

An aerial photograph of a town, likely Mirafiori, is shown in grayscale. A large, semi-transparent green diagonal shape covers the upper-left portion of the image. The text 'an AGRICULTURE based COMMUNITY IN MIRAFIORI' is overlaid on this green area. 'an' and 'based' are in a smaller font, while 'AGRICULTURE', 'COMMUNITY', and 'IN MIRAFIORI' are in a larger, bold font. 'COMMUNITY' is white, and the other words are black.

an **AGRICULTURE** based
COMMUNITY
IN MIRAFIORI

POLITECNICO DI MILANO

Facoltà di Architettura e Società
Laurea Magistrale in Architettura



An agriculture based community in Turin Mirafiori

Supervisor: DAGLIO LAURA
Assistant supervisor: OSCAR EUGENIO BELLINI
Author: JIA WANG (780861)
Co-author: YIMING YIN (781368)
12/2013

CONTENTS

LIST OF FIGURES

ABSTRACT English & Italian	2
1 COMPETITION BACKGROUND	4
1.1 Introduction to the Competition	4
1.2 Requirements of the Competition	5
2 URBAN AGRICULTURE	6
2.1 What is Urban Agriculture	7
2.2 Why Talking About Urban Agriculture	8
2.2.1 Challenges from population growth	8
2.2.2 Influences of the traditional agriculture	9
2.2.3 Benefits of Urban agriculture	12
2.3 Existing Typologies of Urban Agriculture	16
2.4 Innovative Technologies Applied in Urban Agriculture	18
2.5 Case studies of Urban Agriculture	20
2.5.1 City Scale	19
2.5.2 Community Scale	21
2.5.3 Building Scale	29
2.6 Conclusion	36
3 SITE ANALYSIS	38
3.1 City Scale Analysis	39
3.2 Local Scale Analysis	47
3.3 Site Scale Analysis	59

4 MASTERPLAN DESIGN	64
4.1 Steps Toward The Design	65
4.2 Masterplan and Illustrations	75
5 AGRICULTURAL SPACES AND ACTIVITIES	81
5.1 Shared Agricultural Space	82
5.2 Private Agricultural Spaces (agriculture integrated with building)	85
5.3 Application of The ICT System	86
6 RECREATIONAL AND EDUCATIONAL SPACES AND ACTIVITIES	96
7 SUSTAINABLE OPERATION SYSTEMS	99
7.1 Water Treatment	100
7.2 Waste Treatment and Energy Generation	106
8 TWO DWELLING TYPOLOGIES INTEGRATED WITH AGRICULTURE	108
8.1 Semi-detached Typology	109
8.2 High-density Typology	126
BIBLIOGRAPHY	134
THANKS	137

LIST OF FIGURES

Number	Name	Source
Chapter 1	COMPETITION BACKGROUND	
<i>fig1.01</i>	Logo of the competition	Competition document
<i>fig1.02</i>	Map of the design area	Competition document
Chapter 2	URBAN AGRICULTURE	
<i>fig2.01</i>	Timeline of the Urban agriculture development	Self-made illustration
<i>fig2.02</i>	Eneergy crisis	From google search
<i>fig2.03</i>	Disafforestation	From google search
<i>fig2.04</i>	Water scarcity	From google search
<i>fig2.05</i>	Environmental impact of swiss consumption and production	Self-made illustration based on <i>ref.4</i>
<i>fig2.06</i>	Detailed fuel cost of a standard white loaf	Self-made illustration based on <i>ref.5</i>
<i>fig2.07</i>	Total fuel cost of a standard white loaf	Self-made illustration based on <i>ref.5</i>
<i>fig2.08</i>	global freshwater withdraw	Self-made illustration based on <i>ref.6</i>
<i>fig2.09</i>	Agriculture water use and population growth	Illustration made at <i>ref.6</i>
<i>fig2.10</i>	Extensive treatment of water in the city	Self-made illustration based on <i>ref.7</i>
<i>fig2.11</i>	Urban ommunity independently water treatment	Self-made illustration based on <i>ref.7</i>
<i>fig2.12</i>	Closed water loop systems	Self-made illustration based on <i>ref.7</i>
<i>fig2.13</i>	Food loop - food waste treatment	Self-made illustration based on <i>ref.8</i>
<i>fig2.14</i>	Activities realated with healthy issue	Illustration made at <i>ref.9</i>
<i>fig2.15</i>	Activities realated with Education issue	Illustration made at <i>ref.9</i>
<i>fig2.16</i>	Activities realated with Social issue	Illustration made at <i>ref.9</i>
<i>fig2.17</i>	Activities realated with Economic issue	Illustration made at <i>ref.9</i>
<i>fig2.18</i>	Four types of existing urban agriculture	Illustration made at <i>ref.9</i>
<i>fig2.19</i>	Vegetables catalogs accroding to the depth of growing media	Illustration made at <i>ref.11</i>
<i>fig2.20</i>	Layers of the green roof construction	Illustration made at <i>ref.10</i>

<i>fig2.21</i>	seed or cuttings	From google search	<i>fig2.49</i>	Diagram of Before and After situation	Illustration made at <i>ref.25</i>
<i>fig2.22</i>	pot-grown plants or plugs	From google search	<i>fig2.50</i>	Diagram of the project highlights the various features and intended function	Illustration made at <i>ref.25</i>
<i>fig2.23</i>	vegetation mats	From google search	<i>fig2.51</i>	Photo of the community garden	Illustration made at <i>ref.25</i>
<i>fig2.24</i>	Wall mounted systems	From google search	<i>fig2.52</i>	Photo of the community event	Illustration made at <i>ref.25</i>
<i>fig2.25</i>	Modular systems	From google search	<i>fig2.53</i>	Diagram of operation of food loop	Illustration made at <i>ref.8</i>
<i>fig2.26</i>	Nutrient film technique (NFT)	Illustration made at <i>ref.16</i>	<i>fig2.54</i>	Diagram of cycle of food waste - compost - fresh food	Illustration made at <i>ref.8</i>
<i>fig2.27</i>	Drip Irrigation system	Illustration made at <i>ref.16</i>	<i>fig2.55</i>	Operation system of the houwelling tomato project	Illustration made at <i>ref.26</i>
<i>fig2.28</i>	Ventura Action drip system	Illustration made at <i>ref.16</i>	<i>fig2.56</i>	Eagle Street Rooftop Farms	Illustration made at <i>ref.27</i>
<i>fig2.29</i>	Deep Water Culture (DWC)	Illustration made at <i>ref.16</i>	<i>fig2.57</i>	installation of waterproofing menbrane and plumbing system	Illustration made at <i>ref.27</i>
<i>fig2.30</i>	Flood and Drain (EBB)	Illustration made at <i>ref.16</i>	<i>fig2.58</i>	irregation system and planting beds.	Illustration made at <i>ref.27</i>
<i>fig2.31</i>	Flow systems	Illustration made at <i>ref.16</i>	<i>fig2.59</i>	vegetation products of the farm	Illustration made at <i>ref.27</i>
<i>fig2.32</i>	Aeroponics	Illustration made at <i>ref.16</i>	<i>fig2.60</i>	Photo of the leangreen house under construction	Illustration made at <i>ref.28</i>
<i>fig2.33</i>	Aquaponics	Illustration made at <i>ref.17</i>	<i>fig2.61</i>	The crops growed on the roof	Illustration made at <i>ref.28</i>
<i>fig2.34</i>	suspended container	Photo taken in exhibition	<i>fig2.62</i>	Shipping container greenhouses on the parking lot	Illustration made at <i>ref.30</i>
<i>fig2.35</i>	cantilevered container	Illustration made at <i>ref.18</i>	<i>fig2.63</i>	Photo of the shipping container greenhouse	Illustration made at <i>ref.30</i>
<i>fig2.36</i>	rised beds	Illustration made at <i>ref.19</i>	<i>fig2.64</i>	Exploded axonometric diagram of the shipping container greenhouse	Illustration made at <i>ref.30</i>
<i>fig2.37</i>	movable stands	Illustration made at <i>ref.20</i>	<i>fig2.65</i>	View of the project	Illustration made at <i>ref.31</i>
<i>fig2.38</i>	Principle of Greenhouse	Illustration made at <i>ref.22</i>	<i>fig2.66</i>	Plan of the Mobile greenhouse	Illustration made at <i>ref.31</i>
<i>fig2.39</i>	Example of Greenhouse	Illustration made at <i>ref.23</i>	<i>fig2.67</i>	Diagram of the 'Systems wall'	Illustration made at <i>ref.31</i>
<i>fig2.40</i>	LeisurEscape before and after implementing a CPUL	Illustration made at <i>ref.5</i>	<i>fig2.68</i>	Axonometric view of the ECO Laboratory building	Illustration made at <i>ref.32</i>
<i>fig2.41</i>	Middlesbrough Urban Growing	Illustration made at <i>ref.5</i>	<i>fig2.69</i>	Interior view of the growing area	Illustration made at <i>ref.32</i>
<i>fig2.42</i>	View of the R-URBAN project	Illustration made at <i>ref.24</i>	<i>fig2.70</i>	Water havest system of the ECO Laboratory	Illustration made at <i>ref.32</i>
<i>fig2.43</i>	R-URBAN pilot facilities and cycles	Illustration made at <i>ref.24</i>	<i>fig2.71</i>	Energy diagram of the ECO Laboratory	Illustration made at <i>ref.32</i>
<i>fig2.44</i>	Location of the three Unit	Illustration made at <i>ref.24</i>	<i>fig2.72</i>	Water facilities of the ECO Laborator	Illustration made at <i>ref.32</i>
<i>fig2.45</i>	R-URBAN micro-urbanism principles	Illustration made at <i>ref.24</i>	<i>fig2.73</i>	Food, Water, Energy, Landscape integrated system	Self-made illustration
<i>fig2.46</i>	Operation cycle of the ECOHAB unit	Illustration made at <i>ref.24</i>			
<i>fig2.47</i>	View of the AGROLAB unit	Illustration made at <i>ref.24</i>			
<i>fig2.48</i>	Operation diagram of the AGROCITE unit	Illustration made at <i>ref.24</i>			

Chapter 3

SITE ANALYSIS

<i>fig3.01</i>	Location of Turin in Italy	Self-made illustration
<i>fig3.02</i>	Location of site in Turin	Self-made illustration based on <i>ref.33</i>
<i>fig3.03</i>	Interregional connection	Self-made illustration based on <i>ref.34</i>
<i>fig3.04</i>	Urban mobility plan	Self-made illustration based on <i>ref.33</i>
<i>fig3.05</i>	Main public transportation	Self-made illustration based on <i>ref.33</i>
<i>fig3.06</i>	Green space system	Self-made illustration based on <i>ref.5</i>
<i>fig3.07</i>	Corso marche section	Illustration made at <i>ref.35</i>
<i>fig3.08</i>	Corso marche plan	Illustration made at <i>ref.35</i>
<i>fig3.09</i>	Sangone green space project	Illustration made at <i>ref.34</i>
<i>fig3.10</i>	Selected important features of Turin	Self-made illustration based on <i>ref.36</i>
<i>fig3.11</i>	Administration boundary of Turin and the surrounding rural regions	Self-made illustration based on <i>ref.33</i>
<i>fig3.12</i>	The existing situation of the infrastructure system	Self-made illustration based on <i>ref.36</i>
<i>fig3.13</i>	The reorganized situation of the infrastructure system as in PUMS	Self-made illustration based on <i>ref.36</i>
<i>fig3.14</i>	The important elements of the infrastructure system	Self-made illustration based on <i>ref.5</i>
<i>fig3.15</i>	The green open space system	Self-made illustration
<i>fig3.16</i>	The recreational spaces	Self-made illustration
<i>fig3.17</i>	The agriculture spaces	Self-made illustration
<i>fig3.18</i>	The logo of CAAT	Illustration made at <i>ref.37</i>
<i>fig3.19</i>	The logo of VOV 102 Farmers' market	Illustration made at <i>ref.38</i>
<i>fig3.20</i>	The logo of Cascina Roccafranca	Illustration made at <i>ref.39</i>
<i>fig3.21</i>	The logo of Miraoti	Illustration made at <i>ref.40</i>
<i>fig3.22</i>	The logo of The agricultural Park	Illustration made at <i>ref.1</i>
<i>fig3.23</i>	The main features of the area	Self-made illustration
<i>fig3.24</i>	The plan of the TNE project	Illustration made at <i>ref.36,41</i>
<i>fig3.25</i>	Selected important features of the site surrounding area	Self-made illustration
<i>fig3.26</i>	The panoramic view of the site	Illustration made at <i>ref.1</i>
<i>fig3.27</i>	The important features of the site	Self-made illustration

fig3.28

The Problem and Potentials of the area

Self-made illustration

fig3.29

The accessibility of the area

Self-made illustration

fig3.30

The index for the photos

Illustration made at *ref.1*

fig3.31

Photos of the site

Illustration made at *ref.1*

Chapter 4

MASTERPLAN DESIGN

fig4.01

Flow from city to countryside cross the site

Self-made illustration

fig4.02

Flow from neighbourhood to the site

Self-made illustration

fig4.03

Linear green space

Self-made illustration

fig4.04

Interaction zone facing the street

Self-made illustration

fig4.05

Density of the area

Self-made illustration

fig4.06

Classification of the dwelling units

Self-made illustration

fig4.07

Arrangement of different typology on the site

Self-made illustration

fig4.08

Main open space structure of the site

Self-made illustration

fig4.09

A range of different open spaces

Self-made illustration based on *ref.56*

fig4.10

Different type of agriculture spaces

Self-made illustration

fig4.11

Agricultural network

Self-made illustration

fig4.12

Sustainable operational cycle of the community

Self-made illustration

fig4.13

Masterplan

Drawing

fig4.14

Layering of the design

Self-made illustration

fig4.15

Residential buildings distribution

Self-made illustration

fig4.16

Commercial buildings distribution

Self-made illustration

fig4.17

Public buildings distribution

Self-made illustration

fig4.18

Section 1-1

Drawing

fig4.19

Section 2-2

Drawing

fig4.20

Section 3-3

Drawing

fig4.21

Masterplan zoom in

Drawing

Chapter 5

AGRICULTURAL SPACES AND ACTIVITIES

<i>fig5.01</i>	Shared agriculture spaces	Self-made illustration
<i>fig5.02</i>	Agriculture spaces in the community building	Self-made illustration
<i>fig5.03</i>	CROPS for different types of community agricultural spaces	Self-made table
<i>fig5.04</i>	Possible Products	Self-made table
<i>fig5.05</i>	Agriculture spaces in typology 1	Self-made illustration
<i>fig5.06</i>	Agriculture spaces in typology 2	Self-made illustration
<i>fig5.07</i>	Crops for kitchen garden	Self-made table
<i>fig5.08</i>	Illustration of the ICT system	Self-made illustration
<i>fig5.09</i>	The expert systems based on ICT system	Self-made illustration
<i>fig5.10</i>	The trading system based on ICT system	Self-made illustration
<i>fig5.11</i>	The Loop of the food delivery and collecting service	Self-made illustration
<i>fig5.12</i>	The process of the food delivery and collecting service	Self-made illustration
<i>fig5.13</i>	Exemple of the information list	Self-made illustration
<i>fig5.14</i>	ICT system in habitants daily life	Self-made illustration
<i>fig5.15</i>	supermarkets around the site	Self-made illustration
<i>fig5.16</i>	"From farm to fork" process	Self-made illustration

Chapter 6

RECREATIONAL AND EDUCATIONAL SPACES AND ACTIVITIES

<i>fig6.01</i>	Recreational spaces and activities	Self-made illustration
<i>fig6.02</i>	Educational spaces and activities	Self-made illustration
<i>fig6.03</i>	Imagining a day visiting the community	Self-made table

Chapter 7

SUSTAINABLE OPERATIONAL SYSTEMS

<i>fig7.01</i>	<i>Corso marche masterplan</i>	Self-made illustration based on <i>ref.35</i>
<i>fig7.02</i>	Water and food loop	Self-made illustration based on <i>ref.7</i>
<i>fig7.03</i>	Water management plan	Self-made illustration

<i>fig7.04</i>	Photo of rain garden	From google search
<i>fig7.05</i>	Photo of bioretention ponds	From google search
<i>fig7.06</i>	Photo of bioswales and water feature	From google search
<i>fig7.07</i>	Membrane Bioreactor Technology	Self-made illustration based on <i>ref.51</i>
<i>fig7.08</i>	Illustration of space around the bioswales	Self-made illustration
<i>fig7.09</i>	Illustration of space around the retention ponds	Self-made illustration
<i>fig7.10</i>	Operation principle of the water system on site	Self-made illustration
<i>fig7.11</i>	Waste treatment and energy generation	Self-made illustration

Chapter 8

TWO DWELLING TYPOLOGIES INTEGRATED WITH AGRICULTURE

<i>fig8.01</i>	Volume of the basic unit	Self-made illustration
<i>fig8.02</i>	Plan of the basic unit	Drawing
<i>fig8.03</i>	The surface toward the sun	Self-made illustration
<i>fig8.04</i>	Section of the basic group	Drawing
<i>fig8.05</i>	Potential of expansion	Self-made illustration
<i>fig8.06</i>	Diagram to show the griculture spaces	Self-made illustration
<i>fig8.07</i>	Agriculture spaces in this typology	Self-made illustration
<i>fig8.08</i>	Photoes of the unit composition process	photoes of the model
<i>fig8.09</i>	Basic units	Self-made illustration based on <i>ref.52</i>
<i>fig8.10</i>	Secondary units	Self-made illustration
<i>fig8.11</i>	Unit combination 1	Self-made illustration
<i>fig8.12</i>	Unit combination 2	Self-made illustration
<i>fig8.13</i>	Unit combination 3	Self-made illustration
<i>fig8.14</i>	Ground floor plan of group1	Drawing
<i>fig8.15</i>	First floor plan of group1	Drawing
<i>fig8.16</i>	Second floor plan of group1	Drawing
<i>fig8.17</i>	Ground floor plan of group2	Drawing
<i>fig8.18</i>	First floor plan of group2	Drawing

<i>fig8.19</i>	Second floor plan of group2	Drawing
<i>fig8.20</i>	Ground floor plan of group3	Drawing
<i>fig8.21</i>	First floor plan of group3	Drawing
<i>fig8.22</i>	Section of group1	Drawing
<i>fig8.23</i>	Section of group2	Drawing
<i>fig8.24</i>	Section of group3	Drawing
<i>fig8.25</i>	3-D view of group1	Self-made illustration
<i>fig8.26</i>	3-D view of group2	Self-made illustration
<i>fig8.27</i>	3-D view of group3	Self-made illustration
<i>fig8.28</i>	Combination of the units of typology2	Self-made illustration
<i>fig8.29</i>	Laying of the community building of typology2	Self-made illustration
<i>fig8.30</i>	Basic unit of typology 2	Self-made illustration
<i>fig8.31</i>	3-D explanation of typology 2 unit	Self-made illustration
<i>fig8.32</i>	Ground floor plan	Drawing
<i>fig8.33</i>	First floor plan	Drawing
<i>fig8.34</i>	Second floor plan	Drawing
<i>fig8.35</i>	Third floor plan	Drawing
<i>fig8.36</i>	Section 2-2	Drawing
<i>fig8.37</i>	Section 1-1	Drawing

ABSTRACT - ENGLISH VERSION

The project is based on the The "Tur(i)nto green" competition, which is aimed at transforming the previous industrial area, South Mirafiori, into an agriculture based community. This community, designed for low income people, younger generation and immigrants, will provide Turin with a new model of urban life.

It will become part of an agricultural urban system, and be integrated with the adjacent farms situated on the outskirts of the city.

In the design process, we make an effort to deal with the operative grounds instead of just designing the houses.

With a careful research of Urban agriculture, we create spaces for agriculture as well as the related activities and services. The process of agriculture will be integrated with other sustainable aspects: waste, water and energy. All these aspects act together to operate this sustainable community.

At the same time, through the application of ICT (information communication technology) system, we are able to make the food production and consumption cycle more efficient, inhabitants could gain easier accesses to the information they need.

For the layout of the masterplan, our approach has a psycho-social dimension. We preliminarily shaped the open spaces of the public realm, tried to connect the community life with nature, later we defined an open space system which is as rich a hierarchy as possible. The arrangement of the dwelling clusters shows the consideration of the identity of the community and the sensation of belongingness, a feeling of home, which is very important for these immigrants.

The project is interesting not only for its form and visual appeal, which is never the less considerable, but also for the new lifestyles we proposed and the rich variety of experiences we would offer.

ABSTRACT - ITALIAN VERSION

Il progetto si basa sul concorso "Tur(i)nto green", che mira a trasformare l'area di Mirafiori in una comunità basata sull'agricoltura. Questa comunità è per le persone a basso reddito o disoccupati e gli immigrati.

Sarà il principale quartiere produzione alimentare della città, e la comunità sostenibile principale di Torino.

Nel processo di progettazione, l'obiettivo è di affrontare gli aspetti gestionali e non solo la progettazione delle case.

Con un'attenta ricerca di agricoltura urbana, creiamo spazi per l'agricoltura, e per le relative attività e servizi. Il processo di integrazione dell'agricoltura con il trattamento dei rifiuti, trattamento delle acque e la generazione di energia sono tutti aspetti che agiscono insieme per rendere questa comunità sostenibile.

Allo stesso tempo, attraverso l'applicazione del sistema ICT (tecnologia di comunicazione informazioni), siamo in grado di rendere la produzione alimentare e il ciclo di consumo più efficienti, gli abitanti possono ottenere un facile e accesso alle informazioni di cui hanno bisogno. Per il layout del masterplan, il nostro approccio ha una dimensione psico-sociale. Abbiamo in primoluogo conformato gli spazi aperti della sfera pubblica, cerchiamo di collegare la vita comunitaria con la natura, in seguito definiamo un sistema di spazi aperti, che è ricco di una gerarchia possibile.

La combinazione cluster per l'abitazione mostra una attenzione per l'identità e la sensazione di appartenenza, una sensazione di casa, che è molto importante per questi immigrati.

Il progetto si concentra non solo sulla forma e impatto visivo, che non è mai di secondaria importanza, ma anche per la ricchezza delle possibili esperienze che vorremmo offrire.

CHAPTER 1: THE COMPETITION BACKGROUND

1.1 Introduction of the competition



fig1.01 Logo of the competition

Background:

The CRD-PVS (Research and Documentation Centre in Technology, Architecture and City in Developing Countries) at the Politecnico di Torino (Italy), hold an International Student Design Competition tur(i)ntogreen - Farms In A Town.

Topics:

The massive transformation of the global economy, the redistribution of wealth and rights, new locations and methods of production of goods and services are transforming the boundaries of the contemporary city; the fragile balance between rural areas and urban settlements is quickly evolving. Younger generations from the rural areas in the whole world continue to move into the cities, claiming the right to share the benefits supplied by joint services, wealth and employment, peculiarities of the city even if they imply unacceptable life conditions. This has already led to an increase in urban population that generates the demand for new architectural solutions ensuring dignity and integrated living conditions. In order to assure a bright future to Turin, we need to consider transforming or to replacing the current models of urban management, life and development. One of the possible models refers to the concepts of agro - housing and urban - farming, which are becoming more and more widespread: the use of open spaces - also unconventional - for diverse agricultural and cropping technologies and methods along with innovative production and management processes within a highly populated urban realm.

1.2 Requirements of the competition

The narrow area of the FIAT production area car parking will be the chance to provide Turin with a new model of urban life. Dwellings integrated with food production, in traditional (surface field) or innovative (vertical) models; housing for low income people and immigrants, with agricultural skills; spaces, services and features to let the younger generation reinvent their own way to work; urban farming that opens towards a new economy, including education, documentation, food retailing, agricultural and zoo-technical services.

SPATIAL Requirements:

1. land use:

- Area 1: 60 % agriculture;
- Area 2: 40 % agriculture;
- Area 3: 20 % agriculture

2. Dwellings:

Dwellings with high quality of life delivered at an affordable standard.
they should be designed with a community orientation in mind.
These buildings should contain parts for self-construction and/or self-maintenance.

SERVICES

New facilities, services and spaces for habitants
These may include spaces for temporary jobs, shared spaces and workshops, public ICT facilities.

Employment opportunities for the new citizens to engage with others in new forms of social enterprise.

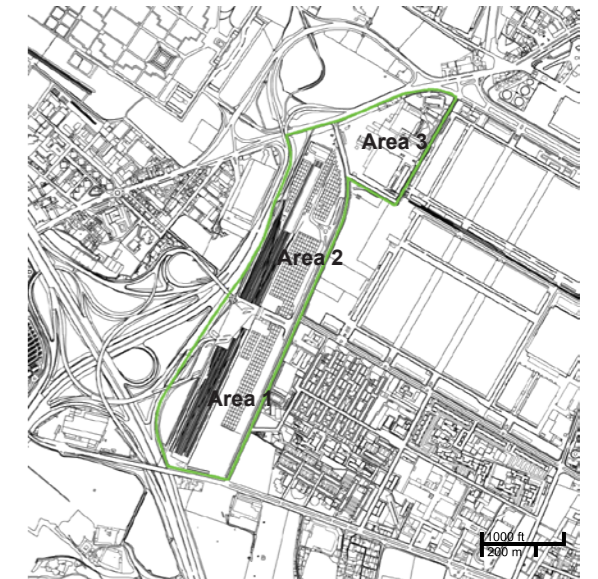


fig1.02 Map of the design area
Turin, Italy. South Mirafiori, Circonscrizione 10 (45°1'30.71"N, 7°36'22.92"E)
Strada Antica di Collegno, Strada della Manta, Via Anselmetti, Strada del Drosso

TECHNOLOGIES

Integration between residential and agricultural activities, through the definition of new building typologies and integrated solutions.

Integration of residential requirements and waste with the agricultural productive process.

Chapter 2: URBAN AGRICULTURE

2.1 What is Urban Agriculture

2.2 Why Talking About Urban Agriculture

2.3 Existing Typologies of Urban Agriculture

2.4 Innovative Technologies Applied in Urban Agriculture

2.5 Case Studies of Urban Agriculture

2.1 What is Urban Agriculture²



fig2.01 Timeline of the Urban agriculture development

The definition of "Urban Argriculrure"

The expression "urban argriculrure" is originally used only by scholars and the media, and then been adopted by a lot of agenda. It has been broadly defined as :

" all agricultural activities located within(intra-urban) or on the periphery (peri-urban) of a settlement, city or metropolis, independently or collectively developed by people for self-consumption or commercialization purposes; involving the cultivation or raising, processing, and distribution of a diversity of products-be these edible or not-largely via the (re)utilization of human and material resources, products and services located in and around the urban area in question, in turn contributing considerable material and human resources to that area.

The actors involved in urban agriculture

Many actors are involved in UA, they are the suppliers of resources,inputs services, the producers, the transportors, the retailers, the consumers, the promotors and the managers. These actors pertain to the public and private sectors, the formal and the informal economy.

Areas used for urban agriculture

Areas used for agriculture are of all sizes, from tiny home spaces (windowsills, containers, fences, rooftops, basements, walls) to recreational grounds, utility and transportation rights-of-way (stream or roadsides), to suburban public or private estates. On the other hand, those areas are used in a complementary way. For instance, year-round homegardens often serve as nurseries for rainfed off-plot fields; the same streamside field may carry vegetables in the dry season and grain crops in the wet season. In this way can maximise the outpus within critical inputs and ensure the stability against crop loss and market eviction.

2.2 Why Talking About Urban Agriculture

2.2.1 Challenges from population growth³

► FOOD SUPPLY

World population is expected to increase by 1.8 billion as of 2030 and by 2.5 billion as of 2050, reaching 9.2 billion. Food demand is expected to increase by 50 percent by 2030 and 100 percent by 2050, because of continued population growth and higher incomes.

2050

90 000 000 people
70% live in city
100% more food

TODAY

► LIMITED RESOURCES

People are accustomed to being able to find whether domestic or exotic foods all the year around in the supermarket. Thanks to the technologies of farming and distribution, people are enjoying this convenience and easiness of urban life. However, when this pattern of food consumption is being formed, few people know that such a common daily habit bring a whole range of costs.

Energy



fig 2.02 Energy crisis

Land



fig 2.03 Disafforestation

Water



fig2.04 water scarcity

2.2.2 Influences of the traditional agriculture

The supermarket food relies on the importation of food worldwide to maximize choices of the customers. Long distance trade leads to specialization in farming. The crops will be grown over large scales in industrialized conditions to achieve the economies of scale.

► Influence on LOCAL ECOLOGY

During last years, agriculture in developed countries has been transformed to be more capital intensive. The supermarket food relies on the importation of food worldwide to maximize choices of the customers. Long distance trade leads to specialization in farming. In the modern farm, the crops will be grown over large scales in industrialized conditions to achieve the economies of scale.

► Influence on ENVIRONMENTAL FOOTPRINT⁴

Worldwide, agriculture and related up-stream activities such as fertilizer manufacture plus land use change are responsible for about one third of the world's greenhouse gas emissions.

Million Eco points per capita and year

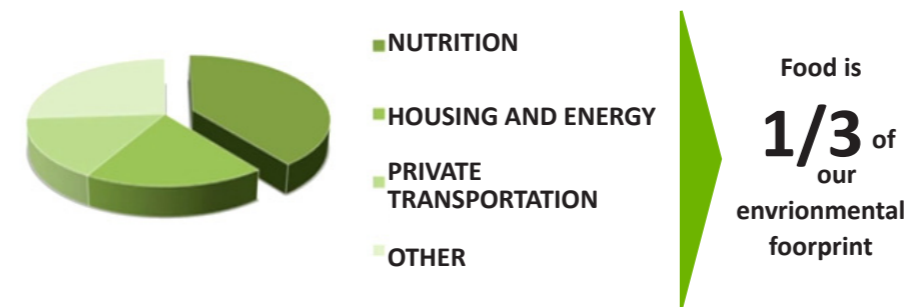


fig2.05 Environmental impact of swiss consumption and production

► Influence on ENERGY⁵

There is dependence on energy throughout the food chain: from the manufacture and application of agricultural inputs, such as fertilizers and irrigation, through crop and livestock production, processing and packaging, distribution services, cold storage, disposal equipment in food retailing and in home kitchens. It was estimated that vegetables have traveled 2000 kilometers on average before they arrive the store where people buy it.

The detailed breakdown of fuel cost of a standard white loaf

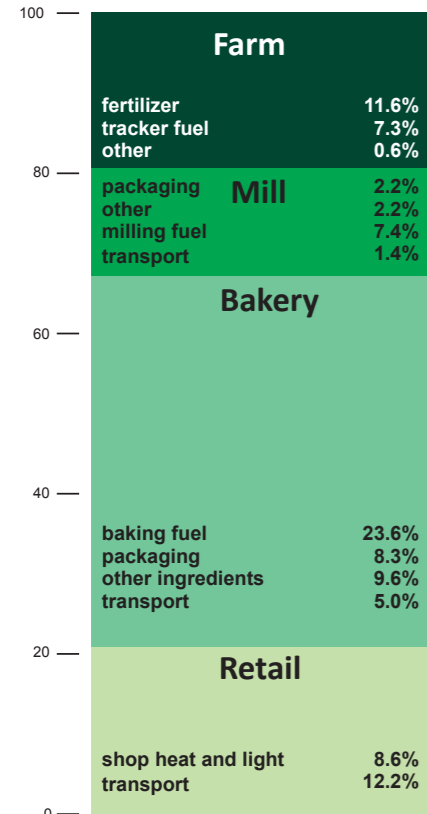


fig2.06 Detailed fuel cost of a standard white loaf

A research done by Peter Chapman in 1975 illustrates the embodied energy for a loaf of bread. It shows the energy consumed in making the food is hundreds times as much energy as calories the food actually contains.

-The total cost is 5.6kwh/loaf
 -Fertiliser and Transport account for 37.6 of embodied energy



research done by Peter Chapman in 1975

fig2.07 Total fuel cost of a standard white loaf

► Influence on WATER⁶

Global average freshwater withdraw

Access to fresh food for many cities is a constant challenge, while unsustainable consumption of potable water for non-potable uses is increasingly threatening our freshwater resources. However, agriculture withdraws the most amounts of the available freshwater every year. Great amount of agricultural runoff, which contains pesticides and other wastes, is produced due to the water inefficient irrigation. The resulting contaminated agricultural runoff is the leading source of water quality impacts on rivers, lakes and other ground water. It represents not only a waste of agricultural chemicals, but also an environmental threat to downstream ecosystems.

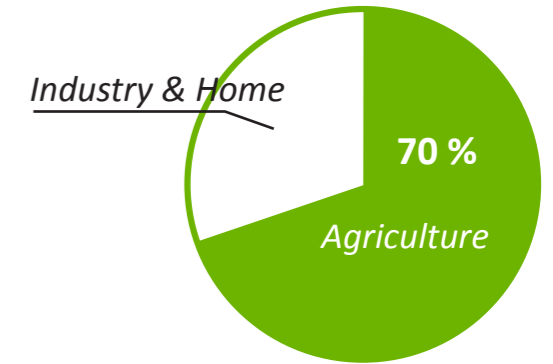


fig2.08 global freshwater withdraw

Agriculture, Water Use and population growth

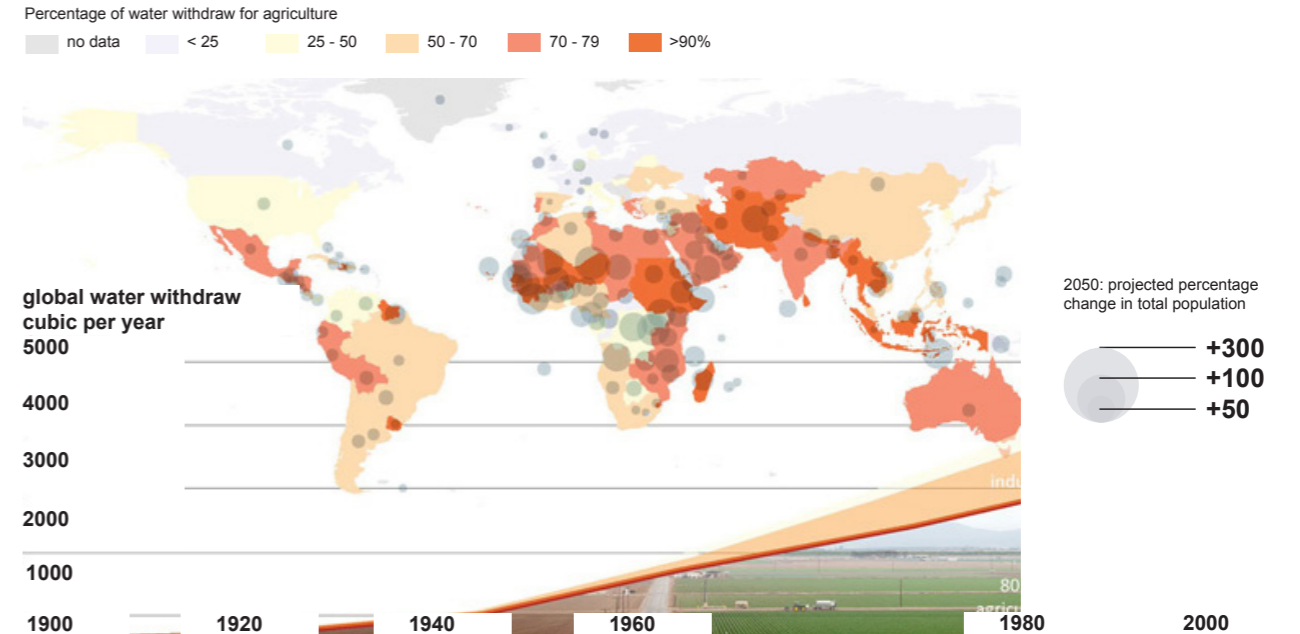


fig2.09 Agriculture water use and population growth

2.2.3 Benefits of Urban Agriculture

Water Efficiency⁷

Open-loop (linear) potable water usage pattern

As cities continue to grow, more and more resources will be channeled into them generating more waste in the form of urban wastewater. The larger the growth in population, the larger the volume of wastewater generated. Thus, the current urban population growth trend will correlate to urban wastewater as an ever-growing resource for water as well as nutrients in it.

Current flow of resources into and out of the city is linear and wasteful.



fig2.10 Extensive treatment of water in the city

Conventionally, in the developed world, urban wastewater moves through an extensive network of hidden infrastructure to large-scale, centralized wastewater treatment facilities that remove suspended and dissolved toxins and then discharge the treated water into oceans and freshwater bodies. Even where extensive, responsible wastewater infrastructure exists, in many developed countries it is showing its age. Water pollution, soil contamination and spread of waterborne diseases due to leakage and spillage are increasing, costing the local government and the residents in terms of both health and wealth. The prospect of reinstalling a new city-wide network for wastewater collection and treatment is tremendously daunting to local governments.

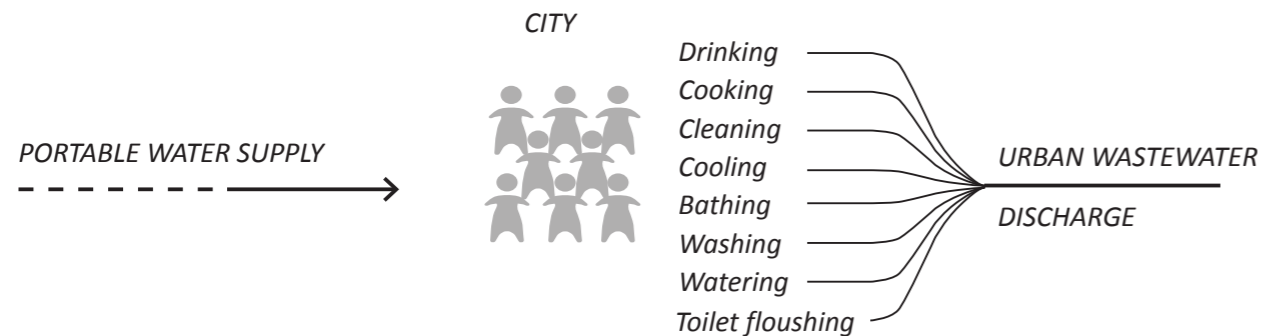


fig2.11 Urban community independently water treatment

Water Efficiency⁷

Closed-loop systems

Localized, individual fixes in the next couple of decades will cost billions of dollars. Thus, regarded in the context of long-term viability, an ecological and economical approach that advocates decentralizing the process in order to treat water locally and naturally and allow it the opportunity to be reabsorbed back in the local ecosystem emerges as the best solution. This on-site wastewater treatment and reuse mimics the closed cycle of a natural ecosystem. As illustrated in below, this decentralized system will regenerate the urban ecosystem, manage urban wastewater and serve as a building block for a green economy by way of urban farms.

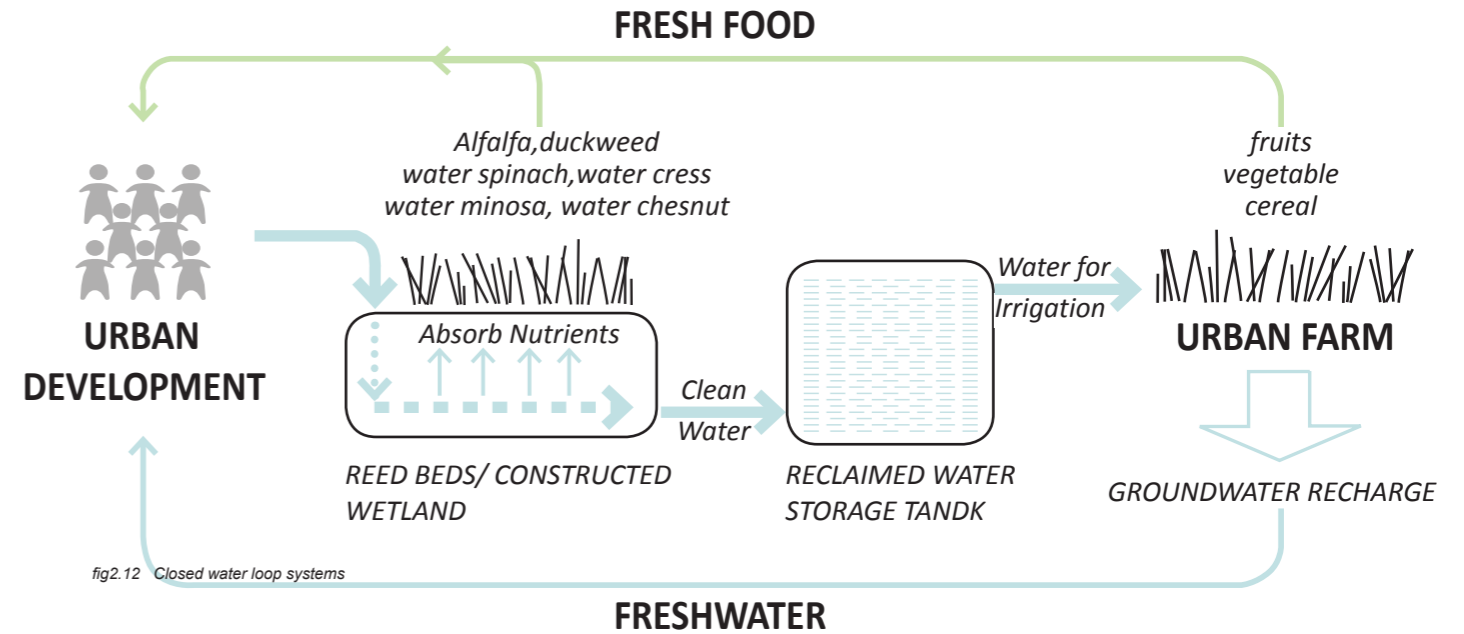


fig2.12 Closed water loop systems

Wastewater treatment process

- Primary : to remove suspended solid
- Secondary : to remove pathogenic organisms, absorb the nutrients
- Tertiary : to remove any traces of chemicals and salts

Risks involved

- Potential Health Risks;
- Risk of Soil and Water Pollution;
- Maintenance Issues;
- Physical Challenges;

► ENVIRONMENTAL BENEFITS--- Waste reuse⁸

The combination of urban organic wastes (UOW) and urban agriculture (UA) creates particular issues in the modern urban setting. On the one hand, the interests of urban waste reduction mesh well with the promotion of UA, since urban and peri-urban farmers are in need of organic matter as soil conditioner/ fertilizer and animal feed, and cities and towns wish to conserve disposal space and reduce the costs of municipal solid waste management (MSWM).

