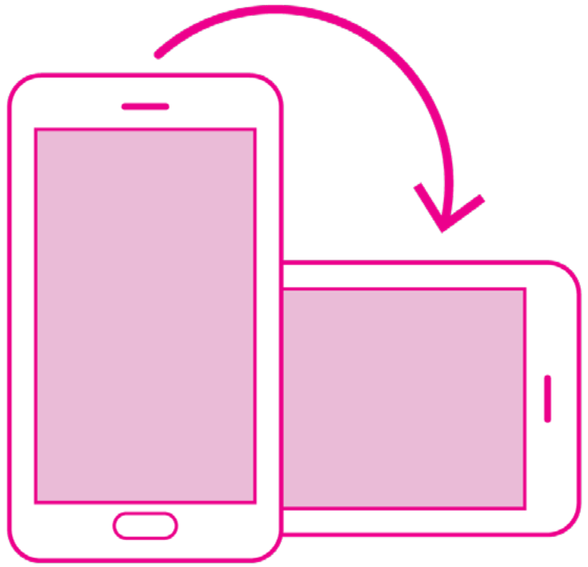

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ALIANZA PARA CENTROAMÉRICA
LIBERTAD Y LIDERAZGO PARA EL DESARROLLO

FRIEDRICH NAUMANN STIFTUNG Für die Freiheit.

SMART CITIES 2.0

MARCO MARTINEZ O'DALY

BEST PRACTICES GUIDE

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TOOLKIT

TOOLKIT

PROLOGUE

When we think of smart cities, the first thing we think about is innovation and digitalization. Innovation is not just technological, it implies political, economic, sociocultural, environmental, and other types of changes. And in the context of smart cities, digitalization plays an important role in these aspects, particularly politically and socially.

In the political aspect, it allows for more efficiency and transparency in government services, and therefore, less corruption. As a result, digitalization also sparks change in the political culture of government officials who begin to understand that upon participating in digital and transparent governmental and administrative processes, they are recognized as good public servants, seeking to change the status quo, attempting to provide better services to the city's residents. As sources of corruption are eliminated, honesty increases among politicians and government officials.

In the social aspect, digitalization makes citizen participation in decision making easier, allowing individuals to expose their needs and demands with regards to the city they want to live in, and the services they require. As a result, citizens are able to make use of their freedom to participate and to assume responsibility for the environment in which they live.

Smart governance, therefore, presupposes the use of technology, as well as citizen commitment. Projects that focus on improving social relations can become catalysts of investment, they can modify social behaviors, and they can build connection within a community, leading to a better society in a smart city.

If we want to promote an improved urban quality of life, we must be willing to apply new technologies to solve urban problems and challenges, reinventing political and social dynamics. The innovation process is a continuous one, and cities that manage to create spaces for innovation and implementation of best practices, while preserving their authentic identity, will be much more competitive in attracting the investment and human capital necessary for their development.

In an attempt to promote the development of smart cities in Mexico and Central America, to allow citizens to obtain better quality of life, in 2019 the Friedrich Naumann Stiftung für die Freiheit and he Alliance for Central America have ventures with the initiative to publish a Best Practices Guide for Smart Cities.

We thank the representatives of the municipalities of the City of Guatemala (Guatemala), Puerto Cortes (Honduras), San Jose (Costa Rica), Panama City (Panama), and the corresponding governments from around Mexico: Guadalajara, Tepatitlán, Tijuana, Cajeme, Tecate and Playas de Rosarito, and the states of Chihuahua and Sonora, for sharing with our Smart Cities Network about their experiences and efforts to make their cities smarter. And a special thanks to Marco Martinez O'Daly for his authorship and support in coordinating this publication. May this document serve as recommendation for action for Mexican and Central American policy makers. I wish you a motivating and enriching reading.

Elisabeth Maigler Kluesserath

Director of Projects for Central America
Friedrich Naumann Stiftung für die Freiheit

INTRODUCTION

This book is the second edition of what is meant to be a live book, constantly evolving from the feedback, knowledge and experience of cities and urban entrepreneurs from around Latin America and the world. This becomes particularly important for the relevance of tools and solutions necessary for the current health crisis and the unprecedented challenges facing cities today. We must not only work to alleviate historical shortcomings, but new health related difficulties, and unprecedented, national and international threats to individual freedoms that have caught the world by surprise.

In that sense, this version of the book is shaped by some of the most renowned urban thinkers and entrepreneurs from the region, to whom I am extremely grateful for their support throughout months of valuable virtual interviews and research. Experts like Juan Felipe Ordóñez, Gabriel Todd, Alejando Ruiz, Desdemona Cota, Marcela Herrera, Saraí Domínguez, Ernesto Flores, Marco Chávez, and Marco A. Martinez Dabdoub (my father) have made important contributions to this publication. Similarly, the tools contributed by great friends and experts in the first version, from hundreds of projects, results of their own local efforts, that one way or another are reflected in this version, still maintain great relevance today.

Furthermore, in this edition we are able to share some of our findings from an exploration tour we ventured during 2020 with dozens of flights and more than 10,000 kilometers of road trips to explore almost 20 cities around North America. In this tour we were able to document cases from cities from the United States, like Tucson, San Diego, San Francisco, Portland, Seattle, Salt Lake City, Miami, Phoenix and Flagstaff, and dozens of cities from Mexico like San Miguel de Allende, Guadalajara, Mexico City, Tulum, Tijuana, Tecate, Playas de Rosarito, Ensenada, Nogales, Hermosillo and Obregon.

We were also able to document valuable case studies from cities with which we were working remotely through the 2020 Smart Cities Program, including municipalities such as Guatemala, Mixco, San Jose, Puerto Cortes and Tepatitlán. Due to the health restrictions of the pandemic, workshops were held remotely, from home, but we hope to be able to document more about their successes in person, soon.

As a result of the threats of the pandemic and social distancing, the way billions of people live and work has been modified; but, the ability to provide quality public services has also been significantly affected. This is where the tools and best practices of smart cities can help.

So, we must first ask, what is a smart city?

A smart city must have the basic elements for people to survive, prosper and enjoy life in a city, independently of pandemics: from smart health services to recreational alternatives, those that allow people to live and enjoy life in open spaces, and now especially cities that have places adequate for social distancing accessible to all residents.

But a smart city also requires smart street designs and transportation options, resulting in lower mobility costs, risks and time lost in traffic, and mitigating risks of contagion, accidents, diseases caused by air pollution, and all sorts of cardiovascular diseases caused by the current urban model. It is now indispensable for cities to have access to all sorts of smart services, such as in education, transport and public safety. Similarly, cities must be able to venture with the modernization of public services, implementing best practices that have positively transformed many sectors of government around the world, services that are now more necessary than ever for our communities.

COVID-19 has also highlighted the importance for cities to have much more diverse industries, especially creative and technological industries, and those that allow for more remote or digital work.

We must begin thinking of our cities in a different way: as places where it is smart to live in. Cities must allow people not only to survive, but to prosper, despite all sorts of global shocks, able to attract and retain talent and skilled labor such as artists, athletes, entrepreneurs, inventors, investors, resulting in more and better jobs,

and higher possibilities for families to diversify their income and to generate savings, especially within the most vulnerable communities.

Every city around the world today is in a great shock, but the first cities to smartly adapt, with smart tools and public policy, the ones that find ways to provide quality of life for their residents, with or without a pandemic, those are the cities that will captivate the entire world and will be positioned as the cities of the future, and not in decades, but in just months.

What role does technology play? What challenges will most, or all, cities face in the 21st century? What will be the most attractive cities to live in the near future?

Through the Smart City Network of Mexico and Central America, we propose several basic principles that make a smart city: 1) an entrepreneurial culture; 2) urban mobility; 3) accessibility (urban and financial); 4) environmental resilience; and 5) transparency for effective co-governance. These five principles can be summarized with the acronym for SMART cities, for the first letter of each word: Startup, Mobile, Accessible, Resilient, and Transparent.

First, a Startup City represents those where the local culture and their legal and administrative frameworks make it easy for, and even celebrate, local and global innovation and entrepreneurship. A city's ability to be business friendly directly determines their people's level of income and job opportunities. Allowing increases in competition and innovation among businesses, employers are forced to increase salaries to attract and retain employees, resulting in more work opportunities. In a Startup City, anyone can quickly and transparently open and grow a business, with minimal resources. A local entrepreneurial culture attempts to constantly eliminate barriers to entry, both for attracting foreign investment, as well as for promoting new, local, small and medium sized businesses. There, dozens of businesses open and close constantly, reinventing the local economy at a faster pace than other cities, therefore, people find more and better opportunities, and are able to enjoy several sources of income, and increased labor mobility, and financial freedom. In the opposite extreme, we find cities with very little entrepreneurship, regions with excessive regulations and highly bureaucratic processes, seeking to preserve corporatist and political interests of a select few, over the freedom and opportunities of everyone else, resulting in high levels of corruption, and in low paying jobs, with precarious labor conditions, condemning residents to settle for jobs from among one or very few companies.

Secondly, a Mobile City is one that reduces the average, daily price of transport. This can be measured as the percentage of a family's income that is spent in transportation, whether it is on automobile, subway, bus, bicycle, or walking. But it is equally important for mobility to measure the average time spent in traffic. The time and cost spent on daily transport in a city are a direct result of their public space design and their buildable space regulations. In an unfortunate extreme we find cities based on sprawl, focused on zoning regulations, artificially maintaining low densities and separating land uses from one another, prioritizing a car dependent mobility. In turn, a mobile city allows for mixed use and compact development, prioritizing pedestrian accessibility and comfort within neighborhoods, reducing the need for constant, long distance trips in cars, and providing many more attractive options for modes of transport.

Third, an Accessible City refers to access to quality, public services in a city, allowing more people to meet their basic needs, but also access to quality, public spaces, allowing for much more enjoyment and a better social life. Access to basic products and services, such as housing, water, electricity and others, are negatively impacted under heavily regulated, anti-competitive and bureaucratic administrative systems. Similarly, access to services of all types, and the costs of living, are negatively impacted when there is insufficient connectivity throughout a city's street network, making infrastructure and public services much more expensive in the long run. Therefore, an Accessible City is one that allows markets to play a more important role in public service funding, and one where cities achieve better design and funding for infrastructure and public spaces.

Fourth, a Resilient City refers to strategies to mitigate and survive natural disasters, with green infrastructure planning, and strategies to reduce pollution, allowing cities to survive, despite the threats of global warming, and to avoid having an increased negative impact on it. Cities must be planned to foresee extreme natural events that occur every 50 or 100 years (or even more severe events if the planet continues to increase in temperature). Therefore, a city that finds itself in a crisis over an insignificant rainy day is destined to fail. And so we now see that cities that failed to adequately plan its rivers, streams, lakes, beaches, water reservoirs, steep mountain sides, geological fault lines, and other high risk areas in a city are now suffering the consequences year after year. On the other hand, cities with clear strategies to protect those elements through smart, public space design of linear parks and boardwalks, and smart regulations for water harvesting, among other strategies, not only manage natural events much better, but they also use these spaces to contribute to the cultural, environmental and architectural richness of a city.

Finally, a Transparent city, one with systems of effective Co-Governance, refers to a city with open data, using participatory models and technology to empower citizens in decision making, for public funds management, and for access to information. The traditional model of central planning of infrastructure and arbitrary administration of public funds is becoming more and more obsolete. Today, citizens have access to tools that could allow them to participate in real time decisions about how they want their tax money spent, and in defining their neighborhoods investment priorities. In that sense, some cities have now espoused participatory budgeting tools, infrastructure sustainability financing tools, public and private competition tools, for improved public service options, and tools for increased access to information and indicators. Through all these, the freedom to decide for their own lived and for the future of their own neighborhoods are brought closer and closer to citizens themselves.

Nevertheless, beyond the tools developed within these five categories that any city can innovate with, for these to qualify as smart city tools, they must reflect as many of the following principles as possible:

Common sense: prioritizing of practical solutions and that really work over technological or complex solutions, in order to improve the wellbeing of every citizen, particularly for the most vulnerable or marginalized in a society.

Human scale: promotion of walkable and livable cities (based on the urban planning principles of 'Reforma Urbana').

Vibrant economies: promotion strategies that reduce poverty and maximize the financial resiliency of families and of the local economy.

Energy efficiency: promotion of strategies that reduce pollution and negative environmental externalities, and those that help mitigate climate change locally.

Care for the planet: care for natural ecosystems and biodiversity, as well as the sustainable use of natural resources.

Diversity: maximum flexibility and recognition of solutions that respect the diverse local cultures and traditions.

Financial resilience: maximum amount of municipal financial health, sustainability and autonomy.

Competition: maximum amount of solutions guided by entrepreneurship and private innovation, and participation of government only where indispensable.

Self-management: prioritizing self-sufficient neighborhood solutions and co-governance systems, so that citizens themselves are able to solve most of their own needs and problems with the least necessary help from the government.

Digitalization: prioritizing digital solutions for all government procedures possible and for improved public services.

The world is witnessing a wave of creative destruction that is revolutionizing the way we live in cities today. The digital era offers unprecedented solutions for entrepreneurs, but this threatens to destroy obsolete industries, including industries with great influence and political power in many cities. Even so, every city must decide which path to take. Some visionary cities will stand out during this process, becoming the most attractive and smartest cities to live in from around the world. Other cities will wait to see examples and best practices, to try to jump on the wave and reinvent themselves before it's too late.

Unfortunately, many cities today are ignoring or attempting to stop that wave, protecting business and families who got there first. Just as some cities fought the automobile industry in the past, in defense of the horse and carriage industries, or the telephone industry in defense of that of the telegraph. There is no way to stop a global revolution so powerful as the digital revolution, and your city must decide whether it will become a smart city in time, or not..■

"Implementation of smart cities" workshop, in the Guadalajara City Museum (Mexico) 2020.

Case Study

SMART Cities + SMART Plans

One of the problems facing most cities today is a great failure in their planning efforts. In the best-case scenarios, they have outdated plans, but in most cases, they have plans that are so complex and confusing that only a select few individuals have actually read them or understand them. These plans consist of hundreds of pages of diagnostics, regulations, and good intentions, without strategy or clarity. The most vital issues - those that must be addressed for the basic survival of the city - are lost among the crowded texts of confusing, and often contradicting, norms. Among such complexity, barely any plan is realized, mostly resulting in counterproductive bureaucracy.

S.M.A.R.T. plans must achieve the opposite: it must be Simple, Measurable, Actionable, Realistic, and Timely. Simple means it should easily describe what, concretely, will change, with the current goals, plan or vision. Measurable means it must establish the indicators that must be evaluated and measured for progress each year. Actionable means it must clearly establish the new infrastructure projects that must be built, and in stages, with a clear action plan. Realistic means it must be possible, and especially financially viable, but it also means that every norm or regulation that is unlikely to be followed must be avoided. Timely means that the plan must establish stages, and timeframes, for each it's projects and goals.

01 STARTUP CITY

The promotion and protection of an entrepreneurship culture is one of the most important tools for urban and economic development, for lowering poverty levels, for more and better types of jobs, for lower costs of living, for attracting foreign investment, for promoting local investment, and for improving the economic opportunities for everyone, especially for the poor.[1]

For this, the best practices in projects and public policy must attend to questions such as:

- How easy or difficult is it to invest, innovate or start, and grow, a business in your city?
- How much time, budget, and legal risk does it entail?
- The most successful entrepreneurs and talent stays or leaves?
- What percentage of people in the city (and in each of it's neighborhoods) start a business?

Mexico City (Mexico), Francisco I. Madero Street, pedestrian street project in the city's historic downtown, started in 2010.

Guatemala City (Guatemala), Sixth Avenue Boulevard, part of the city's downtown revitalization project for the Historic Downtown, started in 2011.

WALKABLE STREETS AND NEIGHBORHOODS[II]

Cities designed for a 'human scale'[iii]

The 20th century urban planning model overregulated cities' buildable space, increasing costs of entrepreneurship. This model also focused on providing maximum comfort to automobiles, separating land uses, which meant that entrepreneurs would no longer have captive customers living close by to serve daily and organically, forcing businesses to invest in expensive advertising campaigns to attract clients who would be obligated to drive a significant distance for the product or service. As a result, businesses would also be required to pay for large swaths of parking, assuming all their customers would have to drive there, giving rise to Big Box Shopping and strip malls, which mainly favored business models of large, national and international chains over small, local businesses.

A smart city must make neighborhood entrepreneurship easy, with walkable streets and neighborhood designs, allowing small businesses to open close to potential customers, serving as spaces to foster community as well, and saving the high cost of excessive parking, instead captivating customers through their windows, as neighbors walk on by.

Walkability and smart urbanism can be achieved in streets, blocks and entire neighborhoods through:

Allowing mixed uses and increased densities, focusing on regulations that line up buildings close to the sidewalk, to create a more enjoyable on-street, walkable experience.

Building wide, continuous and comfortable sidewalks, that prioritize pedestrians, not cars.

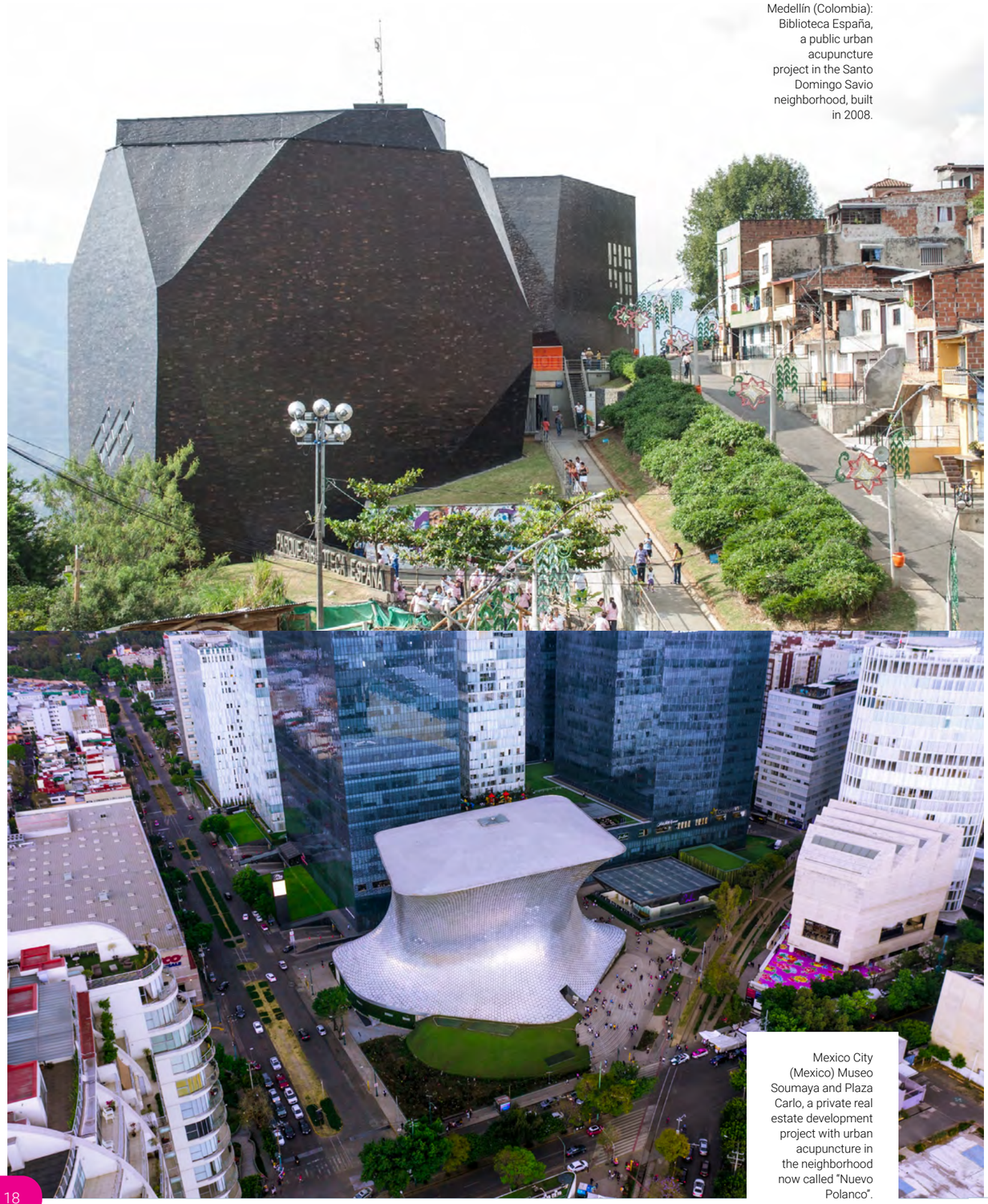
Minimizing parking requirements, favoring on street (paid) parking, back-alley parking, or multilevel parking structures over mandatory storefront parking.

Creating programs that help to redesign and bring people to some strategic streets, retrofitting them to serve as walkable, recreational, commercial, lively, main streets. ■

Tlaquepaque (Mexico) downtown walkable alleys.

Above right: Merida (Mexico) Centro Historico (Historic Center).

Right: Playa del Carmen (Mexico) Fifth Avenue.



Medellín (Colombia): Biblioteca España, a public urban acupuncture project in the Santo Domingo Savio neighborhood, built in 2008.

Mexico City (Mexico) Museo Soumaya and Plaza Carlo, a private real estate development project with urban acupuncture in the neighborhood now called "Nuevo Polanco".

URBAN ACUPUNCTURE

Economic promotion of marginalized neighborhoods through strategic public space projects

One of the unfortunate trends in many cities today, on one side, is the criteria for site selection of large public buildings, prioritizing vacant lots in new development areas. This results in great, direct benefit and economic value for landowners, which creates significant opportunities for corruption. Meanwhile, many marginalized communities deteriorate more and more, concentrating social challenges, high crime rates, and significant economic barriers for its residents.

A smart city must identify the neighborhoods with the most pressing social and economic challenges, and spearhead public and private urban projects, focused on integrating high impact potential public buildings and public spaces, and seek to spark deep transformation in the community, to create more and better opportunities for property owners and residents, to generate more connectivity, traffic and activity, bringing life to currently dangerous and disconnected spaces, expelling gang-related and criminal activity.

These programs are a useful strategy to reduce the gap between prosperous neighborhoods and marginalized communities. To make use of this tool, after identifying the priority zones, those of highest concern, it is important to launch participatory processes, to cocreate functional and ambitious solutions, together with the community.

Some strategies and tools to apply urban acupuncture programs to consider:

Parks and strategic public buildings, such as museums, libraries, public markets, hospitals, schools, among others.

Redesign and activation of main streets, particularly of neighborhoods that do not currently have distinctive neighborhood centers or adequate public spaces.

Rescue of important environmental areas or high risk of natural hazards, such as canyons, rivers, mudslide zones, lakes, dams, among others, particularly all those that can be redeveloped as recreational public spaces.

Urban acupuncture for road connectivity, to relieve vehicular traffic caused by bottlenecks, but also to eliminate the stronghold that some gangs can have when they control limited access points to an entire neighborhood.

Art and monuments that attract tourism, to activate underused, dark or abandoned alleyways, turning them into tourist, recreational and commercial destinations through creative tools. ■

Mexico City (Mexico): View of Soumaya Museum.

Antigua (Guatemala): view of the Santa Catalina arch, in a city with a focus on sustainable and creative tourism.

SMART TOURISM

Attraction of business and talent tourism, particularly from creative industries

Traditional tourism is often considered an attractive industry for its economic contribution to cities. Nevertheless, tourism is an industry that can become in an economic trap, limiting a city's economic development, increasing costs of living for local residents, making a whole city dependent on a single, recreational, seasonal industry, condemning a whole city to extremes of poverty and luxuries to which most permanent residents do not have access to.

A city with smart tourism must strive for a type of tourism of people who will want to stay to live in, not just to vacation in, but as a destination to invest in and work in, in ways that support continuous urban improvements. Attracting a regional and international talent pool is different from a vacation oriented market in that the former seeks experiences and creative industries to grow in professionally, well paid jobs, attractive and affordable housing, enjoyable neighborhoods to live in, preferably walkable, fun, beautiful and conducive to a social life. These people are willing to relocate to any city in their region or around the world, in search of the right experiences, the right job, and the right overall city, resulting in a great win for the cities they move to and for everyone else already living there, due to the net positive social and economic contribution they bring along.

To become a city with smart tourism, it is first necessary to be an attractive city to visit. These qualities can be environmental, like beaches, mountains, national parks and nature, or they can be urban and cultural, such as architecture, monuments, history, festivals, local traditions, plazas and parks, among others. Nevertheless, both of these features work only to spark curiosity, and must therefore be cultivated properly, to avoid becoming tourist traps, as single-visit destinations. Smart tourism must strive for long stays, or recurring visits, particularly for value added industries. Some of these industries are:

- Technological/ creative tourism
- Academic/ scientific tourism
- Sustainable/ environmental tourism
- Remote-work friendly cities

To transition from a traditional tourist destination towards city with smart tourism, the following aspects must be pursued:

Promotion of extraordinary experiences, sites and activities, natural or urban, highly enjoyable and memorable.

Ease of navigation and access, allowing everyone to enjoy the cities service and main destinations, both for tourists and for residents, with easy access to technological or digital tools for transportation, commerce, recreation, and more.

Strengthening of local social structures and culture, with destinations and experiences that integrate visitors with residents, not those that separate them intentionally.

Improved municipal finances, using tourism to finance the quality and coverage of infrastructure and public services.

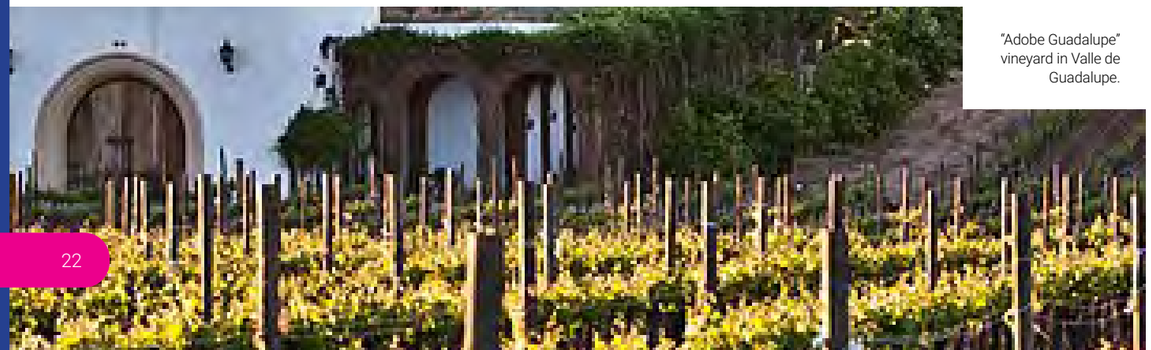
Quality environmental protection, and ecological equilibrium, with the sustainable management of high conservation value areas and of natural resources.

Incorporation of digital technologies, particularly for tourism related data collection. ■

Valle de Guadalupe (Mexico): attractive destination for tourism for its wineries, gastronomy and iconic architecture, located between the cities of Rosarito Beach and Ensenada, in Baja California.

"Encuentro Guadalupe" vineyard in Valle de Guadalupe.

"Bruma Vinicola" vineyward in Valle de Guadalupe.



"Adobe Guadalupe" vineyard in Valle de Guadalupe.

Tequila (Mexico): a "pueblo mágico" (magical town) 60 kms from Guadalajara, attracts tourists from around the world to its "Tequila Route".

Tequila plantations supervised by the Tequila Regulation Council.

The tourist train "Tequila Express".

View of downtown Tequila, Jalisco.

Tulum (Mexico): tourist destination that captivates youth from around the world its great many artistic and natural experiences, with jungles, beaches, sinkholes, architecture, and entertainment.

Black Rock City (United States): a city for 3 weeks per year, an urban, artistic, and social experiment based on experiences and community of creatives and celebrities from Silicon Valley.

View of Black Rock City, with noticeable city block formations, made up of camps, streets, plazas, and even formal zoning codes since 1997.

CREATING EXPERIENCES

Places that provide memorable experiences and help attract more and better talent for smart tourism[iv]

What type of local experiences are required for smart tourism then? Smart tourism tends to be comprised of what is now being described as "the creative class"[v], typically highly educated youth, with technological skills, from all types of technological and digital industries, who seek more than just a job, they seek a great place to live in, where they can connect with people, and surround themselves with cultural, social, artistic, and urban experiences. Experiences means art, food, music, festivals, books, movies, sports, architecture, cafes, and in summary, memories, particularly those filled with human interaction. A rule of thumb, to better understand what may result as an adequate experience builder: many people will want to post the project or experience to Instagram or social media?

Some effective strategies for the creation of experiences include:

Urban experiences, particularly when a city has good urbanism and extraordinary public spaces, as do walkable streets and neighborhoods, and those with good architecture, streetscape design and an iconic cityscape.

Culinary experiences, with food, coffee shops, breweries, streets that concentrate popular culinary and recreational spots, entrepreneurial ventures that innovate and explore new concepts, such as food truck venues, urban markets, festivals and more.

Artistic experiences, with urban spaces and constant activities that seek to visually or audibly stimulate the senses, with music, murals, cinema, sports and cultural traditions.

Environmental and recreational experiences, that help to inspire the senses and the soul through appreciation of nature and wildlife, as well as sports and recreation that helps dive deeper in the experience, such as hiking, fishing, scuba diving, rafting, cycling, etc.

Digital and audiovisual experiences, with strategies designed to create an impact for photography and video, promoting the digital creativity of social media users. ■

Burning man visitors using bicycles as transportation.

Burning Man 2016.

Burning Man 2020 "Uchronia" by Arne Quinze.

05 TOOLKIT

CREATIVE INDUSTRIES AND THE ORANGE ECONOMY

Technology and high value-added industries

Many cities continue to invest in subsistence industries, many in decay, or in manufacturing and foreign investments that require cheap labor. Smart cities, on the other hand, are those that invest in the industries of the future, of high value added, of technology, and digital tools, or even entertainment, what many refer to as the orange economy,[vi] sectors that are surging as part of the fourth industrial revolution, or the digital revolution.[vii]

Therefore, a smart city is one that is recognized for its growth in creative industries, such as:

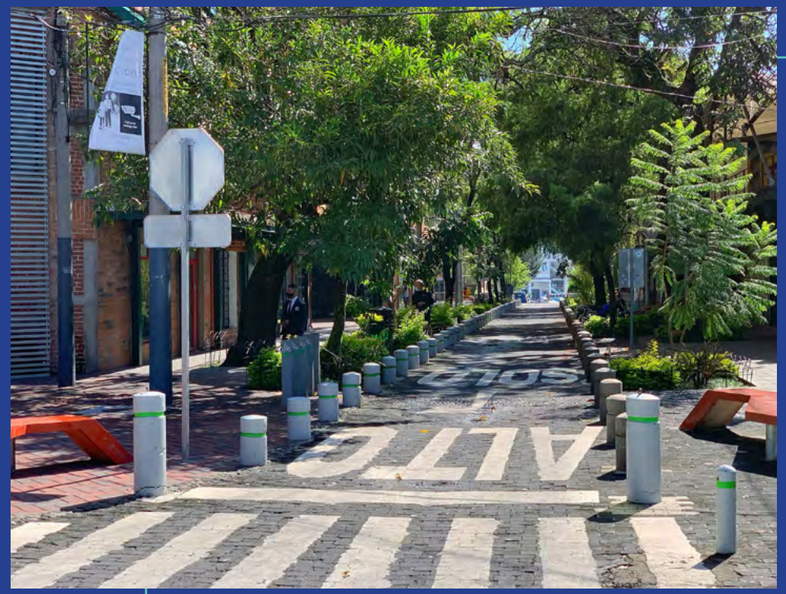
- Experiences industries
- High value-added technology
- Bioengineering and biomedicine
- Internet and electronic commerce
- Social media and digital apps
- Art and design
- Fashion and culture
- Music, films, and entertainment

For this, not only is high speed, quality internet required, but more importantly, talent, precisely from the creative class. If the entrepreneur, with a startup or scaleup,[viii] does not find the necessary talent for his company in a given city, at a certain critical point, he will have to move to a different one. ■

Hollywood (United States), known as one of the main destinations for creative industries, for filmmaking, television, music, and the arts.

View of the iconic Hollywood sign, built in 1923.

Akihabara (Japan), a famous district known for its electronics, video games, anime, and digital technology industries.



Case Study

4o Grados Norte, Guatemala City, Guatemala

A neighborhood that began a renovation process in 2022, led by the private sector, with support from the municipality, has become one of the best creative neighborhoods in Latin America, the Silicon Valley version of Guatemala. Today, it is home to a great variety of restaurants, food trucks, lofts, and schools for creatives. Nevertheless, during its first renovation attempt, the project suffered a setback, when it began attracting a great many bars and a nuisance causing style of tourism. After a brief pause in the project, the promoters redesigned their commercial strategy, and were able to turn it into a great place to live in instead.

06 TOOLKIT

CREATIVE NEIGHBORHOODS

Creativity and innovation districts that attract startups and people from the creative class

So where do we start, when trying to put our city in the map for smart tourism, for the creative class, to attract and retain talent, and therefore, smart investments? The answer: we begin with a single neighborhood.

Fortunately, it is not necessary to wait decades and for an entire city to transform, or for the entire regulatory framework, or industrial model, to change. Smart cities begin with the transformation of one neighborhood, or a couple of blocks, turning these into walkable, vibrant places, filled with trendy art or architecture, celebrating diversity, creativity, and experiences. This is a type of urban acupuncture that, instead of investing in marginalized neighborhoods, seeks to intervene and reinvent neighborhoods with an already high potential for a creative transformation.

Some of the lessons learned from cities that have attempted to create creative neighborhoods include:

Private sector leadership, from social or urban entrepreneurs, who may promote key public investments, but are mainly driven by private investments.

Definition of a creative theme, which can be art, architecture, key industries, like fashion and film making, or any concept that is able to truly captivate the creative class.

Organic growth, instead of new, massive development, these places require smaller, progressive improvements and renovation.

Celebration of diversity, with an atmosphere that welcomes everyone, particularly the creative class and people who tend to have more alternative lifestyles.

Cultural or commercial anchors, as strategic investments or destinations that will serve as detonators for recreation, restaurants, bars, and even more importantly, cafes.

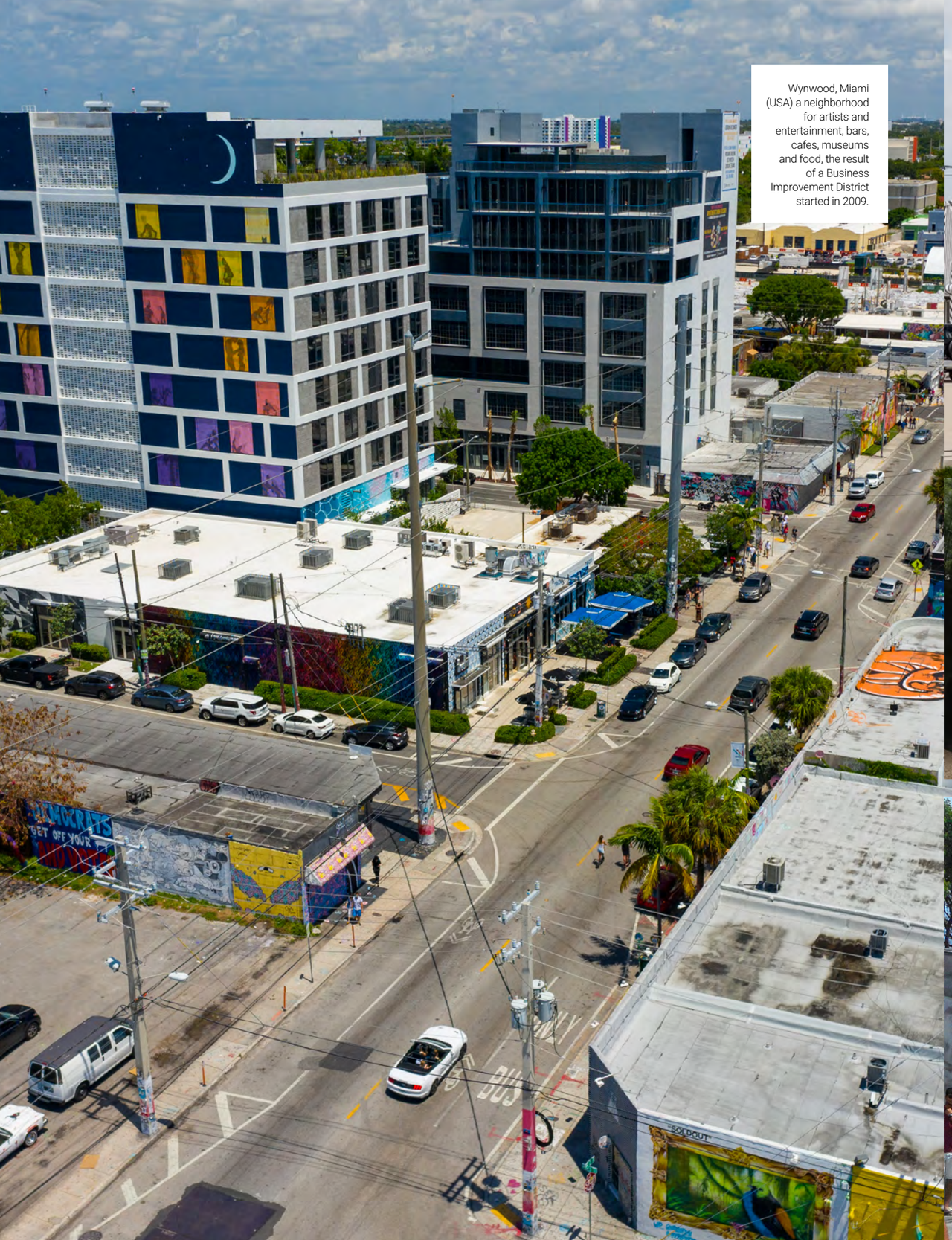
Walkability, with vibrant streets as a common denominator, which allow for walking to and from work, home, places of leisure, or simply for sitting in benches, outdoor dining, and an overall memorable urban experience. ■

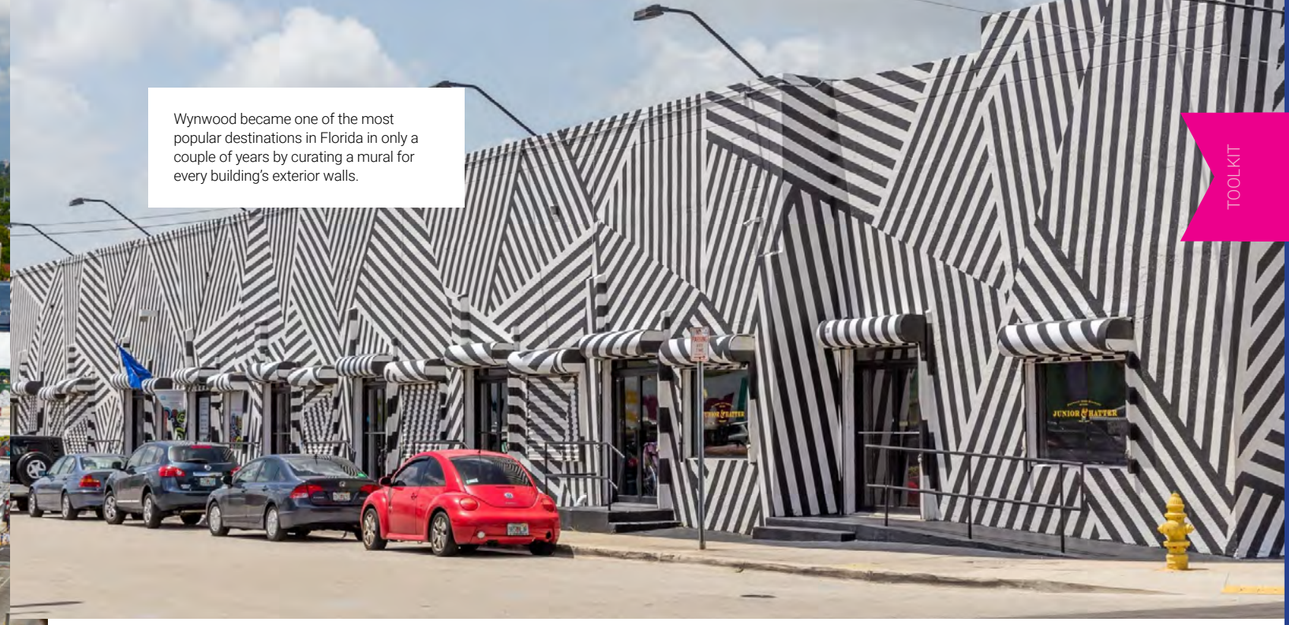
Case Study

Casco Viejo, Panama City, Panama

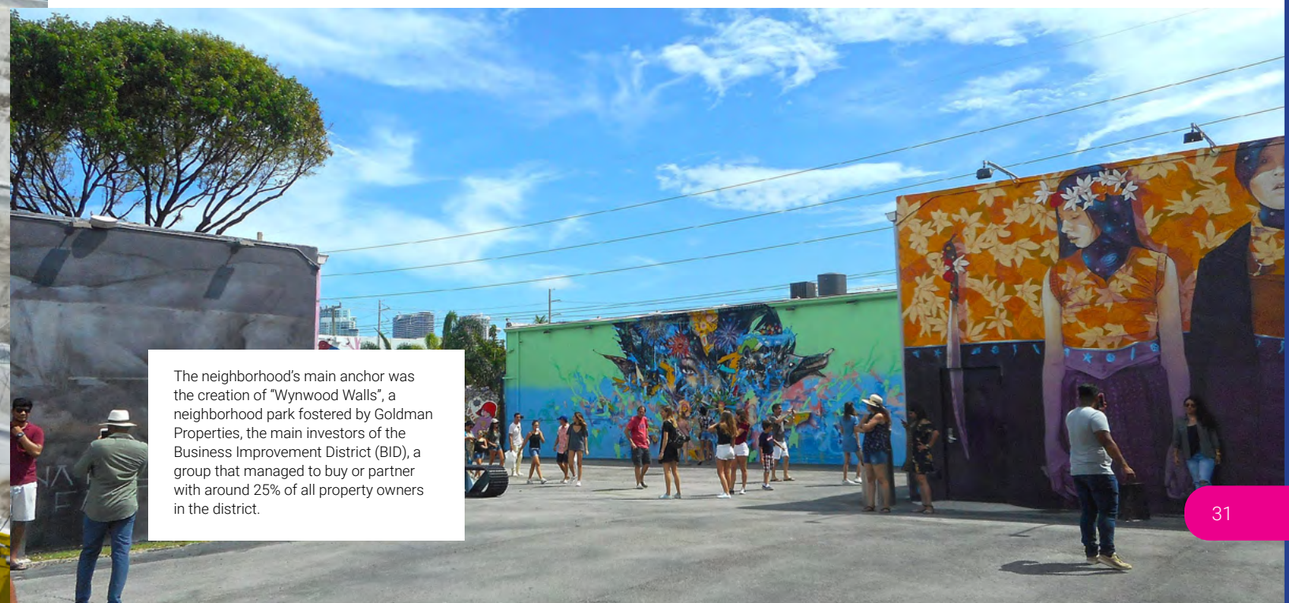
This success story of the renovation and redevelopment of a historic downtown started in the nineties. Today, it has become a creative neighborhood, a destination for smart tourism, of artists, entrepreneurs, and investors, attracting visitors from around the world, captivating many to stay and live in Panama. This place is identified by great traditional architecture, magnificent views towards the city's beautiful ocean and skyline, and is filled with restaurants, bars, rooftops, festivals, and cultural events, a great place to spend time with family and friends, and to enjoy, whether in the daytime or at night, undoubtedly an attractive place for creatives.

Wynwood, Miami (USA) a neighborhood for artists and entertainment, bars, cafes, museums and food, the result of a Business Improvement District started in 2009.





Wynwood became one of the most popular destinations in Florida in only a couple of years by curating a mural for every building's exterior walls.



The neighborhood's main anchor was the creation of "Wynwood Walls", a neighborhood park fostered by Goldman Properties, the main investors of the Business Improvement District (BID), a group that managed to buy or partner with around 25% of all property owners in the district.

Case Study

Mexico's Urban Reform

In 2012, as a result of years of effort and advocacy from cities and specialists from around the country, a working group was established for the development of a comprehensive reform to the country's General Law on Human Settlements, the law responsible for the urban planning and regulatory model still used in most cities today.

The working group was led by Senator Francisco Burquez Valenzuela, president of the Urban Development and Land Ordinance Committee in Mexico's Senate, but the group was supported by parlamentarians from most political parties, as well as by the federal government, through the Agrarian, Territorial and Urban Development Secretariat (SEDATU). More than 120 forums and workshops were held with experts, cities, professional bodies, universities, business chambers and urban activists of all types.

One of the priorities set by senators from the beginning, with which the group would struggle the most, while they attempted to grapple with a great diversity of perspectives, was to guarantee a reform that would simplify urban planning and development processes and transparency. Nevertheless, in the end, articles 59 and 60 of the new bill would include a great legislative solution, giving birth to a new technical model for regulating zoning and land use, and for improved transparency and agility of urban development permits.

After four years of analysis and revisions, in 2016 the new bill for Human Settlements, Land Ordinance and Urban Development was approved unanimously.

07 TOOLKIT

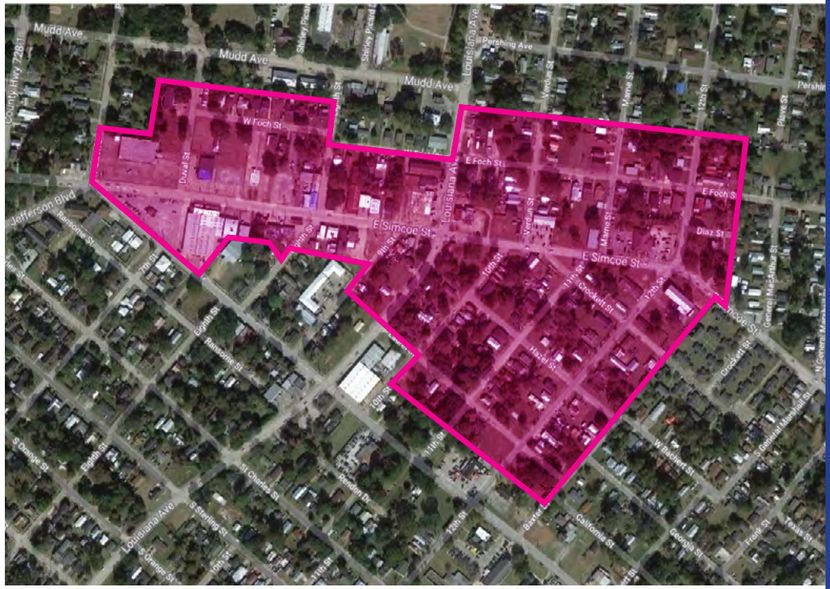
REGULATORY IMPROVEMENT AND SMART REFORMS

Identify and reform all possible barriers to entry for entrepreneurship in a city

Most cities have decades old regulations piled up, many of them obsolete, in the best-case scenario, but others flat out contradictory among them, while still others impossible to abide by. This situation favors big corporations, those with the resources necessary to hire experts or lobbyists that can help them navigate the regulatory complexities, which hinders innovation and formal entrepreneurship, particularly for small and medium sized enterprises, protecting obsolete businesses and industries.

Therefore, smart cities must launch a full scale revision of all its laws, norms and regulations, **starting with codes for urban development and construction**. The process of simplifying regulations must be ambitious, making it as easy as possible for every citizen to start a business, paying special attention to indispensable regulations for public safety.

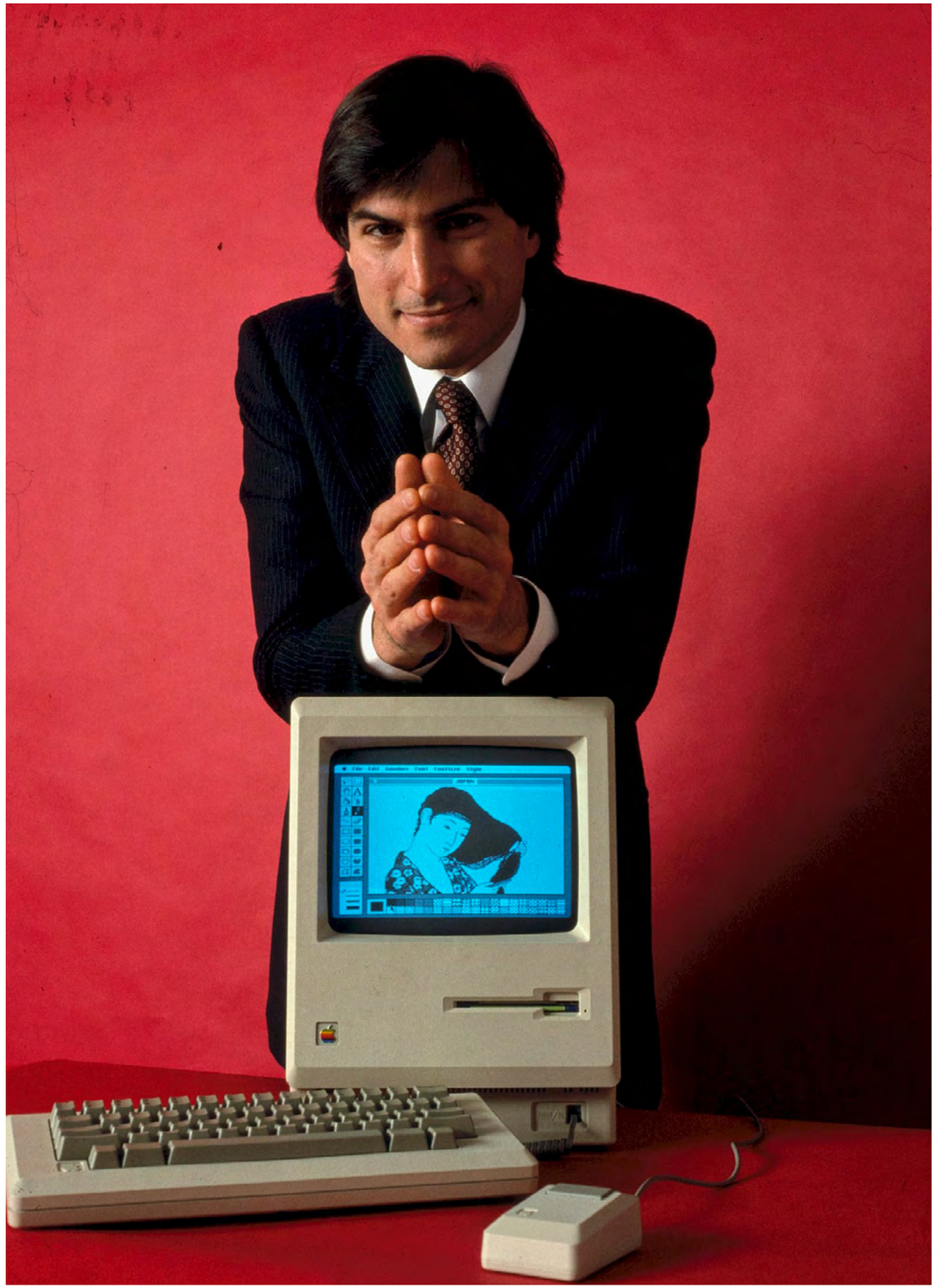
If we really want to promote business friendly cities, when revising and designing laws and regulations for a city in a responsible way, we must ask two things:



Lafayette (USA): Example of a famous Pink Zone, a special improvement district where permits for a many types of building modalities and innovations are fast tracked, a great example of the types of programs promoted by the "Project for Lean Urbanism" in the United States.

Will this law or regulation increase or reduce the amount of startups and innovations?

Is this law or regulation indispensable for long term, public safety and sustainability? ■



Steve Jobs, one of the icons of the digital revolution and of concepts now used for smart cities, started his company, Apple, from his garage in a residential zone in Los Altos, California, which demonstrates the importance of economic competitiveness and schemes that favor local entrepreneurship.

ECONOMIC AND REAL ESTATE COMPETITIVENESS PROGRAMS

Allowing diversity for as many types of real estate models and projects as possible

Real estate is one of the most important industries in a city, determining a big part of a city's overall competitiveness, increasing or lowering the costs of doing business and the costs of living for households, particularly through housing.

Nevertheless, the real estate development industry tends to be one of the industries with the most barriers to entry. On one hand, land markets may be hindering competition, controlled by one or only a few landowners, with monopolies or oligopoly trends, incentivized to speculate, or able to artificially increase the cost of land for urbanization and real estate construction. On the other hand, the bureaucratic maze that result from local regulatory complexities, given a great number of separate permitting processes, along with the costs and timeframes necessary to venture with real estate development projects, means that only large corporations will be able to successfully navigate, resulting in mass production of uniform, inflated, and low-quality housing and real estate products. This hinders investment, entrepreneurship, innovation and talent, resulting in greater socio-spatial segregation, condemning a higher number of entrepreneurs to informal markets, and pushes a greater number of families out onto distant suburbs, or informal settlements.

Part of real estate development competitiveness requires planning of land reserves, in order to free up large portions of urban and suburban land, which cannot be developed without adequate physical access.

Therefore, a smart city must promote public policy and programs that reduce barriers of entry that foster greater entrepreneurship and competition in its real estate development industry. This must be achieved, first, through policies that increase competition in a city's land markets, multiplying the available, legal land, of both small and large plots, with ready or available infrastructure, ready to be built on.

This is also achieved through greater flexibility for land use of all existing urban properties, for increased density or intensity, allowing entry to entrepreneurs willing to build or renovate not only large scale projects, but also one or a couple new homes, or commercial units, in empty plots, rooftops, or even underutilized back (or front) yards. The main goal must be to encourage the greatest number of families to undertake small real estate development projects and investments.

Besides the smart expansion and densification policies (pages 124 and 125), several tools and best practices to foster real estate development competitiveness in a city include:

Designation of a special working group to coordinate a multisector agenda, with direct support from the mayor's office, tasked with identifying current barriers to entry and bottlenecks, and to develop the corresponding institutional, regulatory and administrative reforms and solutions.

