UBC Social Ecological Economic Development Studies (SEEDS) Sustainability Program

Student Research Report

Ecosystemic Urbanism at UBC

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University of British Columbia

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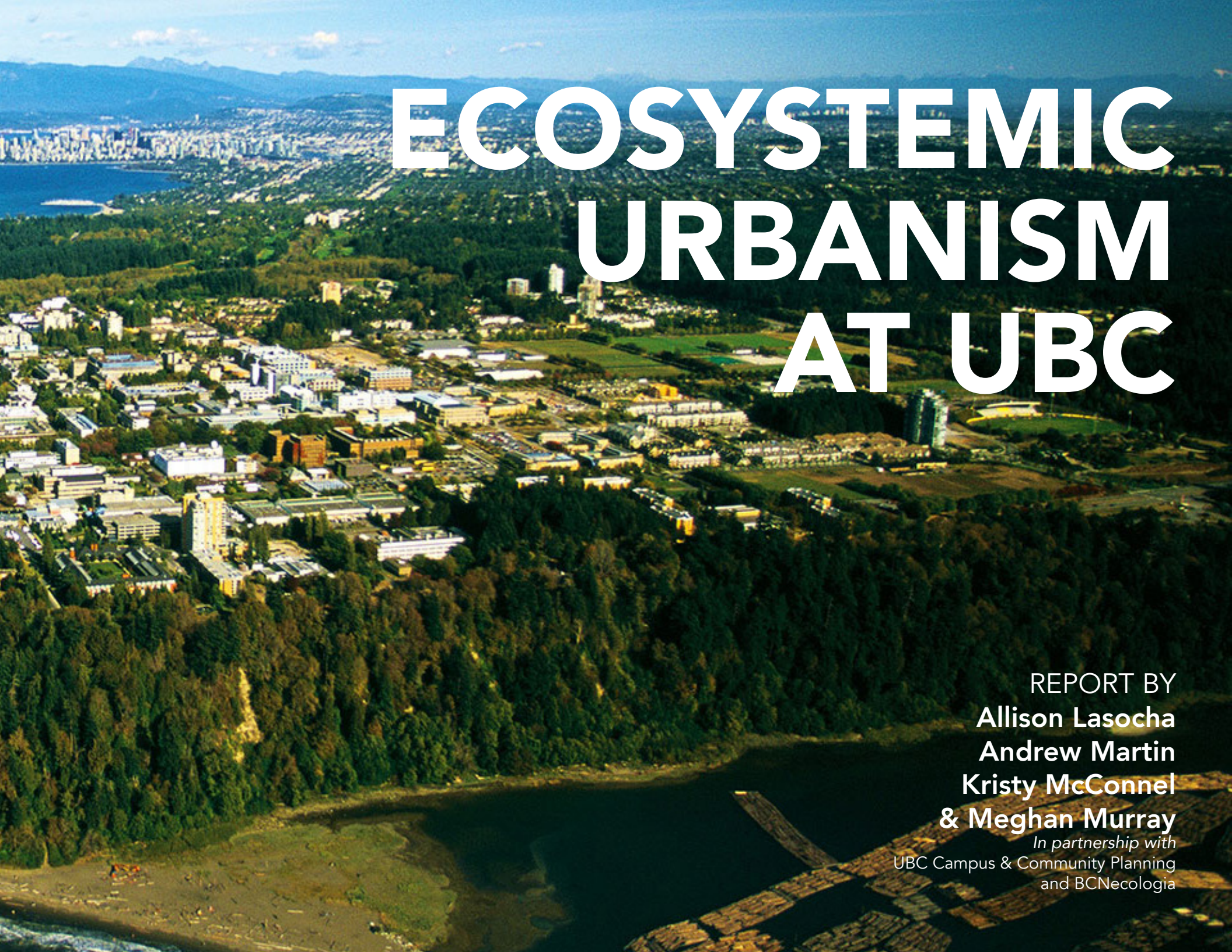

ECOSYSTEMIC URBANISM AT UBC

REPORT BY
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In partnership with
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and BCNecologia

Ecosystemic Urbanism at UBC (2017). Report by Allison Lasocha, Andrew Martin, Kristy McConnel, & Meghan Murray, in partnership with UBC Campus and Community Planning, and BCNecologia.

THE UNIVERSITY OF BRITISH COLUMBIA
Campus + Community Planning

Acknowledgments

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background.

Introduction

Stadium Neighbourhood in Context. *(UBC, 2017).* Stadium Neighbourhood is located west of East Mall, and north of 16th Avenue, adjacent to the UBC Botanical Gardens and the Rhododendron Wood. The site has the potential to play a key role in improving connectivity of the campus while enhancing human and environmental wellbeing. (Source: UBC Archives)

The University of British Columbia (UBC) believes in sustainability as a necessity, as the ecological and human consequences of being unsustainable are devastating. Not only is it the right thing to do ethically and in terms of distributive justice, it is desirable in itself, offering the possibility of a better life for people and the planet (UBC, 2014).

As part of UBC's commitment to sustainability, a 20-year Sustainability Strategy was developed in consultation with the community including students, faculty, staff, campus residents, the University Neighbourhood Association (UNA), Musqueam First Nation, and external community partners. The strategy guides UBC's efforts towards not only a more sustainable university but a more sustainable world.

Since a 2015 workshop with Salvador Rueda of BCNecologia, UBC has been interested in how the organization's theory, principles and evaluative framework can be applied on campus to support the pursuit of sustainability. Stadium Neighbourhood and the adjoining academic lands provide an opportunity to test this framework, known as Ecosystemic Urbanism, at UBC. This project aims to apply the theories and principles of the evaluative tool in the UBC context, while working to develop mixed-use design options for Stadium Neighbourhood. The work is the result of a collaboration between UBC Campus and Community Planning (C&CP), the UBC School of Community and Regional Planning (SCARP), and BCNecologia.

Vision & Objectives

UBC is a microcosm unto itself, where a person can live, work, study, and play. In an Information Age, UBC is a living laboratory, where knowledge is our currency. The planning and design of Stadium Neighbourhood will bolster this vision through embedding principles of regenerative sustainability in all aspects of its development. The new neighbourhood will be leveraged to connect the campus in its entirety, to foster new partnerships, support innovation, and improve human and environmental wellbeing.

evaluate

Ecosystemic Urbanism as a tool for measuring neighbourhood sustainability.

understand

the utility of Ecosystemic Urbanism as an analytical tool in the UBC planning context.

create

design options for Stadium Neighbourhood with respect to the principles of Ecosystemic Urbanism.

Methodology

This project was completed as part of a studio course at the University of British Columbia (UBC) in the Master of Community and Regional Planning program at the School of Community and Regional Planning (SCARP). The project was completed from September, 2016 to April, 2017.

A collaborative approach was used to achieve the objectives of the project. From September to November 2016, the SCARP student team engaged with the project partner, UBC Campus and Community Planning (C&CP), and conducted secondary research, to gain a thorough understanding of the UBC planning context. Concurrently, the students worked to analyze online publications and books on Ecoystemic Urbanism to gain an understanding of the framework and its potential utility in North America and, more specifically, at UBC. In November 2016, UBC C&CP and the student team connected with key stakeholders at BCNecologia by conference call, and began to discuss the potential applicability of Ecosystemic Urbanism at UBC. From November to December, the students worked with staff at C&CP to collect primary data inputs, which were then used by BCNecologia to study the UBC campus according to the framework.

An analysis was completed by BCNecologia and returned to the UBC team in January, 2017. The research and analysis culminated in the design of a charrette style workshop that convened 30 professionals. At the workshop, presentations and materials were provided by the student team to inform the creation of two schemes for Stadium Neighbourhood, based on the principles of Ecosystemic Urbanism. Following the workshop, the students used all prior research and analysis to inform a single design for Stadium Neighbourhood. This design embodies the principles of Ecosystemic Urbanism. The research, analysis, and design are summarized in this report.

Limitations

There were three key limiting factors in completing this work: limited time; availability of data; and the proprietary nature of Ecosystemic Urbanism. In terms of time, the project was completed in only seven months. Ecosystemic Urbanism is a highly complex, and comprehensive tool. In order to fully understand the tool, and the challenges in adapting it to the local context, it would be necessary to dedicate more than the available time. In a typical process, BCNecologia may spend up to six months analyzing the local context prior to data collection. In this project, only seven months were available to study the context, collect data, and perform an analysis.

Availability of data was another limiting factor in this work. Ecosystemic Urbanism requires specific, detailed, geolocated data. There were significant data gaps for the UBC context, and some datasets were only available at inappropriate scales or in inappropriate formats. Since it was not possible to collect all required data in the given time period, the analysis conducted by BCNecologia was incomplete and therefore did not provide a true test of the tool's suitability to the local context.

Lastly, a significant challenge was the proprietary nature of Ecosystemic Urbanism. The framework is intended to be utilized by staff at BCNecologia. Therefore, the available publications do not provide comprehensive explanations of the methodology. The students interpreted the framework by looking at a number of different, and at times contradictory, sources. Further details on the challenges of applying Ecosystemic Urbanism in the UBC context are provided in Part 6.

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ubc planning and design context.

Buildings in a sea of parking. *(UBC, 1973)*. Until recently, UBC's campus was dominated by cars, and parking lots, as evidenced by this aerial photo.
(Source: UBC Archives)

Pedestrians on Main Mall. *(UBC, current)*. Once dedicated to car traffic, many routes on campus are now pedestrian only zones.
(Source: UBC Welcome Centre)

from...

single-use
car dominated
commuter campus

to...

mixed-use
pedestrian-oriented
complete community

A Cultural Shift

UBC has undergone a major transformation in recent years. Aerial photos from the 1970s reveal buildings in a sea of parking, however, what was once a single-use commuter campus is becoming increasingly diverse. C&CP is working to create a complete community where students, staff, faculty and residents have access to all the needs of daily life and where sustainability is prioritized. The emphasis is increasingly on pedestrian experience.

Motivations for Neighbourhood

The evolution of the campus is evident in its housing stock. The first UBC neighbourhood, completed in 1989, was Hampton Place. The neighbourhood was developed with a vision of being UBC's first multi-family unit community and is a single-use, housing development. UBC's newest neighbourhood, Wesbrook Place, is still in the process of build-out. The neighbourhood's vision is "to bring new rental and family housing opportunities, sustainable development and quality community amenities to the largest neighbourhood [at UBC]" (UBC Campus and Community Planning, 2017). It is a vibrant, mixed-use community where social and environmental health are top priorities. This demonstrates UBC's gradual evolution from a commuter campus, to a bedroom community with academic lands, to a complete, mixed-use campus community. The provision of these mixed-use residential neighbourhoods are a key component of a sustainable campus.

UBC's first neighbourhood. Built in 1989, Hampton Place is a single-use, bedroom community. (Source: University Neighborhood Association)

UBC's latest neighbourhood. Approved in 2005 and still in the process of build-out, Wesbrook Place it is a vibrant neighbourhood where environmental and social sustainability are top priorities. (Source: University Neighborhood Association)

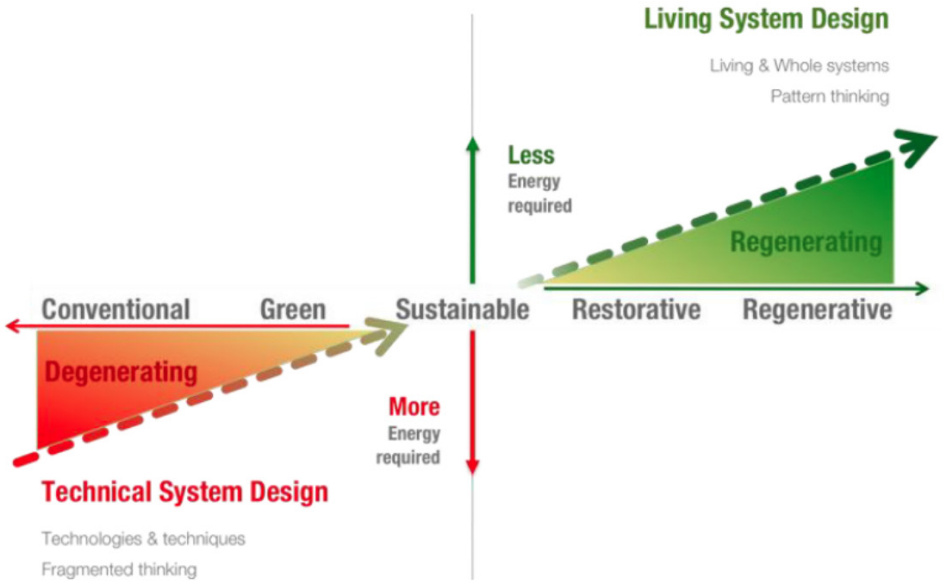
Centre for Interactive Research on Sustainability (CIRS). Completed in 2011, CIRS is the first building on campus to embody the principles of regenerative design. (Source: UBC Blogs)

Olympic Village. This is Canada's first LEED Platinum neighbourhood. Though it is not technically regenerative, it is built to high environmental standards, with an emphasis on energy efficiency and high quality public realm. (Source: Pinterest)

Regenerative Urbanism

One approach to move beyond the dominant sustainability narrative is regenerative design. Typically, sustainability focuses on harm reduction. Regenerative design applies whole systems thinking, and has been described as "the active restoration and regeneration of the environment; and the active pursuit of improvements in the well-being of the community" (Robinson and Cole, 2015). This is demonstrated in the diagram to the right, which represents a transition from conventional, or technical systems design, to living systems design. Conventional design, shown at the bottom left of the graphic, results in urban systems that are degrading to the land and consume more energy than they produce. Living systems design, shown at the top right of the graphic, is net-positive. These systems are self-sustaining, and create more energy than is consumed. This net-positive design is the theory behind regenerative urbanism.