The new FoodLoop

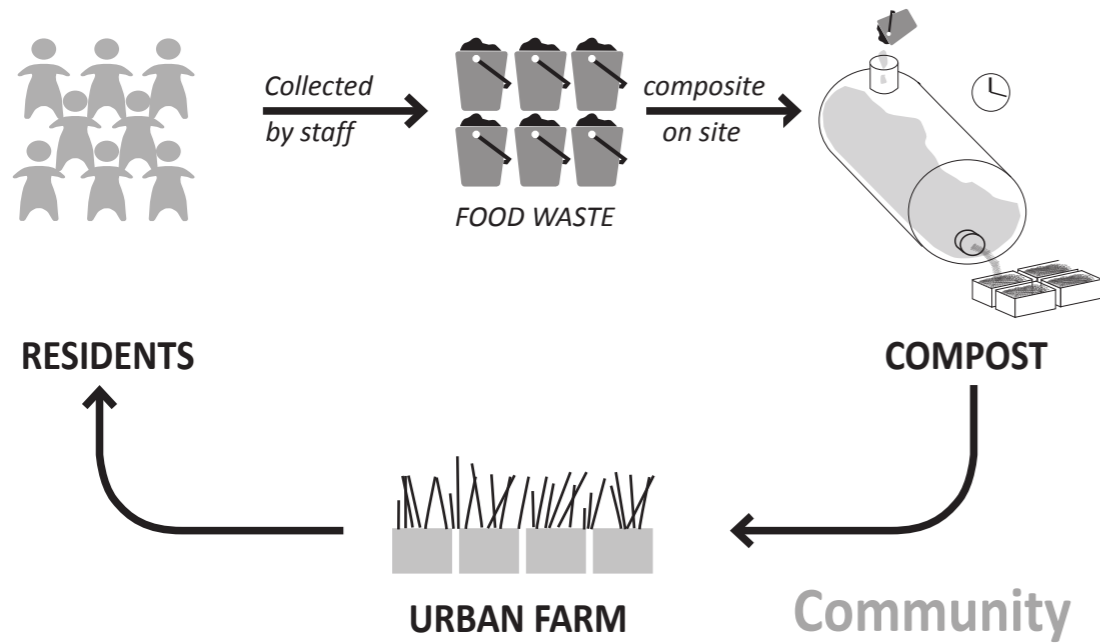


fig2.13 Food loop - food waste treatment

► SOCIAL BENEFITS⁹

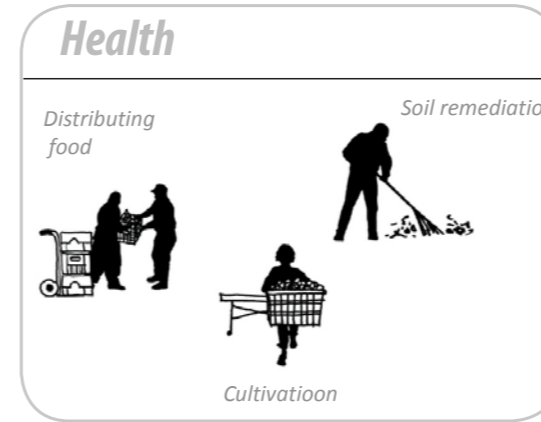


Fig2.14 Activities related with healthy issue
to improve the health of participants through providing access to fresh and safe food, involving people in farming as physical activity,

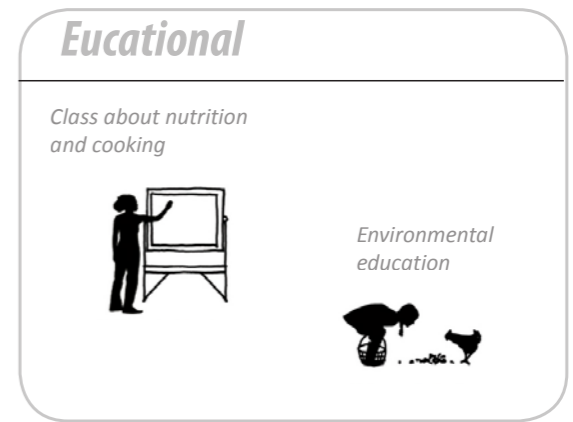


Fig2.15 Activities related with Education issue
Motivating people to have healthy diet that to consume more vegetable and fruits, educating people the relationship between nutrition and food.



Fig2.16 Activities related with Social issue
Transforming the vacant public space to urban farms to offer spaces for people to meet and working together. Residents in the neighbourhood establish and join the Community based organizations and institutions in order to operation to farms.

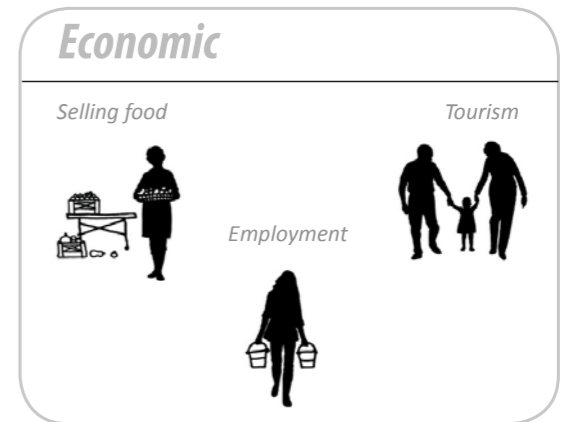


Fig2.17 Activities related with Economic issue
The farmers market helps getting income form selling what they grow. Some of the farms provide jobs of managing farm operations and participating in leadership programs, and this will attract more tourists to consume here.

2.3 Existing typologies of Urban agriculture⁹

Institutional Farms and Gardens:

Affiliated with an institution (such as hospitals, churches, prisons, schools, public housing) whose primary mission is not food production, but which have goals that urban agriculture supports.

Community Gardens:

located on publicly-owned land or land trusts. Typically managed by local resident volunteers, mainly grow food.

Commercial Farms:

In general, commercial farmers try to maximize crop performance in order to achieve profitability, however, some share many of the health and ecological goals of the broader urban agriculture community.

Community Farms:

Tend to be communal growing spaces operated by a nonprofit organization that engages the surrounding community in food production but also social and educational programming.

<http://www.fiveboroughfarm.org/urban-agriculture/4-types/>




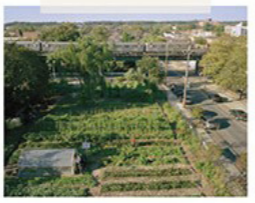




Institutional Farms and Gardens	Commercial Farms	Community Gardens	Community Farms
			
Edward A. Reynolds West Side High School	Eagle Street Rooftop Farm	Temple of David Community Garden	East New York Farms
 245 NYCHA gardens* 117 public school gardens	 3 farms	 390 gardens	 7 farms
Affiliated with an institution (e.g. school, housing development, prison, etc.)	Managed as a for-profit business	Typically managed by group of local resident volunteers	Typically managed by a nonprofit organization; includes in its mission engagement with the surrounding community

fig2.18 Four types of existing urban agriculture

2.4 Innovative technologies applied in Urban agriculture

Green Roof^{10,11}

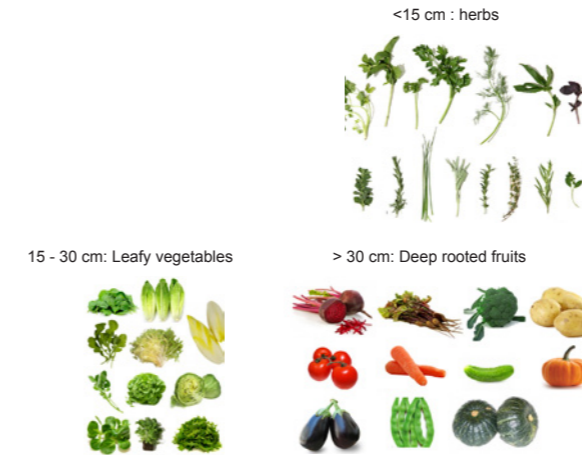


Fig2.19 Vegetables catalogs according to the depth of growing media

Construction:

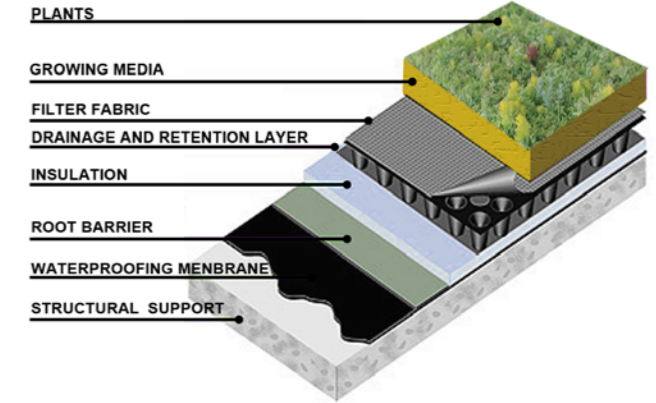


Fig2.20 Layers of the green roof construction

Irrigation Methods¹²

- Drip and tube systems
- sprinkler systems
- Capillary systems
- Standing-water systems

Plant Establish Methods:

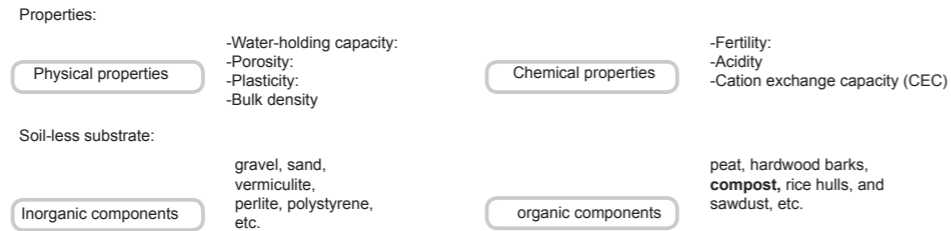


Living Wall¹³

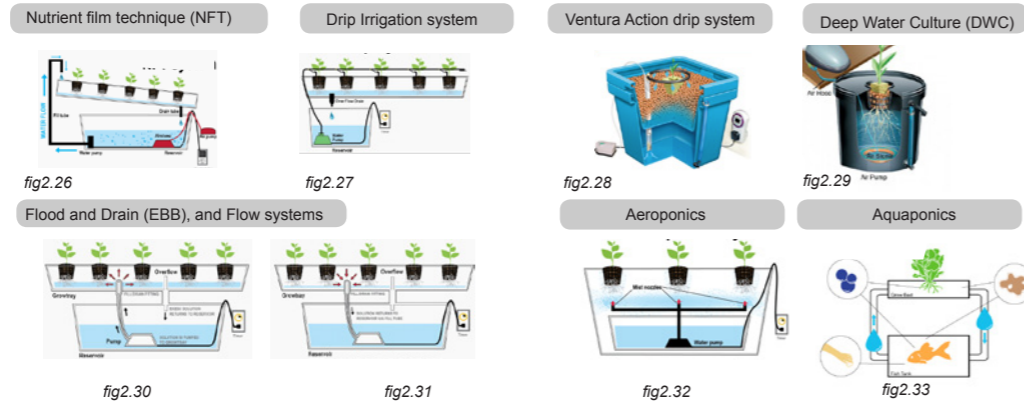


2.4 Innovative technologies applied in Urban agriculture

Substrate¹⁴



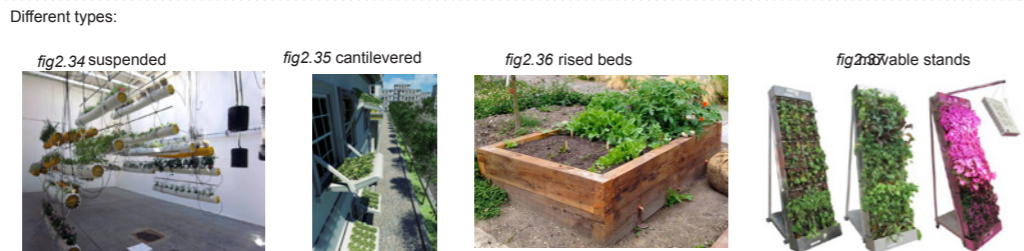
Hydroponics^{15,16,17}



Container

Different types:

product name(from right to left):
al aire;
Herbow¹⁸
Karoo Practical¹⁹
G.l.Y garden²⁰
Mobile Edible Wall, Green Living Technologies International²¹



Greenhouse

Principle of Greenhouse²²

Example of Greenhouse²³

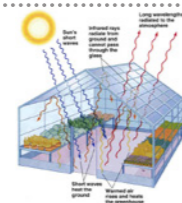


fig2.38 Principle of Greenhouse



fig2.39 Example of Greenhouse

2.5 Case studies of urban agriculture

2.5.1 City scale

► Continuous Productive Urban Landscapes (CPULs)⁵

The concept of CPUL City is a strategic and associative framework for the theoretical and practical exploration of productive landscapes within contemporary urban design. Central to the CPUL concept is the creation of multi-functional open urban space networks that complement and support the built environment.

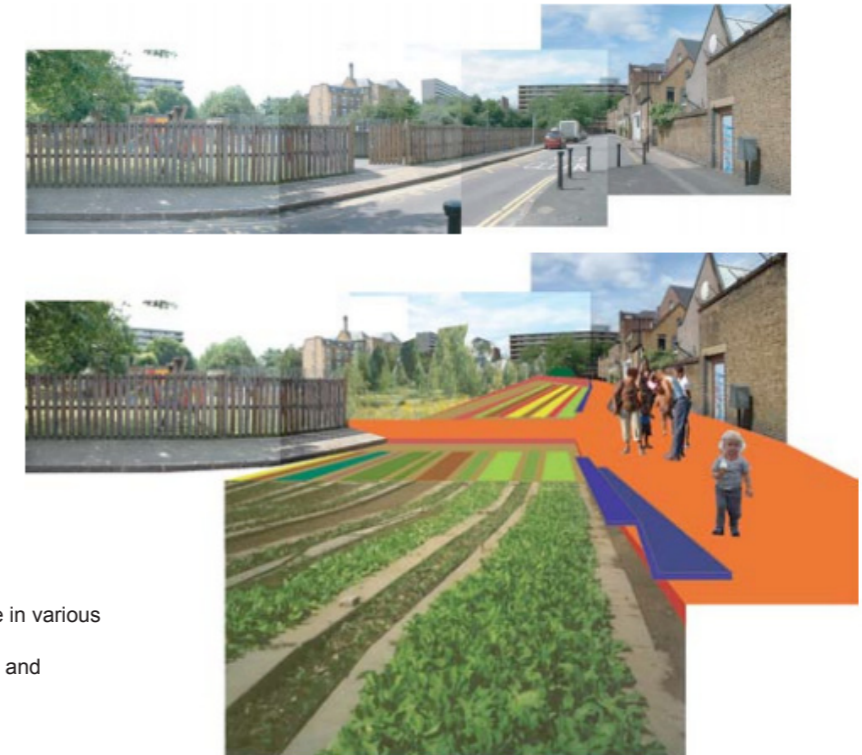


fig2.40 London, LeisurEscape. Munton Road, before and after implementing a CPUL. In this proposal, the road, which is lightly used by vehicles, would be converted into an urban agricultural field surrounded by cycle and pedestrian ways.

CPULs will be productive in various ways:
offering space for leisure and recreational activities,
access routes,
urban green lungs, etc.
But most unique, they will be productive by providing open space for urban agriculture, for the inner-urban and peri-urban growing of food.

The project will be developed on a number of sites in Colombes, a city located in the northwestern suburbs of Paris. The network -losed ecological cycles - will including three Units, each with complementary urban functions.



fig2.44 Location of the three Unit

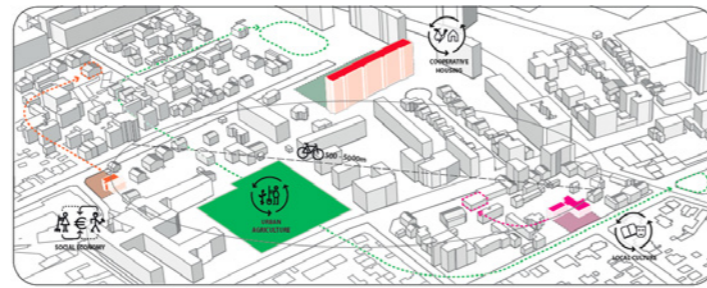


fig2.45 R-URBAN micro-urbanism principles

RECYCLAB is a recycling and green building which is formed around a series equipment for recycling waste urban and transforming them into subsets for eco-construction, thus contributing to significant reduction of local waste and CO2 emissions.

ÉCOHAB

is an Ecological Cooperative Housing Unit, cooperative and environmental, which includes housing experimental and public spaces, self-built part. These include housing innovative devices to reduce consumption energy, making gardens in height, establish a carpool, etc..

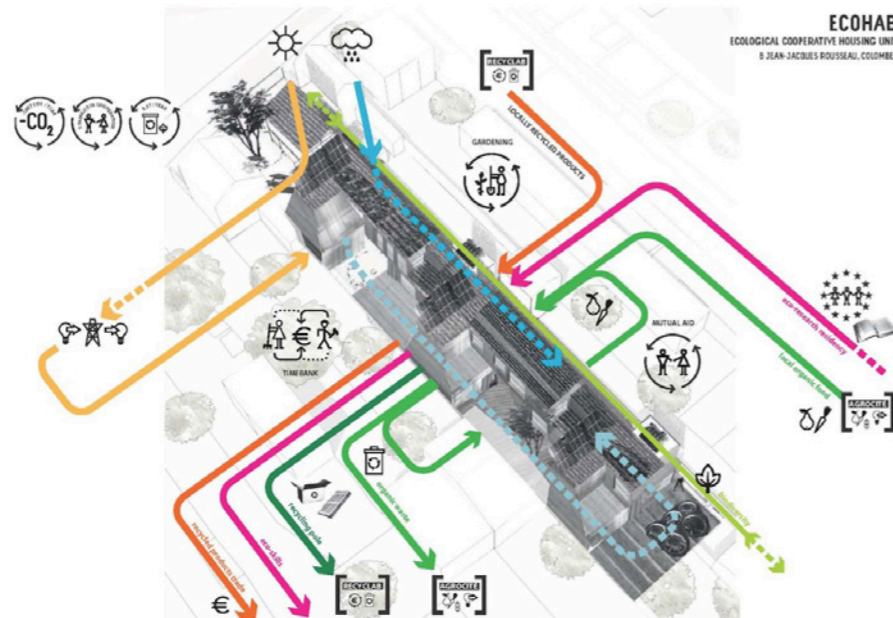


fig2.46 Operation cycle of the ECOHAB unit

AgroCité is designed to introduce and support the dynamics of urban agriculture and provide support for the cultural and educational activities related to the R-URBAN project, currently emerging in the city of Colombes.

The unit consists of three parts:

- an 'AgroLab' specialising in experimenting with intensive organic agricultural production
- an area for community gardening
- an area for activities related to nature and agriculture

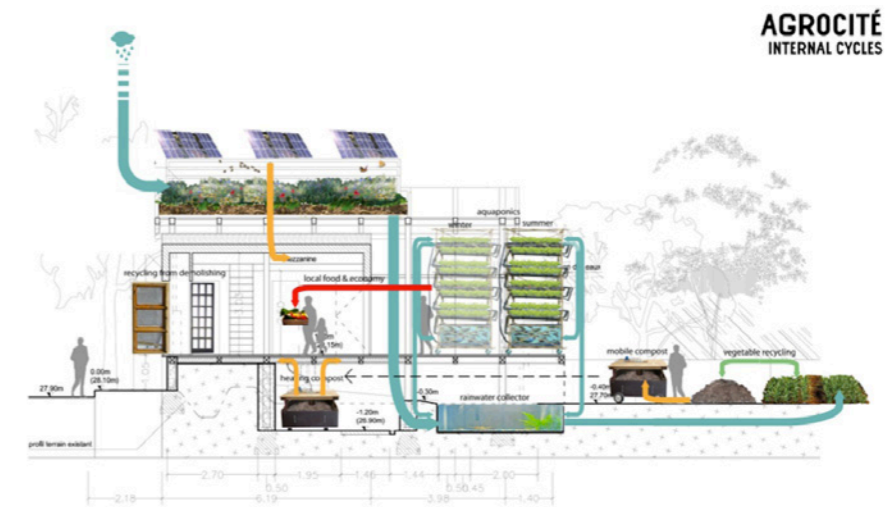
All three areas are made up of cultivable land and will include:

- an experimental urban agricultural farm is:
- a shared garden for residents of the neighbourhood
- an educational garden
- a shared greenhouse for plants and seedlings, equipment for collecting rainwater, phytoremediation, solar energy and biogas, aquaponics crops, agricultural short circuits.



fig2.47 View of the AGROLAB unit

The buildings will include prototypes of organic intensive farming and a range of equipment and know-how covering: a seed library; a vegetable market and local agricultural products; collective Café and cooking facility; a collective bread oven.



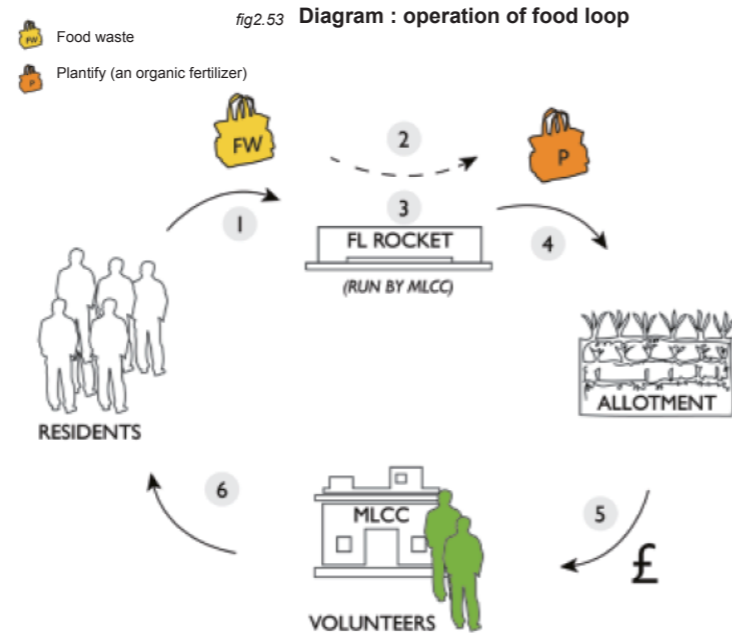
▶ FOOD LOOP CYCLE⁸

About 18 per cent of household waste (in UK) is food waste, and could be as high as 40 per cent in some areas. Its decomposition in landfill sites creates methane, 23 times more powerful as a greenhouse gas than CO₂, and it has been estimated that Emissions from household food waste directly account for 5 percent of UK annual emissions. Casting an eye into the not-so-distant future, when the scarcity of resources will completely change

our current lifestyles, designers will need to not only create ways of doing things differently, but also make those new behaviours interesting. This will certainly mean working in different ways: addressing the redesign of services and infrastructure as well as stuff, learning to integrate innovative business models into the creative process, and being humble enough to facilitate the evolution of communities.

FoodLoop is a project about food waste and food growing which began in 2008 as a partnership with the Policy Studies Institute. It is helping residents of Maiden Lane Estate in King's Cross take over the running of a food waste collection scheme without council funding. The idea is to change residents' perception of food scraps as a waste stream to instead being a resource, and making them more amenable to the idea of separating the scraps from their other rubbish and putting them out for collection once a week.

An in-vessel Rocket composter⁷ was installed in September 2009, and a contractor was brought in to carry out food waste collections and run the machine. With the help of SEED Foundation's design and enterprise skills, a core group of residents convinced the council to allow the community to utilise the equipment that was already on the estate, by demonstrating that it was possible to generate enough income from the composting to be able to run the service alone, with no financial support from the council except for the weekly provision of caddy liners.



1. Residents contribute their food waste to the ROCKET
2. The Rockets converts food waste into compost
3. some compost are made into organic fertilizer :Plantify
4. Plantify are sold to ALLOTMENT
5. The income is returned to community's MLCC organization.
6. MLCC uses income from Plantify to fund the Rewards for residences.

waste collections and run the machine. With the help of SEED Foundation's design and enterprise skills, a core group of residents convinced the council to allow the community to utilise the equipment that was already on the estate, by demonstrating that it was possible to generate enough income from the composting to be able to run the service alone, with no financial support from the council except for the weekly provision of caddy liners.

But how could enough income be generated to pay people to carry out collections, operate the Rocket and manage the compost? A potential solution (on paper at least) was found to lie in the compost itself, which has been rebranded as Plantify. It is a crumbly, nitrogen-rich, soil-like substance containing a high concentration of many of the elements and offer an extraordinary boost to vegetable growth. With the recent boom in urban farming, the commercial future of Plantify is a distinct possibility.

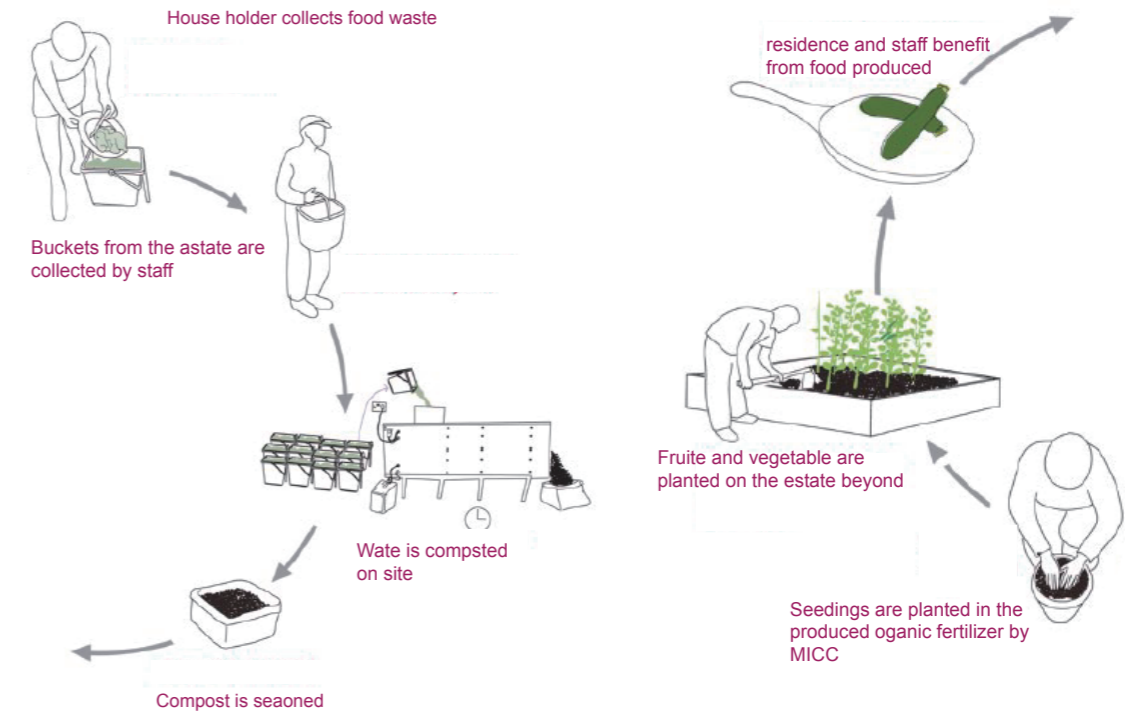


fig 2.54 Diagram : cycle of food waste - compost - fresh food

► HOUWELING' TOMATOES, heat and power greenhouse project²⁶

The Houweling's Tomatoes project, launched by General Electric Company (GE), uses natural gas engines and a carbon dioxide fertilisation system to provide heat, power and carbon dioxide to the 125-acre tomato greenhouse, except that it provides flexible energy generation and contributes electric power in peak times for the community in Camarillo, California. This CHP system, which is powered by natural gas, generates 8.7 MW of electrical power and 10.6 MW of thermal power from hot water to heat the large on-site glasshouses. Its total thermal efficiency is almost 90%. The thermal energy produced during power generation can be transferred to the greenhouse immediately in cooler periods kept in existing thermal storage tanks to use at other times. Thermal energy is recovered in exhaust gas heat exchangers to be used in the ultra-efficient greenhouse, which uses extremely low water temperatures in its heating system to cool exhaust temperatures under the dew point. Carbon dioxide from engine exhaust gases will be purified and piped into the greenhouse to fertilize tomato plants through the photosynthesis process. The technology for the carbon dioxide fertilization system was developed by GE's Center of Excellence in Holland.

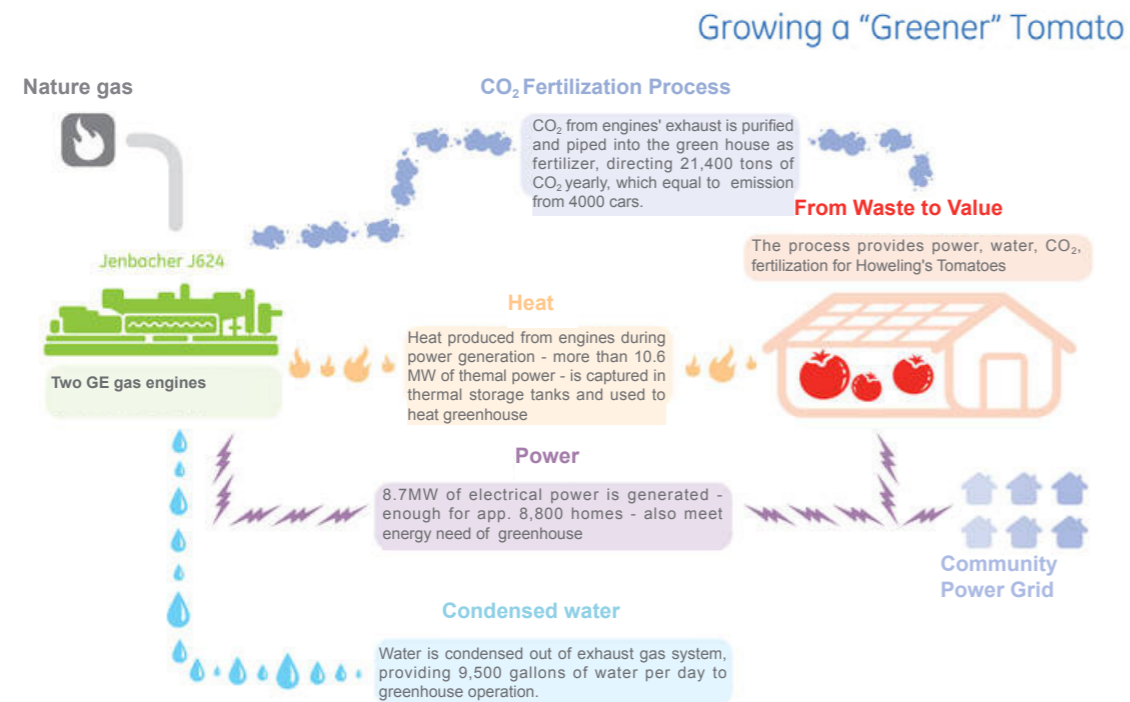


fig2.55 Operation system of the houwelling tomato project

2.5.3 Building scale

► EAGLE STREET ROOFTOP FARMS^{27,29}

The green roof sit on top of a warehouse owned by the Brooklyn company Broadway Stages and was designed by the Green roof company Goode Green. It is the first commercial organic rooftop vegetable farm with a community scale in US.



fig2.56 Eagle Street Rooftop Farms

Design and Installation

- The green roof base system is comprised of 2" of built-up components: polyethelene, drainage mat, and retention and separation fabrics.
- With the approval of the building's engineer, 200,000 pounds of growing medium were lifted onto the roof by crane in "super-sacks" over the course of a single day. The growing medium, laid directly onto the green roof base, is a mixture of compost, rock particulates and shale and is manufactured in Pennsylvania. Here are 30 food-growing beds facing north-south and measuring 1.2m wide, and these were divided by a central, mulch-covered aisle. The growing medium in the beds is 100-175mm deep. A buried pipe irrigation system delivers water. It is a green roof component that at the same time retains water, allows for air circulation and is lightweight.
- The green roof can hold over 1.5" of rain, providing a significant reduction in storm water runoff. The captured water, in turn, can help to cool the warehouse below yielding a reduction in cooling costs.
- Installation cost was approximately \$10 per square foot. This is significantly lower than most green roof installations due in part to two main factors: the three story building and open expanse of roof were very accessible, and that recycled materials such as used rafters were utilized for edging. The urban farming unit is a module consists of a shipping container with a greenhouse extension on its roof which may be moved and placed anywhere there is space. Its purpose is to be used to produce food according to the needs of local residents, as well as enhance the existing fabric of our boroughs.

anywhere there is space. Its purpose is to be used to produce food according to the needs of local residents, as well as enhance the existing fabric of our boroughs.

The operation: Eagle Street operates as a for-profit farm and staffed by the Farm Manager. In addition, each week during the growing season, the farm hosts volunteers, who assist with seasonal tasks, harvest and composting. They get successful crops include tomatoes, salad greens and microgreens (lettuce and mustard greens harvested when about 25mm high), onions and herbs. Their production is sold directly at the farm's own market and to local restaurants. The farm also runs a community-supported agriculture scheme, which generates a lot of social benefits.



fig2.57 installation of waterproofing membrane and plumbing system



fig2.58 irrigation system and planting beds.



fig2.59 vegetation products of the farm

WHEELER STREET LEANGREEN HOUSE^{28,29}

This roof garden is located on the top of shed in Berkeley California to produce food and manage stormwater. It was totally DIY and use very low-tech materials and method.

Installation: It is a timber-frame structure with metacrylics as waterproofing. Above is 425mm square planting trays made from black plastic with 75mm high walls and a plastic mesh base. The tray are filled with the three-eighths coconut coir, one-eighth household compost, one-eighth composted grape seeds, one-eighth chicken manure, and lava rock.

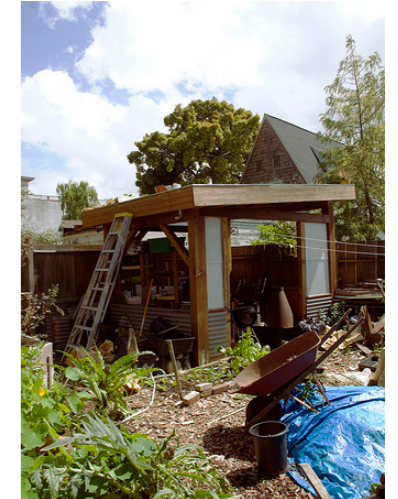


fig2.60 Photo of the leangreen house under construction



fig2.61 The crops grown on the roof

SHIPPING CONTAINER GREENHOUSE³⁰

The urban farming unit is a module consists of a shipping container with a greenhouse extension on its roof which may be moved and placed anywhere there is space. Its purpose is to be used to produce food according to the needs of local residents, as well as enhance the existing fabric of our boroughs.

The units employ aquaponics. Each of the units is comprised of two cubic meters of water, flowing in a closed circuit in which fish feces are broken down by bacteria in a sewage tank, transformed into minerals which serve as fertilizer for the plants, which they filter - the water returning back to the pool of fish. In the case of installing several containers, one can imagine filling a bio-gas plant to collect and recycle organic waste. Each structure is designed with standard components: hydroponics, an industrial greenhouse, scaffolding, and an open-top container, adaptable to various situations. Since 2010, three farms have been built in Zurich, Berlin and Brussels.

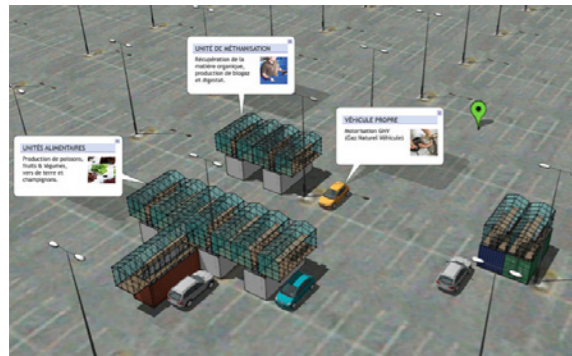


fig2.62 Shipping container greenhouses on the parking lot



fig2.63 Photo of the shipping container greenhouse

- AQUAPONICS UNIT:
- ① FISH TANK
 - ② BACTERIAL FILTER
 - ③ PUMP
 - ④ HYDROPONIC PIPES
 - ⑤ CONTROLS
 - ⑥ GREENHOUSE
 - ⑦ GRID FLOOR
 - ⑧ CONTAINER

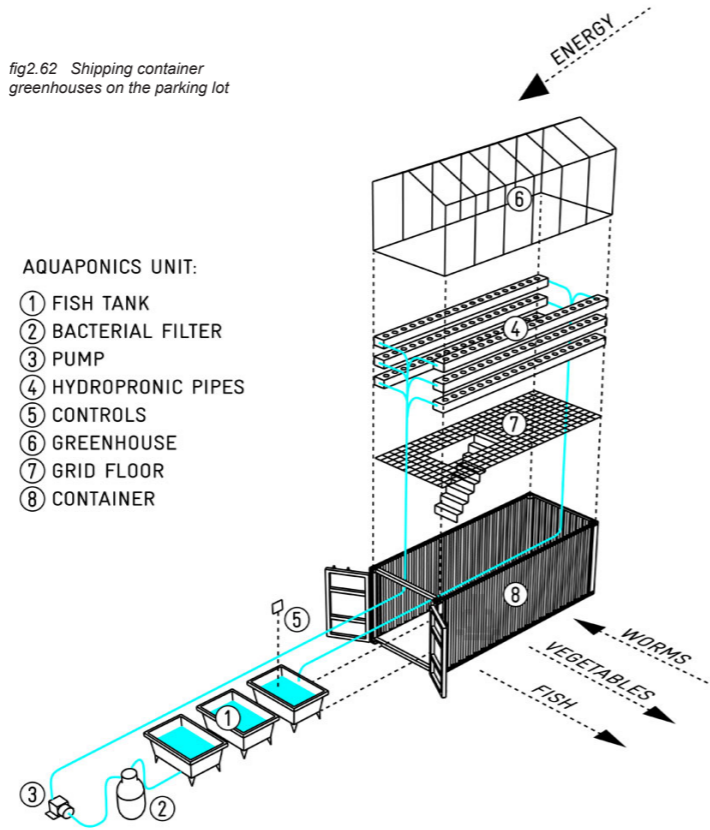


fig2.64 Exploded axonometric diagram of the shipping container greenhouse

EDIBLE SCHOOLYARD³¹

Edible Schoolyard is designed by Work AC, in collaboration with Edible Schoolyard NY and the Alice Waters' Chez Panisse Foundation. It is a new schoolyard designed as a series of interlinked sustainable systems, offering the young New Yorkers a different learning experience. The garden will allow the children to care for plants, providing a unique learning environment for kids. It's centered on a kitchen classroom that is surrounded by a mobile greenhouse on one side and a "systems wall" on the other.