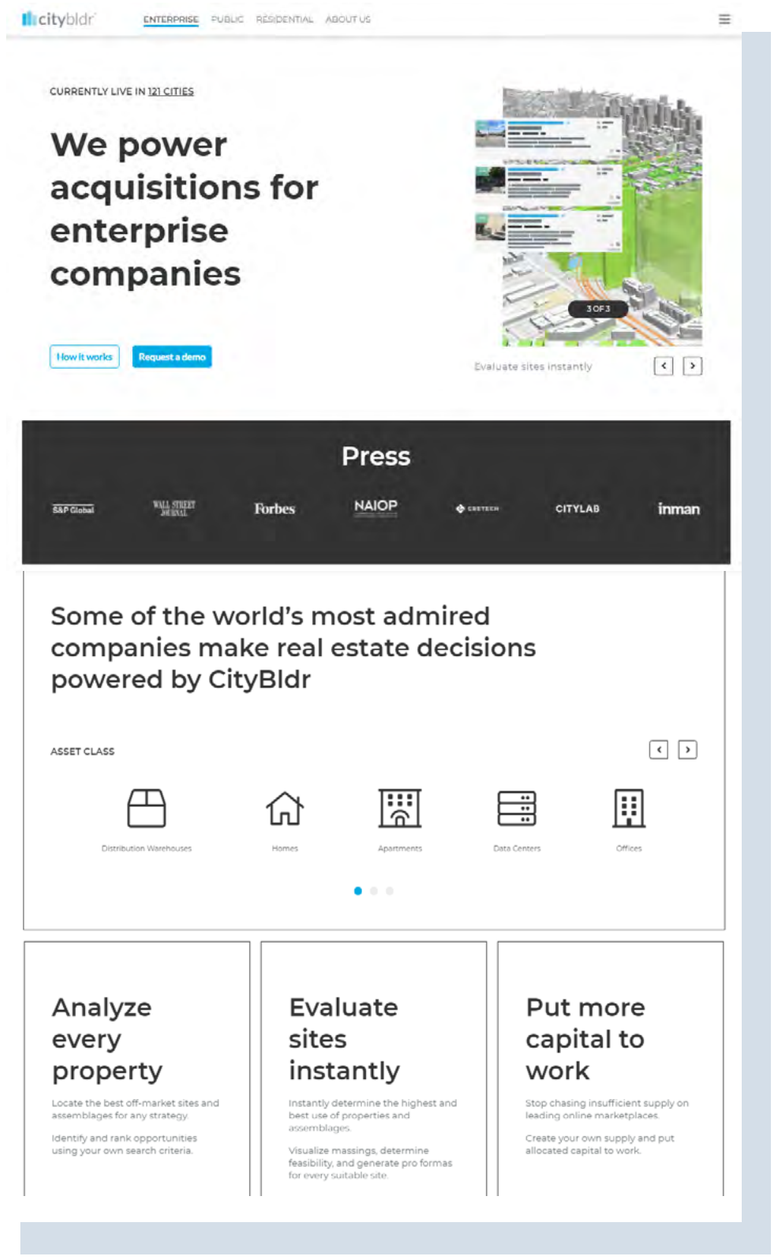
Creation of a real estate development promotion department, for the acquisition of large plots of underutilized lands, to plan, subdivide, and market these lands, particularly land with legal complications, as well as agricultural or communal lands.

Creation of a virtual, or in person, real estate development orientation office, able to guide investors, addressing any possible question they may have, simplifying the administrative process, and in many cases, to defend developers against possible extortion or corruption from other departments.[ix]

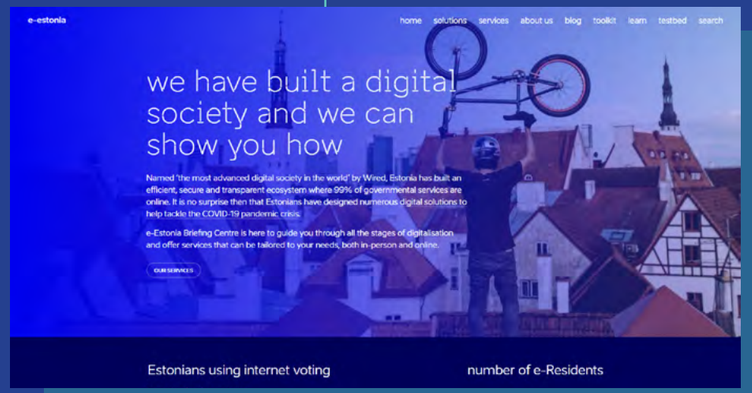
Apps and digital tools for real estate developers, that concentrate all necessary information for investors, with specific building limitations information for each plot, but also, with a list of possible building types and models allowed in each, as well as a clear path for the process to build any of them. ■

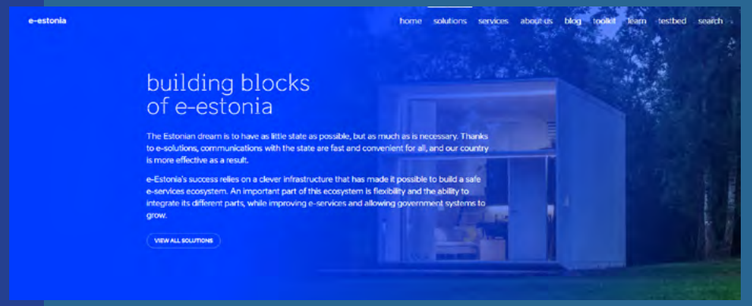
Hermosillo (Mexico): Bosco Residential, from company DEREX, an example of an innovative model of real estate development.

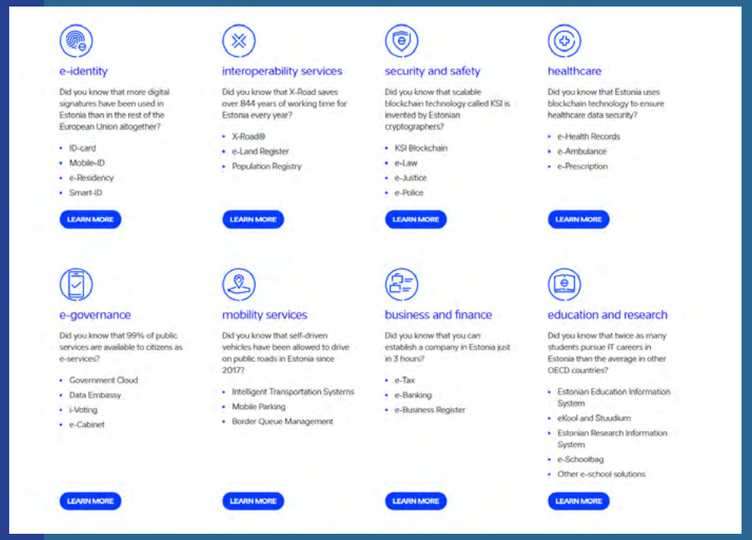
The project comes about from a collaboration with the architecture firm TAX, headed by architect Alberto Kalach, during the National Sustainable Housing Forum in 2014.



Citybildr is an American startup that connects property owners in close proximity with each other and guides them with competitive tools regarding the best land use for their properties, under collaborative development systems.







Case Study

e-Estonia, Estonia*

One of the most successful examples of transparency and co-governance is e-Estonia's governance platform. In Estonia, all public services, permits and payments are digitalized, except those for marriage or for selling your home, "but we are working on those too" states their homepage. Nevertheless, 99% of their public services today are already digital. How did they achieve this?

One of the tools that has allowed for digitalization around the country is their national identification card, or e-ID. This card includes a digital chip, and when inserted into your computer's USB port, or phone, works as an authorized digital signature, and it stores all your personal information, avoiding ever having to manually fill in a form again. This information is highly secure, protected through blockchain technology, making it impossible to hack, and so no one can access the information without direct authorization from its owner.

But e-Estonia is much more than that. First, they have an e-Residency program, that allows any citizen from around the world to become a resident of Estonia, and to subscribe to this residency program from the convenience of their home, wherever they currently are, and at a very reasonable price. Upon registration, you are shipped your digital kit over the mail, which includes your e-ID. As of today, Estonia now has over 40,000 foreigners as e-Residents from 155 different countries. This gives them access to open bank accounts online, and to open a business. Through this platform, starting a business in Estonia takes less than 18 minutes. As a result, the country now has over 6,600 foreign businesses, and is estimating a complete automation of tax payments by the year 2020, which means people do not have to worry about having an accountant or having to file yearly tax returns. Additionally, people can also vote in presidential elections online, from any part of the world.

09 TOOLKIT

SMART PERMITS AND PROCEDURES

Digital, one-stop-shops and automatic permitting processes

e-Estonia shares downloadable presentations on their webpage, to promote their know how, which ends up promoting even more investments into their country.

Beyond real estate development businesses, if the process and procedures for acquiring the permits and licenses necessary to open and operate any kind of business are difficult, confusing, costly, arbitrary or prohibitive, as it currently is in most cities around the world, then the levels of entrepreneurship and investment will be lower. Only businesses with disposable funds will be able to bear such costs, or those with special political capital with the possibility of receiving special treatment and exclusive privileges. The losers under this system are startups, both small and medium sized entrepreneurships.

A smart city seeks to simplify all procedures in order for more people to be willing and able to start a formal business, in a fast and cost-effective way.

Additionally, a slow turn around for permitting responses represents extra costs and uncertainty for investors, therefore reducing the levels of entrepreneurship. Besides, arbitrary timetables for procedures fosters corruption.

A smart city must establish procedures, controls and technologies that result in speedy, or automatic permit acquisitions, anywhere from simple construction, to zoning and land use, and development permits, tax payments, information requests, etc. Technology allows us to analyze information in seconds that previously took weeks. A vast majority of procedures may be automatic, eliminating all need for long lines or in person waits. As a result, many cities have undertaken this challenge through:

One stop shop office, where residents may obtain all necessary permits from all the different governmental departments in a single place.

Time limits on procedures, for all permits and processes, including shorter time limits on second round procedures, in the event of projects that were required minor fixes or adjustments.

Automatic approvals, those that assume that a permit is automatic, unless a mistake is spotted within a given time frame.

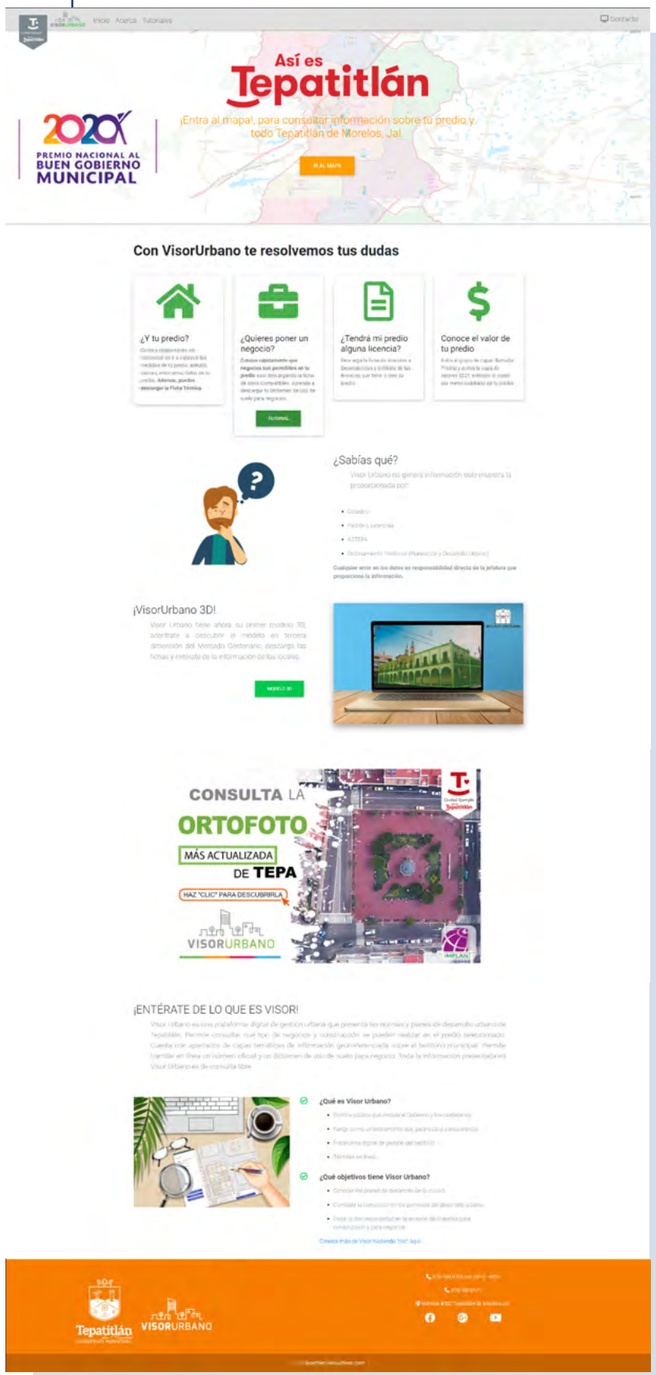
Digitalization of procedures, particularly for low to medium risk activities.

Digital portals, that allow for almost any procedure through the comfort of someone's own computer or phone, from any part of the world.

Digital signatures, that help create binding, legal documents through passwords and electronic chips, and systems that allow for even more reliability than signing with witnesses, government officials or a notary public.

Digital kiosks, eliminating human interaction and arbitrariness from procedures.

Cost reduction, ensuring the cost of permits and licenses to start almost any business become almost symbolic. ■



Case Study

Visor Urbano, Tepatitlán, México

Visor Urbano is a digital platform for urban management that presents the norms and urban development plans of Tepatitlán. This platform allows citizens to consult the development plans of the municipality, as well as cadastral information in real time for each of their properties, having informative and educational layers. Likewise, it becomes the way for the generation of online procedures that are synonymous with a process of regulatory improvement, as well as the unification of processes and corresponding legal reforms. As of the year 2021, it already has three procedures: land use report, proof of no property debt and assignment of an official number.

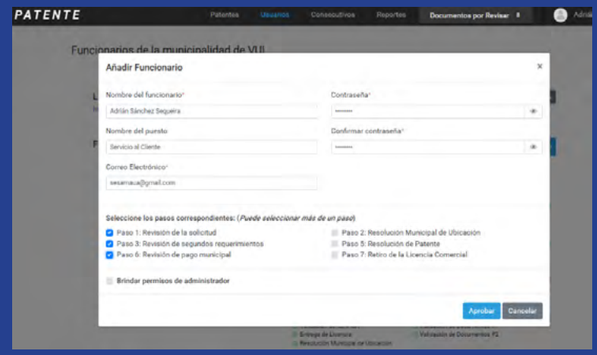
The project began to be managed in 2019, its implementation was prepared in 8 months and it has been operating for a year and a half. Prior to Visor Urbano, these procedures had to be done in person. Land reports cost almost $600 Mexican pesos ($30 USD) and were sometimes issued after two days; certificates of property debt cost $42.50 Mexican pesos and were delivered up to 1 hour after the request; and the assignment of an official number cost $50 mexican pesos and was obtained up to 3 working days later. With Visor Urbano these procedures are done remotely, with just 1 click and at no cost.

In addition, the platform empowers citizens by giving them access to the municipality's entire cadastral and information database, which previously varied among different government agencies. Visor Urbano allows the interactive use of concentrated information. The platform started with 21 layers of information; to date, around 150 layers of multi-thematic information have been published.

For the case of Tepatitlán and due to the pre-existing conditions for its implementation, the cost of the project will be around 1 million Mexican pesos ($50,000 USD). But this is totally self-financing, since the collection increases naturally when the different debts are made public.

The main challenge to carry out this project was the adaptation of the different databases for their correct processing in the platform and the teamwork of the dependencies.

The platform uses free software tools and programming languages such as Qgis, Geoserver, Visual Studio, Node Js, Typescript, Angular, Cesium JS, Express, PDFmakerJS, Java Script, AutoCadMap.



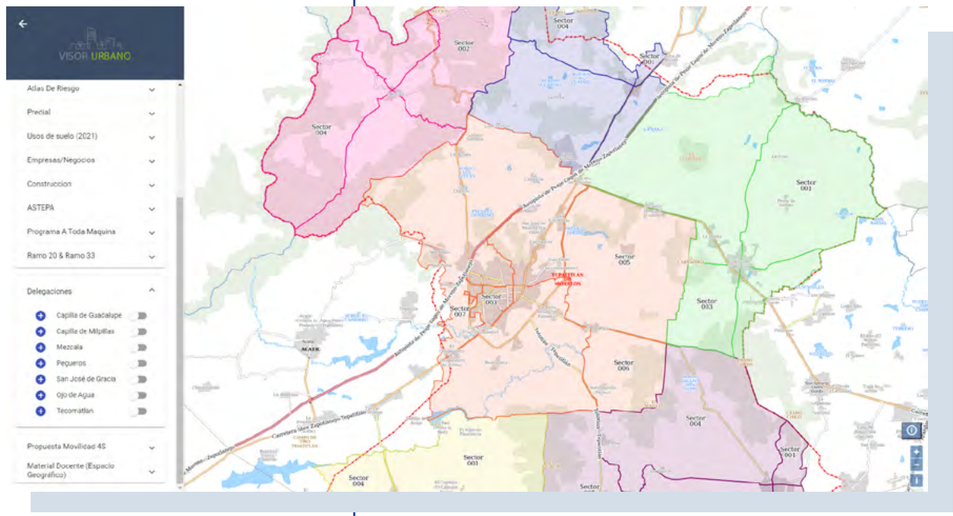
Case Study

One-Stop Investment Window Project,[xi] San José, Costa Rica

Costa Rica ranks fifth among the best places to do business in Latin America. In order to move up even higher, the country has decided to undertake a series of improvements in regulatory matters in order to reduce, accelerate and simplify the paperwork. Among the initiatives, the Municipality of San José has taken the lead, with the purpose of having greater legal security in the procedures that the citizen must manage before the Local Government, facilitating the national and foreign investment attraction.

For all this, the One-Stop Investment Window Project (VUI) has been implemented, as well as several initiatives to simplify procedures. The One-Stop Investment Window is a window to carry out procedures in Costa Rica, which will speed up the processes to manage land use, obtain licenses for commercial activities, register patents, through a Geographic Information Systems platform, so that investors can start a business quickly, in one to two days maximum.[xii]

Source: Tepatitlán Visor Urbano



Case Study

Zoning and urban development reforms for Rosarito Beach, Tecate, and Tijuana

The approval of Mexico's 2016 Human Settlements, Land Ordinance and Urban Development Law, gave rise to a process of legislative and regulatory reforms that must eventually shape the infrastructure plans, zoning codes and urban development regulations for every municipality around the country. But the urgent political and administrative challenges that confront local governments and citizens have made these medium- and long-term tools and solutions more difficult to prioritize. Furthermore, decades of standardization of the previous regulatory model have resulted in great resistance particularly from specialists and government officials, which results in only a partial implementation of the new plans and reforms, and a tendency to maintain the old model's anti-entrepreneurial overregulation vices.

Nevertheless, some cities, as is the case with the three municipalities in Tijuana's Metropolitan Area, after years of evaluation, skills building, debate and consensus building, among government officials, citizens and civil society, with the leadership of their urban planning departments, they approved new land ordinances and codes in 2021. With this reform, these cities now prioritize public space planning, protection of high conservation value areas, and of high natural disaster risk zones, creation of parks and plazas, and of a coherent street network, and street redesign, for sustainable mobility. Similarly, these plans promote compatibility matrixes with more flexibility for densification and mixed uses, through the use of transect-based smart codes.

SMART PLANS AND REGULATIONS

Regulations focused on better design for public spaces and more flexibility for the buildable space[xiii]

In recent decades, we have spent more on urban planning than at any time in history, but we have generated more dysfunctional and segregated cities, with great overregulation of the buildable space, which aims to control land uses and densities, and with minimal or inexistent open-space planning public.

A smart city must invert this model, with more and better planning of open spaces, which means streets, parks, high conservation value areas, high risk areas, with a long-term vision and greater flexibility for innovation within the building space. This would allow the market and competition to play a more important role in the regulation and constant evolution of densities, land uses, minimum yard requirements, minimum parking space requirements and other characteristics of what each entrepreneur builds or undertakes within their property. To achieve this in a safe and orderly manner we recommend:

To guarantee a smart distribution of high quality public spaces that is able to serve an unpredictable evolution of land uses and densities.[xiv]

Focus land use regulations on prohibited or conditioned land uses -those dangerous for the community- to avoid uses and activities that can really risk a loss of community life.

Regulate emission levels of noise, odors and pollution. This means rebuilding the public safety and inspection handbooks and establishing practical complaint mechanisms that guarantee that citizens are protected from imprudent neighbors. ■

"Urban Reform Labs" in Sonora (top) and in Baja California (bottom).

Case Study

Innovate Summit

INNOVATE Entrepreneurship Summit is an initiative that aims to promote innovation, entrepreneurship and productivity in Central American economies. In addition, it works as a turning point for projects from emerging entrepreneurs who aspire to create positive changes in the region.

Starting in 2020, the project evolved from a series of events that turned into a permanent program to support entrepreneurs in Central America, joined now by Mexico as well. Thus arises the INNOVATE Entrepreneurship Programme. Through a series of events that take place in the main cities and areas of Central America and Mexico, the INNOVATE Entrepreneurship Program allows for the interaction between economic agents in the region and experts in the fields of innovation, entrepreneurship, leadership, investment and business.

For their part, entrepreneurs have the opportunity to learn from experts, to bring their products or services closer to more people, and to regionalize their business ideas. In addition, they have access to permanent training spaces (diplomas and workshops), mentoring and networking that allow them to connect with other entrepreneurs from the INNOVATE community in all the participating countries from Central America and Mexico.

BUSINESS AND INNOVATION ECOSYSTEMS

Business incubators, accelerators, programs, and events that foster an entrepreneurial culture

On occasions, a city may get everything right, comprehensive reforms, regulatory improvements, neighborhood transformation, experiences creation, urban acupuncture, neighborhood transformation, all the conditions necessary for an economic revolution; yet, for some reason, nothing changes, the fire does not catch on, the city's entrepreneurial spirit may still not come about.

To this end, smart cities may have to provide the local economy with an extra boost through innovation and business hubs, which can be promoted both as departments from public sector initiatives, or as social enterprises from the private sector. It is necessary to promote success stories and to create social support systems that encourage young people be willing to learn by trial and error. Sometimes, there may still be regulatory, administrative, or cultural barriers to business and innovation which will not be readily identified until entrepreneurs get organized and begin a more structured dialogue with decision makers. It is important that these spaces for dialogue give a voice first to new entrepreneurs and to scaleups from creative industries, avoiding scenarios that may otherwise empower established entrepreneurs that may be incentivized to promote economic models that protect them against competition, which is the opposite of what is required in a Startup city.

Guatemala (Guatemala): A scene from the 2019 Innovation Summit.

Examples to follow from Latin America include:

Innovate Summit, in this space every year entrepreneurs and innovators from all over Central America meet in Guatemala with investors and successful entrepreneurs. The objective is to promote innovation in the Central American region and offer participants forums, training and entrepreneurial skills.

Road to Innovate, a series of events prior to the Innovate Summit that are organized city by city around the region.

Sonora Lab, a case study from Mexico, which, in collaboration with Harvard, managed to promote training programs for entrepreneurs and social innovators, and promotes events and programs in a space known as The Bunker.

Department for Innovation and Technological Sectors of the State of Sonora, an institution born from the Sonora Lab program, which now allows or public funding and support for innovative industries.

Tijuana Development Council stands out as a program funded with public resources, from the Baja California Business Trust, designed to support projects that help trigger the economic and social development of the city.

Tijuana Innovadora, a civil society forum that has become one of the world's benchmarks for promoting innovation and has given life to various social, environmental, and cultural programs and hundreds of local ventures, another positive example from Tijuana. ■

Las Vegas, Nevada (top) and Scottsdale, Arizona (bottom), two cities located in one of the world's hottest deserts, enjoy a vibrant nightlife economy.

EVENING ECONOMY

Doubling the capacity of the current urban infrastructure beyond daytime use, with evening demand[xv]

Cities that are currently designed exclusively for automobiles result in significant underutilization of its infrastructure, particularly that which is used for moving and storing cars, having little use after five or six in the afternoon. Furthermore, a common misconception many cities have, particularly those in hot, tropical or desert climates, is that walkable urban models are not feasible for them. Nevertheless, most of these places ignore one of their biggest assets: their excellent night time weather. A smart city would instead promote and facilitate all sorts of industries and public services that can operate during alternatives hours. This would provide twice the benefit, allowing for both public and private infrastructure to be redesigned and used much more efficiently, diversifying and growing the local economy, catering to a much more diverse range of users.

In this manner, a smart and sustainable nocturnal economy strategy entails:

Creating sites with identity, designed for community life to be enjoyed during afternoons and evenings, such as public markets and streets that are turned into pedestrian only streets at nights.

Concentrating noisome or high impact industries in special districts, allowing for casinos, night clubs, stadiums and event centers to serve as tourist attractions without affecting residential life.

Promoting commercial diversity, for nocturnal industries, which activate streets and key sites during evenings, without depending on any single industry, and avoiding noisome or high impact venues.

Emitting nocturnal exemptions for regulations, particularly in key sites that are being targeted for nocturnal activation, to foster small and medium sized business ventures, for food vendors and temporary markets, food trucks, and services of all kinds, as well as for transportation and product delivery.

Providing essential services, especially transportation, for night shift workers. ■

Phú Quốc (Vietnam).

Case Study

Sonora, Mexico

Cities in the Sonoran Desert typically exceed 50 degrees Celsius (122 F), arguing against its walkability potential for decades.

But in 2012, an unexpected phenomenon is born, private sector, outdoor, food truck parks, which have sparked a vibrant nocturnal economy, with a great diversity of culinary startups. Since then, more than 4 similar nighttime parks and districts have been created in Hermosillo, as well as in medium sized cities like Nogales and Navojoa.

View of the Panama Canal.

Tsi Ying Island in Hong Kong's industrial zone.

HIGH-VALUE INDUSTRIAL AND LOGISTICAL ECONOMIES

Attracting smart foreign direct investments

Promoting creative industries, and local startups and scaleups, is a smart strategy. The creation of small and medium sized creative businesses results in a very favorable economic growth and spillover. Nevertheless, the international manufacturing industry, foreign investments and logistical industries continue to be a great opportunity for underdeveloped cities.

Therefore, a smart city diversifies its economy with traditional industries as well, which not only allows them to accelerate average wage increases for some of their most impoverished sectors, but this also attracts skilled labor and technical skill development for the working class. This can be very favorable as long as it isn't pursued through strategies that inhibit creative industries and local startups.

Smart cities can plan logistical strategies that promote industrial development, independent of their geographical location. For this, they can consider:

Basic international or regional logistics infrastructure, like ports, airports, and train stations.

Logistics income as a municipal finance tool, ensuring that the costs of infrastructure and its maintenance is paid by the logistics industry, to provide locals with high quality urban infrastructure.

Storage and multimodal transfer facilities, allowing to store all sorts of products without having to transport it through the city, avoiding wear and tear and traffic on urban infrastructure, and in any case, facilitating the transfer of local merchandise into smaller vehicles, more compatible with urban streets.

Specialized logistics infrastructure, of significantly lower cost, that specializes in a much smaller and higher value-added niche, such as ports for sail boats and yachts, heliports and airports for smaller luxury planes, among others.

Smart technologies for logistical efficiency, aimed at amplifying the capacity of current land and physical infrastructure, avoiding long lines and unpredictable traffic using technology to manage appointments, wait times and virtual check-ins.[xvi] ■

Case Study

Puerto Cortes, Honduras[xvii]

Puerto Cortes is the most important port city in the Central American Caribbean. The port was given in concession to the private sector in 2014, with the purpose of modernizing it, increasing its efficiency, and therefore, the municipal income derived from its operation. 4% of the port's income is paid as commission to the city, equivalent to approximately $15 million USD, strengthening municipal finances, allowing the financing of innovative and attractive urban projects. The city obtained an international fair logistics certification and is currently working on the creation of a dry port, or pre-port, seeking to become even more competitive on the global market, with the necessary, modern logistics conditions (Customs, parking, shipping and transport agencies, and more), improving local traffic management and environmental conditions.

Case Study

Cases from South Korea and Malaysia

As of 2016, Malaysia ventured with an example of a Special Economic Zone 4.0, with its Digital Free Trade Zones[xix] seeking to capitalize on the exponential growth of the internet economy and the transnational digital commerce. The Digital Free Trade Zones (DFTZ) seeks to facilitate trade between countries, allowing the easy export of goods acquired through online platforms (eCommerce). These DFTZs consist of three main components that make up both its physical and virtual zones:

eFullfilment Hubs: with distribution centers that help small and medium sized businesses speed up its exports.

Satellite Services Hubs: to connect businesses with key actors, and financial services, as well as last mile delivery, insurances, and others important for international commerce.

eServices Platforms: for the expeditious management of Customs authorizations and other export related processes.

On the other hand, in 2019, South Korea began a program for the promotion of Special Economic Zones 5.0, in the cities of Changwon and Banwol-Sihwa, projects they refer to as "smart industrial zones."[xx]

With an investment of approximately $200 million USD, they are planning for the digital infrastructure of these two cities, in order that businesses of all sorts the benefits of advanced technology that could be out of their financial reach on their own.

Studies estimate that such digital infrastructure and access to specialized information may increase its users' productivity by up to 15%.

These companies will have access to an ecosystem of sharing economies, allowing them to split costs on raw materials, inputs and different types of services, tapping into economies of scale advantages.

The Changwon smart park has the additional advantage of having access to universities and research centers, while the Banwol-Sihwa has the advantage of starting off with an already high density of small and medium sized businesses.

SPECIAL ECONOMIC ZONES 4.0 AND 5.0

Special neighborhoods, with differentiated infrastructure and regulations, designed to spark the most investment and competitive advantages possible for creative industries[xviii]

Special neighborhoods, with differentiated infrastructure and regulations, designed to spark the most investment and competitive advantages possible for creative industries.

In the previous century, some cities made a successful bet on the international manufacturing industries and were able to position themselves on the global market, particularly those assigned as special economic zones by their federal governments, creating special tax, regulation and legal exemptions in certain districts around their countries, many of which would shortly turn into some of the most prosperous industrial cities in the region. Nevertheless, as many of those industries are now in decline, particularly in cities that aspire to better paid and higher value-added industries, Special Economic Zones now require a new perspective.

As a result, we are now seeing the rise of Special Economic Zones 4.0 and 5.0, cities that create special environments for economic and industrial development, but now under the context of advanced digital technology, for the commercial cooperation between small and medium ventures, allowing them to achieve economies of scale and compete against large capitals, thanks to sharing economies and strategic public investments.

Additionally, these new types of special economic zones and technology parks are built im a context of significantly more integration into the urban fabric and infrastructure. Fortunately, these types of special economic zones have an additional advantage, they can be created in large part by cities themselves, without the need of federal or international legal or regulatory exemptions, as was the case with the traditional zones. ■

Photos from Changwon, South Korea.

Case Study

Seattle's Public Market + Starbucks

Seattle is home to some of the most successful businesses in the world, like Amazon and Starbucks. These companies offer thousands of the best jobs in the world, in that same clty, in such a way that each time anyone, anywhere in the world, buys on Amazon or in a Starbucks, Seattle's economy grows. This is the result of decades of business-friendly programs.

One such program is a great Farmers Market, called Pike Place Market, created in 1907, one of the first farmers markets in the United States. Thanks to this public market, hundreds of entrepreneurships were born, such as the case as the first Starbucks which opened its first coffee shop right in front of the market in 1971.

More than a common public market, though, this has become one of the most attractive and vibrant public spaces of the City of Seattle, and a great tourist destination. The experience it conveys, the way fishermen unload and sell their catch of the day, the diversity and quality of the handicraft and products from each vendor, the market's distinctive outdoor sign, which has become one of the city's photography icons, and curious experiences such as the "wall gum" make this place much more than a public market, they make it a key part of the city, and a great space for the promotion of local entrepreneurs.

MICRO-ENTREPRENEURSHIP AND ECONOMIC STIMULUS PROGRAMS

Programs to help start and grow startups of all types, both formal and informal

Many of the strategies and solutions for economic development in a city imply urban, regulatory and institutional reforms, which require time and perseverance through several election periods to eventually be reflected in the economy of households. But frequently, the needs of the community are much more urgent. Therefore, it is necessary to create economic stimulus programs that begin to work immediately, particularly programs that help these families start micro and small businesses, from home, or in their own neighborhood, helping them to become entrepreneurs and self-employed, or the generate extra income.

Some programs that have succeeded in this category include:

Neighborhood centers or public space activation with community markets, for temporary vendor opportunities, to promote neighborhood commerce, with creative rules that guarantee quality vendors and an added unique identity to the neighborhood.

Commercial alleys and public markets with an identity, for permanent vendor opportunities, focused on the social and economic development of a neighborhood. These commercial programs should include orientation, partnerships and skill development workshops with educational institutions or nonprofit organizations that can help these entrepreneurs scale up.

Microfinancing programs, for families and micro entrepreneurs, facilitating not just social financing for families, but incorporating community support systems and financial planning programs.

Local currency programs, designed for local consumption, as a tool for for cooperation between businesses, NGOs and local government, and for the promotion of local entrepreneurs. ■

View of the original Starbucks shop next to Pike Place Market.

Pike Place Market, in Seattle (United States).

Morelos Monument, in the Plaza de Armas, the central square of Tepatitlan de Morelos (Mexico).

Tokyo (Japan): Hachiko Monument, a famous mascot in the from the city's history.

INCREASED LOCAL GREATNESS AND IDENTITY

Programs to design and highlight a city's best features and to kick start a more distinctive urban identity and a sense of local pride

A historic lesson of societies is the way people modify their behavior according to their perception of their environment, expressing disdain or pride towards it. When residents perceive a mediocre, abandoned, unfair, or ugly city, their interest in taking care of it or improving is low, and so is their interest in entrepreneurial or creative ventures, causing a negative feedback loop. Additionally, this creates a culture where the most admired and respected people, which young people aspire to become like, are gang leaders, drug lords, or personalities that contribute very little to the creation of a better society.

On the other hand, when residents cherish their city's wonders, when it conveys beauty, greatness, opportunity, this not only stimulates creativity, innovation and entrepreneurship, but the citizens themselves become the main ambassadors in promoting their city, talking about it, sharing about its great history, virtues and beauty to all who visit, feeding a positive feedback loop of economic promotion. Furthermore, it is precisely in cities like these where talent thrives, academic, scientific, athletic, entrepreneurial, political and creative talent, inspiring future generations more than imaginable.

A smart city can therefore invest in some simple strategies to improve residents' perception of the city they live in.

Strategies for the creation, identification, and promotion of extraordinary sites from around the city, helping everyone to readily identify their city's most memorable places, with history, or even urban legends, worth sharing.

Strategies for promoting key historical or outstanding personalities, worth being proud of, which historically was achieved through monuments or murals, but can now be achieved through alternative mediums, documentaries, film, theatre, etc.

Intentional positive news, identifying and promoting all those news that are cause for celebration, optimism, and admiration.

Support for local sports teams, causing fandom based on a local identity that competes, and even exceeds, other cities' levels.[xxi]

Communication strategies that reflect a local identity, using styles that residents can relate with, conveying a sense of pride and belonging (ie: "Don't mess with Texas" littering awareness campaign). ■

Iconic statue of the Little Mermaid in Copenhagen (below), and same statue at an exhibition in Shanghai (middle), as part of a global promotional tour of Copenhagen, and a bus with an image of Hachiko in Tokyo (below).

Case Study

Walk of Fame, Tijuana

Tijuana has the challenge of being a border city, where many immigrants are expelled to during deportation from the United States, others there just passing by, and others still as temporary workers, with little or no interest in settle there. Furthermore, media, movies, and governments have labeled Tijuana as a cradle for cartels and organized crime, as a war zone, and with extreme poverty.

But Tijuana has a different face, which many don't know of. The city is the birthplace of singers like Lupita D'Alessio, and personalities like Carlos Sanchez, head of design for Ferrari, major league baseball players like Adria Gonzalez, Benjamin Gil and Esteban Loaiza, as well as boxing champions like Erick (El Terrible) Morales.

Aa a result, the local organization of Tijuanna Innovadora promotes a program called "Walk of Fame", seeking to recognize personalities that were born or migrated to Tijuana, who made a successful career in the arts, sciences, sports or business, who have transcended with fame throughout the country or the world, positive role models that serve as inspiration for future generations.

Today, the Walk of Fame is located in several areas of the city such as sports facilities and even in the airport, and it includes over 100 figures, with more added every year.

Photos of Hollywood's Walk of Fame (top), and the "Off- Road Walk of Fame", representing the famous Baja 1000 race in Baja California.

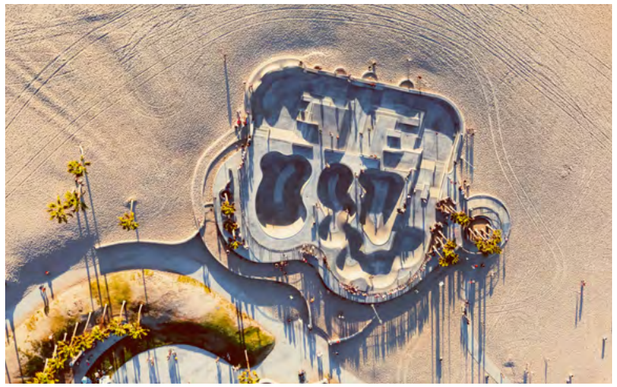
Case Study

Mill Ends Park, Portland

The City of Portland is known as one of the greenest cities in the United States, and with among the best public spaces. As a part of this local identity rise all sorts of creative ventures that reinforce this sense of belonging, as shown by the story of Mill Ends Park.

This park measures less than a squared meter (0.62 m) and has the Guiness World Record for being the smallest park in the world. This resulted from a sort of tactical urbanism joke, from a newspaper writer who planted a tree in the middle of a street in 1948. But this small park has been the subject of a great many urban legends, leprechaun stories, treasures, news stories, activism, and stories celebrated by local residents, who recount about this project with great pride. It is a story worth looking into for every city as it can serve as inspiration for implementing creative ideas at little or no cost.

South Beach, Maimi (United States): Muscle Beach.



Venice Beach, Los Angeles (United States): Skate Park.

SMART ART, SPORTS AND CULTURE

Strategies to cultivate art, culture and sports programs in a direction that helps build a smart, distinctive local identity

What do art, culture and sports have to do with entrepreneurship and economic development? In some cities, not much. Unfortunately, most cities address these issues in a very limiter way, as through the construction of extremely expensive sports fields or stadiums, which, in the best-case scenario are used mainly or exclusively by sports leagues or companies, contributing very little to its surroundings.

A smart city must address these issues differently, seeking to turn art, culture, and sports into an effective tool for economic, social and human development, and for the development of local talent, artists, painters, movie producers, singers, musicians, professional athletes, and inventors. In turn, this vision can spark the creation of museums, galleries, stadiums, theatres and tourist destinations, key characteristics of a memorable local identity, with real local pride. This is how local creativity is promoted, and how cities can attract creatives from around the world to visit, live, work, start businesses and invest there.

But if this was not reason enough, art, culture and sports can be a key component for the activation of public spaces, for the creation of evening economies, and the promotion of smart tourism.

Therefore, a smart city should consider:

Los Angeles (United States): photo of Staples Center during the 2016 world championship of League of Legends.

Strategies for new, creative type of sports tournaments, reflecting local traditions, like street soccer, outdoor chess games, hiking, kiting, toy boat races, each city promoting and maximizing its local talent.

Non-traditional arena specs for traditional sports, which can allow for football on sand, half-court basketball games, acoustic shells and neighborhood amphitheaters, with fun and unique variations that lower the cost of such projects, also avoiding being overrun by traditional and exclusive leagues and tournaments.

Programs for the temporary use of empty lots, with cultural and sports activities, through strategic incentives for landowners to lend their properties temporarily.

Programs for rooftop usage, with incentives for investors to design and integrate recreational uses for building rooftops.

Programs based on financial rewards for schools with outstanding sports programs, through incentives for schools and administrators that invest more in their student's extracurricular activities and spaces. ■

SMART CITIES: STARTUP CITY

Case Study

Buenos Aires, Budapest and Rodas

The perspective of sports and culture in urban development has been subject to great innovations in smart cities. In 2018, we saw the way the World Olympic Youth Games were organized in Buenos Aires, using for existing or renovated urban parks. Jumping on this trend, now Paris, in preparation for the 2024 Olympic Games has designed a proposal for the creation of a great urban park, the Olympic Park, which appears to be more of a park than a stadium, integrating not just urban features for music, food and art, but also visualizing its evolution into a mixed used, sustainable neighborhood, based on the *15-minute city* concept.

But these remain somewhat traditional and risky investments for a smart city. Therefore, a better example was the 2019 World Urban Games in Budapest. This event consisted of not just tournaments but also sports exhibitions, alongside a great cultural festival, all designed to promote a new style of unique urban sports, including parkour, frisbee, BMX bikes, street basketball (3x3), laser gun races, street skating, among others.

Finally, with the future of smart cities in sight, new concepts are being introduced such as Aphetor, a sports entrepreneurship for social media influencers, made up of sports that can be played by the audience, and with an emphasis on the creation of digital content, which can be monetized by participants.

Buenos Aires (Argentina): photo of the basecamp for athletes during the 2018 World Urban Youth Games.

Rio de Janeiro (Brazil): Rings installed in an urban park of the Zona Norte, for the 2016 Summer Olympics.

San Jose (Costa Rica): Parque La Sabana.

Case Study

Guatemala's electric and solar Tuk Tuk

The solar Tuk Tuk is a great, local, automobile innovation, and the first motorcycle taxi of it's kind in the region, designed and built by G-22, with contributions by over 200 experts in technology, science, design, and art, from institutions and businesses.

The vehicle works with energy generated by four, last generation, photovoltaic, solar panels, of 150W each, for a total of 600W power, and a 1200W engine, capable of running at up to 45 kph (30 mph). It can also be charged in a typical, home outlet, but during the day, it obtains its energy from the sun, without producing atmospheric emissions or noise. This vehicle aims at reducing greenhouse gases and noise pollution that are currently generated by thousands of the country's motorbike taxis. Additionally, the solar tuk tuk represents a significant opportunity for cost savings on gas, oil changes and maintenance from traditional internal combustion vehicles.

The project is currently developing a solar-electric kit that can be adapted onto existing tuk tuk's with $3,000 USD or less, which would include insurance and road and safety training for drivers.

18 TOOLKIT

INCENTIVES FOR DISTINCTIVE, LOCAL TECHNOLOGIES AND SOLUTIONS

Allowing easier entry for local innovations and technologies that are typically discouraged by corporate lobbying and federal or international norms

One of the current challenges of the economy of most cities is that a large part of household spending goes to companies based in other cities, or abroad, that represent employment and economic development for the cities in which they are based. By this we mean automobile services, electric power or gasoline, home construction, food and beverage industries, among others.

The problem is not really that they are foreign companies. If their services were really the best option at the best price, they would represent savings for families that would be reflected in greater purchasing power and therefore in greater economic development of the cities. The problem is that these services and technologies are often much more expensive than they could be considering local alternatives. However, local laws and regulations often respond to national or global inertia and lobbying, which protects foreign industries against local competition.

Therefore, a smart city must remove barriers to entry and encourage innovation and entrepreneurship, even with technologies in industries that initially will pose unknown health and safety risks.

The following industries could be promoted from the local level:

The automotive industry that allows for much greater diversity and innovation in all types of vehicles, cars, motorcycles, scooters, skates, electric bikes, drones, etc.

The housing industry that allows much greater diversity in housing typology, as well as in materials and construction systems.

The transportation industry for people and products, allowing new vehicle and fare alternatives.

The electricity markets industry, allowing for much greater innovation in systems for the generation, storage and transportation of electricity.

The beer and local or craft liquor industry, which beyond sounding insignificant or secondary, tends to be one of the most decisive industries for the creation of local experiences and identity. ■

Bali (Indonesia): the famous Green School known for its emphasis on environmental education.

(Italy): photo of TECLA, the first structure completely 3D printed with natural materials, by WASP company.

Ciudad Obregon (Mexico): Photo of Norman Borlaug with his local collaborators in the Yaqui Valley.

Case Study

Norman Bourlaug and the Hub of Cajeme, Sonora

Norman Bourlaug, 20th century agronomist and humanitarian, came to Cajeme (also known as Ciudad Obregon) in the Mexican state of Sonora and the Yaqui Valley through a research program, funded in part by the Rockefeller Foundation and supported by academic and research institutions in the city.

This agricultural bioengineering research and development ecosystem that he undertook, managed to trigger the production of new, much more resilient methods of crops. In particular, this research would:

a) Transcend national and international agricultural frontiers;

b) Help create new seeds that would resist plant pests and diseases significantly better than the local varieties to be replaced;

c) Increase agricultural production by a high percentage;

d) When new crops (soybean, sorghum) were accepted and adapted, they would be rotated and thus enrich the soil and increase their capacity to retain water. (Mario Cerutti).[xxii]

These technological and scientific advances would serve to revolutionize the agricultural industry worldwide, thereby saving an estimated one billion lives that would otherwise have been lost to famine and disease resulting from hunger and extreme poverty. This phenomenon is known as "The Green Revolution." For his leadership Norman Bourlaug received the Nobel Peace Prize in 1970 and Cajeme in Sonora was positioned for decades as one of the most innovative and prosperous agricultural and economic hubs in the country.

19 TOOLKIT

UNIVERSITY SCIENTIFIC RESEARCH ECOSYSTEMS

Cultivating a higher education and research and development ecosystem that can help attract human capital from around the world

Monterrey (Mexico): Photo of the Tec de Monterrey, one of the many highly regarded universities that attract young people from all over Latin America to study in the city.

Another characteristic associated with smart cities is the high density of higher education and research institutions, as well as the number of citizens with university and postgraduate degrees. The reason why this characteristic should be catalogued as a primary tool for fostering entrepreneurship and economic development is because higher value-added industries and innovations require this type of cities, where skilled labor abounds, as well as spaces and technology for research and development of new lines of products and services.

Furthermore, once a city reaches a critical mass of institutions and highly educated citizens, it becomes a magnet for talent and creative minds from around the world, seeking not just job opportunities and experiences, but community. They find it attractive to belong to a city or a neighborhood with people who have similar training, projects and research, which result in interpersonal and professional relationships. For this reason, a city with a large number of higher education institutions is positioned as a brand for those who seek to live in this type of environment.

As with other smart city strategies, a city can achieve change in this regard through:

University districts that encourage the development of schools and educational and research institutions, within the same neighborhood and with common public spaces that provide a memorable university experience, even if only a few schools are established initially.

Scholarships and research programs to attract renowned personalities and highly talented researchers from around the world, creating an ecosystem and community that becomes a great attraction for other talents and entrepreneurs from around the world and that allows collaboration and contribution of knowledge to organizations and local businesses.■

Boston (United States): Photo of Boston University, as part of one of the ecosystems with the largest number of prestigious universities in the world.

Case Study

Digital Education and Artificial Intelligence in Mexico

Veritas Technology VR is a Mexican company that develops and distributes educational technology products. In an alliance with Century Tech from the United Kingdom, it now offers primary and secondary education students in Mexico a digital learning platform from any electronic device.

In addition, this platform uses artificial intelligence to evaluate and personalize each student's lessons in real time, depending on his or her own performance. It offers creative learning tools and games that encourage further study and stimulate young people intellectually. Especially in times when many students have found it necessary to study from home, these tools become vitally important, and the future can no longer be imagined without their existence.

Currently, this platform is used in public and private schools in the states of Guanajuato, Baja California, Sonora and Querétaro, in Mexico, as a support tool for teachers. The platform codifies the educational curriculum, based on national and international programs, and the teacher uses the tool to assign homework and evaluate the performance of each student, with access to real-time reports of each student's progress, allowing for personalized attention to each student.

These types of educational platforms offer great opportunities for every student and teacher, using Century's artificial intelligence software, at a fraction of the cost of printed materials or traditional educational expenses. In the case of Guanajuato, the platform is used in 15 cities by more than 500 teachers and around 15,000 students.

But the application of any technology or tool of this type involves challenges. First, access to electronic devices in the most marginalized communities and, second, resistance to change by some teachers and other actors in the education systems.

LOCAL EDUCATIONAL AND TALENT GENERATING STRATEGIES

Basic and creative education programs that help empower children and communities with increased competitive advantages

Beyond the availability of university and scientific talent required for the development of high value-added industries, economic competitiveness, in general, requires education of all kinds and a workforce with technical skills.

Therefore, a smart city must drive educational improvement programs that better prepare its students to be able to compete and grow in the labor market and bring real value to their industries.

Unfortunately, many educational systems are subject to national or regional policies, as well as to interests such as unions, which are not optimal and result in obsolete programs, with old curricula that do not respond to the industries, technologies and technical needs of the present. And even when improvements in this area are promoted, in many cities young people who graduate do not find jobs related to their careers because they never received orientation on the knowledge demanded by the labor market in their city.

Finally, many of the most talented students end up underemployed, without incentives or real support, in a system that does not take advantage of their superior skills, working in industries that do not adequately compensate superior skills. As a result, young people have little incentive to achieve outstanding academic performance, and with that, a city's academic average and labor force stagnate.

To foster an educational culture of much greater value and utility in a smart city, one can consider:

Building iconic schools and educational facilities that inspire their students with architecture and technology that allow them to realize that they have the opportunity to become whatever they set their minds to.

Building public educational technology and science labs for citizens and youth to play, learn and experiment, using advanced technologies such as 3D printing.

Boosting extracurricular educational programs that teach modern skills, which are not currently being taught in schools, through local, evening programs or summer camps.

Funds or vouchers that reward the most outstanding schools, public and private, with financial incentives for the purchase of equipment and improvements to the school and incentives for their principals, so that some competition is generated between teachers and schools each year.

Collaborative programs for the co-creation of curricula between local companies and schools that meet the demands of the labor market.

Local incentives for the use of technologies and digital education programs that support schools, teachers, parents, businesses and NGOs. ■

Guanajuato (Mexico): Training of teachers in the use of Veritas digital education program.

San Jose (Costa Rica): FabLab VERITAS university research center.

FabLab Newton in Brazil, located at the Newton University Center.

Case Study

Fab Lab Querétaro

A Fab Lab (Fabrication Laboratory) is a space for the design and production of physical objects, in particular by means of 3D printers. Fab Labs are based on the concept of Do it Yourself (DIY), or self-production and open source (the free flow of information and knowledge). The concept of Fab Lab is a concept born from the Media Lab of the Massachusetts Institute of Technology MIT and eventually opened to collaboration with cities around the world.[xxiii] These labs are adapted to various types of programs and local uses, from educational purposes with programs at local or university level, to commercial purposes for the production of industrial parts, or for emergency purposes, as occurred in many cases during the pandemic.

This is how the Fab Lab Querétaro,[xxiv] which was built with the support of the School of Architecture of the Universidad Anáhuac, was also born. It is a large university space for creation, like a classroom within the Campus, where students learn about the principles, applications and implications of technology in digital manufacturing, giving life to an extensive cooperation with companies and needs of the entire city.

The machines typically used in this type of Fab Labs are rapid prototypers, which are typically 3D printers, laser cutters, milling machines to make medium-sized furniture and house parts, vinyl cutters to make flexible circuits and antennas, precision milling machines to make three-dimensional molds, and programming tools for low-cost processors.

02 MOBILE CITY

The way and ease with which people move around cities on a daily basis represents one of the most important aspects of a city's life, determining to a large extent how enjoyable or insufferable it is and how efficient or inefficient its economy is. Therefore, a smart city is one with intelligent plans and strategies for mobility, minimizing the time and costs of daily trips, the energy wasted and the negative effects of the emissions generated by those trips.

To this end, best practices in public policy and projects address questions such as the following:

- How much time do people spend on their daily commute and what means of transportation do they use?
- What percentage of their income do individuals and families spend on average on these trips each month?
- How many automobile trips do they make on average per week? How many walking?
- Which is more attractive, the automobile or public transportation alternatives? In time? In cost? In comfort?

STREET CONNECTIVITY CRITERIA

A highly interconnected street grid that reduces bottlenecks and promotes walkability

The most determining element for predicting the success or failure of mobility within a city is the level of connectivity of the city's street network. Today, many cities follow a street model of just a few high-speed arterial roadways, which connect hundreds of segregated, single-entry residential developments. This is a highly inefficient model, which results in more and more automobile traffic, despite extraordinary road engineering infrastructure and budgets.[xxvi]

A smart city, on the other hand, is one with a highly interconnected network of roads, resulting in fewer bottlenecks, less time and income wasted on mobility[xxvii], greater walkability, greater number of collective or non-motorized modes transport, and better adaptability to increases in density over time.

Smart street connectivity should seek:

A network of interconnected primary roads of one kilometer by one kilometer, to facilitate future mass transport systems.

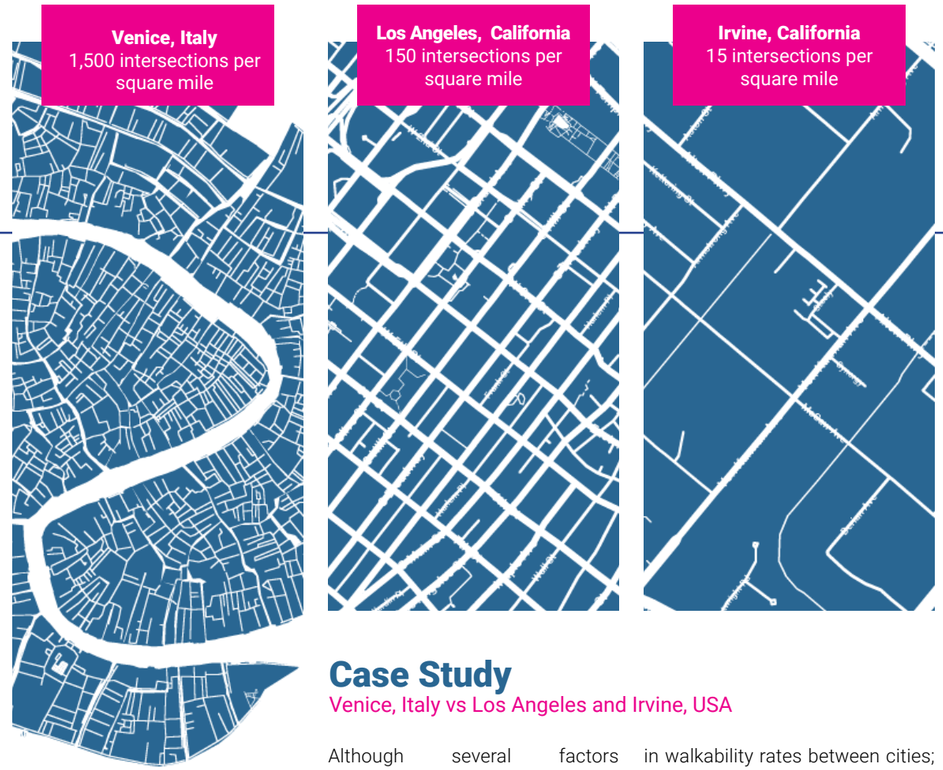
A minimum connectivity of 80 intersections per square kilometer (or about 120 x 120 meters maximum block sizes) to promote walkability.[xxvii] ■

Case Study

Bernd Pfannenstein, Geographer

"What is a gated community? A residential complex segregated from the urban environment through the use of walls or fences, with restricted access, to which only its residents can freely enter: these provide a false illusion of safety, in an urban context that has lost the essence of a healthy coexistence. We are increasingly losing the essence of cities, of coexistence, increasingly segregating and moving further away from each other. If we want safer cities, we must think about urban design. We must return to the virtues of the traditional cities from Latin America and focus on generating coexistence, building community, not exclusion. What we have today is a false illusion of security of the 4 C's: carros, cerradas, centros comerciales (cars, gated communities, and shopping malls). This model forces us to depend on the automobile, to segregate ourselves by socioeconomic level, and to create more distance from each other through sprawl, lagging in public space, replacing it instead with shopping centers. We must change this model to one that centers on urban design.

Barcelona (Spain): the famous grid of the Ensanche de Barcelona, the result of Cerdá's Plan of 1859.



Case Study

Venice, Italy vs Los Angeles and Irvine, USA

Although several factors determine preferences between different modes of mobility in a city, such as its sidewalks, zoning, transportation systems, and distance between various activities, the most determining factor in predicting how walkable neighborhoods or cities are depends largely on the number of intersections in any given area.

