



United Arab Emirates

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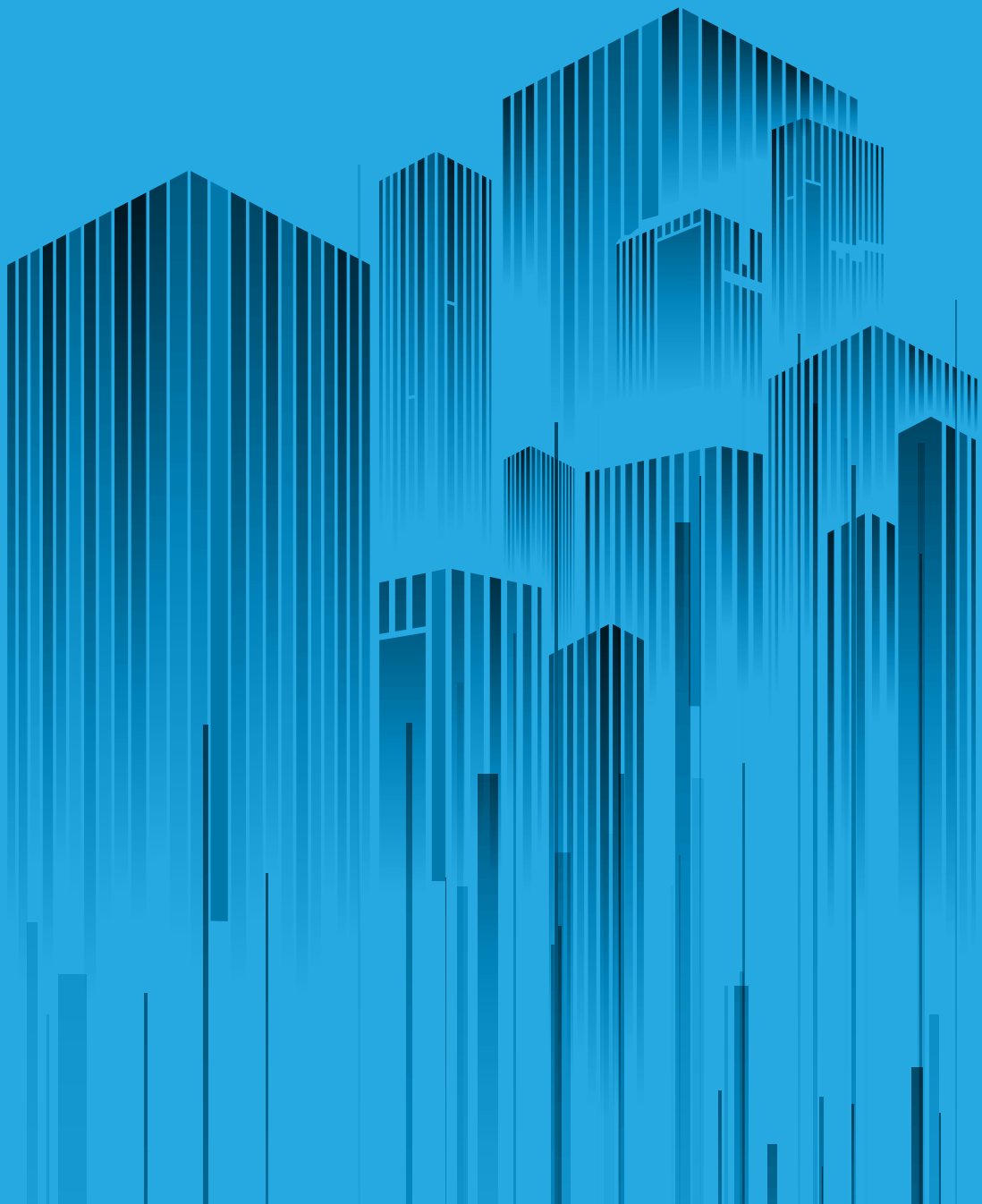


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# CITIES INNOVATIONS

## to manage Urban Sprawl







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The 21st century marks the first time in history where more than half of humans live in cities. From the earliest civilizations until the modern era, urbanization and non-agricultural activities were outliers to the human experience. Research suggests that 1 million people was the size limit on cities throughout history, even at the peak of empires, from Beijing to Rome to Baghdad. However, since the industrial revolution, that is no longer the case. The largest city today, Tokyo, is home to more than 37 million people, and there are ten additional urban areas exceeding 20 million people.

The global threshold for 50% of humans living in cities was crossed very recently: between 2010 and 2020; by 2071, the global urbanization rate is expected to reach 75%. That equates to about 8 billion people living in cities, up from 4.3 billion people today.

The implications of such a gargantuan urban shift are profound. Cities are engines for new ideas, higher standards of living, better access to goods and services, and accelerators of culture. Humans thrive better in cities. On the other hand, cities need to be able to support these ever-growing populations, from providing electricity and water to waste treatment to road infrastructure to law enforcement to business licenses, and more. Running a city is exponentially more complicated and expensive than it was even a generation ago. The rest of the 21st century is unlikely to be easier.

Between this massive population influx and the digital revolution, how we manage and operate cities will need to evolve in the coming decades. This will be a slow process, since city growth and city decline is a gradual process. The largest cities today are not guaranteed to keep their rankings in the coming decades, nor are the wealthiest. The ingredients for a successful city are complex, and no specific road map or innovation is guaranteed to bring greater growth or prosperity.

At the same time, human settlements have deployed many similar strategies over centuries, regardless of geography or heritage. It is important we remember these foundational lessons in urban planning as we attempt to improve it. Many cities built in the last century have abandoned their ancient walkable roots in favor of becoming car centric, and now are trying to undo billions in wasted infrastructure investment. Other cities ripped up thousands of trees in favor of new parking lots and buildings, and are trying to re-introduce nature into urban cores decades later.

With the COVID-19 pandemic, developed and emerging cities alike are navigating a difficult economic period, and will lead the recovery with long-term strengths that transcend short-term difficulties. Moreover, as citizens' expectations grow and urban populations continue to expand, the pace of progress and the need for municipal innovation is unlikely to decelerate.

This report will cover and showcase public sector innovations in municipal Innovations in City Planning, Urban Living, Mobility, community management, and so forth. The global projects described are mostly in planning or pilot phases, so scaling across multiple cities in the future will require additional research and localization. However, these case studies show some of the most promising attempts at re-invigorating the urban experience.









UNITED ARAB EMIRATES

1

## Expo City Dubai: The Human-Centric City of the Future - UAE

For six months starting in 2021, Dubai hosted the World's Fair, a global exhibition that has gathered nations together every five years since the early 1800s. Dubai was the first city to host from the Middle East, Africa, or South Asia. The event centered on three themes: sustainability, mobility, and opportunity, with each of the 190+ participating countries preparing a national pavilion under one of those three topics. In addition, museum-style exhibits were also constructed for visitors to learn about the core themes more broadly.

The event was a major success, bringing an estimated 24 million visitors over a 6 month timespan. However, once the event finished, there was a huge question to answer: what to do with all the new infrastructure that was built on the site? But in fact, plans for Expo 2020's legacy site were first revealed in 2017, years prior to Expo 2020 opening, with many glad that the site would leave a permanent mark on the city afterwards. Converting the Expo site into a long-term community was a core part of the site's value proposition during planning and construction.

Now up and running and free to access 24/7, "Expo City Dubai" (renamed from the originally announced "District 2020") features four pavilions to explore and a host of other attractions to visit.





