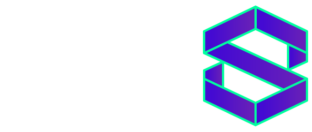
SPECTRA

WHITEPAPER

# BUILDING A SUSTAINABLE, LIVABLE, AND AFFORDABLE CITY FOR 1M+ PEOPLE THROUGH MULTILAYER BLOCKCHAIN COOPERATIVES AND EXTENDED REALITY EXPERIMENTATION

Version 0.1



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Building a sustainable, livable, and affordable city for 1M+ people
through multilayer blockchain cooperatives and extended reality experimentation

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# 0 Executive Summary

Spectra is a multidisciplinary project to solve existing problems in cities and define a new model of sustainable, human-centered, and technologically progressive urbanization. To do so, Spectra pairs a traditional philosophy of cooperative business and living, with modern advancements in extended reality (XR) and blockchain technology. The result is (1) a sustainable, livable, and affordable city for at least one million people; (2) a massive virtual world; and (3) a multilayer structure of blockchain cooperatives to govern, fund, and build it all.

This whitepaper is composed of five chapters. The first introduces Spectra's motivations and plans for building a new city. The second discusses the initial blueprint for the physical city in terms of design and function. The third describes the virtual world which serves as a space for experimentation, community, business, art, gaming, and recreation. The fourth provides further details about the social, economic, and governance dimensions of Spectra, including how the project will start and grow over time. The fifth concludes with a call to action.

Although the contents of these chapters are deeply intertwined—making it a challenge to neatly cover all their topics in linear fashion—we introduce them in this order purposefully. The ultimate goal of Spectra is to build a physical city. The virtual world is the engine which provides unparalleled opportunity for exploring project design options. The cooperative structure and its corresponding financial and governance systems are tools which enable those developments in the long run. In practice, though, the virtual world will be released first. Then, the social and economic dimensions will mature as the virtual world grows. Finally, the physical city will have the necessary community ties, urban planning, governance mechanisms, and financial resources to be built.

By condensing centuries of city growth processes in the physical world into years or decades of urban planning and community practice in a virtual world, Spectra aims to build a sustainable, livable, and affordable city *for* the future.

## 0.1 Baseline goals

| | |
|---|---|
| **Scale** | • 1,000,000+ people in a densely populated city modeled after neighborhoods in cities like New York, Paris, Tokyo, and Barcelona.<br>• Utilize core construction modules which can be built quickly. |
| **Lifestyle Diversity** | • Mixed use development built for work, leisure, and play in every block.<br>• Allow aging in place through customized living options for singles, families, and the elderly. |
| **Transportation** | • Prioritize cityspace for people by building for pedestrians and small vehicles above ground and autonomous delivery systems and shuttles below ground. |
| **Health & Wellness** | • Provide the majority of daily fruit and vegetable needs through local food production within each cluster.<br>• Preserve ample public and private green spaces.<br>• Ensure public safety and access to affordable healthcare services. |
| **Environmental Sustainability** | • Design an energy portfolio around renewable sources including solar, wind, and hydropower.<br>• Create efficient recycling and waste capture systems.<br>• Use sustainable building materials and ethical procurement practices. |
| **Cooperative Economics & Governance** | • Create systems for cooperative ownership of land and public assets which boost affordability and reward people for their hard work.<br>• Invest in healthy green economic growth.<br>• Foster community practices which support collective capacity and resilience.<br>• Design blockchain-based tools for coordinating democratic decision-making across a global movement. |
| **Technologically Progressive** | • Use technology responsibly to meet social and sustainable development goals.<br>• Use extended reality (XR)—including a virtual world—to test core concepts before implementation in the physical world, to facilitate community-building, and to unlock imaginative futures. |

## 0.2 Contributing organizations

| | |
|---|---|
| **Spectra Studios LLC** | • Spectra Studios LLC is a Puerto Rico-based entity founded by Ryan Rzepecki. Ryan has a masters in urban planning, worked for the Department of Transportation in NYC, and spent over a decade pioneering dockless micromobility at Social Bicycles/JUMP which was acquired by Uber in 2018.<br>• Spectra Studios has incubated the Spectra concept with the intention of establishing a decentralized and open-source community. Spectra Studios may continue to provide services to the Spectra cooperative once established and approved through community vote. |
| **NUMENA** | • NUMENA is an award winning creative studio that designs and develops both virtual and physical spaces. They combine programming and architecture to create experiences that span across multiple realities and incorporate a wide range of creative mediums including coding, architecture, virtual and augmented reality, parametric design, 3D modeling, gaming, and graphics.<br>• NUMENA has brought the Spectra concept to realization in a virtual world ('Spectra Cities'), co-designing the city's blueprint with Spectra Studios. NUMENA may continue to provide services to the Spectra cooperative once established and approved through community vote. |

# 1 Introduction

Spectra was founded to build better cities that are focused on solving the profound social and environmental problems that we will face this century. This chapter lists out the big challenges confronting cities and their residents. It starts with an overview of global population growth projections and how existing cities alone will not be able to accommodate that growth. Then, we dive deeper into some of the primary urban planning problems which Spectra aims to solve. The chapter ends on a high note by introducing Spectra's three-part plan: creating a virtual world, developing a cooperative society, and building a physical city.

## 1.1 Why build a new city?

The global population living in cities is expected to increase by 2.5 billion by the year 2050.[1] Roughly 68% of people will be living in urban areas, compared to 55% now.[2] Yet, cities account for less than 2% of the Earth's surface. In regions which are experiencing both population growth and urbanization, new cities will form regardless of whether they are thoughtfully planned. The choice then is whether these cities will grow through organic disarray—often with less efficient density, greater car dependency, and a lack of public infrastructure—or if they can benefit from a more sustainable, yet still bottom-up, model of urbanization. The affordability and quality of life for urban residents can be dramatically improved by planning for growth and embracing new city designs.

Spectra's city design is meant to enable efficiencies in population density while upholding the importance of safe green public spaces, convenient transportation, sustainable lifestyles, and affordability. City planning of this magnitude requires a systemic reorganization of urban space which would be near-impossible to fully accomplish in existing cities. Building a new city is necessary for testing and implementing methods for addressing these planning challenges.

Even in regions with a stable population or slow growth, new cities can catalyze economic and social development by showcasing forms of community practice, technology, systems, and other innovations that can be adapted as needed in existing cities. Further, planned cities could help address the problems of housing affordability, displacement, and bad zoning by adding new housing supply in regions where markets have been constrained by local politics.[3] New housing developments can lower rents and make cities and their opportunities more financially accessible. Building a new city allows for experimentation with new economic models and governance systems to address the roots of many systemic problems.

[1] United Nations, Department of Economic and Social Affairs, *World Urbanization Prospects: The 2018 Revision* (New York, NY: UN, 2019), 1, https://population.un.org/wup/Publications/Files/WUP2018-Report.pdf.
[2] UNDESA, *World Urbanization Prospects*, 1.
[3] M. Nolan Gray, *Arbitrary Lines: How Zoning Broke the American City and How to Fix It* (USA: Island Press, 2022).

## 1.2 The need for sustainable, livable, and affordable cities

Achieving sustainability and higher quality of life are the prevailing socioeconomic challenges which face humanity. Crises of environmental degradation (including the climate crisis), inequality, transportation, health, food, housing, waste, and more threaten our daily lifestyles in the short run and our collective existence in the long run. Many of these crises are experienced at their extremes in cities; for example, congested roads or inflated housing markets. However, as hubs of population, innovation, commerce, and consumption, cities also offer our greatest opportunity to address these challenges.

Cities are home to 55% of the global population and produce over 80% of global GDP,[4] but come at a steep environmental cost due to conventional, unsustainable practices. According to UN Habitat, cities consume 78% of the world's energy and produce more than 60% of greenhouse gas emissions.[5] Additionally, worldwide, cities generate over 720 billion tons of waste every year.[6] Wasteful production, consumption, and disposal of goods is creating massive landfills and floating garbage islands, devastating biodiversity, and contributing to the climate crisis. Densely populated cities have a lesser environmental impact per capita than suburban sprawl,[7] but there is still a critical need to redesign our production and consumption practices.

In many cities, transportation is unsafe, inconvenient, inaccessible, unsustainable, and/or unaffordable. The prevailing practice is to prioritize and accommodate cars. Sidewalks and bicycle lanes are dominated by automobile lanes. Up to 50% of all city land, which could be used for residential units, safe green public spaces, and other human needs, are instead allocated to roads, parking lots, garages, gas stations, and driveways.[8] Some of the most expensive, central, and attractive real estate space is reserved for cars. Cars which spend 92% of the time parked, 1.5% stuck in congestion, and 1.5% looking for parking.[9] Not to mention the costs and life-threatening dangers caused by traffic accidents. Humans have been relegated to the sidelines.

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[4] Per Espen Stoknes, *Tomorrow's Economy: A Guide to Creating Healthy Green Growth* (Cambridge, Massachusetts: The MIT Press, 2021), 89.

[5] United Nations, "Climate Action: Generating Power," accessed 14 January 2022, https://www.un.org/en/climatechange/climate-solutions/cities-pollution; United Nations, Climate Change, "Seven Ways Cities Can Take Climate Action," 9 April 2021, accessed 14 January 2022, https://unfccc.int/blog/seven-ways-cities-can-take-climate-action.

[6] UN, "Climate Action."

[7] Christopher Jones and Daniel M. Kammen, "Spatial Distribution of U.S. Household Carbon Footprints Reveals Suburbanization Undermines Greenhouse Gas Benefits from Urban Population Density," *Environmental Science & Technology* 48, no. 2 (2014), https://doi.org/10.1021/es4034364; Richard Florida, "Why Bigger Cities Are Greener," Bloomberg CityLab, accessed 27 January 2022, https://www.bloomberg.com/news/articles/2012-04-19/why-bigger-cities-are-greener; Maanvi Singh and Oliver Milman, "Denser cities could be a climate boon – but nimbyism stands in the way," The Guardian, accessed 27 January 2022, https://www.theguardian.com/us-news/2021/aug/22/cities-climate-change-dense-sprawl-yimby-nimby.

[8] E. MacArthur, K. Zumwinkel, and M. R. Stuchtey, *Growth Within: A Circular Economy Vision for a Competitive Europe* (Ellen MacArthur Foundation, 2015), 19.

[9] Martin R. Stuchtey, Per-Anders Enkvist, and Klaus Zumwinkel, *A Good Disruption: Redefining Growth in the Twenty-First Century* (London: Bloomsbury, 2016), loc. 2087.

Cities are also the epicenter of several public health crises. Pollution results in increased health complications, not limited to asthma, cancers, and heart disease. Scarcity of affordable and nutritious foods has created food deserts in marginalized communities where residents are more likely to develop diseases such as diabetes. Foods grown thousands of miles away and transported to cities contribute to the above issues. A lack of convenient public transportation options and safe public spaces enables unhealthy sedentary lifestyles. Homelessness caused by high cost of living is connected to myriad physical and mental health conditions.

Socially, people are increasingly disconnected from their neighbors and local communities. Lack of safe public spaces and reliance on private transportation to and from all our daily destinations have eroded the natural opportunities to soak in our surroundings. Dependence on digital devices and online interactions has disturbed our online-offline balance and distanced us even further from our immediate surroundings. Addiction to streaming and online content reduces our time spent outdoors. The COVID-19 pandemic has exacerbated these issues.[10]

Cities have too many economic barriers to entry. Many residents of existing cities, especially young people, are paying exorbitantly high rents to a mostly older landowning class. The cost of living is prohibitively high, preventing many people from being able to afford other necessities (such as healthcare or education), save money, and invest in their future. Newcomers of all socioeconomic backgrounds should be able to enter an affordable market, feel secure in their assets, and invest their hard earned money for the future. The profits and prosperity which come from vibrant communities and rising property values should belong to all residents.