The systems wall integrated many technical systems all together ensure the building's self-sufficient. It includes a cistern, space for composting and waste-sorting, solar batteries, dishwashing facilities, a tool shed and a chicken coop, rests on the opposite side of the yard.



fig2.65 View of the project

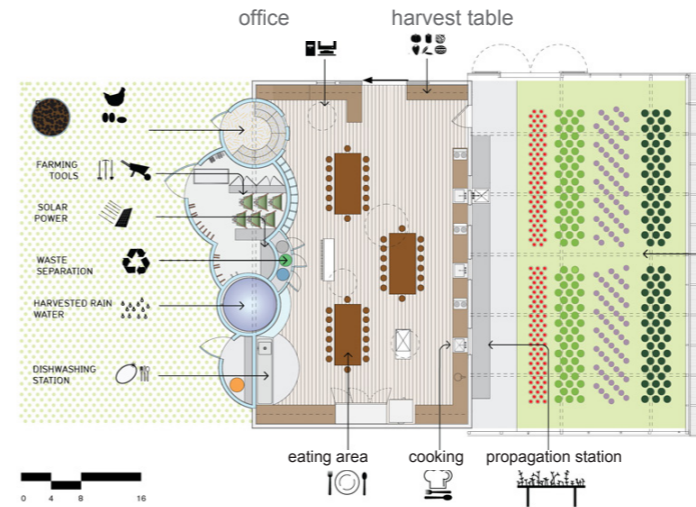


fig2.66 Plan of the Mobile greenhouse

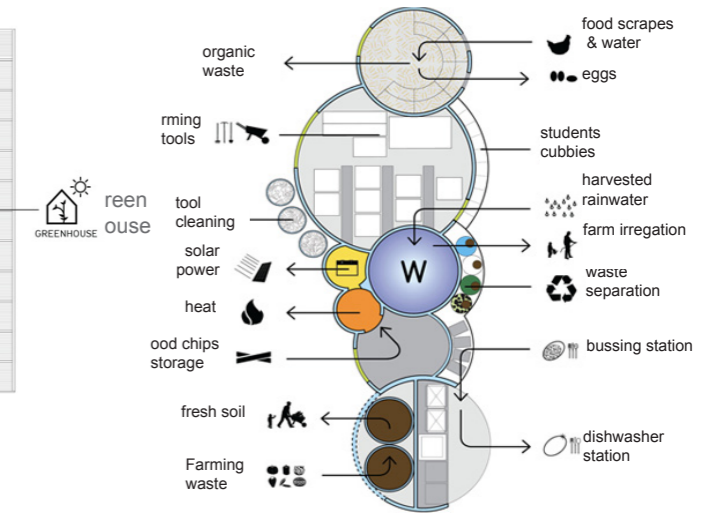


fig2.67 Diagram of the 'Systems wall'

ECO LABORATORY³²

Designed to meet the Living Building Challenge, this theoretical project for a block in Seattle's Belltown neighborhood, won the 2008 Natural Talent Design Competition. It is a two-building conceptual project, incorporates vertical farming with residential, merges existing neighborhood amenities, neighborhood market, vocational training facility and a public sustainability educational center – into a financially viable development.

The design incorporated a myriad of innovative and sustainable features. Those interconnected systems are able to create a closed cycle so that building and community are almost completely self-sustainable.



fig2.68 Axonometric view of the ECO Laboratory building



fig2.69 Interior view of the growing area

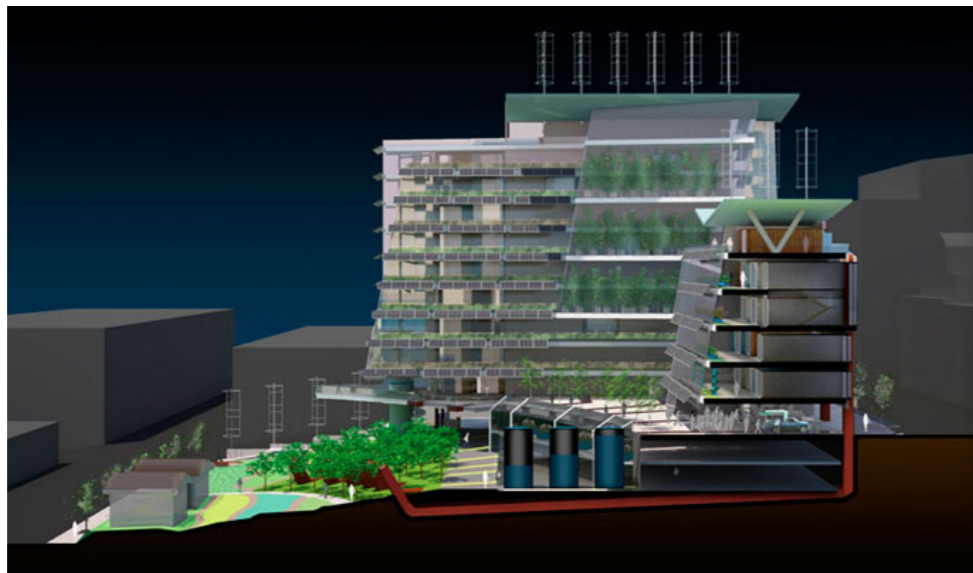


fig2.70 Water harvest system of the ECO Laboratory

Energy: design harnesses wind, solar, biofuel and hydrogen

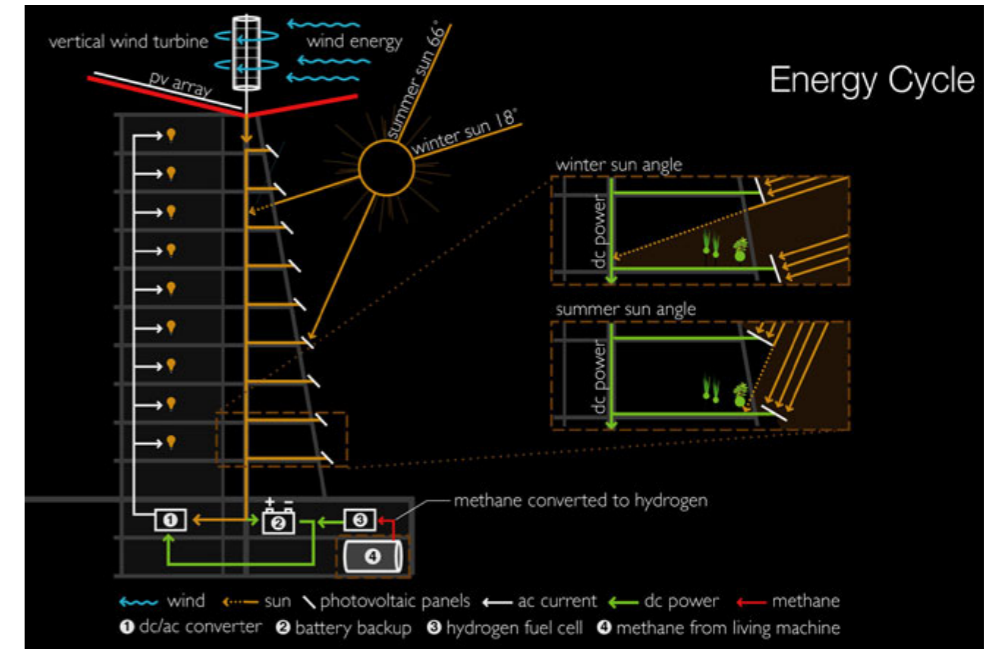


fig2.71 Energy diagram of the ECO Laboratory

Water facilities: Rainwater Collection System, Hydroponic garden, Biological wastewater treatment system, and greywater cisterns.

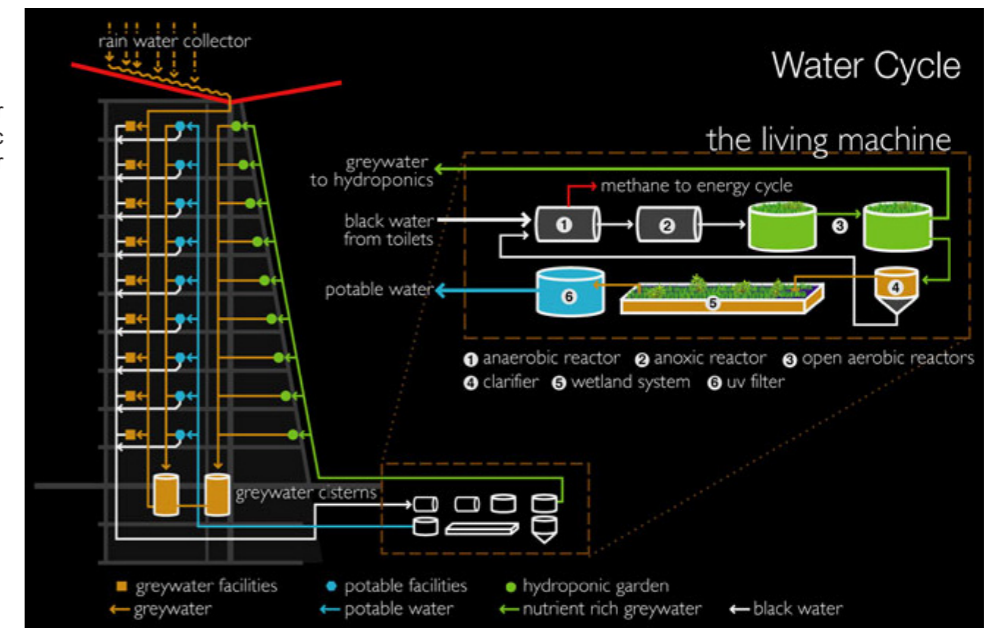


fig2.72 Water facilities of the ECO Laboratory

2.6 CONCLUSION

Through the study of Urban Agriculture, we understand that Urban agriculture is not just about the cultivated land, but an organized system, a closed cycle of production and consumption.

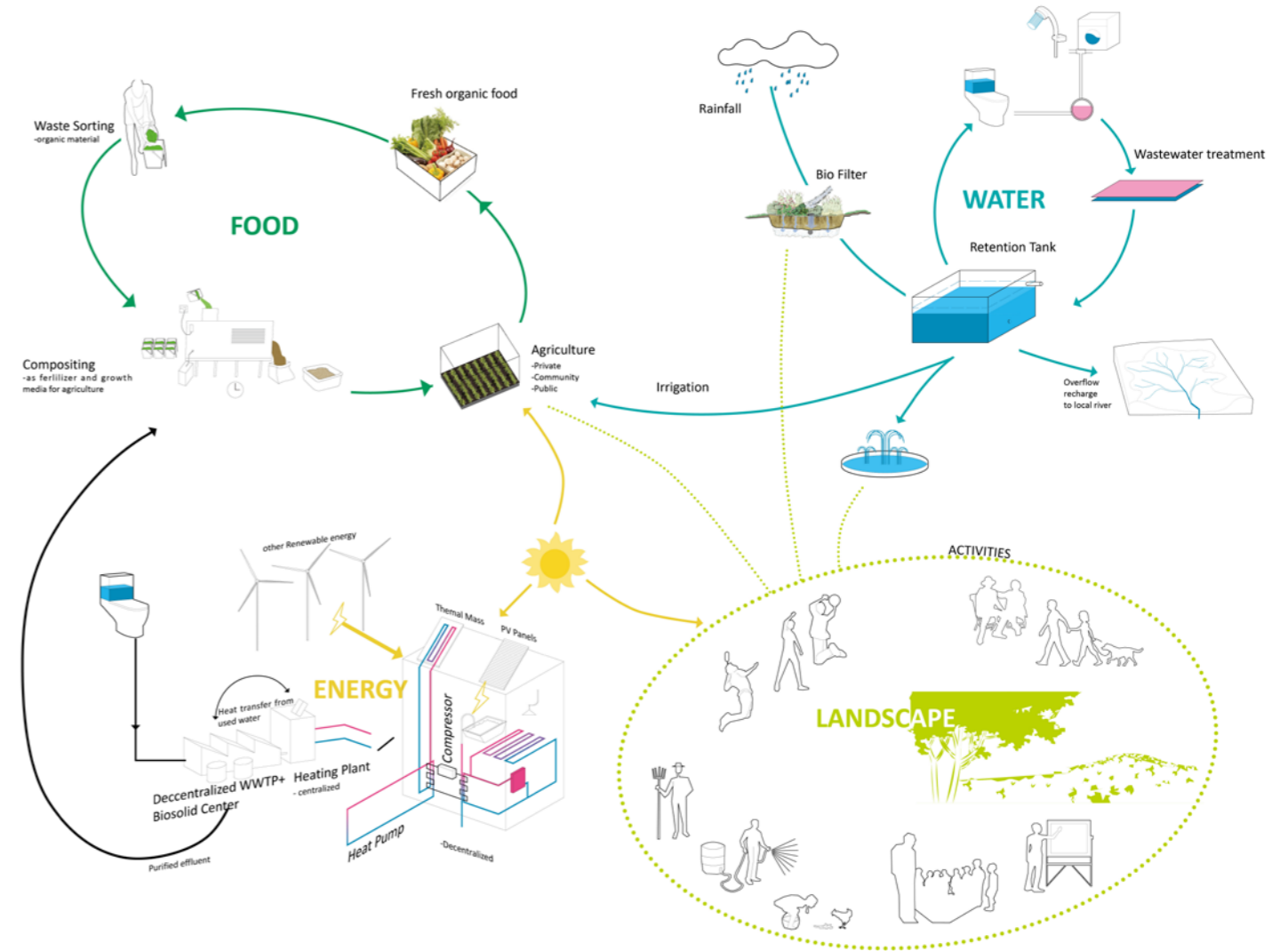
The application of Urban agriculture not only creates job opportunities to benefit the local economy, but also helps to foster the weaker strata of the society, and give these new citizens a feeling of belongingness, a sense of home.

Urban agriculture is not just about the food, but also the integration of food production, waste treatment, water management, and energy generation, all these aspects work together to achieve a sustainable living.

It produces healthy food for society at the same time offers spaces for recreational and educational activities.

Therefore, the integration of Urban agriculture and community design will help us achieve the objective established by the competition.

fig2.73 Food, Water, Energy, Landscape integrated system



Here is the system we made. It is a preliminary structure for our design which contains the important programs of this community.

Chapter 3: Site Analysis

The territory of the site is observed on 3 consecutive scales: the city /the south-western area/ the site.

3.1 City scale analysis

3.2 Local scale analysis

3.3 Site scale analysis

3.1 City scale analysis

► Site location³³



fig3.01 Location of Turin in Italy

The competition site area, located in South Mirafiori of Turin, used to be a parking lot for the stock of the newly produced cars. It has been a barrier to the expansion and integration of the neighbourhood.

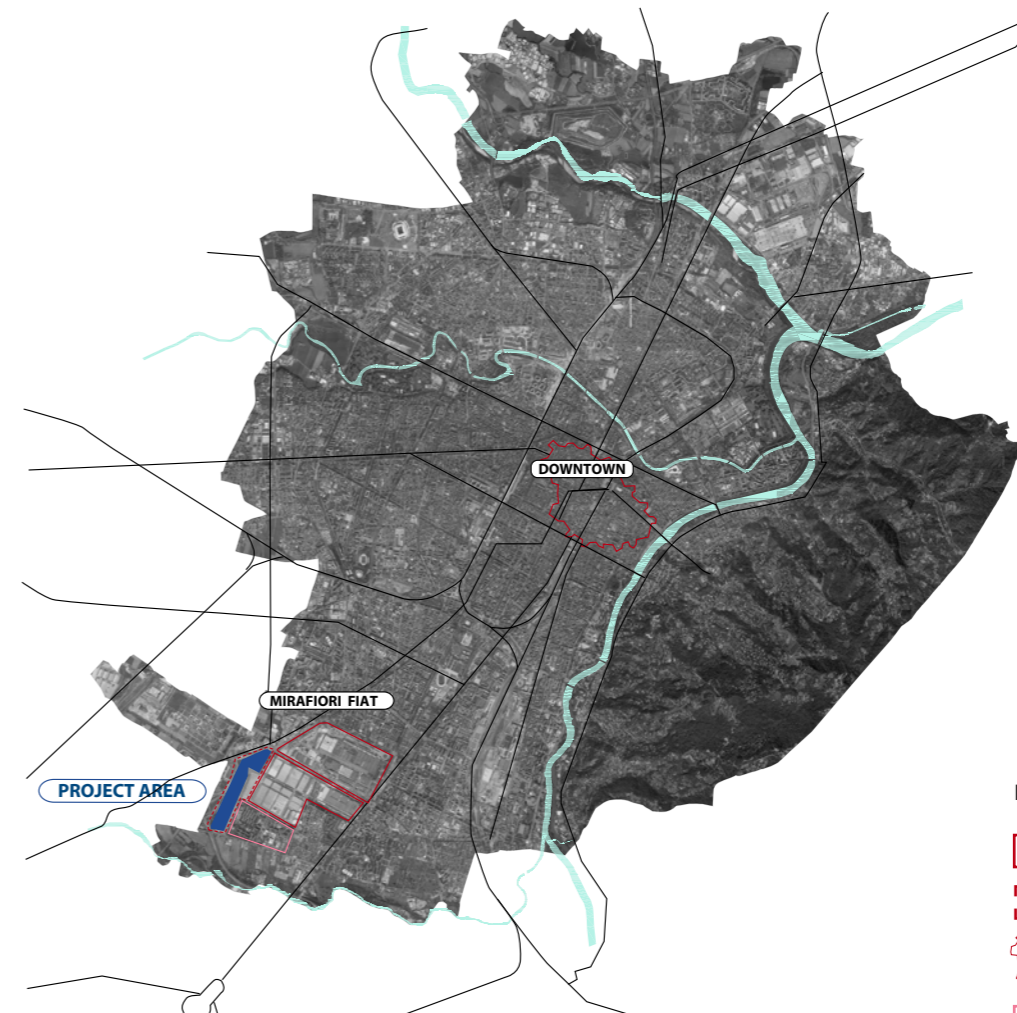


fig3.02 Location of site in Turin

Legend

- FIAT factory
- Dismissed Industry Area
- Historic Wall
- South Mirafioro neighbourhood

► Interregional connection³⁴

The site is the south gate of Turin.

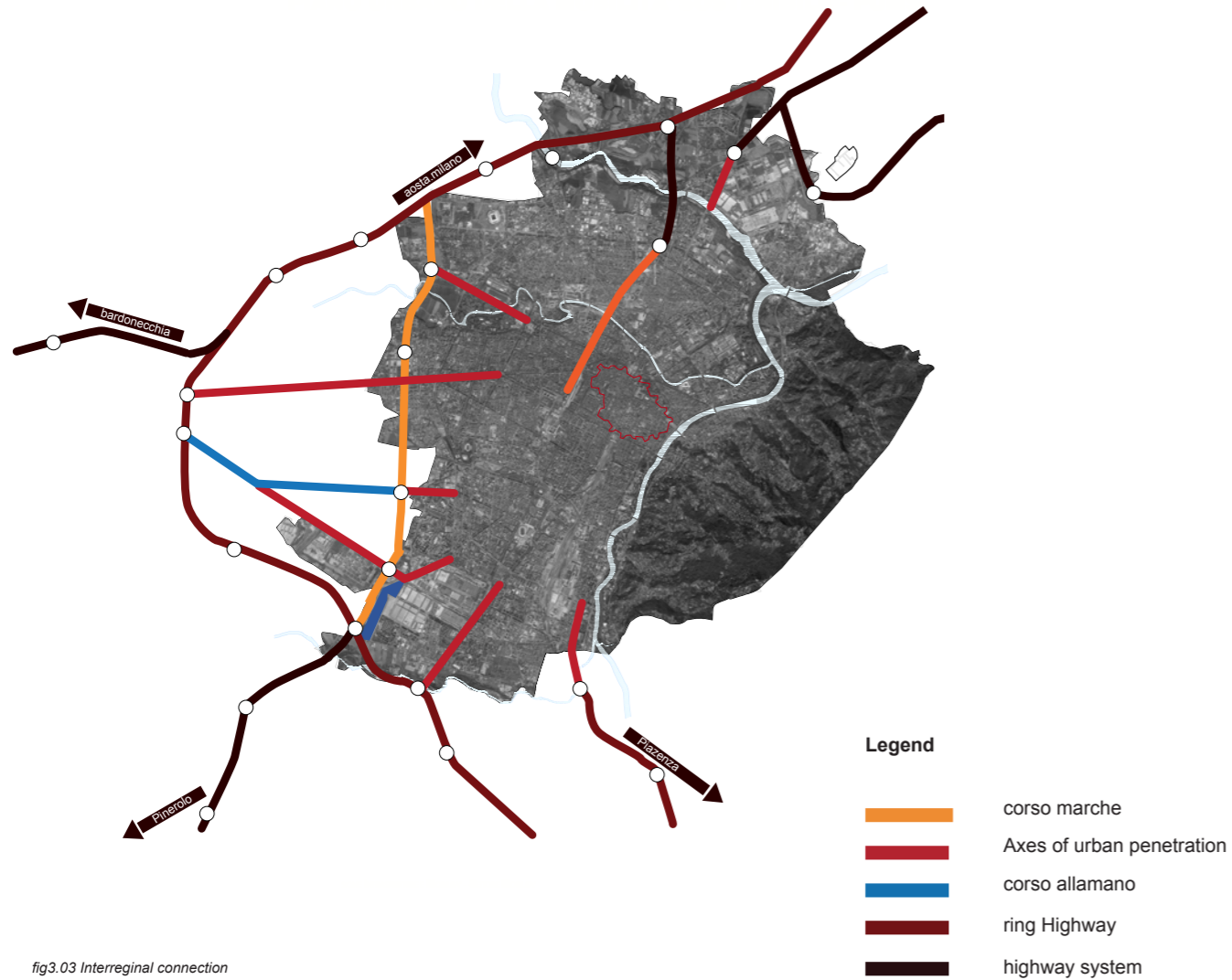


fig3.03 Interregional connection

► Urban mobility plan³³

The site is an important node of the infrastructure system of Turin. It will also be one of the important node of the future plan according to the PUMS.

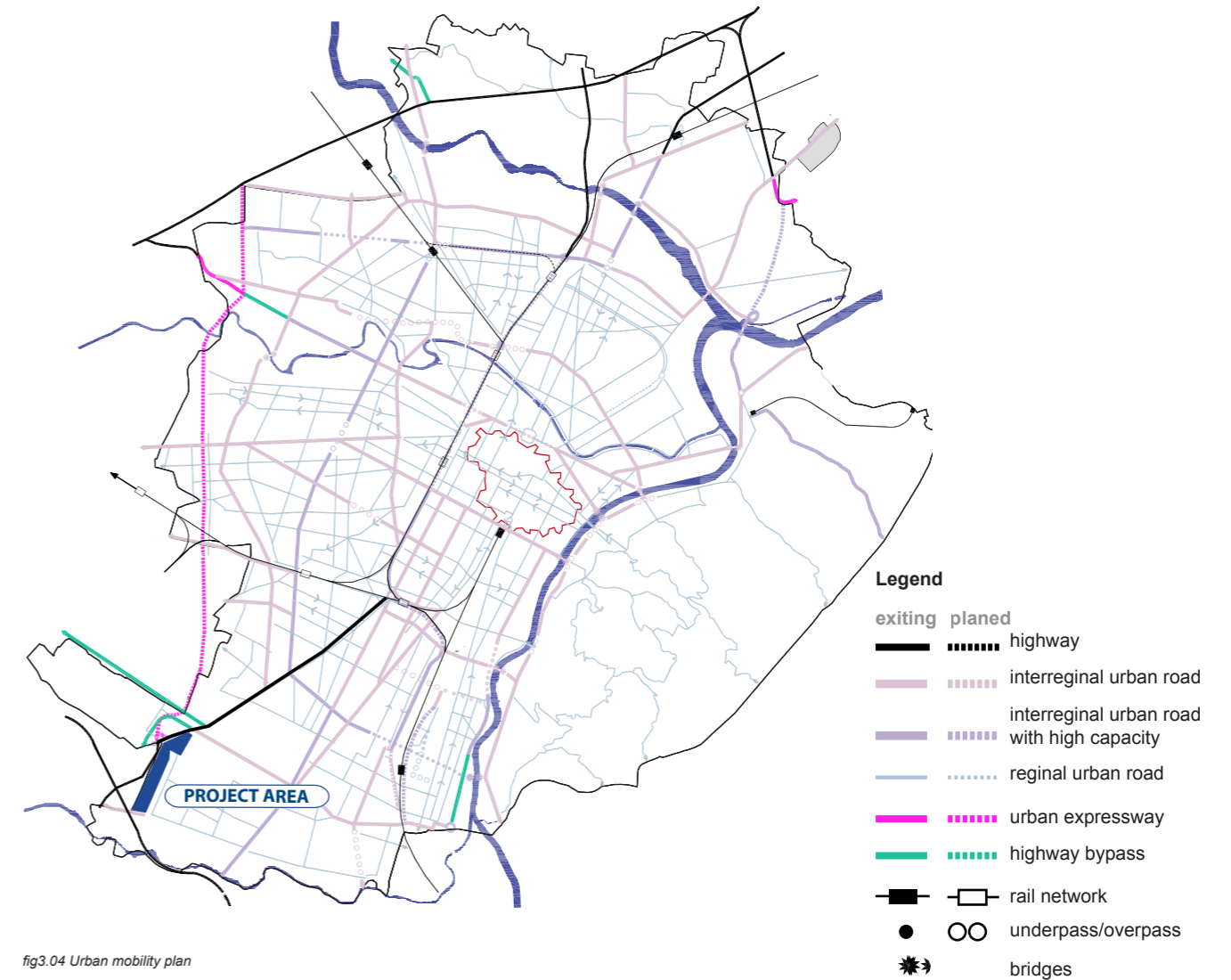


fig3.04 Urban mobility plan

► Main public transportation system³³

The site will benefit from the new public transportation plan, with the new line of metro, the site will have a better connection with the city.

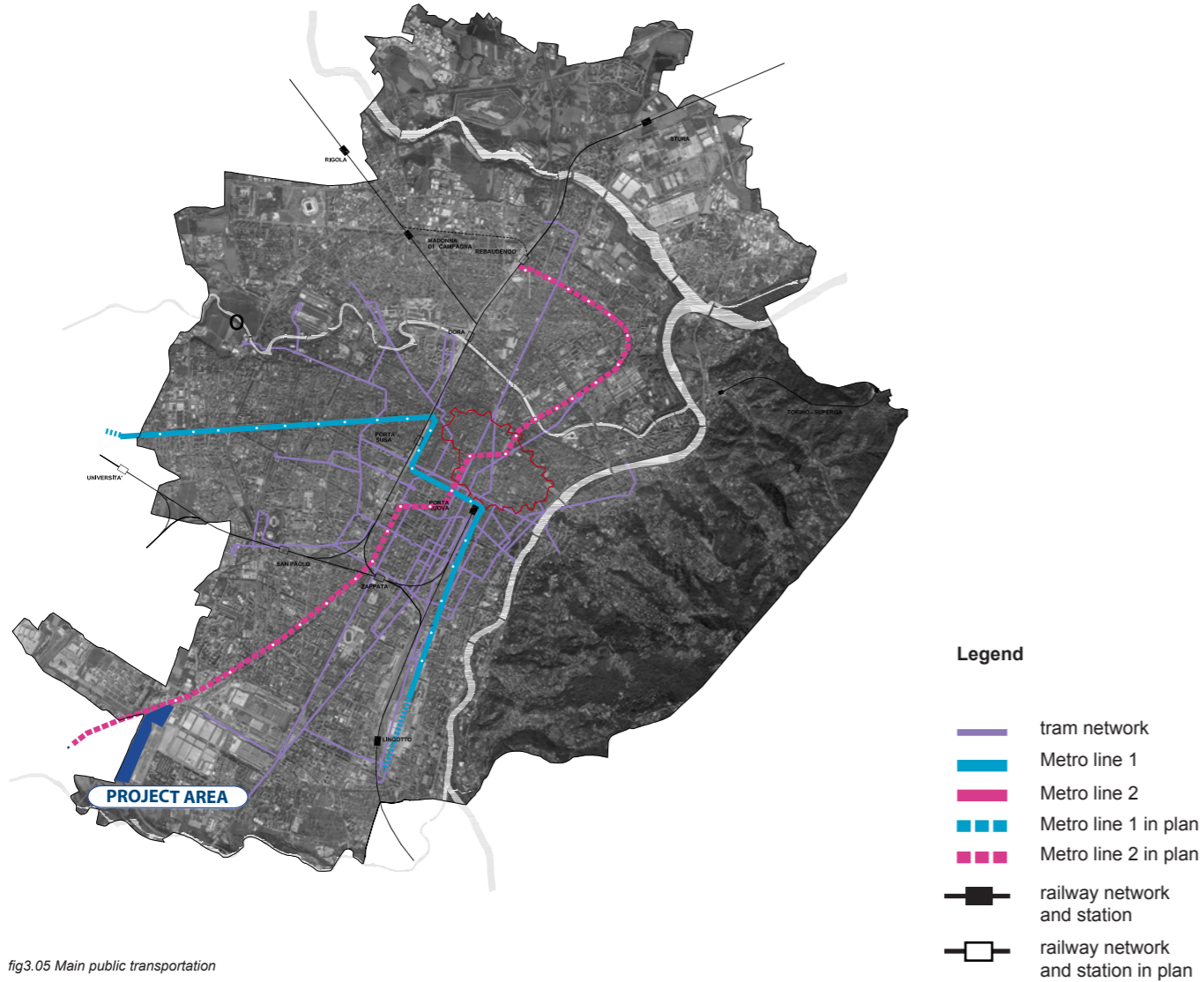


fig3.05 Main public transportation

► Green space system³³

The site is part of the green belt system, it is the missing link of the belt.

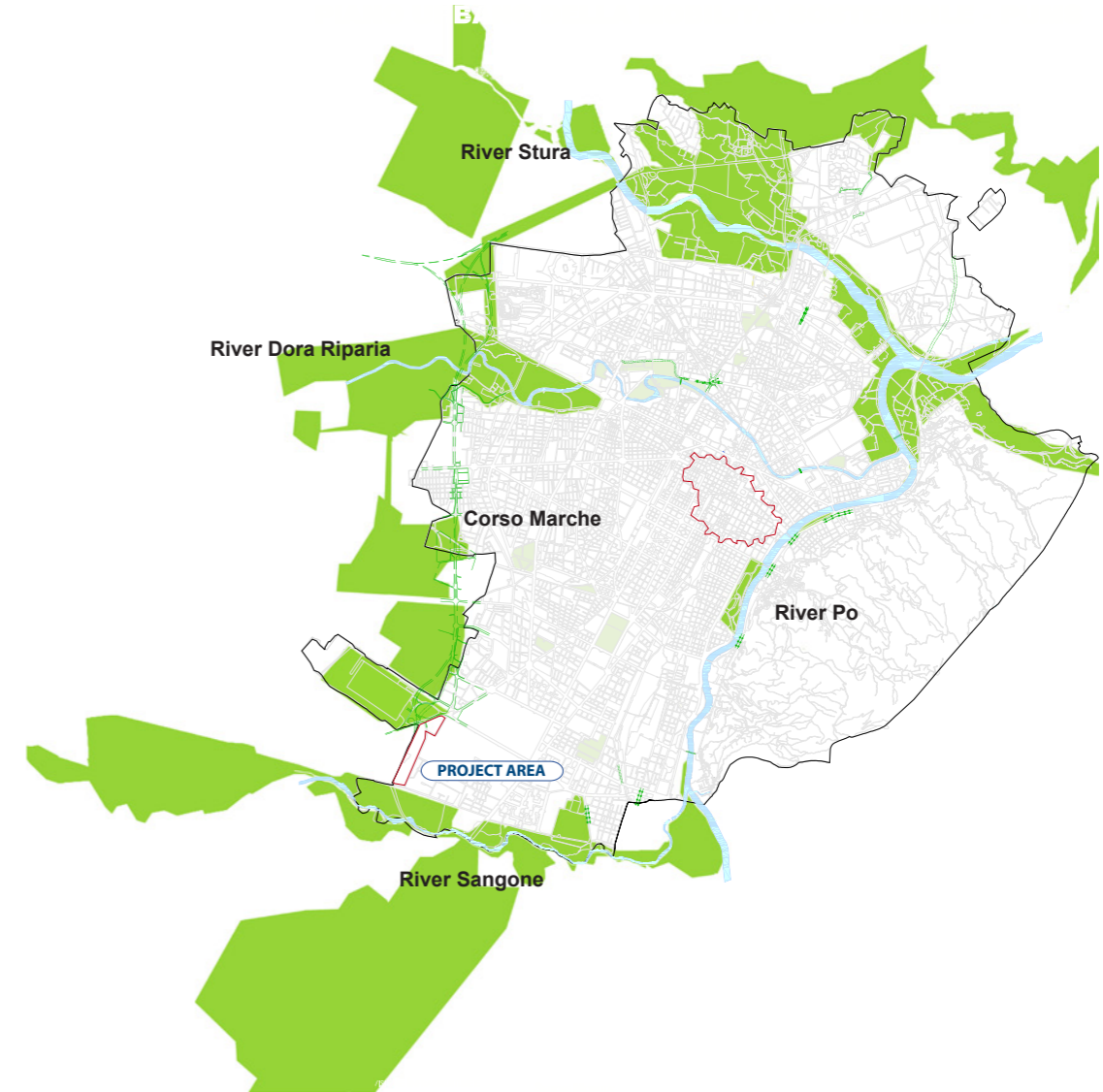


fig3.06 Green space system

► Corso Marche project³⁵



fig3.08 Corso marche plan

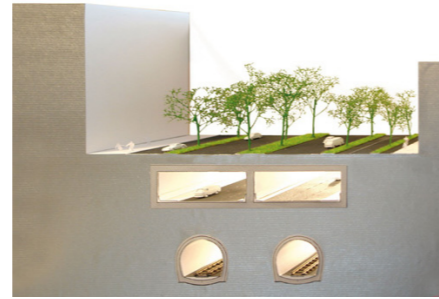
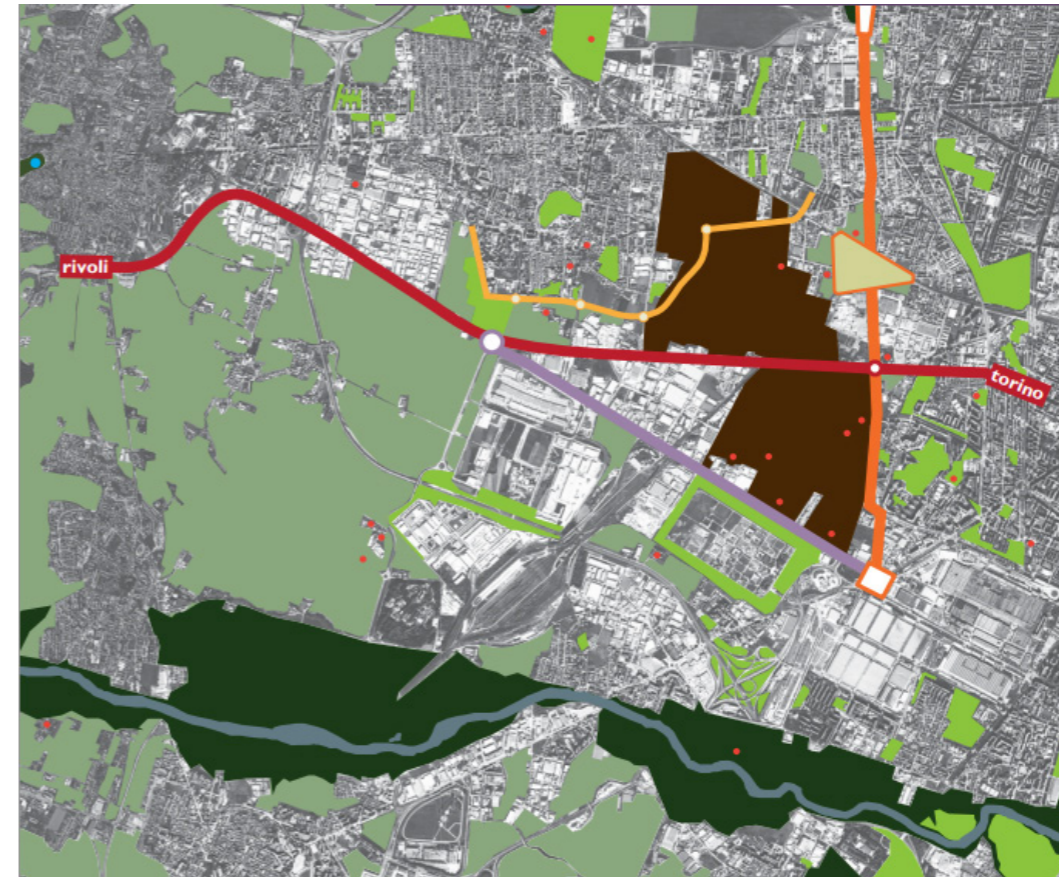


fig3.07 Corso marche section

The new corso marche is one of the 3 centralities of the new Turin master plan, it integrates the Po river and the avenue of Spina.

The axis is a compact system which appears like a great boulevard, but has the fast pass way and railroad underneath, to guarantee the quick connection between Venaria Reale and Stupingi.

► Sangone green space project³⁴



- Park Po;
- Agriculture land;
- System of the farms;
- Corso Allamano;
- Agricultural park of Grugliasco;
- Grugliasco green "vampart"
- Sabaude residences;
- Corso Marche

fig3.09 Sangone green space project

Considering the green areas, large parks, the peri-urban agriculture spaces, the fabric of Turin metropolitan area appears fragmented and inhomogeneous.

The west territory seems much more urbanized by the presence of industrial settlements and infrastructures. Yet the West Quadrant is bordered on the north and south by two river systems, the Sangone with River Po and the River Dora Baltea, along which stretched important natural areas, the two ecological corridors, which suffer from the lack of reciprocal links

Just on this point the project will intervene between the peri-urban and Rural area, make use of the agricultural land overlooking the corso Allamano. The project has a key role in the redevelopment of the entire environmental system of this area. The aim is to balance the pressures of development and increase the profitability of the existing agricultural activities in the metropolitan area.