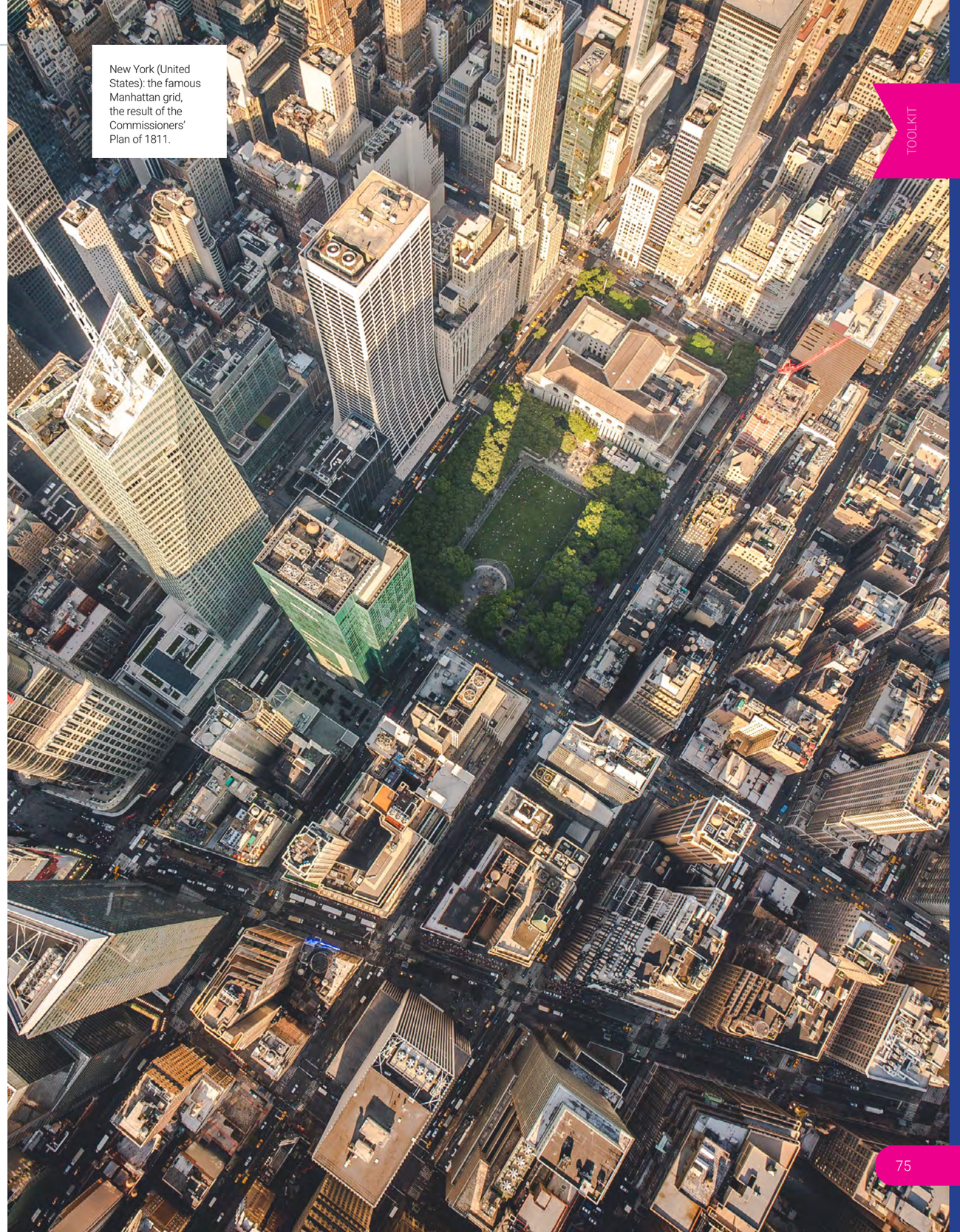
Here we can see the reason. In the same theoretical neighborhood, with two different layouts, we see in graph 1 that the time needed to walk from point A to point B, with 15 or fewer intersections per square kilometer, is approximately 25 minutes, and a total distance walked 3 to 4 times greater than that in graph B, which has 80 intersections per square kilometer, allowing a much more direct route, of approximately 8 minutes.

With this explanation in mind, we can then understand the difference in walkability rates between cities; without knowing almost anything about land use, density, quality of sidewalks, or public transportation, we can accurately predict what neighborhoods and cities will result in greater walkability.

In this case, we see the example of Venice in Italy, one of the cities with the highest walkability rates in the world, which has more than 500 intersections per square kilometer.

In comparison, the central neighborhoods of the city of Los Angeles in the US have around 50 intersections per square kilometer, which means that people do not walk much, but still some.

On the other end of the spectrum, Irvine, a suburb of Los Angeles, has less than 10 intersections per square kilometer, where hardly anyone walks, except for sports related purposes, which could itself be an unpleasant experience.



New York (United States): the famous Manhattan grid, the result of the Commissioners' Plan of 1811.

Mexico City (Mexico): *Pasaje Polanco*, a famous traditional mixed-use plaza in the heart of the traditional Polanco neighborhood.

Mexico City (Mexico): view from Calle Alvaro Obregon, in the traditional neighborhood of La Roma.

Weatherfield, the setting of the famous novel Coronation Street, a fictional town based on the city of Salford.

MIXED USE ZONING

Generally allowing and promoting proximity between residences and a wide diversity of land uses[xxviii]

The 20th century gave life to the zoning model that is based on separating urban land uses between residential, commercial, industrial, and office space. This began to spread cities out, horizontally, and to increase the time and distance between people's daily activities, more and more. This also resulted in less safe cities, due to the increase in crime-prone, low-use zones.

A smart city reintroduces a smarter land use planning model that allows for mixed uses, a model that had succeeded for thousands of years, still characteristic of some of the most successful neighborhoods in the world today, allowing for more walking and proximity between residents' daily activities.

A smart mixed-use land policy, then, should:

Define prohibited uses, instead of permitted uses, primarily focused on restricting those uses that represent a real threat to the health and safety of neighbors.

Allow the evolution of uses, instead of trying to predict the appropriate future uses for land, we must allow the market to explore and evolve towards an optimal mix.

Design architectural codes and neighborhood rules that guarantee esthetic and behavioral harmony between uses, with strict rules for noise, odors, and pollution, as well as for building styles and colors. ■

Tijuana (Mexico): The Eazy Living, a mixed-use, retail, office and housing rentals building, with both co-living and co-working concepts.

	RURAL	LOW	MEDIUM	HIGH	CENTRAL
	T0 Rural	T2 Suburban	T3 General Urban	T4 Urban Center	T5 Core
Residential: HI + HP + HM					
Housing Units	4	40	90	150	225
✦ Parking spots	4	40	90	150	225
Mixed Use, code MI;					
Housing Units	4	40	90	150	225
✦ Shopfront style	100m2	400m2	6.000m2	12.000m2	25000m2
✦ Commercial / industrial	0	0	6.000m2	25.000m2	50000m2
✦ Parking spots	4	40	90	150	225
Commercial (neighborhood, conditional, special) + industrial (neighborhood, conditional, special)					
Shopfront style	+100m2	400m2	6000m2	12.000m2	2500m2
Commercial / industrial	0	0	6000m2	25000m2	500m2
Parking spots	4	40	90	150	225
Height	6m	6m	15m	22.5m	36.5m
(Maximum)	6	-	22.5m	36.5m	free

Table of theoretical intensities of 'Urban Reform', used as a basis for reforms in the Metropolitan Zone of Tijuana.

Case Study

Tijuana's Proposed Intensity Table

During 2020, a working group was set up to design a new, much simpler regulatory framework, which would allow the city of Tijuana to move towards a new regulation model for mixed land uses and flexible densities, or intensities.

One of the first challenges for the project was the idea of regulating heights instead of densities, which have historically been regulated by measuring homes per hectare. This formula is reflected in regulations of all sorts, especially in a tax reform that had just been approved and that had no possibility of being adjusted for at least a couple of years. With this constraint, a development tax would be calculated based on the sale of "Development Rights" to developers who required "densities" higher than those currently allowed in the city's zoning maps, a resource that would then serve to finance important urban improvements.

But now, the city decided to pursue mixed-use, compact neighborhoods and cities. Therefore, a new intensity regulation model was needed, which was achieved through a zoning map that divided the entire city into 5 simple and flexible transects, instead of zones, each regulating development based on different level of intensities. The resulting Intensity Table then regulates three things: the maximum density of households allowed, the maximum number of parking spaces allowed, and the maximum height allowed for a building. Thus, an investor knows exactly what he can initially build on each of the 5 city transects. If he requires greater density, height, or more parking spaces, he can make a payment to obtain the corresponding "Development Rights", applying certain restrictions for some parts of the city due to infrastructure, risks, or cultural conflicts.

This table eliminates all kinds of traditional regulations and complexities, such as minimum parking, maximum land coverage or utilization coefficients, setbacks, compatibility matrices, etc.

Although a slightly more traditional compatibility matrix was ultimately chosen to avoid an overly accelerated transition, this exercise allowed for the incorporation of a much simpler regulatory code and began a city-wide dialogue on new possibilities for smart regulation.

FLEXIBLE DENSITY

Allowing greater heights and population density, guided by market demand and technical feasibility

The current model of suburban style development tries to emulate the quiet life of the countryside, strictly limiting heights and densities allowed within most areas of a city. This resulted in artificially accelerated urban sprawl, making us more and more dependent on cars. This also increased the price of land and housing, expelling the poorest families to the outskirts.[xxix]

A smart city is a more compact city, with denser neighborhoods, allowing the market to play a more flexible role in defining optimal heights and densities, resulting in the optimal tradeoff between housing and transportation costs for citizens[xxx]. So, a smart density policy should:

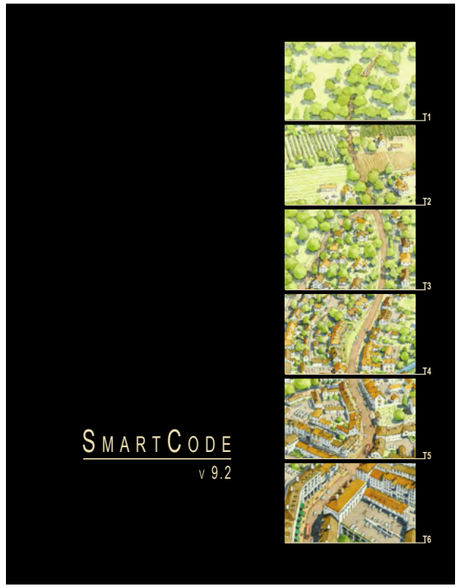
Limit densities in areas with unstable soil, ensuring strict safety rules there.

Define financing programs that guarantee the adequate adaptation of infrastructure particularly of water, drainage, electricity, and sidewalks, helping to reduce the technical limitations to increased densities.

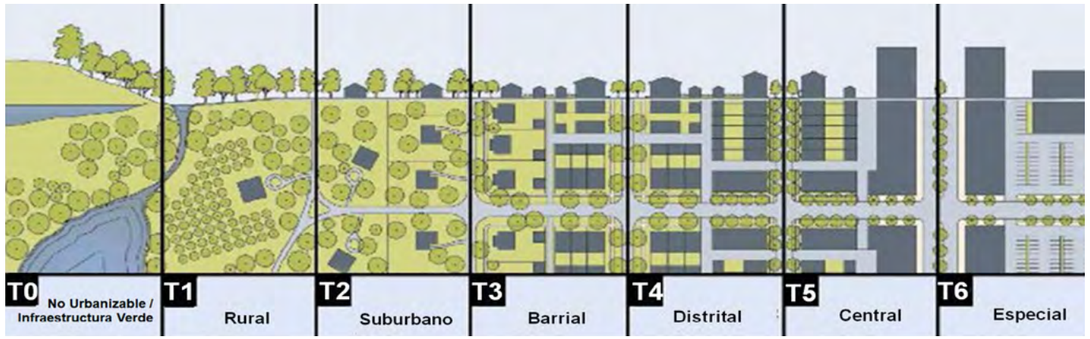
When in doubt, allow at least 5 stories: this height is greater than what is allowed in most neighborhoods today, and is the height that people historically have been willing to live in even without an elevator, and it does not generally require large, underground foundations. ■

Mexico City (Mexico): Paseo de la Reforma, surrounded by some of the tallest buildings in Mexico, the 57-story Torre Reforma and the 58-story Chapultepec 1.

"SmartCode" from the Center for Applied Transect Studies is an open source document that allows municipalities to use it as an initial basis for codifying zoning regulations to guide real estate development toward a walkable, compact, mixed-use city.



The Transect: a classic illustration depicting the natural progression of cities from rural to dense.



SMART CODES

Form-based codes that regulate the architecture of buildings and public spaces instead of land use, to generate a more cohesive urban landscape

Smart design codes are urban and architectural guidelines, also known as form-based codes, that aim to regulate the form of buildings, rather than their internal uses or densities.

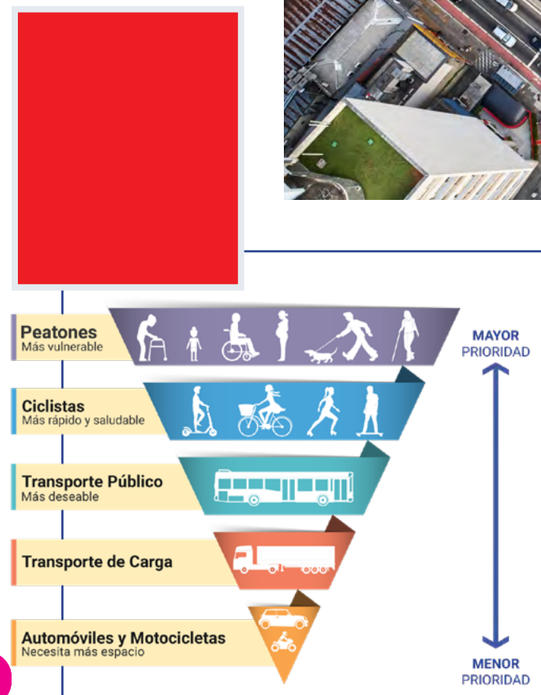
These codes are based on the transect, or intensity categories, for which specific guidelines are defined, ranging from the most rural to the most urban category. The transect is, then, a classification of areas in the city based on those that are more urban or central, which will be destined for greater use and intensity, and those that are more rural or remote, or with greater risks, destined for less use and intensity.

While some codes regulate only simple elements, such as the shape of buildings, others go into very precise details, such as color, architectural style, location, and window dimensions, materials, etc. Therefore, this regulatory model has proven to be very useful not only for new developments but also for the preservation and improvement of cultural heritage and historical preservation areas.

These smart codes seek to enhance the quality of urban development through the regulation of the architecture of buildings and streets. Thus, the buildable space maintains much greater flexibility for development, especially for mixed uses and higher densities, but at the same time, this results in the construction of much more beautiful streets, blocks, and neighborhoods, with a unique personality and *human scale*. ■

Mexico City (Mexico): The transect shown overlooking Paseo de la Reforma.

Paulista Avenue in Sao Paulo, Brazil.



Case Study

Smart Legislation, Chihuahua, Mexico[xlii]

The state of Chihuahua has undertaken a series of legislative proposals that establish the famous pyramid of mobility priorities, prioritizing pedestrian and collective transport over the automobile, but seeking to reconcile the right of all types of users, without necessarily stigmatizing the vehicle. The law also creates incentives to generate more compact, dense, mixed-use cities. The importance of incorporating this into law stems from the concern that what is not institutionalized remains subject to the goodwill of subsequent administrations.

SMART STREET DESIGNS AND MANUALS

Regulations, codes, and street designs that prioritize pedestrians, non-motorized mobility, and public transport

The current road model favors car mobility and hinders pedestrian mobility: with more and more lanes, more concrete, more bridges, freeways, and overpasses. The financial cost of this model is unsustainable and of very little functionality[xxxi] but, above all, it is contrary to what is required to make a street more walkable and a city more efficient for mobility. Smart cities have begun to redesign their streets to favor pedestrian mobility, non-motorized mobility, and mass transport systems instead of automobiles.

In addition to a better street layout and connectivity, this goal is mainly achieved with wide, safe, continuous, tree-lined sidewalks and with safe and frequent pedestrian crossings. To do this, street guidelines must consider fewer lanes for vehicular traffic, and instead, greater proportion of sidewalks, bicycle lanes, and public transportation lanes.

Therefore, it is important to have clear manuals and guidelines that regulate at least the following characteristics of street design:

Minimum connectivity guidelines for block formation, ideally no larger than 120 x 120 meters.

Total width of each type of road (primary, secondary, collectors, one-way collectors, etc.), as well as its vehicular lanes and sidewalks, bike paths (if any), and medians.

Paseo de la Reforma, Mexico City.

Technical criteria for the design of sidewalks: dimensions, materials, textures, and modifications allowed for individual plot accesses, according to the corresponding type of road.

Technical criteria for the design of safe crossings, depending on the type of roads they cross.

Location and style of parking lots on public roads, where appropriate, ensuring human scale street designs.

Types of trees and their landscape characteristics and installation techniques, including the separation between trees, dimensions, and technical criteria for underground root systems, to ensure their favorable growth.

Location and style of street furniture, and signage, as well as underground and/or aerial wiring.

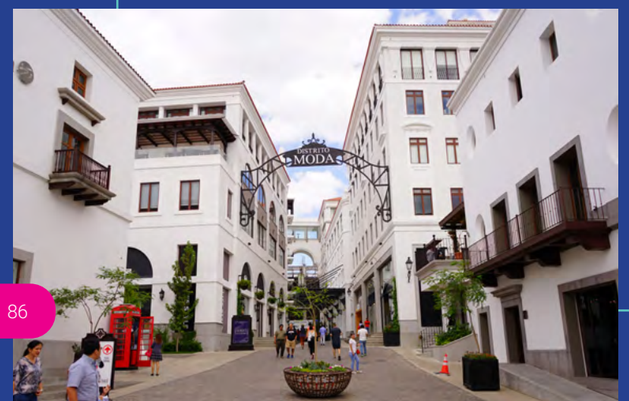
Visual illustrations, clearly indicating the permitted styles and technical specifications. ■

SMART CITIES: MOBILE CITY

Case Study

Zona 4, Guatemala

Guatemala's Zone 4 is witnessing an accelerated development boom, with high-density buildings and large-scale real estate investments. For its part, the Municipality of Guatemala, together with the private sector, integrated a self-financing plan to improve public spaces, with great focus on smart street design, which is already reflected through the area's new, wide sidewalks, and much more walkable, beautiful, and enjoyable streets.



Guatemala City (Guatemala): Ciudad Cayalá is a high-end, walkable, mixed-use subdivision in the heart of the city, with streets and plazas open to the public, ranging from single-family homes to 4-, 6- and 8-story buildings, planned in 2003 with the help of famed urban planner León Krier.

Case Study

Cayalá City, Guatemala City

This new, mix-use real estate development has become an important destination in Guatemala, known for its New Urbanism[xxxiv], open to the public, not just its residents, characterized by its great walkability, and great architectural design of its public spaces and buildings, as well as a diverse mix of heights and densities throughout the development. This project caters to a high socioeconomic housing market but contains useful lessons that will guide other smart, real estate developments.

26 TOOLKIT

INTEGRAL URBAN DEVELOPMENTS AND SMART SUBURBS

Promoting more sustainable land development models with higher density, mixed uses and better urban design[xxxii]

A new error that has arisen in many cities recently has been an attempt to completely prohibit horizontal development, in search of achieving a more compact city. The problem with this strategy is that it increases the cost of land and housing disproportionately, especially for the poorest, resulting in greater illegality and poverty[xxxiii] .

A smart city must, instead, promote compact real estate developments, even in the suburbs, making them more walkable, with mixed-uses, quality public spaces and neighborhood cores, allowing suburban residents to carry out most of their activities within the same neighborhood. To do this, an intelligent real estate development policy must:

Plan neighborhood centers that manage to articulate several independent developments, locating them within a walking distance of central parks or squares.

Define strict rules for road connectivity and sidewalk design that prioritize and encourage walkability within all developments.

Allow mixed uses and facilitate land use changes throughout most areas of the city.

Promote urban improvement programs for suburban, residential-only developments that were built poorly, with tactical urbanism and urban acupuncture projects. ■

Loreto (Mexico): Loreto Bay (pictured below) is a resort town with vacation amenities, especially golf, but designed as an integrated, walkable, mixed-use, traditional urbanism suburb.

Google Maps view of the before and after remodeling of La Jolla Boulevard in San Diego, California.

Case Study

La Jolla Boulevard, San Diego

La Jolla Boulevard, one of the main streets of the La Jolla neighborhood in San Diego, California, was converted and redesigned into a main street[xxxv]. The new design first reduced the car lanes from five to two, added roundabouts, widened sidewalks, and introduced streetscape architecture with landscaping and angled parking.

Pedestrians previously had 21 meters of pavement to cross at intersections. Now, with the roundabouts, they only need to cross between 3.5 and 4 meters of pavement at a time, with protective pedestrian islands in between (see photo at top). In a parallel route, along La Jolla Hermosa Street, bicycle lanes were included.

Planning began in 2000. The city hired a walkability consultant, Dan Burden, who led a three-day series of community workshops, or public design charrettes, to develop a vision for the neighborhood. The city council approved the project in 2004, without controversy, and the detailed engineering and design planning began.

Approximately $3.2 million was spent on roundabout construction and traffic calming. The total project cost of USD 7.2 million included main sewer replacement, planning, and engineering. Some of the funding sources were a $2 million smart growth match from the California Department of Transportation, and a transportation match from the San Diego Association of Governments (SANDAG), but also funds generated from development fees and improvement contributions.

Traffic count remained roughly the same (23,000 vehicles per day before, 22,000 after), but walking, bicycling, use of public transportation, street parking and retail sales rose to much higher levels. Retail sales increased by 30% and noise levels fell by 77%.

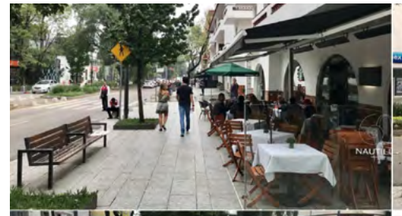
The boulevard, before a fast and dangerous street, has been transformed into a safe, enjoyable, beautiful street with great community coexistence. Traffic accidents fell by 90%. The project has helped revitalize La Jolla Boulevard, acting as a catalyst for several new mixed-use developments, a 139-unit condominium development, and a major pharmacy.

Motorists found that instead of waiting 24 seconds for a pedestrian to cross 70 feet of street, they now only wait 3-4 seconds, or not at all. Companies that feared the loss of customers arriving by car improved their business.

ROAD DIETS

Sidewalk expansion and intersection redesign for pedestrian safety and traffic calming

Regulations that ensure streets are built with intelligent design from the outset is the most practical strategy to transition towards a smart mobility future. However, a big part of cities was already designed and built under the old, car-centric model. For this reason, one of the biggest and most important challenges that cities will face, will be to redesign existing roads under a new, more walkable model.



To achieve this, cities must begin to widen sidewalks and redesign pedestrian crossings. This is achieved by:

Widening sidewalks to at least 3 meters, or preferably up to 4, 5, or even 6 meters wherever possible.

Eliminating an entire car lane for widening sidewalks.

Eliminating the on-street parking row for curb widening, where necessary.

Relocating all private parking spaces that block the sidewalk and interfere with pedestrian flow.

Reducing the number of vehicular accesses to buildings, particularly from primary roads, sending these accesses to back alleys or secondary streets wherever possible.

Introducing a row of trees that divide the street from the sidewalk, as a barrier and protection between cars and pedestrians, also as a way of providing streetscape architecture.

Extending sidewalks at corners and intersections, so vehicles slow down, allowing pedestrians to cross streets with lesser risk. ■

Case Study

Masaryk Avenue, Mexico City

Masaryk Avenue is an example of a recently redesigned street with a smart design. By removing the parking lanes on both sides from the original street, it was able to achieve wide and enjoyable sidewalks. It also integrated safe crossings, with curb extensions that bring the pedestrian from one side of the street to the other, and benches, trees, and “bollards” that protect pedestrians from traffic. As a result of this redesign, this is now one of the most iconic and functional streets in Mexico.

Case Study

Cuernavaca Railway Linear Park, Mexico City

This linear park is an excellent example of urban intervention in which the train now coexists with cyclists, pedestrians, benches, art, games and culture. This park extends through the entire area known as Nuevo Polanco, one of the newer, most developed areas of the city, with accelerated levels of densification. The problem is that not enough open spaces were foreseen in time, prior to this area's estate boom. With this linear park, non-motorized mobility alternatives are integrated with a breath of good urbanism, greenery and beautiful public spaces.

28 TOOLKIT

BICYCLE LANES WITH A FUTURE

Promoting bicycle and non-motorized mobility through isolated paths and protected lanes

One of the fastest growing trends in the design of intelligent streets is the installation of bicycle lanes and the promotion of a cycling culture. Bicycles are an excellent mobility alternative for many cities, although not for all of them.

However, the approach that many cities undertake today is not optimal, particularly when painting lines to integrate bike lanes into primary, high-speed roads. This not only exposes cyclists to too much risk, but also turns them into an inconvenience for the thousands of motorists who were already using this road, which now, with less space, becomes even more congested.

In addition, what many of these primary roads urgently need, if anything, is a widening of sidewalks, which should always be a priority over bike lanes in a smart street. Therefore, an inadequate bikeway strategy will only serve a few cyclists, those who cycle out of conviction or those who do so because they have no choice.

A smart bike path policy should be the opposite, it should design an entire network of routes, separated from primary roads, and should think of pedestrians as their best allies, hand in hand with a sidewalk widening strategy, for improved pedestrian mobility.

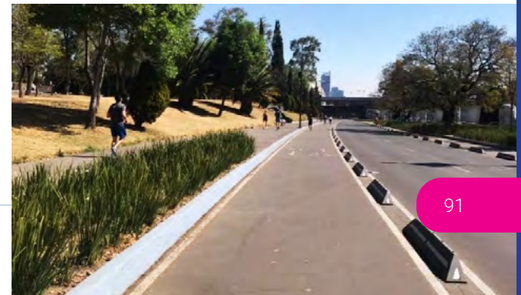
Now, with the advent of new electric bicycle technologies and with health challenges such as COVID-19, which paralyzed entire public transportation systems, the bicycle lane should not be just a fad, but an indispensable tool.

To achieve this, a smart city must:

Integrate bikeways into linear parks, especially along the sides of streams and railroad tracks.

Integrate bike lanes on secondary streets with less vehicular traffic, which will garner less resistance.

Create sidewalks with elevated bike lanes, and leave an exterior protection of trees, or at least bollards, to protect from passing cars, and to avoid bad parking practices. ■



Photos of bike lanes in Mexico City (Mexico), Cartago (Costa Rica) and Guatemala City (Guatemala).

SMART CITIES: MOBILE CITY

Electric skates and bicycle lanes in the city of Bogota (Colombia).

Jump electric bikeshare in Mexico City, Mexico.

SHARED BICYCLE AND SCOOTER SYSTEMS

Electric or non-motorized, and shared, modes of transportation, to promote multimodal mobility

One of the most unexpected game changers in the mobility game is bike and scooter sharing. This make it easier for everyone to take advantage of the bicycle mobility perks, without the traditional hassles of having to store it, put it on the bus or repair flat tires.

As if that were not enough, many of these systems are now electric, making the bike's faster, and digital, allowing users to locate, reserve, unlock and pay straight from their smart phones.

This bike sharing system is now part of the sharing economy, where volunteer "gig workers" pick them up, charge them at their homes overnight, and distribute them back for public use the next morning, and the app pays them for doing so, without the need for bureaucracy or public funds. However, this requires an urgent redesign of streets and sidewalks.

Therefore, a smart city must:

Encourage, manage, and celebrate the arrival of bike sharing systems, both for public and private bicycles and scooters.

Undertake new designs of intelligent streets, with even safer bicycle lanes and intelligent parking points, striving for order.

Define new rules of road sharing, which help to preserve order and healthy coexistence between motorists, pedestrians and new technologies.

EcoBici bike-sharing in Mexico City.

Be patient with change: we are witnessing an evolving technology that is transforming cities, smart cities must encourage patience so as to reap the best rewards of innovation, or risk being left behind. ■

ZipCar car sharing in the city of London, England.

LAST MILE, AUTONOMOUS, NEIGHBORHOOD TRANSPORTATION

Technology that connects that last mile between neighborhoods and main public transport lines

No matter how attractive a city's transportation system is, there are two factors that largely determine how well the system will work: on the one hand, both the experience and wait times at the bus stop or pick up site. But even more importantly, before that, is the experience of getting from their homes to the stop.

Therefore, one of the first things that must be undertaken to promote better mobility alternatives is an intelligent redesign of the streets within the neighborhoods, allowing transport users to reach one of these stops in 5 minutes or less, through comfortable and enjoyable pedestrian routes. However, 5 minutes walking is half a mile, which means that, when a city does not have a sufficiently structured transportation system, or sufficient road connectivity, it is very likely that users' journeys will exceed half a mile to reach the bus stop. That can result in the failure of the entire model.

To this end, smart cities are designing "last mile" modes of transportation that connect transit users through convenient, or even automated, multimodal, or low-cost transportation alternatives, transporting users from locations close to their homes to the mass transit sites. This is becoming increasingly common as technology advances, with cable cars, escalators, electric escalators, electric conveyors, and now the use of self-driving, last-mile vehicles as well.[xxxvi] ■

Transportation systems with cable cars in the cities of Santo Domingo (Dominican Republic) and La Paz (Bolivia).

Transportation systems with escalators in the commune 13 of the city of Medellin (Colombia).

Case Study

Free Rides Everywhere Downtown, San Diego

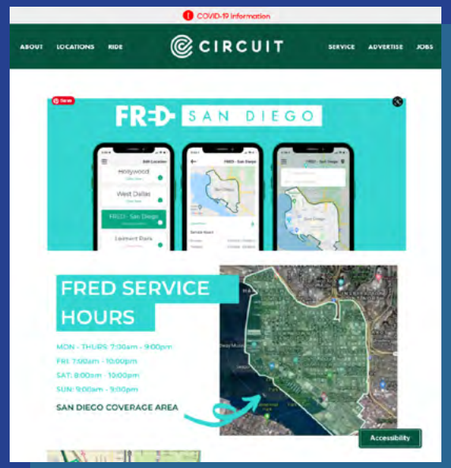
Downtown San Diego is an extremely popular destination, both for living, working, walking and enjoying, characterized by an extraordinary flow of local and international tourism. Unfortunately, in recent years its popularity has also had negative, undesired consequences, particularly for finding parking, which can take hours to do so on busy days.

This is how Free Rides Everywhere Downtown (FRED) was born, which is a free, "on demand" last mile transportation service in downtown San Diego, California,[xxxvii] that allows drivers and all types of users to park a little further away from their final destination, avoiding saturating the heart of downtown by allowing users to request a ride through a digital app, similar to Uber and Lyft, but in a kind of modern, shared tuk-tuk taxi.

This project was initially launched as a business by James Mirras and Alex Esposito in 2011, a model that offered free rides funded by advertising sponsors on top of the cars, but in 2016, the San Diego Downtown Planning Agency signed a 5-year contract with the company to subsidize its operation, a very ambitious expansion, as a radical solution for sustainable mobility in downtown.

By 2021, FRED's 6-passenger vehicles will have served more than 900,000 passengers. This equates to a reduction in carbon dioxide emissions of approximately 750 tons.

In 2021, FRED signed a contract for the extension of its contract with the City of San Diego.



ON DEMAND TRANSIT

Digital, on demand, public transit systems, as taxis or buses, that can personalize their routes in real time depending on users' pickup and drop off locations

While traditional bus systems attempted to guess the best routes, sometimes with studies and diagnostics, these systems remain highly ineffective, especially for secondary routes, outside the main routes. On the other hand, traditional cab systems are excessively expensive, and often dangerous.

Therefore, alternatives such as Uber, Lyft, Didi, Cabify, among others, have revolutionized the on-demand transportation industry. But, as if that were not enough, now there is also Uber Pool and Uber Bus, as well as a great diversity of shared bus platforms, which adapt their route, in real time, using artificial intelligence algorithms. These tools will revolutionize the transportation industry, especially as autonomous cars arrive, making public transportation a much more personalized and flexible service.

However, these tools are still evolving and exploring the market. Several cities have experienced setbacks, due to a lack of market demand, or to operation costs that are still too high. ■

Last-mile transportation systems around San Diego's Balboa Park Metropolitan Park (United States).

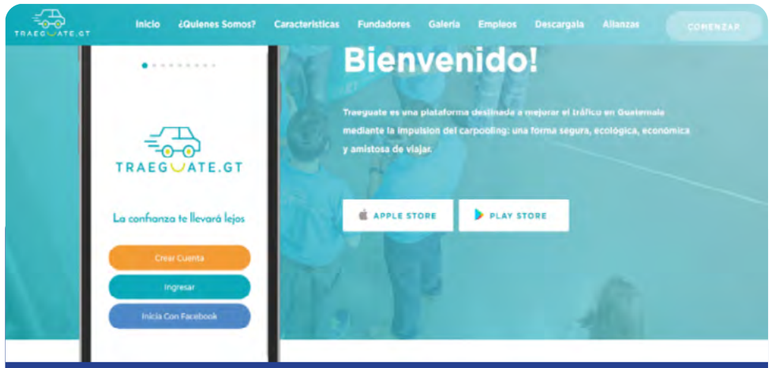
Autonomous, driverless transportation system in Espoo, Finland.

CARPOOLING INFRASTRUCTURE

Systems that promote ridesharing, helping to avoid the excessive traffic caused by single-passenger trips

Another current traffic challenge is the prevalence of vehicles carrying a single passenger. Carpooling results in significant savings, both in traffic for the entire city and in costs for citizens, but currently, this does not seem to happen by itself, it involves too much effort, and the benefit does not seem to be sufficient. Therefore, smart cities have undertaken smart carpooling strategies, multiplying incentives for people to share their rides, with exclusive carpool lanes, which avoid traffic and reduce travel time. But now, through technology, digital platforms are emerging that facilitate the process, systematizing the dynamics and improving the experience of finding daily carpooling partners. ■

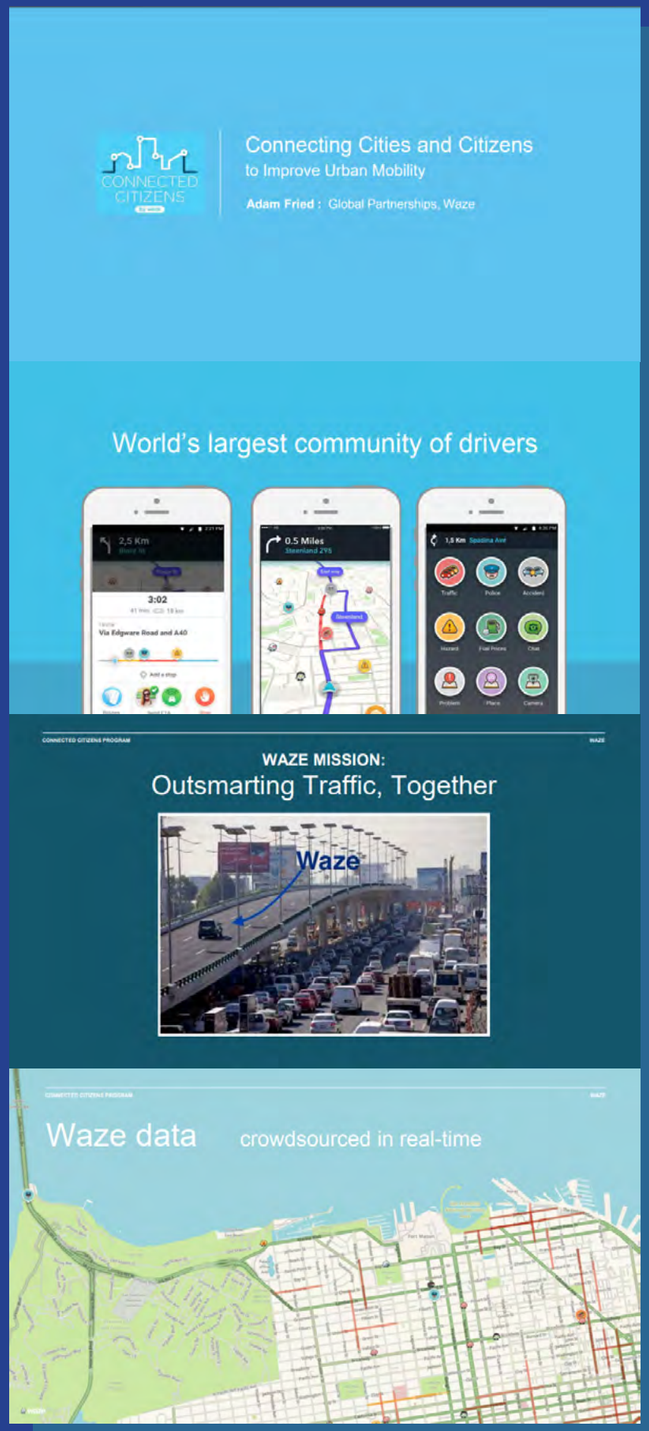
Exclusive lane for vehicles carrying two or more passengers, in the City of Los Angeles (United States).



Case Study

TraeGuate – Guatemala

Around the world, digital platforms have emerged to facilitate carpooling between people. One of these platforms was born in Guatemala and since its launch, it has had a great impact on the mobility of people, especially university students. With the support of the Municipality of Guatemala and its universities, TraeGuate has achieved various incentives and privileges for its users, resulting in an exponential and accelerated growth of the platform.



Case Study

Connected Citizens

Connected Citizens (CCP) is a Waze platform program for collaboration between citizens and local authorities to answer the question "What's happening right now?"[xxxviii] Waze is an app that allows users to contribute to real-time traffic information and thus obtain details of alternate routes to ensure they get to their destination as quickly as possible.

Through Connected Citizens, the platform exchanges information about traffic incidents or blockages that allow the authority to respond much faster, as well as road conditions in terms of potholes and dangerous crossings. Likewise, the platform allows authorities to communicate information about streets under repair, or closed for marathons or festivals, as well as warnings of flooding or dangerous conflicts.

The program was launched in 2014 and has been adopted in Mexico by the cities of Puebla, Monterrey and the Mayor's Office of Miguel Hidalgo in Mexico City, as well as by several Latin American cities such as in San José, Costa Rica, in the district of Miraflores, Peru, in Rio de Janeiro, and in Bogota.

33 TOOLKIT

SMART TRAFFIC MANAGEMENT

Modern, automated tools for managing and alleviating traffic

Another component that stands out when the subject of smart cities arises is that of technologies for optimizing vehicular traffic, particularly through traffic lights and electronic fines. However, these not only do not solve traffic conflicts, but sometimes make them worse. Drivers are forced to brake suddenly or choose to ignore the color change of the traffic light, thus blocking intersections in all directions, resulting in a complete paralysis of the area. However, there are smart intersection tools, which are an extremely useful, as they facilitate crosswalk by means of audible and visual identifiers so that every user can cross safely.

The most valuable solutions for traffic management in a smart city are those that take the citizen into account.

Through electronic devices, drivers and transportation users send constant information of all kinds to communication applications, as well as maps and directions. The sum of this information tells a "big data" story, with incalculable value. In an age of smartphones, cities that manage to compile this information in real time to alleviate bottlenecks and to communicate with users about unforeseen events and alternative routes have the potential to revolutionize the city's commuting experience. ■

Waze, in use in Brasília (Brazil).

Case Study

Urban Mobility Plan - Guatemala City

Guatemala City is currently working on an Urban Mobility Plan that focuses on five transportation proposals: a fleet of modern urban buses that will replace the old buses, a BRT or confined lane bus, a Tram, cable cars or aerometers, and finally, bicycles. With five different options, the idea is to allow the user to choose the option that best suits his or her convenience. All are designed so that, by 2032, 85% of the city's residents will live no further than 500 meters from a public transport service. All of these options are integrated, in anticipation of the city's growth, which is estimated to double in that time frame.

To improve the user experience, one of the strategies is to incorporate smart bus stops, especially for the Transmetro. The bus stop is a basic infrastructure, of great importance, where we wait for the bus, but it can be the place in the trip where the user feels more at risk. The social effect of the stress of these waits have discouraged the use of public transportation. Now, bus stops are being turned into spaces of comfort and safety. They are designed as open stations, allowing users to see what is happening outside and inside. hey are roofed, and so, even when it rains, people take shelter there because it is a more comfortable place. They are bigger, with safety measures to protect children and avoid accidents. They also now have more orderly lines and free wireless internet to make the waiting experience more pleasant.[xxix]

34 TOOLKIT

BUS RAPID TRANSIT SYSTEMS

Higher speed public transport with bus only lanes, a lower cost alternative to subways, but must still be faster than riding a car

While subways and high-speed rail are the way to smarter high-speed alternatives to the current freeway model, the cost of trains, especially subways, can be prohibitive and out of reach for most cities. Fortunately, there is a more affordable alternative that does not require large investments: buses with confined lanes, or BRTs (Bus Rapid Transit).

In general, mass transit does not yet compete in speed, safety, and enjoyment against automobiles, at least not in most cities. With confined lanes, mass transit can compete better, at least in the speed category, captivating a larger market. ■

Case Study

Transportation Modernization - Costa Rica

Costa Rica has made progress towards the modernization of public transportation. Today bus controls are electronic, people boarding the bus are counted automatically, and the information is downloaded digitally, without personnel in the field. 100% of the units have a platform for people with disabilities.

The transportation fare is dynamic, adjusting every 6 months, which is possible thanks to the transparency of criteria with which both its upward or downward adjustments are calculated; if fuel went down (22% of the fare) then the fare for the next semester goes down. This tariff model also rewards the transportation companies for improvement investments: the older the units, the lower the commission, and the lower the profitability. All units have GPS - approximately 5,000 buses. The age of the buses cannot be older than 15 years, but the brands are flexible, each company can choose, as long as they have the widths and distances between seats, and bells for the blind, preferential seating, etc.

In an agreement among the business sector, the transportation companies, the Central Bank and a technical committee, technological details are being analyzed to implement electronic payment for public transportation. This has been difficult step since most people in Costa Rica still prefer cash. Achieving electronic payments would mean even greater transparency, information on how many users and what type use public transport.[xl]

Case Study

The Trolleys of San Francisco, USA

Another important challenge for public transport, even with exclusive lanes, is that they remain unsafe and uncomfortable experiences for users, and of very low revenue and extremely costly maintenance for service providers. This is why the radically different model of San Francisco's Trolleybuses, or Cable Cars[xii], is so valuable. Trolleys are a transportation system that is pulled by cables, a type of horizontal elevator. These trolleys represent not only an efficient mode of mass transportation, but they provide a great positive experience to their users, to such a degree that even tourists want to experience them.

Trolleys were invented right in San Francisco, by Andrew Smith Hallidie in 1873, an idea that came to him after he saw horses being whipped to pull a cart up the city's iconic steep hills. Hallidie's father had invented and patented a type of "trip wire" used to pull material out of mines in small carts. Using that same technology, Hallidie would embark on one of the world's most enduring and successful public transportation systems. Nearly 150 years later, that same system is still in operation, in one of the most prosperous, technologically advanced, and intelligent cities in the world today.

SUBWAYS AND TROLLEYS

Mass transit systems must be faster and more comfortable than riding a car

The urban mobility model that privileges automobiles, designs infrastructure primarily for cars, subsidizing bridges, overpasses, road widening and paving, costs that all taxpayers have to contribute to, in benefit of car owners. A smart city's budget does the opposite, favoring collective mobility alternatives, including high-speed trains, aerial or subway trains, with user fees, allowing cities to invest in profitable infrastructure projects, multiplying their budget by charging infrastructure and operation costs to those who use it.

However, for these transportation alternatives to really work, they not only need to be less expensive options for suers, but they also need to be 1) faster, 2) safer and 3) more enjoyable than using a car.

Otherwise, it will only be a means of transportation for the poorest, who, as soon as they can afford it, will decide to buy and use a car. ■

Urban electric train transportation system in Medellín, Colombia.

The new bus stops with digital information on Paseo de la Reforma in Mexico City (Mexico).

The new Transmetro bus stops in Guatemala City, Guatemala.

SMART BUS STOPS

Designing a positive experience in bus stops, with digital tools

In the case where a city improves the walking experience, achieving a short, safe, comfortable and enjoyable journey from people's homes to nearby bus stops, the next key element that determines much of the user experience and the success or failure towards a real, cultural shift towards public transport, is users' experience while waiting at bus stops. This experience must be brief, safe, comfortable, and enjoyable, but above all, it must be predictable.

It is important to remember that we are competing against the alternative, trying to captivate the citizen to leave the comfort and certainty of time provided by their car. Not knowing how long it will take to get to a public transportation stop, not knowing the different routes and types of buses, not knowing which bus to take, waiting in the open and on lonely corners that may be poorly lit at night, are factors that could discourage citizens from using public transportation. Public transport users are not professional navigators who can decipher route maps and complex timetable formulas, and most of them, for safety reasons, do not usually ask for information or directions from strangers on the street.

Fortunately, with a smart bus stop strategy, it is simple and inexpensive to transform the user experience. To this end, some solutions to consider are:

Correctly mark the places where the bus stops, even if there is no bus stop.

Design bus route maps that are extremely easy to navigate, so that even a second grader can understand them.

Install GPS and digital mapping systems that allow users to track bus times and routes through apps or QR codes.

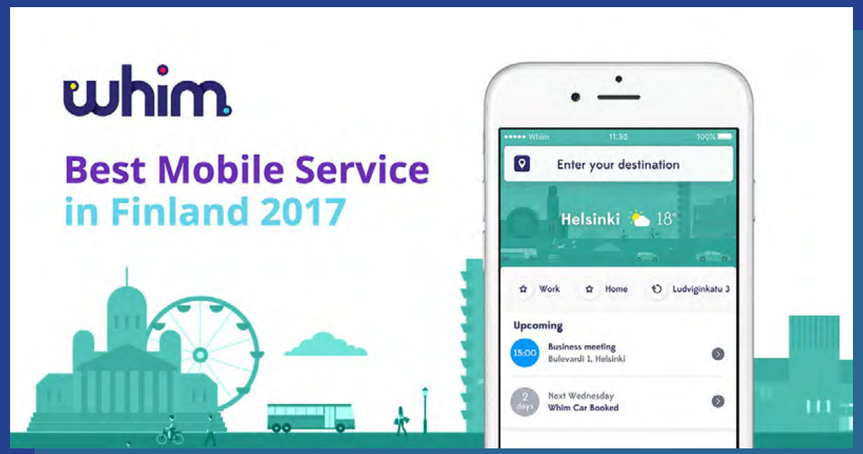
Integrate physical, digital trackers that indicate exact wait times for the arrival time of the next buses.

Manage intelligent payment systems that facilitate the payment process for the user, with on-site options for payment by card or cash, prepaid cards, or payment options on transport apps.

Design bus stops as pocket parks with all the design components that this implies, not just a bus stop design.

Provide commercial or community life and activities around the site to maximize the natural safety provided by consistent traffic and neighbors. ■

Bus stops in the financial district of the city of London (England).



Case Study

Whim, in Helsinki, Finland

Helsinki, the capital of Finland, has launched Whim, a multimodal transportation app, designed by MaaS Global, which specializes in the concept of "Mobility as a Service,[xliii] provides its users with various routes and modes of transportation to reach their desired destination.

This app can, for example, suggest a route with a bus ride, then a public bicycle and finally a cab. The user can pay for each trip individually or pay for an all-inclusive membership. The app has two types of memberships, a monthly membership of €60 that covers most of your rides, including unlimited bikes and buses and €10 flat fee for cabs; and a monthly membership of €500 per month, which includes unlimited transportation of all kinds.

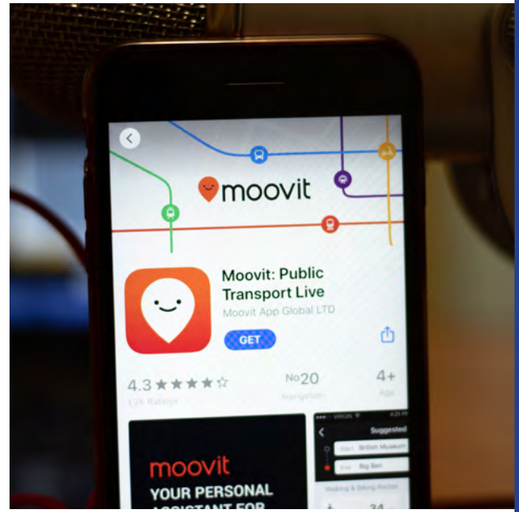
Although the second price seems high, close to the cost of buying your own car, this reminds us that in a smart city it is important to compete against cars not just on price, but on quality. It is important to leave behind the current mobility experience where *even the poor need a car*, and create one so appealing that *even the rich prefer to use the public transport system*, based on design, not ideology or regulation.

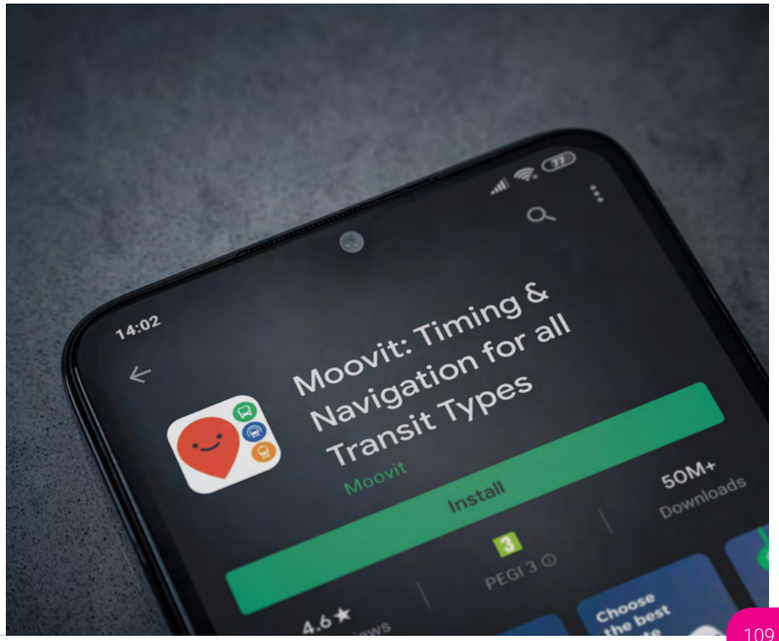
MULTIMODAL TRANSPORT APPS

Digital apps that personalize each user's routes even through different modes of transportation

Another tool that has emerged, especially in developed countries, are smartphone apps that allow users to design their entire route and pay for the entire journey, all in a single ticket or payment, even if it involves various transportation alternatives, i.e., a multimodal route. These routes can include pedestrian or bike-sharing sections, as well as bus or subway sections. These applications allow calculating the approximate time of the route and the best routes and alternatives to achieve it, from the comfort of a smartphone.

However, this seemingly obvious and technologically simple idea requires a great deal of sometimes prohibitively expensive planning process. This involves negotiating systems and fares with current operators, as with various local, state or federal departments, and sometimes with different municipalities, especially in metropolitan areas, which involve various administrative systems and mayors, often with contrary interests or priorities. However, this is a smart solution to the historical challenges of the difficulty users face when navigating public transportation. Cities that succeed will see great benefits. ■





Integrated multimodal transportation Apps, for the payment of memberships or rides through a single digital application.

Singapore's congestion charge system.

Congestion charge system using colored license plates in Singapore: red plates indicate that you only drive on weekends and pay less tax.

Toll bridge system in the city of San Francisco.

CONGESTION CHARGE SYSTEMS

Systems designed to self-regulate traffic with extra charges or dynamic pricing during peak hours

One of the great failures of the current mobility model, apart from the marked subsidy of automobile mobility and the lack of smarter alternatives, is the complete absence of mechanisms for the intelligent regulation and improvement of vehicular traffic. In any market, a scarce product is regulated through the price mechanism, increasing the price of a product to the extent that the product becomes scarce. This not only serves to limit excess demand, but this also helps to finance additional future supply, using part of the profit from surcharges generated during seasons of higher prices, allowing suppliers to better serve a higher demand in the future.

This mechanism is nonexistent when it comes to roadway capacity. Using the road is not only free, but we all subsidize it, including those who do not use cars. Instead of understanding this failure, some cities have turned to some demand regulation mechanisms, for example, limiting the days on which families can use their cars, depending on their license plate numbers, which is unfortunately useless in the long run, but also mainly hurts the poorest, those who can only afford one car.

For this reason, smart cities must instead turn to price regulation mechanisms through road usage charges and dynamic rates at peak hours, which help to diversify the schedules in which people choose to make their journeys. For this to work, in an intelligent way, we must ensure that the revenue generated by these mechanisms are used exclusively to finance high quality, mass transportation alternatives, to reduce and solve vehicular traffic problems in the medium and long term. Otherwise, this becomes just another tax, which, although it may somewhat alleviate traffic in the short term, it will result in a greater backlog in the long run. ■

Case Study

Paris, Rome, London and Stockholm

The A1 freeway is an expressway connecting Paris to Lille and, since 1992, has charged higher fares during certain hours on certain days, in order to discourage its use at the typical departure time from work.

Singapore implemented the first successful congestion pricing scheme in urban centers,[xliv] with an automated charging scheme, since 1998. Rome, London and Stockholm have implemented similar strategies.[xlv] Milan introduced a congestion charging system called Ecopass, which exempts electric vehicles from payment.

Singapore and Stockholm charge every time a car enters a certain perimeter, while London charges a daily fee, regardless of how many times it enters and leaves the controlled sector. In Singapore the charge is pay-as-you-go and the rates are set according to traffic conditions at the charging points.

Parking payment system by license plate, allowing payment by internet or credit card, in the city of Vancouver (Canada).

SMART PARKING

Charging for on street parking to regulate for sufficient availability, even allowing for reservation of spaces ahead of time

One of the problems generated by increased traffic in cities is the difficulty of finding a parking space, forcing drivers to drive around for a prolonged period of time in search of a spot. This is the problem of free parking, which, without price regulation mechanisms, generates excess demand and not enough supply -public or private-. This lack of price regulation ignores the fact that many people would be willing, and even happy, to pay for parking spots, as long as this meant they would have a guaranteed place to park, saving them time and reducing uncertainty. Therefore, smart cities should:

Always charge on-street parking with dynamic rates, which self-regulate demand, and incentivize supply, where necessary.

Implement digital systems that allow parking spaces to be reserved prior to arrival or even departure to a destination. ■

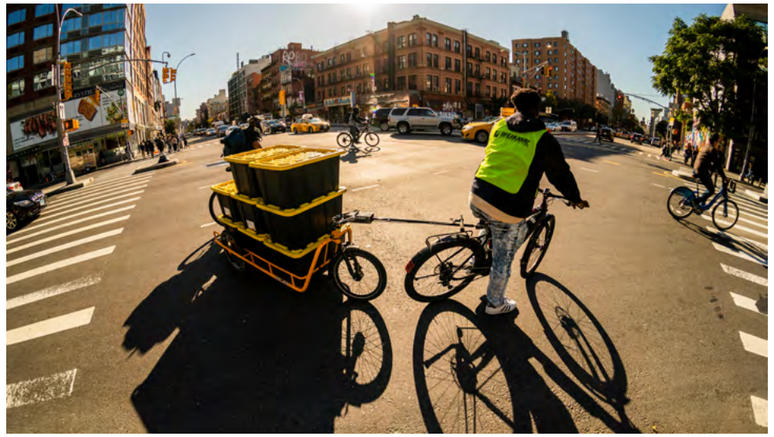
Intelligent parking system that indicates the number of spaces available per floor or per street, to prevent wasted time.