Expo City Dubai consists of 80 percent Expo-built infrastructure, repurposed into an integrated mixed-use community that will continue to attract businesses and people to work, live, visit and enjoy. The transformation includes residential areas, green spaces, coworking spots, and smart mobility options, and aims to cater to a population of 145,000 at full capacity.

From the award-winning Expo 2020, a number of pavilions will remain open for future visitors and residents. These include popular industry-focused ones dedicated to sustainability and mobility, among others, as well as specific countries such as the UAE, Saudi Arabia, Luxembourg, Australia, Pakistan, India, Morocco, and Egypt.

Powered by AI, separate platforms will manage energy, smart-buildings and security work together to create synergy and efficiency. They allow building managers to control functions such as cooling, air quality, access and fire alarms – in real time using an app. Facility managers can even improve water usage in irrigation systems, which is especially important in the Middle East, because buildings can consume up to 80% of the energy supply.

This isn't technology for its own sake. It draws information from over 200,000 data points, 3,500 doors and 15,000 cameras to optimize operations, reduce emissions, enhance visitors' comfort and security – all at once, seamlessly. It saves energy. It balances the peaks and troughs of renewable power. It optimizes battery storage and e-mobility charging.

Fueled by cross-industry collaboration, Expo City Dubai will contribute to the growth of Dubai's innovation economy through a focus on four key growth industries and disruptive technologies such as the Internet of Things (IoT), AI, big data, and blockchain. For example, MindSphere is Expo's central nervous system; an IoT operating system for Expo's infrastructure. It runs in the background, almost invisibly, but everyone who lives in District 2020 will benefit from it. It will be the largest space in the world to be fully covered by a 5G-enabled network.

Sustainability will also be at its core as part of Dubai's plans to become a greener economy. The city will focus on reusing LEED Gold and Platinum-certified buildings, erected for the Expo, as part of its plans for the integrated mixed-use community. The entire neighborhood will be free of single-use plastics. 22% of the site's electricity consumption is already generated through solar panels, which are on top of every building. Buildings have also been designed in a very efficient way so they consume almost 50% less water than typical buildings elsewhere in the country. Plus, there's a lot of greenery around the development to provide shade and lower the urban heat island. For residents and visitors, Expo City Dubai will have a 10km bike track, a 5km running track and vast amounts of pleasant outdoor spaces. In addition, the city will be a car-free destination, offering visitors other mobility options such as buggies, e-scooters and e-bikes.

Dubai aims to provide opportunities to stakeholders in key sectors, including Fortune 500s, SMEs, startups, entrepreneurs and innovators with programs such as Scale2Dubai. Expo City Dubai has already attracted some of the world's leading industrial, tech and logistic giants, including Siemens, Terminus, and DP World. Startups and small businesses enrolled with Scale2Dubai will have the opportunity to collaborate with large corporations, government entities, accelerators and universities at District 2020. They will also have access to venture capitalists and funding entities to support their growth plans. Shanghai-based investment and incubation company Atlas Capital Holding has also announced it is building a blockchain campus in District 2020.

Expo City Dubai's master plan will play an integral role in supporting Dubai's current and future growth ambitions and has been identified as the fifth urban centre in the Dubai 2040 Urban Masterplan.





## Abu Dhabi Develops Integrated Food Security, Agricultural Data Platform

Food security is a high priority for the entire GCC region, because water is scarce and conditions are not ideal for most conventional farming practices. Therefore, the vast majority of food needed for the large and fast-growing populations need to be carefully imported from all over the globe.

Government leaders are well aware of their climate limitations and are taking extensive steps to improve food and water security for future generations. Some projects are highly visible, like massive urban hydroponic farms, while others are less visible but equally as important, like technology platforms that can massively improve sector efficiencies.

In Spring 2022, the Abu Dhabi Agriculture and Food Safety Authority (ADAFSA) launched a strategic project to develop an integrated food security and agricultural data platform. This was in collaboration with stakeholders from both the public and private sectors.





The platform provides access to accurate, comprehensive and integrated data for the agricultural and food sector in Abu Dhabi to inform decision-making using the best data governance practices. This will be used as a step forward to achieving ADAFSA's priorities to ensure food availability and safety while simultaneously promoting sustainable agricultural development in Abu Dhabi.

The platform does this by supporting a sustainable, flexible and integrated food system supported by a rapid response system, to effectively address food and biosecurity risks, thus increasing the competitiveness of local products.

In addition, the data platform features an integrated dashboard to monitor local, regional and global food security situations, which supports decision-makers in responding to food, livestock and agricultural emergencies, taking early action to prevent supply chain disruptions, and avoiding any potential food risks. The platform covers all data of the agricultural and food sector in Abu Dhabi and some relevant data at the federal and global levels. Therefore, the platform provides comprehensive insights about agricultural production, trade, logistics, environment, weather, biosecurity and food safety, which promotes Abu Dhabi's position in this important sector.

The data platform collects and monitors all agriculture and food security data. This includes data related to local agricultural production, trade, investment, future production, levels of strategic food reserves, food loss and waste rates throughout the value chain. The platform also monitors data on livestock and plant health, pest control programs, and vaccination programs against communicable and zoonotic diseases.

Data fragmentation and the lack of a clear model for data governance preclude the provision of the needed information for predicting threats and developing plans for emergencies. Therefore, collaboration between government and private sector actors is critical for the platform's success.

Furthermore, the platform delivers scientific forecasts on production, consumption, supply and demand for food commodities. This enables accurate analysis of self-sufficiency levels by comparing local production to consumption, monitoring the strategic food reserves, and analyzing price tendencies of major domestic and global products and the level of dependence on food imports for each item.

According to officials, the platform also features an alert system for local, regional and global food risks, supporting decision-makers to develop the needed plans to address normal and abnormal conditions. The alerts are activated if there are any changes to global or local product prices, production levels, weather conditions and diseases affecting the availability of local or global supplies.

Thanks in part to the implementation of this food security data platform, Abu Dhabi was able to credibly sign the Milan Urban Food Policy Pact in October 2022. The city joins over 250 others worldwide – representing 450 million people – committed to reducing food waste and developing a more sustainable food system. As well as offering a comprehensive framework, the Pact includes recommendations and actions that support sound planning of laws and systems, governance, the production and distribution of sustainable food systems and supply networks, social and economic fairness, and how to avoid wasting food resources.





SPAIN



## Barcelona's Superblocks

Modern cities are ruled by cars. Streets are designed for them; bikers, pedestrians, vendors, and all other forms of human life are pushed to the perimeter in narrow lanes or sidewalks. Truly shared spaces are confined to parks and the occasional plaza. For example, Barcelona is considered the noisiest city in Europe -- and one of the noisiest in the world -- in part because of its relationships with cars.

The lack of human-centric spaces and excessive noise are not the only problems with car-dependent cities, either. Cars produce heat, and the concrete or asphalt surfaces they drive on cause cities to become physically warmer than surrounding rural areas. Barcelona reaches 7 or 8° C warmer than the surrounding region, depending on the season. The extra heat, academically referred to as the heat island effect, takes a heavy toll on vulnerable populations, especially children and the elderly.