► Conclusion³⁶

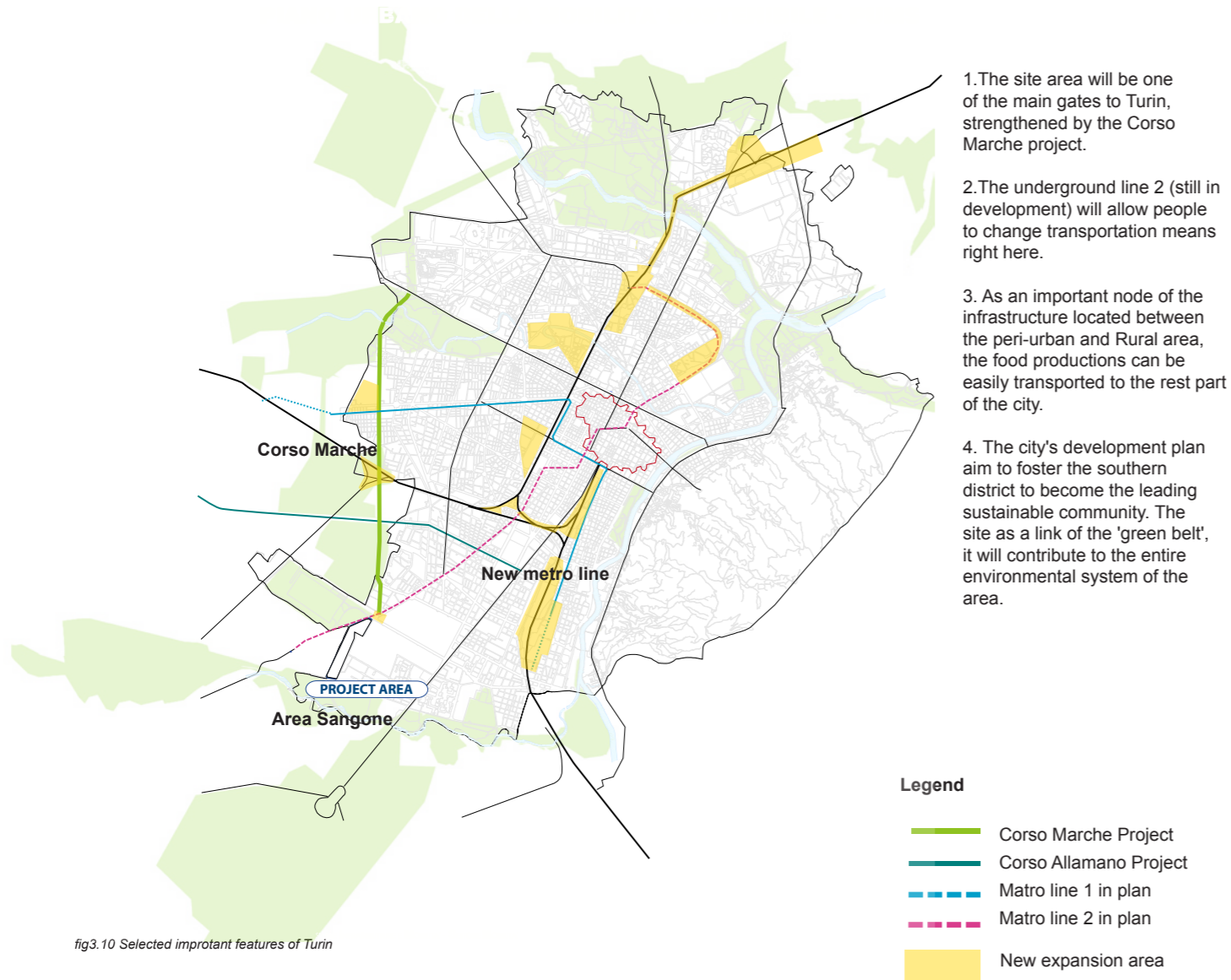


fig3.10 Selected important features of Turin

3.2 Local scale analysis

3.2.1 Location in-between Urban and Rural area

3.2.2 Infrastructures

3.2.2.1 The existing situation

3.2.2.2 The reorganised situation as in PUMS

3.2.2.3 The important element for the site

3.2.3 Green Open spaces

3.2.3.1 The existing open spaces

3.2.3.2 A recreational system contributed by the project

3.2.3.3 An agriculture net work contributed by the project

3.2.4 Main features on the site

3.2.5 Conclusion

3.2.1 Location in-between urban and rural area ³³

► Rural regions around the site

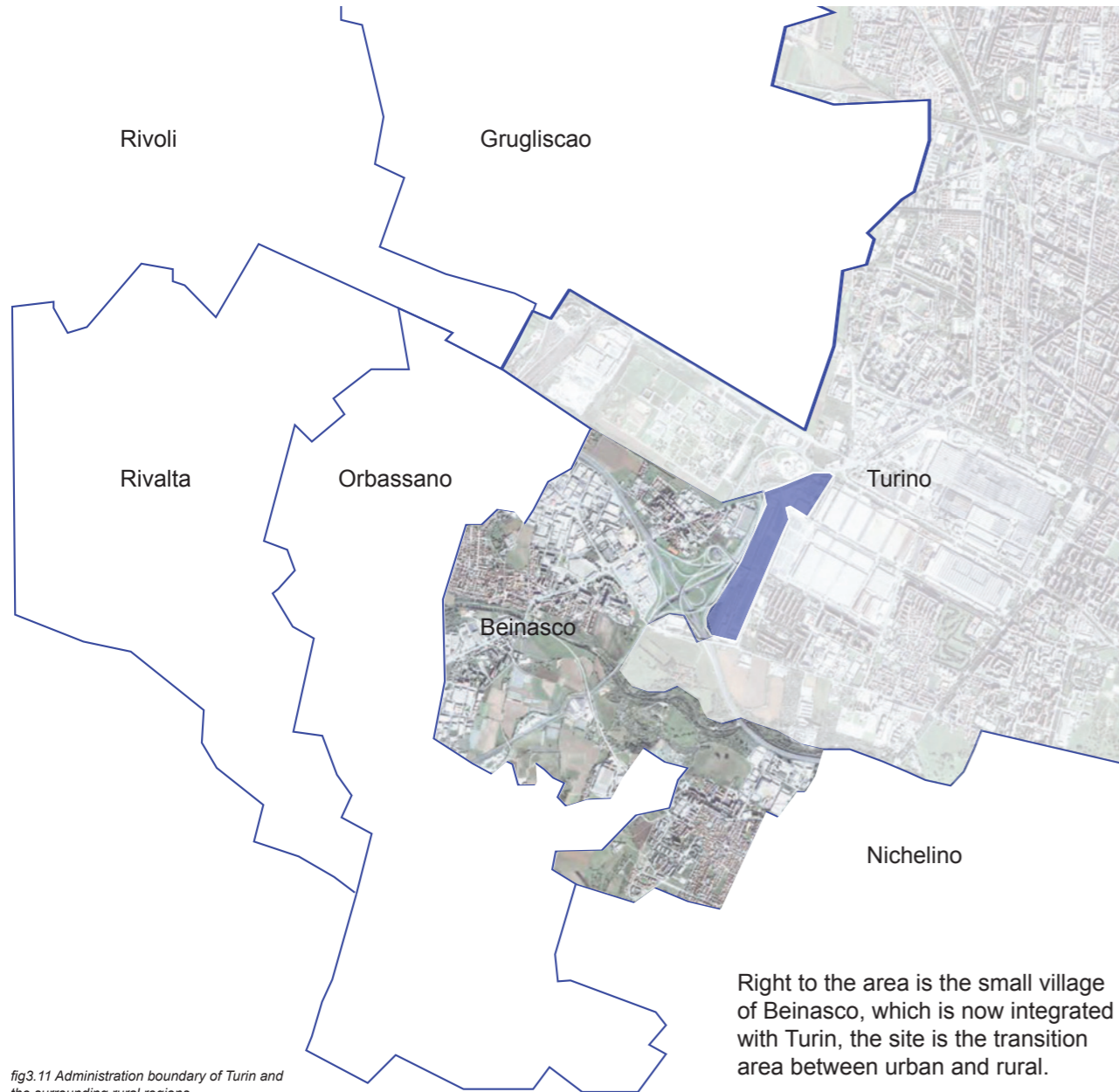
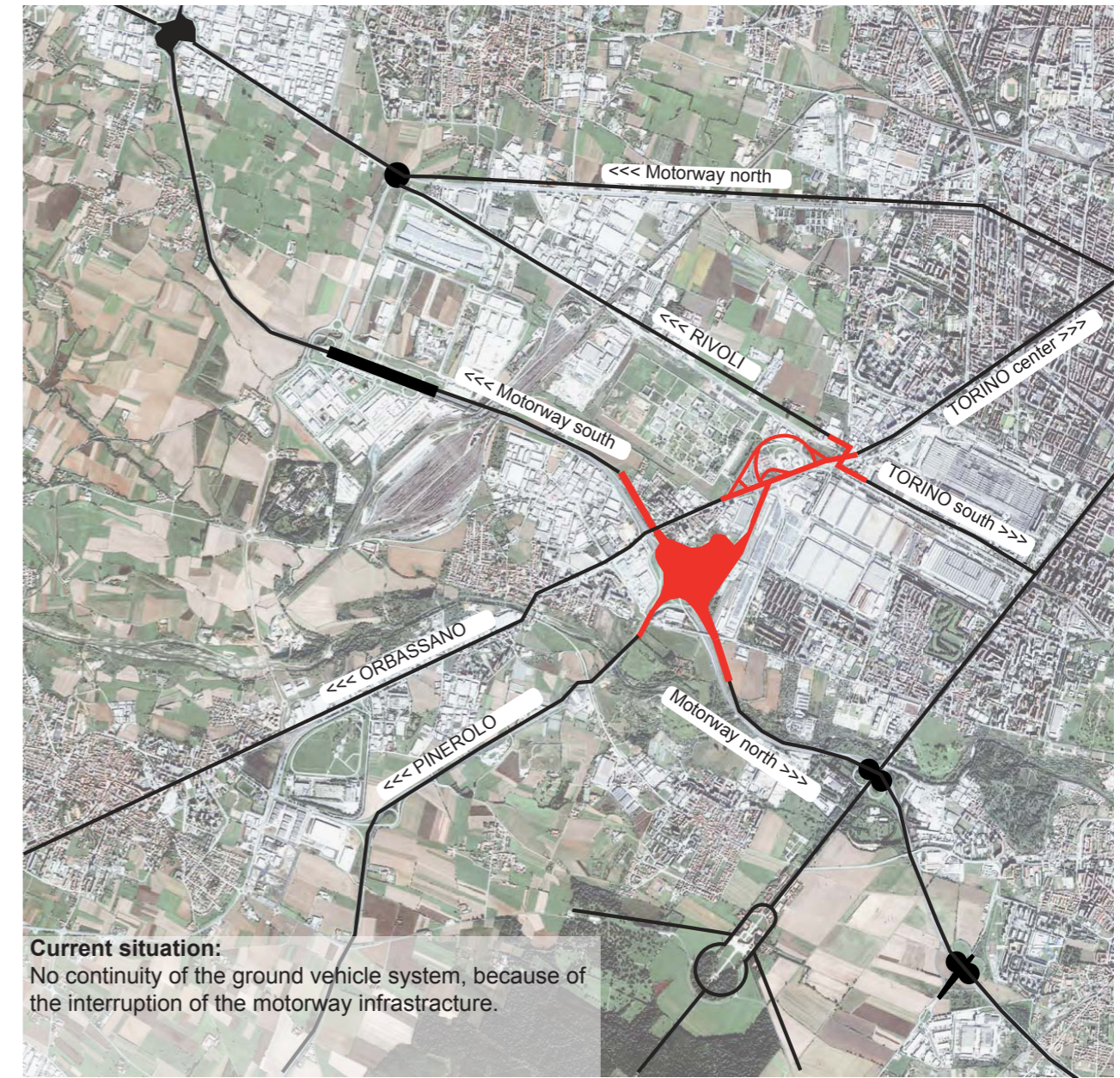


fig3.11 Administration boundary of Turin and the surrounding rural regions

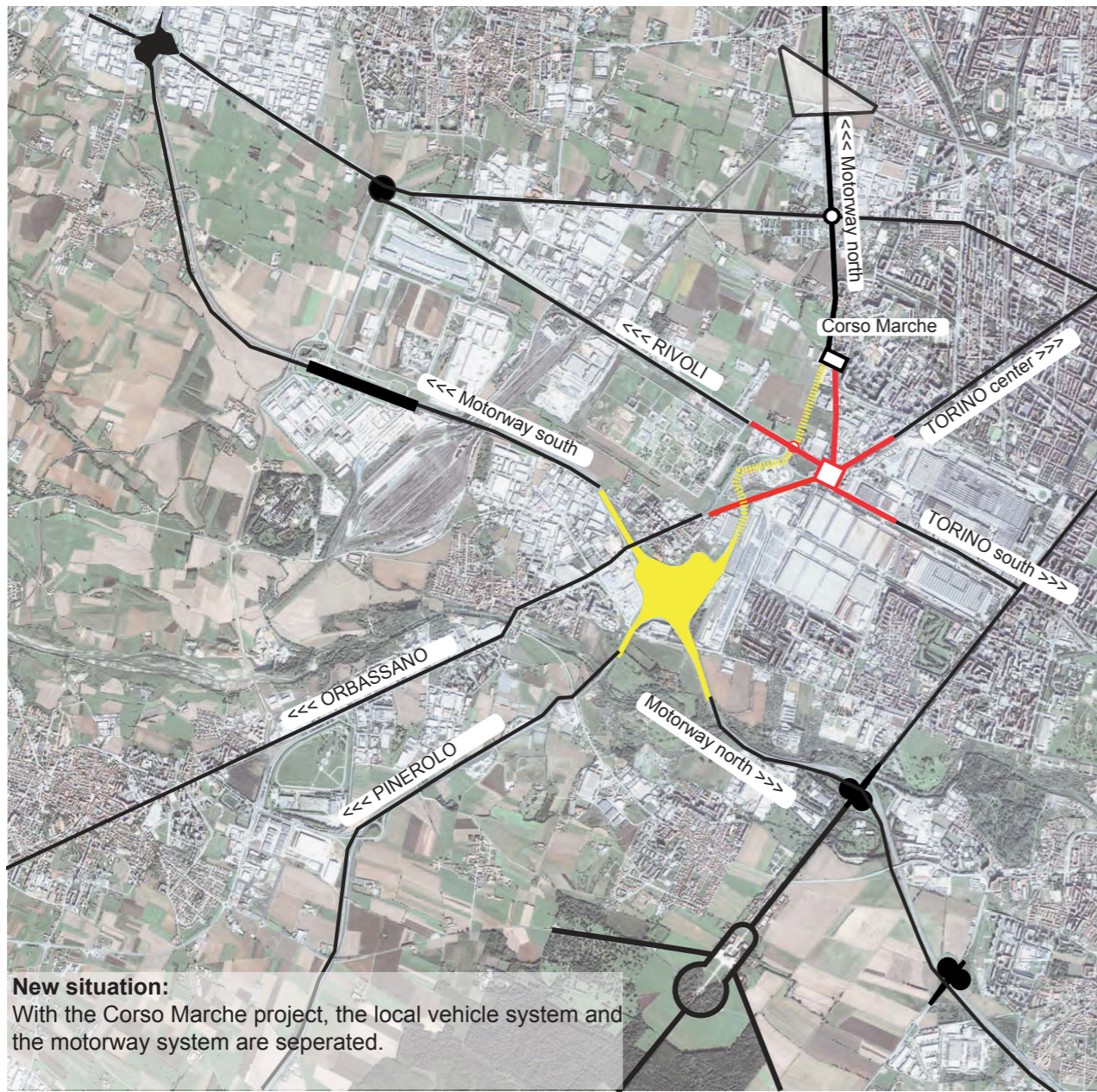
3.2.2 Infrastructures ³⁶ - The Existing Situation



Exchange junctions between motorway and the local infrastructure.

fig3.12 The existing situation of the infrastructure system

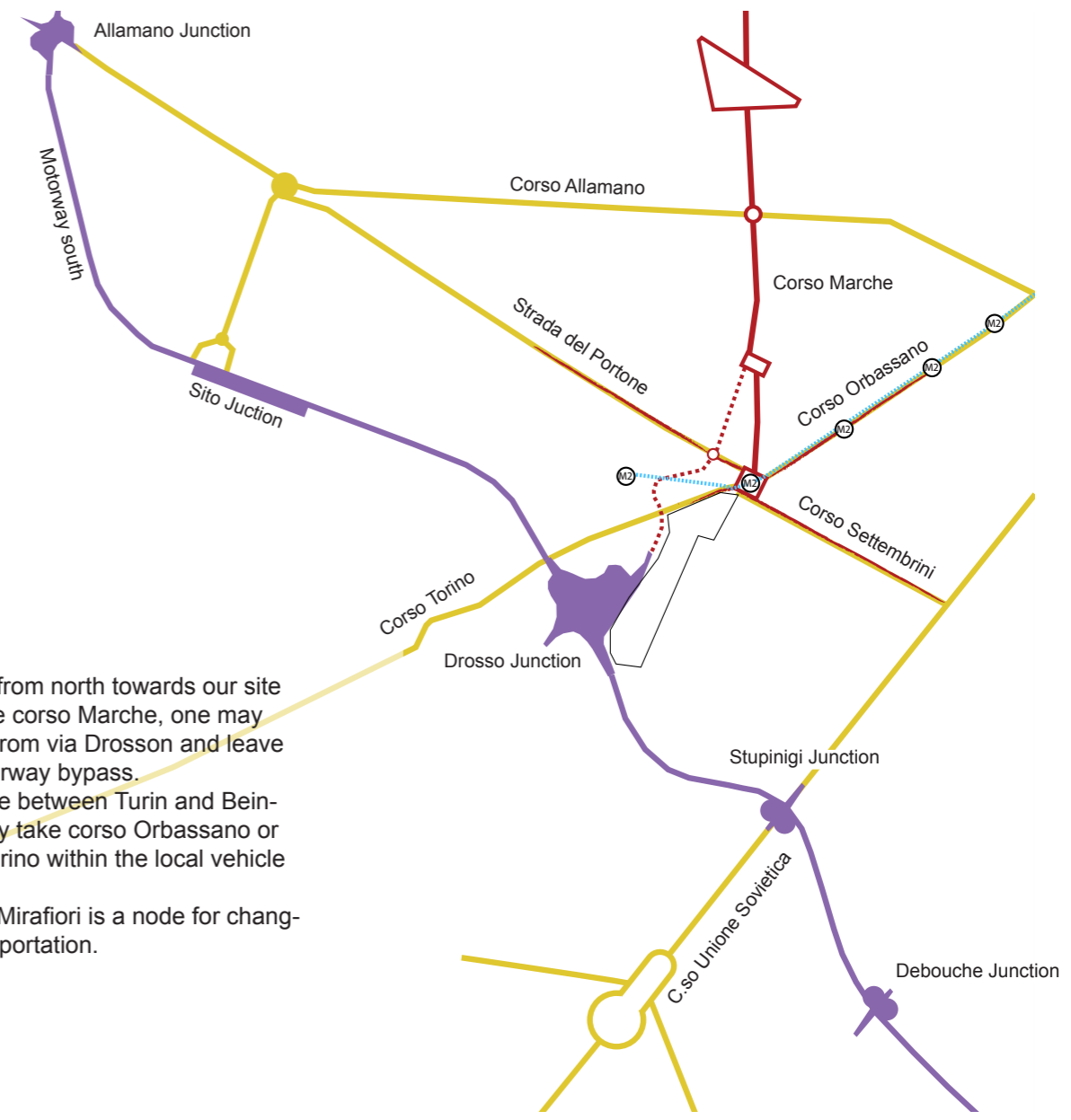
3.2.2 Infrastructures³⁶ - The Reorganised Situation as in PUMS



New situation:
With the Corso Marche project, the local vehicle system and the motorway system are separated.

Red line: local fast pathway Yellow line: Motorway
fig3.13 The reorganized situation of the infrastructure system as in PUMS

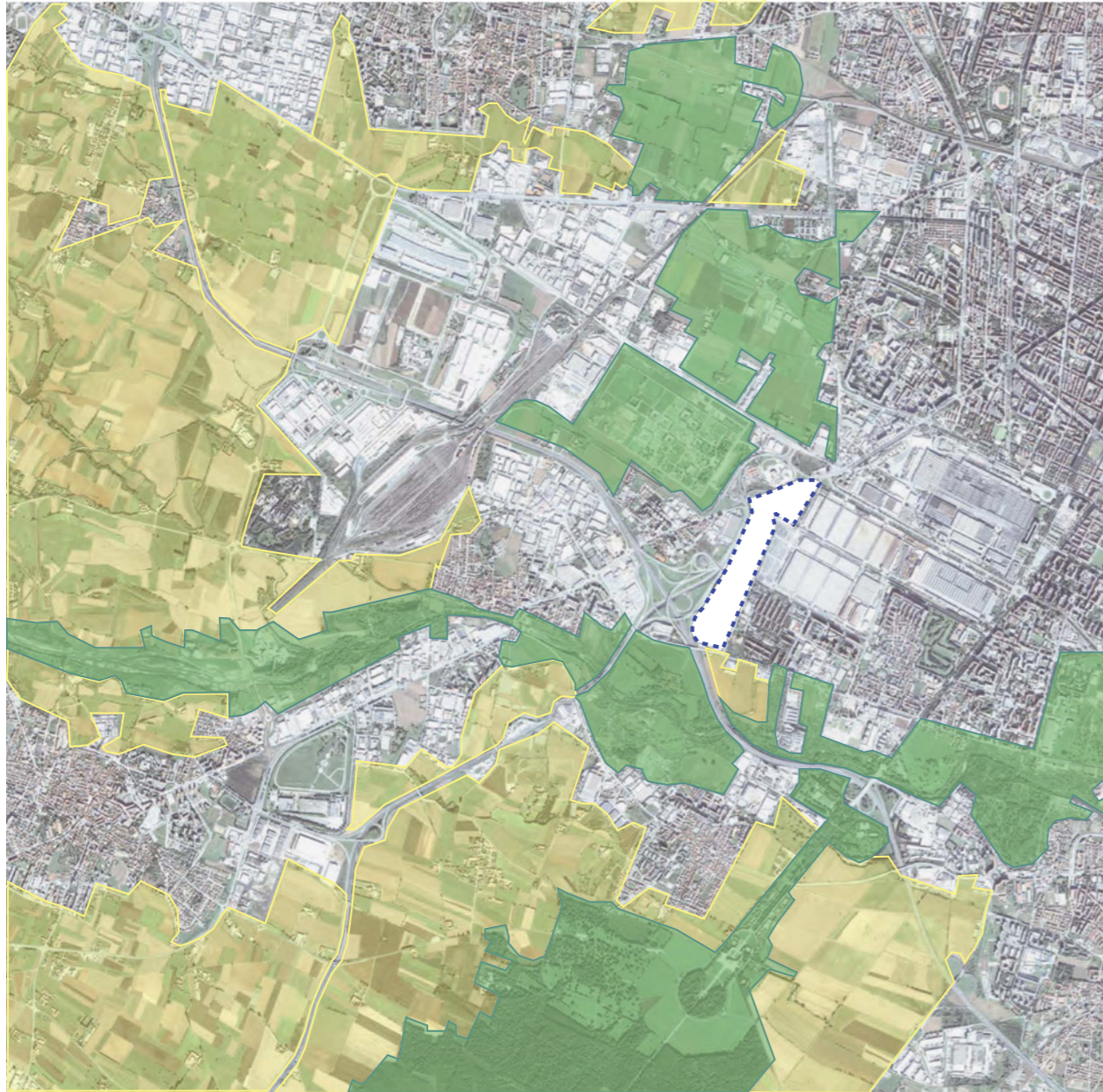
3.2.2 Infrastructures - Important Elements for the Project



Coming from north towards our site along the corso Marche, one may release from via Drosson and leave the motorway bypass. Commute between Turin and Beinasco may take corso Orbassano or strada torino within the local vehicle system. And the Mirafiori is a node for changing transportation.

Yellow line: Main vehicle axis Purple line: Motorway Red line: Corso Marche Blue dashed line: Metro line
fig3.14 The important elements of the infrastructure system

3.2.2 Green Open Spaces³⁶ - The Existing System



Farm land
 Park

fig3.15 The green open space system

3.2.2 Green Open Spaces - Recreational Spaces

The open space of the community could be integrated to the city recreational structure, used by citizens for the recreational activities.

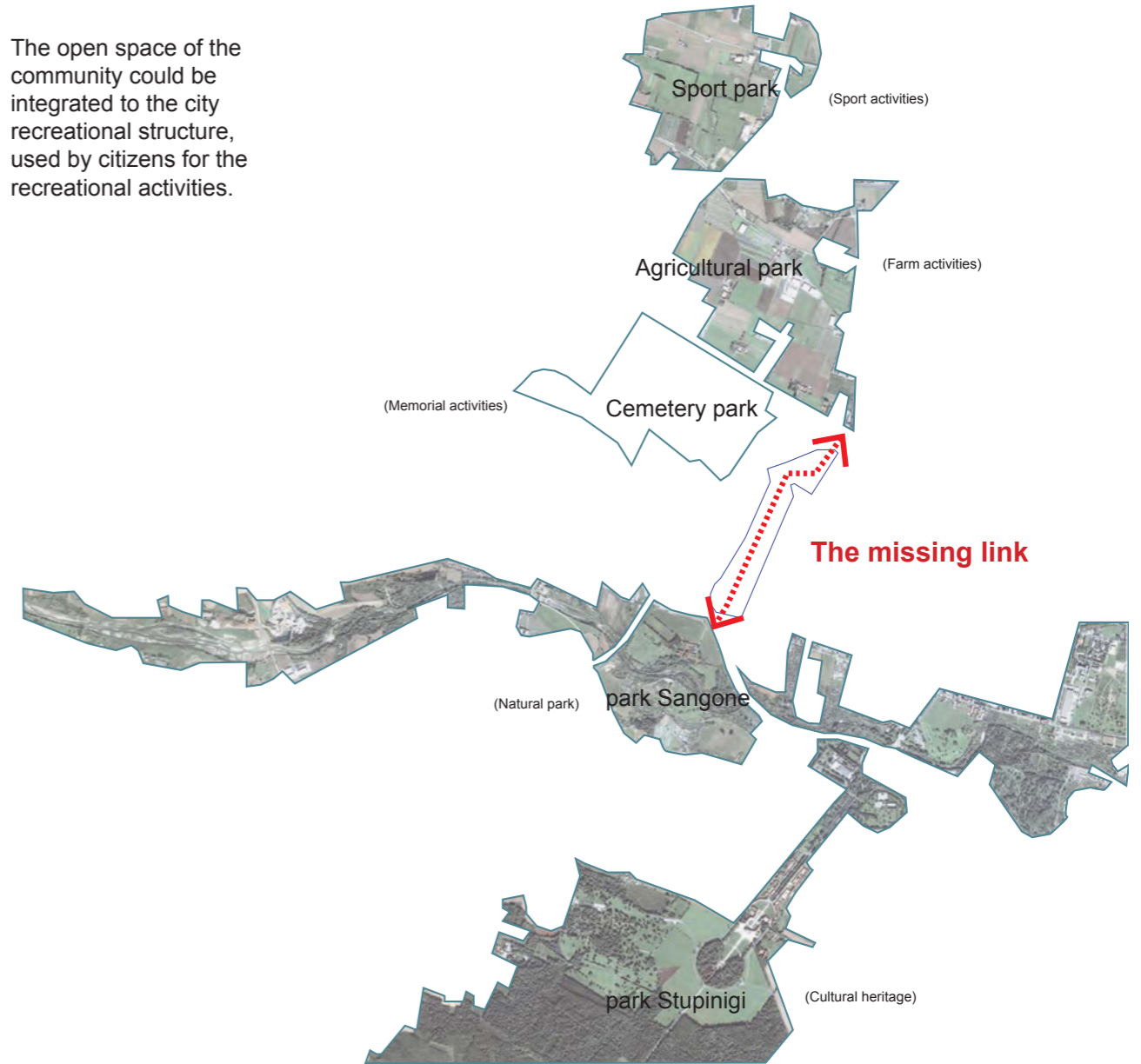


fig3.16 The recreational spaces

3.2.3 Green Open Spaces - Agricultural Spaces



fig3.17 The agriculture spaces

Introductions about the existing agricultural projects

► The Agro Alimentary Centre of Turin ³⁷ (strada del portone)



fig3.18 The logo of CAAT

The CAAT is the new, highly efficient, site for operators in the fruit and vegetable sectors.

► Vov 102 Farmers' Market ³⁸

(via Oranato Vigliani 102)

fig3.19 The logo of VOV 102 Farmers' market



Promoted and realized by Coldiretti with the collaboration of Enzo B non-profit organization. On the road Onorato Vigliani 102, is opened VOV 102, a real market with a very short chain of capital and food. The producers have a specific space in which to present their products, strictly seasonal and 0 Km.

► Cascina Roccafranca ³⁹

(Via Rubino 45)

fig3.20 The logo of Cascina Roccafranca



Roccafranca farm is a cultural center. A place where to participate into Mirafiori life, to meet neighbours, to spend some times expanding hobbies and interests.

There are no other centers in Turin, where every activity and service focuses on values such as participation and integration.

► Miraorti ⁴⁰ (Via Rubino 45)



fig3.21 The logo of Miraorti

Miraorti is a project started in october 2011 during the regeneration of the area composed between the stream Sangone and South Mirafiori neighbourhood. It is a participative design process in support of Turin municipality, that deals with agriculture in urban area. A new way to faces with urban transformation, focus on social relations, brings together stakeholders, citizens and institutions. Aim of the project is to increase understanding and knowledge of this important district of the city, to involve citizens at local and urban level, to experience a methodology to legalize and organize private illegal allotment fostering to strengthen the image of Mirafiori as the agro-urban district of the city

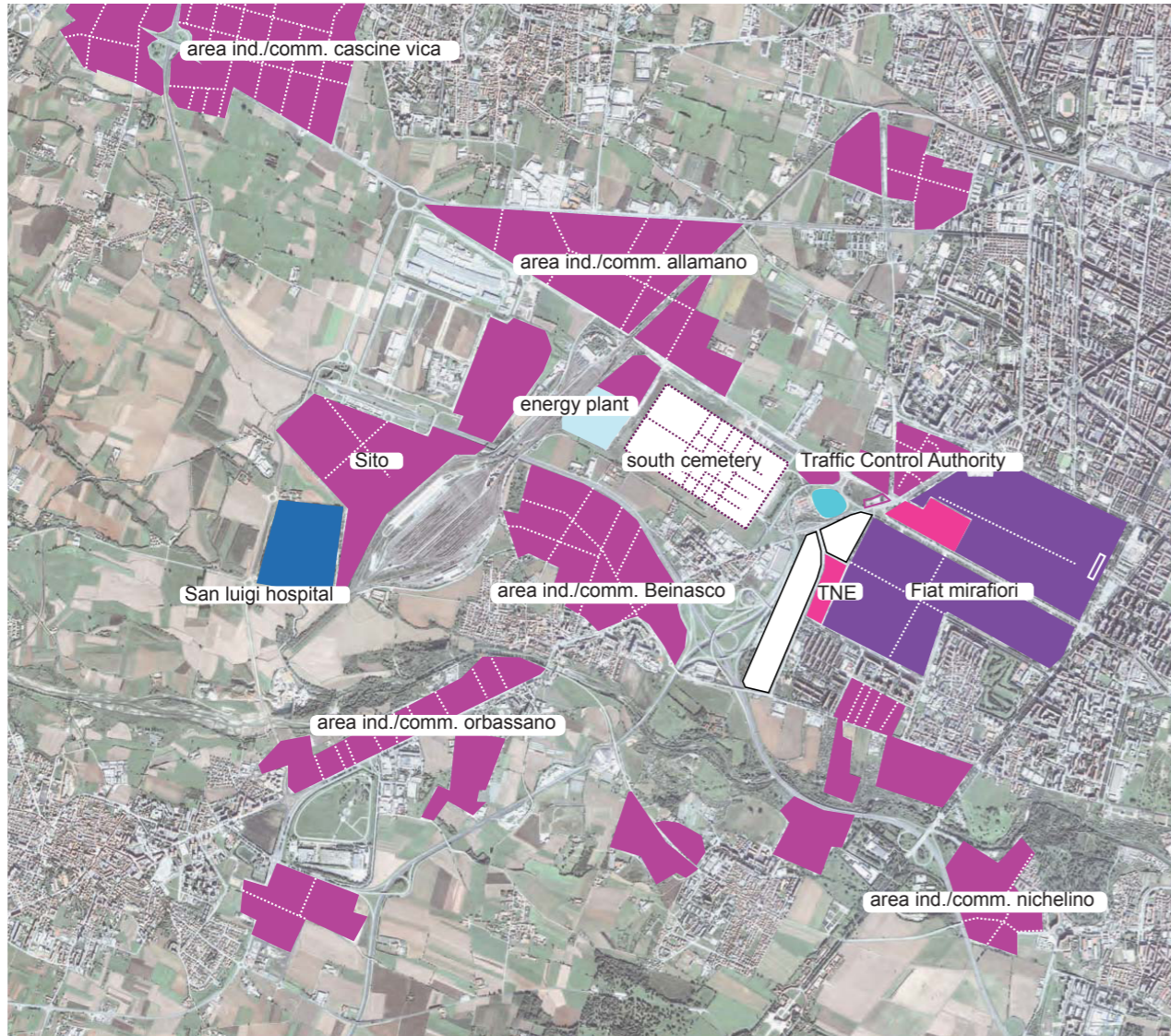
► The Agricultural Park ¹ (strada del portone)

fig3.22 The logo of The agricultural Park



The area comprised in the Agricultural Park is an example of the farming and irrigation system in the Turin surroundings, using Dora and Sangone as a water reservoir, not being affected by the industrial revolution. The aim is to keep the existing farms working, decreasing the physical pressure around the area caused by factories, houses and warehouses getting a new high environmental standard to the city boundary area.

3.2.4 Main Features of The Area³⁶



- Industry and Commercial areas
- Mirafiori / TNE
- Fiat Mirafiori
- Energy plant
- Traffic Control Authority
- South cemetery
- San Luigi hospital

fig3.23 The main features of the area

Introductions about the On-going Mirafiori / TNE project^{36,41}

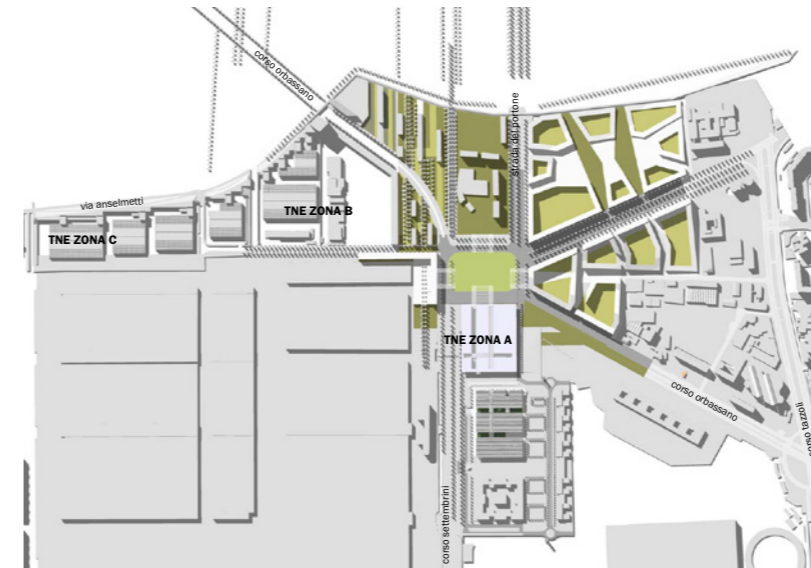


fig3.24 The plan of the TNE project

A 310,000 square meter portion of more than 3 million square meter area making up Fiat Mirafiori industrial complex has recently been dismissed and transferred by the City of Torino. The project include the Center of Design, Zone A, Zone B, Zone C, and Mirafiori Piazza.

- ▶ **zoneA** (*Corso Settembrini, corso Orbassano*)
The project for zoneA involves the construction of services for individuals and companies, which is closely interrelated and complementary to the productivity of the FIAT abandoned land.
- ▶ **zoneB** (*Strada della Manta, corso Orbassano*)
ZoneB is occupied by the ex Center Stile, ex Mercato Italia and ex Fiat Engineering with attached offices. The zone B is under preliminary feasibility studies, aims at reuse of the existing buildings.
- ▶ **ZoneC** (*Via Anselmetti*)
The project provides spaces to link production and service area, along the road via Anselmetti, creates cycle line and green pedestrian to link the future Piazza Mirafiori and the bank of Sangone.
- ▶ **Mirafiori piazza**
The piazza joining Corso Marche, Via Settembrini and Via orbassano will represent an infrastructure system with high accessibility to the area.
- ▶ **The Centre of Design** (*Corso Settembrini, corso Orbassano*)
The project transforms the ex Dai shedded space into the Centre of Design, which will combine the educational activities of Politecnico di Torino, laboratories and experiments related to production. Under the large metal structure and covered sheet placed 6 building blocks of 2 levels, each of them has a different cladding.

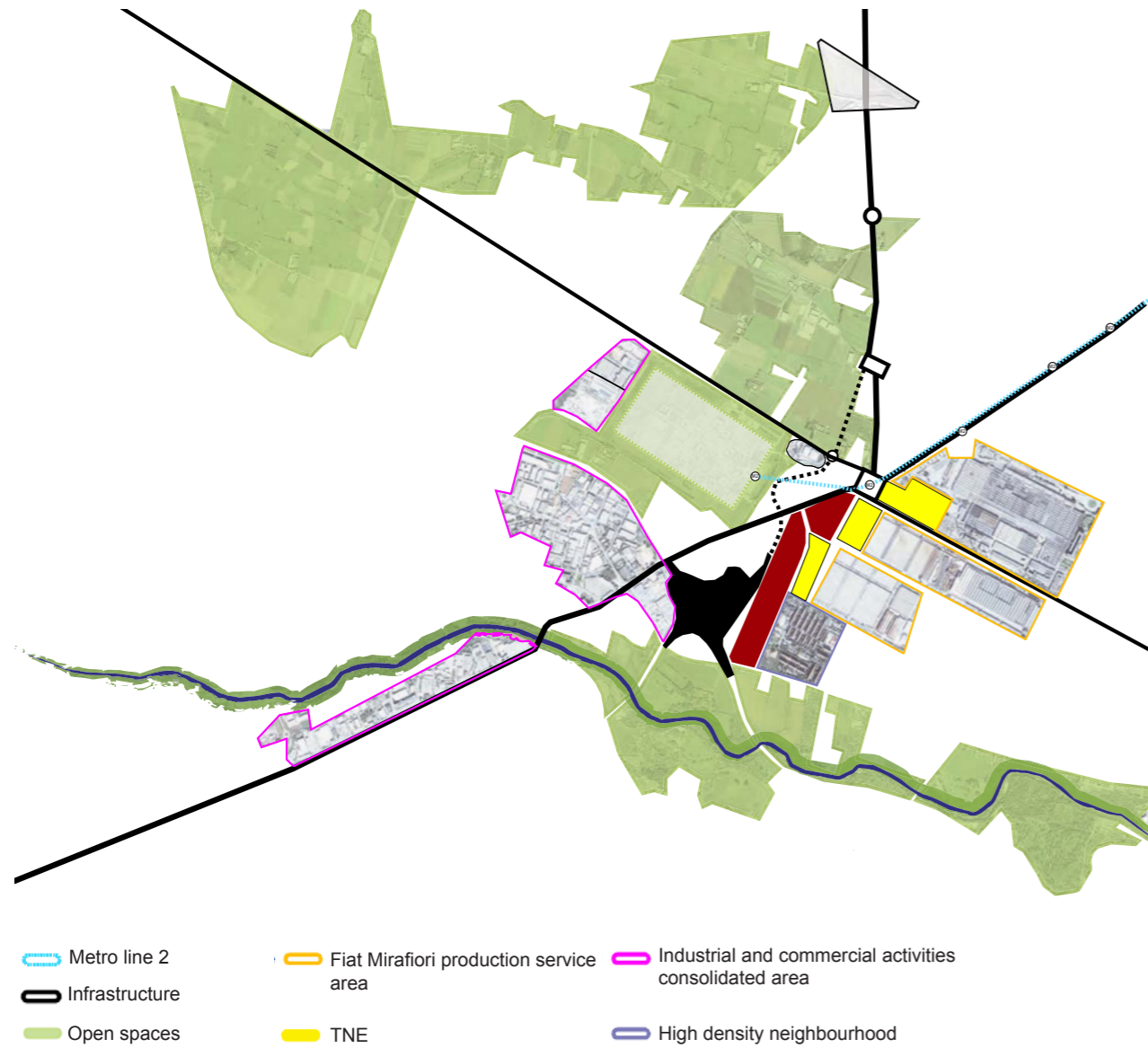


fig3.25 Selected important features of the site surrounding area

3.3 Site scale analysis

3.3.1 Important features around the site

3.3.2 Potential and Problems of the site

3.3.3 Accessibility of the site

3.3.4 Photos of the site



fig3.26 The panoramic view of the site

3.3.1 Important features around the site

One of the two cemeteries of the city is located right besides the motorway.

The triangular area with several abandoned industrial warehouses, today often used by homeless people to take shelter during the night.

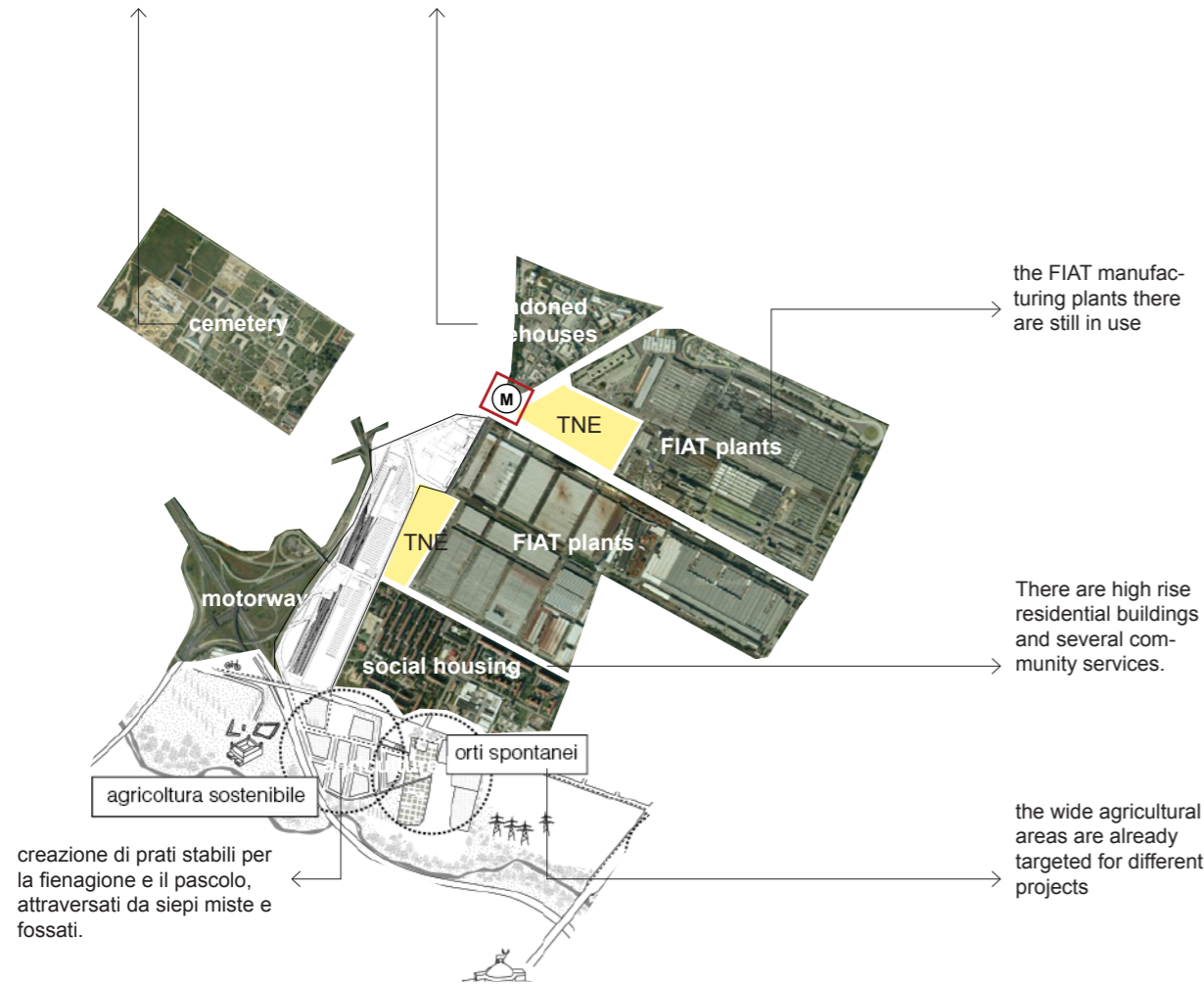


fig3.27 The important features of the site

3.3.2 Potential and Problems of the site

► **1.Existing geometry:** with a sunk space 6m below the ground level.

↓
Respect the situation, make use of the different height

3.Existing underground path

↓
The design will enlarge this under pass, and think about add other pass.

6.Existing buildings: these are recent built buildings with poor conditions which are not sustainable in terms of reservation cost.

↓
Demolish materials will be reused by the adjacent TNE project.

