Resilient Cities Shaping a Digital World
Latin America and the Caribbean Edition, 2020

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General coordination: Ruben Salazar Genovés
Senior Vice-president, Head of Products and Solutions
Visa International Service Association, Latin America and the Caribbean

Aida Esteban Millat
Head of Urban Mobility and Smart Cities
Visa International Service Association, Latin America and the Caribbean

Eugene D. Zapata Gareschê
Managing Director, Latin America and the Caribbean
Resilient Cities Network

Luis Bonilla Ortiz-Arrieta
Senior Consultant on Partnerships and Communications, LAC
Resilient Cities Network

Editorial coordination: Jennifer Aguirre
Product Manager
Visa International Service Association, Latin America

Nicole Ponce
Technical Assistant
Resilient Cities Network

Editorial team: Luciana Cardoso,
Resilient Cities Network, LAC

Alvaro Soldevila
Resilient Cities Network, LAC

Consultants: Sonny Ajmani
Senior Partner
Kepler Cannon

Urvi Kochhar
Consultant
Kepler Cannon

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On February of 2020, during the 10th World Urban Forum (WUF) in Abu Dhabi, Visa and the Resilient Cities Network announced their partnership to help cities develop their digital infrastructure that can build and further resilience across Latin American cities. Digital transformations have gained relevance as an enabler of resilience in recent years, which has been accelerated by the pandemic as people have started changing the way they access services, interact and navigate spaces. The program “Digital Cities Shaping a Digital World”, through collaborative work, will support cities to deploy digital solutions as part of their resilience strategy, with a special focus on urban mobility as a catalyst to accelerate these changes.

This Concept Paper, developed as a vital tool for the program, builds the foundation of the collaborative work, as it takes the first steps toward understanding the challenges and opportunities of Latin American cities from a digital lens – to be better able to take more informed resilient actions. In addition, the concept paper discusses the role of digital inclusion when building urban resilience, as well as the current state of digitalization of a select set of Latin American cities. Finally, it invites the reader to explore and start imagining digital strategies for their individual cities through city specific snapshots and a preliminary menu of windows of opportunity that can pave the way for a more resilient digital future in urban Latin America.
## GLOSSARY OF ACRONYMS

<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
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<tr>
<td>BRT</td>
<td>Bus Rapid Transit</td>
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<tr>
<td>ICT</td>
<td>Communication Technologies</td>
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<td>EMEA</td>
<td>Europe, Middle East &amp; Africa</td>
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<td>FCE</td>
<td>Final Consumption Expenditure</td>
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<td>FDI</td>
<td>Foreign Direct Investment</td>
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<td>Gross Domestic Product</td>
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<td>IDB</td>
<td>Inter-American Development Bank</td>
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<td>IoT</td>
<td>Internet of Things</td>
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<tr>
<td>IMEPLAN</td>
<td>Institute for Development Planning and Management of the Guadalajara Metropolitan Area</td>
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<td>LAC</td>
<td>Latin America and the Caribbean</td>
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<tr>
<td>MTA</td>
<td>Metropolitan Transportation Authority</td>
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<tr>
<td>MaaS</td>
<td>Mobility as a Service</td>
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<td>NGOs</td>
<td>Non-Governmental Organizations</td>
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<tr>
<td>NFC</td>
<td>Near-field communication</td>
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<tr>
<td>SAM</td>
<td>Secure Access Module</td>
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<tr>
<td>SDG</td>
<td>Sustainable Development Goals</td>
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<tr>
<td>TOD</td>
<td>Transit Oriented Development</td>
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<tr>
<td>STUB</td>
<td>Urban Transport System of Bogotá</td>
</tr>
<tr>
<td>WUF</td>
<td>World Urban Forum</td>
</tr>
</tbody>
</table>
DIGITAL CITIES OF TOMORROW

Urbanization in Latin America is expected to reach 90% by 2050.¹ Citizens are moving to cities to prosper from commercial and economic activities. The expected population explosion, combined with the bustling, fast-paced life of cities will make them vulnerable to shocks and stresses. Shocks include natural disasters, disease outbreaks etc., while stresses can manifest in the form of economic vulnerabilities, social injustices and compromised management systems.

In order to prepare against such shocks and stresses and minimize disruption, cities need to become resilient so that they can prevent, minimize and effectively manage these scenarios. In fact, to survive, adapt and grow through shocks and stresses, such resilience practices must be supported by a strong underlying foundation of adaptability. Adaptive resilience or the ability to be prepared for and respond to the city’s unique challenges and problems helps maximize benefits for cities.

Digital transformation is a key enabler of such adaptive resilience. It is a one-stop solution for preparing for disasters and calamities (through early warning data-enabled forecast systems) or improving citizen involvement (through digital platforms) among others. Digital practices increase adaptiveness of a city’s management capabilities and processes by shortening time to acquire information and increasing agility. Such a transformation also entails digital inclusion of citizens by empowering them socially and economically through digital tools and infrastructure. As a result, citizens can contribute to wealth creation through widespread participation in economic activities. Digital inclusion is also catalyzing long overdue human-centric, technologically inclusive cities.

COVID-19 has forced local governments to rethink the functioning of several services and industries including healthcare, manufacturing, food supplies, education, security, payments, transportation etc. In fact, in a world of social distancing, digital processes help keep the economy operational. Delivery-based offerings, contactless, online/mobile payments and digital government processes are some of the areas experiencing significant changes. For example, innovative digital ways

¹ World Economic Forum

Digital inclusion is key to catalyzing long overdue human-centric, technologically inclusive cities.
for fund disbursement are being designed and deployed during COVID-19. In Dominican Republic, governmental agencies turned national identity cards into payment cards for letting vulnerable groups make use of the government COVID-19 subsidy.

There is an early shift in consumer behaviour towards use of contactless and card-not-present payments. For example, circulation of Visa contactless cards in Latin America and the Caribbean has tripled, as of March 2020, compared to a year ago. Markets such as Costa Rica and Chile are leading the penetration of contactless payments, with more than 50% of face-to-face payments made in March 2020, being contactless. Additionally, more than 13 million cardholders (or 2 out of 10 active cardholders), made their first e-commerce transaction during COVID-19 in key markets of the region.

Today, most cities in Latin America and the Caribbean have a conducive environment for widespread digital inclusion, even though they are currently in early stages. As many as 67% of Latin Americans owned a mobile phone in 2018. The region also benefits from strong internet infrastructure with only 7% of the population lying outside the connectivity of mobile broadband services. Still, any plans for digital inclusion need to consider some persistent challenges. These include lack of feeling of security while using the internet, low incentives to use digital platforms, low accessibility and affordability and lack of digital education, among others. In addition, high variations in socio-economic attributes also need to be considered while designing solutions for digital inclusion.

The omnipresent nature of payments in the lives of citizens makes it powerful for driving digital inclusion; adoption of digital and electronic payments can promote its widespread prevalence. Currently, several countries within the region continue to be reliant on cash usage despite efforts of governments to promote banking and financial inclusion. New ways to replace cash, smartphone-enabled payments, and promotion of other inclusive payment methods, can help empower excluded populations at the grassroot level.

It is estimated that cities globally can uncover potential benefits of USD 470B from adoption of digital payments. These benefits are derived from increased transparency and practicality of financial transactions, feeling of security and convenience, and enhanced agility of operations.

Enabling digital payments within public transportation systems can also drive widespread digital inclusion. Today, public transportation accounts for 45% of all modes of transportation in Latin America. Smart transit cards, open loop electronic payments, mobile taps etc., are proven ways to transform and drive inclusion.

Despite digitizing processes and systems, a city cannot truly become technologically inclusive without harnessing the power of data it produces. A data layer supported by strong governance, security protocols and robust management is a key enabler. Hence, governments must put their efforts into building a data foundation with proper security and protection measures in place, comprising of different sources of internal and external data.

One potential source of such external data lies with business organizations who possess deep citizen knowledge. Anonymized transactional records can be informative; local governments can harness the benefit of this information by partnering with private players to deliver solutions for citizens, particularly the vulnerable sections.

COVID-19 has accelerated digital transformation of cities and increased adoption of contactless and low touch solutions.
For example, as cities restart and rebuild their economy amidst COVID-19, payment transactions and mobility information can provide insights needed by local governments to decide which industries to open first, and how to manage public transport systems effectively.

Lastly, city governments should partner with citizens, businesses, start-ups, fintechs, academia, etc., to foster a collaborative ecosystem and create a customized palette of solutions. The systematic construction of the modern age digital city cannot be done by policy makers and government entities alone. The spectrum of digital transformation is rather large; cities can start off by realizing some quick wins by adopting pre-made solutions as stepping stones to a more nuanced journey. These can be successful initiatives that have benefited other geographies. These efforts should be combined with venues and platforms for open dialogue, learning and understanding to foster an inclusive approach to problem solving.

The challenges encompassing cities will only grow as populations expand and systems become overburdened with increased usage. Now, more than ever, is the best time for cities to engage in far-reaching digital transformation. Visa and the Resilient Cities Network – a city led organization driving urban resilience – have pioneered the program “Resilient Cities Shaping a Digital World” to support cities in addressing their most pressing challenges and generating a positive impact through the right infrastructure for digital transformation.

The call for cities is to turn themselves into intelligence centers - bustling with economic and social prosperity – that are ready to take on challenges and stresses as they come. The digital world is fast approaching, and innovative, tactical and modern solutions, designed and implemented through a resilience lens, are potential windows of opportunities that could benefit one and all.

Innovative digital solutions to make a city more resilient require collaboration of the public sector, private groups and other stakeholders representing citizens.
THE RESILIENT DIGITAL CITY

Realizing resilience through digital transformation
Urbanization in Latin America is expected to reach 90% by 2050. As a result of this phenomenon, more and more people have settled in cities to take advantage of economic opportunities, innovation cultures and improved well being.

Despite being prosperous hubs of endless activity, cities can become shackled with several stresses. These manifest in the form of economic vulnerabilities, social injustices and compromised management systems associated with aging infrastructure, inefficient management processes, and social prejudices, among others. In addition, cities also face sudden shocks like disease outbreaks and natural disasters, further increasing their vulnerability.

In order to be prepared against such shocks and stresses and minimize disruption, local governments need to plan and implement resilience.

**Urban resilience** refers to the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience.  

The essence of resilience lies in enhancing the system to be prepared for different challenges, instead of just preventing or mitigating loss of assets in the face of adversities. Such preparedness combines the responsive capacities of different systems with futuristic, risk-aware and robust stress management mechanisms.

There exists no standard blueprint for cities to become prepared. Uniqueness of cities and their challenges, must guide creation of the most effective resilient systems.
However, local governments should base their resilience on incorporating some foundational qualities within planning and designing of mechanisms to prevent, manage and mitigate losses associated with unfavourable conditions. By keeping these qualities in mind, local governments are able to look at the functioning of their cities through a resilience lens and are able to design best-suited strategies for city growth.

**QUALITIES OF A RESILIENT SYSTEM**

- **Flexible**  
  Enhance willingness and ability to adopt alternative strategies in response to changing circumstances or sudden crises

- **Redundant**  
  Build spare capacity to accommodate disruption, with multiple ways to achieve a given need

- **Robust**  
  Develop well-conceived systems to ensure failure is predictable, safe, and proportionate to the cause

- **Integrated**  
  Bring together a range of distinct systems and institutions to allow for the catalysis of additional benefits, as resources are shared

- **Inclusive**  
  Prioritize broad consultation and participation to create a sense of shared ownership in decision-making

- **Resourceful**  
  Recognize alternative ways to use resources, particularly in times of crisis, to achieve goals

- **Reflective**  
  Use experience to inform future decisions and be able to modify standards previously established
Crisis and shocks are inevitable but the way in which systems respond to them, ultimately determines their future success. Inefficient or incomplete resilience planning results in delayed recovery post crisis, while the absence of resilience causes complete failure of socio-economic systems.

While enhancing preparedness against unfavourable scenarios, cities must not only focus on adopting certain traits and qualities but should also aim to maximize benefits through “Adaptive Resilience.”

Today, the varying success of managing the COVID-19 pandemic and its economic impact, is a good indicator of each city’s adaptive resilience capabilities.

Such resilience can be catalysed further through digital transformation of critical public services.

CITIES SHOULD SEEK TO IMPLEMENT ADAPTIVE RESILIENCE TO THRIVE IN THE FACE OF ADVERSITY
## Examples of Public Service Resilience Through Digital Transformation

### 01 Security
- Predictive policing
- Gunshot detection
- Smart surveillance
- Emergency response optimization
- Disaster early-warning systems
- Crowd management

#### Qualities of a Resilience System
- Flexible
- Redundant
- Robust
- Integrated
- Inclusive
- Resourceful
- Reflective

#### 02 Healthcare
- Telemedicine
- Real-time air quality information
- Infectious disease surveillance
- Data-based public health interventions: Sanitation
- Integrated patient flow management systems

#### 03 Water & Waste
- Water consumption tracking
- Leakage detection and control
- Smart irrigation
- Water quality monitoring

#### 04 Citizen Engagement
- Local civic engagement applications
- Local connection platforms
- Digital citizen services

#### 05 Mobility
- Real time public transit information
- Predictive maintenance of infrastructure
- Intelligent traffic signals
- Integrated multimodal information

### 06 Payments
- Mobile apps/online platforms for utility payments, transit etc.
- Digital business licensing and tax filing
- Digital government transactions; business to government and vice-versa, citizen to government and vice-versa

### 2020 Visa and Resilient Cities Network

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*Visa Cashless Cities Report 2017 (A study quantifying net benefits associated with adopting digital payments at the city-level for 100 cities across 80 countries/regions, segmented by stage of digital maturity. These cities are modelled to an “achievable cashless scenario” where the entire population will move to digital payment usage equal to the top 10% of the users in that city today.)*
COVID-19 has successfully shown how digital cities can effectively manage lockdowns

As the world reeled from the effects of a global pandemic, cities were forced to shut down, putting restrictions on movement and everyday activities. Confinement measures, brought forward by COVID-19, encouraged cities to think of new ways to function in order to control disease transmission as well as keep the economy running.

As a result, many cities fast-tracked digital practices, leveraging digital tools and infrastructure to manage the lockdown. Some of these efforts helped to:

- **PREVENT DISEASE TRANSMISSION**
  Measures like analytics to study large sets of big data, use of geo-spatial data, drones for mass sanitization etc., to help contain the spread of disease.

- **IDENTIFY POTENTIAL INFECTION**
  Measures like interactive patient engagement platforms, chatbots and symptom checking apps etc., to help assess presence of infection.

- **IMPLEMENT PUBLIC SAFETY DURING PANDEMIC**
  Measures like predictive analytics, technology for tracking mobility of infected cases etc., to help inform public about safety measures.

- **PROVIDE REMOTE HEALTHCARE**
  Measures like telehealth, remote monitoring, mental health chatbots, wearable sensors etc., to help speed up testing for the infection.

- **PREPARE REMOTE HOSPITAL CARE MECHANISMS**
  Measures like artificial ventilators, bed-side health analytics for patient monitoring and robots to help transport tools and medications.

- **MANAGE CITY SERVICES**
  Measures like online civic services, deliveries of essentials, autonomous stores, etc., to help sustain urban life during confinement.

- **MANAGE INDUSTRIAL PRACTICES**
  Measures like digital factory, real-time supply chain monitoring, and autonomous vehicles etc., to help manage human absence in factories.
Digital transformations not only increase efficiency of public services but also entail digital inclusion that enables populations - especially disadvantaged groups - to access and use Information and Communication Technologies (ICT) and therefore participate in and benefit from today’s information society. The internet along with digital devices like mobile phones, smartphones and desktops can increase accessibility and streamline critical functions like education, healthcare, information dissemination, employment opportunities etc., for socially excluded groups of the population.

Digital Transformation has wide-reaching effects; it entails digital inclusion that can help improve lives of impoverished and marginalized communities by increasing access to different functions and empowering them with inclusive mechanisms.

Digital inclusion focuses not only in expanding connectivity and mobile internet adoption but also on empowering vulnerable sections through relevant digital content and services along with providing training to ensure widespread adoption.

A key consideration for enabling digital inclusion, however, lies in driving usage. Despite the availability of a robust network of infrastructure and connectivity, many sections of the population may still not widely adopt digital tools and services. Local governments must focus on efforts to acclimatize citizens with such tools and services and encourage them to use them on a wider scale.
Ciudad Juarez, with a population of 1.4 million is located on the U.S.-Mexican border, only a few kms away from the city of El Paso, Texas. Popularly known as the ‘Borderplex’, it is a center of economic activity for a host of products, including narcotics, between the U.S. and Mexico. Due to its geographic location, the city suffers from persistent violence, that is often escalated by cartel instability and constant flow of migrants.

To improve the safety within the city, a two-day workshop was held between local and international NGOs, city authorities, global firms, and Resilient Cities Network member cities Colima (Mexico) and St. Louis (USA). As a result, the following focus areas for security were identified:

- **Understand the wider system contributing to violence**, including causes, challenges, and existing efforts for mitigation.
- **Uncover opportunities to leverage new technologies** to develop a “Juarez Roadmap to Reduce and Prevent Violence.”
- **Implement and take advantage of global best practices** in crime-reduction technologies and data-driven decision-making.
- **Leverage the Citizens’ Observatory for Prevention, Security, and Justice** that uses state-of-the-art systems to collect and analyse data, produce reports of crime incidence and geographical distribution.
- **Improve overall social cohesion**, especially for more vulnerable populations including women and young people by building safety zones that have kiosks installed with video cameras and alarm buttons in crime hot-spots.

Additionally, the city has even made efforts to overcome crime against women. A **mobile application called, No Estoy Sola ("I am not alone")** was previously launched to empower women by letting them send emergency text messages to trusted contacts through the click of a button.

**Cities like Ciudad Juarez have deployed digital initiatives to combat security challenges faced by the vulnerable sections of society.**

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**KEY RESILIENCE QUALITIES**

- Inclusive
- Flexible
- Integrated

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The local government in Veracruz, Mexico, built the Veracruz digital city program based on principles of open and e-government to increase transparency and generate citizen-oriented digital services. To implement the initiative, online consultations were held with citizens and funding was obtained from municipal and federal governments. Additionally, a Directorate of Innovation and Electronic Government was appointed to lead the project. The services can be accessed through the city’s municipal portal and some of them include the following:

- **A complaint management portal** for citizens and government employees to track and geo-reference complaints.
- **A digital system for citizens** to apply for municipal services and download all their documents.
- **An employment website** to search for and offer job opportunities.
- **A platform for attention and monitoring of gender violence** to record, track and resolve complaints.
- **Other services like online payments, online tax collection, and an online application** for government scholarships.
- **A mobile app, online chatting and call center service** for communication between citizens and city officials.
- **A transparency portal with an open data section** for wider access and usage.

Within a month of launch of the employment Veracruz website, 2,500 job offers and over 20,000 visits were recorded. The call center served 141,036 citizens while the online chat system served 29,549 citizens. In the future, Veracruz hopes to provide 100% of its municipal services electronically, improve Wi-Fi connectivity across the city and create a website for local e-commerce and other initiatives.

**Others like Veracruz have enhanced widespread community engagement through digital government services.**

**Key Resilience Qualities**

- Robust
- Integrated
- Inclusive

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Kenya in Africa suffered from one of the lowest rates of banked populations in the world – only 26% of the population had access to formal banking in 2006 – with extreme dependence on cash usage. As a means to add convenience and offer a tech-based approach to transfer money, a mobile based system was introduced. Safaricom (telecom operator) launched M-Pesa in 2007 allowing any person using a mobile to send money to any user through a simple text message and a dedicated PIN.