Spectra believes that cities—as the home of the majority of all people on Earth—should facilitate joyful, enriching, and sustainable lifestyles. A “livable city” is one in which its residents are able to safely, conveniently, affordably, and sustainably meet the majority of their daily needs within their local neighborhood. Through human-centered urban planning, we can design the next generation of cities to achieve sustainability goals, attain greater population density and standard of living, and support more vibrant communities.

[10] Apurvakumar Pandya and Pragya Lodha, “Social Connectedness, Excessive Screen Time During COVID-19 and Mental Health: A Review of Current Evidence,” *Frontiers in Human Dynamics* (22 July 2021), https://doi.org/10.3389/fhumd.2021.684137.

## 1.3 Our plans

***PART ONE*: Create a virtual world which includes the "digital sibling" city to experiment with urban planning and community practices before implementing them in physical cities, as well as host VR entertainment and gaming.**

Building in extended reality (XR) allows us to experiment, prototype, and revise parts of Spectra as they are implemented without the costs or permanence of building in the physical world. It's much easier to move pixels than bricks. As an open-source, community-driven project, building in XR enables interactive stakeholder engagement and the opportunity for subject matter experts to directly contribute to the planning from Day One (See 3, 4.2). Whereas most cities have developed organically over centuries of trial and error, we are learning from history and condensing this organic process into years or decades through experimenting and community practice in a virtual world. Cities are "an immense laboratory of trial and error, failure and success" – and planned cities should respect that process.[11]

Yet, experimentation in digital spaces will allow for more than efficient urban planning. After all, building a community is more than laying roads and raising houses. It's about people. XR will provide revolutionary opportunities for Spectrans to interact with their potential neighbors, local shop owners, and governing delegates before Spectra even starts construction. Complex social, political, and economic systems will have years to evolve before transitioning to a physical city. Similarly, this time will allow members to adaptively revise, regulate, or remove any innovations, technologies, or practices which do more harm than good to the community.

In these ways, Spectra goes beyond other virtual world projects and planned cities. To date, many existing virtual worlds are poorly planned schemes with nonsensical city layouts and underdeveloped avatars. Furthermore, their implementations of digital property and real estate have little value beyond the speculation that "scarcity" drives. On the other hand, many planned cities and so-called "smart cities" overcorrect from the organic disarray of unplanned cities to be too top-down and hierarchical in their planning, effectively cutting out community input from the development process. Spectra will offer practical solutions and bold imaginations for how XR can contribute to urban planning in our city (and beyond) and Spectra's members will be at the center of this process.

[11] Jane Jacobs, *The Death and Life of Great American Cities* (1961; reis., New York: Vintage Books, 1992), 6.

***PART TWO*: Develop a multilayer cooperative structure to grow Spectra's community from the bottom up, facilitate global decentralized decision-making, and manage shared financial assets—enabled by blockchain and cryptocurrencies.**

Building a city really starts with building community. It is foremost a social undertaking. Why will people join Spectra and commit to its mission? Some may want to live in a more connected space with friends and family than is possible in existing cities. Others may want to form unique communities—perhaps for artistic pursuits or scientific research. Most will likely be passionate about sustainable living in general. Many will be seeking new economic opportunities and the ability to live a better life than they could elsewhere. As people with distinct identities and values come together they will be growing Spectra's community from the bottom up.

While over-reliance on past technological advancements—from cars to social media—is partially to blame for fragmenting our local communities, technology can also help us connect and build together when thoughtfully applied. The key is to recognize technology as just one type of tool among many. Spectra will utilize public blockchains to facilitate cooperative bottom-up decisions and local growth to reconnect people to what matters to them (See 4). Blockchain technology makes it possible to coalesce a global movement of smaller groups with compatible missions. Online coordination to spark offline action.

Economically, blockchain technology offers new opportunities for shared ownership of a city based on a cooperative model in which all community members are stakeholders (See 4.6). A new model of real estate built on shared ownership and cooperative governance will allow housing to be built more affordably and for land value appreciation to benefit the entire community. New urban development will be driven by community need rather than people optimizing individual property values. As people form cooperatives, they could even design smart contracts to automatically give a portion of their block's earnings as project funds, donations, or microloans.

Blockchain technology can also be used when redesigning our decision-making processes. There is dissatisfaction globally with existing political processes, including the selection of leaders, the decisions they make, and the power of lobbies and interest groups in influencing those decisions. Polarization, lack of trust, demagoguery, and demanding election timelines derail progress. Many people feel that they have to deal with the consequences of political decisions, but don't have a say in shaping them. Similarly, existing political processes are ill-equipped to handle issues in an increasingly digital world which moves quicker than current legislation and regulation can keep up.[12] Spectrans can use blockchain technology and smart contracts to design the city they live in and the rules which govern it (See 4.5).

[12] Rob Reich, Mehran Sahami, and Jeremy M. Weinstein, *System Error: Where Big Tech Went Wrong and How We Can Reboot*, (New York: HarperCollins, 2021).

***PART THREE*: Build a sustainable, livable, and affordable city with mixed use development, convenient transportation, safe green public spaces, local food production, responsible production and consumption practices, and imaginative landscapes—enabled by strong community ties, shared values, and technological advancements.**

Only after Spectra already exists as a virtual world, a collection of tight-knit communities, and robust financial and governance systems will we purchase land to develop a physical city. Proceeding in this order provides us the time and resources to design a city which is truly sustainable, livable, and affordable. When it's time to build, Spectra's highly scalable architecture and modular urban planning will enable quicker construction timelines than other planned cities which prioritize the grandiose over the practical.

While Spectra's primary mission is to build a new city for 1 million people, we aspire more broadly to have a positive impact on physical placemaking and virtual worldbuilding wherever they occur. As we navigate an age of myriad global social problems and unprecedented technological advancement, we must ask ourselves: What do we want the future to look like? How can we create vibrant and sustainable cities? In what ways can we reimagine living in physical and virtual reality? How can we balance the online and offline? How can we negotiate our relationship with technology to be beneficial, and not make us worse off in the long run? How can we create systems that truly empower people?

Spectra is an opportunity to build new communities with shared values, to carefully design our lived spaces, and to leverage new technologies and practices to enhance daily life in meaningful ways through their incremental, sustainable, and ethical implementation. We don't pretend to have all the answers, but as a community-driven project, we hope to find others who share our passion for solving the problems.

As we do so, sustainability, accessibility, and balance will be among Spectra's guiding principles. Why these principles? Spectra is committed to building a city which will support global sustainability goals, be accessible to people of diverse backgrounds, and promote balance between the online and offline parts of daily life. As a city *for* the future, Spectra will contribute to defining it.

# 2 Blueprint Logic for the Physical City

Spectra aims to build a livable city which is sustainably constructed and powered, technologically progressive, and designed to meet the diverse needs of residents. This chapter lays out the initial blueprint for Spectra's physical city. This is the foundational "logic" for Spectra's urban planning, rather than any attempt to itemize or cement our ideas. In doing so, we recognize and eagerly anticipate that the plans introduced here will continue to be developed by any and all Spectrans as the project grows. We have simply provided the springboard. The chapter begins with a discussion of the city's overall design, then proceeds topically to discuss transportation, public spaces, urban agriculture, energy, waste management, and—last but not least—possible locations for the city.

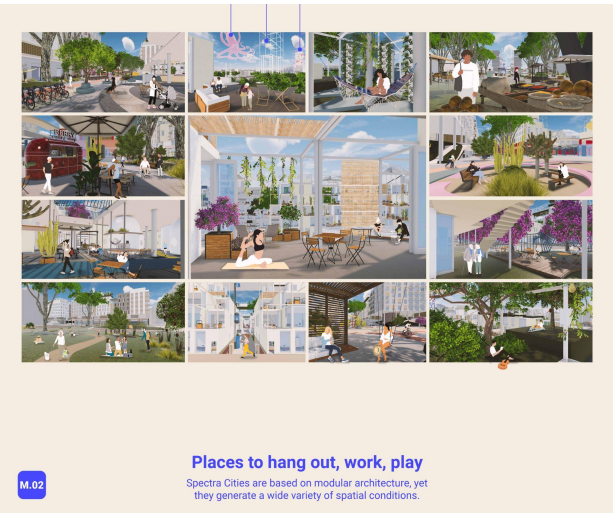
## 2.1 Inspiration from Cerdà's Barcelona and other global cities

Spectra's urban planning is partly inspired by the low-rise, high-density areas of global cities such as Greenwich Village and Lower East Side in New York, the neighborhoods of central Paris, much of Tokyo, and Ildefons Cerdà's 19th century design of the Eixample district of Barcelona, as well as the city's more recent superblocks. As of 2017, Barcelona has a total municipal area of 101.4 square kilometers with an estimated population of 1.6 million residents, resulting in an average density around 16,000 people per square kilometer.[13] Most development in Eixample is mixed-use with residents living above businesses, schools, and government buildings. Barcelona's density has allowed it to create and implement a meaningful public transportation network between walking, biking, and other modes of transit. Many commutes can be achieved within a 15-minute bike ride.

Spectra's city will be at least 60 square kilometers of densely populated city blocks composed of primarily 4- to 7-story buildings and lined by car-free streets. It is designed to eventually support a population of at least 1 million people.

Each city block in Spectra is home to a mix of businesses and residences, and has a large courtyard space in its center as well as spacious mixed-purpose ground floor and basement areas. Blocks are designed to match the daily needs and lifestyle interests of their residents, while still being structurally similar enough to enable turnkey development across the city. Some local community-based governing activities also take place in blocks via a cooperative structure (See 4). Each consecutive grouping of nine blocks is organized as a "cluster" with its own governing activities.

[13] UN Habitat, "Barcelona: Population and Demographics," Urban Resilience Hub, accessed 10 December 2021, https://urbanresiliencehub.org/city-population/barcelona/.


Movement through the city occurs on four levels: the ground level; the second story and rooftops which host interconnecting walkways between blocks; and the basement level which houses a large underground network of autonomous shuttles and other delivery systems. Aside from a few Experimental Growth Areas (See 2.2.3), the city appears as a grid from above. All together, this matrix of blocks, streets, and delivery systems makes up the physical organization of the city. The scalable architecture and modular planning of blocks as well as the symmetries between the transportation networks across the city will enable quick construction timelines once Spectra is ready to transition to a physical site.

## 2.2 Urban planning at multiple layers

The physical city consists of three layers: the block, the cluster, and the city. Delegating funds, tasks, and responsibilities at different layers allows Spectrans to uniquely customize their blocks while still belonging to a larger community. The social and economic features of Spectra will be addressed later in the paper (See 3). The following sections discuss the urban planning of each layer.

### 2.2.1 The Block

The block is the smallest organizational unit in Spectra. Blocks are designed to include a mix of residences, businesses, and safe green public spaces. Each block is home to about 300 to 400 residents.

**The Courtyard**

R.02

The multi-layered courtyard gives rise to a variety of spatial conditions.
The design and theme of the courtyard varies with each block.

Typically, the ground floor is made up of businesses including grocery stores, restaurants, pharmacies, clinics, clothing stores, and suppliers of most other daily needs. Some blocks will have a recreational or mixed-use industrial space in the core of the ground floor. The second story hosts common spaces for residents (such as work spaces, small conference rooms, and fitness areas), a large public courtyard, and elevated walkways which connect blocks to each other. The courtyard for each block is different. Some are grassy spaces for field-based recreational sports. Others are specially designed for safe child-friendly play. Others have gardens, small boutiques, pools, and more.

The remaining stories consist of an arrangement of residential units and common spaces for residents, including studio residential units on the third floor. The rooftop area, like the courtyard, can vary to include community gardens, a track for running or walking, barbecue grills, bars and restaurants, additional elevated walkways, and more. Lastly, the basement area also varies between utilities, micro-factories, indoor agricultural spaces, recreational facilities, warehousing, and automated vehicle infrastructure connecting the city.

