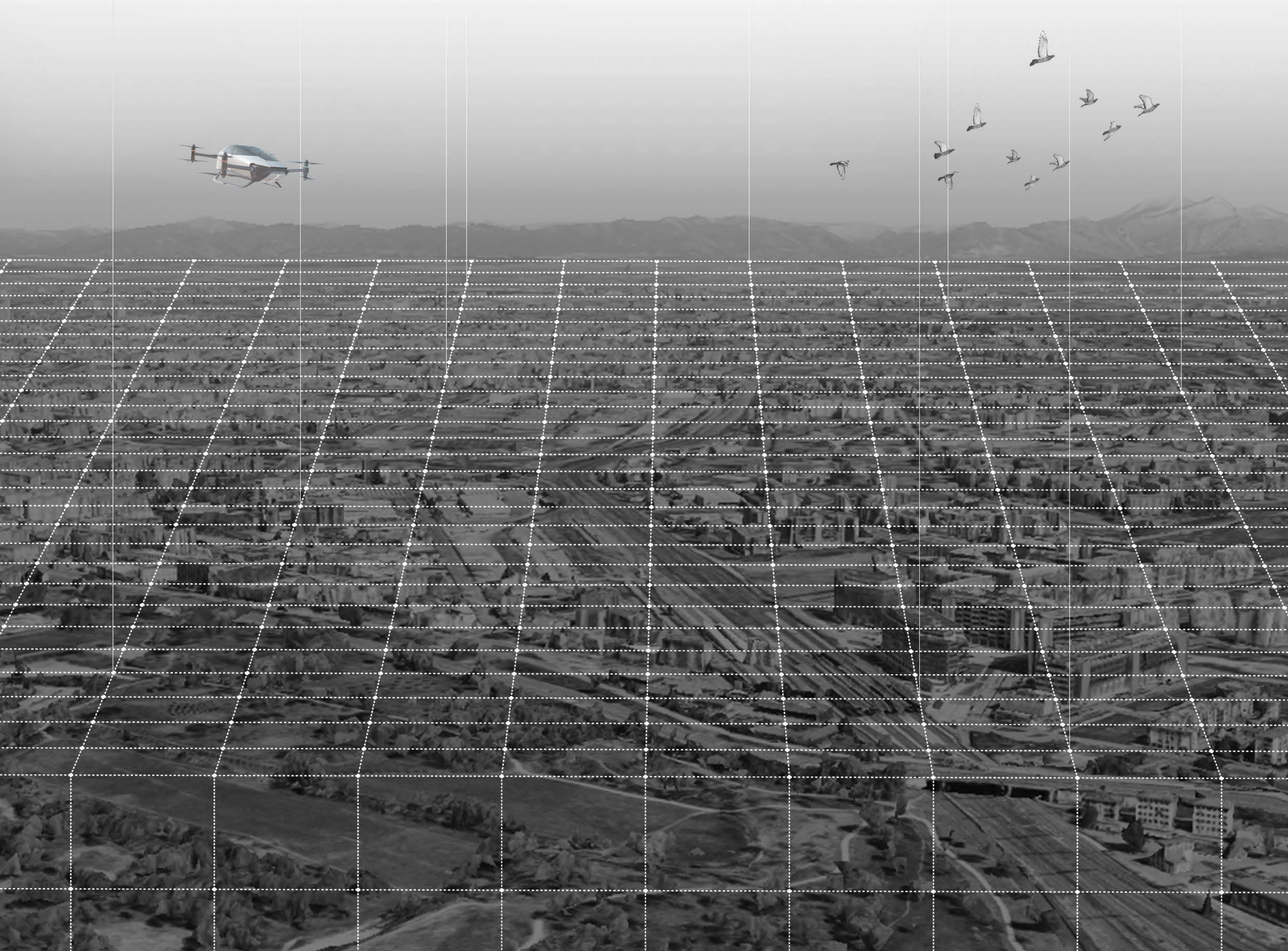
Zero-carbon Community

Residential & Co-working Design of the Reconstruction Project of Abandoned Train Station in Rogoredo



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ABSTRACT

Today's society is facing the challenges of major events such as global warming, energy crisis, Covid-19 epidemic and immigration waves. People's lifestyles are gradually changing as a result —— low-carbon life, home office and green travel are increasingly favored by people. How to create a new type of living and office space to meet people's new pursuits and improve the environment will become the focus of this project.

As the "cellular unit" of the city, the community is the main place where people work and live, and it is also an important source of carbon emissions for residents. The concept of "zero-carbon community" aims to minimize greenhouse gas emissions by developing a low-carbon economy, innovating sustainable technologies, and changing lifestyles within the community. In addition, co-working is gaining popularity as a new office community model that saves costs and provides convenience through the use of common infrastructure. The combination of "zero carbon community" and "co-working" will become a new trend in the future.

In response to the planning blueprint of Milan 2030, this project selected an abandoned railyard near Rogoredo Station in Milan as the site to create a zero-carbon community, which will provide social housing as well as co-working spaces for various families. In the project, green buildings, renewable energy utilization, rainwater collection and utilization, and green transportation will be the key design directions. Finally, it is hoped that the community will provide a possible prototype for future sustainable urban development.

Keyword:

Zero-carbon; Sustainable; Social housing; Co-working; Green travel.

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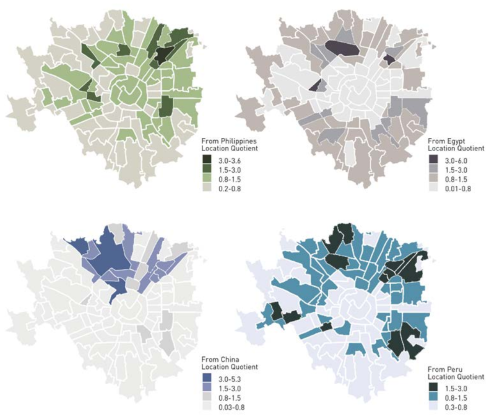

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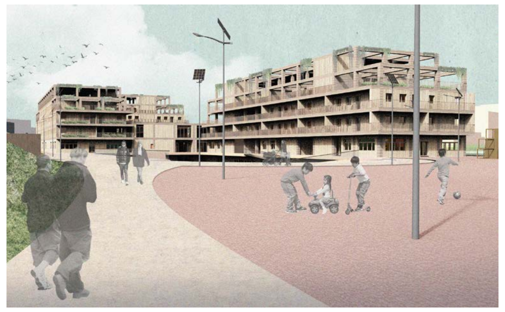

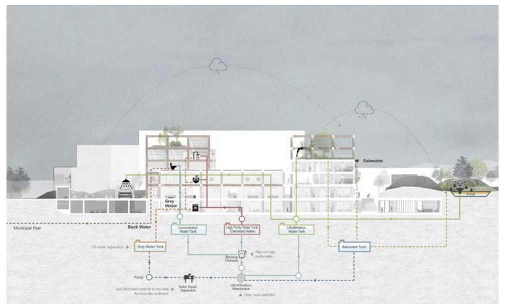

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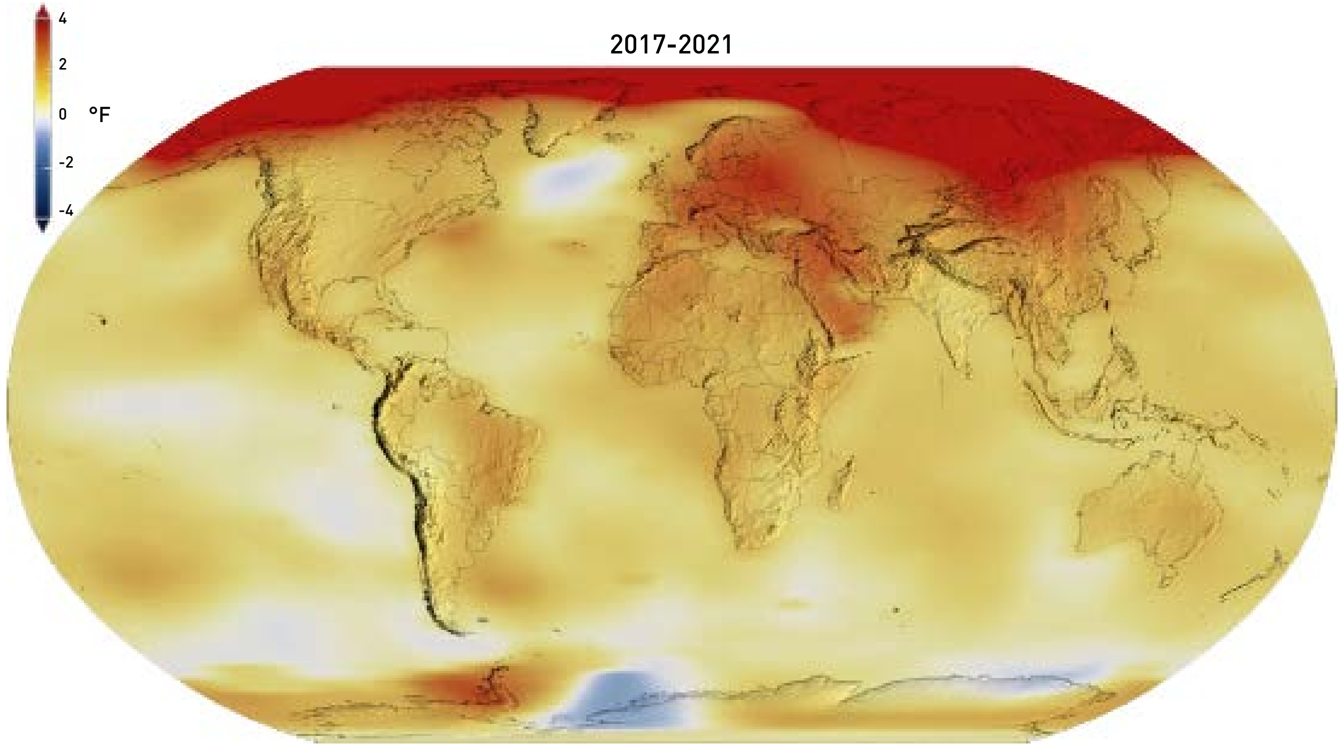
01 Background

Global Warming

Global warming is the long-term heating of Earth's surface observed since the pre-industrial period due to human activities, primarily fossil fuel burning, which increases heat-trapping greenhouse gas (GHG) levels in Earth's atmosphere.



Global surface temperature anomalies for 2021

Addiction to Fossil-Based Resources and Non-Renewable Materials

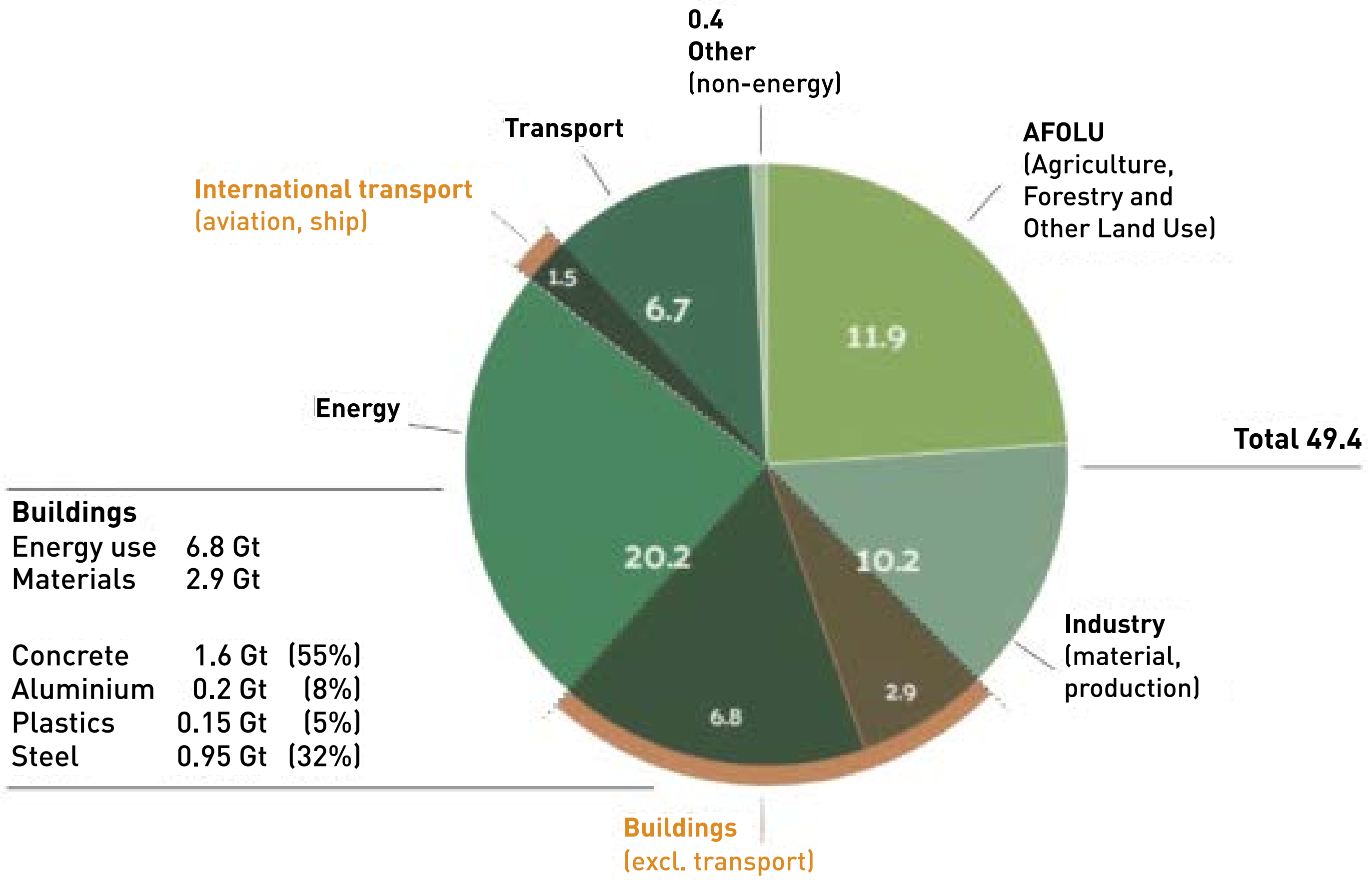
The growing human population in combination with an increase in consumption per capita has led to an enormous growth in demand for materials that are mostly abiotic, and energy sources that are mostly fossil-based. This trend is not expected to change: projections by the UN show an increase of the global population from 7 to 10 billion by 2050. This is further accelerated by increasing consumption per capita as a result of increasing wealth, which means we can expect a two- to three-fold increase in global resource demand by 2050.

This unsustainable overconsumption causes several interrelated global environmental problems, such as depletion of resources, deterioration of ecosystems and human health through global warming, toxic pollution, acidification, eutrophication, etc. For humankind the most prominent and urgent of these problems are global warming and resource depletion. The built environment has a huge impact on both.

The Impact of Rising CO_2 Emissions

Climate change is increasingly acknowledged as a threat to the environment and human society. Binding agreements have been made during COP 21 in Paris to try to prevent a temperature rise of 1.5 °C as a result of global warming, which means that GHG emissions need to be reduced to zero by around 2050. Global GHG emissions have increased by almost 50% since 1990, even though on a regional level considerable improvements have been made. For example, the EU has accomplished a 22% reduction in 2017 compared to the 1990 level.

There is scientific consensus that GHG emissions are directly linked to temperature rise. In 2020, the GHG emissions scenario seems to mostly align with the RCP4.5 scenario of the Intergovernmental Panel on Climate Change (IPCC), which forecasts a temperature raise of 1.7 to 3.2 °C by 2100.



Global GHG emissions (billion tons of CO2 eq per year)

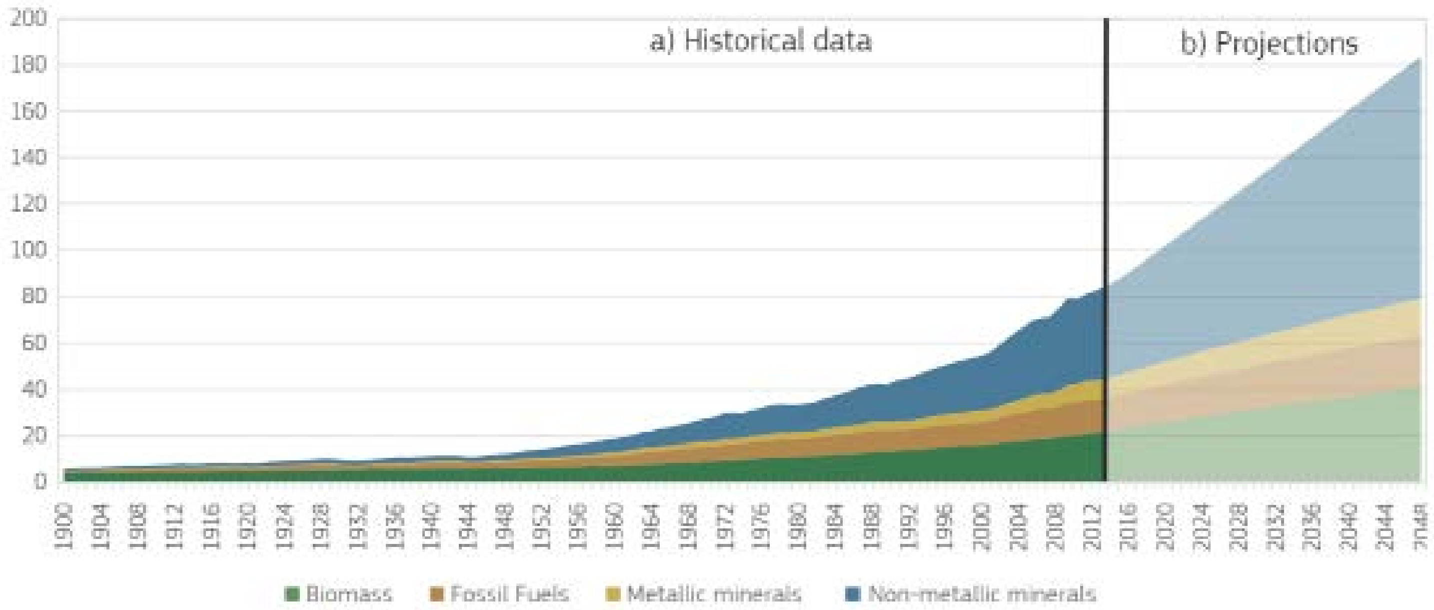
The building sector has a large influence on global man-made GHG emissions through operational energy use (6.8 Gt CO_2 eq, or around 18%) and through embodied CO_2 emissions for the manufacture of building materials, in particular abiotic materials (2.9 Gt, or around 8%, which is expected to grow to 5.3 Gt CO_2 eq/year in 2050).

Background

Resource Depletion

At the beginning of this millennium the sustainability debate was mainly focused on the required transition to renewable energy because of the depletion of fossil fuel reserves. Since 2010 the debate has shifted towards materials availability as the other main environmental problem affecting humankind.

Global material extraction 1900 - 2050 (billion tons)



The Built Environment: A Major Resource Consumer

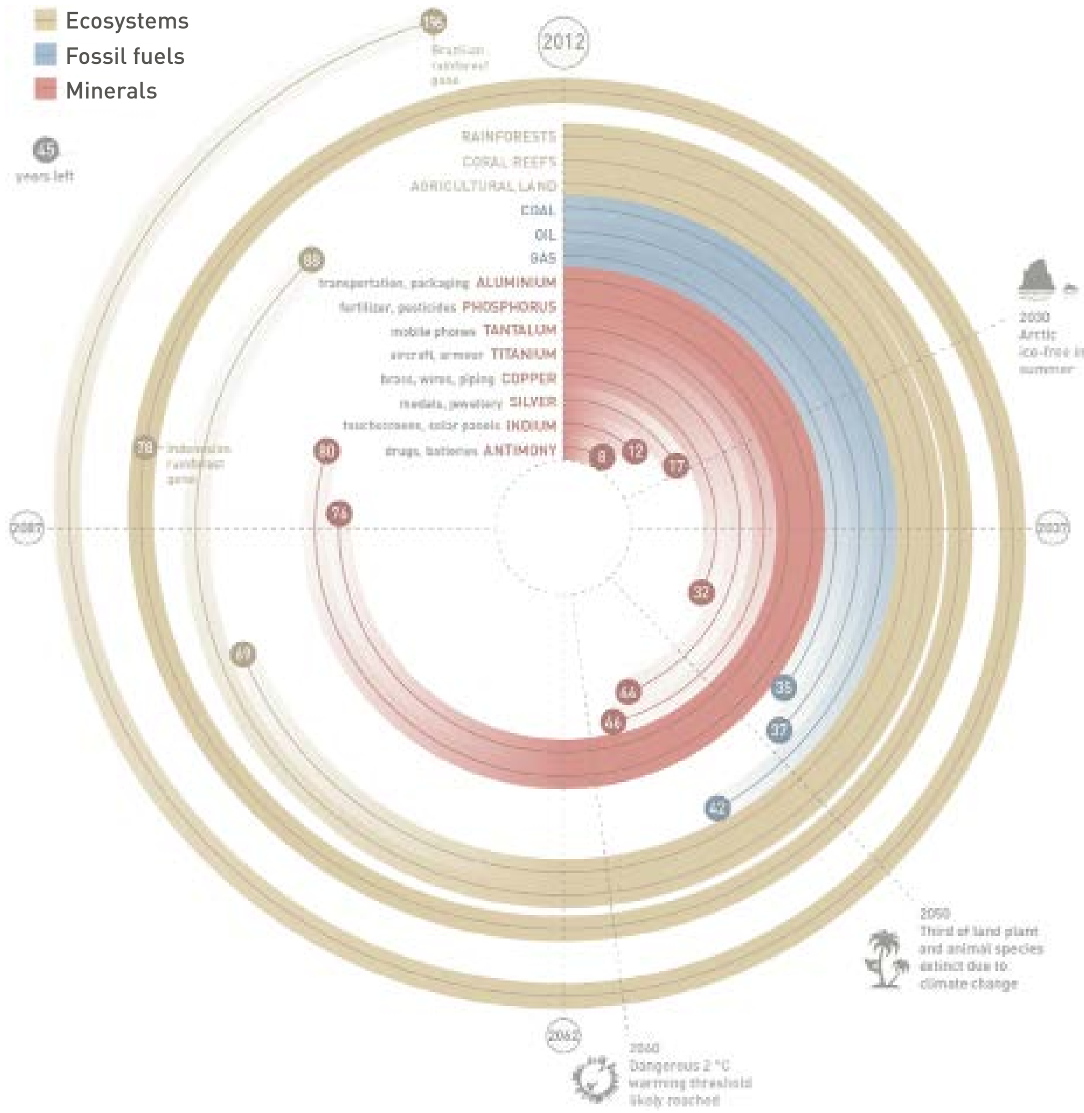
Materials consumption is at an all-time high, at 92.8 Gt per year. Because of population growth and increasing consumption rates, materials consumption is set to double compared to the 2015 levels to almost 177 Gt in 2050. The building industry is a major factor, consuming around 44% of all extracted materials (40.6 Gt in 2015).

Abiotic Materials Don't Grow Back

While there still are enough resources to produce concrete and other mass produced minerals, particularly the diminishing reserves of economically-viable extractable metallic minerals constitute a problem. A number of them have economically-extractable reserves of less than a couple of decades, for example lead (21 years), zinc (24 years) and copper (32 years). With oil reserves also steadily declining, oil-based products such as plastics and bitumen are expected to become increasingly scarce in the 21st century. Although high level recycling is expected to somewhat extend the availability of scarce resources, it is not expected to provide a full solution.

Zero-carbon Community

Stony materials and particularly concrete dominate global production, with an annual production of over 10 Gt of concrete." This means that annually for each inhabitant of earth about 1 ton of concrete is used. The good news is that most of the key ingredients of concrete - cement (clay, limestone), sand and gravel - and also other key building materials, such as bricks and glass, are still relatively abundantly available. However, also here some limitations are appearing, for example, scientists warn that sand may become scarce due to the enormous current extraction volumes (28.6 Gt/year).



Estimated remaining material supplies worldwilde (years left)

Furthermore, for the production of these materials, high temperatures (often →1500 °C) are required, meaning high energy consumption and related CO_2 emissions - around 14% of man-made GHG emissions derive from concrete and steel production. Therefore, in this case not the source materials but the fading availability of fossil fuels could prove to be the bottleneck, unless a transition to renewable energy sources is made in time.

Background

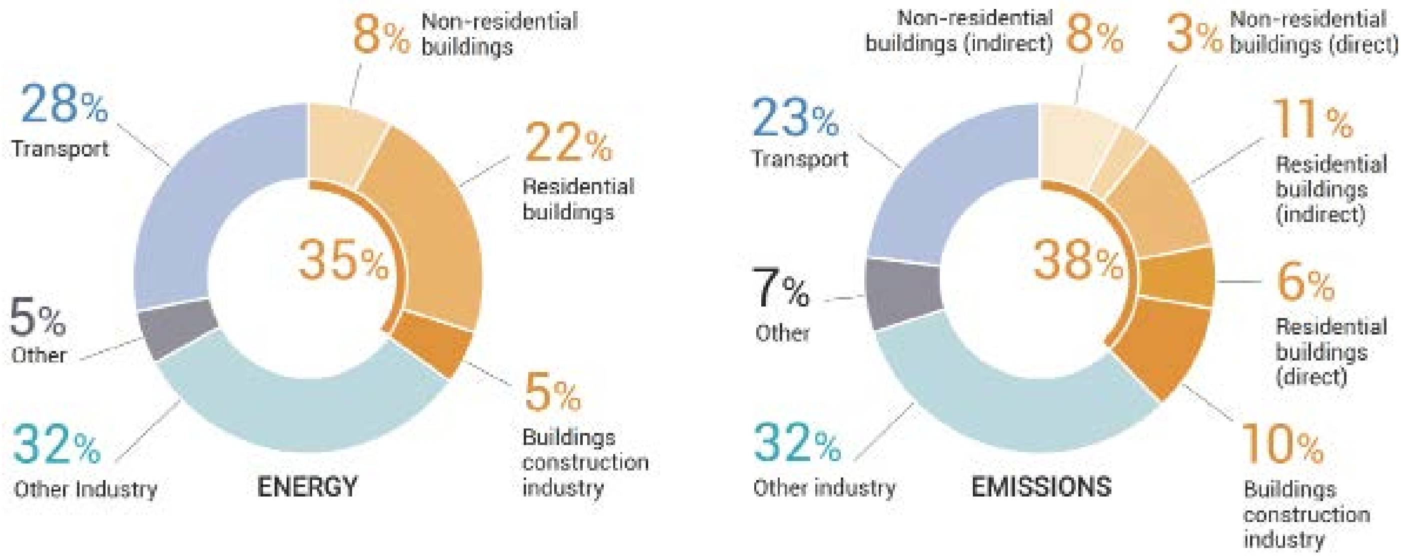
Global Building Energy Consumption

The Built Environment: A Major Contributor to GHG Emissions

Like the transport and industry sectors, the building sector has a large influence on global man-made GHG emissions through operational energy use (6.8 Gt CO_2 eq, or around 18%) and through embodied CO_2 emissions for the manufacture of building materials, in particular abiotic materials (2.9 Gt, or around 8%, which is expected to grow to 5.3 Gt CO_2 eq/year in 2050).

CO_2 Emissions from the Building Sector Are the Highest Ever Recorded

In the total final energy consumption of the global buildings sector, CO_2 emissions from the operation of buildings have increased to their highest level yet at around 10 GtCO_2, or 28% of total global energy-related CO_2 emissions. With the inclusion of emissions from the buildings construction industry, this share increases to 38% of total global energy related CO2 emissions.



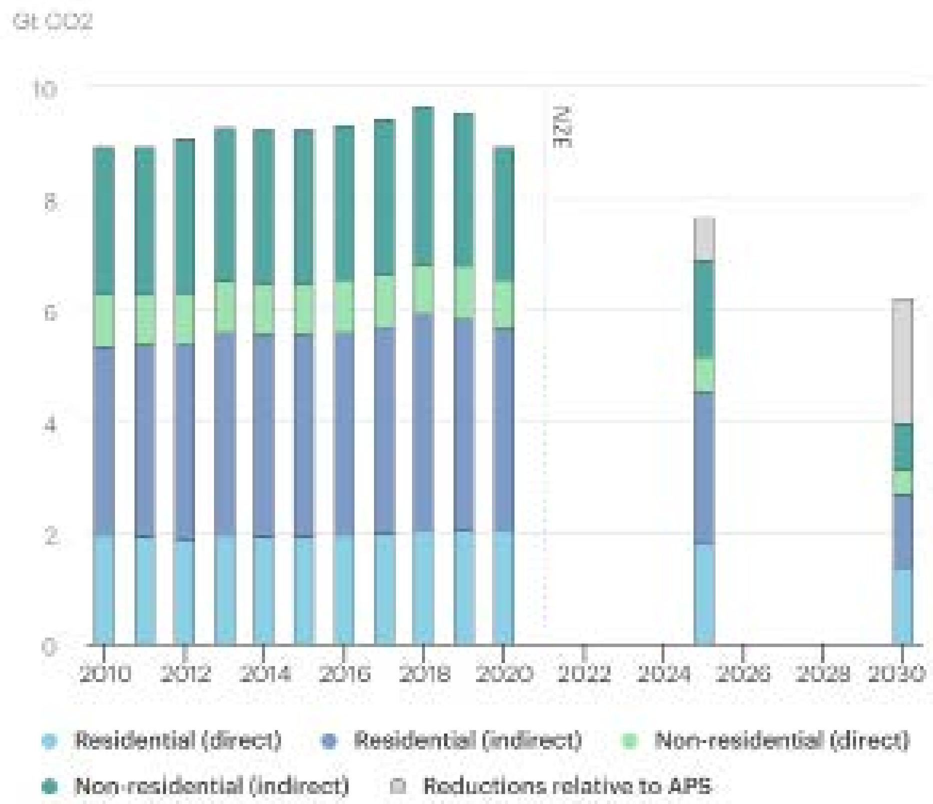
Global share of buildings and construction final energy and emissions, 2019

The buildings sector emission increase is due to a continued use of coal, oil and natural gas for heating and cooking combined with higher activity levels in regions where electricity remains carbon-intensive, resulting in a steady level of direct emissions but growing indirect emissions (i.e. electricity). Electricity consumption in building operations represents nearly 55% of global electricity consumption.

Zero-carbon Community

Energy-related CO_2 Emissions from Buildings Have Risen in Recent Years

Direct and indirect emissions from building operations plummeted to about 9 Gt in 2020, after having risen an average 1% per year since 2010. Although minimum performance standards are tightening, heat pump and renewable equipment deployment is accelerating and the power sector is continuing to decarbonise, the 2020 drop in buildings sector CO_2 emissions resulted primarily from lower activity in the services sector.



Global CO2 emissions from building operations in the Net Zero Scenario, 2010-2030

To be on track to achieving a net-zero carbon building stock by 2050, the IEA estimates that direct building CO2 emissions would need to decrease by 50% and indirect building sector emissions decline through a reduction of 60% in power generation emissions by 2030. These efforts would need to see building sector emissions fall by around 6% per year from 2020 to 2030. For comparison, the global energy sector CO2 emissions decreased by 7% during the pandemic.

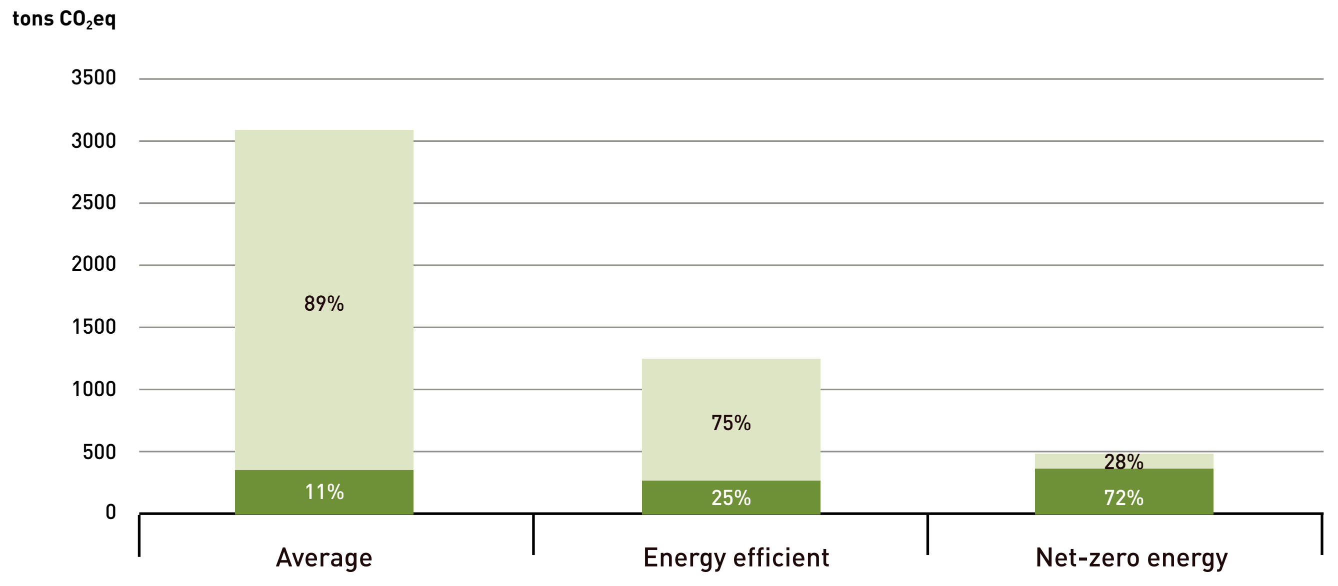
Green Building Trend

Decarbonizing the Building Sector

The building sector is one of the harder to decarbonize due to several challenges, including: retrofitting the massive existing global stock of residential and commercial buildings, moving many areas of the world away from in-building particulate and CO_2-generating biomass and coal, and motivating efficiency and potentially more expensive building approaches.

CO_2 emissions during the construction of the building are considered "embodied". CO_2 emissions can equal 20-30% of the total emissions of a building during its lifetime. "Operating" emissions are the emissions associated with running the building, including fossil-fuel electricity, heat generation, or cooking, and can come from a variety of fuels. A net-zero energy building gets all its operating energy needs from renewables. A net-zero carbon building (ZCB) has a negative ongoing carbon footprint such that the carbon emitted during construction is offset during the life of the building.

Building life cycle GHG emissions (in kg CO_2eq)



Strategies to make buildings net-zero energy and zero-carbon are a key part of the global decarbonisation strategy and must become the primary form of building construction across all economies to achieve net zero emissions by 2050.

Feasible Green Building Trends

To make our future living environment more sustainable, there are some green building trends popping up everywhere in both commercial and residential spaces:

- Net Zero Energy Buildings
  Net Zero Energy Buildings can generate energy. This means that the energy they use is replaced almost immediately, drastically reducing or even eliminating their carbon footprint.

- Prefabricated Modular Buildings
  Prefabricated modular buildings are not just green; they also tend to be higher quality because builders have much more control.

- Smart Buildings
  These types of buildings strive to use the optimal and least amount of energy possible. Virtually everything in the building is optimized and automated.

- Distributed Energy Systems
  Distributed energy systems refer to diversified ways to collect and use energy. Since people can get the power from several different sources, it is generally cleaner and more eco-friendly.

- Energy Efficiency Design
  It is one of the most logical green buildings trends. The idea is to maximize the home or business's energy use by tapping into alternative energies and monitoring gas and electric use.

- Renewable Energy Usage
  Water conservation systems and solar panels are rapidly rising in popularity. Since green options are so prevalent and cost-effective, many people are seeing the true benefit of them.

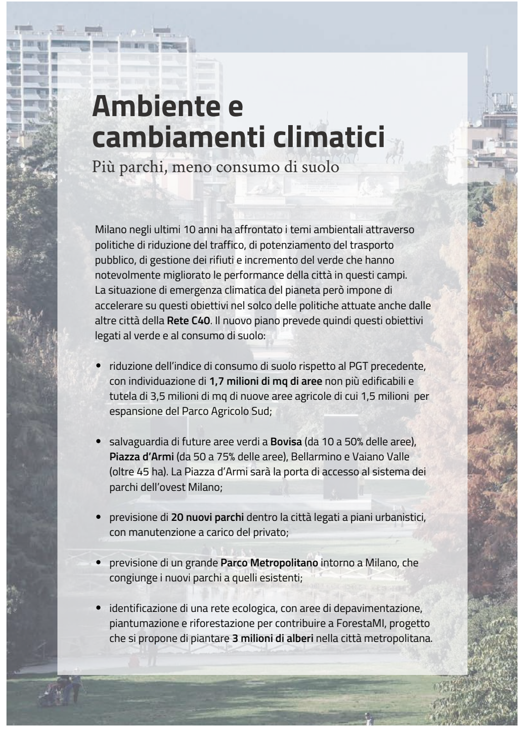
- Biomimicry
  Essentially, biomimicry refers to using natural inspiration to dictate design. Engineers are even using biomimicry to produce sustainable building materials.

- Sustainable Building Materials
  Simply selecting building materials with the earth in mind can significantly reduce carbon footprint. Plus, sustainable building materials tend to be reasonably cost-effective and easy to get.

- Cool Roofs
  Cool roofs can reflect sunlight, keeping people's home a lot cooler during the sweltering summer months.

- Low-Emitting Windows
  These windows have a thin coating of metallic oxide on them. This coating protects us from overheating or freezing.

PGT Analysis



Ambiente e cambiamenti climatici

Più parchi, meno consumo di suolo

Milano negli ultimi 10 anni ha affrontato i temi ambientali attraverso politiche di riduzione del traffico, di potenziamento del trasporto pubblico, di gestione dei rifiuti e incremento del verde che hanno notevolmente migliorato le performance della città in questi campi.
La situazione di emergenza climatica del pianeta però impone di accelerare su questi obiettivi nel solco delle politiche attuate anche dalle altre città della **Rete C40**. Il nuovo piano prevede quindi questi obiettivi legati al verde e al consumo di suolo:

- riduzione dell'indice di consumo di suolo rispetto al PGT precedente, con individuazione di **1,7 milioni di mq di aree** non più edificabili e tutela di 3,5 milioni di mq di nuove aree agricole di cui 1,5 milioni per espansione del Parco Agricolo Sud;
- salvaguardia di future aree verdi a **Bovisa** (da 10 a 50% delle aree), **Piazza d'Armi** (da 50 a 75% delle aree), Bellarmino e Vaiano Valle (oltre 45 ha). La Piazza d'Armi sarà la porta di accesso al sistema dei parchi dell'ovest Milano;
- previsione di **20 nuovi parchi** dentro la città legati a piani urbanistici, con manutenzione a carico del privato;
- previsione di un grande **Parco Metropolitano** intorno a Milano, che congiunge i nuovi parchi a quelli esistenti;
- identificazione di una rete ecologica, con aree di depavimentazione, piantumazione e riforestazione per contribuire a ForestaMI, progetto che si propone di piantare **3 milioni di alberi** nella città metropolitana.

Edifici a zero emissioni e tetti verdi

L'impronta ecologica del PGT passa anche per le nuove norme sulle modalità di costruzione dei nuovi edifici, degli interventi di demolizione con ricostruzione e di ristrutturazione dell'esistente.
Ecco le principali novità:

- tutti i nuovi edifici a partire dal 2020 dovranno essere **carbon neutral**, in anticipo con gli impegni di C40 per il 2030;
- riduzione dell'**impronta del suolo** consumato di almeno il 10% nei casi di demolizione e ricostruzione;
- introduzione dell'**Indice di Riduzione Impatto Climatico** (sul modello del Biotope Area Factor di Berlino) per calcolare la dotazione minima d'integrazione del verde negli interventi urbanistici ed edilizi volto a favorire la realizzazione di tetti e pareti verdi sui nuovi edificio a depavimentare aree anche fuori dal lotto di intervento;
- elaborazione di una **mappa** delle aree della città che si intende depavimentare, piantumare o forestare;
- utilizzo di tutte le **monetizzazioni ambientali** per la realizzazione del Parco Metropolitano e per il progetto ForestaMi.

Milano2030 Piano di Governo del Territorio

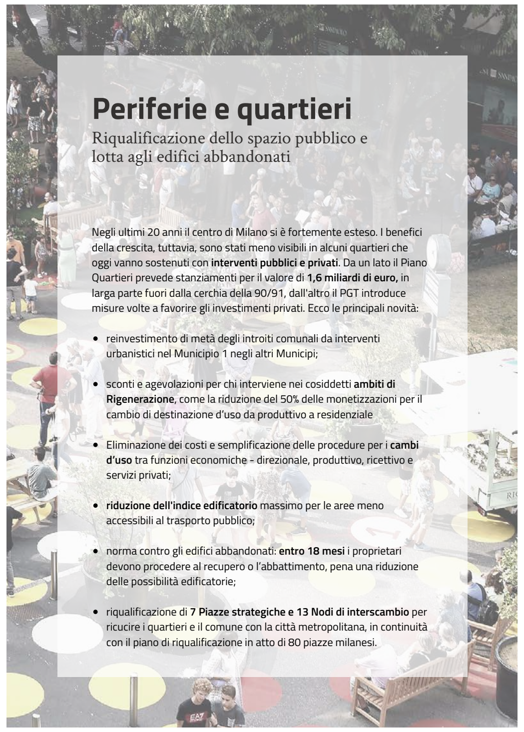
The Milan Territory Government Plan, approved by the Municipal Council on 14 October 2019, sets the objectives towards Milan 2030 in a phase of growth of the city from a demographic point of view (the city has just exceeded 1,400,000 inhabitants), economic (growth of 2% of the available, exceeding the pre-crisis data), tourism (+ 10% of visitors per year after Expo).

Milan today has a clear vision of its future, since that all the infrastructures planned for the 2026 Winter Olympics would have been built. The three points on which the plan strongly innovates the vision of the city are: **environment and climate change, suburbs and neighborhoods, and right to housing and controlled rents.**

Environment and climate change - More parks, less land use:
1. reduction of the land use index compared to the previous PGT;
2. safeguarding future green areas in Bovisa, Piazza d¡ Armi, Bellarmino and Vaiano Valle;
3. provision of 20 new parks within the city linked to urban plans, with maintenance by the private individual;
4. provision of a large Metropolitan Park around Milan, which connects the new parks to existing ones; 5. identification of an ecological network, with de-paving, planting and reforestation areas to contribute to ForestaMI, a project that aims to plant 3 million trees in the metropolitan city.

Background

Zero-carbon Community



Periferie e quartieri

Riqualificazione dello spazio pubblico e lotta agli edifici abbandonati

Negli ultimi 20 anni il centro di Milano si è fortemente esteso. I benefici della crescita, tuttavia, sono stati meno visibili in alcuni quartieri che oggi vanno sostenuti con **interventi pubblici e privati**. Da un lato il Piano Quartieri prevede stanziamenti per il valore di **1,6 miliardi di euro,** in larga parte fuori dalla cerchia della 90/91, dall'altro il PGT introduce misure volte a favorire gli investimenti privati. Ecco le principali novità:

- reinvestimento di metà degli introiti comunali da interventi urbanistici nel Municipio 1 negli altri Municipi;
- sconti e agevolazioni per chi interviene nei cosiddetti **ambiti di Rigenerazione**, come la riduzione del 50% delle monetizzazioni per il cambio di destinazione d'uso da produttivo a residenziale
- Eliminazione dei costi e semplificazione delle procedure per i **cambi d'uso** tra funzioni economiche - direzionale, produttivo, ricettivo e servizi privati;
- **riduzione dell'indice edificatorio** massimo per le aree meno accessibili al trasporto pubblico;
- norma contro gli edifici abbandonati: **entro 18 mesi** i proprietari devono procedere al recupero o l'abbattimento, pena una riduzione delle possibilità edificatorie;
- riqualificazione di **7 Piazze strategiche e 13 Nodi di interscambio** per ricucire i quartieri e il comune con la città metropolitana, in continuità con il piano di riqualificazione in atto di 80 piazze milanesi.

