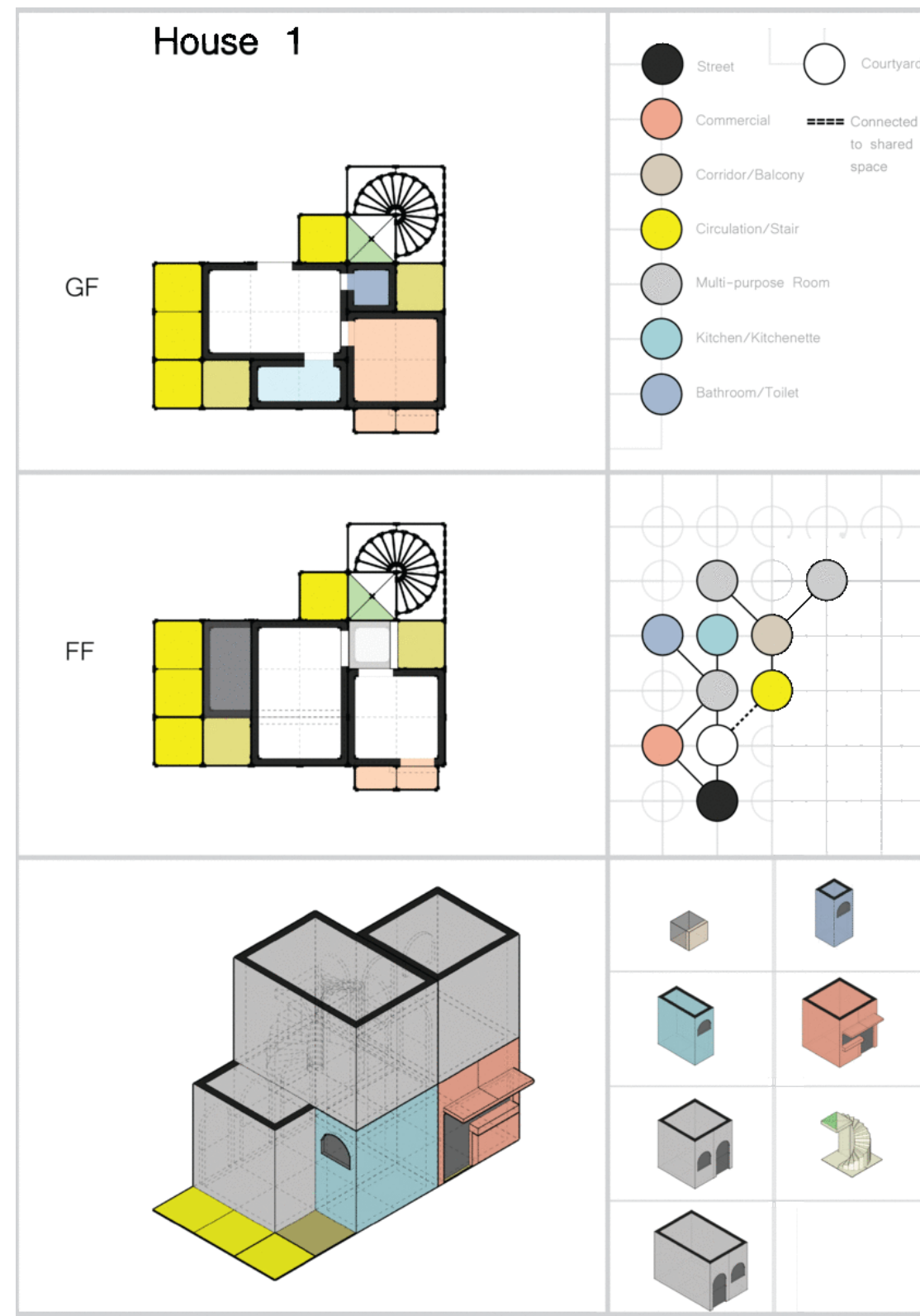
Once the shared modules are placed, the players use their tokens to get room modules and configure their space.

