

EXPLORING THE FUTURE OF ECOLOGY AND MISSING MIDDLE HOUSING IN A
DISPERSED METROPOLIS

A Thesis

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by

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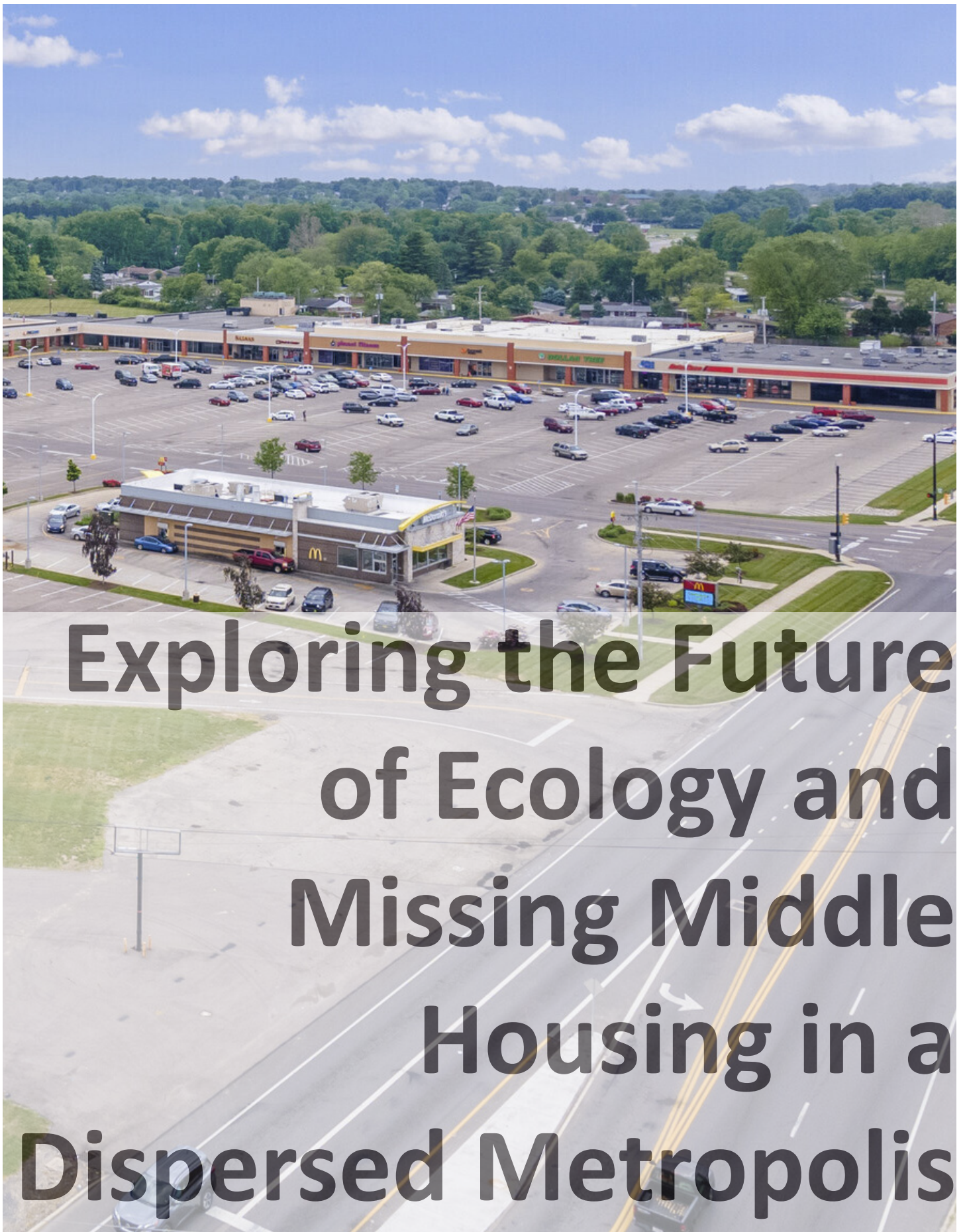
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Airway Shopping Center
Woodman Drive, Dayton
39,000 SqFt Retail
from Google Maps



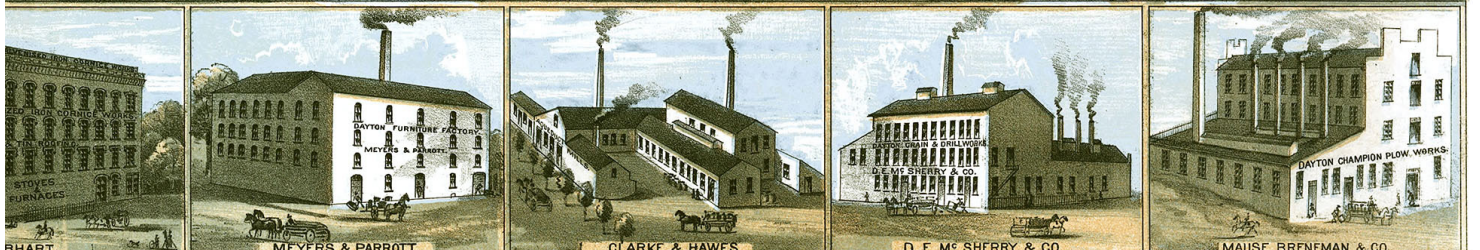
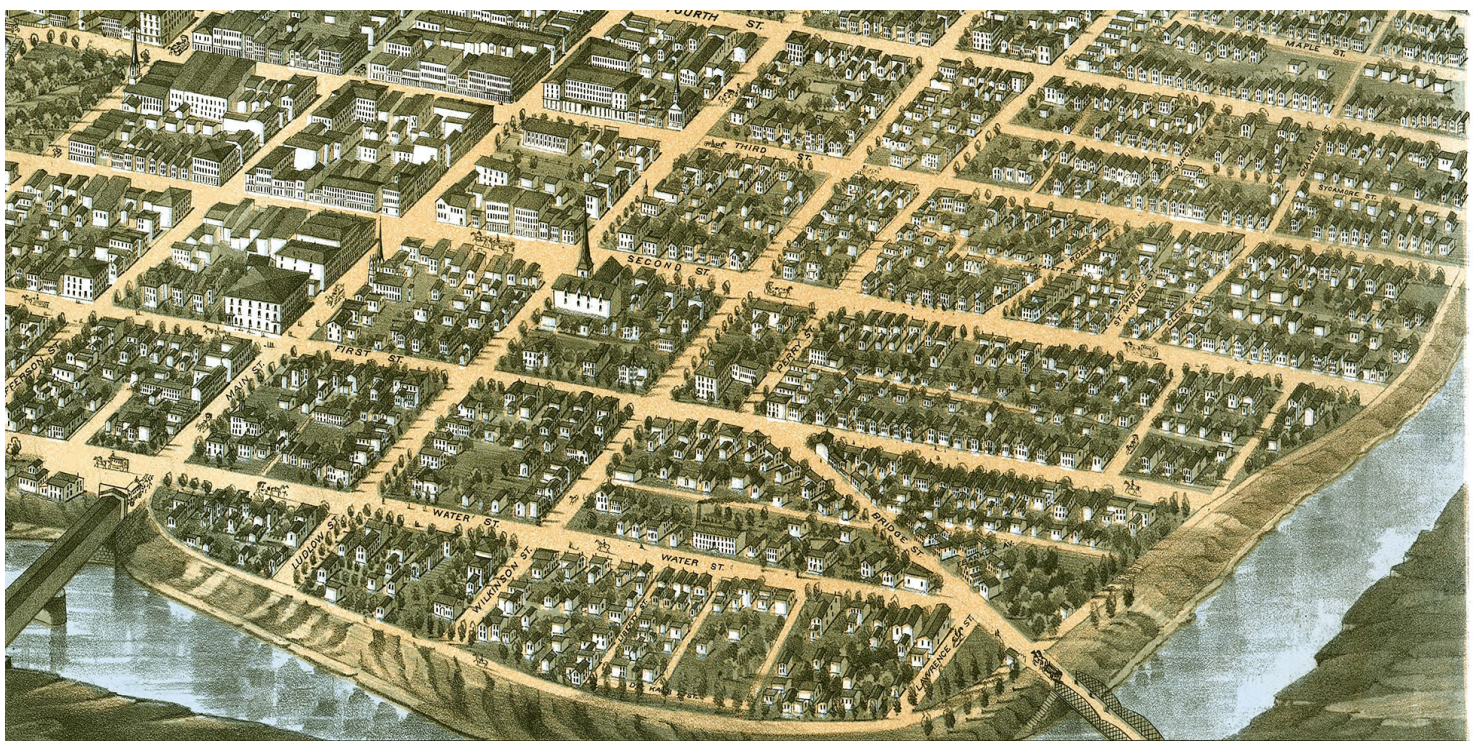
**Exploring the Future
of Ecology and
Missing Middle
Housing in a
Dispersed Metropolis**

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“The city is not merely a repository of pleasures. It is the stage on which we fight our battles, where we act out the drama of our own lives. It can enhance or corrode our ability to cope with everyday challenges. It can steal our autonomy or give us the freedom to thrive. It can offer a navigable environment, or it can create a series of impossible gauntlets that wear us down daily. The messages encoded in architecture and systems can foster a sense of mastery or helplessness.”

— Charles Montgomery, *Happy City: Transforming Our Lives Through Urban Design*



Abstract

Creating Connections

As complex beings we are striving for improvement and change. Idealists planned for Garden or Radiant cities to alleviate the filth and disease of crowded industrial cities. Development spurred by the automobile created new pollutants and social upheaval as people left the cities for the suburbs. Today, suburban communities that seemed like the answer to urban woes are now disintegrating due to lack of connectivity and services.

The future of suburban sprawl is grim as the world necessarily shifts from carbon heavy, car dependent, dispersed development towards increased density that enables equity, affordability and convenience. The separation of work, housing, and recreation has taken a toll on the social and ecological environments which make up our lives. More than ever, people (myself included) are commuting from their suburban lots by car to school, work, play, and to engage socially. Highways, traffic, and pollution are filling up the once clean air of the suburbs that were an escape from the industrial-era pollution of cities.



Critique

Alternative to Suburban Sprawl: An Argument for Densification

One response to the current situation and climate related issues caused by our carbon fed existence is to examine the failures and personal successes of suburban life. In *Happy City: Transforming Our Lives Through Urban Design*, Charles Montgomery details some reasons people flocked to the suburbs and the unintended consequences of sprawl. People gained personal space in their own home and neighborhood by moving out of the city. The economy boomed and new jobs and services were created as each new house needed built, furnished and maintained. However, as the lots became larger and the suburbs extended further, it became common for people to have a 1-2 hour commute each way to reach their place of employment. Long commutes eat up many of the advantages of having and maintaining a typical suburban home. In particular Montgomery related that long commutes have been linked to increased stress, fatigue and greater dissatisfaction in life. Long commutes often mean that being social also takes longer as does running basic errands. These effects also decrease available time to be neighborly and involved in your local community as well as result in paying for a largely vacant home in a commuter neighborhood. What if there was a way to bring services and conveniences closer to residents? What if this could be accomplished by increasing the density of suburban areas and building up multifunctional areas instead of traveling miles to work, miles to school and miles to the grocery store?



World Future Council

Research Review

Suburbanization to Regeneration

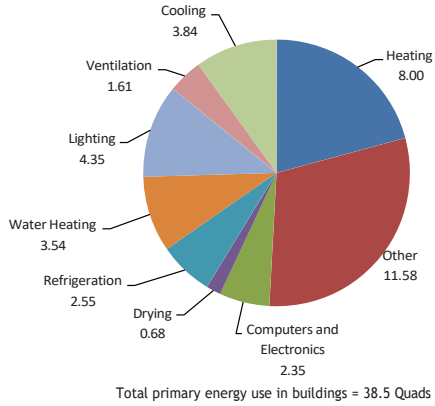
Charles Montgomery states that suburban zoning was based on property type use and was based on a segregation of uses rather than the multifaceted streets that Jane Jacobs admonishes are necessary and healthy for people in city life in her book *The Death and Life of Great American Cities*. This difference between these two development types is based on segregation of uses, segregation of race and segregation of income. Kenneth T. Jackson, in *Crabgrass Frontier, the Suburbanization of the United States* clearly states that “There were two necessary conditions for American residential deconcentration—the suburban ideal and population growth—and two fundamental causes—racial prejudice and cheap housing. (Jackson, 287)

Montgomery illustrates that exclusionary zoning practices kept the suburban tracts homogenous in race and income as wash house, apartments and industrial uses were not allowed, as well as to qualify for a mortgage an income minimum must be met. This kept the suburbs mainly white and middle class as they could afford the lifestyle and met the requirements of redlining instated by banks and government. Jackson states, “With increased use of automobiles, the life of the sidewalk and front yard has largely disappeared, and the social intercourse that used to be the main characteristic of urban life has vanished.” (Jackson, 279)

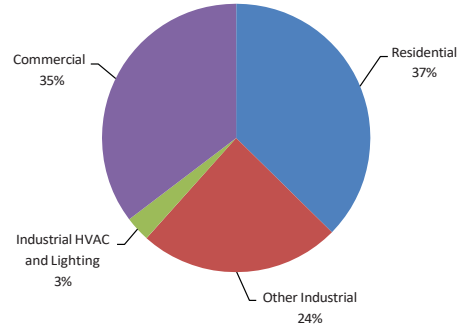
Willis H Carrier developed air conditioning in 1906 which was a boon to drawing the public into movie theaters during the heat of the day. In the 1960’s it became much more prevalent and entire cities, such as Houston, Texas began to be built

Figure 5.1 Buildings Use More Than 38% of all U.S. Energy and 76% of U.S. Electricity¹