The theory of regenerative design is well-understood for its potential benefits to both the environment and society. UBC's Centre for Interactive Research on Sustainability, completed in 2011, is the first building on campus to embody the principles of regenerative design. It was built as a living lab, to help the university gain an understanding of how the principles of regenerative design can be applied to the local context. While there are no existing projects on the neighbourhood scale based on the principles of regenerative design, there are examples of developments striving towards similar goals. Olympic Village is Canada's first LEED Platinum neighbourhood. It was built with high environmental standards and innovative energy efficiency, incorporating green roofs and solar technology. Additionally, there is a strong emphasis on the public realm, with significant space dedicated to urban agriculture and green landscaping features. While there is a trend toward regenerative design, a lack of clarity exists around its effective implementation.



Pathways to Regenerative Urbanism. While technical systems design was once the norm, there is a paradigm shift towards living systems design. (Source: Gerry McGeough 2016)

3

ecosystemic
urbanism.


Activities in Barcelona's *Eixample* sector.
CLUB
INSTITUT
P

Theory

Towards Urban Complexity

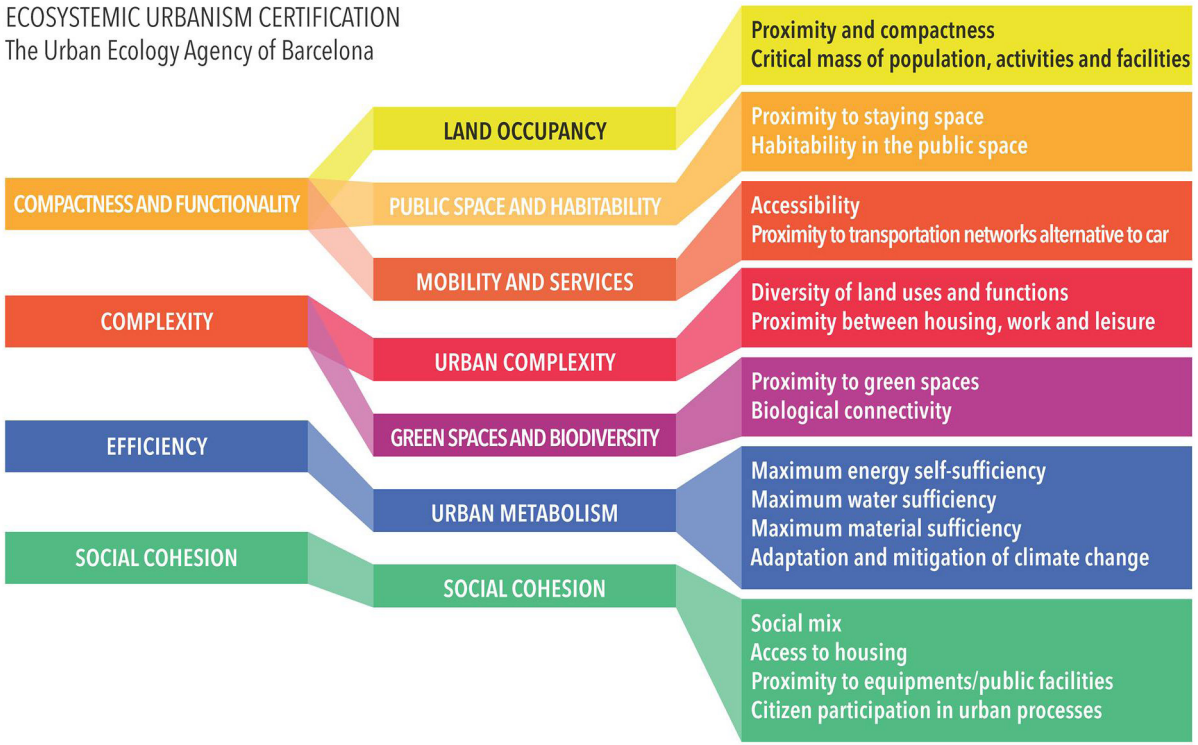
Ecosystemic Urbanism provides a framework for the implementation of regenerative urbanism. It was developed in Barcelona by BCNecologia, spearheaded by Salvador Rueda. The tool is grounded in the theory of urban efficiency, which applies the same logic to urban systems as that which is applied to natural systems. Cities are understood as ecosystems ruled by the laws of physics.

Ecosystemic Urbanism postulates that as urban organization (nH) increases in complexity (measured by the number and diversity of legal entities in the study area), energy consumption (e) will naturally reduce, leading to a more efficient system over time. As this trend towards increased complexity and reduced energy consumption continues, it will eventually reach a regenerative state.

$$\frac{\text{resources (e)}}{\text{urban organization (nH)}} \longrightarrow \text{time}$$

e = the consumption of energy (as a synthesis of the consumption of resources)
n = the number of legal entities (businesses, institutions and associations)
H = the value of the diversity of these legal entities

Urban Complexity. Urban complexity plays a key role in the theory of Ecosystemic Urbanism. The framework utilizes a series of icons to represent urban diversity (shown left).
(Source: BCNecologia)



Ecological Urbanism Certification.
Ecosystemic Urbanism is grounded in the four goals, seven objectives, and fifteen design principles shown above. This conceptual framework comprises the majority of BCNecologica's public facing process.

INDICATORS

01 Housing density
02 Absolute compactness
03 Corrected compactness
04 Staying space per inhabitant
05 Air quality
06 Acoustic comfort
07 Thermal comfort
08 Road accessibility
09 Road space for pedestrians
10 Proportion of the street
11 Visual perception of urban green
12 Habitability index in the public space
13 Proximity to public transport
14 Proximity to cycling network
15 Motorized road space
16 Proximity to bicycle parking
17 Off-road car parking spaces
18 Provision of vehicle parking spaces
19 Provision of bicycle parking spaces
20 Off-road space for the distribution of goods
21 Urban diversity
22 Balance between activity and residence
23 Spatial and functional continuity of street
24 Soil biotic index
25 Green space per inhabitant
26 Simultaneous proximity to green spaces
27 Density of trees
28 Urban green connectors
29 Energy demand in the residential sector
30 Energy demand in the tertiary sector and equipment
31 Energy demand in the public space
32 Consumption
33 Energy self-sufficiency from renewable energies
34 Emissions of greenhouse gases
35 Potable water demand
36 Water sufficiency
37 Proximity to waste collection points
38 Proximity to household waste recycling centre
39 Closing the organic matter cycle
40 Model integration with adjacent waste management
41 Provision of subsidized housing
42 Spatial distribution of subsidized housing
43 Provision of public facilities
44 Proximity to public facilities

Method

Ecosystemic Urbanism is a neighbourhoood-scale sustainability assessment framework that utilizes an indicators approach. The framework is intended to guide the growth and development of cities with an urban population of greater than 50,000 residents. The city being evaluated is broken down into minimum units of action for analysis. The study area is defined by a radius of 300 meters or by a surface area of 16 hectares.

Guiding Principles

A unit of action, or the study area, is analyzed using a series of indicators that are designed to bring a balanced, holistic and ultimately regenerative approach to urban planning projects. The indicators are based on four key principles: Compactness and Functionality, Complexity, Efficiency, and Social Cohesion. The framework can be applied to both new fabrics, new neighbourhoods or development proposals, and existing fabrics, existing neighbourhoods or developments. Each context is assessed using a unique, but related set of indicators, which are based on the same set of principles shown in the diagram.

Differing Contexts

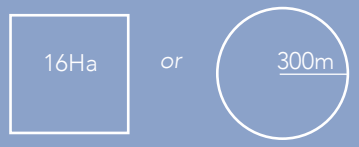
The study of new fabrics has two components - a Pre-existing Context Analysis and an Assessment of the Neighbourhood Proposal. The Pre-existing Context Analysis is performed using 30 indicators in order to gain a thorough understanding of current conditions, and to identify deficiencies. This will be discussed further in Part 4. An Assessment of the Neighbourhood Proposal is then applied to the proposed development, to gain a theoretical understanding of its performance. The existing fabrics indicators are applied to an existing neighbourhood. These indicators are almost identical to the Assessment of the Neighbourhood Proposal indicators, but are applied to built-out areas to assess performance. Together, these indicators are designed to provide a holistic view of neighbourhood performance.

the tool guides the growth and development of cities with an

urban population > 50,000

cities being evaluated are broken into

minimum units of action



the tool uses an indicators approach...

new fabrics

Pre-Existing Context Analysis (30 indicators)
Assesment of Neighbourhood Proposal (44 indicators)

existing fabrics

Assesment of Existing Neighbourhood (44 indicators)

01. Land Occupancy

Description
Land Occupancy prioritizes compact development. This encourages efficient land consumption and efficient use of natural resources in order to decrease pressure on urban support systems. Emphasis is placed on integration, connectivity, building density, and intensity of land uses.

Main Objectives
01. Generate a critical population mass
02. Create a compact urban fabric
03. Develop patterns of walkability

02. Public Space & Habitability

Description
Public Space and Habitability emphasizes high quality public spaces in order to create a city that is both habitable and sustainable. Key features of public spaces are accessibility, safety, and health. Health includes low pollution levels, and high levels of acoustic, lighting, and thermal comfort.

Main Objectives
01. Seek a balance between built and gathering spaces
02. Reserve ample "staying" space for inhabitants
03. Ensure environmental comfort
04. Create safe and accessible streets for people
05. Design well-proportioned, human-scale streets

05. Green Space & Biodiversity

Description
Green Space and Biodiversity should be prioritized in neighbourhood design to support wildlife and maintain permeable surfaces, while creating green spaces for recreation, both at grade and as green walls and roofs. Networks should comprise a green mosaic of parks, gardens, and interior blocks.

Main Objectives
01. Implement a structured green network
02. Promote soil permeability
03. Plant native and drought resistant species
04. Ensure inhabitants are within walking distance to green space

06. Urban Metabolism

Description
Urban Metabolism seeks self-sufficiency in all urban systems. Closed loop systems, for energy, water, waste, materials and food are desired. New urban development projects should incorporate strategic actions to mitigate climate change.

Main Objectives
01. Optimize efficiency and self-sufficiency
02. Apply systems thinking
03. Promote closed loop systems

03. Mobility & Services

Description
Mobility and Services promotes transportation alternatives to private vehicles, where the street is predominantly reserved for pedestrians. This promotes reduced energy consumption, and air and noise pollution while increasing safety and reducing traffic accidents. A safe, accessible, and continuous bicycle and pedestrian network is required.

Main Objectives
01. Reduce automobile dependency
02. Develop a land-use transportation plan
03. Create a multi-modal transit network
04. Guarantee frequent and accessible public transportation
.

04. Urban Complexity

Description
Urban Complexity aims to create a complex, knowledge-dense fabric of legal entities which ensures access to key goods and services close to home. Diversity of organizations supports a balanced social structure and creates local employment opportunities.

Main Objectives
01. Promote the knowledge/information economy
02. Promote a diverse critical mass of legal entities
03. Create residential areas services by daily needs
04. Promote fine-grained urban fabric
05. Create a mixing of uses

07. Social Cohesion

Description
Social cohesion refers to the level of harmonious co-existence among groups of people with different cultures, ages, incomes and occupations. Housing and social infrastructure, including cultural, sport, education, healthcare and social services, should promote diversity of access and inclusion.