M-Pesa (or mobile money) leveraged the high rate of mobile penetration prevalent in the country – about 70% in 2007 – to enable person-to-person payments using an agent assisted system. The development of the solution was also influenced by the Kenyan government – who owns 35% of Safaricom – and other regulators. Within the first year of operation, 350,000 clients were reported to have used this service. By 2017, M-Pesa had nearly 20 million users. Today, there exists over 152,000 agents ready to cash in or cash out money on the platform.

The solution has been able to amass such success as it directly addressed specific needs of the Kenyan population. It helped ease transfers between urban and rural areas through simple text messages without the use of unreliable and costly courier services that were used prior to the launch of M-Pesa.

Owing to the success and fast adoption of this solution, Safaricom launched other interrelated services: Lipa Na M-Pesa enabled payments in the formal economy while M-Shwari let users avail microcredits. Additionally, several partnerships with other companies and governments were also made to enable citizens to pay electricity bills, send money through Western Union and even pay taxes (i-Tax), among others.

Some countries like Kenya have promoted financial inclusion by allowing citizens to make mobile-based money transfers.\(^{18}\)

Money transfers based on mobile-enabled simple text messages help with financial inclusion of vulnerable populations. They even promote creation of a formalized economy by offering citizens a convenient, practical and low-cost solution to participate in financial flows.
Partnerships are the best way for local governments to accelerate digital inclusion

Cities cannot work in isolation to understand and implement the right set of solutions. Key stakeholders such as businesses, innovative start-ups, the academic sector and civil society organizations can offer valuable experience and other physical and knowledge based resources to complement the efforts of local governments in achieving widespread digital inclusion. The Resilient Cities Network provides evidence of the success achieved by cities in using a collaborative process to strategize key focus areas for development and driving inclusion.

<table>
<thead>
<tr>
<th>COLLABORATORS OF RESILIENT CITIES NETWORK</th>
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<tbody>
<tr>
<td><strong>National Authorities</strong></td>
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<tr>
<td>Cities benefit from guidance from different levels of government like provincial authorities, federated state authorities.</td>
</tr>
<tr>
<td>Selected Examples</td>
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<tr>
<td>Mexico</td>
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<tr>
<td>Argentina</td>
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<tr>
<td>India</td>
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<tr>
<td>Singapore</td>
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<tr>
<td><strong>Private Sector</strong></td>
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<tr>
<td>Cities partner with all types and sizes of private sector firms - from global conglomerates to, small and medium sized enterprises.</td>
</tr>
<tr>
<td>Selected Examples</td>
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<tr>
<td>VISA</td>
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<tr>
<td>Citi</td>
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<tr>
<td><strong>Academia</strong></td>
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<tr>
<td>Cities collaborate with universities, think tanks, research institutes and graduate students who care about a resilient future.</td>
</tr>
<tr>
<td>Selected Examples</td>
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<tr>
<td>Manchester</td>
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<tr>
<td>Dhaka</td>
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<tr>
<td>National Autonomous University of Mexico</td>
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<tr>
<td><strong>People and NGOs</strong></td>
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<tr>
<td>Cities receive involvement of local/international NGOs, community-based groups, Chambers of Commerce.</td>
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<tr>
<td>Selected Examples</td>
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<tr>
<td>Ocean Conservancy</td>
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<td>The Group Initiative</td>
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<tr>
<td><strong>Global Partners</strong></td>
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<tr>
<td>Cities leverage global partners including international organizations, development banks and UN Agencies.</td>
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<tr>
<td>Selected Examples</td>
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<tr>
<td>The World Bank</td>
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<td>IDB</td>
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<td>ADB</td>
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<tr>
<td>UNDRR</td>
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<tr>
<td><strong>Technical Partners</strong></td>
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<tr>
<td>Cities get concrete, demand-driven and context specific technical assistance to tackle their challenges.</td>
</tr>
<tr>
<td>Selected Examples</td>
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<tr>
<td>Dalberg</td>
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<td>QUDC</td>
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03 DIGITAL LANDSCAPE

Key considerations for digital inclusion
Today, Latin America and the Caribbean’s major cities are in their early to middle stages of realizing their digital vision. Cities are increasingly investing in and implementing digital inclusion. While European and South-East Asian countries lead this effort, those in Latin America and the Caribbean are well along the journey of widespread adoption.

There is an opportunity for the region to accelerate efforts for digital inclusion; several foundational assets create a conducive environment for countries within the region to realize their digital vision.

However, any approach to digital inclusion should consider or overcome deep-rooted challenges of adoption of digital tools and devices, economic vulnerability and social exclusion shackling the region.
KEY CONSIDERATIONS FOR DIGITAL INCLUSION IN LATIN AMERICA AND THE CARIBBEAN

01. Latin America and the Caribbean is one of the fastest-growing markets for mobile subscribers in the world; with unique mobile subscribers expected to reach 73% of population by 2025.

02. The region is ahead of South Asia and Africa in terms of mobile internet connectivity. However, challenges related to security, availability of relevant content and digital education need to be overcome for widespread adoption.

03. At the regional level, Latin America and the Caribbean is 2nd only to Asia, in its commitment to financial inclusion; Brazil and Chile lead the region in financial inclusion; however, the culture of cash usage still largely prevails, preventing citizens from benefiting from digital payments.

04. Latin America and the Caribbean’s digital inclusion strategies need to bolster current efforts to reduce socio-economic variations.

05. Most Latin American and the Caribbean cities have mature urban mobility systems, but would benefit from more innovation and interoperable mobility options.
Latin America and the Caribbean is one of the fastest-growing markets for mobile subscribers in the world; with unique mobile subscribers expected to reach 73% of population by 2025.

Out of a population of close to 640 million people, 416 million people accounted for unique mobile subscribers (about 67% of total population) in 2018. This figure is estimated to reach 484 million (about 73% of total population) by 2025. However, there exists a diversity among different countries in relation to mobile adoption - driven by the size and socioeconomic characteristics of the population of each one of them. Brazil, Mexico and Argentina are ahead of the rest of the region in the number of unique subscribers and will account for nearly two thirds of new subscribers between 2018 and 2025.

As a result of the growth in mobile phone users, Latin America and the Caribbean has the opportunity to convert mobile phones from just communication devices to a one stop solution for financial inclusion, basic education, healthcare access etc.
MOBILE INTERNET CONNECTIVITY

In %, base as total population

<table>
<thead>
<tr>
<th>Region</th>
<th>Connected</th>
<th>Usage Gap</th>
<th>Coverage Gap</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td>75</td>
<td>24</td>
<td>3</td>
</tr>
<tr>
<td>Europe and Central Asia</td>
<td>68</td>
<td>28</td>
<td>4</td>
</tr>
<tr>
<td>East Asia and Pacific</td>
<td>56</td>
<td>41</td>
<td>7</td>
</tr>
<tr>
<td>Latin America and Caribbean</td>
<td>53</td>
<td>39</td>
<td>12</td>
</tr>
<tr>
<td>South Asia</td>
<td>33</td>
<td>55</td>
<td>12</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>24</td>
<td>46</td>
<td>30</td>
</tr>
</tbody>
</table>

Note: ‘Connected’ refers to mobile internet penetration, which is the number of unique users who have used internet services on a mobile device. ‘Usage gap’ refers to those that live within the footprint of a mobile broadband network but are not using mobile internet. ‘Coverage gap’ refers to those that do not live within the footprint of a mobile broadband network.

02

The region is ahead of South Asia and Africa in terms of mobile internet connectivity. However, challenges related to security, availability of relevant content and digital education need to be overcome for widespread adoption.

Latin America and the Caribbean is fast adopting mobile internet connectivity and has internet infrastructure covering close to 90% of the region. This network connectivity rivals those of advanced economies in North America and Europe. In 2018, 3G network infrastructure covered 93% of the population (up from 83% in 2014) while 4G network covered 82% of the population (up from 30% in 2014).

However, a usage gap exists among 39% of the population in adoption of internet services. A key barrier to use of mobile internet services lies in the lack of feeling of safety and security as the internet is prone to cyberthreats and crimes. There is a need to bolster cybersecurity measures by governments to ensure safety. Moreover, factors such as availability of locally relevant content and sufficiency of digital skills for proper usage are also considered as hindrances in several countries within the region.
Governments’ across Latin America and the Caribbean have shown strong commitment and are much ahead of Eastern Europe and other developed economies in promotion of financial inclusion and implementation of mandates for bringing formal banking services to large sections of the population.

Efforts guided by strategy documents and policy regulations, along with fintech disruption and their customized offerings, have sought to expand banking networks, improve financial education, and diversify savings and credit services to facilitate liberalization of financial flows, and address financial vulnerabilities.

Additionally, governments are also focused on improving distribution channels for vulnerable sections and ensuring broader access through efforts like correspondent banking for provision of social aid.

03a
At the regional level, Latin America and the Caribbean is 2nd only to Asia, in its commitment to financial inclusion.

Note: G-7 countries include US, Japan, Canada, Germany, France, Italy, United Kingdom. LAC7 refers to the seven largest Latin American economies, namely, Argentina, Brazil, Chile, Colombia, Mexico, Peru and Venezuela, which together account for 93% of the region’s GDP.
**FINANCIAL INCLUSION INDICATORS**\(^27\)

In %, base as total population

<table>
<thead>
<tr>
<th>Country</th>
<th>Unbanked Population</th>
<th>Debit Card Ownership</th>
<th>Credit Card Ownership</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brazil</td>
<td>30</td>
<td>27</td>
<td>59</td>
</tr>
<tr>
<td>Chile</td>
<td>26</td>
<td>30</td>
<td>60</td>
</tr>
<tr>
<td>Argentina</td>
<td>51</td>
<td>41</td>
<td>51</td>
</tr>
<tr>
<td>Colombia</td>
<td>26</td>
<td>24</td>
<td>54</td>
</tr>
<tr>
<td>Dominican Republic</td>
<td>44</td>
<td>32</td>
<td>44</td>
</tr>
<tr>
<td>Panama</td>
<td>54</td>
<td>16</td>
<td>54</td>
</tr>
<tr>
<td>Mexico</td>
<td>26</td>
<td>14</td>
<td>63</td>
</tr>
<tr>
<td>Ecuador</td>
<td>25</td>
<td>10</td>
<td>49</td>
</tr>
</tbody>
</table>

Despite efforts of Latin American and the Caribbean governments to promote financial inclusion by simplifying and increasing accessibility of financial services, a sizeable section of the population is still outside its ambit. While Brazil and Chile have made some advances in bringing their populations within the formal economy through increasing its banking penetration, for most countries, problems persist in driving adoption of digital payments.

Barriers such as the large informal cash economy, lack of trust in financial institutions, low prevalence of customized financial services - particularly in rural areas, low penetration of electronic payments, and high financial services costs are preventing citizens from availing benefits of digital payments.

03b

Brazil and Chile lead the region in financial inclusion; however, the **culture of cash usage** still largely prevails, preventing citizens from benefiting from digital payments.
INCOME INEQUALITY BASED ON GINI INDEX\textsuperscript{28}

Range from 0 to 100

Note: Gini index measures the degree of inequality in the distribution of family income in a country. The more nearly equal a country’s income distribution, the lower its Gini index while the more unequal a country’s income distribution, the higher its Gini index. If income were distributed with perfect equality the index would be zero; if income were distributed with perfect inequality, the index would be 100.

04

Latin America and the Caribbean’s digital inclusion strategies need to bolster current efforts to reduce socio-economic variations.

Despite making considerable efforts, such as increased social spending to bridge inequality, Latin America and the Caribbean is still stymied with vast income variations. Not only at a regional or country level, but differences in income levels exist among cities within the same country as well. About 76\% of the population in the region belongs to the low income or lower-middle income strata.\textsuperscript{29} As of 2017, more than half of them have not finished secondary level education.\textsuperscript{30} In addition, 36.6\% of the population has occupations with high levels of informality including non-professional self-employed workers and salaried workers in small and micro businesses.\textsuperscript{31}

There is a need re-think measures to achieve social inclusion by offering quality employment and pay, improved liveability and holistic development etc., by driving efforts through digital inclusion for broader access.
05
Most Latin American and the Caribbean cities have **mature urban mobility systems, but would benefit from more innovation and interoperable mobility options.**

Urban mobility systems across Latin America are heavily dependent on public transit (45% of all transit, compared to only 31% worldwide). As a result, the region has pertinently strong public transportation. The financial attractiveness and frequency of usage of public transit in the region is also well above the global average.

Still, most transportation systems in Latin America need further innovation. For example, multi-mobility applications, interoperable payment systems, car sharing, self driving, etc., are less prevalent in the region, compared to European and American cities. There should be a focus on innovative solutions, co-created by the public and private sectors, to help overcome current innovation roadblocks and drive digital inclusion simultaneously.
04 BEST PRACTICES FOR DIGITAL TRANSFORMATION

Adopting and accelerating inclusion through digital efforts
Digital Payments

“Digital technology provides a low-cost way for people in developing countries to send money to each other, buy and sell goods, borrow and save as long as the financial regulation environment is supportive.”

- Bill Gates
NET BENEFITS FROM DIGITAL PAYMENTS

USD 470B PER YEAR
Total potential net benefits from digital payments to 100 cities

CITIZENS

BUSINESS

GOVERNMENT

USD 28B
- Time savings in banking, transit and retail transactions
- Savings from avoidance of late payment fees
- Improved budgeting and expense tracking
- Better data to build credit profiles

USD 312B
- Reduced theft and pilferage
- Labor time savings
- Savings from reduced float times
- Potential for sales through digital medium
- Better data to improve customer experience

USD 130B
- Increased tax revenues from recaptured informal economy
- Smart cities to enhance quality of life for citizens
- Toll road and transit agency cost savings
- Better tracking of movement of money

Note: Survey conducted across 100 cities segmented by different states of digital maturity and then modelled to adopt “achievable levels of cashlessness” where population will move to usage of digital payments equal to top 10% of users in that city today.

Digitizing day-to-day payments can unlock significant benefits and establish a strong foundation for Digital Inclusion.

It is estimated that adoption of digital payments by 100 cities globally across 80 countries/regions can uncover potential net benefits of USD 470B per year for multiple stakeholders. This can be realized if cities move to “achievable levels of cashlessness” where the entire population will adopt digital payment usage equal to the top 10% of the users in that city today. On average these net benefits represent a little over 3% of a city’s current GDP and can support close to 45,000 additional jobs per year per city.

These benefits arise for different stakeholders – governments, businesses and citizens – in different ways. Citizens across the 100 cities spend time equivalent to a full working week on cash-related payment activities. By increasing adoption of digital...
payments and unlocking savings associated with reduction in cash-related crimes, citizens can realize over USD 28 billion per year across 100 cities. For businesses, cash and checks cost 7 cents for every dollar received compared to 5 cents for every dollar collected from digital sources. These savings, combined with increased sales from digital payments usage, can result in net benefits of USD 312 billion per year. Lastly, for governments, digital payments usage can cause a reduction in cash-related crime, unlock savings in direct administrative expenditures, and increase tax revenue, thereby, enabling potential net benefits of USD 130B across 100 cities.

Based on current penetration of digital payments in Latin America and the Caribbean, cities can receive varying benefits. Cash centric cities like Buenos Aires and Mexico City, for example, can benefit from savings worth USD 12.4 billion and USD 12.1 billion, respectively while digitally transitioning cities of Santiago, San Juan and Montevideo can unlock USD 3.9 billion, USD 2 billion and USD 2 billion respectively.

Moreover, digital payments can also establish a strong foundation for digital inclusion due to its omnipresent nature in the lives of citizens. New digital payment methods such as QR codes, cash exchanges for digital currency, bank-account linked digital wallets, and technology-based mobile apps are simplifying payments and increasing transaction security and data privacy around the world. Such solutions have broad coverage that extend to previously financially excluded segments and empower populations at the grass root level by familiarizing them with digital transactions.

### POTENTIAL NET BENEFITS FOR CITIES

#### In USD Million

<table>
<thead>
<tr>
<th>City</th>
<th>Net benefits as % of GDP</th>
<th>Cash Centric</th>
<th>Digitally Transitioning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Buenos Aires</td>
<td>4.8%</td>
<td>12,414</td>
<td></td>
</tr>
<tr>
<td>Mexico City</td>
<td>3.8%</td>
<td>12,187</td>
<td></td>
</tr>
<tr>
<td>Panama City</td>
<td>4.3%</td>
<td>1,604</td>
<td></td>
</tr>
<tr>
<td>Santiago</td>
<td>3.2%</td>
<td>3,902</td>
<td></td>
</tr>
<tr>
<td>San Juan</td>
<td>2.7%</td>
<td>2,040</td>
<td></td>
</tr>
<tr>
<td>Montevideo</td>
<td>4.0%</td>
<td>1,995</td>
<td></td>
</tr>
</tbody>
</table>

©2020 Visa and Resilient Cities Network.
Amidst the lockdown measures imposed in Dominican Republic during COVID-19, vulnerable populations were faced with multiple challenges including:

- **Lack of sufficient information** about the subsidy “Stay at Home” created by the government’s Social Policy Coordination Cabinet.
- **Irregular working hours of banks** due to the lockdown.
- **Low level of banking** for the most vulnerable citizens.
- **Difficulty to leave houses** due to imposition of lockdown measures.

To battle these challenges and provide access to the subsidy among the vulnerable class, Banreservas or Dominican Republic’s state bank and Visa collaborated to explore an efficient way to distribute emergency funds to more than 770,000 vulnerable families, who were restricted inside their houses due to the strict quarantine measures.

In addition, various government entities were also involved in leading the effort, like the Administrator of Social Grants in coordination with the Vice Presidency and the Ministry of Finance. The initiative involved development of a solution focused on converting the Dominican identity card into a payment card with credentials consisting of the bin’s 6 digits plus 10 digits of the card.

Through this solution, beneficiaries just needed their identity cards to access the funds at the point of sale, without needing ATMs or bank branches, to make their first purchase.

Moreover, to support these payments, Cardnet developed a remote terminal upgrade with an agile affiliation model to include new merchants and Visanet Dominican created a mobile app that enabled micro merchants to use their cell phones as a payment terminal.

**KEY RESILIENCE QUALITIES**
- Redundant
- Resourceful
- Inclusive
A high proportion of the population in Latin America and the Caribbean is still underbanked. One potential cause for this lies in the inadequacy of traditional solutions - offered by banks - to serve customers with large socio-economic diversity. Some of the challenges faced with respect to these solutions include:

- **Requirement for multiple documents and proofs** such as proof of job, citizenship and financial paperwork that can make the process of opening bank accounts cumbersome.
- **Nuanced additional criteria and terms and conditions** such as income requirements etc., that prevent economically vulnerable citizens from becoming part of the financial system.
- **Expensive solution offerings** making them difficult to afford for vulnerable populations.

Hence there exists an opportunity for innovative solutions like mobile banking, digital wallets etc., to drive financial inclusion.

High smart phone penetration in the region also provides an opportunity for innovative solutions like mobile banking and digital wallets etc., to drive financial inclusion.\(^{39}\)

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- **Expensive solution offerings** making them difficult to afford for vulnerable populations.

Hence there exists an opportunity for innovative solutions like mobile banking, digital wallets etc., to be scaled up for maximum benefits. These solutions leverage mobile-based technology to provide service offerings, instead of having branch-based distribution models. As a result, the account management costs are much lower for them. Within the region, such solutions can drive banking access for individuals and small, medium enterprises, that have previously found it hard to access the financial system.