2014 Residential and Commercial Building Primary Energy Use (Quads)

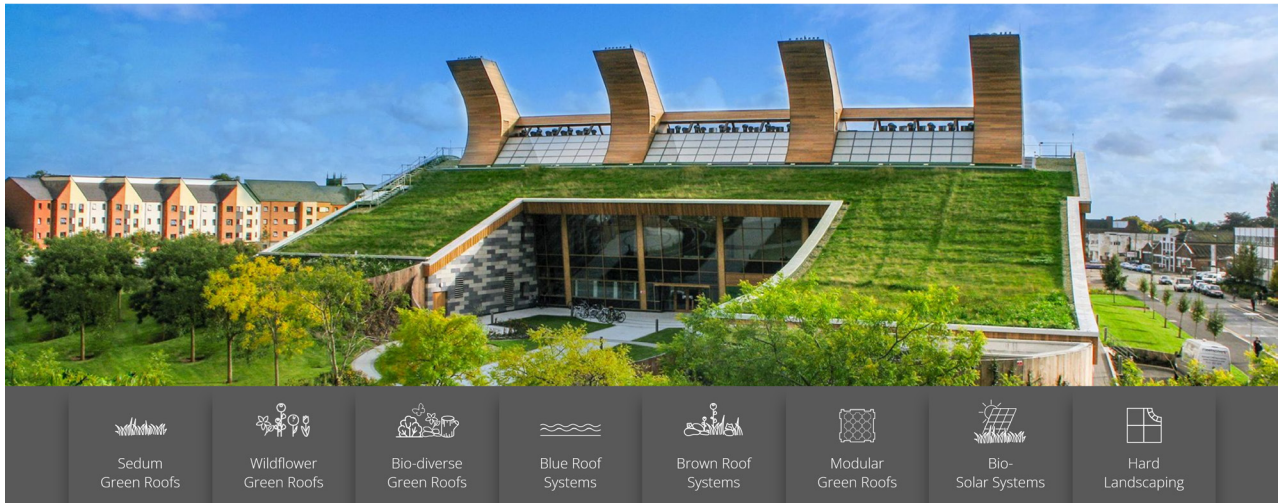


2014 Electricity Sale for Buildings



Key: **Quad** = quadrillion Btu; **Btu** = British thermal unit

Department Of Energy



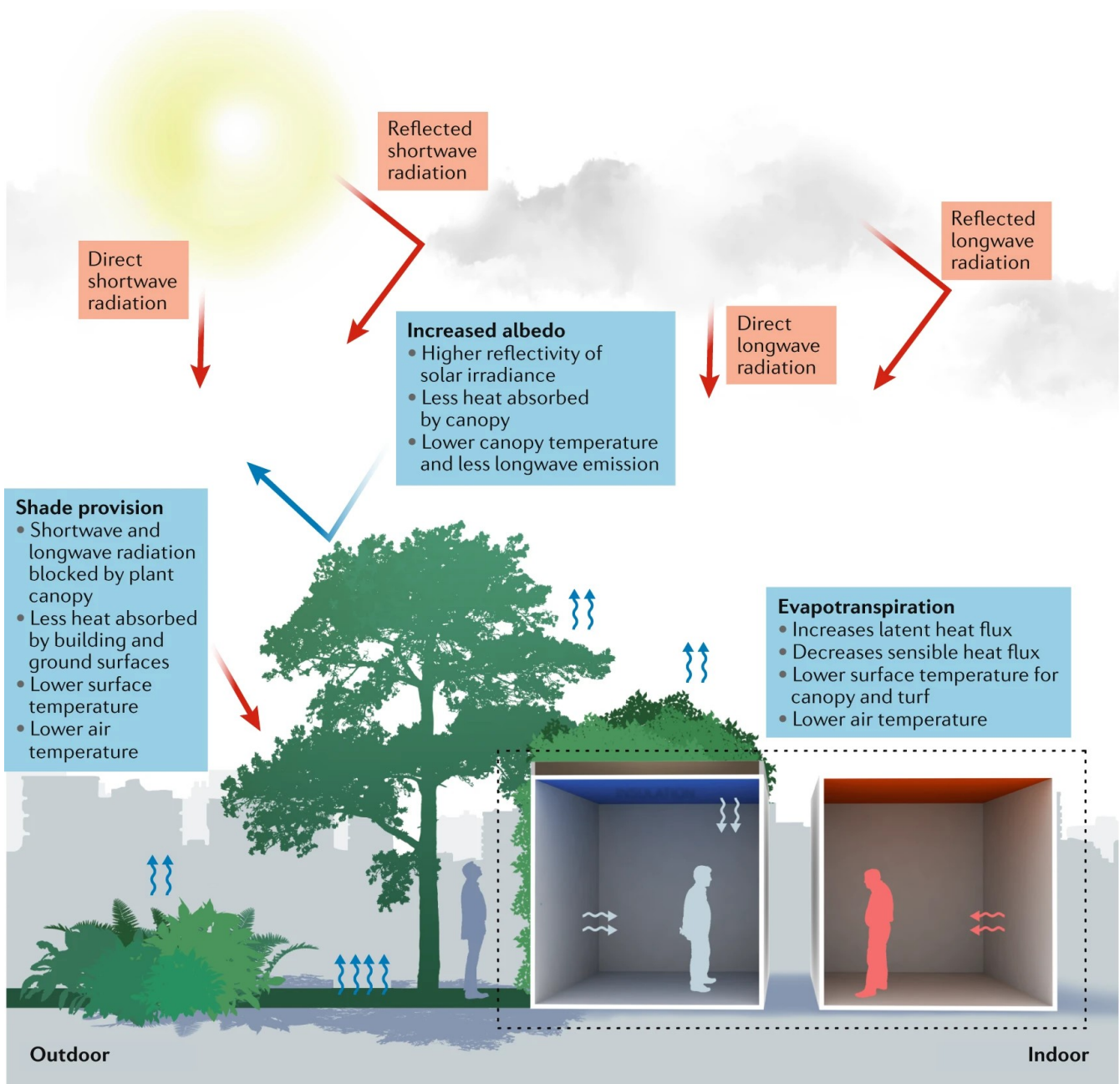
ICB Projects

in areas previously uninhabitable because of the oppressive heat. Most homes, offices, restaurants and our cars are equipped with air conditioning which make us more comfortable and also more reclusive seeking the conditioned air rather than using the streets as an escape from uncomfortable indoors.

This modern miracle of conditioned air, both heating and cooling is having an effect on our environment. Large buildings with single pane glass built in 1960-1970 depended upon air conditioning to keep occupants cool and comfortable as our buildings shifted to deeper floor plates with less natural light and outside air exchange.

Heating, ventilation, and air conditioning, while usage has been reduced with more energy efficient buildings, continue to consume the most energy in current buildings, up to 35%; while lighting consumes an additional 11%. (DOE, 145) The Department of Energy's Quadrennial Technology Review published in 2015 states that the "buildings sector accounts for about 76% of electricity use and 40% of all US primary energy use and associated greenhouse gas emissions." They calculate that by 2030 energy use could be reduced by more than 20% using current cost-effective technologies and decreased more than 35% by meeting research goals despite forecasted population and business growth.

However, energy efficient buildings depend upon, "a combination of good architecture and energy system design and on effective operations and maintenance once the building is occupied." (DOE, 147) These designs must be climate specific and optimized to local conditions while meeting thermal comfort and air quality benchmarks which are dictated by the building envelope and supported by climatically responsive strategies. Daylighting, heating, and cooling are major com-

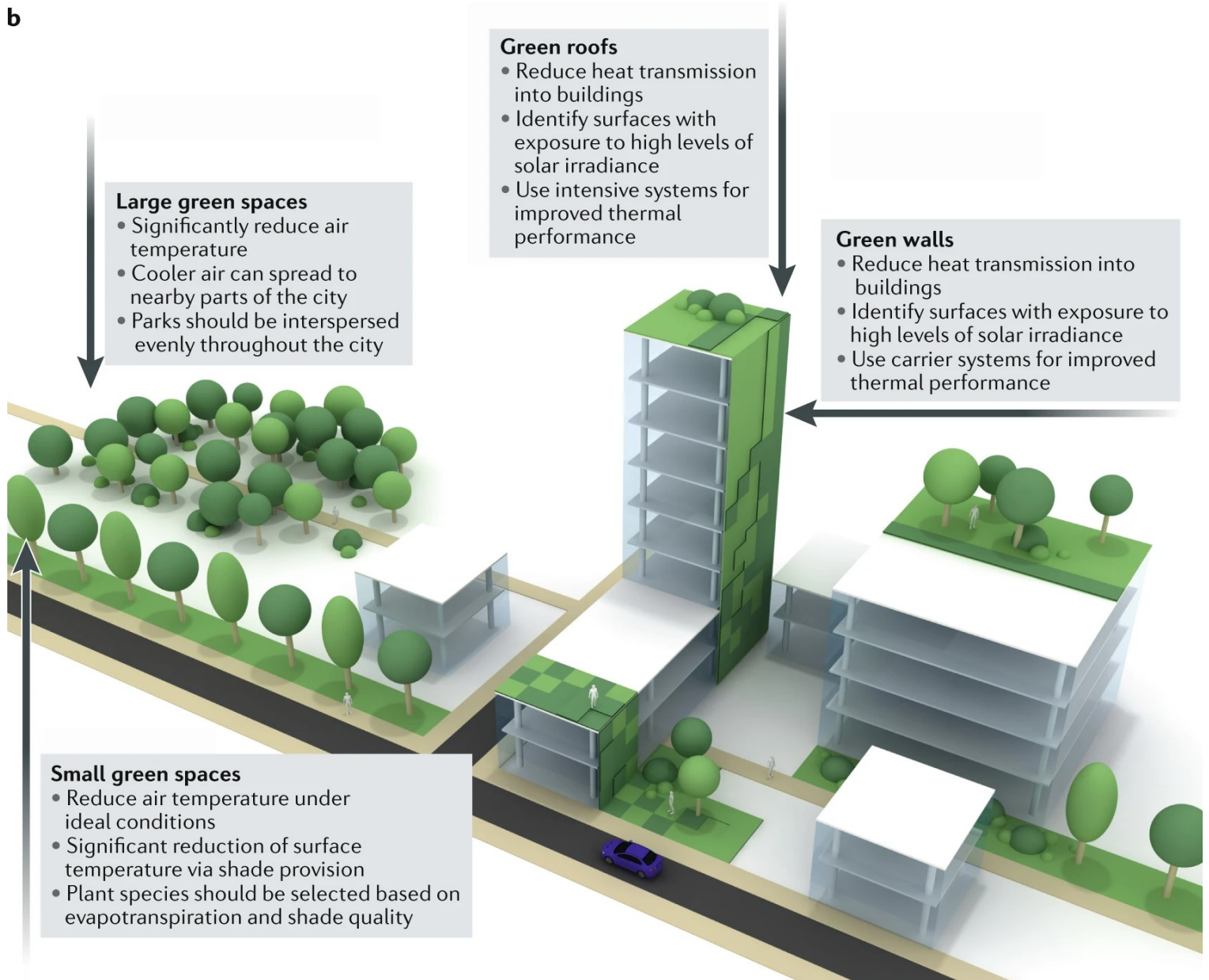
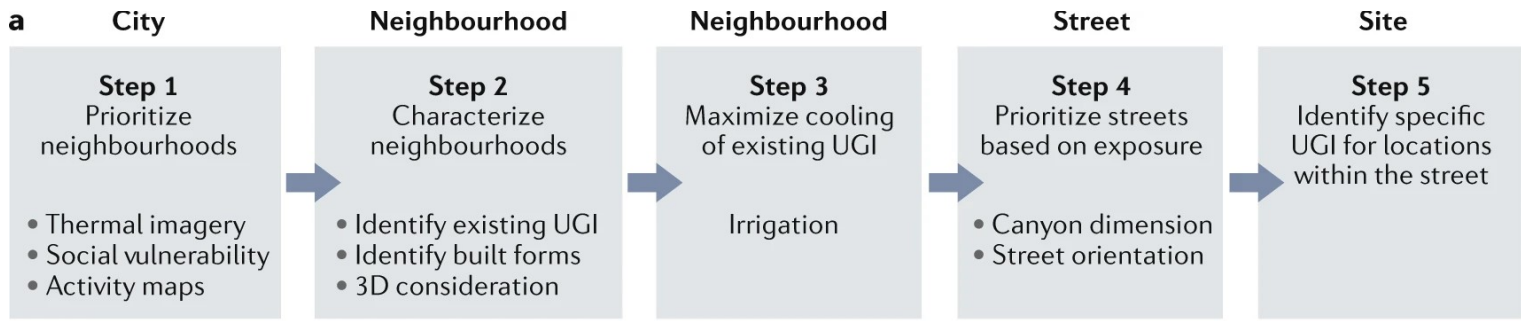


Nature Based Strategies

ponents affecting building design and energy use. As design specifics, such as building orientation, natural ventilation, glass emissivity, insulation, and systems, like mechanical, thermal energy redistribution, and lighting control are implemented, the building efficiency improves. DOE states that as of 2015, design energy consumption can be reduced by 44% compared to existing 2003 building stock however, only 55% of commercial buildings utilized modeling in their process. Efficient buildings are a necessary foundation for sustainability and moving towards regenerative cities.

In 1987 the UN Brundtland report defined sustainability as, “the ability to meet the needs of the present without compromising the ability of future generations to meet their own needs.” These goals are insufficient to cope with the damage done to the environment by the culture of industrialization that has spread worldwide. SOM recognizes this in a Los Angeles case study published by the Journal of Urban Design and Mental Health titled Regenerative Cities: Moving Beyond Sustainability, “It is imperative that we do more than simply sustain life, but begin to fix the mistakes of the past and heal as we grow. We must decouple inefficiencies and structural imbalances in order to promote a system that produces inclusive wellbeing and happiness.” (SOM)

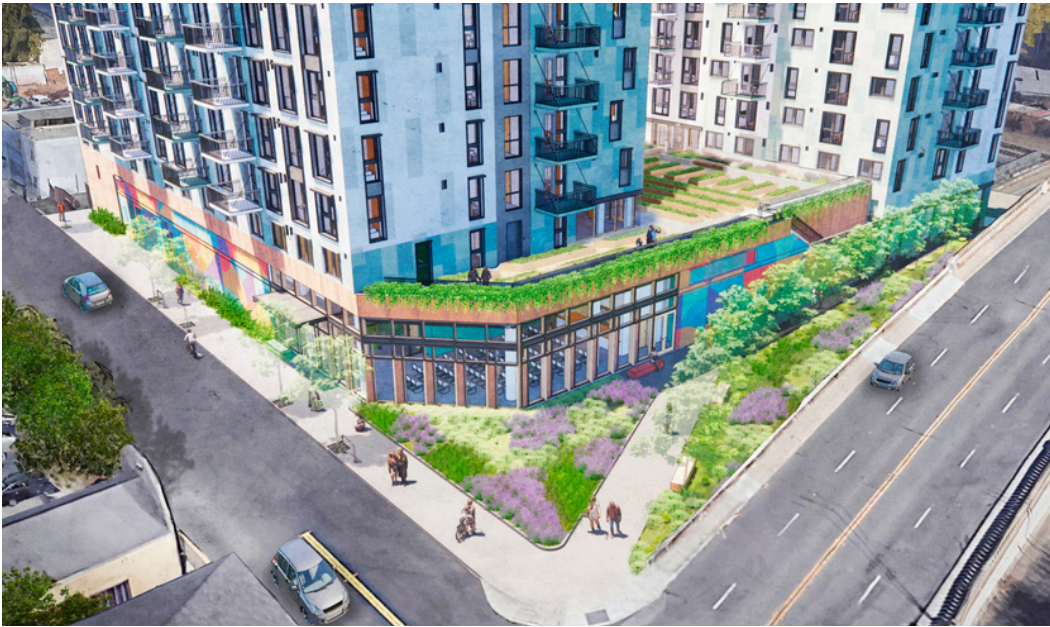
The authors propose that regeneration is encapsulated in ten principles defined as Livability, Equity, Ecology, Nutrition, Access, Waste, Water, Resiliency, Energy, and Heritage. Application of these modalities encompass infrastructure investment, social and community cohesion, economic mobility, symbiosis with nature, distribution and access to local food, transportation, waste mitigation and recyclability, water recharge and recycling, resiliency to climactic conditions, renewable energy production, and cultural identity. As with building efficiency,