Main Objectives
01. Foster a mixed population
02. Foster mixed and inclusive housing composition
03. Distribute public services, goods and infrastructure equitably

The 7 Objectives of Ecosystemic Urbanism. The 44 indicators used to conduct both an Assessment of Neighbourhood Proposals and Assessment of Existing Neighbourhoods are rooted in the 7 key objectives described here and will be used to analyze the design concept in Part 5.

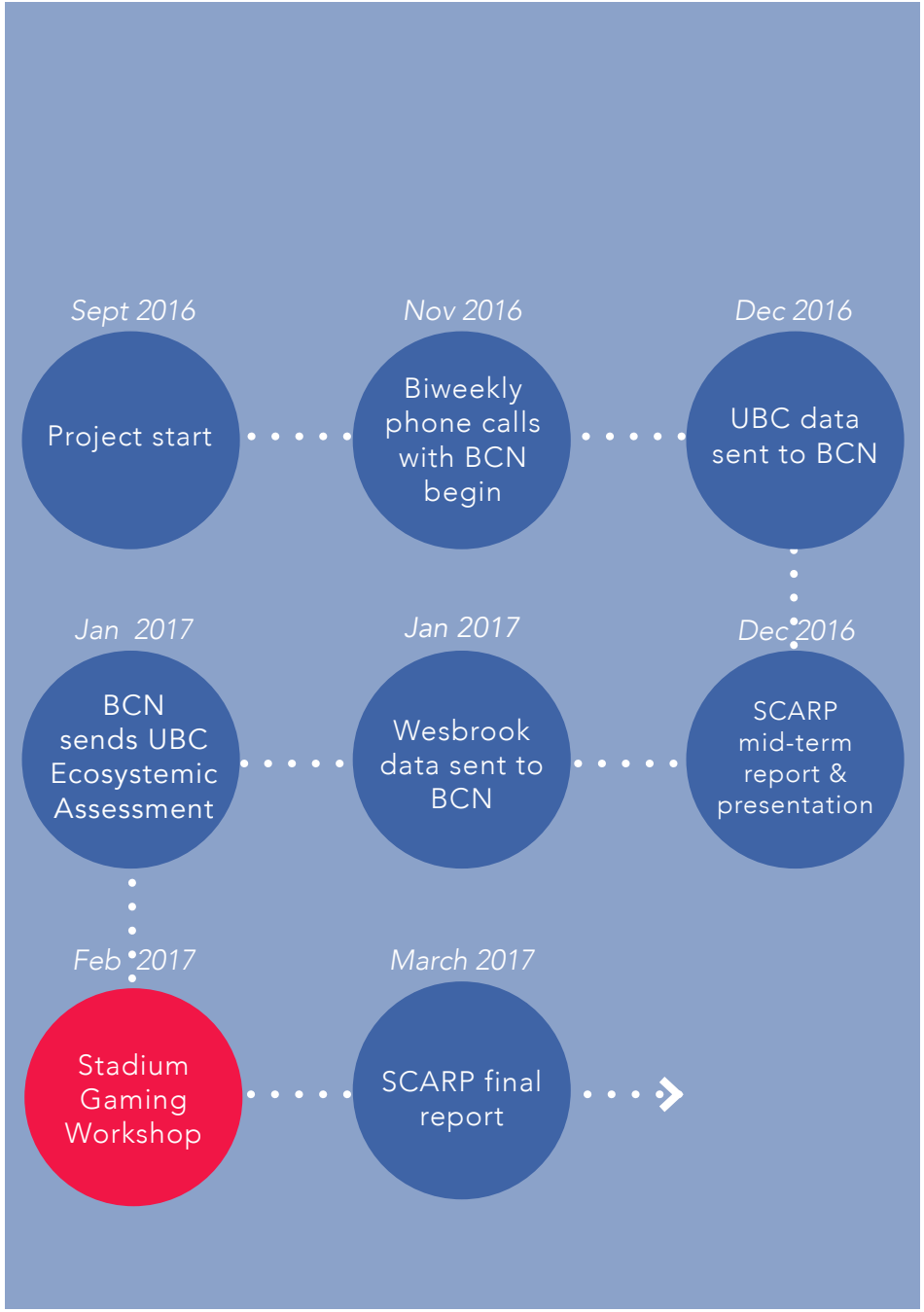
4

ecosystemic urbanism at ubc.


ECOSYSTEMIC URBANISM @UBC
REGENERATIVE URBANISM
RESOURCES (e) CONSUMED
URBAN ORGANIZATION (nk)
sustainable tendency
unsustainable tendency
time
CITIES
A lot of people talk about "SUSTAINABILITY," but we need a completely new
FRAMEWORK METHODOLOGY TOOLS
STRATEGY
An ECOLOGICAL approach within all specialized roles!
We require a CRITICAL MASS of people to enable clustering, vibrant public space, effective public transport, etc.
the campus, this KNOWLEDGE CITY must become a real living laboratory to test better ways of planning and building, thus leading research in this field for our region.
THE MOST SUSTAINABLE CITY MODEL
MANAGEMENT & GOVERNANCE
·proper decision making
SOCIAL COHESION
·increase interpersonal networks
·guarantee access to housing
·guarantee facility accessibility, max. 600m to walk
URBAN METABOLISM
·energy self sufficiency
·water self sufficiency
·food + materials self sufficiency
URBAN BIODIVERSITY
·green spaces
·adapt to climate change
URBAN COMPLEXITY
·reach high levels of diversity
·physical compactness of 5m+ is required
MOBILITY & SERVICES
·dense & efficient public transit
PUBLIC SPACE & HABITABILITY
·users of public space as citizens, not just peds.
·habitability of spaces
·at 65 dB, one can have a conversation at 1m.
·with insulation, 35 dB indoors is nec for sleepin
LAND CONSUMPTION
·reach a population critical mass
·proximity between population & services
AIR QUALI
<40 µg/m³ (annual)
<65 dB daytime hours
for a healthy urban life we need a balance betwee in
the SU
PEDESTRIAN-IZATION
>75% of street space is for pedestrians
PUBLIC TRANSPORT
<300m from population to transit stop
GREEN VOLUME
>10% of street section free space is green
examples of indicators and their targets
THERMAL COMFORT
>7.5h /day of comfort in public space
UNITS OF ANALY
"The real voyage of discovery consists seeking new landscapes, but in
A MIXED USE PEDESTRIAN ORIENTED COMPLETE COMMUNITY
CAR DOMINATED COMMUTER CAMPUS
(IN PROGRESS)

Partnership with BCNecologia

In 2015, a group of representatives from BCNecologia came to the UBC campus for a workshop with Campus and Community Planning and other external stakeholders. The goal of the workshop was to describe Ecosystemic Urbanism and its potential applicability within the region. With continued interest in the framework, and the start of the SCARP student team project, C&CP reached out to connect with BCNecologia and Salvador Rueda. Mr. Rueda expressed interest in the project and its goal of testing Ecosystemic Urbanism on campus. This began a relationship that spanned the project and culminated in a workshop with C&CP, external stakeholders, the SCARP team and Salvador Rueda. The sections following further describe the SCARP student team's analysis, BCNecologia's assessment and contributions, and the Stadium Gaming Workshop.



Stadium Gaming Workshop. (UBC, 2017)
As Salvador Rueda gave a lecture on the theory of Ecosystemic Urbanism at the Stadium Gaming Workshop, Andrew Martin captured key concepts through graphic recording.


University Blvd
Main Mall
Hawthorne Place
West Mall
East Mall
Sports Fields
Botanincal Gardens
SW Marine Dr
West 16th Ave
Wesbrook
UBC Farm

Student Analysis

To gain an understanding of the pre-existing conditions at Stadium Neighbourhood, the SCARP student team conducted a preliminary analysis through the lens of Ecosystemic Urbanism. The 30 indicators for the Pre-existing Context Analysis are organized into 5 categories: Site Vulnerability, Territorial Fitting of the New Fabric, Efficient Land Consumption, Urban Planning Demands, and Resource Availability. Each category is further divided into sub-categories, with the indicators distributed among these sub-categories. Due to limited time, and availability of data, it was not possible to calculate all indicators, so a high level analysis was conducted using the five categories and their sub-categories. The following provides a summary of key features of the site to be considered in the design process.

new fabrics

01. Site Vulnerability
- 1.1 natural & anthropic hazards
- 1.2 environmental & cultural assets
- 1.3 social vulnerability

02. Territorial Fitting
- 2.1 integration & connectivity
- 2.2 access to services
- 2.3 urban complexity
- 2.4 compactness

03. Land Consumption
- 3.1 urban saturation
- 3.2 urban fix

04. Planning Demands
- 4.1 urban facilities
- 4.2 public space

05. Local Resources
- 5.1 water
- 5.2 energy
- 5.3 food
- 5.4 waste management

Student Context Analysis. Utilizing the Ecosystemic Urbanism framework, a Pre-existing Context Analysis was conducted, with Stadium Neighbourhood as the focal point. Many indicators extend well beyond the campus boundaries and into neighbouring regions.

01. SITE VULNERABILITY
1.1 Natural & Anthropic Hazards

risk of earthquake

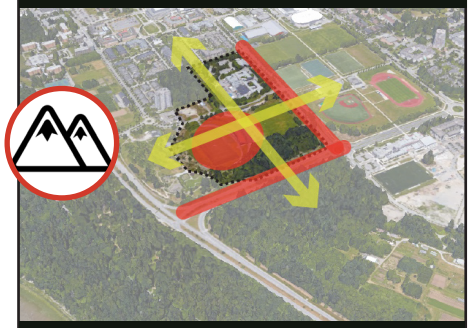
01. SITE VULNERABILITY
1.1 Natural & Anthropic Hazards

risk of tree fall from high winds

01. SITE VULNERABILITY
1.1 Natural & Anthropic Hazards

acoustic pollution from roads and stadium

01. SITE VULNERABILITY
1.2 Environmental & Cultural Assets



stable, flat terrain

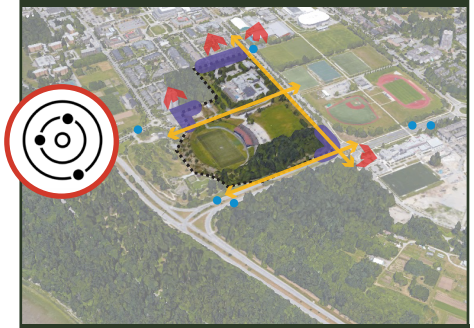
02. TERRITORIAL FITTING
2.1 Integration & Connectivity