Given the diversity of block designs, it is likely that many blocks will develop to be themed to meet specific needs for their residents, such as childcare for young families or nightlife for young adults. It is also expected that some blocks will be more business oriented than others, dedicating more space toward shops, dining, entertainment, factories, and other essentials in a large city. Like any interesting city, Spectra will not be homogeneous. This block design allows for a standardized form which can be built quickly and affordably, while still providing opportunity for customization and imagination. Concept art for possible block configurations can be seen below.

**Family block**

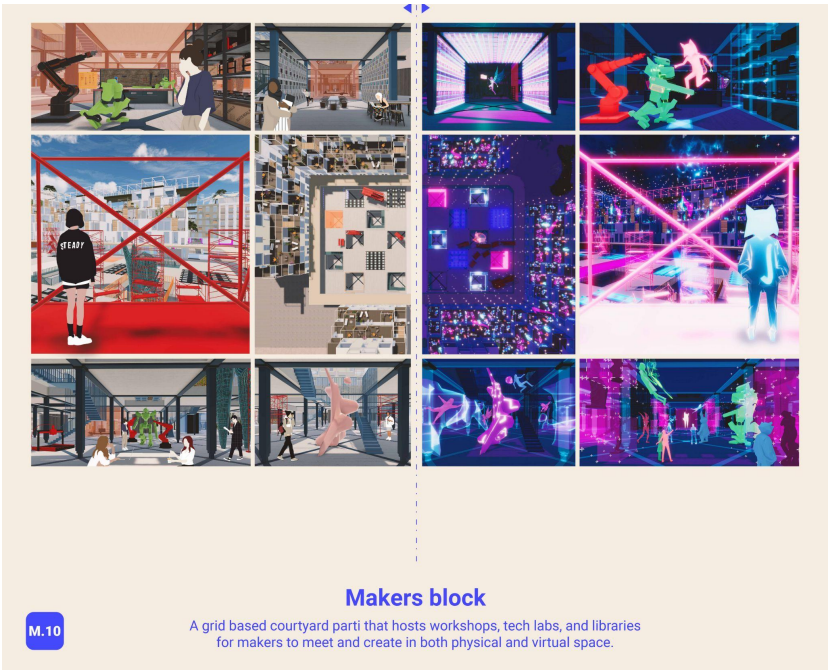
M.07

The entire courtyard level is occupied by playful spatial arrangements.
The ground floor is reserved for light industrial use.

**Sports block**

M.09

This courtyard theme features areas for a variety of sports above and pools and shared social space on the ground floor below.



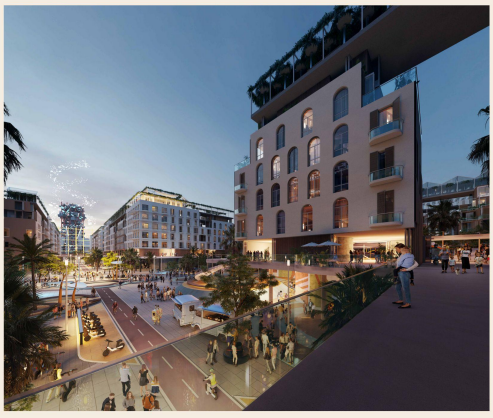
**Makers block**

M.10

A grid based courtyard parti that hosts workshops, tech labs, and libraries for makers to meet and create in both physical and virtual space.

## 2.2.2 The Cluster

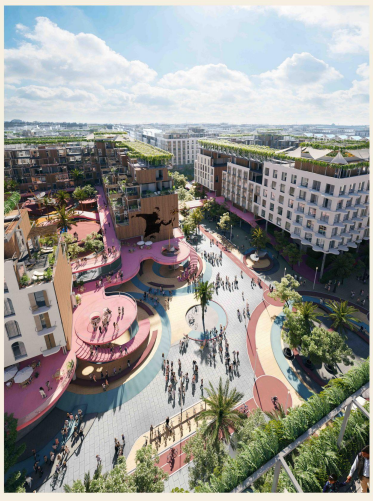
Each consecutive grouping of nine blocks (3x3) in the city is recognized as a cluster. Residents and visitors should be able to meet the majority of their needs within their cluster, commuting either at the ground level or using the elevated walkways. Each cluster will include about 2,700 to 3,600 members—the residents of the constituent blocks.



**Public Life**

R.04

Three vertical layers are available for public and semi-public programming: the open ground floor, the connected network of courtyards, and the rooftops.



**The Intersection**

R.03

Each block is composed of only two building types: corner and inline. Excluding a unit, a corner building in this case, creates generous intersections.

Similar to blocks, it is expected that clusters will organize in ways that are beneficial to the needs of their residents. For example, an artist community block may have less financial resources than a business oriented block, but the two blocks could have synergies within the same cluster. Blocks may find it advantageous to group into diverse clusters so that their local area is vibrant and imaginative, but also stable and affordable. Alternatively, some clusters may be more oriented towards a specific role, such as promoting local businesses or manufacturing, and group together to achieve economies of scale and create an industry hub.

### 2.2.3 The City

There are also large areas in the city which are not made up of blocks and clusters as the low-rise mixed-purpose buildings that have so far been described. For example, some of these areas—such as a public park—will be designed by a cluster cooperative and stand in place of a block (See 4.2). In other words, a cluster might have only 8 blocks and one open space. Other areas will deviate more dramatically from the Cerdà-ian grid design.

- *Green blocks* are large open public park spaces which may span multiple blocks.
- *Plazas* are another example of a larger open public space for events.
- *Experimental growth areas* are extensive sections of the city which purposefully deviate from the Cerdà-ian design to allow Spectra to further experiment and design its cultural landscape.

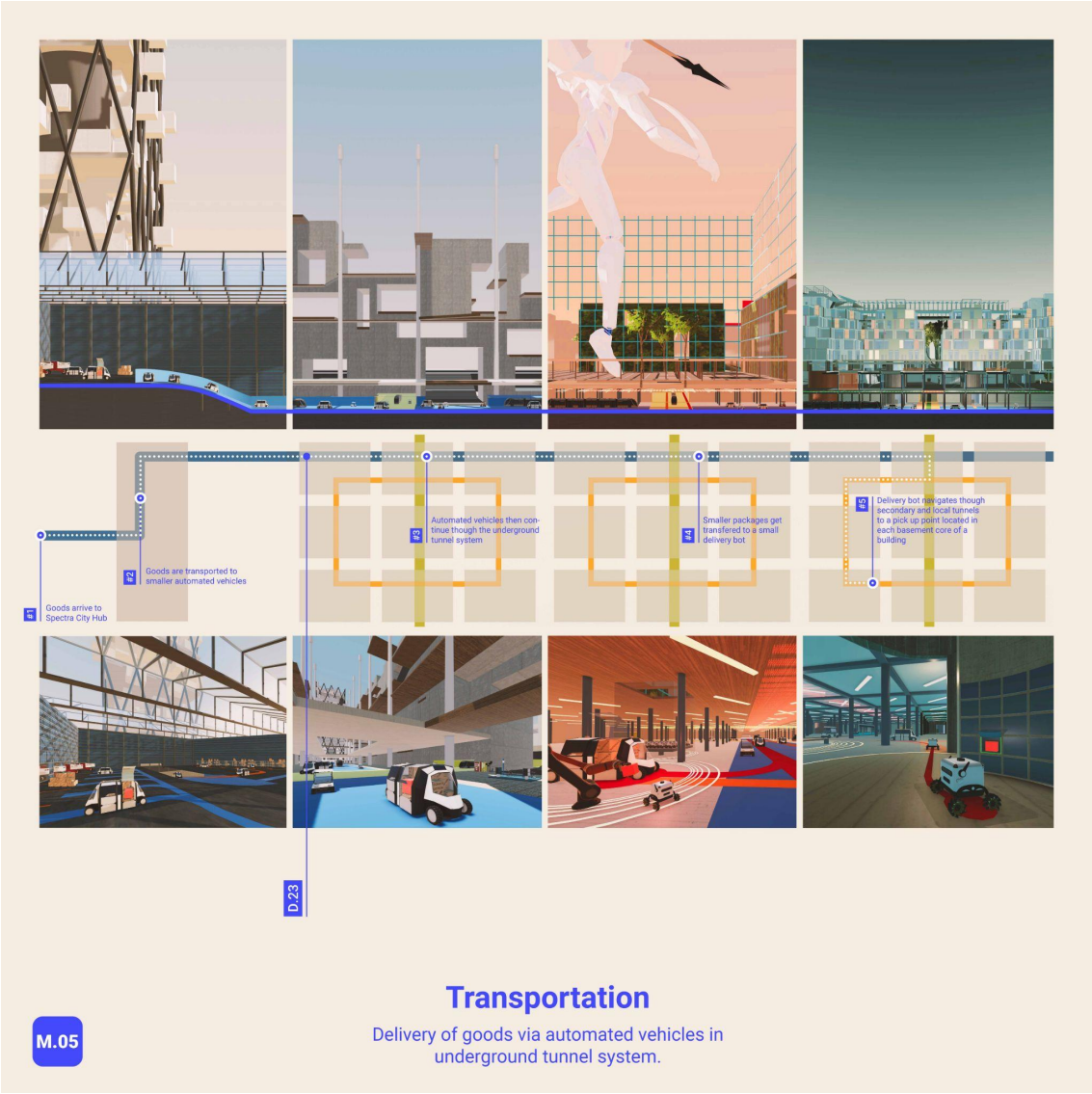
In addition to these possible combinations of blocks, clusters, and public spaces, there are several other institutions which make up the city. These institutions are governed and operated at the city layer or through other cooperative methods (See 4.3). For example, hospitals, schools and universities, public libraries and museums, places of worship, water and waste treatment centers, utilities, fire departments, public safety offices, and logistics hubs.


## 2.3 Designing transportation infrastructure for a livable city

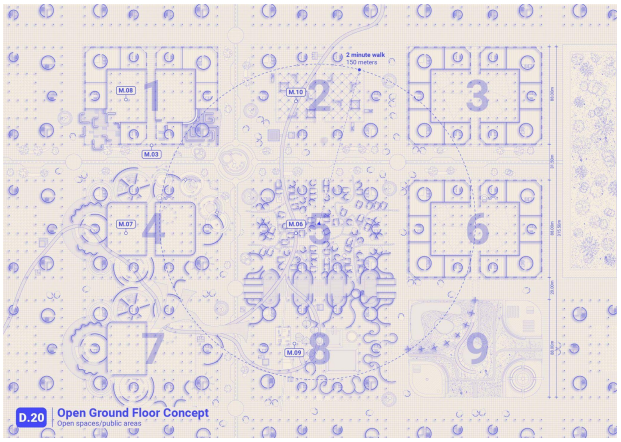
A central component of Spectra's vision for the city is enabling a truly livable urban landscape which is built for people rather than cars. To build public parks instead of parking garages. To reconnect with nature even in an urban environment. Enabling safe and sustainable commuting requires separating the transportation of people and goods, providing diverse commuting options, and ensuring accessibility to everyone.

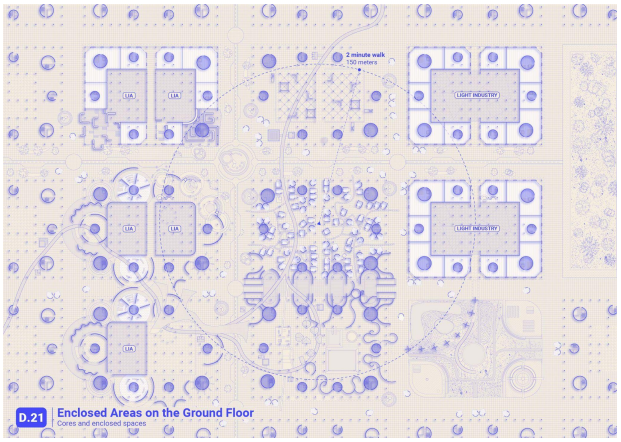
The first step to enabling a city which does not rely on cars is to separate the need to transport goods from the need to transport people. This process begins upon entrance to the city at the logistics hubs. The hubs are where private vehicles are safely and securely parked for short- and

long-term storage. They are the connection from the city to the road network of the surrounding region. From here, several modes of affordable, accessible public transportation both above and below ground are available to assist people as they commute to anywhere in the city. The hubs are also where all incoming goods to the city are processed before distribution.