Case Study

PANAPPARK – Panama

PANAPPARK is a digital platform that allows users to reserve spaces and manage parking lots, both on public roads and in the private sector. This entrepreneurship was the winner of the Smart Cities category of the Innovate Entrepreneurship Summit 2019, held in Guatemala. This allows its users to save time and avoid inconveniences while parking their cars, allowing them to reserve and paya spot on public roads or in private spaces, through the PANAPPARK app, solving a need both for drivers and for cities.

Amazon Prime freight and mail delivery system, by vans, around the United States.



Last-mile freight delivery system by bicycle in New York City (United States).

Schenker's electric bicycle last-mile freight delivery system in Oslo, Norway.

HEAVY CARGO TRAFFIC AND CURB MANAGEMENT SYSTEMS

Reducing heavy cargo and traffic on urban streets through mandatory cargo transfer stations and curb management

Another problem faced by many cities today is the traffic generated by cargo transportation within the city. These vehicles not only wear out roads, but also, due to their size, take up more space and alter the flow of traffic, especially when they attempt maneuvers for which city streets are not designed.

This becomes even more complicated as cities and neighborhoods diversify their uses, which can result in the risk of freight transport entering residential areas, affecting the peace and safety of their streets. For this reason, it will be especially important for smart cities to establish logistics transfer centers, which will allow the transfer of products that must enter the city onto small and medium-sized vehicles that can deliver these products without hindering the roads.

It is important to mention that this strategy must be undertaken carefully, as for many cities such policies have resulted in a large increase in corruption. When these rules become impractical, or difficult to enforce, the result is worse than what was intended.

But not only is it necessary to manage heavy freight, but with the growth of eCommerce and ridesharing economies, it now also becomes especially important to manage last-mile transportation, to pick up and deliver products, food, and people.

Cargo bike in Florence (Italy).

To this end, smart cities should consider tools such as:

Toll booths for heavy cargo that needs to enter the city, to discourage heavy cargo traffic, but also as a real mechanism to finance pavement.

Urban logistics transfer nodes that allow goods to be transferred outside the city, to avoid charges.

Curb management with permitted schedules for commercial, on-street parking for deliveries.

Neighborhood logistics transfer nodes that allow transferring commercial loads to smaller vehicles, for daytime deliveries.

Definition of specific passenger pick-up and drop-off sites during peak hours.

Differentiated fees for small, environmentally friendly cabs and delivery vehicles, as well as for ridesharing cars. ■

An electric charging station from a truck charging network in The Netherlands.

ELECTROMOBILITY

To incentivize electric mobility technology, for bikes, cars, and fleets

The mobility issue is not only one of vehicular traffic and the resulting time expenditure, but also one of excessive spending in high gasoline costs, as well as pollution due to the high carbon emissions generated by excessive use of cars. Therefore, in addition to the promotion of more environmentally friendly transportation alternatives, smart cities generate incentives for a greater number of users to bet on electric cars. However, for this to work, cities must bet on visionary strategies for car charging infrastructure.

Although an electric car can represent significant savings, citizens will only choose this alternative if it is practical, with sufficient charging stations, and significant savings. This can require public infrastructure, but also incentives for electric charging options in private buildings, shopping centers and workplaces. Some north american cities have even decided to dedicate an exclusive lane on their highways for electric cars, thus adding additional incentives to foster a culture of electric mobility.[xlvi] ■

Sticker that identifies an electric car, which gives it access to exclusive parking spaces in California, United States.

Exclusive parking spaces, for electric cars, with electric charging connectors, at the City of Boise's public library (United States).

PUBLIC NUISANCE AND DISTURBANCE CONTROLS

Norms and systems that allow for peace and health among residential and commercial neighbors

If we could identify the most important issue for the promotion of a new model of sustainable mobility in cities, we would not think about widening sidewalks or redesigning streets, nor about mixed uses and density, although these aspects are extremely important.

In principle, people will not truly consider walking as a mode of transport if the neighbor's dog, on the street corner, terrorizes every pedestrian; no one will accept the idea of mixed uses in their residential neighborhood if their only experience with commerce is the one related to the pharmacy that begins to loudly advertise through a blaring speaker horn starting at 8 in the morning on sundays, or the one of an event hall or bar that plays loud music every Saturday until 4 in the morning; similarly, no one is going to celebrate densification if the only apartment building in the neighborhood has neighbors who shoot guns in the air every weekend (or weekdays) when they throw a party, and not even the police dares to intervene.

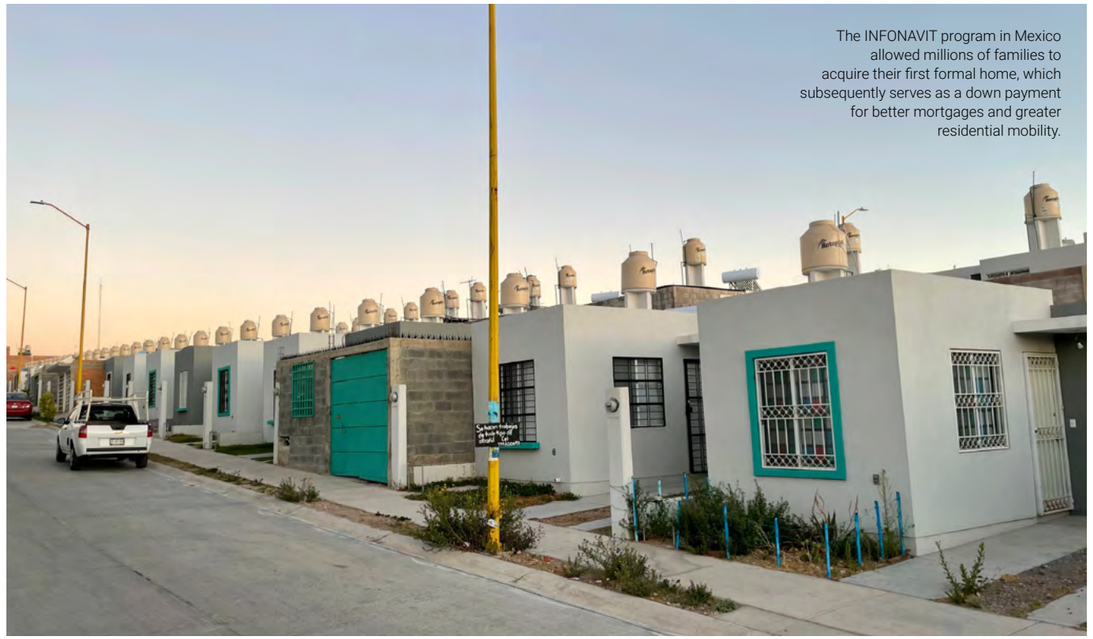
Therefore, the only way we will be able to move towards this new model will be with **much clearer rules, systems of denunciation and control, and effective institutions to guarantee peace and safety in mixed use, dense, walkable neighborhoods.** ■

Neighborhood rules for visual harmony and residential tranquility in San Miguel de Allende (Mexico) that allow a healthy coexistence between cultural heritage, residential life and commerce.

Neighborhood peace and safety systems that require the care and safekeeping of pets in public spaces.

Neighborhood rules in New York City allow a healthy coexistence in residential areas, including for bars, nightlife and entertainment establishments.

Noise level meters to ensure public health and peace among neighbors and in public spaces.



The INFONAVIT program in Mexico allowed millions of families to acquire their first formal home, which subsequently serves as a down payment for better mortgages and greater residential mobility.

RESIDENTIAL MOBILITY

Public policy and incentives that make it easier for families to move closer to their jobs[xlvii]

Finally, the best mobility strategy is to not have to travel such long distances every day. Therefore, the smartest policies to reduce traffic are those that allow people to relocate, every few years, to places closer to where they work. This is known as residential mobility.

It is preferable to relocate once, even though it can be quite a headache for a full weekend or two, but this can save a family a whole hour or two every single day for years. The first challenge for this policy, then, can be a legal barrier, particularly in countries with property tenure challenges. On the other hand, it is a matter of supply, since, due to inadequate regulations, sometimes there is no housing supply, at an affordable price, in the areas close to where the work of most citizens is concentrated.

It is important to note that, on average, in their lifetimes, families relocate on average between 7 and 9 times in Latin America and between 9 and 11 times in North America. An increase in smart residential mobility would help to increase the average by up to one or two additional moves over the course of their lives.

Therefore, a smart city must promote public policies that facilitate residential mobility, through:

A *Pie de Casa* program ("First foot in the door homes") in the border city of Nogales, a small housing model to help families get started on the financial path to a better home.

Abandoned housing in the San Pedro Valley of the City of Tijuana (Mexico), which due to its remoteness resulted in low demand and low residential mobility.

Land tenure regularization programs, which formalize the ownership situation of people's homes, facilitating their ability to sell, buy and relocate, if they so wish.

Reforms that improve property rights to encourage a greater supply of rental homes.

Housing exchange programs to connect families with households of similar values who are looking to relocate to complementary locations, and willing to swap homes.

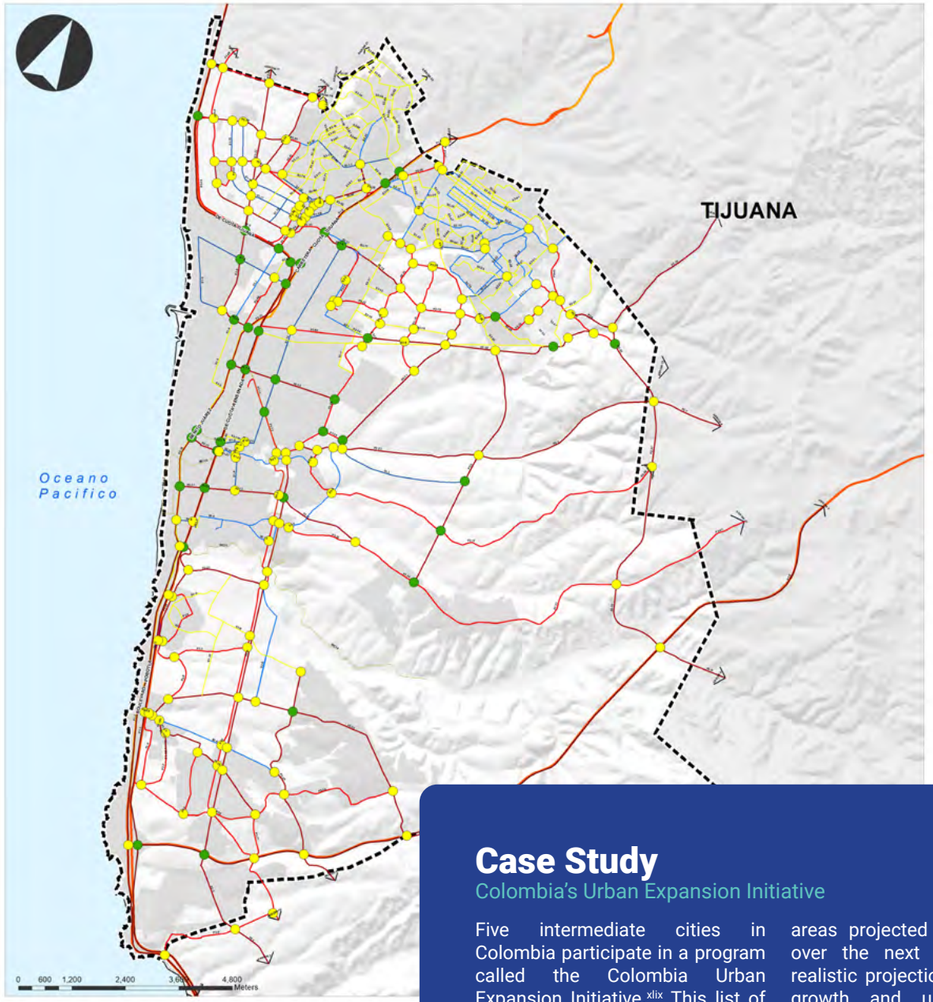
Promote incentives and awareness campaigns that encourage families to relocate more frequently, even one more time throughout their lives, by measuring, detailing and communicating the personal and urban benefits. ■

03 ACCESIBLE CITY

Cities are usually vibrant places full of opportunities and services that allow us to better meet our basic needs much better than in the countryside. Cities are also full of social interaction, culture, education, art, architecture, recreation, sports, entertainment and, in general, human connection, places that nourish the human mind and spirit. A smart city, then, should be a place that makes it easier to access all this, starting with access to basic services, especially for the most vulnerable groups.

Therefore, the best practices, public policy and projects of an accessible city address questions such as the following:

- How much does it cost to live in your city?
- What percentage of residents have access to basic services?
- How does the quality of services in your city compare with those in other cities?
- How enjoyable are the public spaces and urban life in your city?
- What percentage of neighborhoods and households have access to these spaces and to quality activities?



PDUCP PR 2021-2040

Playas de Rosarito (Mexico): An example of planning for orderly growth, which was approved in 2021, in the 2021-2040 Urban Development Program of Playas de Rosarito, which established a network of primary roads every kilometer, and of secondary roads every 500 meters, for the entire projected expansion area of the city. Likewise, the program implements the transect system to regulate land use, facilitating better densities and mixed uses in all suitable areas.

Case Study

Colombia's Urban Expansion Initiative

Five intermediate cities in Colombia participate in a program called the Colombia Urban Expansion Initiative.[xlix] This list of cities includes Montería, Córdoba; Tunja, Boyacá; Valledupar, César; Santa Marta, Magdalena; and Yopal, Casanare.

The program led by Dr. Shlomo Angel, of the New York University (NYU) Stern School of Business and author of the book The Planet of Cities, is conducted in collaboration with the Marron Institute for Cities and the Urban Environment, headed by Professor Paul Romer of NYU's Department of Economics (2018 Nobel Laureate).

The Urban Expansion Initiative consists, first, of planning the areas projected to be urbanized over the next 30 years, using realistic projections of population growth and urban expansion. Secondly, it seeks to define sufficient growth boundaries and get the authorities to establish them as such to be able to execute the plans. In addition, the program establishes a grid of primary roads, 25 or 30 meter wide, spaced 1 kilometer apart, covering the entire expansion area, acquiring rights of way in favor of the municipality. Finally, some strategic public open spaces are also established within the expansion area and a transfer of land rights process is also coordinated with the municipalities.

ORDERLY URBAN EXPANSION AND GROWTH PROGRAMS

Preparing room for sufficient horizontal and vertical urban development, fostering real estate competitiveness that results in lower housing costs

The most extensive, empirical study of cities, which has evaluated more than 2,000 cities around the world over several decades, identifies that both the quality of a city's street system and ample room for growth are the two most determinant factors in predicting how accessible or inaccessible a city's housing and basic services will be.[xlviii] Another significant factor is compact neighborhoods.

However, many cities have reversed the importance of compactness over orderly growth. In doing so, they attempt to prohibit or contain development in urban peripheries. Therefore, many cities avoid planning the peripheries, fearing that planning will drive development. However, market pressures end up exceeding these highly constricted growth limits -legally or illegally- and the unavoidable result is a disorderly, excessive sprawl, with higher housing costs than would have been the case with just a little intelligent planning.

Additionally, prioritizing compactness, in trying to densify the already built city, but only in some select places, limited to neighborhoods without significant opposition from residents, planners end up making densities more flexible in an extremely small area of the city. This triggers excessive densification in these selected neighborhoods because the entire, accumulated, excess demand of an entire city tries to unburden itself in these few areas. This real estate explosion and its considerable urban consequences scare residents in the rest of the city, creating less acceptance for densification policies.

A smart city must do the opposite, it must generate both a greater supply of land and airspace for orderly development, to foster greater land and real estate competitiveness. In this sense, it must:

Draw up an orderly urban expansion plan that defines at least a grid of primary roads and certain, strategic open spaces for a reasonable amount of room for long term growth.

Create an effective legal and administrative policy for the acquisition of rights-of-way that allows for negotiation with landowners, to acquire the corresponding land, sharing costs and benefits among those property owners affected.

Clearly demarcate these spaces, preferably with trees, on what will one day be sidewalks.

Extend height limits in a more generalized manner within the city, allowing moderate densification in most of the city, not only in exceptions.

Define financial mechanisms that guarantee the acquisition of these spaces and for the construction and adaptation of its infrastructure, particularly where it has been lacking and in places with greater demand for development. ■

Planning in advance, for roads, environmental zones and neighborhood parks, prior to development.

Gardens by the Bay, Singapore's iconic park, part of the city's program to rescue public spaces to become a "Garden City."

GREEN SPACE AND PUBLIC SPACE DESIGN DIAGNOSIS

Systems for evaluating the location, hierarchy, and design of better public spaces

The planning and design of adequate green spaces, for the preservation of high environmental value areas and for the creation of plazas and parks, determine, in large part, the quality of life of a city and the levels of access to a healthy community life.

Unfortunately, the planning and regulation model of recent decades considered these components to be secondary, delegating these considerations to the private sector and to real estate developers who had neither the interest nor the capacity to assume this responsibility with a long-term, citywide vision, resulting in the design of gated communities with no urbanistic sense or distinctive identity.

But even when addressing the issue of greenery, the main assessment tool became a formula of square meters of green space per inhabitant. This meant that a city with a large natural reserve, but without any parks close to most households, could be rated positively.

A smart city should assess the opposite: location, proximity, size, design and quality always above quantity. Today, we must also consider green or open spaces as a basic survival element during pandemics and diseases of all kinds, which provide significantly better solutions for social distancing and recreation, but due to their absence, during the COVID0 19 crisis condemned millions of families around the world to forced confinement in overcrowded homes, in conditions of great precariousness and little human dignity.

Therefore, smart cities must ensure that green spaces are truly public spaces that fulfill ecological functions (environmental services of all kinds), cultural (including art, history, culture, commerce, and traditions), recreational (including sports, exercise, games), and, finally, streetscaping (considering the contributions of landscape and architecture to the image of the city).

There are a couple of basic classifications of green space that should be designed into cities:

Urban forests, natural parks and green corridors that tend to result from the need to protect areas of high environmental value or high risk, such as forests, beaches, rivers, unstable hillsides, dry lakes, among others.

Metropolitan parks of about 5 or more hectares in size, able to serve people from around the entire city, and so must have parking for vehicles and/or adequate access with transportation.

Neighborhood parks or plazas with dimensions between 1 and 2 hectares, to mostly serve neighborhoods or districts of about 1 square kilometer, a walkable distance.

Main streets and pedestrian walkways that fulfill all the technical functions of a park or green space and should serve an area of 250-500 meters in both directions.

Pocket parks smaller than 1 hectare, which tend to only or mostly serve the directly adjacent blocks.

To assess the quality of public spaces, a smart city should rate each green space:

Marking the area served by each green space, according to its dimension, and identifying all those areas without coverage.

Rating each green area's technical characteristics based on the 4 design features, to identify clear deficiencies, with respect to their use of 1) ecological, 2) cultural, 3) recreational, and 4) architectural features. ■

The Superkilen Park, in the city of Copenhagen (Denmark), designed in a collaboration between the art firm Superflex and the architecture firm Bjarke Ingels Group, opened in 2012. The park aims to promote integration and tolerance in a community with a history of divisiveness.

NEIGHBORHOOD PARKS FOR SOCIO-SPATIAL INCLUSIVITY

Avoid segregation resulting from isolated real estate developments through city-forming parks in between multiple developments

One of the great failures of the current model of city development is the lack of quality public spaces. Many parks tend to be small residual lots from housing developments, with very limited designs and functionality.

The challenge for the creation of quality public spaces and neighborhood parks is that they should be at least one to two hectares in size, to function as real, neighborhood centers, connecting and serving several developments, not just one.

But most real estate developments are small developments of only one or a few blocks each, or a single building, so no developer has the capacity to fund or build parks of an entire hectare, nor do they have the interest or incentives to provide identity to an entire neighborhood, beyond their own development. Therefore, this work must be planned by the city before a territory is developed.

To achieve the construction of neighborhood parks, then, smart cities must:

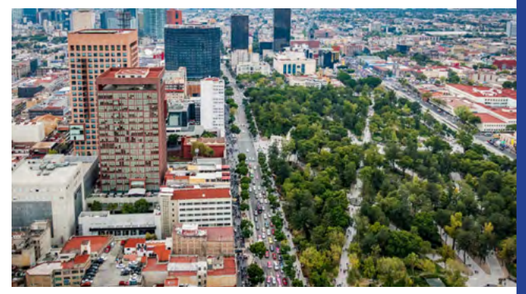
Guarantee the incorporation of at least one large park in each neighborhood of the city, even in the already built part of the city, but preferably before development arrives, when there are still vacant lots, cities must coordinate this planning effort among all affected and beneficiary landowners.

Work with neighbors so that they can jointly define the location, design, and management and financing mechanisms for their neighborhood park, both in the already built city and in growth areas.

Pass on the cost of their construction to the owners of the surrounding land, especially in new growth areas, when this results in great capital gain or economic benefit for the owners of neighboring vacant land.

Define an activation strategy, which could be the promotion of commercial spaces, markets or the strategic public facilities, to ensure that the park's surroundings maintain as much life as possible. ■

Two exemplary neighborhood parks, recently revitalized, the Parque Central de Lima, known as Parque Kennedy, in the Miraflores district of Lima (Peru) and the Alameda Central in downtown Mexico City (Mexico).



Parque Grande, an example of a traditional neighborhood plaza in Merida, Mexico.

Lombardi Street, a slow traffic street, has become one of San Francisco's (USA) top destinations for tourists and locals alike for its distinctive design and streetscape architecture.

MAIN STREETS AND SUPERBLOCKS

Pedestrian walkways, or streets with large sidewalks, that serve as the major commercial corridor and space in each neighborhood

When there is not enough space to integrate a neighborhood park of adequate dimensions, the neighborhood streets themselves become a good option to emulate a large public space. In particular, the best way to turn a street into a neighborhood park is to make it a very walkable place, a linear park. This can be achieved by a complete pedestrianization of a street, when a neighborhood has sufficient alternative road connectivity, but in some cases can even be achieved by simply redesigning sidewalks and crosswalks to spark greater community life. In any case, the sidewalk must be designed not only, or even primarily, for mobility, but for recreation, for streetscape architecture, and a unique neighborhood identity, and all the other environmental and cultural functions that a neighborhood park should fulfill.

To integrate these types of recreational streets into a neighborhood, some basic elements to consider:

Work hand in hand with the community throughout the process, to define the exact sections and customize the design, addressing the specific needs and concerns of each community.

Prioritize pedestrian comfort and universal accessibility, and design it specifically for the blind, wheelchair users, and baby carriages, because if they enjoy it, the rest of us will enjoy it even more.

Encourage the activation of fist floors or building fonts, in order to promote mixed uses and activities that generate eyes on the street, and enliven the public space, such as with outdoor tables or balconies.

Relocate vehicular accesses and parking lots to back alleys or on street parking, preventing cars from driving on or blocking sidewalks.

Integrate slow traffic designs, that make drivers naturally want to slow down, providing greater safety to pedestrians with roundabouts, sidewalk extensions, and even on street trees -not with speed bumps-. ■

India Street is a successful example of a central street in the Little Italy neighborhood of San Diego.

Cesar E. Chavez Street has been promoted as a main street for the revitalization of Barrio Logan, in San Diego (United States).

SMART CITIES: ACCESIBLE CITY

Case Study

Barcelona's Superblocks

Superblocks are an innovative method of urban planning for the rescue of public spaces through which the city of Barcelona, in conjunction with its Urban Ecology Agency, seeks the urban regeneration of the city through street interventions within sections of approximately 400 x 400 meters.

The objective is to displace vehicular traffic to peripheral streets and to enliven main streets within each of these districts, which will be designed as public spaces mainly for pedestrians and cyclists, revitalizing community life, recreation, and commercial activity. Barcelona currently has examples of superblocks in the Gracia district and the model has been replicated in the cities of Vitoria, La Coruña, Ferrol and others.[li]

SMART CITIES: ACCESIBLE CITY

FROM HIGHWAYS TO LINEAR PARKS

Rethinking highways, freeways and overpasses to turn them into boulevards and linear parks

One of the most celebrated actions of the new urbanism and smart cities movements has been the remodeling of infrastructure that was originally designed exclusively for motorized mobility -such as highways, overpasses, bridges, or railroad tracks- and converting them into public spaces, for social life, community, and sustainable mobility.[lii]

These actions not only result in a positive transformation of their environments, but more than that, they represent a symbol, a message to the world, of a before and an after, a position very few cities have decided to take so far. These become cities committed to change towards a new urban model. ■

The great linear park of Cheonggyecheon in Seoul (South Korea) was a highway before 2005.

Case Study

El *High Line Elevated Park* de Nueva York

The High Line is an elevated linear park over 2 kilometers long, built on the former New York City railroad line, designed by James Corner Field Operations.[liii]

The railroad tracks ceased to be used in 1980, and since 2003, alternatives to regenerate the space began to be analyzed. The first phase was completed in 2009 and the project was completed in 2014 into what the High Line Elevated Park is now.

This runs from Gansevoort Street to 34th Street on the west side of New York, it's divided into three sections, and can be accessed by way of several entrances along its route, from above. It has gardens, benches and heavily landscaped walkways, which have become an important destination for watching the sunset each evening. In addition, the park is used for activities such as Yoga, Pilates and even astronomy classes.

The park has become a major tourist destination and has triggered real estate development in surrounding buildings, with a significant increase in the value of their rents and property values. By 2014, the park had around 5 million visitors per year and by 2019, more than 8 million per year.

Case Study

Themed alleys of Cajeme, Sonora

In 2018 the city of Cajeme, Sonora (Ciudad Obregón), together with a group of neighbors, artists and architects from a firm called COVEN Arquitects, developed an urban intervention project, with the objective of rescuing the abandoned service alleys that were found all around the city.

This program would be named "100 Alleys Heading into the Centenary" . To this end, a multidisciplinary committee was formed where various municipal agencies, citizens and institutions analyze each space and develop feasible urban intervention projects for implementation.

With dozens of interventions, the following results have been achieved to date:

1. Recovery of urban space.
2. Rescue of the social fabric.
3. Muralism art was sparked throughout the city, transcending beyond the alleyways.
4. Increase in open-air cultural activities (the alleys have become cultural spaces).
5. Significant change in the negative perception that the citizen had of these spaces.
6. The alleys have gone from being abandoned spaces to iconic destinations in the city.
7. Thematizing the interventions has allowed for the participation of diverse social groups.
8. A sense of appropriation of the space has been awakened among residents, so that the recovered areas are self-sustainable and neighbors themselves are concerned with maintaining them in good condition and carrying out activities in them.

ALLEYS AND URBAN POCKET PARKS

Using small, underutilized spaces to bring beauty and identity to deteriorated areas

A pocket park in the Liberdade neighborhood of Sao Paulo, Brazil.

Sometimes, when there is neither the space nor the budget to integrate large public spaces into a neighborhood, nor main streets or commercial corridors, the best alternative is to integrate highly creative pocket parks. With good green space design, which also applies to larger spaces, greater creativity will allow a small park to transform the lives of residents and a neighborhood into a smart city.

Design at every scale should consider the following aspects:

Culture that provides identity to the community, as well as a unique and distinctive personality to the space. This is achieved with monuments about the history or representative characters of the area, as well as with art, murals, iconic signs, etc.

Good landscaping and architecture that really raise the demand to live or hang out around this space, and not the opposite, as sometimes happens. This is achieved with well-designed landscaping, artistic street furniture, water fountains, iconic gates and entrances, scenic views, etc.

Diverse recreational functions, avoiding parks that are only for sports -especially conventional sports-, but ensuring a variety of recreational uses for all ages and styles, from sports to play, socializing, strolling, eating, temporary commerce, etc.

Green infrastructure to improve the surrounding environment, which is achieved through plants that provide cleaner air, trees for air conditioning elements to provide shade and avoid heat-islands, as well as rainwater harvesting to reduce flooding. ■

Well-designed pocket parks in San José (above) and Guatemala City (below).

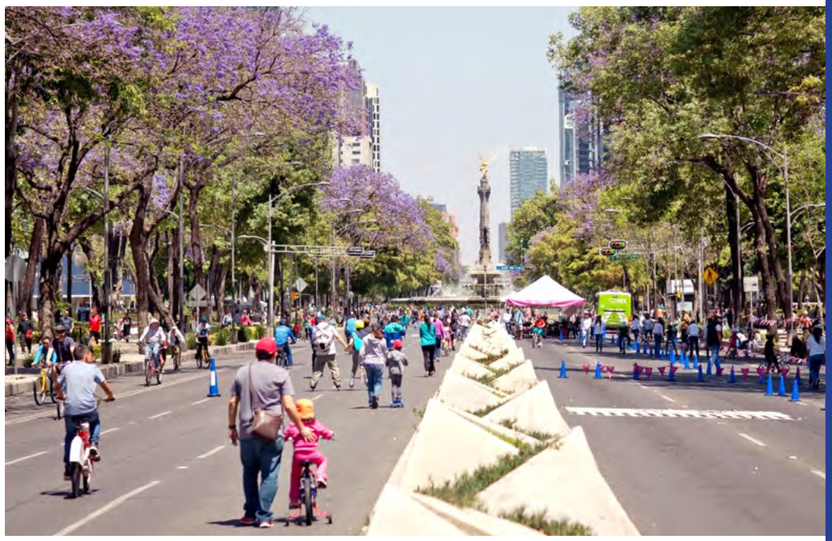
TACTICAL URBANISM

Sparking the transformation of urban spaces through creative, progressive, low-cost actions

Tactical urbanism is a tool that allows for low-cost, low-risk interventions, with the objective of generating progressive changes in spaces originally designed with another approach. With paint, planters, tables, traffic cones, art and temporary furniture, urban changes can be demonstrated; they are experiments that help analyze the way in which a community responds to a proposal, allowing for design changes, prior to committing to formal plans or projects. This also allows the community to experience the change before deciding for or against it.

Tactical urbanism is a very good first step to widen sidewalks, modify crosswalks, create pocket parks or linear parks, garnering first the support of the community.[liv]

Likewise, strategic activities can be considered for the activation of these spaces, such as Sunday "open streets" routes. These have been an excellent tool for citizens to begin to see streets as public spaces and not only as streets for cars. In this sense, these recreational, bike, walk and skate friendly routes serve as a public space, one day a week, so as not to affect traffic on peak days. Normally Sunday is chosen, which is usually the day that many families use for recreational activities and open streets offer that.



Mexico City's famous Sunday recreational pathway on Paseo de la Reforma.

However, thought of as tactical urbanism, open streets should be more than just a once every seven days activity, they should be part of a strategy to transform entire streets under a new model of smartly designed streets. Recreational streets allow more and more citizens to become attached to the idea of cycling, to walk the city, to generate more recreational spaces and eventually to start modifying the design of these streets, widening sidewalks, introducing bike lanes, pocket parks, as well as traffic calming elements. These comprehensive transformations of streets that were once used only for automobiles allow for the creation of quality public spaces.

Some examples of outstanding Sunday open streets include Mexico City, Guadalajara, Monterrey, and Guatemala City. ■

Case Study

Progressive Redesign of Safe Crosswalks

Painting crosswalks for pedestrian safety is not enough to improve the pedestrian experience and safety. Therefore, painting, with tactical urbanism, must be more creative, it must project the progressive widening of sidewalks, with extended crossings and medians, using paint so that the community first lives the experience and takes ownership of the change before integrating it more formally, and replicating it in more places.

PROGRESSIVE, SUSTAINABLE DEVELOPMENTS

Land development programs that allow access to land and self-production housing, for families without access to formal banking or financing services

The most successful type of development of neighborhoods and cities is incremental, progressive development, which begin with austere or modest street and building designs and, in time, begin to witness new housing and buildings, renovations, densification and constant change in the type of use given to original constructions, giving life to a unique, unpredictable place, in constant evolution and growth, adding great worth to the value of residents' properties.

These progressive models also allow much greater financial flexibility; anywhere from business models focused on the sale of lots with basic infrastructure only, for self-construction of each individual plot of land, even allowing many people to reserve several neighboring lots as a future investment for their children; others models cater to collective credit schemes, even financed by the land owner, or models such as productive housing, which allow buyers to generate extra income from home, and better able to pay their mortgages, or even yet, development models that sell lots for investors and small scale developers, all resulting in great diversity of housing options, for all financial capacities, of poor and rich, of workers and entrepreneurs, for formal and informal markets.

While the initial infrastructure investment of such business models may be somewhat under developed, or precisely because of this, progressive management or financing models are defined from the beginning, which guarantee constant investment for the improvement of the infrastructure of streets, parks and services of all kinds, and in this process, neighbors get to know each other, support each other, and form a community.

But the traditional development model allowed by current laws and regulations prohibits most progressive development models, except for high income households. Therefore, we see the construction of housing developments that consist of several entire blocks, or entire neighborhoods, built all at once, in just a couple of years, buildings with no great difference between them, with inflexible and static uses, prohibiting evolution or significant real estate diversity. From the outset, these properties are required, as a rule, to have infrastructure of such a cost that it automatically prohibits the sale of real estate products that are accessible to most families, except for those with sufficient credit capacity (for example, in Mexico, this means less than 30% of families). In this model, once a development is completed, the developer hands over the maintenance responsibility to the local government, and while the needs and preferences of the families who live there begin to evolve, the community has no tools for evolution, so a process of deterioration and abandonment of the properties and the area begins.

For this reason, a smart city must allow progressive and incremental growth schemes, defining legal, regulatory, financial and administrative tools that trigger a large, market competition, and highly attractive business models, but always with the necessary governmental controls to guarantee the progressive, but definitive, financing of the urban infrastructure, which must be covered by the developer and the buyers, not by the city. ■

Villa Verde, a residential neighborhood of a progressive construction, in Constitución (Chile) for 484 families, designed by ELEMENTAL, the 'Do Tank' of Alejandro Aravena.

A progressive development in the city of Almere (The Netherlands).

SMART CITIES: ACCESIBLE CITY

The "Mercado District" in the city of Tucson (United States), a real estate development that integrates new urbanism concepts with lean urbanism tools.

LEAN URBANISM

Special building codes that allow for the construction of lower cost real estate products under better urbanism designs

Every additional rule and regulation on urban development and housing implies an additional cost to the final product. But the lowest priced formal housing today tends to exceed the budget and credit capacity of most Latin American families. This results in a black market for land and housing that exceeds the size of the formal housing industry, driving most citizens to live in informal settlements or in housing that lacks basic services and property rights. For this reason, we must define legal and intelligent alternatives that allow a greater number of families to formally integrate into cities, in environments with dignity.

A smart city, then, must consider instruments of lower cost urbanism, or Lean Urbanism,[iv] to generate affordable housing alternatives, but in developments and neighborhoods still with a high urban quality. Fortunately, this does not require so much innovation, but rather a return to the experience of urbanism that proved successful over past centuries. Some tools to achieve this include:

Avoid imposing minimum parking spaces, allowing a housing market for families who do not have or do not want a car.

Avoid defining minimum lot sizes, building sizes, or specific housing dimensions.

Allow for smaller size of some streets, walkways, and internal facilities.

Allow progressive urbanization mechanisms, and flexibility that allows lower cost materials for cobblestone streets, dirt walkways and facilities for collective services. ■

A traditional alley in the city of Antibes (France).

San Miguel de Allende (in the middle) and Campeche (below), examples of lean urbanism, with buildings that cover the entirety of the lot, without parking, and with narrow cobblestone streets. The cost of this can be almost half that of a popular townhome and yet the quality of life is superior.

SMART CITIES: ACCESIBLE CITY

Case Study

Tijuana's Urban Reforms

As part of the urban planning reform efforts undertaken in the Tijuana Metropolitan Area, a new regulatory scheme was proposed for Zoning and Land Use Regulations, to promote progressive urbanization and inclusive zoning mechanisms and Lean Urbanism, represented in the following (translated) texts from the proposal:

Encouraging Inclusionary Zoning

ARTICLE 139. Fostering affordable and well-located housing, through the definition of areas within the city, within T3, T4 and T5 zones (Transects), in which even greater ease of development will be provided, through the complete elimination of lot sizes, parking spaces requirements, neighborhood facilities, and through the simplification of administrative procedures and costs. Real estate developments considered inclusive real estate developments will be exempt from over-development fees.

To qualify as an inclusive real estate development, it must comply with each and every one of the following characteristics, resulting in a greater diversity of housing typology:

I. Be located within the zones established for inclusionary zoning in urban development plans and programs.

II. Have a proportion of parking spaces no greater than 50% of that established in the Table of Densities and Intensities.

III. At least 10% of housing units must be smaller than 60 square meters.

IV. At least another 10% of housing units must be smaller than 75 square meters.

V. At least another 30% of housing units must be smaller than 90 square meters.

VI. At least 20% of the total area of the development must be destined to community amenities and/or community living spaces.

VII. Comply with the other urban and architectural design characteristics established by the neighborhood's SmartCodes.

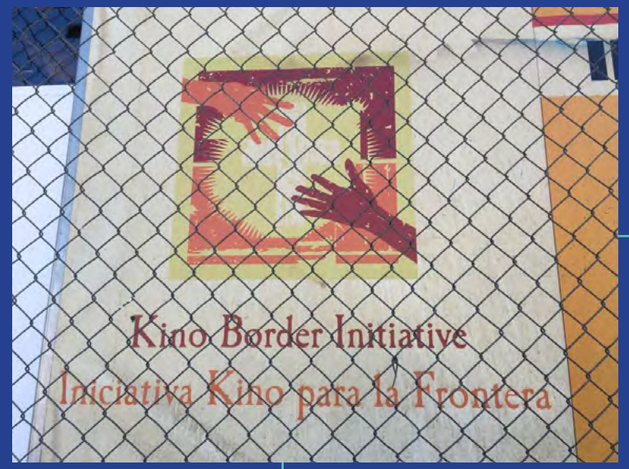
Promotion of sustainable progressive urbanization

Article 140. In response to the demand for land and housing, the City or the State, in association with the private sector in any of the forms provided by the Law governing the matter, or by itself, may carry out empty lot sale programs, under approved models for the progressive introduction of basic infrastructure and services.

For this purpose, there must be a master plan that defines the urban layout, for the identification of blocks and lots, and that such layout complies with the requirements of resilience, sustainable urban mobility and community life established in this regulation and in the SmartCodes and urban development plans and/or programs, for the design of public spaces, streets, sidewalks, parks, green areas, pedestrian walkways, equipment, among others, as well as codes for the regulation of facades and urban image for the buildable space.

In order to facilitate alternative financing schemes, the sale and use of the lots may be allowed, provided that the executive projects and investment schedule for all basic infrastructure is formalized.

Progressive real estate development projects must cover a bond for the total cost of urbanization; or define, within the same project, an area of 40% to 50% of the total buildable area, a percentage that must be defined and safeguarded as collateral by the Municipal Public Spaces Agency, as a guarantee for the eventual completion of infrastructure.



The Migrant's Food Kitchen in the city of Nogales, Mexico, is the main source of support for thousands of migrants from Mexico and Central America who are deported or arrive without resources to this border city each month. The *comedor*, run by the Kino Border Initiative, serves more than 60,000 meals a year, and provides medical care, telephone services, and even shelter for women and children, all of which is funded 100% by local and international charities, without any public resources.

Case Study

Social Formation Center, Ciudad Obregon, Mexico

The Social Training Center is a project in Obregon City in the Mexican state of Sonora, promoted by Fundación Tichi Muñoz A.C. and the Instituto Tecnológico y de Estudios Superiores de Monterrey (Campus Obregon), with the objective of guiding and training local and regional NGOs in the development of their work to address needs and generate changes in the community.

The Center has helped more than 180 NGOs with tools for their professionalization, through advisory services, training and consulting in areas such as fundraising, human capital development, awareness, and partnerships with schools.

SMART WELFARE VOUCHERS FOR BASIC SERVICES

Smart diagnosis and financial support programs for families that could not otherwise afford their public services at market value

Cities face the constant temptation to keep their utility rates artificially low, with a welfare approach. This inevitably results in greater shortages of water, transportation, electricity, etc. Many cities are then forced to ration them, limiting the amount each family receives, to make the service last longer, eventually leaving these public industries bankrupt and their cities in crisis. To achieve more and better-quality services, a smart city must free up the prices of its basic services much more, allowing the market, supply and demand, and the private sector to play a greater role in improving these industries. This can transform the quality and coverage of services in a very positive way, but it can also leave many households vulnerable. A smarter practice, then, is to incorporate direct support systems, in the form of vouchers, so that those who cannot cover their own services can spend their vouchers in various industries and basic services. Some positive experiences of cities that have used it **include socioeconomic diagnostics, so that the support goes to those who really need it, as well as exchange for hours of public service, so that it is not a subsidy, neither free, nor permanent.**

Some tools to consider for the use of smart vouchers:

Concentrate all social assistance budgets into a single fund to be distributed through a comprehensive voucher program, requiring as little bureaucracy as possible.

Develop an evaluation system that differentiates between those with temporary needs and those with chronic difficulties (tool 54) so that each category carries with it significant responsibilities and accompanying mechanisms that truly discourage permanent dependence on the program.

Accompany the program with training mechanisms for technical skills and financial planning and with support mechanisms to obtain the necessary documentation to get a job (birth certificates, licenses, provisional addresses, etc.)[lvi]

Define the list of public and private service providers (in the case of public concessions), with whom they must negotiate the use of vouchers, and the system through which these providers can be easily exchanged for cash (services to be included: water, electricity, energy, transportation, uniforms and municipal, state and federal procedures of all kinds).

Use eVoucher systems through the transportation electronic card system, or issue unique digital codes, to avoid voucher counterfeiting.

Use Blockchain technology to prevent theft, hacking and fraud.[lvii]

Avoid coverage of services that are not administered by the municipality or state agencies, such as medical needs, or food. For these also important but not included needs, it is recommended to strengthen alliances with professional civil society organizations, soup kitchens, shelters, churches, international NGOs, among others, that can provide professional attention and better services.

Create ecosystems of support and professionalization of NGOs. ■

SMART CITIES: ACCESIBLE CITY

Housing program, designed by Marianne Cusato, with new urbanism principles, as part of the program for families affected by Hurricane Katrina in 2005, with which the U.S. Federal Emergency Management Agency (FEMA) has managed to house more than 2,800 families.

"Housing First" housing model in the city of Vancouver (Canada), with 78 prefabricated modular homes in a single building.

SMART HOMELESSNESS ALLEVIATION

Policy and programs to reduce the number of people forced to go without shelter

One of the most prominent and controversial social difficulties in recent years, especially in some of the world's most prosperous cities, is the issue of access to housing and an increasing number of homeless people. This has resulted in massive encampments of homeless people living in streets, in parks, under bridges and in entire neighborhoods, with no hope of adequate housing for them, and a great deterioration in the perception of the rest of the city as well, which witnesses this as visible signs of illegality, indigence, deterioration, injustice, poverty, and insecurity.

It is therefore important to reduce, or even eliminate, the number of people living on the streets in a city. But before doing so, it is essential to recognize the different types of situations, since they require completely different strategies to define the best solution. In this sense, three categories are defined.

The first and easiest to solve is that of families who ended up living on the street due to financial and work-related unforeseen circumstances, accentuated by disabilities or bad luck. These type of people only need a little help and accompaniment to return to self-sufficiency, help that unfortunately they often do not find.

On the other hand, especially in Latin America, there is the migration phenomenon. Migrants, on their journey, especially at borders, tend to make up a significant percentage of people living on the street. Many are victims of crime, corruption, extortion or abuse and stay to live in transit countries because returning to their countries of origin means starting from scratch, since when they migrate, they tend to sell or abandon their assets. Like the previous group, with support, not only economic but also administrative and legal, they manage to get back on track in a couple of months.

Finally, there is an important percentage of chronically homeless people, whose situation is more difficult to resolve. This situation results from disabilities, especially mental disorders, suddenly exacerbated by family loss, severe depression, drug addiction, alcoholism, among others. The challenge for these people does not depend on money or employment, so economic solutions alone are of little use.

Historically, the social fabric of families, churches, friends, and communities in which all these families lived were, and can be, the greatest tool to serve them. This is why it is much more common to see this problem reflected in the streets of countries where family extensions and community ties are smaller, despite greater economic development. In Latin America, for example, this challenge is seen more through overcrowding of homes, and while not as many people sleep on the streets, their financial and psychological difficulties remain important issues for the city to address.

To reduce the number of people forced to live on the streets in a city, a smart city can consider:

Programs for identification and contact to help people find their relatives and to initiate a formal follow-up process.

Temporary shelters, soup kitchens and legal and professional orientation programs to help these people find formal employment or, in the case of migrants, temporary jobs, to help them reach their final destination.

Small house programs as a temporary and progressive solution, with very low-cost housing for families with temporary financial difficulties.

Housing First strategies, which allow immediate and unconditional housing for all homeless people, especially those with chronic homelessness difficulties, but which should be designed and funded closely with local civil society organizations, and must be accompanied by strict loitering, littering, and municipal law and order regulations, to discourage a demand for chronic homelessness and homeless migration from other parts of the country or region.[lviii] ■

SMART WATER MANAGEMENT

Modernization of water management through technology and market mechanisms

One of the biggest challenges for most cities is their management of water, the most important service of all when it comes to survival. However, extracting, cleaning, transporting, and managing water is a complicated and costly process, especially in water-scarce cities. Many cities do not institutionalize a proper strategy, proper tariffs, incentives, or controls, so they run out of water, leaving subsequent generations vulnerable.

A smart city must professionalize its water management with water meters and smart pricing mechanisms, to regulate excessive consumption, and to generate market incentives for investing in more and better infrastructure, multiplying the long term supply and coverage of the service.

The liberalization of water markets in a city can represent such a transformative opportunity for cities that, within just a couple of years it can solve the lag in service quality and coverage, but it can also generate significant profits, funding that could serve as a financing source for investments in other types of urban infrastructure, as was the case of *Empresas Públicas de Medellín.*

But this tool makes assistance vouchers especially important, so that the families that require the vital liquid can avoid a significant impact from the increase in the cost of water, but instead, that such an increase impact more those who want to overuse or waste more water.

The use of technology allows this strategy to be even more effective. Water meters have been an important first step for the modernization of the service and the definition of tariffs in cities, but this is of little use when a subterranean leak or old bathrooms increase consumption and therefore the amount to be paid comes out, accidentally, to an exorbitant amount. But now, with modern technology of digital sensors in water meters, as part of the "internet of things", households can receive daily notifications with reports of their consumption, and the cities can charge water consumption for individual units within buildings with much greater accuracy. ■

Case Study

Water and sanitation company – Puerto Cortés

In the city of Puerto Cortes, a public-private company for water and sanitation called Aguas de Puerto Cortés S.A. de C.V. was established. The municipality holds 15% of the shares and 85% belong to the users of the systems (individuals, cooperatives, and companies), all of whom make up the shareholders' assembly, to whom profits are distributed annually in the form of dividends. The municipality is the owner of the assets and is also responsible for the construction of new works. All assets are managed by the water and sanitation company, which is responsible for the operation and maintenance of the systems, through a lease contract.

Tariffs are reviewed every 3 years based on scientific, technical and economic studies; the Municipal Corporation is the one who finally approves the modification considering the implemented studies. Compared to other cities with similar characteristics, the price of water in Puerto Cortés is between 10% and 15% lower. The service operates 24 hours a day, 7 days a week and its coverage is 98% for drinking water and 75% for wastewater treatment.[lix]

The Hoover Dam, built in the 1930's in the United States, serves as a flood control and water source for the region and as a power source for the city of Las Vegas.

Case Study

The Hong Kong MTR

The Hong Kong Mass Transit System (MTR) uses a model known as rails plus property, which allows the transport company to earn revenue not only from fares paid by transport users, but also from the large increase in the commercial real estate value of the sites where its stations are built. This has resulted in a self-financing infrastructure model, unlike most mass transit systems in cities around the world.

An example of this model is Kowloon Station, where the company developed and manages "Civic Square," a 118-story skyscraper with a shopping mall, two hotels and 6,300 rental housing units. In 2018 alone, the company reported earnings of nearly $2 billion U.S. dollars.[lx]

The MTR moves nearly 6 million people daily, with a 99.9% punctuality rate, despite charging relatively low fares, between approximately one and seven dollars (depending on the distance traveled). Even so, these fares are more than enough to cover the cost of operating the system.

SMART PUBLIC TRANSPORT WITH MARKET MECHANISMS

More and better mass transport options, focusing it on industry competitiveness, and separating it from social welfare duties

Another of the most complicated challenges in cities has been the administration of transportation services, both because of its importance for the daily life of people who need these services to get to or from work or school, and because of the proportion of expenses that this implies for most families, sometimes exceeding 30, 40 or even 50% of their total income. On the other hand, decades of bad practices in the way concessions are regulated and administered resulted in major flaws and inflexibility in the industry. Therefore, any discussion on fare adjustment or innovation in the sector results in great opposition, if not from the users, then from the operators.

A smart city must undertake and innovate to improve the coverage and quality of public transportation. Some basic market tools to improve the competitiveness of any service:

Subsidize vulnerable users directly, rather than capping fares.

Encourage competition among a greater diversity of transport alternatives, so that those who invest in their units or businesses can win market share from those who do not.

Create luxury transportation alternatives, not just low-cost options, to penetrate and compete in new markets.

Make fares more flexible, allowing new service options for diverse markets.

Integrate dynamic fares during peak hours to optimize demand schedules and maximize service profitability.

Promote monthly membership systems and group discounts for companies.

Modernize systems, integrating multimodal transportation mechanisms and digital platforms.■

The San Diego trolley, operated by the Metropolitan Transportation System (MTS), uses a digital fare card system called "Pronto" that can be paid for on a monthly membership or daily pass basis.

Sustainable waste incineration plant in Biebesheim (Germany).

Garbage incineration plant in Kamp- Lintfort (Germany).

SMART WASTE MANAGEMENT SYSTEMS

Opening processes of waste management to markets and investors for improving coverage and quality of the service

As a result of bad practices in the administration of processes and concessions, another service that has become compromised in many cities, is the collection, management, and disposal of solid waste: garbage. But as in other areas, technology is creating new possibilities for competitiveness in this industry. Some cities have even been so successful that they have begun to buy garbage from other cities and other countries. One of the challenges for the industry is to open it up to new competitors, especially smaller suppliers, to create incentives for innovation and competition among different suppliers within the same cities.

With more competitive systems for this industry, we would not only maximize the coverage and quality of collection, but we would eliminate the clandestine dumps that pollute ravines, rivers and seas, and we could turn garbage profitable, to such a level that we could be paid for our garbage.

To this end, it is important to consider a series of innovations and best practices:

Create competition between different service providers, allowing each company, subdivision, district or neighborhood to select the company they prefer, even when they represent a difference in cost and frequency.

Digitalize the service through the collaborative economy, like Uber, but for garbage collection. This means that each person -when required- reserves a time for the collection of their garbage and private providers customize routes to optimize their collection, each day differently. The city pays the provider to dispose of it at the municipal landfill. These platforms can even offer incentives - and even cash - for households that separate their recycling in an orderly manner, allowing vendors to make double business out of collection.[lxi]

Install digital measurement systems, especially in public, communal or commercial garbage containers, that when they start to fill up can alert the municipality and service providers, also allowing them to optimize alternative routes each day.■

Containers with digital sensors of the smart garbage collection program of the city of Guadalajara (Mexico).

SMART PUBLIC SAFETY

Modernization of safety surveillance systems and improved emergency response times

Another challenge facing cities continues to be that of public safety. On the one hand, this is a challenge of institutions and reforms to the administration of justice at the national and regional levels. But, on the other hand, it is a municipal public service, which varies greatly from one city to another and, with the right strategies, can result in great improvements. A smart city should undertake smart security strategies, including:

Citizen led anti-corruption strategies, with concrete, short- and medium-term goals, empowering civil society with denouncing, evaluating and accountability mechanisms.

Promoting broken windows strategies that transform the perception of illegality in the city to reduce crime rates.

Modernization of reporting systems and response times, with programs such as 911 and control centers, with citizen evaluation and supervision mechanisms.[lxii]

Modernization of surveillance systems, with new camera and artificial intelligence technologies, as well as the use of drones, to improve surveillance coverage, response times and even prosecution procedures, at a lower cost and greater security for police officers. ■

Sunnyvale, California police presenting their public safety drone system at Technology Business Expo 2019.

Exhibits at "Expodefensa" an annual conference in Corferias (Colombia) for the promotion of technological development and innovation in public safety and defense equipment and services.

Case Study

Tokyo Police

Tokyo police have launched an anti-drone squadron. A story that went viral says that local gangs have started using drones to move their drugs and that, in response, the police are using drones with nets to capture the shipments in mid-air. The gangs are fighting back with their own drones, to take down the police drones. In a statement, police said, "We haven't had this much fun in years." Whether these comments are true or not, what is certain is that it reflects an important reality about the future of technology and smart public safety.

Case Study

New York, NY and Nogales, Sonora

The broken windows theory became popular after its application in the 1990s in New York City. William Bratton, who started as a transit police chief, applied this strategy with undercover officers to arrest transit riders who used the transit system without paying, resulting in a dramatic reduction in the number of crimes committed on the subway. Upon being promoted to New York City police chief, Bratton introduced this same strategy to the entire city, now focusing on reducing graffiti, people cleaning car windows at intersections or asking for money on the streets, among other types of illegal behavior visible on the streets. In less than 2 years, they achieved a 40% reduction in serious crimes in the city and a 50% reduction in the homicide rate.[lxiv]

But beyond their application in the fight against crime, these types of tools are very useful for the promotion of the rule of law in several essential categories in a city.

In the 2000s the border city of Nogales, Mexico, was in a serious situation, because many citizens were careful not to litter on the north side of the border, on the United States side, but did so freely when crossing to the south side. This resulted in great filth and visible deterioration of streets, streams and mountains throughout the city. In 2007 a broken windows campaign was launched, which would address the littering issue, with a change in administrative rules lxv and a highly visible campaign of arrests and fines in the downtown area of the city. In just a few weeks the campaign would go viral to the point of drastically changing citizens' behavior.

In addition, "Clean-up Campaigns" were launched, in which every Saturday, high-ranking city officials, including the mayor, would enter historically deteriorated neighborhoods to remove accumulated garbage from every last street, ravine and hillside, even inviting neighbors to remove built up garbage from their backyards.

At the same time, the city implemented a strategy of complete renovation of its cleaning and garbage collection systems, including a complete renovation of the fleet of garbage collection trucks, street sweepers and cleaning machinery, increasing garbage collection coverage from 90% in the central neighborhoods and 70% in the peripheral neighborhoods to 100% citywide.[lxvi] This would increase annual collection from 130,000 tons to more than 200,000 tons per year in just 2 years, resulting in a highly recognized transformation in the cleanliness of public spaces.