For example, **Nequi** is a Colombian mobile app that offers consumers free services such that anyone with a Colombian mobile number can make online purchases, wire transfers, manage savings, withdraw cash at Bancolombia ATMs etc., using the app. Likewise, another player, Rappi, launched **RappiPay** in 2019 to transfer money between users using QR codes through the RappiPay app. The company even started offering prepaid cards – that are delivered within a record time of under 45 minutes – in partnership with Visa to enables purchases, withdrawals etc.
Frictionless Urban Mobility

“Planning of the automobile city focuses on saving time. Planning for the accessible city, on the other hand, focuses on time well spent.”

- Robert Cevero, Author, Consultant, Educator in Sustainable Transportation Policy and Planning
Mobility has seen the most investment by cities around the world and can enable an inclusive digital economy and more resilient LAC cities.

Mobility represents the most promising category of digital investments for cities around the world - with the greatest number of mobile apps developed and rolled out within this category. Smartphone apps for trip planning, real-time road navigation, e-hailing and traffic management are becoming increasingly common due to their simplicity in implementation and good pay-off with minimum-to-low investment. Other apps like those for predictive maintenance of mobility infrastructure, congestion pricing and demand based micro-transit are still in early stages of adoption.

Even for cities within Latin America and the Caribbean, mobility holds the key for promoting a digitally inclusive economy - by local governments - due to high dependence of citizens on connectivity by public transit (regional average accounts for 45% of modal split compared to world average of 31%).

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41 Mckinsey Smart Cities: Digital Solutions for a more livable city 2018
42 Arthur D. Little Future of Mobility 3.0
For example, digital payment solutions for transit have been recognized as widely used, scalable solutions that can perpetuate digital inclusion by driving adoption of electronic payments for low-value, everyday transactions. An entire spectrum of payment options exist for transit; smart transit cards, open loop electronic payments providing broader access and usage, mobile taps enabled by near-field communication (NFC) technology etc., can help familiarize citizens with new convenient technologies while promoting digital payments.

### ADOPTION OF MOBILITY APPS

Number of cities (out of 50)

<table>
<thead>
<tr>
<th>Service Type</th>
<th>Number of Cities</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Sharing/e-hailing/ autonomous driving</strong></td>
<td></td>
</tr>
<tr>
<td>Private e-hailing</td>
<td>50</td>
</tr>
<tr>
<td>Bike sharing</td>
<td>37</td>
</tr>
<tr>
<td>Car sharing</td>
<td>33</td>
</tr>
<tr>
<td>Autonomous vehicles</td>
<td>34</td>
</tr>
<tr>
<td>Pooled e-hailing</td>
<td>24</td>
</tr>
<tr>
<td>Demand-based micro transit</td>
<td>4</td>
</tr>
<tr>
<td><strong>Traffic Management and Data services</strong></td>
<td></td>
</tr>
<tr>
<td>Real-time road navigation</td>
<td>49</td>
</tr>
<tr>
<td>Integrated multimodal info</td>
<td>48</td>
</tr>
<tr>
<td>Digital payment in public transit</td>
<td>44</td>
</tr>
<tr>
<td>Intelligent traffic signals and vehicle preemption</td>
<td>25</td>
</tr>
<tr>
<td>Real-time public transit info</td>
<td>35</td>
</tr>
<tr>
<td>Smart parking</td>
<td>7</td>
</tr>
<tr>
<td>Predictive maintenance of transit infrastructure</td>
<td>2</td>
</tr>
<tr>
<td>Congestion Pricing</td>
<td>5</td>
</tr>
<tr>
<td><strong>Urban Cargo</strong></td>
<td></td>
</tr>
<tr>
<td>Smart parcel lockers</td>
<td>12</td>
</tr>
<tr>
<td>Parcel load pooling/urban consolidation centers</td>
<td>7</td>
</tr>
</tbody>
</table>

Note: The study looks at 50 cities across Americas (Bogota, Buenos Aires, Los Angeles, Medellin, Mexico City, New York, Rio de Janeiro, Santiago, São Paulo) EMEA (Abu Dhabi, Amsterdam, Barcelona, Helsinki, London, Stockholm, Tel Aviv) and Asia Pacific (Beijing, Hong Kong, Jakarta, Mumbai, Seoul, Singapore, Sydney, Tokyo) to assess different types of mobile apps and their roll-out.
DIGITAL INCLUSION
DIGITAL PAYMENT OPTIONS FOR MASS TRANSIT

01 CONTACTLESS TRANSIT CARDS
- Open loop network developed by Visa for MetroRio
- Closed loop reloadable smart card for SITP buses in Bogota
- Closed loop reloadable smart card for public transit in Argentina

02 MOBILE PAYMENTS
- Masabi enables purchase and store of tickets on apps in the form of QR codes
- Samsung, Google pay wallets can store credit/debit card in virtual form
- Enables be in be out passenger journey without any stops

03 PERSONAL AUTHENTICATION
- Shanghai’s AI double-decker tour bus uses face-recognition for bus ticketing
- Biometric based payments are being discussed for Britain Railways
- Cubic transportation in London will discuss future use of palm vein authentication

04 WEARABLES
- Singapore enabled NFC fitness trackers for transit payments for public transport
- Gemalto enabled payments for RioCard through wristbands
- MTA in New York will test payment pilot using Fitbit on subway lines
Visa’s Secure Access Module (SAM) technology enables open loop contactless payments for the metro system that digitizes low-value transactions while improving passenger convenience, security, practicality and sustainability of public transit.

Transit operators like MetroRio have enabled open-loop contactless payments solution to promote an inclusive and interoperable payment method for mass transit systems.44

Brazilian transit operator MetroRio, which runs the Rio de Janeiro Metro, began the rollout of contactless payments in partnership with Visa, Banco do Brazil, Bradesco and Cielo, to turn into the first transit operator in the world to use the new Visa Secure Access Module (SAM) technology.

The initiative enabled contactless payments at all 41 metro stations for MetroRio to provide agility and greater flexibility to users in boarding, while minimizing long queues and delays.

The technology allows the user to pay with debit card, prepaid or any mobile device containing NFC (near field communication) technology. The fare gets charged directly from the checking account, with no additional costs or fees, at the end of each day of use.

To popularize the new payment method, the turnstiles at the station were marked with the slogan: ‘Approached, paid, entered. No queues’, with instructions on how to use the new method to pay.

Since its launch in late April 2019, the following results have been achieved:

- In December 2019, 435,000 daily uses were recorded on working days, an increase of 339% since its launch.
- The average daily use during the week per customer is 1.75 times.
- Cell phones have been the most preferred method of payment, securing 56% usage among all modes.
- During the carnival period, the highest number of contactless payments were recorded, ever since the service began in April 2019.

Visa partnered with TfL in 2012 to enable contactless payments through cards issued by Visa, MasterCard, Maestro, AmEx across different modes of transport. In 2015, even mobile payments were enabled using Apple, Google Pay etc.
Some cities like Accra have integrated multiple modes of transport to ease mobility of vulnerable groups.\[^{45}\]

As the capital of Ghana with a population of 1.6M people, Accra is known for being a regional trading and transportation hub. However, the rate of the growth of the city has far superseded the rate of urban planning, creating several challenges that need to be addressed and managed by the city administration.

Among its many challenges include several related to mobility, including:

- **Inability to support the transportation demand** causing congestion and traffic jams.

- **Inadequacy of Bus Rapid Transit (BRT system)** hindering access and usage by citizens.

- **Widespread use of tro-tros or mini-bus vehicles** - an informal mode of transport - creating obstacles related to safety and pollution.

- **Increase in private vehicle usage** by the affluent sections, further creating environmental concerns.

To address these, efforts have been taken to integrate tro-tros into the city’s in-progress BRT system as well as employing better practices to reduce greenhouse gas emissions by tro-tros. In addition, the following steps have also been taken:

- **Development and enforcement of regulations** to improve urban transit with measures related to governance, licensing, road-worthiness, environmental impact etc.

- **Creation of a vehicle-based data system**, to be used as a method to track the maintenance of tro-tros.

- **Promotion of collaborations** between tro-tro owner associations and financial institutions to obtain customized investment packages for the acquisition of safer and more environmentally friendly vehicles.

- **Integration of fare payments systems** across all modes of public transport.
New capabilities like mobility-as-a-service (MaaS) are optimizing travel journeys for citizens.

MaaS provides consumers a frictionless way to get from one place to another by using a single option to access multiple mobility modes and pay for them through an integrated ticketing and payments system. In addition to choosing the best suited mobility options, MaaS also provides added convenience by offering ancillary services that are not traditionally part of the travel experience.

MaaS offerings can vary based on the level of integration they offer. For example, integration could just be limited to information, like a travel planner, without offering details on routes or costs. A level above that would involve integration of routes and costs in addition to offering information on the availability of transport options. Finally, some service providers even offer subscriptions/contracts keeping in mind the full mobility needs of an individual, as an alternative to car usage and ownership.

In many instances, Maas not only regulates usage of existing modes but also facilitates introduction of new forms of transport. Bicycling or car sharing options can become popular through MaaS as solutions offering last mile connectivity to supplement usage of existing mass transit modes.

Lastly, one of the main goals for successful implementation of Maas requires a change in user mindset from private car ownership to adoption of mass transit options. Several MaaS pilots have shown a reduction in private car usage after the availability of MaaS apps. Likewise, more than 20% of participants of the Smile MaaS pilot in Vienna used their private cars less often during the pilot while in Sweden, private car usage dropped 44% amongst users after the launch of UbiGo Maas pilot.

### Impact and Outcomes

- **95.2%** of modal share accounted by public transportation for Whim users
- **3x** more usage of taxis combined with public transport by Whim users
- **30%** of bicycle trips happen after public transportation trips

Launched in November 2017, Whim allows users to combine, plan, and pay for public transport, taxi, car rental, car sharing and city bike trips through a subscription-based model.
Digital signage at mobility hubs are offering broader need-based services to passengers

01 REAL TIME UPDATES

Offer information on up-to-the-minute service updates like information on current and upcoming service alterations etc., that cause delays. Other real-time updates captured through sensors attached to the vehicle are also provided including information on capacity of individual cars, to let passengers find a more comfortable and efficient place to board the train.

02 CUSTOM UPDATES

Engage audience using a variety of content like news, weather, civil protection updates etc., along with some local information like box office information, lifestyle tips etc. These systems are also used for programmatic advertising to deliver dynamic content by connecting to external data feeds and audience measurement tools to provide ads that audiences want to see.

03 VALUE ADD-ONS

Provide peripheral devices like card readers, that can calculate fares and pay for tickets and passes on the spot or enable the recharging of smart fare cards. Other service add-ons include interactive wayfinding, that provide personalized directions to passengers with options like using the passenger’s current point of view to orient on-screen directions etc.
Without data, you're just another person with an opinion.

- W. Edwards Deming, Data Scientist
A robust data foundation is key for digital transformation

Transforming into a digital city is not a one step-process; it is the amalgamation of different needs, systems and collaborators to develop a blueprint to meet the unique requirements of each city. A key foundational element for achieving such digital transformation lies in the identification and collection of data. Data highlights problems, represents needs and offers insights on the various components of an economy, enabling recognition and implementation of solutions with a greater focus on customization. Local governments need to build an information layer through a comprehensive data governance, protection and management strategy. However, while collecting and accessing public data, focus should only be on using it for specific purposes, and such information along with associated benefits of usage should be communicated with the providers of data. Additionally, data protection approaches such as encryption, anonymization, removing personally identifiable information, limiting access to sensitive data etc., should be practiced to sustain public trust.

### BLUEPRINT FOR DIGITAL TRANSFORMATION IN A RESILIENT CITY

**01 PRIORITIZATION OF ISSUES**

Conduct a detailed study of challenges affecting the largest number of people. Identification should be guided by a multi-sectoral approach to narrow down on priority areas requiring technological intervention.

**02 DATA FOUNDATION**

Build a smart data governance and management strategy that involves identification of different sources of data, ways to obtain, store and protect it and allows safe access to multiple parties to develop insights.

**03 CONNECTIVITY INFRASTRUCTURE**

Connect different parts of the city through physical and digital infrastructure across the city and build and deploy sensors and connected devices to capture real-time updates.

**04 USE CASES AND DIGITAL APPLICATIONS**

Convert raw data into action by integrated operation and control centers etc., and collaborate with 3rd parties to develop use cases across security, mobility, health, energy, economic development etc.

**05 ADOPTION AND USAGE**

Drive wider adoption of applications and use cases by departments and citizens to change behaviours and enable transformative changes to take place across the city.
Ingest data from multiple sources; sensors and connected devices providing real-time data, business organisations offering consumer and transactional records, city organizations and departments offering historical records and communities and societies offering crowdsourced opinions.

Encourage citizens and other stakeholders to provide access to data by informing them of who will be using their data and for what purposes to encourage active participation. Additionally, data ingested from different sources needs to be standardized for better usability.

Protect sensitive data by anonymizing it before storing information in a secure manner from disparate systems in a centralized repository. Additionally, a secure back-up must be created as a recovery option in case of any adversity or equipment failure.

Share data with known stakeholders like public sector entities, research firms, private entities, city residents, etc., to promote collaborative efforts in best usage of data. Data should be shared through secure mechanisms: either through data portals or defined contractual agreements.

PROPER GOVERNANCE AND MANAGEMENT are crucial to build a strong data foundation.
A plethora of use cases can be successfully enabled through such a data foundation

With data coming from different sources such as connected devices like sensors powered by internet of things, crowdsourced information and opinions available through social media platforms, business information from transactional records and in-depth historical records made available by governments through open data portals, there is a lot of value for technology providers to create smart and functional solutions that transform raw information into necessary insights. A variety of digital solutions contributing to enhanced resilience can be enabled across categories of mobility, community engagement, healthcare, security, water and waste and

DATA-DRIVEN CITY RESILIENCE

**Static and dynamic sensors, connected devices** powered by internet of things for real time alerts

**Social Media or other Digital Platforms** offering crowdsourced data for future needs and expectations

**Business Data** including transactional data, for areas of growth and investment and recovery after crisis

**Open Data portals** hosted by the government, for universal access to information

**USE OF TECHNOLOGY TO ENABLE USE CASES FOR SMART CITY MANAGEMENT**

**MOBILITY**

**COMMUNITY ENGAGEMENT**

**HEALTHCARE**

**SECURITY**

**WATER & WASTE**

**PAYMENTS**

**RESILIENCE VALUES**

Emphasizes on reliable mobility through tools like diverse multi-modal transport systems and an information system that enables access and alignment between services. It also incorporates redundancy and flexibility by providing alternatives options during demand surges.

Emphasizes on importance of participation and equality, supported by leadership in the form of a committed government that takes decisions based on dialogues with business and civil society. It also promotes inclusivity and resourcefulness through broad consideration.

Emphasizes on minimum human vulnerability and safeguards to promote health and life through integrated services and quick response during emergency. It also incorporates inclusivity and redundancy during increased stress on system.

Emphasizes on comprehensive security and protection from natural shocks. It also enables resourcefulness through adequate crime prevention and emergency management measures and flexibility by ensuring preparation for hazards.

Emphasizes on provision and management of critical services through active management and maintenance of ecosystems, infrastructure, and contingency planning. It enables flexibility and robustness by continuously monitoring usage across citizens.

Emphasis on a sustainable economy and digital inclusivity to enable prosperity among all sections of the society. It incorporates financial inclusivity among citizens and robustness of different processes through proper accountability and greater efficiency.
payments. In addition to these use cases, data and technological capabilities even offer critical insights for managing recovery of economies post the COVID-19 lockdown. Two important reference data points – data of community before the lockdown and data at the peak of the crisis – can provide reference to restore economic and social activity. Different data sources can also help plan forecast scenarios; test numbers, positive diagnosis and geo-location data can be used to determine hotspots for crisis management, data on movement patterns, top places of visit etc., can help manage citizen flows and aggregated consumer records from e-commerce and point-of-sale terminals can help understand economic trends. This data when made available to 3rd party stakeholders can result in development of use cases for restoring normalcy.

EXAMPLES OF DATA DRIVEN SOLUTIONS

TRAFFIC MANAGEMENT FOR NEW YORK CITY

The department of transportation receives real-time images generated by cameras installed on major roads and intersections to provide information on traffic flow on the city streets. By combining this information with data received from weather stations, taxi fleet and mobile apps etc., and deploying technologies like data modeling, analytics tools, geographical information systems (GIS), researchers were able to reduce traffic congestion, change the timing of traffic lights, improve signage and create traffic alert systems using mobile apps.

DATA ALLIANCE FOR ECONOMIC RECOVERY

Rolls-Royce established a data alliance, known as Emer2gent, that combines traditional economic, business, travel and retail data sets with behavior and sentiment data, to create insights and practical applications to support governments and organizations around the world in managing recovery post-lockdowns. Some of the key capabilities used for this initiative include data anonymization, standardization and advanced analytics including artificial intelligence and machine learning.

OPEN DATA PORTAL FOR MONTEVIDEO

In 2010, the city of Montevideo made all data processed by the city administration public and has since then launched 50 datasets for public use. This data is available through the national open-data portal that has been built upon the open-source software developed by the Open Knowledge Foundation as per global standards. As a result of this policy, many new apps were spurred into production; public transport timetables, a map facilitating bicycle commuting, an app showing what taxes are spent on, and tools for finding recycling bins, among many others.
05 WINDOWS OF OPPORTUNITY

Potential solutions for digital inclusion
Since their inception, Visa and the Resilient Cities Network have empowered cities in their capacity as a global payment's leader and a city-led organization for strengthening urban resilience, respectively. They both believe in enhancing the lives of citizens by best adapting to the needs of the ever-changing external environment.

As cities stand on the brink of embracing change due to COVID-19, there exists no better time to drive resilience through digital efforts.

Visa and the Resilient Cities Network partnered in January 2020 to develop a program to collaborate, design, invest, and scale urban solutions within cities by using a digital-enabled resilience approach. Latin America and the Caribbean is home to 17 member cities of the Resilient Cities Network. Local governments can benefit from this initiative by identifying and implementing opportunities enabled through a strong digital infrastructure for their cities.

The program aims to create a positive impact for member cities with the following objectives:

**INCREASE CITY RESILIENCE**
Increase the resilience of the selected participating cities by implementing technologies to develop and advance their digital economies.

**FOSTER INCLUSIVE DIGITALIZATION**
Provide widespread access to a digital economy by bridging the technological gap within different economic classes.

**IMPROVE URBAN SYSTEMS**
Increase quality, safety and efficiency of urban systems such as urban mobility systems through a stronger digital economy.

**PROMOTE COLLABORATIVE ECOSYSTEMS**
Develop an open and collaborative ecosystem that will promote innovation and create spaces of dialogue among different players.
01 CO-CREATE
Collaborate with city governments to understand their most pressing challenges and identify areas to co-innovate and co-develop offerings. These measures can be facilitated with spaces of dialogue and discussion and action-oriented workshops between city officials, Visa, Resilient Cities Network, and key stakeholders. This will help in selecting ideal areas of engagement and in conducting in-depth analysis of issues.

02 ADOPT
Adopt solutions from the existing suite of available offerings to implement successful measures for city prosperity. These measures span areas of mobility, data foundation, and payments to make urban processes simpler while empowering vulnerable populations. Disbursements through digital means, mobility using open loop systems and data enabled use cases can create widespread positive impact for partner cities.