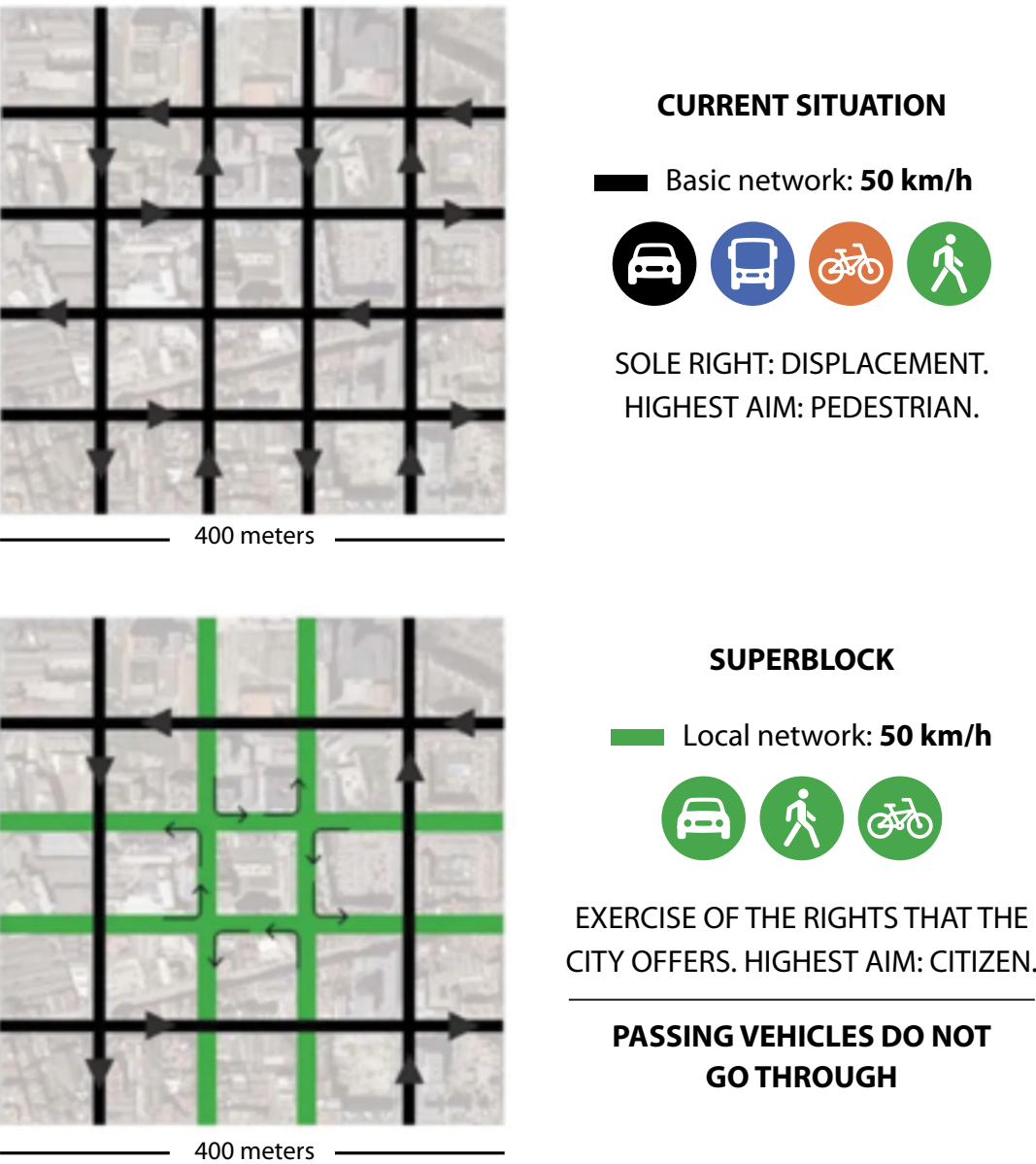
But once a city is already designed for cars, how does the local community take it back? How can cities be reclaimed for people? The city of Barcelona in collaboration with the Urban Ecology Agency have come up with a clever solution to that problem: Superblocks.





Superblocks take multiple square blocks (ideally a square with nine), and, rather than permit all traffic between and among those streets, create a perimeter to keep out through traffic, freight, and city buses. In the interior, only local vehicles, essential services, and deliveries are allowed, and they must travel under 10 kilometers per hour in narrowed lanes. In addition, all the interior streets become one-way loops, so none of them serve through streets. In this way, a nine-square-block mini village is created, the interior spaces of which can be more equitably shared between cars and other uses.

Road hierarchy in a superblock model



The Barcelona government listed six aims for its superblocks:



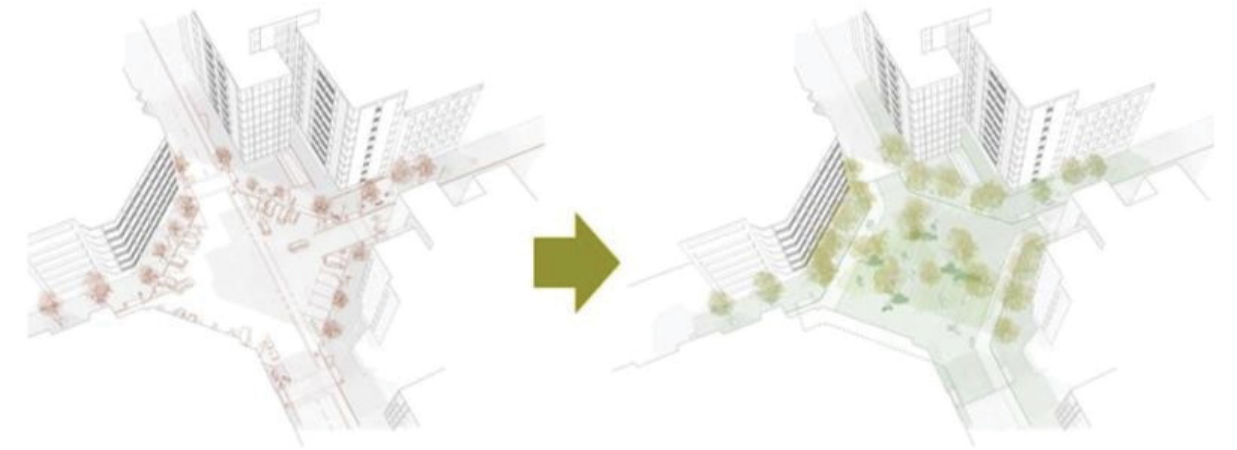
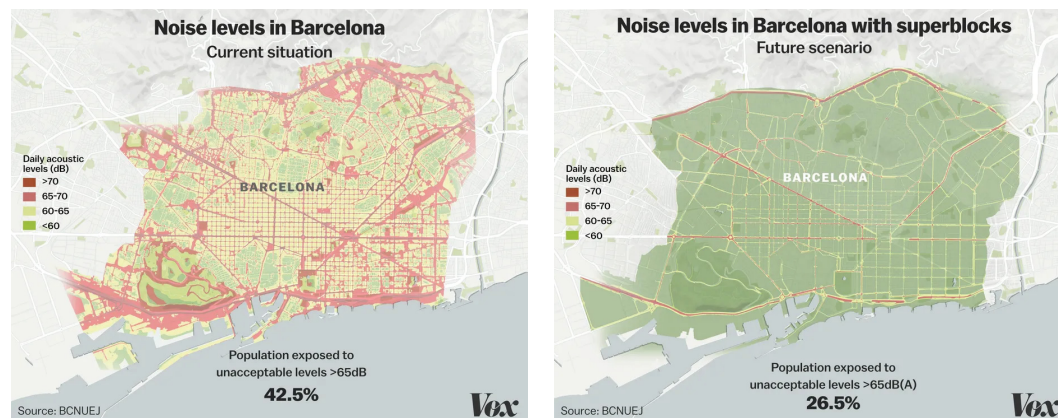


Barcelona has constructed seven Superblocks since 2016, and the concept has been influential in cities around the world. Following its initial success, in 2020 the Catalan capital announced a major supersizing of the idea: Over the next decade, Barcelona will convert its entire central grid into a greener, pedestrian-friendly area almost totally cleared of cars.