Nature Based Strategies

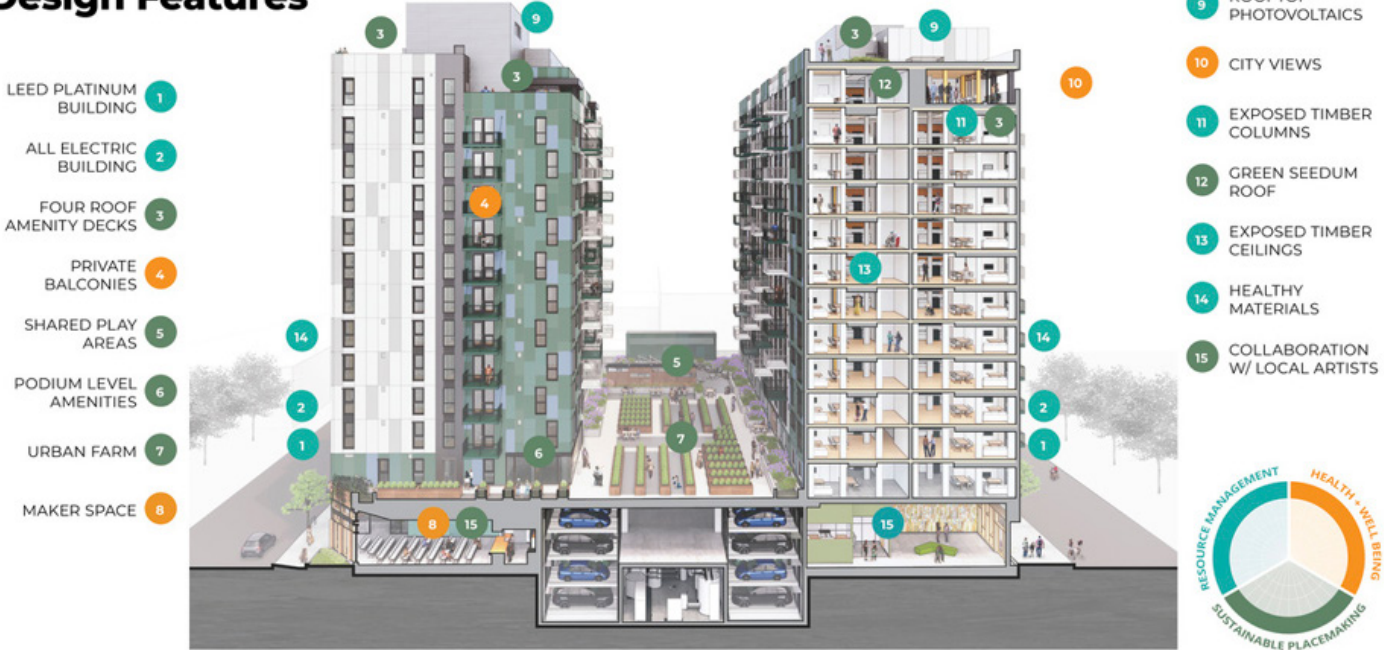
strategies for regeneration are to be analyzed and applied locally and in discourse with the larger context of the city and geography.

It can be said that we build the city, and the city builds us as our needs for human interaction and healthy spaces are met or unmet, the physical and mental effect on productivity and happiness affects the “number of patents, scientific and technology advances”. (Montgomery). Planners and cities are activating against the influence cars have had on their development and growth while rethinking strategies and solutions to generate an unpolluted healthy ecology that will preserve the environment and support wellness of society. As factors of sustainability are pushed deeply into our conscience surrounding buildings we must acknowledge and realize the absolute necessity of a regenerative environment to support our present and future.



Sera Design

Sustainability and Equity Design Features



Precedent

Sustainability and Equity

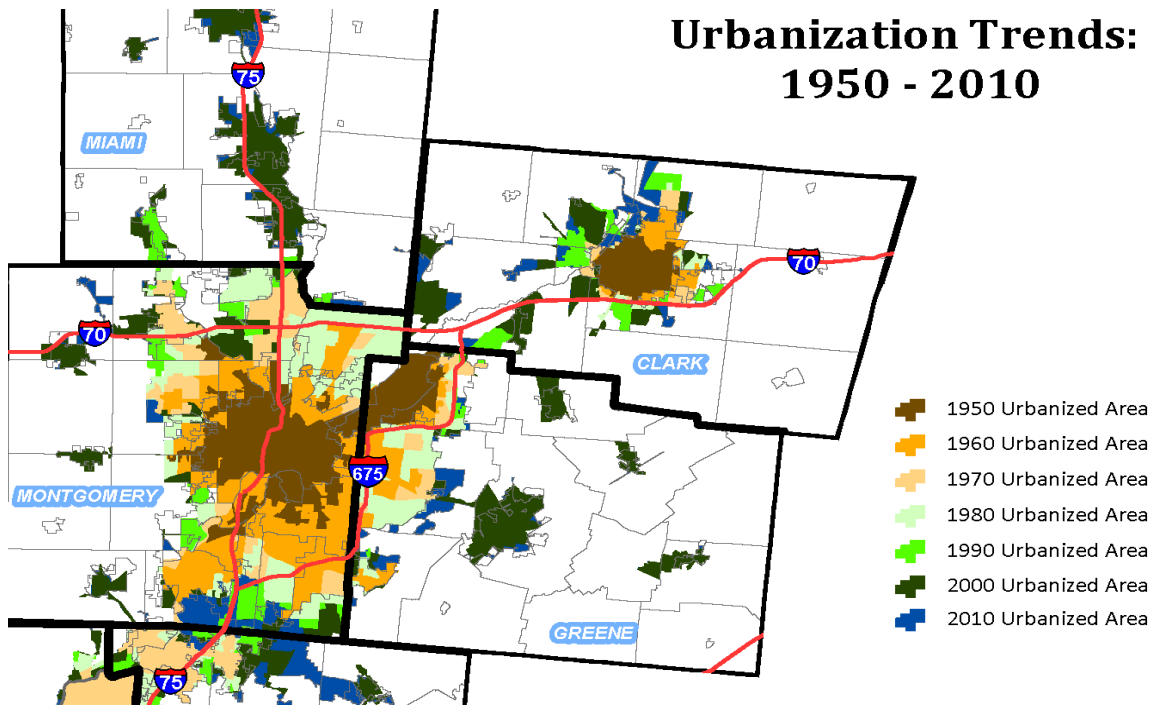
San Jose, CA SERA Architects

Affordable housing is an immediate need as the real estate market pushes upward, inflation increases and supply is peaking. This high performance, affordable housing complex, located near public transit, utilizes mass timber as a carbon sinking construction material while also increasing the speed of assembly. The concrete podium provides a public retail base while concealing underground parking access. Private residential balconies and shared green spaces provide access to nature and fresh air while promoting social engagement through the urban farm and play areas. Renewable energy deploys power for the all-electric building. It achieves LEED Platinum, but more importantly, provides a healthy environment for living.

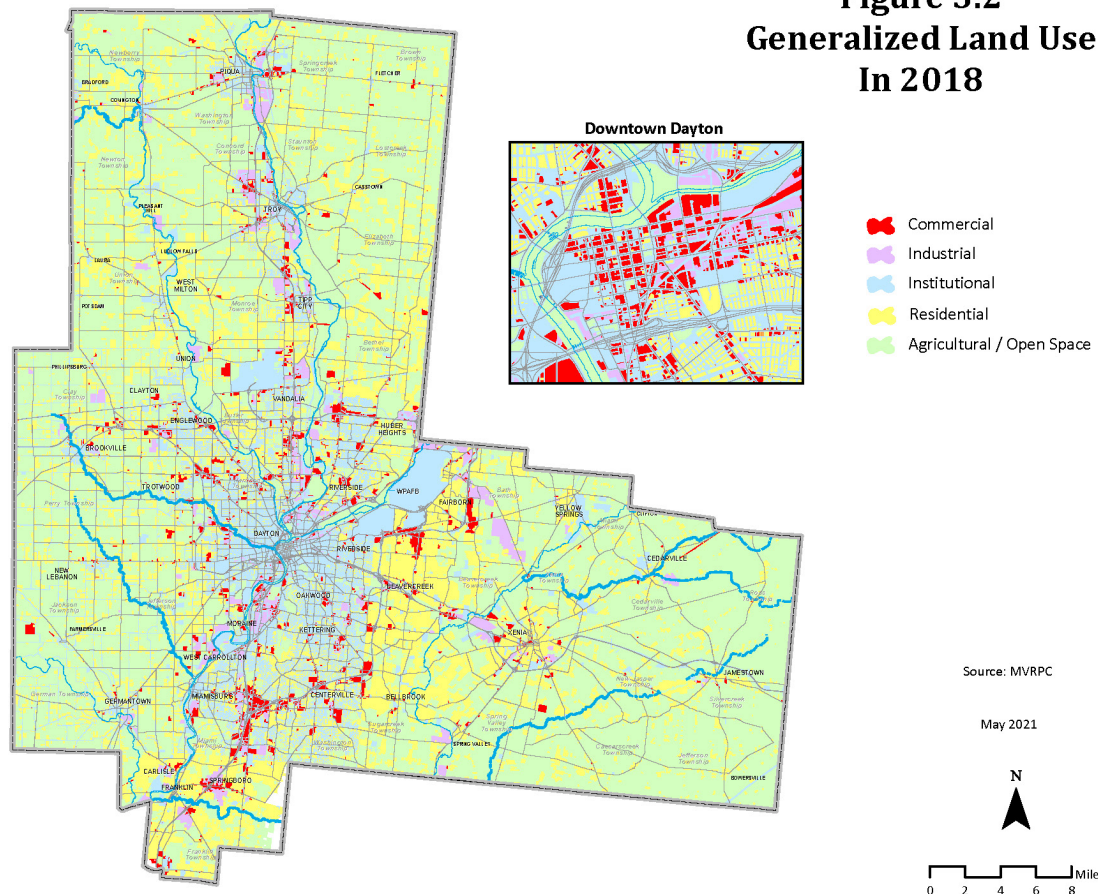


Sera Design

Urbanization Trends: 1950 - 2010



**Figure 3.2
Generalized Land Use
In 2018**



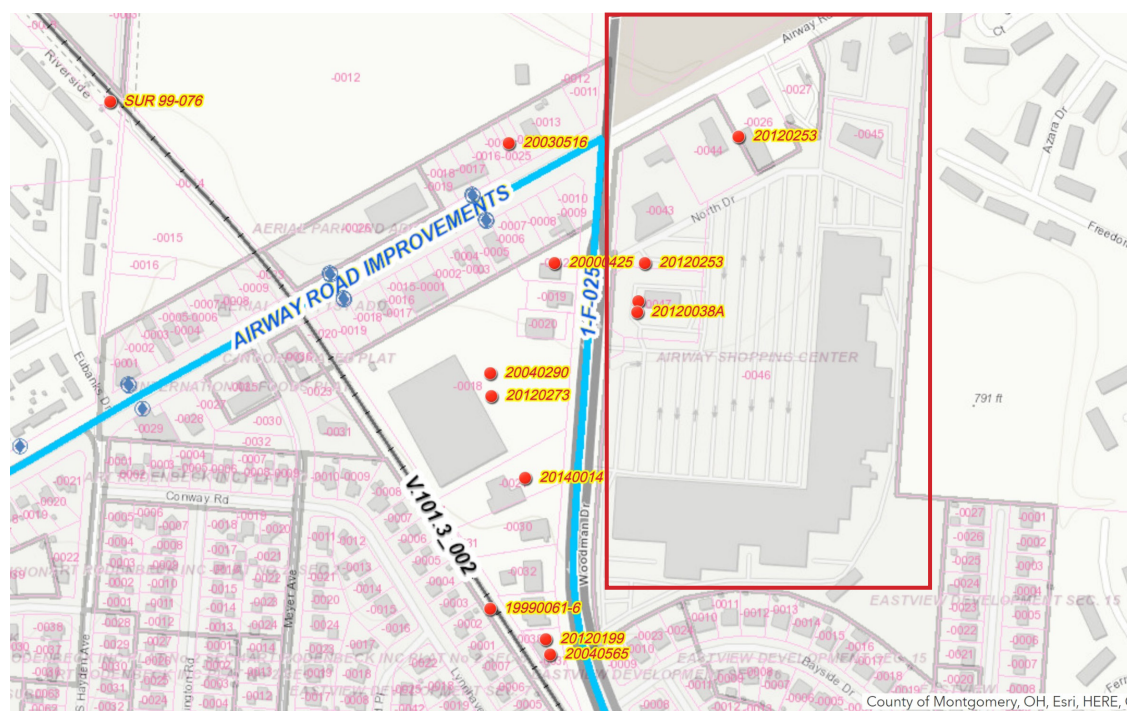
Intervention

Regenerative Development of Ex-urban Greyfields

Mapping and Site Selection

Redevelopment of Ex-Urban Greyfields pinpoints the site of intervention as “economically outdated, failing, or under-capitalised real-estate assets” (Newton, P.W.) within commercial areas. The Dayton Metro Area was developed without town centers that have a traditional ‘Main Street’ to define the commercial center. Rather the suburbs and commerce developed on arterial roads between small towns and filling the space between during a rapid time of expansion defined by strip malls and automobiles.

The map below shows a strip mall located near WPAFB, east of downtown Dayton and adjacent to multiuse trails.



ESRI Map Tool



PEOPLE + PLANET

APPLYING LEED AND THE WELL BUILDING STANDARD™

Strategies for interiors, new buildings and existing buildings seeking dual certification



阶梯观演台
WATERFRONT AMPHITHEATRE



湿地
WETLAND



亲水平台
WATER-FRIENDLY JETTY



水上巴士
WATER BUS STATION



水幕电影
WATER CURTAIN MOVIE



儿童乐园
CHILDREN'S PLAYGROUND



滑板公园
SKATE PARK



皮划艇
KAYAKING



浮水游泳池
FLOATING SWIMMING POOL



生态滞留池
BIO-BASIN



人工沙滩
ARTIFICIAL BEACH



嬉水广场
FOUNTAIN SQUARE



农田
FARMLAND



商业水景
COMMERCIAL WATERSCAPE



瀑布
WATERFALL



绿道
GREENWAY

Intervention

Climate Strategies for Regeneration

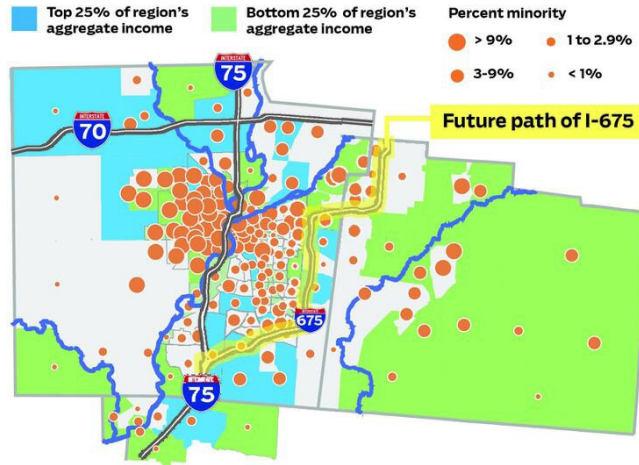
Utilization of multiple, diverse Nature Based Strategies (NbS) dependent upon local conditions will best decrease the effects of human activity upon the environment and create a conduit for Net Zero Carbon Buildings (NZB) and communities. NbS involves the planning, design, and management of nature to affect “socio-environmental challenges, including issues such as climate change, biodiversity degradation, water security, water pollution, food security, human health and disaster risk management.” (Liu, 6)

Various projects individually achieve the standards of LEED, PHIUS, Living Building Challenge, WELL AP, etc. However, future climatic stability depends upon an amalgamation of strategies applied in a comprehensive manner with the committed involvement of various local stakeholders from appropriate fields and backgrounds to accomplish the feat of making our built environment ecologically circular, regenerative and carbon positive. According to the World Future Council Climate and Energy Commission the benefits include environment and natural ecosystem balance, local economy generation, neighborhood cohesion and personal health, resiliency, and local decision-making participation. (WFC, 16)

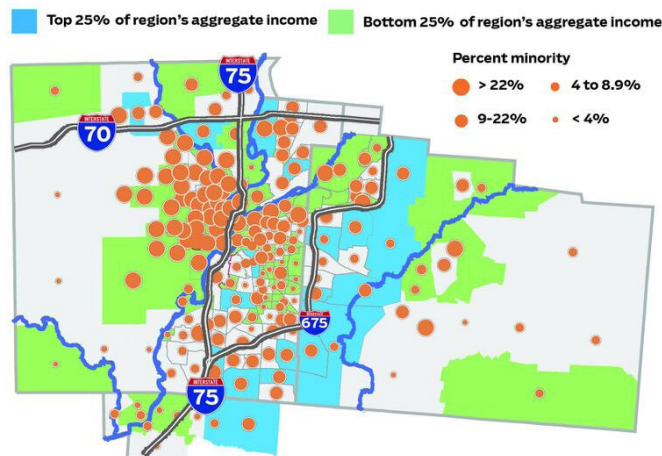
Wealth moves away from the city

The region's aggregate income in 1980 was concentrated in Montgomery County. Since then, the top tier of aggregate income has moved further away from the urban core, to surrounding counties along the I-675 and I-75 corridors. Meanwhile, both the lower tier of aggregate income and minority residents remained concentrated in Dayton and select inner ring suburbs. I-675 was completed in the late 1980s.