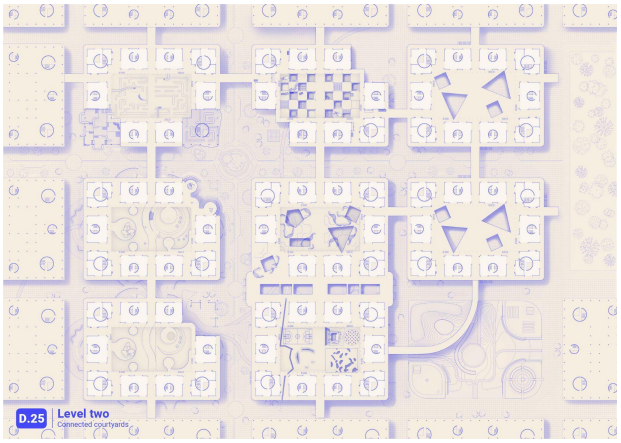


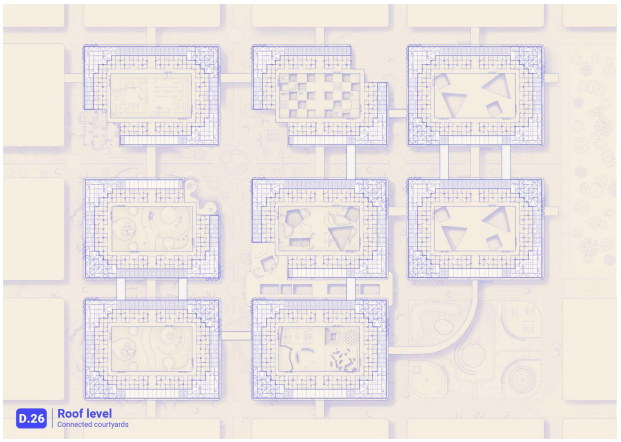

Following a grid design, the road network is organized by boulevards, secondary streets, and intersections, as well as some side streets in the Experimental Growth Areas. However, unlike most modern cities, these roads are not designed for cars. Instead, priority is given to people, whether they are pedestrians, cyclists, or people using other manual or small electric vehicles. Large sidewalks are designed to meet the varied needs of pedestrians and people using wheelchairs or other mobility devices. Some buildings with open concept ground levels allow people even more range in their experience exploring the city.



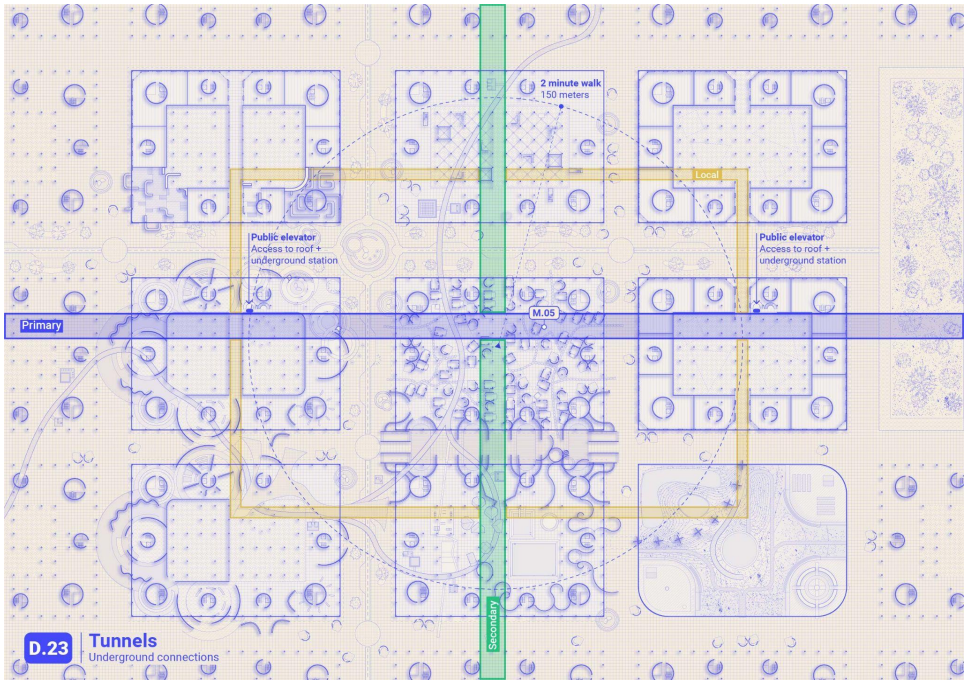




Public courtyards and unique elevated walkways provide another avenue for navigating the city. Several stairways and elevators are available in every block, with at least one set dedicated to public access. On the streets, electric bicycles, scooters, and other human-powered and/or motor-assisted vehicles occupy the primary lanes. Underground, a network of automated vehicles also shuttle passengers across the city at faster speeds.




As for the transportation of goods, a network of primary and secondary tunnels with autonomous vehicles connect the basements of each block to transport goods to any corner of the city.




## 2.4 Promoting safe green public spaces

Spectra aims to reclaim the modern city for people in part by purposefully designing an abundance of safe green public spaces. The prevailing urban lifestyle in many existing cities is associated with chronic stress, insufficient physical activity, and exposure to environmental harms. Green spaces—such as parks, playgrounds, and residential courtyards—can promote mental and physical health and reduce morbidity and mortality in urban residents by providing relaxation and stress alleviation, stimulating social cohesion, supporting physical activity, and reducing exposure to air pollutants, noise, and excessive heat.[14]

These green spaces start in the middle of every block. Public courtyards on the second story of each block host a variety of designs and activities to cater to the interests and needs of residents. Some courtyards will be designed primarily for sports and recreation, including multi-sport game courts, swimming pools, and fitness areas. Other courtyards will be designed for childcare and young families, with playgrounds which are safe for children and stimulate learning through play. Many courtyards will also be designed for outdoor leisure and relaxation, with gardens, picnic areas, hammocks, and other attractions to bring even casual activities into communal spaces. In addition to courtyards, blocks also have patio and roof areas with residential greenery to enable connections to nature in more private spaces.

[14] World Health Organization, *Urban green spaces and health: A review of evidence* (Copenhagen: WHO Regional Office for Europe, 2016), https://www.euro.who.int/__data/assets/pdf_file/0005/321971/Urban-green-spaces-and-health-review-evidence.pdf.

Greenery also extends outside of Spectra's standard city blocks to the open areas across the city. Green blocks are large open public park spaces which may span multiple blocks. Plazas are larger open public spaces which can be used to host events, such as festivals and concerts. At the edge of the city, residents can also walk through vast areas used for agroforestry for a more immersive experience in nature.

## 2.5 Supplying local produce

In addition to large parts of the city being purposefully designed as public or shared spaces to strengthen community, many areas also serve to supply local produce for residents to meet their daily nutrition needs.

The rooftops of many blocks will include greenhouses and gardening spaces for urban agriculture. In these allotments, which are private to the members of the cluster, residents or employees of the block (or cluster) cooperative will grow a variety of produce suitable for the local climate. After a few years of development, the daily fruit and vegetable needs of all residents of a block could be satisfied following a regimented staggered planting schedule, depending on the amount of rooftop space the block chooses to designate for agricultural use. Some blocks may also choose to deploy aquaponics systems to partially meet the protein needs of residents.

R.05 **Rooftops**

Connected rooftops house urban gardens, cafes, and a variety of leisure spaces.

M.04 **Urban Agriculture**

A variety of green areas that can be cultivated for food production and leisure is available throughout the city.

In addition to rooftop spaces, basements can be used for storing seed, nutrient, root vegetables, and canned goods. The wilderness edge of the city will be home to agroforestry activities. Land will also be developed further away from the city for larger scale agricultural and pastoral activities. In these areas, agrivoltaics—the practice of coupling agricultural or pastoral activities with photovoltaic systems—will enable increased yields and supply the city with affordable clean energy.[15]

## 2.6 Powering via an efficient energy portfolio

Spectra will draw on a diversified clean energy portfolio to support our goal of building a sustainable, livable, and affordable city. Efficient methods for harvesting and storing energy will include solar, wind, hydropower, and gravity. The proportion each of these sources make up of the total energy portfolio will depend on the geography and existing national grid of the landing site determined by all Spectrans (See 2.8).

In the fields around the city, agrivoltaic systems could be developed to supply the city with affordable clean energy while simultaneously enabling increased produce yields. Molten salt systems could be used as another form of solar tech which can achieve affordable generation and storage of energy. Wind turbines could also be placed in these fields to provide a consistent supply of clean energy, especially on cloudy days and during the night. Existing hydroelectric infrastructure could be incorporated into Spectra's overall energy portfolio, though it is less likely that Spectra will build any new dams or other hydropower infrastructure. Lastly, large tower cranes which use gravity to move heavy weights as a form of energy storage could also be constructed.

The costs of clean energy are decreasing and economies of scale are growing. Every day in 2016, around 500,000 solar panels were set up somewhere.[16] By two years later, this climbed to one million new panels per day. Once installed, each panel provides energy for around 40 years with minimal maintenance required. Annual solar and wind installations have grown on an average 10% annually since 2010—a rate which doubles capacity every seven years.[17] Meanwhile, the cost of lithium-ion batteries has also fallen on average 24% per year since 2010.[18] The rise of clean energy competitiveness is unstoppable.

[15] Elnaz H. Adeh et al., "Solar PV Power Potential is Greatest Over Croplands," *Scientific Reports* 9, no. 11442 (2019), https://www.nature.com/articles/s41598-019-47803-3.
[16] Stoknes, *Tomorrow's Economy*, 85.
[17] Stoknes, *Tomorrow's Economy*, 86.
[18] New Energy Finance Bloomberg and Logan Goldie-Scot, "A Behind the Scenes Take on Lithium-Ion Battery Prices," *BloombergNEF*, March 5, 2019, https://about.bnef.com/blog/behind-scenes-take-lithium-ion-battery-prices/.

## 2.7 Reducing waste

The global economy is on average only 9% circular, meaning that 91% of extracted resources are wasted after one or no human use per year.[19] To combat this trend, Spectra will implement methods for reducing, reusing, and recycling materials across the city. This process will begin at the hubs, the central processing and distribution centers where all vehicles and incoming goods enter the city. The hubs will enforce strict regulations to reduce wasteful and non-reusable materials. Packaging materials and shipped goods will be required to meet environmental standards.

Once inside the city, there will be a strong focus on the separation of wastes and reusing/recycling materials. Paper, glass, metals, and other recyclable materials will be separated and processed onsite or in the surrounding area depending on logistical costs and limiting any hazardous emissions. Some e-wastes could be recycled onsite in the industrial basement areas of select blocks. When possible, Spectra will aspire to increase the reuse, recycling, and upcycling of plastics, steel, aluminum, and cement—value chains which present huge opportunities for lowering CO2 emissions.[20] Organic waste and greywater will be collected and processed onsite through anaerobic digestion systems which will output fertilizer for agricultural use. Only the remaining materials which cannot be recycled or otherwise reused will be incinerated for energy generation while limiting harmful emissions.