connected to pedestrian/bike routes

02. TERRITORIAL FITTING
2.2 Access to Services

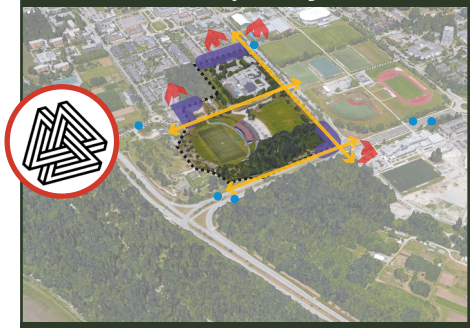
close to bus stops

02. TERRITORIAL FITTING
2.2 Access to Services



close to key service hubs

02. TERRITORIAL FITTING
2.3 Urban Complexity

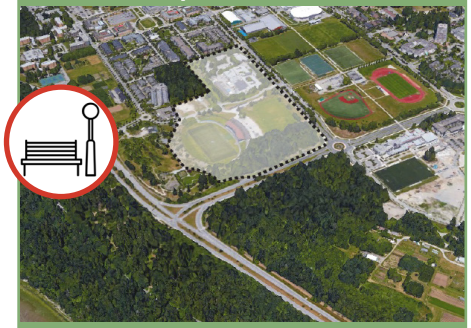


insufficient diversity of urban facilities

04. PLANNING DEMANDS
4.2 Urban Facilities

diverse facilities in area

04. PLANNING DEMANDS
4.3 Public Space



significant access to public/green space

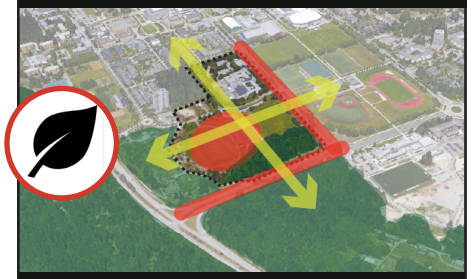
05. LOCAL RESOURCES
5.1 Water

high potential for blue infrastructure

05. LOCAL RESOURCES
5.2 Energy

low potential for solar, moderate for wind

01. SITE VULNERABILITY
1.2 Environmental & Cultural Assets



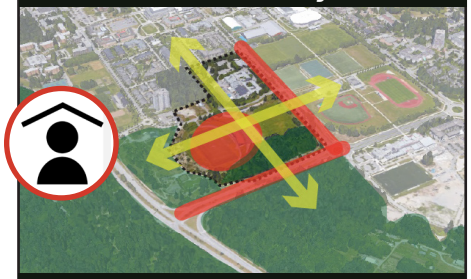
UBC farm, botanical gardens,

regional parks, forested areas

01. SITE VULNERABILITY
1.2 Environmental & Cultural Assets

Musqueam lands

01. SITE VULNERABILITY
1.3 Social Vulnerability



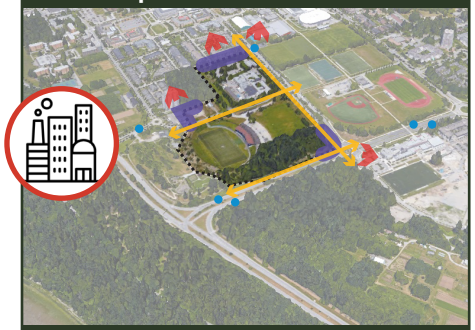
access to housing,

social isolation, mental health

02. TERRITORIAL FITTING
2.1 Integration & Connectivity

limited urban edge connections

02. TERRITORIAL FITTING
2.4 Compactness

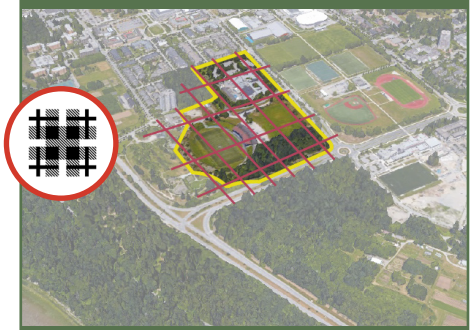


surroundings are not compact

03. LAND CONSUMPTION
3.1 Urban Saturation

small site relative to urban context

03. LAND CONSUMPTION
3.2 Urban Fix

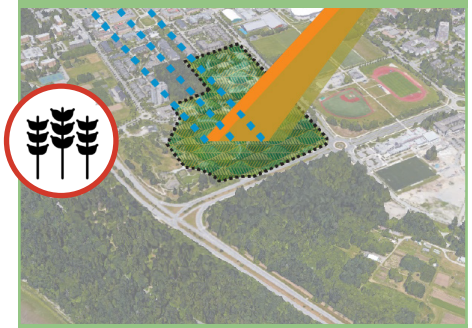


potential for site to connect urban areas

04. PLANNING DEMANDS
4.1 Housing

housing shortages, high costs

05. LOCAL RESOURCES
5.3 Food



close to farm & on-site potential

05. LOCAL RESOURCES
5.4 Waste Management

high potential for closed loop mgmt

ECOSYSTEMIC URBANISM CERTIFICATION

PREEXISTING CONTEXT INDICATORS

Site vulnerability
CTX.01.01 Forest fire hazard
CTX.01.02 Flooding hazard
CTX.01.03 Other natural hazards
CTX.01.04 Chemical atmosphere hazard
CTX.01.05 Chemical soil hazard
CTX.01.06 Acoustic hazard
CTX.01.07 Electromagnetic hazard
CTX.01.08 Radioactive hazard
CTX.01.09 Geotechnical amd geomorphological conditions
CTX.01.10 Protection of sites and habitats of natural and / or agrological interest
CTX.01.11 Protection of elements of cultural interest
CTX.01.12 Social vulnerability of the population

Territorial fitting of the urban planning action
CTX.02.13 Spatial location of the urban planning action
CTX.02.14 Urban action connectivity
CTX.02.15 Proximity to public transport and bicycle network
CTX.02.16 Proximity to basic services networks
CTX.02.17 Urban complexity
CTX.02.18 Absolute compactness

Land consumption
CTX.03.19 Increase of the urbanised area
CTX.03.20 Type of urban planning action

Planning demands
CTX.04.21 Housing deficit
CTX.04.22 Basic urban facilities deficit
CTX.04.23 Green space deficit
CTX.04.24 Public space deficit

EXISTING FABRIC INDICATORS

01 Residential density
02 Absolute Compactness
03 Corrected compactness
04 Staying space per inhabitant
05 Air Quality
06 Acoustic comfort
07 Road accessibility
08 Road space for pedestrians
09 Proportion of the street
10 Visual perception of urban green
11 Habitability index in the public space
12 Proximity to public transport
14 Proximity to cycling network
15 Motorized road space
16 Proximity to bicycle parking
17 Off-road car parking spaces
18 Provision of vehicle parking spaces
19 Provision of bicycle parking spaces
20 Off-road space for the distribution urban freight platforms
21 Urban diversity
22 Balance between activity and residence
23 Spatial and functional continuity of street
24 Soil biotic index
25 Green space per inhabitant
26 Simultaneous proximity to green spaces
27 Density of trees
28 Urban green connectors
29 Energy demand in the residential sector
30 Energy demand in the tertiary sector and equipment
31 Energy demand in the public space
32 Power consumption
33 Energy self-sufficiency from renewable energies
34 Emissions of Greenhouse gases
35 Potable water demand
36 Water sufficiency
37 Proximity to waste collection points
38 Proximity to household waste recycling centre
39 Closing the organic matter cycle
40 Model Integration with adjacent waste management
41 Provision of subsidized housing
42 Spatial distribution of subsidized housing
43 Provision of equipment
44 Proximity to equipment

UBC ECOSYSTEMIC ASSESSMENT

Pre-existing indicators

CTX 01 Forest fire hazard
CTX 02 Flood hazard
CTX 03 Spatial location of the urban planning action
CTX 04 Urban action connectivity
CTX 05 Housing deficit

Current urban fabric indicators

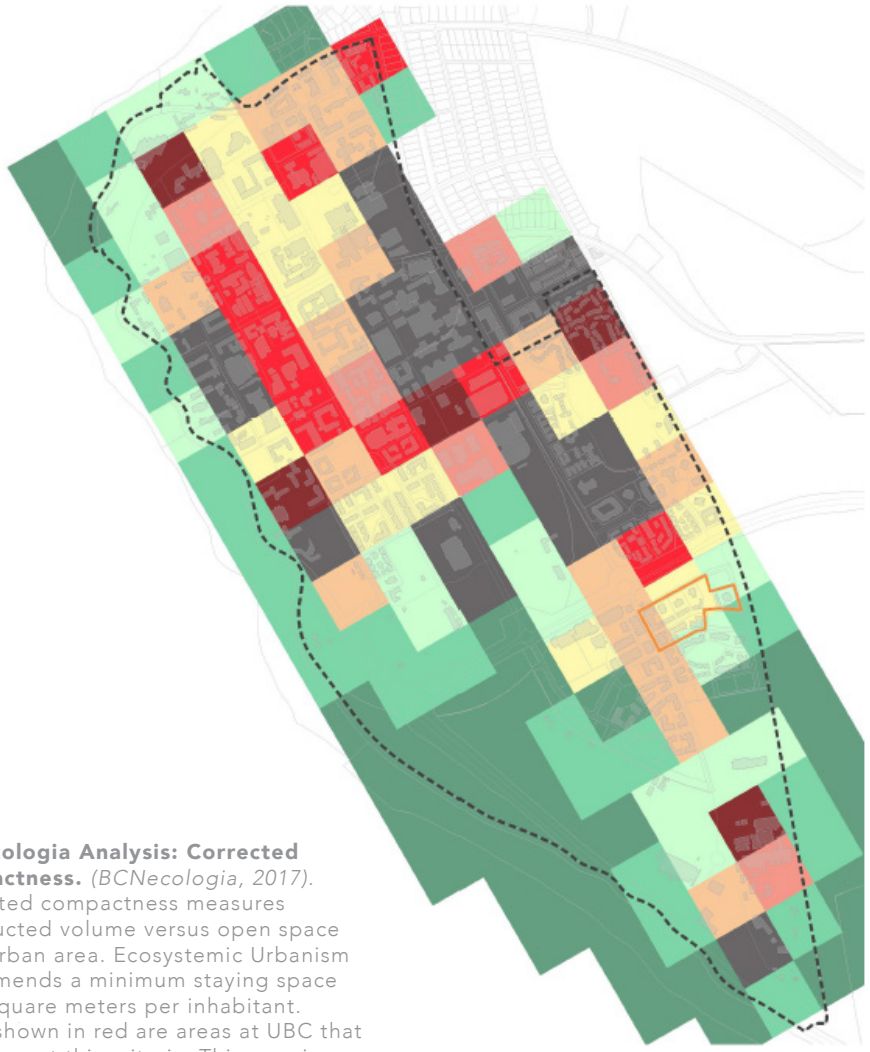
01 Residential density
02 Absolute Compactness
03 Corrected compactness
04 Staying space per inhabitant
05 Proximity to transportation networks alternative to car
06 Motorized road space
07 Proximity to bicycle parking
08 Off-road car parking spaces
09 Provision of vehicle parking spaces
10 Provision of bicycle parking spaces
11 Urban diversity
12 Balance between activity and residence
13 Soil biotic index
14 Green space per inhabitant
15 Simultaneous proximity to green spaces
16 Provision of subsidized housing
17 Provision of public facilities
18 Proximity to public facilities

BCNecologia Analysis

BCNecologia conducted a preliminary analysis of the UBC Campus using the Ecosystemic Urbanism assessment framework and two contexts: Pre-existing Context Analysis, and Existing Fabrics. The analysis was conducted from December, 2016 to January, 2017, in approximately six weeks. This is a significantly condensed period in comparison to a typical analysis by the agency. Additionally, there were substantial gaps in the data, which limited the scope of the analysis.

In order to conduct the Pre-existing Context Analysis, data was collected at a campus-wide scale and was considered with respect to the Stadium Neighbourhood site. While a complete analysis in this context would include results for 30 indicators, only 5 indicators could be calculated given the time and data constraints. The analysis identified three key areas for consideration. First was site vulnerability to forest fire and flooding. Second was the need to increase access to affordable housing. And finally, the tool suggested a need to increase urban complexity across the campus. No indicators were calculated in the categories of Efficient Land Consumption or Local Resources.

It was also of interest to Campus and Community Planning to understand how an existing neighbourhood at UBC was performing according to the Ecosystemic Urbanism framework. To achieve this, data was collected for a sample area in Wesbrook Village to be analyzed by BCNecologia. Of the 44 Existing Fabrics indicators, results were provided for 18. The results suggested the development was excelling in terms of urban morphology, transportation networks, and public space, but did not achieve ideal levels of urban diversity, access to public facilities, and access to affordable housing. It is important to note that only a portion of Wesbrook Village was analyzed, and therefore these results do not provide a complete picture of the neighbourhood.



BCNecologia Analysis: Corrected Compactness. *(BCNecologia, 2017).* Corrected compactness measures constructed volume versus open space in an urban area. Ecosystemic Urbanism recommends a minimum staying space of 15 square meters per inhabitant. Areas shown in red are areas at UBC that do not meet this criteria. This map is one example of a graphic produced in BCNecologia's analysis.

Stadium Gaming Workshop. *(UBC, 2017).* At the Stadium Gaming Workshop, participants began by discussing the neighbourhood's fit into the broader campus context.

Stadium Gaming Workshop

In February 2017, a gaming workshop was hosted to give interested professionals a hands-on introduction to Ecosystemic Urbanism at UBC. A group of 30 academics and professionals from C&CP, SCARP, the University of Montreal, the UBC School of Architecture and Landscape Architecture, the City of Vancouver, DIALOG, and Perkins + Will worked to create two bold plans for Stadium Neighbourhood, while assessing the merits of Ecosystemic Urbanism at UBC. The workshop featured Salvador Rueda, founder of BCNecologia and Ecosystemic Urbanism, who gave a lecture to the participants on the theory and use of the tool.

Day 01

The SCARP student team and partners at C&CP conducted a walking tour of the Wesbrook neighbourhood to introduce Savlador Reuda and his associates, Professor Danny Pearl of the University of Montreal and Suzanne Deschamps to the UBC campus. The afternoon convened all workshop participants for a lecture from Mr. Rueda on the theory of Ecosystemic Urbanism, its indicators, and its data driven approach.

Day 02

Participants were divided in two groups and asked to plan Stadium Neighbourhood based on the principles of Ecosystemic Urbanism. Both teams were provided with minimum targets for land use types and built areas, which were grounded in the theory of the framework and adjusted with respect to the local planning context. Teams were provided with base maps, and a series of gaming pieces, to represent various building typologies, and open and green space typologies.