1980 Aggregate income distribution and minorities



2010 Aggregate income distribution and minorities



Source: Miami Valley Regional Planning Commission and the Kirwan Institute for the Study of Race and Ethnicity at the Ohio State University using data from the U.S. Census Bureau

ALEXIS LARSEN / CONTRIBUTING ARTIST

Six Design Guidelines for Creating Third Places that Support Social Health

- 01 Accessibility:** Creating Places That are Safe, Inclusive, and Walkable
- 02 Activation:** Programming Place from Ordinary to Extraordinary
- 03 Choice:** Finding Joy in Variety, Flexibility, and Control
- 04 Human Scale:** Weaving Comfort into the DNA of a Place
- 05 Nature:** Moving from Gray to Green
- 06 Sense of Place:** Crafting a Place as Unique as the People Who Use It

Intervention

Building Affordability

The suburbs of Dayton began to develop as WWII brought in influx of workers into Wright Patterson Air Force Base. Many hastily built neighborhoods and shantytowns were built on inexpensive, excessively platted lots from the 1920's and provided shelter for war time workers who founded permanent homes in the area. These buildings later housed those leaving the farming communities of Appalachia as technology and automation reduced the number of workers required. Automobiles and improving economic situations developed vacant land into new neighborhoods. Kettering, south east of Dayton, filled with modest, postwar single family homes. Over the intervening decades home prices and sprawl have increased. According to Dayton Realtors, median single family home prices have risen 8.29% from \$170,000 to \$189,500 in the last year. Now the demographics of the suburbs are shifting with younger residents less likely to live there, instead moving back to the cities for work and social life. In Dayton 200 new apartments are planned to fill housing needs.

Community Sociality

Increased disconnect and loneliness are associated with increased technology connectivity. In *Bowling Alone*, Robert Putnam writes that "each additional ten minutes in daily commuting time cuts involvement in community affairs by ten percent." (Putnam, 2000). When we start in our communities we can do better for the climate, our environment, equity and justice, health and wellness, and accessibility for all. Involved residents are stakeholders in the health of their community and a voice for the needs and desires of the people.



Project Process Flow

The following flowchart provides an overview of the Earth Advantage Multifamily certification process. For more information contact Eric Foley at efoley@earthadvantage.org



¹ During the development, all pertinent documentation for certification will be shared by the project team with Earth Advantage staff. Electronic documentation of applicable measures pursued and requiring supplemental is required to be kept on an electronic file sharing site by the owner, architect and/or general contractor organized as minimum by the 11 certification categories and one general section: (1) Site Planning; (2) Waste Manage; (3) Building Envelope and Systems; (4) Heating and Cooling Systems; (5) Infiltration Air Sealing; (6) Ventilation; (7) Lighting, Appliances, and Water Heating; (8) Indoor Air Quality; (9) Resource Efficient Building Materials; (10) Water Efficiency Landscaping; (11) Photovoltaic and Solar Thermal; (12) Earth Advantage Bonus and Innovative Measure; General Accountability Forms and As-built Drawings. Earth Advantage conducts performance testing and requires Testing/Adjusting/Balancing and Reporting of ventilation and exhaust systems and depending on project MEP system designs. We encourage CAI but our earth ourselves perform TAB or CAI services in-house.

Design Proposal

Redevelopment of Ex-Urban Gray-fields into Regenerative Multi-Use Communities

Multifamily Housing

A possible solution is to examine and densify once-vibrant suburban commercial areas now in decline that are located near residential neighborhoods. These gray-fields are developed, built up, typically one-story commercial buildings with large, paved parking areas. When city planning shifted from prioritizing pedestrian and public transportation to private vehicles, the parking lots were filled with cars. As technology has shifted our economic and social culture and provided for many of our needs to be met from our phones, tablets and computers, our built environment has not responded as quickly. Reports of social isolation amid a crowd underscores a basic human need for connection. Especially after living through a worldwide pandemic the last two years, people are recognizing the need for face-to-face interaction. How can we design for daily necessities without a long commute and its effects while meeting changing demographics of density and the demands of the planet to reduce our impact?

Program

Within the construct of suburbia is a sociology that segregates and classifies neighborhoods by race, income, education, and availability of services. I intend to use program to break apart some of these distinctions through equitable planning and access where residents and the surrounding community have access to green spaces, community resources, increased walkability and safety, spaces for community connections and physical connection to nature. The buildings can provide affordable and market rate private apartments and communal spaces, retail adjacencies which accommodate daily needs, safety in eyes on the street, and places for socializing. The site design can incorporate community spaces and programmed parks as well as links to current nature trails. It can also mitigate storm water and produce energy while educating the public on the importance of these types of interventions. The site plan can accommodate for cyclists, pedestrians and public transit while reducing the accommodation of private vehicles. Analysis through mapping and comparison of movement, activities and spaces can optimize the effectiveness of the programmatic elements and the true depth of access and equity brought to the community through site specific interventions. Specific interventions based on data driven factors of health/wellness, economic and ecological outcomes will support the programmatic elements within the building and site design. Juxtaposing complex programs within a tight site constraint mandates evaluation of compatibility and adjacency in serving various ages, needs, abilities and economics as well as ensuring adaptability for future changes and reuses.

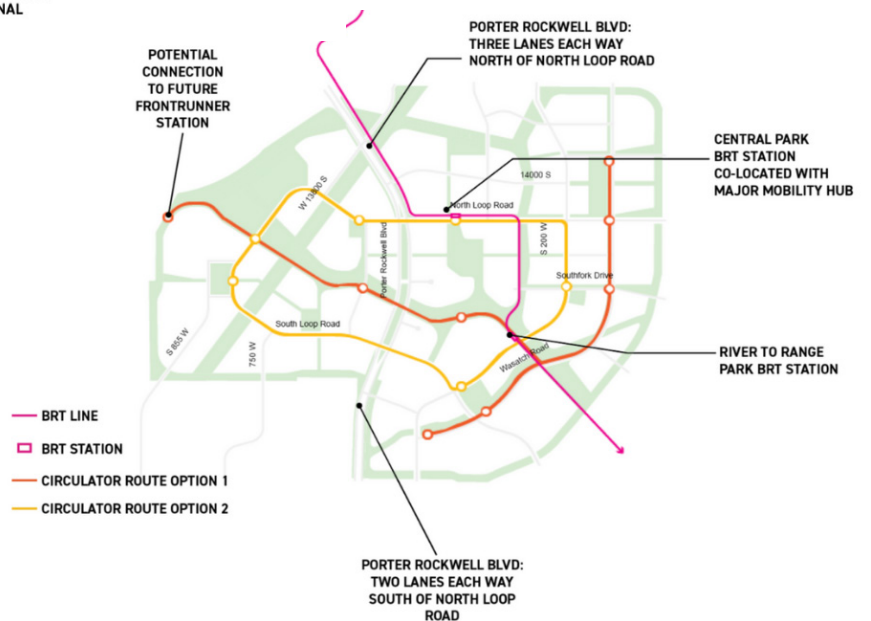


- MOBILITY NODES
- ON-STREET BIKEWAYS
- RIVER TO RANGE TRAIL (14' MULTI-USE TRAIL)
- TRAILS (PAVED MULTI-USE TRAIL)
- EXISTING & POTENTIAL TRAILS
- PARKS/OPEN SPACE

Bike and Pedestrian



Parks and Open Space

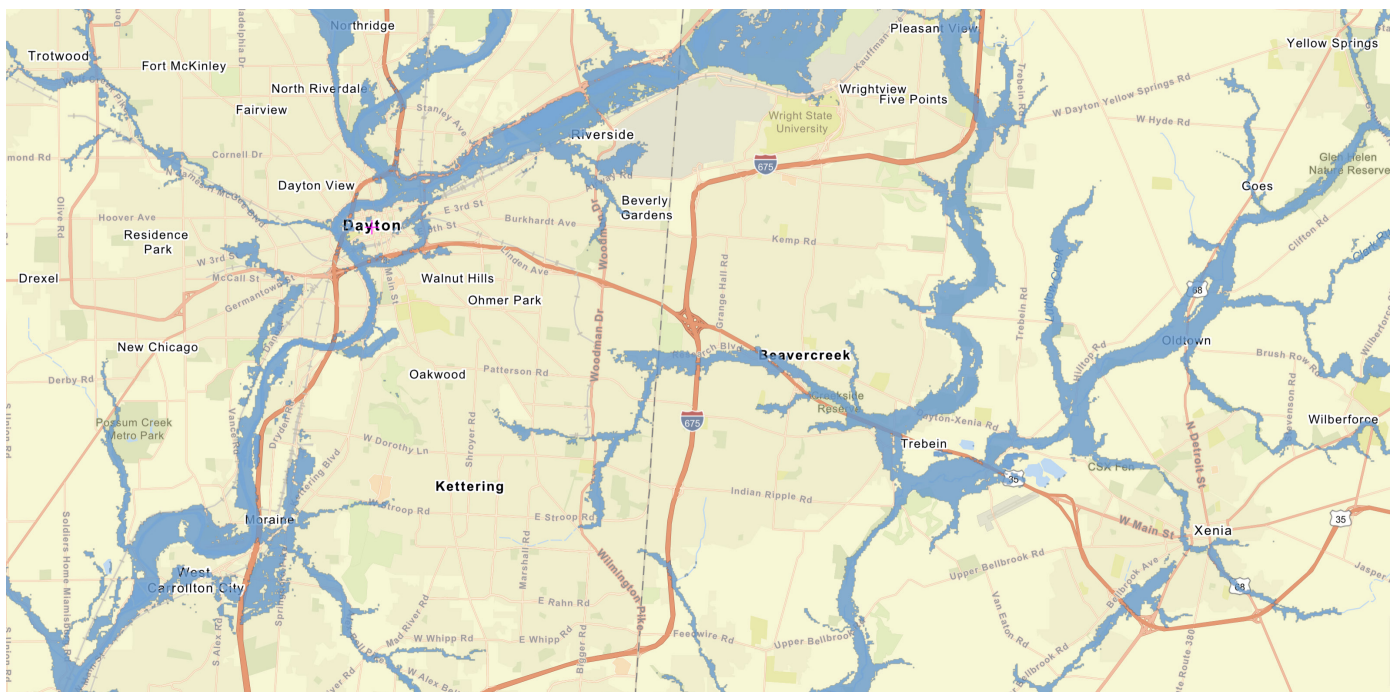
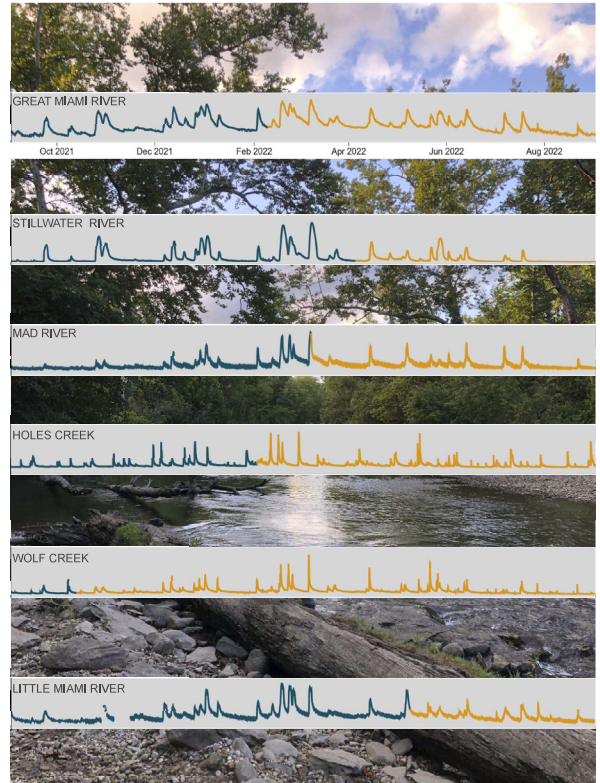
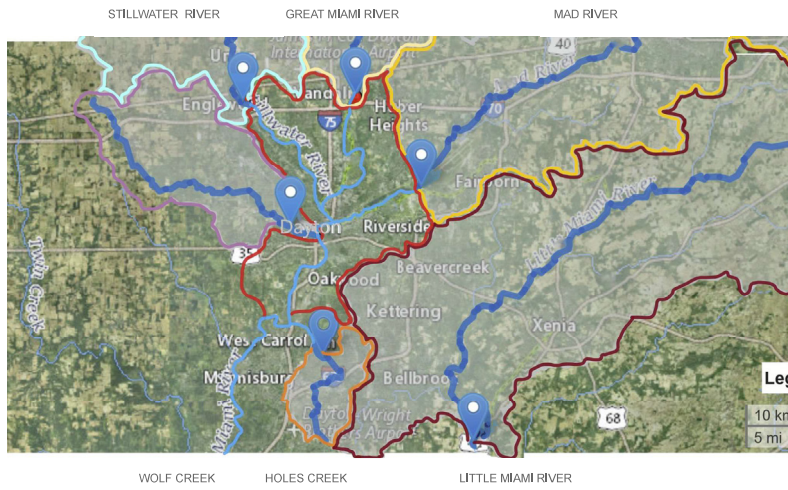


Transportation

Research Methods

This program site in the Dayton area will utilize regenerative strategies including building technology, energy modeling to bring a multifamily typology as well as community sociality absent from current suburban models. Building technology systems include green nature-based interventions, heat waste recovery, efficient mechanical systems, on site energy generation and storage, water management, and building envelopes that meet or exceed Net Zero Energy, LEED and Passive House standards. Multiuse typologies provide advantageous and affordable, work, live, shop environments for residents and the surrounding community as well as creates a social hub within the infrastructure. Utilizing these interventions with the guidance of residential input provides “Empowering social, economic and ecological innovation, to create a sense of ownership of resources.” (Smith, 2013) These strategies combine to build a sustainable and a regenerative program that will involve the citizens and provide a local circular economy to nourish them.