## 2.8 Selecting a location

The landing site for Spectra's first physical city will be a collective democratic decision involving all eligible members of the Spectra cooperative. Several of the details so far discussed—such as agriculture, energy sources, and architecture—will be impacted by geography, climate, and other variables. These details will be addressed once potential sites are further along in the selection process. While this will be community-driven, there are several baseline criteria for a possible location to be considered:

- A minimum area of 60 square kilometers;
- A Mediterranean-like climate if in a vegetative coastal geography, or an arid climate if in a coastal desert location which can be fitted with desalination;
- An existing robust clean national energy grid, or suitability for the quick and affordable development of solar, wind, and/or hydropower infrastructure;
- A reliable supply of fresh water, or access to affordable desalination;

[19] M. De Wit et al., *The Circularity Gap Report: An Analysis of the Circular State of the Global Economy* (Amsterdam: *Circle Economy*, 2019).
[20] Energy Transitions Commission, *Mission Possible: Reaching Net-Zero Carbon Emissions from Harder-to-Abate Sectors by Mid-Century* (2018), http://www.energy-transitions.org/sites/default/files/ETC_MissionPossible_FullReport.pdf.

- Land suitable for large underground transportation systems (i.e., minimal seismic activity);
- Proximity to existing connective infrastructure (i.e., highway, rail, ports, airports);
- Low risk of natural and man-made disasters (i.e., typhoons, earthquakes, forest fires);
- And a host country which is politically stable, favorable toward economic development, friendly toward sustainability, open to immigration, at low risk of violence and war, and a leader in human rights.

The process to select a site for the physical city will begin alongside the launch of the virtual world and Spectra cooperative. Members will be able to compile detailed site proposals which address each of the above baseline criteria. After the virtual city reaches 10,000 residents, members will be able to submit their proposals for the Spectra community to review and vote. The site(s) which pass the vote will then move forward to negotiating land purchase agreements with the host country(ies). After the land purchase agreements have been mutually agreed upon between Spectra and the host country(ies), building of the physical city(ies) will commence!

# 3 Virtual World and Additional XR Features

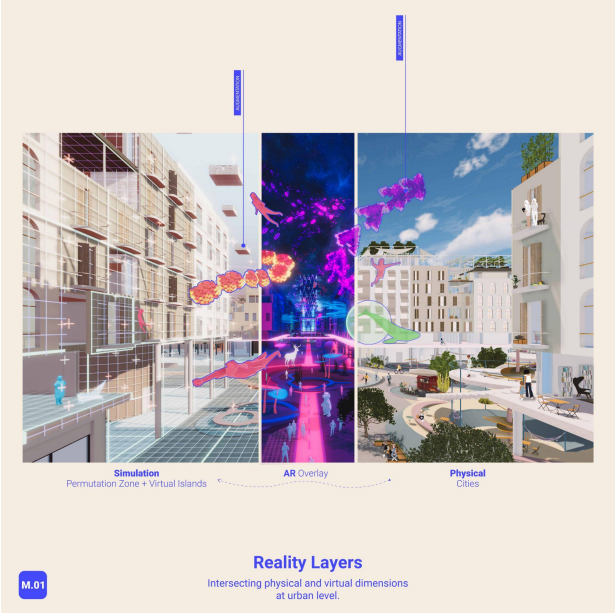
A main role of Spectra's virtual world is to serve as an experimentation space for the planning of the physical city. Whereas most cities have developed organically over centuries of trial and error, we are learning from history and condensing this organic process into years or decades through experimenting and community practice in a virtual world. This chapter elaborates on that process and provides additional information on the other features of the virtual world, such as gaming, art, socializing, and more. After all, the virtual world is more than *just* an experimentation space. It is also its own world with unique experiences and opportunities to offer.

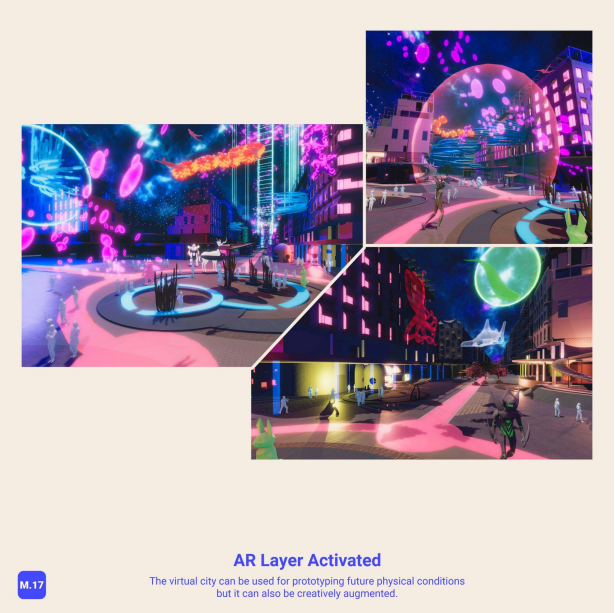
## 3.1 Experimentation in the virtual world and "digital sibling" city

Building in virtual reality with the intention of transitioning a "digital sibling" city into physical reality both requires and allows for a unique design process. For example, the immersive experience of walking through a building complex in VR before it has even been physically constructed is incomparable to looking at a traditional floor plan on paper. One discovers insights about the size, shape, and other aspects of the space which may not have otherwise arisen until much later on in development. At the city level, one can better prepare for the needs of transportation systems, feel what it's like to step into a massive public plaza, and even fly around to examine the hard to reach parts of the map.

This also applies to other forms of experimentation beyond urban planning, such as business, governance, community practice, and recreation. By developing first in an active virtual world, Spectra will be able to monitor governance and financial trends over several years. This time period will provide critical feedback on which parts of the project are most successful, and which need to be tweaked before introduction in the physical city. As blockchain technology and cryptocurrencies continue to evolve, Spectra will fine-tune its own cooperative structures and the governance and financial mechanisms which support them (e.g., voting processes, tokenomics). With regards to recreation and sociocultural trends, Spectra will be able to identify hubs of activity to promote; deserted areas to revitalize; and growth in community capacity over time.

In these ways, experimenting in VR is a gateway to experiencing a practical and creative form of multidimensional reality. It provides ample feedback in the short, medium, and long term to benefit the project. Crucially, it also allows Spectrans all over the world to contribute to the development process. In other words, Spectra will cooperatively build a multidimensional city, and do so more quickly, affordably, and cautiously than a city could be built in physical reality alone.



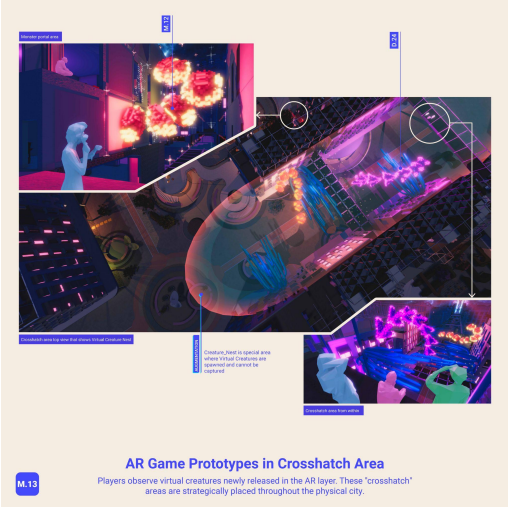



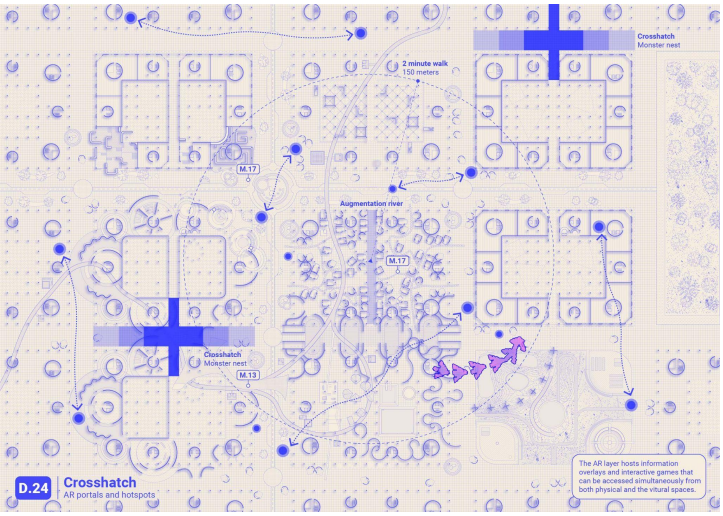

## 3.2 Recreation, entertainment, and other activities

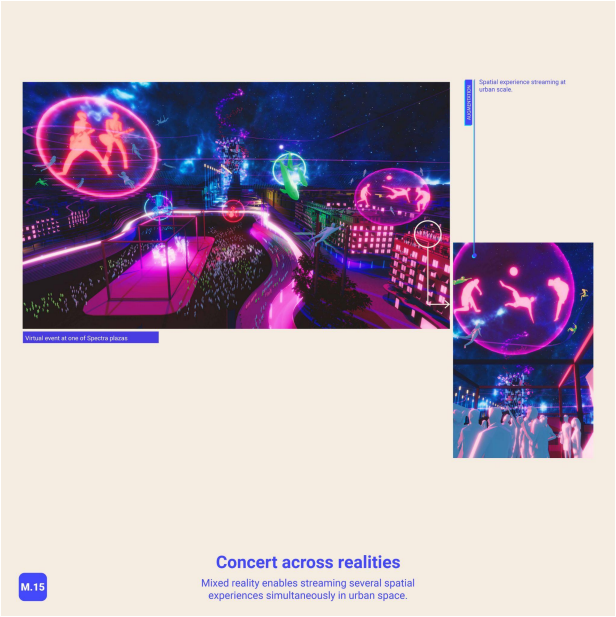
Experiences in a well designed virtual world can be as meaningful as experiences in the physical world. These experiences may seem different at first glance—in a world of 'bits' instead of atoms, and pixels instead of bricks—but that's partly the goal. Spectra's virtual world will let people around the world interact with each other or solo explore in a place where they can fly, play futuristic games, go to popular concerts, watch spectacular arts shows, and more. The places and activities may be different, but the people experiencing them are the same. Those memories and relationships are meaningful.

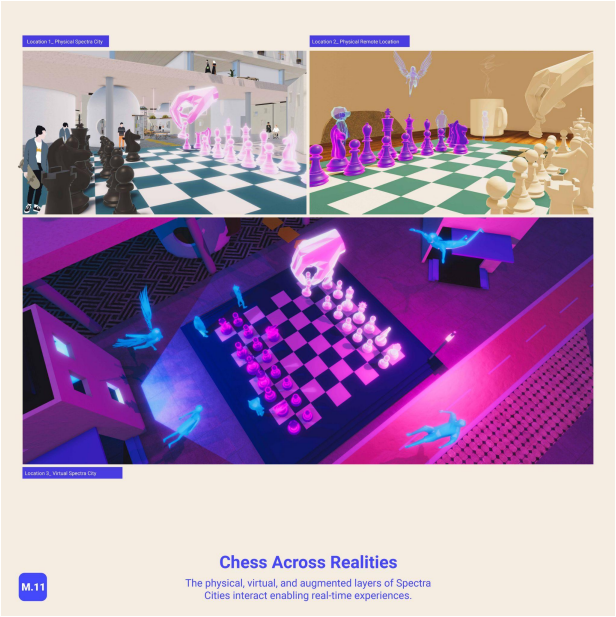
Gaming will be one of Spectra's early priorities in development, both in VR and AR. Gaming and other entertainment in Spectra will be available to members and nonmembers, so anyone can join in the fun and earn rewards.

Entertainment will also include concerts, art displays, sporting contests, and panel discussions. The large open plazas spread across Spectra will host various live performances for artists and showcase the most advanced displays of XR creativity. Other hubs across the city will also function as "crosshatches" between the physical and virtual cities, in which LED displays on walls and voxel sculptures will allow people to interact across dimensions. Courtyards with sporting fields and courts, such as volleyball and basketball, will host XR events in which some players will be competing in the physical world while others are joining in virtually. For more passive activities, talk shows and music streaming via decentralized platforms will also be integrated.