Diritto alla casa e affitti calmierati

Riqualificazione case popolari e alloggi accessibili in affitto

Attualmente a Milano ci sono **63mila alloggi di edilizia popolare** di cui 35mila di Aler (Regione) e 28mila di MM (Comune). Il patrimonio pubblico, pur molto consistente, è spesso in stato di degrado e non risponde alla nuova domanda abitativa. Se da un lato il Comune sta rigenerando 3mila alloggi popolari, dall'altro introduce norme volta a incrementare l'offerta di case in affitto a prezzi accessibili per lavoratori, studenti e famiglie che non hanno i requisiti per accedere all'edilizia popolare, ma non riescono ad affrontare il libero mercato. Ecco le principali novità:

- la quota obbligatoria di **housing sociale** nei nuovi interventi sale **dal 35 al 40%**, con massimizzazione della quota di **housing in affitto** nella composizione dell'indice edificatorio;
- a meno di 500 metri dalle metropolitane e stazioni ferroviarie e 250 metri dalle fermate tranviarie e filoviarie è possibile **superare l'indice massimo** di edificabilità pari a 1 (mq/mq), nel rispetto delle caratteristiche morfologiche, purché tutta la quota eccedente sia in housing sociale in affitto;
- individuate **9 aree** per Housing Sociale ed edilizia popolare per circa 1.300 alloggi che si sommano ai 6.200 previsti nell'ambito della rigenerazione degli scali ferroviari e in altri piani già approvati;
- obiettivo **Zero Case Sfitte** negli immobili di edilizia residenziale pubblica MM entro il 2021 (recupero di 3.000 alloggi, attualmente completato al 33%);

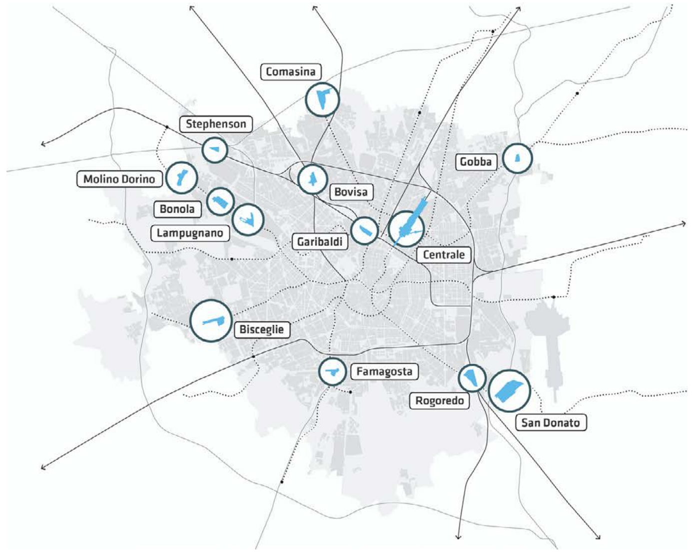
Zero-emission buildings and green roofs:
1. all new buildings starting from 2020 must be carbonneutral, ahead of the commitments of C40 for 2030;
2. reduction of the footprint of the soil consumed by at least 10% in cases of demolition and reconstruction;
3. introduction of the Climate Impact Reduction Index to calculate the minimum amount of green integration in urban planning and building interventions;
4. development of a map of the areas of the cities intended to be paved, planted or forested;
5. use of all environmental monetization for the construction of the Metropolitan Park and for the ForestaMi project.

Suburbs and neighborhoods - Redevelopment of public space and the use of abandoned buildings:
1. reduction of the maximum building index for areas less accessible to public transport;
2. redevelopment of 7 strategic squares and 13 interchange nodes to restore the districts and the municipality with the metropolitan city, in continuity with the ongoing redevelopment plan of 80 Milanese squares.

Right to housing and controlled rents - Redevelopment of public housing and affordable housing for rent:
1. the compulsory share of social housing in new interventions rises from 35 to 40%, with the maximization of the rented housing share in the composition of the building index;
2. less than 500 meters from the subways and railway stations and 250 meters from tram and trolleybus stops; 3. 9 areas for social housing and public housing have been identified for approximately 1,300 dwellings;
4. goal of Zero Vacancies in MM public housing buildings by 2021.

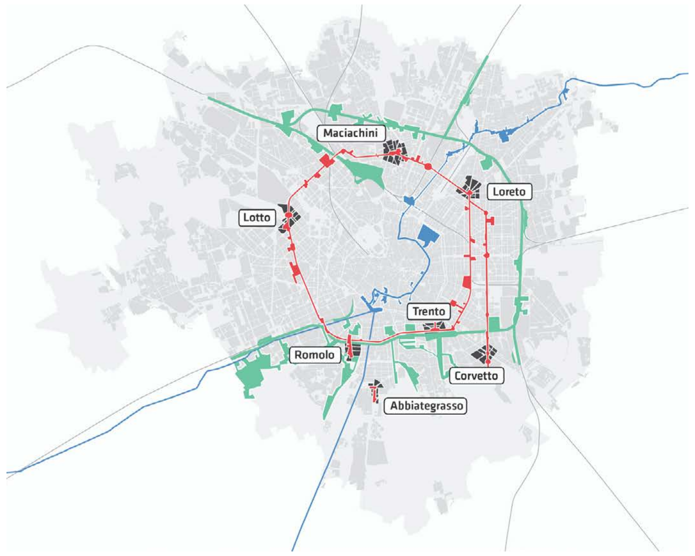
Background

PGT Analysis



MILAN 2030 - A CONNECTED, METROPOLITAN AND GLOBAL CITY

Thanks to a model that integrates built densification and regeneration of public space, 12 transit hubs - which currently attract millions of people daily - are expected to become major metropolitan spots. This is underpinned by the logic of urban growth that clusters residents within a short distance from a train or metro stop, to reduce dependency on private mobility.



MILAN 2030 - A GREEN, LIVABLE, RESILIENT CITY

The Milan 2030 strategy envisions the creation of a consolidated Metropolitan Park, connecting all existing parks, as well as the city's fragmented network of pub-lic and private spaces, into ecological corridors. Overall, the city of 2030 will boast 20 new parks larger than 1 hectare.

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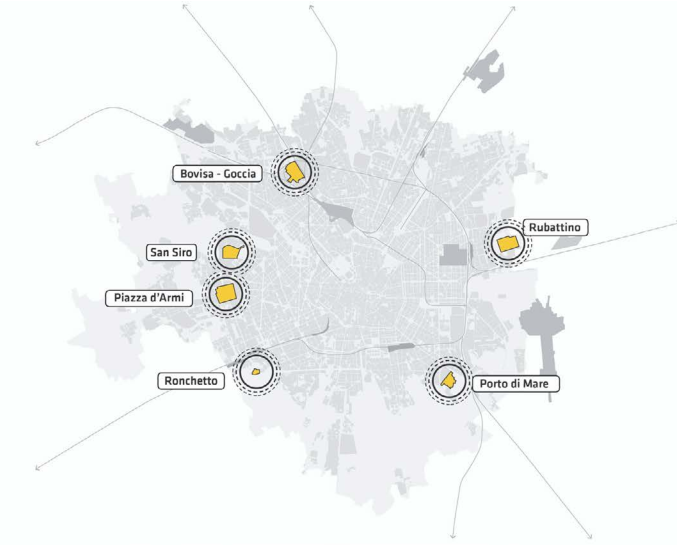
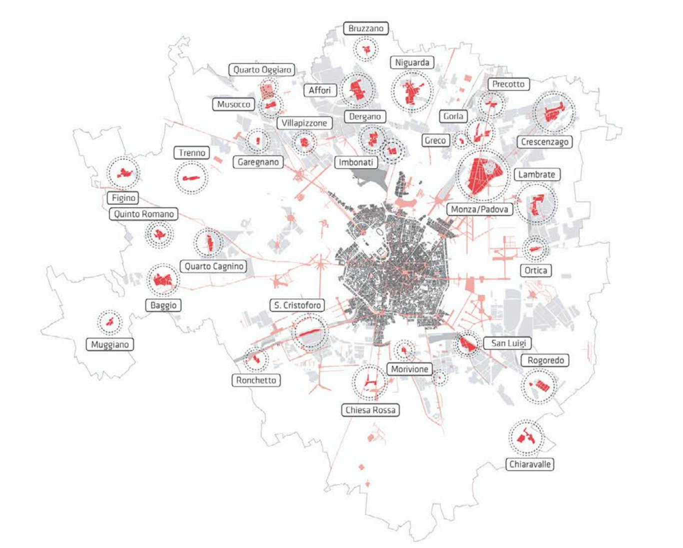


MILAN 2030 - AN ATTRACTIVE AND INCLUSIVE CITY OF OPPORTUNITY

Six areas in Milan's periphery, accessible to all and placed on strategic axes, will additionally be developed with the intent of attracting international invest-ment and serving as centers of economic opportunity. These outposts could be used for: from institutional and adminis-trative offices, to structures to support cultural production, hospital facilities, classrooms and university services, incubi-tion spaces for startups, large sports facilities, or depots for sustainable mobility.



MILAN 2030 - ONE CITY, 88 NEIGHBORHOODS

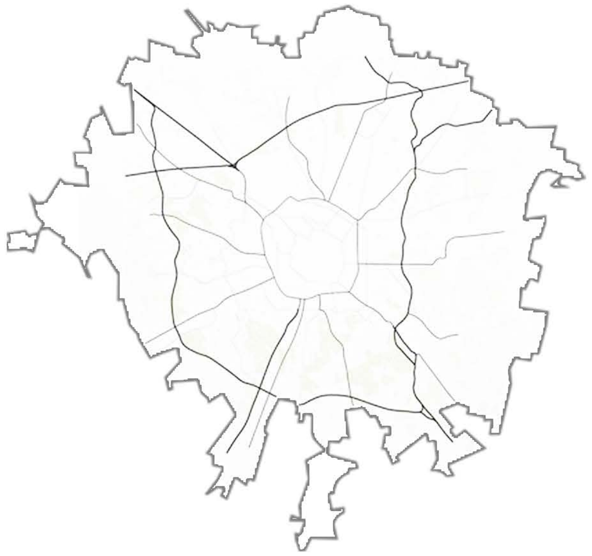
Milan's regeneration, far from being solely focused on the changing skyline, already embraces public space as a fundamental common good. Interventions on public squares both large and small are being undertaken with the aim of strengthening local neighborhood identities, favoring walkability, increas-ing green space, and support-ing local shops and tourism.

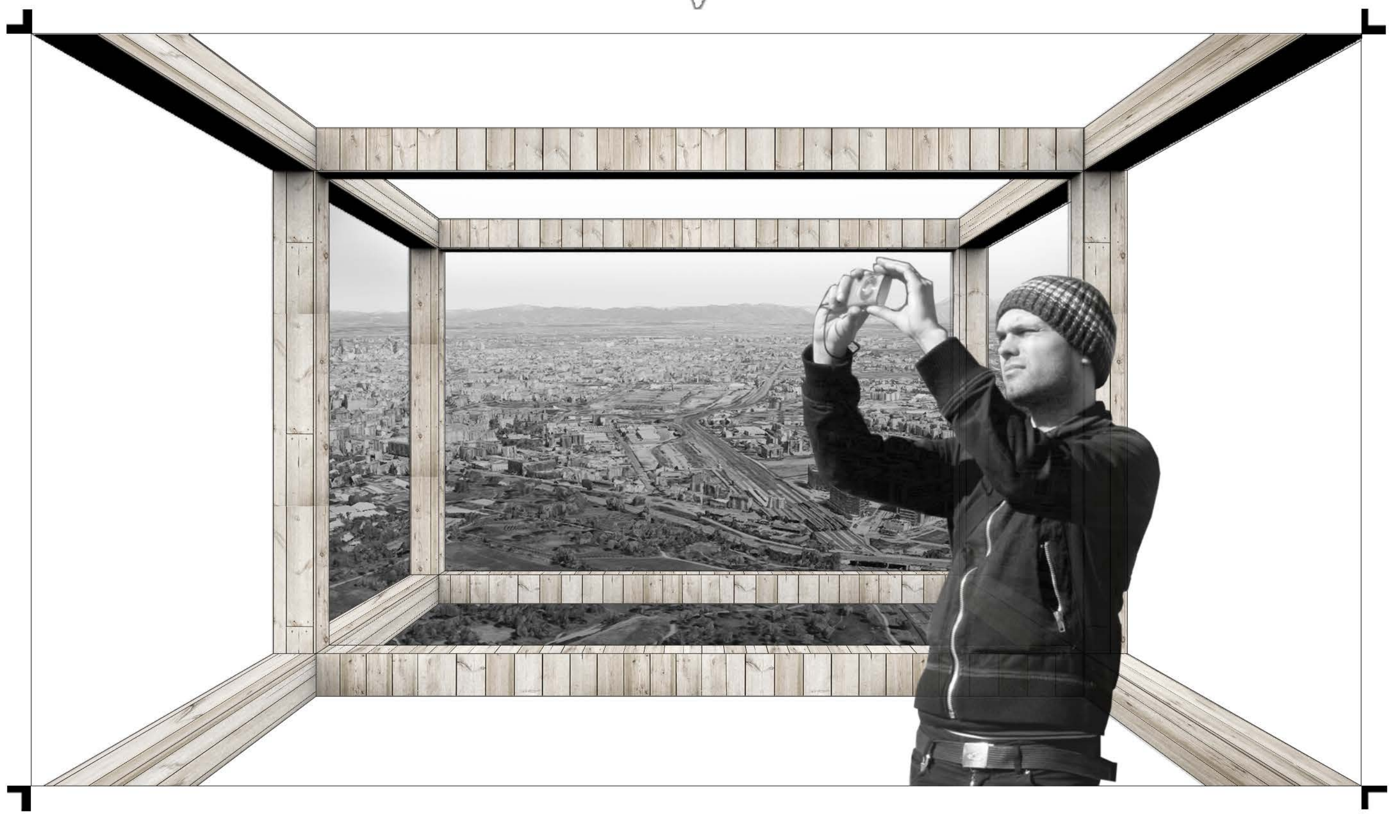
Background

A Future Perspective

Zero-carbon Community

Background





Zero-carbon Community

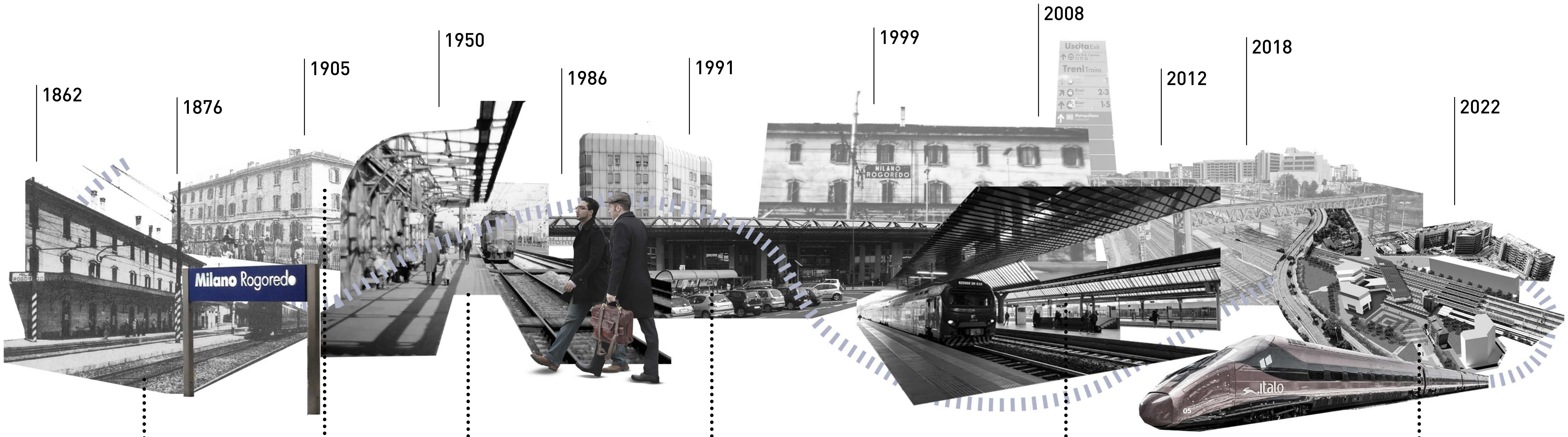
02 Preliminary Survey

History of Rogoredo
Mapping Analysis
Environmental Analysis
User Analysis
Site Survey

History of Rogoredo Station

Milano Rogoredo is a railway station in Milan, Italy. It is one of the key nodes of the Milan suburban railway service as the southern gate of the Milanese urban network.
It was built and gradually opened between 1862 and 1876. Its location was originally (as of 1891) a junction for the old cargo station of Milano Sempione; it became a cargo station itself in 1908. Later, in the late 1950s, it was expanded to a passenger station.
A modernization of the station was planned in the 1990s, and some reconstruction of the station was carried out including platform roofing.

The opening of the subway station in 1991 expanded the station's function as a transfer point for many commuters who work in the city every day. In 1999, work restarted to add four tracks to allow integration with the Passante railway and the high-speed line, as well as to complete the platform roofing.
In August 2009, the station changed to the S-lines for connections through the Passante into Central Milan and on to Malpensa Airport at Bovisa. In early 2012, with the opening of a new high-speed railway station, it became an important focus commuters.



Prosperity! — Challenge?

Operation

Milano Rogoredo was built and gradually opened between 1862 and 1876.

1876

Cargo Station

The station was known since 1891 as a junction to the old cargo station of Milano Sempione, and became a cargo station itself in 1908.

1908

Passenger Station

In thelate 1950s, it became a passenger station. The node grew proportionally with the industrial development of the area, led by the presence of Montedison chemical facilities and Redaelli steel plant.

1950

Modernization

A modernization of the station was planned in the 1990s. In 1999, work restarted to add four tracks to allow integration with the Passante railway and the high-speed line, as well as to complete the platform roofing.

1991

High-speed Railway

In 2008, the "Rogoredo branch" of the railway was launched. The station became the terminus of lines S1, S2, S6 and S10 of the suburban railway service. In 2012, it became a focal point for high-speed-railway commuters.

2008

Future Reconstruction

The station has a reconstruction project that includes the construction of a commercial bridge spanning the tracks and the sanctuary in order to reconnect the front piazza (via Giovanni Battista Cassinis) with the Santa Giulia side.

2018-

Mapping Analysis

Landuse

Landuse

scale 1:15000

Legends:

- Commerical/ Industrial Area
- Green Area
- Residential Area
- Farmland
- Education
- Sport
- Religion
- Public Service
- Squatter Area
- Vacant/ Construction Area

Mapping Analysis

Functional distribution

Service Function Distribution

Public service distribution network

scale 1:20000

Legends:

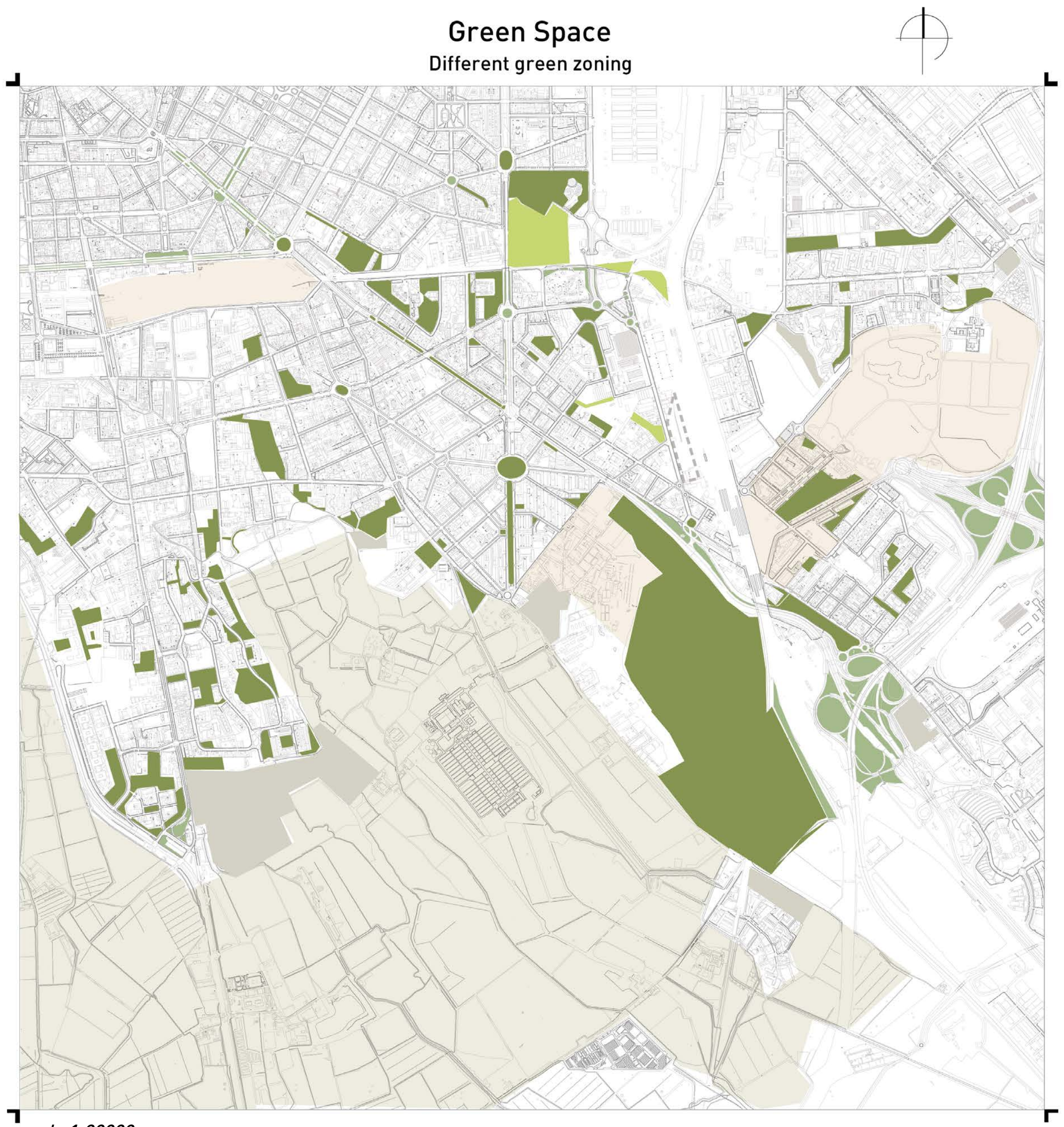
- Administration
- Sports
- Environment infrastructure
- Religion
- Social service
- Health service
- Education
- Commercial
- Culture
- Housing service

Mapping Analysis

Green space

Green Space

Different green zoning



scale 1:20000

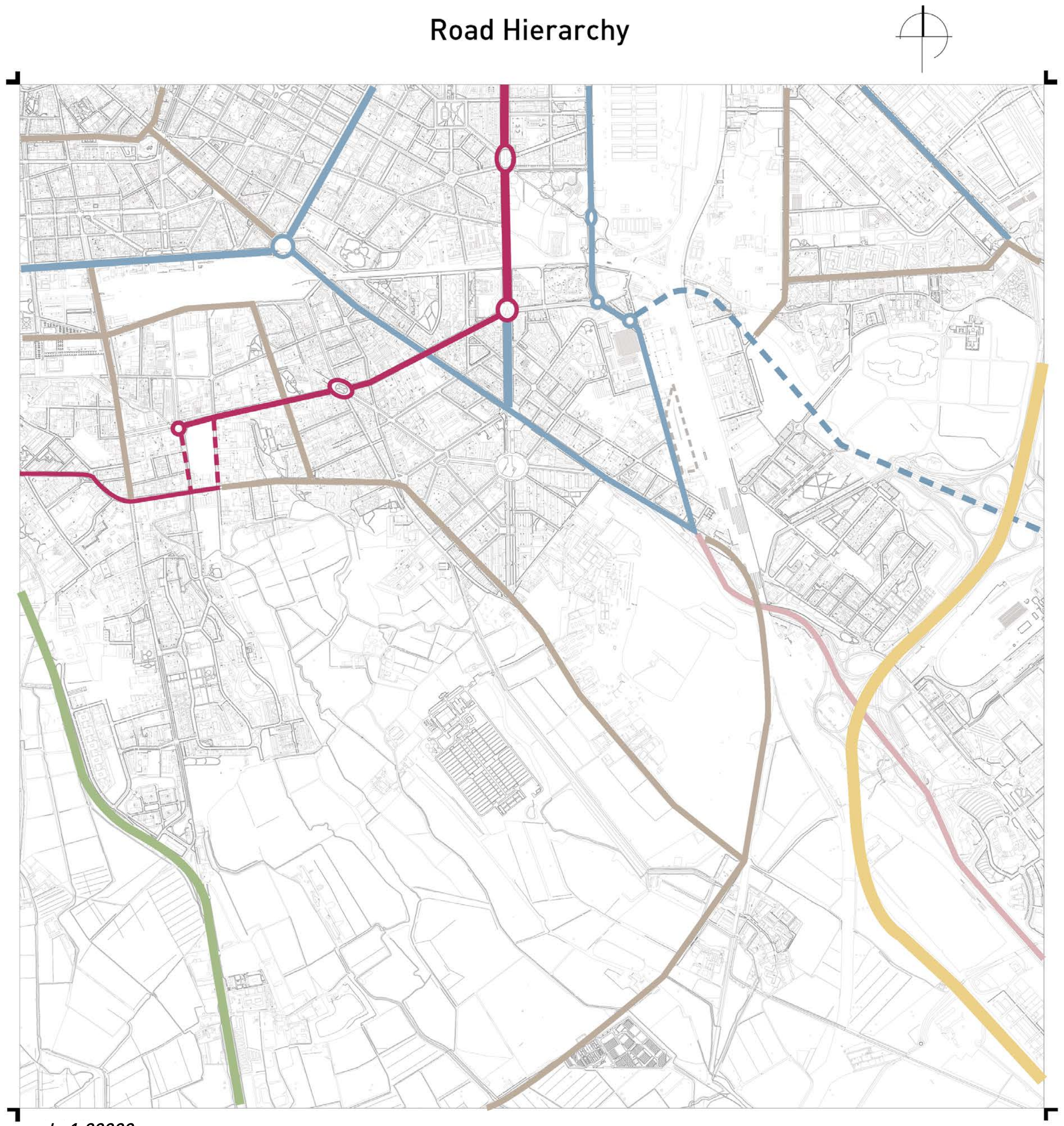
Legends:

- Existing green space
- Buffer zone
- Planned green space
- Park
- Planned park
- Agricultural land

Mapping Analysis

Road hierarchy

Road Hierarchy



scale 1:20000

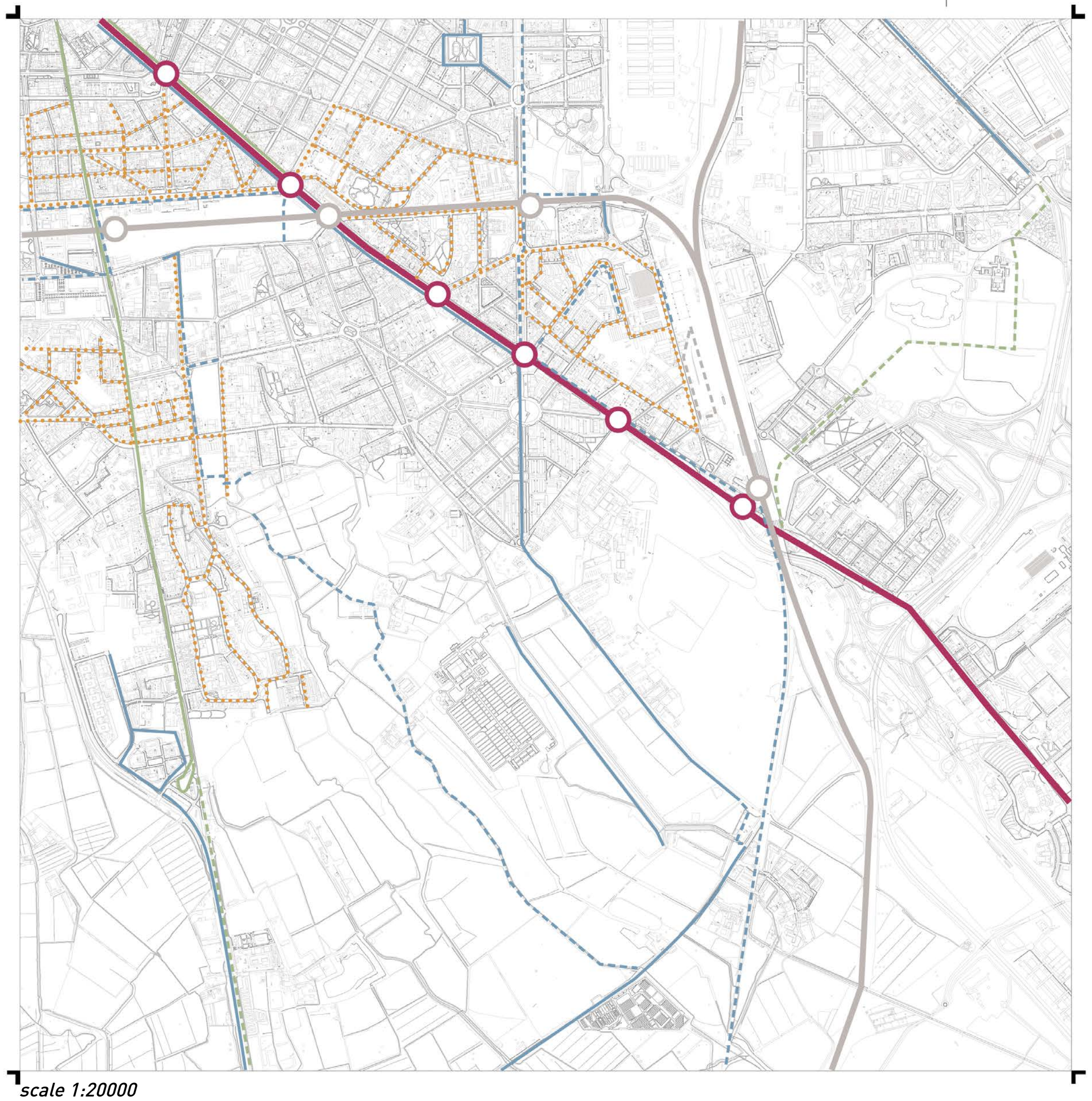
Legends:

- Highway
- Flow primary road
- Inter-regional primary road
- Regional primary road
- Secondary road
- Urban peripheral road
- Planned inter-regional primary road
- Planned regional primary road

Mapping Analysis

Public transport system

Public Transport System



scale 1:20000

Legends:

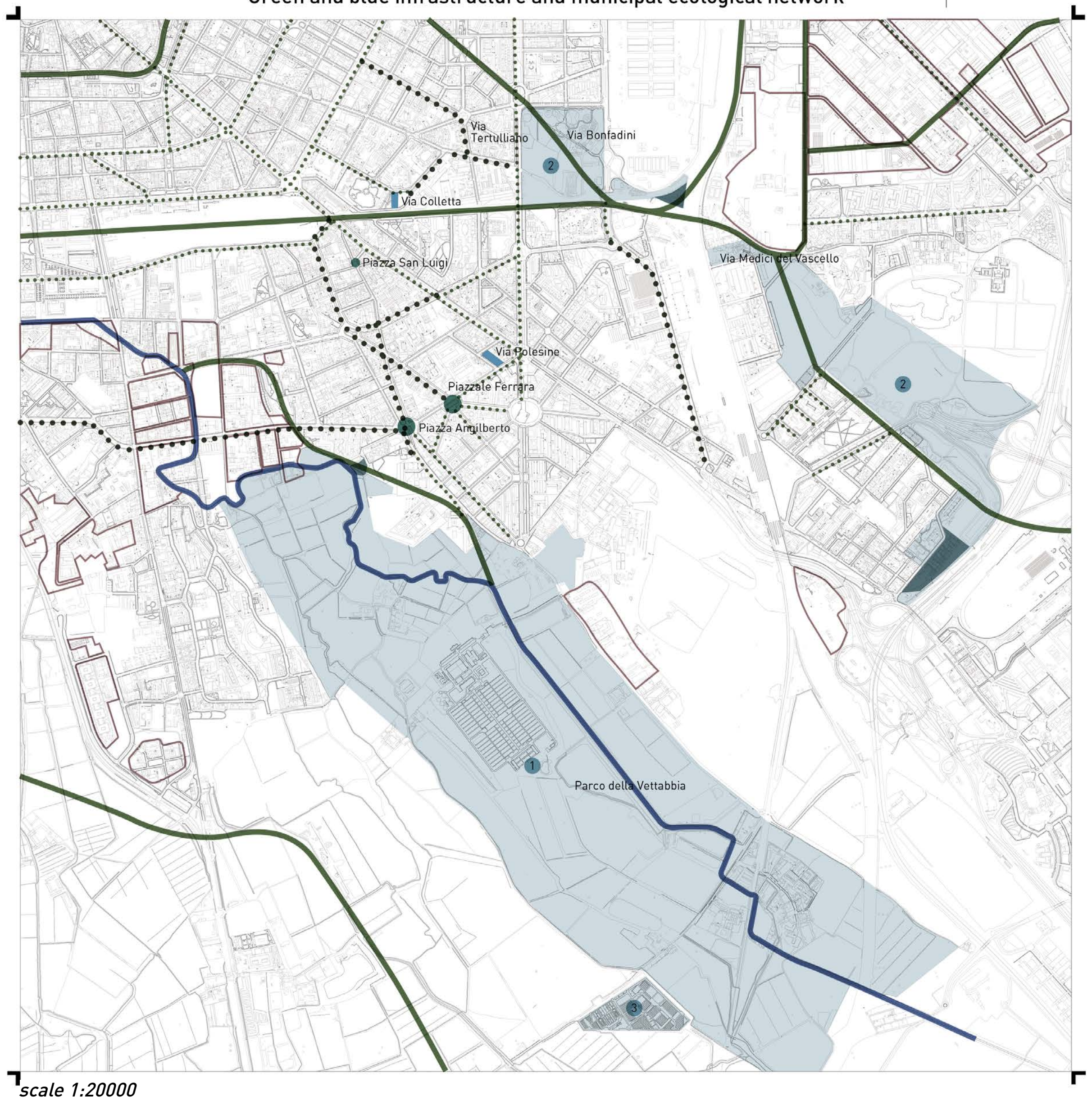
- Metro line 3
- Railway
- Tram line
- Cycle lane
- Planned tram line
- Planned cycle lane
- Planned pedestrian path

Mapping Analysis

Infrastructure

Infrastructure

Green and blue infrastructure and municipal ecological network



scale 1:20000

Legends:

Infrastructure for environmental regeneration and resilience of built-up area.

- Environmental regeneration areas
- Public areaa to be forested/planted
- Parking spaces to be partially decked and planted
- Squares to be partially paved and planted

Infrastructure for environmental networks.

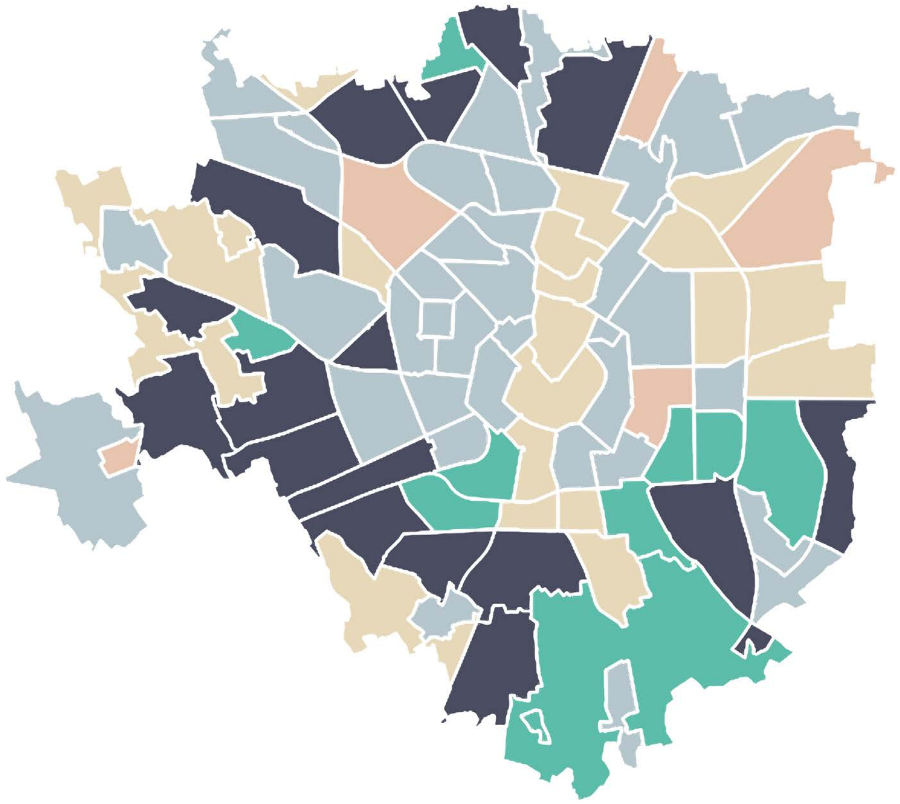
- Green infrastructure
- Existing linear green connections
- Linear green connection to be made
- Blue infrastructure
- 1 Green infrastructure
- 2 Existing linear green connections
- 3 Linear green connection to be made

Mapping Analysis

Social housing

Social Houesing

The location for the data regarding Households in social housing in Milano

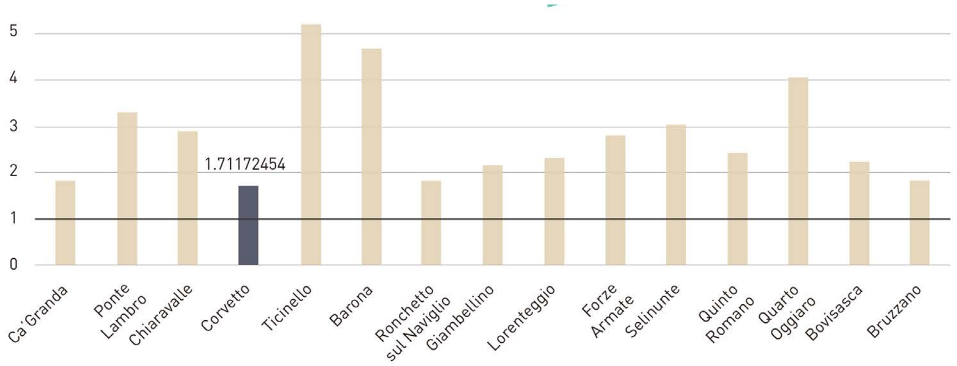


Legends:

Houses owned by public

- 0.0-0.6
- 06.-0.8
- 0.8-1.05
- 1.05-1.4
- 1.4-5.77

Areas with the highest location quotient of social housing



Legends:

The highest location for households in social housing in Milan area

- Corvetto
- Highest LQ in an area

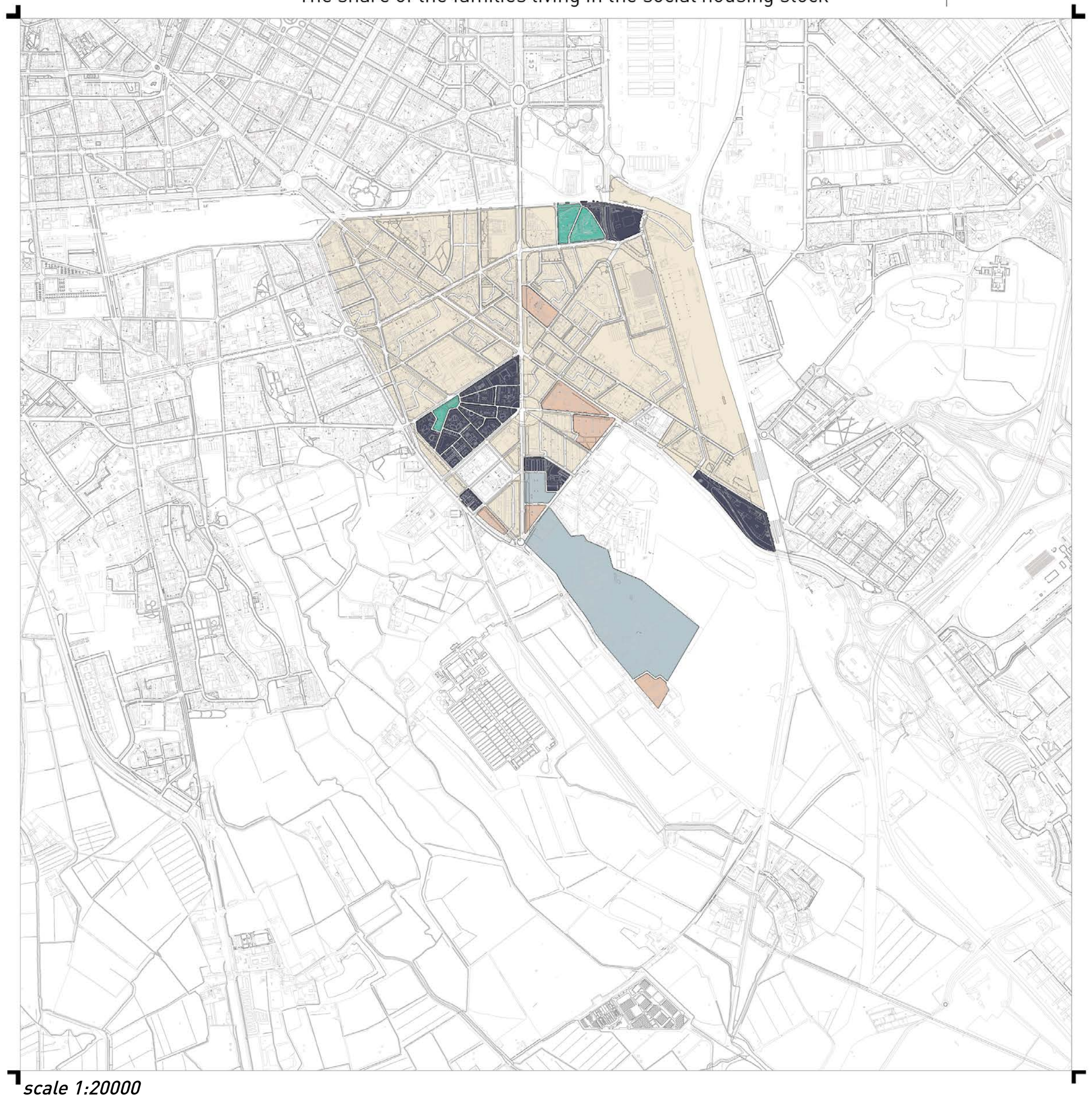
Preliminary Survey

Mapping Analysis

Social housing

Social Housing

The share of the families living in the social housing stock



scale 1:20000

Legends:

Location quotient (LQ)

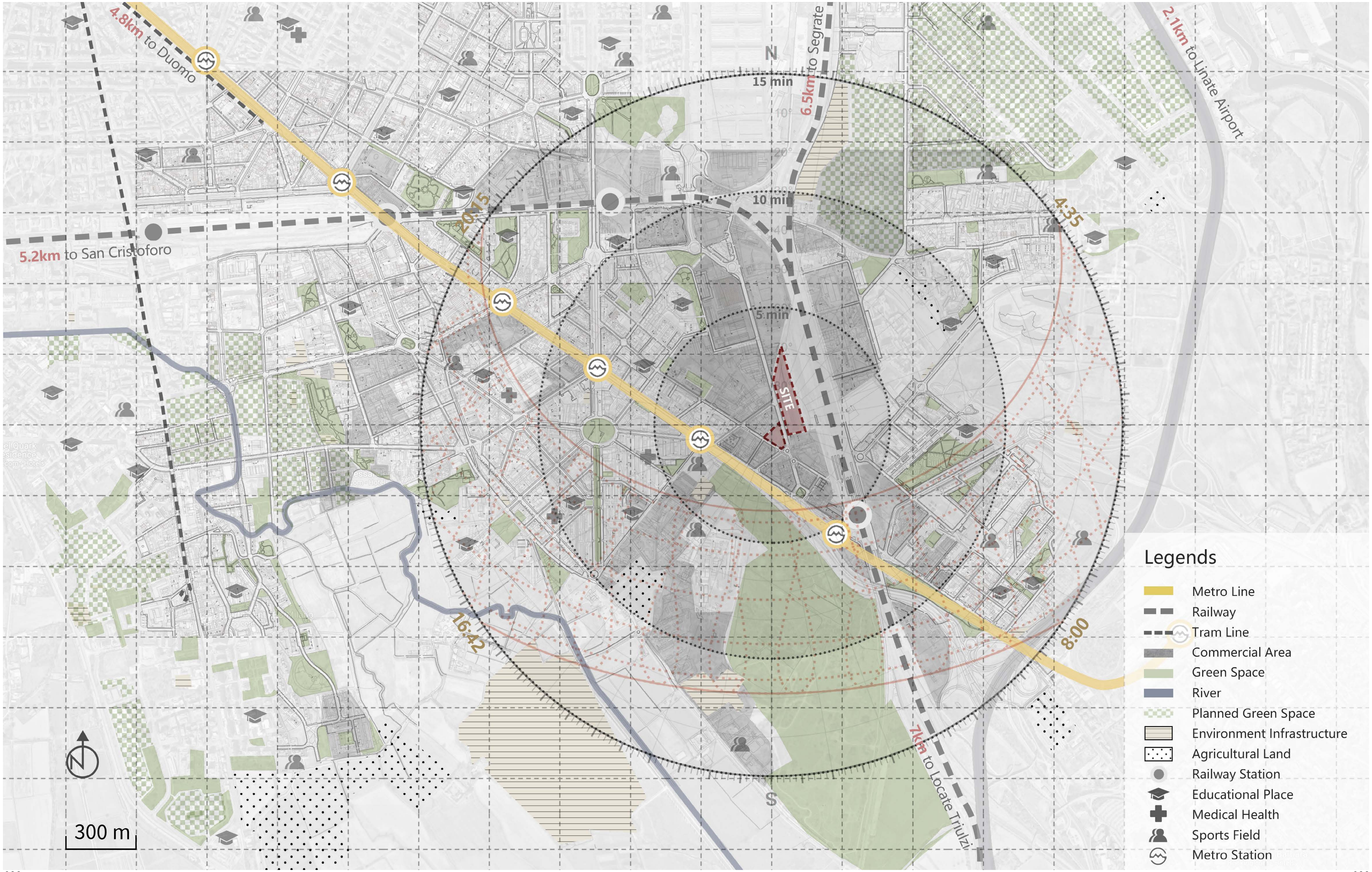
- 0%-10%
- 10%-40%
- 40%-60%
- 60%-80%
- 80%-100%

Perliminary Survey

Zero-carbon Community

Mapping Analysis

Integrated mapping



Environmental Analysis

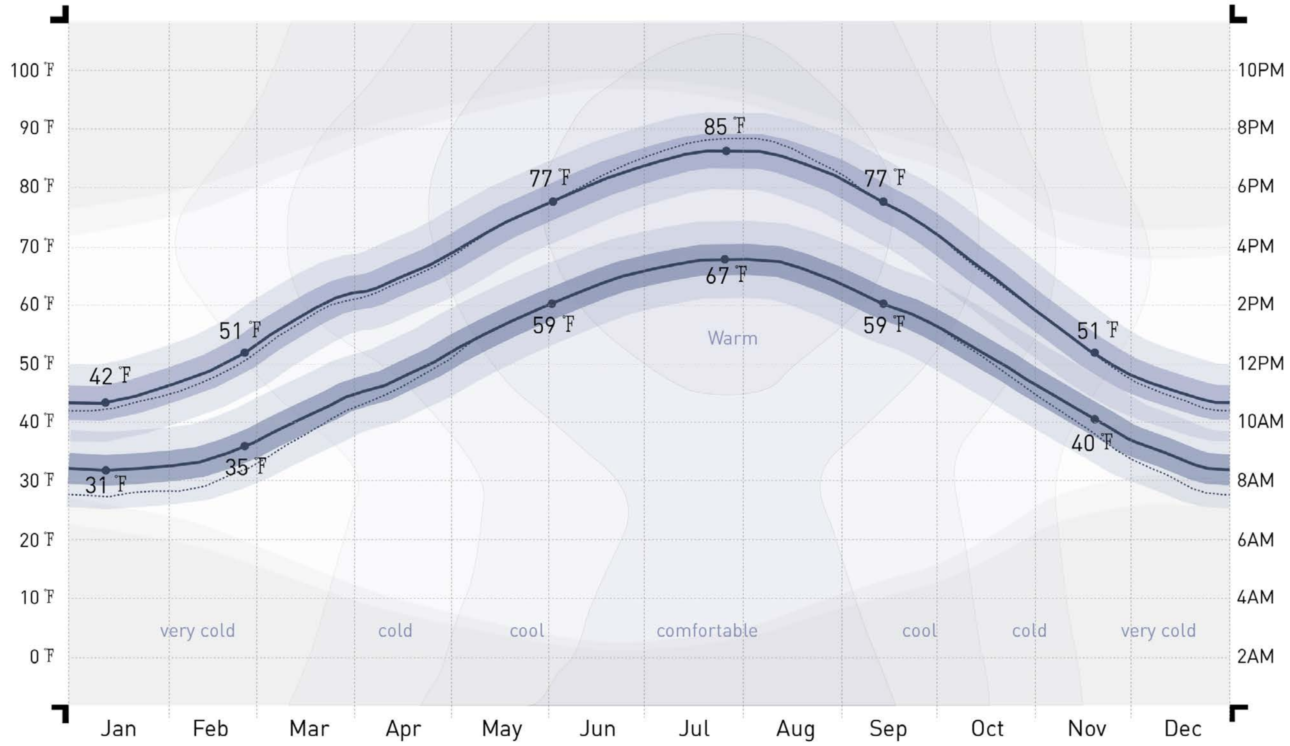
Climate

Climate

Average temperature in Milan

Average High and Low Temperature in Milan (Left)

Average Hourly Temperature in Mliano (Right)



The daily average high (upper line) and low (lower line) temperature, with 25th to 75th and 10th to 90th percentile bands. The thin dotted lines are the corresponding average perceived temperatures. The average hourly temperature, color coded into bands. The shaded overlays indicate night and civil twilight.