03 PARTNER
Partner with innovative stakeholders among the broad ecosystem of players across the city. Stakeholders such as fintechs, start-ups and other next-generation technological providers have wide-ranging innovative expertise that can help solve city challenges through a modern digital perspective. These measures can involve use of digital tools and infrastructure to overcome hurdles and streamline processes.
POTENTIAL ENABLERS OF DIGITAL INCLUSION

DATA FOUNDATION

Use aggregated and anonymized consumer records; transactional data from commerce transactions, mobility records from payment terminals etc., with adequate safety and protection measures in place

Benefits to City

- Plans for successful initiatives by using insights on consumer behavior; peak times for commerce, where people are shopping and parking, transit records about journeys, among others
- Enables creation of synergies between different players to build a robust system that ensures initiatives are implemented in areas where they are needed the most

SEAMLESS MOBILITY

Deploy open loop payment technology for mass transit; enable a secure digital contactless payment experience across multiple modes and familiarize masses with low-ticket value transactions to drive greater adoption of electronic payments

Benefits to City

- Builds customer centric transit solutions as contactless payments provide a frictionless experience; reduces inefficiencies and longer commute times, lowers congestion, promotes safety and security and develops a sustainable transport system
- Promotes inclusivity and boosts ridership as it considers seniors, disabled riders, and the un-or underbanked in mind to ensure everyone has access
- Streamlines multimodal transportation as commuters increasingly mix modes of transit in case of interoperable means of payment
- Enables citizens to become used to low-ticket value transactions and promotes usage of electronic payments for all types of transactions
DISBURSING PAYMENTS

Distribute social benefits, subsidies/conditional cash transfers, disaster relief, pension/social security, income tax refund, grants/scholarships, development loans, healthcare benefits, among other aids

Benefits to City

• Provides a single distribution mechanism to disburse different types of payments and improve control on expenditure by directing usage of funds for select participating merchants only
• Reduces cost for governments in disbursing funds and ensures faster access to funds among citizens as well
• Drives financial inclusion for vulnerable families by bringing them into the financial system and offering immediate access to essential goods and services, while also boosting sales for merchants
• Prepares for future disruptions by maintaining payment inventories/stocking prepaid cards so that they can be instantly activated and distributed during crises

PAYING FOR SERVICES

Pay for procurement, travel and fleet expenses, sales tax/VAT refunds, business loans, grants/subsidies

Benefits to City

• Offers cost savings and faster payments with options like card payments as opposed to using a paper-based process
• Enables robust transaction reporting for effective management of organizational budget and use of those records for negotiating supplier pricing
• Regulates usage and spend through pre-defined spending parameters
• Provides history of transactions that make expense report filing easy, simplifies compliance with expense policies, protects against misuse, and facilitates spend analysis
• Enhances customization and better administration for loans offered to external parties by building interest rates, repayment terms and parameters for use
**RECEIVING PAYMENTS**

Enable citizens and businesses to make tax payments, fee payments for utilities, payments for government services, social security and other contributions

*Benefits to City*

- Offers a one-stop solution for making payments, without the need for citizens to physically move around for payments
- Promotes digital financial inclusion by letting users pay using multiple payment modes and transitions citizens away from large cash or check payments.
- Increases transparency and accountability while providing governments the ability to deploy enhanced financial controls and more robust accounting
- Increases tax and utility collection as citizens are responsive to the introduction of new ways to pay

**KNOWLEDGE COURSES**

Leverage Visa University’s experiences regarding policy responses to accelerate digital payments inclusion or knowledge initiatives by the Resilient Cities Network including knowledge products, trainings and tools for strengthening resilience

*Benefits to City*

- Provides a guide for governments to design efficient public policies that promote digital transformations by enabling efficient digital payments usage
- Enhances problem-solving ability of local governments through knowledge transfers on resilience
CITY SNAPSHOT

Resilient Cities Network
Latin American and the Caribbean
CIUDAD JUÁREZ

BACKGROUND

Population: 1.4M
GDP per capita: 17,310 USD

DID YOU KNOW

- Ciudad Juarez is among the preferred destinations for high tech manufacturing (home to Aptiv’s high-tech Mexico Technical Center) and features in 10 largest manufacturing centers in North America
- At least one-third of Ciudad Juarez university and training center graduates focus on electrical engineering or computer science, laying foundation for strong technical expertise

KEY CHALLENGES FOR RESILIENCE

- Poor Quality of Service: Lack of good quality utilities and public services (water, health, etc.)
- Lack of Public Safety: Domestic and/or community violence
- Inadequate Infrastructure: Inefficient public transportation, lack of safe/affordable housing
- Socio-economic Inequity: Social and economic inequality, unemployment
- Climate Change and Natural Events: Natural Hazards like flooding, earthquakes, etc., and extreme climate change

PILLARS OF RESILIENCE STRATEGY

1. INCLUSIVE
   Promote a safe and empowered community that welcomes cultural diversity, strengthens the sense of belongingness, and fosters laws and programs to empower an informed, involved, committed and responsible citizenry

2. PROSPEROUS
   Build a strong, diversified economy that functions in harmony with sustainable development principles while still remaining competitive

3. INTEGRATED
   Implement a resilient planning model, which bases urban planning and development of regulations on the city’s specific context, features and challenges, with social and community cohesion as its goal

4. ADAPTED
   Protect the environment and increase preparedness to face threats especially those relating to its desert climate and surroundings via trustworthy resource management methodologies
SELECTED DIGITAL INITIATIVES

**Apps for Citizen Safety**
Involves use of mobile applications such as ‘I am not alone’ and ‘Citizen Safety’ which have been developed to enable users to make emergency phone calls for assistance and safety.

**My Job, My Future: Policy Platform**
Involves the use of a platform by the state government of Chihuahua, in partnership with Swae, that invited citizens of Juarez onto a platform to propose, collaborate and vote for the best policy suggestions.

**Open City Council**
Involves open participation by letting citizens have a say in preliminary and working sessions of the City Council. The broadcasting takes place through the official social media sites of the City of Juarez.

**Borderplex App for Tourism**
Involves initiatives to support digital tourism which includes mobile apps, maps and interactive screens. The platform helps to discover areas of interest near oneself and receive offers from companies.

**Smart Digital Government**
Involves use of a SDG tool developed by Black Labs to automate and manage its budget cycle, while complying with the guidelines of results-based budgeting, government accounting etc.

**Literary Tour Map**
Involves displaying and promoting heritage. The project tracks literary references in which the city has important role in poem, novel or play. The collective promotes and distributes the heritage online, laying foundation for literary tour maps for visitors.

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**CIUDAD JUÁREZ**

**DIGITAL CITY DATA**

<table>
<thead>
<tr>
<th>Category</th>
<th>Country</th>
<th>City</th>
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</thead>
<tbody>
<tr>
<td>Innovation Score (0-100)</td>
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<td>Open Data &amp; Local Services</td>
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<td>Open data &amp; online services offered by govt.</td>
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<tr>
<td>Govt. commitment to Financial Inclusion</td>
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<tr>
<td>Average education level (low (20)-high (100))</td>
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<tr>
<td>Digital Payments (vs. cash) (20% population that made or received digital payments)</td>
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<td></td>
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<tr>
<td>Banked Population (%)</td>
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<td>100</td>
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<tr>
<td>Debit Card Penetration (%)</td>
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<tr>
<td>Electronic Public transit payments</td>
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<td>Internet Penetration (%)</td>
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<td>100</td>
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<tr>
<td>Smartphone Penetration (%)</td>
<td></td>
<td>100</td>
</tr>
<tr>
<td>POS terminal penetration (POS per 10,000 people)</td>
<td></td>
<td>100</td>
</tr>
</tbody>
</table>

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CIUDAD JUÁREZ

URBAN MOBILITY MODAL SPLIT\(^1\)
(\% of all trips in a single day occurring on a particular mode)

<table>
<thead>
<tr>
<th>Public</th>
<th>Private</th>
<th>Non-Motorized and others</th>
</tr>
</thead>
<tbody>
<tr>
<td>21%</td>
<td>51%</td>
<td>28%</td>
</tr>
</tbody>
</table>

URBAN MOBILITY INITIATIVES

**Interactive Maps of Travel Routes\(^1\)**
Involves developing an interactive map that brings together the experience and knowledge of bicycle riders, pedestrians and other public space users in real time in a mobile app format to improve safety and connectivity.

**Bicycle Lanes & Pedestrian Corridors\(^1\)**
Involves ensuring safety of cyclists and pedestrians through construction of dedicated lanes and connecting them to the mass transit network and important commuter destinations, such as workplaces, educational centers and commercial businesses.

**Buses with Contactless Payment\(^5\)**
Involves use of ‘Vive Bus’ public transport corridor system, developed in collaboration with the state government, that operates buses with exclusive stops at stations and elevated terminals, a fleet control system, a toll system and access control through prepaid contactless smart cards.

**Road Safety Project\(^1\)**
Involves improvement of transportation networks by developing projects like creation of safer vehicles, improvement of post-crash response, development guidelines to foster a culture of road safety among users etc.
**KEY OPPORTUNITIES**

- **Aggregated consumer records from a variety of means** such as mobility data from payment terminals, POS transactional data etc., to analyze and better understand and plan programs for city management and economic growth

- **Open loop payment system** that offers a secure digital payment experience that can work across multiple modes of transport and support the large ridership

- **Disbursement of subsidies/financial aid** through prepaid cards to ensure provision of financial assistance to vulnerable groups for food, medicine, etc.

- **Distribution of funds for social benefit** in a card based format to vulnerable populations for easier and transparent access to funds (and to drive financial inclusion)

- **Relay of warning and information about natural disaster** to all citizens via apps/text messages to alert them about incoming scenarios and offer measures for protection

- **Digital traffic system to promote active mobility** from high usage of personal non-motorized means. For example, use of apps and tools that make navigation and mobility easier for bicycle riders. *(apps connected to traffic lights can be used to connect cyclists with traffic signals and turn them green faster)*

- **Track of consumption of water** via feedback received through mobile app, email, text, to increase awareness and reduce consumption

**SOURCES**

1. Digital Cities Index 2020, Visa and Resilient Cities Network
2. Juarez Resilience Strategy
3. ‘Border leaders endorse digital tourism initiative aimed at millennials’, Border Report
4. ‘How Swae is helping citizens of Ciudad Juárez contribute new policy solutions to mitigate the risks of technological displacement’, Medium
5. ‘Strengths and Weaknesses of Smart Mobility in two different Metropolitan Contexts: León & Ciudad Juárez’, ResearchGate

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**BACKGROUND**

- **Population**: 1.5M Municipality of Guadalajara
- **GDP per capita**: 17,940 USD
- **Population**: 4.4M Metropolitan Area of Guadalajara

**DID YOU KNOW**

- The municipality of Guadalajara, from the Metropolitan Region, was one of the first of 10 municipalities that was selected to participate in the IEEE Smart Cities Initiative (SCI), an initiative that enables participating cities to collaborate with each other and with world-renowned smart city builders and experts.
- The city is also a part of the Smart Cities for All, a project of the Global Initiative for Inclusive ICTs (G3ict) to track the progress and measure the commitment to digital inclusion.

**KEY CHALLENGES FOR RESILIENCE**

- Inadequate Infrastructure and Transportation
- Unorganized Urban Development
- Lack of Public and Green Spaces
- Security Crisis
- Fires and Natural Crisis
- Environmental Degradation

**PILLARS OF RESILIENCE STRATEGY**

1. **SAFE AND COHESIVE**
   - Promote a safe and cohesive city that has adequate conditions for citizens to coexist in peace, harmony, legality and freedom. Peace is built and rebuilt every day through the respect of dignity of others and the enrichment of social conditions that are conducive to the common good.

2. **EQUITABLE AND WITH LEADERSHIP**
   - Create an equitable city with leadership that prides itself in having achieved a high quality of life for its inhabitants. It comprises of dynamic economic and sustainable activity that distributes its prosperity equitably among all.

3. **PARTICIPATIVE AND WITH DIGNITY**
   - Develop a city where people are in power, a power that comes through an intense participative process. This city has resolved, in an effective way, what is essential, including access to food, education, health, etc., for itself and its community and brings satisfactory life to its inhabitants without presenting prejudice or discrimination.

4. **BEAUTIFUL, CULTURE AND REACTIVE**
   - Respect historic, artistic and natural patrimony. In the same way, it values its traditional life in human scale neighborhoods. In the beautiful city, the urban landscape-composed by both built and natural ecosystems- has great value and contributes to the consolidation of the cultural metropolitan identity of its people.

5. **SUSTAINABLE**
   - Share the responsibility of the management of the city with citizens and form opinions, make decisions and act with decisiveness for its development. The city weaves itself in the network of citizens, these networks then expand and connect to others so that they may receive and transform the metropolis.
**Ciudad Creativa Digital**

Aims to create an environment capable of generating knowledge, enhancing quality of life, and fostering talent and innovative ideas through the intensive use of new technologies. The project harnesses the local context and characteristics of the city to fuel strategic endeavors and develop its economy in a sustainable way.

**Smart Guadalajara**

Focuses on supporting citizens and informing them about smart updates, focuses on street cleaning and trash collection, whilst also allowing citizens to report any issues to the local authorities through a new app.

**Metropolitan Climate Action Plan**

Aims to achieve 100 percent climate neutrality to achieve the goal of becoming a climate neutral metropolitan area by 2050.

**IMEPLAN**

Focuses on involving municipalities, citizens and experts in a participatory planning process through collaborative roundtables and workshops and encourage all stakeholders to plan for a digital and smart city in the future.

### Selected Digital Initiatives

#### Metropolitan Guadalajara

**Digital City Data**

<table>
<thead>
<tr>
<th><strong>COUNTRY</strong></th>
<th><strong>CITY</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>Open Data &amp; Local Services</td>
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<tr>
<td>100</td>
<td>Govt. commitment to Financial Inclusion (low:20, high:100)</td>
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<tr>
<td>40</td>
<td>Average education level (low:20, high:100)</td>
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<td>32</td>
<td>Digital Payments (vs. cash) (% Population that made or received digital payments)</td>
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<tr>
<td>37</td>
<td>Banked Population (%)</td>
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<tr>
<td>24</td>
<td>Debit Card Penetration (%)</td>
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<tr>
<td>63.9</td>
<td>Internet Penetration (%)</td>
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<tr>
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</table>
METROPOLITAN GUADALAJARA

URBAN MOBILITY MODAL SPLIT

(% of all trips in a single day occurring on a particular mode)

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<tr>
<th>Public</th>
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</tr>
</thead>
<tbody>
<tr>
<td>28%</td>
<td>27%</td>
<td>45%</td>
</tr>
</tbody>
</table>

URBAN MOBILITY INITIATIVES

**Integrated Transportation**
Involves hierarchical and integrated network of public metropolitan transportation and public regional transportation integrated with mass transportation.

**Smart Traffic Lights Program**
Involves implementing smart lighting and traffic control systems around the city that would optimize traffic flows to lower fuel consumption and emissions, reduce travel time and enable more efficient, environment and climate-friendly mobility.

**Sustainable Urban Mobility Plan**
Aims to improve the Integrated Plan for Sustainable Urban Mobility in the Guadalajara metropolitan area (AMG) to achieve coordination in mobility between the municipalities that comprise it, by including various modes of accessible, economic, efficient and safe transport. Pilot will involve a mobile application for obtaining new information on citizen movements.

**MIBICI**
Involves a public bicycle-sharing system that improves connectivity and dependence on non-motorized means of transportation with solar powered stations and integration with other modes of transport; stations are built to facilitate intermodal transportation, connecting to light rail lines and the MacroBus BRT.
KEY OPPORTUNITIES

- **Open loop payment system** that offers a secure digital payment experience that can work across multiple modes of transport and support the large ridership

- **Aggregated consumer records from a variety of means** such as mobility data from payment terminals, POS transactional data etc., to analyze and better understand and plan programs for city management and economic growth

- **Deployment of sensors to identify busy routes vs. those that aren’t crowded** to optimize bus routes and improve experience in public transport

- **Data-based advance practices to combat high crime rates**, combined with the existing interoperable surveillance network across the city

- **Data and analytics based models to identify crime hotspots** within the city and deploy greater security via a needs based approach

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Programa De Desarrollo Metropolitano Del Área Metropolitana Guadalajara
2. Ciudad Creativa Digital
3. ‘Guadalajara could become Mexico’s first smart city’, Aztec Report
4. Ecomobility.org
5. Euroclimaplus.org
6. Tumi Initiative’s Transformative Stories
7. IMEPLAN
MUNICIPALITY OF COLIMA

BACKGROUND

- Population
  - City of Colima: 0.14M
  - Municipality of Colima: 0.15M
- GDP per capita: 9,673 USD

DID YOU KNOW

- Municipality of Colima ranked 2nd among small American Cities of the Future on cost effectiveness for attracting FDI in a Financial Times report
- Municipality of Colima ranked 1st in Mexico on National Quality of Life Index which considers factors such as housing, mobility etc.

KEY CHALLENGES FOR RESILIENCE

- Risk Management
  - Earthquake-prone, volcanic activity, risks from human activities
- Social & Economic Development
  - Poverty, limited schooling and job opportunities, rise in violence
- Urban Development
  - Expansion into important ecological and agricultural areas
- Environmental Sustainability
  - Improper solid waste management, water vulnerability

PILLARS OF RESILIENCE STRATEGY

- PREPARED
  - Generate knowledge and information for risk management and planning, improve local capacities to prevent and respond to disasters, strengthen infrastructure and buildings to reduce risks
- PROSPEROUS
  - Create favorable conditions that attract resources to and investment in the municipality, foster development in the city through social and technological innovation, strengthen the prevention of violence in the society and promote a culture of peace
- INTEGRATED
  - Strengthen municipal and metropolitan planning and management of urban development, promote high-density sustainable and transit-oriented urban development (TOD), promote non-motorized mobility and road safety
- SUSTAINABLE
  - Develop and promote energy and climate action policies, promote the integrated management of municipal solid waste and a circular economy, foster sustainable water and natural resources management
MUNICIPALITY OF COLIMA

DIGITAL CITY DATA

<table>
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<tr>
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<tr>
<td>Electronic Public transit payments</td>
<td>Closed Loop</td>
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<tr>
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<td></td>
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</tbody>
</table>

SELECTED DIGITAL INITIATIVES

Flood Forecasting and Monitoring

Involves building real-time early warning system that uses mobile telecommunications and Wi-Fi by installing hydrometric stations and sensors

Digital Government

Involves making government processes efficient and transparent through use of information and communication technologies and also enabling citizens to make payments online

Smart City Center

Involves implementing technologies in the city center to address connectivity (free Wi-Fi hotspots), security (panic buttons) etc., and provide real-time alerts for traffic

MejoraClick: Citizen Participation

Involves developing a system that is used for reception, channelling and monitoring of citizen reports, allowing citizens to report failures in municipal public services
### MUNICIPALITY OF COLIMA

#### URBAN MOBILITY MODAL SPLIT

(\% of all trips in a single day occurring on a particular mode)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Public</th>
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<th>Non-Motorized and others</th>
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<tbody>
<tr>
<td></td>
<td>11%</td>
<td>54%</td>
<td>35%</td>
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</table>

#### URBAN MOBILITY INITIATIVES

- **Complete Streets Networks**
  - Involves designing the roads to make them accessible and efficient so that tracks operate correctly, all people travel safely and redistribution of road space is achieved while studying origin and destination routes.

- **Pedestrian Trails for Sustainability**
  - Aims at planning and building a network of pedestrian trails in the city, improving road quality and constructing pedestrian bridges to promote environmental protection, accessibility to services and equality among travellers.

- **Bicycle Infrastructure Network**
  - Focuses on building a main cycle infrastructure network to make bicycles a safe and convenient transport alternative by studying road sections, paving and installing bicycle parking stations.