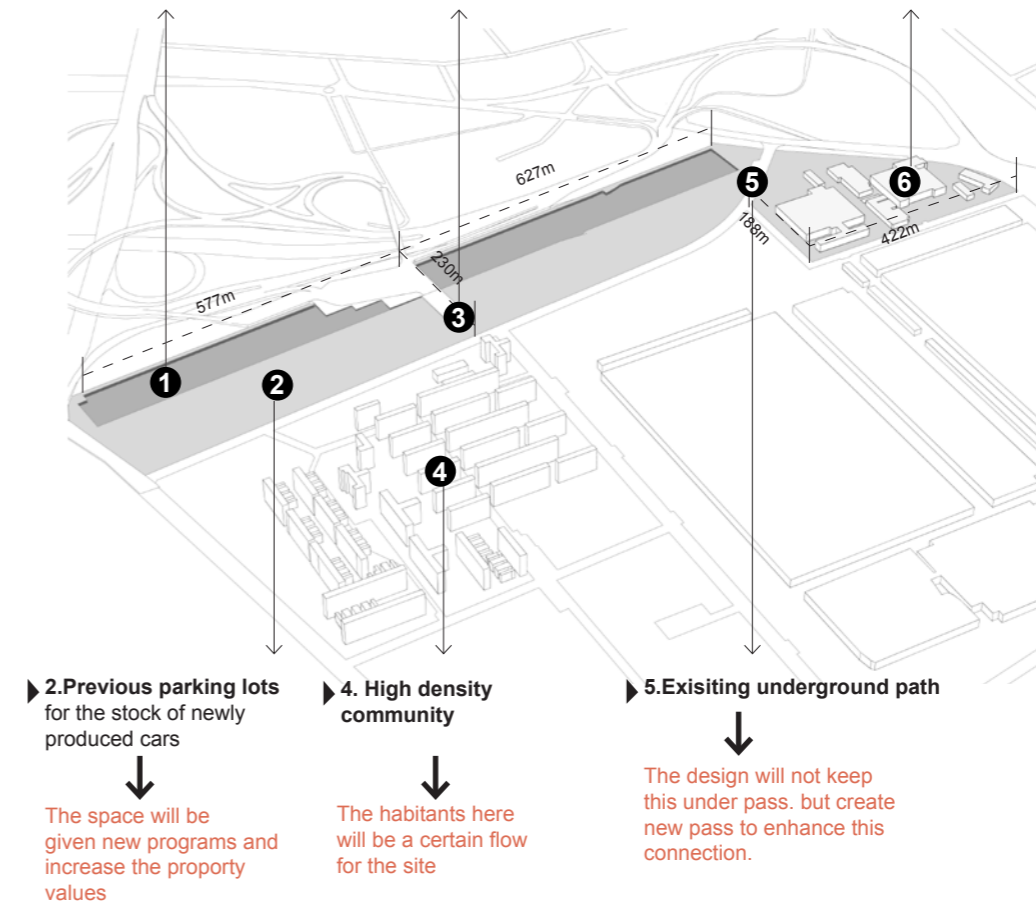


fig3.28 The Problem and Potentials of the area

3.3.3 Accessibility of the site



fig3.29 The accessibility of the area

3.3.4 Photoes of the site

The site [owned by the FIAT group and other companies].
Photoes about the current situation of the area.

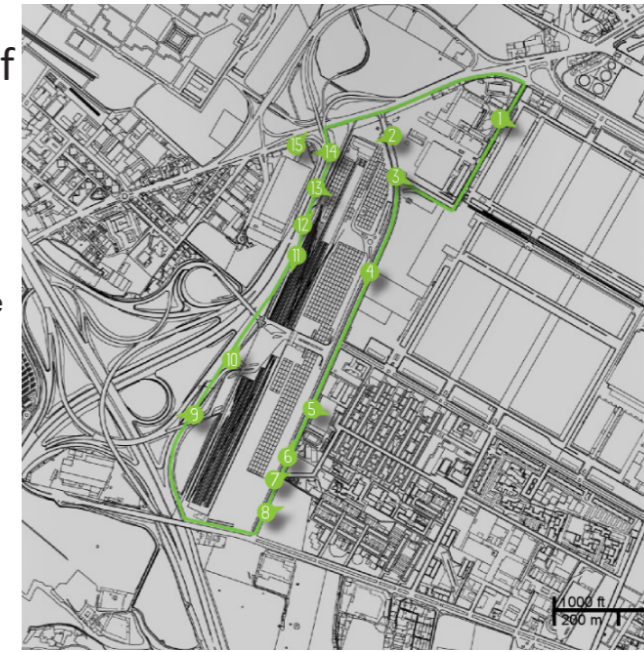


fig3.30 The index for the photoes



fig3.31 Photoes of the site

Chapter 4: Masterplan Design

4.1 Steps Toward The Design

4.2 Masterplan and Illustrations

4.1 Steps Toward The Design

STEP 1 Understand the Potential flow of people

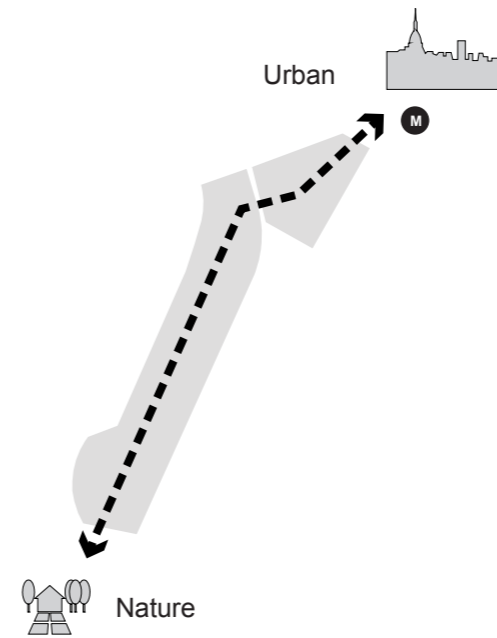


fig4.01 Flow from city to countryside cross the site

The main flow of the site is longitudinal. People go between city and rural to enjoy the nature or the city life.

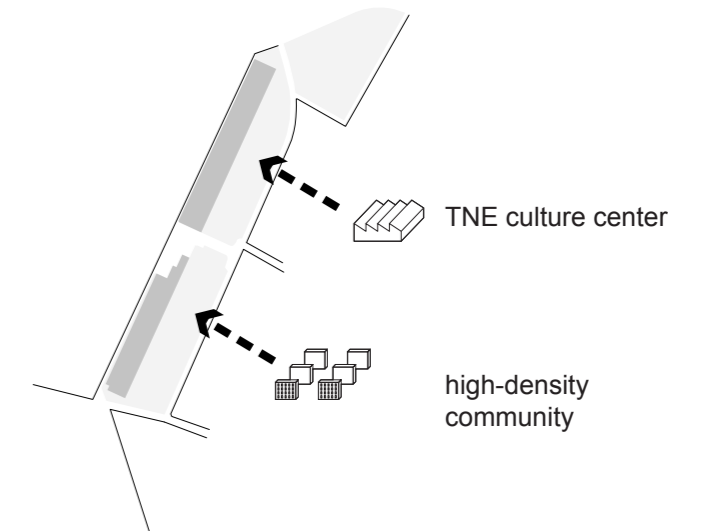


fig4.02 Flow from neighbourhood to the site

There is an other flow which is transversal, that people come from the new cultural center and the adjacent community.

STEP 2 Guide the flow of people

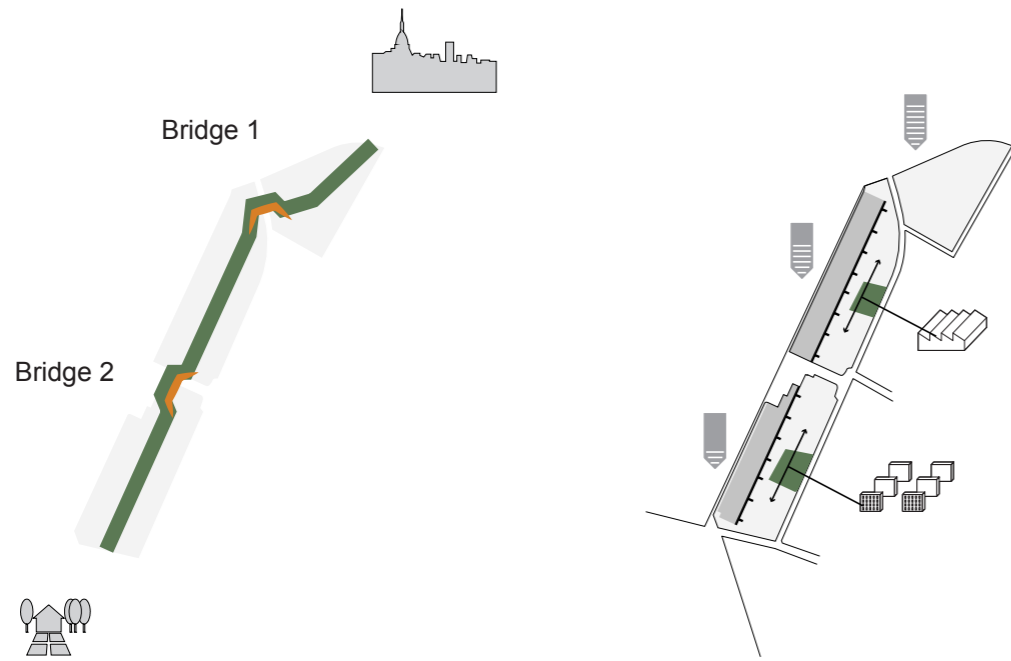


fig4.03 Linear green space

Create a linear park following the direction of the flow to enrich the recreational experience. Build bridges with green cover, to give continuity to this linear park.

fig4.04 Interaction zone facing the street

Open spaces as interaction zone to welcome the people from neighbourhood, this transversal flow stopped at the edge of the sunk space, and join the main flow.

STEP 3 Define the density of each area

Area 3 adjacent with the new Mirafiori piazza and the Metro station of line 2, these give the area a good accessibility, therefore the area is more urban.

Area 2 has a medium density, next to the culture center, the area may contain a center amount of residential building as well as open spaces.

Area 3 is next to the high-density community, In order to balance the density of the area, this area has less residential area, but provide more open spaces which area shared with the neighbourhood.

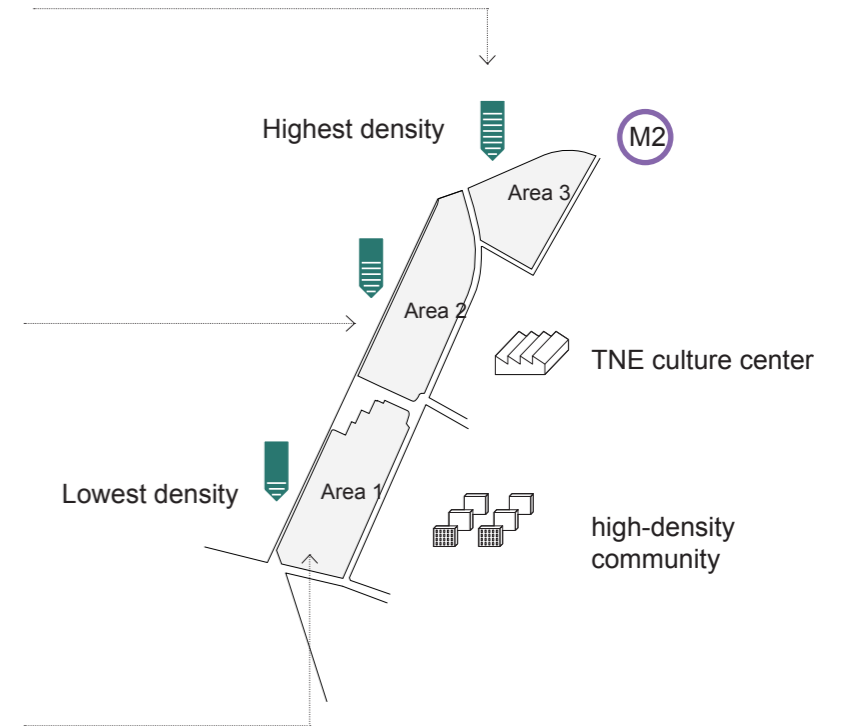


fig4.05 Density of the area

STEP 3 Choose typologies for each area according to the density

“A ‘large’ number of smaller building elements or a small number of ‘large’ ones? In both these extreme cases (or somewhere in-between) it involved the accommodation of a large number of people, and that is no small thing!”

Vincent Ligtelijn e Basel, Birkhauser, Aldo Van Eyck : works, compilato da Vincent Ligtelijn, Basel, Birkhauser, 1999

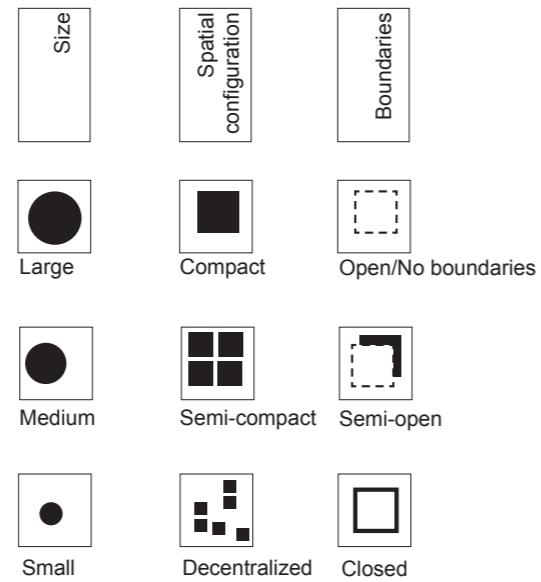


fig4.06 Classification of the dwelling units

STEP 3 Choose typologies for each area according to the density

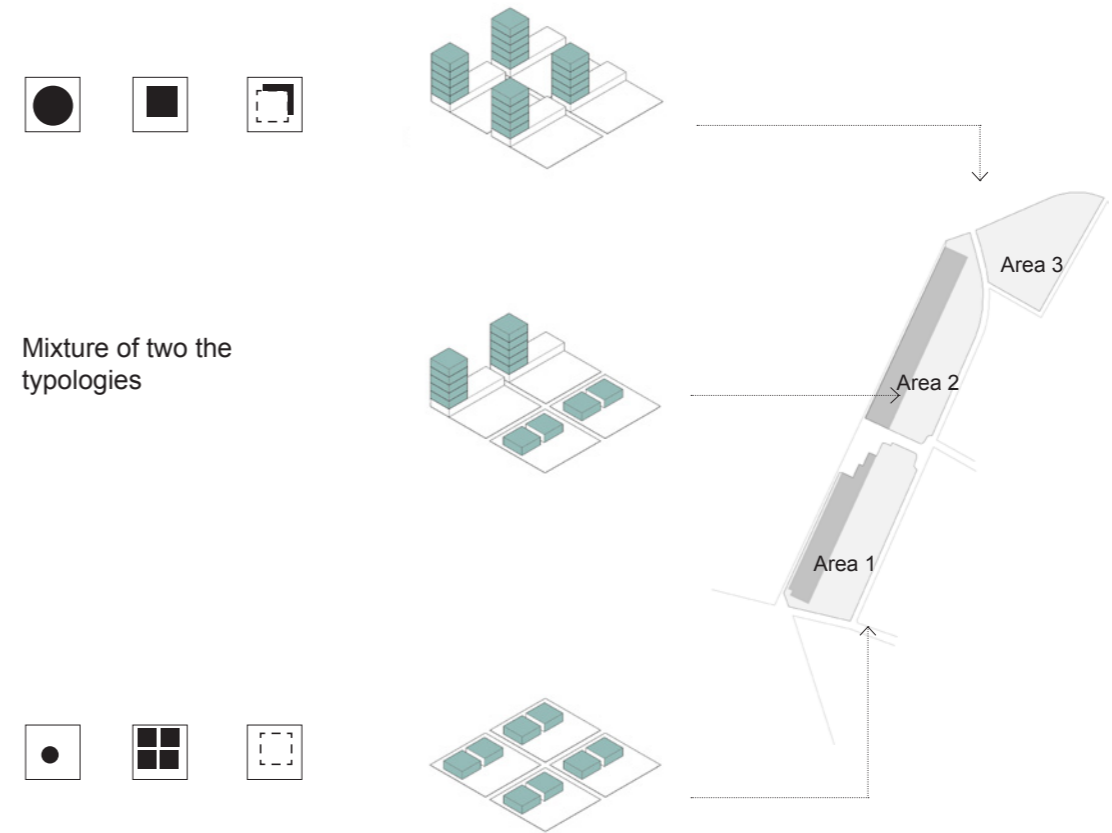
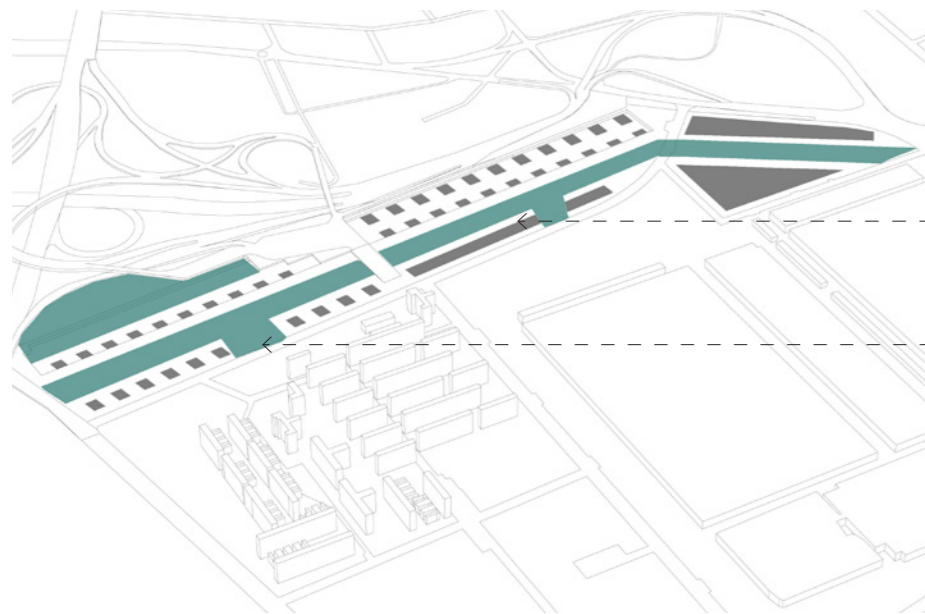


fig4.07 Arrangement of different typology on the site

STEP 4 Define a range of open spaces



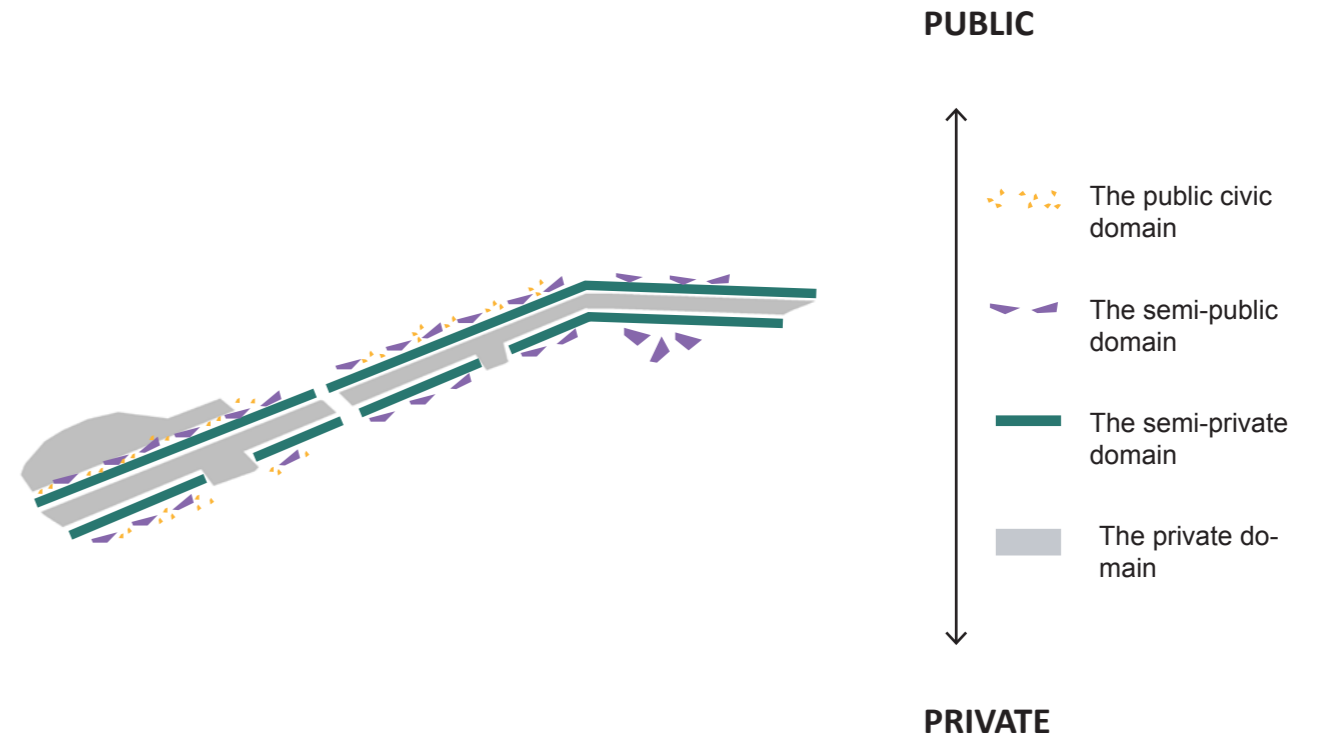
Interface zone

this area face the street will introduce a series of social connections





we try to shape a considerable range of open spaces in our project. A major element in this is a broad boulevard and 2 main squares.

fig4.08 Main open space structure of the site

STEP 4 Define a range of open spaces



PUBLIC

-  The public civic domain
-  The semi-public domain
-  The semi-private domain
-  The private domain

PRIVATE

we want to propose an open space system as rich a hierarchy as possible and then interwoven to create maximum diversity of places, locations and opportunities for encounter.

fig4.09 A range of different open spaces

STEP 5 Define the agriculture typologies

Agriculture land use
Competition requirement

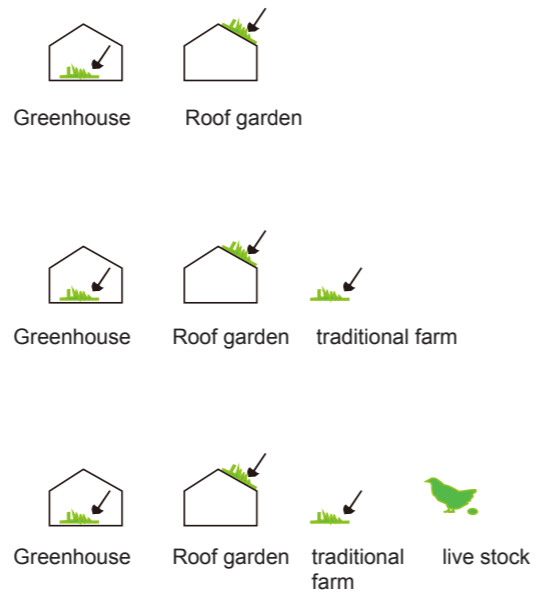
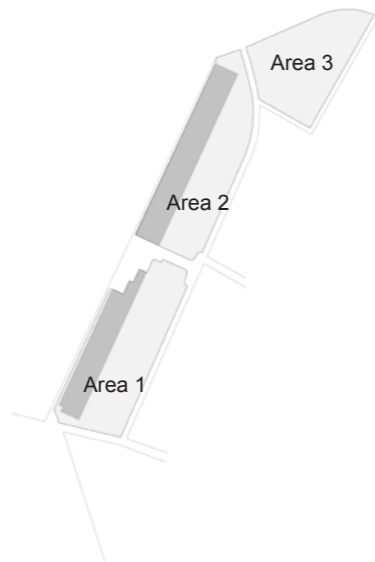
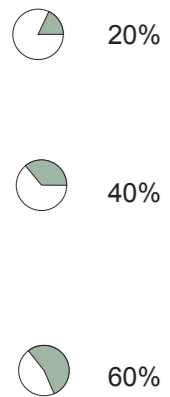


fig4.10 Different type of agriculture spaces

STEP 6 Create the agriculture network

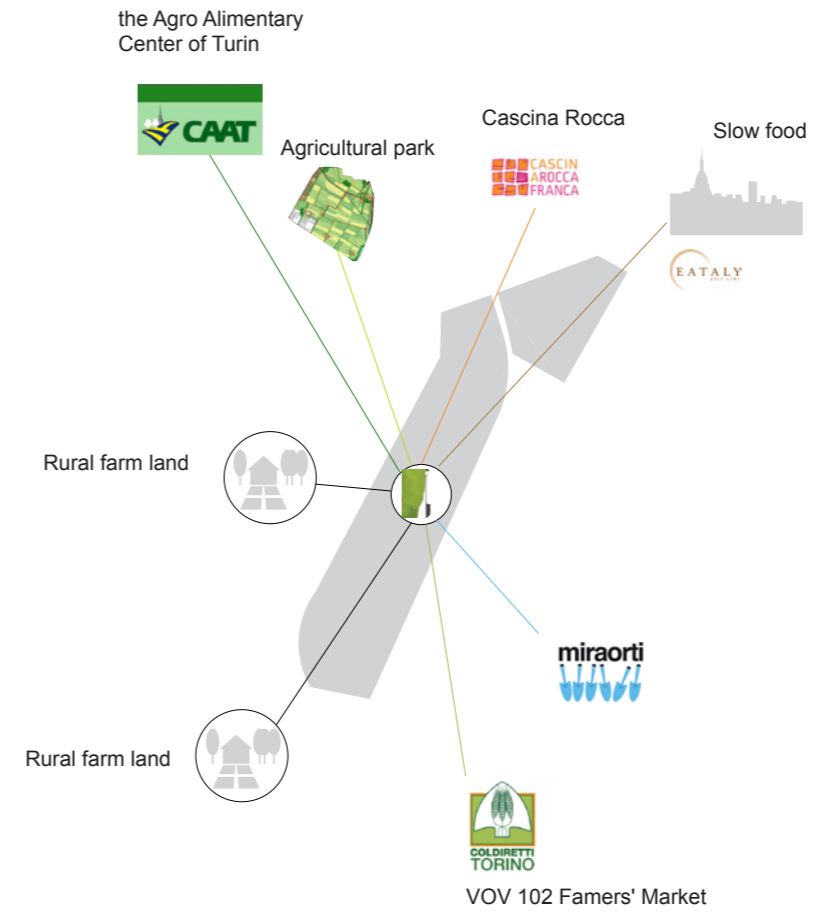


fig4.11 Agricultural network

STEP 7 Agriculture integrated with other sustainable issues

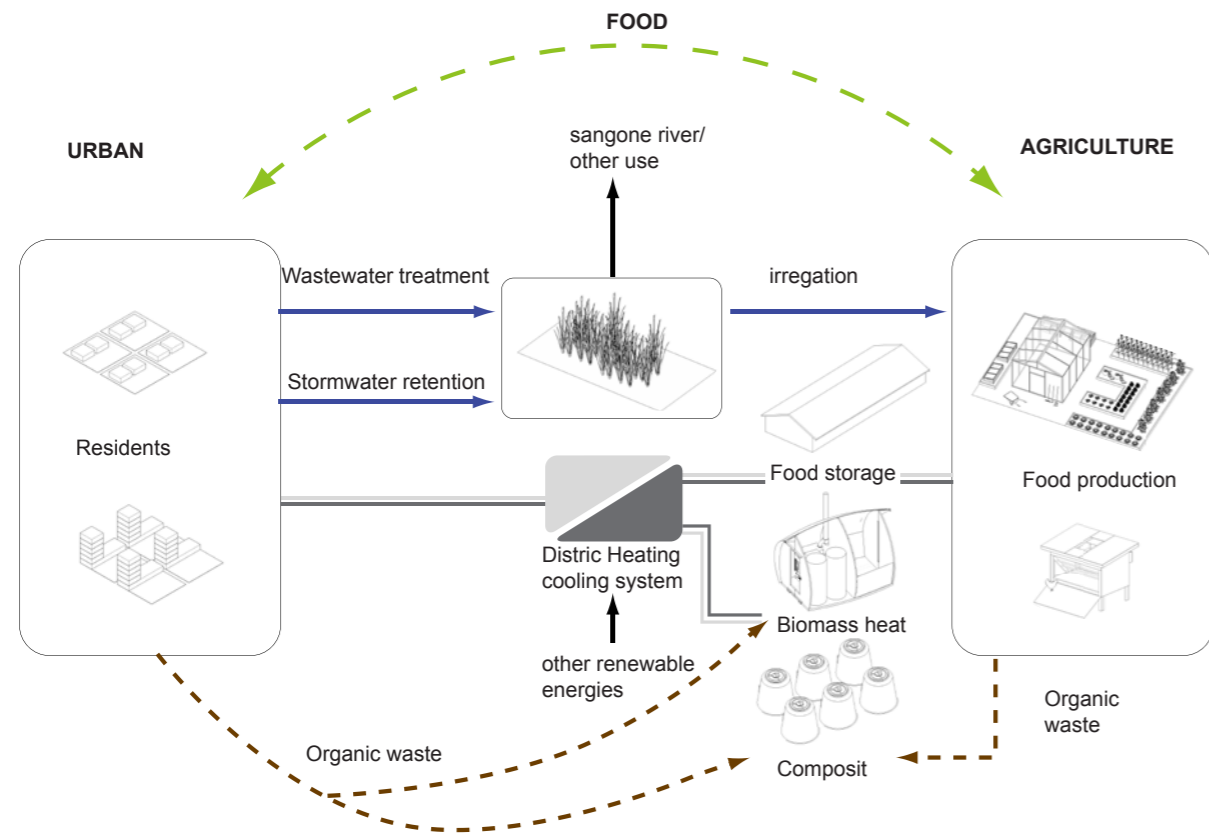


fig4.12 Sustainable operational cycle of the community

4.2 Masterplan and Illustrations

► MASTERPLAN

- Water
- Public Landscape
- Rain garden
- Community farm
- Public farm
- pavements
- Wooden pavements
- Bridges



fig4.13 Masterplan

► LAYERING

The layering shows the different elements of the design: buildings, water, farmland, open spaces, site with it's own geometry. These elements interwoven to create maximum diversity of places, locations and opportunities for encounter.

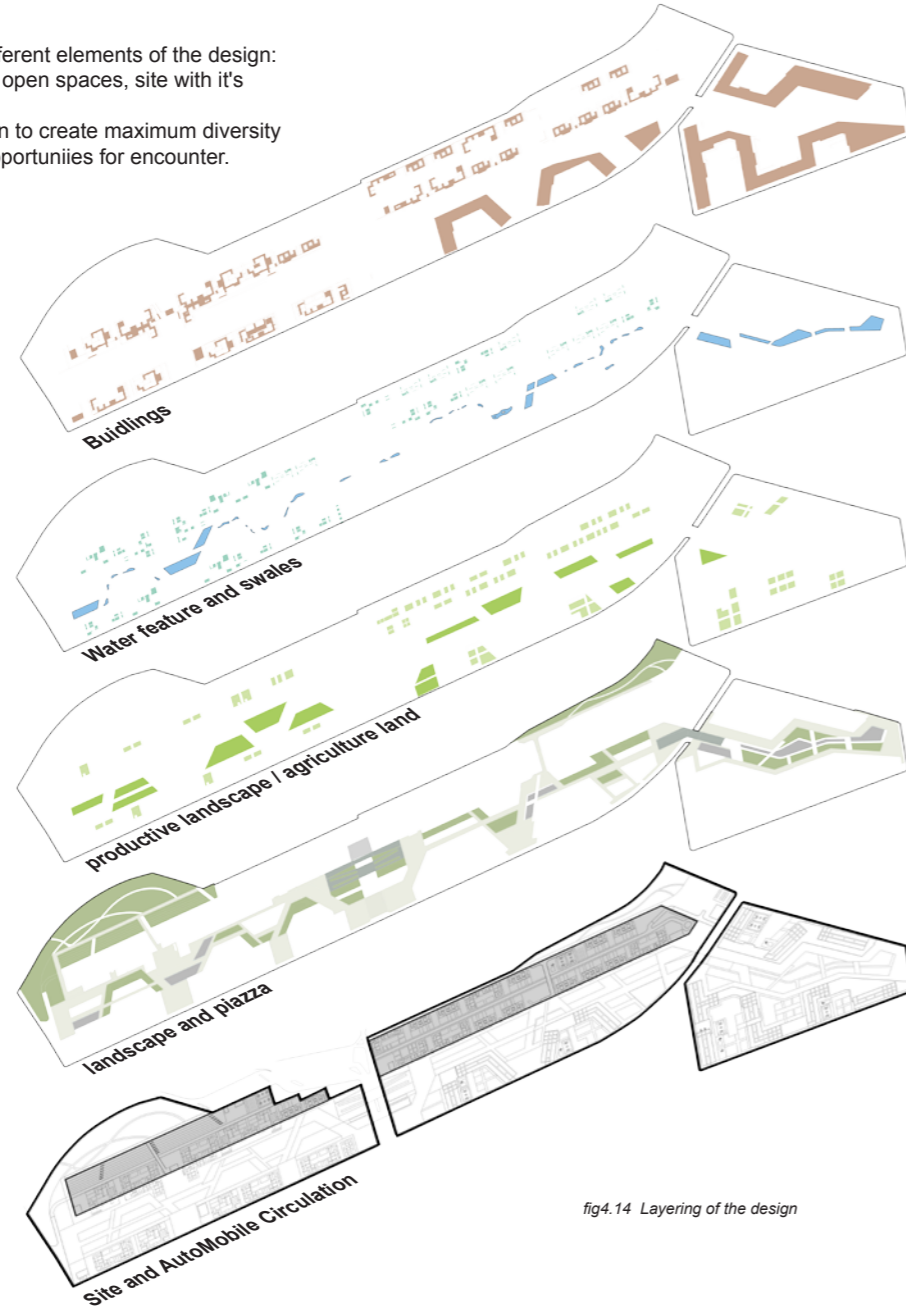


fig4.14 Layering of the design

► PROGRAMS

The programs below show the distribution of habitants, and the services provided by the community.

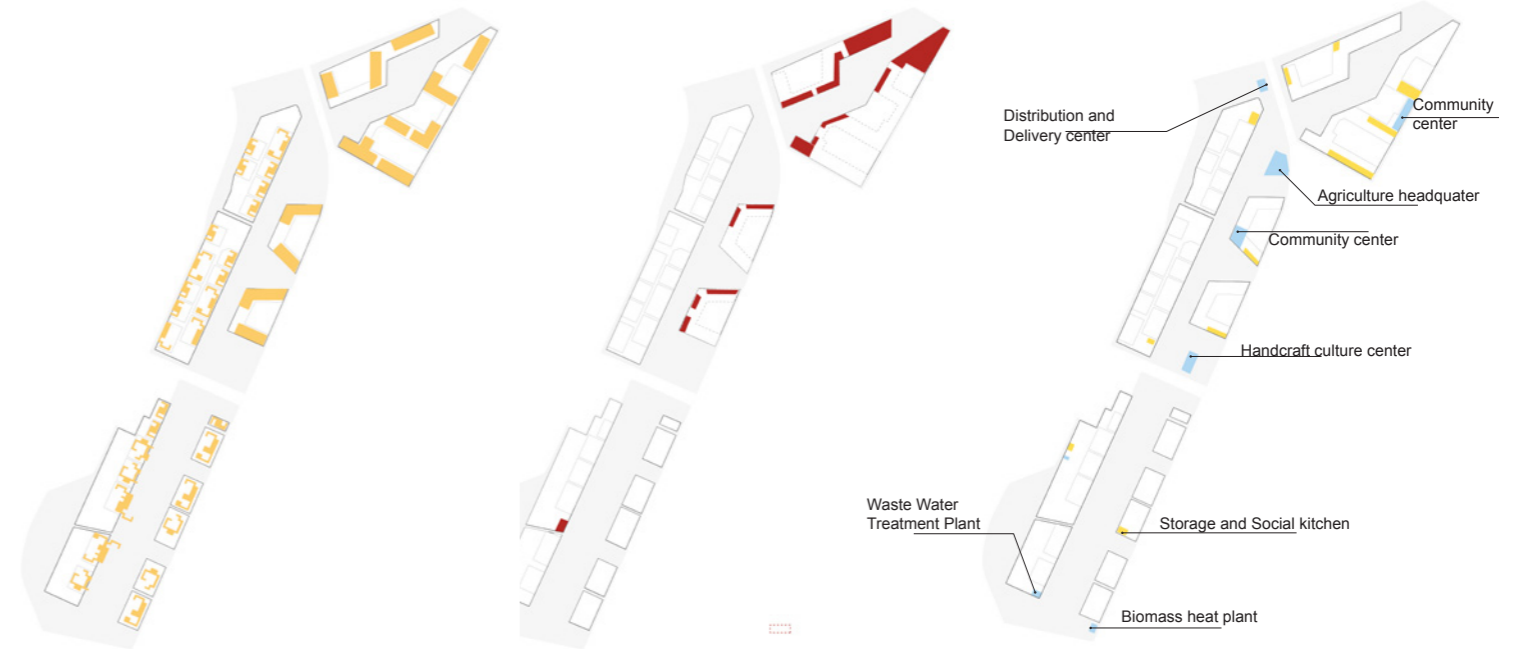


fig 4.15 Residential

fig4.16 Commercial

fig4.17 Public buildings

▶ SECTIONS



section 1-1



fig4.18



section 2-2



fig4.29



section 3-3

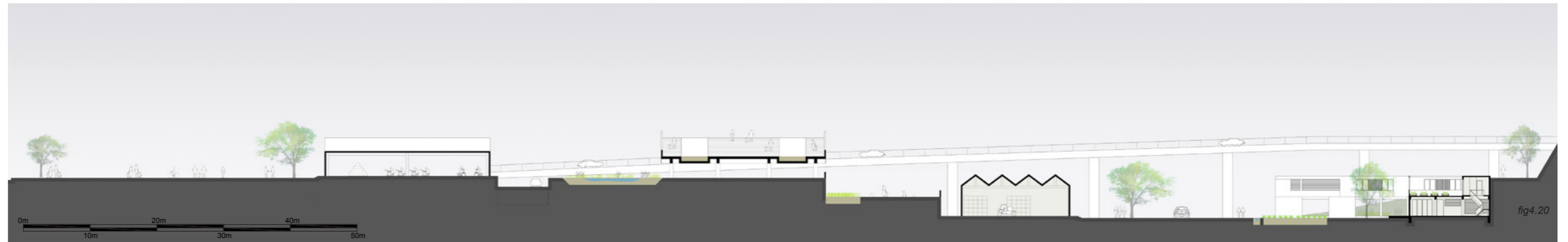


fig4.20

► Materplan Zoom in



Chapter 5: **Agriculture Spaces and activities**

5.1 Shared agricultural spaces

5.2 Private agricultural spaces
(agriculture integrated with building)

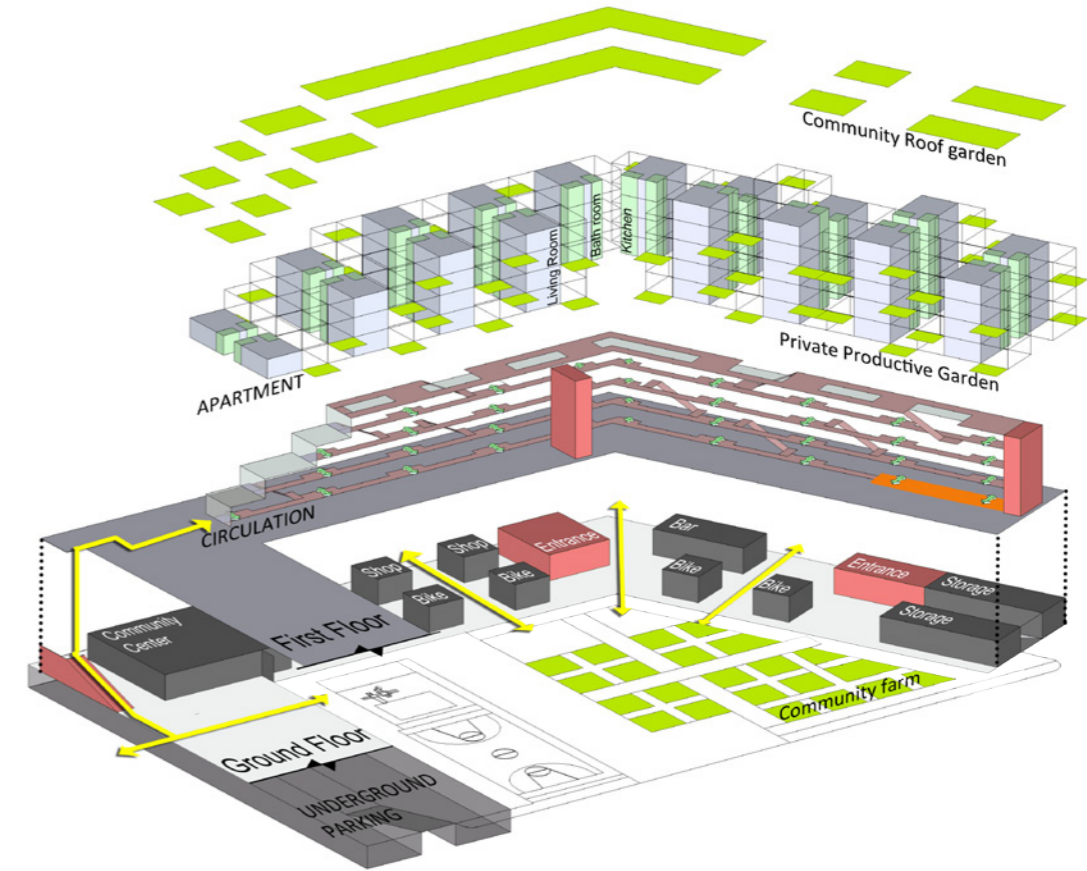
5.3 Application of the ICT system

ref.42,43,44,45,46,47,48

5.1 Shared agricultural spaces



5.1 Shared agricultural spaces



► CROPS for different types of community agricultural spaces

fig5.03

Grow on the tree	Grow on the ground	Grow in the green house	Grow on the vine
<ul style="list-style-type: none"> la prugna il cochi la melagrana la pera l'albicocca la cilliegia la mela le noci le castagne le mandorle 	<ul style="list-style-type: none"> il porro il cavolo rosso le carote lo zenzero il mais il peperocino i broccoli i funghi 	<ul style="list-style-type: none"> il cavolo l'aglio la cipolla i finocchi le patate il sedano i piselli il ravenello il pomodoro 	<ul style="list-style-type: none"> il carciofo gli spinaci la cicoria gli asparagi il basilico la rucola
			<ul style="list-style-type: none"> l'uva le zucchine
		<p>Consider of the climate in Turin and the eating habit of the Italians, here is a catalog of crops and the possible modes of planting.</p>	

5.2 Private agricultural spaces
(agriculture integrated with building)

fig5.04

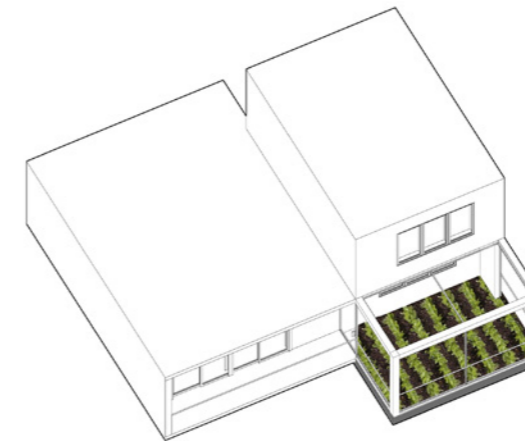
POSSIBLE PRODUCTIONS

- i pomodori sechi
- le conchiglie
- le farfalle
- la baguette
- la focaccia
- gli gnocchi
- il gorgonzola
- la fontina
- il caciocavallo
- la ricotta
- le uova



Agriculture spaces in typology 1

fig5.05



Agriculture spaces in typology 2

fig5.06

fig5.07

CROPS FOR KITCHEN GARDEN'S

Vegetables

- il basilico
- la rucola
- i funghi
- il ravenello
- il porro
- l'aglio
- il peperocino

Animal

- il pollo
- il coniglio

Fruit

- la fragola

5.3 Application of the ICT system

ICT *information and communication technology*

The 'green revolution' carried on the site is driven not only by new technologies of pesticides and fertilizers but also by changes in demographics and the information communication technology landscape.

