

POLISDIGITOCRACY: Citizen Engagement for Climate Action through Digital Technologies

Shannon Lawrence
Director of Global Initiatives, C40

Júlia López Ventura
Regional Director for Europe, C40

Léan Doody
Smart Cities Leader, Arup

Pedro Peracio
Chief Digital Officer of the Municipality
of Rio de Janeiro



- The article has been co-written by authors from the following institutions:
- C40 Cities Climate Leadership Group (C40), a network gathering more than 80 of the world's largest cities, focused on tackling climate change;
 - Arup, a global consultancy firm which specializes in delivering innovative and sustainable designs that reinvent the built environment: Arup has partnered with C40 since 2009 to deliver research on how cities contribute to climate change mitigation and adaptation;
 - The Rio de Janeiro Municipality, particularly advanced on smart city strategies and where the concept of "polisdigitocracy" comes from.

KEYWORDS

- POLISDIGITOCRACY
- DIGITAL TECHNOLOGIES
- CLIMATE CHANGE
- DEMOCRACY
- CITIZENS' PARTICIPATION

The article documents some of the actions currently undertaken by cities across the world to fight climate change by engaging citizens through the use of digital technologies, based on an extensive survey conducted by C40 and Arup in 2015. In addition to being a strategy employed to fight climate change, the authors note examples of cities engaging citizens in the design and implementation of their "smart" or "digital" strategies more broadly. The article goes into the concept of "polisdigitocracy", a term first coined by the mayor of Rio de Janeiro, Eduardo Paes, in 2013, that refers to a new form of governance in which digital technologies can help to renew citizen engagement while enabling cities to tackle climate change and address other urban challenges more efficiently.

INTRODUCTION

Cities are already experiencing the effects of climate change and are increasingly taking action to reduce emissions, adapt to the new risks and mitigate the worst impacts of a warming planet. With the rates of urbanization increasing around the globe, the role of cities in global climate change mitigation and adaptation will be of even greater importance in the coming decades.

Created and led by cities, the C40 Cities Climate Leadership Group (C40), which connects more than 80 of the world's largest cities, is focused on tackling climate change and driving urban action to reduce greenhouse gas emissions and climate risks.

Digital technologies offer a powerful tool that cities can leverage in order to mitigate and adapt to climate change. The notion of "smart city" has recently gained momentum and almost all cities are now implementing their own "smart" strategy; notably, C40 cities are taking over 500 actions to deliver improved services through the use of ICT/smart city technologies. A lot of cities tend to focus only on the technical elements of smart city programs and the efficiency and economy gains that digital technologies bring. But there is also the opportunity to promote the political element of "smart cities" by engaging citizens in through digital means. This vision of "digital cities" embraces a holistic approach to the efficiency, economy and political benefits that technology can offer.

The concept of "polisdigitocracy", outlined by Eduardo Paes, Mayor of Rio de Janeiro and C40

Chair, is particularly relevant in this context. It calls for engaging citizens through the use of digital technologies when designing and implementing climate action and other urban strategies. C40 and Arup recently produced a report entitled “Polisdigitocracy: Digital Technology, Citizen Engagement and Climate Action”¹ that aims to assist cities in designing and implementing effective participatory climate action, with the help of digital technology. “Polisdigitocracy” can be an important strategy for creating more sustainable, livable and equitable cities.

¹ “Polisdigitocracy: Digital Technology, Citizen Engagement and Climate Action”, C40 and Arup, November 2015 (http://publications.arup.com/-/media/Publications/Files/Publications/P/C40_Polisdigitocracy_Report_v2b.asx)

1. A NEW CONTEXT FOR CITIES: A GROWING VULNERABILITY TO CLIMATE CHANGE

Today cities are on the frontline of climate change. They are both vulnerable to climate impacts and responsible for a significant share of global emissions.