Dayton River Watersheds



ESRI EJ1 map tool
100 year flood plain in Dayton Ohio
Images, Dayton Daily News



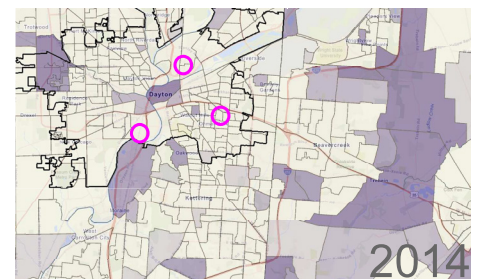
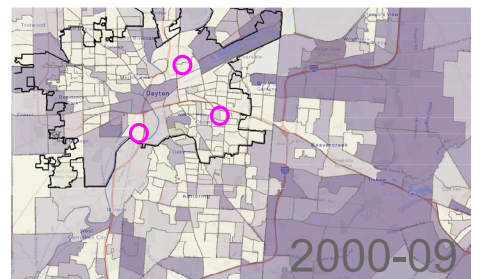
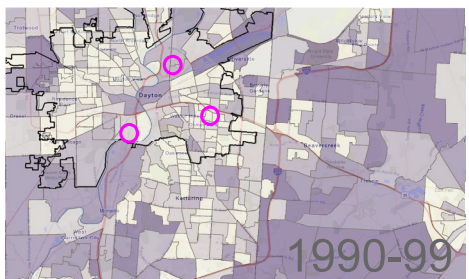
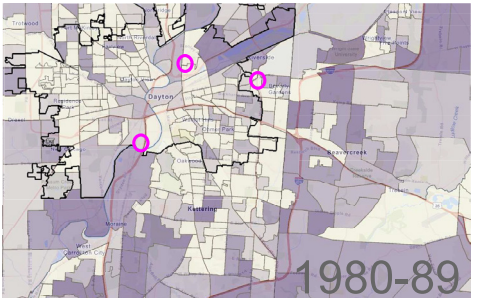
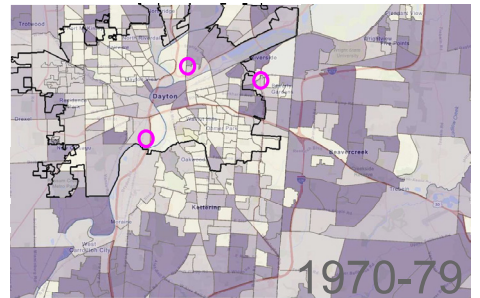
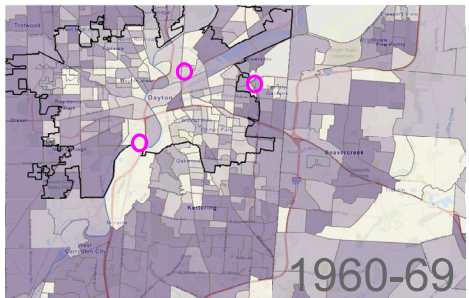
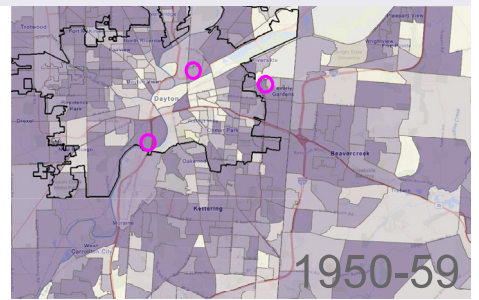
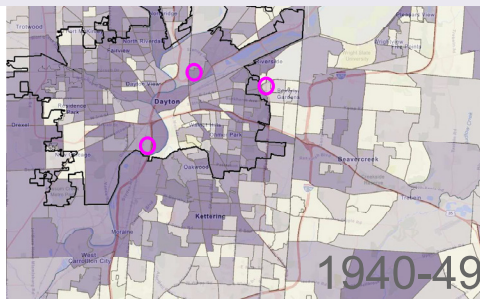
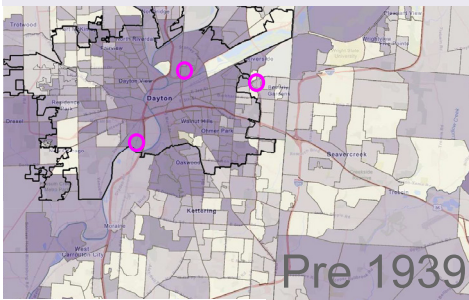
Local Issues

Exploring Ecology and Development in Dayton, Ohio

Watersheds

There are 5 river watersheds of the Great Miami River identified in the top left map which drains to the Ohio river, the Mississippi and out to the Gulf of Mexico. These rivers have affected the road patterns in the Dayton area to follow the natural curvature and flow rather than an imposed grid across the area. The top right image shows the water levels in each river throughout the year which change drastically according to rainfall and affect the areas within their proximity. They often flood depending on the intensity of the rainfall. 55 miles of levees, 5 dams and overflow areas that have been constructed since Dayton's 1913 flood to preserve current neighborhoods. Understanding the potential flood impact and the effect it has on communities allows the most vulnerable areas to be identified for flood mitigation.

Metropolitan Expansion



ESRI EJ map tool
Dayton Ohio

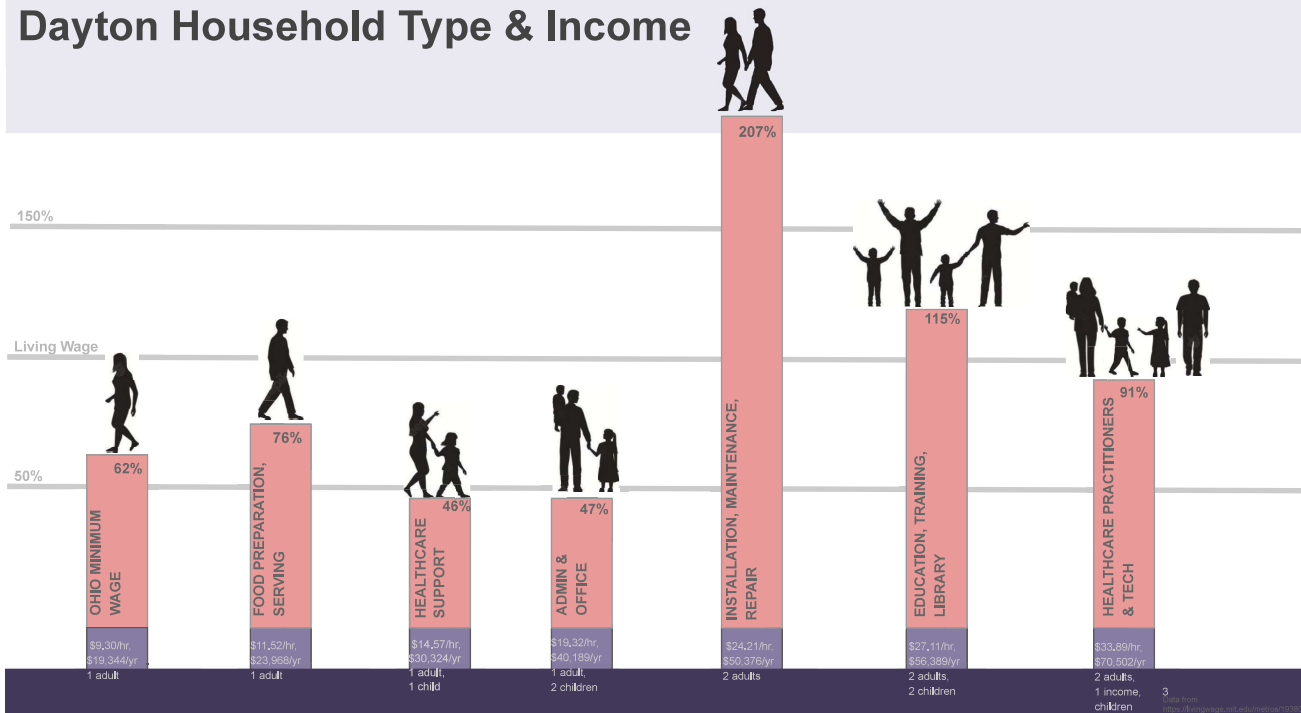
Metropolitan Expansion

In the 1950s and 1960s increased private vehicular traffic on supporting arterial roads.

In the 1950s, population growth resulted in large amounts of residential housing building outside of Dayton's city center and suburban development continued to spread over the decades as new roads and freeways were constructed resulting in a dispersed population. Dayton grew to a peak population of 262,332 in 1960. Dayton's population has dwindled to 136,480 in 2023 while over 814,000 residents live in the metropolitan area. Population decline in the city was heavily influenced by suburban sprawl in the metro area which enticed people to move to winding cu- de-sacs served by shopping centers. The proliferation of suburbia led to disinvestment in established areas and minimal maintenance of aging infrastructure.

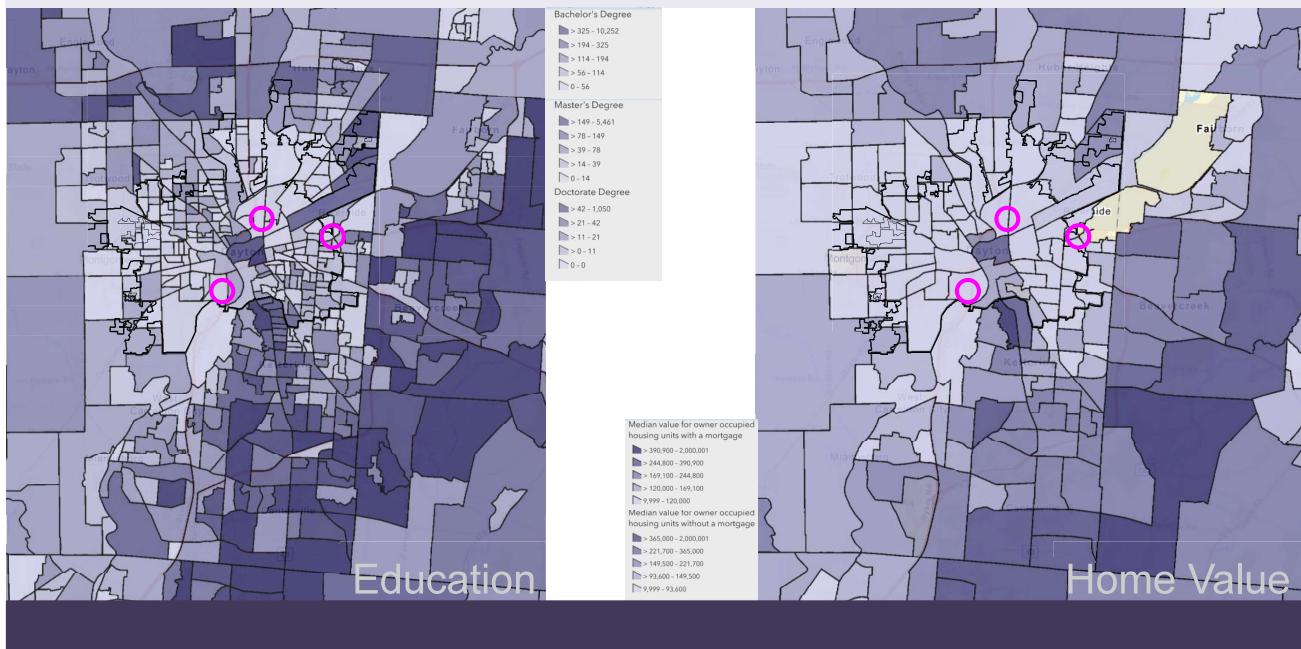
At the periphery of Dayton and sandwiched between older city and newer development within a corridor of aging infrastructure lies a ring of early suburban sprawl from the 1950 and 60's. It is this demographic and geographic area that I have focused on. The results of suburban development have led to patchwork cities and car dependency as it lacks the density, connectivity and convenience of city living.

Dayton Household Type & Income



Data from MIT Living Wage Calculator
Dayton Ohio

Education Affects Affordability



ESRI EJL map tool
Dayton Ohio

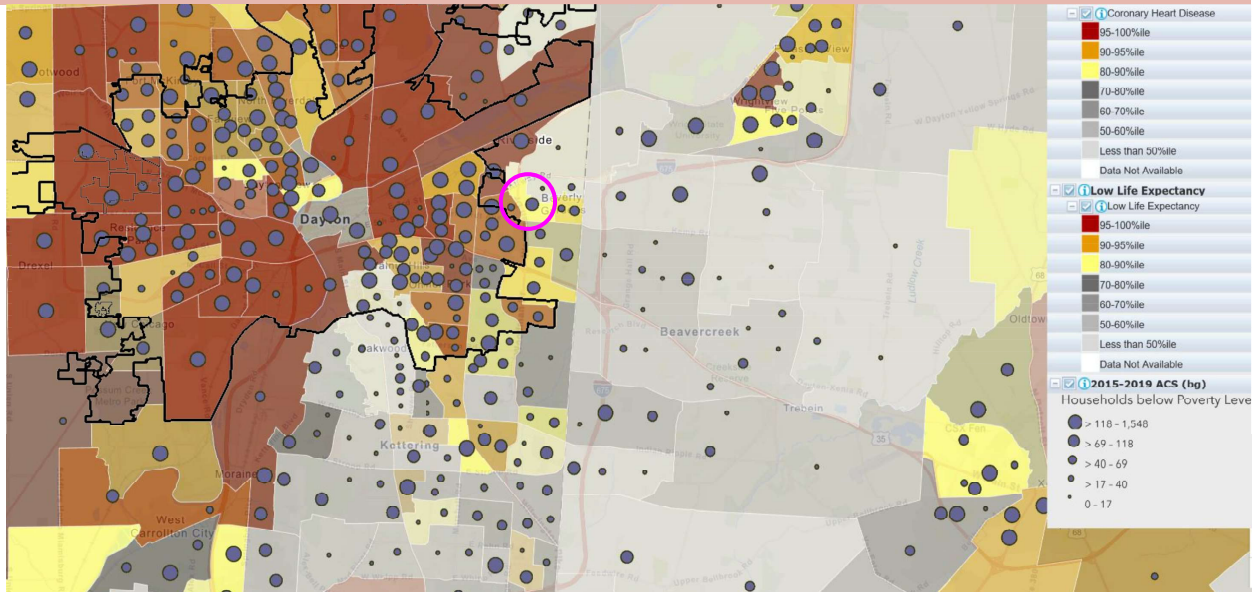
Demographics

Dayton Households

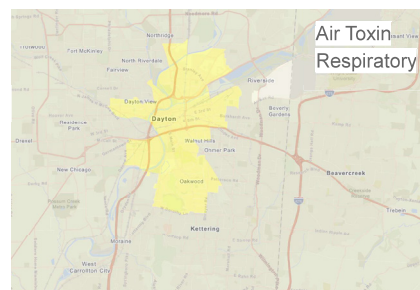
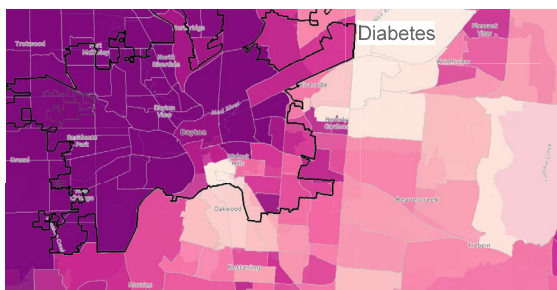
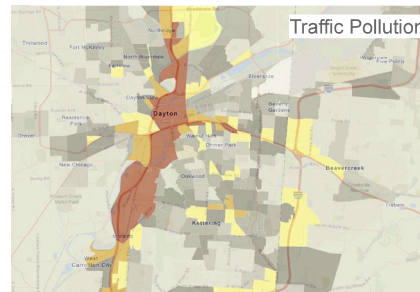
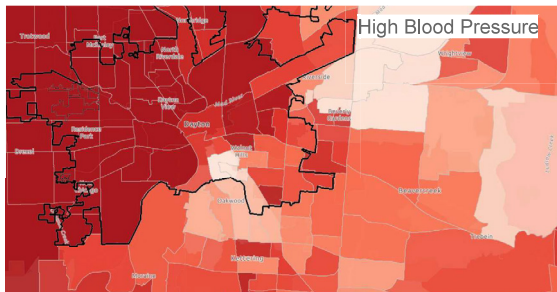
Illustrated here are the most common jobs types and typical incomes in Dayton as aggregated by MIT's Living Wage Calculator. This information is important because it addresses our innate bias that more money equates to more buying power but that is tempered by household types. Income and household size determines whether they are compared to the living wage in the area. housing affordability. This affects housing affordability and limits where a person who can spend up to \$600/month on housing can likely afford to live.