The objectives of the work

is to suggest a frame work create a information data base shared by habitants in this community and accessed by cit-izes at the same time.

The end users of the system

habitants(famer), market, community service workers.

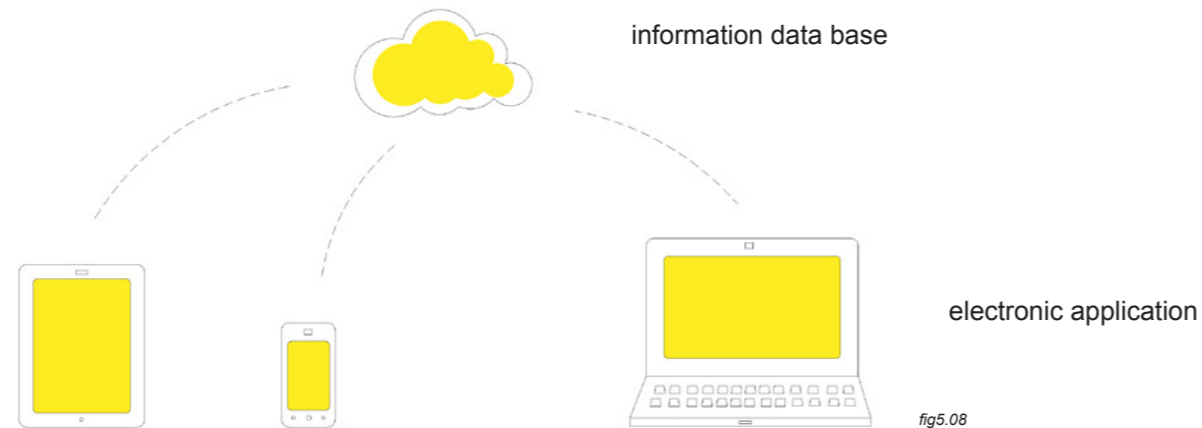


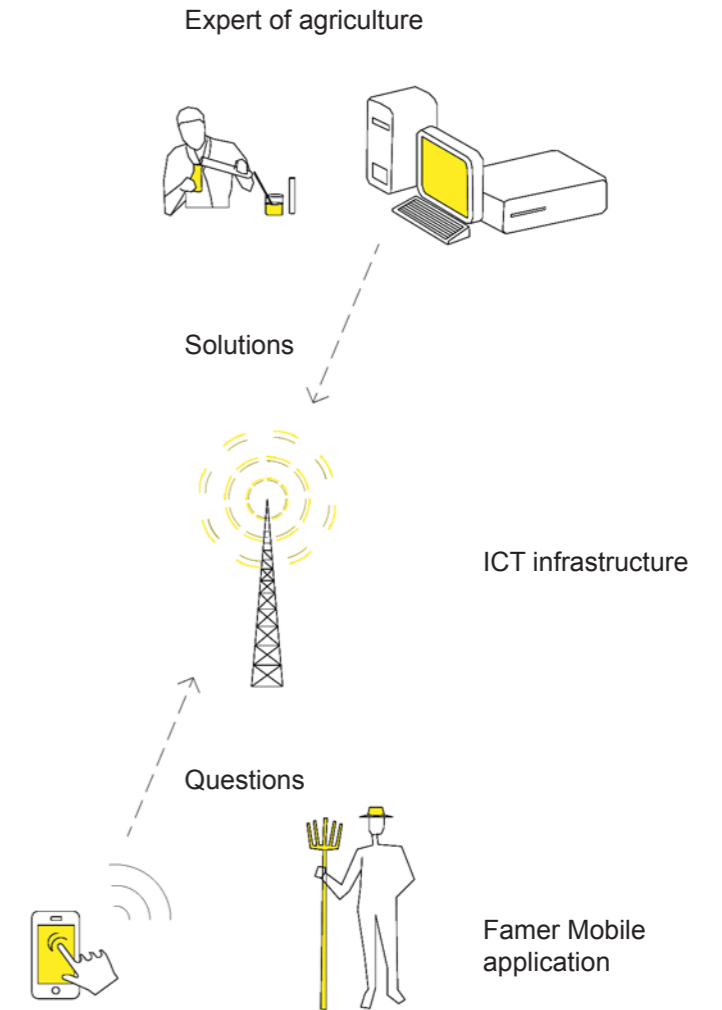
fig5.08

Application of ICT system in the agriculture activities

► In the community scale

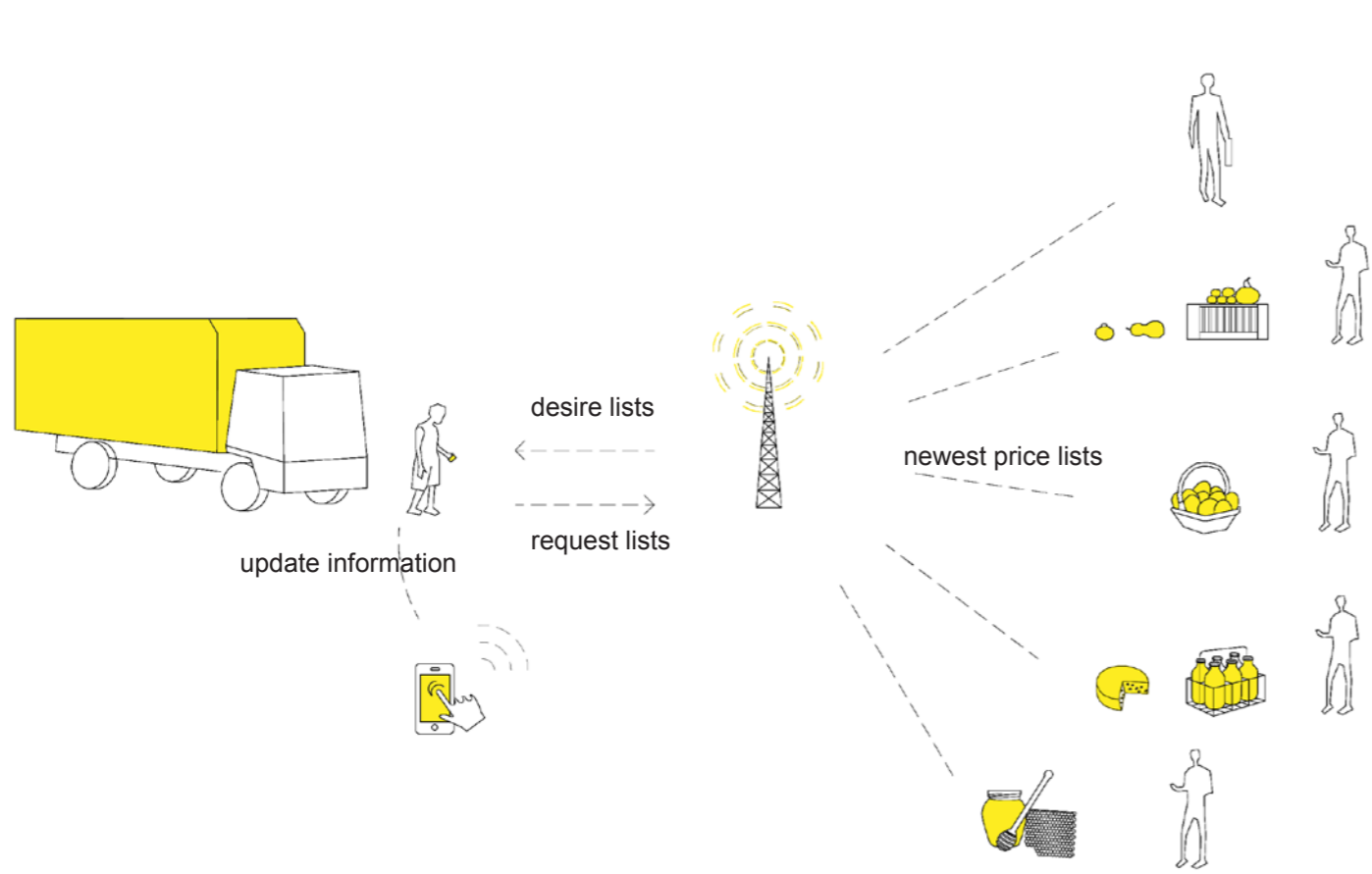
1.An expert systems which helps famers in determining market- ing alternatives and optimal crops management. it will assist famers in desease treatment and give produc- ing advices.

fig5.09



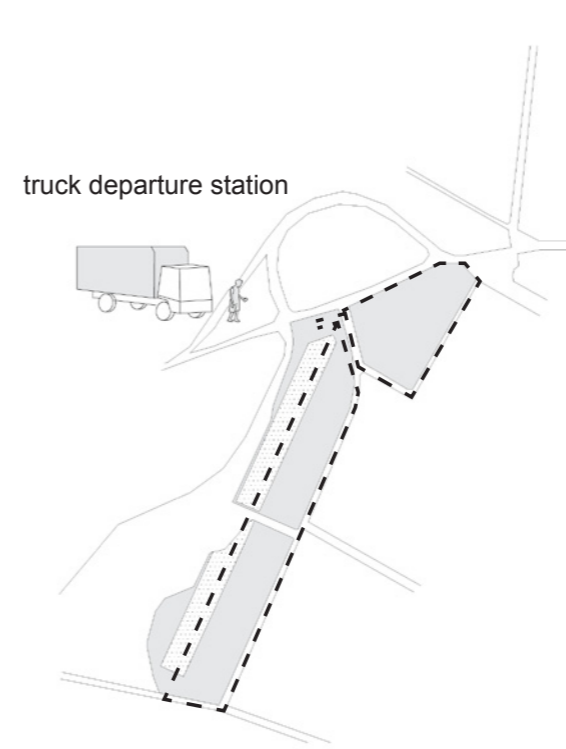
2.A trading system which is a information sharing system that makes crops collection and distribution process more efficient.

fig5.10



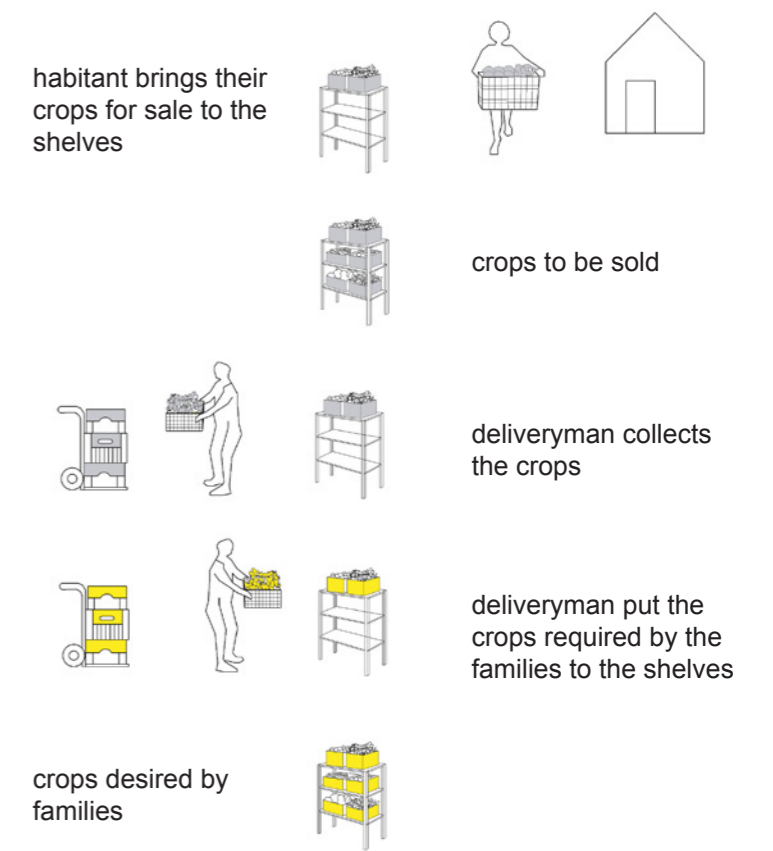
The LOOP of the food delivery and collecting service inside the site

fig5.11



The food delivery and collecting process







fig5.12







Exemple of the information list transferred within habitants and deliveryman

fig5.13




Deliveryman's Supply list

24/03/2013 supply list		
species	quantity (kg)	price (€/kg)
	14	0.30
	10	0.15
	8	0.20
	12	0.11
	7	0.24
	3	0.26
⋮	⋮	⋮













Habitants' Supply list

24/03/2013 HOUSE 015 supply list		
species	quantity (kg)	price (€/kg)
	6	0.30
	5	0.22
	6	0.28
	2	1.08
Total income: 6.74		

Habitants' Desire list

24/03/2013 HOUSE 015 desire list	
species	quantity (kg)
	0.4
	0.2
	1.0

Deliveryman's daily balance list

24/03/2013 Daily balance											
COLLECTED				SOLD TO HABITANTS			SOLD TO MARKET				
species	house num.	quantity (kg)	price (€/kg)	species	quantity (kg)	price (€/kg)	species	quantity (kg)	price (€/kg)		
	01;02;19;44	30	0.30		15	0.15		15	0.20		
	10;22;23;60	32	0.15		10	0.11		10	0.16		
	8;44;56	17	0.20		11	0.24		11	0.30		
	3;12;75	19	0.11		15	0.26		15	0.31		
⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮	⋮		
Total outcome: xxx				Total income: xxx			Total income: xxx				

- Habitants will get the supply list for the day, to get the idea of what they could get .
- The delivery man will receive the supply list from habitants to know what he may collect.
- The delivery man will update his supply list after passing each house.
- At the end of the day, the delivery man need to calculate his dailiy cash flow.

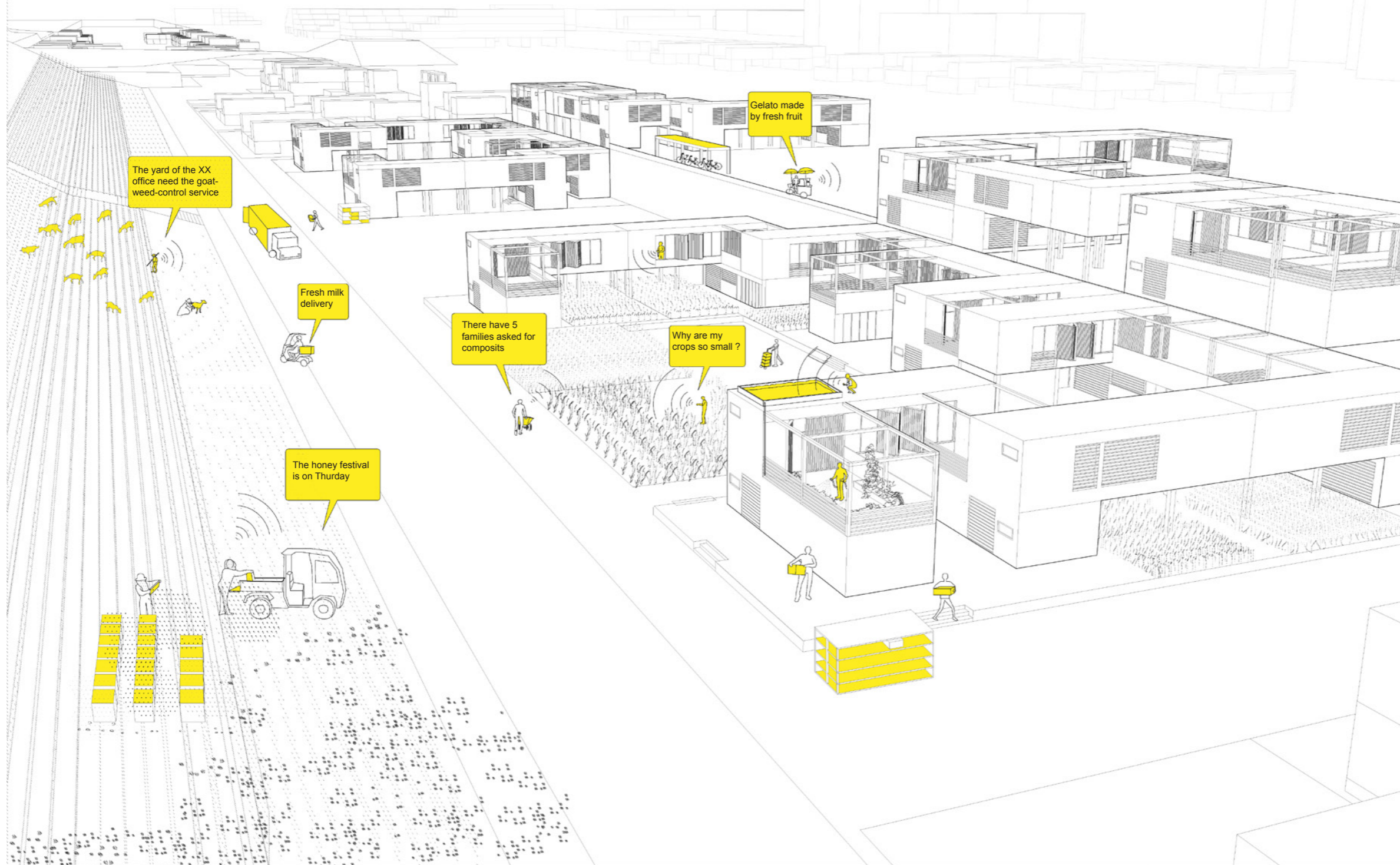


fig5.14

A image to show how the ICT framework service intergrated with habitants daily life.

► In the city scale

It serves as The Whole Chain Traceability Consortium, which helps citizens to follow food throughout fragmented food systems . a really transparent system where data is more fluid throughout the chain.

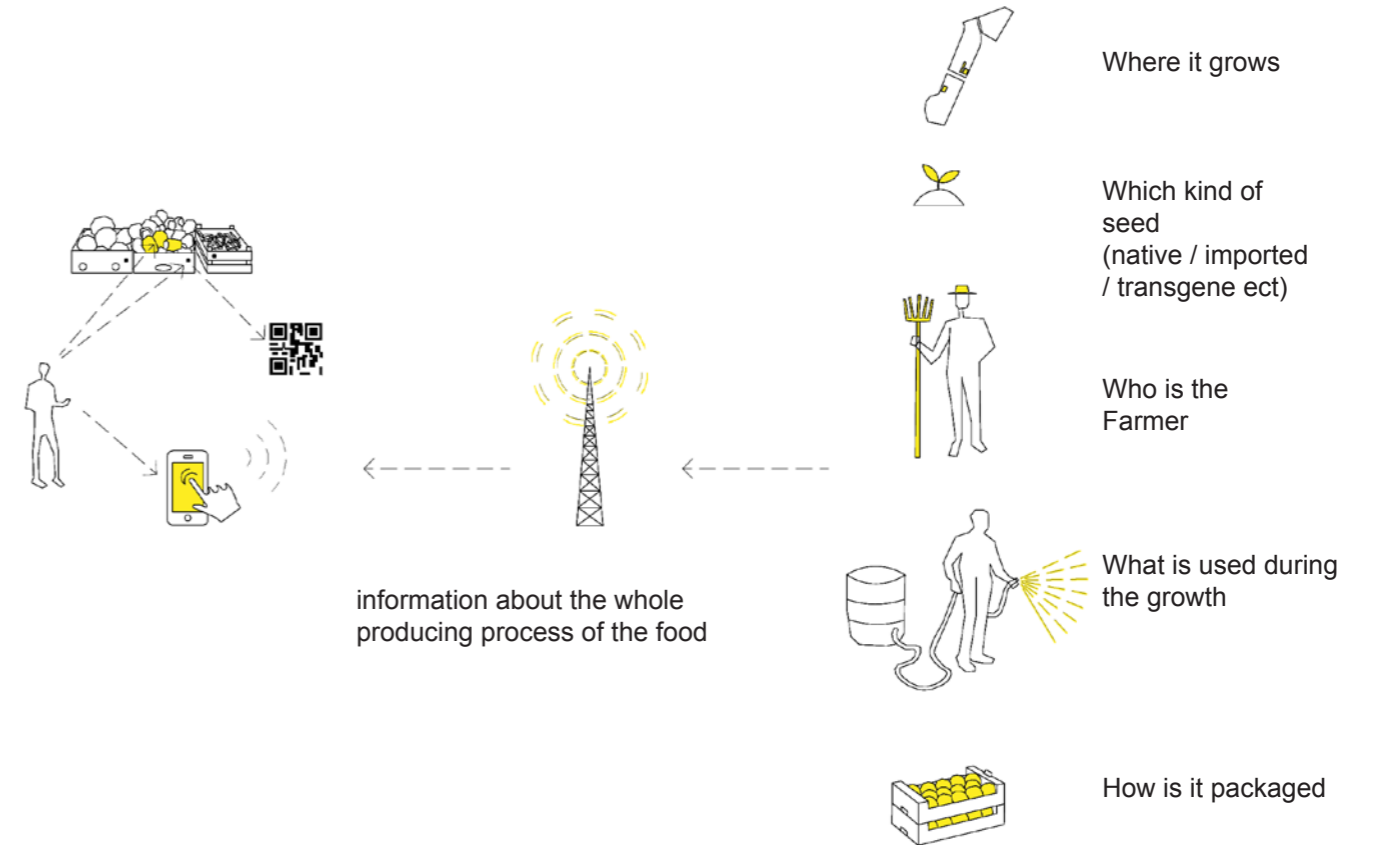


fig5.15
supermarkets around the site within a distance of 5 km

From 'farm to fork.'

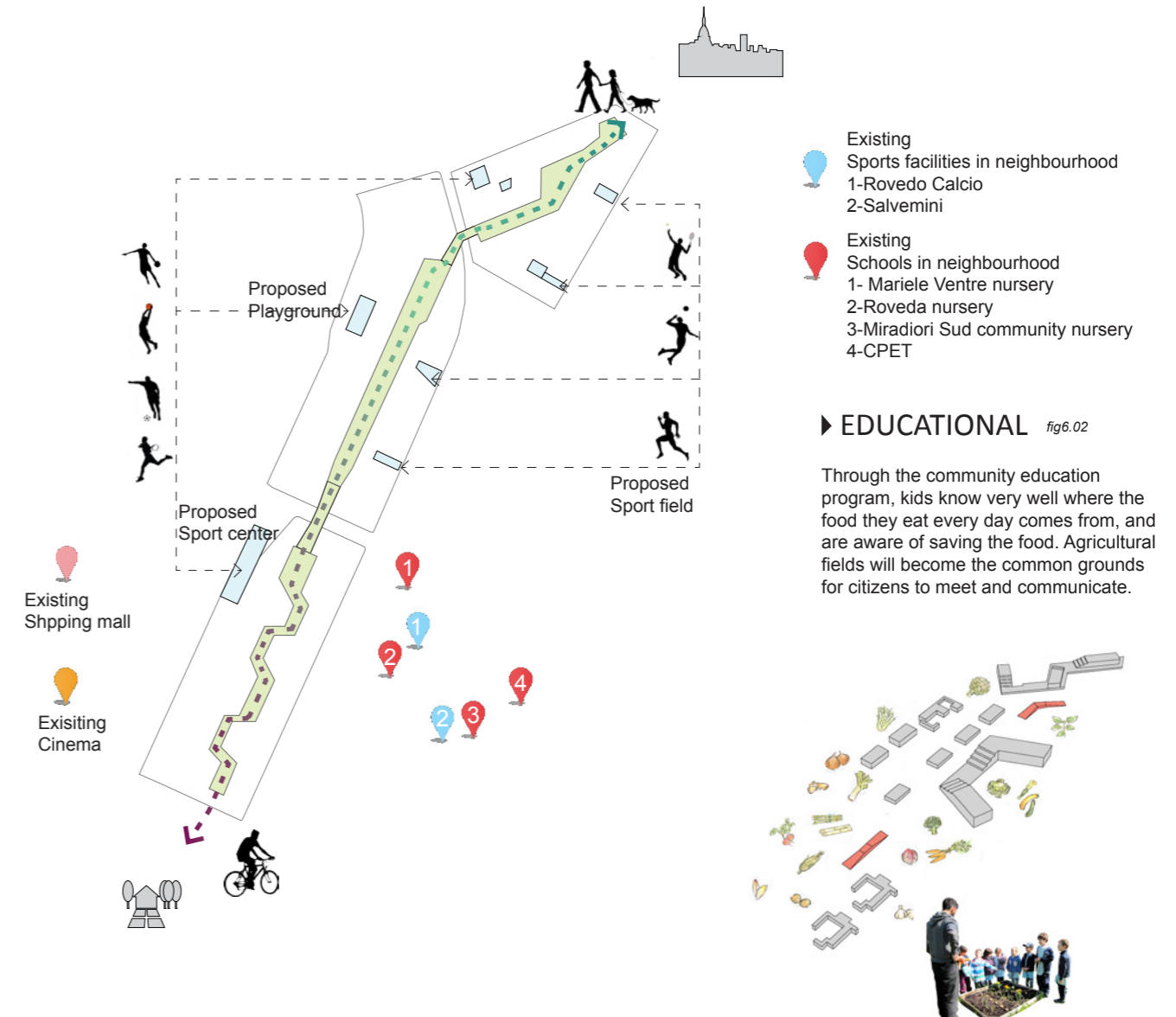
Through which the consumers are able to (by pointing a smart phone at a food product bar code) retrieve all the steps a product took from the farm to the store.

fig5.16

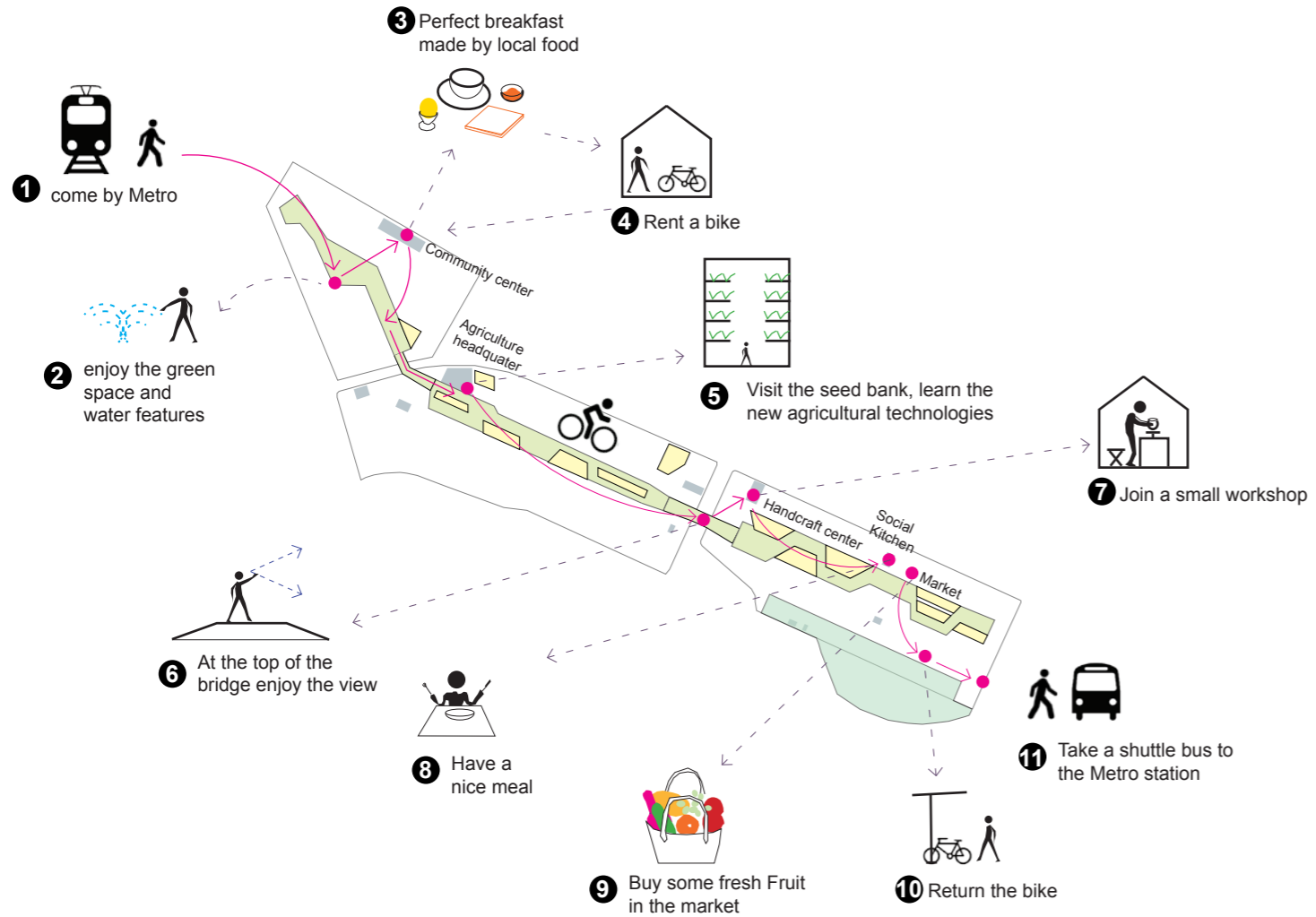


Chapter 6: Recreational and Educational spaces and activities

► RECREATIONAL *fig6.01*



Imagining a day visiting the community fig6.03



Chapter 7: Sustainable Operation Systems

7.1 Water System

7.2 Waste treatment and Energy generation

ref.49,50,51

7.1 WATER SYSTEM- city scale

► Opportunities: Resource Loop

Wastewater (referred to here as 'used water') is a rich resource of fresh water, nutrients and energy that can address issues of water scarcity, food security and climate change. Resource Loop reclaims 'used water' locally through ecologically-advanced treatment processes and reuses it in food producing - constructed wetlands, aquaculture ponds and urban farms to successfully create decentralized resource recovery ecosystems.



Corso marche masterplan

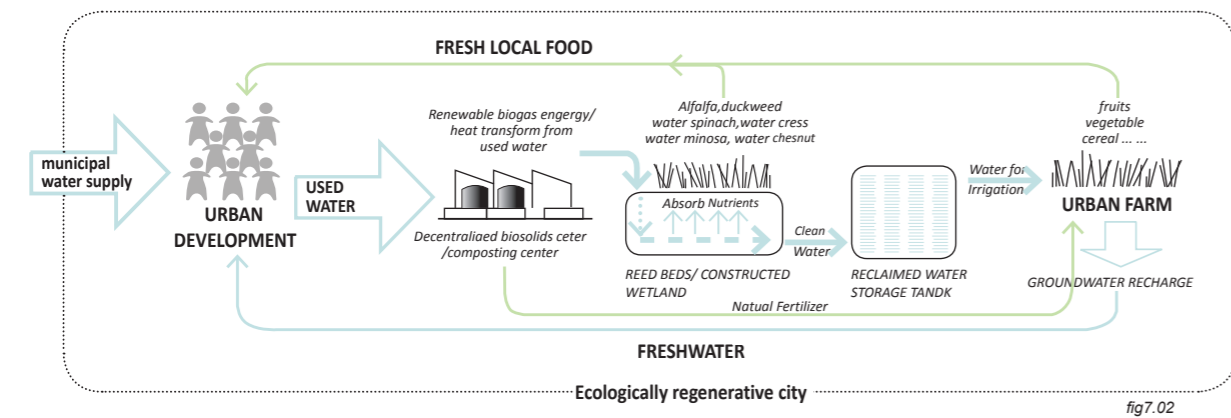
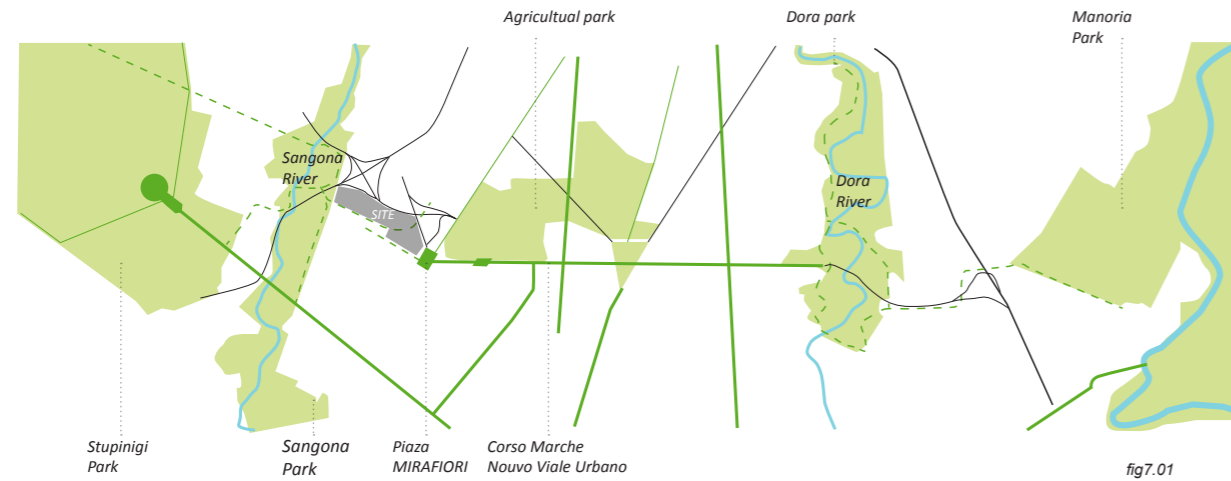


fig7.02

7.1 WATER SYSTEM - site scale

► water sensitive design

The on-site naturalized creek and pond system, along with some underground storage to treat and control flows. The plants selected in the naturalized creek and pond system are native and adaptive species. The greenway will be a significant amenity and featured landscape area.



fig7.03

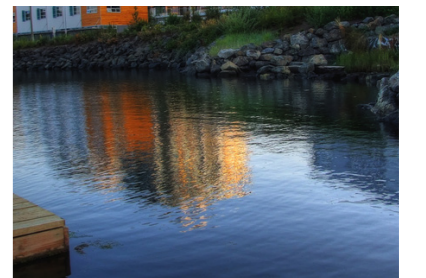
- Water management
- Bioretention Ponds
 - Bioswales
 - Rain gardens (dry swales)
 - waste water treatment Facility

Rain garden fig7.04



fig7.05

Bioretention ponds



Bioswales and water feature fig7.06



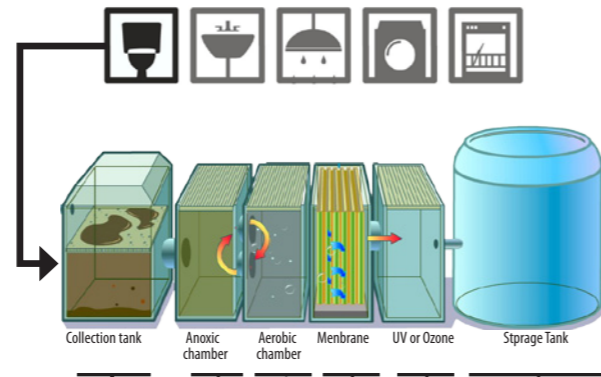
7.1 WATER SYSTEM - site scale

► Wastewater treatment

Membrane Bioreactor Technology

membrane system is a compact, odor-free, in-house system which can reuse all of the grey and black wastewater produced within a commercial or residential complex.

fig7.07



inorganic solids are removed

anoxic chamber (no-air bioreactor) and aerobic bioreactor, in which bacteria consumes the biodegradable waste product

Membrane which forms a physical barrier to any impurities in the wastewater. It filters wastewater through microscopic pores.

An ultraviolet light or ozone generator is used to prevent bacterial growth in the treated water reservoir.

Treated water can be used in landscape irrigation, toilet flush and the laundry facilities.