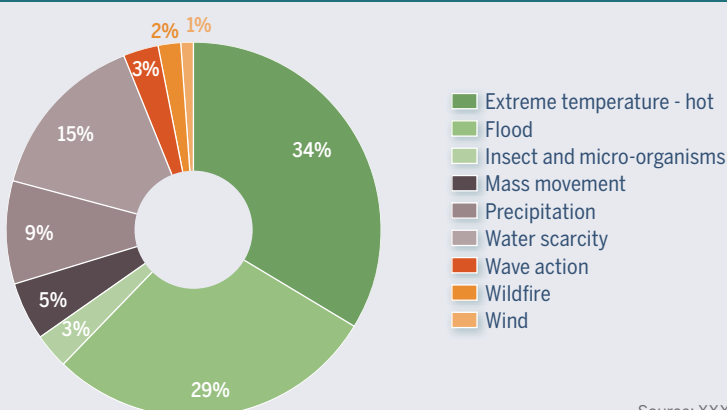
1.1. CITIES ARE HIGHLY VULNERABLE TO CLIMATE HAZARDS

Cities are particularly vulnerable to climate hazards, from sea level rise to severe heat waves, which can disrupt city services and pose serious hazards to citizens’ health and wellbeing, as well as vital infrastructure. The locations and human and economic densities of cities are factors of high vulnerability. Many urban areas are coastal, putting cities at greater risk of flooding from rising sea levels and powerful storms. High population density also increases cities’ vulnerability to climate change.

70% of C40 cities report they are already experiencing the impacts of climate change. Extreme temperature and flooding are the most common hazards experienced by cities, accounting for 63% of all climate change hazards reported globally².

² “Climate Action in Megacities 3.0”, C40 and Arup, December 2015 (<http://cam3.c40.org/#!/main/home>)

Most common climate hazards currently experienced in C40 cities



Source: XXXXX

70% OF ENERGY related global CO₂ emissions originate in cities today

Since 2011, C40 cities have taken over

10,000 ACTIONS to reduce emissions and adapt to climate change

1.2. THE NATURE OF CLIMATE HAZARDS IS CHANGING

While cities have long managed the risks posed by both sudden and chronic climate hazards, they are also increasingly facing hazards that they had rarely, if ever, experienced before. As a result, the proportion of adaptation actions as a percentage of overall climate actions has been continuously increasing since 2011. While it represented 11% of all climate actions reported by C40 cities in 2011, it increased to 16% in 2015³.

Major threats also significantly differ from one global region to the other. North American cities experience more extreme temperatures (40%) than any other region, while European cities report the highest proportion of flooding hazards (30%). 62% of all mass movement hazards (e.g. landslides, earthquakes) are reported by Latin American cities.

As urbanization increases, building resilience, both against immediate climate hazards and to withstand the longer-term impacts of climate change, is an increasingly important agenda for mayors and city governments.

2. CITIES: A LEADING FORCE IN TACKLING CLIMATE CHANGE

2.1. CITIES HAVE A CENTRAL ROLE TO PLAY IN CLIMATE CHANGE MITIGATION

While cities are particularly vulnerable to climate change, they are also partly responsible for it. Indeed, cities concentrate the majority of energy consumption and CO₂ emissions. Today, 70% of the world’s energy is consumed in cities and 70% of energy-related CO₂ emissions originate in urban areas. With the many countries expected to rapidly urbanize in the following decades, these trends are only likely to increase. As such, cities must be key players in global efforts to tackle climate change.

³ “Climate Action in Megacities 3.0”, C40 and Arup, December 2015

World cloud for the climate hazards cities expect to face in the future: the size of each word indicates the number of times it was mentioned by cities as a future hazard.



Research produced by C40 and Stockholm Environment Institute has shown that a third of the global safe carbon budget – the total amount of greenhouse gas emissions we can risk putting into the atmosphere – will be determined by urban policy decisions made between now and 2020. Therefore, the mayors in office now are pivotal actors in delivering climate change solutions.