By all-but-barring cars, Barcelona will free up space for 21 new pedestrian plazas at intersections. The new car-free space will also be filled with 6.6 hectares of new green space and vastly lower urban noise pollution. With work beginning in 2022 to a budget of \$45 million, the plan represents one of the most thorough revamps of a major European city so far this century.

Not everyone is thrilled with the new urban strategy. Superblocks have faced strong resistance from motorists, who in the past have organized demonstrations to protest the car restrictions.

This is a process made somewhat easier by the connecting streets in question having already been partly redesigned to permit more social distancing during the pandemic. Indeed, while the superblock expansion is not being framed by the city as a response provoked by COVID-19, the widespread adoption of remote work during the pandemic, and the partial emptying of business districts, has provided an opportunity to call for a reset to the ways urban space is used, and by whom, when the crowds return.



The exact design of the new streets and plazas will be chosen from a public competition, but the city has already created some tight specifications: At least 80% of the street should be shaded by trees in summer, while at least 20% of surfacing should be permeable, and half of this total planted with grass, to allow the ground to soak up rainwater and improve flood resilience. Priority should be given to creating safe spaces for children and older people, while all public areas need to be equipped with drinking fountains.

While the upheaval involved in the project — and the ultimate extension of the Superblock model across all Barcelona — could be considerable, so is the public health payoff. The city believes it could free up 70% of its current road space for active travel and recreation space if it reaches its aspiration of covering its whole surface area in Superblocks, slashing air pollution, carbon emissions and noise pollution in the process. Expanded tree cover could also reduce summer temperatures. According to a 2019 study published in the journal *Environment International*, a full realization of the city's 503-block plan could prevent 667 premature deaths per year. Furthermore, according to a local health institute, the life expectancy of residents would increase by almost 200 days.

In addition, private car use could fall from 1.19 million trips a week to 230,000. This would reduce nitrogen dioxide emissions to fall below the World Health Organization's recommended value.





FINLAND

# 4

## Helsinki Pioneers Mobility As-A-Service

The average car is left parked 95% of the time. Put another way, a car is only in use 8 hours each week, and sits unused for 160 hours -- requiring valuable real estate for itself the entire time. When cars are in use, they usually only carry 1.6 people, much less than the standard capacity of 4 or 5. Furthermore, about a quarter of car trips are shorter than 1.5 kilometers. Clearly, cars are an inefficient form of transportation.

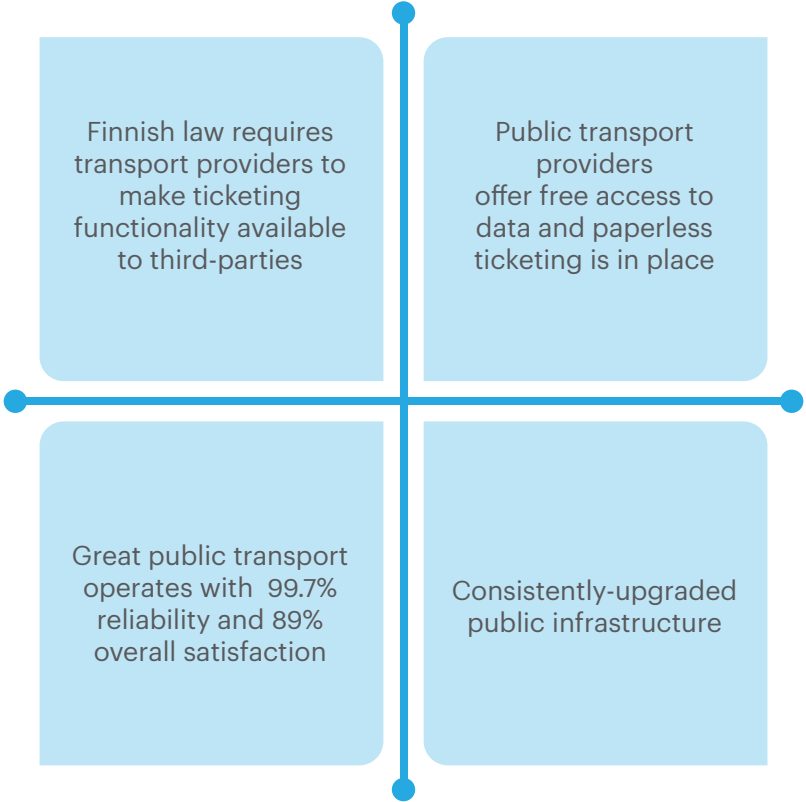
And yet, increasing numbers of people own cars, crowding them into cities that do not expand as quickly. Cars cause many recurring expenses for households and are a large source of pollution globally, neither of which supports a sustainable lifestyle. Constantly dealing with scarce parking and traffic can be endlessly frustrating.

One potential solution to the inefficient distribution of cars is called Mobility as a Service (MaaS), also referred to as Combined Mobility or Transportation as a Service. Many experts see it as the next big thing in mobility. MaaS allows commuters to plan and pay for trips across multiple transportation modes through a single access point, usually an app. In other words, users can book a taxi, ride a bus, rent a shared bicycle, ride a ferry, and even rent a car -- all through one subscription. Different modes of transportation must be combined to optimize traffic flow throughout the city, and for this to work the switch from one mode to another must be both pleasant in the physical realm and totally seamless in the virtual realm.





Finland's capital city of Helsinki, with a regional population of 1.4 million, has become a global testing ground for MaaS. Apart from dealing with environmental issues, Helsinki has been attempting to address increased traffic jams across the city caused by an expanding population. In addition, it was a great experimental environment for MaaS because:



To initiate its transformation project, Helsinki called on a startup, MaaS Global, also known as Whim, the name of its flagship mobile app. Users can use the app to build a multimodal route, with the app suggesting, for example, that the user take a bus, then a bicycle and finally a taxi. The user can pay for the various journeys individually or buy a monthly subscription.

For €60 per month, the core service includes unlimited public transport and bicycles as well as €10 in taxi travel. For €500 per month, the app provides unlimited use of all types of transport. The price may appear high, but its creators say it is warranted, when users calculate the typical monthly costs of owning a car. If users consider that a typical car payment is several hundred a month, and factor in the cost of maintenance, petrol, insurance, or worst case scenario an accident, and that steep €500 per month does not seem so bad after all.



In order to make MaaS work, legislation, regulations, customer interfaces, technology, application interfaces, billing, and the will to get it all done had to align. In short, Finland spent a decade aligning its resources to succeed in this space. In 2009, the Finnish Ministry of Transport and Communication published the first intelligent transportation strategy in the world. It also recognized that this would mean a major shift in focus from maintaining and developing traffic routes to customer based operating of the whole traffic system. In 2010, Finland reformed its transport agencies and started shifting the official policy from infrastructure to a more holistic approach. Close collaboration with different partners and the changes made by the Finnish officials made MaaS-operations possible in Finland. In 2017, all of this regulatory groundwork resulted in the launch of the Whim application, the first all-inclusive MaaS solution commercially available on the market. By 2019, the app had been used for over 6 million trips by residents. As of 2021, the app has over 60,000 active monthly users.

Following initial success at home, Helsinki's MaaS model has subsequently been piloted in other cities across Europe.