BROKEN WINDOWS STRATEGIES FOR CRIME REDUCTION

Reducing the city's crime levels by ordering, first, the more visibly illegal activity in communities

The broken windows theory observes that citizens become disaffected from their communities when a perception of disorder prevails, as a building with broken windows attracts more vandalism and deteriorates at an accelerated rate. The same is true in cities. To implement this smart safety strategy, some cities have launched successful campaigns to transform the perception of law and order by first solving visible crimes, such as graffiti and litter, which quickly translates into lower rates of crime and violence in the city.[lxiii] ■

Graffiti cleaning system with pressure hoses in New York City (United States).

Case Study

The John Hopkins Hospital model

John Hopkins Hospital in Baltimore, USA, has developed a hospital-at-home model since 1994, particularly for elderly patients or those most vulnerable to getting sick in the hospital (or making others sick with highly contagious diseases). The program helped generate a 32% savings per patient, lowering its average cost from $7,480 to $5,081. Also, the average length of stay per patient was reduced from 4.9 to 3.2 days, and no significant differences were found in medical recurrences of patients treated in the hospital versus those treated in the hospital at home model.[lxix]

This model consists of the following steps:

- An emergency department or community doctor identifies patients who require hospitalization, but who are stable enough to be treated at home.
- The suitability of the home is assessed to confirm that it is temperature-conditioned and has clean water.
- A receptionist meets the patient at a medical or emergency center to explain the program to the patient and hand over biometric and communication devices that will be used.
- A doctor sees the patient at home, in person or by video, explains the protocol and sends the necessary staff, therapists, nurses or others, to administer intravenous medications, nebulizers, tests, ultrasounds, X-rays or electrocardiograms. Meals are also scheduled, if necessary.
- The patient's vital signs are monitored electronically, using telemedicine equipment.
- The doctor visits the patient daily and, in some models, everything is done digitally through telemedicine.
- Once the patient improves enough to be discharged, their care is transferred to their family doctor. In some models, the hospital keeps monitoring their improvement for at least 30 additional days, to ensure that the patient takes the medications and attends the follow-up appointments issued.

ACCESS TO SMART MEDICAL CARE

Expanding medical care coverage with public and private, low-cost systems and technology

Public health policies turn out to be one of the main topics of discussion for smart cities, especially after the difficulties caused by the COVID-19 pandemic. Unfortunately, the discussion has remained political in nature, with very little diversity of strategies. Most of these have been top-down, federal or state government impositions of quarantines, social distancing, capacity restrictions, mandates for the use of face masks, among others. This has meant great deprivations of individual freedoms, in the hope of saving lives, which sadly, has not been very successful and even less so in developing countries. Smart cities must propose strategies adapted to local conditions with resilience tools that allow their citizens to not only survive, but to live and thrive, despite all kinds of shocks and pandemics, rather than abide by national or international mandates that are completely disconnected from the challenges and advantages of local solutions (Pandemic Resilience Tool on page 204).

This situation has directed the spotlight on a need that all cities were already facing: the large backlog of hospital beds and intensive care units per capita. Let's remember that such privative and severe health impositions had the sole objective of avoiding hospital overcrowding. In the short term, this was attempted to be achieved by "slowing the curve", which had mixed results. But in the medium and long term, the only solution is to increase the number and capacity of hospitals, especially in cities where this was already a major cause of unnecessary mortality.

In addition, pandemic or no pandemic, digital alternatives should also be exploited, with "beds at home" and telemedicine programs. The cities with the highest coverage have about 414 hospital beds and 13 intensive care units per 100,000 inhabitants[lxvii]

Fortunately, intelligent medical security tools are now emerging, allowing coverage to be expanded and reducing the need for expensive equipment through platforms such as Doc.com.[lxviii] This is a Mexican start-up that connects doctors with patients seeking basic, non-invasive medical care. People download the application and when required, request a consultation from the comfort of their home or work, which is answered in seconds or minutes, connecting the patient through their cell phone camera with a doctor.

These types of consultations are an excellent way to serve patients who only require a simple prescription, which can be given through the same application, reducing a large number of trips to the hospital and long waiting lines, and even allowing patients to arrive at the hospital with a professional orientation ready, when the doctor of the digital consultation indicates the need to do so.

But the most revolutionary thing is that the services are even free of charge. The business is not the consultation but the advertising and the platform that allow the application to market all kinds of services between users and providers.

Thus, a smart city can establish alliances to implement first level health care systems, accessible to all citizens from their mobile devices, reducing the costs of construction of public medical facilities and their operating models. ■

Fire emergency response system with small vehicles in the city of Tokyo (Japan).

INNOVATION FOR EMERGENCY RESPONSE SERVICES

Creative technology for improved response times and quality emergency response services

One of the main challenges cities face in attempting to regulate or enable more accessible and intelligent urbanism models is resistance from building safety specialists and fire marshals. They advocate for road engineering features that prioritize easy access for emergency vehicles, especially firetrucks, which require a lane size and turning radius at intersections far greater than is compatible for walkable street designs, for community life and for financial sustainability. Unfortunately, these urban patterns guided by modern "safety" protocols contribute negatively to the numbers of automobile accidents, pedestrian injuries, and even crime, resulting in greater loss of life and property than any policy that occasionally affects convenience or access for firefighters.

Fortunately, thanks to new technologies and systems, emergency service response times can be improved and their overall quality enhanced, while allowing for a transition to new models of urban design as well. To this end, a smart city must consider:

Acquiring new response units customized to the new, desired street dimensions, able to access neighborhoods with alleys, pedestrian walkways and with lower energy consumption designs.

Use of drones for first responders, allowing to put eyes on any incident as quickly as possible, better coordinate the necessary response, and even make defibrillators available for cardiac arrest situations.[lxx]

Access to voluntary, digital medical information that allow emergency systems, with the patient's authorization, to access his or her history and preexisting conditions, to arrive better prepared at the scene of an accident.[lxxi] ■

Case Study

eHealth Estonia

The Estonian healthcare system has ventured with significant innovations. Every person in Estonia who has visited a doctor has a digital health record (eHealth), which can be consulted using their electronic ID.

The digital health record uses blockchain systems that make it secure and private, so a third party can only access the information when a patient provides access. In this way, Estonia boasts that 99% of the country's medical information is digitized and that more than two million consultations are received by doctors per month. In addition, 99% of prescriptions are issued digitally, without the need for paperwork or face-to-face visits to the doctor, and 100% of medical payments are made digitally. Emergency operators can track a cell phone call in less than 30 seconds to direct the ambulance more accurately, and enroute ambulances can access patient health information to make time-critical decisions.

SMART CITIES: ACCESIBLE CITY

Starlink is a satellite-based high-speed internet program, launched as part of Elon Musk's SpaceX program.

Fixed wireless internet system, with antennas that provide coverage of 30 kilometers around, very useful for rural areas or communities with infrastructure backwardness.

Programs for the modernization of the internet infrastructure through fiber optics.

INTERNET CONNECTIVITY

Programs for improved coverage, quality, and access to internet

We have to say it: a smart city requires good quality internet. It is true that a city is not smart if it does not comply with enough basic, urban principles and characteristics that we have detailed in this manual, for infrastructure and public services, water, mobility, public spaces and sources of employment. But to be a smart city, to really capture the best industries and ventures from other regions or countries, and to take advantage of the many digital tools listed here to provide better services, requires not only access to the internet, but access to good internet.

A city can start by promoting the necessary infrastructure and strategies to at least increase access to computers and the internet for all families and communities in the city. Countries like Estonia propose it as a citizen's right and the government does everything possible to guarantee this access to every citizen, a great public policy for human and social development. But a smart city also requires fiber optic internet with an architecture that optimizes its price, speed, and reliability, as well as the competitiveness of service providers. The internet of things will help revolutionize the way public services are managed and delivered, and the industries of the fourth and fifth industrial revolution will transform the economy of cities. Some of this depends on that extra millisecond of internet speed, when a city compares itself to its competitors in New York, San Francisco, London, etc., because that extra millisecond can become the determinant factor for a level of prosperity that few urban planners can imagine.

Therefore, it is necessary to implement internet improvement programs in cities, considering the following aspects:

Evaluate the existing infrastructure and the quality and speed of the city's internet, compared to the rest of the region and the world.[lxxii]

Analyze existing technologies and identify the best options according to the city's budget. In particular, know the functionality, costs and strategies related to fiber optic systems technology and infrastructure with respect to the concepts of: Middle Mile, Fixed Wireless, Fiber to the Premises/ Home (FTTP/FTTH), Fiber to the Cabinet (FTTC), micro trenching, pushable fiber, shared fiber (PON, or Passive Optical Network), GPON - Gigabit PON, etc.

Build a short, medium and long term business plan for the introduction of fiber optic infrastructure, with management and distribution policies adapted to the capacity of the city (or town).[lxxiii]

Define standards for mandatory underground installation and upgrading of all overhead telephone and internet infrastructure.

Implement smart management and pricing policies for the use of subterranean facilities or shared fiber optic lines.

Define strategies for the modernization of telephone and internet antennas, for the preservation of the urban image and, if necessary, for the construction of shared municipal antennas, to which all companies should be connected and which should be built as monuments, to contribute to local identity and urban image.[lxxiv]

Promote public and private Wi-Fi hotspot systems and companies, both for private venues and for public spaces. ■

Case Study

Digitization of water infrastructure: The case of New York City

The New York City Department of Environmental Protection has embarked on a massive Automated Meter Reading (AMR) program to get a better picture of what is happening with the city's water and to give its users a tool to check their daily water usage.[lxxvi]

These digital reading devices use low-energy radio frequencies that communicate with antennas installed on the rooftops of buildings. With this, the city can charge users with much better accuracy for their consumption, given that up to 17% of households were receiving only estimated water bills due to the limitations of the previous system. With the installation of the new system in more than 800,000 properties, today, less than 3% of households pay estimated amounts.

With this system, through an App, users receive four notifications per day with readings of their consumption and up to one notification per hour for commercial and industrial users. This App also warns users with possible leaks or out-of-normal consumption when anomalies are detected. This "Leak Notification Program" has been very successful, saving approximately $73 million dollars for its users.

This system also includes mechanisms that measure water quality with 40 monitoring stations around the city that detect any water problems, enabling a rapid response to protect users from contamination incidents.

INTERNET OF THINGS AND ARTIFICIAL INTELLIGENCE FOR PUBLIC SERVICES

Digitalization of water, energy, street lighting, streets, trash containers and other public infrastructure and services

Cell phones have evolved from being devices for making calls and sending messages to what they are now, mobile computers, with internet, camera, GPS, operating systems, and advanced programs, including some that allow us to measure different things such as the amount of data we have used on Wi-Fi or roaming. Some applications make it possible to measure the amount of time the phone has been used each week, others count steps, hours slept, even the quality of sleep. With some complementary gadgets, these cell phones can help measure blood sugar, heart rate, sleep quality and issue progress reports and recommendations for adjustments to optimize one's daily routines.

In a smart city the same can be done, to measure all kinds of things, water, garbage, energy, air pollution, traffic, etc. Using the internet, sensors and digital tools evaluate and manage these things more efficiently. This is what the internet of things is all about, identifying problems in real time, finding water leaks, both in public pipes and in homes, or connecting and managing new sources of power generation to the grid, tracking air quality, or sending garbage trucks to trash cans that report being full, before the garbage overflows.

The capacity of these sensors makes it possible to evaluate thousands of variables of everything, quality, frequency, location, patterns, and sudden changes, which may not be understandable to the naked eye by anyone. This is what we mean by Big Data. Without the right tools, the information is stored on a hard disk, or in a report of thousands of pages that will be of little use to decision makers. This is where artificial intelligence becomes the great partner of the internet of things, to process and report on key information, which serves to make decisions in real time, or better yet, for the computer itself to make decisions of a technical nature, such as turning off a gas pipe that reports a leak next to a school, or notifying, via text message, every person with a cell phone located within a flood, tsunami or earthquake zone, the second it is detected.

In reality, the Internet of Things has diverse commercial and personal applications, but in a smart city these tools should be used to better conserve natural resources, to better manage infrastructure and to reduce operating costs, which should translate into better services at a lower cost for users.[lxxv]

Some basic tools to consider in smart cities when thinking about the internet of things are the following:

Smart water and electricity meters that allow users to monitor their daily consumption, as well as possible incidents of leaks or waste, in real time.

Smart water and electricity networks that allow service providers to identify and correct problems and optimize processes, in real time, in infrastructure and service quality.

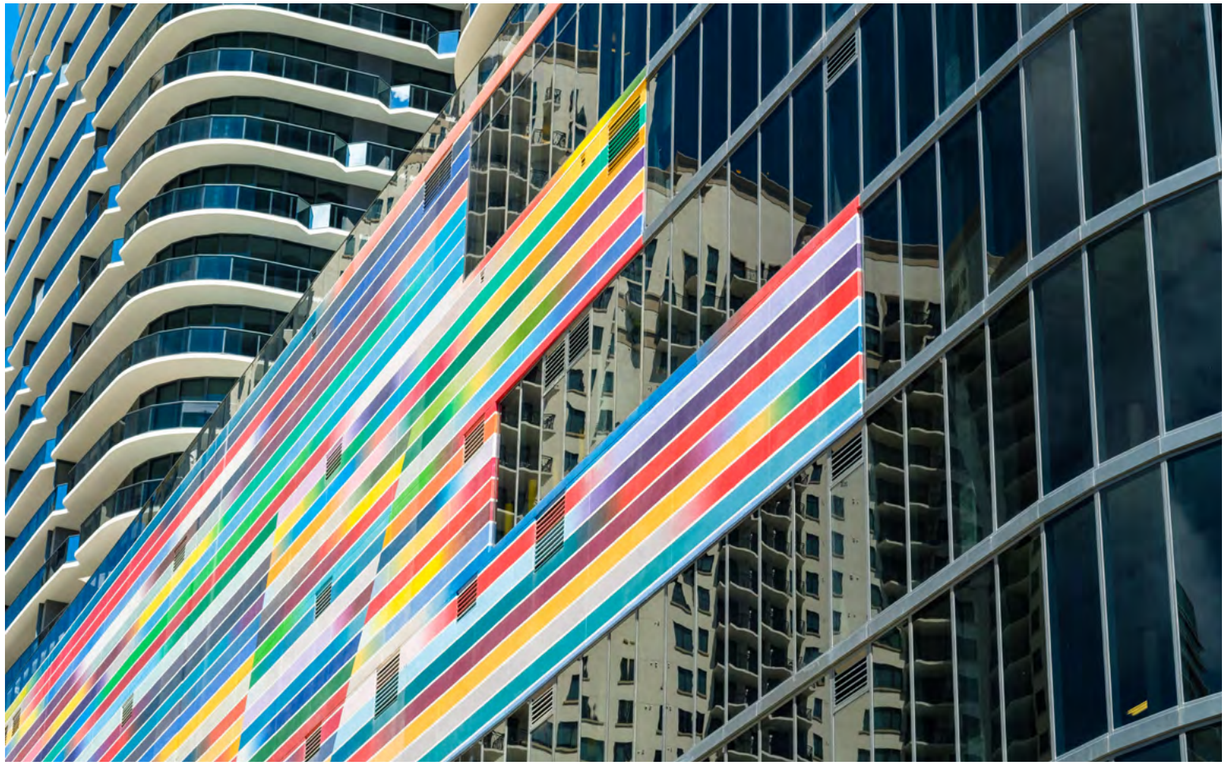
Intelligent waste collection and recycling, allowing companies to optimize their waste collection and separation processes for recycling.

Intelligent public lighting, allowing energy savings in streets without users.

Intelligent parking lots, allowing drivers to easily identify available parking spaces to avoid unnecessary vehicle traffic.

Intelligent air monitoring to communicate pollution contingencies, which is especially vital for people with breathing difficulties. ■

SMART CITIES: ACCESIBLE CITY



The Downtown Miami Development Agency, an independent agency with the authority to create tax incentives and urban improvement funds, has achieved great successes in downtown revitalization and development, including the revitalization of the Flagler District, as well as the management of the Metromover (a free sky train) and the promotion of the major development of the Brickell Financial District.

HISTORIC DOWNTOWN RENOVATION PROGRAMS

Transforming historic or civic downtowns into attractive, local destinations, with social diversity, and rich, cultural heritage

City centers can be places of great cultural, urban, and artistic richness in cities, but they are often neglected places. Sometimes the impediments to development are deteriorated public spaces, but often there are also regulatory constraints, which, in trying to preserve old buildings, end up prohibiting all new development, resulting in unused places. To transform and vitalize their downtowns, cities can start with:

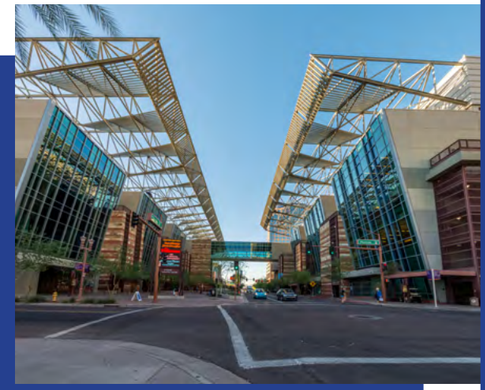
Formation of councils, boards, or development agencies, to coordinate the participation of all key factors, generate a strategic vision and manage the project and investments in the short, medium and long term.

Rescuing and activating public spaces, sidewalks, small squares, and key public and cultural buildings.

Integrating strategic anchors, destinations that generate traffic to these places, which can be cinemas, stadiums, government offices, etc.

Facilitating real estate development to activate these destinations with more commercial and residential density.

Identifying the properties that provide strategic cultural or historical value, as well as the financial and urban planning tools to be implemented to restore them and really turn them into attractive destinations that bring identity, history and beauty to the neighborhood. ■



Case Study

Downtown, Inc. of the city of Phoenix, USA

Phoenix in Arizona has been an icon of the automobile-first planning and regulatory model and is one of the metropolitan cities with the highest temperature in the world, where walking is almost unthinkable. The city is known for its striking freeways and extremely sprawling suburbs and is the last place imaginable as a prospect for walkability.

For decades, Downtown Phoenix had been decaying, without much use or life. Then, some strategic projects were launched, such as a large stadium and light rail, and in 2008 the Downtown Inc. agency was formed,[lxxvii] dedicated to the widening and activation of sidewalks, as well as the revitalization and activation of public spaces. Despite the heat and a culture rooted in the automobile, this vision of neighborhood walkability is an extraordinary success, the transformation to a major metropolitan downtown is visible and has translated into significant economic development, with more than $5 billion invested to date. This is an example that investments in walkability projects, even in the hottest metropolitan city in the world, translate into great economic and urban potential.

SMART CITIES: ACCESIBLE CITY

Payment systems for "on-demand" use in U.S. national parks generate part of the funding necessary for their maintenance.

VOLUNTARY CONTRIBUTIONS FOR CULTURAL SPACES AND EVENTS

Donation-based systems and flexible price schemes for museums and cultural spaces, events, and programs

Art and culture are very favorable elements for cities, because of their ability to attract a greater diversity of people and talent to a city and because of the identity it generates for residents. But due to limited public budgets, greater pressure for austerity, or to prioritize basic needs, many cities have stopped investing in art and culture.

But a smart city must put art and culture at the center of its agenda, creating places for enjoyment that become indispensable to differentiate itself in a global market of talent and investment. To achieve this, while avoiding overspending or divisive controversies, a smart city can find alternative funding mechanisms.

These include voluntary admission prices, which means charging entrance fees at events or museums, but allowing access to those who cannot cover the full suggested cost. This also involves collaboration with civil society and philanthropy, to achieve the financing and operation of cultural facilities with the help of individuals or organizations that are willing to contribute, NGOs, embassies, philanthropists, etc. Some concepts to consider for financing cultural spaces and events in a smart city are:

The American Museum of Natural History in New York City (United States) uses a voluntary pay-as-you-go system, which allows it to be financed without taking away access from families who do not have the budget.

Payments for using the service that can be mandatory, voluntary, requested, membership or hybrid. These payments can be made at kiosks, with cash envelopes, or digitally by credit card or cell phone.[lxxviii]

Charging for parking, so that users who want to use the space without paying can do so, but without the convenience of a car.

Charging for full access, with differentiated charges, and even a free option, to access part of the space. Users who want full access would then be motivated to make an additional payment. ■

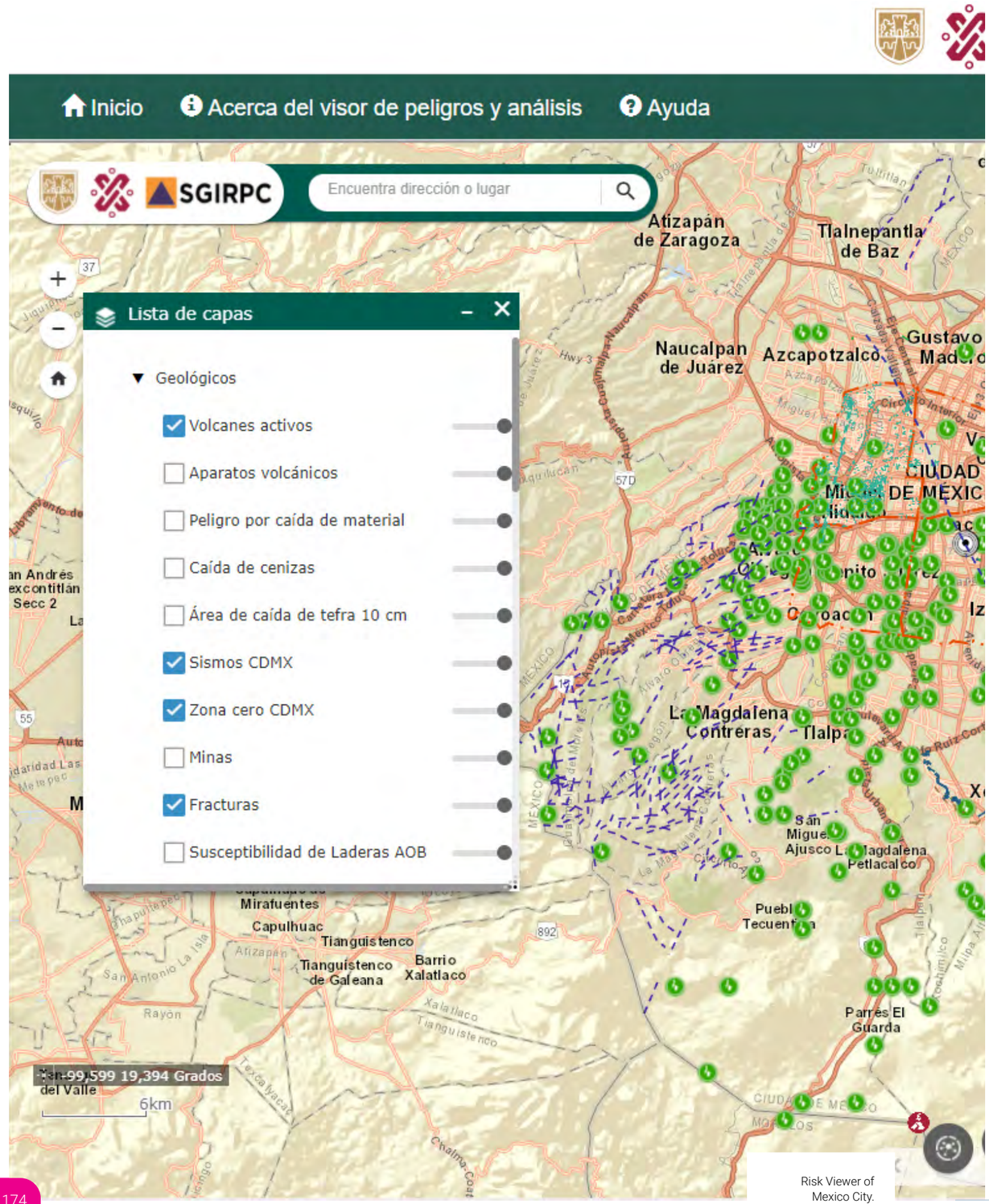
04 RESILIENT CITY

One of the greatest challenges facing cities today, and one of the most important for future generations, is environmental resilience, the ability to adapt to changes and mitigate the risks of climate change (hurricanes, rainfall, floods, droughts, pandemics, etc.).

Additionally, as societies become richer, they increasingly demand that their city have as little negative impact on the planet as possible. Therefore, cities will have to be designed in harmony with the environment and be prepared to face more extreme events.[lxxix]

A resilient city must address questions such as:

- What are the areas with the highest environmental protection value in our city? What are the high-risk areas? How are we protecting both?
- How much water capacity does our city have? How can we multiply it and diversify its sources?
- How are we preventing pollution of the streams and seas?
- How are we reducing our city's carbon footprint?
- How can we mitigate, adapt, and thrive in cities despite new diseases and health risks such as COVID-19?



Risk Viewer of Mexico City.

DIGITIZED RISK ATLASES

Maps that clearly identify areas vulnerable to territorial risks

The first thing a city must do in its planning efforts is to geospatially identify areas prone to natural hazards that pose significant risks to development. If this is not taken into account, floods, mudslides and landslides can cause tragedies in a city.

Many of these risk sites are obvious: riverbeds, beaches, lagoons, swamps, hillsides, etc. But there are other risks such as deep underground caves or water basins that have been left empty and destabilize the ground, as well as geological faults and rising sea levels that are unfortunately identified long after a development has been built.

Therefore, all cities should have a map that clearly identifies high-risk, undevelopable areas, as well as those areas with medium or low risks, which, with some special mitigation measures, allow for safe and sustainable development.

However, to ensure the effectiveness and good use of this tool, a smart city must:

Prioritize the identification of high-risk zones, in which no development should be allowed, except for green infrastructure.

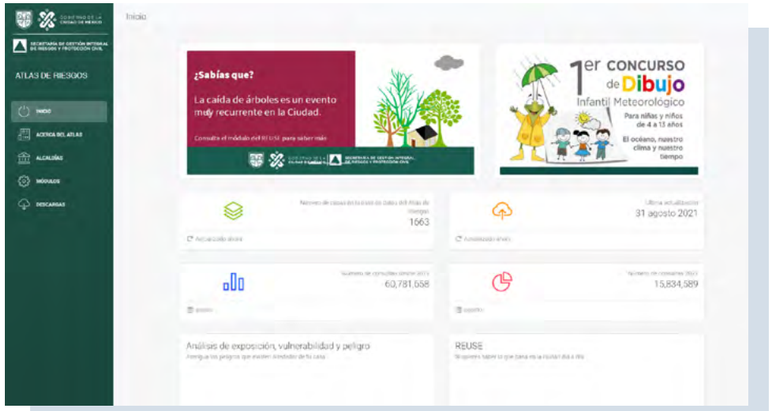
To mark as few high-risk areas as technically feasible since, to the extent that new areas are added, especially zones that are not really high risk, this map loses credibility, and economic and political pressures arise to ignore it.

Identify as few medium or low risk sites as technically possible, and clearly define the mitigation regulations necessary for their land use.

Digitize the risk atlas and include it in all real estate or local geo-information portals, especially within land use and zoning maps, for easy consultation by any authority, citizen or investor.

Create collaborative digital mapping systems to identify new risks and risk trends, in real time, with the help of citizen reports, during weather events or other incidences.

Design a risk management and green infrastructure strategy for all sites identified as high risk due to natural or anthropogenic causes.■



Mexico City's Risk Atlas Portal.

SMART CITIES: RESILIENT CITY

Green infrastructure systems for rainwater harvesting at Balfour Park in Chippendale (Australia).

GREEN INFRASTRUCTURE POLICY

Strategies for environmental protection and risk management through smart design of public infrastructure

The first thing a city must do in its planning efforts is to foresee the infrastructure that will protect its areas of high environmental value, its lakes, streams, beaches, dangerous hillsides, ravines, water regulating vessels, geological faults. The infrastructure to be built on top of these places is called green infrastructure. And this is the most important infrastructure in the city, because without it, the city is prone to natural disasters, floods, landslides, etc.

These spaces are also indispensable for aquifer recharge, especially in water-limited cities, preventing water from flowing to other basins.

But the only way to protect these places effectively is to design them as public spaces, as green areas and parks, making the community take ownership of them. Otherwise, the temptation to develop them prevails, to build houses or roads, regardless of any plan or regulation to the contrary. Sometimes the urbanization of these areas derives from corruption or negligence, but often, not even the decision makers are aware of the original reasons that a site was marked as undevelopable. Only by developing green infrastructure in these areas and using them in a compatible manner will urban development mistakes be avoided.

This applies not only to the large rivers that run through the city, but also to small and medium-sized runoffs. Each development should identify the places where water will run (someday) and connect them with systems and networks of streams that articulate the entire city. The minimum technical considerations should at least design these spaces to receive water when it rains. But smart cities must go a step further: they must recognize the great potential that these spaces represent, turning them into public spaces.

To this end, cities should define simple regulations that allow each small and medium-sized development to consider basic water management and green infrastructure features. ■

Boardwalk in the City of Long Beach, Washington (United States) that uses an elevated wooden walkway to avoid damage to the mangroves.

The slopes of the coast of Lima (Peru) used as a large linear park with viewpoints.

El Represo, a natural rainfall disaster area, becomes a large park in the City of Nogales (Mexico) through the Federal Government's Urban Improvement Program in 2020.

CONSERVATION EASEMENT OF HIGH-RISK AND HIGH CONSERVATION VALUE AREAS

Strategies to preserve rivers, lakes, canyons, wetlands and forests from inadequate development

The Tijuana Estuary, a green reserve in the City of San Diego (United States) that provides an important environmental service for the cleaning of the Tijuana river in its transition from one country to the other.

One of the first steps in promoting effective green infrastructure strategies is the planning of a city's main high conservation value areas. These are areas that should be understood as metropolitan public spaces with universal access, which should be planned and procured by the public sector before private development occurs in their surroundings, and it should be paid by those who will directly benefit, financially, from such investments.

This type of projects should contemplate progressive designs that reflect the financial and budgetary reality of the real estate value of the area, considering low-cost first stages that serve at least for their delimitation, with signage, walking trails, and even low impact activities, allowing for formal construction and financing in later stages.

However, many of these spaces have often been negatively impacted by formal and informal development. Therefore, it is essential to initiate processes of technical delimitation, participatory planning and comprehensive management, allowing for the relocation of at risk human settlements, the progressive restoration or rescue of the area, and the construction of the corresponding, compatible public spaces.

To this end, some of the elements that will be indispensable to plan:

Streams and riverbeds, particularly in places that may not have much rain for extended periods of time. If these are not protected, the city will experience flooding in the future. These should be envisioned as resilient spaces that will regularly, after several decades, witness a large rainfall (known as the 50-year storms). Therefore, they must be designed to survive a flood, able to be cleaned or repaired at low cost, to protect entire neighborhoods, and to channel water intelligently during such events.

First beach dunes should be protected from inappropriate development or from restricted access. They should be designed as the main public space of a city, preventing private developers from excluding access for residents or tourists. These areas determine the ability of cities to survive if sea levels rise due to climate change or if the city faces more and worse storms and hurricanes.

Lakes, wetlands and water reservoirs that must be used to contain rainwater during rain events, but depending on the specific place, they must be considered as dams or lakes that will remain full of water for long seasons and dry for others.

Dangerous ravines and hillsides with risk of landslides that must be protected not only from buildings, but also because they are areas prone to clandestine garbage dumps, discharges of contaminated water, and pollution of aquifers and seas. However, these can also be areas of great beauty and microclimates, with the potential to develop boardwalks, scenic lookout points, and a wide variety of recreational experiences.

Landslide sites and unstable grounds that without public intervention are subject to illegal or inappropriate construction and, in some cases, become crime hotspots.

National forests, especially those above the maximum water feasibility elevation, whose development would imply large financial burdens for the water system, but also those natural sites with extraordinary environmental value and recreational potential. ■

Right: Jaraguá do Sul SC - Aerial view of the Via Verde Linear Park - Cycling Route along the river.

Below: Manzanares Linear Park

Bottom right: Aerial view of the modern skyline of Panama City, Panama with modern Highrise buildings.

Below bottom: Little Island park at Pier 55 in New York, an artificial island park in the Hudson River west of Manhattan, New York City, next to the aerial view of the Hudson River park.

PARK DEDICATION AND CONSERVATION MANAGEMENT PLANS

Designing strategic public spaces for the adequate protection of high risk zones and high conservation value areas

Once areas of high risk or high environmental value are identified and legally established, a smart city must design projects that convert these sites into public spaces, hand in hand with environmental management plans, to ensure adequate ecological services. But areas of high environmental value can and should be enjoyed as public spaces with recreational, cultural and architectural components that should be considered for the creation of successful public spaces.

Therefore, for the design and proper management of all areas already declared as high risk or high environmental value, a smart city should consider:

Clearly marking the precise area of the site that will be affected by water and flooding during rainy seasons.

Identifying the sites necessary for natural water filtration to recharge a city's aquifers.

Defining some specific, but very rare, sites that should avoid all, or as much, human activity as possible.

Integrate as many compatible uses as possible in the rest of the area, not only environmental, but also scenic, recreational and cultural, so that the surrounding communities can take ownership of the spaces, reducing the risk of future temptations for changes in land use.

Building trails, boardwalks and linear parks with rustic walkways, made of clay or with minimal decorations, but well marked, enjoyable for strolling, running or walking, in a more natural environment. This is especially important for beaches, since the temptation of development and beachfront landowners tends to be to get closer and closer to the sea and the beach, forgetting the risks involved and not understanding the catastrophe this can cause to the rest of the city.

Building boardwalks or linear parks, with walkways or bike paths of durable material (such as wood and concrete), which can serve as recreation and mobility throughout the city, in a style that combines nature with urban infrastructure.

Build River Walks, with nearby shops and greater intensity of surrounding uses, with completely urban infrastructure, not necessarily natural, but carefully preserving the ecological function of the riverbed itself.

Parque la Mexicana, a model floodable park in the Santa Fe area of Mexico City (Mexico).

Design linear parks with additional elevation and infrastructure to serve as a barrier against storms, tsunamis and eventual sea level rise. It should also be part of the smart tools of coastal cities, especially those prone to extreme weather events. ■

Case Study
Ecological Beltway, Guatemala City

In many of Guatemala's ravines live families without access to formal housing, invading spaces with a high, latent risk. This, first, causes deforestation, resulting in landslides when the rains come. Guatemala City's new Land Use Plan now prohibits construction on slopes greater than 16%, but many people still consider the option of living in ravines illegally.

Therefore, a Green or Ecological Beltway program aims to protect a network of ravines surrounding the city, adding environmental, tourist, recreational, and community value to these spaces, making it accessible to neighbors, and offering a wide range of sustainable activities that are a source of income. The city seeks to connect the network of ravines with bike paths and pedestrian walkways. These urban parks encourage proximity to nature and wildlife and have a recreational design that generates activities and movement designed for its conservation, preventing anyone else from encroaching on it with inappropriate constructions.[lxxxi]

Case Study
The Dryline, New York

The case of "Superstorm Sandy", which flooded New York in 2012, for example, initiated a green infrastructure planning process that is now called "The Dryline"[lxxx], a mega project of 16 kilometers of elevated linear parks, with planters, retaining walls and recreational and landscaped hills, designed by the famous architecture firm Bjarke Ingels Group, with the objective of making the city more resilient against extreme rainfall events in the future.

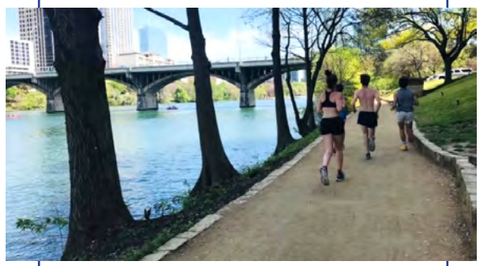
Case Study
Rillito River Park and Sabino Canyon, Tucson, AZ

In 1983, extreme rain events in Southern Arizona resulted in the region's most severe floods in history, taking at least 13 lives. As a solution, the City of Tucson began what would become the "Rillito River Park" project. This great, 20-kilometer linear park is a green infrastructure public space designed to protect the city's great river, the Rillito River, using two surrounding boardwalks. This stretch of the river is part of "The Loop", a great, 200 kilometer long, linear park with a bike path which has become a magnet not just for cyclists but for walking, pets, working out, running, skating and even horse back riding, given that it connects with parts of town that still allow horse ranches.

This creek, like many, almost never has water, but runs or fills up once a year, or even every couple of years. In other cities this can represent a great risk because of the natural disasters it can cause, due to lack of protection or adequate delimitation, resulting in development, either of streets or buildings, within the flood zone. Using this green infrastructure strategy, the city of Tucson was able to turn the areas prone to bad development into a great urban asset, protecting the city from the risks mentioned above and providing it with a series of extraordinary public spaces, both for recreation and for pedestrian and bicycle mobility. This same strategy can be used for all areas of high environmental value, such as beaches, lakes, hills, etc.

Tucson also has a great example of an urban forest known as Sabino Canyon. This place is home to thousands of species of the Sonoran Desert, which attracts more than one million visitors a year and is one of the main recreational destinations for the city's residents. The park has a large visitor center at its entrance, with ample parking (for a fee of $8 USD per car or $40 USD per year, which funds much of its maintenance), dozens of climbing and hiking trails, beautiful hillsides, streams, waterfalls and water pools, as well as ranger station and tram services that can transport families to points of interest.

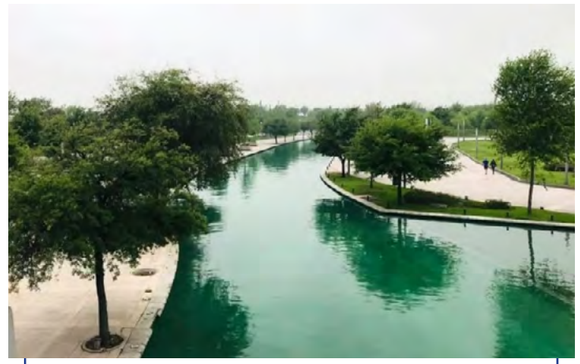
This is an example that has been very successful, selecting the most valuable sites and turning them into a national forest as a metropolitan, public space. The city sees this park as part of its local identity, as one of the best recreational alternatives. Residents now become this natural area's greatest defenders.

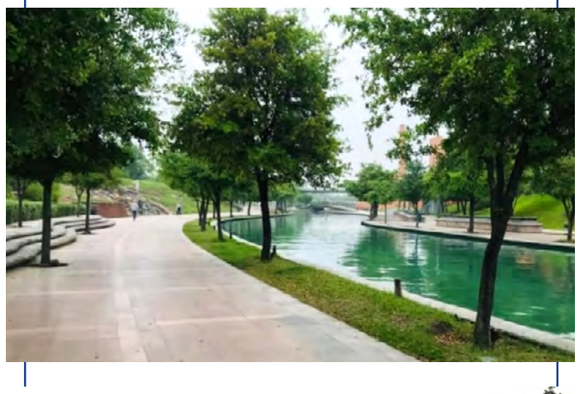


Case Study

Lady Bird Lake, Austin, United States.

Austin is recognized as one of the most vibrant smart cities in the United States, for its creative industries, student culture, food and food trucks, as well as great diversity of people and talent. But the most iconic element of the city is the way it has integrated the great river that runs through the city, taking advantage of it as a public space, with good design and great diversity of uses and activities, which make the experience of visiting or living in Austin a memorable one.





Case Study

Fundidora Park, Monterrey, Mexico

Another example of good urban design, designed to protect an environmental lung, is Fundidora Park in Monterrey. This includes a section inspired by the "River Walk" in San Antonio, Texas, with commerce and intense urban life nearby. Other areas of the park include artificial lakes, benches, playgrounds, nature, bridges, cultural spaces and a diversity of elements that make it one of the best parks in the city and the country.

Case Study

Earthquake Ruins to Build Parks

The Ruins of the Santiago Apostle Parish are now a public space located next to the Main Square of the Municipality of Cartago in Costa Rica. The space is a garden designed within the ruins of a church, damaged by earthquakes on several occasions since its initial construction in the 16th century and finally destroyed by one in 1841. During the last attempt to rebuild the church, the 1910 Santa Monica earthquake resulted in the cancellation of the project.

These permeable infrastructures serve two purposes, as a great public space for the city that attracts visitors from all over the region, but also as a reminder that the terrain is high risk, susceptible to earthquakes.

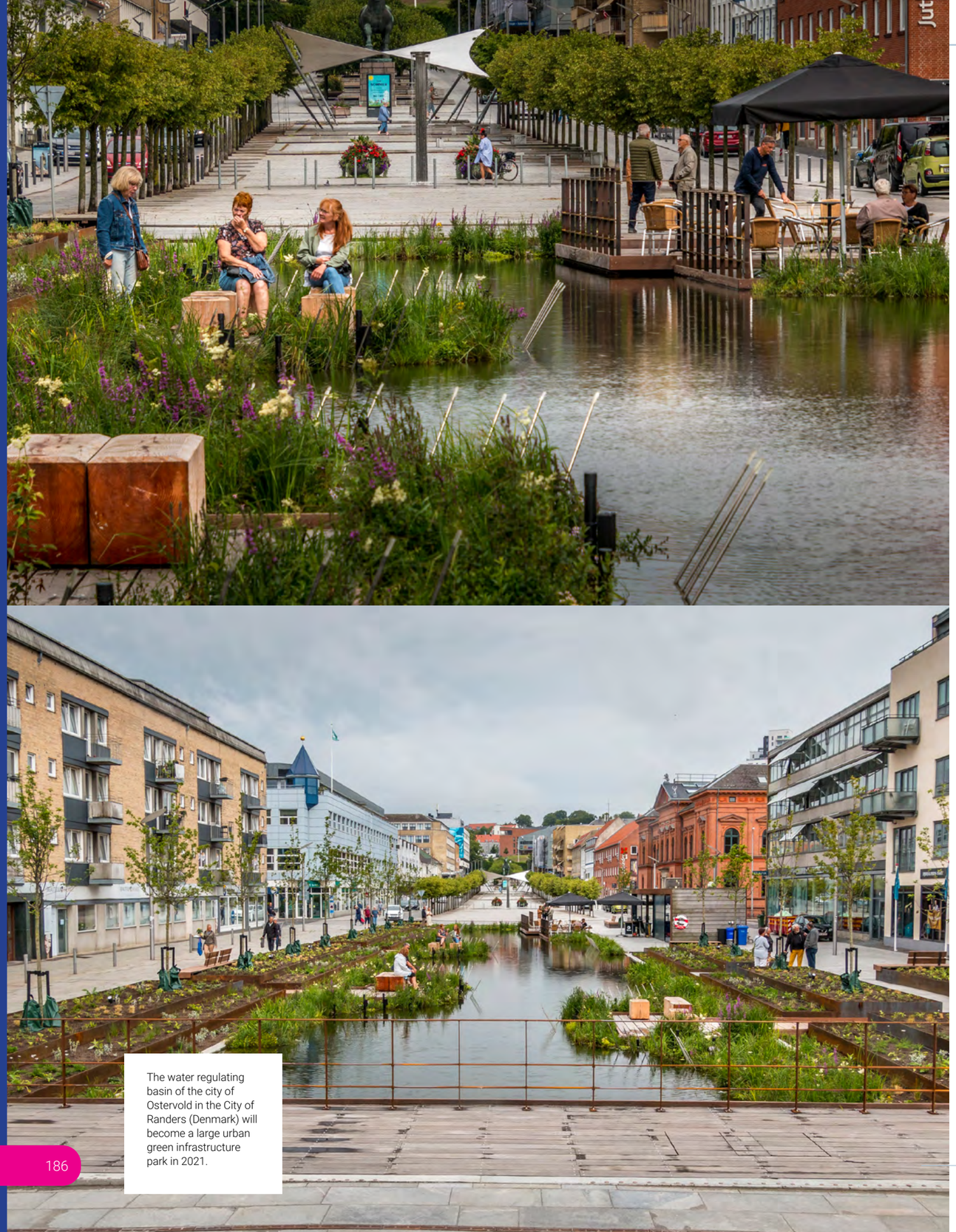
In this sense, cities such as Tijuana in Baja California are now beginning to consider similar strategies for spaces destroyed by earthquakes or landslides. For example, in the Rancho Las Flores neighborhood of Tijuana, a large public space is being designed on the ruins of the destroyed buildings that remain on the hillside after a recent landslide, using the same material, avoiding not only the multimillion dollar expense of removing them, but also using the ruins as an asset in the architecture and landscaping of the future park.

Case Study

Environmental fund, Puerto Cortés, Honduras

Puerto Cortes shares the successful experience of an Environmental Fund established for the protection and restoration of its main water supply source following the strategy of payment for ecosystem services. To this end, a management plan was drawn up defining the programs and activities to be invested in, including plant production, reforestation, environmental education, sanitation, erosion control, among others.

For implementation, an environmental fund was established that is funded by payments from all users of Tulián's water system, which is operated by Empresa Aguas de Puerto Cortés, which retains 5% of the water consumption bill and transfers it to a special account. The administration and use of the Fund's economic resources is monitored by a Municipal Environmental Council, presided over by the mayor and made up of representatives of the institutions with jurisdiction in the area: the water company, trustees, churches, the Fire Department, the Red Cross, the Ministry of Health, Education and Security, and civil society groups, among others, which contributes to efficient, transparent, and effective management. The watershed consists of approximately 5,000 hectares that must be protected against the advance of the agricultural frontier and pollution, as deforestation reduces the amount of water that can be captured, and ultimately hinder the city's water production capacity.



The water regulating basin of the city of Ostervold in the City of Randers (Denmark) will become a large urban green infrastructure park in 2021.

RAINWATER HARVESTING WITH A NETWORK OF DAMS

Building sunken parks and dams along streams, creeks, and floodplains, to manage stormwater runoff and avoid floods

Another tool for smart resilience is rainwater harvesting, which means water retention. This serves to mitigate flooding, to recharge groundwater, to improve environmental ecosystems, to promote microclimates and to convert dry places into places with more vegetation and water. It is a particularly useful tool for cities that flood, cities with valleys, ravines, hills, mountains, broken topography, which due to lack of planning, built houses or developments in the lower parts of their valleys, leaving these areas prone to floods and disasters every year.

To reduce these disasters, smart cities use a resilience strategy with rainwater harvesting, which allows to exponentially decrease the speed at which water flows down into the valley during rainy seasons, especially with the use of smart dams. Instead of building a single dam where all the water is concentrated, which is surely already impossible due to development, these dams are, rather, **dozens or hundreds of small, low-cost dams upstream that retain water at the beginning of runoff, at least during the first 30 minutes of rainfall.** ■

One of 18 rainwater harvesting dams designed in 2008 to hold rainwater during the first 30 minutes of rainfall as a strategic solution to the disasters caused by rainfall each year in the city of Nogales, Mexico.

The Victor Jara Intercommunal Park (formerly known as Aguada Park), is a floodable park parallel to the channeled river Zanjón de la Aguada in Santiago (Chile).

PERMEABLE PUBLIC INFRASTRUCTURE

Street designs for rainwater harvesting, to restore groundwater reserves and to reduce flooding

Rainwater harvesting with permeable infrastructure allows some of the water to be captured during rainfall, for example, with water inlets in medians, sunken parks, or permeable parking lots - that reduce, at least some of the water that flows onto the streets. Permeable infrastructure is especially useful when the subsoil is prepared with suitable materials in the form of stone wells.

Such techniques allow a city to absorb large amounts of water during rainfall events without requiring the broken topography necessary for the smart dam strategy. With permeable infrastructure, the entire city becomes a reservoir.

Many cities are tempted to generate strict green infrastructure codes, which prohibitively complicate development costs and processes.

To avoid over-regulation, cities can establish flexible frameworks that allow for variety in methods, as long as real estate development plans can show adequate techniques for the harvesting of the first 3 centimeters of water during rain events. ■

Permeable pavement catches surface runoff, allowing it to infiltrate into the soil below or into underground canals.

Namba Parks, a real estate development in Osaka (Japan) that includes a system of eight rooftop gardens.

The "8 House" is a residential building in Copenhagen (Denmark) designed by the architectural firm of Bjarke Ingels Group (BIG), which includes a large green roof with a bicycle path, allowing cycling to the pent house on the 10th floor.

SMART GREENERY FOR URBAN CLIMATE CONTROL

Green corridors and networks of tree cover throughout a city, preserve flora and fauna, provide streetscape design, and reduce a city's overall temperature

To take care of the environment, some cities try to preserve large territories within the city as natural spaces or regulate constructions to keep tree coverage woven into backyards and front yards. This is a serious environmental mistake, it ends up causing sprawl and excess expansion, further polluting the environment and hurting the planet more.

A smart alternative should allow for maximum use of buildable space, preferably by relocating trees to public spaces, focusing on designing a smart network of green corridors along all sidewalks and linear parks in the city, forming networks of interconnected trees. These serve as shade, which can lower a city's temperature by up to 6 degrees Celsius,[lxxxii] making it more walkable and energy efficient.

It also represents an opportunity for landscaping and road architecture, bringing beauty and identity to the streets, making it easier for citizens themselves to protect each tree when they know that there should be one precisely every 8 meters, for example.

However, beyond the reforestation of public spaces, some cities have undertaken regulatory and incentive programs for the reforestation of rooftops, parking lots and large expanses of unshaded asphalt, which cause a so called island heat effect.

In recent years a new trend has emerged, beyond reforestation, for the *renaturalization* of urban spaces. This means removing asphalt from some of these large, concrete jungles, from concrete covered urban waterways, or underutilized parking lots, to oversized streets, replacing them with designs that increases the permeable, natural or landscaped area. This not only improves the climate of the city and of the planet, but it also generates a lower financial burden with lower infrastructure construction and maintenance costs. Finally, it represents a great opportunity to live in harmony with the flora and fauna, allowing all kinds of species of birds and creatures to pass through the city and coexist with human life, giving life to an extraordinary urban experience. ■

Above: Boise (United States) is considered the city of trees.

Below: an example of low-water-use desert reforestation systems in Scottsdale (USA).

SMART CITIES: RESILIENT CITY

Case Study

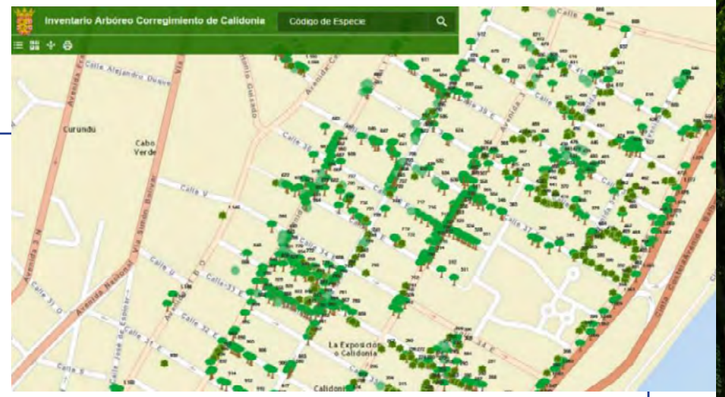
Panama's Arborization Plan

As part of an Arborization Plan, the Mayor's Office of Panama, through the Department of Environmental Management, in 2018 launched a web portal with an inventory of the city's trees. Students from the School of Biology of the State University of Panama, forestry engineers, and personnel from the Municipality participated in the realization of the "Arboreal Inventory".

The census collected information on all the physical, biological and environmental characteristics of each tree, which makes it possible to evaluate phytosanitary conditions and damages to public or private infrastructure. The inventory identified more than 180 tree species, out of more than 10,000 catalogued trees.[lxxxiii]

Through techniques applied to evaluate the phytosanitary condition of urban trees, thanks to the signing of an agreement with the Smithsonian Tropical Research Institute, sonic tomography readings were taken with specialized equipment.

The detailed plan on the web portal of the mayor's office,[lxxxiv] indicates that the program consists of:



Inventory survey with GPS location, description of physical and botanical characteristics, phytosanitary evaluation, description of the environment and existence of affectations to public furniture.

Monitoring of the phytosanitary status of the oldest trees in conjunction with the Smithsonian Institute through sonic tomography.

Programming of preventive pruning to eliminate dry branches, reduce crowns, balance loads and encourage foliage growth.

Reforestation, recovery of green areas and creation of green corridors in the city.

Updating of municipal regulations on urban forestry management with the implementation of new concepts for the granting of pruning and felling permits in the District of Panama in coordination with the Ministry of the Environment.

A green corridor along Poblado Avenue in the city of Medellin (Colombia).

The famous Chicago Lights urban farm is a space managed by the Fourth Presbyterian Church in collaboration with civil society organizations in Chicago (United States).

Desalination plant on the shores of the Arabian Gulf in Dubai, United Arab Emirates.

WATER: SMART MANAGEMENT CULTURE

Diversifying water sources, improving water management, and recycling gray water and blackwater waste

The most important element for the resilience and survival of a city is its capacity to generate water over time. Unfortunately, many cities fail in precisely this most important element, for one or more reasons: ineffective subsidy policies, inadequate water management, wastewater, graywater and sewage waste, but, above all, dependence on a single water source. Many cities have no water and bring water from faraway places, even depending on streams coming from other countries.

A smart and resilient city must professionalize and modernize water management, considering strategies such as:

Diversifying water sources, including new watersheds, aqueducts, desalination plants, and gray and black water recycling systems.

Upgrade pipelines with systems that monitor and minimize leaks, including automatic shut-off valves and smart sensors.

Installing digital smart meters, both to monitor public infrastructure and to allow households to check their consumption levels in real time (New York case).[lxxxv]■

The Al Khafji solar-powered desalination plant in the city of Khafki (Saudi Arabia).

Amager Bakke, a waste-to-energy plant designed by Bjarke Ingels Group, has become a major tourist destination, with a large park above the plant, which in winter becomes a ski hill.

POLLUTION & WASTE: SMART MANAGEMENT

Innovation in municipal waste management and water treatment for cleaner oceans and a cleaner planet

One of the priorities of the smart city philosophy must undoubtedly be to take better care of the planet and the environment, of streams, water, seas, air, natural resources, and biodiversity. As in the rest of the strategies addressed, it becomes especially important to address this area with effective and practical tools.

For the care of the environment and for the reduction of garbage and plastic pollution, a smart city must clearly identify all those tools that are a win-win, that result in a positive boost for the economy, for competition, for self-management and the other previously established objectives. To do this, we can use 80-20 strategies, to solve 80% of the problem (even up to 90% to 95%) with only 20% of the cost, precisely with tools that do not require prohibitions, taxes or disproportionate investments. To achieve this, we must understand the gravity of the problem.

Eighty percent of marine pollution by plastics is the result of poor waste management, inadequate or clandestine dumps, as well as poor cleaning and garbage collection systems, especially in cities located up to 50 kilometers from an ocean coast (The other 20% is attributed to the fishing industry). When it rains or there are strong winds, this garbage (mainly plastic) is washed into rivers and from there into the sea. Worldwide, we produce approximately 270 million tons of plastic per year. Of that, about 100 million tons are used in cities within 50 kilometers of the coasts and only 31 million tons in cities with inadequate collection systems. Of those 31 million tons, approximately 8 million tons end up in the sea. More than a third of all plastic in the sea comes from cities in China and Indonesia, while more than 60% of all trash in the sea comes from cities in East Asia, rising to 70% if South Asian cities are included. Furthermore, the amount of plastics and other litter reaching the sea from cities in Europe, North America, Australia, New Zealand, Japan and South Korea is almost zero, even though plastic production and use are significantly higher.[lxxxvi]

Therefore, the problem is not plastic: 80% of the problem can be solved with a single tool, which is the improvement of garbage disposal systems.