Game Play Demo

Level 2 : Configuration
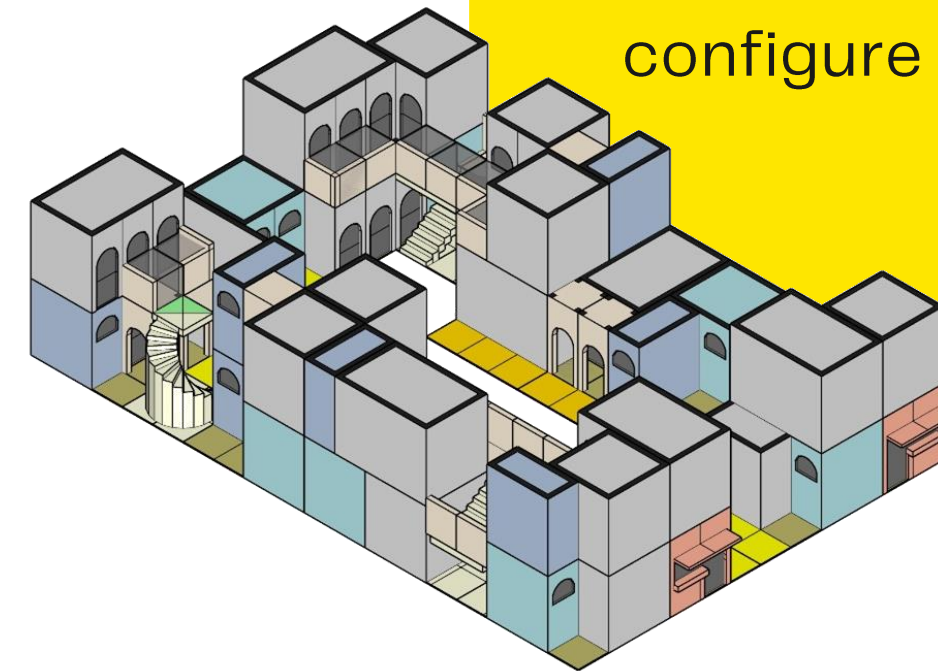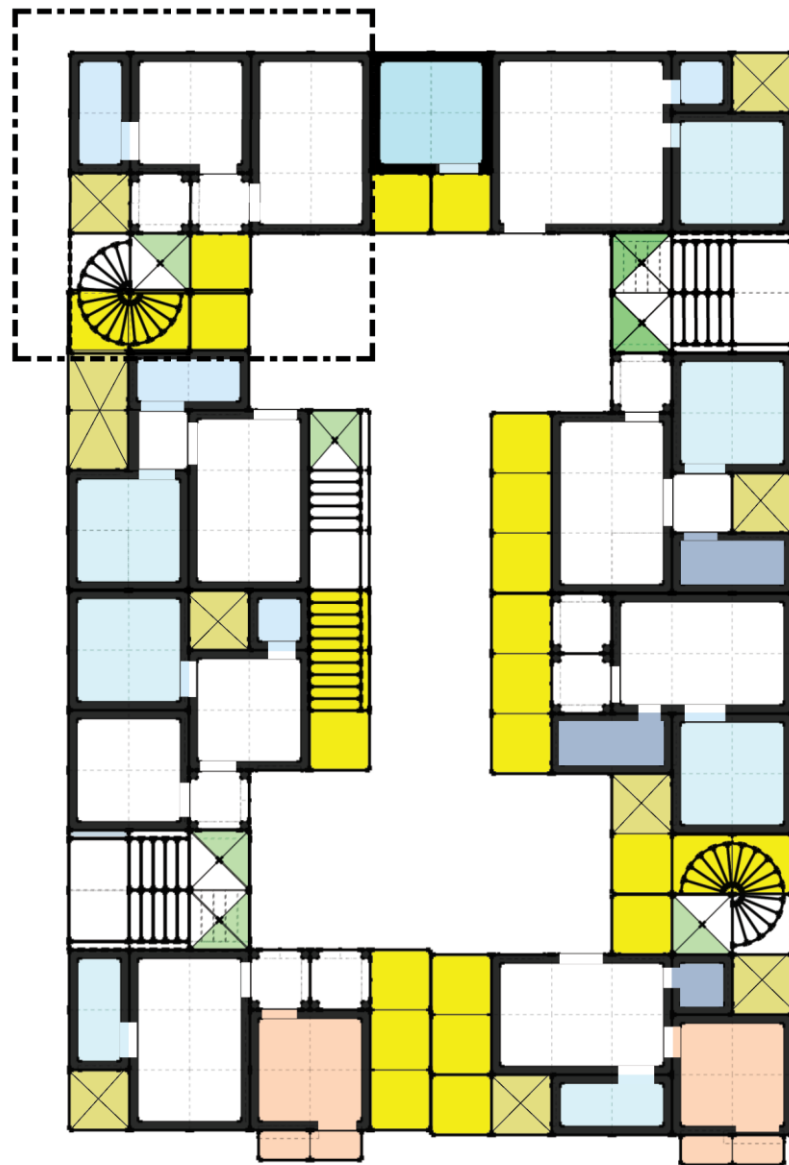
Once the shared modules are placed, the players use their tokens to get room modules and configure their space.