BELGIUM



## Belgium Cities Confiscate Vehicles That Emit Excessive Noise

Drivers who play booming music, slam on the gas, or screech around town have been put on notice by the Belgian city of Ghent: their vehicles could be confiscated for breaching noise limits.

In summer 2021, the Flemish city introduced a new regulation allowing police to impound vehicles whose drivers were causing excessive noise, either by playing loud music, aggressive driving, or tampering with engines and exhaust pipes to make their vehicles noisier. Under the new regulation, drivers who breach noise limits will have their vehicle impounded for at least 72 hours and must bear the cost of towing and storage. The law temporarily expires at the end of 2021 so that its effectiveness can be evaluated.

City authorities say they were receiving mounting complaints about noisy cars, including a protest in June 2021 when dozens of people took to the streets to demonstrate against loud engines and exhaust pipes.





Noise pollution, which has been linked by the World Health Organization (WHO) to hearing loss, tinnitus, heart disease, sleep disturbance and general annoyance, is a leading urban headache. About 113 million people in the European Economic Area experience noise pollution day and night from road traffic exceeding 55 decibels, the threshold at which noise becomes harmful to human health according to the WHO. Of those, 36 million are exposed to traffic noise exceeding 65 decibels. That figure takes into account effects like property depreciation, public health, learning and concentration difficulties, sleep issues and a loss of productivity. Traffic noise is even linked to some illnesses, including cardiovascular disease. The WHO recommends people are exposed to no more than 30 decibels of night noise inside bedrooms to ensure a good sleep.

To the northeast of Ghent, the Dutch city of Rotterdam is also hoping to crack down on nuisance drivers. An investigation into noise pollution last summer found that only 3% of drivers were responsible for 100% of excess noise that was measured. When city researchers installed cameras and sound monitors at three points in the city center, they found 97% of drivers were within noise norms. The 3% who broke noise limits caused a big problem: one vehicle alone was captured exceeding noise limits 15 times in one day.

While Ghent relies on police judgment to determine a breach of noise rules, Dutch officers have to prove noise is excessive by taking the car to a testing center. Law-breaking is hard to prove in practice when aggressive driving can be corrected and remote-controlled modifications to exhaust pipes switched off.

For that reason, city authorities launched a new phase of the research to link noisy vehicles to number plates – the previous phase identified repeat offenders through the model and colour of car. The city hopes in future this will yield a more effective way to catch and fine noisy drivers.

When the research is complete, Rotterdam plans to enter discussions with the Dutch government and hopes a nationwide system to combat noisy drivers can be introduced. Amsterdam, The Hague and Utrecht are also said to be looking at the idea.

For Ghent and Rotterdam, tackling noise is about making the city a better place to live. There is increasing demand for less traffic, safer traffic, less noise, lower speeds. People ask for a city they can live in, and that is not a city where people driving and revving their engines at night wakes everyone up.





UNITED STATES



## Baltimore Offers Design Competition For a Post-pandemic City

In the early days of the COVID-19 pandemic, media outlets lamented the “end of cities”, conjecturing that people would be too fearful to continue living in dense communities. Of course, urban places are not destined for decline. However, our cities’ evolving use of public spaces, commercial districts, and other place-based assets will be driving forces in the long term economic recovery.

In other words, pandemic recovery in cities requires more than just outdoor dining. Instead, there’s a broad need to reimagine public spaces and devise socially distanced ways to navigate the urban landscape over a longer term. In the pandemic’s early days, scores of cities closed streets to vehicle traffic to make room for pedestrians and allow restaurants to claim more sidewalk space.

A new effort focused on Baltimore is offering a set of solutions to public space challenges during the pandemic. A collaboration between the city of Baltimore, the Johns Hopkins Bloomberg School of Public Health, the Baltimore Development Corporation, and the city’s nonprofit Neighborhood Design Center launched a public competition to invest in tactical solutions.





“Design for Distancing” included two components. First, it sponsored a design competition seeking innovative ways to reconfigure public spaces and underused areas to help small businesses reopen and adapt to physical distancing requirements. Second, it launched a pilot initiative to implement winning designs in Baltimore commercial districts and embed public health best practices within the city’s urban landscape to support economic recovery at large.

Shortlisted concepts were drawn from a pool of 162 submissions from architecture and design firms, and then published in a guidebook for global consumption. The plans were conceived around the needs of Baltimore’s neighborhoods, but could be adapted to cities anywhere.

The designs go beyond the ad hoc approach that cities used to widen sidewalks and carve out space with traffic cones for pedestrians in the earlier days of the COVID-19 pandemic: They include modular concepts for outdoor retail, public cleansing stations, community art classes, and pop-up services like haircuts and mobile libraries. Some are no larger than a single parking space; others can be scaled up to a whole retail strip. Many of the designs are built around the notion of a far more car-free streetscape.

In one winning proposal, a street is carpeted with small circular stages where people could sew, do yoga, sell food, or sit beneath the shade of umbrellas.



Two other designs would convert vacant lots into outdoor dining areas with tables separated by wildflowers and tall grass, or a set of outdoor performance and art-making spaces.



These aren’t just design exercises: a handful of selected designs, which will cost between \$5,000 and \$100,000 each to construct, are set to be installed in 17 neighborhoods across Baltimore, supported by a \$1.5 million investment from the city during the second phase of the project. The hope, project leaders say, is that they can also help channel resources into priority districts in low-income communities. Most of the 17 neighborhoods selected are in neighborhoods that have suffered from chronic disinvestment. These aren’t gentrified districts that are currently full of restaurants and retailers.

The teams tasked with building out the design concepts were asked to collect feedback from local communities. The recommendations also consider the issues of structural racism by involving the communities they are built for in the planning process.





AUSTRALIA

# 7

## Melbourne's Urban Forest Strategy

Like all living things, trees decline in health as they age. Trees that are in poor health are not as effective at providing environmental benefits, such as cooling the city, providing habitats for animals, or cleaning the air. If a tree's health is not expected to improve, it should be removed from the landscape to enable a new tree to be planted.

The City of Melbourne is renowned for its historical parks, gardens and boulevards. These contribute greatly to the city's character and are integral to its social and cultural life. While they have performed remarkably well to date in faring against droughts, changing climate and urbanisation, their health is declining as they age. Many of Melbourne's trees were planted at the same time, albeit in a different climatic and social environment. Unfortunately, this also means that many trees will decline in health and require removal at the same time. In addition to this loss of tree canopy cover and amenity, this can reduce the amount of habitat available for wildlife.





Besides the environmental issues, there are numerous economic and community benefits that arise from increased tree cover, such as:

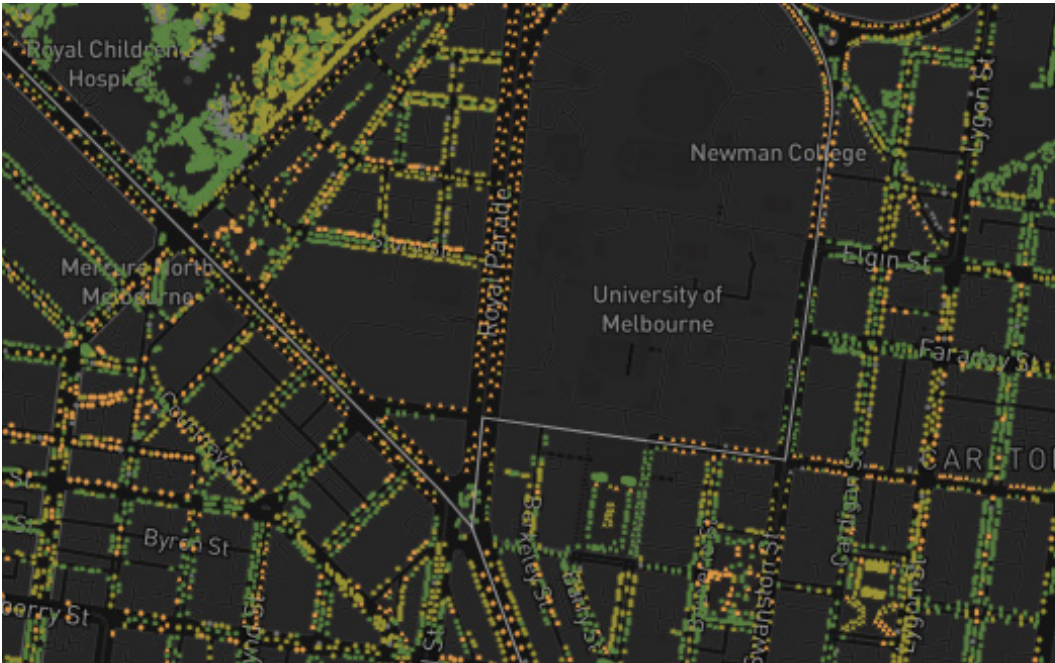
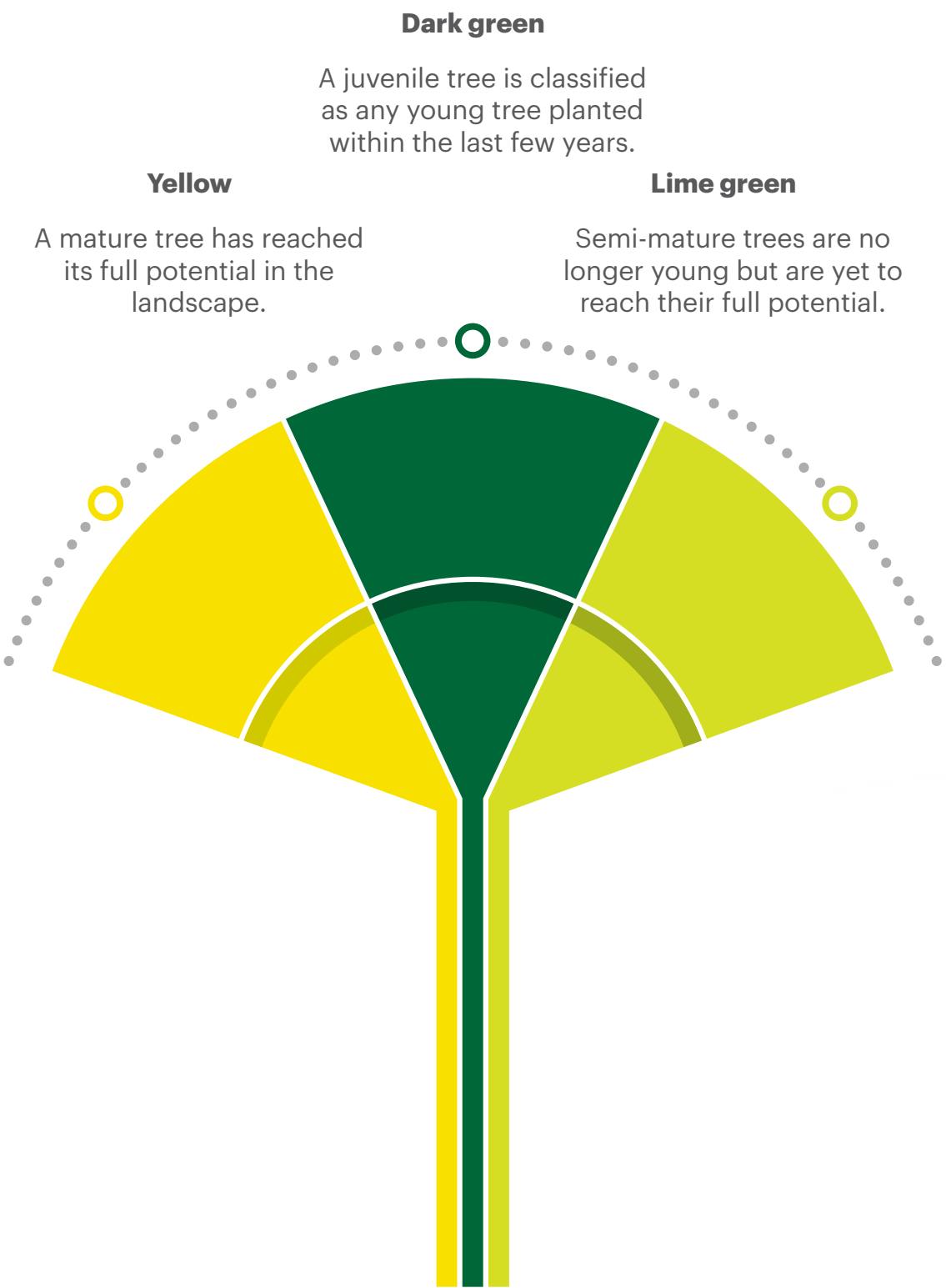
- Reduce Energy costs spent on heating and cooling
- Increasing local property values.
- Lower infrastructure maintenance costs, such as improving the lifespan of asphalt, mitigating flood damage, and assisting stormwater drainage.
- Decreasing resident healthcare costs, such as from heat-related illnesses.
- Creating attractive public spaces which can influence local identities, tourism, and city branding.
- Increasing time spent by residents especially children outdoors.

With these tangible goals in mind, Melbourne’s Urban Forest Strategy revolves around 6 different targets to guide the city to achieve them:

- Increase canopy cover from 22% at present to 40% by 2040.
- The urban forest will be composed of no more than 5% of any tree species, no more than 10% of any genus and no more than 20% of any one family.
- 90% of the City of Melbourne’s tree population will be healthy by 2040.
- Soil moisture levels will be maintained at levels to provide healthy growth of vegetation. Protect and enhance a level of biodiversity that contributes to a healthy ecosystem.
- The community will have a broader understanding of the importance of our urban forest, increase their connection to it and engage with its process of evolution.



To help the city understand the current state of its urban forest, Melbourne created a digital map showing the location, age, and species of all 70,000+ trees in city limits. The map is based on open data principles and is free for all to review. On the map excerpt below, tree diversity is color coded as follows:



A lack of species diversity leaves the urban forest vulnerable to threats from pests, disease, and stress due to climate change. Currently, Melbourne's urban forest is dominated by Eucalyptus, Corymbia, Planes, and Elms. Many of these trees were planted at the same time during condensed periods of planting activity, and large numbers of elms and plants are now reaching the end of their life.

City of Melbourne is divided into 10 precincts, and public workshops have been held in each precinct to help the urban forest strategy be successful. In the future, development of novel green infrastructure will be prioritized, such as green roofs and walls.





JAPAN



## Japan Building A Hydrogen-Powered City With Interlaced Mobility Grids

In 2020, Toyota revealed plans to build a prototype city of the future on a 175-acre site at the base of Mt. Fuji in Japan. Called the Woven City, it will be a fully connected ecosystem powered by a system of hydrogen fuel cells. Toyota has extended an open invitation to collaborate with other commercial and academic partners and invite interested scientists and researchers from around the world to come work on their own projects in this one-of-a-kind, real-world incubator. Groundbreaking occurred in February 2021.

Envisioned as a "living laboratory," the Woven City will serve as a home to full-time residents and researchers who will be able to test and develop technologies such as autonomy, robotics, personal mobility, smart homes and artificial intelligence in a real-world environment.