It is important to note that the amount of education a person achieves affects not only where they can afford to live but also where they are likely to live as a result of desirable home values, safe neighborhoods, and quality of housing. The majority of those with higher education live in nicer, newer single family homes on the south and east sides of Dayton's metropolis. However these neighborhoods lack bussing and sidewalks which enable car free transportation. Contrasting these two sides of Dayton shows the lack of equity and access for those of all income levels as well as a dearth of accessible spaces for wheelchairs, pedestrians and cyclists, skateboards and other modes of moving. It is designed around motor vehicles and prioritizes that one mode of transportation.

Residence Affects Health



ESRI EJ map tool
Dayton Ohio



ESRI EJ map tool
Dayton Ohio

Health

The post war suburban expansion of Dayton has left some low income communities in dire situations as access to healthcare, food, schools, housing, and living wages have been truncated. Additionally, these communities suffer from increased rates of high blood pressure, diabetes and obesity. Access to parks, bike paths and public outdoor recreation are limited to those with vehicles. Excess infrastructure in disrepair struggles to maintain commercial tenants and communities are stranded without local resources as commerce moves to freeway nodes connecting the suburbs. Now we will explore the effect of poverty and access upon health. Utilizing the EJScreen data mapping tool, the purple dots indicate the rate of poverty in that census block while the orange and red shading indicate the detrimental health outcomes of heart disease and decreased life expectancy. Can you imagine that you may live up to 6 years less than someone else located in a more affluent area of the city?

High Blood Pressure, Diabetes and Obesity are concentrated in more poverty stricken, low income areas. This is important as these diseases also cost more money to manage. Diabetes medication can add costs of \$10-15K per year in already tight budgets which may lead to mismanagement of the conditions. Obesity affects the overall health of physiological systems in the body as well as impacts outcomes during times of sickness with spreading of influenza virus 42% longer in obese patients than a fit person. Public Health Crises exist in geographically disadvantaged areas based on access to healthcare and impacted by income



Images from Google Maps Street View



OPTICOS Design

Missing Middle Housing

I embarked on a sound field trip around Dayton to see what some of these different areas looked and sounded like. In the lower income areas there are many vacant lots with boarded up stores and vacancies combined with 6-7 lane wide intersections that are unfriendly to non-vehicular traffic. The shopping is car oriented with large parking lots setback from high speed streets. There are intermittent bus stops. There is a lack of public spaces and parks within walking distance of older housing.

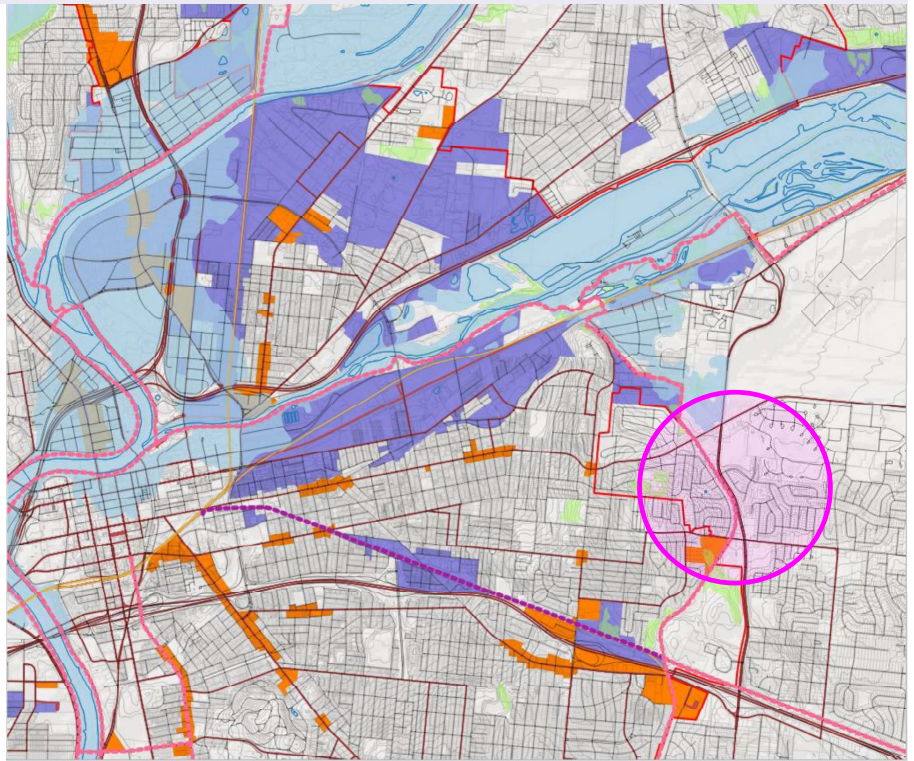
Areas of higher real estate value have quieter, slower streets, cared for public spaces that include shopping and parks with large parking lots and fields for soccer and baseball. Driving is a necessary component in many of these areas as well with sidewalks only present in more public areas and lacking in neighborhoods. Lack of bussing.

Contrasting these two sides of Dayton shows the lack of equity and access for those of all income levels as well as a dearth of accessible spaces for wheelchairs, pedestrians and cyclists, skateboards and other modes of moving. It is designed around motor vehicles and prioritizes that one mode of transportation.

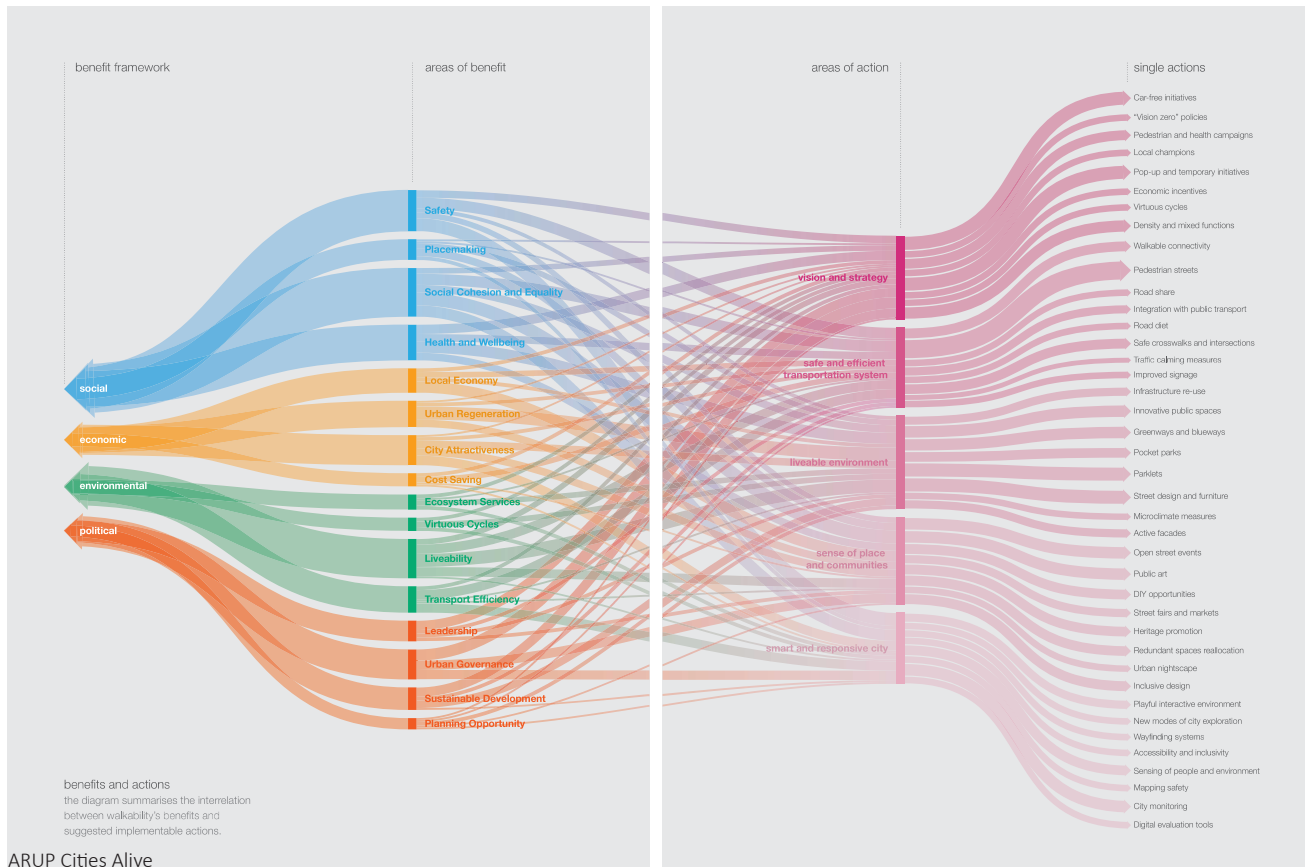
Reimagine: Public Space and Neighborhoods

Airway Rd, Dayton OH

-  Arterial Roadways
-  Commercial Corridors
-  Industrial
-  Bikeways
-  Parks
-  Flood Zones



GIS mapping
Dayton Ohio



Design Intervention

Reimagine Public Space and Neighborhoods

Dispersed Metropolis

This map illustrates proximity of major roads, commerce, industrial, hospitals, schools, bike paths and parks relationships to neighborhoods. Blue is flood plain, orange is commercial, purple is industrial, pink dots are bike paths, green is parks.

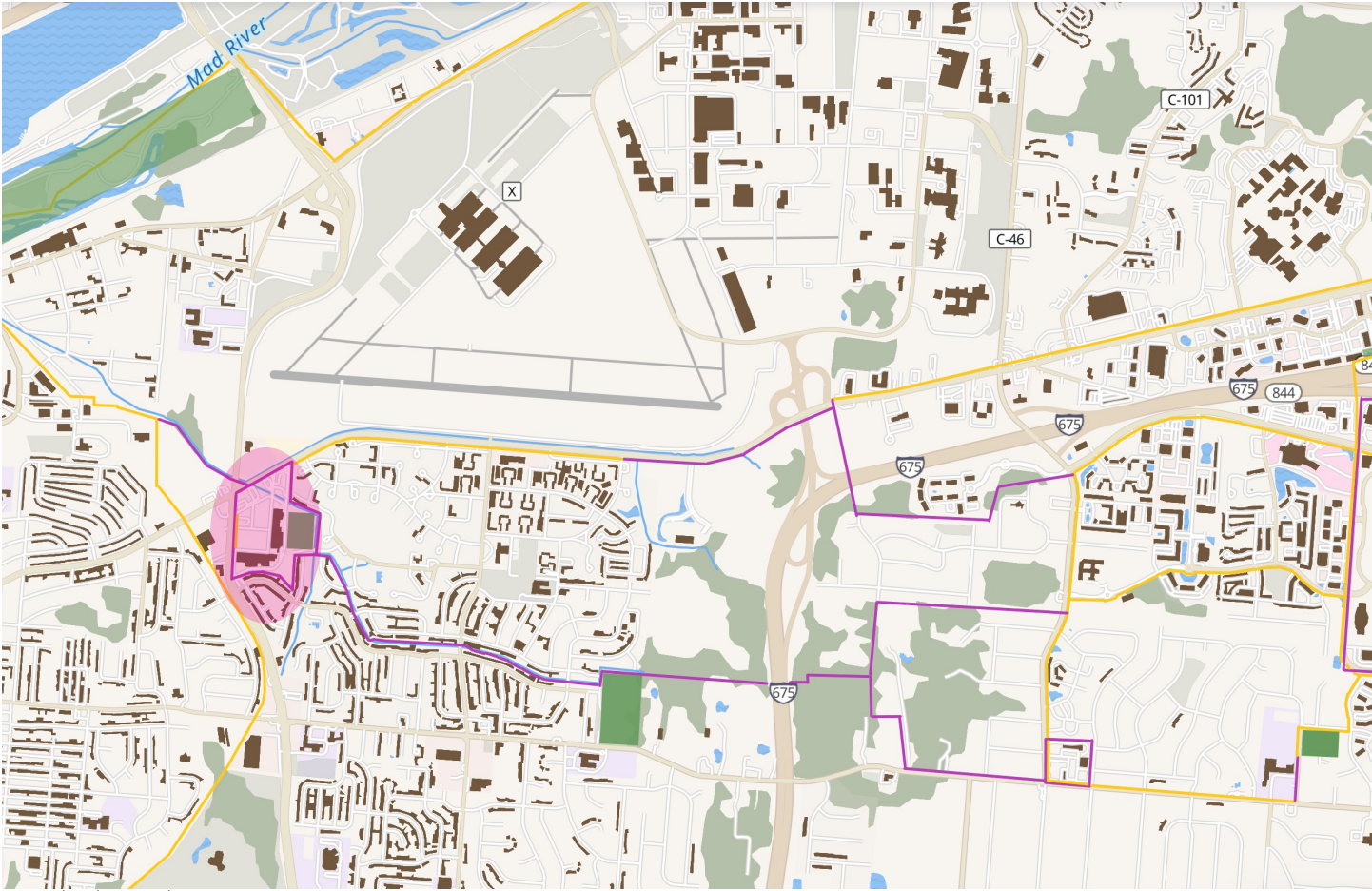
Here we see the metropolitan expansion of Dayton through this area. In downtown the blocks are narrow and streets occur regularly. Towards the periphery the structure changes into winding streets and isolates neighborhoods off of main trunk roads which was a result from the heavy suburbanization building boom of post war American single family homes. In suburban areas commerce is located separately from living areas which results in patchwork rather than integrated urbanity. It is difficult and unhealthy for heavy industry to be located adjacent to residences, however increased distance from everyday necessities is the hallmark of suburbia.

Arup, in the Cities Alive publications have identified the benefits of walkable cities and actions that can be taken and flow analysis of such actions in political, environmental, economic and social constructs.

In the 1970s Village Homes in Davis California incorporated natural drainage, narrow streets, walking paths, clustered housing in a successful project that defied city planning of the time.