Game Play Demo

Level 3: Forming & Materialization
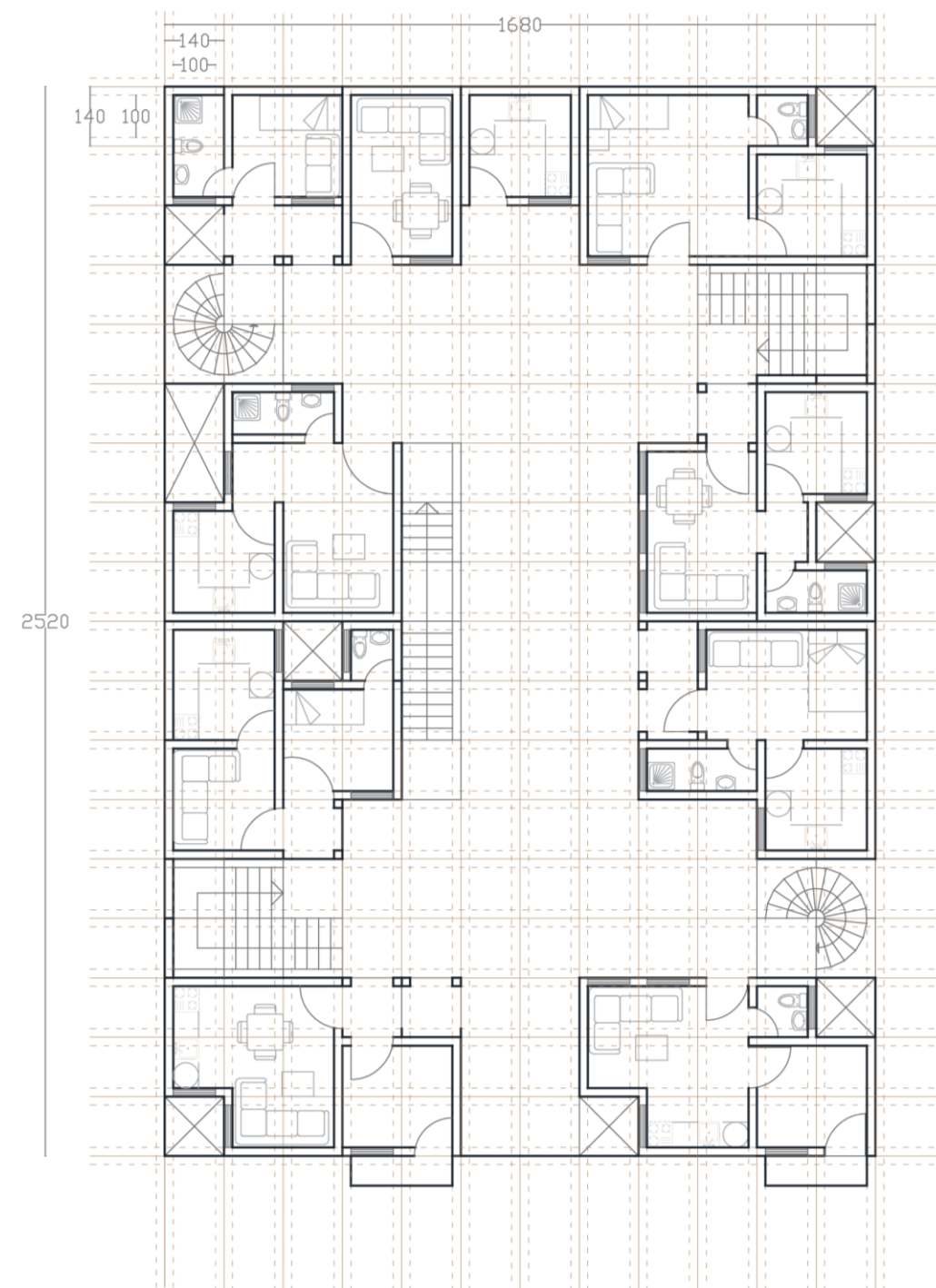
Ground Floor
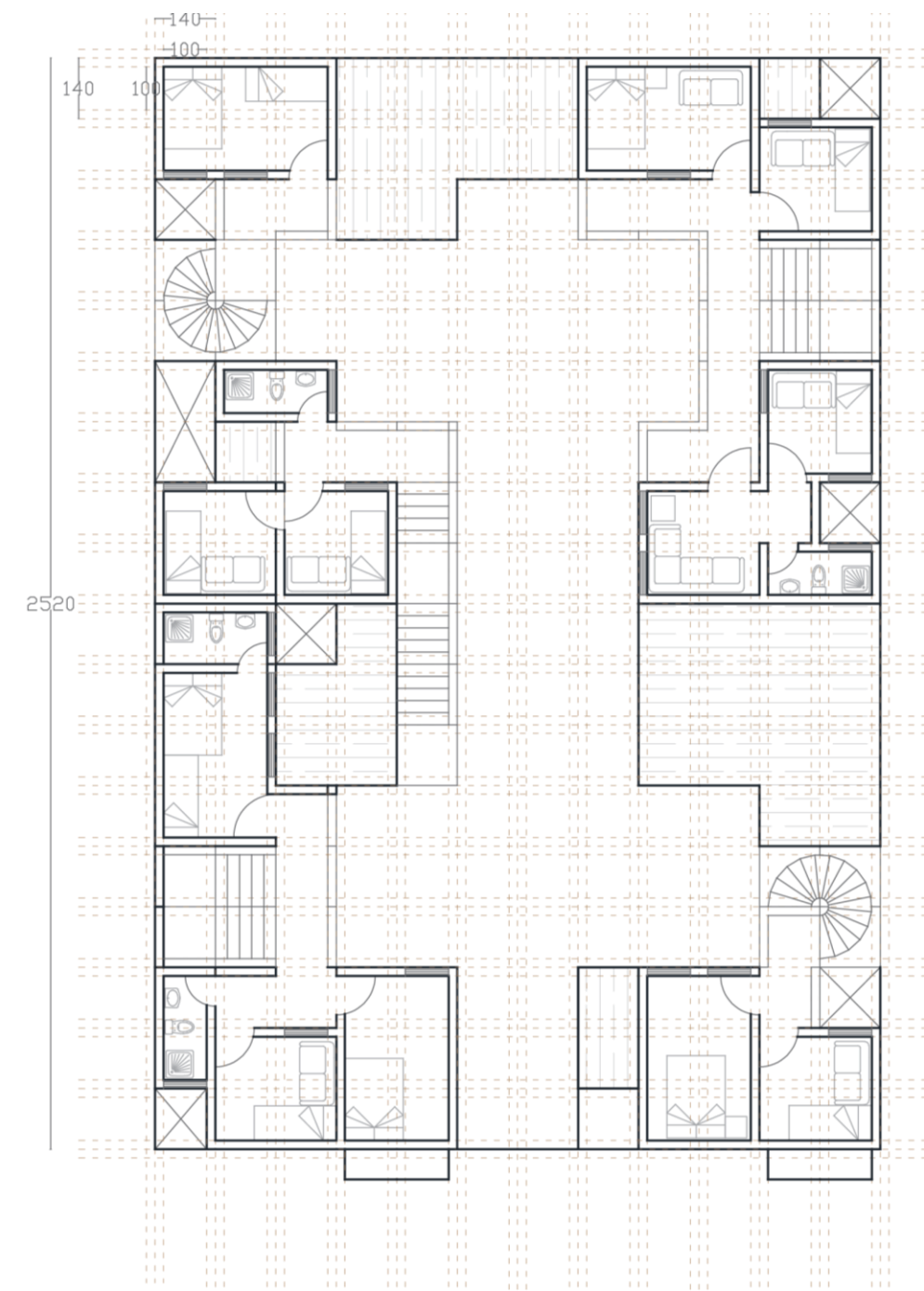
First Floor

Once the configuration is complete, the players can select the type, size and position of walls and openings from the wall modules. They can select the type of roof they would like to use from the roof modules.