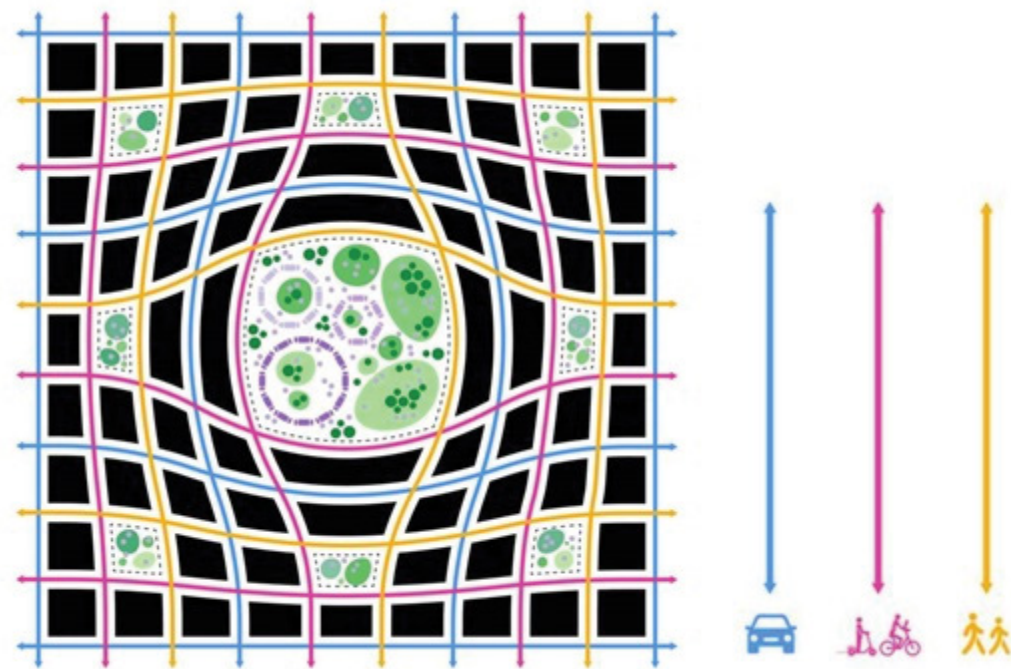
The masterplan of the city includes the designations for street usage into three types: for faster vehicles only, for a mix of lower speed, personal mobility and pedestrians, and for a park-like promenade for pedestrians only. These three street types weave together to form an organic grid pattern to help accelerate the testing of autonomy, while also remaining separate enough to be potentially more efficient and pleasant to move throughout.

This urban fabric additionally expands or contracts to accommodate a variety of programs and outdoor areas. Hidden from view is the underground infrastructure of the city, including telecommunications, stormwater filtration, electricity cables powered by hydrogen, and more.



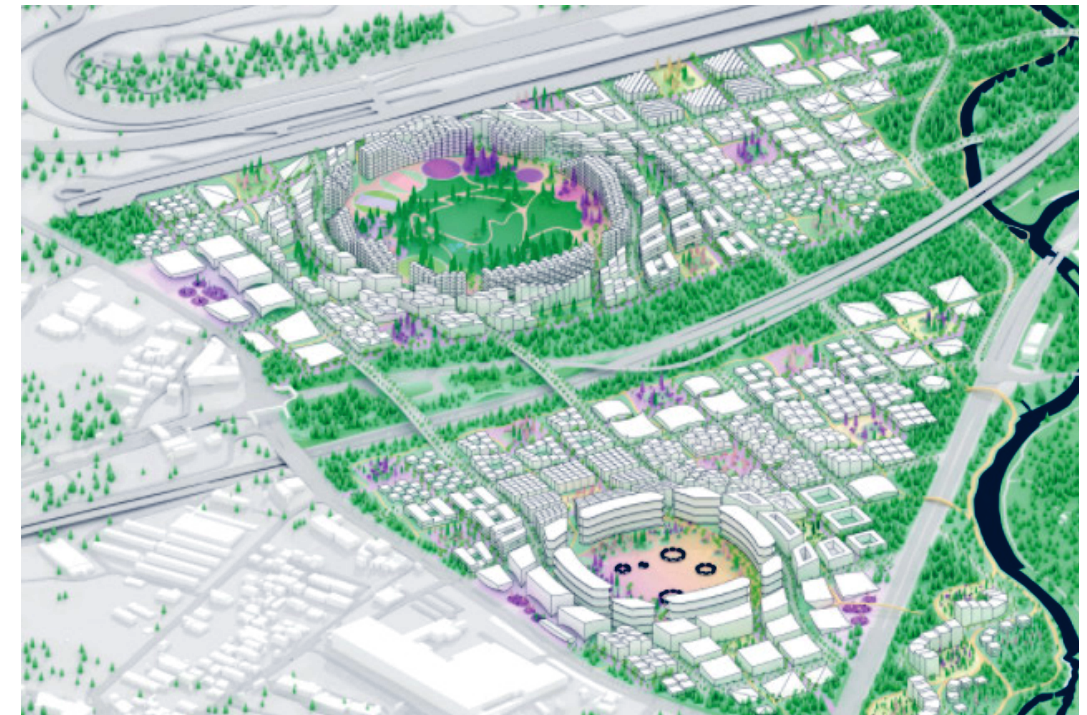


Delivering goods from boxes to mail will have its own unique system. First, everything is delivered to a central logistics center, from which the goods are carried underground via an autonomous robot, to a specialized smart post each household is equipped with. The robots also would collect rubbish and outgoing items' packages from the smart posts to return to the logistics center.



The city is planned to be fully sustainable, with buildings made mostly of wood to minimize the carbon footprint, using traditional Japanese wood joinery, combined with robotic production methods. It is hoped the project will advance mass timber construction, which deploys wooden beams stronger than steel. The rooftops will be covered in photo-voltaic panels to generate solar power in addition to power generated by hydrogen fuel cells. Toyota plans to weave in the outdoors throughout the city, with native vegetation and hydroponics. Autonomous, multipurpose vehicles will be the standard form of motor transportation, not only for residents but retail, hospitality, medical clinics, and more.

Residences will be equipped with the latest in human support technologies, such as in-home robotics to assist with daily living. The homes will use sensor-based AI to check occupants' health, take care of basic needs and enhance daily life, creating an opportunity to deploy connected technology with integrity and trust, securely and positively.



To move residents through the city, only fully-autonomous, zero-emission vehicles will be allowed on the main thoroughfares. Both neighborhood parks and a large central park for recreation, as well as a central plaza for social gatherings, are designed to bring the community together.

Woven City considers itself "software first", meaning that ideas are tested first on an advanced digital twin, to see how they will interact with the community before being physically constructed. Thus, while the traditional development of a city takes place over many years and decades, Woven City can compress that and do many iterations of improvement thanks to digital technology.

The community is slated to start with around 360 residents, mainly senior citizens, families with young children and inventors and is planned to grow to a population of 2,000 or more as the project evolves.

The project is backed by an \$800 million fund, which will invest in growth-stage companies with innovative technologies and business models to help Woven City thrive.





CHINA



## China's Supergrids to Optimize Space and Renewable Energy Profitability

Coal, gas, and nuclear plants are built close to the markets where they provide energy, but large scale solar and wind farms often cannot. They need to be put wherever the wind and sun are strongest, which can be hundreds or thousands of miles from urban centers. If renewable energy sources are to become as plentiful and inexpensive as is necessary to meet climate global targets, they need to be better connected through improved energy grids.