Design Principles and Goals

The exploration of excess underperforming retail sites from the postwar suburban era and their improvement through ecologically directed and socially conscious design results in development of affordable missing middle housing, increased multi-modal connection and increased site biodiversity.



Created with Map Tiler Open Street Map
Dayton Ohio



Google Maps
Airway and
Woodman road
Riverside, Ohio

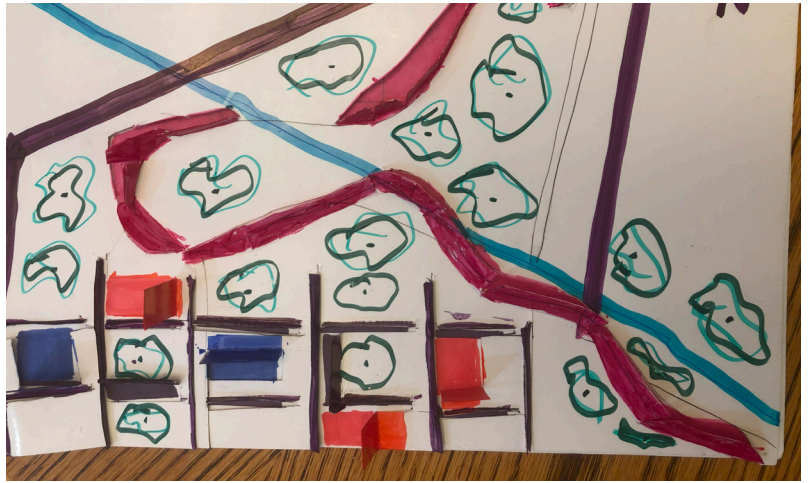
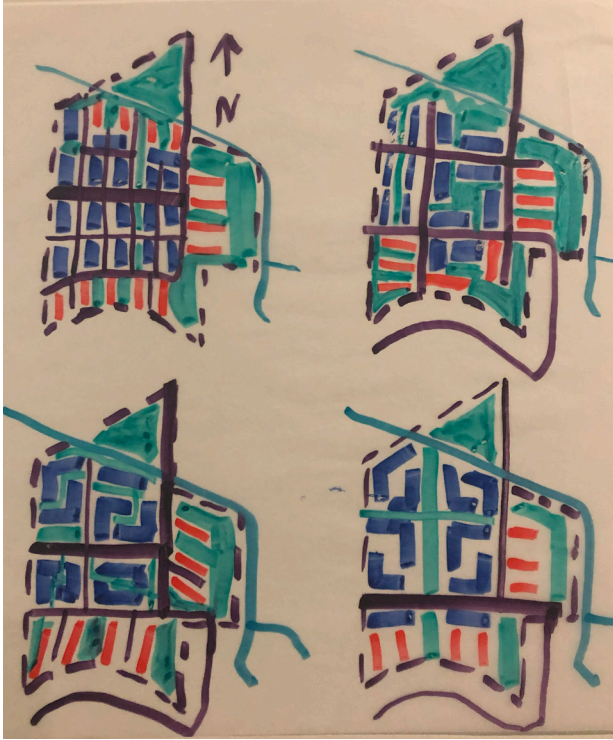
Exploring the Future of Ecology and Missing Middle Housing in a Dispersed Metropolis

This intervention is intended to address those who are shut out from the housing market because of high housing costs and provide public spaces to improve economic and health outcomes. Sustainably built housing decreases utility bills and maintenance through passive house and net zero energy saving strategies which provides long term stability. Locating denser housing within walking distance of commercial necessities and employment decreases the need for owning a vehicle and increases physical activity in a sedentary lifestyle. Reducing reliance on automobiles through prioritizing walkways and bikeways that connect to the broader region, decreases airborne pollutants and improves community health. Onsite flooding is mitigated with native, biodiverse landscaping that holds and absorbs runoff, ultimately impacting the regional river ecology and biodiversity. The landscaping creates nature parks and areas of recreation for residents and neighbors to enjoy. This project aims to provide an inclusive demographic with affordable housing, better health, and economic outcomes in an ecologically regenerative environment.

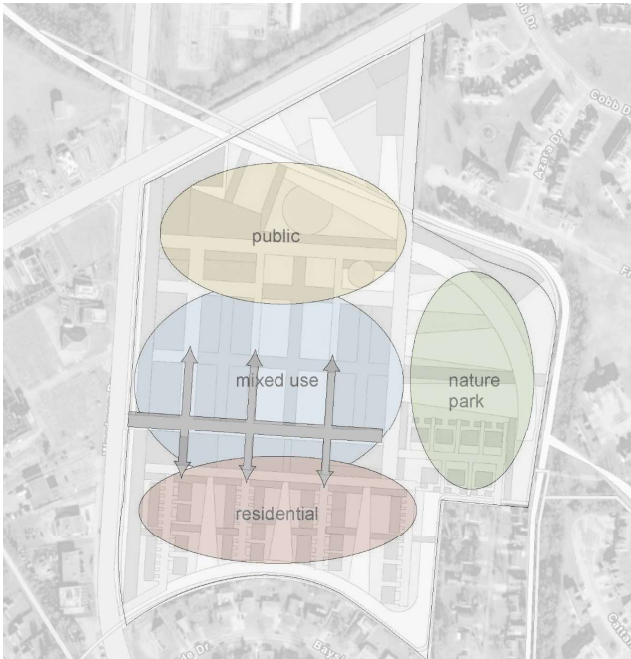
Master Planning

Site Selection

This site selection focuses on arterial roadways from midcentury with declining infrastructure, and commercial corridors that ought to provide non vehicular access to residents as a matter of societal access to services and necessities. This specific corridor of Woodman Dr and Airway Rd is near the Wright Patterson Air Force Base. Single family homes built in the 1950-60's, and a commercial strip mall are car oriented without creating a friendly place for non vehicular traffic with little connection to the natural environment beyond private backyards. This map illustrates the possibilities of connecting this site across the broader region through multi-use trails along waterways and existing trails to provide greater access for all members of the community. These trails would connect the Fairfield mall area across I-675 to the site and on to the Mad River, a total distance of 6 miles.



Site Analysis and Design Process



- bike trails
- bioswales
- green space
- green fingers
- mixed use
- residential
- parking



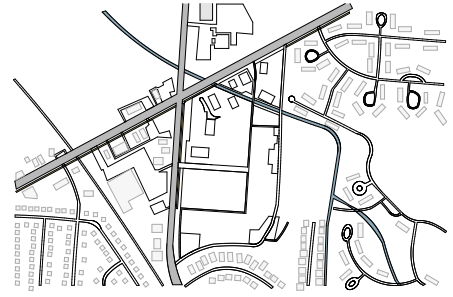
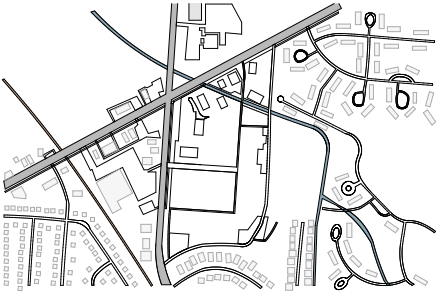
Program Concept

Concept Site Diagram

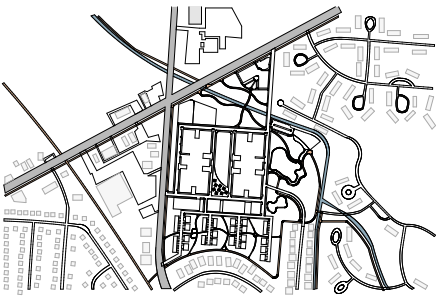
Site Analysis

Considering the main roads of Airway and Woodman I concentrated the public uses towards them and the private spaces towards the existing residential fabric. It was vital to reclaim this site as it has existed for the last 70 years as an asphalt parking lot to increase its permeability and water retention to restore the river's tributary, mitigate its contribution to localized flooding and support the river ecosystem. Concentrating the building density and designing biodiverse green space between them creates a sponge site as well as supports residents and community visitors and their health. Providing missing housing types and multi modal non vehicular access as well as walkable neighborhood streets serve commercial purposes for residents in a mixed use typology.

Site in Current State



Bike Paths



Roads and Parking



Sidewalks



Site with Interventions

Site Mobility

A primary goal is to integrate community with multi modal access. In order to make density work, places must be walkable and reoriented from vehicle prioritized streets to include multi modal uses. Redefining streets to include multi modal access and increase bike and nature paths impacts communities to create spaces for recreation and economic growth. Compare the previous site's roads, bike and pedestrian access with the the interventions planned. Bike paths are increased and interconnected. Roads are reduced and parking is concentrated in multi level garages, and underground with limited street parking intended for the convenience of retail loading and unloading. Safe sidewalks delineate the retail area and connect to the bike paths and walking trails. The mobility across the site is enhanced for all users.



Site Design

The 35 acre site reclaims the land from an asphalt parking lot and low density retail and incorporates 200 apartments, 30 duplexes and 37 townhomes. Site redevelopment includes connection to adjacent bike trails, addition of walking paths and multi use trails, bioswales, meadows, tree planting in riparian buffers to utilize the creek as a regenerative feature rather than a hazard, and creates public green spaces and parks. Connecting this site back to the ecology and water systems and integrating resident experience results in increased physical and mental health through a low impact density with urban biodiversity and native species. This gives residents and neighbors socializing contexts, health boosting access to nature, access to commerce and safe public space. These interventions shift the site from sustainable development to regenerative productivity as biodiversity repairs the soils and mixed use community supports small businesses and economic development through micro retail and outside public market space.

**A- RECREATION
CENTER**

B- HOTEL

C- NATURE CENTER

**D- MIXED USE
MULTIFAMILY
RESIDENTIAL**

E- TOWNHOMES

F- DUPLEXES

3- AMPHITHEATER

4- MULTI USE TRAILS

**7- COURTYARD
GARDEN**

8- PUBLIC PARK

10- PUBLIC MARKET

11- DOG PARK

12- PLAYGROUND

1- BIOSWALE

2- RESTORED CREEK

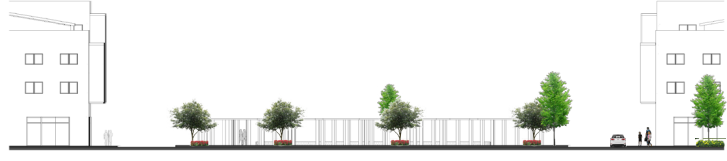
5- NATIVE MEADOW

6- RIPARIAN BUFFER

9- NATIVE GRASSES



① Vignette Native Grasses Bioswale
1/16" = 1'-0"



② Vignette Market Plaza
1/16" = 1'-0"

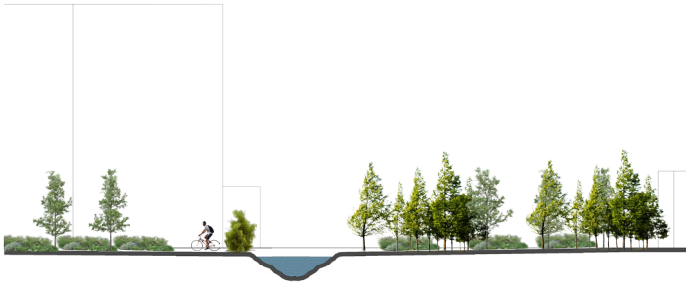


③ Vignette Meadow Bioswale
1/16" = 1'-0"



④ Vignette Riparian Buffer
1/16" = 1'-0"

Site Vignettes East-West



⑤ Vignette Creek Bioswale
1/16" = 1'-0"



⑥ Vignette Duplex Townhomes Bioswale
1/16" = 1'-0"



⑦ Vignette Bike Path
1/16" = 1'-0"



Conceptual Shopping Plaza

Site Vignettes North-South

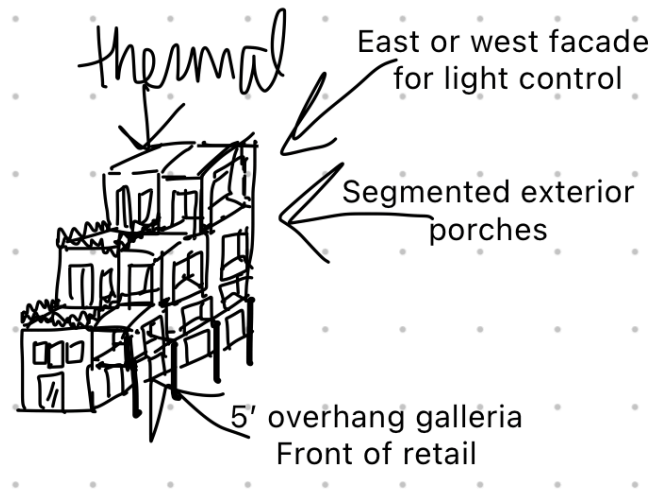
Site Ecology

These vignettes illustrate the impact of biodiversity and on site water mitigation strategies to provide public spaces and regenerate the site. They illustrate the connection between the buildings, streets and nature that people inhabit.

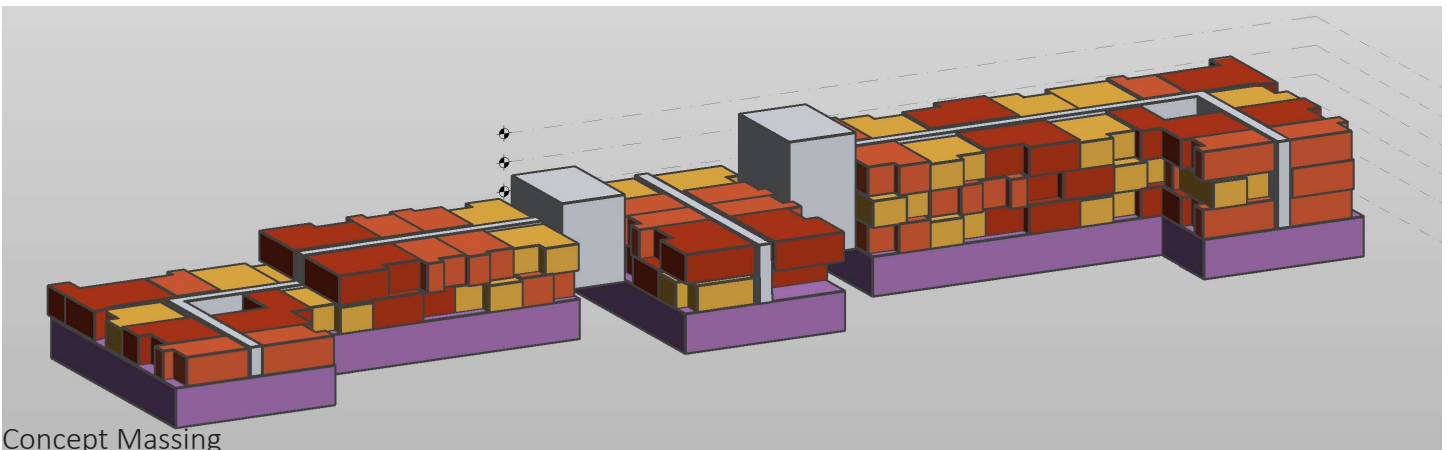
Carefully crafted bike paths connect the entire site, top to bottom and side to side, interacting with the topography and streams, street frontage and new connections to existing and proposed bike paths. The bioswales dispersed across the site allow water to naturally percolate into the ground water preventing site overflow and runoff. The riparian buffer near the stream serves as a filter for moisture before it enters the regions water system. This protects the aquaculture and promotes biodiversity in the rivers. With the natural world woven among the residences and commercial areas, no one is ever far from its presence.