- **Road Safety Plan**
  - Involves analysing current status of road safety in the city and implementing measures to reduce road traffic accidents (and thereby deaths), medical costs, and damage to public roads and private property.
MUNICIPALITY OF COLIMA

KEY OPPORTUNITIES

- **Visa and Resilient Cities Network Opportunities**
- **Other Opportunities**

1. **Disaster relief monies and humanitarian aid issuance for vulnerable populations through digital means to ensure correct allocation of funds**

2. **Waste collection optimization** by deploying sensor technology in waste bins that alerts management about the fullness of trash cans and can also serve as wi-fi hotspots, surveillance mechanisms etc., to encourage responsible waste disposal

3. **Evidence recording by smartphones** to document proof of waste-pickup and evidence socialization with users in the form of daily/monthly reports via app

4. **Smart water meters** to measure consumption remotely at utility companies, reducing labor costs for manual meter reading and enabling dynamic pricing

5. **Digital traffic system to promote active mobility** from high usage of personal non-motorized means. For example, use of apps and tools that make navigation and mobility easier for bicycle riders. (apps connected to traffic lights can be used to connect cyclists with traffic signals and turn them green faster)

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Colima Resilience Strategy
2. Colima Medios
3. Municipal Government of Colima
MEXICO CITY

BACKGROUND

8.9M CDMX
20.1M ZMVM
25,930 USD

DID YOU KNOW

• Mexico City ranked first as Latin America and the Caribbean’s ‘City of the Future’ on FDI attractiveness in Financial Times report
• Mexico City Metro is the second largest metro system in Americas, second only to New York subway

KEY CHALLENGES FOR RESILIENCE

Deterioration of Natural Resources
Insufficient water sustainability, deterioration of biodiversity etc.

Lack of Metropolitan Governance
Insufficient urban planning, high transport pollution, rapid population growth etc.

PILLARS OF RESILIENCE STRATEGY

1. FOSTER REGIONAL COORDINATION
Create resilience through institutional coordination, regional strategic communication, and support regional resilience projects

2. PROMOTE WATER RESILIENCE
Reduce water scarcity and address inequality, and foster a civic culture on the sustainability of water resources

3. PLAN FOR URBAN AND REGIONAL RESILIENCE
Increase spatial social equality, protect conservation areas and reduce risk through urban and regional planning

4. IMPROVE MOBILITY
Promote an integrated mobility system, prepare mobility system for potential risks and effects of climate change, and create accessible city for pedestrians and cyclists

5. DEVELOP INNOVATION AND ADAPTIVE CAPACITY
Promote private sector participation and citizen participation in building resilience, review and adjust the regulatory framework to promote implementation of adaptive measures
Citizen Communication Platform

Involves development of a platform that provides information in timely and adequate manner to help the public address risks, guide their actions in emergency situations, such as facilitate the management for repair of hydraulic system failures, and help with violence complaints, promote cultural events, etc.

Digital and Innovation Agency

Involves creation of an Agency to promote transparency within government, simplify procedures and deploy technology to improve public policies.

Digital Campaign for Collaboration

Involves use of a highly participatory process to write a new constitution for the city by using a ‘crowdsourced’ online campaign and a survey to manage the process of public submissions.

Digital Payments System CoDi

Involves launch of digital payment platform by the Mexican central bank along with other associations based on QR codes and NFC technology in smartphones. The platform currently has 33 participating banks and allows individuals to buy and sell through wire transfers which can be carried out 24/7.

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**URBAN MOBILITY MODAL SPLIT**

(\% of all trips in a single day occurring on a particular mode)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Public</th>
<th>Private</th>
<th>Non-Motorized and Others</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>71%</td>
<td>22%</td>
<td>7%</td>
</tr>
</tbody>
</table>

**URBAN MOBILITY INITIATIVES**

**Integrated Transport System (ITS)**

Involves improving connections among different modes of transportation, unifying service standards, integrating rates and payments, as well as consolidating public transportation systems under a single authority to strengthen institutional coordination.

**Vision Zero Initiative**

Involves development of proper road safety strategies, road users training, better infrastructure, better justice mechanism and a single traffic control system to deter the loss of human lives caused by traffic accidents.

**Mobility Data Usage**

Involves promotion of a public-private partnership to encourage use of mobility data through creation of digital tools to improve decision making.

**Zero Emissions Floating Bus Lane**

Involves developing an elevated bus lane designed for electric trolley buses with stations at regular intervals to switch to different forms of transport; buses will be charged via overhead cables.

**Cablebus: City’s First Cable Car Line**

Involves developing the first cable car line of ~9km, which is expected to benefit 326,000 residents by reducing commute time from 77 to 46 minutes.

**Safety App for Traditional Cabs**

Involves launch of ‘Traxi’ mobile app in which rider can input cab’s license number and know if the cab is registered or not, besides a panic button feature to send alert to police in emergency situations.

**MORE ON MOBILITY**

- Public modes of transport include the metro, which is the largest in Latin America and the Caribbean with 195 stations and is the 8th busiest in the world, and BRT with 7 routes as of 2017.
- Previously operated a transport card across public transport called Tarjeta DF, which got replaced by Tarjeta de Movilidad Integrada, which is interoperable across transport modes including bicycle and cable car being built.
**KEY OPPORTUNITIES**

- **Open loop payment system** that offers a secure digital payment experience that can work across multiple modes of transport and support the large ridership.

- **Aggregated consumer records from a variety of means** such as mobility data from payment terminals, POS transactional data etc., to analyze and better understand and plan programs for city management and economic growth.

- **Remote monitoring of pipe conditions using sensors** to prevent and reduce water leakages for early identification of leaks.

- **Water quality monitoring** in real-time in rivers/water bodies using sensors and deliver alerts to the public via channels such as mobile app, email, text, or website.

- **Track of consumption of water via feedback** received through mobile app, email, text, to increase awareness and reduce consumption.

- **Smart water meters** to measure consumption remotely at utility companies, reducing labor costs for manual meter reading and enabling dynamic pricing.

- **Predictive maintenance of transportation infrastructure** via sensor-based monitoring of the condition of public transit and related infrastructure.

- **Resilient housing allocation system** to help poor/vulnerable groups get access to resilient housing settlements through a knowledge transfer on digital platforms.

**SOURCES**

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Mexico City Resilience Strategy
2. ‘Digital innovation in Mexico city’, Cities Today
3. ‘Making places for innovation; lessons from Mexico City’, Simon White
4. ‘Mexico launches CoDi, a new digital payment platform for financial inclusion’, CMS-Law Now
5. Deloitte Urban Mobility Index
6. ‘Mexico City Introduces Its First Zero-Emissions Floating Bus Lane’, Reset
7. ‘Tender launched for Mexico City’s first cable car line’, Bnamericas
8. Mexico Government Technology
SANTIAGO DE LOS CABALLEROS

BACKGROUND

- Population: 0.9M Santiago de los Caballeros Metropolitan Area
- GDP per capita: 8,050 USD

DID YOU KNOW

- Santiago is the second biggest Dominican city, with just over one million inhabitants, of whom 65% use public transport daily
- While the public transport network has a formal governance structure there is no digital data of public transport

KEY CHALLENGES FOR RESILIENCE

- Water Supply Shortages
- Lack Of Spaces For Social Cohesion
- Disease Outbreak
- Traffic Jams and Congestion
- Crime, Violence and Social inequity
- Management of Liquid/Solid Waste
- Urban Development And Informal Dwellings Out Of Control
- Infrastructure Failure
- Unemployment And Lack Of Economic Development
- Natural Calamities like, Earthquakes, Hurricanes, etc.
- Noise Contamination and Pollution

PILLARS OF RESILIENCE STRATEGY

01 ADAPTED AND ROBUST TO DISASTERS
Strengthen infrastructures, tools and mechanisms to respond, adapt and grow resiliently against natural disasters

02 PROSPEROUS, INNOVATIVE AND CULTURAL SANTIAGO
Build a prosperous economy from economic diversification, innovation, entrepreneurship and the rescue of art and culture

03 SAFE, EMPOWERED AND INCLUSIVE SANTIAGO
Reduce the social problems that latently stress the population

04 HEALTHY, ECO-EFFECTIVE AND FRIEND OF THE YAQUE SANTIAGO
Seek quality public spaces to promote social cohesion, improve mobility and reduce crime

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SANTIAGO DE LOS CABALLEROS

DIGITAL CITY DATA

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>CITY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovation Score (0-100)</td>
<td></td>
</tr>
<tr>
<td>Open data &amp; online services offered by govt.</td>
<td></td>
</tr>
<tr>
<td>Govt. commitment to Financial Inclusion (low (20)-high (100))</td>
<td>100</td>
</tr>
<tr>
<td>Average education level (low (20)-high (100))</td>
<td>60</td>
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<tr>
<td>Digital Payments (vs. cash) (% Population that made or received digital payments)</td>
<td>44</td>
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<tr>
<td>Banked Population (%)</td>
<td>56</td>
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<td>Debit Card Penetration (%)</td>
<td>32</td>
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<td>Electronic Public transit payments</td>
<td>Closed Loop</td>
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<tr>
<td>Internet Penetration (%)</td>
<td>67.6</td>
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<tr>
<td>Smartphone Penetration (%)</td>
<td></td>
</tr>
<tr>
<td>POS terminal penetration (POS per 10,000 people)</td>
<td>21</td>
</tr>
</tbody>
</table>

SELECTED DIGITAL INITIATIVES

Citizen Observatory Project
Focuses on development of the Citizen Observatory Project as a monitoring and analysis system that will oversee the strategic plan “Santiago 2020” and the city’s development. It will be a municipal reference that will inform, analyze, and foster debate among strategic actors at various levels.

Digital Republic initiative
Involves expanding internet access and ICT by providing PCs to students and teachers, deploying free Wi-Fi access points in schools, and implementing a digital literacy program.

Emergency Help
Involves providing an emergency helpline, a national 911 system for emergencies. Since 2016, it began operating in Santiago and it uses monitoring cameras and emergency rescue units throughout the city to improve efficiency.

Santiago 2030
Involves contemplating major transformations in the metropolis and its axes, raising the environmental urban recovery of the Yaque River, changing the transport system, and projects that integrate all sectors of the province.

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### URBAN MOBILITY MODAL SPLIT

(% of all trips in a single day occurring on a particular mode)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Data not available publicly</th>
</tr>
</thead>
</table>

### URBAN MOBILITY INITIATIVES

<table>
<thead>
<tr>
<th>Initiative</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Municipal Lighting Project</strong></td>
<td>Involves improving street lighting by having more light as a result of the replacement of 100% of the lamps it currently has with LED technology and enhancement of the existing network</td>
</tr>
<tr>
<td><strong>MapMap</strong></td>
<td>Involves enabling users to collect georeferenced data from public transport routes in a simple way, to help with the mapping of Santiago’s public transport system</td>
</tr>
<tr>
<td><strong>Strategy for Bicycle Mobility</strong></td>
<td>Aims to launch a pilot on non-motorized sustainable mobility to foster transport renewal and to motivate city residents to see this iconic public space as a symbol of Santiago’s recovery. Later, in a second stage, pilot activities will include identifying and prioritizing the metropolitan areas best suited to adopting the bicycle mobility strategy through digital means</td>
</tr>
<tr>
<td><strong>DATUM: Mapping Santiago</strong></td>
<td>Offers a visual community mapping pilot using digital technology and participatory methodologies to enable citizens to participate in transportation planning for the city. The project included training, mapping of public transport routes, data processing, an analysis of accessibility conditions for people with disabilities, and an assessment of safety conditions for the elderly and disabled</td>
</tr>
</tbody>
</table>
KEY OPPORTUNITIES

- **Distribution of funds for social benefit** in a card based format to vulnerable populations for easier and transparent access to funds (and to drive financial inclusion)
- **Disbursement of subsidies/financial aid** through prepaid cards to ensure provision of financial assistance to vulnerable groups for food, medicine, etc.
- **Open loop payment system** that offers a secure digital payment experience that can work across multiple modes of transport and support the large ridership
- **Disaster relief monies and humanitarian aid issuance** for vulnerable populations through digital means to ensure correct allocation of funds
- **Emergency response optimization** by using analytics and technology (to optimize emergency response call processing and field operations)
- **Data-based advance practices to combat high crime rates**, combined with the existing interoperable surveillance network across the city
- **Data and analytics based models to identify crime hotspots** within the city and deploy greater security via a needs based approach

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Resilience Strategy Santiago De Los Caballeros Report, 2018
2. ‘Dominican president announces Digital Republic initiative’, bnamericas
3. ‘The innovation that changed a Dominican city’s transport system’, IDB
4. ‘Investing in the sustainable future of LAC and the Caribbean’, Global Roundtable
KEY CHALLENGES FOR RESILIENCE

- **Aging Infrastructure**: Infrastructure is not adept to dealing with current situation
- **Natural Calamities**: Inefficient urban planning and risk mitigation for calamities
- **Human Capital Flight**: Continued risk scenarios with lack of awareness causing population decline
- **Disease Outbreak**: Population is prone to spread of diseases

PILLARS OF RESILIENCE STRATEGY

1. **MAXIMIZE SOCIAL WELL-BEING IN ALL INVESTMENTS**
   Seek to maximize social well-being throughout all reconstruction efforts

2. **EQUITY AND INCLUSIVENESS AS A PRIORITY**
   Develop solutions to overcome challenges by prioritizing equitable distribution and inclusiveness in proposed solutions

3. **TRANSPARENCY AT ALL LEVELS OF POLICYMAKING**
   Build accountability and transparency to the ongoing process of recovery planning, implementation, and monitoring

4. **EMPHASIZE AND FOSTER COORDINATION AND COLLABORATION**
   Focus on coordination and collaboration among the multiple stakeholders involved in the rebuilding process to address challenges
Tech-based Zika Prevention

Involves use of a cloud-based mapping software to collect mosquitoes from traps, find their locations, monitor populations etc. A startup has also developed a machine learning system to automate classification of mosquitoes and put a dataset of images and labels to train computer algorithms.

Energy Grid

Involves improvement of the power grid to strengthen infrastructure’s resilience when faced with calamities by partnering with Tesla and SunRun.

Project Owl

Involves deployment of Project OWL or ‘Organization, Whereabouts, Logistics’ that sticks transmitters to trees that emit a low-frequency Wi-Fi that users can link to via their smartphones to enter their medical needs, report emergency etc.

DroneAid

Involves distribution of 5-foot mats to citizens, with standardized symbols, that can be placed on the mats to indicate needs. For example, there will be symbol for food, water, or medical attention. Programmed drones will then read the symbols on the mats and relay the information back to an emergency hub.

Disaster Management Campaign

Involves design of an education campaign through digital means to help residents of Puerto Rico take action to mitigate the impact of future hurricanes and prepare for natural disasters and reduce losses.

Parallel 18

Involves Puerto Rico’s most notable startup accelerator program backed by the government, Parallel 18, that focuses on providing all mentorship and support, along with an equity free grant of USD 40,000 to scale business operations.

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SAN JUAN

URBAN MOBILITY MODAL SPLIT
(% of all trips in a single day occurring on a particular mode)

Data not available publicly

URBAN MOBILITY INITIATIVES

Resiliency for Transport-based Infra
Involves use of means to reduce reliance on traditional sources of power and use more efficient alternative sources to supply for the prioritized circuits of traffic lights, streetlights, etc., to avoid infrastructure breakdown considering calamities like Hurricane Maria

Increasing Mobility Option
Involves improvement of mobility by providing additional travel options for people who do not drive or prefer to use other modes of transportation like ride-hailing/ride-sharing, expanded “publico” (jitney) service, inter-city bus service, bike/scooter-sharing, and peer-to-peer car sharing

Strengthening Public Service
Involves making bus service more reliable through transit signal priority (which gives buses additional time to cross a signalized intersection) and dedicated bus lanes, as well as bus stops that provide real-time arrival information and use smart card fare media (TXN 8)

Complete PR-10
Involves filling gaps in Puerto Rico’s highway network by completing work on PR-10, one of the few north-south routes, and ensure that environmental risks are mitigated, and a resilient design is used by using the latest technology
KEY OPPORTUNITIES

- **Disbursement of subsidies/financial aid** through prepaid cards to ensure provision of financial assistance to vulnerable groups for food, medicine, etc.

- **Aggregated consumer records from a variety of means** such as mobility data from payment terminals, POS transactional data etc., to analyze and better understand and plan programs for city management and economic growth.

- **Distribution of funds for social benefit** in a card based format to vulnerable populations for easier and transparent access to funds (and to drive financial inclusion).

- **Data-based public health interventions for sanitation and hygiene** to direct highly targeted interventions, such as understanding where to increase rainfall absorption capacity or collecting crowdsourced data on gaps in sanitation systems.

- **Local civic engagement applications** (such as digital apps, websites) to promote public engagement in city affairs. May include reporting nonemergency nuisances and maintenance needs, giving input on policy decisions, participating in digital city initiatives, and interaction with city officials and departments on social networks.

- **Digital citizen platforms** to digitize citizen-facing government administrative services such as income tax filing, car registration, etc., and can include digitization of the user journey as well as back-end support functions as needed.

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Resilient Puerto Rico Advisory Commission Report
2. 'Facts about Puerto Rico’s Technology-Focused Future', Launchway Media
3. Puertorico.iem.com
4. Transformation And Innovation In The Wake Of Devastation- an Economic and Disaster Recovery Plan For Puerto Rico- 2018
PANAMA CITY

BACKGROUND

0.5M
Population

33,830 USD
GDP per capita

DID YOU KNOW

• Panama City ranks third in Central and South America in Hotspots 2025 report by The Economist (ranking cities by competitiveness)
• Panama City unveiled Central America’s first metro system in April 2014

KEY CHALLENGES FOR RESILIENCE

High Inequity and Poverty
High informal employment, racial and social discrimination

Poor Disposal of Solid Waste
Improper disposal impairs public health, causes increase in floods

High Crime Rates
High gender violence and lack of proper protection

Decline of Wetlands
Caused by landfills affecting food resources and fishing productivity

Climate Change and Natural Events
Natural Hazards like flooding, earthquakes, etc.

PILLARS OF RESILIENCE STRATEGY

ACCESS TO OPPORTUNITIES
Foster better quality of life based on more integrated mobility; enhance human capital to improve access to job opportunities

INFRASTRUCTURE IN NEIGHBORHOODS
Drive integration of communities through a broader and better social infrastructure; connect the population through a new basic infrastructure

REDISCOVERING WETLAND CITY
Rethink infrastructure to protect from the effects of climate change; effectively communicate the value of water as a resource and that of the ecosystems; Integrate and modernize water coordination and management instruments and ecosystems

INTEGRAL MANAGEMENT OF RISK
Deploy local risk management in the city; create safety for residents upon understanding their vulnerabilities

JOINT RESPONSIBILITY IN THE MAKING OF THE CITY
Strengthen management by streamlining both processes and resources; foster participation in order to build more co-responsible citizens
Involves development of a civic monitoring system to foster informed and participative residents through evaluation of the city’s quality of life.

Involves creation of a database containing hydraulic models of the basins and developing a platform to observe the flood levels in rivers and floodplains for a recurrence from 2 to 500 years.

Involves integration of geospatial data in a unique geographic data system (SIG) to provide real time access to historical data for sensitivity analyses.

Involves transformation of citizen experience through technology initiatives including smart building design, smart traffic, smart lighting etc., in collaboration with Cisco.

Involves development of ‘Smartshi’ app to group all automated payment systems of the state in one place, so that users are not directed to individual institutions.

Involves use of ‘GRP’ platform to integrate operations of local authorities, and reduce the efforts citizens must spend to access municipal information.
PANAMA CITY

**URBAN MOBILITY MODAL SPLIT**

<table>
<thead>
<tr>
<th>Public</th>
<th>Private</th>
<th>Non-Motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>74%</td>
<td>6%</td>
<td>20%</td>
</tr>
</tbody>
</table>

**URBAN MOBILITY INITIATIVES**

**Non-Motorized Mobility Master Plan**
Involves identifying and defining a network of cycle pathways and lanes in an integrated fashion within the framework of the city’s transportation plans, leading to decongestion of road traffic and positive effects on public health.