Environmental Analysis

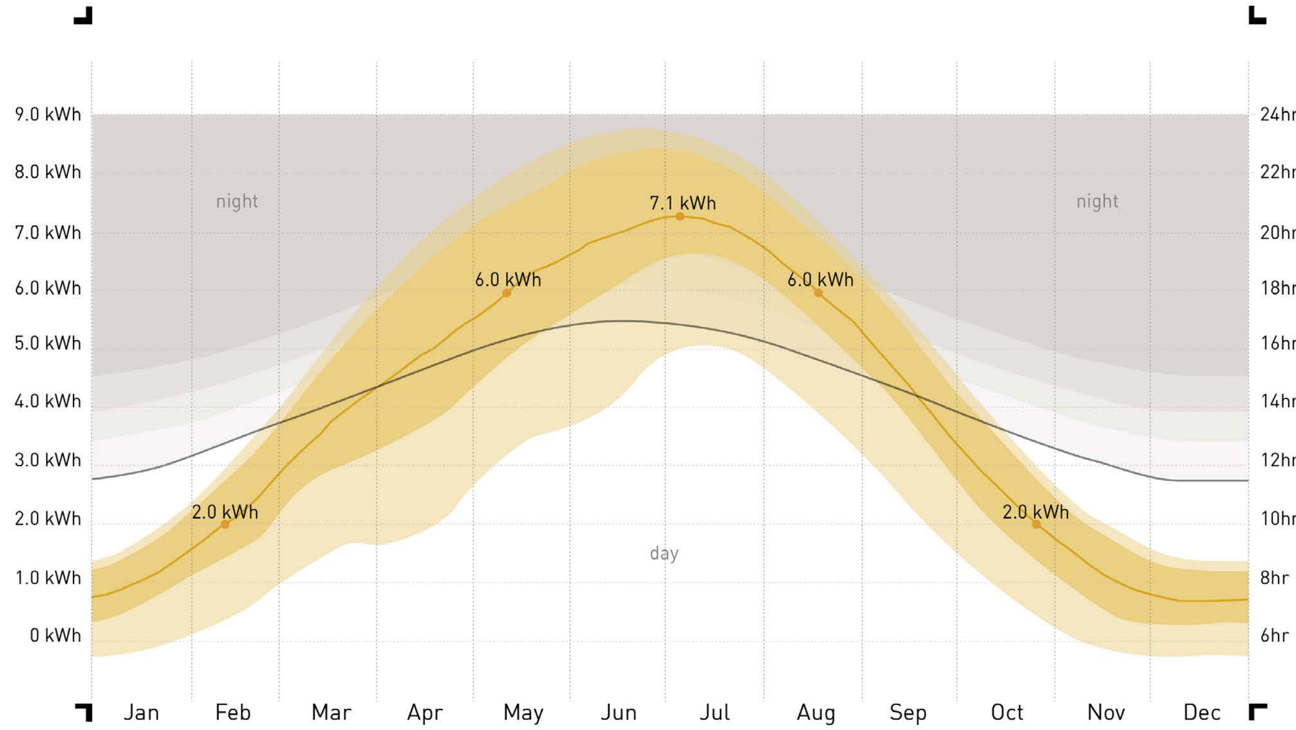
Solar energy

Sun

Solar energy in Milan

Average Daily Incident Shortwave Solar Energy in Milan (Left)

Hours of Daylight and Twilight in Milan (Right)



The average daily shortwave solar energy reaching the ground per square meter (orange line), with 25th to 75th and 10th to 90th percentile bands. The number of hours during which the Sun is visible (black line). From bottom to top (most gray), the color bands indicate: full daylight, twilight (civil, nautical, and astronomical), and full night.

Environmental Analysis

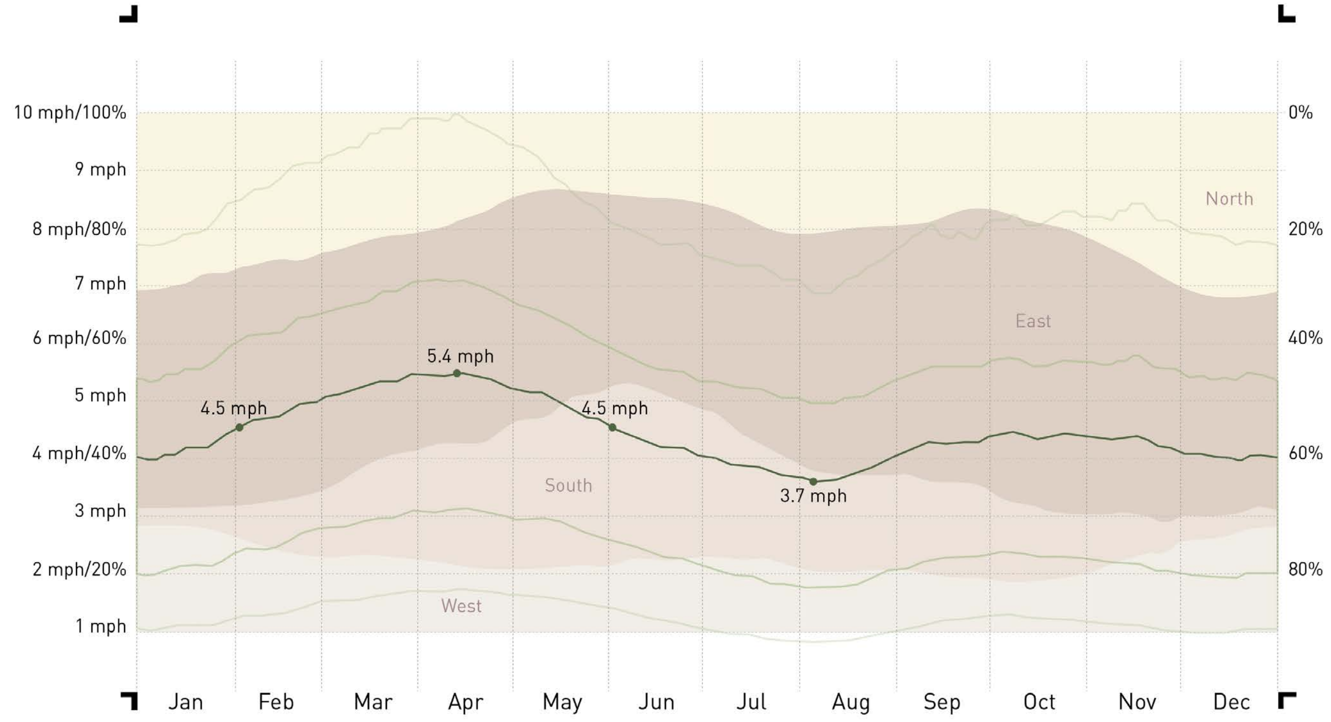
Wind

Wind

Wind speed and direction in Milan

Average Wind Speed in Milan (Left)

Wind Direction in Milan (Right)



The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands. The predominant average hourly wind direction in Milan is from the east throughout the year. The percentage of hours in which the mean wind direction is from each of the four cardinal wind directions, excluding hours in which the mean wind speed is less than 1.0 mph. The lightly tinted areas at the boundaries are the percentage of hours spent in the implied intermediate directions (northeast, southeast, southwest, and northwest).

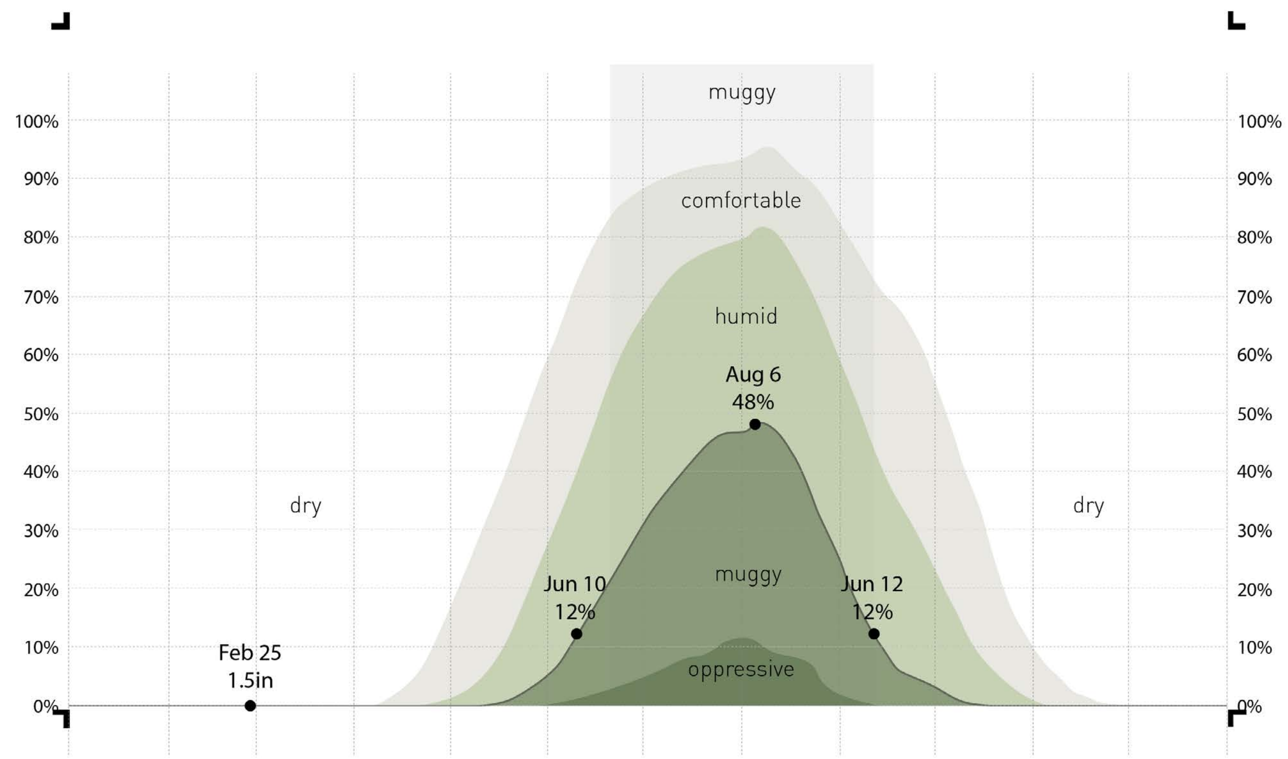
Environmental Analysis

Humidity

Humidity

Humidity Comfort Levels in Milan

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Muggy days	0.0d	0.0d	0.0d	0.0d	0.5d	5.4d	12.7d	12.3d	3.1d	0.2d	0.0d	0.0d



The muggier period of the year lasts for 3.1 months, from June 10 to September 12, during which time the comfort level is muggy, oppressive, or miserable at least 12% of the time. The month with the most muggy days in Milan is July, with 12.7 days that are muggy or worse. The least muggy day of the year is February 27, when muggy conditions are essentially unheard of.

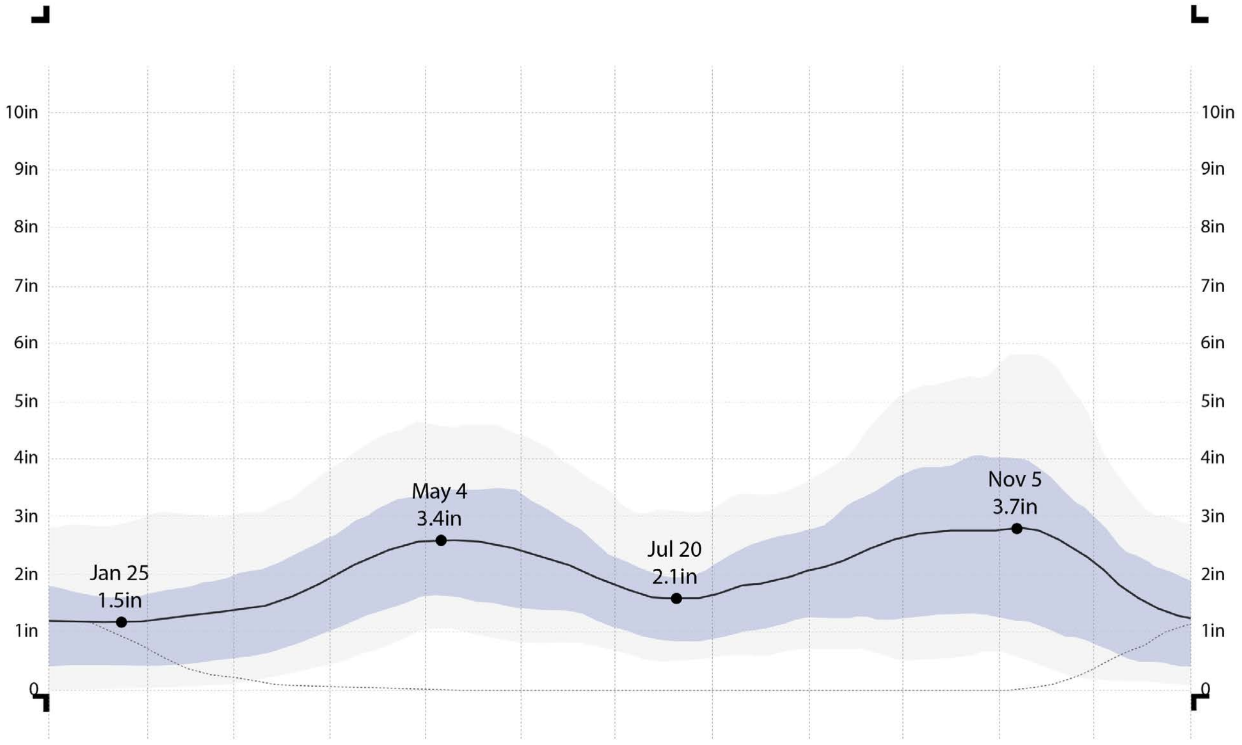
Environmental Analysis

Precipitation

Rainfall

Average Monthly Rainfall in Milan

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Rainfall	1.5"	1.7"	2.1"	3.1"	3.4"	2.8"	2.1"	2.4"	3.1"	3.7"	3.5"	1.9"

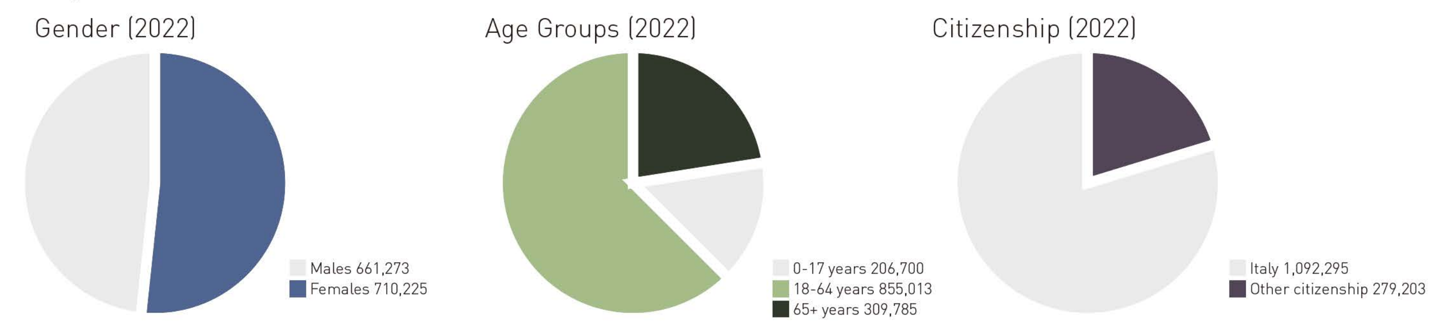


Milan experiences precipitation throughout the year. Rain falls throughout the year in Milan. The month with the most rain in Milan is October, with an average rainfall of 3.7 inches. The month with the least rain in Milan is January, with an average rainfall of 1.5 inches.
The average rainfall (solid line) accumulated over the course of a sliding 31-day period centered on the day in question, with 25th to 75th and 10th to 90th percentile bands. The thin dotted line is the corresponding average snowfall.

Zero-carbon Community

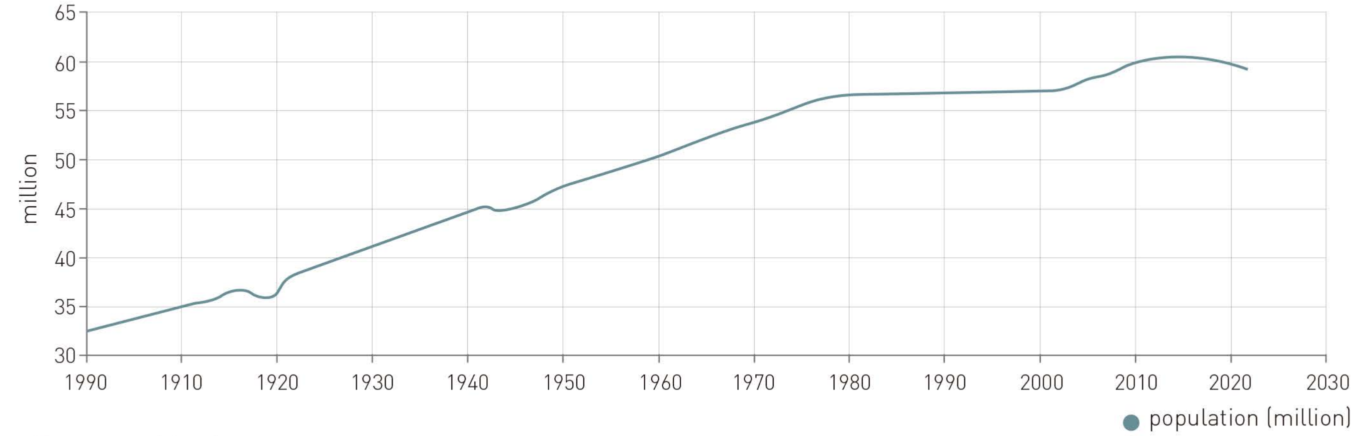
User Analysis

Population survey

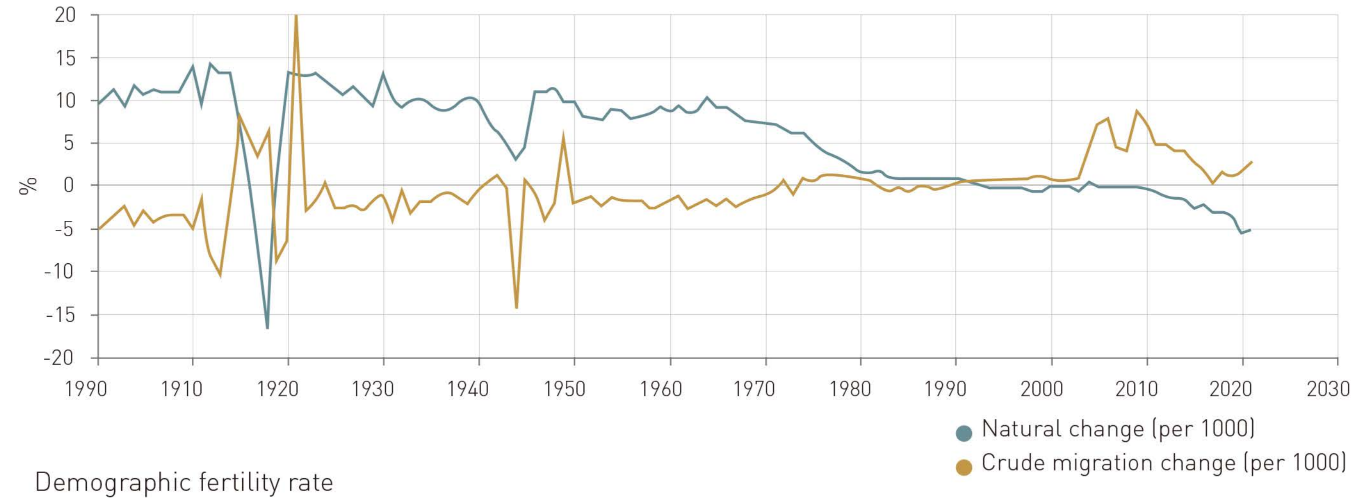


Demographics in Milano

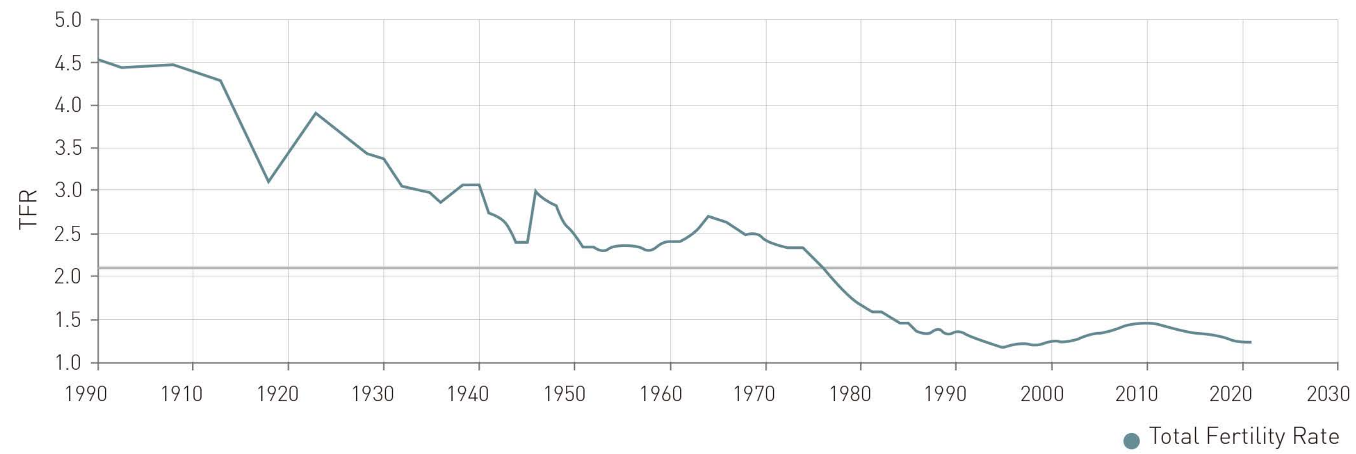
Demographic growth



Demographic change

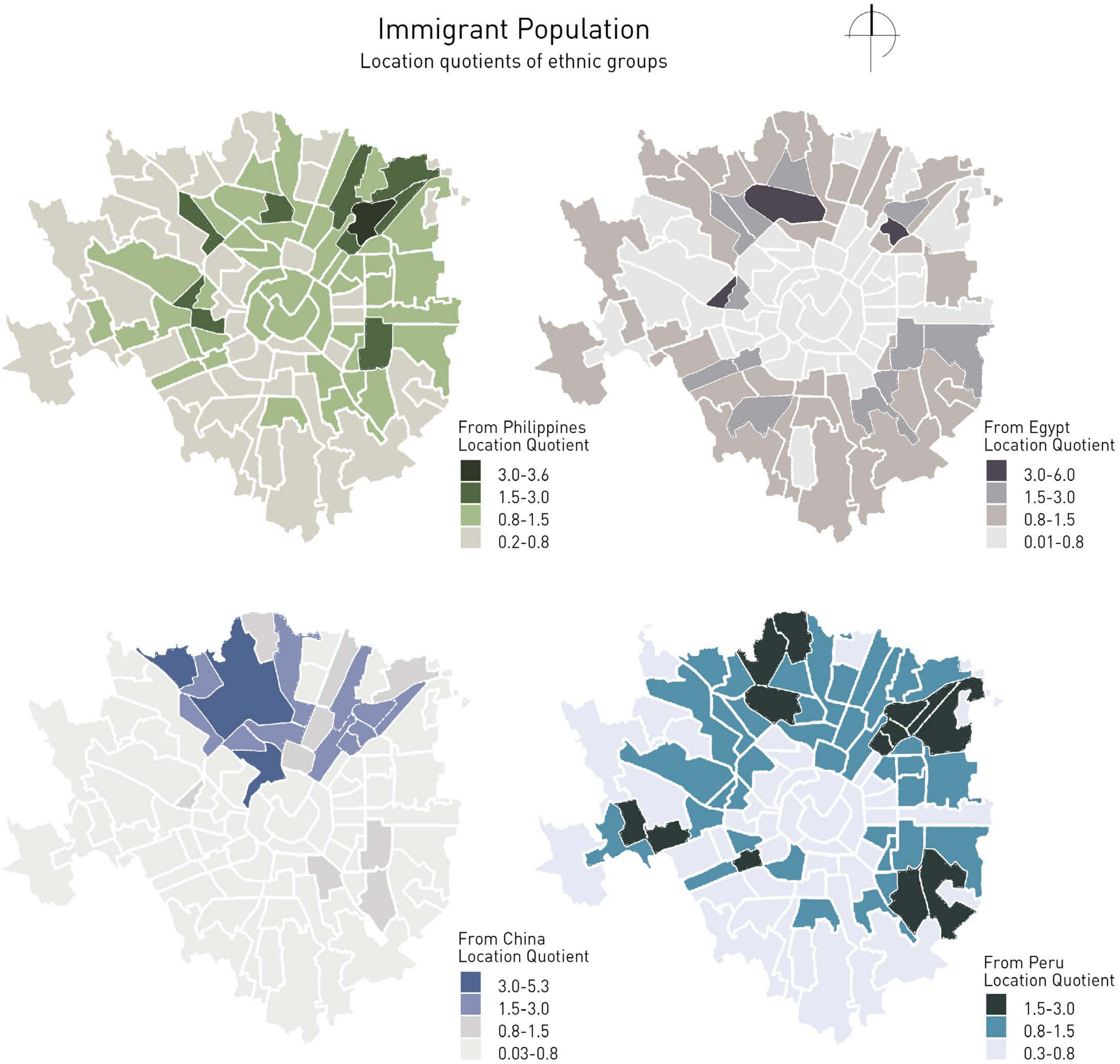


Demographic fertility rate



User Analysis

Immigration distribution



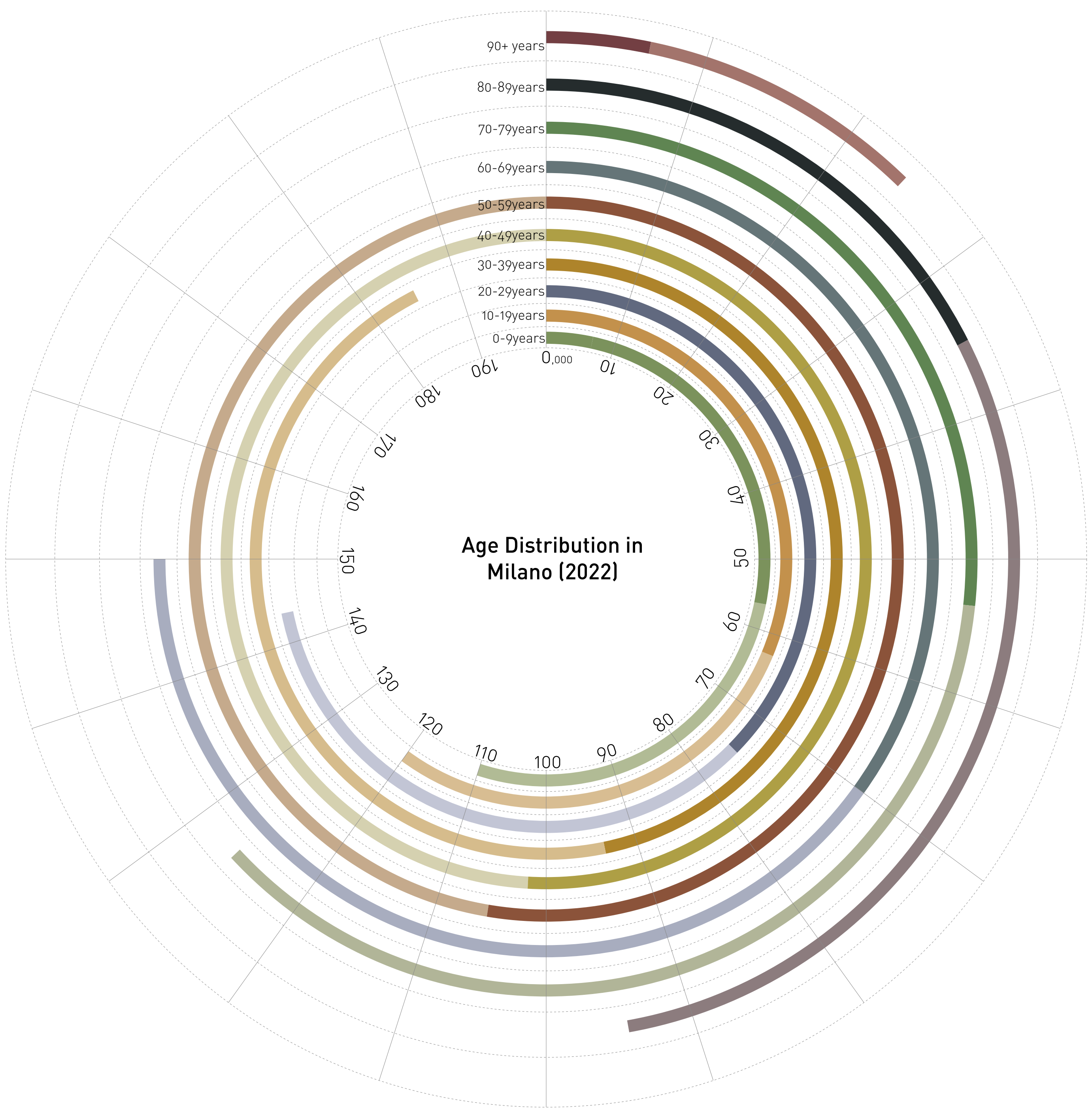
The category other African' are relatively concentrated in Selinunte, Giambellino and Corvetto, with concentrations up to 5.1.

User Analysis

African immigration distribution

User Analysis

Age distribution

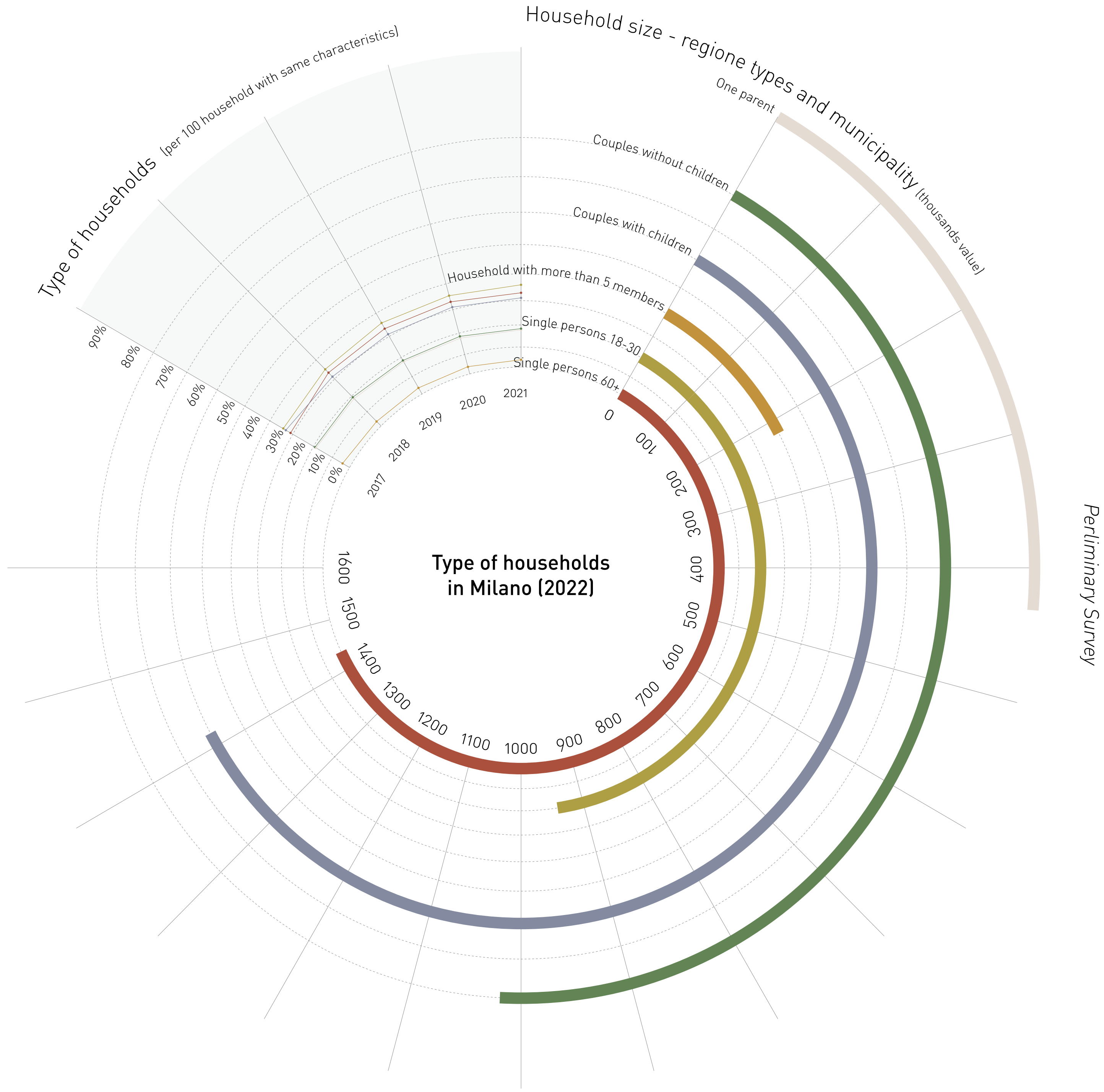


Legend:

0-9Years	10-19Years	20-29Years	30-39Years	40-49Years	50-59Years	60-69Years	70-79Years	80-89Years	90+Years
Male	Male	Male	Male	Male	Male	Male	Male	Male	Male
Female	Female	Female	Female	Female	Female	Female	Female	Female	Female

User Survey

Family structure

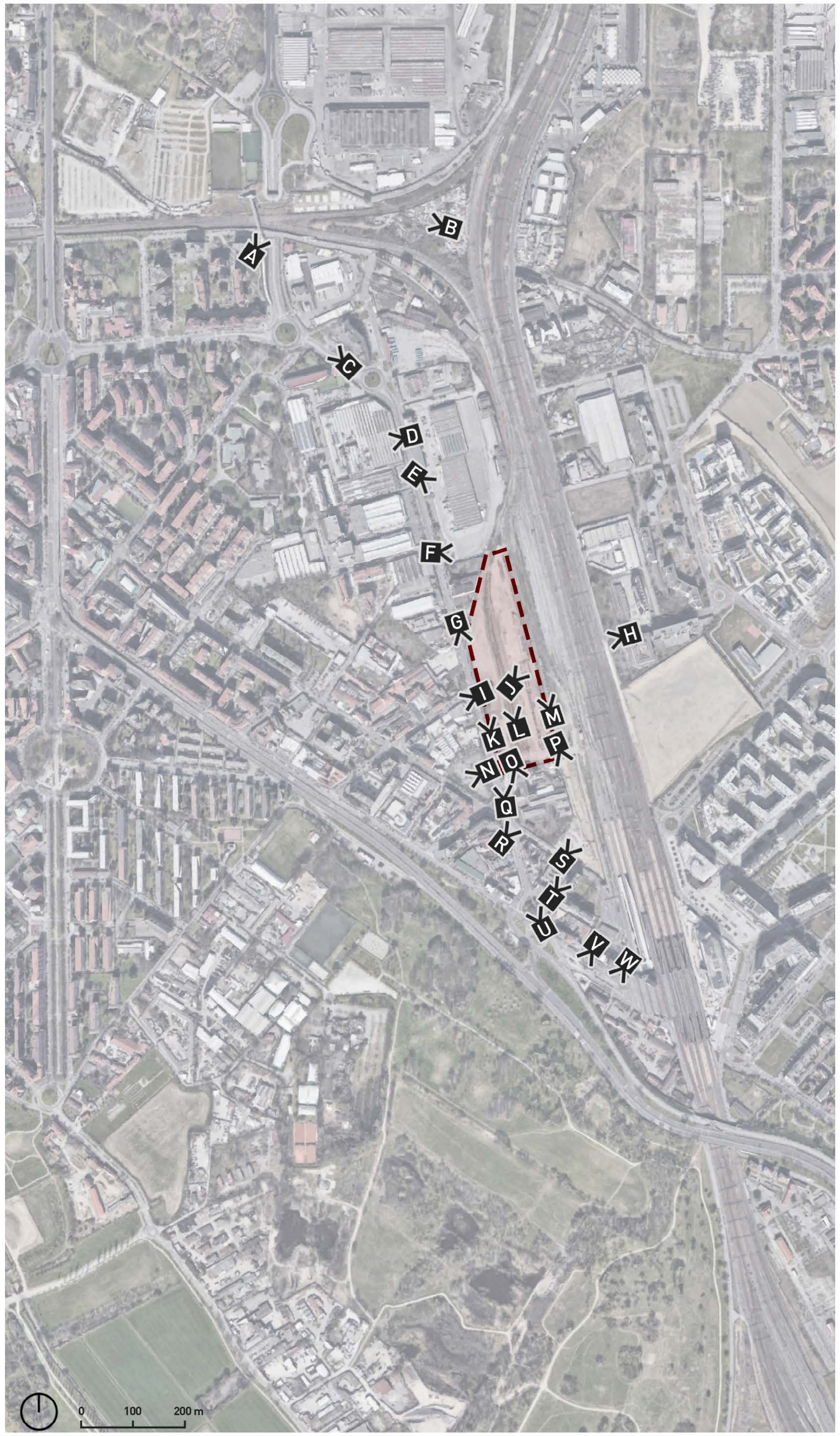


Legend:

- Single person 60+
- Single person18-30
- Household with more than 5 members
- Couples with children
- Couples without children
- One parent

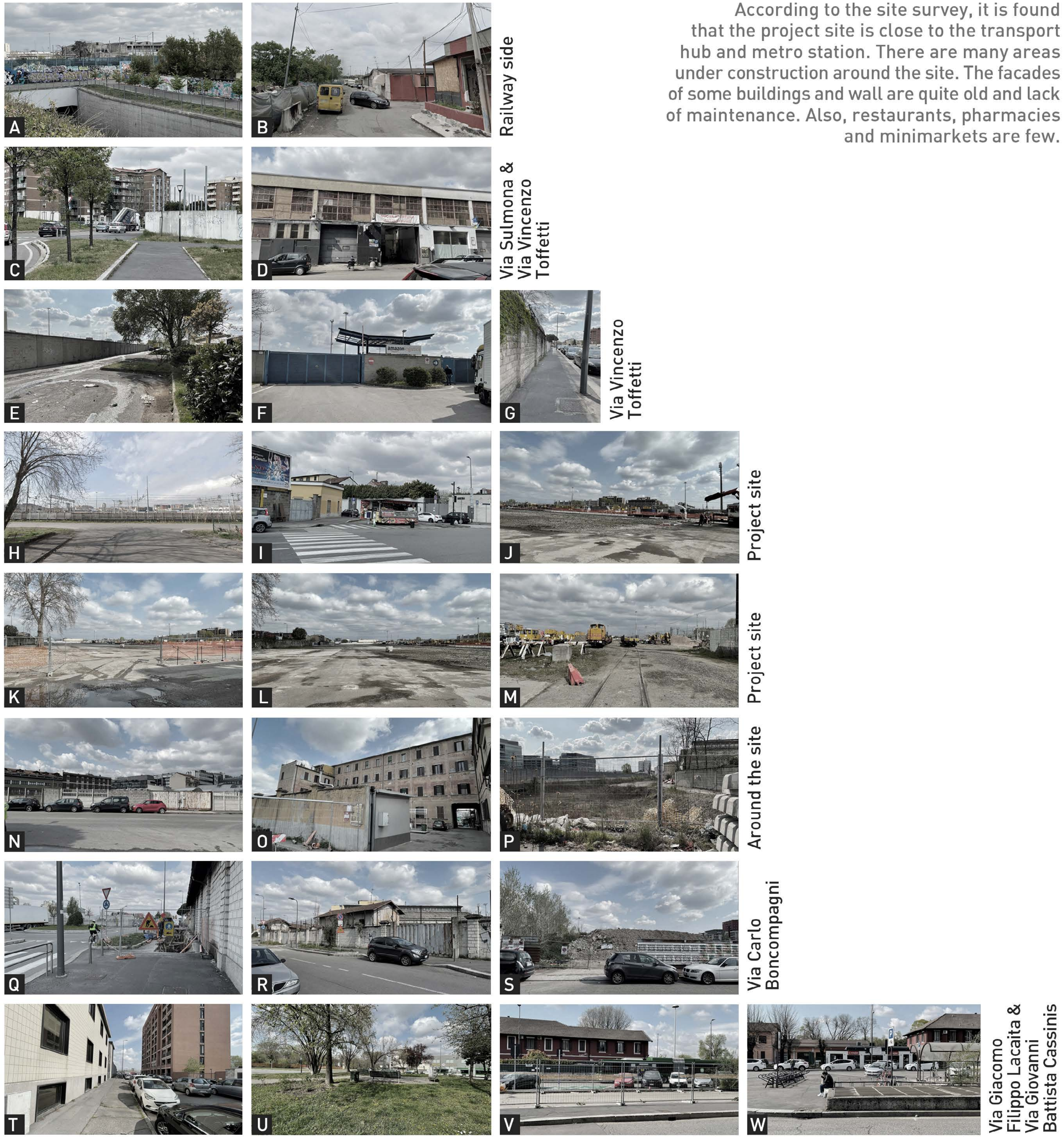
Site Survey

Mapping & Photos



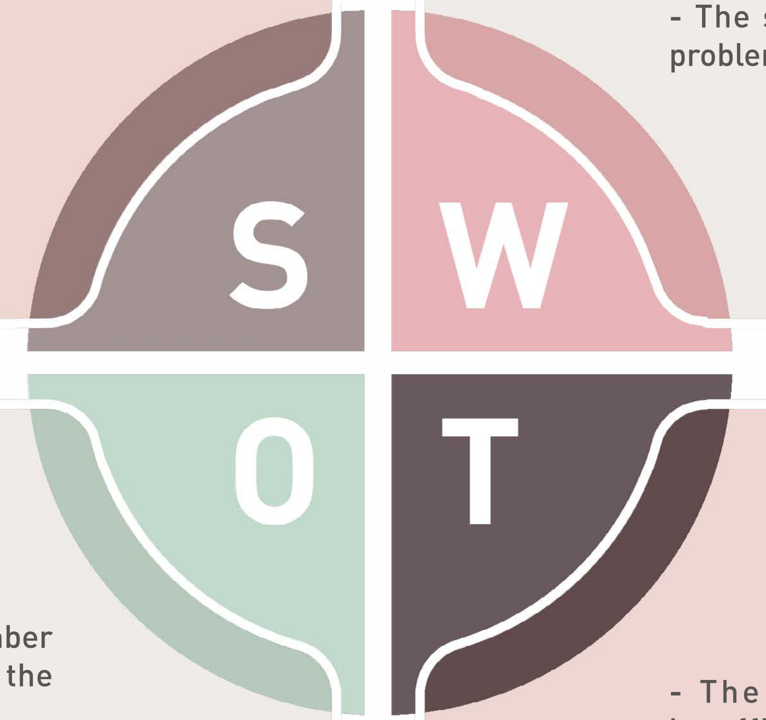
Zero-carbon Community

According to the site survey, it is found that the project site is close to the transport hub and metro station. There are many areas under construction around the site. The facades of some buildings and wall are quite old and lack of maintenance. Also, restaurants, pharmacies and minimarkets are few.