For the working professionals who can't make it to the office, Spectra's virtual world can serve as a remote office, shared workspace, meeting room, and conference hall. Most blocks will have work spaces on the second floor, while some may dedicate larger areas on the first floor and basement level. Public libraries could allow academics who are members of the cooperative to access journal articles, books, and digitized primary documents to bring the niche wonders of archival research to virtual reality.

## 3.3 Cross-platform capability and licensing

Spectra's virtual world and assets exist across multiple platforms. Spectra currently uses Spatial to deploy its basic mobile and PC builds, including apartments, blocks, and scenes from the massive virtual world. New blocks and assets can be created and designed in Spatial. For developers, designers, and other advanced users, a Unity build of 'Spectra Cities' for PC is available on request. Updated Unity builds will be released as blocks are formed and their design assets are approved to the source code. All public design assets in Spectra's virtual world are licensed under CC0. Assets designed by users must also be licensed under CC0 to be approved for inclusion in the Unity builds.

Technical documentation will be available on a Spectra GitHub for current requirements for participating in the virtual world, communications platforms, licensing, and cross-platform capability of digital assets.

# 4 Bottom-up Formation, Financing, and Governance

So far, we have described Spectra's city as it would exist upon completion: sustainable, livable, affordable, and multidimensional. This chapter outlines the bottom-up process for realizing that goal. It starts with a brief historical overview of cooperatives, drawing on examples from around the world. Then, we describe Spectra's plans for designing a multilayer system of cooperatives, how the project will grow, and the organizations supporting it. Lastly, we present the governance and financial mechanisms for managing these systems.

## 4.1 Brief history of cooperatives

A cooperative is "an autonomous association of persons united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly-owned and democratically-controlled enterprise."[21] The modern cooperative movement has its roots in the 18th and 19th centuries, when it formed to protect the livelihoods of workers in response to the industrial revolution and worsening labor conditions. There are 3 million cooperatives around the world with 1.2 billion members.[22] That means 12% of the people on Earth are part of a cooperative.

There are numerous examples of successful cooperative business and living models. In 2017, the top 300 earning cooperative enterprises in the world had a total combined turnover of over $2 trillion.[23] In the UK, more than 7,000 cooperatives contribute £39.7bn to the economy, and 72% of cooperatives survive the first five years of business compared to 43% of companies.[24] In New York City, cooperatives have existed for over a century and make up almost 75% of Manhattan's apartment stock.[25] In Denmark, the co-housing organization Lejerbo rents 35,000 apartments across the country to members only. REI, the largest consumer cooperative in the US, has been ranked as one of the nation's top employers for over two decades.

[21] International Cooperative Alliance, "Cooperative identity, values & principles," accessed 13 March 2022, https://www.ica.coop/en/whats-co-op/co-operative-identity-values-principles.
[22] ICA, "Cooperative identity, values & principles."
[23] ICA, "The World Cooperative Monitor," accessed 14 March 2022, https://www.ica.coop/en/our-work/world-cooperative-monitor.
[24] Co-operatives UK, "Quick facts about co-ops," accessed 14 March 2022, https://www.uk.coop/understanding-co-ops/what-co-op/quick-facts-about-co-ops.
[25] Susan Stellin, "Co-op vs. Condo: The Differences Are Narrowing," The New York Times, 5 October 2012, accessed 17 March 2022, https://www.nytimes.com/2012/10/07/realestate/getting-started-choosing-between-a-co-op-and-a-condo.html; Cait Etherington, "How co-ops became the housing option of choice for New Yorkers," CityRealty, 10 February 2022, accessed 17 March 2022, https://www.cityrealty.com/nyc/market-insight/features/get-to-know/how-co-ops-became-housing-option-choice-new-yorkers/20423.

In Israel, kibbutzim were collectively owned farming communities which followed progressive principles described simply as "from each according to his ability, to each according to his needs."[26] The first kibbutzim were founded as mostly young Jews fled from religious persecution in Eastern Europe and elsewhere. Overcoming many hardships, they succeeded in building communities which played an important role in the country's development. The kibbutz economy has three main sectors: traditional agriculture, industry, and an emerging branch in high-tech. As of 2016, industry accounts for about three-quarters of kibbutz income, with many turning to technology and products to develop profitable businesses.[27] Today, about 270 kibbutzim—with memberships ranging from 40 to more than 1,000—are scattered throughout Israel, with those in the south increasingly looking to high-tech and innovation.

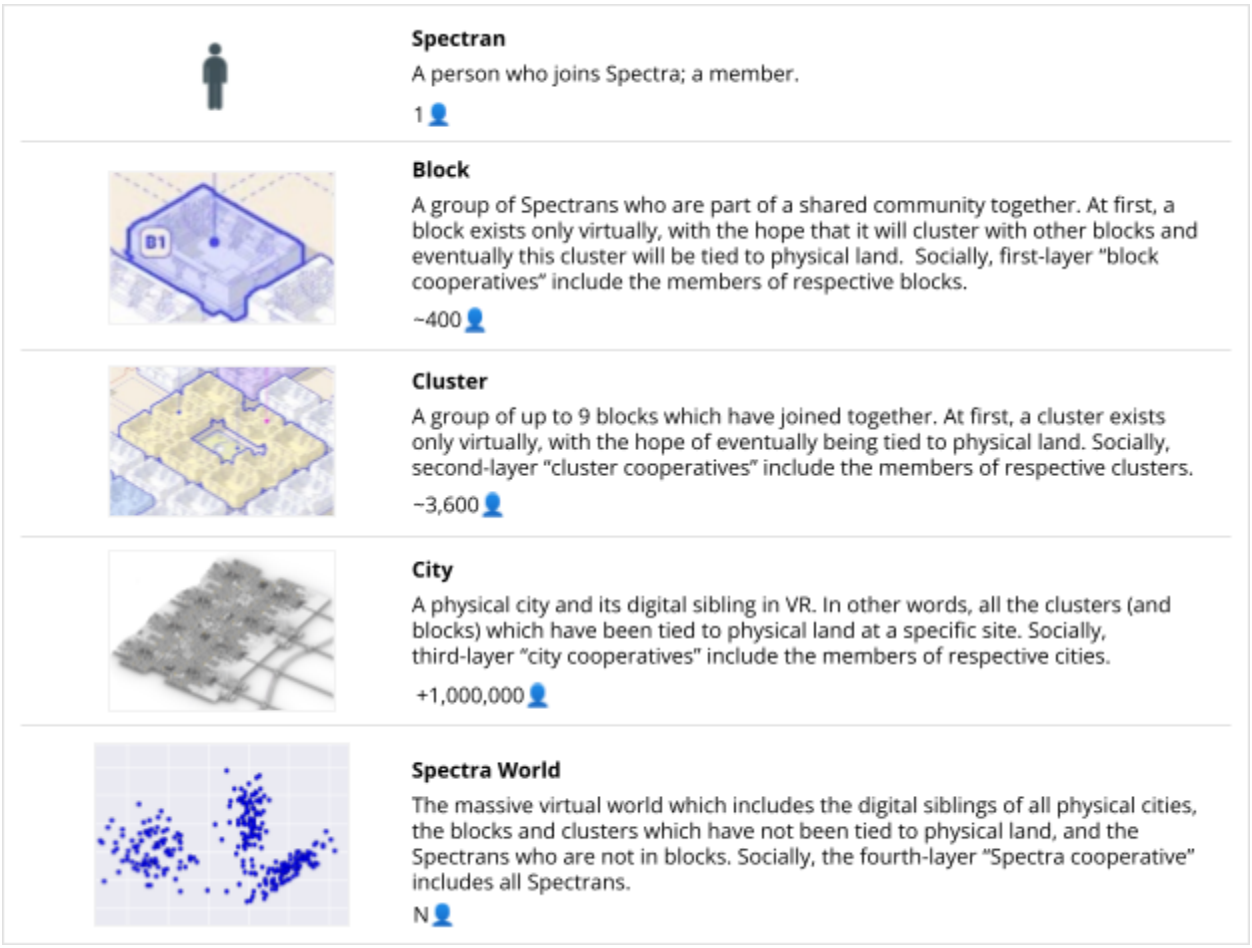
More recently, platform cooperatives have formed as an alternative to venture capital-funded and centralized platforms, such as Uber and Airbnb. For example, in the UK, Stroudco is a platform cooperative that helps farmers sell their products online. Another example, Stocky, is owned by photographers, sells stock photos at a fair price, and practices fair profit-sharing. Similarly, decentralized autonomous organizations (DAOs) use blockchain technology to pool resources, energy, and ideas with trust, efficiency, and global reach. In many ways, DAOs are a modern adaptation of the cooperative philosophy given the availability of new technology.[28]

## 4.2 Community formation, development, and organization

Spectra builds on these historical precedents to coalesce a global movement of small cooperative-like groups called 'blocks' with the end goal of building a sustainable, livable, and affordable city. Spectra's systems and structure are inspired by the collective ownership, living, and decision-making of traditional cooperatives and the digital nativeness of DAOs. As such, we call Spectra a multilayer structure of blockchain cooperatives which is organized at the block, cluster, city, and world layers to simultaneously address localized and global needs. Our aspiration is that such a multilayered community has "the potential for the cooperation that shelters us from storms, while nurturing the competitive creativity of progress" and pluralism.[29]

[26] Jewish Virtual Library, "The Kibbutz & Moshav: History & Overview," https://www.jewishvirtuallibrary.org/history-and-overview-of-the-kibbutz-movement.
[27] Ido Levy, "Kibbutz Economy: How Israeli Collective Communities Near Gaza Are Becoming High-Tech Hubs," NoCamels, 7 February 2018, accessed 20 February 2022, https://nocamels.com/2018/02/kibbutz-becoming-high-tech-hubs/.
[28] "Kelsie Nabben et al., "Grounding Decentralised Technologies in Cooperative Principles: What Can 'Decentralised Autonomous Organisations' (DAOs) and Platform Cooperatives Learn from Each Other?" (Working paper, Platform Cooperative Consortium Conference, 2021), https://dx.doi.org/10.2139/ssrn.3979223.
[29] John Kay and Paul Collier, *Greed is Dead: Politics After Individualism* (Great Britain: Penguin Books, 2021), 99-100.

### 4.2.1 Multilayer design




### 4.2.2 Formation of blockchain cooperatives

In Spectra, people will self-organize into their own block cooperatives, a first-layer group of up to 300 to 400 members which defines governance and financial mechanisms. Block cooperatives are the organizational units of the community. People will form block cooperatives for different reasons: to live in a more connected space with friends and family; to form unique communities for artistic pursuits or scientific research; to practice sustainable lifestyles; to seek new economic opportunities. Whatever their reasons for forming is, it will become a primary motivator for Spectrans to actively participate in their block's governance and contribute more generally toward the realization of Spectra, as a broader social movement to sustain their own goals.