Although Latin American cities produce less than 8% of the garbage in the oceans, these almost three million tons of plastic litter beaches, streams and seas of their own continent. This region's cities cannot solve the global problem, but they can eliminate the garbage they currently throw into the sea by implementing systems for the collection, disposal and intelligent use of garbage. In fact, there are many positive practices in Latin America that, by demonstrating the use of successful and intelligent techniques, will serve to inspire change in cities around the world.

The Mexican cities of Nogales (page 158) and Monterrey (page 199) have modernized their systems in an exemplary manner and use garbage to produce biogas as a source of clean energy, which subsidizes the city's energy costs, further reducing the

SMART CITIES: RESILIENT CITY

Waste-to-energy plant in Brescia, Italy.

cities' environmental impact and improving their finances. Other cities, such as Singapore, go even further, with clean garbage incineration systems that eliminate any possibility of polluting the seas and produce a large amount of energy for sale.

In addition to garbage, another environmental pollution challenge is the one that results from sewage in cities. All kinds of chemicals that are used daily have a harmful impact on the environment, on air quality and biodiversity, both in lakes and streams and in the sea, and finally, on food quality. Industrial chemicals and pesticides, as well as laundry chemicals and detergents, damage the ecosystem when they reach rivers or the sea through untreated sewage water . Fortunately, there are ways to clean up a city's black and gray water.

With water treatment systems, 60% of the water can be cleaned with primary systems, 85% with secondary systems and up to 99% of the polluting chemicals with tertiary systems, resulting in safe, drinking water. However, the cost of the tertiary process for many cities can be twice the cost of plants that implement secondary processes.

In this way, with only two tools, intelligent waste disposal and intelligent water treatment, cities can achieve almost zero negative impact, preserving the great natural wealth of the region and positioning themselves as a global example. ■

Image of a biogas plant at the Messina landfill (Italy).

Case Study

Sanitary Landfill in Monterrey

The Salinas Victoria Landfill in Monterrey, Nuevo Leon began operating in 1990. It is estimated that this landfill will receive waste until 2025 and that the plant will produce energy until 2045.

In the year 2000, the Comprehensive System for Ecological Management and Waste Processing of the State of Nuevo León (Simeprode in spanish) began marketing biogas from the landfill and in 2003 introduced a financial scheme to promote private investment under a new organization called Benlesa.

In the first stage, started in 2003, the landfill power plant had an installed capacity of 7.42 MW, with an electrical energy production of 58,254 GWh/year and an annual consumption of 36.229 million Nm3 of biogas. In its second stage, starting in 2008, it reached an installed capacity of 12.72 MW and finally, in a third stage, 16.96 MW were projected, with an estimated generation of 120,000 MWh/year starting in 2010.

The municipalities in the metropolitan area that make use of the energy produced by the landfill have a 10% saving in their electricity bills. Until 2009, when it had an installed capacity of 12.72 MW, savings of up to 1.5 million dollars per year were generated for the municipalities and for the Government of Nuevo León.[lxxxvii]

Panama City.

Case Study

Compact Cities Paradigm, Shlomo Angel

According to research by Shlomo Angel of NYU's Urbanization Project and the Marron Institute of Urban Management, the growing concern about global warming has translated into a call for increased density in cities, as these are seen as key factors in reducing carbon emissions from both vehicles and buildings. However, for a truly successful densification process to occur, Angel explains the importance of understanding the anatomy of density and the factors that constitute urban density.[lxxxix]

An analysis of 10 cities around the world explains key differences in density. Hong Kong, for example, derives its high density from building height, Kinshasa from overcrowding, while Dhaka and Bogota from residential coverage. The study then presents tools for a smart densification strategy, based on five principles for densification strategies:

1. Increasing the allowable occupancy rate.
2. Increasing land use coefficients.
3. Increasing height allowed for buildings.
4. Increasing the ratio of buildable to unbuildable space.
5. Increase the number of zones allowed for housing.

ENERGY EFFICIENCY WITH COMPACT NEIGHBORHOODS AND CITIES

Reducing a city's carbon footprint by discouraging sprawl and disorderly urban expansion

We sometimes idealize country life or cities that preserve large green expanses within the city, but as studies show, the smartest strategy to reduce our environmental impact is to live in compact cities. This means a planet with fewer cars, fewer CO2 emissions, and less deforestation.[lxxxviii]

As we create more compact, walkable cities and as people can substitute some of their daily car trips -to the grocery store, to the coffee shop, to the gym, to school, to work- we will begin to reduce our negative impact on the planet. But many of our current regulations achieve exactly the opposite: those designed to improve traffic and those designed to protect the local ecology cause a negative environmental impact, disperse the city, and encourage car use.

Therefore, a smart city that seeks to be resilient and minimize its environmental impact must review its urban regulations and policies, with the question: **Does this regulation facilitate a more compact city or does it cause more sprawl?** ■

Four to five stories are considered the optimal height levels for energy efficiency because of their simple construction process and low elevator energy requirements, as seen in the Amsterdam (Netherlands) density model.

Example of another building model for optimal densities, from Melbourne, Australia.

As a compact city with sustainable mobility, Amsterdam becomes a great example of decarbonization.

URBAN DECARBONIZATION PROGRAMS

Digitalization of electric grids and increased competitiveness for alternative energy and energy efficiency industries

To the extent that a city manages to attract greater investment and growth, without an intelligent urban and energy vision, it begins to increase the amount of vehicular traffic as well energy wasting buildings (especially those of big box shopping and massive factories that require excessively expensive cooling and heating systems), and, therefore, greater energy consumption. When all this comes from fossil energy sources, the result is high air pollution and further deterioration of the environment. As a result, cities today are responsible for almost two-thirds of the entire planet's carbon emissions.

Not only does this affect regional efforts to reduce carbon emissions, but poor air quality in a city directly affects the respiratory and cardiovascular health of its inhabitants and ultimately scares away talent and investment. The highest quality investments and ventures will choose to reward cities that make them safer for their health and that of their families. Therefore, cities that undertake successful decarbonization programs will position themselves as the most attractive cities to live in. But in a smart city, successful decarbonization strategies are not only those that reduce carbon emissions, but also those that reduce the energy costs, and therefore the costs of living, of its inhabitants and its entrepreneurs.

Fortunately, the most significant tools on the road to decarbonizing a city are neither taxes nor bans on fossil fuel sources, but rather, first, promoting models that favor the growth of compact, walkable neighborhoods and cities, where it also costs less to start a business and to live.

Secondly, in a smart city, technological and digital strategies that promote energy efficiency reflected in financial savings in electricity bills for businesses, households and governments will be increasingly important.

A digitally integrated city, with smart buildings, lighting, transportation, and smart charging centers, can coordinate significant savings in everyone's electricity consumption.

Likewise, with smart buildings, businesses and households will be able to identify damaged wiring and the type of appliances that are generating the most energy waste, in real time, and take immediate action to minimize their current month's electricity bill.

Left: Frankfurt Central Station (Germany), one of the busiest train stations in the country. Right: Wind turbines between Aachen and Herzogenrath (Germany).

The battery in electric cars will be able to store energy not only for the car, but while the car is not in use, it will serve as a source of energy for the home, or for outdoor street lighting. Surplus energy from solar panels on warehouses or buildings can be used to reduce the energy costs of surrounding residential areas.

Finally, along with the digitalization of electricity grids and local technologies, public policies that eliminate barriers to entry for alternative energy industries must be reformed to generate greater competition and research and development among clean and low-cost energy sources. All this results in an ecosystem of great financial and energy savings and therefore, decarbonization of cities, eventually achieving in some visionary cities near net-zero emissions.

To initiate this process, cities should consider:

Encouragement of optimal architectural styles and densities for energy efficiency, removing as many barriers, permits and building licenses necessary to undertake with these real estate development models.

Development of digital systems for monitoring energy consumption of public facilities, including lighting, buildings, vehicle fleets and public transportation.

Promoting digital systems that provide citizens with access to real-time energy consumption and costs monitoring technologies and artificial intelligence tools to help them identify key areas for potential energy (and financial) savings.

Reduction of regulatory entry barriers to industries that produce and commercialize clean energy, such as hydro, wind, solar, biogas and others; in particular, review of land use restrictions within cities and their peripheries.

Management of programs for the digitalization of infrastructure for the production, transportation, storage and distribution of electric energy in the city. ■

San Francisco (United States) contains a network of neighborhood parks such as Alamo Square Park, each about two hectares in size, as well as a large number of gardens and forests such as Golden Gate Park, which allowed its residents to enjoy a high quality of life despite the pandemic.

The Rheintreppe in Dusseldorf (Germany), a small square with steps that function as a large public space, allows fresh air, coexistence and enjoyment in the open air and with social distancing.

PANDEMIC AND EMERGENCY MITIGATION INFRASTRUCTURE

Designing smart systems and infrastructure for mitigation and adaptation to pandemics and emergencies of all type

Cities have faced all kinds of shocks and emergencies throughout their history, from storms, floods, tsunamis, forest fires, earthquakes, wars and much more. But the great current challenge that occupies the greatest energy of planners and local authorities is that of health contingencies, derived, for example, from the birth of a new virus such as COVID-19 that warns of the possibility of other diseases that could be even more contagious and lethal. Fortunately, smart cities have managed to identify several urban tools that make a big difference, not only for mitigation, but for adapting and thriving, despite health challenges.

The first thing to note is the great difference in the quality of life of all those who were fortunate enough to live in a city with sufficient natural destinations, public spaces and open spaces, which allowed them to enjoy adventure, recreation, even a social life with family or friends, outdoors and with enough space for social distancing. On the contrary, there are those people who had to spend the confinement in their homes or rooms, often in situations of overcrowding, increased substance abuse and domestic violence, without any open space to take refuge.

2020 triggered a large number of initiatives for the creation and rescue of public spaces and tactical urban planning, the redesign of sidewalks, bicycle paths and streets, for recreation and open-air commerce. There was also unprecedented openness from residents to projects that would otherwise have generated resistance.

The second factor that stands out from the contingency is the great difference in the quality of life of all those people with access to technology and good internet and of the industries and workers who had the opportunity to work remotely, many of whom chose to relocate to cities not only with good internet, but also with open spaces and natural destinations and, therefore, with fewer restrictions and less risk of contagion. Quality internet infrastructure, digitization of services and the growth of creative industries that favor remote work, is and will be more important than ever.

Finally, the most salient and underutilized theme is transparency that builds trust. The process of surviving an unknown contingency in cities where citizens trust the veracity of information and the transparency of their authorities facilitates collective solidarity and causes less fear.

In emergency situations, some governments choose to protect their public image at the expense of the truth. Especially when health contingencies, natural phenomena or organized crime expose institutional failures or cases of corruption, authorities are less transparent. This results in greater distrust of governmental, scientific and medical institutions and puts people's health, well-being and safety at greater risk.

Pedestrian streets in Wells (England) and systems for restaurants to set up their tables outdoors, an important tool during the health contingency.

On the other hand, governments that favor transparency and collaboration for the consultation and analysis of information lead to greater solidarity from civil society and citizens, which results in greater participation and the strengthening of institutions in the short, medium and long term.

Therefore, during any contingency, but in particular, in the case of a health contingency, a smart city should consider:

SMART CITIES: RESILIENT CITY

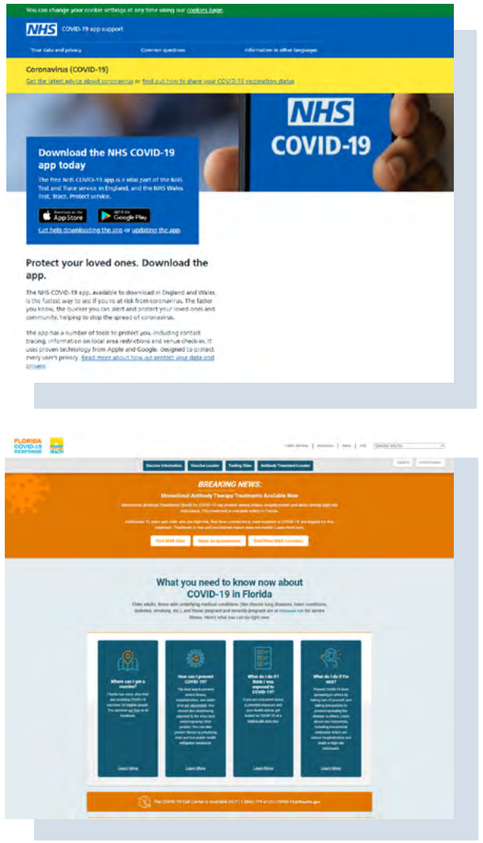
Sanitation system with glass shelters at Ben Gurion Airport in Tel Aviv (Israel).

Radical transparency strategies that include and empower citizens and civil society for the measurement and analysis of available information.

Apps and digital portals for the identification of outbreaks (hot spot tracking apps) that should be voluntary, never imposed, to avoid the deterioration of trust.

Emergency notification apps to alert citizens located in certain areas of the city about emergencies related to earthquakes, floods, hurricanes, tsunamis, protests, violence and disease outbreaks.

Infection recognition technology in sewers that, through the internet of things, allows constant monitoring of sewage for prevention and immediate recognition of virus and bacteria outbreaks and sources.



App for Covid-19 case tracking in the UK.

Emerging streets and bikeways for the widening of sidewalks and for the creation of bike lanes, facilitating new modes of safe mobility, as well as commerce and outdoor recreation.

Metropolitan, urban and neighborhood parks to ensure that everyone has a large open space within walking distance that allows for social distancing and serves for recreation. ■

Wastewater monitoring system for the detection of COVID-19 outbreaks at universities such as Oregon State University and the University of Arizona.

Case Study

COVID-19 detection in Arizona Schools

In August 2020, the University of Arizona reported the success of a COVID-19 outbreak prevention strategy using a sewage measurement system, whereby they detected an outbreak from a student dormitory drain in time. This allowed them to alert students, test and isolate the three sick, symptom-free students in time, preventing the spread to other dormitory residents.[xc]

In the wake of this, other universities around Arizona embarked on similar strategies. Northern Arizona University (NAU) decided to follow a similar strategy. However, each compost meter used for the measurements described above has a $5,000 value, which put the project out of their budget.

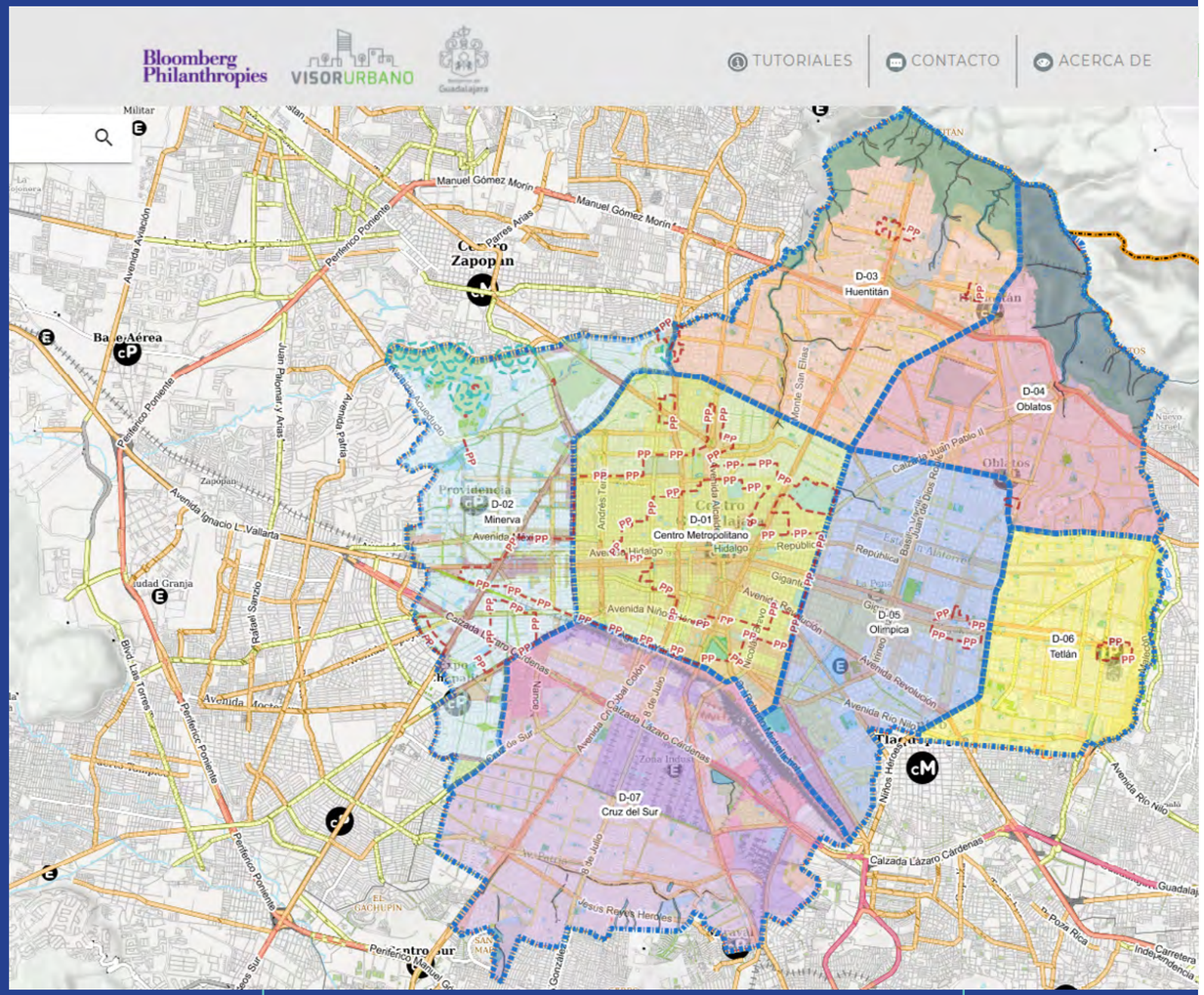
The NAU then turned to an alternative method, with a process that has proven successful for decades, first used by Brendan Moore to detect cases of paratyphoid and typhoid fever in England. The method involves using cotton balls, dipping them into sewage or septic tanks and testing for bacteria or viruses to identify disease outbreaks in certain buildings before they spread. Using this historical method, the University embarked on this innovative Covid-19 prevention strategy, but using tampons as an even more accurate tool than absorbent cotton.[xci]

05 TRANSPARENT CITY

Despite all the strategies analyzed so far, the best way to guarantee positive change that endures in our cities, is by empowering citizens to make decisions and to improve their own communities. This is achieved through an open government, with access to information, to better understand what is happening in the city. But it also requires bringing decisions closer to residents themselves, so that they are the protagonists of the improvement of their neighborhoods.

To this end, a transparent city with effective co-governance responds to reflections such as:

- How well informed are citizens about the plans and regulations of their city and their neighborhoods?
- How has the city evolved in the most important indicators each year?
- Where is that information?
- How much does maintenance cost in each neighborhood? How much does that same neighborhood generate?
- How can we give citizens more responsibility for improving their own neighborhood?



Case Study

Visor Urbano (Urban Viewfinder), Guadalajara, Mexico

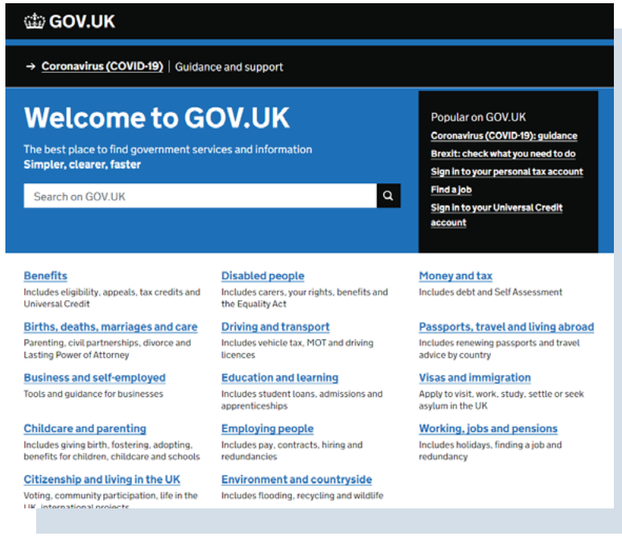
Visor Urbano is a digital platform of transparency and for urban management, which saves citizens time. This platform enables the user to consult from home -in a simple and practical way- what can do with a piece of land, what can be built on it and what can not. It is also used to issue a pre-feasibility for building permits, which are obtained in less than 15 minutes. Previously, the process took anywhere from a week to months. This system, now, speeds up the procedures and works as a great defense against corruption, since it eliminates the human element and allows the city to be managed in a more efficient and transparent way.[xcii]

DIGITAL GOVERNMENT PORTALS

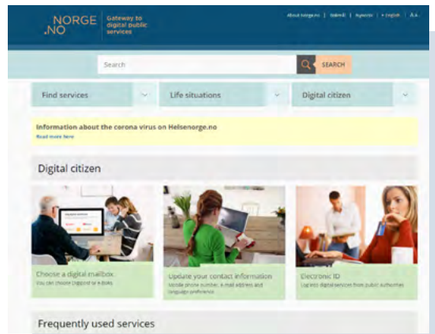
Transfer all municipal paperwork and procedures to automated digital portals

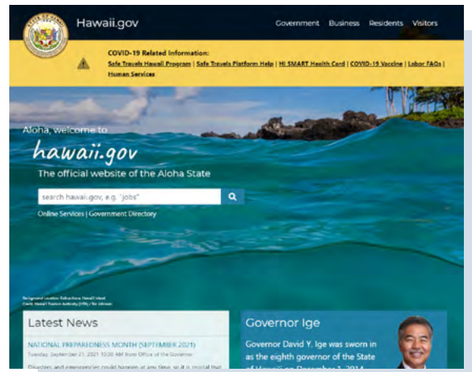
We live in an age where we can take a picture of a check and it'll be automatically deposited into our account; or where we can send money to someone with just their phone number, through digital platforms like Venmo, or Square Cash; or where, to open any type of account, sell, or buy anything, we only need our password or card. However, many cities today still require high-cost, long-waiting times, and face-to-face procedures in different offices, or even different buildings.

Not only is it inconvenient for a citizen, but it is a waste of budget, in terms of salaries and space, which also lends itself to corruption. In a smart city, **most of the procedures and information must be able to be accessed or managed from our phone and we should have a response in seconds, not in hours, days, or weeks.** ■

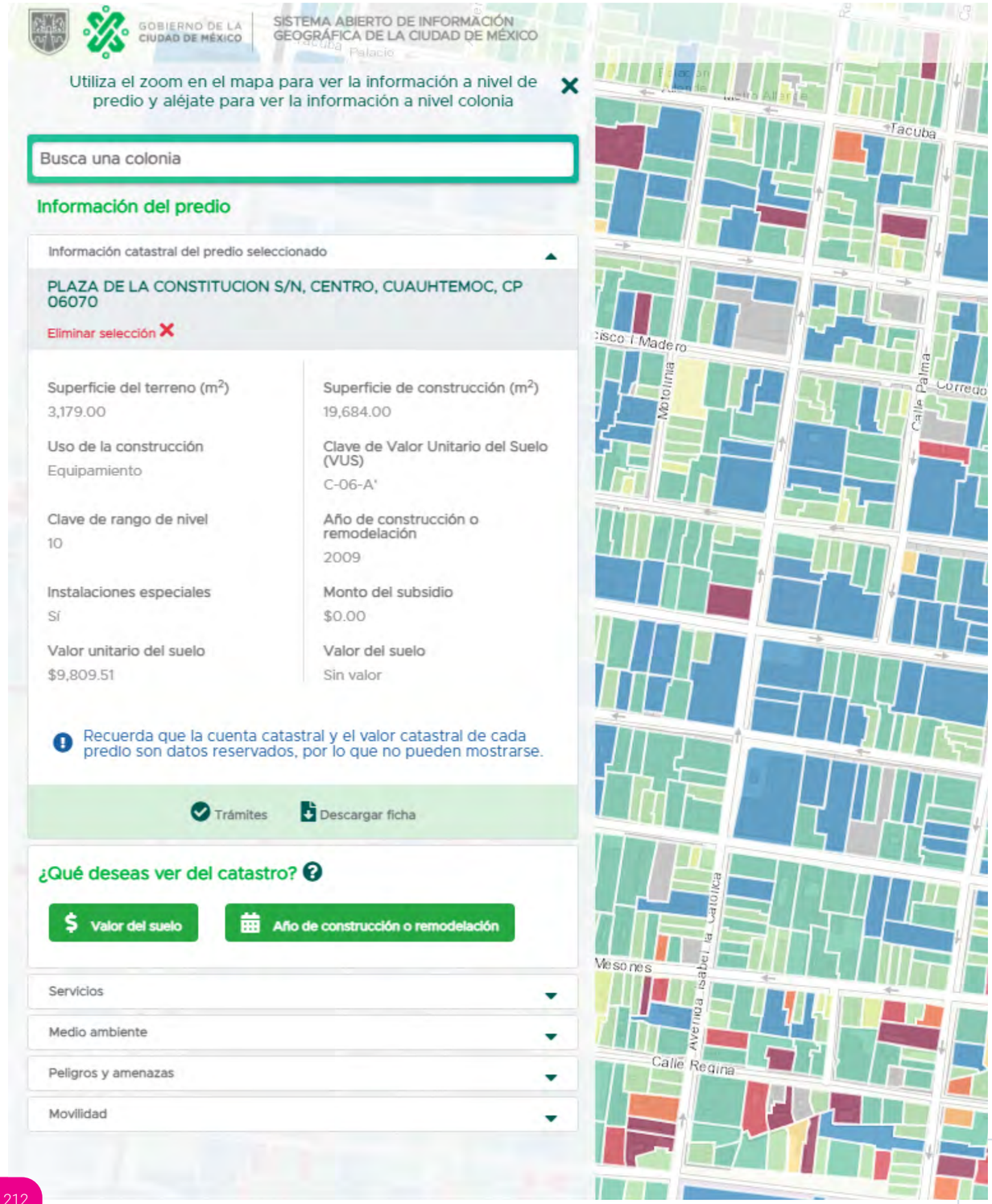


The digital platforms of the United Kingdom, the state of Hawaii, the United States and the public services of Norway, among others, consistently rank among the best global government websites, for their design, accessibility, innovation, content, interactivity and use of technologies.





SMART CITIES: TRANSPARENT CITY



Land Registry of Mexico City (Mexico).

LAND REGISTRY MODERNIZATION

Systems for the digitization and transparency of information on properties and their physical, legal and fiscal characteristics

One of the most important tools for transparency and of great financial utility for cities is their land registry. Land registries are the census of properties and real estate within a city, which contains information on the value of the property and its physical and legal characteristics.

A smart city must have a land registry with high-resolution plans, digitized and freely available for public consultation. This allows identifying and correcting all kinds of deficiencies or legal conflicts of properties or adjoining properties, as well as carrying out purchase and sale procedures, or land uses, with much greater agility.

But, in addition, the land registry becomes a great financial tool for municipalities, allowing the city to identify and correct the list of properties with accumulated debts, of each property. This also allows property values to be updated according to the land use of each property, allowing property taxes to be reduced for households and a greater burden to be passed on to properties with commercial or tourist uses, which are the ones that generate the greatest impact on streets and infrastructure. ■

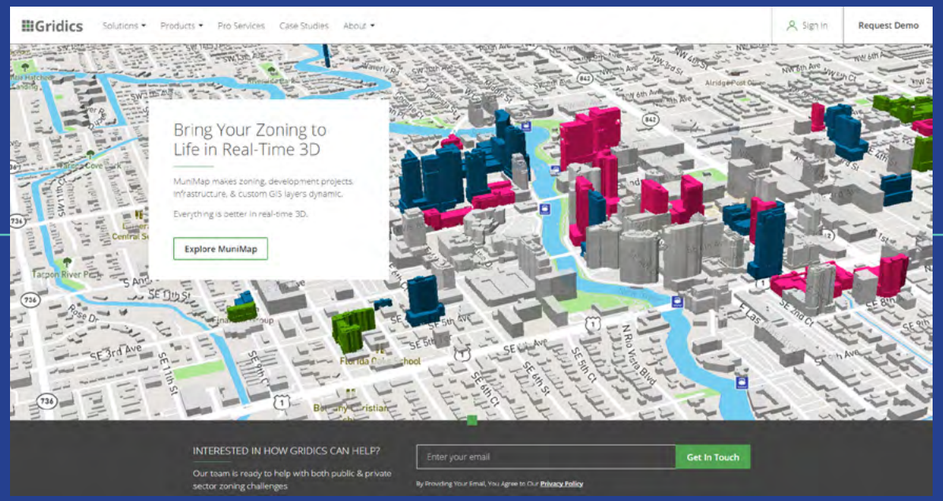
Case Study

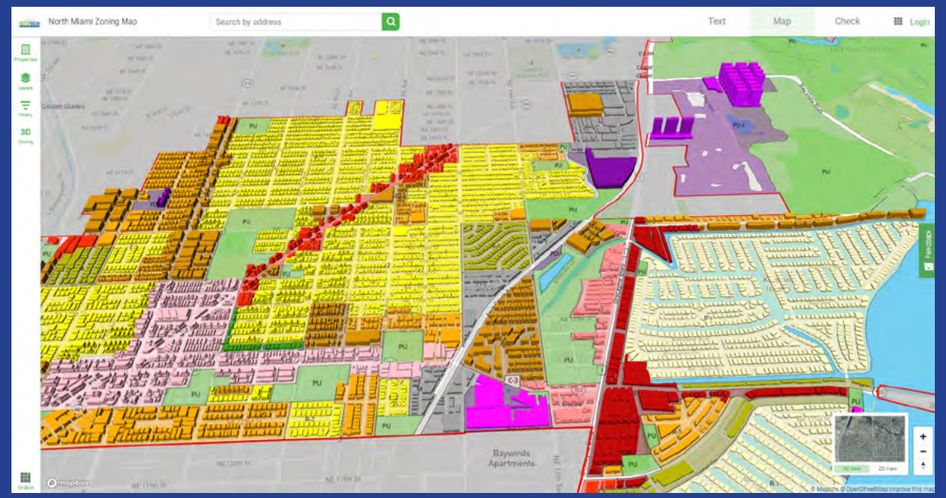
Modernization of the Land Registry of Sinaloa, Mexico

In the Sinaloa land registry, more than 30,000 trips were normally made to manage appraisal forms each year, each requiring users to fill out around 15 forms per trip. The average time it took to assign land registry codes was 3 to 6 months and the process and paperwork for deeds was extremely long. Furthermore, the map's resolution was low, making it difficult to analyze boundaries between properties[xciii].

In 2020, Sinaloa launched the new Digital Land Registry project, a fast and free access platform. This digital portal simplified the most used processes, and allowed full transparency through easy access to a one shop stop portal, with 24/7 customer service.

This project includes the State's Territory Viewfinder, an open source, georeferencing platform, that allows users to distinguish between the morphology of the natural environment and the built environment, with much greater precision in boundaries, which is of great utility for property tax assessments, and for property rights. This platform interprets data and organizes it simplify it's access not just for technicians and analysts but for all users. Similarly, though the use of electronic signatures, the system allows for a significant amount of online procedures.





Case Study

Gridics

The Gridics platform is an individual property information search tool that digitizes urban codes and zoning calculations, building a 3D zoning visualization map.

Likewise, the platform allows the calculation of development potentials to support decision-making in planning, economic development, and execution of public works, integrating all the GIS layers in a digital platform. This allows staff and the public to consult a 3D map, as well as an updated and easy to use version of the regulations, in addition to testing possible changes or modifications of zoning and the effects that these would cause in public infrastructure.

This platform is already being used by various cities around the United States, such as Albuquerque, Miami, and New York. As of 2020, the technology has now also been available for cities in Mexico and Central America.[xcv]

CITY 4.0: DIGITALIZATION OF REGULATIONS AND INFRASTRUCTURE

Digital systems to visualize the development potential of each property based on its regulations and the capacity of infrastructure

One of the essential tools for the digitization of procedures and the creation of digital, one stop shop portals, is the digitization of regulations. To automate the permits and licenses for land use and construction, it is necessary to codify the permitted or prohibited land uses with georeferencing tools. With this, any user will be able to select the lot or the specific sites for a project and will be able to consult or visualize from any computer, the development regulations in terms of density, height, land uses, occupancy or utilization coefficients, parking spaces, natural risks, etc.; all the information necessary to make investment decisions.

Likewise, it is important to digitize the information on the coverage and availability of the water, drainage and electricity infrastructure, and even of a large number of layers of information on transport coverage, on garbage collection, on the pavement, on the water drainage or green infrastructure, etc. Codifying these elements can be even more complex than digitizing the regulations, since each service may be operated by either a public or private agency, and they often may or may not coordinate their actions and information with each other. On many occasions, the municipal or state agencies do not want to publish the information, since information management may be a source of income for them, and sometimes an opportunity for corruption, by evaluating each investor's query through different criteria and urgency.

The use of digital technologies to map urban infrastructure and its capacity, as well as regulations, can be an important transparency tool for a city.

In addition to its benefit of streamlining paperwork and processes, this tool can be of great help for planning and public investment decision-making, by facilitating the identification of streets and areas with poor coverage, as well as areas with excess coverage, in which the load capacity of the infrastructure significantly exceeds what is currently dictated by the regulation. This allows modeling and visualizing processes and scenarios through digital tools.

Eventually, a smart city can digitize its entire infrastructure and install sensors and meters to model possible scenarios in real time through the Internet of Things, as well as to project scenarios and trends through artificial intelligence. It can even serve to relax regulatory limitations, with digital tools that automatically model additional development potential and its urban and environmental impact. This process is known as City 4.0.[xciv]

One example of this is the city of Helsinki in Finland, which has launched a program known as Helsinki 3D+, which seeks to recreate a three-dimensional representation of the city, publishing it as an open data platform to encourage commercial and academic development in the city. ■

Web platform for the collaborative diagnosis and georeferencing of proposals, for the Sustainable Urban Mobility Program of the Tijuana Metropolitan Area (2019).

OPEN DATA PORTALS AND PARTICIPATORY DIAGNOSTICS

Improve decision-making and empower citizens, through analysis, evaluation, and measurement mechanisms

One of the most important elements for decision-making is being able to have reliable information about the challenges and progress of the city. This applies both to decision-makers and to citizens themselves, especially when we try to empower citizens in decision-making. To do this, cities must preferably establish autonomous or citizen led programs, but with access to all information, to monitor and evaluate the progress or setbacks of each of the city's challenges and virtues.

To this end, smart cities can consider:

Open data portals, not only for government transparency and accountability of public spending, works, etc., but for all information of commercial, medical, academic and citizen interest, including Big Data information derived from digitized infrastructure, of the internet of things in public services, as well as crime or health contingencies.

Measurable and reliable information for topics such as education, economy, health, mobility, water, environment, municipal public services, government, security, etc.

Benchmarks to compare the city's performance, both to previous years and to other similar cities.

Citizen councils for periodic diagnosis and evaluation to avoid the temptation of having to hide figures that do not favor the mayor's office in a particular year, allowing complete impartiality of citizen and autonomous organizations.

Evaluation of existing information from popular apps that allow collective information to be obtained and patterns of citizen behavior to be identified, such as traffic, accidents, distances travelled, exercise routes, etc.

Creation of local Apps for common interests, designed for collaboration with specific sectors, for example for hikers on the use and care of trails, or for cyclists and the use of cycle paths, as is the case of the "Santiago en Cleta" App of Santiago in Chile.[xcvi]

Creation of a City App, for collaborative diagnoses (non-emergency incident reporting apps) designed by the city specifically to map citizen problems, such as potholes, vandalism, and crime. ■

UN-Habitat's Block by Block project, which in conjunction with Mojang, the video game company, launched a program that allows Minecraft to be used as a design platform for public spaces in more than 25 developing countries.

Digital portal for the public consultation of the Urban Development Program of the Population Center of Playas de Rosarito 2021-2040, Mexico.

Case Study

Hermosillo Cómo Vamos (Hermosillo, How's it Going?), Hermosillo, México

Hermosillo Cómo Vamos is a non-partisan organization whose main objective is to open dialogue and promote citizen participation through monitoring, evaluation and promotion of public policies, bringing together citizens, organizations, groups, activists, academics and specialists to reflect and share knowledge.

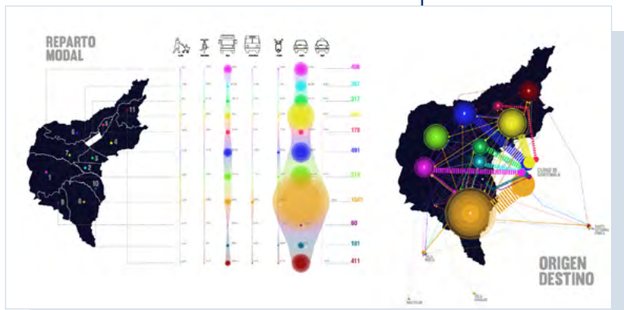
Each year, the organization publishes a report of indicators on the progress of the city, which includes measurable information in each of several categories of importance to citizens.[xcvii]

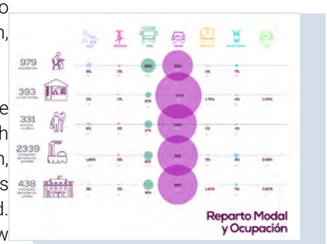
Case Study

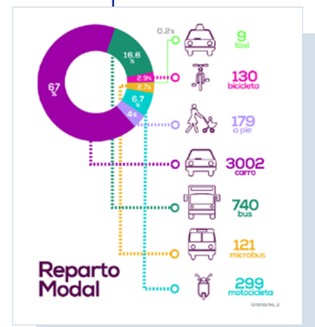
MuniMixco and Digital Surveys - Mixco, Guatemala

The Municipality of Mixco has a digital application, MuniMixco, which is a portal for citizens to geographically reference complaints and demands, as well as to access information such as fines, debts, etc., a kind of digital government. Citizens can now send their concerns directly to the government. The next step is to work on a better replication system, with a maximum response time.

Mixco also has experience in the field of smart diagnostics. Through surveys of origin and destination, the challenges of mobility in this municipality have been understood. This survey was achieved at a low cost, using surveys on Facebook of gender, age, occupation, as well as the reason, amount, expense, origin, and destination of the trips made. In just 15 days, 4,800 responses were achieved. This proved that most people move by car. It was possible to define on a map, from which zone and to where people move.







The cybersecurity laboratory of the OAS (Organization of American States), as one of its training tools for local governments.

CYBERSECURITY AND DATA PROTECTION

Digital infrastructure and systems that give citizens the greatest possible confidence in the processing and protection of their information

Trust and privacy are among the main challenges with digitization of systems, institutions and society. The ease and benefits that digitization provides are extraordinarily positive, but the risks posed by poor governance with access to information, including personal information, and the risks associated with systems without protections against criminals or hackers, can result in great resistance by its citizens, and rightly so.

To embark on digitization, it is essential to provide the necessary cybersecurity and data protection mechanisms. These elements are so important that they should even serve as a limiting factor for the speed of digitization projects, serving as a brake for projects that are intended to be launched without sufficient security or privacy mechanisms. All it takes is one data-misusing official, or one hacking incident, to permanently halt any chance of a smart city future.[xcviii]

Therefore, smart cities must ensure:

All the necessary locks to prioritize the maximum possible trust of all users, always erring on the side of patience and slowness.

Estonian e-Residency program digitally secure ID card.

Voluntary information programs that allow any user to opt out of any analytical, measurement or surveillance program created, in a simple way .

Digital education programs that prioritize the digitization of society and the training of all citizens in the use and knowledge of digital tools, the Internet and technology.

Technologies that ensure that access to all personal information is limited, with biometric controls and passwords, so that no user can access the information of another user without their express authorization. ■

The Uncensored Library is a virtual library, within Minecraft the video game, that protects its users against censorship and provides a space for freedom of expression and freedom of the press, protected by blockchain technology.

Case Study

Empresas Públicas de Medellín (Public Companies of Medellín), Medellin Colombia

Empresas Públicas de Medellín is a state agency that manages utilities, from water to energy, with a business perspective. Its main shareholder is the Municipality of Medellín, but it has a high degree of independence, allowing it to operate and grow on its own. This institution has achieved such a success, penetrating electricity markets beyond even Colombia, now in Guatemala, El Salvador, Panama, Chile, Peru and Brazil; similarly, in water management services, EPM has been awardes contracts as far as Mexico. 30% of its ordinary profits belong to the City of Medellín in full, but with extraordinary profits, to access those shares, the city must submit urban improvement project proposals, which must abide by certain technical and social qualifications originally stipulated in the fund's bylaws and must be analyzed and approved by a special committee. In any given year, the city can receive from EPM, more than 200 million USD[xcix] for ordinary and extraordinary transfers.

FINANCING INSTRUMENTS AND FINANCIAL RESILIENCE

Smart strategies for financing infrastructure and public services

The way in which a city funds its infrastructure, and the efficiency with which it operates its services and manages its finances, determines much of the success or failure of a city. Often, cities become excessively expensive organizations to operate, and providing services becomes a financial burden, resulting in lower quality services, more debt, and even the possibility of bankruptcy. These cities depend more and more on external funds from state or federal governments, subject to budgetary negotiations and decisions made elsewhere, resulting in a lack of resources to improve their cities.

On the other hand, some cities manage their finances and operate their services with a much more entrepreneurial and sustainable vision, with an increasingly positive balance between their income and expenses, reducing their debts and liabilities, improving productivity of their infrastructure, optimization of its processes, and the best possible quality in the service provided to its users.

Some cities even manage to develop financial mechanisms that generate better returns over the years, with many smart investments that allow them greater autonomy and self-sufficiency, thus having a large amount of their own resources to invest in their city. This is financial resilience. To achieve this, a process must be initiated that identifies the percentage of the current budget that comes from own resources, compared to federal contributions, to reduce that percentage each year.

To achieve greater financial resiliency, the city should consider the following smart financing tools:

Restructure each department's financial structure, to clearly identify its sources of income, its pricing models, its liabilities, analyzing all the unnecessary expenses that can and should be eliminated or outsourced .

Earmark part of the current income and all new sources of income, taxes, fee payments, and contributions, setting these aside for funds or trusts, so that they can be invested only towards specific types of infrastructure and public service improvement projects, and not in overhead or bureaucracy.

Financing with debt only for self-financing projects, those that pay for themselves with the resulting new income, or with the savings generated by investment in liabilities such as rental of buildings, machinery, or salaries.

Seek the financial autonomy of each neighborhood, so that the costs of infrastructure and services in each neighborhood are covered with their own contributions and

The CrossBorder Express (CBX), an international pedestrian bridge system, which charges a fee of $16 USD to access the Tijuana airport (Mexico) from a terminal in San Diego (United States).

Example of the local referendum of the city of Nogales (Mexico) in 2007, which put to a vote a proposal of paying around $2 USD for 18 months for the city to finance a new waste management system for better waste collection coverage. The initiative was approved with a majority vote of 78%.

that neighborhoods that encourage greater economic diversity can benefit from a better budget for more and better public services, encouraging inclusion of mixed uses and higher densities to their neighborhoods, and that the districts with less financial sustainability can be promoted as priority economic reactivation districts.

Promote the maximum possible self-sufficiency for each public service, so that public or private companies that provides each service, can operate with its own resources, with adequate quality. To the extent possible, cities must create development agencies that encourage the modernization and restructuring of public service management, by institutionalizing citizen councils and private investors, to ensure a more profitable management.

Promote competition schemes for public utilities, so that public or private companies, small and medium, can provide their services and compete for area-by-area contracts, for parks and landscaping, street cleaning and maintenance, garbage collection, electricity, public lighting, maintenance, education, among others.

Create funds or trust funds for urban improvement, for the city and for every neighborhood, so that all possible sources of financing can be concentrated in earmarked funds for urban infrastructure and utility improvements, so that taxpayers and contributions know exactly what their contributions are going to be used for and that they defend it as an investment for their community and not as an expense.

Under programs such as peso-por-peso and special contributions for improvements, to share costs between neighbors and the government, the city of Nogales achieved between 2006 and 2009 an investment in infrastructure ten times greater than any previous administration.

Smart Financing - Part II

Once the city manages to restructure its financial administration system, with funds, trusts and development agencies, the city can start with new income mechanisms and tools, using various self-financing sources of revenue, not debt, which are also not perceived as taxes but as investments for urban and community improvement.

In this way, smart cities must select the greatest possible diversity of financial instruments.

Local funding sources.

Modernization of the land registry and property taxes to improve the collection system and make the property tax calculation mechanisms more transparent.

Special contributions for improvements, that distribute costs and benefits of public investments, based on transparent formulas derived from the influence radius of each project.

Parking meters and parking tickets to ensure that those who use up the public space the most contribute more to its maintenance.

User fees for streets, sidewalks and public markets, for street vendors.

Congestion fees to charge for the use of certain lanes or zones during peak hours.

Congestion charges for heavy cargo transportation, especially for non-local logistics, to ensure that it contributes to the improvement and maintenance of local infrastructure.

Fees for the use of underground infrastructure and antennas so that the companies that benefit from them, contribute to their construction and maintenance.

Market rate mechanisms for regulating the consumption of utilities to ensure that prices are assigned at equilibrium points and that families or users who require financial support can receive it in the form of municipal vouchers, and not at the expense of the service provider.

Dynamic rates so that the price serves as a regulation for excessive consumption of services during peak hours.

Well prepared local project catalogs, to be able to speedily procure national. international, public and private funds that occasionally become available.

Smart cities must therefore select the greatest possible diversity of financial instruments. ■

Case Study

Porto Alegre, Brazil

Porto Alegre, Brazil was the first city to undertake the concept of participatory budgeting. Since then, the concept has been used and adopted by more than 2,700 governments around the world. Since 1989, the residents of Porto Alegre have gotten together not only to discuss the new gym, the park or the street, but also to decide whether they wanted to finance it or not. By 1997, water and drainage coverage increased from 75% to 98%, the number of schools quadrupled, and pavement coverage quintupled. Participation in budget meetings rose from 1,000 people a year in 1990 to 40,000 by 2000.

However, an important lesson emerges from the Brazilian experience. In recent years, the federal governments of Brazil began to finance large works in the city and the percentage of the local budget with respect to the federal one has dropped considerably. In addition, federal budgets did not consider the priorities of the neighbors, which is why the spirits were reduced and the programs were finally put on hold.[c]

PARTICIPATORY BUDGETS

Define the funds, mechanisms and institutions that allow the investment needs of every neighborhood, each year, to be decided by the taxpayers

The best way to empower citizens in a democratic and truly effective co-governance exercise is by generating responsible participatory budgeting programs. Participatory budgets are programs where the community itself votes to define the priorities in which a given fund should be invested.

This type of program first requires a great exercise of transparency from authorities. Frequently, there is no mechanism to know how much each neighborhood generates, how much it costs to maintain each neighborhood, and how much budget will be available in the coming fiscal years. Obtaining and organizing this information may possibly be the main challenge -technical and political- of this type of program.

To implement smart participatory budgeting programs, a city should consider:

First, calculate how much basic maintenance of a neighborhood currently costs and how much income that same neighborhood represents for the municipality.

Define physical and digital platforms, that will host dialogue, building of ideas and voting.

Create technical advisory mechanisms to provide professional guidance to every community.

Define the categories of infrastructure and services that qualify for these programs, avoiding inappropriate expenses or services.

Define processes that allow communities to increase their budgets, voluntarily, including additional contributions, parking meters, and others. ■

Above: Referendum process for the participatory budget Carril Bici Castellana, Madrid 2019.

Left: Poster of the Carril Bici Castellana project for Participatory Budgeting 2019.

Case Study

Machizukuri, from Japan

Machizukuri is a term that literally means 'town planning', but in Japan it refers to a planning methodology that involves residents and local government to collaborate in an urban improvement process. Historically, cities in Japan, like most cities in the world, had depended on a rigid, centralized, Top-down planning system.

In 1968, with the approval of the Planning Legislation of New Cities, freedom of planning returned from central authority to the municipalities, and in that decade the term of Machizukuri was born.

The concept of Machizukuri has been credited with maturing the civil society of Japanese cities. In recent years, many neighborhood associations have been born and a wide variety of successful planning exercises have been witnessed.

For example, in 2011, the coastal city of Ishinomaki , devastated by a tsunami, had the planning of the program called Ishinomaki 2.0, a detailed a collaborative plan for the reconstruction of the city, which considered the installation of an urban laboratory called Ishonomaki Lab that is a space designed specifically for citizen participation. From there, an animation center called Irori was born, which means "interaction room for revitalization and innovation".

Machizukuri is then a great example of the positive power of collaborative government programs.[ci]

COLLABORATIVE GOVERNMENTS AND SELF-MANAGEMENT SYSTEMS

Create participatory models to involve and empower citizens and the private sector in decision-making and in the financing of the agreed solutions

The best governance strategy is one that allows citizens to solve their own needs, not only with their voice and vote, but through their own funding, so that decisions to improve a community are financed by those who directly benefit.

In the past, this idea of co-governance was practically impossible, coordinating each community and involving it in decision-making on budgets, projects and priorities would have meant very slow and costly processes. But today, technologies allow the implementation of a great diversity of possibilities for low-cost dialogue and voting systems, to implement a collaborative government.

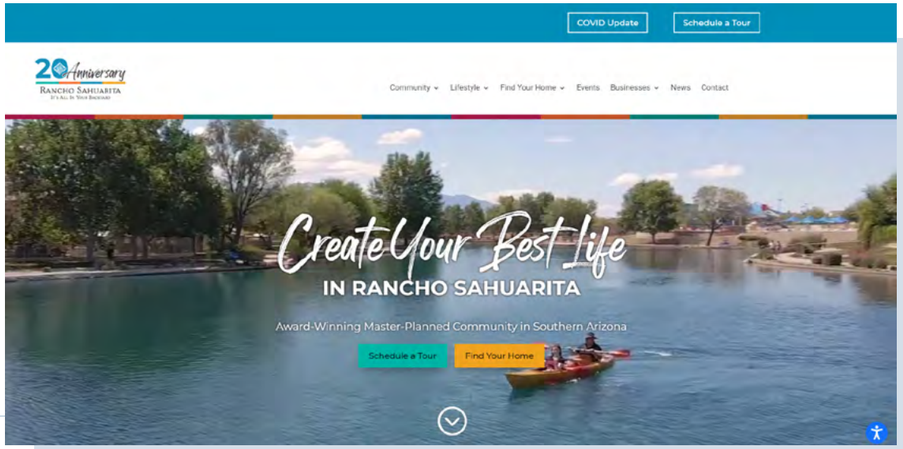
This strategy is recommended because it allows citizens to take ownership of their city, taking a more active role in building solutions. But it also works because then, the problems and failures no longer belong only to the governments in power, but now depend on the community itself. If a community stagnates or fails to improve, it will be the responsibility of those who live in it, unlike those who do organize themselves and undertake the necessary projects.

To promote collaborative programs and self-management systems in a smart city, the following must be considered:

Neighborhood committees, for neighbors to discuss and decide the investment priorities of their own neighborhood each year.

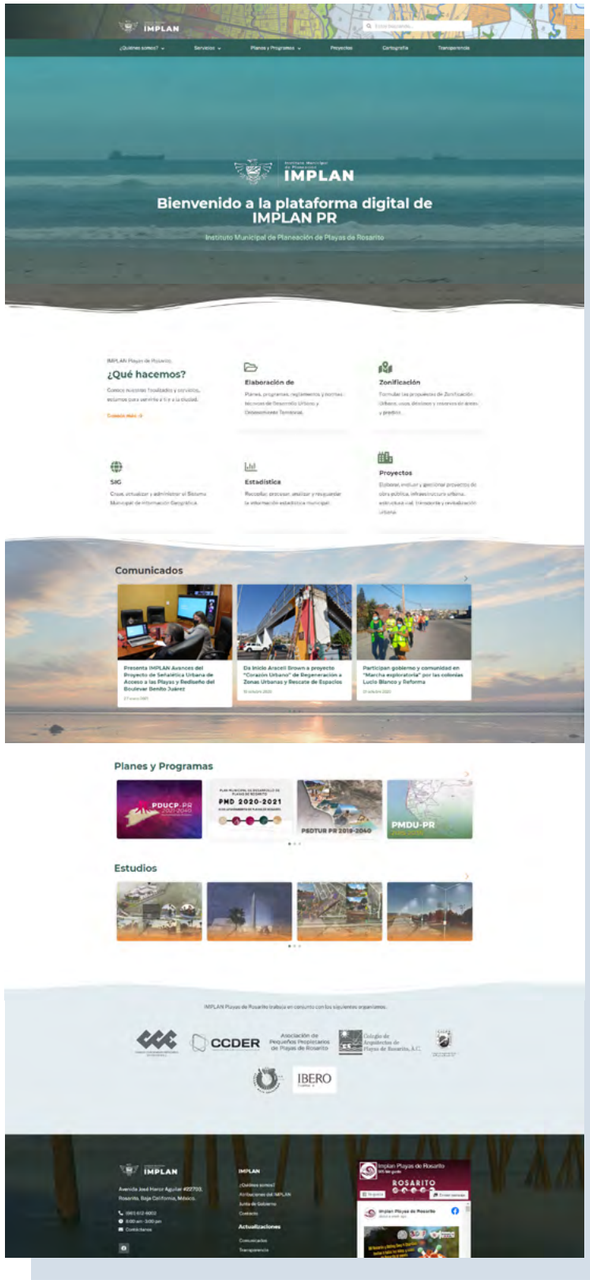
Labeled funds for this program, which are generated from the neighborhood itself, from its own taxes, parking meters and others.

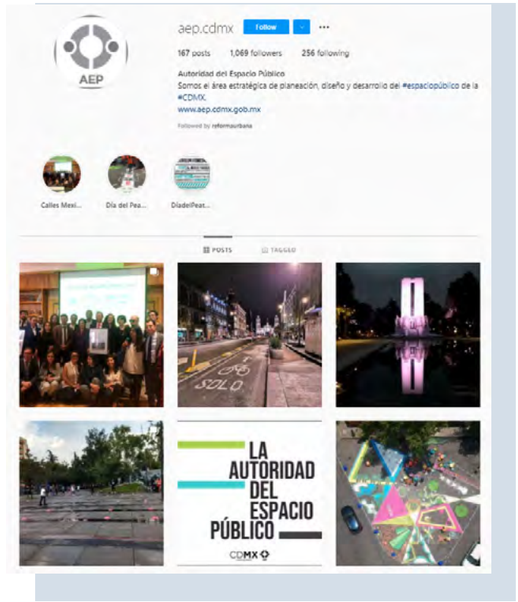
Digital voting mechanisms so that those who contribute to the fund have a voice and a vote. ■



Rancho Sahuarita (United States) has the Rancho Sahuarita Village Program, to which all residents pay a neighborhood fee and with this, the association manages the maintenance of the community, cleaning, gardening, public spaces, sports amenities, and swimming pools.

SMART CITIES: TRANSPARENT CITY





Organizations such as the Planning Institutes of Mexico are a great tool for governance, since they facilitate the monitoring of long-term strategic projects, without depending on political changes during each electoral process. Likewise, organizations such as the Public Space Authority of Mexico City, which operated until 2018, demonstrated great success in the professionalization of public servants in matters of design and administration of public spaces, achieving in just a couple of years a great revitalization of the city.