Game Play Demo

Level 3: Forming & Materialization

Adding roof
and wall modules
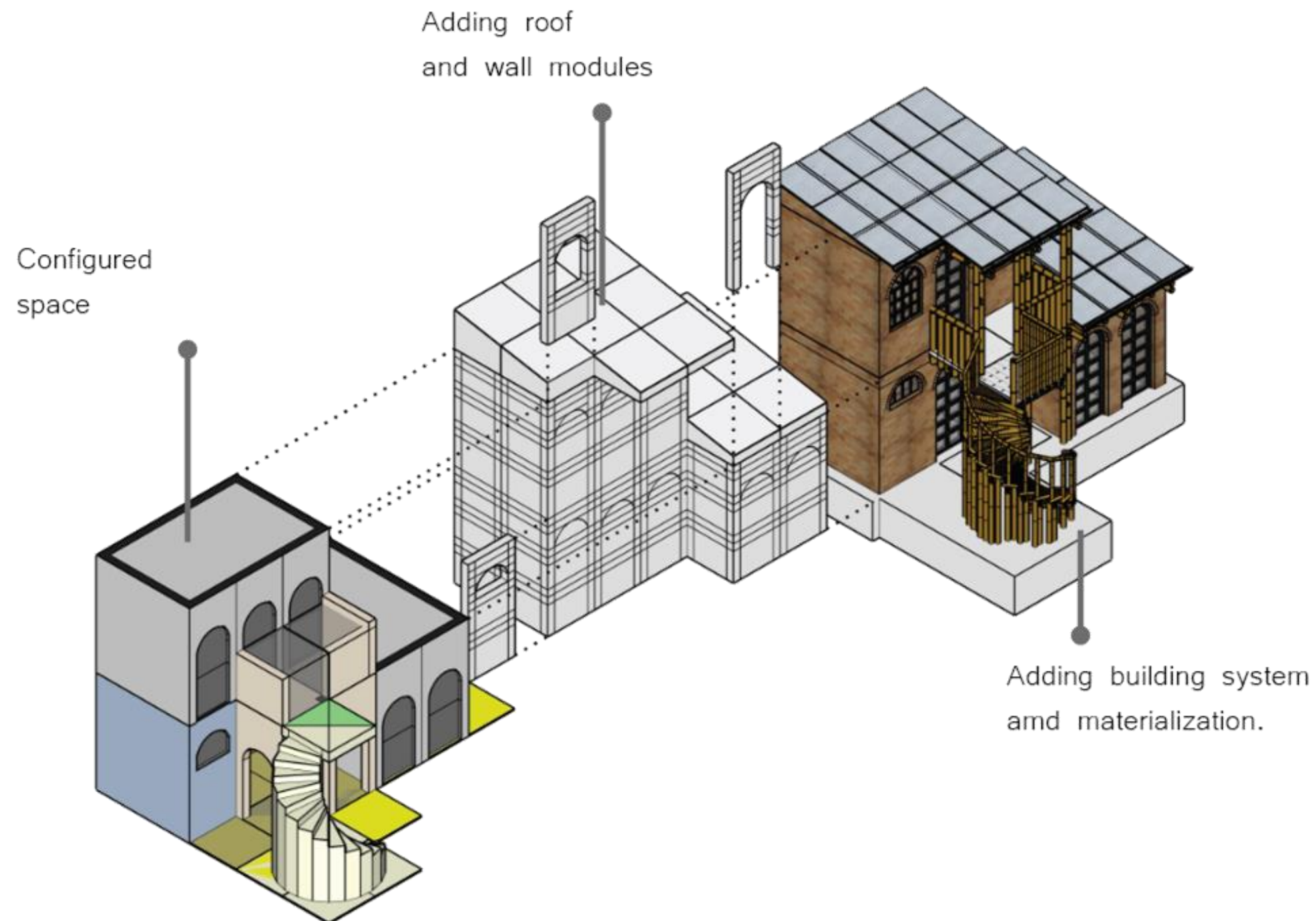
Configured
space

Adding building system
amd materialization.

Once the configuration is complete, the players can select the type, size and position of walls and openings from the wall modules. They can select the type of roof they would like to use from the roof modules.

Game Play Demo

Level 3: Forming & Materialization

Ground Floor Plan
Scale: 1:100

First Floor Plan
Scale: 1:100

Once the configuration is complete, the players can select the type, size and position of walls and openings from the wall modules. They can select the type of roof they would like to use from the roof modules.

Game Play Demo

Level 3: Forming & Materialization

Section A-A
Scale: 1:100

D1: Opening Detail
Scale 1:10

Section B-B
Scale: 1:100

D2: Roof 3D detail

D3: Floor 3D Detail

Once the configuration is complete, the players can select the type, size and position of walls and openings from the wall modules. They can select the type of roof they would like to use from the roof modules.

Game Play Demo

Level 3: Forming & Materialization

Front Elevation
1:100

Left side Elevation
1:100

Once the configuration is complete, the players can select the type, size and position of walls and openings from the wall modules. They can select the type of roof they would like to use from the roof modules.

Game Play Demo

Corrugated iron sheet roofing

Bamboo truss with bamboo purlin.

Cement Stabilized Earth wall.

Steel and glass openigs.

Three layer bamboo floor topped with earth supoorted on bamboo beams.

Stone foundation filled with compacted Earth.

Bamboo stairs.