Team A Outputs

Team A's overall vision was to diversify and energize the campus to increase complexity and energy on Main Mall through the addition of commercial services. The design took inspiration from Superblocks being implemented in Barcelona, and proposed a similar built form with mixed-uses at the periphery of campus. The stadium was placed along the eastern edge of the site, with commercial space under the stands to animate East Mall.

Key Design Features

- One way road access to serve residents
- Main Mall as a greenway connecting the site to campus and Wesbrook Village
- Commons areas on the FP Innovations site with residential and commercial uses included
- Re-design East Mall to reduce street width and provide low rise housing at grade
- Create connections to the Botanical Garden with green linkages
- Create forest "fingers" through the site to foster biodiversity

Indicator	Ecosystemic Target	Site Specific Target	Team A Outputs
Proximity and compactness	>100 residential units/ha	140 units/ha or 130,000 m^2	1,847 dwelling units 168,350 residential m^2
Critical mass of population, activities and facilities	15 to 20% of total built area is non-residential	9,500 m^2	24,800 commercial m^2 85,600 academic m^2 = 1,080 jobs
Proximity to staying space (green or open space)	10 to 15 m^2 of staying space per inhabitant	54,500 m^2	22,500 m^2 of green space 16,300 m^2 of open space = 38,800 m^2
Proximity between housing, work and leisure	15 to 20% of built area is non-residential	62,000 m^2 of academic and 9,500 m^2 of other non-residential	24,800 commercial m^2 85,600 academic m^2 = 110,400 m^2
Proximity to green spaces	10 to 15 m^2 of green space per inhabitant	54,500 m^2 (includes green and open space)	22,500 green space m^2

Team B Outputs

Team B's overall vision was to increase connectivity across campus by strengthening pedestrian and bicycle linkages through the site to Wesbrook, the UBC Farm, the Botanical Garden and athletic fields. The design proposed an off-site stadium to allow for development of a complete and sustainable community. The design also utilized the sunken site of the existing stadium for underground parking, with underground road connection to 16th Avenue.

Key Design Features

- Towers in close proximity to the transit station (located at East Mall and Stadium Road)
- Sloped topography utilized for a park space with commercial activity at the edge
- Main Mall as a greenway connecting campus to the park, and continuing to Wesbrook Village
- Mid-rise buildings adjacent to green space to maintain views
- Academic uses at key "gateways" to the site

Indicator	Ecosystemic Target	Site Specific Target	Team B Outputs
Proximity and compactness	>100 residential units/ha	140 units/ha or 130,000 m^2	2,975 dwelling units 270,990 residential m^2
Critical mass of population, activities and facilities	15 to 20% of total built area is non-residential	9,500 m^2	9,900 commercial m^2 78,330 academic m^2 = 395 jobs
Proximity to staying space (green or open space)	10 to 15 m^2 of staying space per inhabitant	54,500 m^2	6,860 m^2 of green space open space not completed
Proximity between housing, work and leisure	15 to 20% of built area is non-residential	62,000 m^2 of academic and 9,500 m^2 of other non-residential	9,900 commercial m^2 78,330 academic m^2 = 88,230 m^2
Proximity to green spaces	10 to 15 m^2 of green space per inhabitant	54,500 m^2 (includes green and/or open space)	6,860 green space m^2

5

designing
stadium
neighbourhood.

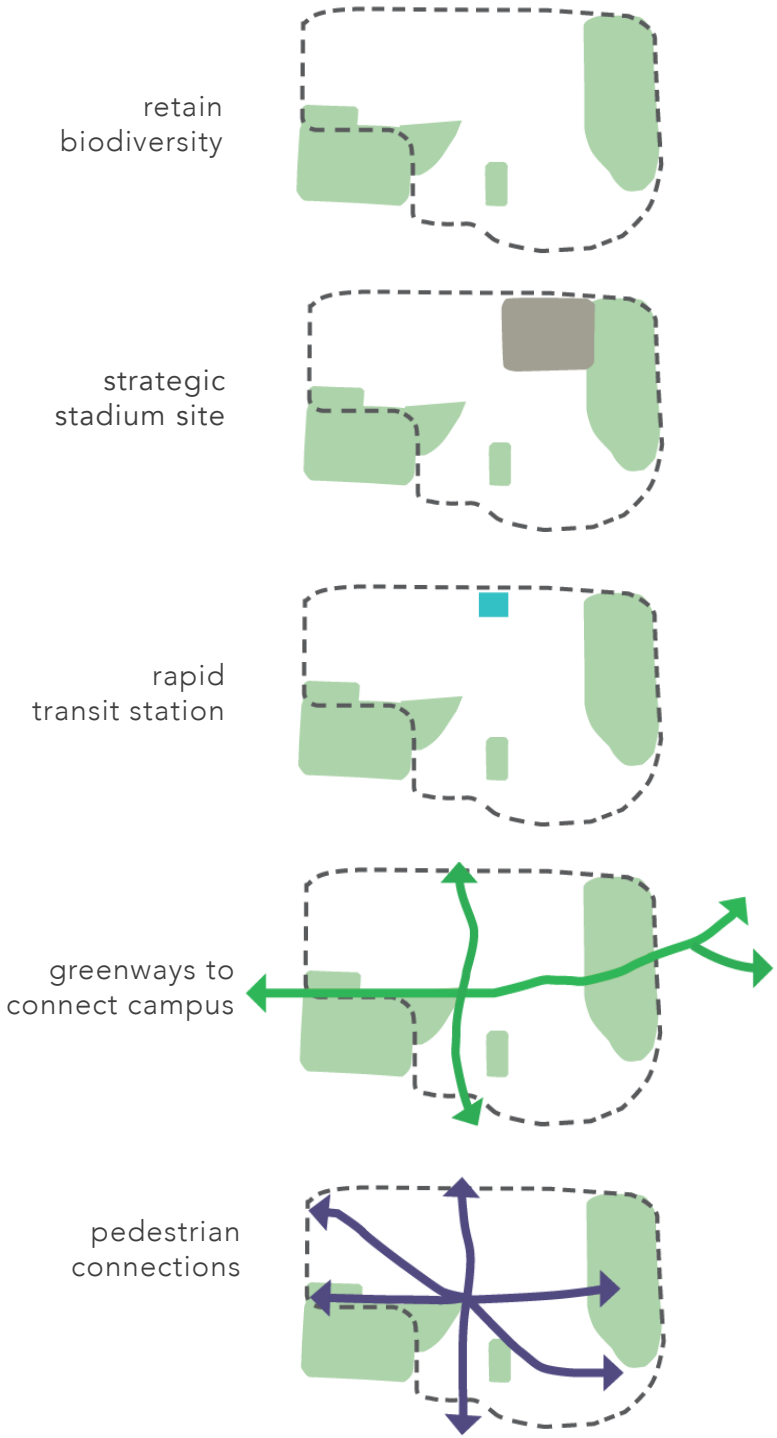
Stadium Design Vision

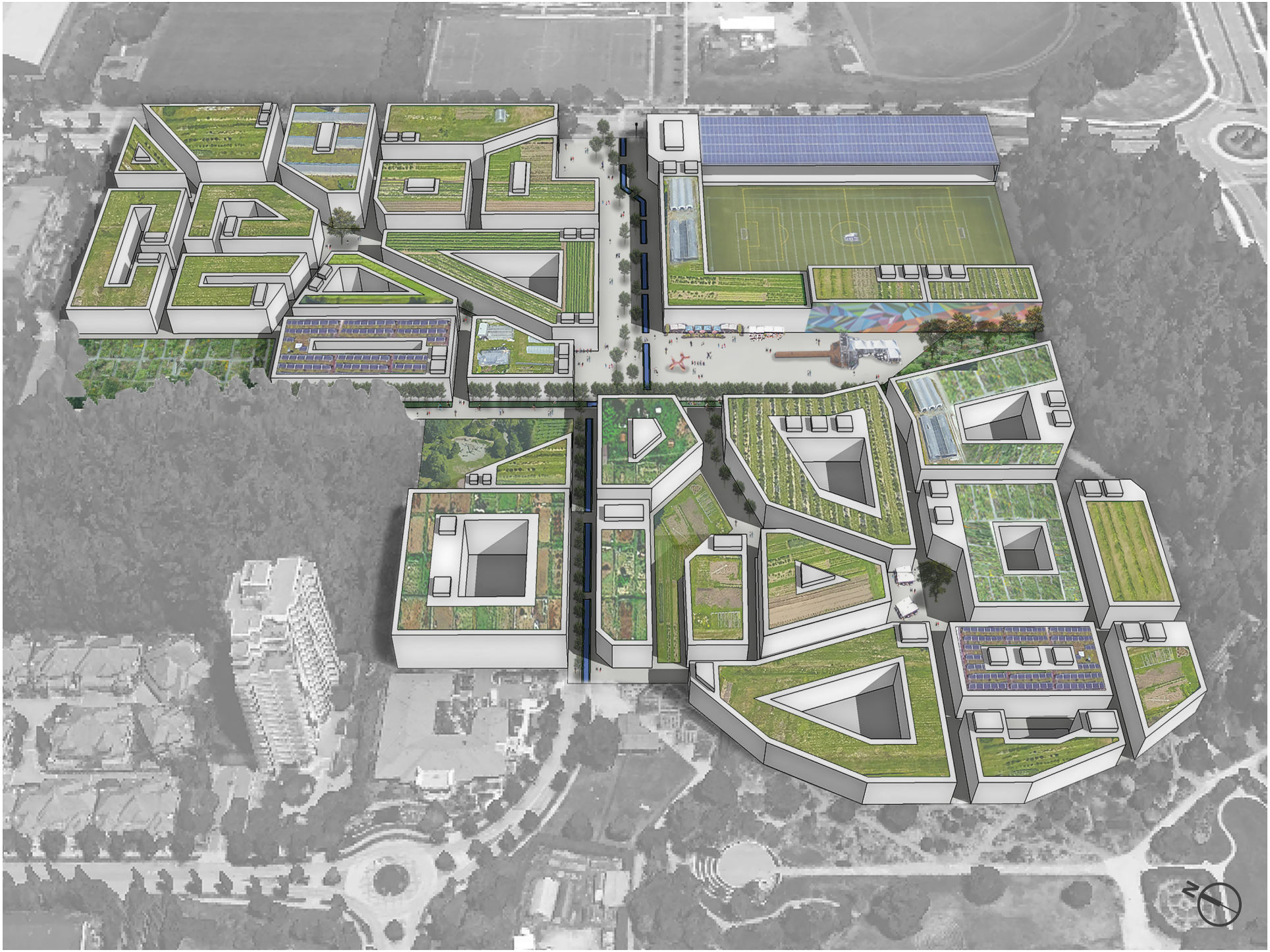
Stadium Neighbourhood is a truly regenerative community. The neighbourhood enhances connectivity and urban complexity at UBC. It bridges Wesbrook Village, the UBC Farm, the Botanical Gardens and Hawthorne Place into a cohesive fabric. The UBC Thunderbird Stadium has been placed along East Mall to take advantage of the forest edge and the planned rapid transit station.

The neighbourhood has vehicular access only for residents who require it and for commercial service vehicles. The main corridors of the community are all mixed-use with programming that activates and excites the space. Academic, commercial and residential uses are intermingled to foster social connections and knowledge transfer. The community itself is diverse, both economically and culturally, with many gathering spaces. Public spaces take advantage of the natural site elevations and sun exposure.

Key Characteristics

Site Area	**12.28 ha**
No. Residents	3,750
Residential Units	1,800
Total Built Area	**238,000 m²**
Residential	134,000 m²
Commercial	27,000 m²
Academic	62,000 m²
Stadium Field	15,000 m²





01. Land Occupancy

Stadium Neighbourhood is a compact community made up of ground-oriented buildings proportioned to a human scale. The facades of the buildings frame the open space, creating a network of outdoor rooms. This configuration produces a tight-knit urban fabric that mimics pre-automobile development. The clustering of mid-rise buildings creates an intimate environment that maintains visual interest across the entire site.