METROPOLITAN PLANNING AND GOVERNANCE

For long-term planning and management of public spaces and strategic infrastructure [cii]

In a world full of possibilities for urban improvement and for the promotion of smart city strategies and tools, it is easy to fall into the same mistake of recent decades, which resulted in the great failure of most cities: in prioritizing secondary tools, basic tools can be forgotten or neglected. Many of the digital systems and technological tools can catalyze great solutions, but only if cities plan their public space layout, infrastructure and financial models correctly. The layout of streets, parks, and areas of high environmental value, as well as the mechanisms for their financing, are tools that must be planned by technicians and specialists. Although the community and civil society must supervise the process, they cannot design these features because they determine the functionality of an entire city, and any mistake can have permanent consequences for subsequent generations.

On the other hand, the nature of democracy eventually causes local governments to be limited to a democratic, election cycle, prioritizing planning and investments that bear immediate fruit, at the expense of future generations, indebting the city or selling parks and public buildings to pay salaries and debts, thereby avoiding long term planning.

Therefore, cities must create the systems and institutions that oversee the planning and professional management of, at least, basic infrastructure. This becomes an especially important task for metropolitan areas, where different municipalities or mayors may have a different vision of their infrastructure, or personal political interests, and, due to lack of technical coordination, primary street sizes or a water ducts between neighboring municipalities may be incompatible, or a municipality may authorizes housing next to a piece of land destined as a landfill by the other city, or situations where a public service costs double from a lack of coordination between authorities, often belonging to different political parties.

Therefore, smart cities must define systems for urban and metropolitan planning and governance, by means of:

Training systems for the continuity of projects and the professionalization of public officials, which guarantees the continuity of strategic projects despite changes in administrations.

Private investment systems for modernizing public utilities and for investors to become a source of pressure and of supervision for the continuity of their investments.

Governance with public-private associations so that the administration of services does not depend on short-term political criteria, but long-term technical and financial ones.

Urban and metropolitan planning institutions for the planning and management of public, metropolitan and urban spaces, as well as supervising the development of their infrastructures.

Development agencies so that, beyond the planning of public space and infrastructure, they can manage and finance adequate development, sharing the costs and benefits in a profitable way for the city.

Public space authorities as an institution in charge of the adequate surveillance, use, financing and correct administration of public space. ■

Case Study

Nextdoor, Citizen and Neighbors

Apps that allow neighbors and citizens to monitor crime in real time and discuss it with neighbors and their communities have exploded in popularity in recent years. Some like Nextdoor, Citizen and now Neighbors, from Amazon Ring, are so popular that they are considered among the most downloaded Apps in the United States.

The Nextdoor App is promoted as "the world's largest social network for neighbors" that seeks to encourage recommendations of nearby restaurants, sale of furniture and second-hand items, or to provide a channel to report a stolen bike.

Citizen's app sends alerts to its users of crimes reported to 911 that occur in their community. This app also allows its users to create groups of close friends that can be alerted in the event of a dangerous situation.

And now Amazon is capitalizing on the huge success of its Ring company, which allows households to use a camera on their doorbell to keep an eye on their yard. This is an increasingly important issue with my home delivery companies because they now allow neighbors to share videos of incidents of theft of their deliveries.

NEIGHBORHOOD SAFETY WITH COMMUNITY TECHNOLOGIES

Empower citizens in surveillance and community peace issues with neighborhood communication and collective mapping applications

One of the challenges of the new model of compact and mixed-use cities is that many families recognize the great failure of the state in basic issues of community living, neighbors with music that is too loud, houses used for drug dealing, and other common conflicts that occur in neighborhoods that often police are not addressing, due to lack of capacity, fear, or corruption.

Therefore, a smart city must empower neighbors, first with **digital communication tools between neighbors**, in the case of suspicious activity or acts of crime, so that together they can stay informed and take ownership of their community's challenges.

Second, with **digital mapping tools that allow them to report, geo-reference and corroborate**, anonymously, those places or houses that are breaking the rules, unsafe alleys, and criminal activity so that with the reinforcement of dozens or hundreds of comments that expose the same problem, under the pressure of media exposure, the police cannot ignore it. ■

Right: Signage for Ring Neighbors system installation in a home.

Case Study

Medellin, Colombia

The city of Medellín has different citizen manuals, designed with the aim of regulating and promoting a new culture of citizen neighborhood life. Some of their most successful manuals are the Adult Coexistence Manual (2006), the Citizen Coexistence Manual (2013), with a children's version, the Urban Cyclist Manual (2014). The publications are accompanied by institutional programs of citizen coexistence, in the framework of which the inhabitants enjoy public space, play sports, learn and strengthen the social fabric, raising the culture of solidarity and the civic sense of their city.

CIVIC EDUCATION WITH CITIZEN MANUALS

Empower citizens with simple manuals that clearly disseminate urban plans, development guidelines and neighborhood rules

One of the challenges for urban planning and regulation, for a long-term vision, designed by experts, is that they tend to result in extremely complicated legal or technical documents that require specialists to understand them. Unfortunately, the challenge is even worst, given that these documents are often full of errors, inconsistencies, and lack of clarity about the future vision of the city.

Therefore, a smart city must try to do the opposite, it must generate smart plans.

But, in addition, it is necessary to go a step further: smart cities must generate simple citizen manuals, which, with just a couple of rules and illustrations in a couple of pages, manage to communicate precisely what the vision of the future of the city is, and what the rules of development are, with such simplicity that even elementary school children can understand and defend it.

The idea is to rally the entire citizenry behind this long term vision, letting citizens themselves become a plan's biggest defenders. This implies several things:

The vision of the city and its goals must be clearly defined, with specific times and indicators that will be used to measure its progress.

Technical regulations must be able to be explained in a couple of rules and pages, otherwise they must be simplified to make them really last.

Neighborhood and public space rules use must be prioritized, details such as the size of sidewalks; tree locations; the permitted levels of noise, odors, and pollution; the rules for pets in public spaces; the basics for neighborhood peace and enjoyment.

Civic education should be promoted based on individual responsibility and the power that entrepreneurship can have, as well as the small daily actions of a person for the betterment of their community (Smart Citizens page 243).

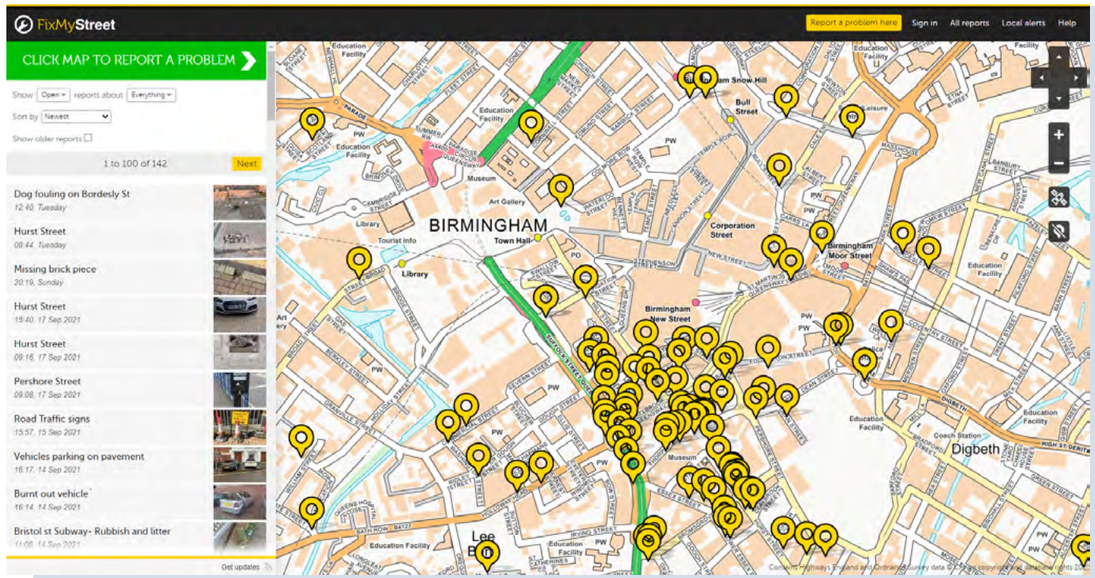
Knowledge must be disseminated about the proper channels for citizen complaints and the processes to care for and defend their communities. ■

Case Study

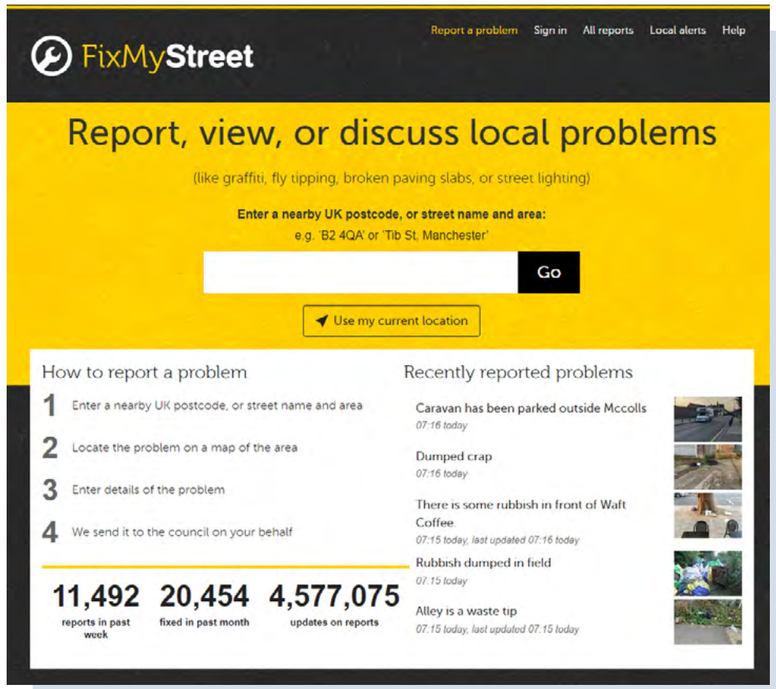
Just a little bit (Nomás Tantito) – Los Supercívicos

Los Supercívicos are a group of citizens who seek to raise awareness and cultivate respect for the rules of coexistence in Mexico, through Banksy-style urban guerrilla warfare, comedy, and complaints of failures in civic conduct through digital media. In 2016 they launched a publication titled "Nomás Tantito" which is a citizen initiative that seeks to make citizens aware of the fact that they do not live alone in a city. The idea is to motivate people to think of their fellow citizens to achieve a beautiful coexistence. This is achieved through pages full of comic-style graphic stories, jokes and Mexican slang, as well as multiple references to the law. Their message has reached at least his millions of followers on social networks, being able to contribute to the gradual improvement of society in Mexico.

SMART CITIES: TRANSPARENT CITY



A virtual platform that allows reporting, analyzing local problems and neighborhood discussions on issues such as graffiti, potholes, broken lighting, etc.



ONE STOP SHOP FOR CITIZEN COMPLAINTS AND THE URBAN PROSECUTOR OFFICE

Creation of a simple and reliable system to report violations of the basic city and neighborhood rules

The best tool to motivate and encourage citizens and communities to take care of their city is to empower them with real tools that result in action and change. And this is especially important as a tool for citizen complaints.

Citizens can be the eyes of the authorities when it comes to caring for their community and ensuring the health and safety of their family and their neighbors, particularly in medium or large cities, by the time an authority becomes aware of an incident, it may be too late. It is important to stop a clandestine garbage dump in time, or the illegal invasion and construction of houses on a ravine or dangerous hillside, and citizens can help.

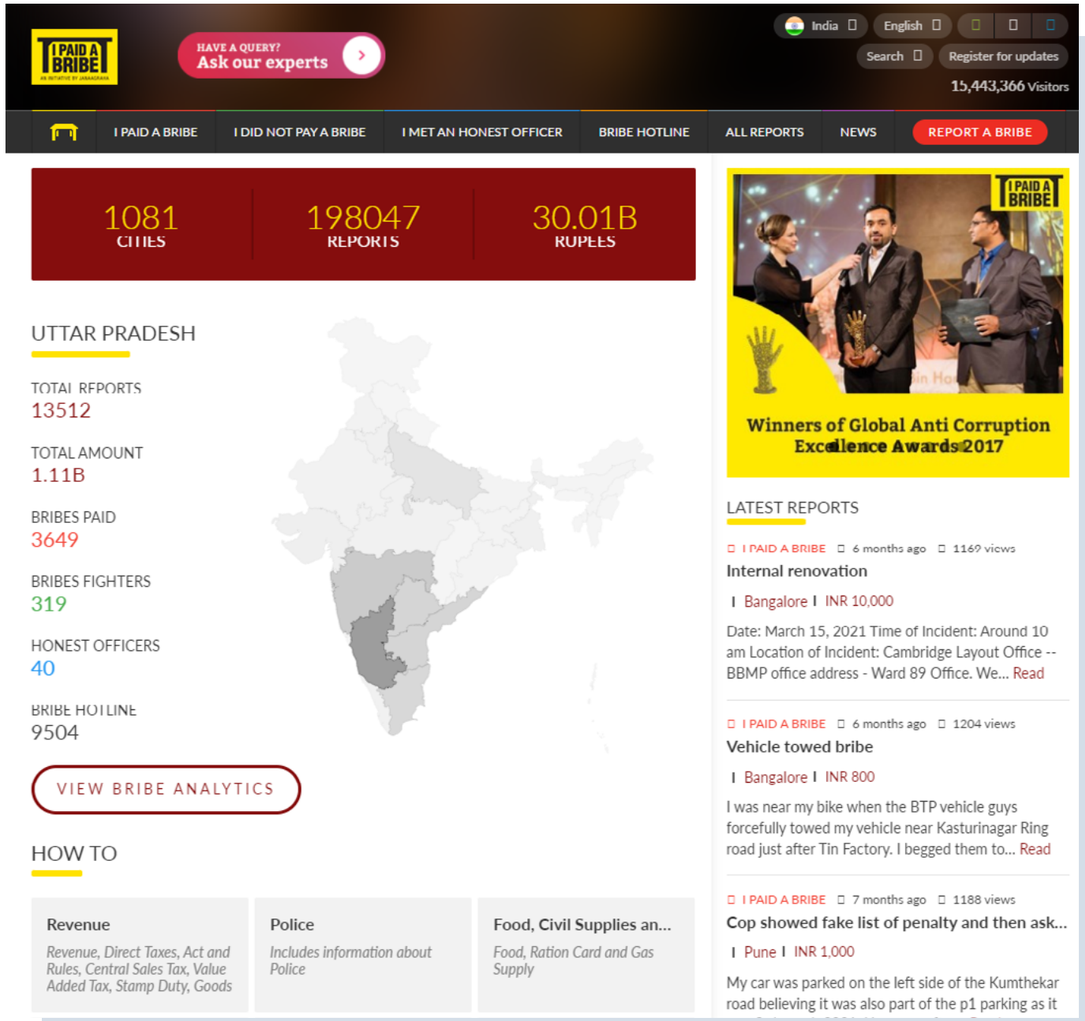
However, this scheme represents several types of risks that are important to anticipate from its design. First, this tool applied in a city with excessive regulations and laws becomes an extortion tool. Government inspectors, or citizens and neighbors, begin to specialize in blackmail strategies, threatening entrepreneurs, investors or neighbors for the rules they are violating, under a system where the only way not to break a rule is not to be different, to innovate, or create.

Therefore, for a citizen complaint tool to work, **it is essential that this program be limited to complaints about damages to public space and some indispensable neighborhood guidelines.**

Second, for this instrument to be universally applicable, the complaint process must be simple and secure. If this is going to take a whole day of trips for a proactive citizen, traveling between confusing and distant government offices, very few citizens will participate. But apart from that, if their complaint is of a sensitive nature, about violence or crime, anonymity will also be important.

For this reason, **a smart city must design platforms for digital citizen complaints, with the flexibility to opt for anonymity**. For this, the digital tools of "non-emergency incident reporting" allow problems to be mapped, alerting the authorities of incidents that are reported repeatedly, even allowing citizens to be notified once their report has been dealt with.

Finally, for this tool to really generate change, **the city must have a control body that can monitor, evaluate and, where appropriate, fine** those who are causing destructive incidents for public space and citizen coexistence. Then an urban prosecutor's office is required, or specialized teams within the institutions responsible for ensuring public space, to follow up on the serious reports that have been denounced. ■



The "ipaidabribe.com" platform in India allows combating corruption through citizen reports in alliance with civil society organizations and law firms united to defend citizens who are victims of government extortion.

ANTI-CORRUPTION PROGRAMS

Incorporate citizen oversight mechanisms to combat corruption

One of the main challenges in most Latin American cities today is the issue of corruption. Our laws, plans, regulations, and institutions are of little use if illegality and corruption prevail. Frequently, this problem originates from the way the national system is configured, with archaic systems for the administration of justice, or laws designed precisely to protect the current system and not citizens. However, a region and a city can significantly counteract this problem.

A smart city fights corruption, starting with:

Formation of a citizen council that must set goals, supervise and evaluate progress.

Definition of short, medium, and long-term anti-corruption goals, starting to combat corruption in relatively easier areas.

Evaluation of norms and procedures to identify and redesign all those that foster corruption, due to their difficulty in being complied with.

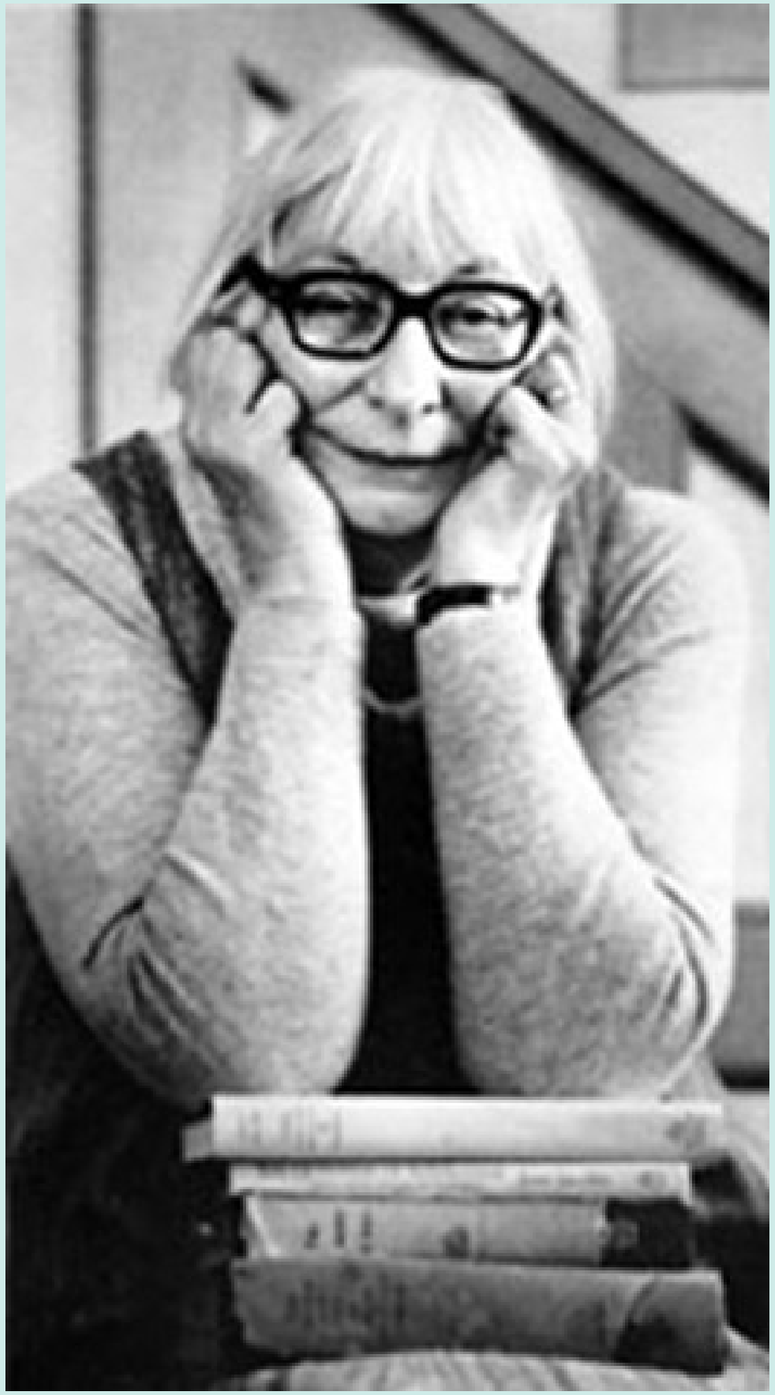
Creation of social punishment mechanisms for officials who participate in acts of corruption; when judicial instances collude and are not a useful resource, using alternative forms of punishment such as public exposure and shame can be very effective tools at a local level.■

06 SMART URBAN ENTREPRENEURS

Although we have analyzed many strategies and projects for urban improvement and for the transformation of cities, which would allow local decision makers to lead smart change, in reality, the future of most cities will be transformed even more by global entrepreneurship and innovation, inventions that are reshaping the way all social and economic structures work. Technology is reinventing the world and the way we live in cities.

Smart cities will see the rise of smart urban entrepreneurs and social innovators, citizens who will dare to be disruptive, making traditional services and industries obsolete, with projects designed to better serve local and international markets. To undertake this type of project, one must think about:

What sector of the city would I like to serve better? What do these people need? How could I provide this service, better than before, better than others, better than in other cities, thanks to new technologies? How can we both win? How can I capitalize on that?



Jane Jacobs (1916-2006), author of the book "The Life and Death of Great American Cities (1961)", was a Canadian-American journalist and is considered one of the pioneers of the modern study of cities. In the 1950s, from an observer perspective in New York City, she began to identify the errors of the 20th century urban planning model and gave life to a movement that half a century later is largely taken up by smart cities. Her ability to observe the city, study it, understand its dynamics, communicate them, organize communities, and collaborate with them in building solutions, at a neighborhood scale, make her an exemplary model of an intelligent citizen.

SMART CITIZENS

Author's Opinion

What can we as individuals do to drive change in our city, to help make it a smart city ? What can we each do to improve not just our community, but the planet, particularly if we don't work in government?

The biggest and most important changes in the world are going to be undertaken not by governments or legislators, but by ordinary citizens, through their endeavors, innovations, technologies, experiments, inventions, generating creative and unexpected solutions to new or historical problems. Governments and laws require much more complex processes that are slow and will always be a couple of years (or decades) behind.

But for citizens with a calling and passion for public service or social activism, there is good news. The best way to transform institutions and generate global solutions to important challenges is by generating changes in a city first, by setting a single, positive example.

It is not necessary for anyone to try to save the world, transforming one city can be more than enough. There is nothing more viral and contagious than a local success story, when something really work, it sparks a revolution in entire, global industries.

Having met hundreds of visionary mayors and legislators and worked with change makers who have transformed industries and communities, some of them responsible for great advances towards the creation of smarter cities, having made important contributions from their respective corner of the world, they all agree on something: before anyone consider a career in government, or leadership positions in their industries, to try to generate collective or systematic changes, it is important to learn about the difficulties and unexpected consequences of effective change first through one's own personal life, home, work and community.

Only after having experienced some inescapable lessons, important technical truths are discovered, about life, human nature, community, and the difference between the tools that work and those that don't.

Many of us are ready to contribute, we want to be part of the change. Fortunately, as in smart cities, also in our lives and communities, we can start to generate positive changes with some specific, smart tools.

A SMART citizen is someone who begins to generate positive changes in his life, at home, at work and in his community. Some of these, especially those who are most successful in their endeavor, will be ready to take leadership positions and bring about positive change through institutions and local governments as well.

So where to start? Among thousands of tools that can be used by smart citizens who seek to generate positive changes in their lives and in their community, the first ten steps to consider are:

1

Explore and learn about how all possible digital technologies and tools work, so that you are among the first to understand them and to apply them in your personal life and in your work. Be the first to learn what a podcast is, find your favorites, use all the sharing economy tools, to move, travel, or buy household items, especially when you travel, analyze technologies in new cities, which have not yet arrived to yours, buy a bitcoin (well, not anymore, unless you plenty of disposable income), or an NFT, better yet, design your own NFT, or take your friends to an augmented reality bar, but above all, start a business in these industries, or try to find work in them, and become that brother, friend, co-worker, or neighbor that everyone calls to ask about innovative tools and solutions.

2

Learn the art of creating positive, memorable experiences within your home and work and in your social life, especially in difficult times, so that more people want to work or collaborate with you, captivating the minds of creative people with whom one day you could develop the best projects and team solutions. This also prepares us for some important skills, necessary to motivate creative teams, and to integrate beauty, not just functionality, in each project undertaken, and to captivate clients, or tourism, able to create a local identity in the event of one day reaching a leadership position.

3

Use as many smart city tools as possible to fix your home first, to lower your electricity and water bills, to experiment with green infrastructure on your roof or in your patio, practicing public space design tools to capture rainwater and improve your house's microclimate, further lowering your electric bill, making sure that the resulting landscape is attractive enough to captivate your family and friends to want to hang out and live around that space, and to want to imitate it. This will teach us about the practical difficulties of planting and maintaining a lively and beautiful ecosystem, and about the difficulty of negotiating ideas and concepts with others, with your family or neighbors, and the limitations of technology, which, despite its great applications, never comes without headaches..

4

Start an eCommerce or sharing economy business through virtual platforms, not only to diversify your income and increase your wealth, in case you ever want to finance social projects yourself, or be able to invest more time in academic or scientific ventures, for the common good, which often do not guarantee a sustainable income; but more importantly, this venture will allow you to better understand the process and the barriers to digital commerce specific to your country and your city.

5

Build a building as a business at least once in your life, even if it's a tiny house in your backyard, or better yet, build more and better buildings, or developments, again, with the intention of generating additional income and wealth, further improving your personal finances, but more importantly, so that you know the barriers and difficulties of real estate development in your city, and the difficulties associated with trying to build a house for someone. But this will also allow you to know the price of materials, of concrete, infrastructure and construction costs in general, which, if one day you reach a leadership position, will allow you to better identify savings opportunities for projects, and better able to spot theft or corruption.

6

Leave every place and job you arrive at better than you found it, getting into the habit of picking up paper or garbage, on your daily walks, or bike rides, and at your work, giving life to projects or processes that grow the company's profits even a little because of you, and improving the work culture through your treatment of colleagues, employees, or bosses, developing the ability to use the broken windows tool in your day to day, in the habit of fixing even small things constantly, especially when you are tired or unmotivated.

7

Transform a public space, once you have practiced in your room, your house and your patio, and corrected mistaken notions, having discovered better techniques and technologies, then you can try to improve the space in front of your houses, the median, the park, the pedestrian crossing, and discover the difficulty of motivating and convincing your neighbors, each one with a thousand different ideas and insecurities; or better yet, help build a church, or a migrant shelter, or fix up the abandoned park next to it, which requires fund management and complex participatory processes.

Jaime Lerner (1937 – 2021), prominent mayor of Latin America, for his tenure as mayor of Curitiba (Brazil), a pioneer in the fields of urban acupuncture, financial resilience and smart cities.

8

Become an expert at something important, but technical, and useful, preferably with regards to a problem related to cities, but also useful for your work, giving you the ability to apply, or invent, innovative solutions to penetrate new markets, or to generate significant savings, while having positive social and environmental impacts. Start by exploring all the digital tools available, online learning, courses, diplomas, mentoring, forums and put it into practice in your industry, so that after 10,000 hours of learning, if one day you participate in public processes, or leadership position, your contribution will be one of an expert and will not inadvertently destroy more than it builds due to lack of knowledge or experience.

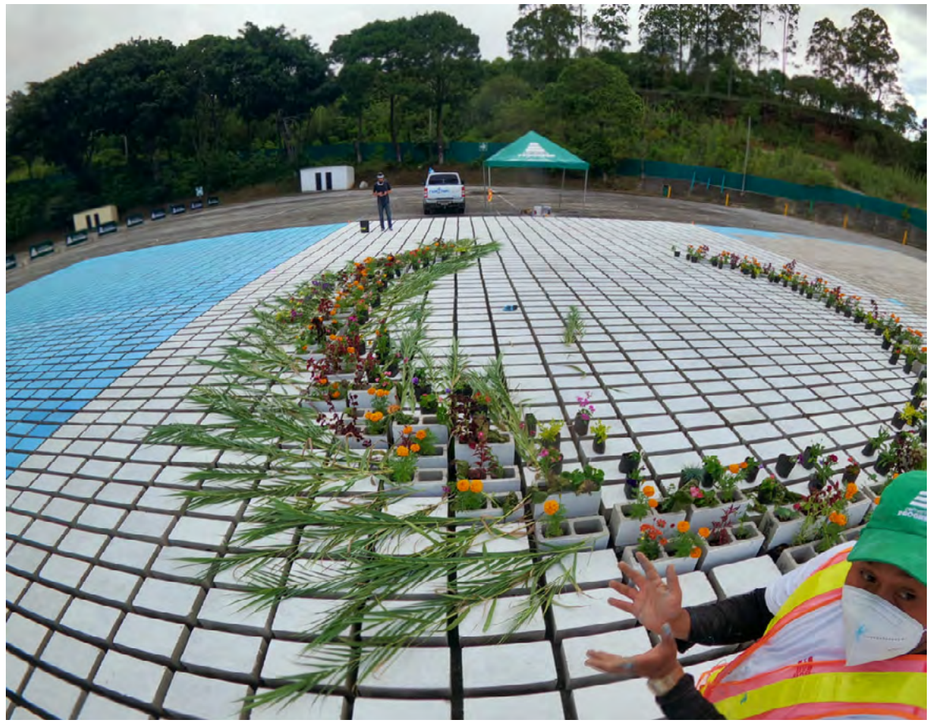
9

Learn to communicate and to listen, for all this knowledge to be useful, it will be necessary to explain it to those who are just starting out, with techniques that captivate and inspire others, knowing how to communicate it so that your ideas and knowledge motivate others to want to be part of the story you are telling, with modern techniques and technologies, through social media and new collaborative apps, but to influence those who have struggles different from yours, and reaching consensus, requires listening and integrating significant adjustments.

10

Participate in townhall forums and workshops to improve your city, so that, although at first it is just learning, it will serve as practice, being able to exercise the ability to contribute to a positive experience with those who sit next to you, practicing communication styles, asking the experts questions, learning from them, and from their debates with other experts, giving you topics to investigate when you get home, and to find research on even other differing solutions. But at the same time, during these townhall conversations, share your knowledge about new technologies, which many older experts may not know or understand, and share about how they're changing your life, in your home, in your projects, and the unexpected barriers you faced in the process, to see if they are being considering already. Finally, these spaces are a great opportunity to connect with other change makers and creative citizens, to learn from, but also develop friendships, teams, and a smarter city. ■

The G-22 environmental association, located in Guatemala, recently coordinated the implementation of the solar tuk-tuk and has been working for more than twenty years on applied sustainability through sustainable architecture.



COLLECTIVES AND URBAN LABS

Spaces to develop social and urban innovation and experiments

Often, many of the urban improvements and transformations being sought are experimental.

No matter how good an idea may seem and no matter how successful that idea may have been in another city, each city has very particular challenges and it is not always guaranteed that a project will be well received by the community or that it will work. The transformation of city models is entrepreneurship, and the nature of democracy and governments greatly limits public sector innovation, it is risky to experiment with public resources or to unleash controversies and opposition.

For this reason, collectives and urban labs can more easily assume these risks, to innovate, garnering support from all kinds of organizations that want to see changes, even with the support of the municipality itself.

Types of groups and urban laboratories:

Real estate entrepreneurs, who seek to transform properties or even deteriorated neighborhoods, as a business or social enterprise, but using real estate and urban innovations.

Events that bring together urban innovators and expose creative ideas, to raise awareness among citizens and begin to open the city's mind to new possibilities.

Activism organizations focused on specific topics, environmental, social, urban, mobility, public spaces, economic development, among others. Among these, organizations dedicated to promoting the use of bicycles tend to be among the best allies and defenders of urban innovation. ■

Case Study

BiCity (BiCiudad), Guatemala + El Salvador

BiCiudad is a combination of NGO and social entrepreneurship, an organizational innovation applied to sustainable mobility, whose objective is to favor security and infrastructure conditions, as well as the awareness of the population, especially among young people, to promote the bicycle as a means of transportation in Guatemala and El Salvador.

Since 2012, they have been managing projects that seek to create a "bike culture" among the population, as well as the generation of public policy and inclusive cycling infrastructure in cities, with initiatives such as film series, art exhibitions, photography contests, Bike Fairs and bike awareness tours.

In countries accustomed to lack of collaboration, Biciudad has managed to unite institutions, civil society and companies in mobility projects, generating a feeling of community. Biciudad works in collaboration with various groups, NGOs and municipalities.[ciii]

The Arab spring was a series of political evolutions that were triggered against governments with authoritarian practices, in several countries of the region including Libya, Egypt, Yemen and Syria, resulting in a large number of political reforms. Their success is largely attributed to the collective power derived from social media.

SOCIAL MEDIA AS A TOOL FOR CITIZEN EMPOWERMENT

Platforms that can serve to disseminate citizen led ideas, messages and events, serving as an accountability tool for public policy decisions

The invention of the printing press was one of the most revolutionary inventions in human history, allowing knowledge, education, and news to be brought to the general population, at a minimum cost, serving as an accelerator of democracy, bring an end to many dictatorships.

Now, through social networks, not only do we all have immediate access to information and news, but we are all the authors of the information. With a smartphone, a camera, and an internet connection, we become reporters for any injustice, act of corruption, or crime that is being committed, even in some of the most remote places around the world. A photo or video taken in the right time and at the right place can spark a revolution, as was the case in the recent Arab Spring, or in the eventual resignation of generals, governors, or even presidents. Social media empowers everyone, with a "like" or a "share" button,

we become active participants for protests. Social media has become a tool for accountability and social pressure for all local and national government officials. ■

Telegraph service. Industries like the telegraph and much of traditional mail became obsolete with the rise of the internet, email, and digital services that are not only free but also much better quality.

DIGITAL TOOLS AS SUBSTITUTES FOR PUBLIC SERVICES

Digital apps that will give birth to voluntary exchange systems for services that historically only governments were able to provide

One of the most important changes being experienced today comes from new digital technologies which offer services that could previously only exist with public subsidies or as monopolies. Today, digital platform companies find all kinds of business models to provide services, including many at no cost to their users, depending on advertising revenue, which results in higher revenues and profits as they generate garner more users.

For example, email services, which have replaced telegraph and many postal services, are now a more reliable and free communication service.

The same happens with communication platforms, such as WhatsApp, which connects people by messages, audio calls or video calls, free of charge, through wireless internet. Navigation apps, which map cities and the entire world, with visual images, are replacing the need for expensive, traditional mapping airplanes; podcasts, which avoid the need for air band controls, tourist information applications that replace the need for entire local or regional government offices, education apps, like Coursera, that offer classes and careers taught by some of the best teachers in the world, for free, or at low cost, security services, such as Ring, which offers surveillance systems for homes and public spaces that can be monitored from cell phones at a low cost, all are revolutionizing the way each service works in the world.

The world of services is truly undergoing a revolution and what citizens will expect from the government will change more and more, as they find more and better solutions to their needs through digital tools. ■

SHARING ECONOMY AS A TOOL FOR SELF-REGULATION AND VOLUNTARY COLLECTIVIZATION

Platforms that will allow for the voluntary exchange of goods and services, with a highly trusted self-regulation system based on collective ratings between service providers and users

Shared electric vehicle systems on the streets of Paris, as in the case of Renault's Zity app.

For a long time, various public agencies had a monopoly to regulate trade. But today, with digital tools, we can do business and exchange services and products with strangers, with a more effective and reliable regulation mechanism: collective, digital ratings. Thus, when a person provides a service, the user rates how satisfied they are. This allows future users to judge who to do business with and who to avoid. It is no longer the government that defines the standard, but the users themselves in each industry.

With thousands of ratings, users decide who to buy from. If someone commits fraud, users destroy the digital reputation of the seller, and without him able to corrupt any official, their business is over. But the same thing happens with buyers, if one does not pay or demonstrates dangerous behavior, the service provider rates the user poorly, and future providers decide not to do business with that user. This represents a threat to some officials whose power (and business) depended on this arbitrary monopoly for trade regulation; today they will have to compete with the sharing economy that seems to be favored by most citizens.

Likewise, thanks to the sharing economy, we will go from a purchasing economy to a borrowing economy, where almost all goods can be borrowed or rented at a better price, through digital platforms. The sharing economy is transforming the nature of commerce and the perspective on the acquisition of goods and property. For centuries, the acquisition of assets, a house, a car, work tools, buildings, land, was the financial objective to which most families aspired to. But now, thanks to the sharing economy, it is becoming less necessary and less convenient to buy and store goods. We are moving from a purchasing economy to one of renting. If we need a car, we reserve it with a single button and we can choose one with a driver or one without a driver. If we need to stay somewhere, we reserve a room, in a hotel or a family's spare room. If we need a work tool, we reserve it through our cell phone and pick it up, or they can bring it to us, and at a fraction of the historical cost.

But, on the other hand, now we have the great opportunity to put all our assets at the service of others when they are not in use, to generate extra income. If we have an extra room in our home, a car parked most of the day, a lawn mower, an extra space in our office, a free parking lot, a free seat on our daily commute, we can make everything we want available to others, generating extra income, meeting new people, and under the safety of "stars" that allow us to decide whom to exchange with. This is opening the doors to small and medium-sized entrepreneurs and even families, to compete in industries that were previously very difficult to penetrate, such as hotels or transportation, all from the comfort of your home and your phone. ■

SMART HOUSES AND THE INTERNET OF THINGS

Technology for the construction of new housing models and new home monitoring and management tools

The cost of housing continues to be the main expense for most families in the world. But not only the cost of the house itself, but everything that is involved in keeping it functional, starting with the cost of energy and water, as well as the high cost of safety, at risk of being the victim of a robbery or a crime.

A smart home is one that allows owners to keep an eye on it digitally, through the "internet of things". The sensors that send information on utilities consumption, in real time, directly to the smartphone of the person who lives in the house, make it possible to measure the use of electricity and water, know when there are unusual increases and offer the ability to turn off the pipes or lights from your smartphone, even if you are on vacation. This also allows for better monitoring of the home when you are away or features to automatically alert neighbors or the police in the event of an incident.

Likewise, these technologies allow the integration of clean energy or even water management tools. Others allow the integration of the electric car, to optimize the use of solar panels, through storage in the car battery. These technologies can be considered in the design process, from the production of a new home, or be integrated via low-cost digital sensors into an existing home.

Beyond innovations that reduce a house's cost, we also see great opportunities in the smart home industry based on good architectural designs that can change a person's life, beyond digital. New materials and construction processes allow us to find better cost and better-quality alternatives, with housing models of all kinds, including tiny or prefabricated houses, modular rooms[cv], or 3D printing construction processes.

Beyond its application in the home, the Internet of Things allows innovation throughout real estate and logistics industries, giving us much greater control of "things" that we previously had to do manually. ■

Examples of smart home management tools and systems like Amazon's Echo Show and Phillips' Smart Hub.

Companies like Superfeet already have 25 pilot stations around the United States to scan the soles of professional runners' feet and print custom shoes using 3D printers.

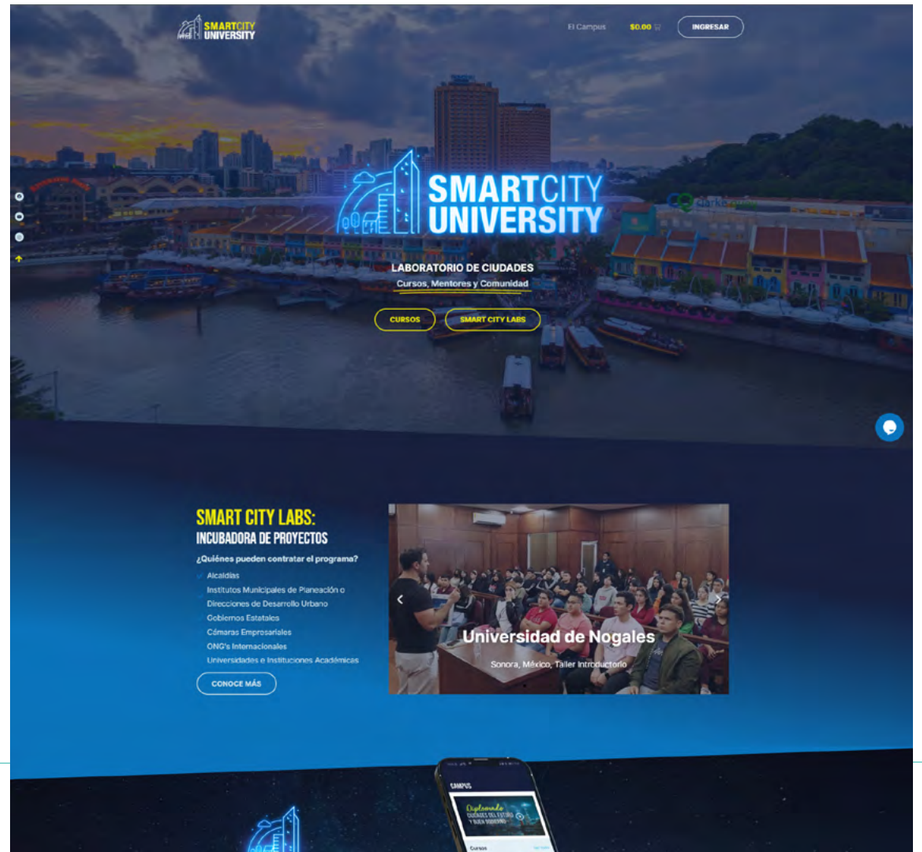
3D PRINTING, MANUFACTURING AND LOGISTICS INDUSTRIES

The rise of local 3D printing factories that will manufacture products on demand, followed by neighborhood dark stores, and ultimately, each household will print a great variety of products, from home

The 3D printer industry is another technology that will revolutionize work and commerce in cities. This is particularly worrisome for developing cities that continue to rely on manufacturing jobs. Most of the maquiladora jobs, which require cheap labor and transportation logistics of thousands of kilometers, across oceans or continents, will not be able to compete against the small, automated factories that do not require labor or significant logistical costs for a wide variety of products that can be "printed" by them. These machines are becoming more accessible and of better quality every year, many schools and industries already beginning to incorporate them into their work programs, but this technology is still in its infancy, as were computers in the eighties or the internet in the nineties, where we were not yet sure of their practical applications, or how it was going to change our lives. Thus, 3D printers today are a still seen often for games or curiosity, for educational programs and for industrial laboratories. But in the coming years we will see this revolution take off.

Shoe industries,[cvi] for example, have launched business models that print your personalized shoes to your preferred design, tailored to your needs, with just a photo of your feet, using their mobile app. Thus, other industries will begin to transform, and the economy and sources of work will undoubtedly reinvent themselves, within a still unknown period. ■

Mick Ebeling's "Not Impossible" company undertook the Daniel Project, in the Nuba Mountains of Sudan and through laboratories with 3D printers they print highly functional and low-cost prostheses for thousands of children who survived forced mutilations during the civil war.



Smart City University, launched in 2021 by the author, Marco Martinez O'Daly, is an educational platform where researchers and professionals have access to courses, classes and urban labs, and learn about legislation, smart cities, design of public spaces, and leadership skills, among other topics that are taught through a collaborative scheme that allows teachers to upload and sell their own classes.

HOME OFFICE AND REMOTE WORK AND LEARNING

A profound transformation of every industry, with an accelerated transition towards remote or hybrid jobs and education models

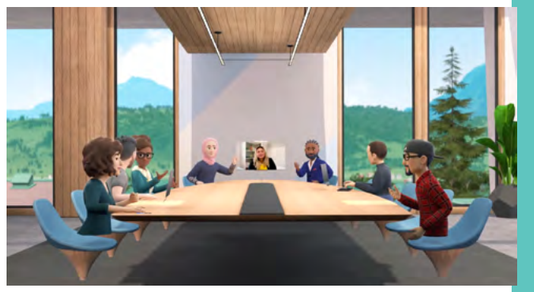
Remote work was already becoming more common and was transforming work and business models, allowing startups to reduce large office costs, and especially significant expense for companies in the world's large cities. Some companies, like Southwest Airlines, had already outsourced some customer service work to be done permanently from home, and others, like American Express, had already implemented an optional Friday telecommuting policy, which many corporate workers enjoyed. Industry was evolving was slower than expected, but still changing. And then 2020 happened, and everything changed.

Based on the measures that millions of companies and industries had to implement overnight , working from home became the new normal. This gave life to two situations. On the one hand, while many companies with traditional structures have tried to return to their previous model, a large percentage of workers who have already had the experience of working from home do not want to return to the office or prefer a hybrid model, which has created serious pressure for these companies to consider, for fear of losing their best employees.

On the other hand, many of the people who could not work from home, because their industries or types of work did not allow it even during the pandemic, have decided to quit, sacrificing their financial security, but with a new outlook on life. The new trend is clear, working from home will be an increasingly valuable tool, especially for companies that know how to implement it properly. This implies a transformational change for industries, especially for companies that were already developing effective organizational models for teams working remotely. But now, it also means major changes to the way we design our homes, with increased demand for work or learning spaces.

One of those industries with the greatest pressure for transformation is the education industry. For parents, the new normality points towards more and better distance learning tools, starting with adequate spaces and advanced technologies at home. For teachers, the need for better technological and didactic tools is of the greatest relevance.

This means a major change for higher learning institutions as well. University students were already questioning the profitability of their college degree, but the social experience that universities represented continued to motivate these great sacrifices. However, after a year of distance learning and uncertainty of the near future, students are now seriously considering the number of high-quality, even better quality, that exist for learning and professional development, through platforms and models that are much more digitized and at a much lower cost. ■



Horizon Workrooms, launched by Facebook as a platform for remote collaborative work through its virtual reality metaverse.

HIGHLY AUTOMATED VEHICLES

While completely self-driving cars seem to be close as well, what we will witness first are highly, but not fully, automated cars, and that in itself will be revolutionary[cvii]

For decades we've been waiting for self-driving cars. This technology is already here and is being tested and used by car companies and transportation companies around the world. Uber already has prototypes of driverless cars providing services in several cities, and Estonia is already launching prototypes of small vehicles doing mail deliveries, without drivers. However, on the one hand, this is not going to be fully functional as long as the critical mass of self-driving cars in cities is not exceeded. On the other hand, these technologies will take even longer to reach developing countries. Nevertheless, this revolution will come faster than we think, and it is may already be here, even in Latin America, not due to driverless cars, but to their precursor technology: highly automated cars.

Highly automated cars can brake on their own, for example, should the driver get distracted; others can drive themselves on highways, virtually hitched to the car in front of them; many also park themselves. This means that the way we travel is going to be transformed. Drivers with these vehicles, in the coming years, will only have to drive the car from their home to the main freeway, and from there the car will almost drive itself. This means that people will be able to work or sleep during these journeys, now willing to make even longer journeys. It also means that parking lots can be more compact, without need for space between cars or for opening doors. All this will imply a revolution in the way we build the cities we live in. ■

Above: Google's self-driving cars.

Below: The interior of a Tesla while driving on autopilot on the highway.

Highly automated vehicles and now with autonomous models like Tesla.

Drones with wheels have grown in popularity, such as in Estonia (above) and now at universities around the United States. Drones from Starship in California and those from Northern Arizona University (NAU) in Flagstaff, Arizona deliver thousands of monthly orders from university restaurants to students around campus and to their dorms.

Photo below:

Starship delivery robots in Mountain View, California, United States.

100 TOOLKIT

HYPERLOCAL LOGISTICAL PLATFORMS, LAST MILE DELIVERY, AND DRONES

From mail delivery, to ordering from neighborhood stores, we will see an increase in eCommerce and drone traffic, which will revolutionize cities and their air space

While highly automated cars are going to revolutionize the way people move in cities, drones are going to revolutionize the way goods move in cities. And this is also going to change the way we do business.

This means even more business through the internet. Self-service industries will be transformed by companies like Amazon, which will be able to further expand their coverage and decrease their delivery times and costs, using drones. The restaurant industry will also see a big change in their business, which we are already seeing emerge with platforms like Uber Eats.

This implies several important changes in the way we live in cities, it means less need to go out on the streets, which can be practical, but it also reduces community life and increases sedentary lifestyles. On the other hand, it means much more access to more and better products and services for distant communities.

Delivery drone prototype, Amazon Prime Air..

Finally, hyperlocal logistics platforms, which refer to all those businesses that are within a specific geographical area, will begin to have a greater presence in electronic commerce, so that when buyers are in a rush, they can choose among vendors geographically, not only from products that must cross an ocean, taking several days or weeks, but able to choose products from the corner store, and to receive them in less than an hour. ■

Zesty App, created by young entrepreneurs from Sonora (Mexico), promotes the digital economy in local businesses such as restaurants, supermarkets, produce vendors, beauty product stores, etc. The App allows them to set up their own online store and facilitates the home delivery service. Today it has more than 350 affiliated businesses and more than 400,000 orders delivered.

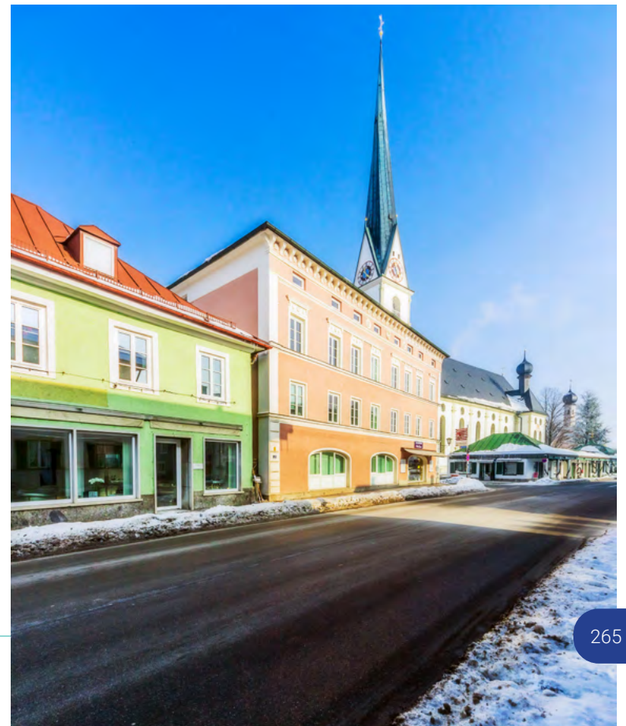
CRYPTOCURRENCIES AND THE FUTURE OF LOCAL ECONOMIES

Now that any city can have its own currency, without great technical complexity, we will see some local economies take off

In the coming years, one of Jane Jacob's thesis on the economy of cities will be tested[cviii], which proposes that one of the most determining elements to predict a culture of entrepreneurship and how much a local economy will grow depends to a large extent on its currency. When a city has its own currency, it serves as a self-regulating mechanism that fosters local consumption, especially when its economy faces a recession. This, Jacobs proposes, is one of the advantages that have propelled the success of city states such as Hong Kong and Singapore.

But currently, due to technical and legal limitations, most cities depend on national currencies and economies. This is changing rapidly, with the rise of cryptocurrencies and blockchain technology. Private companies and cities are starting up with their own, smarter, and more attractive currencies. In the coming years, this will cause a financial and economic transformation for innovative regions around the world. ■

The Chiemgauer is a regional currency started in 2003 in the city of Prien am Chiemsee (Germany), designed by young students as part of a school project for the promotion of the local economy, now already accepted by more than 600 local businesses, with a scope of $5.1 million euros that can only be spent locally.



Bitcoin, Ethereum, Cardano, Binance Coin, and Tether are five of the most popular cryptocurrencies right now.

Concentrated solar thermal plant in California's Mojave desert (United States).

Solar farm between Toowoomba and Dalby in the Queensland region of Australia.

SICET biomass energy production plant in Ospitale di Cadore (Italy).

ALTERNATIVE ENERGIES AND THEIR IMPACT IN CITIES

While biogas, solar, wind and other types of even more reliable alternative energies already support the energy grid in many cities, an even greater change is coming with fusion energy

Possibly the most important and transformative revolution of all, will be the one that arises with the possible -albeit remote- implementation of fusion energy. Today we are already seeing great changes in the energy industry, with various renewable energy alternatives, such as solar and wind, and others that use the waves of the sea to produce energy, we are increasingly seeing more innovations in the sector. However, many of these alternatives still have a long way to go to achieve the profitability and reliability necessary to compete with traditional energy industries.

But fusion power can change that forever. This is an almost infinite source of energy that several companies had been aspiring to for decades, and while there was no way of knowing whether this would be achieved in our generation, in 2022, fusion ignition was finally achieved by a research laboratory in the United States. Though this is the first of a long road to sustained fusion, what it implies is that energy may become almost free for our homes and cars, with zero environmental impact and zero emissions, within our lifetime. It would mean endless water sources.

Urk, a fishing village in the Netherlands that uses alternative energy sources.

Currently, water desalination processes are not financially viable, due to the amount of energy the process require. With this technology, cities would be able to desalinate water, almost free, from the sea. It means skyscrapers for agriculture within the same cities and reforestation and preservation of the countryside, which would no longer be needed for agriculture.

It is really worth paying attention to and being part of these intelligent urban ventures, which are and will continue to transform cities and the way in which everyone, but above all, the most marginalized, live in them. ■

SMART URBAN ENTREPRENEURS

Photo of the official trailer of the new VR Chat, virtual reality social platform, which allows you to interact with others using avatars in virtual worlds.

VIRTUAL REALITY AND THE METAVERSE

Building of digital worlds that will serve as destinations for entertainment and commerce through virtual and augmented reality tools

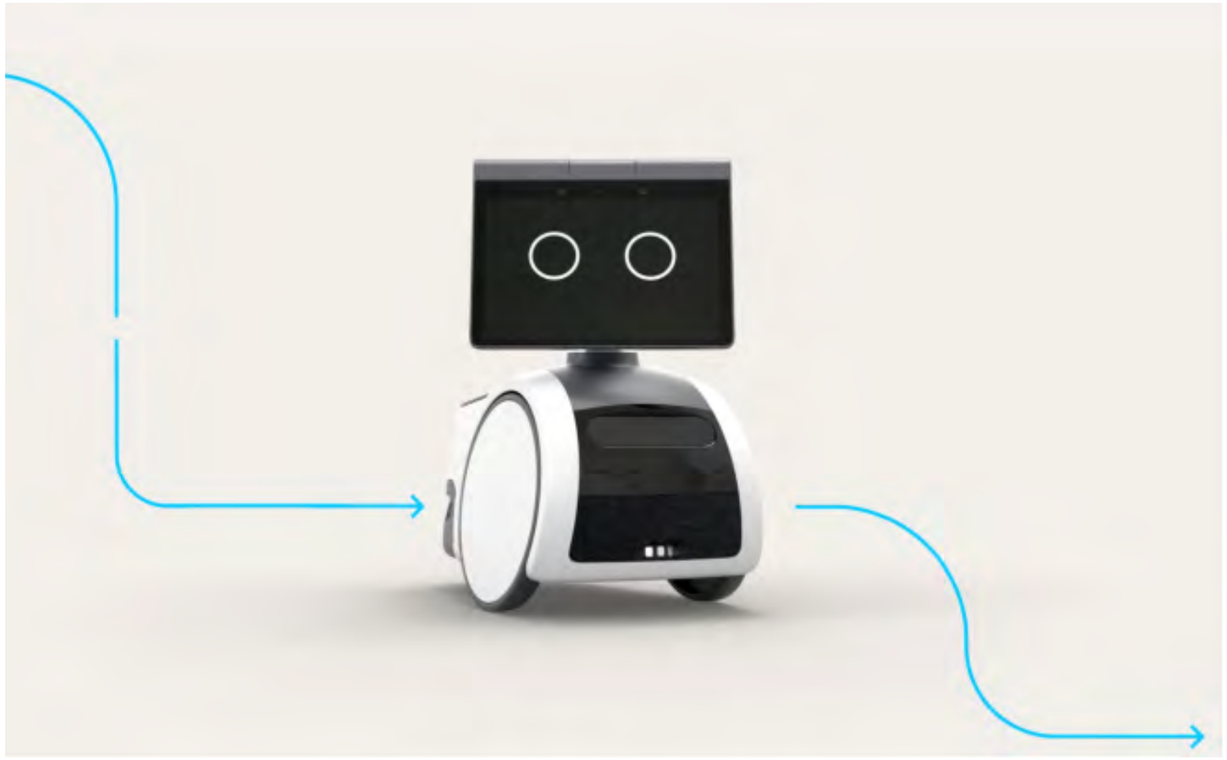
Virtual Reality will allow us to model prototypes of houses, for example, revolutionizing industries that previously required more upfront capital, and opening markets more to low-risk startups, especially in a post-COVID19 world. And with this we can now see the construction of a Metaverse, a parallel, digital universe that will trigger a digital and commercial revolution.