 Once the configuration is complete, the players can select the type, size and position of walls and openings from the wall modules. They can select the type of roof they would like to use from the roof modules.
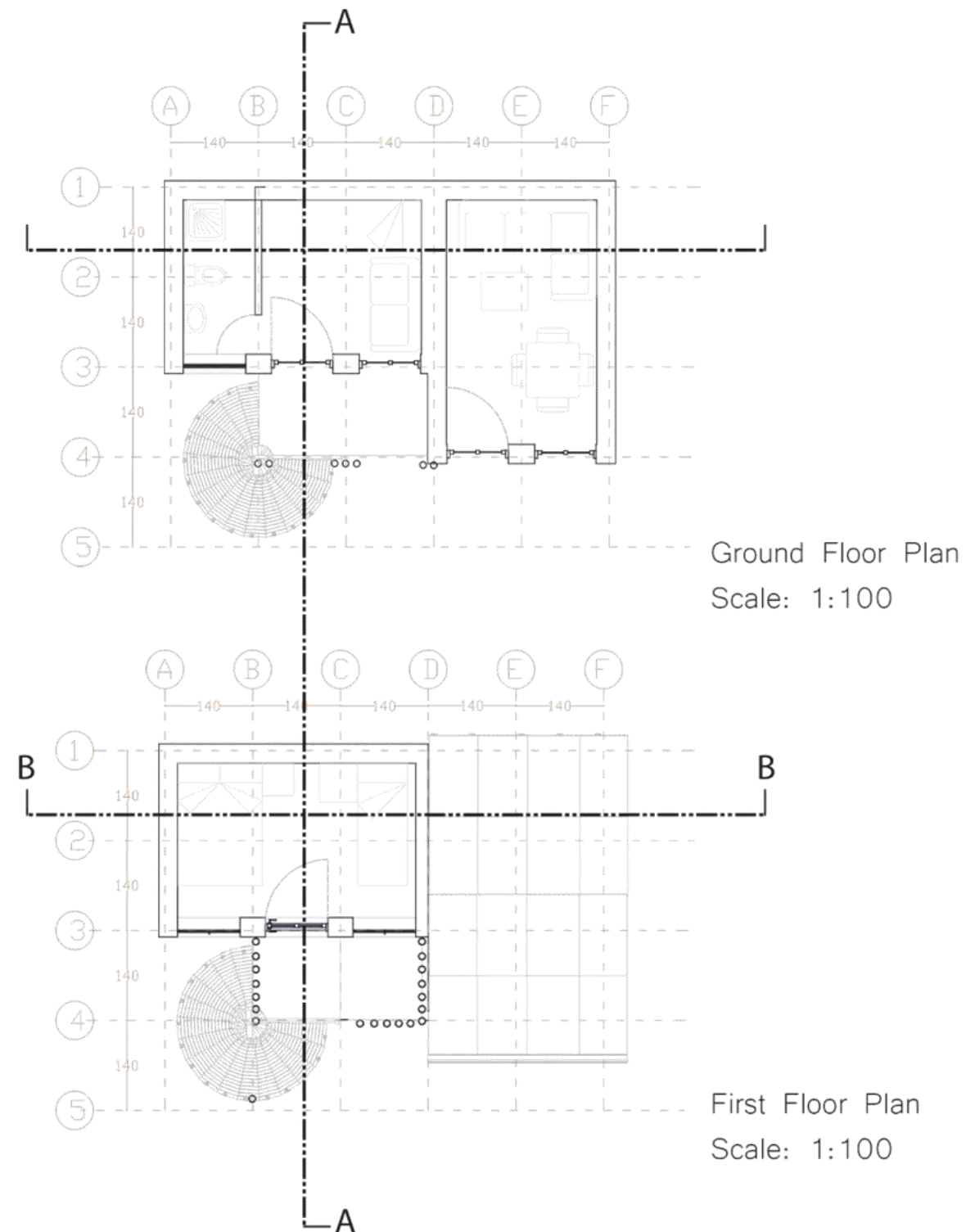
Game Application

Upgrading Existing Kebele houses

-Upgrade their houses in place

-Use the participatory game to re-configure their courtyard based low-rise houses

-Conditional privatization strategy by meeting the minimum improvement standard

Plot dimentions

17m

26m

Existing compound

Grid

Formed Cluster

Cluster

Re-Configuration
to original plot shape

Configuration
(with plot adjustment)
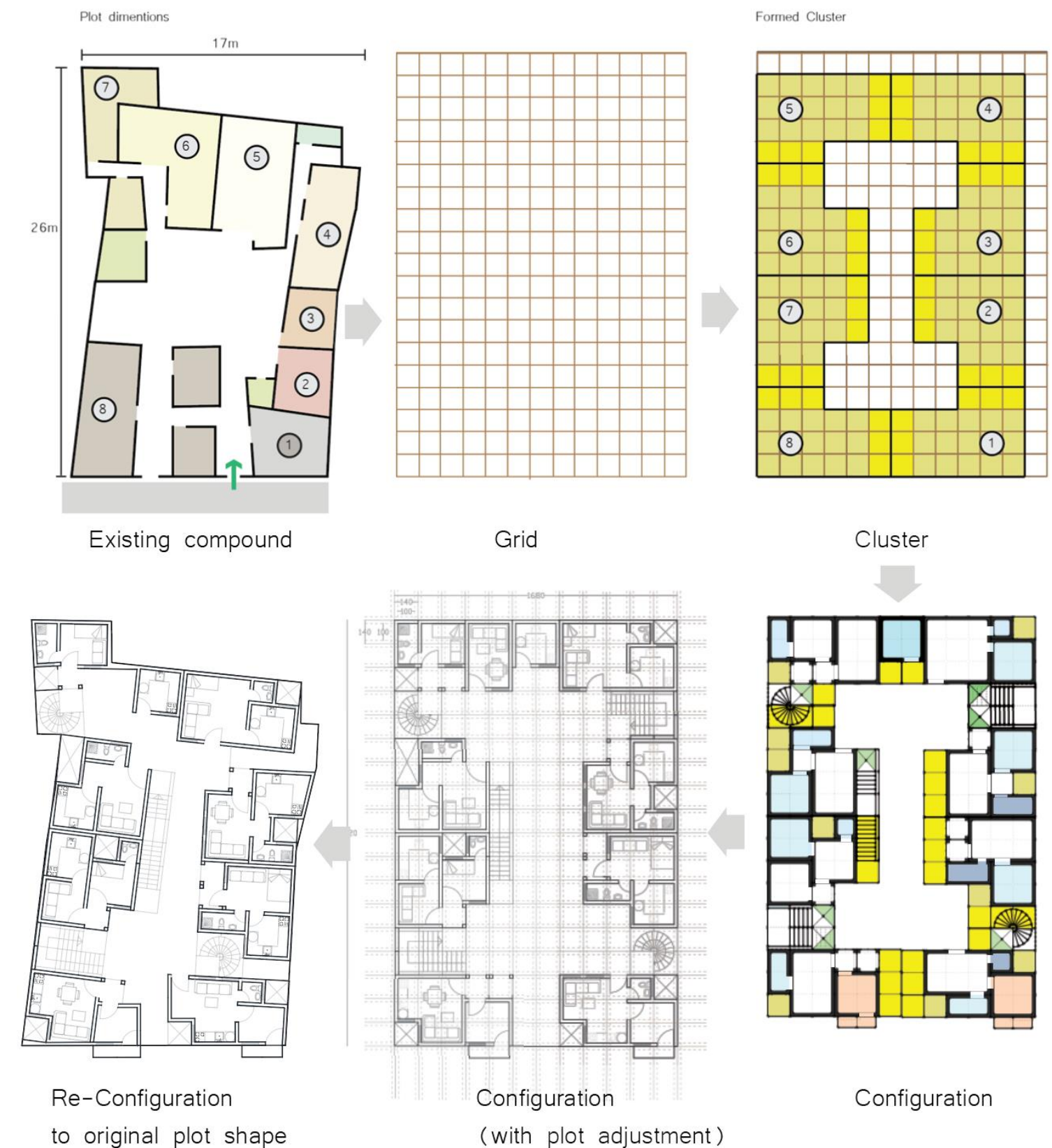
Configuration

Game Application

New housing development proposal

The game can be used for new housing proposals in re–development projects.