Key Features

01. The compact urban fabric and associated population mass support a mixed-use, vibrant community
02. Compactness yields proximity, which encourages travel by foot
03. The labyrinthine style of the forms and spaces was inspired by the historic walled city of Lucca, but with improved sight lines
04. Buildings of 4 to 6 storeys enable density while maintaining connectivity between upper storeys and the ground, so that all residents can feel connected to their surrounding spaces
05. All buildings built in wood frame, which sequesters carbon and is less expensive than concrete construction

Indicator	Ecosystemic Target	Proposed Design
Proximity and compactness	>100 residential units/ha	145 units/ha
Critical mass of population, activities and facilities	15 to 20% of total built area is non-residential	36% (due to inclusion of academic use)

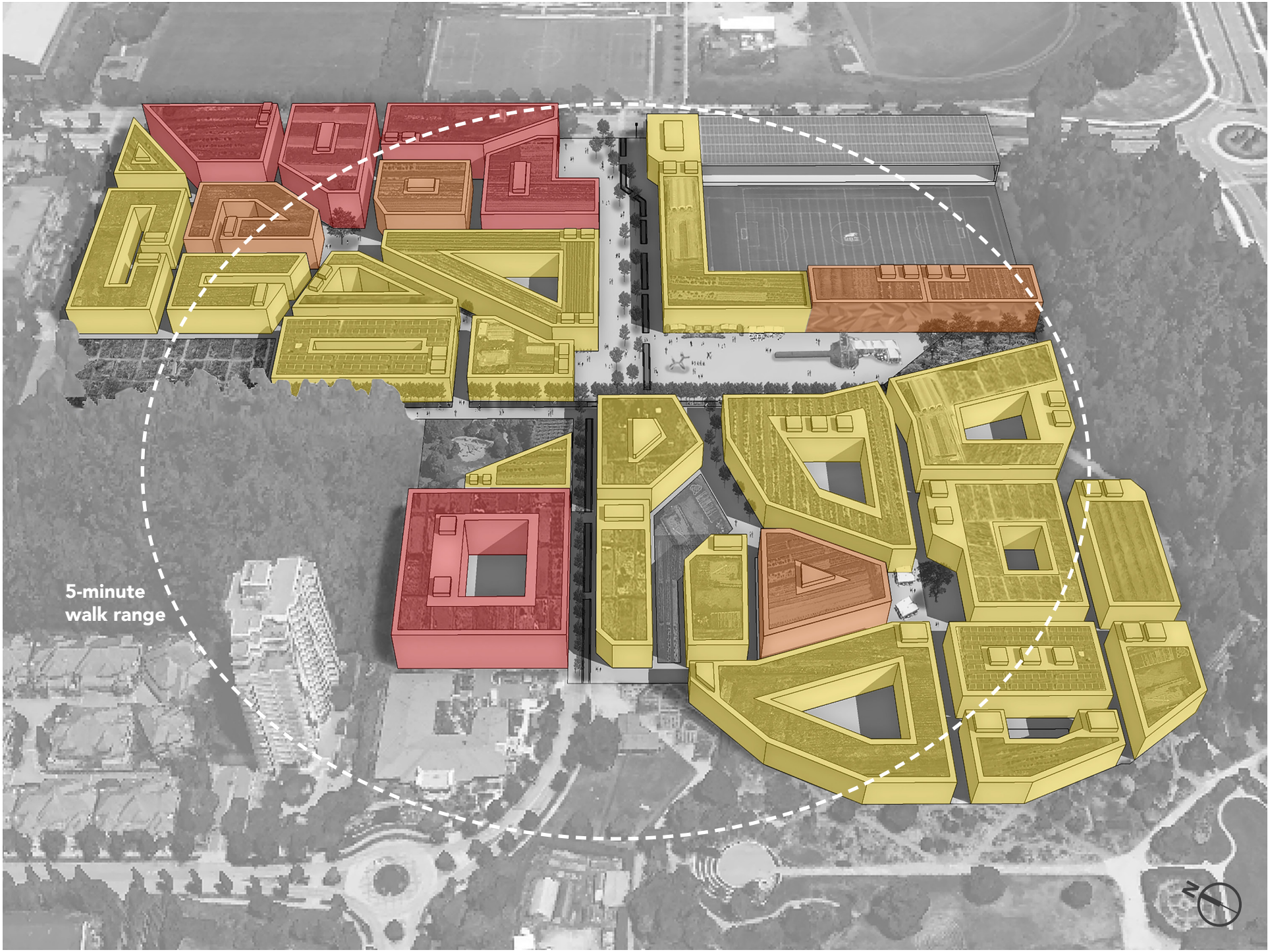
Building Heights

- 6-storey
- 5-storey
- 4-storey

Urban Rooms
Lucca, Italy

Compact Fabric
Lucca, Italy

Mid-Rise Apartments
Copenhagen


5-minute
walk range
N

02. Public Space & Habitability

Stadium Neighbourhood emphasizes high quality public spaces at multiples scales. The car-free neighbourhood features accessible and comfortable pedestrian-only streets that link to open, active public gathering places. A large plaza and main retail avenue hug the sports venue to allow for large public gatherings during events and an active commercial atmosphere. Other gathering places are linked with intimate pedestrian paths of varying widths. There is a mix of private and public courtyards, allowing for a mix of quiet, contemplative spaces and open, lively spaces.

Key Features

01. A pedestrian mall modeled after the Pearl Street Mall in Boulder
02. A large plaza provides space for outdoor concerts and public art
03. A mix of courtyard types create calm and intimate spaces
04. Ample parks for playgrounds and community food gardens
05. Narrow streets and local plazas create finer-grain environments
06. Strong sight lines and active uses improve safety

Indicator	Ecosystemic Target	Proposed Design
Proximity to staying space	10-15 m^2 of staying space per inhabitant	16.6 m^2 per inhabitant
Habitability in the public space	Maximize: air quality, acoustics and climactic comfort	- Limit vehicle access - Utilize solar gain - Activate frontages

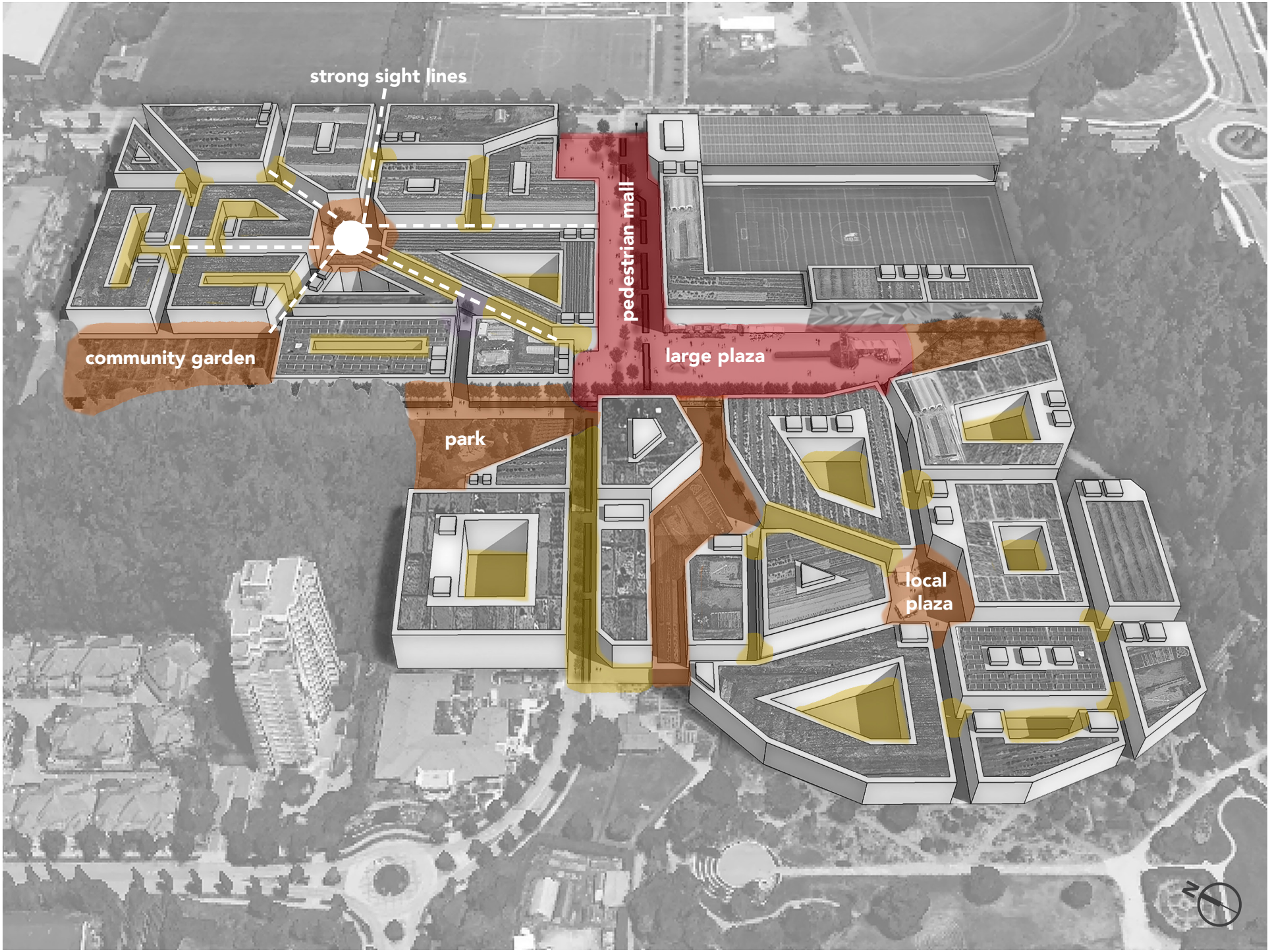
Public Space

- High intensity
- Medium intensity
- Low intensity

Pearl Street Mall,
Boulder, CO

Staying Space
Pearl Street Mall

Staying Space
Copenhagen


strong sight lines
pedestrian mall
community garden
large plaza
park
local plaza

03. Mobility & Services

Stadium Neighbourhood prioritizes active transportation modes with a continuous network of greenways and active commercial corridors, connected to rapid transit. The streets have restricted access for private vehicles, resulting in reduced air and noise pollution, as well as increased safety. Vehicles are kept to the perimeter with a single underground parking lot, making this the first car-free neighbourhood in the region.

Key Features

01. "Thunderbird" Skytrain Station connects directly to the new stadium
02. A double axis of greenways link Main Mall to skytrain to Wesbrook Village, with all-ages-and-abilities cycling infrastructure
03. Through-traffic and anticipated Autonomous Vehicle drop zones are kept to the periphery of the site, but minimum road widths of 5m within the neighbourhood allow access for emergency vehicles, deliveries, and people with disabilities
04. A single underground parking lot services the community, taking advantage of a topographical depression left by the old stadium

Indicator	Ecosystemic Target	Proposed Design
Accessibility	100% of population is within 800 m of rapid transit	All buildings are within 450 m of rapid transit
Proximity to non-car transportation networks	Create pedestrian- and bike-friendly streets	- All buildings are within 60 m of a AAA cycling route - The neighbourhood prioritizes pedestrians