**Carpooling Application**
Involves analyzing the feasibility of creating a carpooling application in order to lower costs for users and integrate safety features and lessons learned across the world.

**Parking Mobile App (Pango)**
Involves implementing a global parking management ecosystem in collaboration with Pango and Hectronic, including multi space pay stations, digital residential permits, a pay-by-phone app, an integrated enforcement platform.

**Wi-Fi at Bus Stops**
Involves installing free wireless internet access points and digital screens to provide travelers with information about the city and their journey. Travelers can see the nearest bus and at what time it will arrive.

**MORE ON MOBILITY**

- Operates BRT that replaced the flamboyant "red devils" buses with modern, air-conditioned city buses. These do not accept cash, and accepts payments through a fare card.
- Metro de Panama opened in 2014 and is by far the most preferred method to get to the places it serves. However there are still many places of interest not served by it.
PANAMA CITY

KEY OPPORTUNITIES

- **Visa and Resilient Cities Network Opportunities**
  - **Disaster relief monies and humanitarian aid issuance** for vulnerable populations through digital means to ensure correct allocation of funds
  - **Open loop payment system** that offers a secure digital payment experience that can work across multiple modes of transport and support the large ridership
  - **Waste collection optimization** by deploying sensor technology in waste bins that alerts management about the fullness of trash cans and can serve as wi-fi hotspots, surveillance mechanisms etc., to encourage responsible waste disposal
  - **Evidence recording by smartphones** to document proof of waste-pickup and evidence socialization with users in the form of daily/monthly reports via app
  - **Data-based public health interventions for sanitation and hygiene** to direct highly targeted interventions, such as understanding where to increase rainfall absorption capacity or collecting crowdsourced data on gaps in sanitation systems
  - **Improvement in employability** of citizens through online retraining programs to help individuals who are unemployed or at risk of becoming unemployed gain new skills
  - **Remote monitoring of pipe conditions using sensors** to prevent and reduce water leakages for early identification of leaks

- **Other Opportunities**

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Panama City Resilience Strategy
2. ‘Cisco and Panama City Collaboration’, Cisco Report
3. ‘Panama aspires to be a "smart" city’, Revista Summa
4. Smart city Report, Raconteur
5. Global BRT Data website
6. Pango
7. ‘Panama City’s Smart City Initiatives’, Safe and Smart City
MEDELLIN

BACKGROUND

2.5M
Population

16,230 USD
GDP per capita

KEY CHALLENGES FOR RESILIENCE

Socio Inequity
Widespread poverty, social exclusion, unemployment

Inadequate Safety
Organized crime, culture of intolerance and lack of safety

Threats to Resources
Natural/man-made shocks affecting vulnerable groups

Lack of Reliable Information
Lack of unified structure to identify vulnerabilities

PILLARS OF RESILIENCE STRATEGY

EQUITABLE
Strengthen and create new strategies for educating citizens that will facilitate access to new opportunities tailored to the needs of different city contexts

SAFE AND PEACEFUL
Focus on preventing crime, creating strategies that permit access to justice, comprehensive care of victims, and remembrance

SUSTAINABLE AND RISK-PREPARED
Find the best way to mitigate economic losses and adverse effects caused by natural and human made disasters

WELL-INFORMED AND ENGAGED
Identify coordinated, holistic solutions to priority issues through using data based decision-making practices and having a system or an agency responsible for data integration

DID YOU KNOW

• Medellin ranked 4th among the top American cities of the future in the category FDI strategy in Financial Times report (after New York, Chicago and Montreal)
• Medellin is the largest digital nomad hotspot of South America, partly owing to reliable connectivity

MEDELLIN
Population: 2.5M
GDP per capita: 16,230 USD

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**Early Warning System (SIATA)**

Involves strengthening of the Early-Warning Environmental System (SIATA) to develop an appropriate forecast model for the Medellin’s topography.

**Agency for Information Integration**

Involves creating a neutral agency to integrate and coordinate the city’s information so that public and private entities can obtain reliable and up-to-date information.

**Buen Comienzo (Good Start)**

Helps in avoiding long travels for doctor’s appointment by expectant mothers living in remote areas by offering medical information online at 150 public areas.

**Strategy for Citizen Participation**

Promotes online participation of people to use the citizen platform as a channel for listening, through which the public administration can receive development ideas.

**Network of Social Observatories**

Aims to empower the city’s research capacity by coordinating with public and private research centers, and investing in tools for good quality statistical information.

**Text Notifications**

Involves leveraging universal SMS cell phone penetration and providing text notifications to residents on subjects such as ‘deadline is near to pay a bill’.
## URBAN MOBILITY MODAL SPLIT

<table>
<thead>
<tr>
<th>Public</th>
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<tbody>
<tr>
<td>51%</td>
<td>19%</td>
<td>30%</td>
</tr>
</tbody>
</table>

## URBAN MOBILITY INITIATIVES

### Integration of Public Transport
Promotes intermodality of transport service by integrating it physically and tariff-wise so that users benefit from greater coverage and lower cost in their trips.

### TPMED: App for mobility
Involves use of smart device app for public transport so that travelers can access maps with routes, stops, trajectories from one point to another etc., to plan their trips.

### Intelligent Mobility System (SIMM)
Focuses on creation of ITS system aimed at improving mobility, reducing accidents and incident response time through operations center and a series of monitoring and control services including photo-fines, CCTV system etc.

### Public Bicycle Program (Encicla)
Aims at free lending of bicycles to the public who can see available bikes at all the stations on a live map and mobile apps. As part of the integrated transport system, it helps to avoid taxis for local transportation before/after using metro system.
KEY OPPORTUNITIES

- **Aggregated consumer records from a variety of means** such as mobility data from payment terminals, POS transactional data etc., to analyze and better understand and plan programs for city management and economic growth.

- **Predictive maintenance of transportation infrastructure** via sensor-based monitoring of the condition of public transit and related infrastructure.

- **Predictive policing by using big data and analytics** (including social media monitoring) to predict where and when crimes are likely to happen with greater precision and deploying police patrols and targeting prevention efforts.

- **Data-based advance practices to combat high crime rates**, combined with the existing interoperable surveillance network across the city.

- **Data and analytics based models to identify crime hotspots** within the city and deploy greater security via a needs based approach.

- **E-learning platforms** to reduce the digital illiteracy and empower all individuals with equal digital opportunities.

- **Improvement in employability** of citizens through online retraining programs to help individuals who are unemployed or at risk of becoming unemployed gain new skills.

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Medellín Resilience Strategy
2. 'Medellín, The Smart City', Americas Quarterly, 2015
3. Global BRT Data website
4. Municipal Development Plan Project 2020-2023
5. 'An Intelligent System to travel in Medellín', ACI Medellín
6. 'Medellín - Smart city', AQTr
7. 'Encicla: A Guide to Medellín’s Free City Bikes System', Medellinguru
BACKGROUND

- Population: 2.4M
- GDP per capita: 14,520 USD

DID YOU KNOW

- Cali is the main urban and economic center in the south of the country, and is one of Colombia’s fastest-growing economies
- It is the third largest city in Colombia and the first city in the country to use electric buses
- The Fundación Bolívar and the Cali Chamber of Commerce support the scale-up of firms through an acceleration program of start-ups

KEY CHALLENGES FOR RESILIENCE

- Natural Disasters
  - Prone to earthquakes, floods, landslides, affecting vulnerable populations
- High level of Violence
  - Susceptible to high crime rate and lack of a proper public security system
- Quality of Education
  - Deficient in facility and educational infrastructure
- Insufficient Mobility
  - Lack of traffic routes and transportation system
- Deficient City Management
  - Lack of strategic vision causing improper management
- Water Shortages
  - Pollution and shortage of water resources

PILLARS OF RESILIENCE STRATEGY

1. EDUCATION FOR OPPORTUNITIES
   - Promote education and safe neighborhoods to prepare its inhabitants to contribute to society, to transform their environment, and to make the most of opportunities

2. MOBILITY FOR DEVELOPMENT
   - Create multiple sustainable, reliable and safe transportation options so that the city is prepared for development

3. COEXISTENCE FOR LIFE
   - Acknowledge and respect diversity so that conflicts are resolved without violence, and young people are kept away from crime

4. SUSTAINABILITY FOR THE FUTURE
   - Prepare to mitigate climate change events and protect the city’s water sources as well as their surrounding ecosystems

5. PLANNING FOR PROGRESS
   - Plan the city in a structured manner to ensure preparedness for the future
Involves creation of a platform to strengthen institutional processes using (ICT) tools. It also includes implementation of information systems that improve provision of services to residents, enable automation of processes and reduce risk of corruption.

**App to beat Zika Virus**

Involves collection of information to identify mosquito breeding sites by recording, georeferencing and photographing areas and then passing to the city health authorities to raise awareness.

**Crisis Room Construction**

Involves creation of a state-of-the-art technology complex to centralize information that stakeholders need for crisis decision-making, facing and monitoring an acute shock, such as an earthquake, flood, or attack.

**Edu. Quality Management Platform**

Focuses on development of a simple and easy-to-use technology platform that includes educational quality data (i.e., information on curricula, improvement plans, teacher training) from public education institutions and educational infrastructure management tools.

**Investment Project Incubator**

Aims at creation of an investment project incubator with representatives from all Municipal Government organizations, facilitating knowledge exchange among those in charge of creating, modifying and monitoring the investments.

**Centers of Excellence**

Involves the creation of two centers of excellences, one on big data (CAOBA) and another on the IoT (CEA en IoT), focusing on promoting co-operation in innovation between several private and public companies and state.

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**SELECTED DIGITAL INITIATIVES**

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<thead>
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<th>Innovation Score (0-100)</th>
<th>31</th>
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</thead>
<tbody>
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<td>Open Data &amp; Local Services</td>
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<td>Internet Penetration (%)</td>
<td>62.3</td>
</tr>
<tr>
<td>Smartphone Penetration (%)</td>
<td>39.8</td>
</tr>
<tr>
<td>POS terminal penetration (POS per 10,000 people)</td>
<td>14.8</td>
</tr>
</tbody>
</table>
URBAN MOBILITY MODAL SPLIT (% of all trips in a single day occurring on a particular mode)

<table>
<thead>
<tr>
<th>Public</th>
<th>Private</th>
<th>Non-Motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td>48%</td>
<td>17%</td>
<td>35%</td>
</tr>
</tbody>
</table>

URBAN MOBILITY INITIATIVES

**Avenida Colombia - Cali’s Big dig**
Involves better management of traffic in city center through the creation of longest urban tunnel in Colombia. The tunnel also has state-of-the-art security elements, like noise cancelling screens, acoustic walls and gas detectors and extractors.

**MIO BRT**
Aims to improve bus transport and connectivity, not by over-expanding on just BRT, but complementing it with a new BRT line with special electric buses containing devices installed for smart card payment, GPS, communications with the control center etc., serving the stations.

**Contactless Smart Card (TISC) system**
Involves transfer of users to other buses or stations for a single fare. The passage on credit, makes it easier for users to enter buses and stations when they do not have a balance on their card. The system lends them up to the value of a ticket.

**Tools to Strengthen Mobility**
Involves development of human capital and provision of computer tools for advanced analysis of mobility issues. In addition, stakeholders propose to increase the number of staff with professional degrees and increase inter-institutional cooperation by creating collaborative spaces among agencies and joint responsibility for programs and projects.

MORE ON MOBILITY

- Public transit modes include BRT that runs through 97% of the city and a cable car network that enables vulnerable groups to access the BRT network.
- BRT operates MIO contactless reloadable smart cards in which consumers have 2 hours transfer time between different routes, otherwise the fare is the new ride’s cost
  - Insufficient places to recharge cards has resulted in long lines to charge cards and a revenue loss for MIO operators
- City has ambitions to move to an open loop system, which is ‘close to launch’
KEY OPPORTUNITIES

- **Aggregated consumer records from a variety of means** such as mobility data from payment terminals, POS transactional data etc., to analyze and better understand and plan programs for city management and economic growth
- **Multiple use cases for infrastructure layer of sensors** across the city in collaboration with the innovative start-up ecosystem present to bridge social inequity
- **Geo-spatial urban planning** to assess the rate of informal settlement occurrence as compared to the rate of new housing development expansion and to visualize patterns of informal settlement distribution for targeted actions
- **Track of consumption of water via feedback** received through mobile app, email, text, to increase awareness and reduce consumption
- **Smart water meters** to measure consumption remotely at utility companies, reducing labor costs for manual meter reading and enabling dynamic pricing
- **E-learning platforms** to reduce the digital illiteracy and empower all individuals with equal digital opportunities
- **Predictive maintenance of transportation infrastructure** via sensor-based monitoring of the condition of public transit and related infrastructure

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Cali Resilience Strategy
2. ‘App to beat Zika Virus’, World Economic Forum
3. OECD Reviews of Digital Transformation: Going Digital in Colombia
4. Global BRT Data website
5. ‘Urban Tunnels in Colombia: Cali’s Big Dig’, Smartcitiesdive
6. Itdp.org
7. Safran-group.com
**BACKGROUND**

2.6M
Population

$25,840 USD
GDP per capita

**DID YOU KNOW**

- Quito actively harbors innovation, with home to several incubators and initiatives to promote start-ups in the city.
- Headquarters and regional offices of many national and international financial institutions, oil corporations and international businesses are also located in Quito, making it a world class business city.

**KEY CHALLENGES FOR RESILIENCE**

- Fragile Environment
  Degraded urban environment and lack of proper care

- Unstable Economy
  Non-diversified and non-inclusive economy

- Unsafe Territory
  Continued risk scenarios with lack of awareness

- Weak Social Fabric
  Weak citizen partnership and lack of social cohesion

- Scattered City
  Inefficient mobility systems and urban planning

**PILLARS OF RESILIENCE STRATEGY**

1. INCLUSIVE AND EMPOWERED CITIZENS
   Facilitate participatory processes for democracy, validating the public administration’s work and strengthening processes of co-responsibility between citizens and the municipality

2. ROBUST AND SUSTAINABLE ENVIRONMENT
   Develop efficient participatory administration mechanisms for areas that foster environmental consciousness and citizen involvement

3. INTEGRATED AND COMPACT CITY
   Control urban sprawl and maximize positive impact of Quito’s first metro line and create a mobility system that favors active mobility

4. RESOURCEFUL AND SOLID ECONOMY
   Create economic environment conducive to strengthening job supply and demand, with a special focus on youth and even promote food-related economy as a guideline for development

5. REFLECTIVE AND SAFE TERRITORY
   Avoid creating new risks, mitigate existing risks, and prepare the city to respond to potential natural and man-made disasters
**SELECTED DIGITAL INITIATIVES**

**Public Area Wi-Fi**
Involves activation of Wi-Fi areas via ‘QuitoTeConecta’ project by collaborating with private institutions and the academic sector including universities.

**Digital City Program**
Promotes development of different projects like digitalizing national identity cards using facial recognition technology, monitoring available parking spots, tracking bus arrival times, and checking emergency systems on highways.

**Territorial Monitoring Tool**
Focuses on development of a technological tool to monitor dynamics involving real estate development (height and extension) using satellite georeferencing.

**Digital Citizen Partnership Platform**
Involves implementation of different decision-making mechanisms by involving citizen partnership; provides access to information, fosters social capital and automates citizen participation processes.

**Mi Ciudad**
Involves developing an app which will share data about the city, including services, infrastructure and budget allocation to enable more citizen participation and digitize the current system of budget allocation based on citizen decisions in neighborhood assemblies.

**Quito Recycle Campaign**
Promotes use of mobile app for cooperation between environmental management agents and the general public for recovering recyclable waste, special and hazardous domestic waste.

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**DIGITAL CITY DATA**

| Key Differentiators | Innovation Score (0-100) | 30 | Open data & online services offered by govt. | Open Data & Local Services | Govt. commitment to Financial Inclusion (low (20)-high (100)) | 50 | Average education level (low (20)-high (100)) | 45 | Digital Payments (vs. cash) (% Population that made or received digital payments) | 32 | Banked Population (%) | 51 | Debit Card Penetration (%) | 28 | Electronic Public transit payments | Closed Loop | Internet Penetration (%) | 57.3 | Smartphone Penetration (%) | | POS terminal penetration (POS per 10,000 people) | 14.5 |

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QUITO

URBAN MOBILITY MODAL SPLIT

(% of all trips in a single day occurring on a particular mode)

<table>
<thead>
<tr>
<th>Public</th>
<th>Private</th>
<th>Non-Motorized and others</th>
</tr>
</thead>
<tbody>
<tr>
<td>62%</td>
<td>23%</td>
<td>15%</td>
</tr>
</tbody>
</table>

URBAN MOBILITY INITIATIVES

Data Value

Involves collection and analysis of mobile data related to citizen movement from Telefonica’s network by Luca transit platform (access to 1.4M users in Quito). This information enables the municipality to create exact studies on the future users of the city’s transport system.

Transport-Payment Integration Plan

Involves combining public and private setups by integrating multiple forms of transport via a fully integrated system of routes, schedules, rates, and collection. Also, there is work on integrating payment for public transportation.

Active Mobility Plan

Involves launch of a contest with proposals to improve pedestrian and bicycle routes with better conditions for space and safety in public areas. The contest seeks solutions to complement municipal efforts to create efficient means of transportation, design sidewalks, and improve public areas and mobility.

Information Dissemination Apps

Promotes use of ‘MovilízateUIO’ to provide information to public transport users and enable crowdsourcing; provides information on schedules, routes and frequencies of mobility options and the crowdsourcing part allows the user to interact with the authority, through a localised geo interface, that reports events on the road or public space.

MORE ON MOBILITY

- Public modes of transport include a BRT network with 3 electric bus routes; Trole - a trolleybus system, Ecovia, and Central Norte with designated car free lanes and a metro that is currently under construction.
- Metro de Quito (MDQ) project consisting of 15 stations and a 22 km long passageway is the largest public works project in Quito. With its launch in 2020, it can help with the following:
  - Offer opportunities for social inclusion and better rural-urban connectivity
  - Launch of new payment system such for fare payments
- To reduce congestion on street, the city has a Pico y Placa rule that restricts cars from being driven during specific hours on weekdays.

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KEY OPPORTUNITIES

- **Aggregated consumer records from a variety of means**—such as mobility data from payment terminals, POS transactional data etc., to analyze and better understand and plan programs for city management and economic growth

- **Disaster relief monies and humanitarian aid issuance** for vulnerable populations through digital means to ensure correct allocation of funds

- **Track of consumption of water via feedback** received through mobile app, email, text, to increase awareness and reduce consumption

- **Smart surveillance** via intelligent monitoring to detect anomalies based on visual feeds including facial recognition, smart closed-circuit TVs, and license plate recognition

- **Technology based disaster early-warning systems** to predict and mitigate the effects of natural disasters such as hurricanes, earthquakes, floods, and wildfires

- **Predictive maintenance of transportation infrastructure** via sensor-based monitoring of the condition of public transit and related infrastructure

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Quito Resilience Strategy
2. ‘Quito to launch facial recognition for public surveillance under smart city project’, Biomertricupdate
3. Smartnet.niua.org
4. Ecomobility.org
5. Luca Transit, Telefonica
6. ‘How Quito is building resilience into its mobility services’, Cities Today
BACKGROUND

DID YOU KNOW

- Salvador is an entrepreneurial city with two technology parks, four incubators and several Micro Individual Companies
- Salvador Bahia Airport has been acknowledged as ‘Most Sustainable Aerodrome in Brazil on 2019’, owing to zero liquid discharge, 100 per cent LED lighting etc.