The end–users will be able to form clusters of homes based on their existing social network and configure their space based on their needs and priorities.

The collection of these clusters then forms a neighborhood of low–rise communal housings.

8 household cluster

6 household cluster

4 household cluster
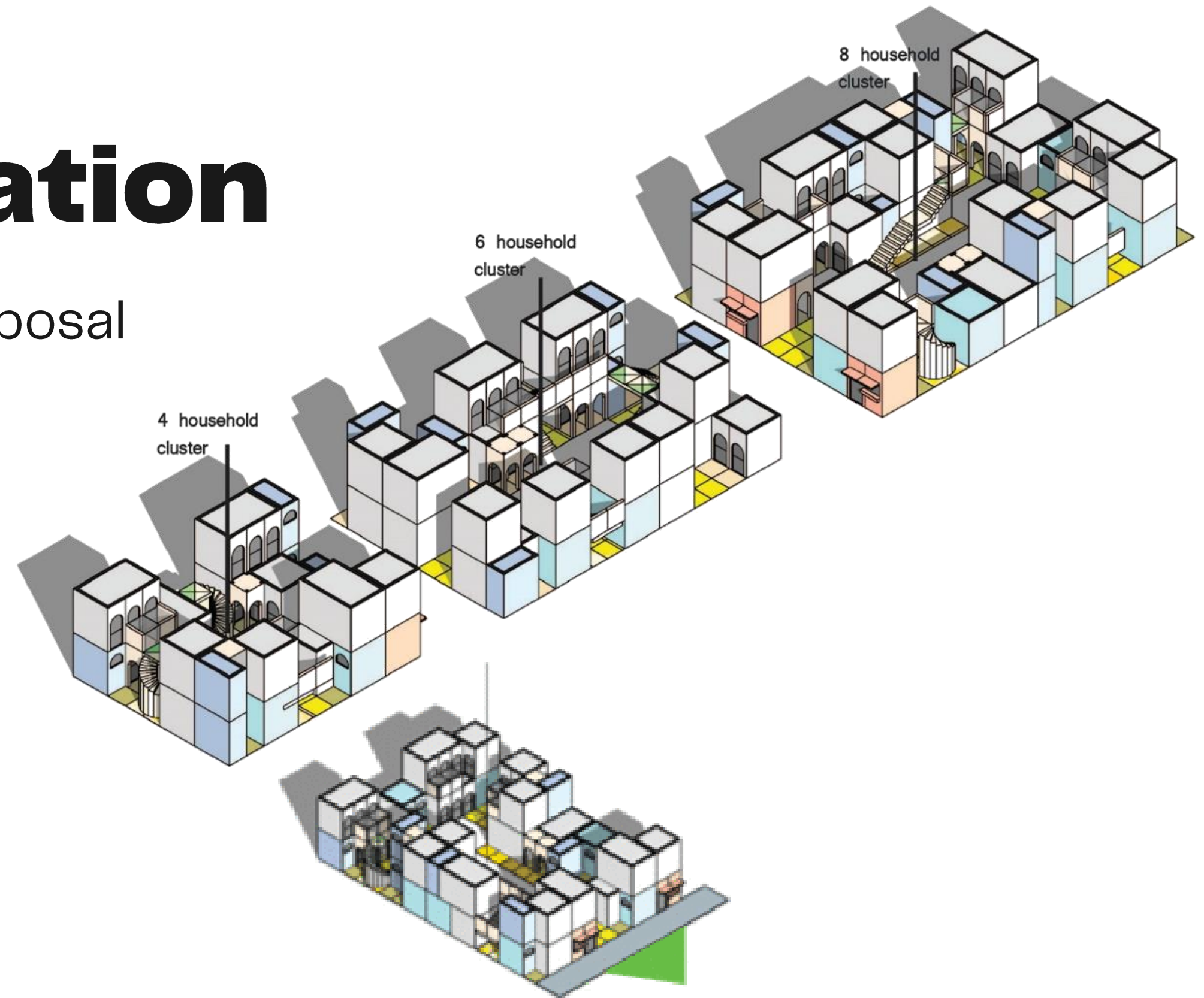
Game Application

New-configuration

The game can alternatively be used to gauge the end-users' spatial needs and their preference of hierarchal arrangement of spaces that can inform the development of new housing typologies that are more personalized
to the end-user's need.