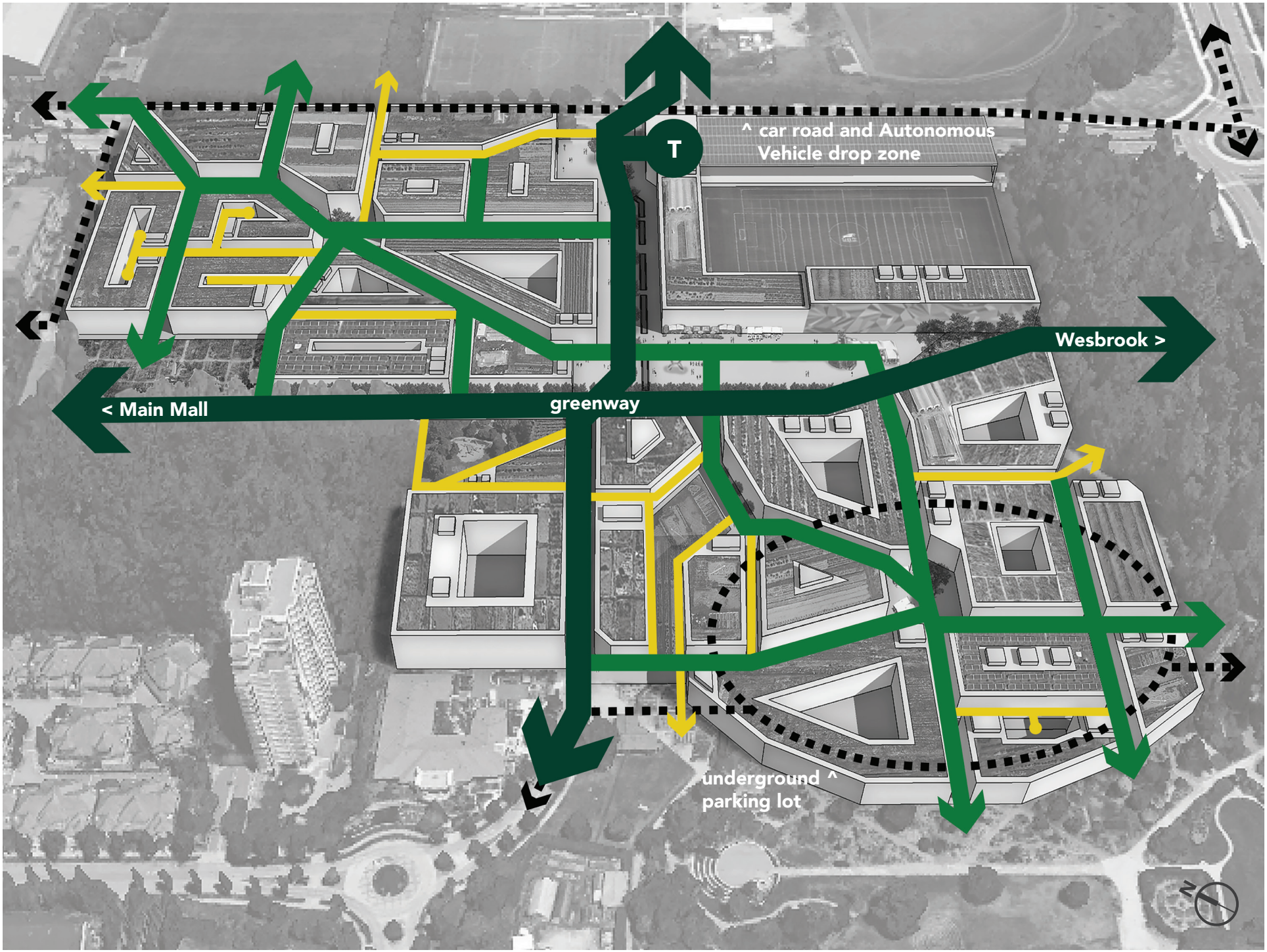
Routes

Primary
Secondary
Tertiary
Car road

King Edward Station
Vancouver, BC

A mixed-use greenway

LSE Central London Campus


T
^ car road and Autonomous
Vehicle drop zone
Wesbrook >
< Main Mall
greenway
underground ^
parking lot

04. Urban Complexity

Stadium Neighbourhood features a diverse array of shops, services, businesses and community organizations that create proximity patterns between home, work, leisure and services. This urban complexity reduces the need for off-campus travel and satisfies some of the local demand for jobs. Due to the integrated nature of academic facilities, knowledge transfer between organizations and within the community are increased.

Key Features

01. A knowledge and information economy is promoted through the integration of academic uses, concentrated in two sub-areas
02. A diverse critical mass of businesses, organizations, and academia create lively streets and encourage interdisciplinary cross-pollination
03. The daily needs of residents are met within the neighbourhood
04. Retail and service facilities vary in scale across the neighbourhood, in relation to the scale of the streets they front onto

Indicator	Ecosystemic Target	Proposed Design
A diversity of land uses and functions	Diversity in types of legal entities (uses)	Encourages development of all necessary facilities
Proximity between housing, work and leisure	15-20% of built area is non-residential	25% of built area is academic and 11% is other non-residential

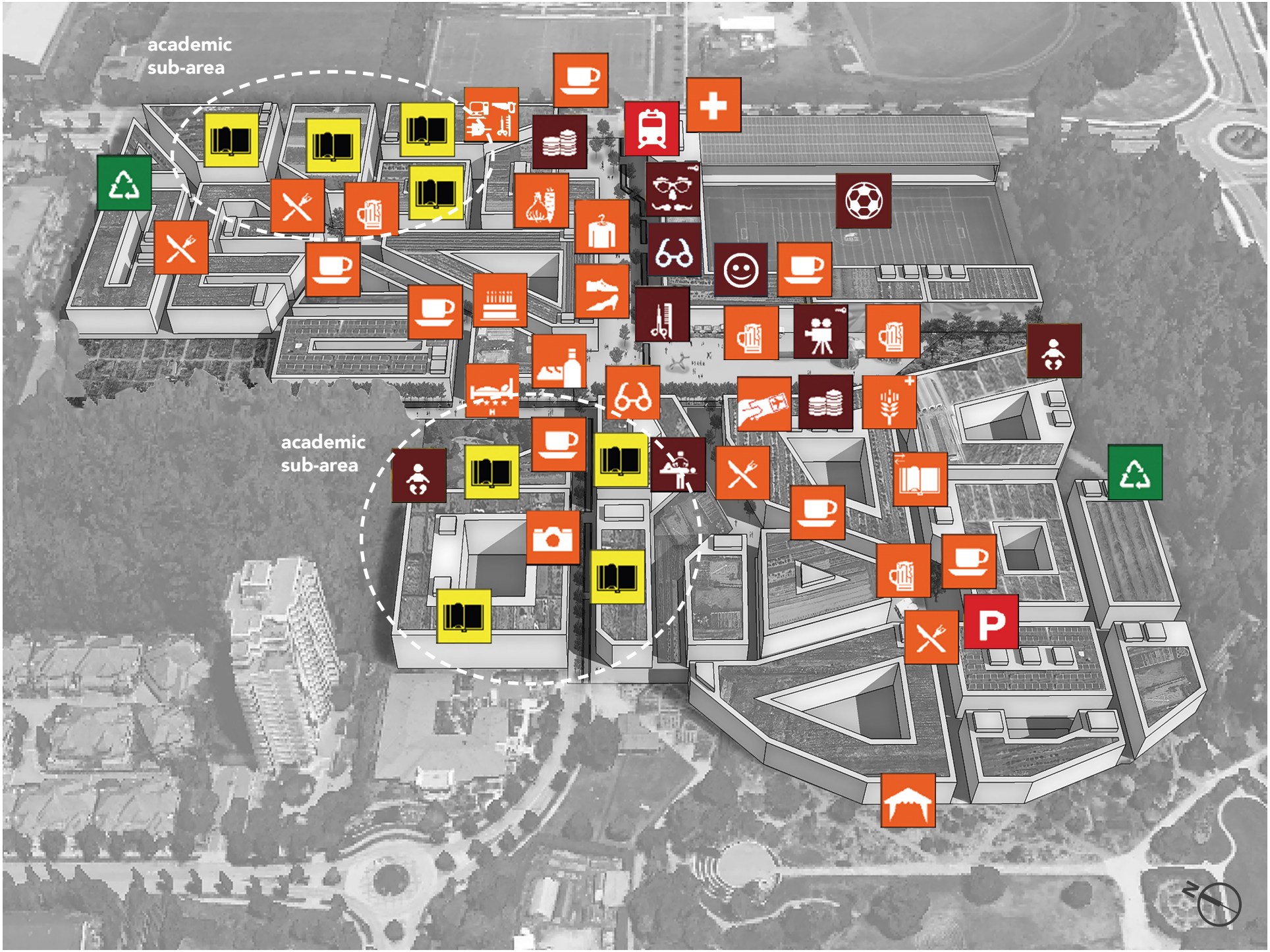
Legal Entities

- Culture & Services
- Retail & Restaurants
- Transportation
- Academic
- Municipal Services

A student-run cafe at the University of Copenhagen

A small cafe in Copenhagen

The New Lawn timber-built stadium in Nailsworth, England


academic
sub-area
academic
sub-area
P

05. Green Space & Biodiversity

Stadium Neighbourhood preserves and links the forests that bound the site, ensuring the ecological integrity of these stepping stones are kept intact. This green corridor features native plantings to promote biodiversity and healthy ecosystems. Parks, gardens and other green spaces are connected through a green network. Green spaces are found above ground with community gardens and urban farms on the roofs of most buildings.

Key Features

01. A structured green network connects forests that edge the site
02. Soil permeability is promoted through the use of permeable path ways and surfaces
03. Native plants are used for the benefit of local species
04. All inhabitants are within easy walking distance of green space

Indicator	Ecosystemic Target	Proposed Design
Proximity to green spaces	10-15 m^2 open space per inhabitant	16.6 m^2 open space per inhabitant, excluding preserved forest
Biological connectivity	>15% of roofs are green, with tree-lined biodiverse streets	- All roofs are green - All streets include greenery and trees

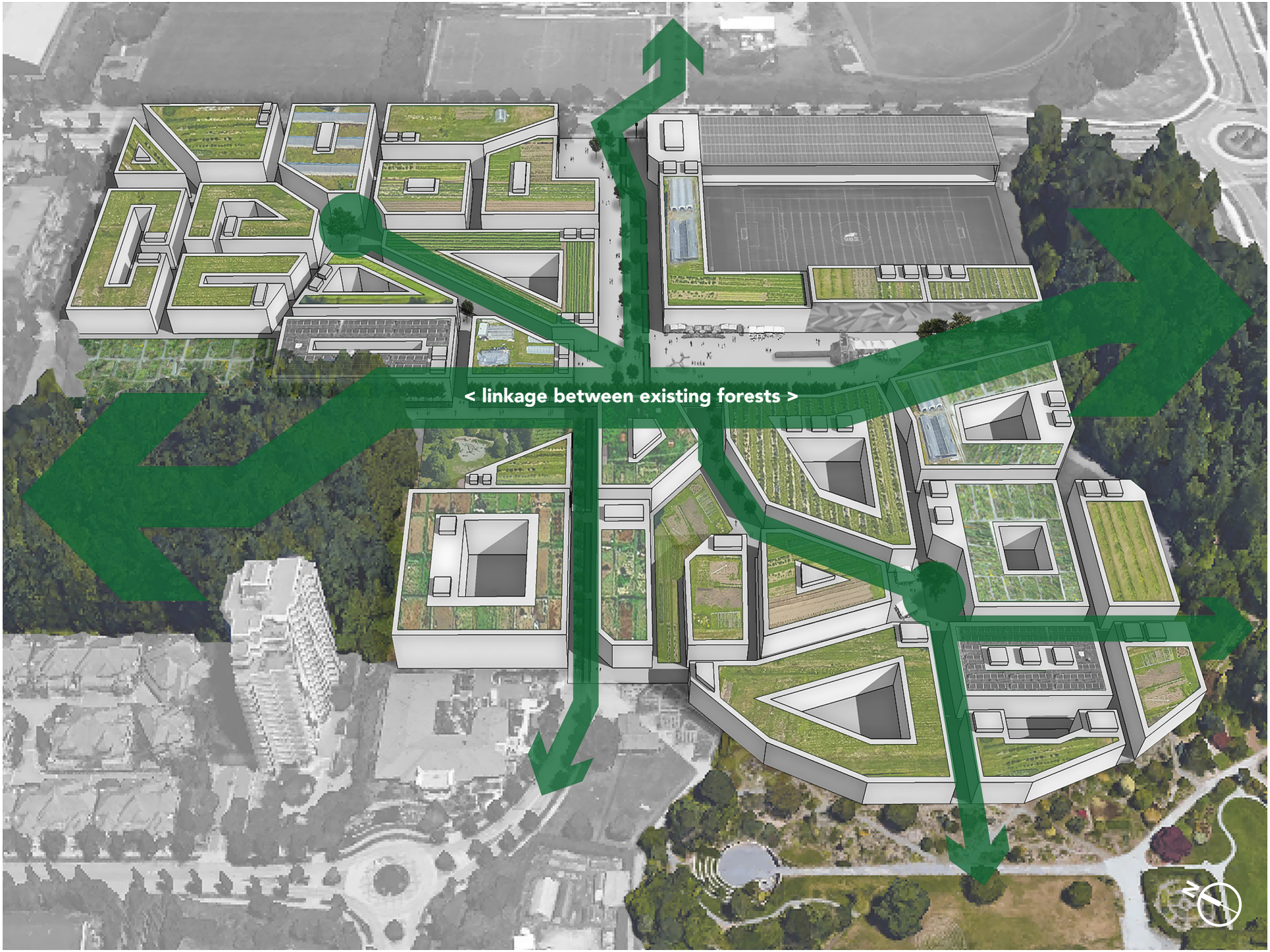
Green Spaces

Ecological corridor

A tree and patio lined street in Shanghai

A "natural materials" playground

A forest boardwalk


< linkage between existing forests >

06. Urban Metabolism

Stadium Neighbourhood seeks self-sufficiency in urban ecosystems. This includes green and blue infrastructure such as a bioswale with native species and a stormwater retention pond area. Other features include passive house design, connection to the UBC district energy system and solar panels. Food production is promoted through community gardens and urban farming, and space is allocated for on-site composting and greywater recycling.