Site Survey

SWOT analysis



S

- The site is close to Rogoredo Railway Station and Metro Line 3, so the transportation is convenient.

- Rent in this area is relatively cheap and suitable for people with low incomes.

- Public services are relatively complete in the district.

W

- There are many construction areas around the site, and the environment is chaotic and unsafe.

- The quality of urban greening is poor and there is a lot of garbage.

- The facades of some buildings and walls along the street are old and lack maintenance.

- Lack of green transportation facilities.

- The site is close to the railway, so there is a problem with noise pollution.

- Lack of basic life services (restaurants, pharmacies, supermarkets, sports fields, etc.) are relatively lacking.

O

- There are immigrants in the district, and they have housing needs.

- The government plans to build a large number of residential areas in the area to improve the quality of life around.

- The harmonious coexistence of immigrants can enhance cultural diversity and enhance community identity.

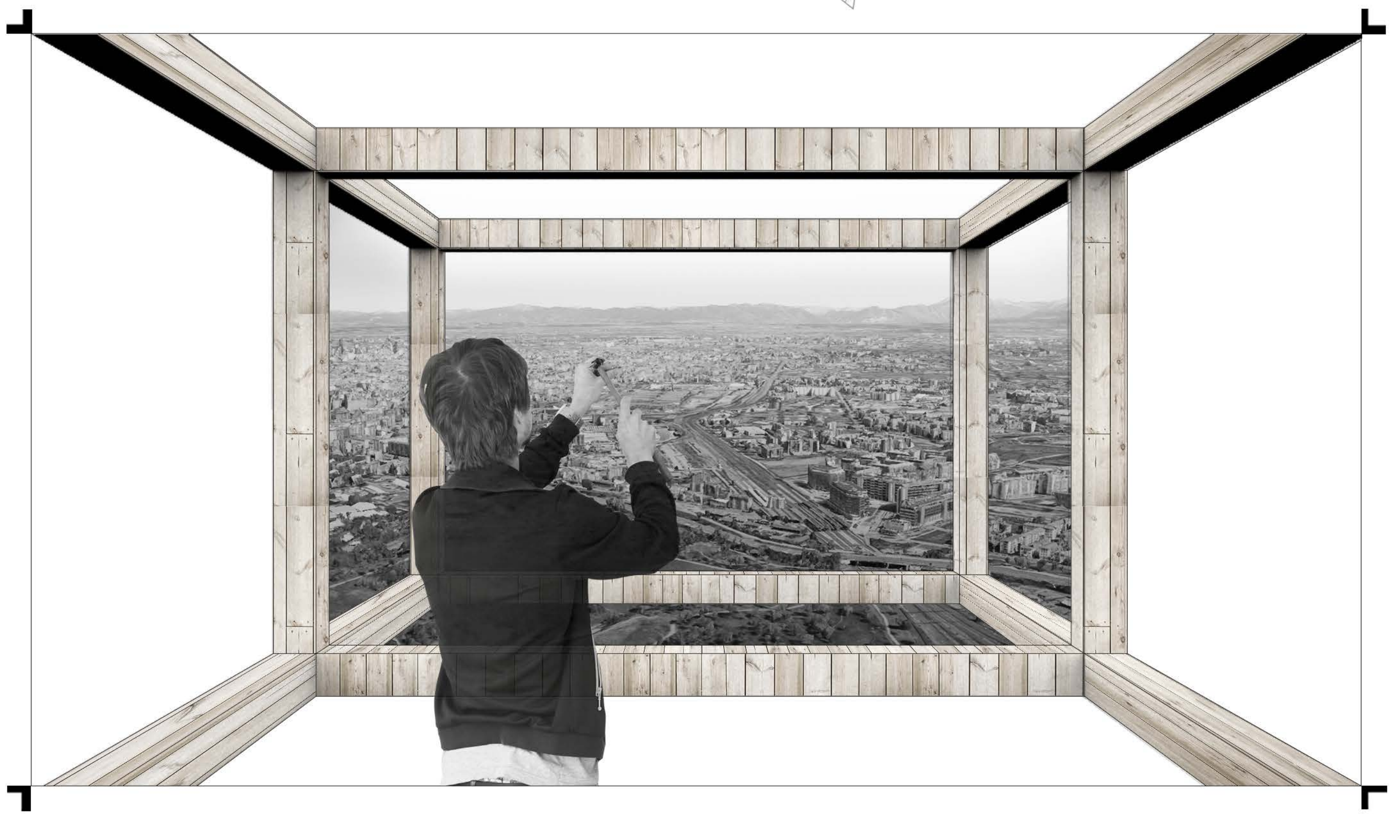
- The transformation of the area could serve as a model for future green sustainable communities.

- New co-working spaces could offer people a third alternative to working in the office or at home.

T

- The influx of immigrants can create issues of inequity, safety concerns, segregation, and more.

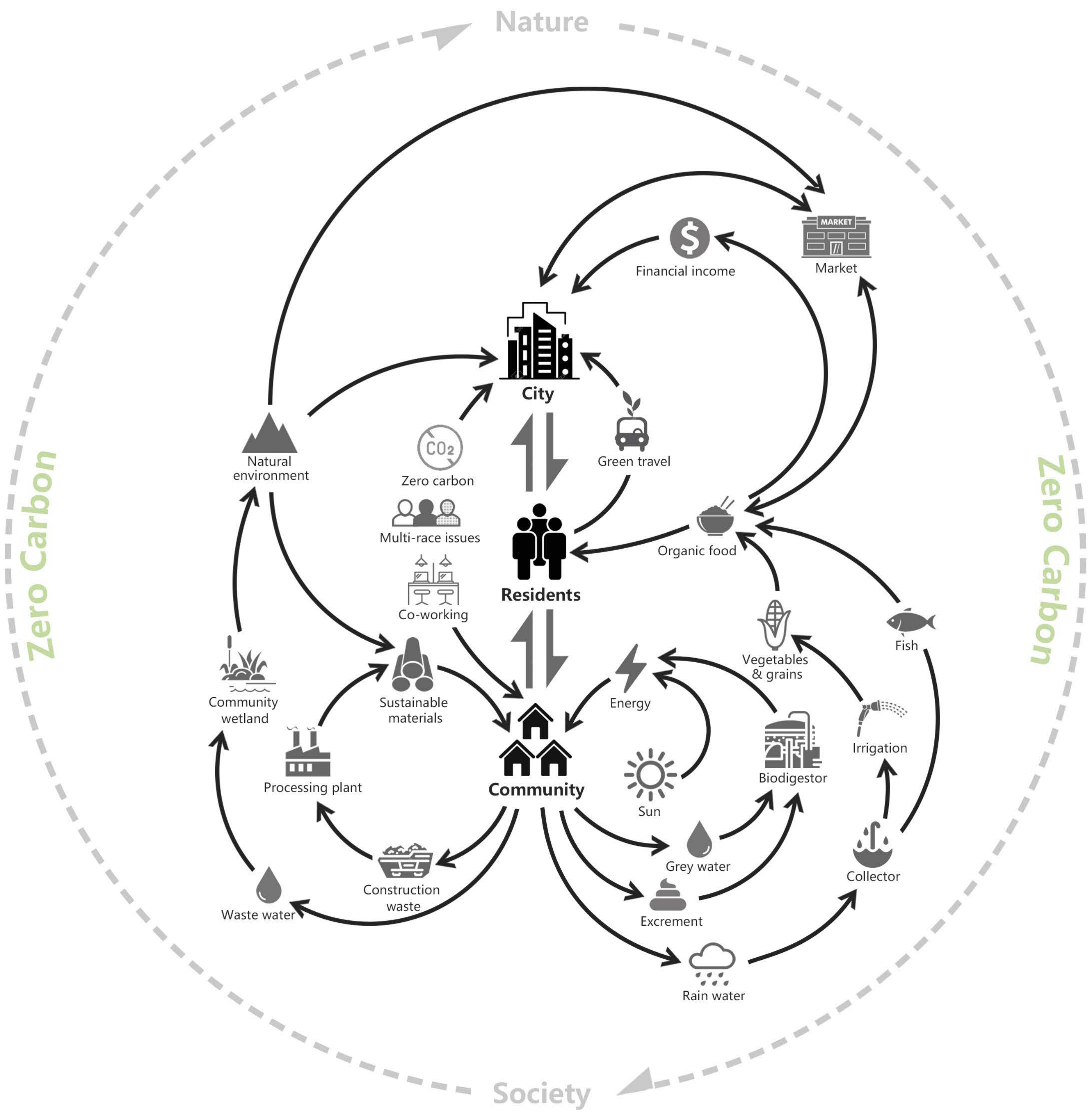
- The increase in population may lead to insufficient and uneven distribution of public resources, thereby intensifying social conflicts.



03 Design

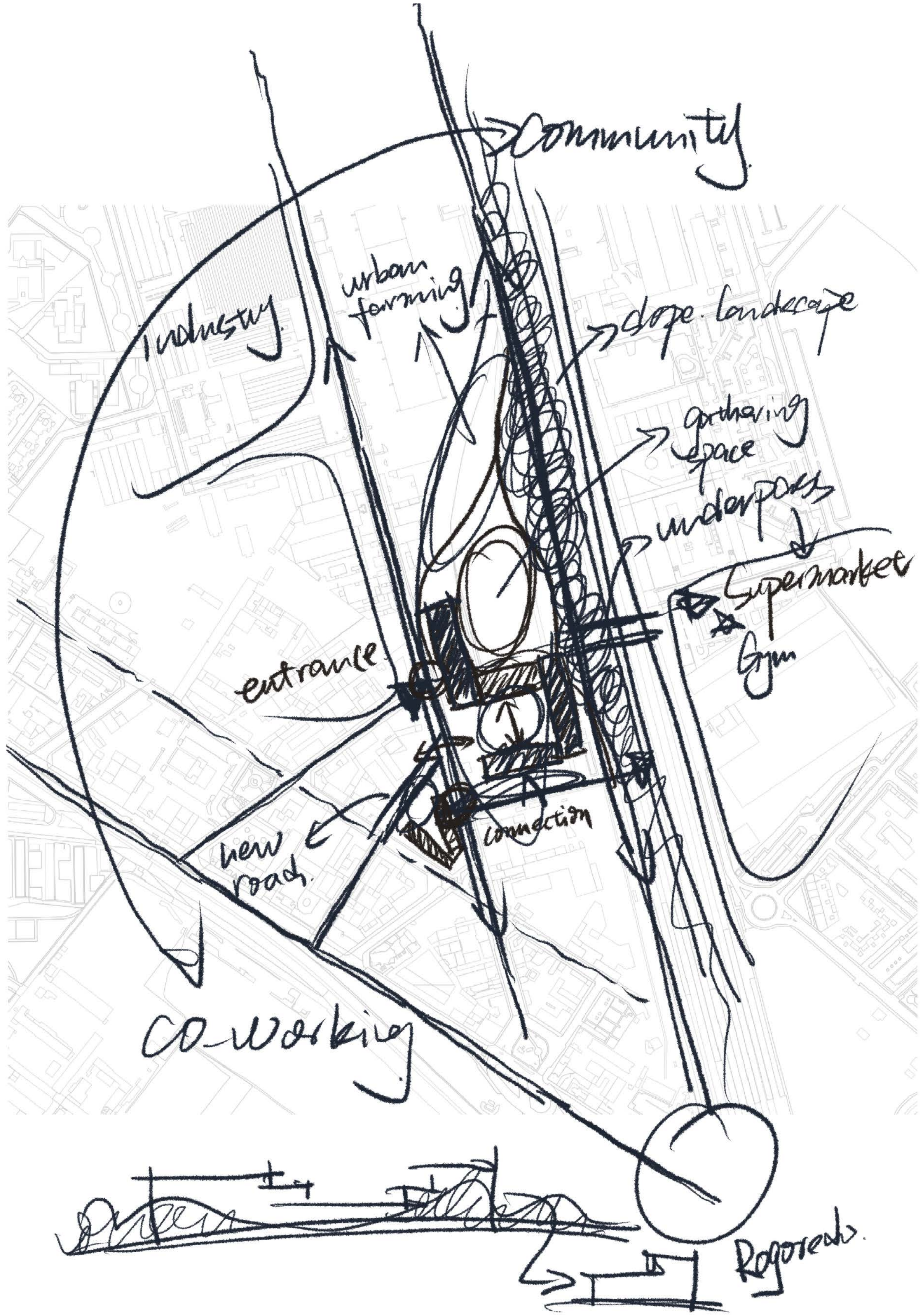
Concept
Strategy
Case Study
Design Process
Design Circle
Function List
Masterplan
Axonometric View
'Residential Community Design'
'Co-working Center'
Sustainablility

Concept



The concept of the project is to create a zero-carbon social housing community and office space that can meet the needs of different groups of people next to the Rogoredo Station. Through a more sustainable and more humane concept, designers will reinterpret the theme of collective life and the connection between the community and Milan. It is hoped that the design could be used as a prototype for future social development, so that society and nature can coexist in harmony.

Strategy



Case Study

Blatchford Project

A new landmark development in the City of Edmonton, Blatchford is a sustainable live-work community that uses 100% renewable energy, aims to be carbon neutral and encourages a suatainable lifestyle. Built on the 536-acre site of a former municipal airport in the heart of Edmonton, the community uses innovative systems to a achieve environment, social and economic benefits.

The primary goal of the Blatchford project is to develop a carbon neutral community using 100% renewable energy. The district energy sharings system can reduce overall energy consumption by 15%-20% once the community is fully built. And GHG emissions from homes and buildings will be about 75% less than a traditional neighbourhood, saving about 30,000 tonnes of GHG annually at full build out. The project is expected to realize significant economic benefits as well, and is projected to make over $ 200 million in profit that can be reinvested in Edmonton.

Aims:

1. **Environmental sustainability** includes freen construction and building standards, low impact development storm water management, district energy sharing system.

2. **Social sustainability** includes meeting daily needs, affordable housing, high quality public realm, safe transportation options.

3. **Economic sustainability** includes employment opportunities, leveraging existing and surrounding infrastructure, positive net revenue.

Zero-carbon Community

Design

The primary challenge facing the project is the housing market. A soft market in Edmonton in recent years combined with unemployment and lasting economic effects from the COVID-19 pandemic create uncertainties for the future of real estate. This project will enhance the flexibility to adapt to changes in the economy, community needs and sustainable technologies well into the future.

What can we learn

We can draw on features such as the neighborhood's high-performance building envelope and efficient energy system. They use significantly less energy for heating, cooling and hot water. The site is located ar the public transport node, similar to our chosen location, and can be used as a sample for studying green travel. Mixd-use communities foster interaction and a sense of community. Employment in the community will contribute to its economic sustainability.

Case Study

La Borda Housing Cooperative

Sustainable housing enhancing the participation of the users.

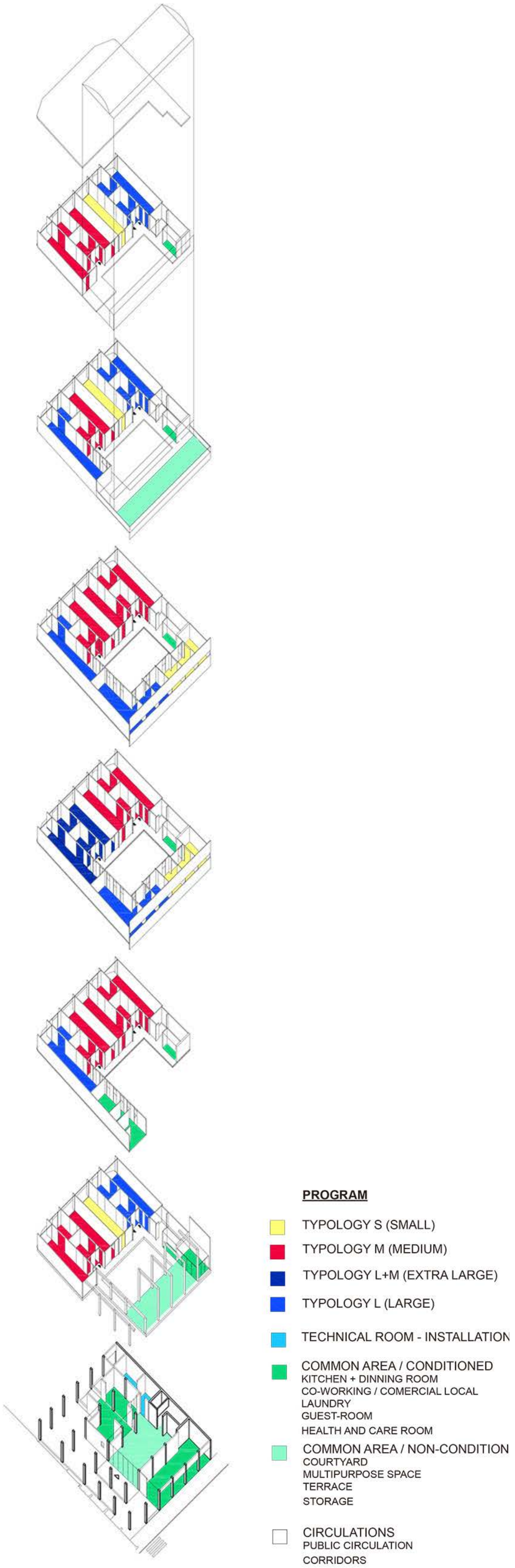
La Borda housing cooperative is a development self-organized by its users to access decent, non-speculative housing that places its use value in the center, through a collective structure. (P1)

The project follows "Three fundamental and cross-sectional principles"

1. Redefine the collective housing program

The building program proposes 28 units (40, 60 and 75 ㎡) and community spaces that allow stretching the fact of living, from the private space to the public space to enhance the community life. (P2)

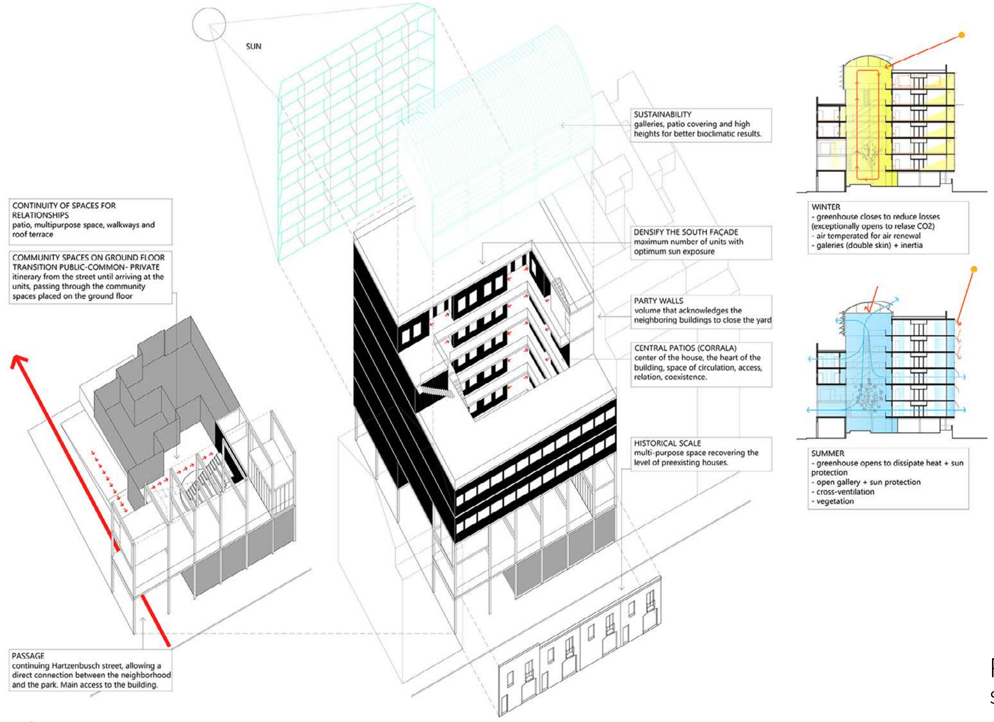
P1. External view of the building



P2. Combination of the living units and the community spaces

2. Sustainability and environmental quality

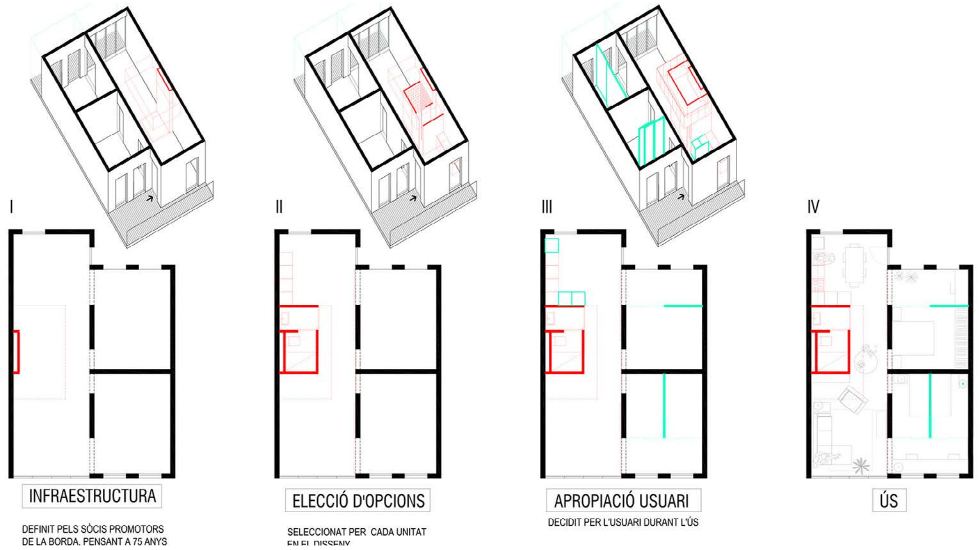
The goal of the design is to minimize potential environmental impacts during construction and use, create comfortable living spaces with minimal energy, reduce the overall cost of living, and eliminate energy poverty for occupants.(P3)



P3. Environmental strategy analysis

2. User participation

Self-referral and the attendant management of assemblies means that future users need to be involved in the design, build and use phases, which are the most important and unique variables of the project, providing opportunities for people to engage with the project and communicate specific needs. (P4)



P4. Different uses of the living units

What can we learn

The aspects of the Spanish social housing program that are worthy of reference are the redefinition of collective housing and the use of sustainable means to enhance the quality of the environment. For the residential aspect the combination of residential and communal units and the changeable spatial pattern within the residential units; for the sustainable aspect the priority is given to passive strategies, such as passive shading devices, in order to achieve the maximum use of available resources.

Case Study

Transformation of 530 dwellings

The project involves the transformation of three social housing buildings comprising 530 housing units(P1). Built in the early 1960s, their renovation was necessary, after the demolition was finally dismissed. The transformation of housing, in occupied site, from inside, and by the addition of winter gardens and balconies, offers to each housing of new qualities: **more space**, **more natural light**, **sight and improved services**.

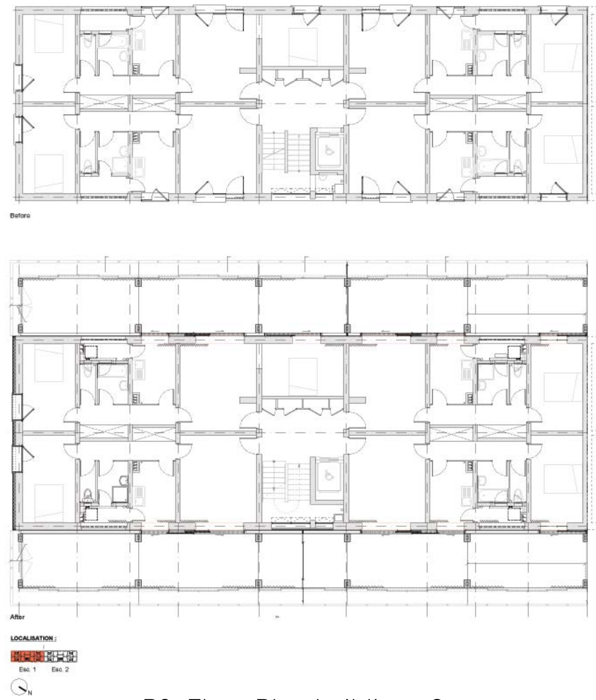
P1. Buildings after transformation

P1. Buildings before transformation

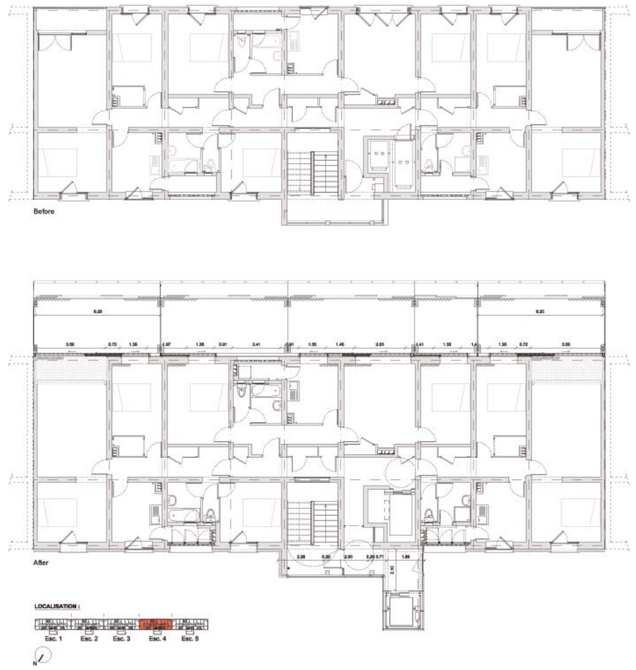
The transformation gives to all dwellings new qualities of space and living, by inventorying very precisely the existing qualities that should be preserved, and what is missing that must be supplemented.
The addition of large winter gardens and balconies in extension of the existing give the opportunity, for each apartment, to enjoy more space, more natural light, more mobility of use and more views.(P2)

P2. AXO/Project

While the high-rise buildings for luxury housing are now designated as examples of ecological housing, the G, H and I buildings(P3) offer the opportunity to reach these qualities immediately, in a generous, economic and sustainable way.
The project excludes interventions on the existing structure, stairs or floors, and proceeds by additions and extensions, large enough to be fully used. Inside the flats, only refurbishment of facilities or finishes has been done.

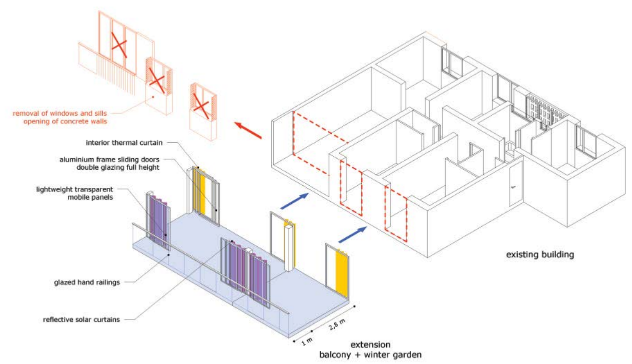


P3. Floor Plan buildings G



P3. Floor Plan buildings H,I

The existing small windows are replaced by large glazed sliding doors opening onto the winter garden(P4).
The extensions of 3,80m deep widen the space of use and the mobility through large glazed sliding doors connecting every room to the winter garden, offering, as in a house, a pleasant private semi outdoor space.
The energetic performance of the building envelope is highly improved by the addition of winter gardens which act as passive solar collectors.



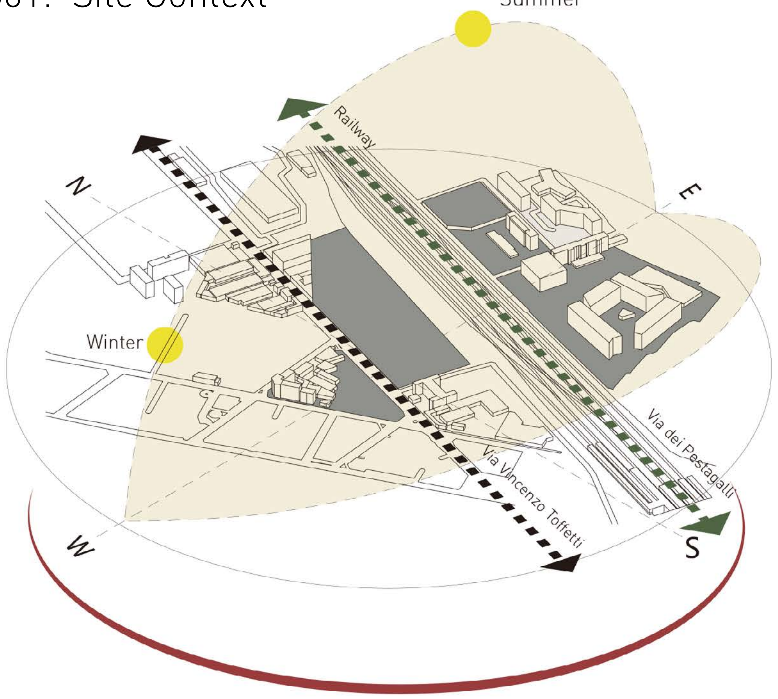
P4. Extension principle

What can we learn

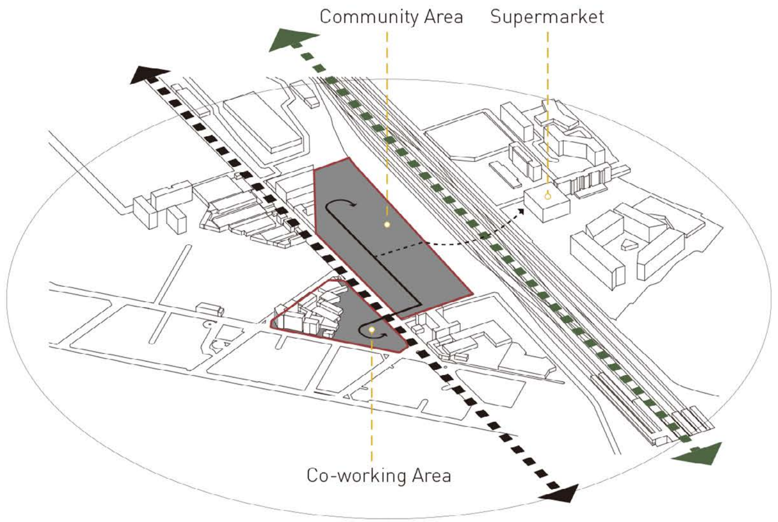
The informative aspect of the project is the way in which the renovation has promoted the opportunity for each apartment to enjoy more space, more natural light, more mobility of use and more views. The winter garden treatment provides active private semi-outdoor space for all apartment types and adds to act as a passive solar collector.

Design Process

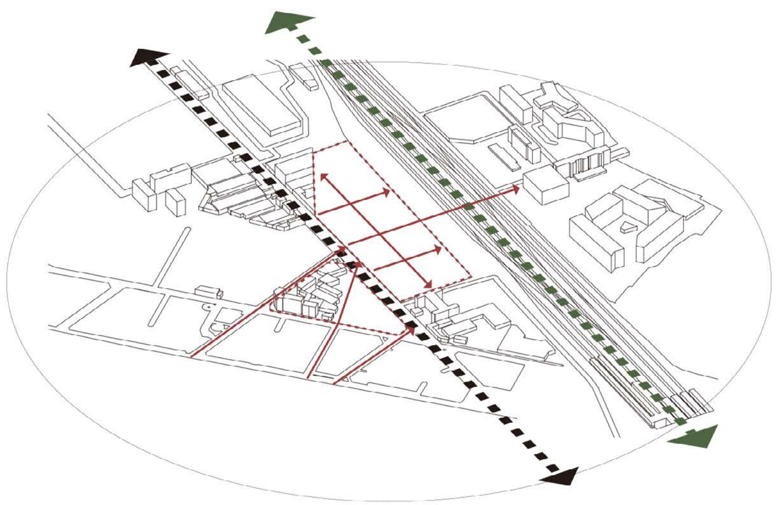
Step01: Site Context



Step02: Establish site connection



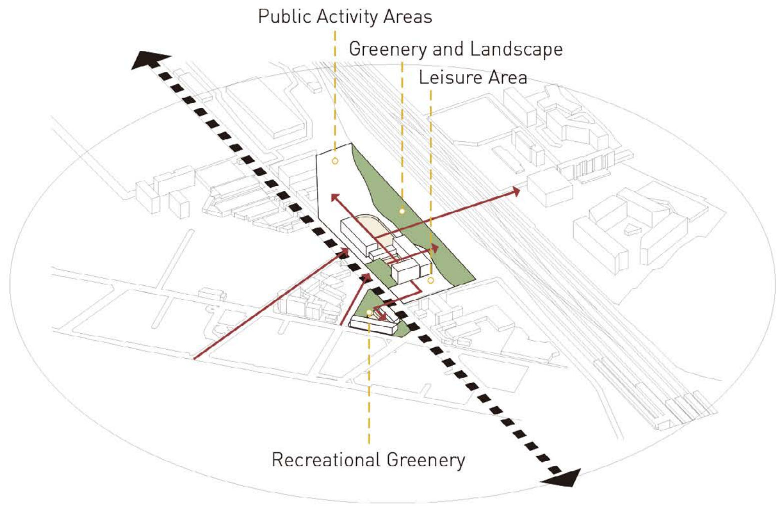
Step03: Massing and limited boundary for site



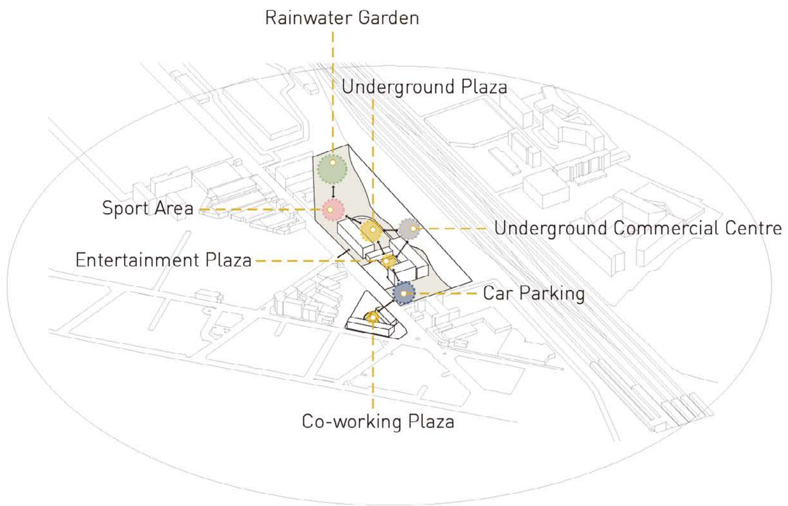
Zero-carbon Community

Design

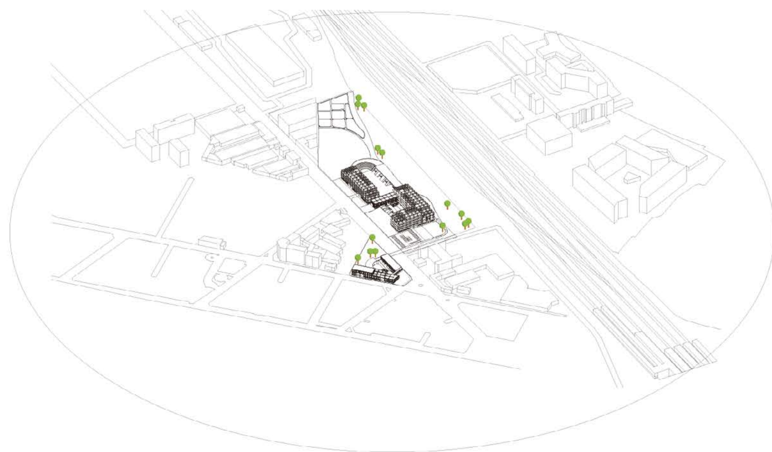
Step04: Volid and solid volume



Step05: Streamline system: connection and entrance



Step06: Derailed buildings

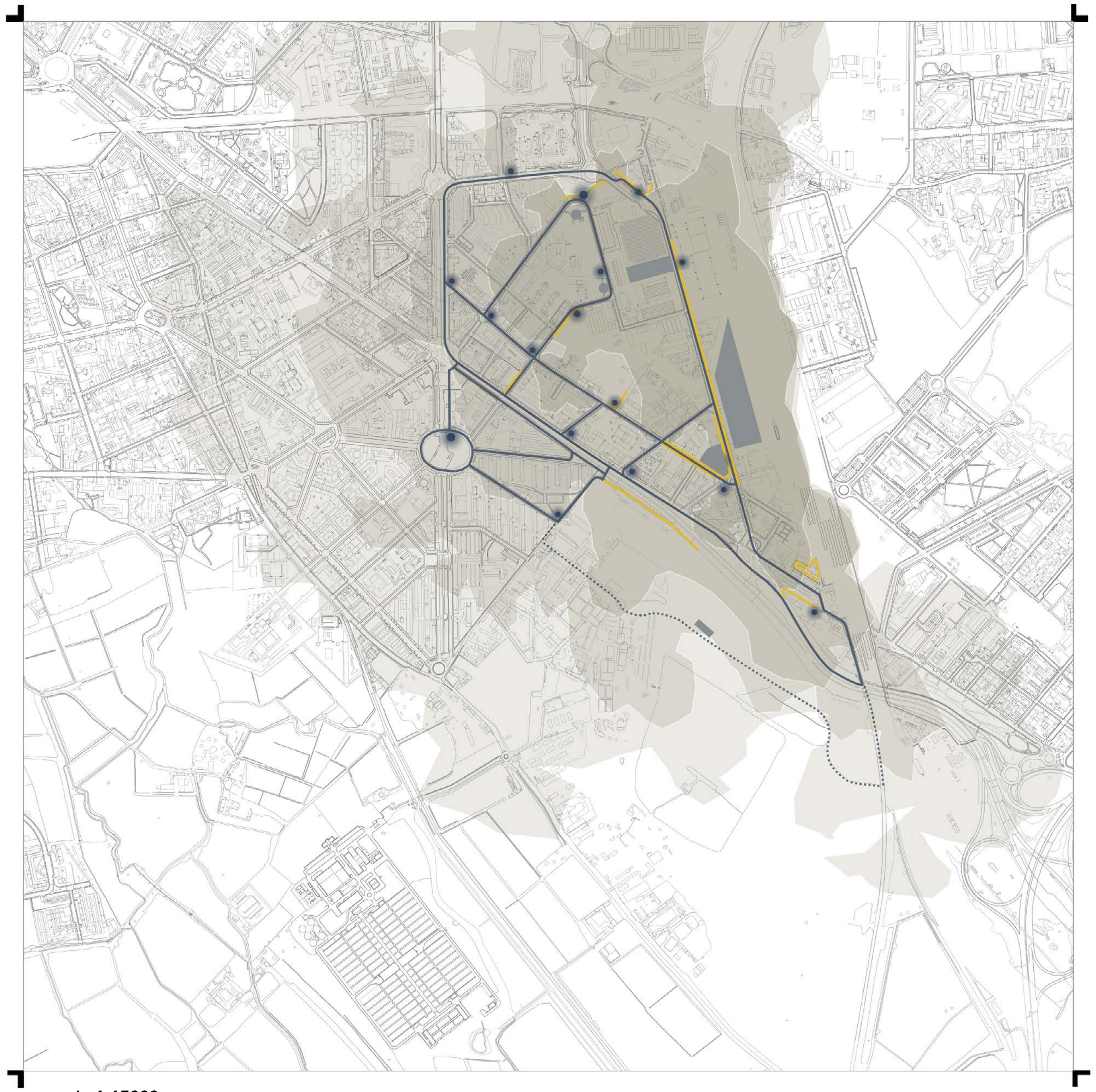


Design Circle

Design Circle

Insert the subtitle you wish, just need to be centered

In order to promote green travel to achieve the zero carbon emission target, three interventions are being used at this stage to achieve the target.



scale 1:15000

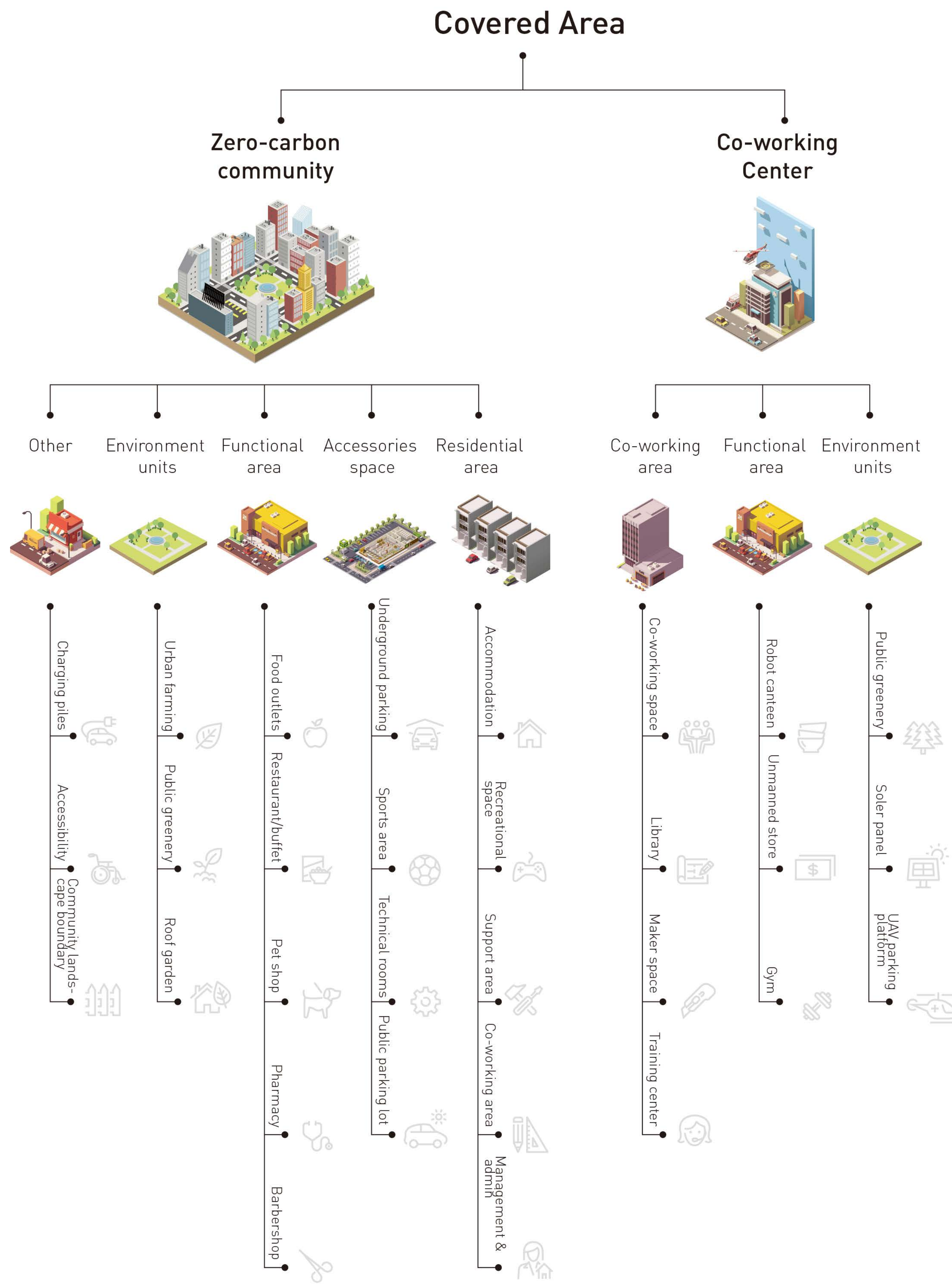
1. First is to improve the cycling system by increasing the number of shared bicycle spots and planning complete cycle paths.
2. Secondly, to encourage the development of new energy vehicles by add more charging facilities.
3. Thirdly, in the context of the Covid, work-life patterns are changing and new models of co-working are being tried.