KEY CHALLENGES FOR RESILIENCE

- Socio-economic Inequality: Persistence of racism, exclusion of minority groups
- High Unemployment: High rates of unemployment, limited investments
- Climate Change: Presence of heat, air pollution, risk of landslides, floods
- Inadequate Urban Planning: Population growth, limited resources for public services

PILLARS OF RESILIENCE STRATEGY

1. CULTURE AND MULTIPLE IDENTITIES
   Value and requalify Salvador’s historic heritage, strengthen the cultural diversity of Salvador, give visibility and consolidate the multiple territorial identities of the city

2. HEALTHY AND ENGAGED COMMUNITY
   Expand access and strengthen quality public education, foster co-responsibility and citizen culture, promote racial and gender equity, promote quality health management

3. DIVERSIFIED AND INCLUSIVE ECONOMY
   Support and facilitate business entrepreneurship, strengthen the tourism sector in an integrated and sustainable way, promote training activities to strengthen and diversify the local economy

4. INFORMED CITY AND INNOVATIVE GOVERNANCE
   Integrate data, allow people to get to know the city, provide services in an inclusive, innovative and integrated way through transparent and efficient data management

5. SUSTAINABLE URBAN TRANSPORTATION
   Prepare the city for climate change, create innovative forms of development, promote the transformation of the city in a sustainable way

SALVADOR

Population 2.9M
GDP per capita 13,170 USD
**SELECTED DIGITAL INITIATIVES**

**Electronic Listening to Needs**

Involves listening to the needs and demands of each neighbourhood electronically through website and mobile app under 'Ouvindo Nosso Bairro' program.

**Single Database**

Involves deploying a geospatial data infrastructure to provide municipality with interactive and dynamic information system for better city planning.

**Air Quality Monitoring**

Involves introducing innovative air quality monitoring systems as part of health surveillance to prevent and mitigate health impact of air pollution in the city.

**PMS Purchase Portal**

Involves providing online services such as all legislation on materials and assets, news about government events, monitoring of bidding processes etc.

**Performance Evaluation**

Involves providing performance evaluation system for greater agility and transparency in vendor’s performance evaluation process by providing evaluation criteria and calculating results.

**Mulheres and Technology**

Aims to support women leading small business to provide innovative solutions to improve the city’s resilience by improving digital inclusion.

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**Key Differentiators**

<table>
<thead>
<tr>
<th>Innovation Score (0-100)</th>
<th>34</th>
</tr>
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<tbody>
<tr>
<td>Govt. commitment to Financial Inclusion (low (20)-high (100))</td>
<td>100</td>
</tr>
<tr>
<td>Average education level (low (20)-high (100))</td>
<td>51</td>
</tr>
<tr>
<td>Digital Payments (vs. cash) (Population that made or received digital payments)</td>
<td>58</td>
</tr>
<tr>
<td>Banked Population (%)</td>
<td>70</td>
</tr>
<tr>
<td>Debit Card Penetration (%)</td>
<td>59</td>
</tr>
<tr>
<td>Electronic Public transit payments</td>
<td>Closed Loop</td>
</tr>
<tr>
<td>Internet Penetration (%)</td>
<td>67.5</td>
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<tr>
<td>Smartphone Penetration (%)</td>
<td>41.3</td>
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<tr>
<td>POS terminal penetration (POS per 10,000 people)</td>
<td>57.1</td>
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</table>

**DIGITAL CITY DATA**

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>34</th>
</tr>
</thead>
<tbody>
<tr>
<td>CITY</td>
<td>Open Data &amp; Local Services</td>
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</table>

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URBAN MOBILITY MODAL SPLIT
(% of all trips in a single day occurring on a particular mode)

<table>
<thead>
<tr>
<th>Mode</th>
<th>Public</th>
<th>Private</th>
<th>Non-Motorized</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40%</td>
<td>21%</td>
<td>39%</td>
</tr>
</tbody>
</table>

URBAN MOBILITY INITIATIVES

Micro-accessibility
Involves complementing the modes of transport in the city, taking solutions from major lanes to interiors of neighbourhoods, integrating small alleys and ticket system with city’s main transportation corridors.

Urban Mobility App
Provides information about nearest bus stops, and allows complaints against taxi drivers for denial of service, poor vehicle condition, non-compliance with the price list etc.

Bus Rapid Transit System
Involves implementation of Bus Rapid Transit system for modern and high-speed public transport system in areas which are not covered by the metro; safety and comfort to be ensured and designs to be made based on landscaping, traffic etc.

Salvador Card
Promotes use of electronic ticketing system that integrates payment across different modes of public transport including buses, subway, bicycle network with multiple recharge possibilities such as at Salvador Card service stations, accredited points of sale etc.
KEY OPPORTUNITIES

- **Aggregated consumer records from a variety of means** such as mobility data from payment terminals, POS transactional data etc., to analyze and better understand and plan programs for city management and economic growth

- **Procurement using a purchasing card or virtual account by the local government** to streamline acquisition of supplies, equipment, materials and professional services

- **Smart surveillance** via intelligent monitoring to detect anomalies based on visual feeds including facial recognition, smart closed-circuit TVs, and license plate recognition

- **Data-based public health interventions for sanitation and hygiene** to direct highly targeted interventions, such as understanding where to increase rainfall absorption capacity or collecting crowdsourced data on gaps in sanitation systems

- **Apps to monitor congestion pricing to reduce traffic by charging fees** for private car usage in certain areas, during times of peak demand, or both

- **E-hailing provision** via apps for real-time ordering of point-to-point transportation through a mobile device, increasing vehicle utilization

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Salvador Resilience Strategy
2. Salvador Municipality
3. desafiosconsentido.crowdicity.com
4. Salvador Card
**BACKGROUND**

- Population: 6.5M
- GDP per capita: 17,730 USD

**DID YOU KNOW**

- The city operates a start-up Rio project that has annual editions to foster a culture of entrepreneurship to turn Rio de Janeiro into an international reference center in digital technology.
- The economy of the city is mainly based on services and the city ranks as the 5th smartest city in Latin America, as per smart city journal.

**KEY CHALLENGES FOR RESILIENCE**

- **Relationship with Water**: Mismanagement, wasteful use, disorganized urbanization and over-reliance on a source.
- **Relationship with Infrastructure**: Poorly equipped urban spaces' failure to deal with citizens' needs with population increase.
- **Relationship with Each Other**: Social inequality caused by unequal provision of services and economic opportunities.
- **Climate Change and Natural Events**: Natural hazards like flooding, storms, etc., and extreme climate change.
- **Criminality**: High crime rate and lack of security impacting the city.

**PILLARS OF RESILIENCE STRATEGY**

1. **EMBRACE OUR WATER**
   - Ensure clean water in the rivers, lakes and beaches and foster vibrant tourism and economic activities.

2. **BUILD OUR FUTURE**
   - Promote safe, green, climate-smart urban spaces and the well-being of citizens, and ensure housing and high-quality basic services, especially sanitation, is available to all.

3. **EMPOWER OUR PEOPLE**
   - Offer plenty of jobs within a diversified, inclusive, low-carbon and circular economy to empower citizens; also offer them an opportunity to participate actively in the decisions that affect them and learn, prevent, mobilize and grow from the shocks and stresses that affect the city.

**STRATEGIC INITIATIVES (COVERING ALL PILLARS)**

- **STRATEGIC PLAN 2017-20**
  - Defines specific goals, indicators and budget to help achieve near future goals, which invariably help achieve Rio Vision 500 aspirations.

- **RIO VISION 500**
  - Created in 2015 when Rio completed 450 years, the strategy targets aspirations in the next 50 years for Rio.
RIO DE JANEIRO

DIGITAL CITY DATA

<table>
<thead>
<tr>
<th>COUNTRY</th>
<th>CITY</th>
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</thead>
<tbody>
<tr>
<td>Innovation Score (0-100)</td>
<td>42</td>
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<tr>
<td>Open data &amp; online services offered by govt.</td>
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<td>Govt. commitment to Financial Inclusion (low (20)-high (100))</td>
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</tbody>
</table>

SELECTED DIGITAL INITIATIVES

Carioca Digital

Involves use of a website to deliver electronic services to citizens. Offerings include school report cards, availability of buses in nearby localities, parking cards, contact for citizen service center, business registration records etc.

Monitoring Climate Trends

Aims to establish permanent, integrated and multidisciplinary climate monitoring, with the involvement of city departments, other spheres of government, NGOs and citizens

Simulations for Crisis Response

Involves preparation and testing first response capabilities of different private/public departments towards highly complex problems thus increasing effectiveness and practical knowledge in real life situations

Early Warning System (EWS)

Aims at providing warning ahead of calamities by monitoring weather change via meteorological radars and relaying information to the operations center and intimating citizens via a public information platform

Rio Operations Center

Involves integration of data and monitoring functions of ~30 municipal, state agencies and corresponding utilities together. Like a crisis room, the center is meant to optimize city functioning, especially during emergency situations

Investment Impact Evaluation

Involves development of a tool to calculate the social and environmental impacts of new investments, public and private, considering indicators such as carbon emissions, job creation and the potential for circularity

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Involves promotion of new and segregated BRT lines, light rail vehicle and bike lanes - that can help minimize shocks and chronic stresses of the city. These plans must analyze impact of microclimates in neighborhoods, effects on walkability, exposure to climate shocks, adequate public lighting, etc.

Smart Grid LED Street Lighting
Focuses on provision of low-cost luminosity including remote detection of defects, adjustable dimming and the use of flickering as alerts during an emergency. The lighting can also host sensors, for present and future use cases related to traffic, security, microclimate, flooding detection, crime warning, etc.

Integrated Traffic Management
Involves monitoring main and alternate routes in the city in real time. It integrates infrastructure such as traffic lights, variable message signs, cameras, and other sensors, and monitors bus fleets as well. This whole network is integrated with Rio’s operation center, which also receives information from urban mobility operations centers.

Contactless Payments for MetroRio
Aids in making contactless and hassle free payments by passengers travelling on the metro using an open loop system that enables payments via credit cards, mobile phones, wearables etc.
KEY OPPORTUNITIES

- **Aggregated consumer records from a variety of means** such as mobility data from payment terminals, POS transactional data etc., to analyze and better understand and plan programs for city management and economic growth

- **Digital card based payments system for salary disbursement** to improve the efficiency in funds allocation for employees

- **Remote monitoring of pipe conditions using sensors** to prevent and reduce water leakages for early identification of leaks

- **Water quality monitoring** in real-time in rivers/water bodies using sensors and deliver alerts to the public via channels such as mobile app, email, text, or website

- **Track of consumption of water via feedback** received through mobile app, email, text, to increase awareness and reduce consumption

- **Smart water meters** to measure consumption remotely at utility companies, reducing labor costs for manual meter reading and enabling dynamic pricing

- **Improvement in employability** of citizens through online retraining programs to help individuals who are unemployed or at risk of becoming unemployed gain new skills

- **E-learning platforms** to reduce the digital illiteracy and empower all individuals with equal digital opportunities

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Rio de Janeiro Resilience Strategy
2. Carioca.rio
3. City’s Early Warning System For Heavy Rain, ELLA
4. C40 Cities
5. Global BRT Data website
6. International Case Studies of Smart Cities, Inter-American Development Bank
7. ‘MetroRio launches contactless transit ticketing payments in Brazil’, NFCW
PORTO ALEGRE

BACKGROUND

1.4M
Population

19,250 USD
GDP per capita

DID YOU KNOW

• One of the country’s largest cities, Porto Alegre is second only to São Paulo in commercial and industrial importance in southern Brazil
• Porto Alegre was awarded the World Smart City award (by SmartCity Expo) in 2014
• It is one of the first Latin cities to have smart station and PoA enabled bike sharing facility

KEY CHALLENGES FOR RESILIENCE

- Poor Economic Diversification
  Low diversification prohibiting growth and innovation

- Low Quality of Life
  Inequality, lack of integration, poor quality initiative

- Human Immobility
  Poor public transport and connectivity, lack of accessibility

- Natural Disasters
  Poor risk management from natural disasters

- Land Regulation
  Lack of clarity around land regulation and occupation

- Resilience of City Planning
  Lack of resilience within the strategies of city planning

PILLARS OF RESILIENCE STRATEGY

1. DYNAMIC AND INNOVATIVE ECOSYSTEM
   Foster creative, collaborative economies and new technologies

2. CULTURE OF PEACE
   Democratize access to quality education, preventive health and citizen security

3. QUALITY MOBILITY
   Create a mobility system that meets the needs of Porto Alegre

4. RISK PREVENTION
   Develop a risk prevention system and protect families and avoid displacement of people

5. LEGAL LAND
   Establish a land regularization process capable of eliminating informal occupations

6. BUDGETING AND RESILIENT MANAGEMENT
   Enable a participatory management model that promotes a culture of resilience
Involves mapping the city’s innovation and technology ecosystem by connecting actors in the ecosystem of innovation (startups). It offers a content distribution channel on innovation, technology and entrepreneurship to foster the city’s entrepreneurship.

**ObservaPOA**

Involves access of demographic and socio-economic information of the city, allowing crosschecks of illiteracy rate and number of neighborhood schools via a personal computer or smartphone.

**Wireless Internet Program**

Involves provision of free wireless internet access available through radio equipment connected to the fiber network (information highway) at major parks, squares, important buildings, such as the municipal market, cultural center etc.

**Porto Alegre.cc**

Involves launch of wikicity for Porto Alegre, that maps each of the 82 city districts, on the website, through which citizens can give their opinion, create wikispots and stimulate discussion.

**Fourth District**

Focuses on creating and promoting a self-sustaining, safe, and creative economy to fuel growth and entrepreneurial innovation in ‘The 4th District’ Porto Alegre. It is intended to be a technological hub in the city.

**Wireless Health- Infovia**

Involves creation of an integrated information system that qualifies the user service, the working conditions and the management of healthcare activities in the capital by creating electronic records etc.
URBAN MOBILITY INITIATIVES

**Smart Roads**
Involves provision of efficient roads through structure of fiber optics, surveillance cameras at major intersections etc., to allow for traffic monitoring and rapid response to accidents and problems in the flow.

**Accessible Transportation**
Involves use of various initiatives for improving accessibility like: (1) the "Accessible Route", that intends to make service, tourism and culture sites accessible to all; (2) "Blue Area", that offers free parking to people with disabilities; (3) "Free Pass", to offer free bus pass to mentally, physically, visually or hearing disabled persons.

**Fleet Qualification Plan**
Involves development of a fleet qualification plan for the use of BRTs and Eco Buses by supplying them with alternative fuels, focusing on improving the quality of transportation and making the system less polluted and have slower depreciation.

**Loop-Bike PoA**
Involves development of Latin America and the Caribbean’s first virtual bike-sharing station that provides a PoA system with compact FIT bikes and allows the person to withdraw a bike in a specific station by sending a text to a pre-paid system. In addition to bikes and Smart Stations, there is also an app for users, management system for operators, etc.
PORTO ALEGRE

KEY OPPORTUNITIES

- **Government sponsored loan payment disbursement** to businesses by making lines of credit available on cards making it easier in comparison to cash
- **Distribution of funds for social benefit** in a card based format to vulnerable populations for easier and transparent access to funds (and to drive financial inclusion)
- **Open loop payment system** that offers a secure digital payment experience that can work across multiple modes of transport
- **Car sharing through digital means** to manage access to short-term car use without full ownership; can be round-trip (station-based), one-way (free-floating), peer-to-peer, or fractional
- **Multiple use cases for infrastructure layer of sensors** across the city in collaboration with the innovative start-up ecosystem present to bridge social inequity
- **Geo-spatial urban planning** to assess the rate of informal settlement occurrence as compared to the rate of new housing development expansion and to visualize patterns of informal settlement distribution for targeted actions

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Porto Alegre Resilience Strategy
2. ‘Porto Alegre—a Brazilian city searching to be smarter’, 14th Annual International Conference on Digital Government Research
3. ‘Porto Alegre, Brazil: Fourth District’, Medium
4. Global BRT Data website
BACKGROUND

Population: 7.3M
GDP per capita: 29,950 USD

DID YOU KNOW

- Santiago was the winner of several awards for sustainable mobility, one of which was the 2017 Sustainable Transport Award for improving infrastructure for active modes of transportation.
- In 2019, the city ranked as Latin America and the Caribbean’s smartest city, taking 66th place internationally, in the ranking of world’s smart cities published by the Center for Globalization and Strategy of the IESE Business School.

KEY CHALLENGES FOR RESILIENCE

- Unplanned Mobility: Inefficiency and challenges faced in public transport system.
- Security Concerns: Crime scenarios enhanced by high drop-out and unemployment.
- Environmental Issues: Air pollution, lack of green areas, poor waste management.
- Natural Disasters: Vulnerability to natural disasters like drought, landslide, earthquake.
- Urban Segregation: Divide between urban-rural communities and infrastructure.

PILLARS OF RESILIENCE STRATEGY

1. **URBAN MOBILITY**
   - Prioritize public transport, cyclists, and pedestrians over automobiles and offer a reliable, safe, sustainable and intelligent integrated mobility system.

2. **ENVIRONMENT**
   - Use natural resources responsibly to ensure city growth is in harmony with the environment and provide equal access to green areas and high-quality urban parks.

3. **SECURITY**
   - Promote peaceful coexistence of inhabitants by understanding the multi-causality of crime and address it in a collaborative, coordinated, strategic and intelligent manner.

4. **RISK MANAGEMENT**
   - Prepare for future disasters, thus reducing related damages and impacts, by learning from the city’s history as well as history of others.

5. **ECONOMIC DEVELOPMENT**
   - Create new opportunities, amid an ecosystem of regional innovation, entrepreneurship and circular economy for a territorially equitable city.

6. **SOCIAL EQUITY**
   - Reduce social gaps, inequality and territorial fragmentation to ensure provision of benefits and opportunities that the city provides.

SANTIAGO METROPOLITAN REGION

DID YOU KNOW

- Santiago was the winner of several awards for sustainable mobility, one of which was the 2017 Sustainable Transport Award for improving infrastructure for active modes of transportation.
- In 2019, the city ranked as Latin America and the Caribbean’s smartest city, taking 66th place internationally, in the ranking of world’s smart cities published by the Center for Globalization and Strategy of the IESE Business School.

Population: 7.3M
GDP per capita: 29,950 USD

SANTIAGO

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SELECTED DIGITAL INITIATIVES

**Waste Management Center and Apps**
Involves use of a technology waste center for research on new waste management techniques and practices and for creating a database of waste information. Efforts also involve citizen engagement via mobile apps for waste collection.

**Integrated Tele-protection Network**
Involves integration and interoperability of surveillance cameras operated by public and private institutions across the city for a greater response ability to mass casualty incidents and the reinforcement of crime prevention.

**Regional Street People Policy**
Promotes regional adaptation of National policy that includes the creation of an IT platform for PSC with a digital registry, and collection and centralization of information to create better-tailored programs for this vulnerable group.

**Ciudad Intelligente Regional Program**
Focuses on improvement of services and infrastructure with initiatives like sustainable mobility, coordination of city emergencies, collaboration between stakeholders to foster innovation, crime prevention protocols and apps.

**Disaster Management Center**
Focuses on monitoring, collection, analysis, and sharing of information among several institutions at a single operational point, in order to prioritize actions in times of crisis and disaster, and make effective and timely decisions.