Street

Courtyard

Commercial

Corridor/Balcony

Circulation/Stair

Multi-purpose Room

Kitchen/Kitchenette

Bathroom/Toilet
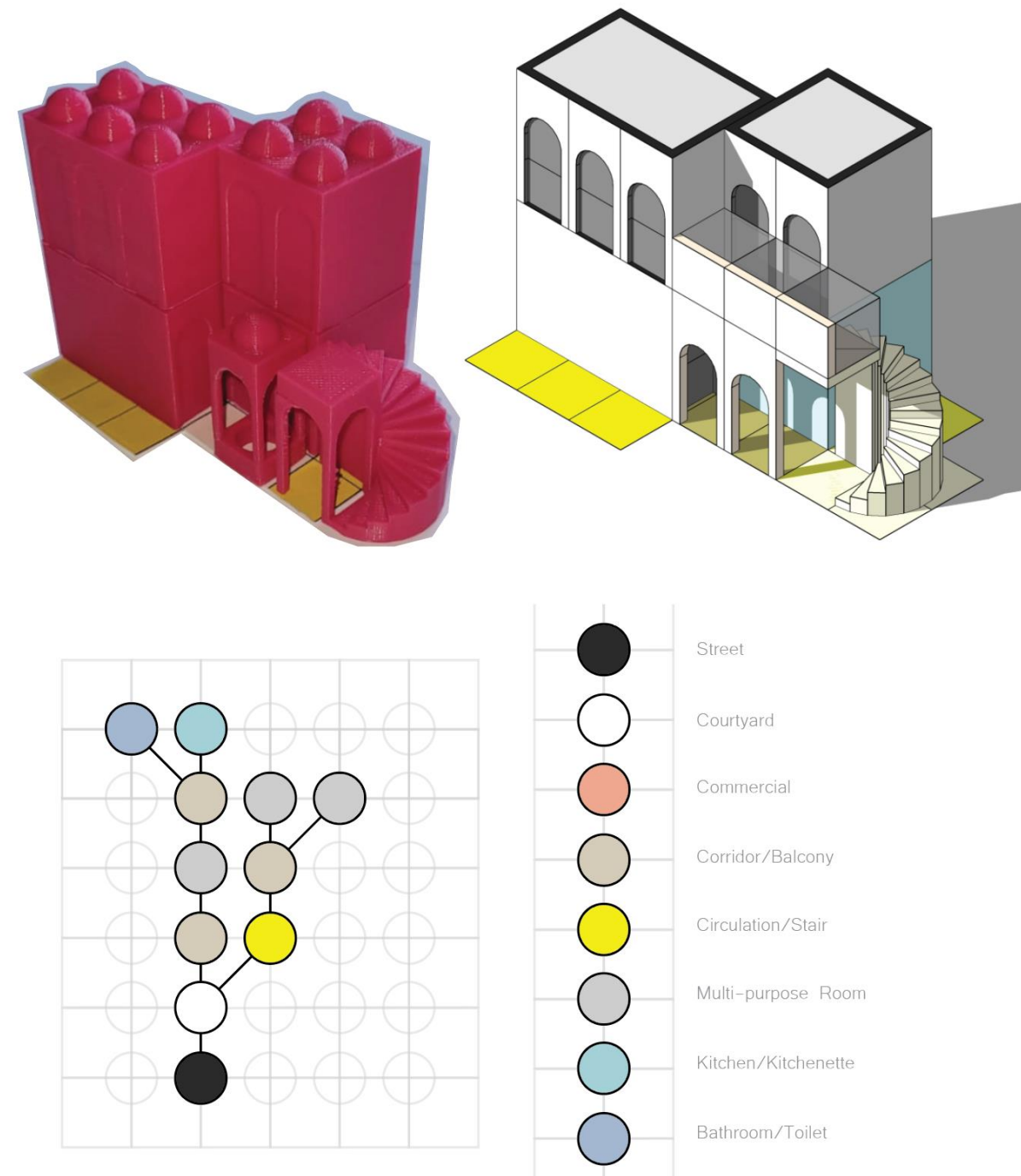
Game Application

Analyzing user needs

The game can be used to identify spatial priorities of end-users. The use of tokens creates a trade-off requiring users to weigh between different domestic spaces and functions to identify their immediate spatial needs.

The game can be also used to identify which spaces users are willing to share and which activities can take place in the shared space.

Spatial priorities
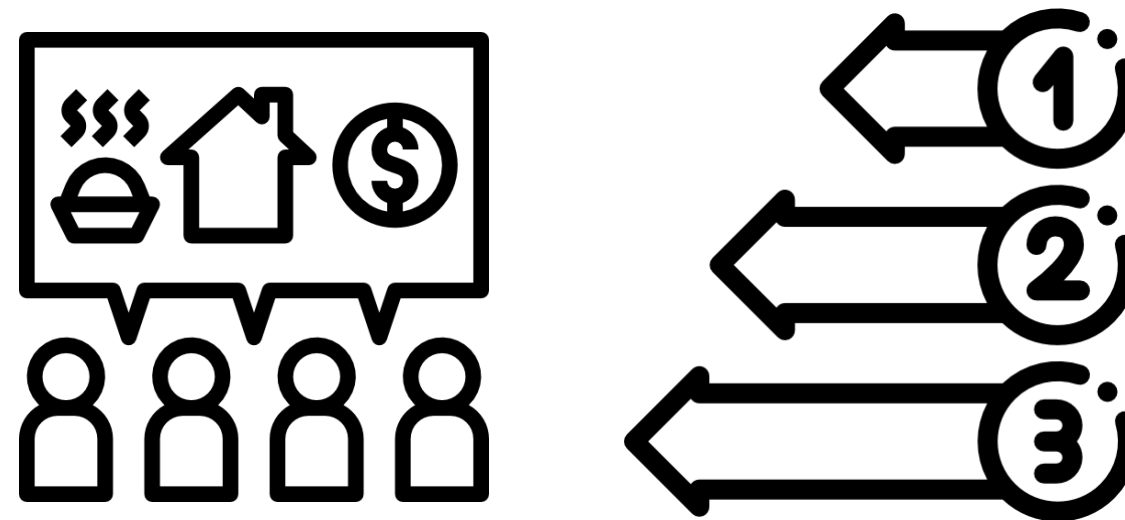
Identify their immediate spatial needs
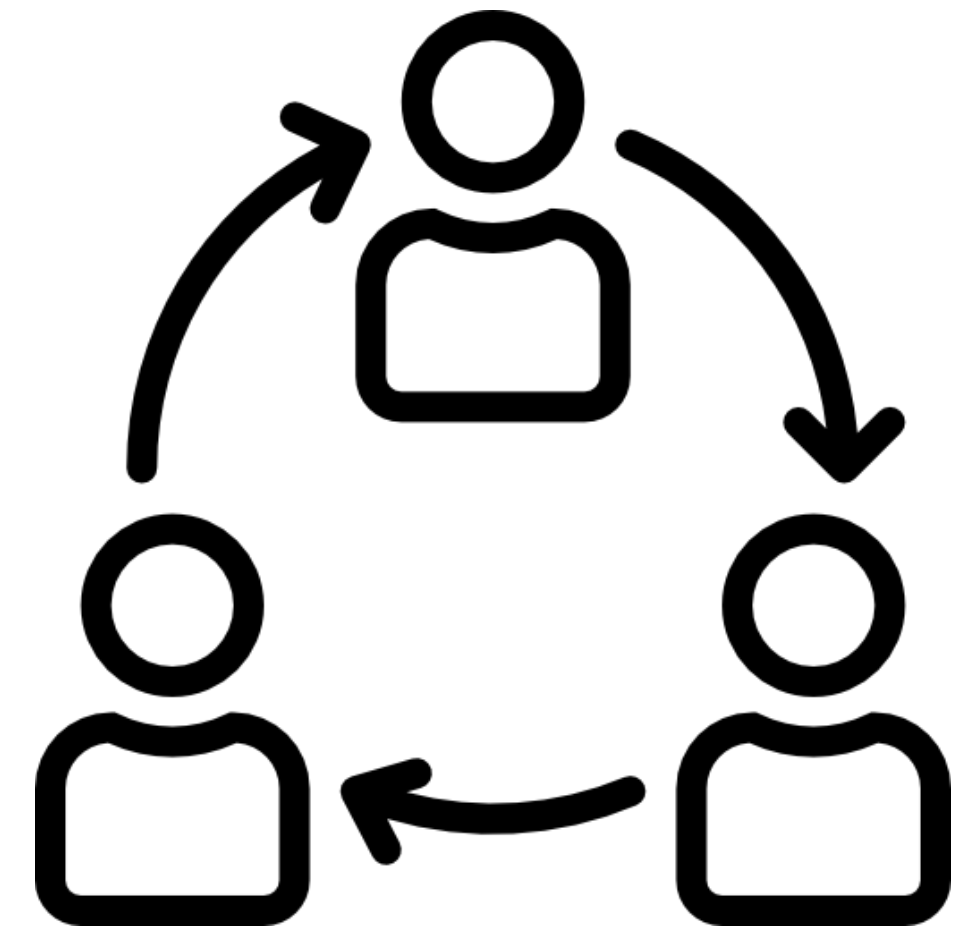
Identify shared spaces