Legends:

- Co-working area
- New Energy Vehicles charging post
- Bike spot
- Bick paths
- 10-min living circle
- 15-min living circle
- 20-min living circle
- 25-min living circle

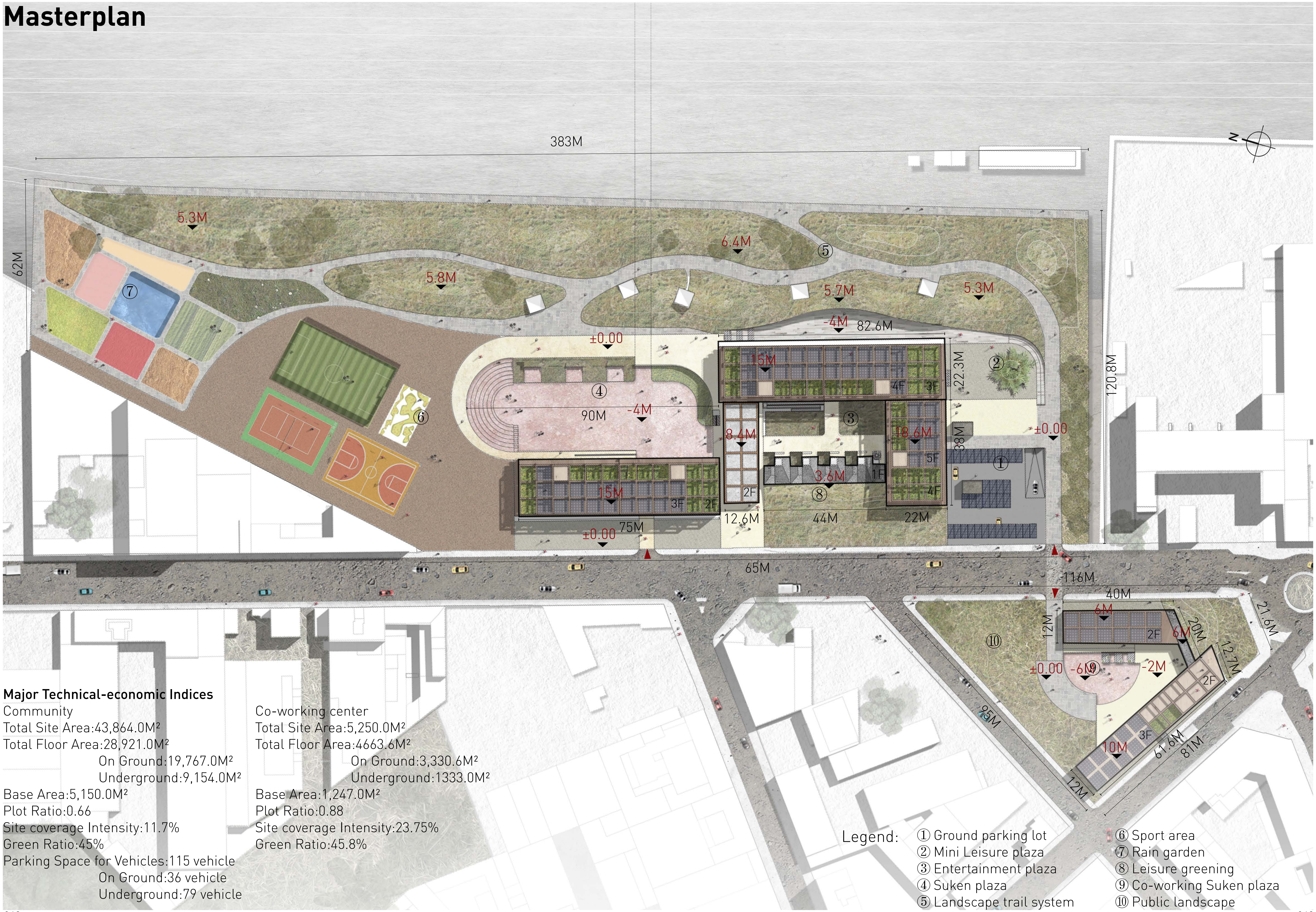
Zero-carbon Community

Function List



Zero-carbon Community

Masterplan



Major Technical-economic Indices

Community
Total Site Area:43,864.0M²
Total Floor Area:28,921.0M²
On Ground:19,767.0M²
Underground:9,154.0M²
Base Area:5,150.0M²
Plot Ratio:0.66
Site coverage Intensity:11.7%
Green Ratio:45%
Parking Space for Vehicles:115 vehicle
On Ground:36 vehicle
Underground:79 vehicle

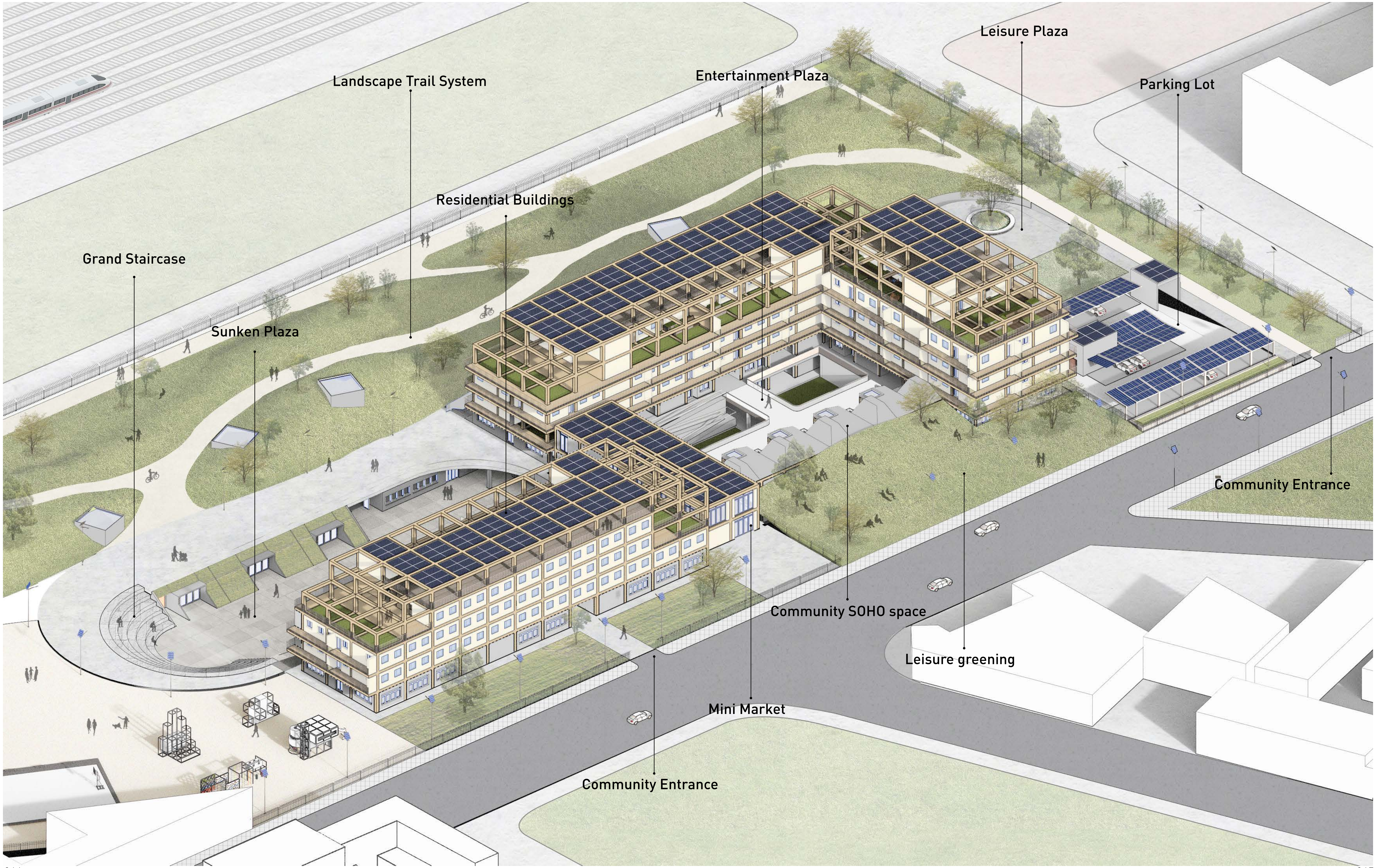
Co-working center
Total Site Area:5,250.0M²
Total Floor Area:4663.6M²
On Ground:3,330.6M²
Underground:1333.0M²
Base Area:1,247.0M²
Plot Ratio:0.88
Site coverage Intensity:23.75%
Green Ratio:45.8%

Legend:
① Ground parking lot
② Mini Leisure plaza
③ Entertainment plaza
④ Suken plaza
⑤ Landscape trail system
⑥ Sport area
⑦ Rain garden
⑧ Leisure greening
⑨ Co-working Suken plaza
⑩ Public landscape

Design

Zero-carbon Community

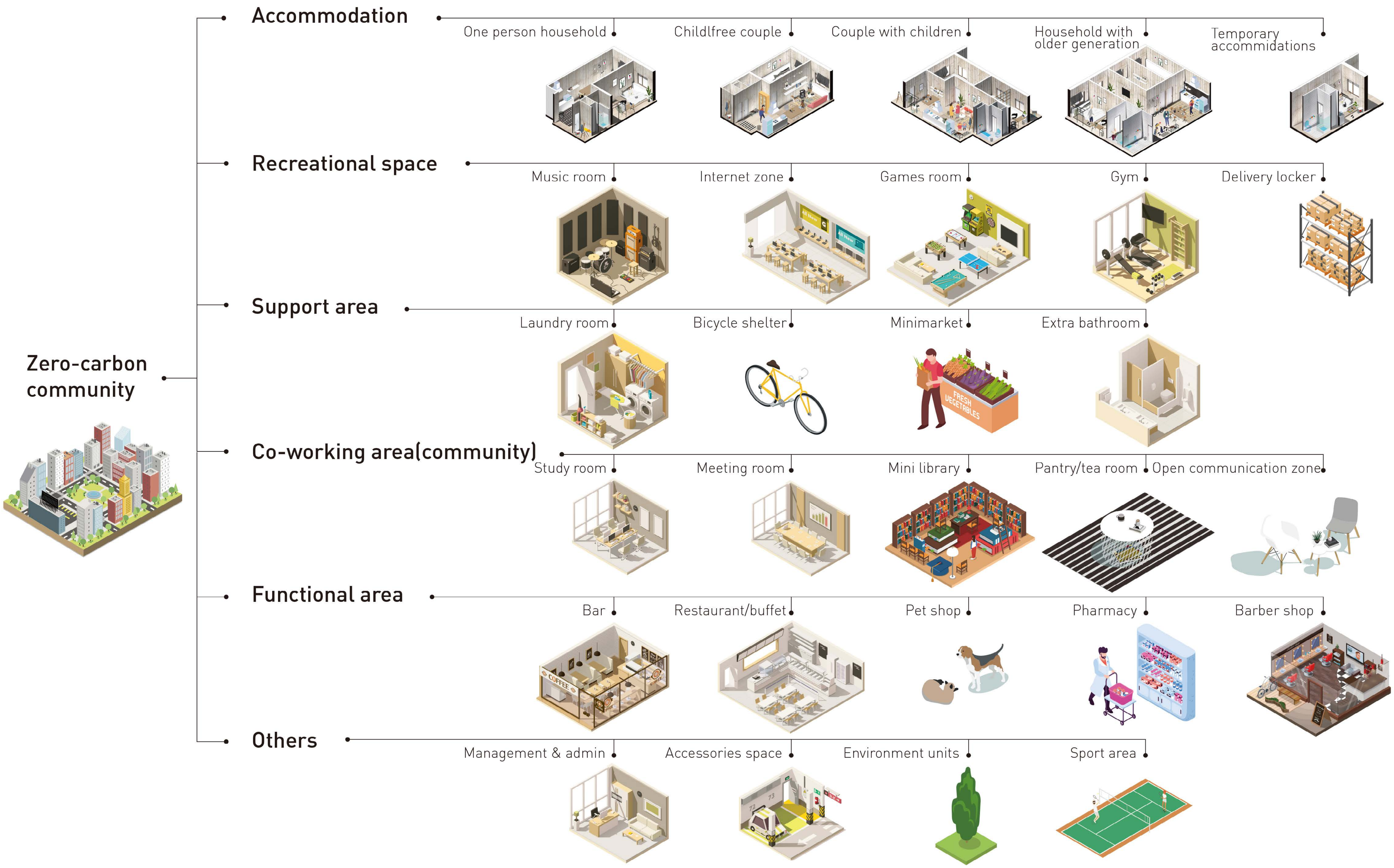
Axonometric View



Design

'Residential Community Design'

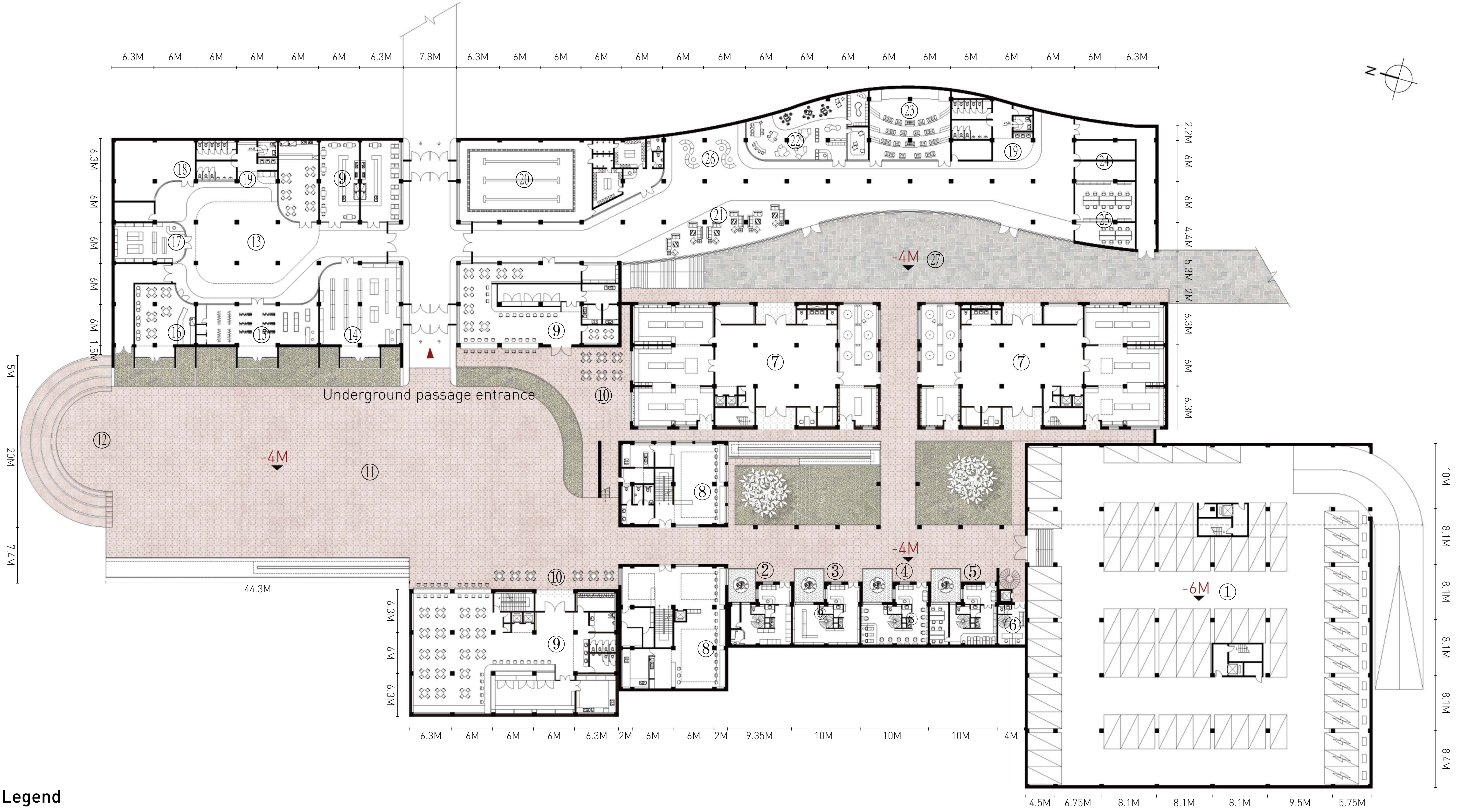
Functions



Zero-carbon Community

'Residential Community Design'

Underground floor plan



Legend

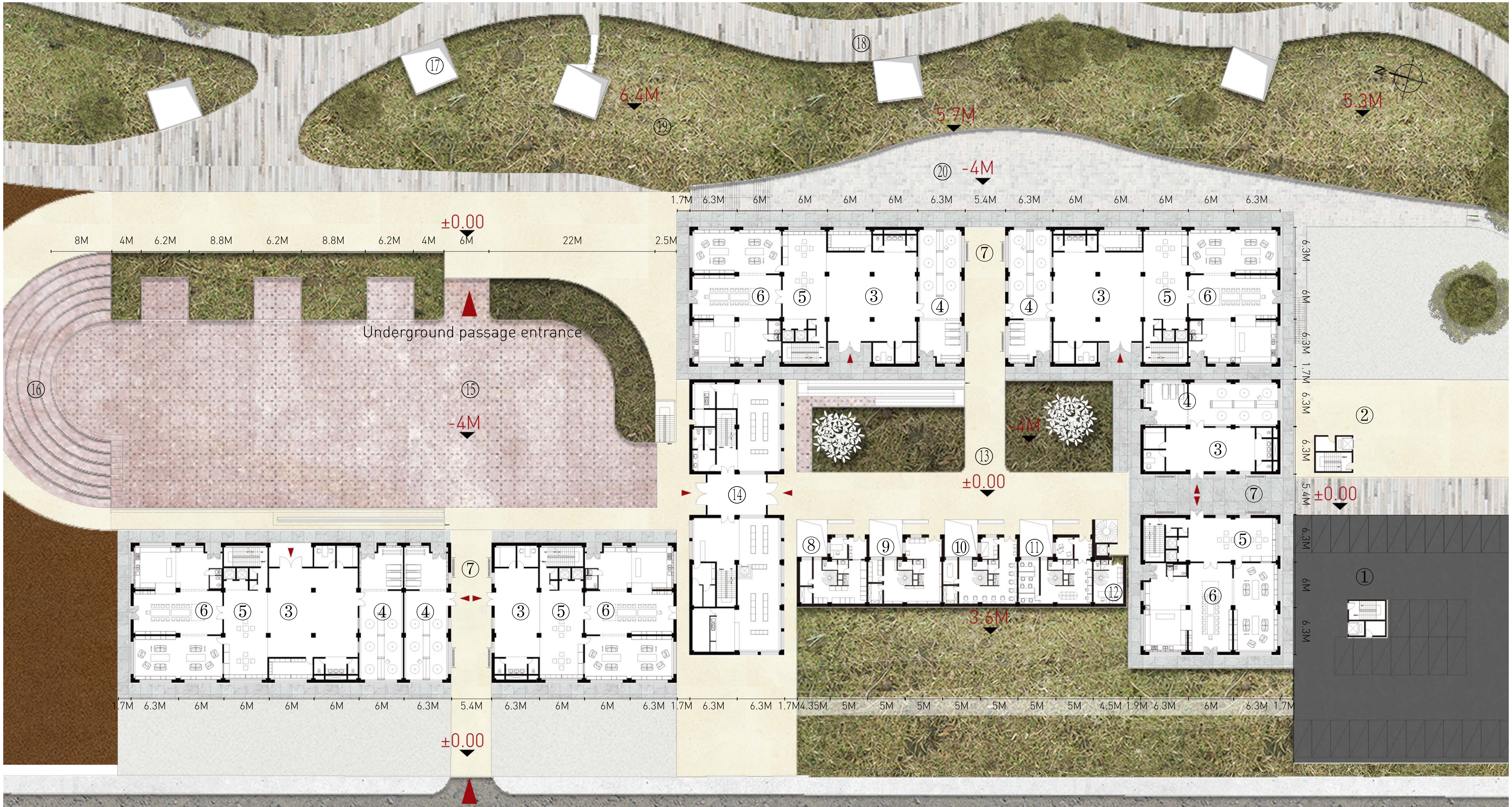
Community part:

① Underground parking lot
② Pet store
③ Mini pharmacy
④ Barbershop
⑤ Day nursery
⑥ Manager's office
⑦ Residential underground store
⑧ Underground court
⑨ Restaurant
⑩ Outdoor dining area
⑪ Sunken plaza
⑫ Grand staircase
⑬ Underground commercial centre
⑭ Retail
⑮ Clothing shops
⑯ Café
⑰ Electrical shops
⑱ Facilities management office
⑲ Toilet
⑳ Indoor swimming pool
㉑ Indoor leisure zone
㉒ Parent-child workshop
㉓ Mini cinema
㉔ Equipment room
㉕ Activity room
㉖ Children's activity zone
㉗ Community life plaza

Zero-carbon Community

'Residential Community Design'

Ground floor plan



Design

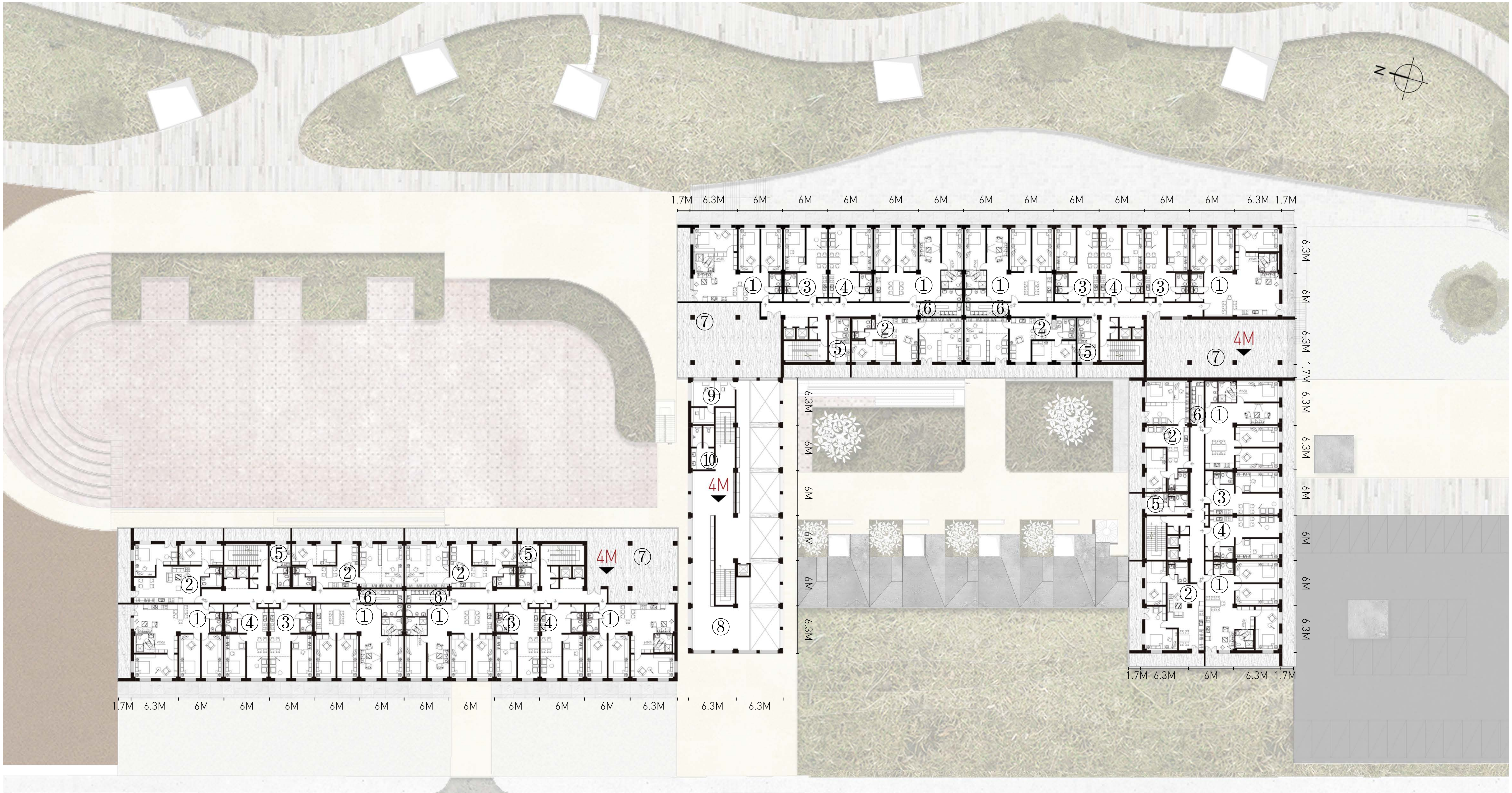
Legend

Community part:

① Parking lot
② Leisure plaza
③ Lobby
④ Unit multifunctional area
⑤ Open communication area
⑥ Unit co-working area
⑦ Bicycle parking area
⑧ Pet store
⑨ Mini pharmacy
⑩ Barbershop
⑪ Day nursery
⑫ Manager's office
⑬ Entertainment plaza
⑭ Mini market
⑮ Sunken plaza
⑯ Grand staircase
⑰ Skylight
⑱ Landscaped walkways
⑲ Landscaped hills
⑳ Community life plaza

'Residential Community Design'

1st floor plan



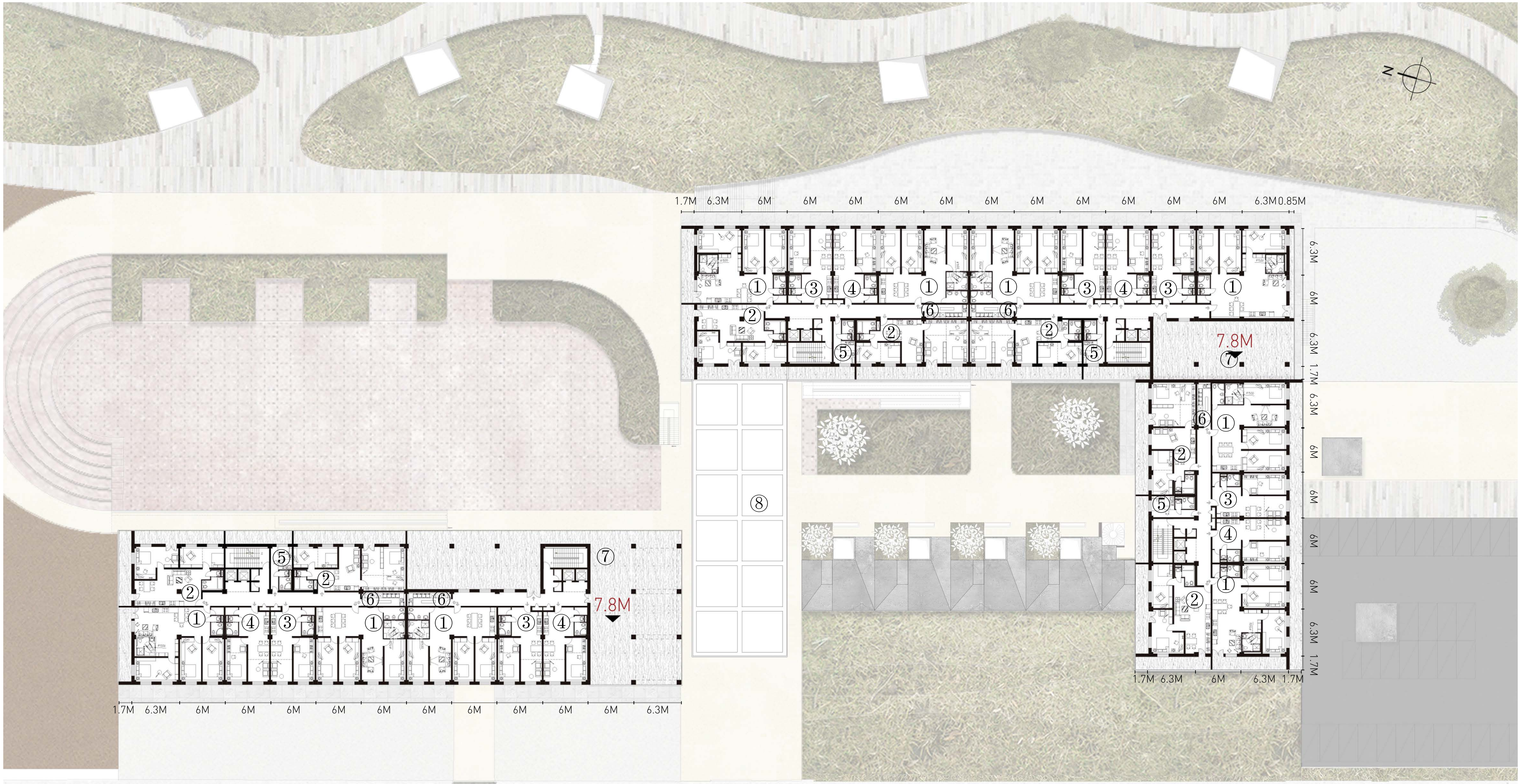
Legend

Community part:

① Household with older generation
② Househole for single/couple with children
③ Household for one person
④ Household for Childlfree couple
⑤ Temporary accomodation
⑥ Public laundry room
⑦ Roof garden
⑧ Exhibition
⑨ Office
⑩ Toilet

'Residential Community Design'

2nd floor plan



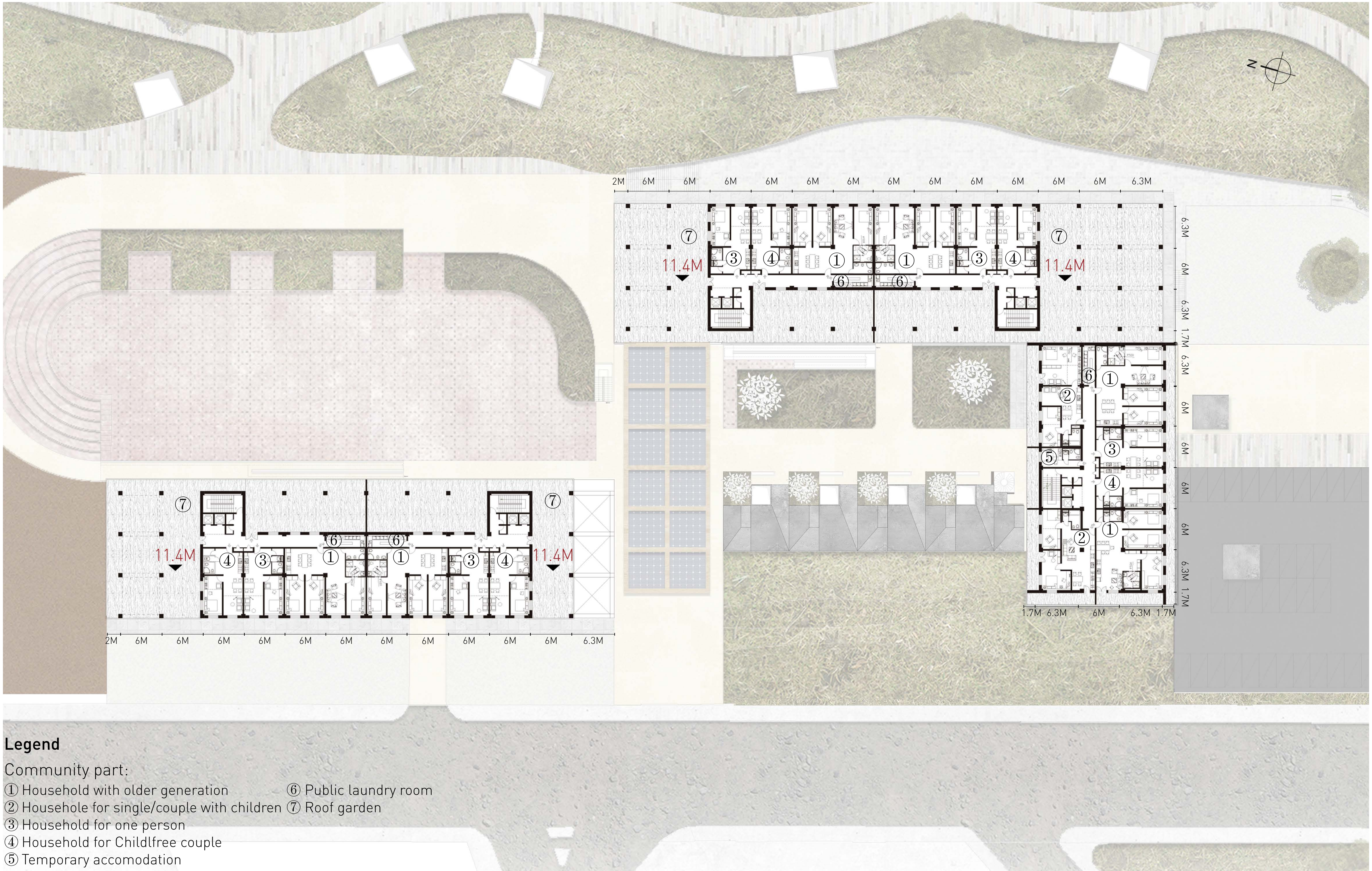
Legend

Community part:

① Household with older generation
② Househole for single/couple with children
③ Household for one person
④ Household for Childlfree couple
⑤ Temporary accomodation
⑥ Public laundry room
⑦ Roof garden
⑧ Roof for mini market

'Residential Community Design'

3rd floor plan



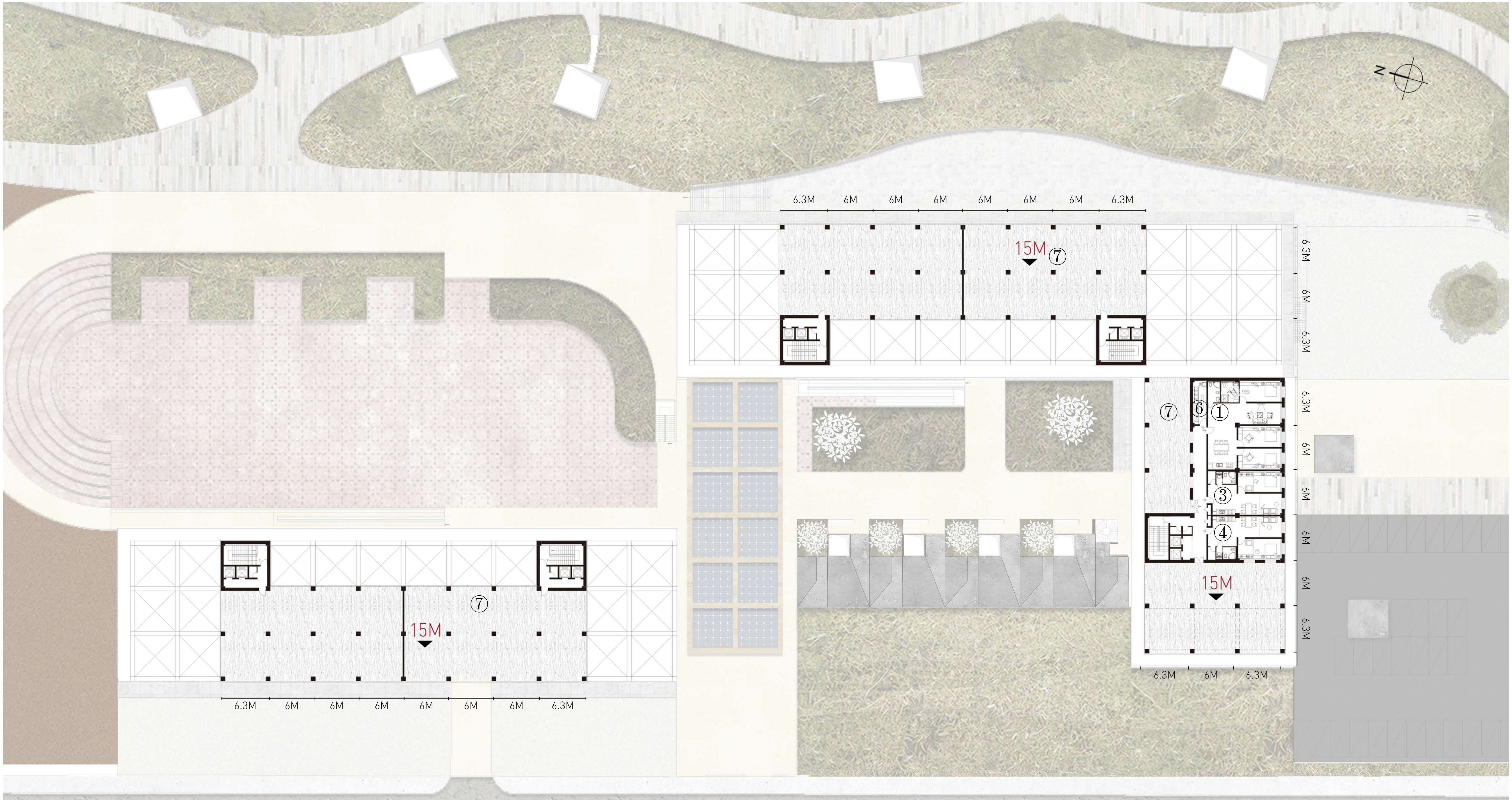
Legend

Community part:

① Household with older generation
② Househole for single/couple with children
③ Household for one person
④ Household for Childlfree couple
⑤ Temporary accomodation
⑥ Public laundry room
⑦ Roof garden

'Residential Community Design'