The co-benefits of climate action – beyond greenhouse gas emission reductions – are also critical for cities. The same actions that reduce carbon emissions also help reduce air pollution, improve public health, and help cities attract new residents and businesses.

2.2. CITIES ARE INCREASINGLY UNDERTAKING CLIMATE ACTIONS

Founded in 2005, C40 is a network of the world's megacities committed to addressing climate change. C40 supports cities to collaborate, share knowledge and drive meaningful, measurable and sustainable action on climate change. Today the organization connects more than 80 of the world's greatest cities, representing 650 million people and one quarter of the global economy. Through their involvement in the network, C40 mayors have made ambitious commitments to take substantial action on climate change by reducing their emissions by more than 3 gigatons of CO₂ by 2030 – the equivalent of taking 600 million cars off the road.

Anne Hidalgo, Mayor of Paris, summarized the ambition of the network as follows: *“As mayors, we all face similar challenges and have to innovate to solve them, often in the same ways. The C40 network connects us all, enabling us to share ideas and collaborate, working together towards a greener, healthier future.”*

Since 2011, C40 cities have taken over 10,000 actions to reduce emissions and adapt to climate change. 30 of C40 cities' members have also reported an absolute reduction in their greenhouse gas emissions since 2009⁴.

While the number of climate actions undertaken by cities has increased in recent years, the scale of actions is also increasing. For example, in 2011 the majority of climate actions were at a “pilot” stage, but the latest data shows a significant shift towards citywide projects (51% of climate actions undertaken in 2015 were implemented at city level).

By demonstrating that climate action is possible to deliver, scalable, and relevant across all regions, cities are leading the charge to achieving the ambitious climate action required on a global scale and act as real change-makers in addressing climate change.

2.3. ICTS ARE A KEY TOOL TO IMPROVE CITY MANAGEMENT AND COMBAT CLIMATE CHANGE

Information and communications technologies (ICT) provide a powerful tool for cities to deliver climate action. Urban sensing (through the use of environmental sensors), big data and analytics enable better understanding of the real-time functioning of cities as well as informing longer-term planning and policy decisions.

C40 cities are taking over 500 actions to deliver improved services through the use of ICT/smart city technologies. These range from improved public transport through smart cards and real-time route information, to smart meters driving building energy efficiency, to improving connectivity through access to public computers and wireless hotspots. Over 80% of C40 cities are dedicating staff with specific responsibility to support citywide ICT services. Approximately 80% of C40 cities are sharing online data sets with citizens publicly and 90% of cities directly connect the mayor and city officials with citizens through social media and web platforms.⁵

As illustrated above, there are many different ways that ICTs, including digital technologies, can be used in fighting climate change today. Examples include flood-related actions (e.g. flood mapping using digital technologies), lighting-related programs (e.g. smart outdoor lighting systems), and energy-optimization programs (e.g. smart grids and intelligent transport systems).

70% OF C40 CITIES are already experiencing the impacts of climate change and adaptation actions have increased from 11% of all actions reported by C40 cities in 2011 to 16% in 2015

Over **80% OF CITIES** are dedicating staff with specific responsibility to support citywide information and communications technologies services

Approximately **80% OF CITIES** are sharing online data sets with citizens publicly

⁴ “Climate Action in Megacities 3.0”, C40 and Arup, December 2015

⁵ “Climate Action in Megacities 3.0”, C40 and Arup, December 2015

FOCUS 1: CENTER OF OPERATIONS IN RIO DE JANEIRO

Sea level rise or heavy rain can lead to flooding in both coastal and inland cities and this issue is becoming an increasing concern as extreme weather events become more frequent. Some cities have turned to ICTs to guide their flood management strategies, through the identification of flood-prone areas, the detailed mapping of high-risk neighborhoods or broader GIS modelling undertaken for the entire city. A key outcome of such programs is that data is available online to keep citizens in high-risk

neighborhoods informed of the risk they face.