Virtual reality technology, to many, sounds like an entertainment tool. Without a doubt, it will be used for entertainment, just like all social tools that are used today, such as "FaceTime" and video calls. But virtual reality is much more than that: it is a commercial tool that will allow us to prototype products, real estate, buildings, and entire cities, without the need for multimillion-dollar initial investments.

Now, for an architect, instead of having to build a physical prototype, they will design a virtual, digital one. This will give life to many new business models that will be able to access financing based on pre-sale, allowing new and smaller competitors in the real estate industry. But this also implies the need for new digital knowledge for all kinds of educational programs, both for architects and engineers, and for marketers.

In April 2020, the artist Travis Scott organized a virtual concert in the multiplatform game Fortnite, with 12.3 million people connected live and generated an approximate profit of $20 million USD.

While the utility of this tool for individual products and services has grown in popularity, the next step is now coming to life, with the construction of a parallel digital universe, in which people can socialize, buy property, and build buildings, sell services model existing cities and explore them from home, using virtual reality glasses. This is one of the next steps for platforms such as Facebook cx, taking into account that from the pandemic experienced in 2020 and the great crisis that this has meant for some of the creative industries -especially those of entertainment, concerts, sports and festivals, for example, the famous Burning Man of Black Rock City,[cxi] - it has resulted in an acceleration of the creative process, causing a revolution towards the integration of virtual tools. ■



Astro is Amazon's new robot for the home, integrating the Echo Show's smart home tool functionality and Alexa's communication features into a camera-enabled robot that walks around the house.

The recent popularity of artistic gastronomy ventures such as Doggos Gus, in San Diego (United States), in Farmers Markets and at events that hire artistic cooks for private events, it demonstrates the future of work, which will require more personalized and social experiences as AI caters to traditional jobs.

ARTIFICIAL INTELLIGENCE AND THE FUTURE OF JOBS

Automation, robots, hyperlocal logistics platforms and distribution centers operated by robots

The future of the workforce will be robots, computers, and fully automated processes that, with the help of artificial intelligence programs, will be able to resolve complex conflicts that previously required humans.

Especially in the world of electronic commerce, shipments, transportation and delivery of products (agriculture, food and household items) will have a high level of automation and less and less need for human labor. Stores will have a robotic system to pack and mail shipments to homes, and companies like Amazon will have highly automated processes in distribution centers run entirely by robots , as well as automated cars or drones that can bring shipments to the door of homes. companies and organizations.

This is not the future; these mechanisms are already implemented to a certain level in the processes of many industries and each year the trend increases. The same occurs with the manufacture of products, such as cars and houses, which is increasingly becoming more automated and will continue to increase with the growth of 3D machines.

Mass production jobs, cheap labor, and low-income jobs are going to disappear. Thus, the manufacturing costs of almost every product will disappear. Logistics costs, which until now required shipments by train, plane or ship and storage in warehouses for weeks or months, accumulating costs that had to be passed on to the consumer, will now go down, as products will be manufactured more frequently, in real time, close to the consumer. Things that used to require paying 6 months' of a household's salary will now cost 2 weeks' worth of salary. More and more families will have more and more disposable income and free time to spend on luxuries, recreation, entertainment, travel, studies, and personal preferences.

We will no longer find work in factories, in the fields, in warehouses or kitchens. And while it will be big business for people with certain types of technical or digital knowledge to design systems and program technologies for a while, specific expertise will be replaced by artificial intelligence, as is happening now with open AI and chat GPT, making every product and service even less expensive to produce.

So where will people work and make money from?

The short answer: wherever each person wants, and without so many financial worries.

One of the fastest growing and most popular phenomena in recent years in the United States are the "Farmers Markets" or artisan markets, especially in the most prosperous cities with the greatest technological advances.

The nature of all jobs will evolve. As all the necessities of housing, transportation, food, healthcare, and education fall in price, humans will start spending a higher proportion of their income on one specific thing: human connection. And this has no automation or technological substitute. We will no longer go to the supermarket to buy bread, we will seek a artisan bread maker and live an artistic demonstration; and we will go with our friends to enjoy the experience, and we will spend more and more on experiences that help us make new friends, find love, create families and belong to a community, to live memorable experiences with.

And it is in this industry of entertainment, experiences, and community creation, in which all humans will work without any robot or computer replacing them. ■

THE INDUSTRIES OF ENTERTAINMENT, EXPERIENCES AND COMMUNITY

The future of business and cities will depend on their ability to create three things: entertainment, experiences and community

In the past, experiences were limited to weekends, or to occasional family trips, hoping to discover a new city or a new country. Now people go skiing on an artificial mountain in the middle of Copenhagen, built on top of the world's most advanced clean power plant. Just look at the number of photos, videos, stories, and profile updates that have exploded in recent years, on platforms like Instagram, that receive more than half a million daily active users. You already live in the world of experiences.

And this is appreciated on a different scale in all industries, from pet stores to the dentist, all compete in the Experience Economy.[cxii] In the same way each individual, when it comes to entertaining their family, friends, clients, passengers, or co-workers, has developed ways to contribute to better experiences. This is nothing new, since the beginning of humanity, people have aspired to face-to-face experiences of entertainment, play, memories and, above all, community.

Furthermore, we must add an additional element: the search for status and prestige. Much of what has accelerated this new experience industry is social competition, a competition to upload stories or photos that help brand or bring status among people's social or professional circles.

How can we use this both for business, and to contribute to the development of smarter cities?

Today, everything requires the creative element of memorable experiences, from mindful travel to immersive culinary experiences. Trends also point to immersive museums and cinemas, designed to trigger people's creativity. Similarly, remote villages could spring up on beaches and forests, designed to cultivate community. Austerity trends may even be observed, where people with environmental or social awareness pay more for a trip that allows them to connect with nature, or with local communities, an experience that feeds their soul, without luxuries, but with a sense of purpose.

The future of cities, of companies, and of people's ability to be a successful change maker will depend, to a great extent, on the individual's ability to design and provide memorable experiences to those around them. ■

The Zipaquirá Salt Cathedral is a Catholic cathedral built inside the old Zipaquirá salt mines, a great immersive and artistic experience, one hour from Bogotá (Colombia).

Exhibition of the artist Yayoi Kusama in an infinite room in a museum in Singapore.

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PHOTOGRAPHS AND IMAGES

Toolkit		Image name	Author	License / Source	
	Introduction	Fotografías Smart Lab Guadalajara (1-3)	Fundacion Friedrich Naumann para la Libertad		
	Startup City	Sunrise at the market with light reflection on the cobblestone street	MCarter	Shutterstock	
1	Walkable Streets and Neighborhoods	People, shops and restaurants at the always busy Madero boulevard in downtown Mexico City	Kamira	Shutterstock	
		Guatemala City, Guatemala- Mother and daughter walk along Avenida sexta	nobito	Shutterstock	
		People on 5th Avenue, the main street The city boasts a wide array of tourist activities due to its geographical location in the Riviera Maya.	posztos	Shutterstock	
		Street of Tlaquepaque	Luis Alvarado Alvarado	Shutterstock	
		Historical center in sunny weather, HDR image	mehdi33300	Shutterstock	
2	Urban Acupuncture	Aerial shot of the Soumaya Museum, with the Polanco and the Ampliación Granada neighborhoods.	Ricardo Pacheco	Shutterstock	
		The Museo Soumaya is a private museum in Mexico City	ItzaVU	Shutterstock	
		Biblioteca España, Medellín, Colombia	dubessonego	123F	
3	Smart Tourism	Valle de Guadalupe Banner.jpg	Tomas Castelazo	CC BY-SA 4.0	Wikimedia Commons
		Encuentro Guadalupe - Breakfast	¡Carlitos	CC BY-NC-SA 2.0	Creative Commons
		Encuentro Guadalupe	¡Carlitos	CC BY-NC-SA 2.0	Creative Commons
		Bruma winery	T.Tseng	CC BY 2.0	Creative Commons
		Colonial street of tequila in guadalajara jalisco in pais de mexico	Jesus Cervantes	Shutterstock	
		Tequila, Mexico	posztos	Shutterstock	
		Tequila, Jalisco, Mexico, farmer with donkey	T photography	Shutterstock	
		Jose Cuervo Express	Mel Gonzalez	Shutterstock	
		Tequila, Jalisco, Mexico	T photography	Shutterstock	
		Colonial architecture in the ancient city of Antigua Guatemala, Central America, Guatemala	Galyna Andrushko	123F	

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4	Creating Experiences	Black Rock city. Festival Burning Man.jpg	master instalaciones efímeras ETSAM	CC BY-SA 4.0	Wikimedia Commons
		Uchronia by Arne Quinze, Front view, Nevada desert, USA.jpg	Bramcoud	CC BY-SA 4.0	Wikimedia Commons
		Black Rock Desert, United States (Unsplash).jpg	G. - Gerome Viavant / geromeviavant.com	CC0 1.0 Universal (CC0 1.0) Public Domain Dedication	Wikimedia Commons
		Burning Man 2016 Daytime 176 (29713390824).jpg	Carnaval.com Studios	Creative Commons Attribution 2.0 Generic	Wikimedia Commons
		rafael-cisneros-mendez-28PdNL1PE9s-unsplash.jpg	Rafael Cisneros Méndez	Unsplash License	Unsplash
		Group of people riding on bikes in dust storm	Kevin Sutton	Shutterstock	
5	Creative Industries and the Orange Economy	Hollywood, California	Gabriel Santiago, (@whileimout)	Unsplash License	Unsplash
		benoit-debaix-c-HGZNddplw-unsplash.jpg	Benoit Debaix	Unsplash License	Unsplash
		The historic electronics district has evolved into a shopping area for video games, anime, manga, and computer goods.	ESB Professional	Shutterstock	
6	Creative Neighborhoods	4 Grados Norte (7), Guatemala.jpg	Rudy Cano	CC BY-SA 2.0	Wikimedia Commons
		4 Grados Norte (6), Guatemala.jpg			
		4 Grados Norte (3), Guatemala.jpg			
		4 Grados Norte (4), Guatemala.jpg			
		Pedestrian zones in Guatemala City	Rene Hernandez	CC BY-SA 2.0	Wikimedia Commons
		Casco Viejo, Panamá (1-3)	Marco Martínez		
		Miami - Wynwood Arts District - Wynwood Walls 10.jpg	Daniel Di Palma	CC BY-SA 4.0	Wikimedia Commons
		Miami - Wynwood Art District - Wynwood Walls General View of Courtyard.jpg			
		Indigenous portraits mural by Kobra at Wynwood Walls, Miami.jpg	Jules Antonio	CC BY-SA 2.0	Wikimedia Commons
		Miami, FL, USA	Felix Mizioznikov	Shutterstock	
		Miami, USA	pio3	Shutterstock	
7	Regulatory Improvement and Smart Reforms	Presentation of the book: The Urban Reform, to rescue your city and take care of the Planet.	Marco Martínez		
		Presentation of the book: The Urban Reform, to rescue your city and take care of the Planet.			
		Case Study: Urban Reform (Senate)			
		Pink Zone in Lafayette, Louisiana	Pink Zone in Lafayette, Louisiana. Adapted from "How Pink Zones can help small-scale projects", (Steuteville, R., 2018), Congress for the New Urbanism: (https://www.cnu.org/publicsquare/2018/11/06/how-pink-zones-can-help-disinvested-areas). Courtesy of *Project for Lean Urbanism* (leanurbanism.org).		

Toolkit		Image name	Author	License / Source	
8	Economic and Real Estate Competitiveness Programs	Steve Jobs [Apple computer]	Bernard Gotfryd	Bernard Gotfryd photograph collection (Library of Congress), Prints & Photographs Division, Library of Congress, LC-DIG-gtfy-01855 (digital file from original), https://hdl.loc.gov/loc.pnp/gtfy.01855 Library of Congress, LC-DIG-gtfy-01855 (digital file from original).	
		Land plot in aerial view. Include landscape, real estate, green field, agricultural plant, pin location icon. For housing subdivision, residential, development, owned, sale, rent, buy or investment.	DifferR	Shutterstock	
		Bosco Residencial Sustainable Community	© DEREX Desarrollo Residencial S.A. de C.V.	http://www.derex.com.mx/articulo/bosco-derex-caso-estudio-en-harvard	
		Bosco Residencial Sustainable Community			
		Bosco Residencial Sustainable Community			
		CityBldr - we build smart cities	CityBldr Real Estate, LLC	https://www.citybldr.com/	
		CityBldr - we build smart cities			
9	Smart permits and procedures	Digital Portal of the One-Stop Investment Window (VUI), Costa Rica	Mauricio Vega	PROCOMER	© Ventanilla Única de Inversión 2021
		Visor Urbano, Municipal Government of Tepatitlán	Visor Urbano, Gobierno Municipal de Tepatitlán	© Municipio de Tepatitlán	https://tepatitlan.visorurbano.com/
		Visor Urbano, Municipal Government of Tepatitlán			
		Procedures in automatic kiosks, Tepatitlán, Jalisco, Mexico			
		Intelligent procedures of the e-Estonia portal	e-Estonia	Enterprise Estonia	https://e-estonia.com/
10	Smart Plans and Regulations	Reforma Urbana Lab, Tijuana, April 2019 (photos 1-2)	Marco Martínez		
		Case study: Tecate and Sonora (photos 1-4)			
11	Business and Innovation Ecosystems	Photos Innovate Summit, 2019	Friedrich Naumann Foundation for Freedom		
12	Evening Economy	La Ruina Park, Hermosillo, Sonora	the real duluoz	CC BY-NC-SA 2.0	Creative Commons
		Las Vegas, Nevada	Miune	Shutterstock	
		Scottsdale, Arizona	kenelamb photographics	Shutterstock	
		People walking between food stalls under chinese lanterns	Chris Slupski	Unsplash License	Unsplash
13	High-Value Industrial and Logistical Economies	Panorama Aerial bird eye view Marine industry Container transport at Tsing Yi in HONG KONG	Zen S Prarom	Shutterstock	
		Panama city/Panama-07/20/2019 photo from Panama Canal in Panama	artemu kopylovk	Shutterstock	
14	Special Economic Zones 4.0 and 5.0	Aerial view of Changwon city, South Korea. Aerial seascape in South Korea	Panwasin seemala	Shutterstock	
		Changwon	Seo Sang Jin	Shutterstock	
15	Micro-Entrepreneurship and Economic Stimulus Programs	Lower Floor, en Pike Place Market, Seattle, EE. UU.	Taylor Simpson	Unsplash License	Unsplash
		First Starbucks coffee store at Pike Place Public Market in Seattle	happycreator	Shutterstock	
		SEATTLE - JULY 5: The Public Market Center also known worldwide as Pike Place Market in Seattle, Washington on July 5, 2014.	f11photo	Shutterstock	

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16	Increased Local Greatness and Identity	Little Mermaid, Copenhagen, Denmark	Peter OToole	Shutterstock	
		PORTLAND, OREGON - AUG 22: Mills End Park in Portland, Oregon, on Aug 22, 2018	Ritu Manoj Jethani	Shutterstock	
		Tepatitlan de Morelos, Jalisco / Mexico - Jul 2010	Arturo Verea	Shutterstock	
		Shibuya Hachiko Bus	Stéfan	CC BY-SA 2.0	Wikimedia Commons
		Danish Pavilion	FHKE	CC BY-SA 2.0	Wikimedia Commons
		Japan, Tokyo, - December 01, 2018	ItzaVU	Shutterstock	
		Off-Road Walk of Fame, Ensenada	Saraí Domínguez		
		Los Angeles / United States - 15 Jul 2017	Sergey-73	Shutterstock	
		Star of Hollywood Walk of Fame on October 15, 2011 in Los Angeles	nito	Shutterstock	
17	Smart Art, Sports and Culture	2018-10-10 Youth Olympic Village at 2018 Summer Youth Olympics (Martin Rulsch) 150.jpg	Martin Rulsch	CC BY-SA 4.0	Wikimedia Commons
		A picture of the Staples Center as used for the 2016 League of Legends World Championship finals.	Patar knight	CC BY-SA 4.0	Wikimedia Commons
		Miami Beach, FL, USA	Felix Mizioznikov	Shutterstock	
		Rio de Janeiro	lazyllama	Shutterstock	
		La Sabana Park National Stadium	Joshua ten Brink	Shutterstock	
		Aerial view skate park, Venice Beach, CA.	TierneyMJ	Shutterstock	
		MIAMI - CIRCA JUNE, 2018	lazyllama	Shutterstock	
		Skate board park in Venice beach at sunset, California, USA	Fominayaphoto	Shutterstock	
18	Incentives for Distinctive, Local Technologies and Solutions	Eco-sustainable 3D printed house "Tecla".jpg	Alfredo Milano	CC BY 2.5	Wikimedia Commons
		TUK TUK Solar 2021, Biciudad/G-22	Guatemala22 (G-22)	https://www.g-22.org/	
		TUK TUK Solar 2021, Biciudad/G-22			
		Classroom interiors at Green School on February 27, 2012 in Bali, Indonesia	paul prescott	Shutterstock	
19	University Scientific Research Ecosystems	En. Criadero Buck (Argentina), from left to right, Tuchi Terwissen, Carlos Buck, Lisardo Gonzalez, Norman Borlaug, Kurt Meyle, 1971	CIMMYT	CC BY-NC-SA 2.0	Creative Commons
		March 2019 Winner: Growth under the watch of Norman Borlaug	CIMMYT	CC BY-NC 2.0	Creative Commons
		Monterrey, Nuevo León/México; March 12 2020: Architecture of one of the most prestigious universities in Mexico named Tecnologico de Monterrey	Guillermo Alejandro	Shutterstock	
		BOSTON, USA - 17of October 2017: (BU) Boston University entrance	eskystudio	Shutterstock	
20	Local Educational and Talent Generating Strategies	Fab Lab VERITAS - Research Center for Innovation, University VERITAS	Rogarita	CC BY-SA 4.0	Wikimedia Commons
		Sao Paulo / Brazil	Jo Galvao	Shutterstock	
		Veritas digital program training teachers	© 2020 Veritas Technology VR		
		Screenshot of the Veritas program			
		Children using tablets with the Veritas program			

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	Mobile City	Panorama of Hong Kong City skyline	Travel man	Shutterstock	
21	Street Connectivity Criteria	Top view, Example residencial famous urban grid	ikumaru	Shutterstock	
		Aerial photograph taken from a helicopter	Stephane Legrand	Shutterstock	
		Venice, Los Angeles and Irvine California Intersections	Marco Martinez	Generación propia	
22	Mixed Use Zoning	Coronation Street outdoor set	Elaine Champion	CC BY-SA 2.0	Creative Commons
		Iconic commercial mall full of businesses on the ground floor	Aberu.Go	Shutterstock	
		Alvaro Restaurant at the Alvaro Obregon avenue on the fashionable Roma Norte neighborhood	Kamira	Shutterstock	
		Tijuana downtown cleanup and gentrification	Robert Briggs	Shutterstock	
23	Flexible Density	View from the heights of the city.	Andrei M24	Shutterstock	
		Table of theoretical intensities of 'Urban Reform', used as a basis for reforms in the Metropolitan Zone of Tijuana.	Reforma Urbana		
24	Smart Codes	Aerial view of Mexico City's Paseo de la Reforma.	Matt Gush	Shutterstock	
		Smart Code v 9.2 book cover	Center for Applied Transect Studies	https://transect.org/codes.html	
		Transect diagram			
25	Smart Street Designs and Manuals	Paulista Avenue Bicycle path 02	Marcelo Camargo, para Agência Brasil	CC BY 3.0 BR	Wikimedia Commons
		Buildings in zone 4, Guatemala City	Hondurasteamo90	CC BY-SA 4.0	Wikimedia Commons
		Top view of intersection between the Paulista avenue and Consolacao street , crosswalk and cityscape.	cifotart	Shutterstock	
		Photos of Zone 4, Guatemala (1-2)	Marco Martínez		
		Mobility pyramid	Own generation based on the Manual de Calles Completas de México.		
		Paseo de la Reforma		123F	
26	Integral Urban Developments and Smart Suburbs	Guatemala City photos 1-4	Marco Martinez		
		Ciudad Cayalá, Guatemala	StudioGShock	Shutterstock	
		Guatemala City, Guatemala. March 8th, 2019. The luxurious Cayalá zone	Ricardo Pacheco	Shutterstock	
		Image of architecture Loreto Bay, Baja, Mexico	Russ Heinl	Shutterstock	
		Loreto Bay Nopolo Aerial View	Fer Ro	Shutterstock	
27	Road Diets	Photos of Masaryk Avenue (1-4)	Marco Martínez		
		Screenshot, Google Street View on La Jolla Boulevard	Screenshots de generación propia	Google Street view	
		Screenshot, Google Street View on La Jolla Boulevard			
28	Bicycle Lanes with a Future	Longitudinal park and cycle path along the ancient tracks at Ferrocarril de Cuernavaca	Santiago Castillo Chomel	Shutterstock	
		Longitudinal park and cycle path	Santiago Castillo Chomel	Shutterstock	
		Old passenger car parked in front of the famous Soumaya and Jumex museums	Aberu.Go	Shutterstock	
		Photos of bicycle lanes in CDMX, Guatemala City and in Cartagena (1-4)	Marco Martínez		

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29	Shared Bicycle and Scooter Systems	LONDON, UK - JULY 6, 2016: People walk by Zipcar vehicle in London, UK. Zipcar is an American car-sharing company. It is part of Avis Budget Group	Tupungato	Shutterstock	
		MEXICO CITY, MEXICO - SEPTEMBER 13, 2020: Public bikes parked in a station in the street. Eco friendly alternative for public transportation in big cities	Bruno_Doinel	Shutterstock	
		Photo of red bicycles	Marco Martínez		
		Distrito Usaquén, Bogotá, Colombia	markpittimages	Editorial Use Only	123RF
30	Last Mile, Autonomous, Neighborhood Transportation	Station in Santo Domingo	Matyas Rehak	Shutterstock	
		Escalator of the commune 13 tourist zone of Medellín	Alexander Canas Arango	Shutterstock	
		Escalator of the commune 13 tourist zone of Medellín	Alexander Canas Arango	Shutterstock	
		Escalator of the commune 13 tourist zone of Medellín	Alexander Canas Arango	Shutterstock	
		Photo of cable car in La Paz, Bolivia without ID		123F	
31	On Demand Transit	Robot bus or driverless bus on its route in Southern Helsinki	SariMe	Shutterstock	
		Screenshot Circuit FRED San Diego	© 2020 Circuit	Captura de pantalla, www.ridecircuit.com/fred	
		Screenshot of CIRCUIT bus	© 2020 Circuit	https://www.youtube.com/watch?v=RGZvtW09GdI	
		Last Mile in San Diego's Balboa Park		123F	
32	Carpooling Infrastructure	Driving on the freeways of Los Angeles county on the carpool lane	Sundry Photography	Shutterstock	
		Screenshot of Traeguate portal	© TraeGuate	© TraeGuate	
		Foto carpooling		123F	
33	Smart Traffic Management	GPS application Waze running on phone in a car.	Alison Nunes Calazans	Shutterstock	
		Screenshot de plataforma: Connecting Cities and Citizens to Improve Urban Mobility	Waze	https://unstats.un.org/unsd/geoinfo/ungegn/docs/11th-uncsgn-docs/Waze_UN_Presentation.pdf	
34	Bus Rapid Transit Systems	New Transmetro units in Guatemala	Eddy Morataya		
		Transportation Modernization - Costa Rica	123F		
35	Subways and Trolleys	Strip photo of San Francisco Cable Car 10.jpg	Dllu	CC BY-SA 4.0	Wikimedia Commons
		The Medellín tramway is a means of urban, electric, and passenger rail transportation	Alexander Canas Arango	Shutterstock	
		Classic view of historic traditional Cable Cars riding on famous California	canadastock	Shutterstock	
36	Smart Bus Stops	Guatemala City	ansoncfit	CC BY-NC 2.0	Creative Commons
		Bus Stop, Reforma Area, Mexico	Lupita Rojas Solis	Shutterstock	
		London, UK	Alena Veasey	Shutterstock	
37	Multimodal Transport Apps	Moovit App	Maor_Winetrob	Shutterstock	
		Moovit App	Postmodern Studio	Shutterstock	
		Image of Whim, Mobile Service, Finlandia	Whim [@WhimappFI]		Twitter
38	Congestion Charge Systems	Traffic approaching Bay Bridge Toll Plaza, San Francisco	Ann Baldwin	Shutterstock	
		A car with a red number plate is an "Off-peak vehicle"	Dr David Sing	Shutterstock	
		027 ERP gantry.jpg	VK35	CC BY-SA 3.0	Wikimedia Commons

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39	Smart Parking	Register vehicle license plate and credit card to pay for parking	sophiecat	Shutterstock	
		Smart Parking lot Guidance System with Overhead Indicators, Intelligent assist, Realistic illustration 3D Rendering	Akarat Phasura	Shutterstock	
		Panappark app screenshot	Panappark		
40	Heavy Cargo Traffic and Curb Management Systems	Amazon Prime electric delivery vans in East Barnet Road.jpg	Philafrenzy	CC BY-SA 4.0	Wikimedia Commons
		DB Schenker Electric Delivery Cargo Bike	SariMe	Shutterstock	
		A bicycle delivery person laden with Amazon Fresh	rblfmr	Shutterstock	
		Close up of man loading box on his cargo bike	Giacomo Pratellesi	Shutterstock	
41	Electromobility	Electric cars charging at electricity filling station in the fast expanding car charging network in the Netherlands	Rudmer Zwerver	Shutterstock	
		An electric car is charging at a preferred parking charging station	Valphotog	Shutterstock	
		A governmental californian bumper sticker on a car shows it is access ok	oliverdelahaye	Shutterstock	
42	Public Nuisance and Disturbance Controls	Walking the pack of dogs	Brester Irina	Shutterstock	
		Sojo, Manhattan, NY	shu2260	Shutterstock	
		San Miguel de Allende, Mexico	cdrin	Shutterstock	
		Sound level meter that measures the noise of the industrial ventilation unit.	JRJfin	Shutterstock	
43	Residential Mobility	Aguascalientes, Mexico	JPJPJP	Shutterstock	
		View of a new low-cost low-income housing development	D Busquets	Shutterstock	
		Abandoned house in Valle de San Pedro	Carlos Bustamante		
		Pie de Casa Program, Nogales	Com. social Nogales		
	Accessible City	Miami Beach, Florida hotels and restaurants at sunset on Ocean Drive	fotomak	Shutterstock	
44	Orderly Urban Expansion and Growth Programs	Road subsystem map of Playas de Rosarito for the PDUCP PR 2021-2040	IMPLAN Playas de Rosarito		
		Advance roadway planning		123F	
45	Green Space and Public Space Design Diagnosis	Super Tree Grove at Gardens by the Bay	Coleen Rivas	Unsplash License	Unsplash
46	Neighborhood Parks for Socio-Spatial Inclusivity	Lima, Peru	Myriam B	Shutterstock	
		Copenhagen, Denmark	Oliver Foerstner	Shutterstock	
		Copenhagen / Denmark	Stephanie Braconnier	Shutterstock	
		Central park in Merida from above	dmi-sky	Shutterstock	
		Alameda Central Park		123F	
47	Main Streets and Superblocks	Little Italy SD Sign.JPG	Christopher Mann McKay	CC BY-SA 3.0	Wikimedia Commons
		20161231_173525	Toni Hermoso Pulido	CC BY-SA 2.0	Creative Commons
		NCN_191244	Places & Activities	CC BY-NC-SA 2.0	Creative Commons
		SAN DIEGO, CA	GagliardiPhotography	Shutterstock	
		Barcelona, Spain	MaxPalla	Shutterstock	
		San Francisco Road USA	Lukas Bischoff Photograph	Shutterstock	
		SAN DIEGO, CALIFORNIA, USA	Chad Zuber	Shutterstock	
		BARCELONA OCTOBER 2019	MeriPopps	Shutterstock	

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48	From Highways to Linear Parks	A visit to the High Line park.jpg	David Berkowitz	Creative Commons Attribution 2.0 Generic license.	Creative Commons
		NEW YORK - JUNE 15, 2013: The High Line Park in New York with locals and tourists. The High Line is a popular linear park built on the elevated train tracks above Tenth Ave in New York City	pisaphotography	Shutterstock	
		NEW YORK, USA - SEP 08, 2017: High Line Park Walk Path People Nature Green	Gregorio Koji	Shutterstock	
		High Line Park		123F	
		Cheonggyecheon Linear Park		123F	
49	Alleys and Urban Pocket Parks	Sao Paulo, Brazil, December 08, 2016. Pedestrian Lane on Liberdade neighborhood, downtown Sao Paulo	Alf Ribeiro	Shutterstock	
		Thematic alley Cajeme 1	Cortesía de Margarita Velez de Mariscal, Presidenta del DIF 2018-2021, Cajeme, Sonora		
		Thematic alley Cajeme 2			
		Thematic alley Cajeme 3			
		San José Park, Costa Rica		123F	
		Guatemala City	Marco Martínez		
50	Tactical Urbanism	1st and U NW tactical urbanism sidewalk extensions	BeyondDC	CC BY-NC 2.0	Creative Commons
		LOS ANGELES, CA, USA	Kapi Ng	Shutterstock	
		Paseo de Reforma CDMX		123F	
51	Progressive, Sustainable Developments	Aerial view of small houses in Almere, The Netherlands		Shutterstock	
		Photo VillaVerde1	Arch Daily	https://www.youtube.com/watch?v=SthuNNLQbLg	
		Photo VillaVerde2			
52	Lean Urbanism	Colorful street in Antibes walkway and shops view, Southern France	xbrchx	Shutterstock	
		Beautiful streets and colorful facades of San Miguel de Allende in Guanajuato, Mexico	Rubi Rodriguez Martinez	Shutterstock	
		Bright colors in colonial houses in downtown Campeche, Mexico.	Jess Kraft	Shutterstock	
		Photographs District Market, Tucson, Arizona (1-6)	Marco Martínez		
53	Smart Welfare Vouchers for Basic Services	Letrero Kino Border Initiative	Courtesy of Maria Engracia Robles, Iniciativa Kino AC, Nogales Sonora		
		Kino Border Initiative 1			
		Kino Border Initiative 2			
		Kino Border Initiative 3			
54	Smart Homelessness Alleviation	FEMA - 37544 - Mississippi Cottage with residents.jpg	Jennifer Smits	CC BY-SA 3.0	Wikimedia Commons
		78 New Supportive Modular Homes in Vancouver	Province of British Columbia	CC BY-NC-ND 2.0	Creative Commons
		View of the German campground with tents, caravans, trailer park and cabin cabins.	Tsuguliev	Shutterstock	
55	Smart Water Management	Hoover Dam	nootprapa	shutterstock	
		Water meters		123F	
56	Smart Public Transport with Market Mechanisms	HONG KONG,MTR train,2020MAR27	HUI YT	Shutterstock	
		HONG KONG - OCTOBER 9: Entrance to Civic Square	Sean Pavone	Shutterstock	
		Subway train station on May 9, 2014 in Hong Kong	pisaphotography	Shutterstock	
		San Diego's Trolley		123F	

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57	Smart Waste Management Systems	Waste incinerating plant, Biebesheim, Hesse, Germany	Ana Gram	Shutterstock	
		KAMP-LINTFORT / GERMANY - MAY 07 2016	Lukassek	Shutterstock	
		Public garbage systems	Marco Martínez		
		Garbage separation systems	Marco Martínez		
58	Smart Public Safety	Shibuya Halloween 2019 (October 31)	Dick Thomas Johnson	CC BY 2.0	Creative Commons
		August 29, 2019 Sunnyvale / CA / USA - Police officer presenting the drone program at the "Technology Business Expo"	Sundry Photography	Shutterstock	
		Colombian Police (15475892517).jpg	National Police of Colombia	CC BY-SA 2.0	Wikimedia Commons
		Colombian Police (15475890227)	National Police of Colombia	CC BY-SA 2.0	Wikimedia Commons
		Colombian Police (15475891857).jpg	National Police of Colombia	CC BY-SA 2.0	Wikimedia Commons
59	Broken Windows Strategies for Crime Reduction	New York, NY - June 4, 2020: Maintenance workers remove derogatory graffiti	Iev radin	Shutterstock	
		Employee removing graffiti		123F	
		Photographs of Nogales	Comunicación Social, transparency portal, Nogales, Sonora 2006-2009		
60	Access to Smart Medical Care	Old disabled woman lying in hospital bed having an online video call with a doctor.	DC Studio	Shutterstock	
		The Johns Hopkins Hospital in Baltimore	Daniel J. Macy	Shutterstock	
		Young nurse checking the blood pressure of sick old woman in nursing home.	DC Studio	Shutterstock	
		Doctor in virtual application		123F	
61	Innovation for Emergency Response Services	Tokyo, Tokyo / Japan - 03 12 2020: Tokyo fire department trucks and firefighters in action in Asakusa	Viktoriyani	Shutterstock	
		TOKYO, JAPAN - NOVEMBER 4, 2018: Red fire fighters truck in in Tokyo, Japan	riodejano	Shutterstock	
		Drone carrying AED kit for emergency medical care concept	Chesky	Shutterstock	
62	Internet Connectivity	Starlink Mission	Official SpaceX Photos	CC BY-NC 2.0	Creative Commons
		A SpaceX Starlink satellite dish mounted on the roof of a rural home	JL IMAGES	Shutterstock	
		Starlink app on Apple iPhone screen.	Thomas Dutour	Shutterstock	
		Fiber optic cable laying in the ground, buried cable for faster internet in rural region, near the village Eschede	juerginho	Shutterstock	
		Slum of labours be hide phone antenna post.	thaisign	Shutterstock	
63	Internet of Things and Artificial Intelligence for Public Services	A smart electric energy meter that measures energy consumption	JWPhotoworks	Shutterstock	
		Manchester, England / United Kingdom - January 21 2020: nPower (EON) Smart meter for gas & electricity.	Vitalij Terescsuk	Shutterstock	
		Fairhaven, Massachusetts/USA - June 20 2020: a Sensus iPerl electronic 'smart' water meter	Mystic Stock Photography	Shutterstock	

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64	Historic Downtown Renovation Programs	View of US Airways Center and Chase Field	Eileen_10	Shutterstock	
		Skyward view of the Brickell area in downtown Miami.	Fotoluminate LLC	Shutterstock	
		Close up view of the completed construction of the colorful Brickell Heights residential building	Fotoluminate LLC	Shutterstock	
		Downtown Miami cityscape with the popular Metromover passing along Biscayne Boulevard.	Fotoluminate LLC	Shutterstock	
		The beautiful modern and colorful architecture of the luxury SLS Brickell Hotel in the popular downtown Brickell area.	Fotoluminate LLC	Shutterstock	
		Phoenix Arizona Convention Center	Manuela Durson	Shutterstock	
65	Voluntary Contributions for Cultural Spaces and Events	Marlinton, USA - October 6, 2020: Tea creek campground information board sign with fee collection box	Kristi Blokhin	Shutterstock	
		American Museum of Natural History		123F	
		Bristol, New Hampshire (NH) / USA - August 22, 2020: Elwell and sugar-loaf mountain trail-head in Wellington State Park near Newfound lake.	Jon Michael Pics	Shutterstock	
	Resilient City	SINGAPORE - JUNE 23, 2018: Singapore Flyer	S-F	Shutterstock	
66	Digitized Risk Atlases	Risk atlas viewer	Secretaría de Gestión Integral de Riesgos y Protección Civil, Gobierno de la Ciudad de México	https://www.atlas.cdmx.gob.mx/analisisn2/	
		Screenshots of the CDMX Risk Atlas Portal		https://www.atlas.cdmx.gob.mx/principal/inicio	
67	Green Infrastructure Policy	Brick swale, balfour street pocket park.JPG	Didiunsw	CC BY-SA 4.0	Wikimedia Commons
		Balfour Street Park.jpg	Newtown grafitti	CC BY 2.0	Wikimedia Commons
		Planted brick swale, balfour street pocket park.JPG	Didiunsw	CC BY-SA 4.0	Wikimedia Commons
		The annual event draws kite enthusiasts from around the world.	CrackerClips Stock Media	Shutterstock	
		Boardwalk at Long Beach with kites flying into the misty sky	Lucille Ryan	Shutterstock	
68	Conservation Easement of High-Risk and High Conservation Value Areas	Tijuana Estuary looking north from the south end of Seacoast Drive	Lisa A. Cox	CC BY-NC-SA 2.0	Creative Commons
		A beautiful aerial view of a brown lake and dense buildings in Nogales Sonora, Mexico.	Wirestock Creators	Shutterstock	
		Toma aérea de Lima, Perú	Fotos593	Shutterstock	
69	Park Dedication and Conservation Management Plans	RILLITO	Bill Morrow	CC BY-NC-SA 2.0	Creative Commons
		Aerial view of the modern skyline of Panama City, Panama with modern Highrise buildings.	Gualberto Becerra	Shutterstock	
		Little Island park at Pier 55 in New York, a man-made island park in the Hudson River west of Manhattan, New York City, next to the aerial view of Hudson River Park.	Creative Family	Shutterstock	
		Jaraguá do Sul SC - Aerial view of the Via Verde Linear Park - Cycling Route along the River	Viagens e Caminhos	Shutterstock	
		New York City Sky View	Rene Pi	Shutterstock	
		Manzanares linear park	cribe	Shutterstock	
		Aerial shot of La Mexicana Park in Santa Fe, Mexico City.	Jacomergo	Shutterstock	

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		Ecological Belt, Guatemala City 1-2	Marco Martínez		
		Mapa Town of Marana	Marco Martínez		
		Rilito River Bikeway	Marco Martínez		
		Photos Lady Bird Lake 1-3	Marco Martínez		
		Fundidora Park 1-3	Marco Martínez		
		Ruins of the Parish of Santiago Apóstol		123F	
		Environmental fund, Puerto Cortés	Marco Martínez		
70	Rainwater Harvesting with a Network of Dams	Randers, Denmark - 10-July-2021: The new rainwater basin at Ostervold in Randers, People look at flowers and nature, street resturant.	Karl Aage Isaksen	Shutterstock	
		Randers, Denmark - 10-July-2021: The new rainwater basin at Ostervold in Randers, People look at flowers and nature, street resturant.	Karl Aage Isaksen	Shutterstock	
		Dam in Nogales, Sonora	Marco Martínez		
71	Permeable Public Infrastructure	Screenshot of video Parque Intercomunal Victor Jara in Santiago	Canal de youtube: Chile N Thailand Travel https://www.youtube.com/watch?v=w8toEhSQN8g		
		Screenshot of video Parque Intercomunal Victor Jara in Santiago			
		Permeable parking lots		123F	
72	Smart Greenery for Urban Climate Control	Medellin, Antioquia, Colombia. July 20, 2020: Poblado avenue and green corridor in the city.	oscar garces	Shutterstock	
		COPENHAGEN, DENMARK - SEPTEMBER 2, 2019:8 House, 8 Tallet, Big House	Anna50	Shutterstock	
		Ode to Chicago. View from Chicago's Urban Farm of Lights.	CYJ 360	Shutterstock	
		Fall colors in the city of trees Boise Idaho tomorrow.	Charles Knowles	Shutterstock	
		Screenshot Panama Tree Planting Plan 1	Alcaldía de Panamá	https://datos-geomupa.opendata.arcgis.com/datasets/arborizaci%C3%B3n-calidonia-p/explore	
		Screenshot Panama Tree Planting Plan 2			
		Scottsdale: Desert landscape walking path on a summer day	Gina Santangelo	Unsplash	Unsplash
		Aerial view Namba Parks, Osaka, Japan	Unsplash	Mike Swigunski / GlobalCareerBook.com	
73	Smart Water Management Culture	Al Khafji Solar desalination station.png	دي‌مُج	Creative Commons CC0 1.0 Universal Public Domain Dedication	
		Dubai. Summer 2016. Modern desalination plant on the shores of the Arabian Gulf.	Stanislav71	Shutterstock	
74	Smart Pollution and Waste Management	Copenhagen, Denmark - September 5, 2021: Aerial view of the Amager Bakke, Copenhill Waste-to-Energy Power Plant in Copenhagen with the ski area on the roof.	Ingus Kruklitis	Shutterstock	
		Factory that generates electricity and heat using waste residue (Brescia, Italy).	Korina T.	CC BY-SA 4.0	Wikimedia Commons
		Waste to biogas plant in Sofia Bulgaria		123F	
		Messina, Sicily, Italy, 11 October 2012, municipal landfill. methane gas production plant	newphotoservice	Shutterstock	
75	Energy Efficiency with Compact Neighborhoods and Cities	Melbourne, Victoria, Australia. 05-24-2021 New City High Rise Buildings	Graham Drew Photography	Shutterstock	
		City of Amsterdam from above. General view from the high point of the day.	Unique Vision	Shutterstock	
		Main road in Panama City		123F	

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76	Urban Decarbonization Programs	Frankfurt Central station. It's one of the most important and busiest railway stations in Germany.	MikeDotta	Shutterstock	
		Flat west German landscape near Aachen and Herzogenrath with wind turbines in the foreground.	IndustryAndTravel	Shutterstock	
		Historic Gable Houses along the Bloemgracht viewed from the Tweede Leliedwarsstreet Bridge	Harry Beugelink	Shutterstock	
77	Pandemic and Emergency Mitigation Infrastructure	COVID-19 wastewater testing.jpg	Oregon State University	CC BY-SA 4.0	Wikimedia Commons
		Wells, UK - August 20, 2020: People dine out at street side restaurants.	1000 Words	Shutterstock	
		Sunbathers aggregate outdoors at Dolores Park on a hot Saturday afternoon during Covid-19.	eddie-hernandez.com	Shutterstock	
		A staff member works at a new COVID-19 testing booth in Ben Gurion International Airport near Tel Aviv, Israel, November, 9, 2020.	Gil Cohen Magen	Shutterstock	
		Screenshot of the NHS-Covid platform 19	© National Health Service, UK (NHS)	© Crown copyright (UK)	https://www.nhs.uk/conditions/coronavirus-covid-19/
		Screenshot of Florida Covid 19-Response platform	Florida Department of Health	https://floridahealthcovid19.gov/	
		Düsseldorf, Germany - JUNE 2020: Group of People sit inside circle which are drawn on Rheintreppe, along Rhine River, during quarantine, New Normal and Social Distancing with epidemic of COVID-19.	Peeradontax	Shutterstock	
	Transparent City	Golden Gate Bridge Twilight,San Francisco	Arthit Kaeoratana-pattama	Shutterstock	
78	Digital Government Portals	Screenshot Visor Urbano, Guadalajara	Visor Urbano, Gobierno Municipal de Tepatitlán	© Municipio de Tepatitlán	https://tepatitlan.visorurbano.com/
		Screenshot GOV.UK	© Crown copyright (UK)	Open Government Licence v3.0	https://www.gov.uk/
		Screenshot Hawaii.gov	eHawaii.gov	© 2021 State of Hawai'i	https://portal.ehawaii.gov/
		Screenshot Norge.no	Norwegian Digitization Directorate	Open Data	https://www.norge.no/
79	Land Registry Modernization	Screenshot Cadastre CDMX	Agencia Digital de Innovación Pública, Gobierno de la Ciudad de México (con mapas de ESRI, OpenStreetMap)https://sig.cdmx.gob.mx/		
		Screenshot of the Catastro Sinaloa platform	Instituto Catastral del Estado de Sinaloa, México (ICES) https://ices.gob.mx/portal/		
80	City 4.0: Digitalization of Regulations and Infrastructure	Screenshot Gridics 1	©2021 Gridics LLC.	https://gridics.com/	
		Screenshot Gridics 2			

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81	Open Data Portals and Participatory Diagnostics	Screenshot Metropolitan PIMUS platform, Tijuana, Tecate and Playas de Rosarito	IMPLAN Tijuana, Baja California 2019		
		Screenshot Proyect Block by Block	Block by Block ™	https://www.blockbyblock.org/	
		Screenshot of the PDUCP-R consultation platform of Playas de Rosarito	IMPLAN Playas de Rosarito, Baja California, 2020-2021		
		Screenshot Hermosillo Cómo vamos platform	Hermosillo, ¿Cómo vamos?, 2019 (por Observatorio para la Competitividad y el Desarrollo de Sonora, A. C.) https://hermosillocomovamos.org/		
		Digital survey munimixco 1	Municipality of Mixco, Guatemala	https://www.munimixco.gob.gt	
		Digital survey munimixco 2			
		Digital survey munimixco 3			
		Digital survey munimixco 4			
		Digital survey munimixco 5			
82	Cybersecurity and Data Protection	New Lab to Train Against Cyber Attacks	OEA - OAS	CC BY-NC-ND 2.0	Creative Commons
		Cyber security banner web icon flat design	buffaloboy	Shutterstock	
		E-estonia Card	e-Estonia	Enterprise Estonia	https://e-estonia.com/
		Screenshot The Uncensored Library	The Uncensored Library	https://www.uncensoredlibrary.com/en	
83	Financing Instruments and Financial Resilience	Cross Border Express, Otay Mesa, California	Harrison Photographic	Creative Commons Attribution-Share Alike 4.0 International	Wikimedia Commons
		Cross Border Xpress 15.jpg	OtayMesa_HarrisonPhoto	Creative Commons Attribution-Share Alike 4.0 International	Wikimedia Commons
		CBX exterior.jpg	Keizers	Creative Commons Attribution-Share Alike 4.0 International	Wikimedia Commons
		Hidroituango Diagram.jpg	Hidroituango	Creative Commons Attribution-Share Alike 4.0 International	wikimedia Commons
		Illuminated EPM Logo in Medellin	Alexandre Laprise	Shutterstock	
		Empresas Públicas de Medellín Building		123F	
		Road sign for garbage collection	Comunicacion Social, portal de transparencia, Nogales, Sonora 2006-2009		
		Garbage collection trucks			
		Infrastructure work on Hermosillo, Sonora roadways			
		Nogales, Sonora Police			
		Aerial view of a park in Medellín called Parques del Río.	Oscar Echeverri G	Shutterstock	

Toolkit		Image name	Author	License / Source	
84	Participatory Budgets	Submit your project for the Participatory Budgeting 02.jpg	Diario de Madrid	Creative Commons Attribution-Share Alike 4.0 International	Wikimedia Commons
		Poster Participatory Budgeting 2019.jpg	Fjvinal	Creative Commons Attribution-Share Alike 4.0 International	Wikimedia Commons
		And the winning projects of the participatory budgets are.... 01.jpg	Diario de Madrid	Creative Commons Attribution-Share Alike 4.0 International	Wikimedia Commons
		Large cities seen from above. City of Porto Alegre in the state of Rio Grande do Sul, Brazil South America.	ranimiro	Shutterstock	
		Woman inserting ballot in a box		123F	
85	Collaborative Governments and Self-Management Systems	Hanshin-Awaji earthquake 1995 338.jpg	松岡明芳	Creative Commons Attribution-Share Alike 4.0 International	Wikimedia Commons
		Ishinomaki in snow.jpg	Save the Children Canada	Creative Commons Attribution-Share Alike 4.0 International	Wikimedia Commons
		Screenshot Rancho Sahuarita	Rancho Sahuarita	https://ranchosahuarita.com/	
86	Metropolitan Planning and Governance	Screenshot authority of public space	Autoridad del Espacio Público [@aep.cdmx], Instagram (imagen)		
		Screenshot of Implan Playas de Rosarito platform	IMPLAN Playas de Rosarito, Baja California	https://implanplayasderosarito.gob.mx/	
87	Neighborhood Safety with Community Technologies	Ring Doorbell and Ring Home Security Systems.	Eric Glenn	Shutterstock	
		New York, USA - Circa 2018: Ring video doorbell owned by Amazon. manufactures home smart security products allowing homeowners to monitor remotely via smart cell phone app. Illustrative editorial	BrandonKleinPhoto	Shutterstock	
		Ring home security sign outside the house	Fang Deng	shutterstock	
		Neighborhood watch concept		123F	
88	Civic Education with Citizen Manuals	Manual de convivencia ciudadana Medellin screenshot 1	Alcaldía de Medellín, Colombia	https://www.medellin.gov.co/	
		Manual de convivencia ciudadana Medellin screenshot 2			
		Photograph of the inside of the publication "Nomás Tantito".	Saraí Domínguez		
89	One Stop Shop for Citizen Complaints and Urban Prosecutor Offices	Screenshot Fix my Street 1	SocietyWorks Ltd.	https://www.fixmystreet.com/#	
		Screenshot Fix my Street 2			
90	Anti-Corruption Programs	Screenshot Ipaidabribe	IPaidABribe.com	https://ipaidabribe.com/#gsc.tab=0	
		Surveillance cameras		123F	123F

Toolkit		Image name	Author	License / Source	
	Smart Urban Entrepreneurs	Astronaut spaceman do spacewalk while working for space station in outer space	Blue Planet Studio	Shutterstock	
91	Smart Citizens	Jane Jacobs	orionpozo	CC BY 2.0	Creative Commons
		Jaime LERNER	International Transport Forum	CC BY-NC-ND 2.0	Creative Commons
92	Collectives and Urban Labs	Flag of Guatemala with Tuk Tuk Solar	Cortesía de G-22.ORG/2021		
		Guatemala flag close-up			
		Biciudad camión	Biciudad		
		Biciudad Letrero			
93	Social Media as a Tool for Citizen Empowerment	Egyptian Youth Protesting Against Muslim Brotherhood - Alexandria, Sidi Gaber, Egypt 30 June 2013	MidoSemsem	Shutterstock	
		11 October 2011. Sana'a Yemen. The Arab Spring or Democracy Spring was a revolutionary wave of both violent and non-violent demonstrations, protests, riots, coups and civil wars in North Africa.	ymphotos	Shutterstock	
94	Digital Tools as Substitutes for Public Services	W.A.A.A.F. fabric workers and telegraphic workers	State Library Victoria Collections	CC BY-NC 2.0	Creative Commons
		Social networks		123F	
95	Sharing Economy as a Tool for Self-Regulation and Voluntary Collectivization	Handheld with smartphone and service apps		123F	
		The future of transport, Share cars in busy Paris, France	Col Brad		
96	Smart Houses and the Internet of Things	Remote home control system on a digital tablet or phone.	REDPIXEL.PL	Shutterstock	
		Neumorph theme technology of home automation system.	LIORIKI	Shutterstock	
		Nov 2019, UK - Google Home, Hub, Nest devices together on show in group	Vantage_DS	Shutterstock	
97	3D Printing and Manufacturing and Logistics Industries	3d printed shoe figure close-up	asharkyu	Shutterstock	
		Hand with 3d printed shoe figure close-up	asharkyu	Shutterstock	
		Screenshots de Project Daniel de Not Impossible	Not Impossible	https://www.notimpossible.com/projects/project-daniel	
98	Home Office and Remote Work and Learning	Back view of female employee speak talk on video call	fizkes	Shutterstock	
99	Highly Automated Vehicles	While running errands today, I ran into a gaggle of Google self driving cars.	austin tx	CC BY-NC 2.0	Creative Commons
		Connected cars		123F	
		Man working on laptop & texting on mobile	Flystock	Shutterstock	
100	Hyperlocal Logistical Platforms, Last Mile Delivery, and Drones	Mountain View, CALIFORNIA / USA - June 22 2020: Fleet of Starship delivery robots outside Ava's Downtown Market & Deli	Volodymyr Osypov	Shutterstock	
		Amazon Prime Air	Amazon	Amazon Prime Air: https://www.amazon.com/Amazon-Prime-Air/b?ie=UTF8&node=8037720011	
		Estonia uses robots for mail delivery	e-Estonia		
		Zesty App	Esteban Martinez, Director, Zesty App, Nogales, Sonora		

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101	Cryptocurrencies and the Future of Local Economies	Top view horizontal close up of ethereal litecina and gold coin stack gold coin background texture exchange concept	macondo	Shutterstock	
		The region of Prien, near to the sea Chiemsee in bavaria, Germany, Europe	Thomas Haupt	Shutterstock	
		"Chiemgauer paikallisvaluutta"	Jakonen		Creative Commons
102	Alternative Energies and their Impact in Cities	SICET, Biomass power plant in Ospitale di Cadore, Italy.	Tiia Monto	CC BY-SA 3.0	Wikimedia Commons
		Concentrated solar thermal power plant in the California Mojave Desert, United States.	Piotr Zajda	Shutterstock	
		A huge solar farm between Toowoomba and Dalby in central Queensland, Australia.	John Carnemolla	Shutterstock	
		Urk, a fishing village in the Netherlands that uses alternative energy sources		123F	
103	Virtual Reality and the Metaverse	(screenshot) In April 2020, music artist Travis Scott staged a virtual concert inside the game that was attended live by 12.3 million people. It was a global phenomenon that sent the American rapper to the top of all music charts and earned him a reported $20 million.	Dezeen	https://www.dezeen.com/2021/07/23/digi-tal-twins-metaverse-david-weir-mccall-epic-games/	
		Kids playing in virtual reality		123F	
		(screenshot) VR chat official trailer	VR Chat	https://www.youtube.com/watch?v=ZGl8E7Cy7gU	
104	Artificial Intelligence and the Future of Jobs	Greengrocer selling organic fresh agricultural product at farmer market	Rawpixel.com	Shutterstock	
		Woman with food	Surasek Saneha	123F	
		Amazon Astro	Amazon		
105	The Industries of Entertainment, Experiences and Community	Singapore-August 13,2017: An infinity mirror room full with yellow and black polka dots pumpkins installation art by Japanese artist ,Yayoi Kusama.	ephst	Shutterstock	
		ZIPAQUIRA, COLOMBIA - FEBRUARY 3, 2015: Marble and salt sculptures at underground Salt Cathedral Zipaquira built within the multicolored tunnels from a mine. One impresive accomplishment of Colombian	Fotos593	Shutterstock	