7.1 WATER SYSTEM - site scale

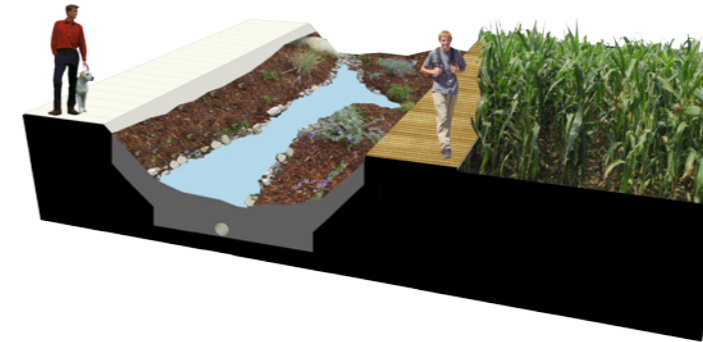


fig7.08

schematic drawings of space around the bioswales

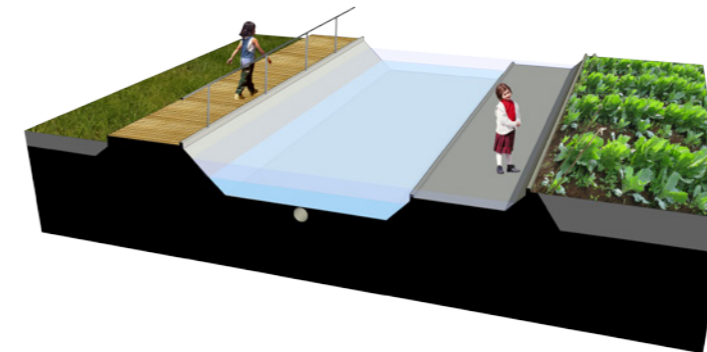
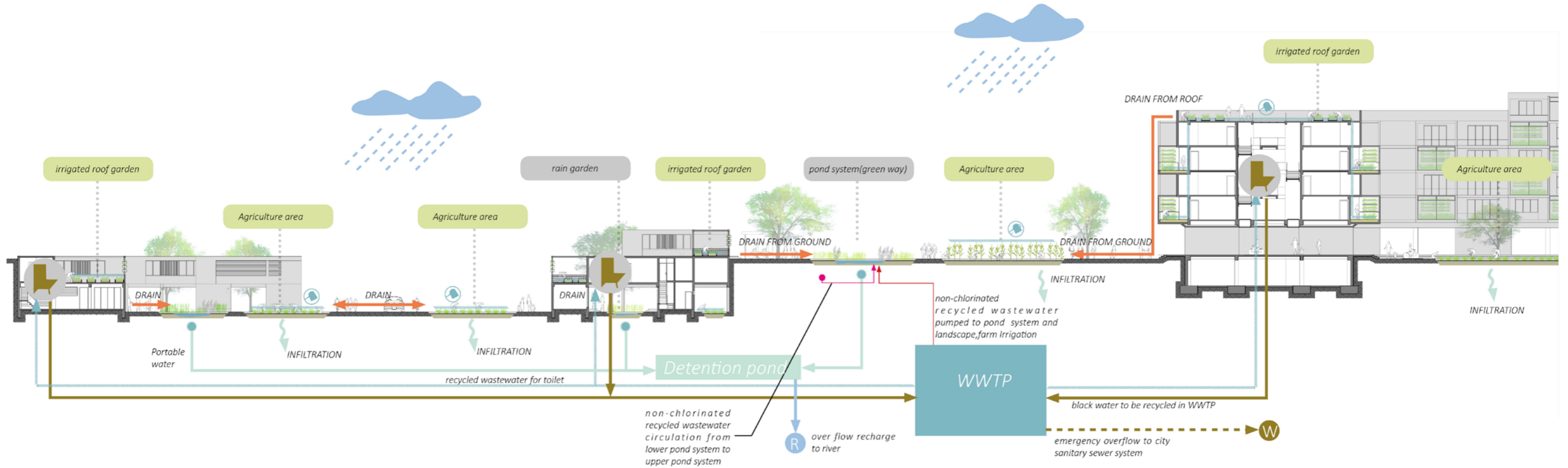


fig7.09

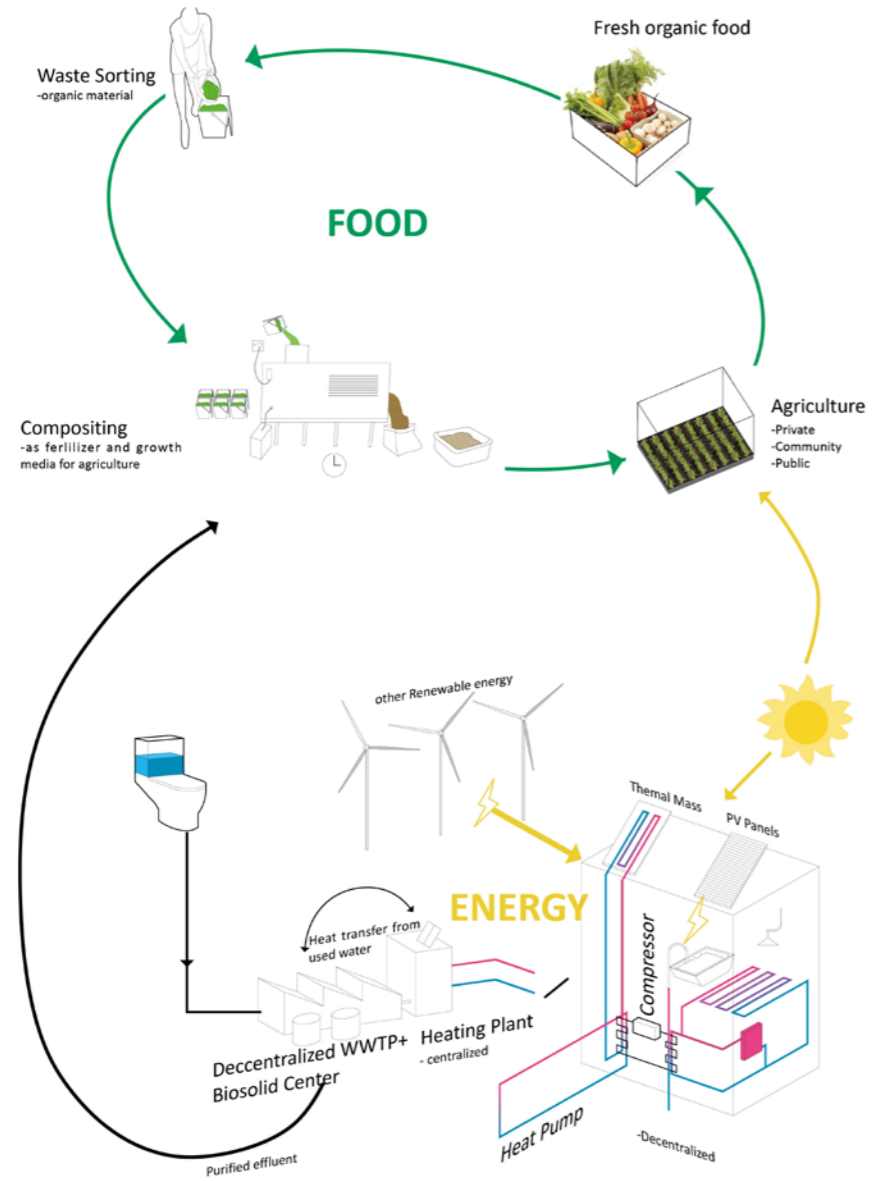
schematic drawings of space around the retention ponds

7.1 WATER SYSTEM - site scale *fig7.10*



7.2 WASTE TREATMENT AND ENERGY GENERATION

fig7.11



Chapter 8: Two Dwelling Typologies Integrated With Agriculture

8.1 Semi-detached Typology

8.2 High-density Typology

ref. 52, 53, 54, 55, 56, 57, 58, 59

8.1 SEMI-DETACHED TYPOLOGY --- Single family scale

► Basic dwelling unit

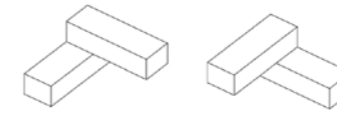


FIG8.01

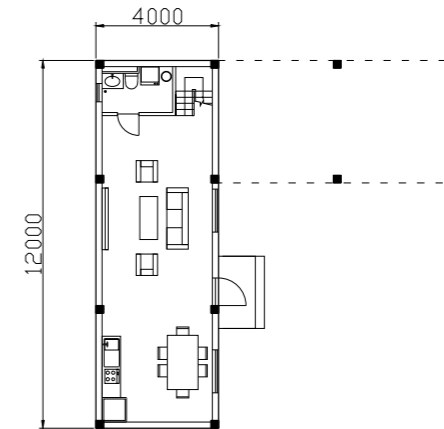
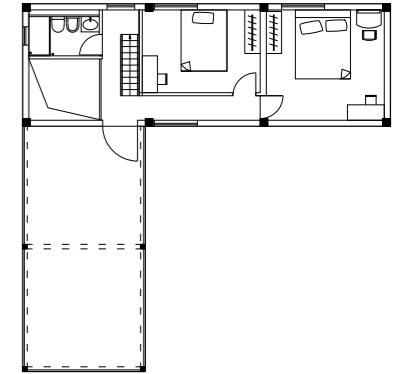


FIG8.02



The basic unit has a 'L' shape plan, with 2 floors, made up by two overlapped boxes which is 4 meters wide 12 meters long, the boxes are placed at the right angle, that the floted part of the upper box is supported by the columns which provide a piloti, and the roof of the lower box can be used as roof garden.

► Same amount of surface toward the sun

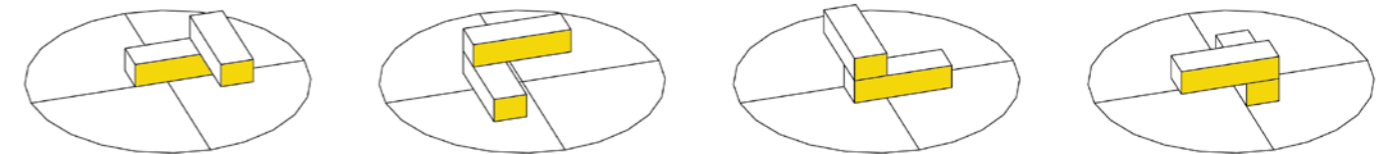


FIG8.03

The advantages of this unit is that it provide each family the cross ventilation, a side wall toward south, as well as the possibility of future expansion according to the growth of the family.

► The Generative potenciality

After having studied some projects about the expandable dwellings, in some case, the expensation result-ing in the loss of outdoor spaces, of direct access to all rooms, and a serious reduction of light and air in the surrounding rooms.
In our basic units, the expansion was in a fixed frame, which will provide alternative use of space without loss of quality of the living spaces.

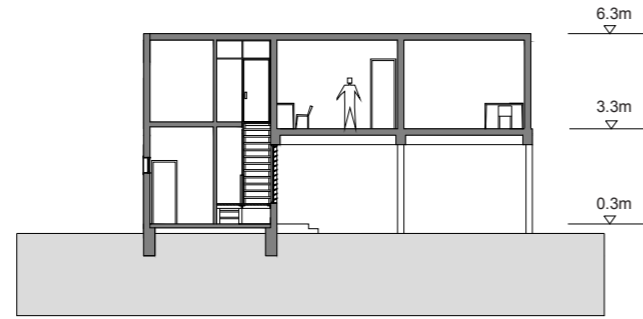
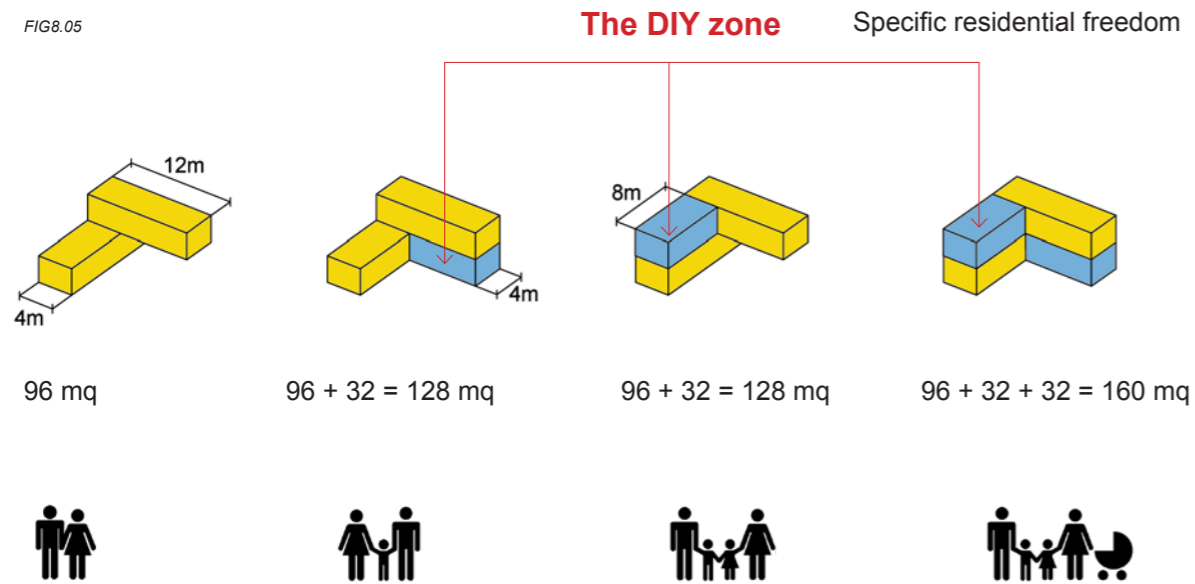


FIG8.04

FIG8.05



► Kitchen gardens

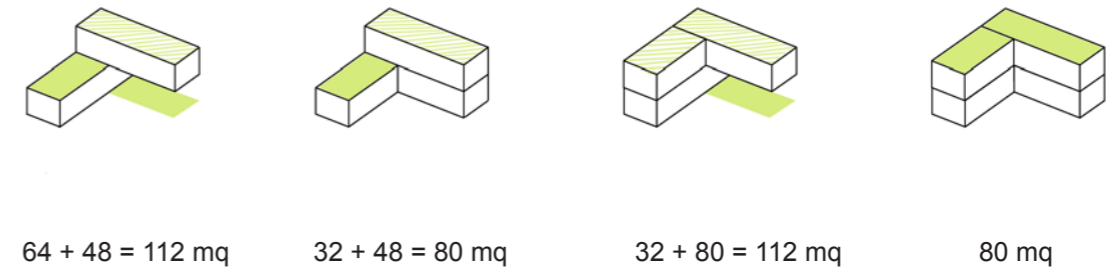
How big should the self sufficient garden be ?



A garden of 50-60mq will be able to support a Family of four in all of the basic Vegetables all year around.

<http://www.aselfsufficientlife.com/how-big-should-the-vegetable-garden-be.html>

FIG8.06



These are the possible planting area at home, the habitants could decide the exact area to be used for food production.
At the same time in their shared courtyard and the community allotments, they may apply for futher place to cultivate crops for family use or for sale.



FIG8.07

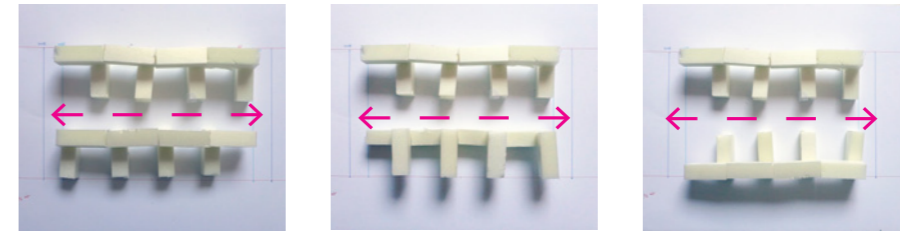
8.1 SEMI-DETACHED TYPOLOGY --- Family group scale

How should these basic units be arranged in the area ?

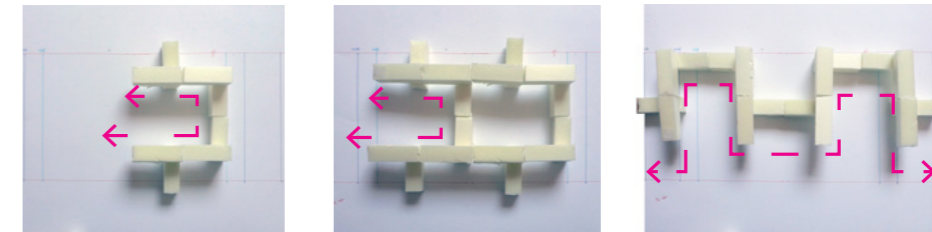
Each individual dwelling possesses the potential to develop, by means of configurative multiplication, into a group(sub-cluster) in which the identity of each dwelling is not only maintained but extended in a qualitative dimension that is specifically relevant to the particular multiplicative stage to which it belongs. Whilst the resulting group is, in turn fortified in the next multiplicative stage by a new identity which will again enrich that which precedes it.

Steps towards a configurative discipline
By Aldo Von Eyck

FIG8.08

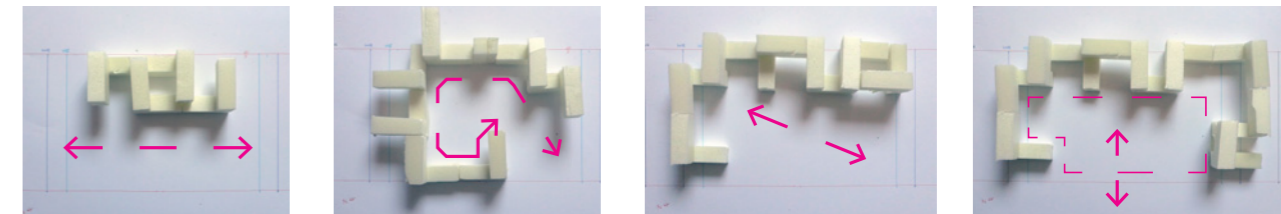


No-end expendable system,
lack of the sense of identity.



Infinite expensation in one direction,
the outdoor spaces are uniform.

Selected combinations



Different form of common space
Diverse movement and tension of the space.

How are the units combined together?

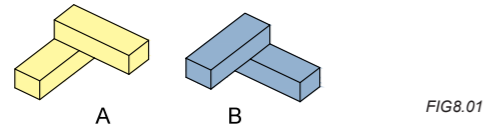
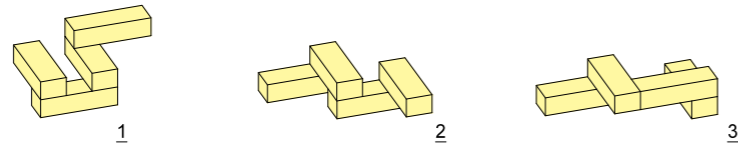


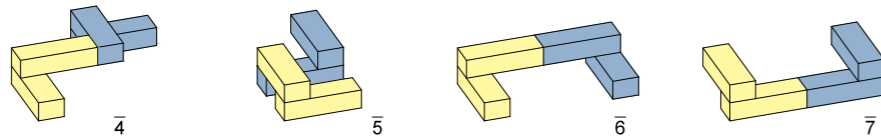
FIG8.01

We have two units, below are the basic combination of the these units. FIG8.10

A + A

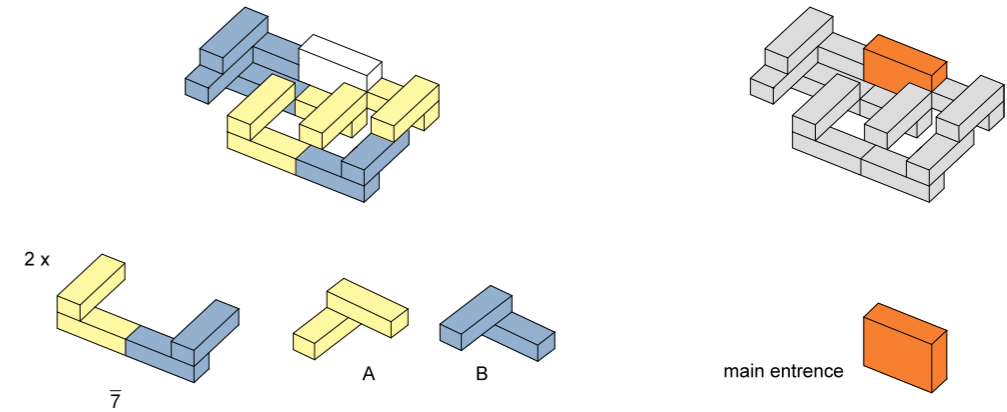


B + B

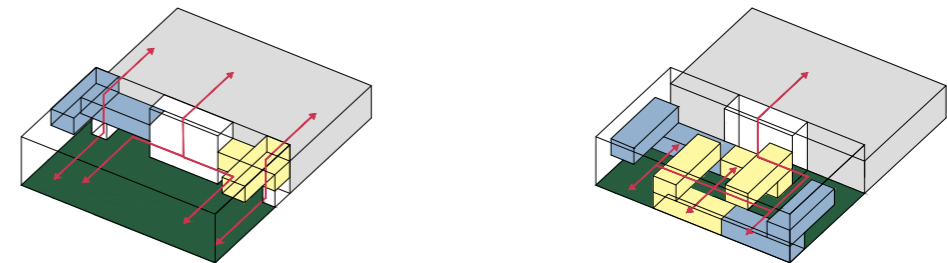


UNIT COMBINATION 1 FIG8.11

Group 1 has 8 families

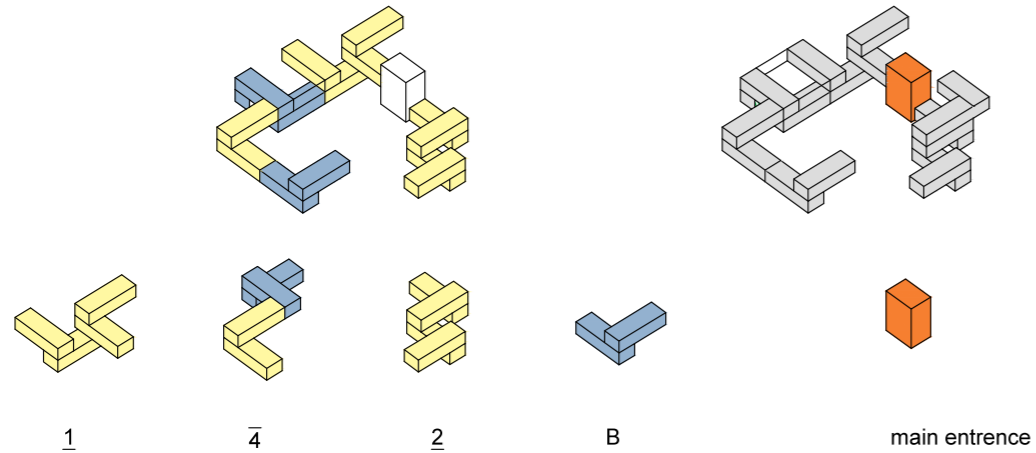


The path of each family from the upper ground to the sunk space.

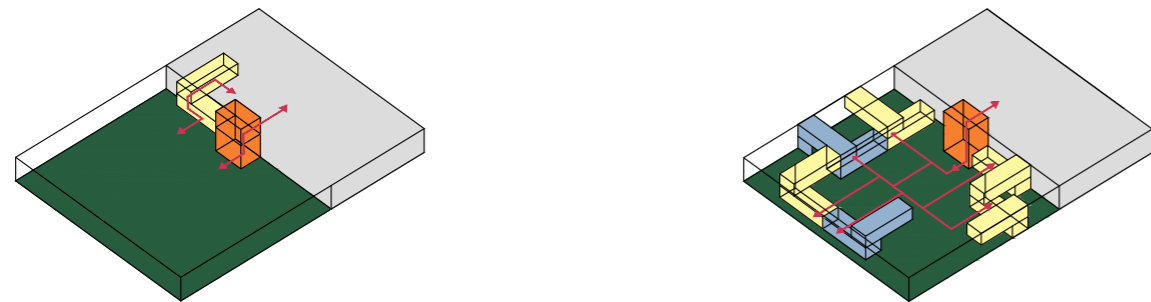


UNIT COMBINATION 2 FIG8.12

Group 2 has 7 families

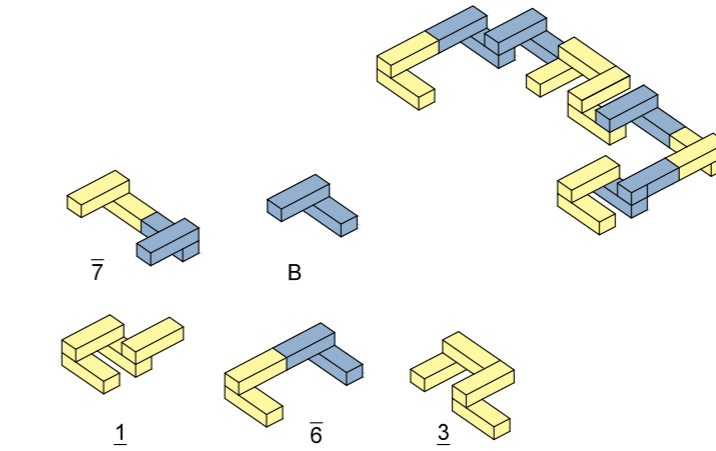


The path of each family from the upper ground to the sunk space.

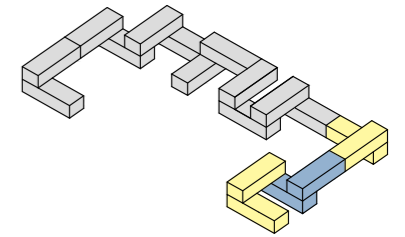


UNIT COMBINATION 3 FIG8.13

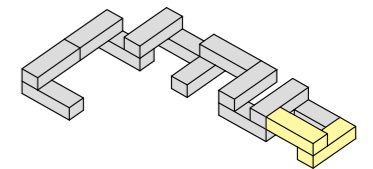
Group 3 has 9 families



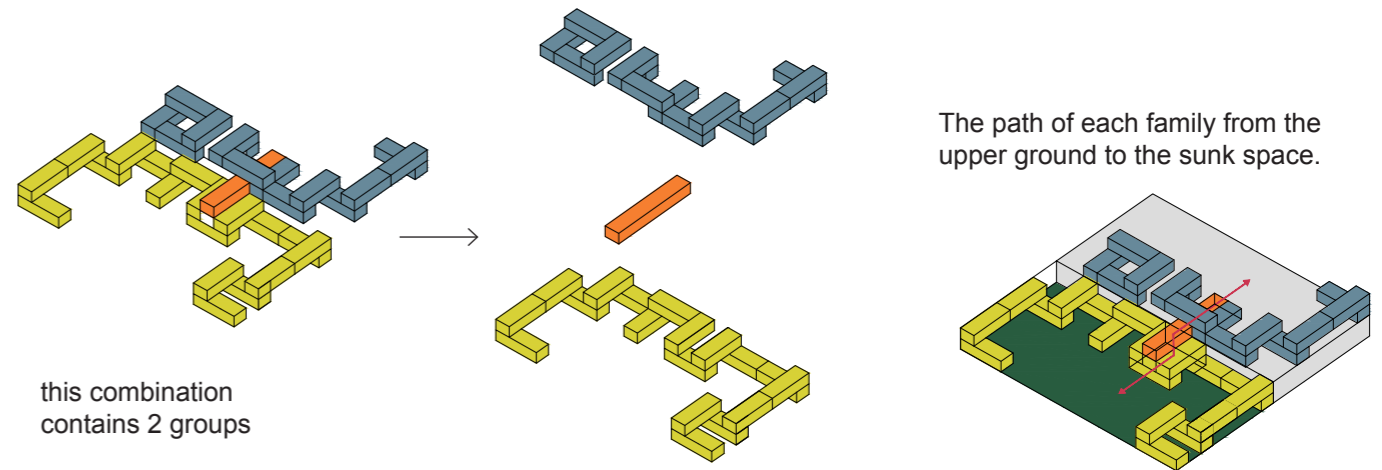
The original group



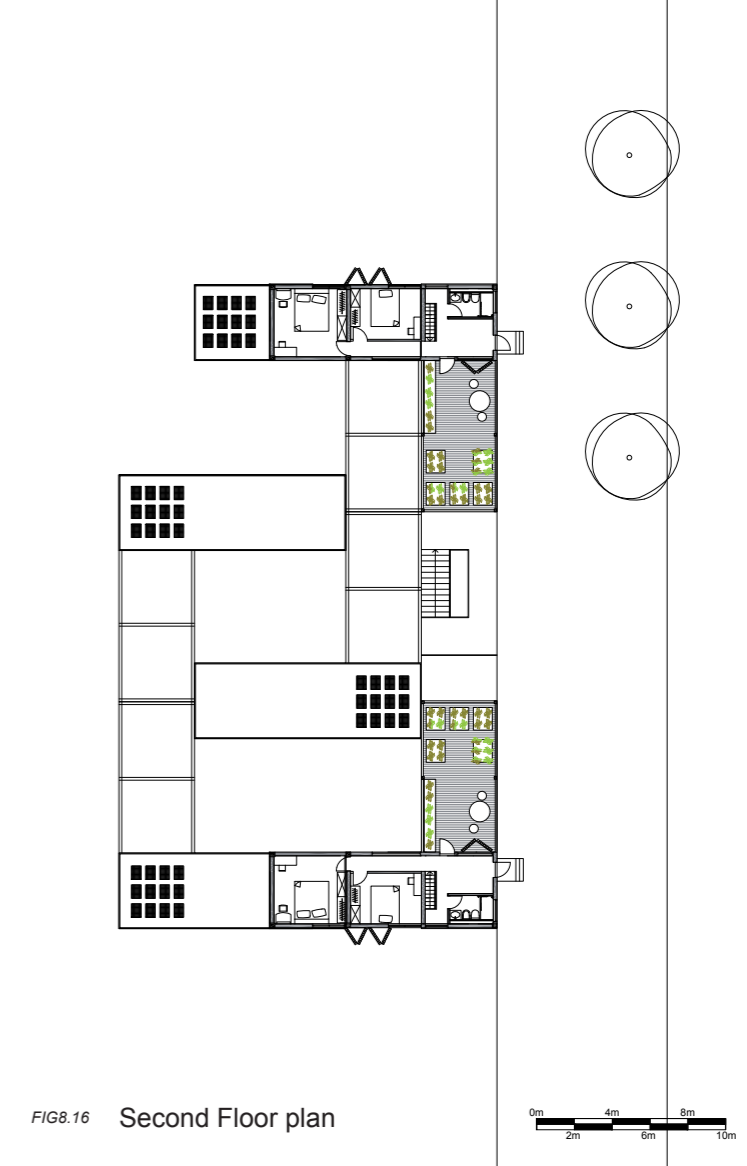
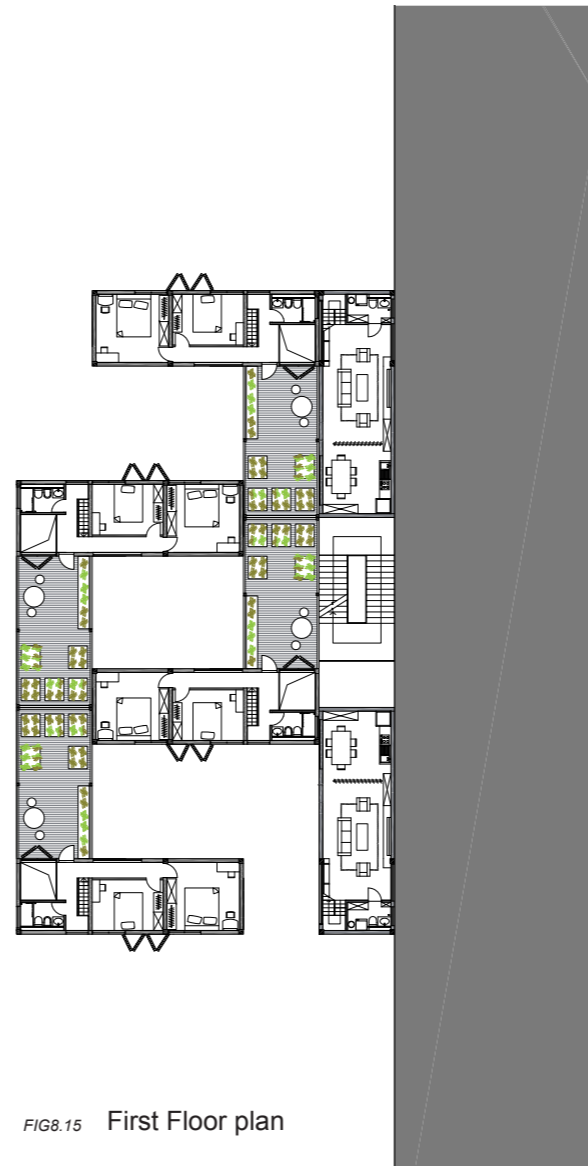
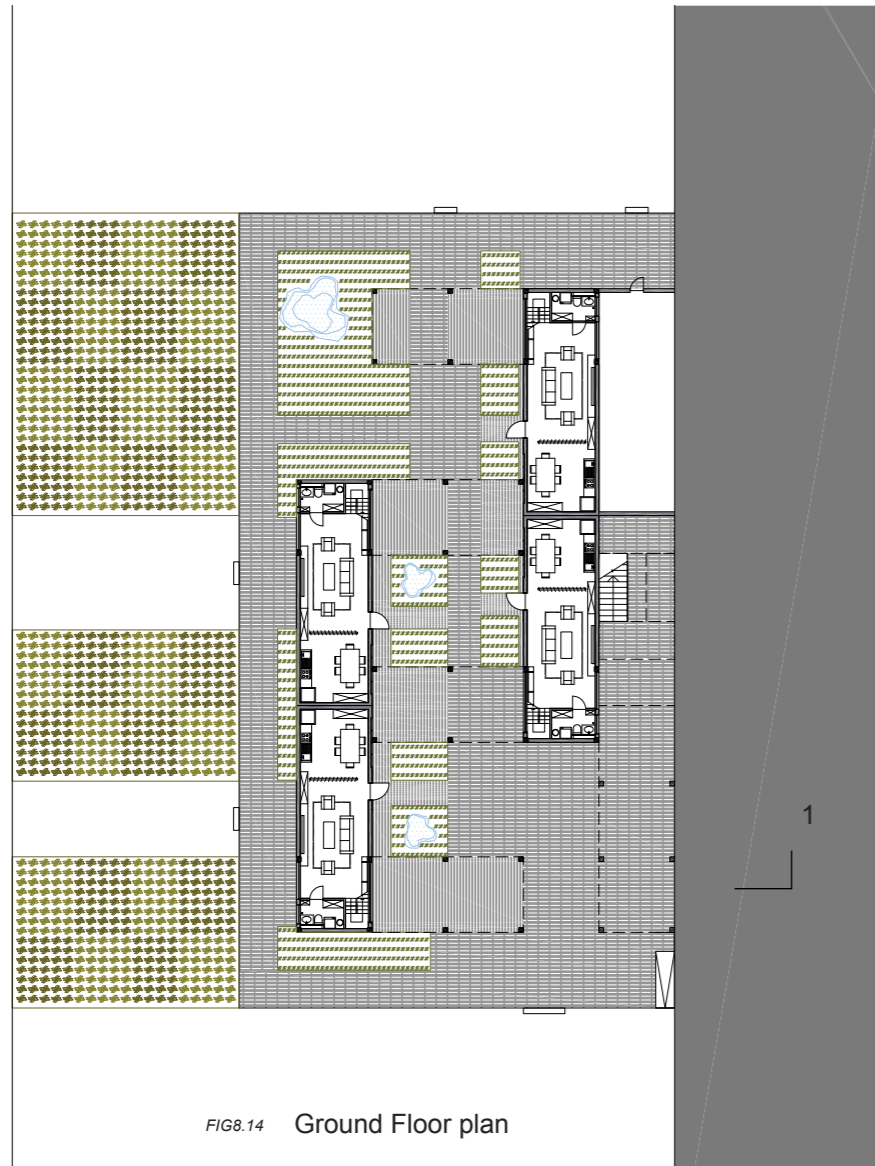
The homogeneous group which has 8 families



The path of each family from the upper ground to the sunk space.