In Rio de Janeiro, after heavy rains and flooding led to landslides that killed more than 50 people in 2010, Mayor Paes established a city operations center in partnership with IBM and Oracle. The Rio Operations Center (COR, acronym in Portuguese) was created primarily for risk management and prevention though it soon became clear that it was also a strategic tool for managing urban mobility and coordinating large-scale events.

The COR ensures coordination across almost 30 city departments, public agencies and utility companies, as well as State Government's representatives. It enables a new administration model that provides communication and coordination between public entities, facilitates information sharing and enables prompt and efficient decision-making processes. The COR also provides and exchanges information with the public through the media and social networks.

FOCUS 2: CHANGWON'S SMART GRID AND COOL ROOFS INITIATIVES

Changwon in South Korea decided to test a new smart grid project: the smart grid will be connected to 60 small and medium-sized companies to facilitate response to increased demand and energy efficiency, and enable a greater integration of renewable energy resources, thus reducing emissions. This smart grid requires an investment of more than \$10 million, some of which will be financed through grants and subsidies.

Changwon has also developed a pilot program to subsidize cool roofs (heat-reflective surfaces) and applied techniques developed in Tokyo to improve its heat reduction measurement methodologies. The result is to reduce the urban heat island effect and vulnerability to extreme heat waves. The need for air conditioning systems will also be reduced, thereby cutting greenhouse gas emissions.

FOCUS 4: CREATING COLLABORATIVE SUSTAINABILITY MAPS WITH CITIZENS IN BARCELONA

In 2015, the City of Barcelona created the B+S Map (Barcelona Més Sostenible)⁶, a web-based virtual, interactive and collaborative map that visualized everything that the city was doing to increase its sustainability. The map provides practical information and details of projects, signposted with QR codes, as well as citizen feedback about their experiences. By making such information available the map is intended to be a tool for community recognition, communication and awareness.

⁶ <http://www.bcnostenible.cat/en/mapa/index>

FOCUS 3: STRENGTHENING ENERGY EFFICIENCY IN BUILDINGS IN CAPE TOWN

In Cape Town, the *Energy Efficiency in Buildings program* helps reduce electricity consumption through a range of behavioral and technological changes. Cape Town has completed retrofitting of approximately 26% of its large municipal buildings and has installed smart electricity meters in more than half of its largest administrative buildings. The meters will allow the continuous monitoring of electricity usage by each department. This is combined with technical and practical training of city staff on how to extract, read and interpret the smart meter data. The city also runs a behavior change program to enable building managers and users to effectively manage electricity consumption within their buildings. A campaign on energy savings was launched at the same time, targeting residential and commercial consumers. For the commercial sector, a knowledge sharing forum was set up in partnership with the public utility provider and the South African Property Owners Association (SAPOA).

Approximately
90% OF CITIES
directly connect the mayor
and city officials with citizens
through social media and
web platforms

Arup's research predicts that
the global market for smart
systems will be around
\$400 BILLION
by 2020

FOCUS 5: DISTRICT-SCALE DEVELOPMENTS: CONSTRUCTING STOCKHOLM ROYAL SEAPORT

The Stockholm Royal Seaport⁷ is a major urban development project that will provide 10,000 homes and 30,000 workspaces when finished in 2025. The new district is built in the city center, adjacent to Frihamnen docks. Stockholm Royal Seaport will be the first city district in the world to feature full-scale smart grids.

Stockholm Royal Seaport will be a living and integrated city district, built with the human scale in mind. Co-benefits include: cost savings due to lower resource use (energy, transport, waste) over the long term; green growth by creating green jobs in the clean tech sector; a stronger community through the creation of IT-based networks, project groups and residents association; and the proximity to and availability of green structures.