4th floor plan



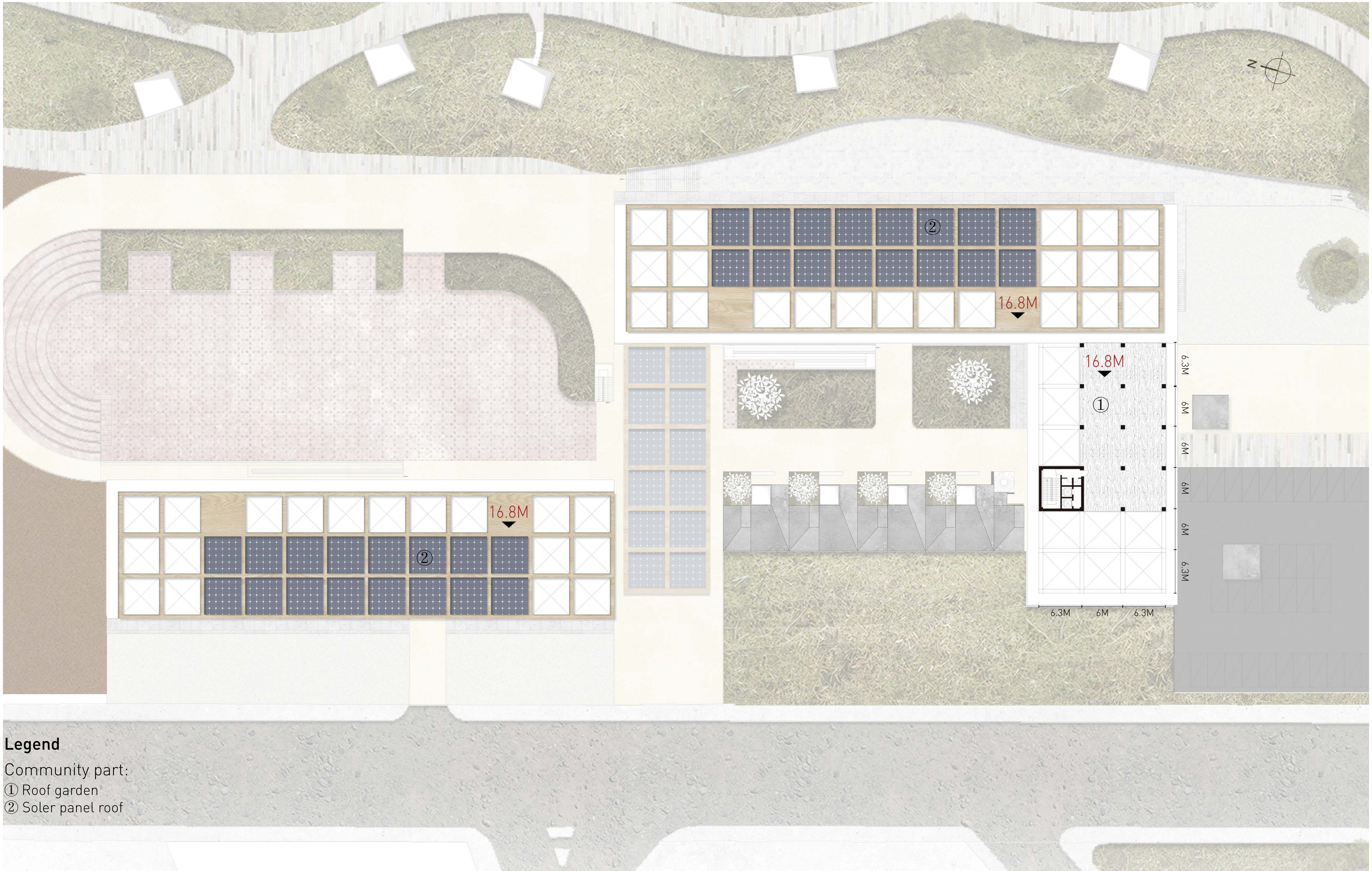
Legend

Community part:

① Household with older generation
② Househole for single/couple with children
③ Household for one person
④ Household for Childlfree couple
⑤ Temporary accomodation
⑥ Public laundry room
⑦ Roof garden

'Residential Community Design'

5th floor plan



Legend

Community part:

① Roof garden

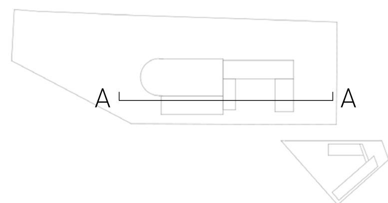
② Soler panel roof

Zero-carbon Community

'Residential Community Design'

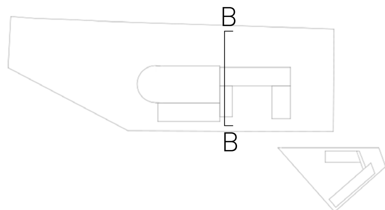
Section A-A 1:500

Design



'Residential Community Design'

Section B-B 1:500



Zero-carbon Community

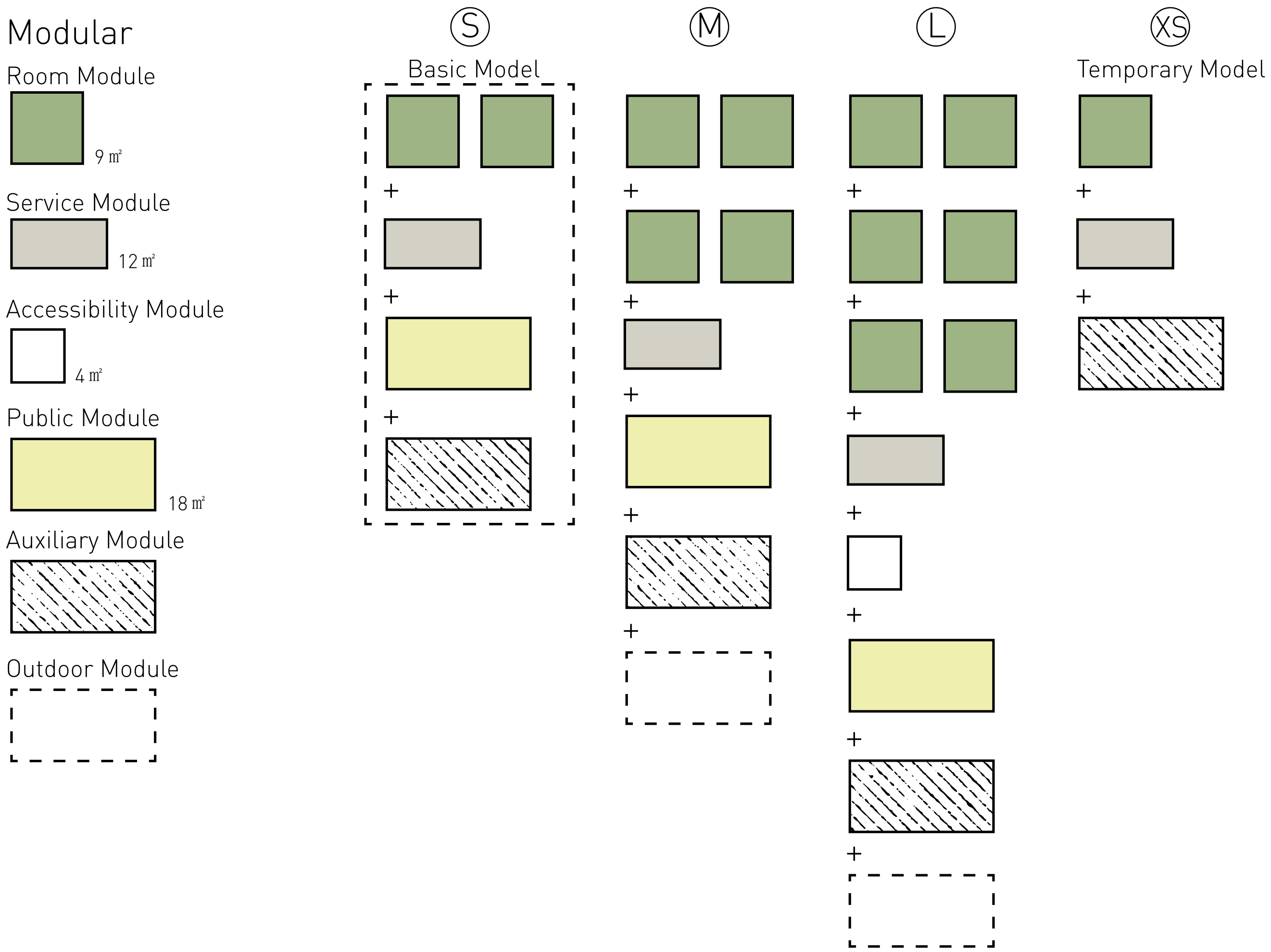
'Residential Community Design'

West elevation 1： 500

Design

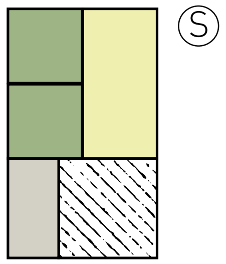
'Residential Community Design'

Unit typologies

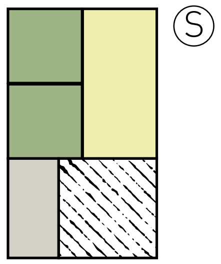


Multiple Type Combinations

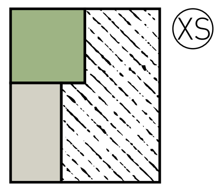
One Person Type



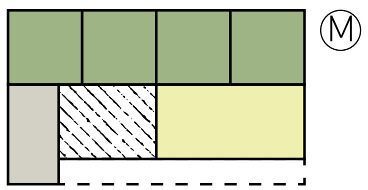
Childfree Couple Type

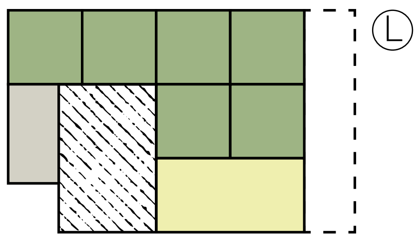


Temporary Rental Type

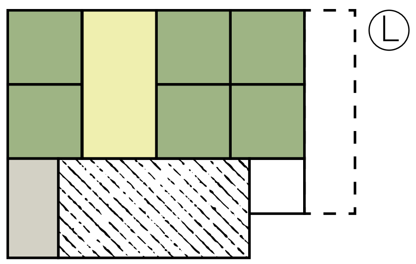


Couple/Single Adult with One or More Children





Household with Older Generation



Unit 01 Temporary accommodation

Users

Temporary accommodation is provided for people who live there for a short period which is available to all social groups on a rental basis. Temporary housing is available for one person.

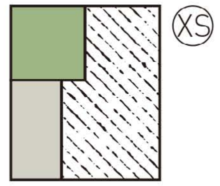
Area

16 ㎡

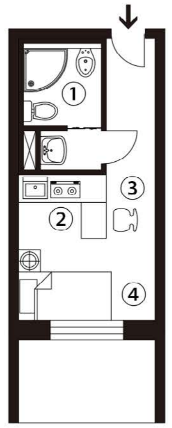
Type

Rent

Functional Mode



Plan 1:150



Legend
① Bathroom
② Kitchen
③ Restaurant
④ Bedroom

0 1 2 3 4m

Axonometric

'Residential Community Design'

Unit typologies

Unit 02 House for One Person Household

Users

The one-person family type is available for users under the age of 35, which can accommodate up to two people, taking into account future changes in family structure patterns.

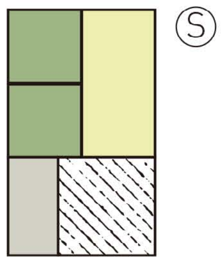
Area

56 ㎡

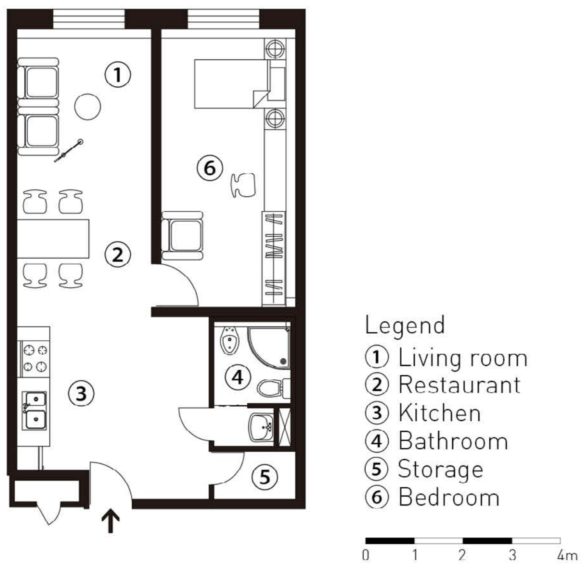
Type

Sale

Functional Mode



Plan 1:150



Axonometric

Unit 03 House for Childlfree Couple Household

Users

The house type is available for childlfree couple model. This house type can accommodate two people.

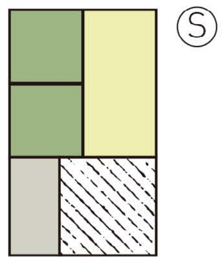
Area

56 ㎡

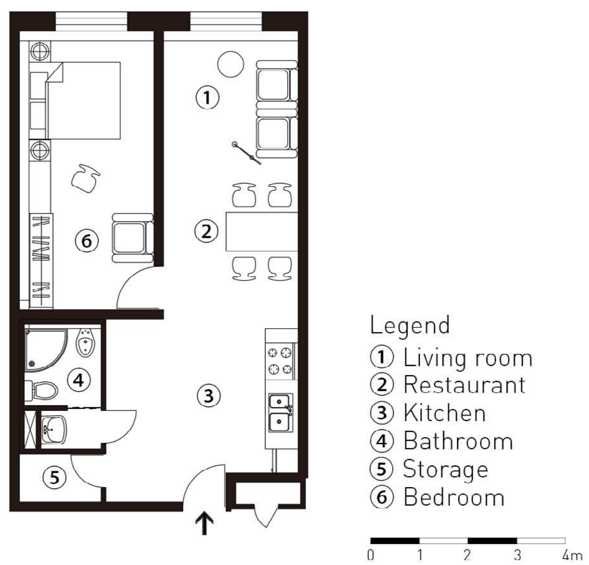
Type

Sale

Functional Mode



Plan 1:150



Axonometric

'Residential Community Design'

Unit typologies

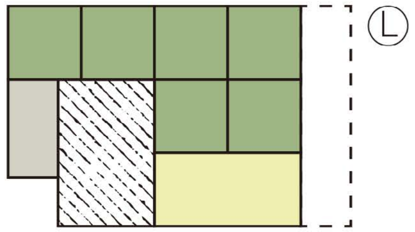
Unit 04-1 House for Single adult/Couple with children Household

Users

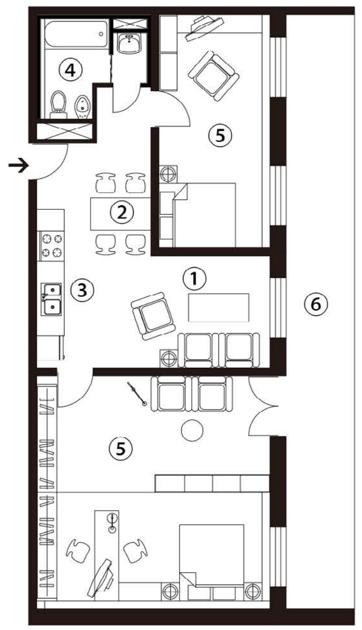
This type of household is offered to couple or single-parent families with children, taking into account future changes in family structure, where light partition walls can be added to bedrooms to accommodate future increases in people. This room type can accommodate 2-4 people.

Area	Type
86+25 ㎡	Sale

Functional Mode



Plan 1:180



Legend
① Living room
② Restaurant
③ Kitchen
④ Bathroom
⑤ Bedroom
⑥ Balcony

0 1 2 3 4m

Axonometric

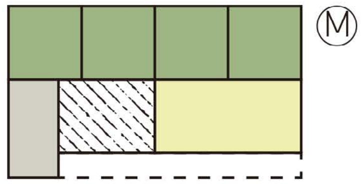
Unit 04-2 House for Single adult/Couple with children Household

Users

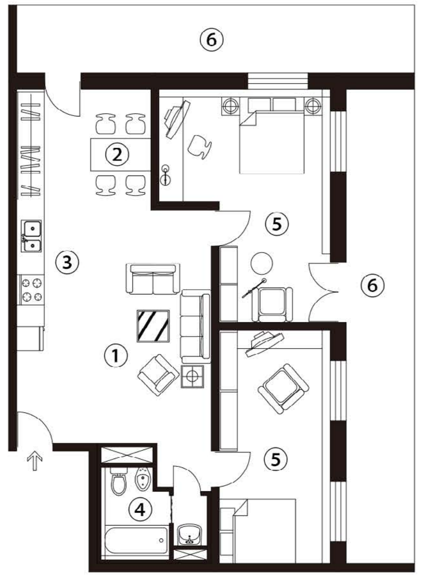
This type of household is offered to couple or single-parent families with children, taking into account future changes in family structure, where light partition walls can be added to bedrooms to accommodate future increases in people. This room type can accommodate 2-4 people.

Area	Type
86+37 ㎡	Sale

Functional Mode



Plan 1:180



Legend
① Living room
② Restaurant
③ Kitchen
④ Bathroom
⑤ Bedroom
⑥ Balcony

0 1 2 3 4m

Axonometric

'Residential Community Design'

Unit typologies

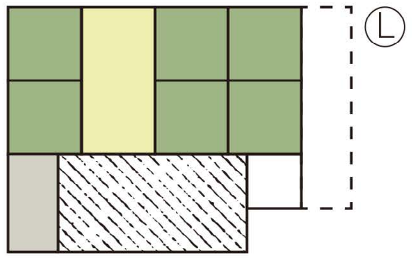
Unit 05-1 Household with older generation

Users

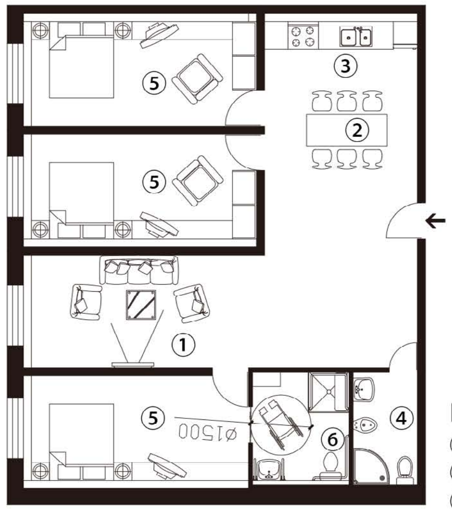
This house type is offered for families of 5 or more, with family members including those older than 60 years. Therefore this house type is designed with accessibility in mind and allows for wheelchair movement.

Area	Type
116 ㎡	Sale

Functional Mode



Plan 1:180



Legend
① Living room
② Restaurant
③ Kitchen
④ Bathroom
⑤ Bedroom
⑥ Accessible bathroom

0 1 2 3 4m

Axonometric

Design

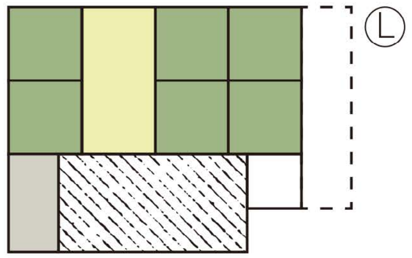
Unit 05-2 Household with older generation

Users

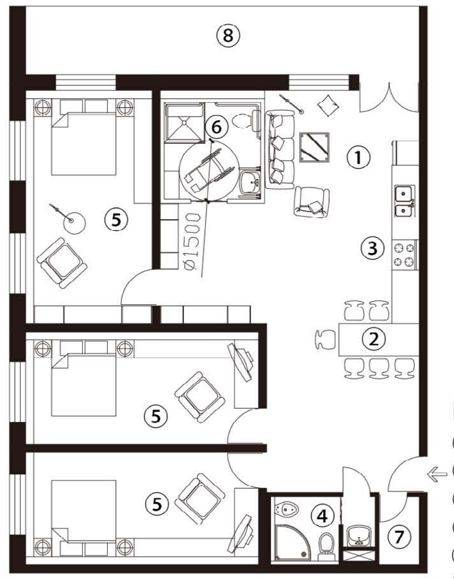
This house type is offered for families of 5 or more, with family members including those older than 60 years. Therefore this house type is designed with accessibility in mind and allows for wheelchair movement.

Area	Type
116+16 ㎡	Sale

Functional Mode



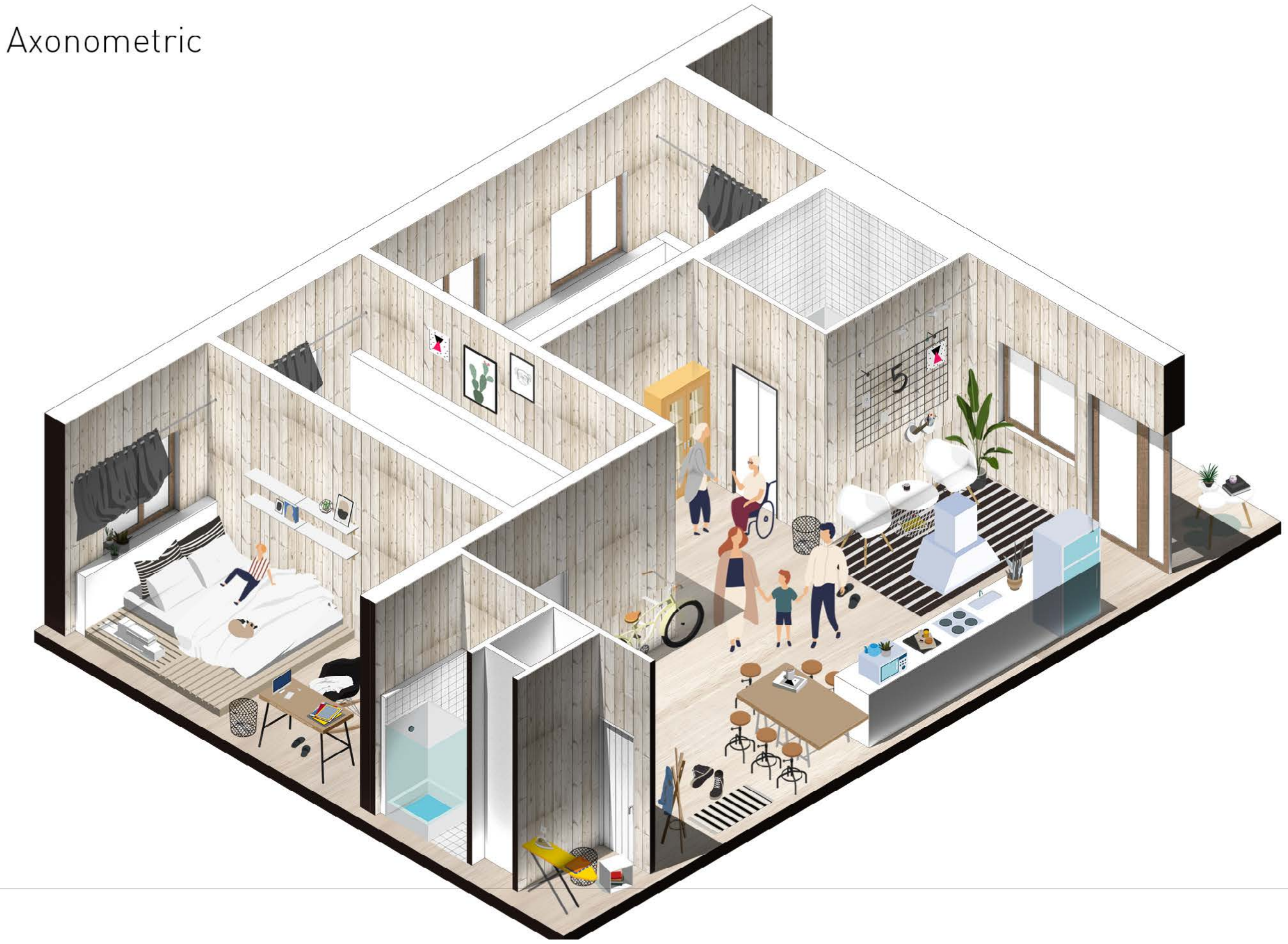
Plan 1:180



0 1 2 3 4m

Legend
① Living room
② Restaurant
③ Kitchen
④ Bathroom
⑤ Bedroom
⑥ Accessible bathroom
⑦ Storage
⑧ Balcony

Axonometric



Design

'Residential Community Design'

Unit typologies

Community Household Type Proportion

Household Type		Room Number	Person Number	Area	Floor Distribution	Precent
Household for One Person		18	18-36 Person	1008 ㎡	F1/F2/F3/F4	21.7%
Household for Childlfree Couple		16	36 Person	896 ㎡	F1/F2/F3/F4	19.3%
Household for Single/Couple with Children		15	30-60 Person	1290 ㎡	F1/F2/F3	18.0%
Household with Older Generation		24	120 Person	2784 ㎡	F1/F2/F3/F4	29%
Temporary Accomodation		10	10 Person	160 ㎡	F1/F2/F3	12.0%
Total		83	214-262 Person	6138 ㎡		100%

'Residential Community Design'

Cluster combinations

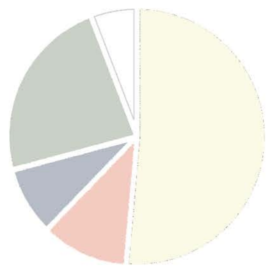
Users

The ground floor of the unit mainly provides living, entertainment and office needs for the residents of this unit, and meets the online office needs of the residents.

Area

658+120 ㎡

Household proportion



Residential Ground Floor Plan 1:250

(1) Lobby
(2) Internet zone
(3) Mini gym
(4) Storage
(5) Manager's office
(6) Public toilet
(7) Delivery lockers
(8) Open communication zone
(9) Café
(10) Public office area
(11) Leisure zone

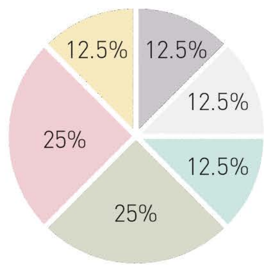
Users

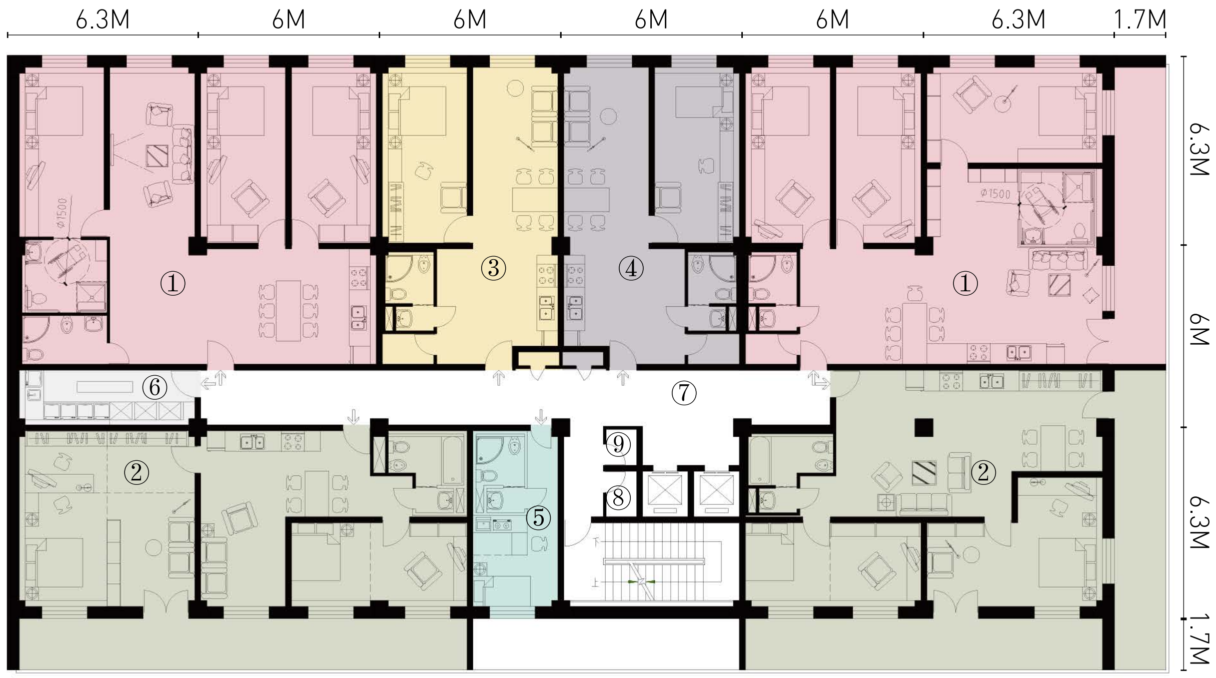
The unit floor is the main living space for the residents of this unit, and each floor is equipped with a public laundry room.

Area

778 ㎡

Household proportion





Residential First Floor Plan 1:250

(1) Household with older generation
(2) Househole for single/couple with children
(3) Household for one person
(4) Household for Childlfree couple
(5) Temporary accomodation
(6) Public laundry room
(7) Corridor
(8) Equipment room
(9) Storage

'Residential Community Design'

Cluster combinations

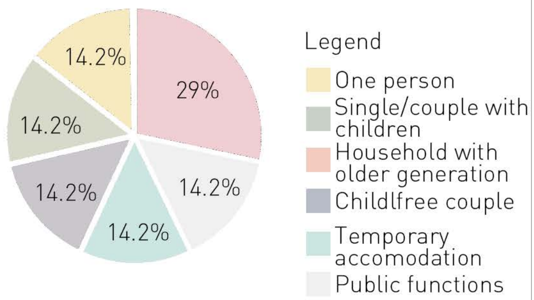
Users

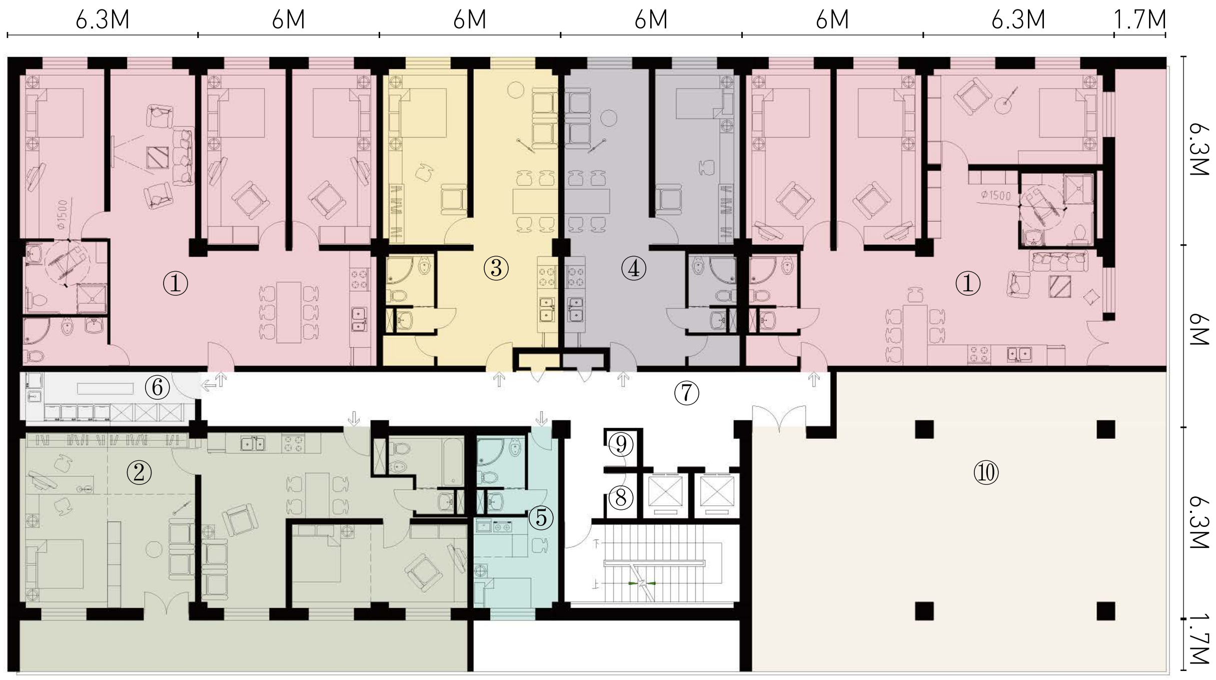
The unit floor is the main living space for the residents of this unit, and each floor is equipped with a public laundry room.

Area

778 ㎡

Household proportion





Residential Standard Floor 1:250

① Household with older generation
② Househole for single/couple with children
③ Household for one person
④ Household for Childlfree couple
⑤ Temporary accomodation
⑥ Public laundry room
⑦ Corridor
⑧ Equipment room
⑨ Storage
⑩ Roof garden

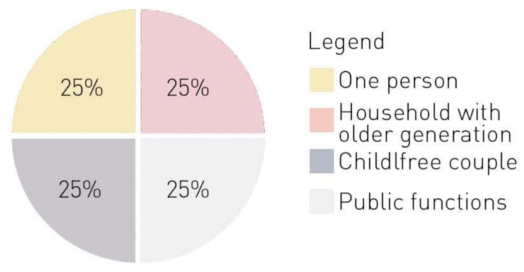
Users

The unit floor is the main living space for the residents of this unit, and each floor is equipped with a public laundry room.

Area

778 ㎡

Household proportion



Residential Roof Floor Plan 1:250

① Household with older generation
② Household for one person
③ Household for Childlfree couple
④ Public laundry room
⑤ Public laundry room
⑥ Equipment room
⑦ Storage
⑧ Roof garden

Zero-carbon Community

'Residential Community Design'

Entertainment Plaza

Design

Zero-carbon Community

'Residential Community Design'

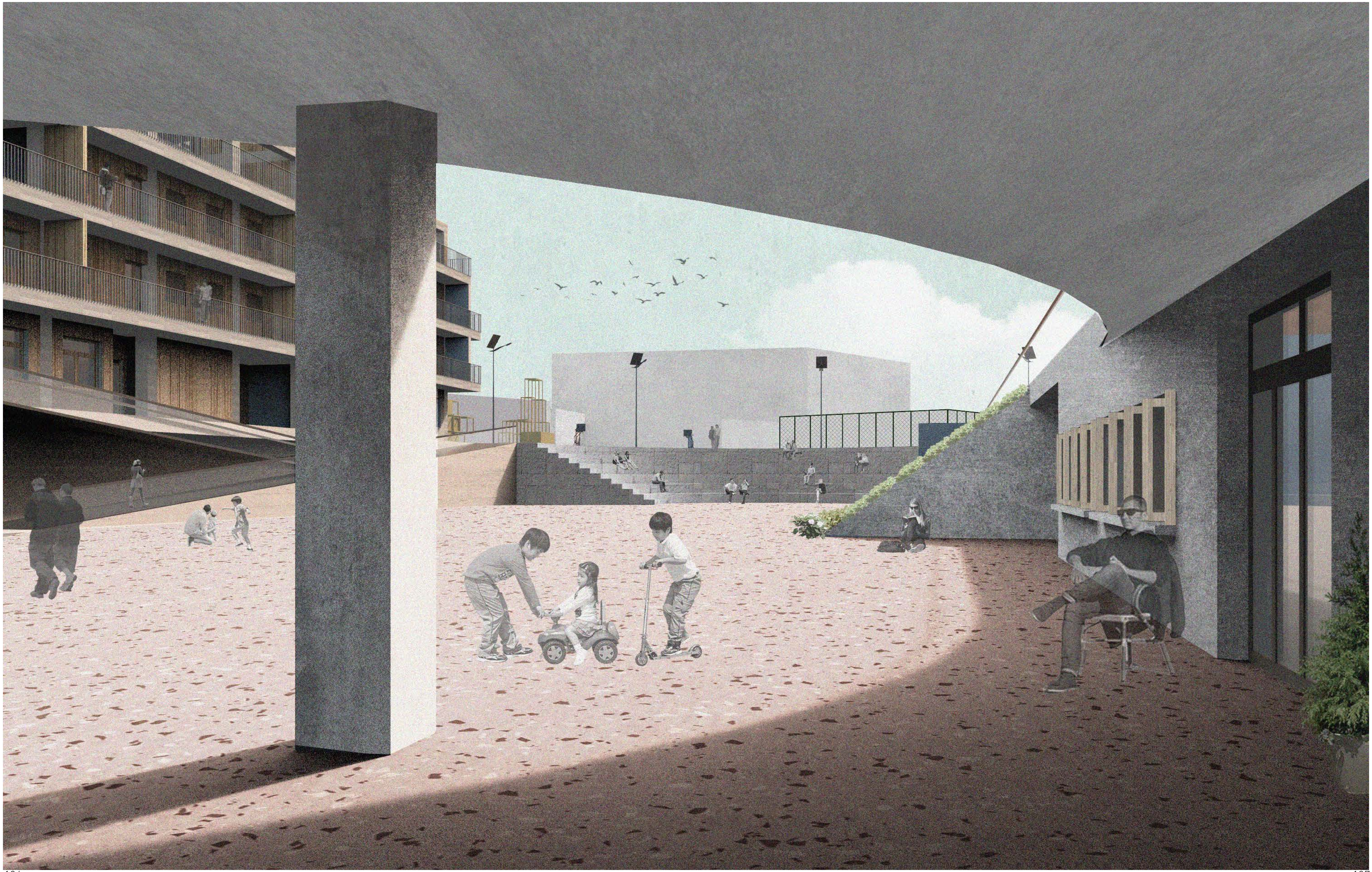
Sunken Plaza

Design

Zero-carbon Community

'Residential Community Design'

Outdoor Dining Area

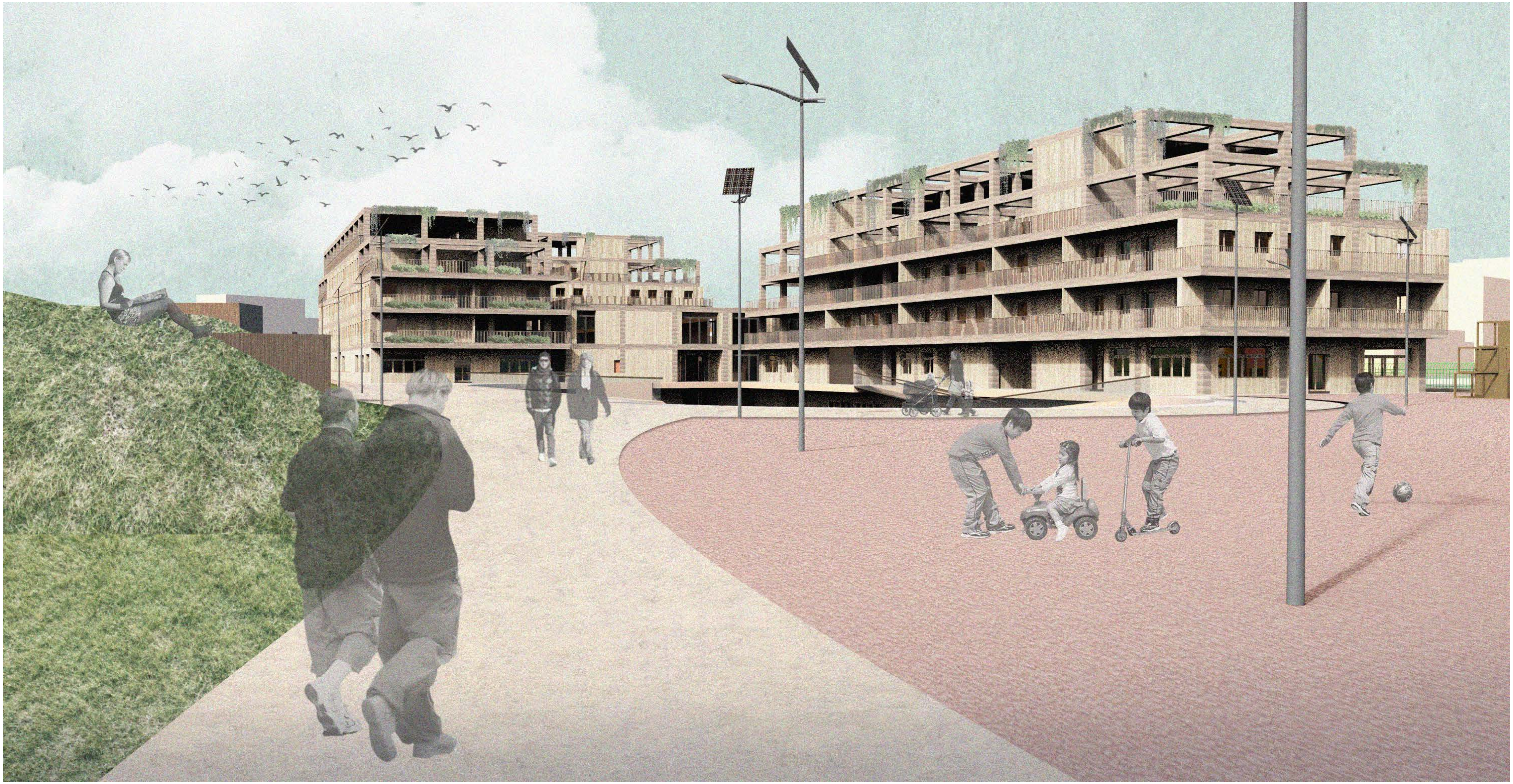


Design

Zero-carbon Community

'Residential Community Design'

Sport Area



Design

Zero-carbon Community

'Residential Community Design'

Rooftop Garden

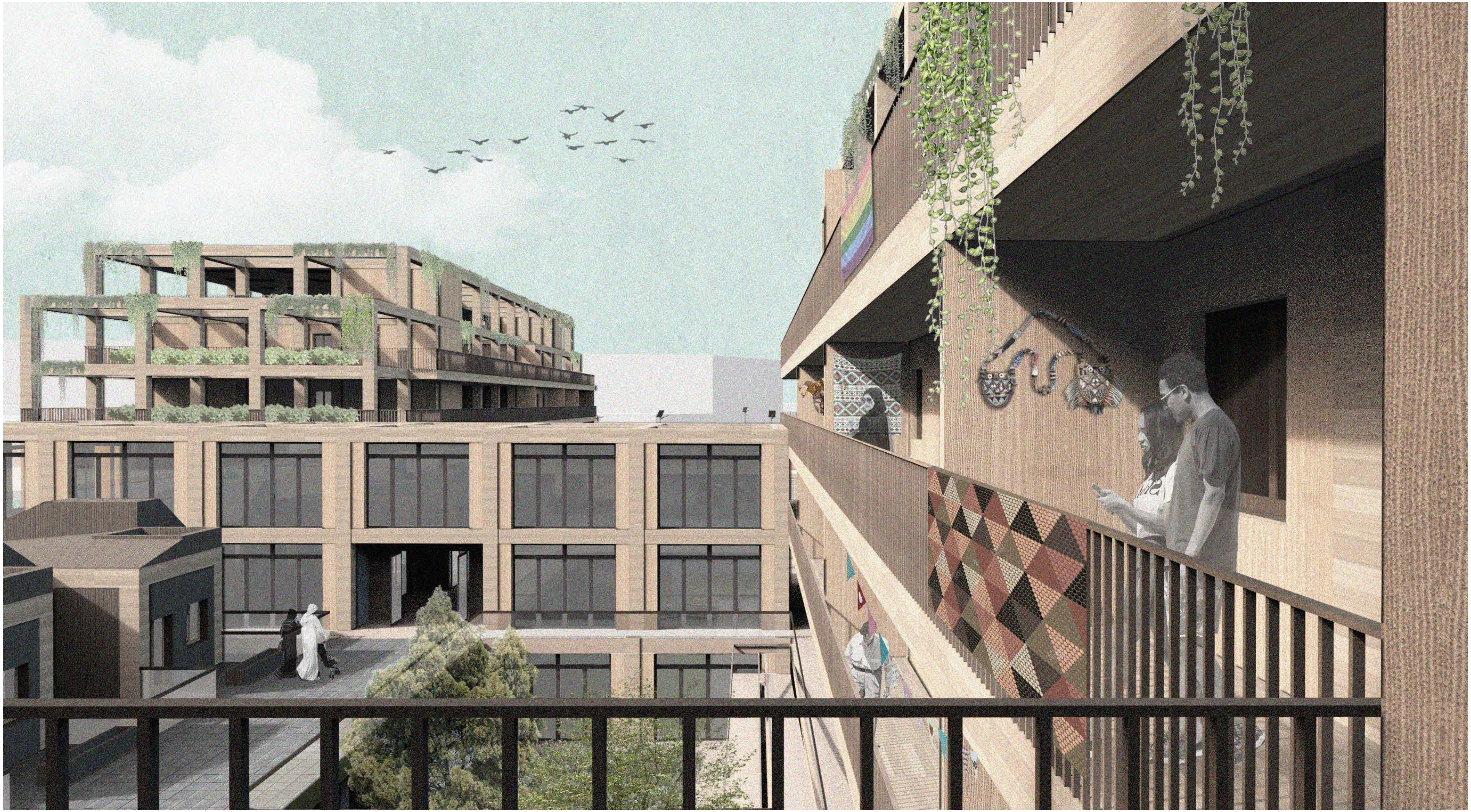
Design

Zero-carbon Community

'Residential Community Design'