PLANS OF GROUP 1



PLANS OF GROUP 2



FIG8.17 Groud floor plan

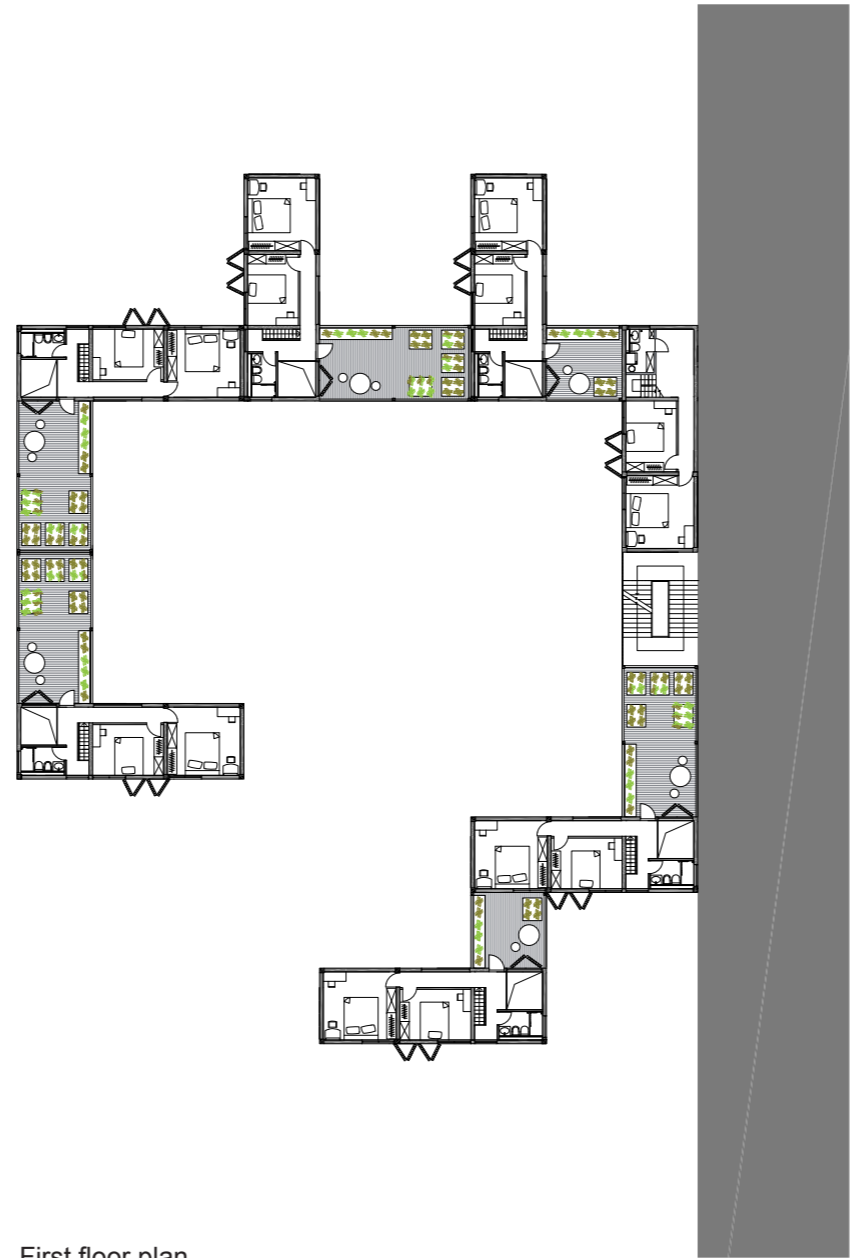


FIG8.18 First floor plan

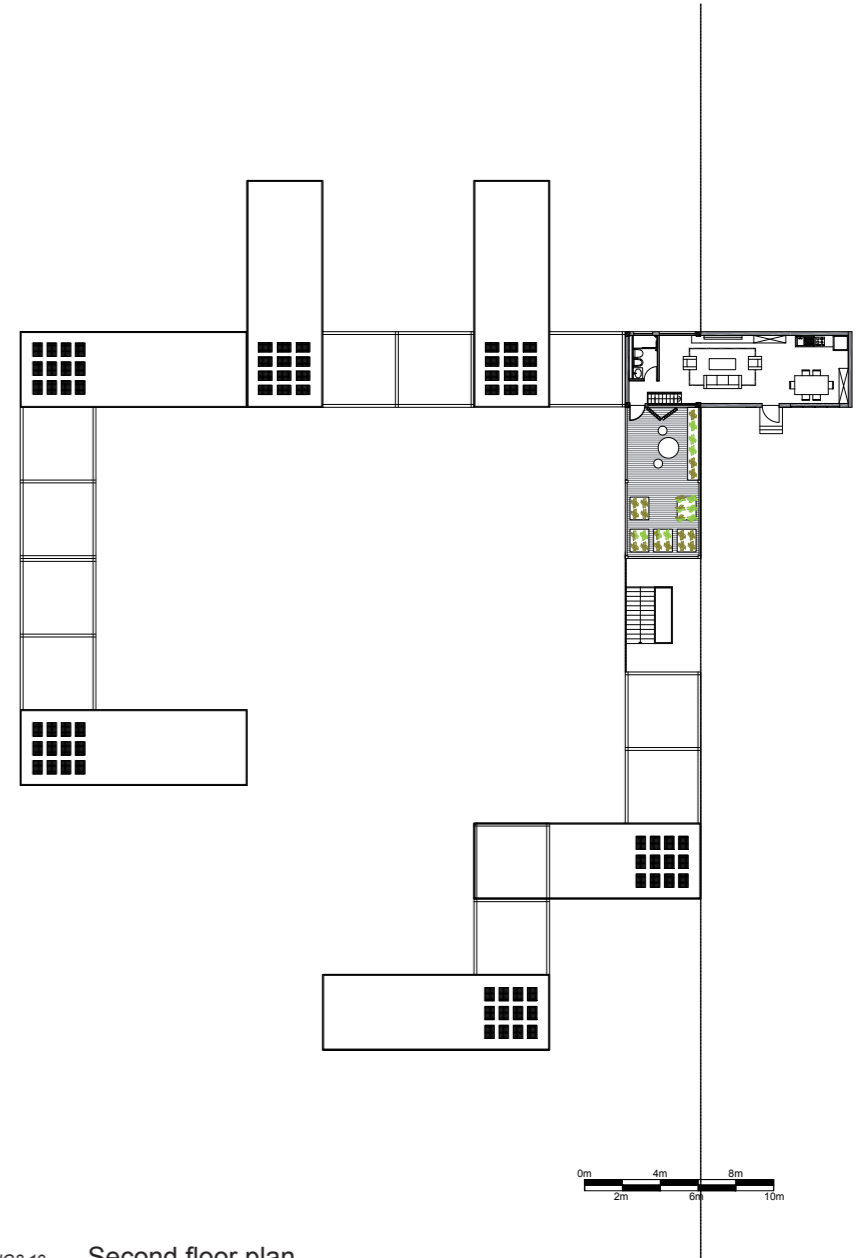


FIG8.19 Second floor plan

PLANS OF GROUP 3

3

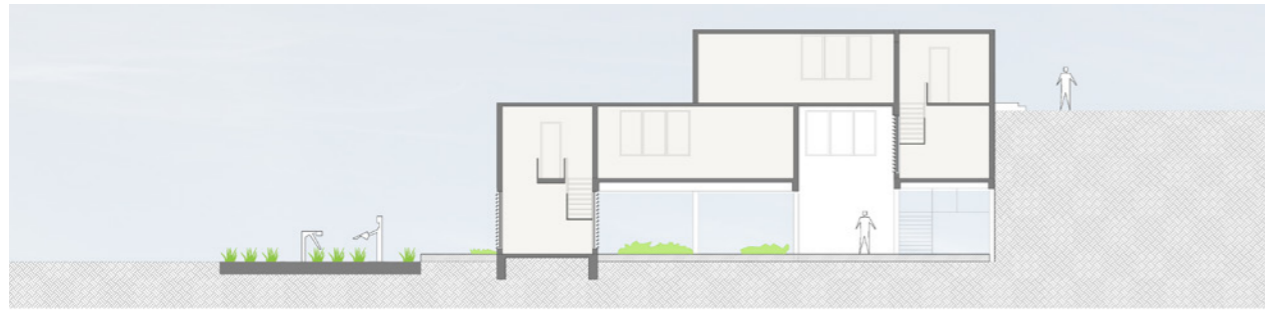


FIG8.20 Groud floor plan



FIG8.21 First floor plan

SECTIONS OF THE 3 GROUPS



Section 1-1 FIG8.22



Section 2-2 FIG8.23



Section 3-3 FIG8.24



VIEWS OF THE 3 GROUPS

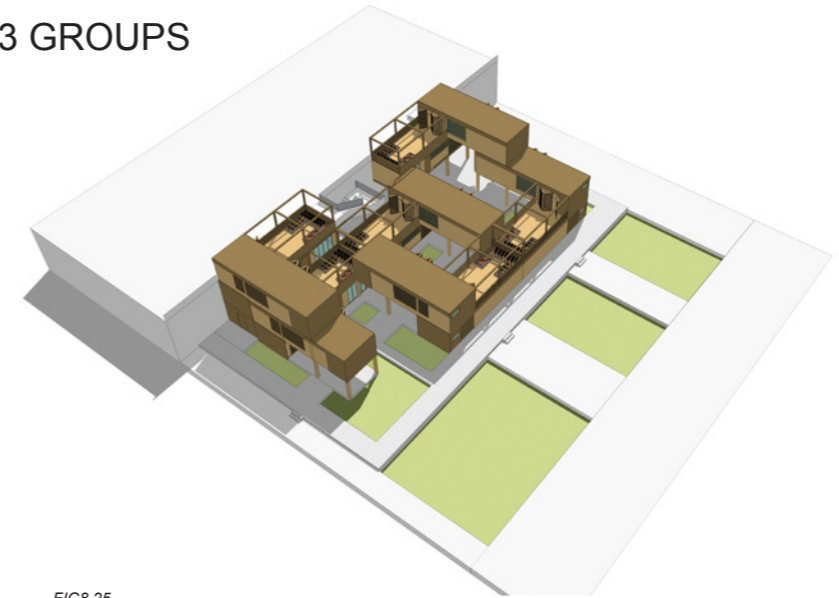


FIG8.25



FIG8.26

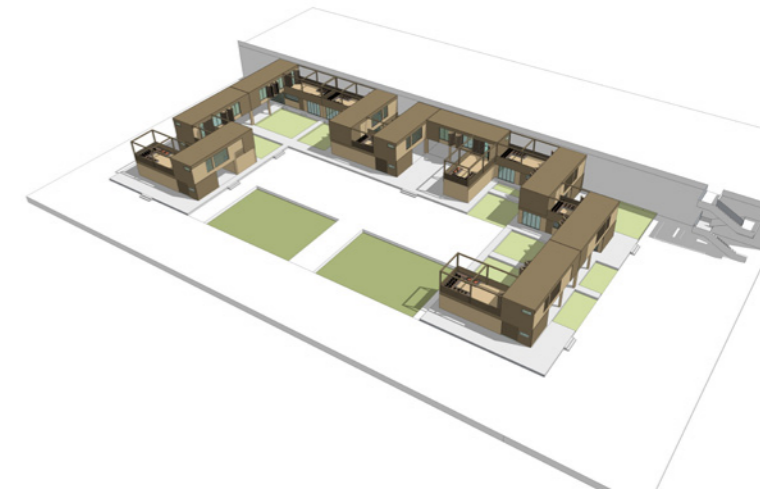
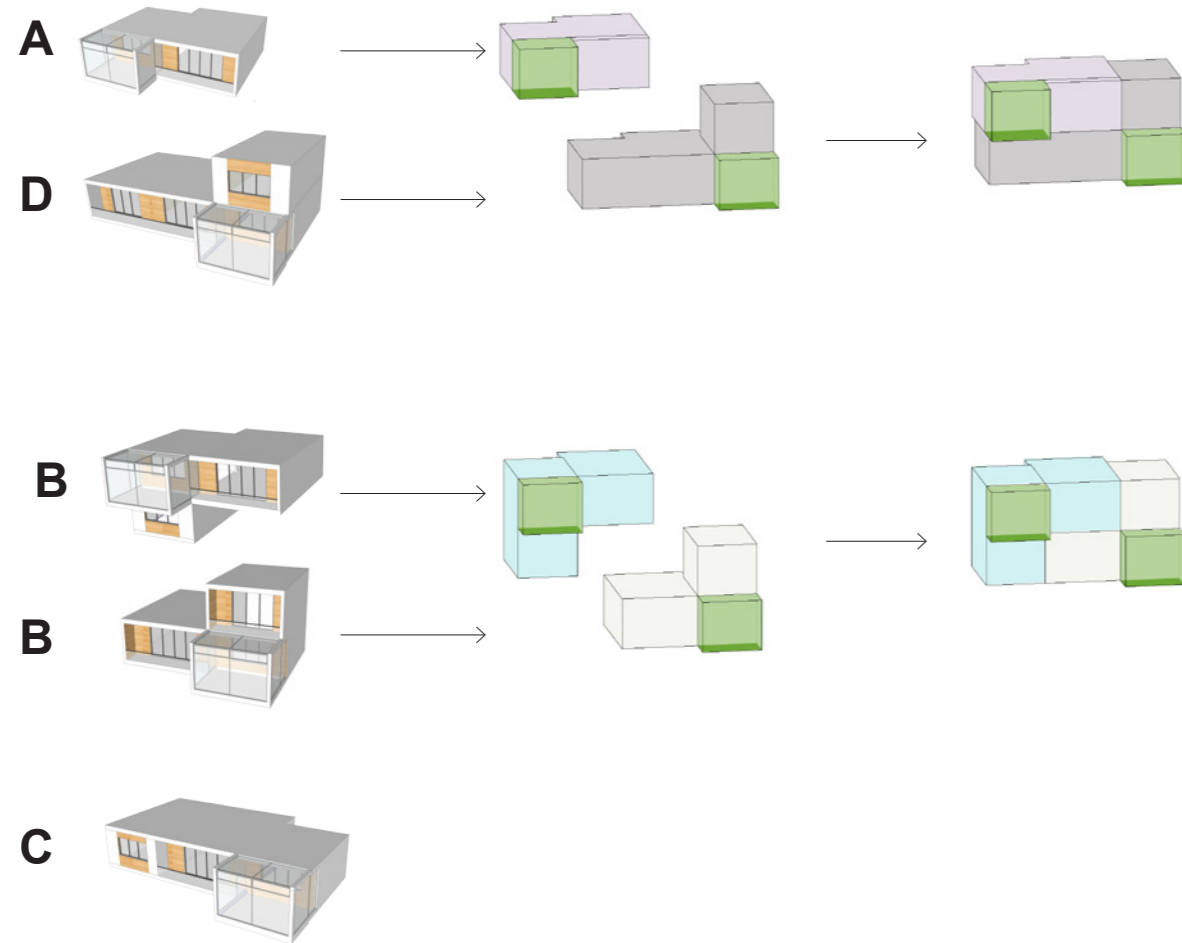


FIG8.27

8.2 HIGH-DENSITY TYPOLOGY --- Family group scale

The different typology of can be combined to a regular cubic shape which is easier to be add up as a whole residential building.

FIG8.28



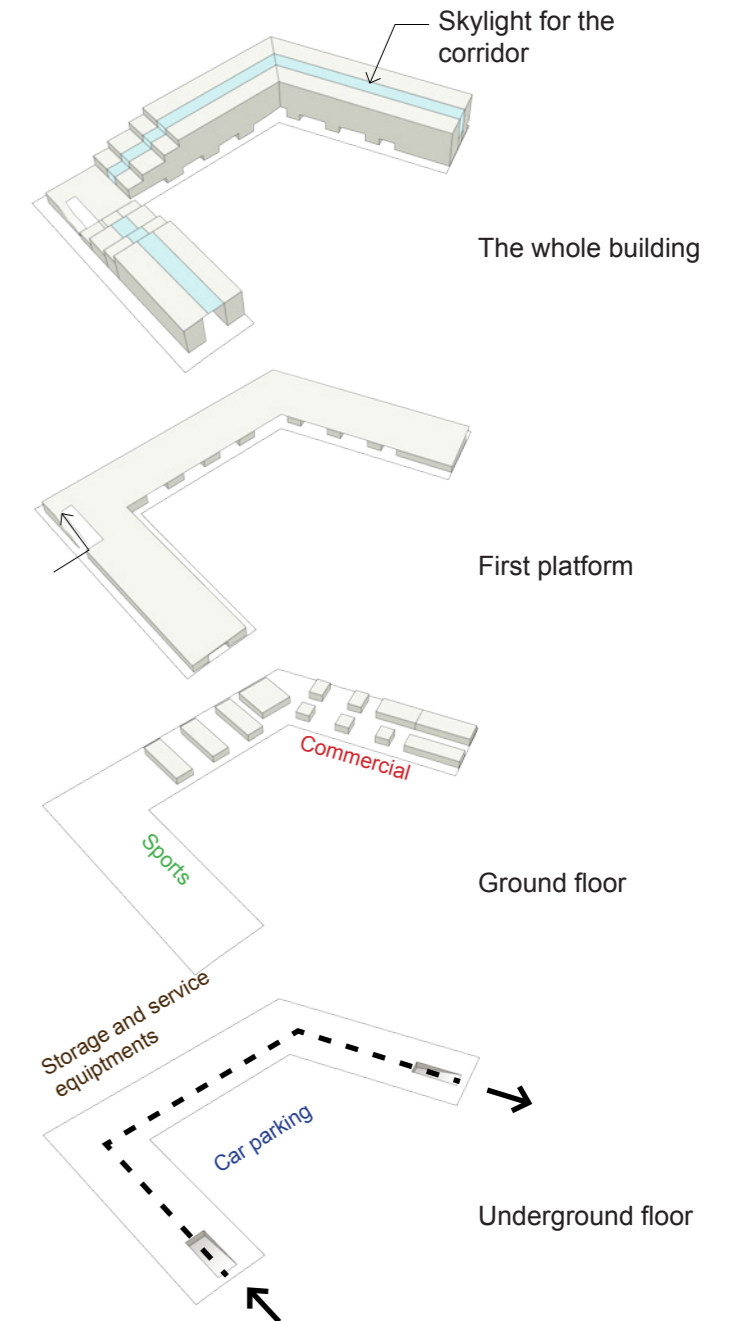
8.2 HIGH-DENSITY TYPOLOGY --- Community building

This typology has a higher density.

It is a terraced building which has a central corridor to connect apartments. An opened platform for each floor to have shared activities.

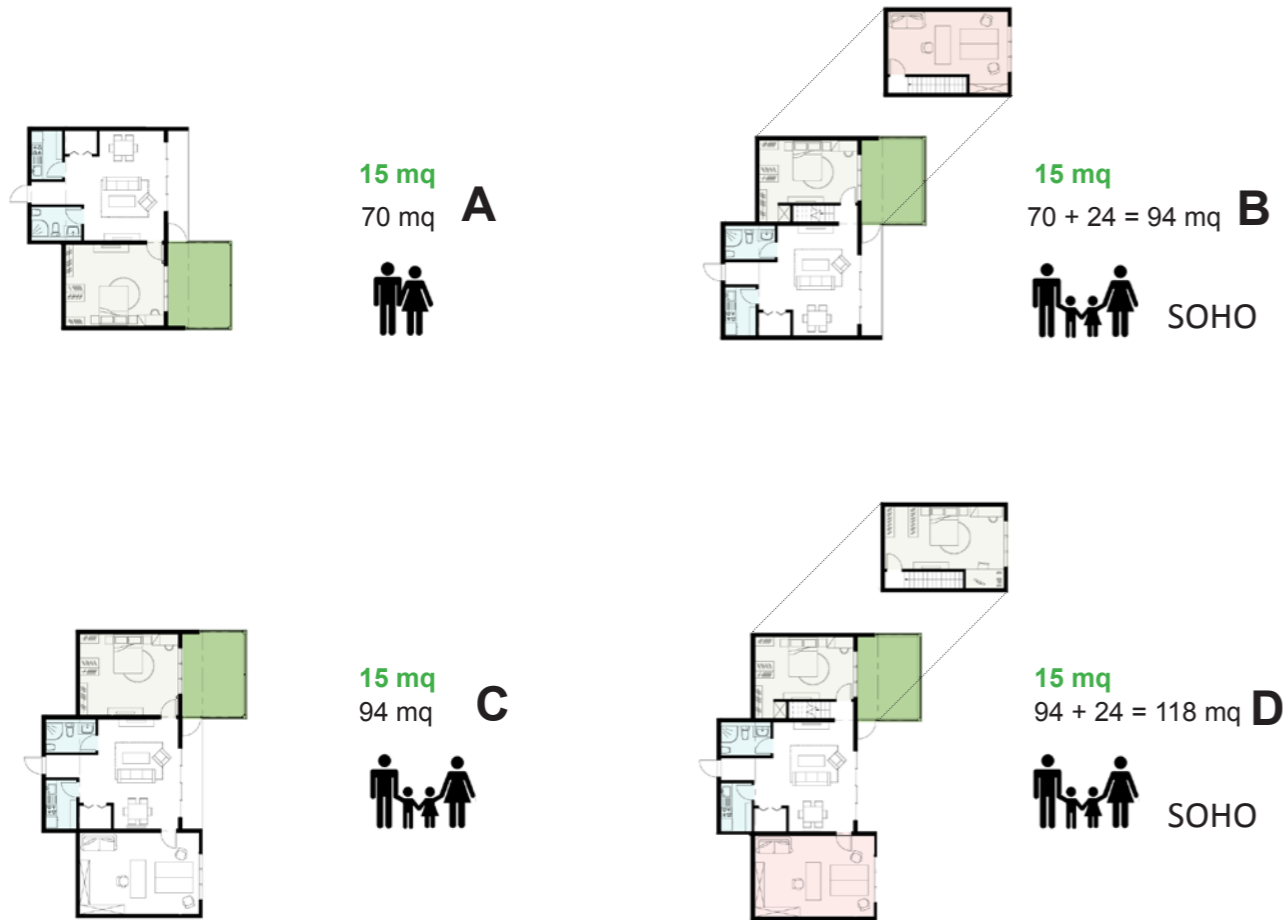
The building is rised up on the ground floor which provide penetrated movement and hold the commercial units.

FIG8.29



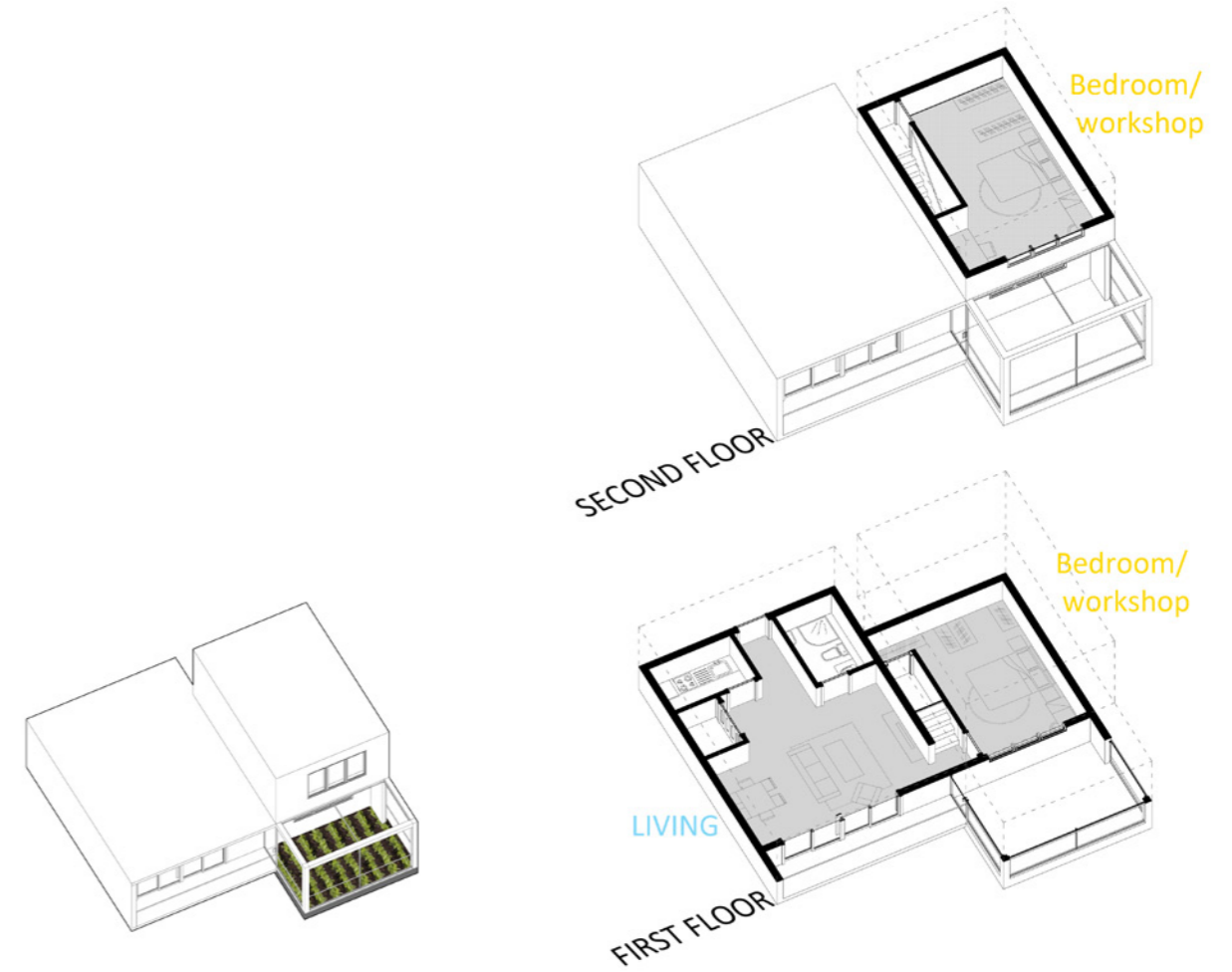
8.2 HIGH-DENSITY TYPOLOGY --- Single family scale

There are 4 layout of the apartments, all of them with sufficient living space plus a planting area that is 15 mq. *FIG8.30*



8.2 HIGH-DENSITY TYPOLOGY --- Single family scale

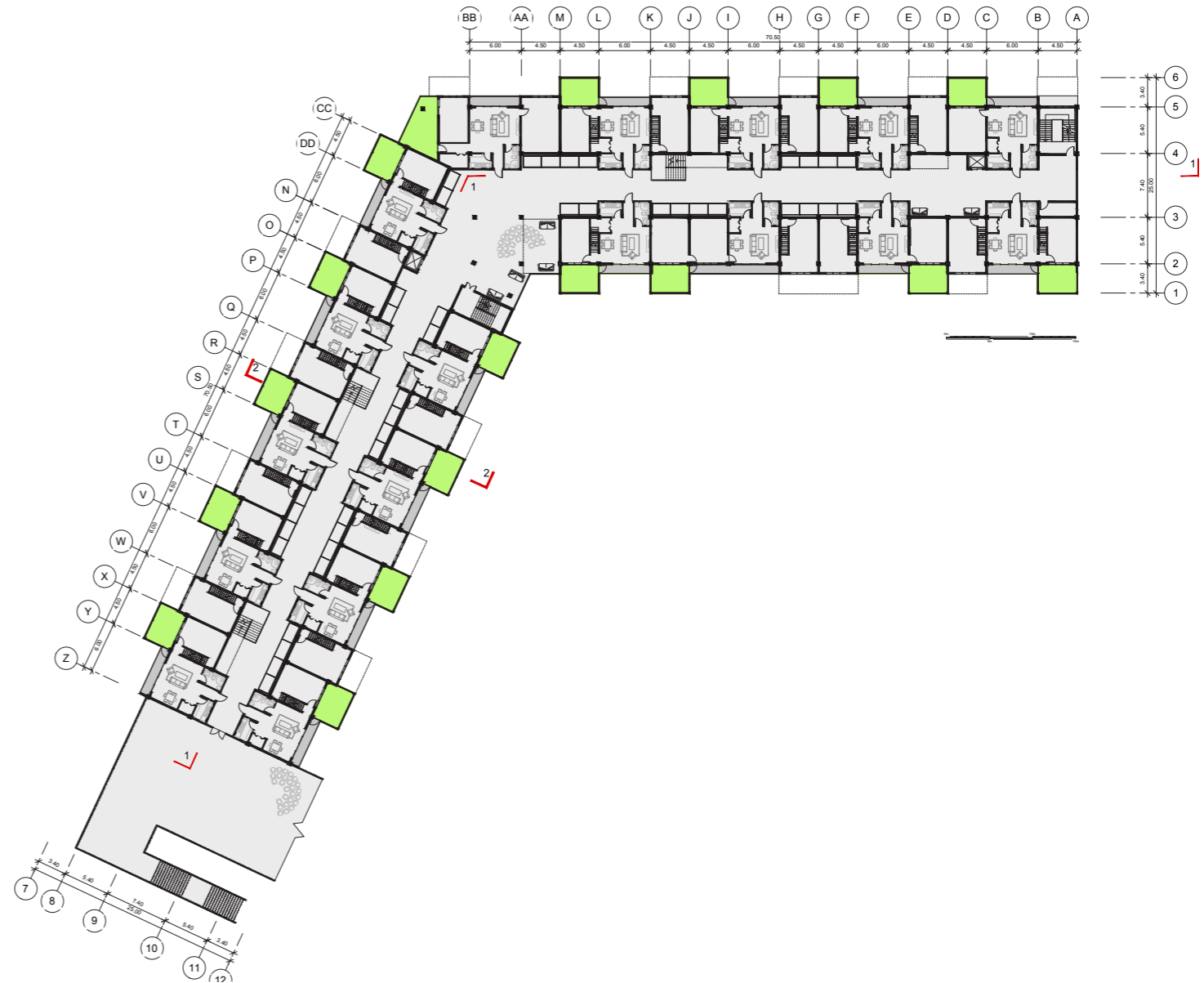
3D Explanation of the type 2 *FIG8.31*



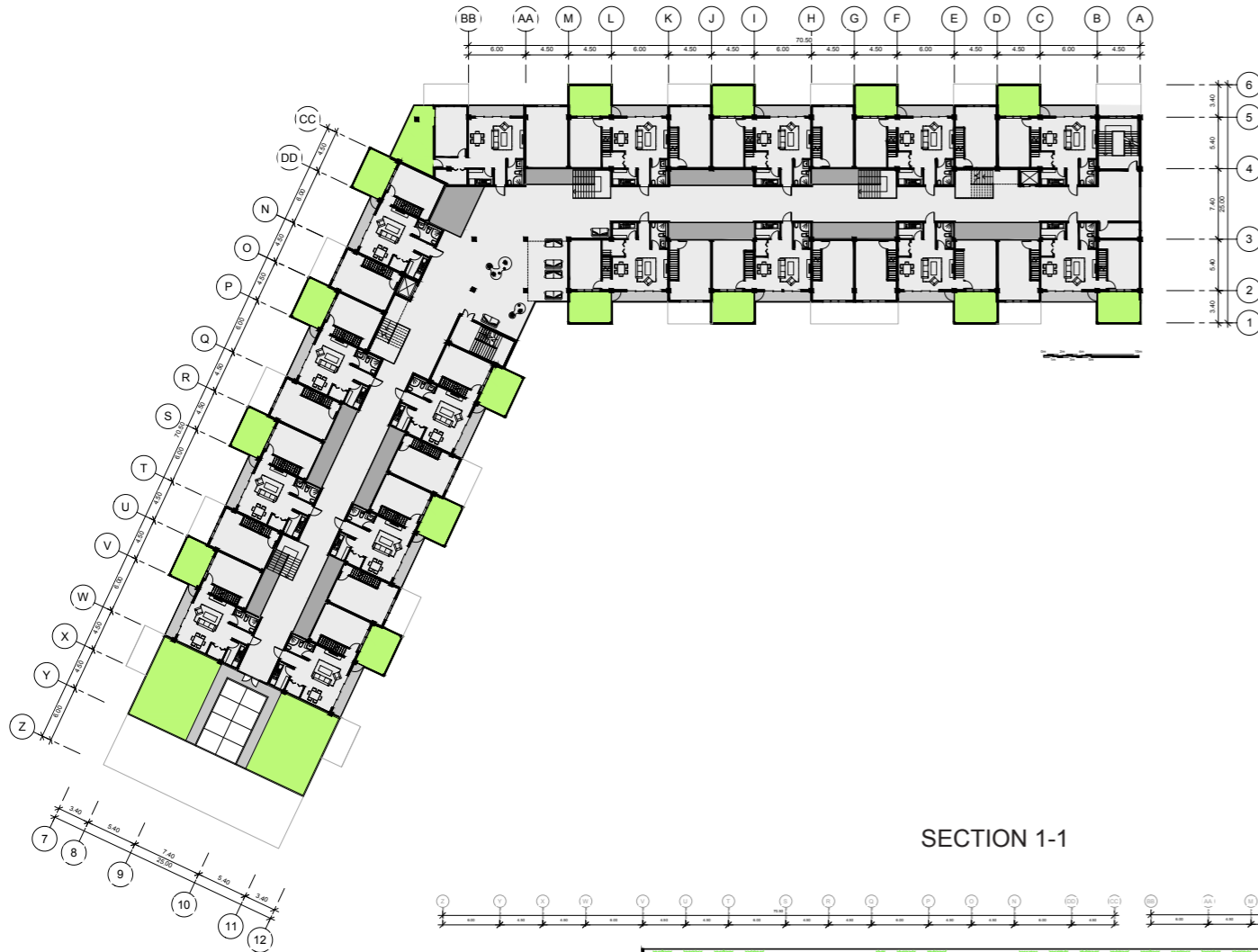
GROUND FLOOR PLAN



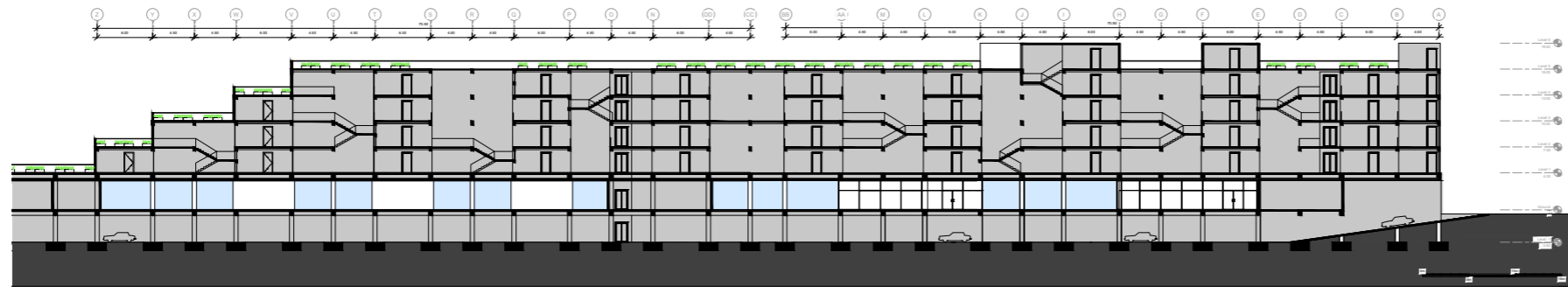
FIRST FLOOR PLAN



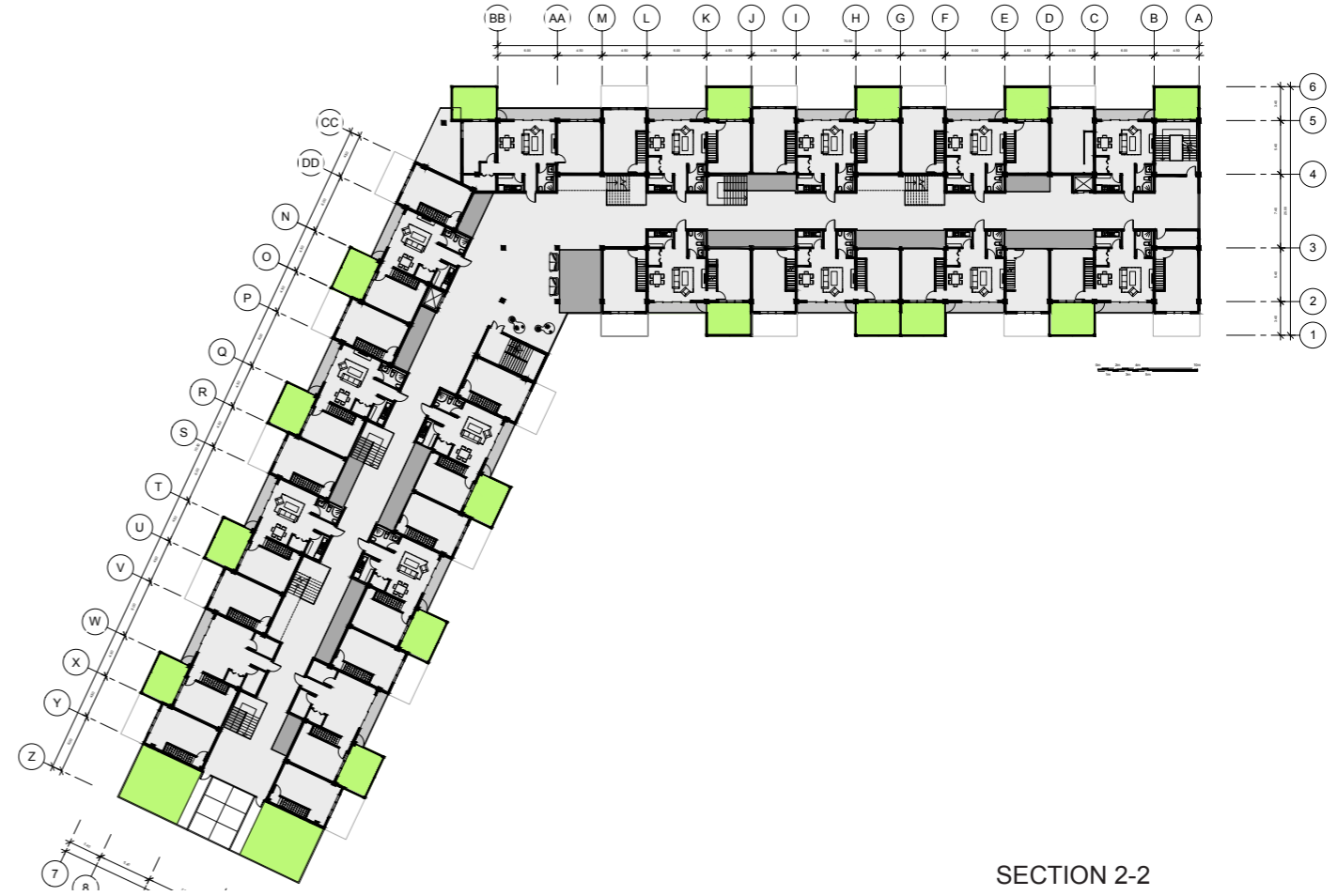
GROUND FLOOR PLAN



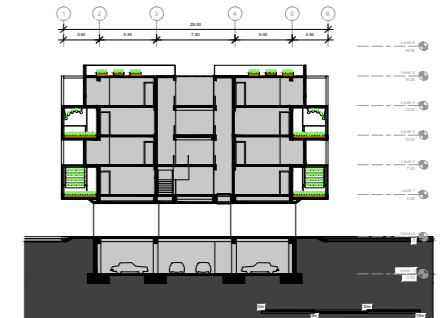
SECTION 1-1



THIRD FLOOR PLAN



SECTION 2-2



Bibliography

- REF.1 www.polito.it/turintogreen "Turintogreen | International Student Design Competition." Turintogreen RSS. N.p., n.d
- REF.2 Mougeot, Luc J. A. , Agropolis: The Social, Political and Environmental Dimensions of Urban Agriculture, London: Earthscan, 2005
- REF.3 www.fao.org/fileadmin/templates/wsfs/docs/expert_paper/How_to_Feed_the_World_in_2050.pdf "How to Feed the World in 2050", FAO
- REF.4 www.bafu.admin.ch/uw-1111-f "Environmental Impacts of Swiss Consumption and Production." Federal Office for the Environment FOEN, 2011
- REF.5 Viljoen, André, Katrin Bohn, and J. Howe. Continuous Productive Urban Landscapes: Designing Urban Agriculture for Sustainable Cities, Oxford: Architectural, 2005
- REF.6 www.eusem.com/main/CE/I_FoodWater
- REF.7 Geeti Silwal, AICP, LEED® AP, "urban wasteater: A Renewable, Reliable Water Resource for Urban Farming", Perkins+Will Research Journal, Volume 02.01, pages 67-75, 2012
- REF.8 Clare Brass, Flora Bowden, and Kate McGeevor. "Can an Urban Community Run Its Own Waste Services Independently?" Architectural Design, Special Issue: Scarcity: Architecture in an Age of Depleting Resources Volume 82, Issue 4, pages 62–65, July/August 2012
- REF.9 www.fiveboroughfarm.org/urban-agriculture
- REF.10 William McDonough, Green Roofs: Ecological Design And Construction, Schiffer Publishing, Limited, 2005
- REF.11 <http://libalab.com/building-integrated-agriculturW>, "Building Integrated Agriculture [BIA]. A qualitative comparative analysis of methods for commercial food production using buildings as an agricultural settlement", Lily Bakratsa
- REF.12 Dusty Gedge, John Little, Edmund C, Snodgrass. Small Green Roofs: Low-tech Options for Greener Living. Timber Press, 2011
- REF.13 Dunnett, Nigel, and Noel Kingsbury. Planting Green Roofs and Living Walls. Timber Press, Portland, Oregon, 2008
- REF.14 www.worldagroforestry.org/NurseryManuals/Research/Substrate.pdf , "Substrates", World Agroforestry Center
- REF.15 Jeffrey Winterborne, Hydroponics - indoor horticulture, Pukka Press, 2008
- REF.16 <http://sdhydroponics.com/resources/articles/gardening/how-to-grow-hydroponically-%E2%80%93-overview-of-grow-systems> "How to Grow Hydroponically – Overview of Grow Systems" ,Sunny Datko
- REF.17 www.foodparadox.com/?p=86, "Aquaponics System: more productive than conventional gardening & farming"
- REF.18 www.yankodesign.com/2012/11/19/herbed-windows/, "Herbed Windows", Hsu Hao-Po, Chang Yuhui, Chang Chun-Wei

- REF.19 www.karoo-dmdepot.be/practical/, "Karoo Practical", D&M depot NV/SA
- REF.20 www.giygardens.com/how-it-works.html, G.I.Y.Gardens
- REF.21 <http://agreenroof.com/vertical-urban-farms/mobile-edible-walls-mewu-vertical-farming/>, "Vertical Farms - Mobile Edible Wall Unit (MEWU)", Green living technologies, international llc
- REF.22 <http://home.howstuffworks.com/lawn-garden/professional-landscaping/alternative-methods/greenhouse2.htm>, "How Greenhouses Work ", Sara Elliott
- REF.23 <http://www.rooftopgreenhouse.co.uk>
- REF.24 <http://www.urbantactics.org/projects/rurban/rurban.html>, "R-URBAN - participative strategy for development, practices and networks of local resilience", Ateliter D'architecture Autogeree
- REF.25 <http://www.urbantactics.org/projects/passage%2056/passage56html.html???> "Le 56 / Eco-interstice" Ateliter D'architecture Autogeree
- REF.26 <http://www.earthtimes.org/business/first-us-greenhouse-heat-power-project-co2-fertilisation/2149/>, "First US greenhouse heat and power project with CO2 fertilisation", Linden Volsun
- REF.27 <http://www.brooklyngrangefarm.com/>
- REF.28 <http://leangreen.org/gallery/main.php>
- REF.29 Edmund C. Snodgrass, Linda McIntyre, The Green Roof Manual: A Professional Guide to Design, Installation, and Maintenance, London : Timber press, 2010
- REF.30 www.designboom.com/architecture/shipping-container-greenhouse-urban-farm-unit-by-damien-chiviale/?utm_campaign=daily, "shipping container greenhouse urban farm unit", Damien Chiviale
- REF.31 www.archdaily.com/47183, Edible Schoolyard", Cilento , Karen
- REF.32 <http://weberthompson.com/projects/319>. "ECO LABORATORY", Weber Thompson Architects
- REF.33 <http://www.comune.torino.it/geoportale/pums/cms/> "PUMS-Piano urbano della mobilita sostenibile, Citta di Torino", divisione infrastrutture e mobilita
- REF.34 http://images.torino-internazionale.org/ff/Eventi/al/allamano_web.pdf "CORSO ALLAMANO - una lettura del territorio tra sguardi sul presente e prospettive per il futuro"
- REF.35 http://www.provincia.torino.gov.it/speciali/corso_marche/ "Corridoio di corso Marche"
- REF.36 http://webdata.urbancenter.to.it/UCM/accompagnamento/links/piazzamirafiori/2011.III_MF.Masterplan_Acc.Progr..pdf "Quadrante Sud-Ovest dell'area metropolitana torinese. Masterplan." ,Urban Center Metropolitan Torino, 2011
- REF.37 www.caat.it/
- REF.38 www.vicini.to.it/vicini/2013/01/farmers-market-e-la-spesa-a-km-0/
- REF.39 www.cascinaroccafranca.it

REF.40 <http://miraorti.com/>

REF.41 www.urbancenter.to.it

REF.42 www.e-agriculture.org/content/mobile-application-development-precision-farming-indian-context

REF.43 www.foodtechconnect.com/2011/11/29/tracking-and-incentivizing-data-the-whole-chain-traceability-consortium/, "Tracking & Incentivizing Data Sharing: The Whole Chain Traceability Consortium", beth hoffman,2011

REF.44 Saurabh Suman, Vishal R More, Romy Sinha (2012) , "Mobile application development for precision farming", World Journal of Science and Technology, Vol 2, No 10

REF.45 "Minerva: An Electronic Town Hall," Policy Sciences, Vol. 3, No. 4 (December 1972), pp.457-474.

REF.46 www.sheep101.info/201/housing.html, "Housing for sheep"

REF.47 www.urbanfarmonline.com/

REF.48 issuu.com/fernandocobelo/docs/thesis_caracas2020, "CARACAS2020: The growing city - a project about agro-housing & urban farming", Fernando Menendez Cobelo

REF.49 Jacqueline Hoyer, Wolfgang Dickhaut , Lukas Kronawittera and Björn Weber, Water Sensitive Urban Design: Principles and Inspiration for Sustainable Stormwater Management in the City of the Future,Jovis 2011

REF.50 www.docksidegreen.com, Dockside Green Annual Sustainability Report 2009

REF.51 [www.docksidegreen.com/Portals/0/LiveContent/544/Flash/zenon-Anim-Changes-08-F7%20\(1\).swf](http://www.docksidegreen.com/Portals/0/LiveContent/544/Flash/zenon-Anim-Changes-08-F7%20(1).swf) , ZeeWees MAR Water Reuse Process, GE water & Process Technologies ZENON Membrane Solutions

REF.52 Alto van Eyck, (1962). 'Steps Toward a Configurative Discipline', in Forum (Netherlands), no 3, pp81- 94

REF.53 <http://isites.harvard.edu/fs/docs/icb.topic892112.files/Previ/AD.pdf>, PREVI/LIMA. Low cost housing project, Alto von Eyck

REF.54 www.generativeart.com/on/cic/papers2005/30.MahnazShah.htm"The Modular: An Analysis into Generative Architecture", Mahnaz Shah

REF.55 Alison Margaret Smithson, "Cluster City, a New Shape for Community', in The Architectural Review, November, pp393-396.

REF.56 www.architectural-review.com/home/the-big-rethink/the-big-rethink-conclusion/8648437.article, "The big rethink concludes nrighbourhood as the expansion of the home", Peter Buchanan, The Architecture Review, 2013

REF.57 Alison G. Kwok and Walter T. Grondzik, Green studio handbook : environmental strategies for schematic design,2. ed. , Burlington : Architectural Press, 2011

REF.58 Christian Schittich (Ed.) with essays contributed by Andrea Wiegelmann,In detail : Semi-detached and terraced houses ,München : Detail ; Basel : Birkhäuser, 2006

REF.59 Christian Schittich (ed.), In detail : *High-density housing : concepts, planning, construction, München : Detail-Institutfür internationale Architektur Dokumentation ; Basel : Birkhäuser, c2004

Thanks

We would like to thank Professor Laura Daglio for her visionary guide, Oscar Eugenio Bellini for his constructive suggestions. Also, we would like to thank Politecnico Di Milano for providing us with great study resources during two years' master courses. Finally, we would like to show most gratitude to our parents, who have supported us for studying all these years. / Jia Wang & Yiming Yin 2013