Game Application

Policy change

Form cooperatives and get a low-interest long-term loan to upgrade their houses.

Pool their finances and mobilize additional funding from NGOs and the government (at low-interest rates).

Employ self-help construction to further reduce cost of construction.

Roles for managing finances, supervision, and maintenance can be done by members of the cooperatives on an electoral or rotating basis.

The kebele administration: organize the participatory design game workshops

:can provide support in the provision/privatization of land, supply of subsidized building material, infrastructural services, and technical assistance.
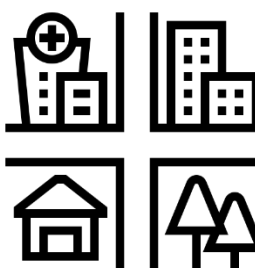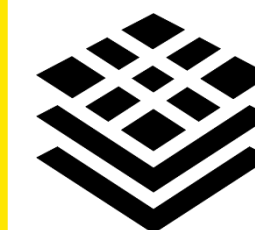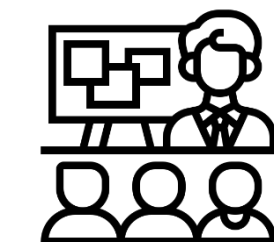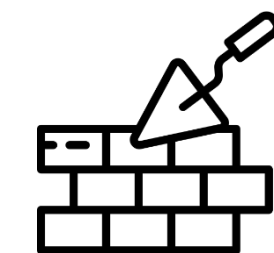
Game Application

Density comparision

IHDP condominium projects range in density from 175 to 300 units per hectare

Typology	Percentage per block
Studio	20%
1 Bedroom	40%
2 Bedroom	20%
3 Bedroom	20%

60% of the stock is studio and one bedroom

Proposed low-rise incremental housing has a density that ranges from 182 to 204 units per hectare

Cluster size	Number of Units	Area in m2	Unit/ hectare
4 household cluster	4	196	204
6 household cluster	6	313.6	191
8 household cluster	8	420	185
10 household cluster	10	548.8	182
12 household cluster	12	713.4	196

Conclusion

A design game that abstracts the working spatial and social qualities of the kebele houses and embedding them into a system of configurational elements and rules.

The game components were designed based on a modular co-ordination system using a double band tartan grid to allow for design flexibility.

The use of simple configuration rules allows for generation of various spatial configurations.

The game allows for addition of game components based on the modular co-ordination system (new board types, modules , activity cards) .

The use of physical props and real–time participation allows non–professionals to easily understand the design problem.

At the basic level, the game can be used to collect information about end–user preferences regarding spatial configuration, the use of tokens creates a trade–off where players have to prioritize their immediate spatial needs.

At a higher level, the game can be used in a bottom–up planning strategy for ideating new housing solutions.

Recomendation for future research

While transitioning from the configuration level to the forming and materialization level, use of a digital tool is recommended to easily iterate between various options.

In further development affordability can be accounted by integrating real–time cost in the digital tool.

Required policy changes and further practicalities can be studied more.

Limitations

–Affordable Housing is a complex and broad subject; matters of land, tenure, cost, population growth, available building materials, city development plans are some factors taken into consideration when proposing housing solutions.

This research mainly focuses on the configurational and participation aspect of affordable housing and may be lacking in other facets of the subject.

Further in–depth study is required to inform Policy changes and financing.

The project narrowed down to focus on the participation of end–users at the housing scale to minimize the scope and the broad range of stakeholders involved at larger scales.

The game was not extensive tested and evaluated as it requires the physical presence of players which doesn't align with the current corona virus safety measures.

Open for Questions

Thank You!