Residential Courtyard over underground parking



Procaccini 17, Milan
 Modourbano Architettura
 Courtyard typology of Milanese “Ringheira” rebuilding the urban fabric and balancing private and public spaces.



Concept Massing



Studio



Building Massing

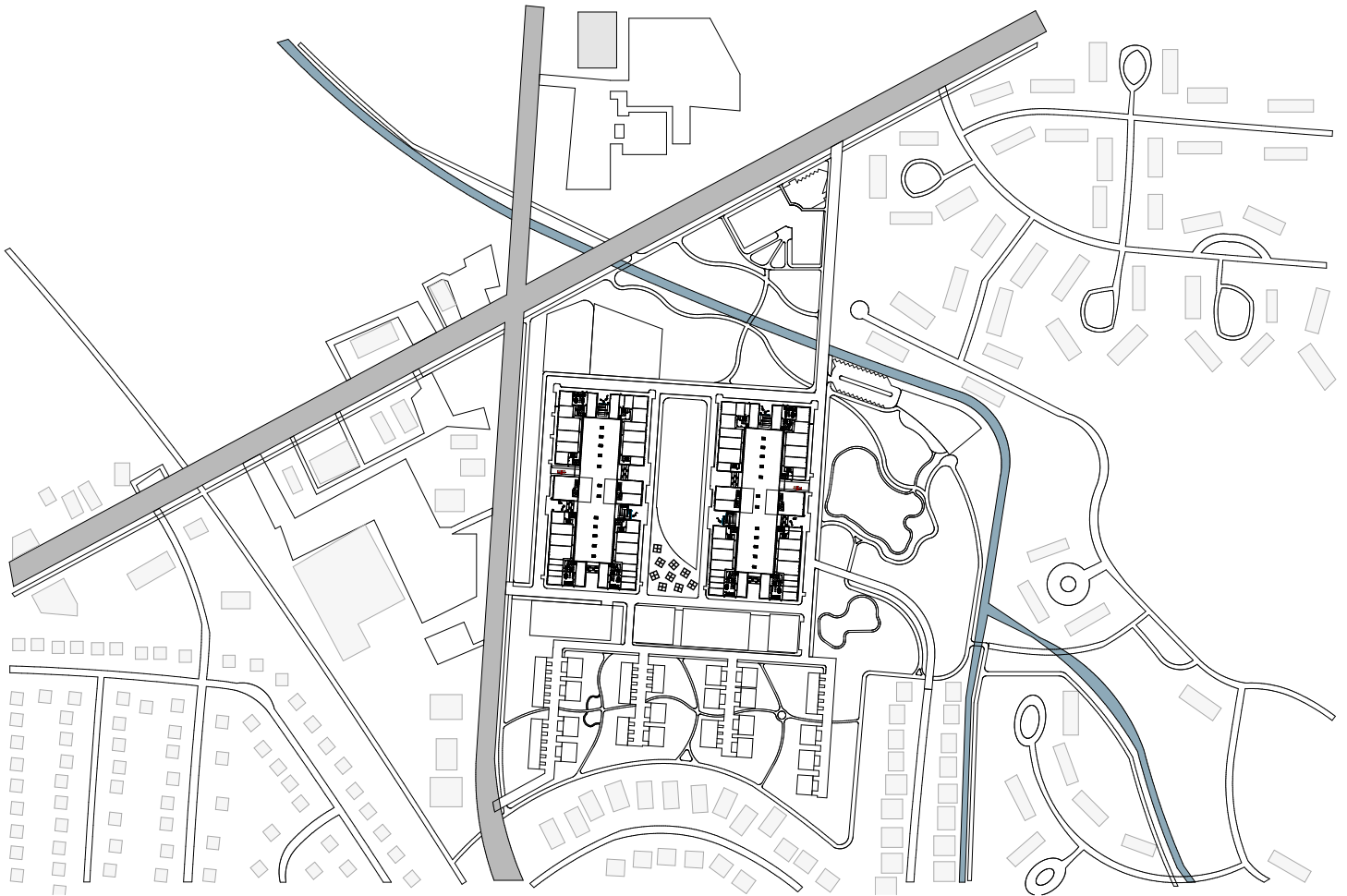
Building Design

Precedent & Concept

Dayton consists of tall city center buildings immediately surrounded by single family homes on private lots. Largely missing are middle housing types, which lean more affordable, and denser typologies which support semi urban nodes. Multiple kinds of housing increase the density of residents to support local commerce while providing affordable and varied options.

This project in Milan by Modourbano contributed to the urban fabric utilizing a courtyard typology which balances private and public spaces. The strong street presence shields residences inner privacy while creating a varied facade.

The concept massing plays with protrusions of the facade based on apartment type and sizes: studio, 1 bedroom and 2 bedroom. Each residential floor level has casual nooks that let light into the hallways and provide a place for reading or gathering together. The gray connecting masses provide gather spaces for residents programed with coworking space, and a gym. The thermal envelope of the building is maintained as the balconies are cantilevered off the facade. Balconies are deep enough to provide shading on the east and west facades of the building. The courtyard typology covers the block but is broken into sections at the ground plan to allow site permeability and access to breezes while the stepping mass invites sunshine into the interior.



Ground Floor Plan with Site Context



Shopping Plaza Section
1/8" = 1'-0"

Connections to Site

The multi family residential and mixed use retail are nested within the center of the site. Pocket parks adjacent to retail at ground level back up to the raised courtyard with stepped planting beds. The residential cowork space has a view over the street front and residential courtyard and bridges between the masses to protect the pocket park underneath. Wheelchair accessible ramps and stairs provide access from the courtyard to the large central plaza



Pocket Park



Residential Cowork space with view to Courtyard



Ramp and Stair access to Courtyard



View North over Market and Park toward Mixed Use Residential



1 Site Section East West
1" = 30'-0"

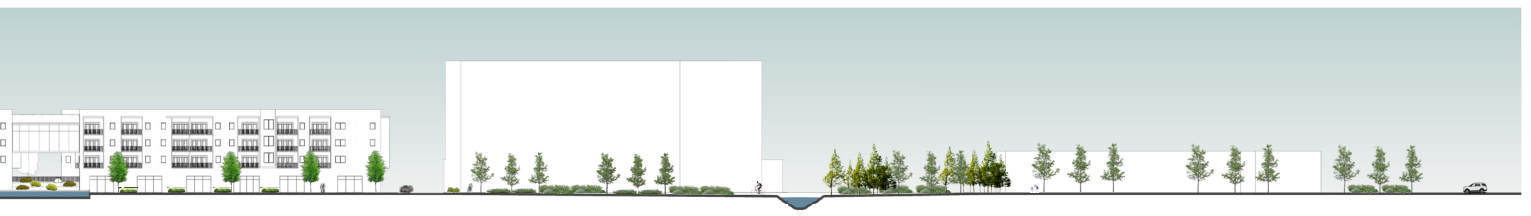


2 Site Section North South
1" = 30'-0"

Exterior Elevations & Site Sections



① SOUTH ELEVATION
1/16" = 1'-0"

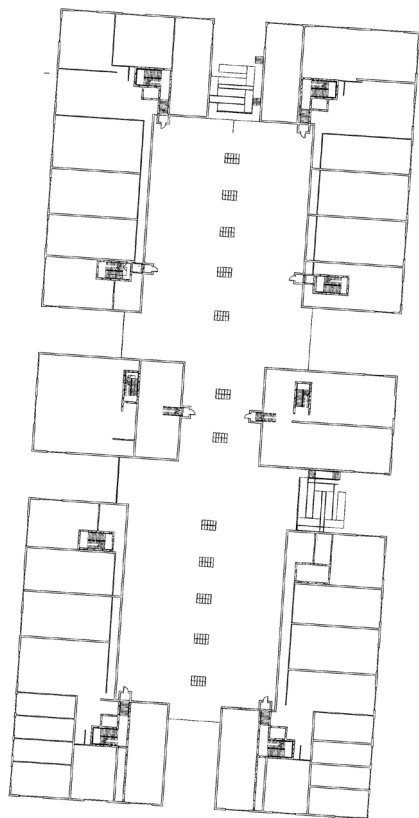




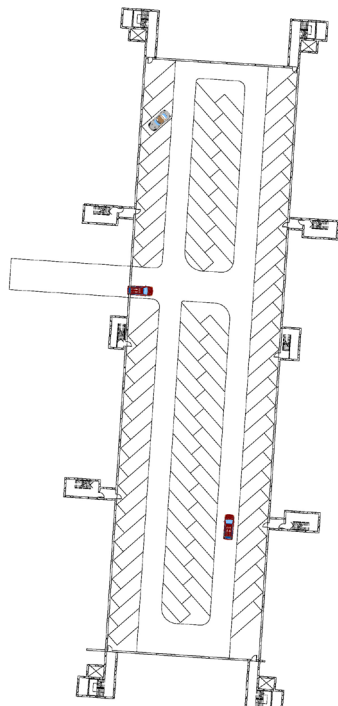
1 EAST ELEVATION
1/16" = 1'-0"



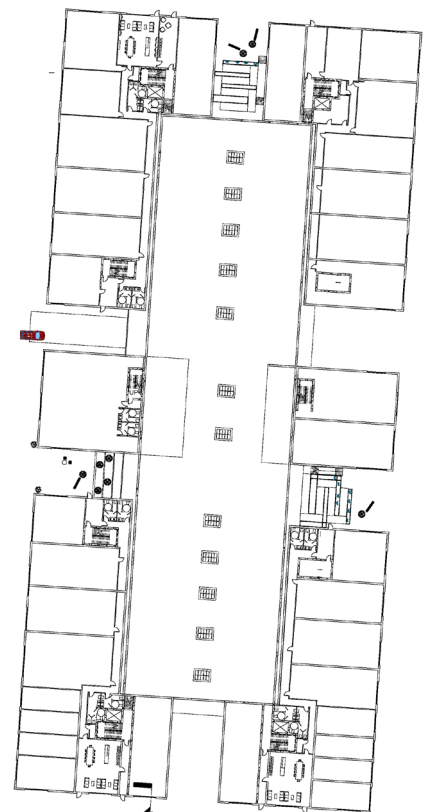
1 West Elevation
1/16" = 1'-0"



1 Courtyard
1/32" = 1'-0"

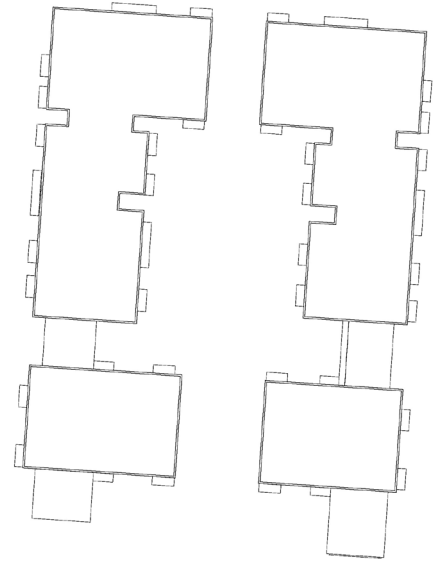


1 Parking
1/32" = 1'-0"

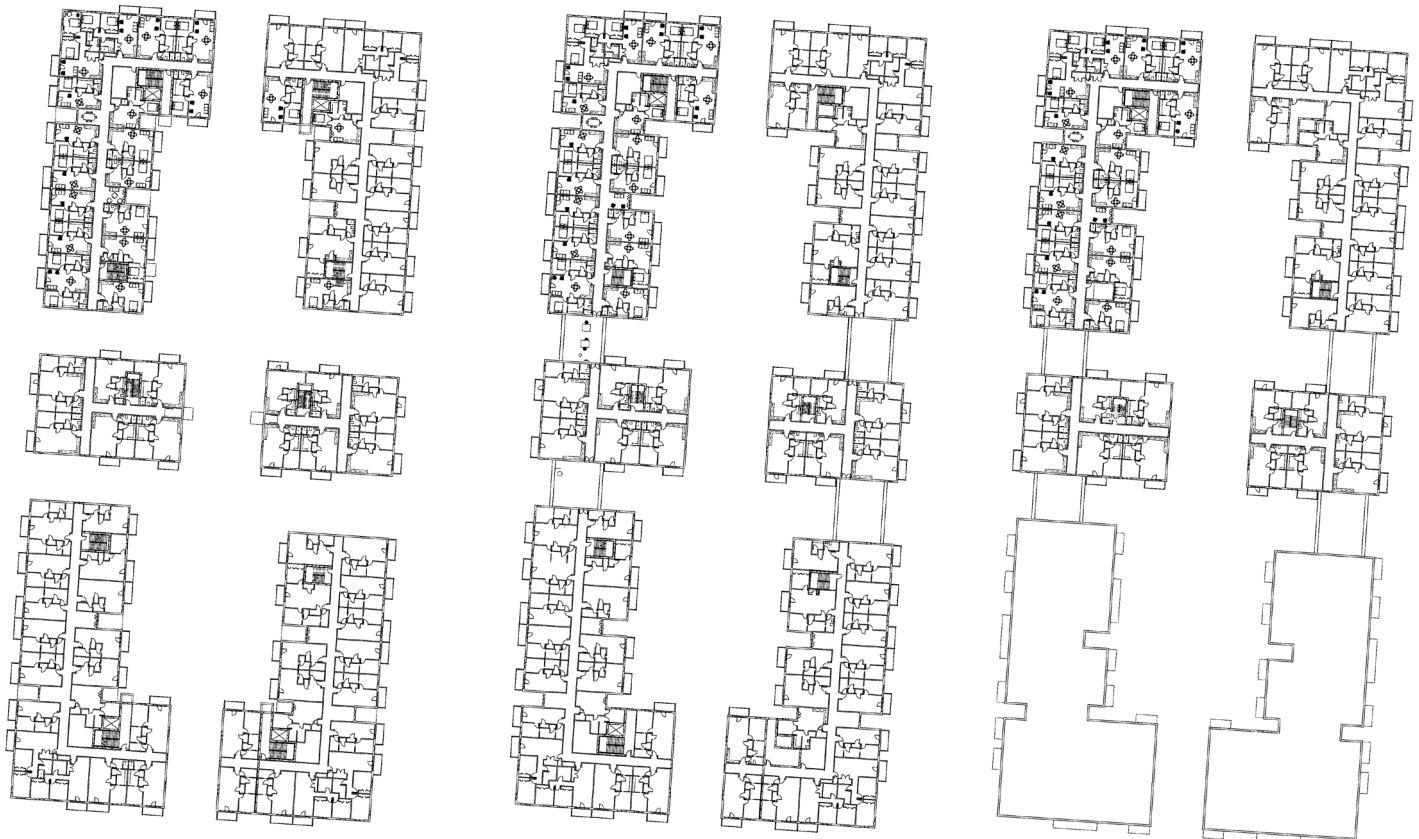


Level 1
1/32" = 1'-0"

Exterior Elevations & Floor Plans



MX 5
1/32" = 1'-0"



MX 2
1/32" = 1'-0"

MX 3
1/32" = 1'-0"

MX 4
1/32" = 1'-0"



Residential Lobby



Residential Lobby

Interior Views



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