Residential Balconies

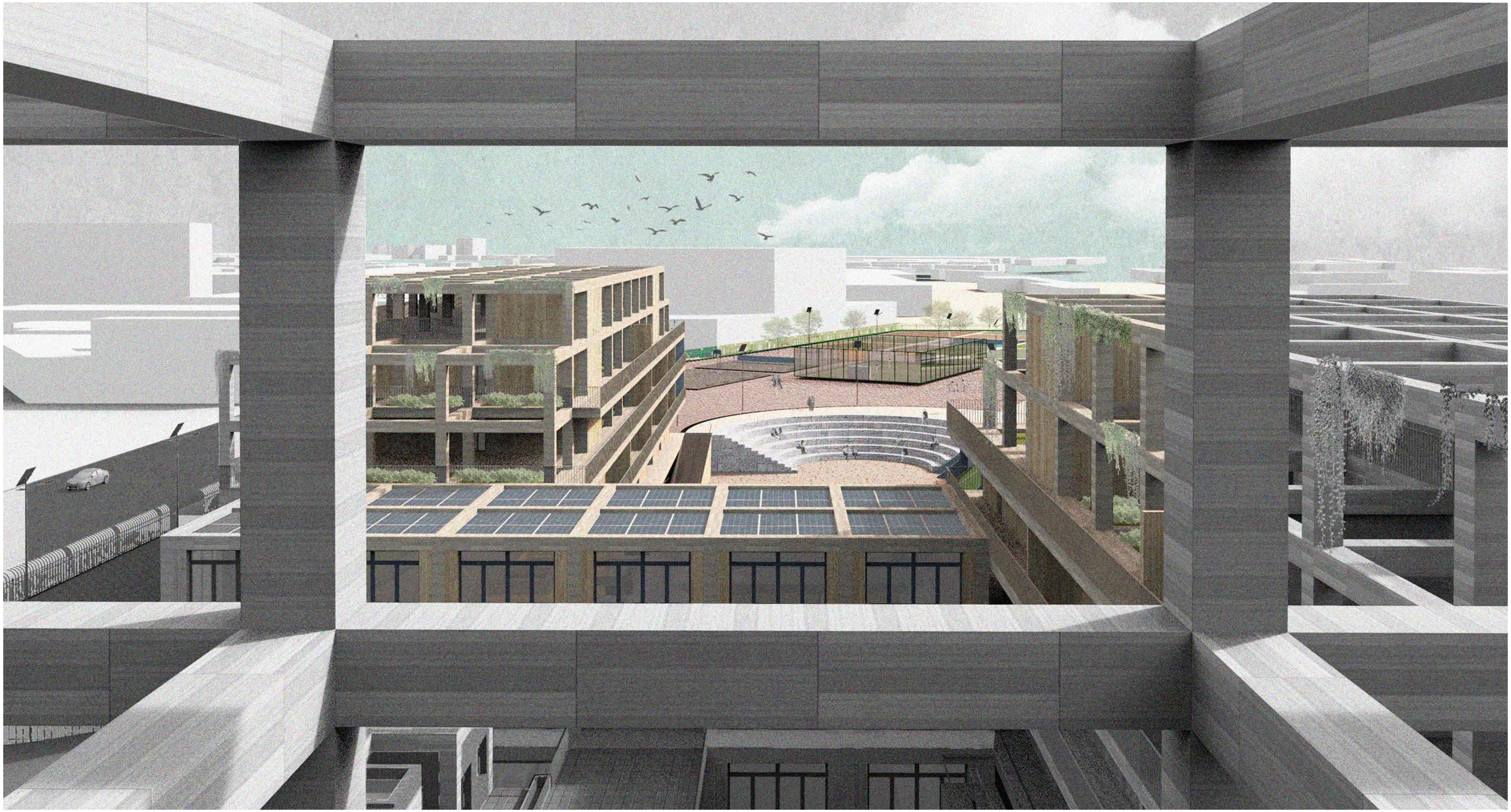
Design



Zero-carbon Community

'Residential Community Design'

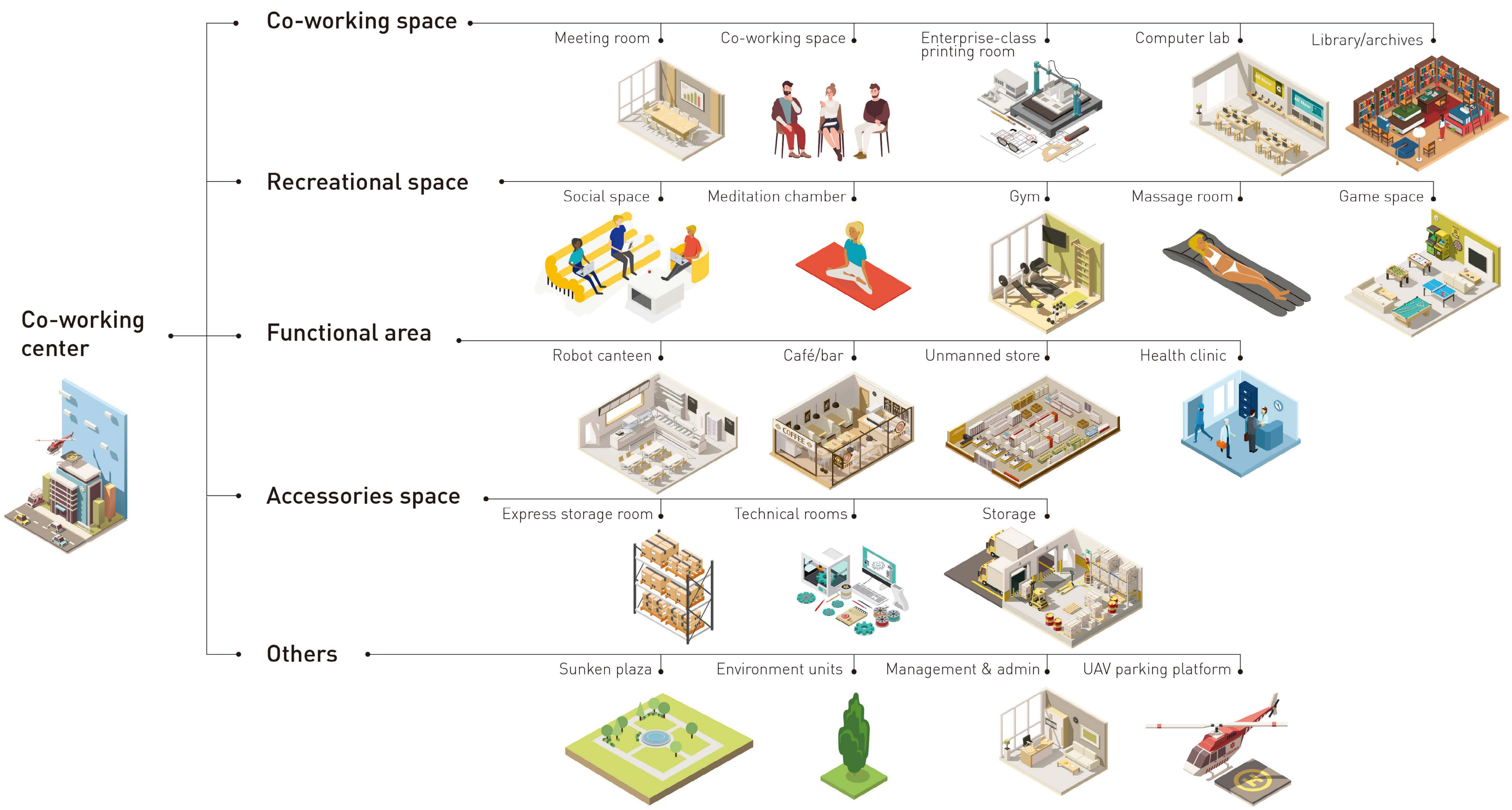
Residential Rooftop



Design

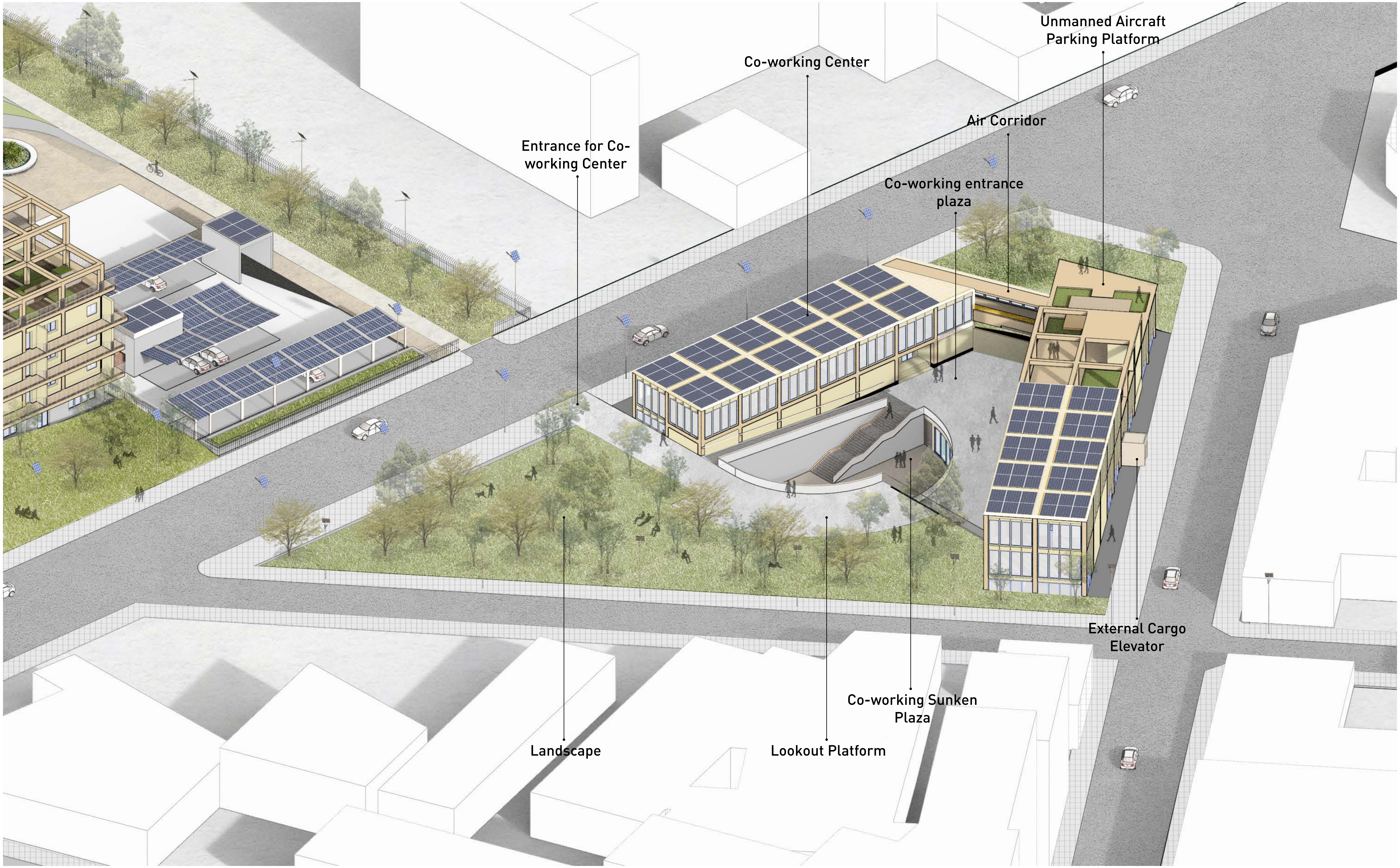
'Co-working Center'

Functions



'Co-working Center'

Axonometric View



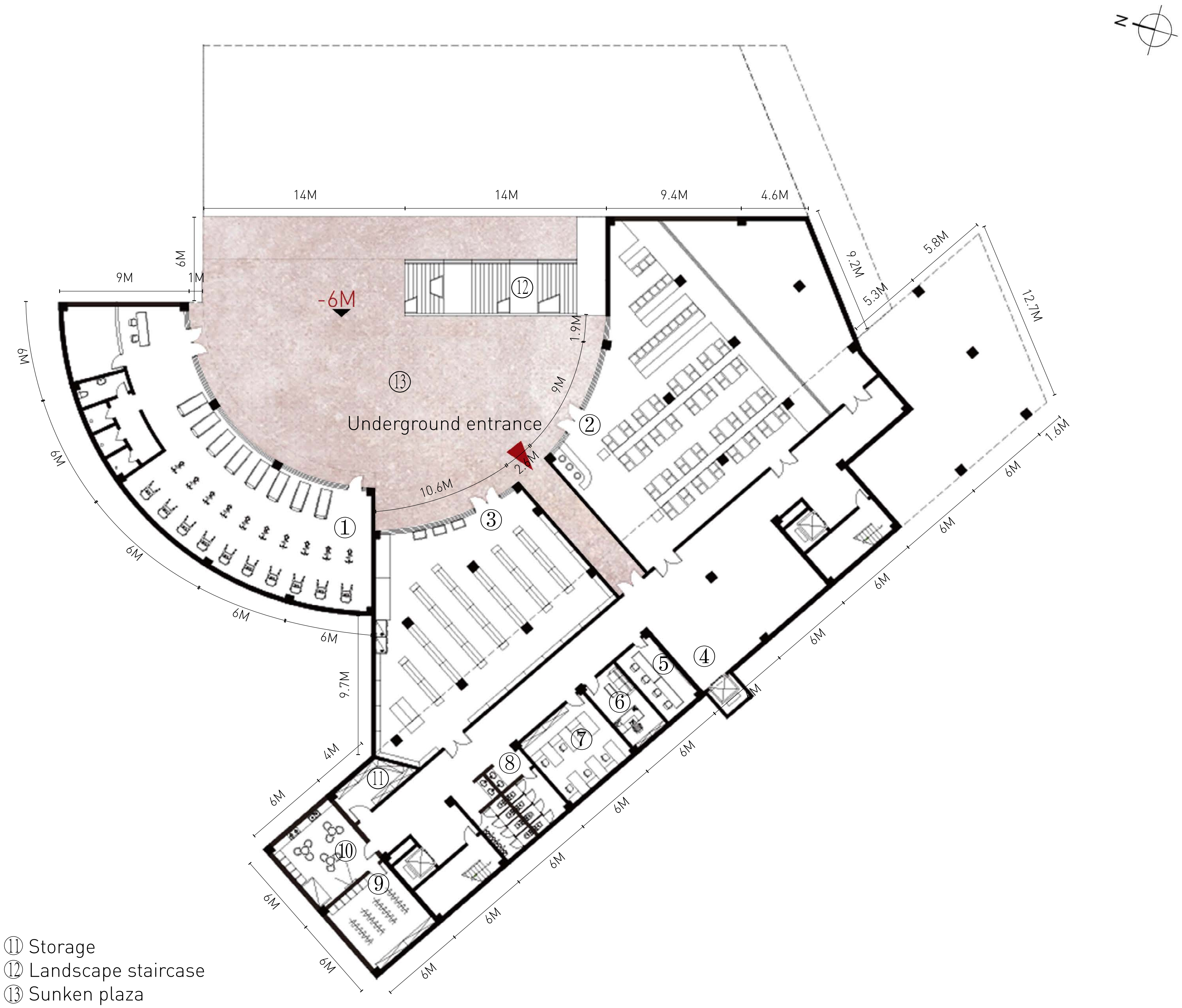
Zero-carbon Community

Design

Zero-carbon Community

'Co-working Center'

Underground floor plan



Legend

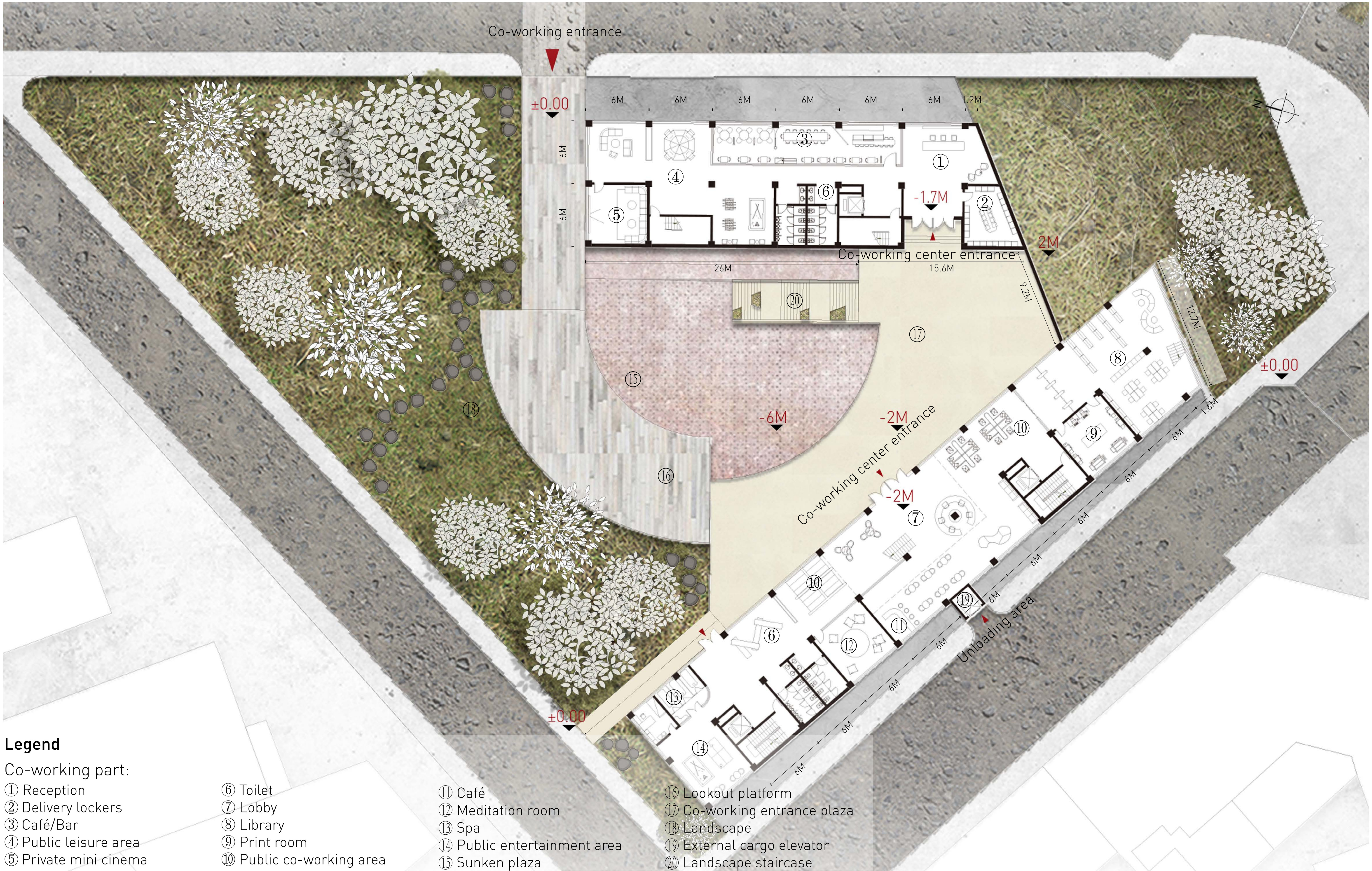
Co-working part:

- ① Gym
- ② Robot Canteen
- ③ Unmanned Supermarket
- ④ Unloading area
- ⑤ Staff conference room
- ⑥ Manager's office
- ⑦ Employee office
- ⑧ Toilet
- ⑨ Staff changing room
- ⑩ Staff rest room
- ⑪ Storage
- ⑫ Landscape staircase
- ⑬ Sunken plaza

Zero-carbon Community

'Co-working Center'

Ground floor plan



Legend

Co-working part:

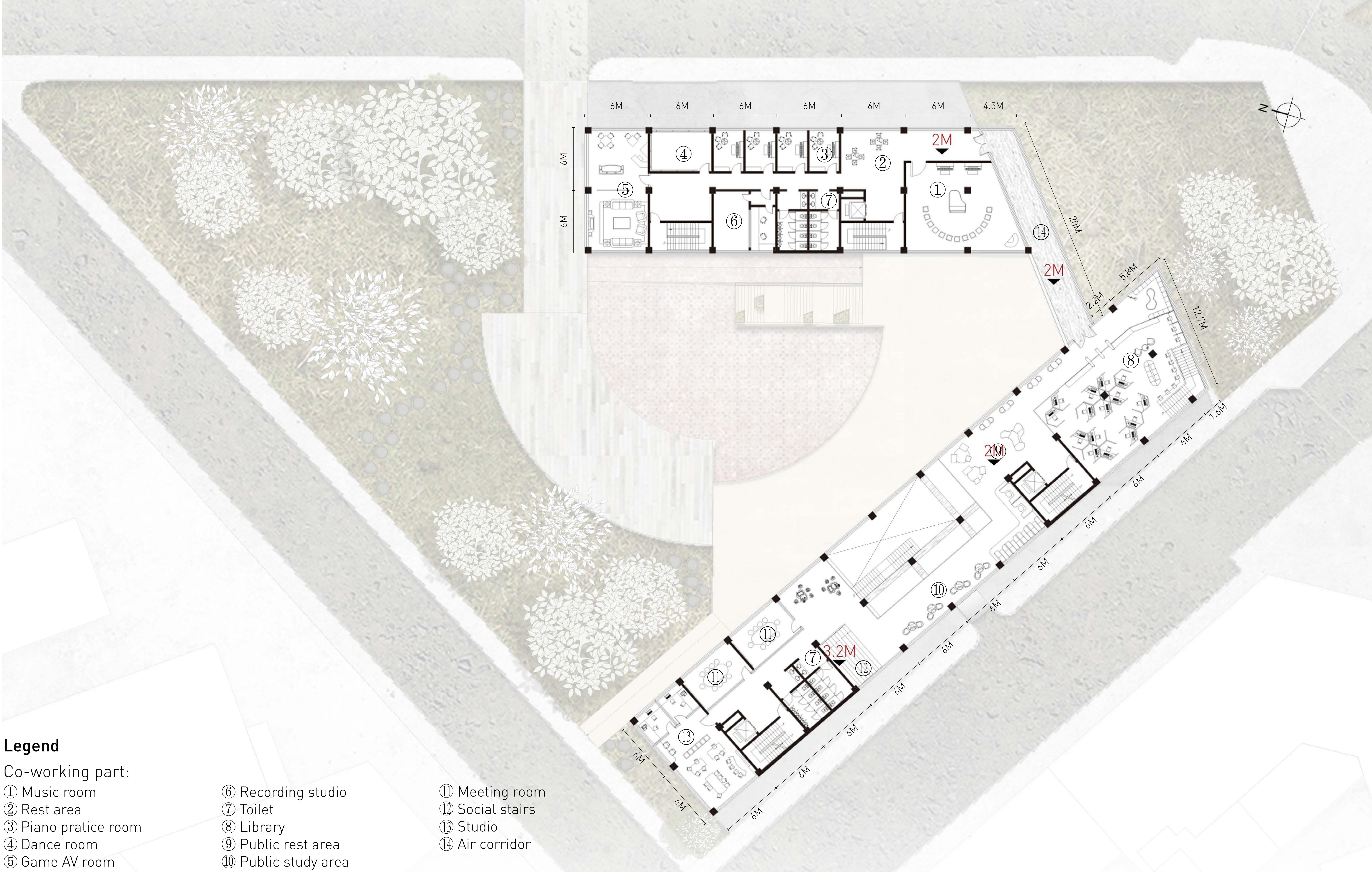
① Reception
② Delivery lockers
③ Café/Bar
④ Public leisure area
⑤ Private mini cinema
⑥ Toilet
⑦ Lobby
⑧ Library
⑨ Print room
⑩ Public co-working area
⑪ Café
⑫ Meditation room
⑬ Spa
⑭ Public entertainment area
⑮ Sunken plaza
⑯ Lookout platform
⑰ Co-working entrance plaza
⑱ Landscape
⑲ External cargo elevator
⑳ Landscape staircase

Design

Zero-carbon Community

'Co-working Center'

1st floor plan



Legend

Co-working part:

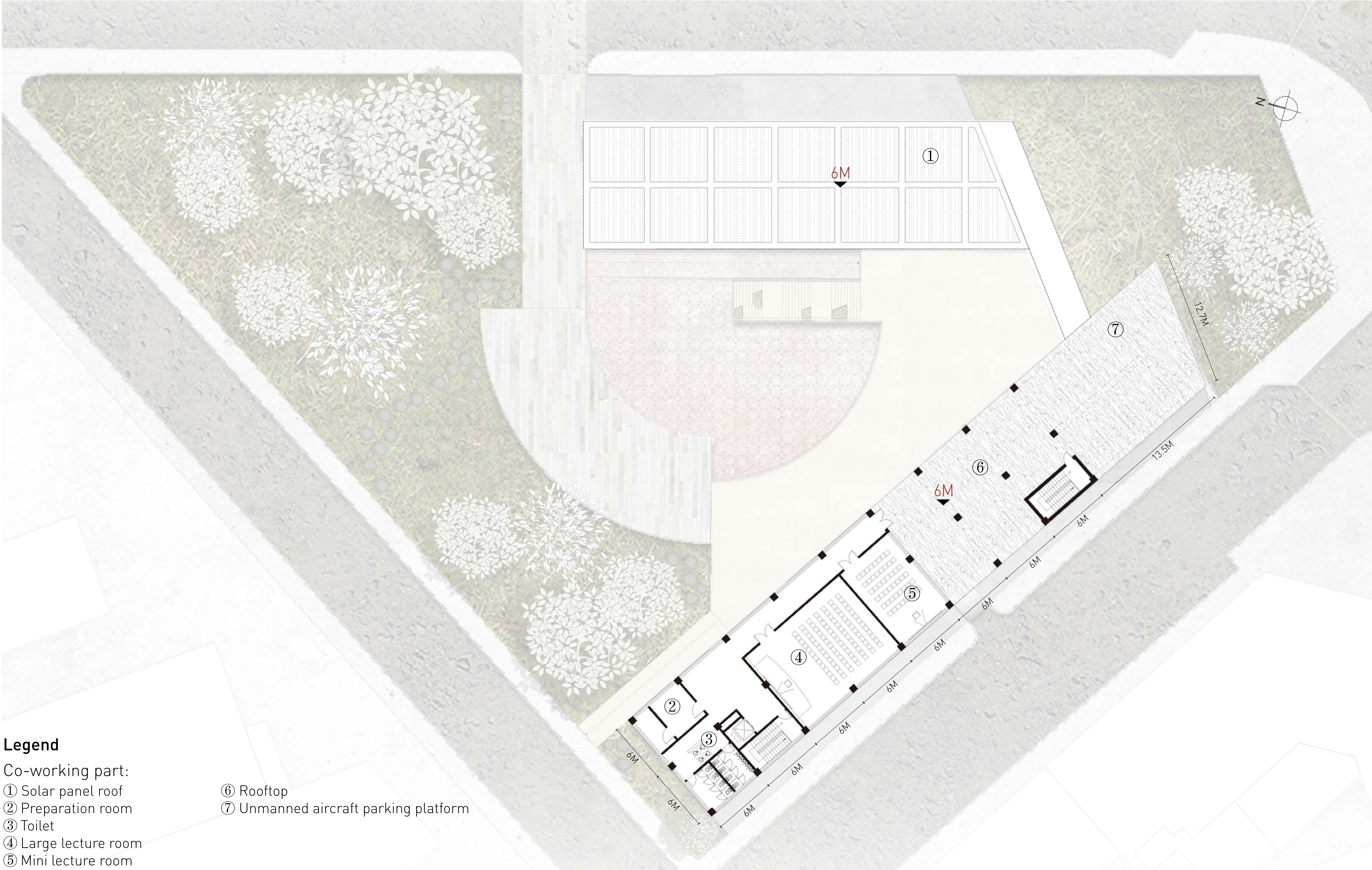
① Music room
② Rest area
③ Piano pratice room
④ Dance room
⑤ Game AV room
⑥ Recording studio
⑦ Toilet
⑧ Library
⑨ Public rest area
⑩ Public study area
⑪ Meeting room
⑫ Social stairs
⑬ Studio
⑭ Air corridor

Design

Zero-carbon Community

'Co-working Center'

2nd floor plan



Legend

Co-working part:

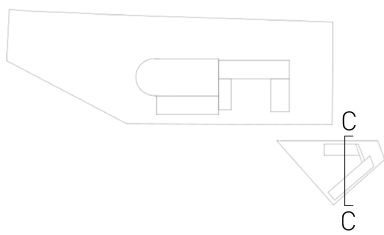
① Solar panel roof
② Preparation room
③ Toilet
④ Large lecture room
⑤ Mini lecture room
⑥ Rooftop
⑦ Unmanned aircraft parking platform

Zero-carbon Community

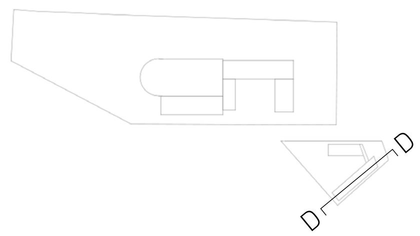
'Co-working Center'

Section

Co-working section C-C 1:500



Co-working section D-D 1:500



Design

'Co-working Center'

Elevation

Southwest elevation 1:500

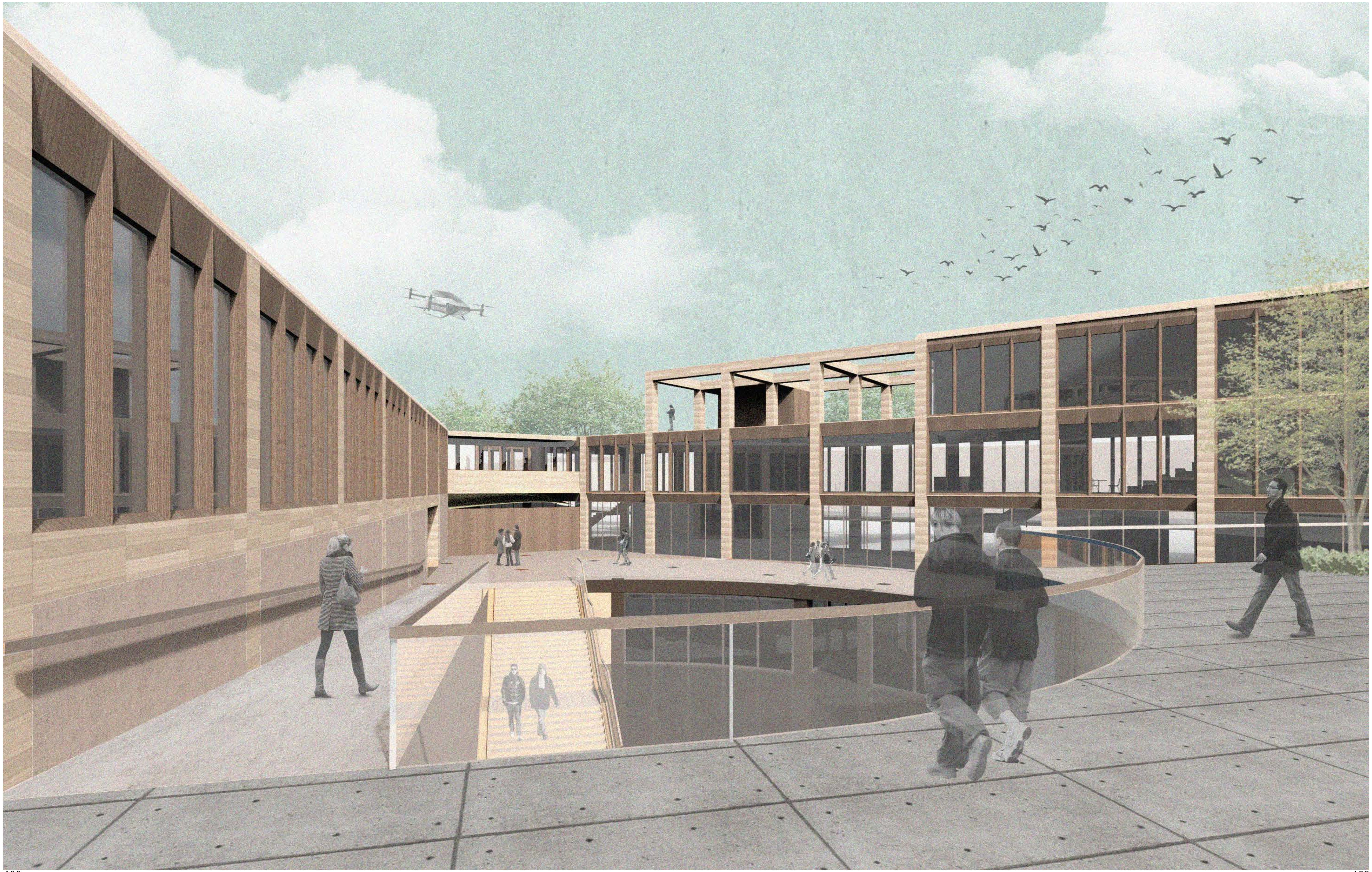
East elevation 1:500

Zero-carbon Community

'Co-working Center'

Sunken Plaza

Design



Zero-carbon Community

'Co-working Center'

Rooftop UAV(Unmanned Aerial Vehicles) Parking Platform

Design

Zero-carbon Community

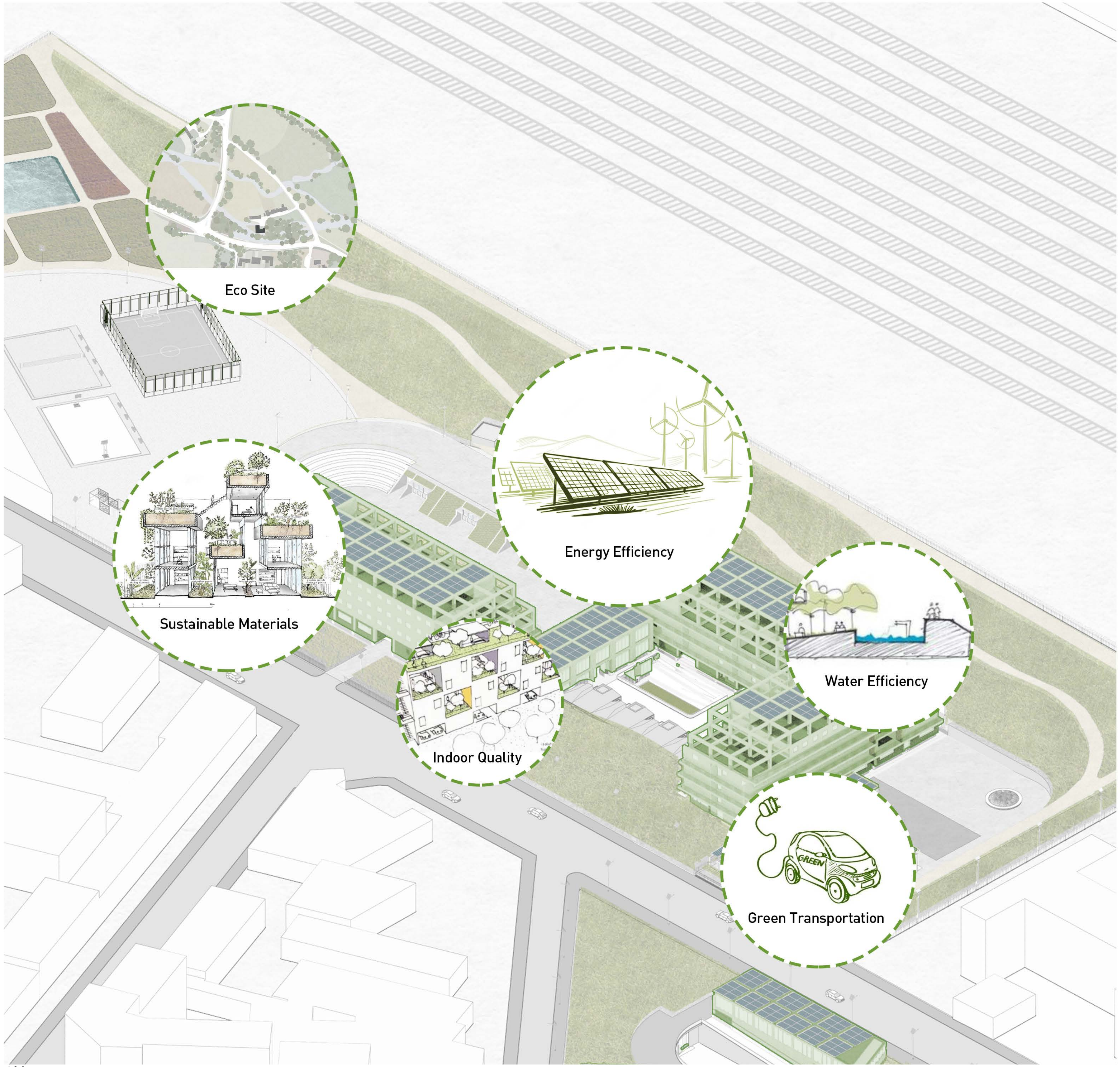
'Co-working Center'

Lobby

Design

Sustainability

Stratergy



Zero-carbon Community

Eco Site

Green Open Space

The plot is covered with large green areas, including green roofs, lawns, ecological parks, etc. Open green space can not only improve the quality of life of residents, but also improve the regional ecology.

Urban Farming

Encourage a social movement for a sustainable community by providing farmland for residents to grow crops and ponds for fish within the plot.

Sustainable Materials

There are new processes, and sustainable as well as green building material alternatives that can be used in construction today to reduce carbon emission.

Energy Efficiency

Renewable Energy

Use renewable energy such as solar energy to provide electricity to the community and reduce dependence on non-renewable energy.

Passive Solar Building

It can reduce heat loss or heat radiation, and make the living space warm in winter and cool in summer.

Indoor Quality

Through architectural design and water & energy efficiency design, it can provide people with a comfortable environment while reducing the energy consumption of the interior space.

Water Efficiency

Through an efficient water management system, as well as the collection and reuse of rainwater, domestic water consumption is reduced and urban flooding is avoided.

Green Transportation

Green Vehicle

Encourage people to use eco-buses or shared bicycles to travel and reduce the use of gasoline-powered vehicles.

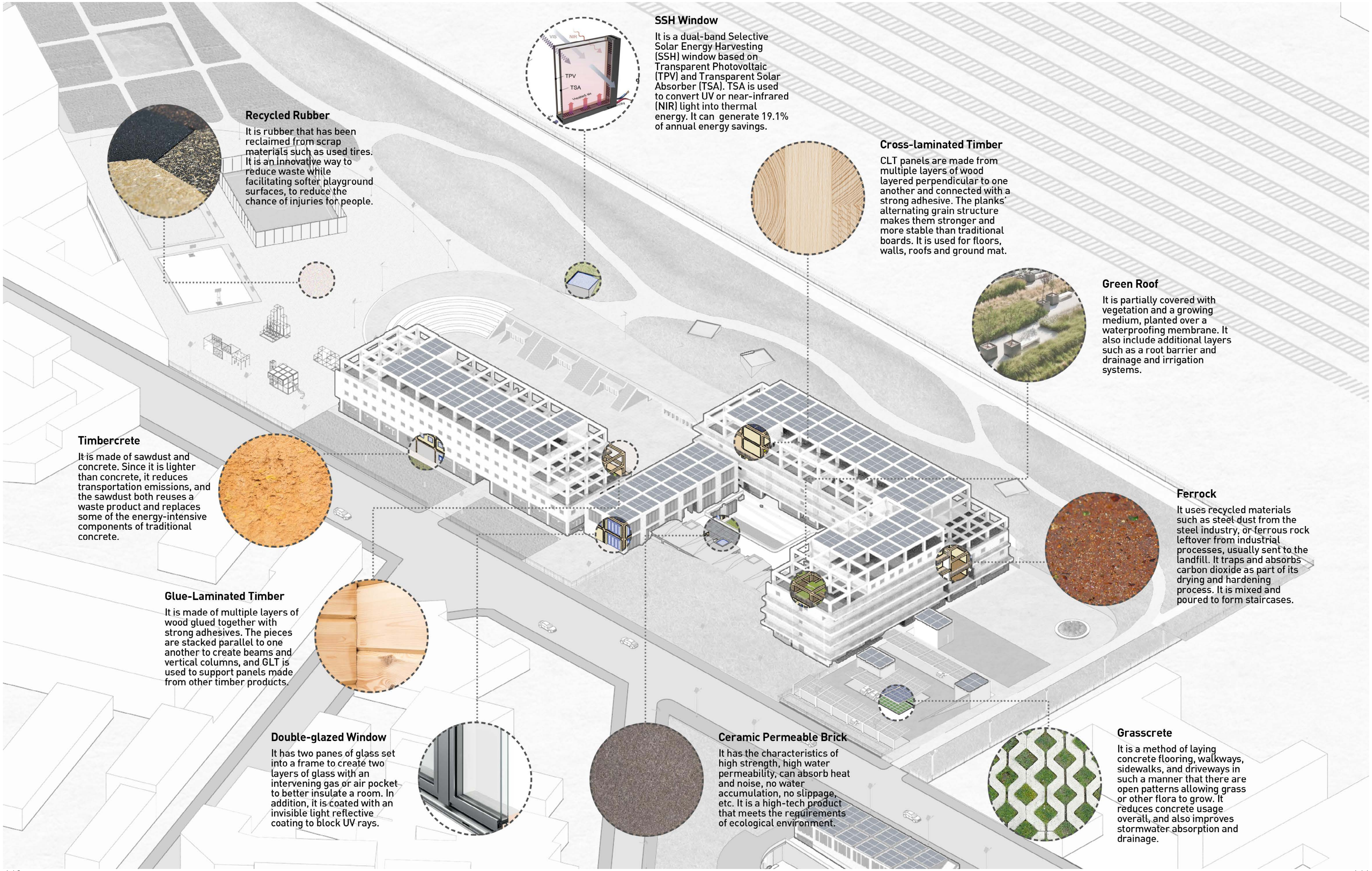
Charging pile parking space

Set up more charging pile parking spaces to encourage people to use electric vehicles

Zero-carbon Community

Sustainability

Materials



SSH Window

It is a dual-band Selective Solar Energy Harvesting (SSH) window based on Transparent Photovoltaic (TPV) and Transparent Solar Absorber (TSA). TSA is used to convert UV or near-infrared (NIR) light into thermal energy. It can generate 19.1% of annual energy savings.

Recycled Rubber

It is rubber that has been reclaimed from scrap materials such as used tires. It is an innovative way to reduce waste while facilitating softer playground surfaces, to reduce the chance of injuries for people.

Cross-laminated Timber

CLT panels are made from multiple layers of wood layered perpendicular to one another and connected with a strong adhesive. The planks' alternating grain structure makes them stronger and more stable than traditional boards. It is used for floors, walls, roofs and ground mat.