⁷ <http://www.stockholmroyalseaport.com/en/>

The potential co-benefits of using digital technologies in the fight against climate change are numerous. Research by Arup identified five main potential outcomes of the digital city⁸:

- Functional benefit: improving the efficiency and integration of urban systems
- Humane benefit: supporting citizens through greater connectivity and improving their well-being
- Economic benefit: developing a market for smart systems (Arup's research predicts that it will be around \$400 billion globally by 2020⁹)
- Environmental benefit: increasing resource efficiency and reducing carbon outputs
- Political benefit: driving community engagement and empowerment

To achieve those benefits though, cities have to go beyond the simple implementation of technologies. Citizen engagement in digital programs is one of the best ways to enable broader public buy-in and participation in climate action.

⁸ "Delivering the Smart City", Arup, 2014: http://publications.arup.com/publications/d/delivering_the_smart_city

⁹ Department for Business Innovation & Skills, "The Smart City Market: Opportunities for the UK", BIS, London, 2013: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/249423/bis-13-1217-smart-city-market-opportunities-uk.pdf

3. "POLISDIGITOCRACY": HOW DIGITAL TECHNOLOGIES CAN SUPPORT CITIZEN ENGAGEMENT TO DRIVE CLIMATE ACTION

Technological fixes alone cannot solve the problem of climate change or other major challenges faced by cities, which is why citizen engagement is essential.

First, because the most relevant and accurate data about the impacts of climate change is in the hands of citizens themselves, as Mandy Ikert, Head of C40's Water and Adaptation Initiative, pointed out: "A lot of the data we need to understand city climate change adaptation and resilience at a local level resides in the citizenry. Our cities are starting to experiment with digital platforms that can crowd-source this data and put it to use both in emergency situations and to inform longer term planning decisions¹⁰."

Also, technologies will bring their best results only if they are coordinated with behavior change efforts (such as in the case of energy efficiency programs). Zoe Springs, Head of C40's Energy Initiative, stated: "Cities in the [C40] network have been grappling for a long time with how they might better use energy data to cultivate enhanced citizen action – and begin to encourage a change in energy usage behaviors¹¹."

As digital technologies continue to define and redefine how cities function and are organized, there is significant opportunity to leverage them for effective climate action. "Polisdigitocracy" can be applied to climate action with great success. The objective is to build upon the nexus of digital technology, citizen voices and climate action in order to maximize the response to climate change.

3.1. "POLISDIGITOCRACY": ENGAGING CITIZENS THROUGH THE USE OF DIGITAL TECHNOLOGIES

The term "polisdigitocracy" was first coined by Mayor Paes of Rio de Janeiro and chair of C40 to refer to a new form of government: "what we are witnessing is the birth of something I call 'polisdigitocracy'. This is a form of government that counts participation and transparency as its cornerstones and uses technology as its guide", Eduardo Paes wrote in *The Huffington Post* in 2013¹².

As analyzed by Mayor Paes, ICTs and globalization facilitated both a crisis of representative democracy and a revival of democratic aspirations: "Debates among citizens are now more agile and much more varied than they were in the Greek agora. [...] People want more participation and collaboration with their government. They demand to be closer to institutions and authorities. The Polis is back and the Internet is the new Agora¹³."

Mayor Paes insists on the opportunity this evolution represents to reinvent democracy and adapt it to contemporary times: "The digital revolution is allowing democracy to recall its foundations and evolution is modernizing and reinforcing our fundamental values¹⁴."

¹⁰ "Climate Action in Megacities 3.0", C40 and Arup, December 2015

¹¹ "Climate Action in Megacities 3.0", C40 and Arup, December 2015

¹² "Polisdigitocracy", by Eduardo Paes, Mayor of Rio de Janeiro, and Chair C40 Cities Climate Leadership Group, *The Huffington Post*, April 10th, 2013.

¹³ "Polisdigitocracy", by Eduardo Paes, Mayor of Rio de Janeiro, and Chair C40 Cities Climate Leadership Group, *The Huffington Post*, April 10th, 2013.