**Co-Creation Program**
Involves development of solutions proposed by civil society, private companies, government agencies etc., through a collaborative process. Some initiatives include lab of metropolitan challenges for an intelligent region, funds to strengthen scientific research etc.
**SANTIAGO METROPOLITAN REGION**

**URBAN MOBILITY MODAL SPLIT**

(\(\%\) of all trips in a single day occurring on a particular mode)

| Data not available publicly |

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**URBAN MOBILITY INITIATIVES**

**Data Value\(^1\,\,\,^3\)**

Involves collection and use of updated data generated by the transport network for decision-making for public and freight transport systems. Additionally, Santiago metro has digital signage systems at 18 smart stations for providing up-to-date passenger travel information like potential delays etc.

**Urban-Rural Mobility Integration\(^1\)**

Focuses on development of an intermodal plan aimed at identifying relevant transfer points from rural areas and implementing a fare integration model, improving operation of rural buses and developing intercity bus terminals for intermodal points.

**Santiago Pedal Plan\(^1\)**

Involves promotion of active mobility via actions like; implementing an inter-municipal system of self-service bicycles and promoting its integration with the transport system, building a new legislation on use of bicycles as a mode of transport, and developing a 400-km multipurpose trail network in rural areas.

**Electromobility Consortium\(^4\)**

Promotes definition and implementation of a strategy for electric mobility and use of smart city tools and solutions mainly in public transport. The focus is also on identifying barriers for implementation of electro-mobility, developing strategies for establishing market conditions and generating an innovation platform around electric mobility.
KEY OPPORTUNITIES

- Aggregated consumer records from a variety of means to add to the city’s reliance program – data such as mobility data from payment terminals, POS transactional data etc., to analyze and better understand and plan programs for city management and economic growth
- Open loop payment system that offers a secure digital payment experience that can work across multiple modes of transport and support the large ridership
- Data-based advance practices to combat high crime rates, combined with the existing interoperable surveillance network across the city
- Data and analytics based models to identify crime hotspots within the city and deploy greater security via a needs based approach
- Relay of warning and information about natural disaster to all citizens via apps/text messages to alert them about incoming scenarios and offer measures for protection
- Digital platforms offering e-career opportunities and online training programs to help enhance knowledge of individuals and provide opportunities to strengthen economic prospects of vulnerable populations

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Santiago Metropolitan Area Resilience Strategy
2. Chile: Disaster Management Reference Handbook May 2017
3. ‘New digital signage system installed across Chile’s Santiago Metro’, Intelligent Transport
4. ‘How Santiago de Chile Became a Global Leader on Electric Buses’, The City Fix
SANTAFE

BACKGROUND

0.4M
Population

11,683 USD
GDP per capita

DID YOU KNOW

• Santa Fe is one of the oldest towns in Argentina, where walking is the most popular mode of transport (40% modal share)
• The city allows users of rechargeable contactless smart card SUBE to fund it with Bitcoin for payment for public transportation along with 36 other cities in Argentina

KEY CHALLENGES FOR RESILIENCE

- Violence and Crime: Increasing violence, security problems, poor performance of law enforcement, etc.
- Housing Deficit: Precarious housing and slum settlements in low-lying areas at greater risk of flooding
- Environmental Management: Poor management of city activities like waste disposal, recycling, etc.
- Economic Situation: Undeveloped potential to achieve economic diversification
- Transportation and Mobility: Poor urban mobility, lack of public transport options hindering social integration
- Young People and Employment: Lack of employment and economic perspectives of the city

PILLARS OF RESILIENCE STRATEGY

1. EMBRACE CHANGE
Focus on improving the city’s future by improving use of resources by ensuring better management

2. CONNECT TO OPPORTUNITIES
Aim to grow with equity and guarantee access to basic services to all citizens

3. FOSTER CIVIC ENGAGEMENT
Promote a sense of belongingness, social cohesion and the right to the city

4. UNDERSTAND TO INNOVATE
Manage knowledge and take advantage of new technologies to spur local development

DID YOU KNOW

0.4M
Population

11,683 USD
GDP per capita
**SELECTED DIGITAL INITIATIVES**

**Santa Fe Online**
Includes initiatives to improve connectivity and strengthen the ICT sector, by creating a comprehensive plan to ensure residents’ access to efficient internet and mobile telephone services.

**Prevention of Water Borne Disease**
Focuses on the prevention of water borne diseases by increasing the quality and quantity of open data and by analyzing the existing infrastructure and its deficits.

**Idea Generator**
Involves creation of a virtual communication channel where the government will share challenges and projects, and citizens will be able to share ideas and partner with the city to analyze/tackle stresses, ensuring citizen participation in public policy.

**Santa Lab**
Involves use of a public innovation library and a collaborative interface that brings together citizen initiatives on lines of innovation co-managed by the state, citizens, organizations and companies.

**E-Government Program**
Involves use of a website that makes information and procedures available to citizens on services like mobility, taxation, driver’s license, parking system and even provides a web platform to conduct online processes.

**Monitoring and Control Center**
Involves creation of a Monitoring and Control Center (MCC), with state-of-the-art technology and qualified resources to manage/supervise the city’s infrastructure systems by acquiring premises and integrating the four systems: safety, risk management, mobility and citizen service.

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**DIGITAL CITY DATA**

<table>
<thead>
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<th>Innovation Score (0-100)</th>
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(% of all trips in a single day occurring on a particular mode)

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<td>17%</td>
<td>26%</td>
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URBAN MOBILITY INITIATIVES

Comprehensive Mobility Plan
Involves creation of a mobility plan taking into consideration the socio-economic growth of the metropolitan area, intercity connection, vehicular traffic in main highways, city access roads, location of key infrastructure works, transport systems and railway network in the region.

Subite a la bici
Involves use of a public bike-sharing system, focused on promoting numerous health, social and environmental benefits, while also stimulating a bike culture and raising awareness of active mobility. There are ~10k registered users who use these cycles from 185 bicycle stations.

Measured Parking System
Involves implementation of a metered parking system by allowing users to register online and manage parking services by downloading the app. Text messages containing specific words can also be sent to enter and exit after making payments for using the parking meter.

INTERPUERTOS Project
Involves initiatives that will transform the former municipal freight facilities into a modern center for freight transfer and logistical operations. Even headquarters of the main transport companies will be located with necessary facilities for cold logistics (refrigerated products), facilities for drivers to rest, cross-docking services, and warehouses.
KEY OPPORTUNITIES

- **Open loop payment system** that offers a secure digital payment experience that can work across multiple modes of transport
- **Distribution of funds for social benefit** in a card based format to vulnerable populations for easier and transparent access to funds (and to drive financial inclusion)
- **Digital card based payments system for salary disbursement** to improve the efficiency in funds allocation for employees
- **Payout of economic support** such as scholarships, grants and healthcare benefits through digital means
- **Digital payment solutions for payment for government services** such as utilities, business licenses, registration and other services like tax payments etc.
- **Local connection platforms** (on websites or mobile apps) to help people connect with and potentially meet others in their community
- **Improvement in employability of** citizens through online retraining programs to help individuals who are unemployed or at risk of becoming unemployed gain new skills

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Santa Fe Resilience Strategy, 2017
2. OECD iLibrary
3. Santafeciudad.gov.ar
4. Interpuertos.com.ar
5. Ecomobility.org
KEY CHALLENGES FOR RESILIENCE

- **Growing Inequality**: Widening socio-economic gap, access to housing, gender inequality
- **Informal Settlements**: Inadequate provision of infrastructure and public services
- **Impact of Climate Change**: Calamities causing frequent disruption in urban infrastructure
- **Change in labour market**: City needs to adapt to changing workforce in market
- **Regeneration of public spaces**: Growing need to improve the public spaces
- **Digital and Collaborative Economies**: Disruptions and challenges associated with new economies

PILLARS OF RESILIENCE STRATEGY

1. **DIVERSITY, GENDER AND COEXISTENCE**
   Transform the city to promote women’s full development and recognize and promote equity in diversity, equality of opportunities, inclusion and coexistence of all its neighbors

2. **INNOVATION, TALENT AND OPPORTUNITIES**
   Promote equality of opportunities for all by guaranteeing quality inclusive education, learning opportunities that favor access to quality jobs and encouraging innovation and generation of opportunities for economic development

3. **ENVIRONMENT AND SUSTAINABILITY**
   Create a sustainable city that seeks better quality of life, committed to preserving the environment and using resources efficiently

4. **SOCIAL AND URBAN INTEGRATION**
   Contemplate the social and urban integration of all the neighborhoods of the city, focusing on improving access to quality housing, as well as promoting sustainable mobility and metropolitan intramodality

5. **SECURITY AND RISK MANAGEMENT**
   Avoid creating new risks, mitigate existing risks including climate risk, and prepare the city to respond to potential natural and man-made disasters

**DID YOU KNOW**

- Buenos Aires is known for its innovation culture with programs like ‘Startup Buenos Aires’ that connects members, to develop a start-up ecosystem
- The city is popular as a blockchain hotspot with several blockchain projects underway to drive financial inclusion
- Supported by a strong foundation of digital initiatives by the federal government including open government, the city focuses on digital inclusion through digital training and mobile apps/websites
BUENOS AIRES

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SELECTED DIGITAL INITIATIVES

**Warning Systems for Climate Effects**
Involves mitigation of flood risks through Storm Warning System (SAT) that analyses big data to anticipate accurately the arrival of storms and different extreme climate phenomena.

**Open and E-government Initiative**
Involves a government website offering online services for education, healthcare, urban development etc. Government also provides open data on 200 fields for public use to foster innovative solutions and free Wi-Fi access at selected places.

**Digital Tools for Healthcare**
Promotes use of a city run WhatsApp chatbot ‘Boti’ to respond to COVID-19 queries. Additionally, Improvements are being made to remote care, and incorporating medical records and prescriptions into digital formats using text messages, WhatsApp and email.

**IDs using Facial Recognition**
Involves collation and digitization of physical IDs, and the data available on the National Population Register and National Social Insurance Agency, to develop digital facial recognition IDs.

**App BA147 for Citizen Engagement**
Involves creation of an app that allows citizens to directly contact the City administration to issue complaints and receive updates on topics including transport, security, waste collection.

**Tourist Intelligence System (SIT)**
Offers a platform on which information on tourism and big data is open and available for both public and private sectors.
Involves initiative to reduce emissions of polluting gases that are generated by combustion vehicles, with the clear objective of improving quality of life, by using more eco friendly alternatives in public and private transportation (electric bus, BRT to improve efficiency, electric cars, bicycles, etc.)

Involves deploying a comprehensive sensor network plan in collaboration with private players. The focus is on making these sensors available across the city and promote low frequency and low-cost solutions particularly in the mobility space.

Aims to use new tools such as smart signaling, electronic ticketing, integrated timetables and fares, for the management of traffic to facilitate movement within the city of Buenos Aires.

Involves use of a mobile app that allows citizens to check how to get from one point to another in the city by bus, train, subway, bicycle, walking or by car.
SELECTED OPPORTUNITIES

- **Open loop payment system** that offers a secure digital payment experience that can work across multiple modes of transport and support the large ridership.
- **Disbursement of subsidies/financial aid** through prepaid cards to ensure provision of financial assistance to vulnerable groups for food, medicine, etc.
- **Distribution of funds for social benefit** in a card-based format to vulnerable populations for easier and transparent access to funds (and to drive financial inclusion).
- **Resilient housing allocation system** to help poor/vulnerable groups get access to resilient housing settlements through a knowledge transfer on digital platforms.
- **E-hailing provision** via apps for real-time ordering of point-to-point transportation through a mobile device, increasing vehicle utilization.
- **Geo-spatial urban planning** to assess the rate of informal settlement occurrence as compared to the rate of new housing development expansion and to visualize patterns of informal settlement distribution for targeted actions.
- **Digital platforms offering e-career opportunities and online training programs** to help enhance knowledge of individuals and provide opportunities to strengthen economic prospects of vulnerable populations.

SOURCES

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Buenos Aires Resilience Strategy, 2018
2. Digital Government Review of Argentina Accelerating the digitalisation of the public sector, OECD
3. OECD Public Governance Review
4. Buenosaires.gob.ar
5. ‘Buenos Aires uses WhatsApp to assist COVID-19 response’ Cities Today
6. BA Tourist Intelligent System, ThinkDigital.travel
7. Ecomobility.org
8. C40.org
10. ‘Buenos Aires to build comprehensive sensor delivery plan’, Cities Today
11. ‘Case of Argentina’, Smartcity Journal
MONTEVIDEO

BACKGROUND

KEY CHALLENGES FOR RESILIENCE

PILLARS OF RESILIENCE STRATEGY

1.3M
Population

17,277 USD
GDP per capita

DID YOU KNOW

- As per Mercer ranking 2018, Montevideo continues to be ranked as the city with best quality of life in Latin America and the Caribbean (over a decade long streak)
- The city is the financial hub of Uruguay and the cultural anchor of the metropolitan area
- In 2010, Montevideo was the first city in Latin America and the Caribbean to establish an open data policy

EXPANSION OF URBAN AREA AND TERRITORIAL DEVELOPMENT MODEL
Rise in informal settlements, lack of affordable housing

SOCIO-ECONOMIC AND TERRITORIAL INEQUALITY
Poverty stricken population

MOBILITY & TRANSPORTATION
Inadequate public transport and rise in congestion and accidents

ENVIRONMENT
Sustainability and waste management
Improper waste management, biodiversity loss

CLIMATE CHANGE, COASTAL TERRITORIES AND RISK MANAGEMENT
Effects of climate change, severe storms and floods

CONNECTED AND DYNAMIC
Create a dynamic city that is well connected and makes efficient use of its territory via an urban mobility system combining transport modes and prioritizes sustainability, socio-territorial integration and equitable use of the territory

INCLUSIVE AND SUPPORTIVE
Enhance local development based on an inclusive and equitable model, centered on being human-centric. It involves modern participation and decision mechanisms, that are effective and innovative and allow the integration of all people

INNOVATIVE AND CO-CREATIVE
Build a thriving, multifaceted and enjoyable place, combining the city’s role as a tourist capital with industries that are strongly centered on the creative capacity of its inhabitants, the access to knowledge, the commitment to innovation and the promotion of culture

COMMITTED AND PREPARED
Promote a sustainable territory, that protects its coast, water courses, rural environment, natural ecosystems, and manages its solid wastes in an integral way under an economic, social and environmental vision to build an increasingly resilient territory

MONTEVIDEO

GDP per capita

1.3M
Population

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MONTEVIDEO

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SELECTED DIGITAL INITIATIVES

Montevideo ICT 2030 Project
Involves several ICT projects; Antel Arena focuses on the development of a physical space devoted to technological innovation, and Integral mobility management center that focuses on traffic control, monitoring, central management of traffic light, etc.

Real Estate Market Observatory
Involves collection, debugging, analysis and continuous and systematic diffusion of information on real estate market values and changes in trends to generate reference models for better urban planning.

Citizen Laboratory MVD Lab
Involves use of a digital platform that allows a public floor to propose and influence the municipality’s actions. It aims to promote and create a culture of direct citizen participation through digital media.

Transitory Use of Infrastructure
Involves creation of a digital platform for users to access available spaces and obtain said space, under certain conditions of exchange. This way, vacant spaces or those with a higher potential of intensive use will be available to provide opportunities for economic development.

Montevideo Decide
Involves creation of a physical and digital space or citizen laboratory for the production, experimentation and diffusion of innovative projects aimed at creating new and better solutions to the challenges posed by the city.

Policy for an Open Montevideo
Involves an online portal ‘Intendencia de Montevideo’ offering a variety of online procedures related to mobility, housing, availability of healthcare etc. It is based on principles of open data, open services, free software and open knowledge.

* Observatorio Territorio Uruguay indicates that internet penetration reaches 69.3% at a country level.
**MONTEVIDEO**

**URBAN MOBILITY MODAL SPLIT**

(\% of all trips in a single day occurring on a particular mode)

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<td>31%</td>
<td>41%</td>
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**URBAN MOBILITY INITIATIVES**

**Apps to Aid Mobility**

Involves use of apps like Cómo ir that enables users to manage time periods and check for availability of public transport, and Por mi Barrio or In my neighborhood that makes it possible to report incidents and bring them to the notice of required authority.

**Transition Towards Electromobility**

Involves the direct acquisition of 80 electric units for collective public transportation. By 2020, 5\% of Montevideo’s public transportation fleet will correspond to electric vehicles. By 2020, 10\% of Montevideo’s taxi fleet will correspond to electric vehicles and the city will have 40 parking points dedicated to electric vehicles.

**Big Data In Mobility System**

Involves use of several intelligent transportation systems by the Mobility Management Center, that are applied to administration, management, traffic control and transportation of MVD. It possesses technological equipment that allows for acquisition of a large volume of data in real time.

**Digital Traffic Regulation**

Aims at using sensors in several streets in the city to gather information on the amount of vehicles, the periods when more cars move around and the speed at which they do so. Such data enables the municipal to efficiently plan the use of streets and facilitate mobility of vehicles and pedestrians.
**MONTEVIDEO**

**KEY OPPORTUNITIES**

- **Open loop payment system** that offers a secure digital payment experience that can work across multiple modes of transport and support the large ridership
- **Disaster relief monies and humanitarian aid issuance** for vulnerable populations through digital means to ensure correct allocation of funds
- **E-hailing provision** via apps for real-time ordering of point-to-point transportation through a mobile device, increasing vehicle utilization
- **Deployment of sensors to identify busy routes vs. those that aren’t** crowded to optimize bus routes and improve experience in public transport
- **Digital traffic system to promote active mobility** from high usage of personal non-motorized means. For instance, apps connected to traffic lights can be used to connect cyclists with traffic signals and turn them green faster

**SOURCES**

0. Digital Cities Index 2020, Visa and Resilient Cities Network
1. Montevideo Resilience Strategy
2. ‘Smart cities-Uruguay’, Smart City Journal
3. ‘Evolution of smart cities in Latin America’, Smart City Journal
**About Visa Inc.**
Visa Inc. (NYSE: V) is the world’s leader in digital payments. Our mission is to connect the world through the most innovative, reliable and secure payment network - enabling individuals, businesses and economies to thrive. Our advanced global processing network, VisaNet, provides secure and reliable payments around the world, and is capable of handling more than 65,000 transaction messages a second. The company’s relentless focus on innovation is a catalyst for the rapid growth of digital commerce on any device for everyone, everywhere. As the world moves from analog to digital, Visa is applying our brand, products, people, network and scale to reshape the future of commerce. For more information, visit About Visa, visa.com/blog and @VisaNews.

**About Resilient Cities Network**
Resilient Cities Network is a city-led organization comprising 97 member cities in over 40 countries, that drives urban resilience action to protect vulnerable communities from climate change and other physical, social and economic adversities. With support from The Rockefeller Foundation and other partners, Resilient Cities Network gathers a global network of City Chief Resilience Officers dedicated to future-proofing their communities and critical infrastructure from acute shocks and chronic stresses. In connection with a wide range of partners from the public and private sectors, Resilient Cities Network is the leading organization acting to create a safer and more equitable urban future.

Resilient Cities Network includes the following member cities in Latin America and the Caribbean: Ciudad Juárez, Municipality of Colima, Metropolitan Guadalajara and Mexico City, in Mexico; Santiago de los Caballeros in Dominican Republic; San Juan in Puerto Rico; Panama City, in Panama; Cali and Medellin in Colombia; Quito in Ecuador; Salvador, Rio de Janeiro and Porto Alegre in Brazil; Montevideo in Uruguay; Santiago Metropolitan Region in Chile and Santa Fe and Buenos Aires in Argentina.

For more information, please contact:
LACSmartCities@visa.com
media@resilientcitiesnetwork.org