These block cooperatives correspond to the city blocks in the virtual world, and eventually in the physical city. Spectra can have countless blocks in its ever-growing virtual world, some fully open to join and others which are privately curated. The goals of a block cooperative are to bring together a

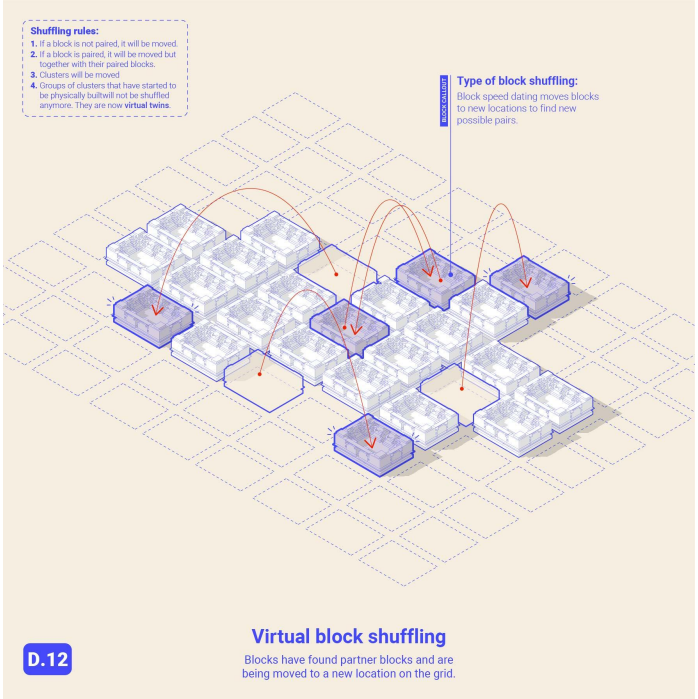
dynamic community of people; to design their virtual block to match their collective interests and values; and, ultimately, to fund the construction of their block in the physical city. In the future, people may pay a membership fee to join a block. In return, they would receive block-specific tokens representing their share of the block cooperative, a private apartment space in the block (in the virtual world), access to other resident-only spaces, and the ability to pledge capital toward purchasing land and building the physical block.

### 4.2.3 Organization of the virtual world

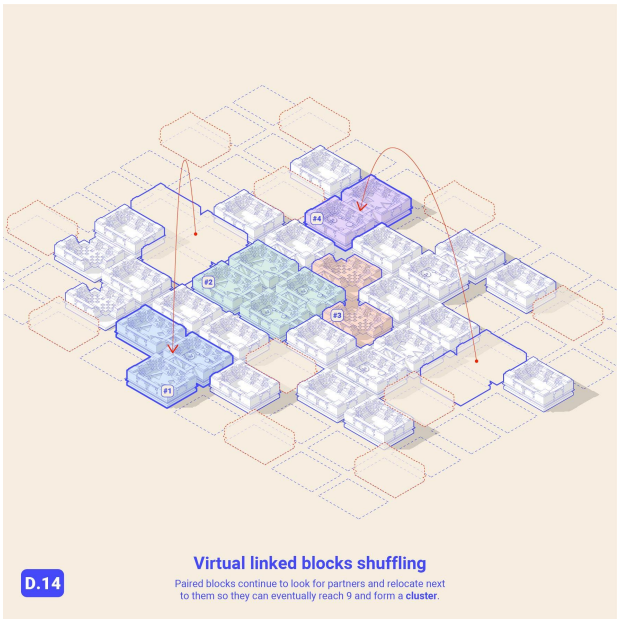
The virtual world will be one massive, contiguous online space which is continuously growing as new blocks are formed and their design assets are approved to the source code. In the virtual world, the locations of blocks are not permanent. Every three months blocks are shuffled. Blocks are placed to ensure that the designs and functions of adjacent blocks are compatible, while still allowing for spontaneity. The goal is that shuffling stimulates creativity, generates economic activity, and encourages blocks to broaden their social networks.

D.10 **Virtual grid**
Virtual blocks are spawned inside an infinite grid.

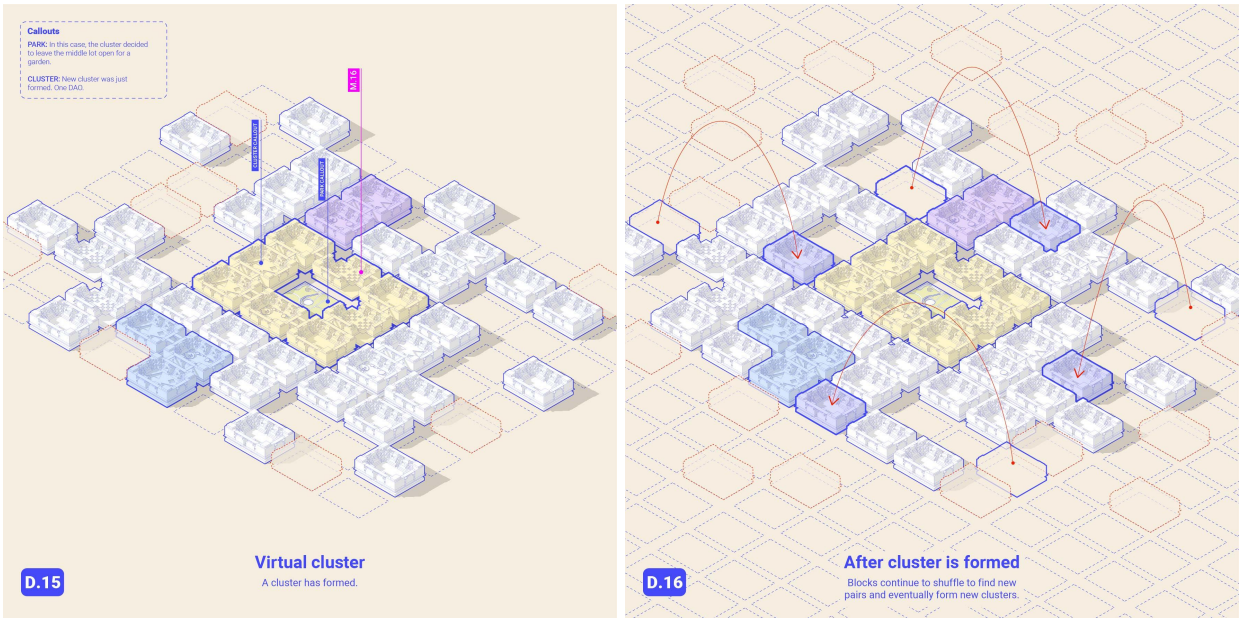

D.11 **Virtual block spawning**
Blocks start to spawn as people join the virtual city and organize sponsors.




For blocks to form permanent connections with each other, they can join together into groups of (at most) nine to form clusters.[30] Clustered blocks are rearranged together in a 3x3. This formation of nine constituent blocks no longer changes, but the other blocks and clusters which border them still do. Furthermore, the members of each block cooperative in a cluster become members of a new cluster cooperative, a second-layer group to make decisions and accumulate capital together.


[30] Some clusters may consist of eight blocks and a park, or other use of space, as economic incentives evolve.

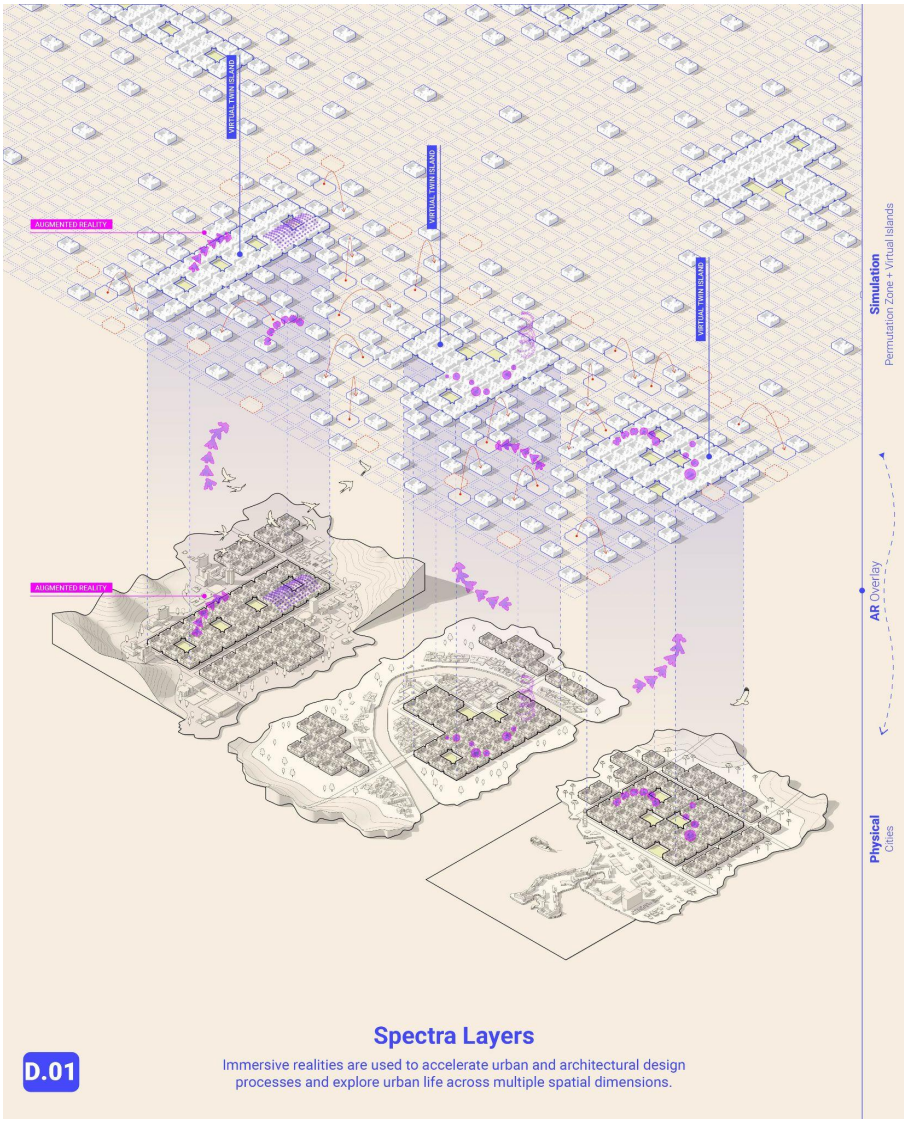



### 4.2.4 Transition from virtual city to physical city

As Spectra grows it will accumulate capital to buy land in the physical world. Once a site has been selected (See 2.8), cluster cooperatives will be able to bid for land parcels. Clusters which successfully purchase land will begin construction in the physical city and they will be positioned in the virtual world to reflect their geographic location. The dimensions and topography of the land will be fully represented in the virtual world. Cluster locations in that section of the virtual world will no longer be shuffled, and together they will be a "digital sibling" virtual city to the physical city.

Furthermore, the members of each cluster cooperative in the digital sibling become members of the city cooperative, a third-layer group with institutions to fulfill the role of city government (See 4.3.2). Other blocks and clusters which did not purchase land will continue to be shuffled around the digital sibling in the virtual world. Eventually, additional land may become available for purchase. Unclustered blocks will in most cases only reside in the virtual world, with exceptions possibly being in Experimental Growth Areas, proof-of-concept scenarios, and/or one-off developments.

Though the land selection process includes many criteria and steps (See 2.8), there may be situations in which site conditions deviate. For example, there may be a stream, lake, rocky outcrop, or wooded area which Spectra wants to preserve. Or, the site geography could motivate non-linear growth, such as a curved coastline. In these situations, it is important to recognize that this whitepaper is not an immutable master plan, but instead will be edited to the characteristics of the site(s). During the transition from virtual to physical, highly detailed site proposals will be reviewed and, ultimately, the city's shape and the parcels of land available there will be thoughtfully designed. However the physical city is shaped, the locations of clusters in the virtual world will mirror it.