Green Roof

It is partially covered with vegetation and a growing medium, planted over a waterproofing membrane. It also include additional layers such as a root barrier and drainage and irrigation systems.

Timbercrete

It is made of sawdust and concrete. Since it is lighter than concrete, it reduces transportation emissions, and the sawdust both reuses a waste product and replaces some of the energy-intensive components of traditional concrete.

Ferrock

It uses recycled materials such as steel dust from the steel industry, or ferrous rock leftover from industrial processes, usually sent to the landfill. It traps and absorbs carbon dioxide as part of its drying and hardening process. It is mixed and poured to form staircases.

Glue-Laminated Timber

It is made of multiple layers of wood glued together with strong adhesives. The pieces are stacked parallel to one another to create beams and vertical columns, and GLT is used to support panels made from other timber products.

Double-glazed Window

It has two panes of glass set into a frame to create two layers of glass with an intervening gas or air pocket to better insulate a room. In addition, it is coated with an invisible light reflective coating to block UV rays.

Ceramic Permeable Brick

It has the characteristics of high strength, high water permeability, can absorb heat and noise, no water accumulation, no slippage, etc. It is a high-tech product that meets the requirements of ecological environment.

Grasscrete

It is a method of laying concrete flooring, walkways, sidewalks, and driveways in such a manner that there are open patterns allowing grass or other flora to grow. It reduces concrete usage overall, and also improves stormwater absorption and drainage.

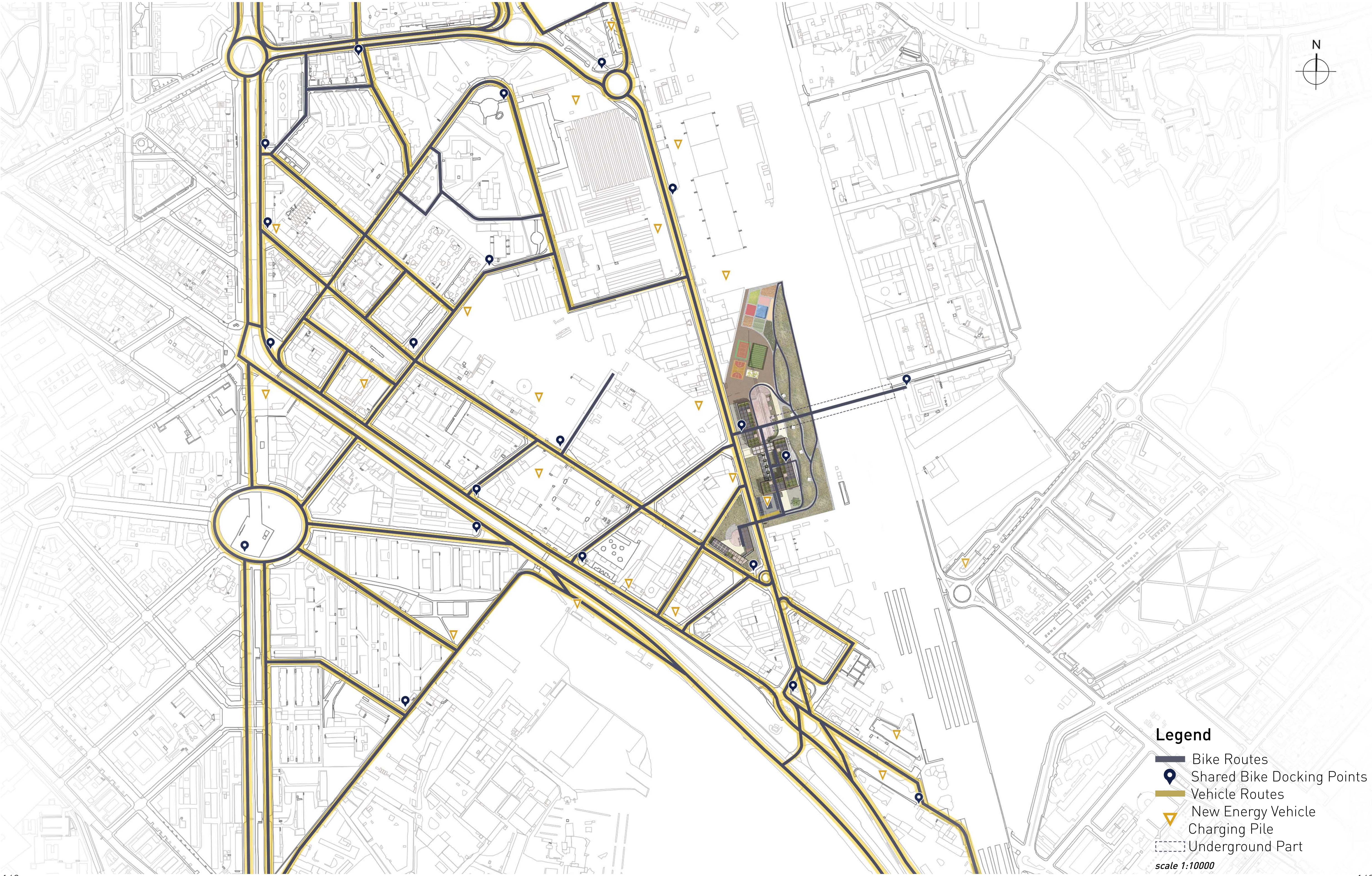
Ssustainable Design

Zero-carbon Community

Sustainability

Green transportation

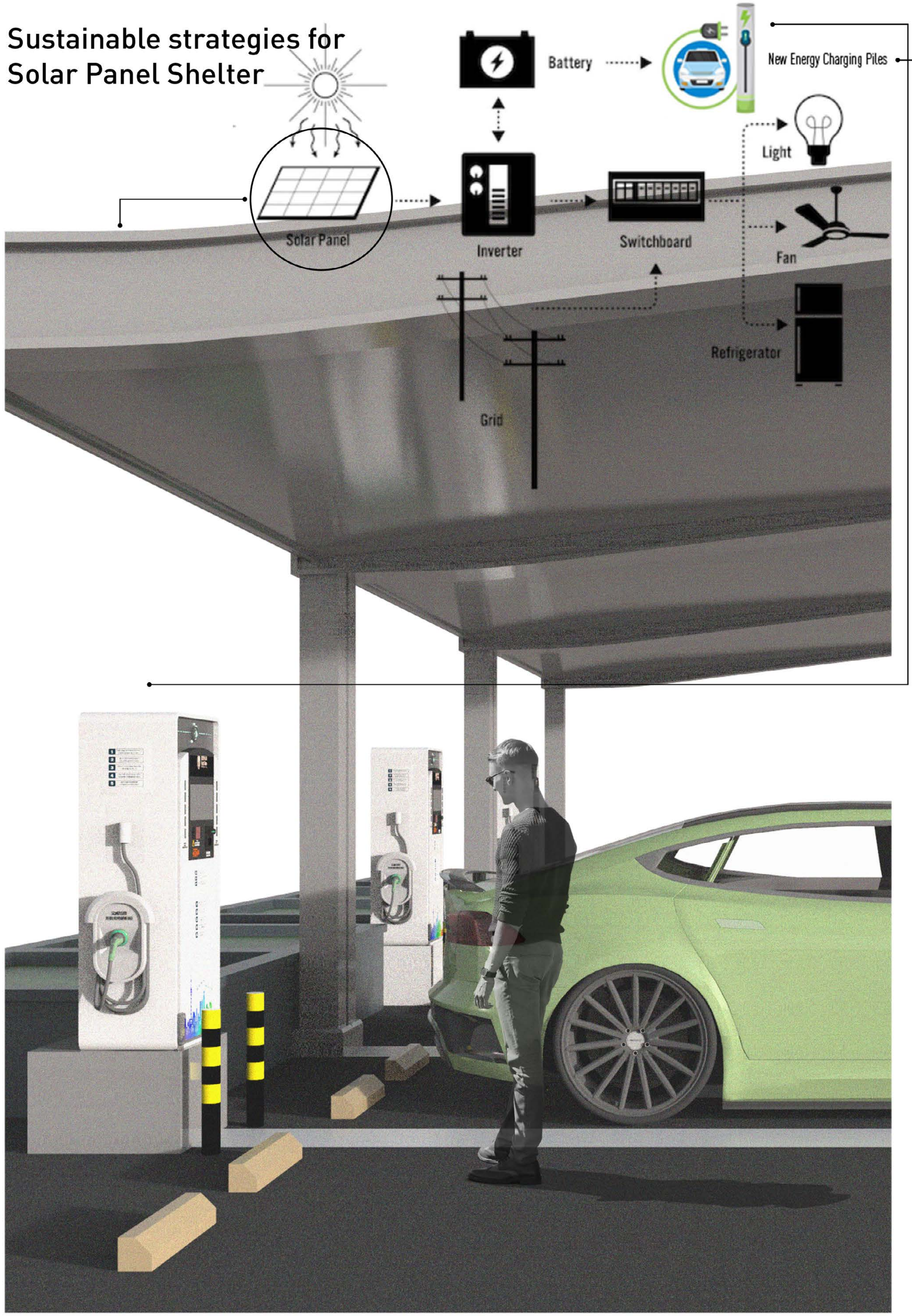
Ssustainable Design



Zero-carbon Community

Sustainability

Reduced parking footprint



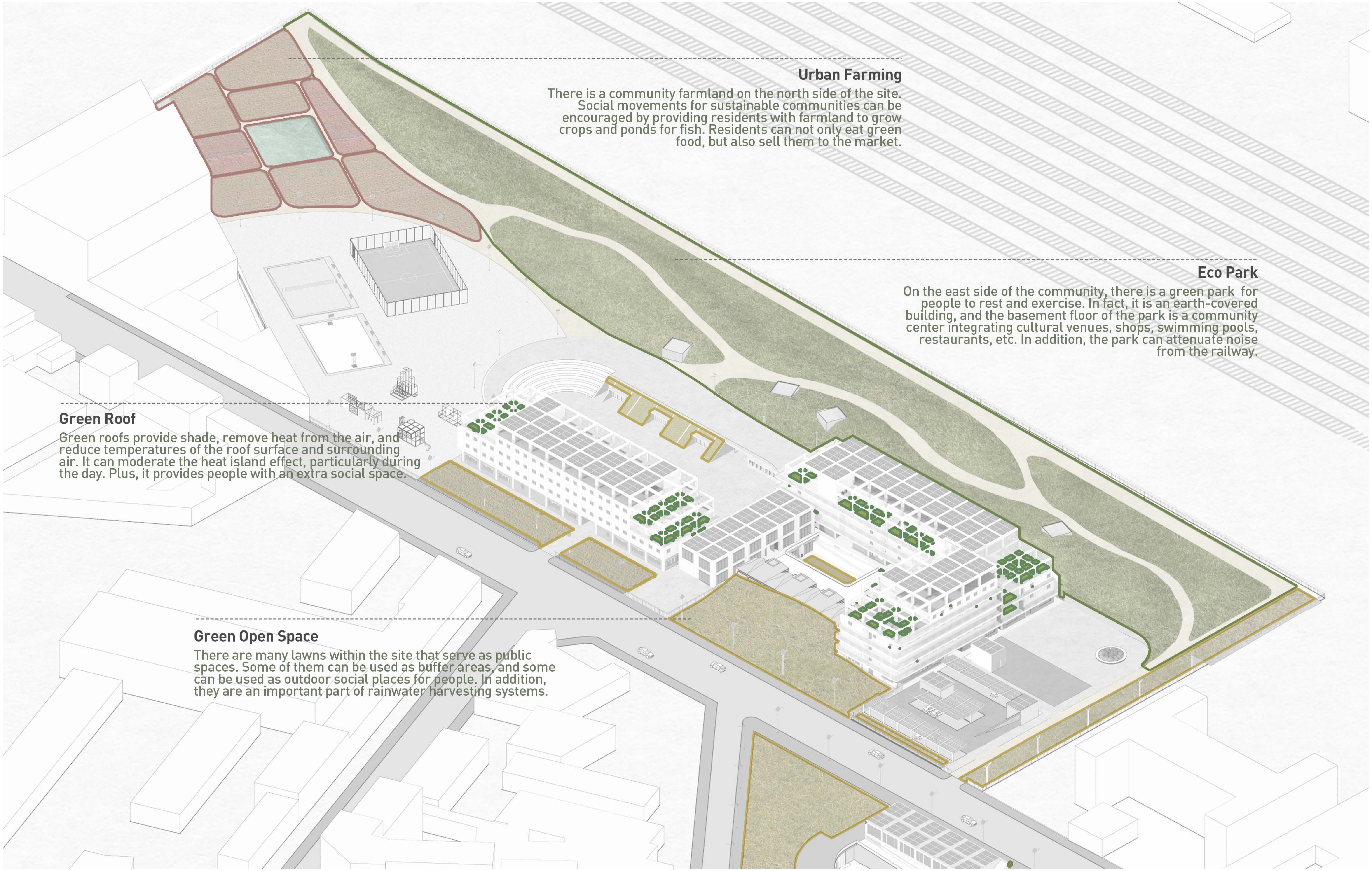
Electric Vehicles Infographic

How to charge E-Vehicles through apps

Zero-carbon Community

Sustainability

Green space



Urban Farming

There is a community farmland on the north side of the site. Social movements for sustainable communities can be encouraged by providing residents with farmland to grow crops and ponds for fish. Residents can not only eat green food, but also sell them to the market.

Eco Park

On the east side of the community, there is a green park for people to rest and exercise. In fact, it is an earth-covered building, and the basement floor of the park is a community center integrating cultural venues, shops, swimming pools, restaurants, etc. In addition, the park can attenuate noise from the railway.

Green Roof

Green roofs provide shade, remove heat from the air, and reduce temperatures of the roof surface and surrounding air. It can moderate the heat island effect, particularly during the day. Plus, it provides people with an extra social space.

Green Open Space

There are many lawns within the site that serve as public spaces. Some of them can be used as buffer areas, and some can be used as outdoor social places for people. In addition, they are an important part of rainwater harvesting systems.

Ssustainable Design

Zero-carbon Community

Sustainability

Green space

Recommended vegetation species for Urban Farming

Recommended species	Plantation seasoning	Growth need and Environment adptability

Jan - Mar Apr - Jun Jul - Sep Oct - Dec

Wheat
Water adptability
Soil adptability
Height
Cost
Growing speed

Rice
Water adptability
Soil adptability
Height
Cost
Growing speed

Maize
Water adptability
Soil adptability
Height
Cost
Growing speed

Tomato
Water adptability
Soil adptability
Height
Cost
Growing speed

Apple
Water adptability
Soil adptability
Height
Cost
Growing speed

Recommended species	Plantation seasoning	Growth need and Environment adptability

Jan - Mar Apr - Jun Jul - Sep Oct - Dec

Carrot
Water adptability
Soil adptability
Height
Cost
Growing speed

Grape
Water adptability
Soil adptability
Height
Cost
Growing speed

Squash
Water adptability
Soil adptability
Height
Cost
Growing speed

Spinach
Water adptability
Soil adptability
Height
Cost
Growing speed

Cabbage
Water adptability
Soil adptability
Height
Cost
Growing speed

Ssustainable Design

Zero-carbon Community

Sustainability

Green space

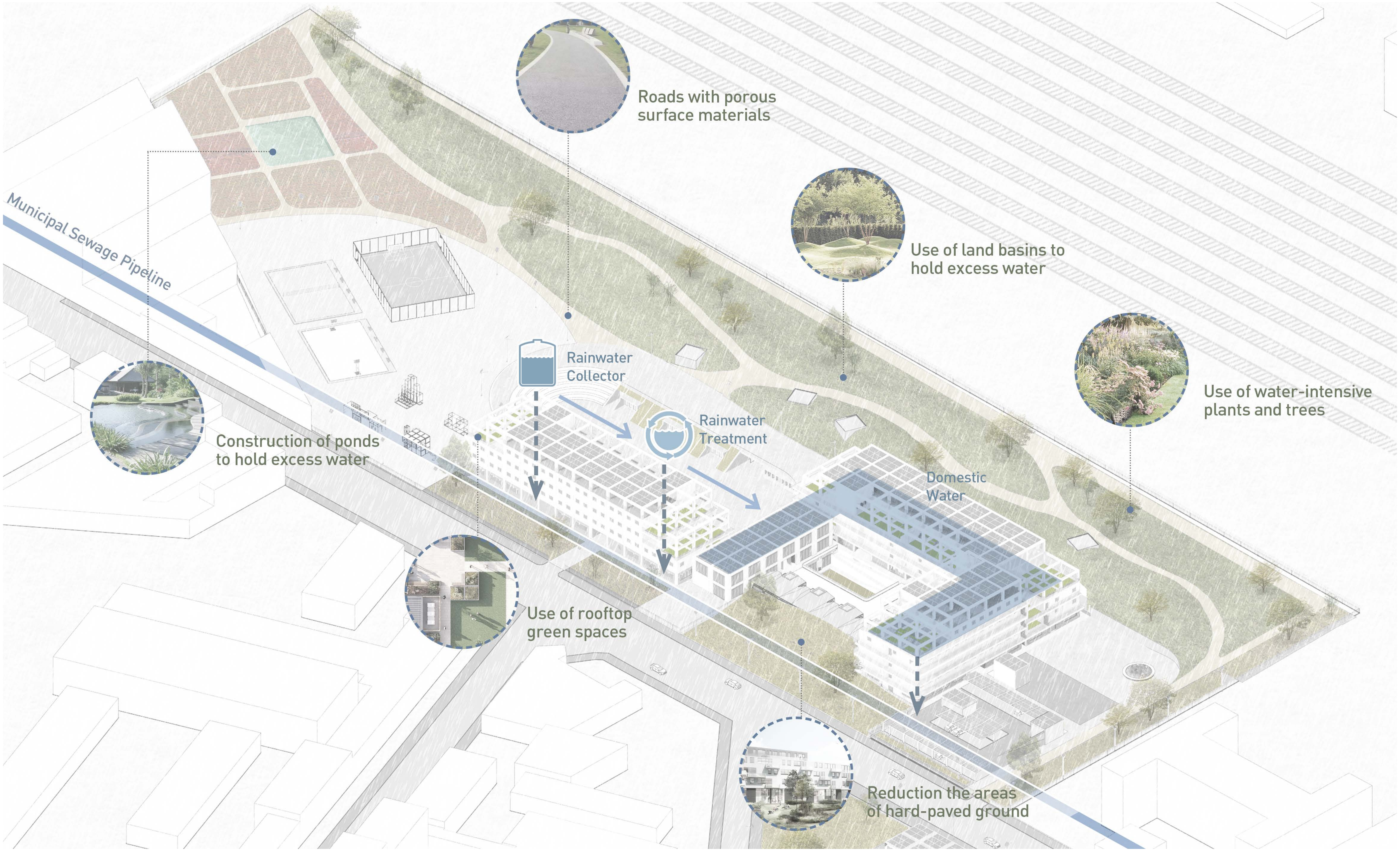
Botanical analysis of landscape greening

Ssustainable Design

Zero-carbon Community

Sustainability

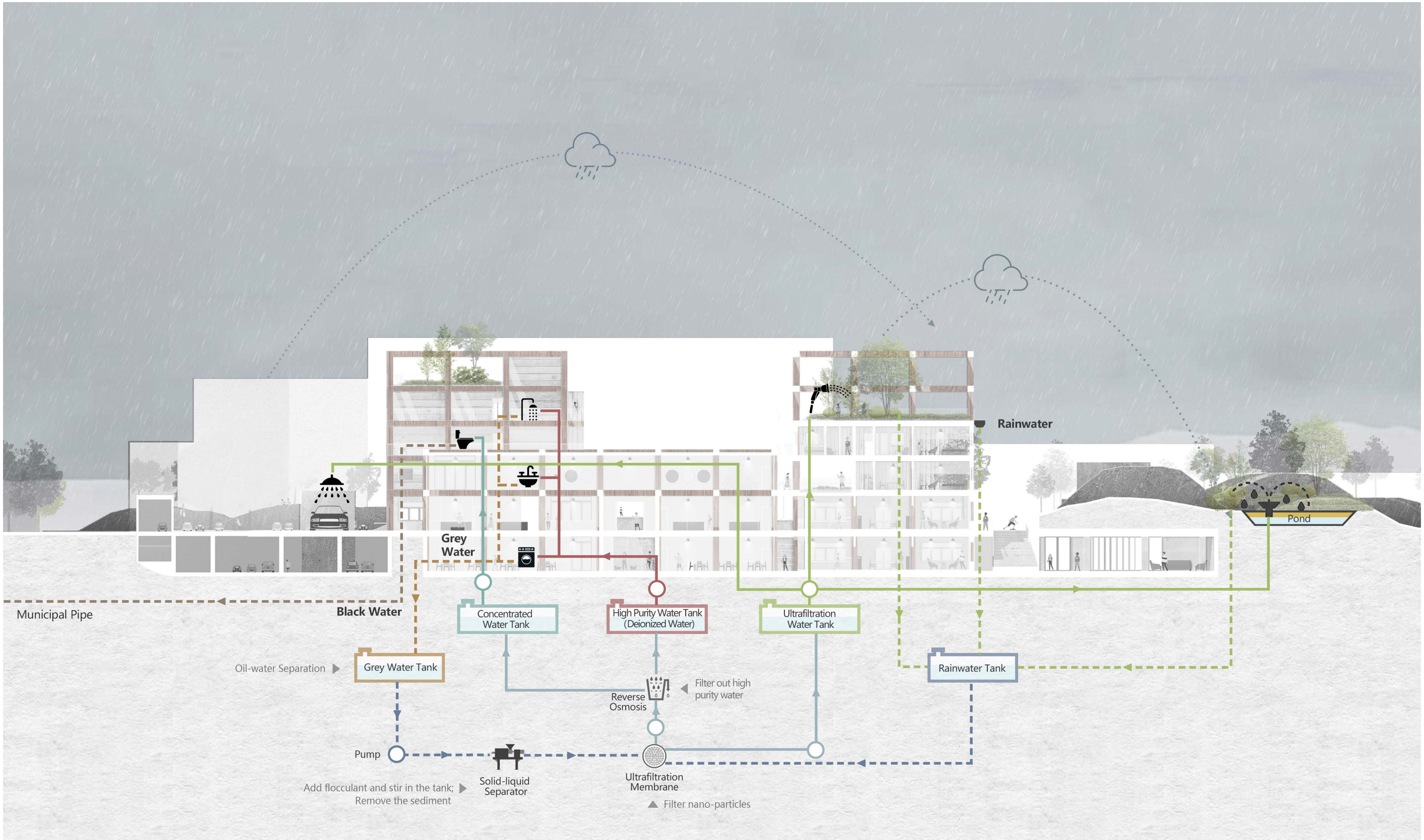
Sponge community



Ssustainable Design

Sustainability

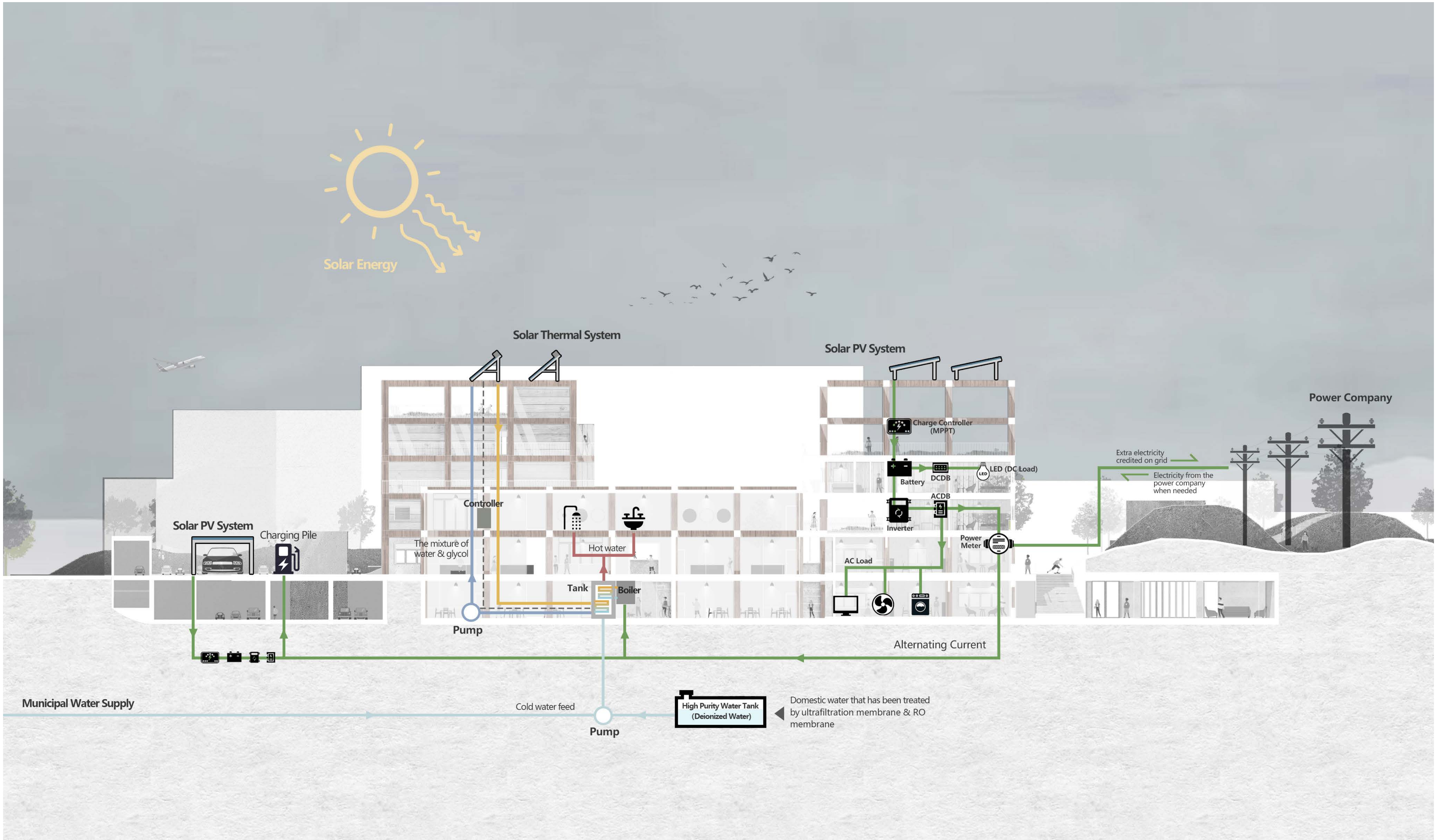
Water management



Zero-carbon Community

Sustainability

Renewable energy production



Ssustainable Design

Sustainability

U value

CLT External Wall

U Value Calculation (d_{wall}=0.41m)							
	LAYER DESCRIPTION (from outside to inside)		*d*	*λ*	*C*	*R*	*U_K*
			m	W/mK	W/m²K	m²K/W	W/m²K
	Internal thermal resistance ($1/h_i$)					0.11	
1	Finishing layer	Top coating	0.0002				
		Putty	0.002				
2	Screed coat	Cement mortar	0.02	0.93		0.02	
3	Base coat	Alkali resistant primer	0.001				
4	Structure	CLT	0.24	0.13		1.85	
5	Base coat	Alkali resistant primer	0.001				
6	Screed coat	Cement mortar	0.02	0.93		0.02	
7	Thermal insulation layer	Adhesive	0.0005				
		Phenolic insulation	0.12	0.021		5.71	
8	Reinforcement	Anti-crack mortar	0.006				
		Glass fiber mesh					
		Anti-crack mortar					
		Anchors					
9	Interior finishing layer	Putty	0.002				
		Top coating	0.0002				
	External thermal resistance ($1/h_e$)					0.04(W)/0.05(S)	
	Gross layer and U_K		**0.4129**			**7.15(W)/7.16(S)**	**0.140**

Timbercrete External Wall

U Value Calculation (d_{wall}=0.41m)							
	LAYER DESCRIPTION (from outside to inside)		*d*	*λ*	*C*	*R*	*U_K*
			m	W/mK	W/m²K	m²K/W	W/m²K
	Internal thermal resistance ($1/h_i$)					0.11	
1	Finishing layer	Top coating	0.0002				
		Putty	0.002				
2	Screed coat	Cement mortar	0.02	0.93		0.02	
3	Base coat	Alkali resistant primer	0.001				
4	Structure	Timbercrete	0.24	0.23		1.04	
5	Base coat	Alkali resistant primer	0.001				
6	Screed coat	Cement mortar	0.02	0.93		0.02	
7	Thermal insulation layer	Adhesive	0.0005				
		Phenolic insulation	0.12	0.021		5.71	
8	Reinforcement	Anti-crack mortar	0.006				
		Glass fiber mesh					
		Anti-crack mortar					
		Anchors					
9	Interior finishing layer	Putty	0.002				
		Top coating	0.0002				
	External thermal resistance ($1/h_e$)					0.04(W)/0.05(S)	
	Gross layer and U_K		**0.4129**			**6.95(W)/6.96(S)**	**0.144**

CLT Slab

U Value Calculation (d_{slab}=0.23m)							
	LAYER DESCRIPTION (from outside to inside)		*d*	*λ*	*C*	*R*	*U_K*
			m	W/mK	W/m²K	m²K/W	W/m²K
	Internal thermal resistance ($1/h_i$)					0.11	
1	Finishing layer	Top coating	0.0002				
		Putty	0.002				
2	Reinforcement	Anchors	0.006				
		Anti-crack mortar					
		Glass fiber mesh					
		Anti-crack mortar					
3	Thermal insulation layer	Phenolic insulation	0.08	0.018		4.44	
		Adhesive	0.0005				
4	Screed coat	Cement mortar	0.02	0.93		0.02	
5	Base coat	Alkali resistant primer	0.001				
6	Structure	CLT	0.1	0.13		0.77	
7	Base coat	Alkali resistant primer	0.001				
8	Screed coat	Cement mortar	0.02	0.93		0.02	
9	Finishing layer	Putty	0.002				
		Top coating	0.0002				
	External thermal resistance ($1/h_e$)					0.04(W)/0.05(S)	
	Gross layer and U_K		**0.2329**			**5.41(W)/5.42(S)**	**0.185**

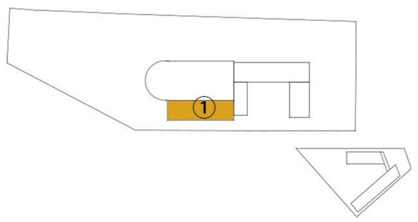
Green Roof

U Value Calculation (d_{roof}=0.6m)							
	LAYER DESCRIPTION (from outside to inside)		*d*	*λ*	*C*	*R*	*U_K*
			m	W/mK	W/m²K	m²K/W	W/m²K
	Internal thermal resistance ($1/h_i$)					0.11	
1	Vegetation & soil layer		0.2	0.58		0.34	
2	Non-woven filter layer		0.001				
3	Plastic shaping board root-resistant hydrophobic layer		0.08	0.17		0.47	
4	Chlorinated polyethylene-rubber blended coil		0.015	0.2		0.08	
5	Phenolic insulation layer		0.1	0.018		5.56	
6	Asphalt polyurethane waterproof coating		0.002	0.17		0.01	
7	Fine stone concrete screed		0.05	0.87		0.06	
8	CLT structure		0.15	0.13		1.15	
	External thermal resistance ($1/h_e$)					0.04(W)/0.05(S)	
	Gross layer and U_K		**0.598**			**7.82(W)/7.83(S)**	**0.128**

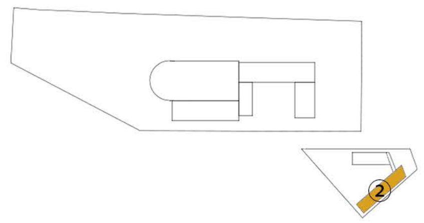
Sustainability

Thermal loss

THERMAL LOSSES CALCULATION FORM						
Room	Intended Use			T_i (°C)	T_e (°C)	Δ T
N. ①	Residential Building			20	-5	25
Heat Losses coefficient for transmission through walls H_d			$H_d = U_K \cdot A_K \cdot f_K$			
N.	Description	U (W/m²K)	A (m²)	f_K	H_d (W/K)	
1	CLT External Wall(400mm)	0.140	1745.8	1	244.4	
2	Timbercrete External Wall(400mm)	0.144	304.8	1	43.9	
3	Window with wooden frame	1.6	367	1	587.2	
4	Glass Door with wooden frame	1.6	100	1	160	
5	Green Roof	0.128	583.2	1	74.6	
6	CLT Roof Slab	0.185	914.8	1	169.2	
7						
8						
9						
10						
				Total	1,279.3	
Heat Losses coefficient for transmission through thermal bridges H_{pt}			$H_{pt} = \Psi \cdot l \cdot f_K$			
N.	Description	Ψ (W/mK)	l (m)	f_K	H_{pt} (W/K)	
				Total	255.8	
Design Heat Losses for Transmission Q_T		$Q_T = (H_d + H_{pt}) \cdot \Delta T$		38,379 W		
Thermal Losses coefficient for ventilation			$H_v = 0{,}34 \cdot V_i \cdot n_{min}$			
Net volume		V_i	m³	26,888.7		
Minimum ventitation rate		n_{min}	h⁻¹	0.5		
Design Heat Losses for Ventilation Q_V		$Q_V = H_v \cdot \Delta T$		114,277 W		
Overall Design Thermal Losses		$Q_T + Q_V$		152,656 **W**		



THERMAL LOSSES CALCULATION FORM						
Room	Intended Use			T_i (°C)	T_e (°C)	Δ T
N. ②	Co-working building			20	-5	25
Heat Losses coefficient for transmission through walls H_d			$H_d = U_K \cdot A_K \cdot f_K$			
N.	Description	U (W/m²K)	A (m²)	f_K	H_d (W/K)	
1	CLT External Wall(400mm)	0.140	193.5	1	27.09	
2	Glass Curtain with wooden frame	1.40	1004.4	1	1406.2	
3	Green Roof	0.128	165	1	21	
4	CLT Roof Slab	0.185	456.6	1	84.5	
5						
6						
7						
8						
9						
10						
				Total	1,538.8	
Heat Losses coefficient for transmission through thermal bridges H_{pt}			$H_{pt} = \Psi \cdot l \cdot f_K$			
N.	Description	Ψ (W/mK)	l (m)	f_K	H_{pt} (W/K)	
				Total	307.8	
Design Heat Losses for Transmission Q_T		$Q_T = (H_d + H_{pt}) \cdot \Delta T$		46,165W		
Thermal Losses coefficient for ventilation			$H_v = 0{,}34 \cdot V_i \cdot n_{min}$			
Net volume		V_i	m³	7,579.2		
Minimum ventitation rate		n_{min}	h⁻¹	1		
Design Heat Losses for Ventilation Q_V		$Q_V = H_v \cdot \Delta T$		64,423.2 W		
Overall Design Thermal Losses		$Q_T + Q_V$		110,588.2 **W**		



Ssustainable Design

Zero-carbon Community

Sustainability

LEED credits

LEED v4 for BD+C: New Construction and Major Renovation
Project Checklist

Y	?	N			
1			Credit	Integrative Process	1
11	**3**	**2**		**Location and Transportation**	**16**
			Credit	LEED for Neighborhood Development Location	16
		1	Credit	Sensitive Land Protection	1
1		1	Credit	High Priority Site	2
3	2		Credit	Surrounding Density and Diverse Uses	5
4	1		Credit	Access to Quality Transit	5
1			Credit	Bicycle Facilities	1
1			Credit	Reduced Parking Footprint	1
1			Credit	Green Vehicles	1
8	**0**	**2**		**Sustainable Sites**	**10**
Y			Prereq	Construction Activity Pollution Prevention	Required
1			Credit	Site Assessment	1
		2	Credit	Site Development - Protect or Restore Habitat	2
1			Credit	Open Space	1
3			Credit	Rainwater Management	3
2			Credit	Heat Island Reduction	2
1			Credit	Light Pollution Reduction	1
8	**1**	**2**		**Water Efficiency**	**11**
Y			Prereq	Outdoor Water Use Reduction	Required
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
2			Credit	Outdoor Water Use Reduction	2
4	1	1	Credit	Indoor Water Use Reduction	6
1		1	Credit	Cooling Tower Water Use	2
1			Credit	Water Metering	1
24	**2**	**7**		**Energy and Atmosphere**	**33**
Y			Prereq	Fundamental Commissioning and Verification	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
4		2	Credit	Enhanced Commissioning	6
12	2	4	Credit	Optimize Energy Performance	18
1			Credit	Advanced Energy Metering	1
2			Credit	Demand Response	2
3			Credit	Renewable Energy Production	3
		1	Credit	Enhanced Refrigerant Management	1
2			Credit	Green Power and Carbon Offsets	2

Project Name: Zero-carbon Community

8	**2**	**3**		**Materials and Resources**	**13**
Y			Prereq	Storage and Collection of Recyclables	Required
Y			Prereq	Construction and Demolition Waste Management Planning	Required
3	1	1	Credit	Building Life-Cycle Impact Reduction	5
2			Credit	Building Product Disclosure and Optimization - Environmental Product Declarations	2
		2	Credit	Building Product Disclosure and Optimization - Sourcing of Raw Materials	2
1	1		Credit	Building Product Disclosure and Optimization - Material Ingredients	2
2			Credit	Construction and Demolition Waste Management	2
10	**3**	**2**		**Indoor Environmental Quality**	**16**
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
1	1		Credit	Enhanced Indoor Air Quality Strategies	2
2	1		Credit	Low-Emitting Materials	3
1			Credit	Construction Indoor Air Quality Management Plan	1
1		1	Credit	Indoor Air Quality Assessment	2
1			Credit	Thermal Comfort	1
1	1		Credit	Interior Lighting	2
2		1	Credit	Daylight	3
1			Credit	Quality Views	1
		0	Credit	Acoustic Performance	1
3	**0**	**3**		**Innovation**	**6**
2		3	Credit	Innovation	5
1			Credit	LEED Accredited Professional	1
0	**0**	**4**		**Regional Priority**	**4**
		1	Credit	Regional Priority: Specific Credit	1
		1	Credit	Regional Priority: Specific Credit	1
		1	Credit	Regional Priority: Specific Credit	1
		1	Credit	Regional Priority: Specific Credit	1
73	**11**	**25**		**TOTALS** Possible Points:	**110**

Certified: 40 to 49 points, **Silver:** 50 to 59 points, **Gold:** 60 to 79 points, **Platinum:** 80 to 110

Ssustainable Design

Sustainability

Strategy solutions

Credit	Score	Detail
Integrative Process	1	Beginning in pre-design and continuing throughout the design phases, identify and use opportunities to achieve synergies across disciplines and building systems. Use the analyses of **Energy-Related Systems** and **Water-Related Systems.**
Location and Transportation		
Sensitive Land Protection	1	Avoid the development of environmentally sensitive lands and reduce the environmental impact from the location of a building on a site.
High Priority Site	1	Locate the project on a renewal community site
Surrounding Density and Diverse Uses	3-5	Conserve land and protect farmland and wildlife habitat by encouraging development in areas with existing infrastructure. To promote walkability, and transportation efficiency and reduce vehicle distance traveled. To improve public health by encouraging daily physical activity.
Access to Quality Transit	4-5	Locate entries of the project within a ¼-mile (400-meter) walking distance of existing or planned bus, streetcar, or rideshare stops, or within a ½-mile (800-meter) walking distance of existing or planned bus rapid transit stops, light or heavy rail stations.
Bicycle Facilities	1	Design or locate the project such that a functional entry or bicycle storage is within a 200-yard (180- meter) walking distance or bicycling distance from a bicycle network.
Reduced Parking Footprint	1	Minimize the environmental harms associated with parking facilities, including automobile dependence, land consumption, and rainwater runoff.
Green Vehicles	1	Install electrical vehicle supply equipment (EVSE) in 2% of all parking spaces used by the project.
Sustainable Sites		
Site Assessment	1	Assess site conditions before design to evaluate sustainable options and inform related decisions about site design.
Open Space	1	Provide outdoor space greater than or equal to 30% of the total site area. A minimum of 25% of that outdoor space are vegetated..
Rainwater Management	3	Manage on site the runoff from the developed site for the 95th percentile of regional or local rainfall events using low-impact development (LID) and green infrastructure.
Heat Island Reduction	2	Use the existing plant material or install plants that provide shade over paving areas. Provide shade with structures covered by energy generation systems. Provide shade with vegetated structures and roofs. Place a minimum of 75% of parking spaces under cover.
Light Pollution Reduction	1	Increase night sky access, improve nighttime visibility, and reduce the consequences of development for wildlife and people.
Water Efficiency		
Outdoor Water Use Reduction	1-2	Reduce the project's landscape water requirement by at least 30% from the calculated baseline for the site's peak watering month.
Indoor Water Use Reduction	4-5	The rainwater is treated and supplemented as domestic water.
Cooling Tower Water Use	1	To conserve water used for cooling tower makeup while controlling microbes, corrosion, and scale in the condenser water system.
Water Metering	1	Support water management and identify opportunities for additional water savings by tracking water consumption.
Energy and Atmosphere		
Enhanced Commissioning	4	To further support the design, construction, and eventual operation of a project that meets the owner's project requirements for energy, water, indoor environmental quality, and durability.
Optimize Energy Performance	12	Analyze efficiency measures during the design process and account for the results in design decision making. Use energy simulation of efficiency opportunities, past energy simulation analyses for similar buildings, or published data from analyses for similar buildings.
Advanced Energy Metering	1	Support energy management and identify opportunities for additional energy savings by tracking building-level and system-level energy use.
Demand Response	2	Design building and equipment for participation in demand response programs through load shedding or shifting.
Renewable Energy Production	3	Use renewable energy systems to offset building energy cost.
Green Power and Carbon Offsets	2	Encourage the reduction of greenhouse gas emissions through the use of grid-source, renewable energy technologies and carbon mitigation projects.

Zero-carbon Community

Credit	Score	Detail
Materials and Resources		
Building Life-Cycle Impact Reduction	3-4	Reuse or salvage building materials from off site or on site as a percentage of the surface area.
Building Product Disclosure and Optimization - Environmental Product Declarations	2	Use 20 different permanently installed products sourced from at least five different manufacturers.
Building Product Disclosure and Optimization - Material Ingredients	1-2	To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts.
Construction and Demolition Waste Management	2	Reduce construction and demolition waste disposed of in landfills and incineration facilities by recovering, reusing, and recycling materials.
Indoor Environmental Quality		
Enhanced Indoor Air Quality Strategies	1-2	Promote occupants' comfort, well-being, and productivity by improving indoor air quality.
Low-Emitting Materials	2-3	Reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.
Construction Indoor Air Quality Management Plan	1	Promote the well-being of construction workers and building occupants by minimizing indoor air quality problems associated with construction and renovation.
Indoor Air Quality Assessment	1	Install new filtration media and perform a building flush-out by supplying a total air volume of 14,000 cubic feet of outdoor air per square foot of gross floor area while maintaining an internal temperature of at least 15°C and no higher than 27°C and relative humidity no higher than 60%.
Thermal Comfort	1	Meet the requirements for both thermal comfort design and thermal comfort control.
Interior Lighting	1-2	For at least 90% of individual occupant spaces, provide individual lighting controls that enable occupants to adjust the lighting to suit their individual tasks and preferences, with at least three lighting levels or scenes (on, off, midlevel).
Daylight	2	Demonstrate through annual computer simulations that spatial daylight autonomy300/50% (sDA300/50%) of at least 55%, 75%, or 90% is achieved.
Quality Views	1	Achieve a direct line of sight to the outdoors via vision glazing for 75% of all regularly occupied floor area.
Innovation		
Innovation	2	Achieve significant, measurable environmental performance using a strategy not addressed in the LEED green building rating system. Achieve exemplary performance in an existing LEED v4 prerequisite or credit that allows exemplary performance, as specified in the LEED Reference Guide, v4 edition.
LEED Accredited Professional	1	Encourage the team integration required by a LEED project and to streamline the application and certification process.

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