Over the last 15 years, China has experimented with supersizing its electricity grid, to take advantage of renewable energy potential in less populated areas while supplying badly needed energy to its rapidly growing megacities.

Ancient trade corridors across China's interior now carry a distinctly modern commodity: gigawatts of electricity destined for the megacities of eastern China. Energy from the Western China's wind turbines, solar farms, and coal-fired power plants transverse across thousands of kilometers until they are fed into regional power grids.





Above all, this rectifies the huge geographic mismatch between where China produces its cleanest power (in the north and west) and where power is consumed (in the densely populated east). Long cables can also connect peak afternoon solar power in one time zone to peak evening demand in another, reducing the price volatility caused by mismatches in supply and demand as well as the need for fossil-fueled back up capacity when the sun or wind fade.

By using higher voltages of direct current, which flows through conductors more uniformly than does alternating current, the new transmission lines dramatically reduce the amount of power that's lost along the way.

The sheer scale of an individual Chinese supergrid project dwarfs anything going on in almost any other country. And yet, there are 22 similar ultrahigh-voltage megaprojects that grid operators have built across China over the past decade.



That aggressive build-out has helped fast-growing urban centers such as Shanghai stave off power shortages despite delays in the expansion of China's nuclear power capacity and constraints on local coal power due to air-quality concerns. The new grid is also helping the country lead the global transition to renewable generation. Experts abroad say their supergrid technology is far ahead of the rest of the world.

The system is not perfect, of course. Since China is actively experimenting with new technologies, engineers are struggling to maintain and scale the innovative transmission system. For example, they must ensure that the new supergrid additions do not destabilize existing power grids. For now, long range cables are operating far below maximum capacity, in order to work out potential problems.

Chinese scientists are now proposing going a step further, and constructing an international super-grid that would connect Northeast Asia's major economies and make renewable energy as cheap as coal. The region, including China, Taiwan, Japan, South Korea, Mongolia, and Russia, consumes a third of the world's electricity, with demand set to double by 2050.

The new element is the opportunity to link fossil-fuel-dependent countries such as Japan and South Korea with relatively cheap wind energy from Mongolia, solar power from the Gobi Desert and hydropower from Russia. In theory, the Gobi has potential to deliver 2.6 terawatts of wind and solar power—more than double the U.S.'s entire installed power generation capacity. The Gobi's potential remains largely unrealized, in part because there is currently little means to deliver the power produced there beyond Mongolia's tiny market.

Furthermore, in the event of an earthquake or other disaster that could potentially destabilize local energy production (such as what happened in 2011 with the Fukushima disaster), an interconnected grid would give all participating countries alternatives to keep the lights on. The transmission lines would be accompanied by battery storage facilities to smooth fluctuations in power output.

If they can pull it off, hydropower, wind and solar could cost as little as five \$0.05 per kilowatt-hour – about what electricity generated by China's coal-fired power plants currently costs.





SENEGAL

10

## Senegal's Akon City: An Urban Community Powered By Its Own Cryptocurrency

Celebrity rapper Akon is returning to his birthplace of Senegal to build a new city from the ground up. The city will use new cryptocurrency as its sole medium of exchange. The project was first announced in conjunction with the country's ministry of tourism in 2018, and is slated to be completed before 2030. The project is also trying to capitalize on Afro-Futurism and the success of Marvel Studios' film *Black Panther* to encourage investment into, as Akon describes it, a "real life Wakanda".

"Akon City" will be built about 2 hours from the capital city of Dakar, on a 800-hectare site near the coastal village of Mbodiène that is also close to a new international airport. The project will initially cost an estimated \$6 billion (of which at least one-third has been funded). The planned city will eventually feature apartments, offices, parks, a university, an ocean resort, and a 5,000-bed hospital. It will also be designated as a special tax zone within Senegal.





The city will be divided into seven districts, as follows:

Office and residential towers.

African Culture Village, focusing on tourism and hospitality facilities.

“Senewood”, a filming, recording studios and media hub to compete produce original African content.

Entertainment, with a casino resort, shopping facilities, and a sports stadium.

Health and Safety, with medical facilities and emergency services.

Education Park, featuring a university.

Tech Park, with research facilities, venture capital offices, and other supportive business infrastructure.

[The city's currency](#), Akoin, can already be purchased on designated online exchanges using fiat currencies or other tokens like Bitcoin. Akon's main aim is reducing paperwork and procedures for entrepreneurs and small businesses, so they can compete in the international market. Current hurdles with currency exchanges often make this difficult for West African businesses. Unlike other cryptocurrencies tied to stable currencies, Akoin is tied to mobile phone minutes and relies on the use of smartphones. People in Africa tend to trust their mobile companies more than they trust local currency.

Akon argues that blockchain, the underlying technology behind cryptocurrencies, can enable Africans to become less dependent on their governments, offering a more secure way to engage with the international community when there is domestic volatility. For example, blockchain and Akoin will become an ecosystem for services ranging from for gig economies, health and financial sectors, and governance, among others. Blockchain can even be used for voting and banking services. That way, African entrepreneurs can build companies and offer services that can aid and fund the new city.

However, there are large hurdles still to overcome, such as financial inclusion: as of 2018, only one-third of Senegal's 16 million people had access to a smartphone which would be compatible with Akoin. In addition, the COVID-19 pandemic has wiped out Senegal's fledgling tourism economy, making the business case more difficult for investors to join Akoin City.





مركز محمد بن راشد  
للابتكار الحكومي  
MOHAMMED BIN RASHID CENTRE  
FOR GOVERNMENT INNOVATION

**The Mohammed Bin Rashid Centre for Government Innovation (MBRCGI) is**

dedicated to embedding innovation at the heart of the UAE Government. Aligned with the vision of H.H. Sheikh Mohammed Bin Rashid Al Maktoum, UAE Vice President, Prime Minister, and Ruler of Dubai, MBRCGI aims to develop the necessary capabilities for each phase of development, inspire possibilities and celebrate wins and lessons, ultimately establishing the UAE Government as one of the most innovative in the world and fostering a forward-thinking economy.

The mission of the MBRCGI revolves around three main areas of focus: innovation enablers, innovation possibilities and innovation platforms, and is in line with the objectives of the “We the UAE 2031” vision. Through our work, we unlock the capabilities of individuals that are at the heart of driving innovation across the ecosystem to position the country as a global innovation hub. We inspire possibilities by collaborating with key players across the ecosystem. We design platforms that multiply and create the ripple effect necessary to make innovation a daily practice for all. MBRCGI propels the UAE towards its Centennial 2071 goals.

Inspired by the visionary leadership of the UAE, MBRCGI has embarked on a journey across a vibrant landscape to redefine innovation for the public sector and drive value and impact across the ecosystem. We are catalysts for public sector innovation, providing the necessary platforms to promote and facilitate innovation. We raise awareness on innovation, redefine the culture of innovation in the country to align with the ever-evolving aspirations of our leadership, and explore opportunities in the innovation ecosystem across the country. The Center collaborates with key partners to ensure that innovation delivers value and impact and is utilized to its maximum potential.

At the heart of the work we do at MBRCGI lies a commitment to building innovation enablers, unravelling the threads of possibilities and exploring the landscape of platforms. This is a strategic pursuit to take public sector innovation to the next level and position the UAE as a trailblazer in the innovation space. We challenge assumptions and work for today and a future that transcends boundaries and possibilities. The Center ensures that innovation permeates every facet of public sector work.

Welcome to a world where innovation is no longer an option but a way of life!