## 4.3 City Modders, Teams, and Guilds

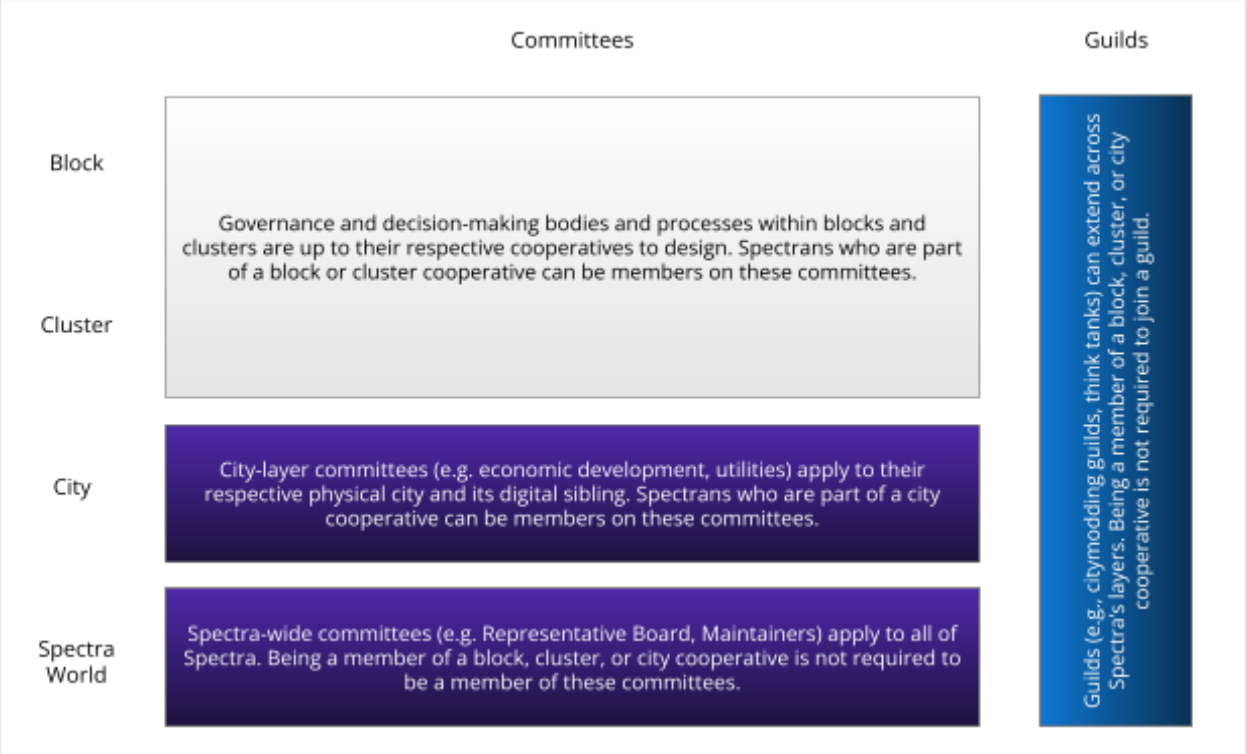
Members who actively contribute to Spectra's growth, design, and functionality are called "city modders." They modify the city across the physical, the digital, and the societal. City modders choose how to contribute based on their skills and interests.

Leadership of projects will be managed by smaller teams of city modders. Some activities benefit from taking place within a clear decision-making structure, while others require the ability to work flexibly and independently. Similarly, some activities must remain within the multilayer structure for governance and security reasons, while others benefit from healthy competition and pluralism. We

anticipate many smaller project teams working on specific issues and guilds of skilled professionals available to work across projects.

While Spectra is still in its early stages, the distinction between teams and guilds will not be as apparent. Though, this will likely change as Spectra, its membership, and the number of projects increase and institutions begin to form and require more defined organizational structures and legal frameworks.

### 4.3.1 Multidirectional design




### 4.3.2 Committees, the Representative Board, and Maintainers

Eventually, teams might evolve into more robust committees which operate within Spectra's multilayer design. Committees would exist to address the specific needs and roles which would otherwise be challenging for a decentralized, open-source community to do on a daily basis. Particularly, when authority, expertise, security, or urgency is required.

At the Spectra-wide layer, committees will address issues which impact the entirety of Spectra. Some examples include representatives and version control of the virtual world. At the city layer,

committees will roughly match the functions of government and publicly-funded agencies in existing cities. Some examples include transportation services, utilities, health services, housing services, urban agriculture, public libraries, emergency response, logistics and trade, and economic development. Blocks and clusters may also choose to have committees, though their structure and functions are up to their members to decide.

Initially, members on some Spectra-wide committees (e.g., Representative Board, Maintainers) may be decided by Spectra's founders. Other committees—particularly, those at the block, cluster and city layers—are open to members of their respective cooperatives based on their skills and interests. Membership of each committee will be representative of the many interests, values, and backgrounds of Spectra's diverse community. Some committee members will be employed by the Spectra cooperative depending on the level of expertise and workload of the position.

One special committee at the Spectra-wide layer is the Representative Board. There will arise circumstances in which Spectra representative(s) may be necessary, such as strategic and time-sensitive decision-making. It is the responsibility of the Representative Board to act on behalf of all Spectrans in these situations. At first, these representatives will be the founding members. However, Spectra's goal is to create governance systems which will evolve as needed and whose management will become increasingly decentralized. As such, with time, representatives may be elected by vote or other means of equitable selection to serve for a term on the board. There may also be procedures for replacing representatives before the end of their term if necessary.

Another special committee at the Spectra-wide layer is the Maintainers. It is the job of maintainers to manage the version control of Spectra's virtual world. As members make changes to their local version of the virtual world by designing their blocks' buildings, courtyards, and units, maintainers must assess which contributions meet the technical requirements for addition into the source version of the virtual world. These requirements must be met to maintain the cross-platform capability of the virtual world.

### 4.3.3 Guilds

Guilds operate across Spectra's multilayer design. Similar to committees, guilds also exist to address the specific needs and roles which would otherwise be challenging for a decentralized, open-source community to do on a daily basis. Particularly, when expertise is required. Some examples include design, architecture, programming, VR development, governance, sustainability, think tanks, food services, health services, and so on.

Notice that there can be overlap in the subject matter of committees and guilds in the same way that there can be overlap between an existing city's department of transportation and the bike share companies that operate in the city. The primary differences between guilds and committees is that

guilds do not have official decision-making authority and their activities do not need to remain within Spectra's governance structure for security reasons.

Instead, guilds can benefit from inter-guild competition, much like private sector firms. There may eventually be many guilds working on the same activities as Spectra grows, whereas there is only one of each committee at the Spectra-wide and city layers. For example, there could be three guilds which specialize in providing apartment interior design services, whereas there is only one Maintainers committee at the Spectra-wide layer and only one housing services committee per city. Otherwise, governance and democratic decision-making would be near-impossible.

Guilds can also partner with and be supported by committees to achieve Spectra's goals. This is similar to existing forms of public-private partnership, but in this case both organizations are cooperatives. For example, a farmers guild may be contracted by a city's urban agriculture committee to R&D new advancements in rooftop harvest methods. The goal is to reform the role of both traditionally public and private institutions, and inspire both to be productive innovators.

## 4.4 Projects-based action

In Spectra, making progress will be organized around task-specific projects.[31] Especially in the early stages of Spectra when its multilayer/multidirectional structure of cooperatives, committees, and guilds is still taking shape. Spectran city modders can join and contribute to projects based on their interests and expertise. Examples include the land search, courtyard design competitions, research collaborations, science fiction writing groups, VR asset making, and so on. Even the formation of Spectra's first two genesis blocks will initially be carried out as projects, since the multilayer structure will not yet exist.

At first, projects will be selected by the founders based on the requirements to get a minimum viable version of Spectra. The selection process will broaden as Spectra's city modder population and capacity grow. To help coordinate the proposal, selection, and completion of projects, they will have project lead(s). Projects do not need to be structured organizations. They can be highly decentralized and still accomplish their goals. Projects are also more temporary in nature than committees and guilds, since they wrap up when they achieve their goals.

## 4.5 Governance, decision-making, and community practice

What is important when designing a new city isn't just the buildings we will construct, the parks we will landscape, or the technology we will use. Rather, it is that the city is forged by the ideas and

[31] This differs from when we refer to Spectra itself as a project.

needs of the communities which will call it 'home.' This is the standard to which Spectra aspires. Spectra aims to create governance systems which are reliable and respected; able to adapt and evolve as the project changes; and will responsibly empower more Spectrans over time to participate in decision-making processes.

Governance and decision-making will take place at every layer of Spectra: block, cluster, city, and world. These systems will look different at each layer, as they engage different topics and stakeholders. Our goal is that more decision-making can take place locally, where needs are acutely felt and stakeholder knowledge is valuable. Of course, some decisions make more sense to address at the city or world layer, and there may also arise situations in which these larger layers (i.e., the broader Spectra community) need to step in to moderate, arbitrate, or retract actions. Especially, if community guidelines have been violated.

Decision-making will be more vertical in the early stages of Spectra. Dedicated leadership is needed to get Spectra started and guide its growth. Decision-making processes will broaden as more people become members and contribute to Spectra's mission. This transition will start with simple polls, such as which projects to focus our time and resources on. More nuanced issues will require greater deliberation and the right tools to make difficult decisions. Eventually, the use of blockchain and tokens will help us to decentralize through smart contracts for customized voting procedures and to execute those outcomes on-chain.

Though, to facilitate good governance and democratic decision-making which is truly inclusive requires a strong culture of community practice and the use of other "off-chain" tools before voting even begins. At the block and cluster layers, community meetings and other means of civil discourse can be well-suited to making decisions which are both efficient and represent the needs of the entire group. At the city and world layers, where populations are larger and more diverse, the deliberation of a representative sample of people or use of focus groups for specific needs can guide informed voting. When decisions are time-sensitive or require expertise, representatives, committees, and guilds could offer assistance without overriding the will of the people (See 4.3).

## 4.6 Layered tokens

Spectra will need a sophisticated economy to facilitate the development and decision-making of the multilayer structure of blockchain cooperatives (block, cluster, city, and world), virtual world, and physical city. Blocks will need a token which allows them to efficiently coordinate financial decisions, stake into their projects from anywhere in the world, and earn fair compensation for hard work. The virtual world will need a token to address its unique tasks, such as the cost of hosting blocks on servers, raising a fund to acquire land, and to incentivize participation in the network. The physical city will need a stable currency which fits into the regional economy of its host country and can be used for daily transactions, while still being easily exchangeable for the block and virtual world

currencies. Decision-making processes may require tokens for certain voting mechanisms. In order to meet these complex needs and build a sustainable, livable, and affordable city, Spectra will use blockchain as one of its foundational technologies and cryptocurrencies as its units of trade.[32]

[32] Despite the environmental unsustainability of some preceding use cases of cryptocurrencies (e.g. Bitcoin), the technology is becoming increasingly eco-friendly as new blockchains are being created with sustainability as a core principle (e.g., Solana, PoS Ethereum).

# 5 Conclusion

To recap, Spectra aims to build a sustainable, livable, and affordable city for 1M+ people. Our primary means of doing so will be to pair a traditional philosophy of cooperative business and living with modern advancements in XR and blockchain technology. Combining VR experimentation with modular urban design will enable quick construction timelines once a physical site is selected.

While many other planned cities and so-called 'smart cities' are top-down, hierarchical, and overly technosolutionist in their planning, Spectra will be a highly collaborative network of block cooperatives each developing their own urban spaces and governance solutions according to their values. This approach puts the community back at the center of the development process and allows for innovation and experimentation in each block. Our belief is that "cities have the capability of providing something for everybody, only because, and only when, they are created by everybody."[33]

We must strive to create a better world for future generations. As urban populations continue to grow, we must build cities which can support them without straining fragile planetary boundaries. As the line between online and offline becomes harder to define, we must build cities which are enjoyable to live in and restore balanced lifestyles. As economic inequality and poverty continue to rage, we must build cities which are accessible to people from diverse backgrounds and drive healthy green economic growth. More than just a city building project, Spectra is a movement to solve existing problems in cities and define a new model of urbanization.

What do you want the future to look like? Come join us in building it.

Website: www.spectracities.com
Discord: https://discord.gg/cGpPpcxhqR
Twitter, TikTok, Instagram, LinkedIn: @spectracities

[33] Jacobs, *The Death and Life of Great American Cities*, 238.