Key Features

01. Recycling and composting facilities on-site
02. A bioswale runs the length of the site, collecting storm water and connecting to a park that contains a depressed area for flood retention in cases of severe weather events
03. Solar panels on the tops of some buildings support local power generation
04. Green roofs everywhere improve local food self-sufficiency

Indicator	Ecosystemic Target	Proposed Design
Maximize energy, water, material self-sufficiency	Decrease external inputs by increasing on-site capacity	Incorporate best practice technology in all areas
Mitigation of climate change impacts	Create strategic actions	Daylight bioswale with floor retention pond

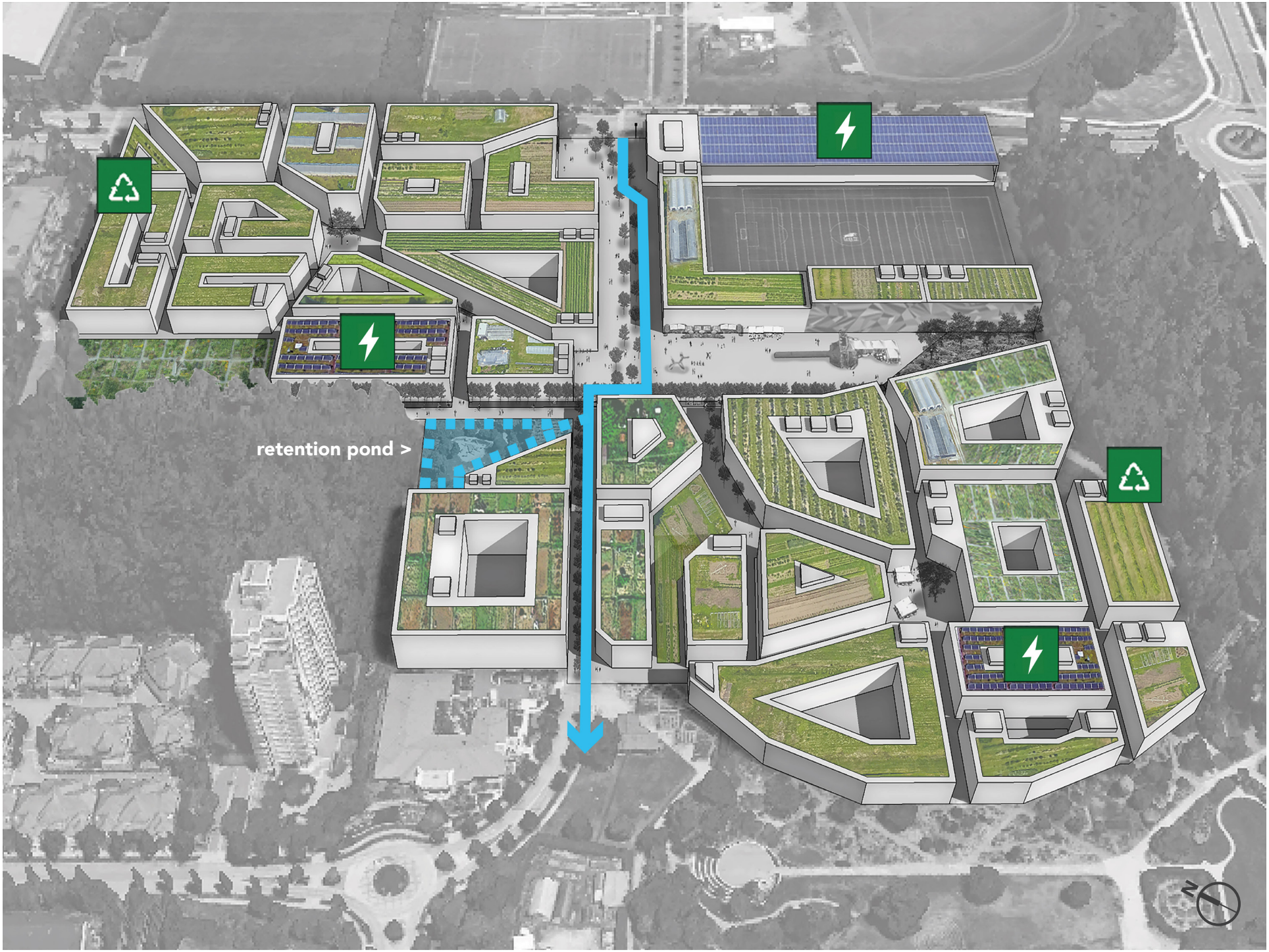
Systems Features

- Bioswale
- Flood retention
- Food production
- Solar array
- Waste processing

A water feature integrated into public space

A park that doubles as flood retention

A roof-top food garden


retention pond >

07. Social Cohesion

Stadium Neighbourhood is a socially cohesive community with people of different cultures, ages, incomes and occupations. There will be a mix of affordable student, staff, faculty and workforce housing constituting 50% of residential units, including a mix of housing models such as co-housing and co-operatives. Stadium Neighbourhood residents have access to community services across the UBC campus, as well as on-site services including two forest kindergartens and a community centre with a public library, recreational space and multi-purpose hall.

Key Features

01. The Stadium Neighbourhood community is diverse and inclusive
02. Stadium Neighbourhood has a mixed and inclusive housing composition with 50% of housing as affordable
03. Key community and cultural services are easily accessible

Indicator	Ecosystemic Target	Proposed Design
Access to housing	>40% of total residential floor area is social housing	50% of residential units are subsidized or co-operatively operated student, staff, and faculty housing
Citizen participation in urban processes	Ensure influence of citizens in planning	Inclusive planning process begins soon

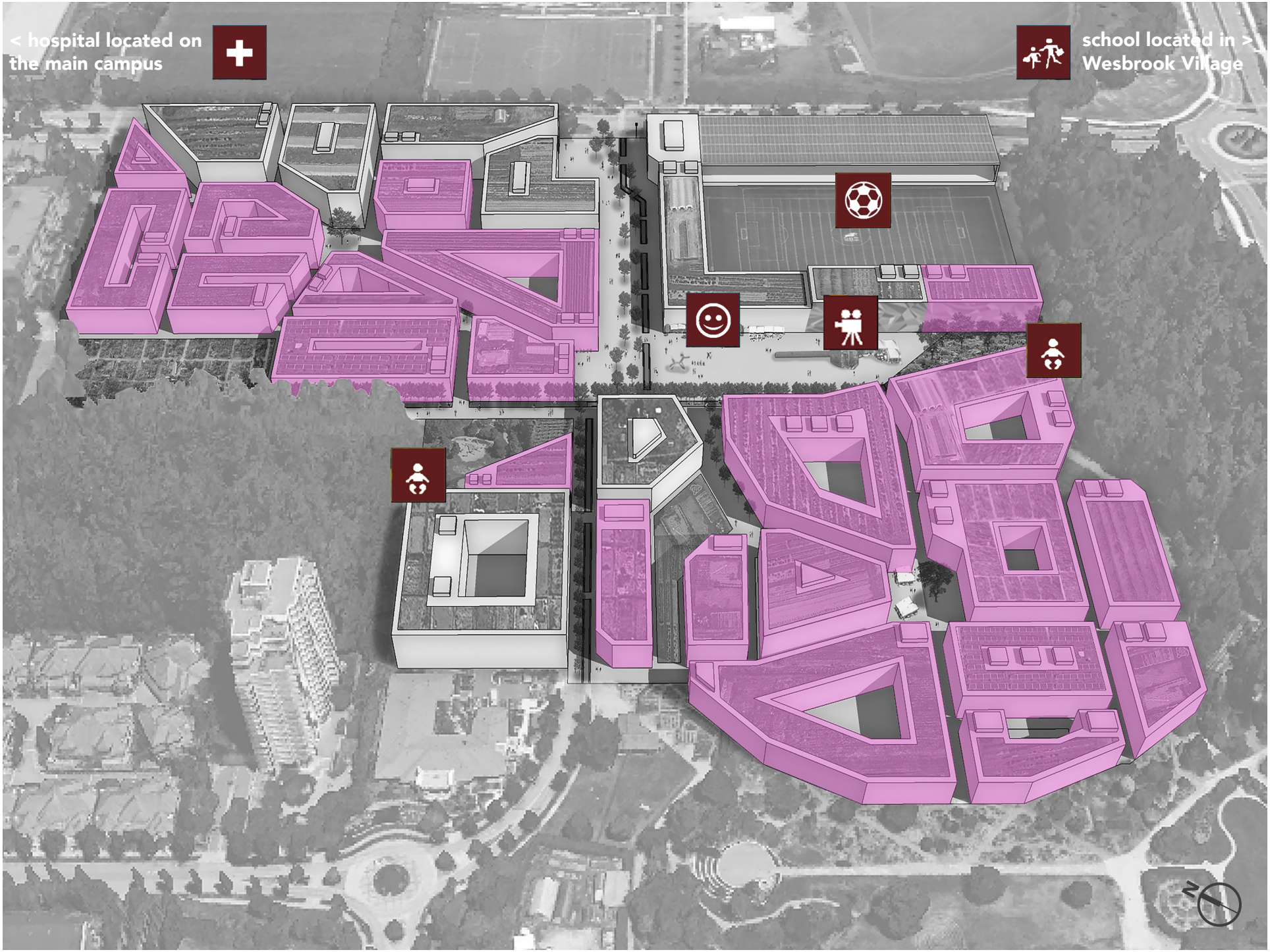
Social Entities

- Public facilities
- Housing

Services and activities to build community

Spaces for student mingling

A forest kindergarten


< hospital located on
the main campus
school located in >
Wesbrook Village

6

reflections.

The application of Ecosystemic Urbanism in the UBC context presents a number of unique opportunities, as well as several limitations. Both opportunities and threats have been organized into key themes, to aid Campus and Community Planning in determining whether to pursue a complete application of Ecosystemic Urbanism in the UBC context.

The Applicability of Ecosystemic Urbanism at UBC

Opportunities

Pedestrians as Citizens

Ecosystemic Urbanism provides a comprehensive, innovative framework for analyzing neighbourhood sustainability. Particularly, there is a strong emphasis on urban complexity and social cohesion with an aim of creating high quality public spaces. This notion of pedestrians as citizens who have a right to the city is a powerful, and unique feature of the tool.

Supporting a Cultural Shift

Ecosystemic Urbanism supports a shift in the way we view and understand urban places. It promotes growth in the knowledge sector over growth in resource consumption and acts to inspire new ways of thinking. This core narrative helps to promote the long-range, systems approach to planning that C&CP is striving for.

Early Adopter

UBC has an opportunity to be an early adopter of Ecosystemic Urbanism in adapting the tool to the North American, and university context for the first time. This both provides a new planning lens with which to develop Stadium Neighbourhood and fulfills UBC's mandate of "campus as a living lab".

Limitations

Proprietary and Complex

The proprietary nature of Ecosystemic Urbanism is a significant limitation. The tool is highly complex, and knowledge is closely held by BCNecologia, which means the tool is only usable with the agency's direct involvement.

Data Limitations

The breadth and complexity of the data required to run the Ecosystemic Urbanism assessment may be prohibitive to UBC's implementation of the tool as well as other municipalities interested in its use. The tool requires specific, geolocated information that does not currently exist for the campus. The cost and time investment required to collect the necessary data should be carefully considered.

Contextual Considerations

Ecosystemic Urbanism was developed in Barcelona, Spain and is therefore grounded in the regions geographic, cultural, and political context. To effectively apply the tool at UBC the targets for each indicator would need to be reconsidered to ensure alignment with local policies. Particular consideration must be given to indigenous culture.

Urban Bias

Ecosystemic Urbanism has an urban bias which presents a significant challenge. The tool was developed for a stable, urban population of greater than 50,000 inhabitants, living within a single political jurisdiction. When applied at UBC, the analysis crosses political boundaries which complicates data collection and analysis. Additionally, UBC has a predominantly academic land use, and a population that fluctuates with time of day and season. These factors need to be fully considered for the tool to be adapted to the context.

Longevity and Adaptability

Longevity, adaptability and responsiveness of the framework over time should be considered. Based on available literature, it is unclear how to the tool is adapted to new contexts, or responds to new innovations in technology over time.

Conclusion

UBC Campus and Community Planning has an opportunity to design one of the region's first truly regenerative communities at Stadium Neighbourhood. By designing a compact, complex, and efficient neighbourhood, the site can be leveraged to connect the campus in its entirety, fostering new partnerships, supporting innovation, and improving human and environmental wellbeing. Ecosystemic Urbanism provides a comprehensive set of principles that can inspire new ways of planning, and can help to support the campus vision of UBC as a living laboratory, where knowledge is currency. Through ambitious and creative planning, UBC can push beyond the dominant narrative of sustainability, and create communities that are truly regenerative, thus playing a key role improving the health of both the campus, and the world.

Resources

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