¹⁴ "Polisdigitocracy", by Eduardo Paes, Mayor of Rio de Janeiro, and Chair C40 Cities Climate Leadership Group, *The Huffington Post*, April 10th, 2013.

3.2. DIGITAL PARTICIPATION FOR CLIMATE ACTION: FROM BETTER CITY MANAGEMENT TO MORE DEMOCRATIC EXPRESSION OF CITIZENS

In “*Polisdigitocracy: Digital Technology, Citizen Engagement and Climate Action*”¹⁵, C40 and Arup investigate and document how digital technologies are being used to drive citizen engagement for climate action. The aim of the report is to understand how cities are increasingly using digital platforms, social media, open data, crowdsourcing, hackathons and other engagement tools to create truly participative solutions and unlock climate action. Documenting various examples of programs that belong to the “*polisdigitocracy*” framework also enabled the identification of key success factors for mainstreaming innovative uses of technology for community engagement and empowerment. Findings were drawn from a series of interviews with city governments in the C40 network and key C40 staff, as well as a C40-hosted webinar with representatives from Mexico City, Buenos Aires and Rio de Janeiro.

The report categorizes “*polisdigitocracy*” initiatives by four objectives¹⁶:

- Improving services to citizens
- Improving city planning and projects
- Unlocking community action
- Responding to external pressure

Improving services to citizens

Using digital platforms to crowdsource information from citizens about the real-time functioning of the city can improve services to citizens. *Street Bump*¹⁷ is an example of a mobile application developed in Boston that enables drivers to collect road condition data while driving. The city then aggregates the data across users to provide the city with real-time information to fix short-term problems and plan long-term investments.

City operation centers are another example of programs relying upon technology that enable to better manage a city, in particular in case of emergency. In Rio de Janeiro, a city operation center was created by Mayor Paes in 2010 in response to a landslide that killed more than 50 people (see *Focus 1*). Built in partnership with IBM and Oracle, it is used by decision makers in the city to operate general city services as well as responsive services in case of emergency issues. The center is open to both citizens and media and has a mission to keep citizens informed at all times (through radio stations and a Twitter account). Rio’s operation center thus aligns with the government’s aim to improve transparency and engage citizens.

Improving city planning and projects

Improving city planning by incorporating online engagement into the city’s existing and proposed projects is another objective supported by digital participation. It consists of allowing citizens to participate more directly in decision making through online consultation and participatory budgeting for instance, while ensuring that projects are appropriate for the communities in which they are implemented.

**“CITIES ARE NOT JUST SETTING TARGETS
TO REDUCE EMISSIONS; THEY ARE
MAKING STRONG COMMITMENTS TO
ACHIEVING THOSE WITH PRACTICAL
ACTION PLANS AND INNOVATIVE
SOLUTIONS [...] MAYORS ARE PIVOTAL
ACTORS IN DELIVERING GLOBAL
SOLUTIONS TODAY.”**

*Mapeando*¹⁸ is a project implemented in Rio de Janeiro which enables citizens to suggest physical changes to the city by marking them on an online map. For example, citizens can request where they would like to see new bike lanes through *Mapeando*.

Since 2014, a participatory budgeting experiment has been tested in Paris with the “*Madame la Maire, j’ai une idée/ Madame Mayor, I have an idea*”¹⁹ initiative: citizens can propose and vote for sustainable projects they want to see implemented (e.g. green walls, urban agricultural projects, cycle infrastructure, etc.).

Unlocking community action

Making city data available can also enable citizens to develop their own solutions to climate-oriented challenges, hence unlocking community action and innovation to help tackle climate change. Interesting examples of programs achieving this objective can be found in citizen communication platforms operated in cities around the world.

*Talk London*²⁰, a citizen communication platform designed by the Greater London Authority (GLA) to facilitate online community discussions about the city’s big issues, got its start in 2010 when the GLA crowd-sourced ideas for climate change mitigation. A recent conversation hosted on the platform explored how Londoners could mitigate air pollution in the city.

*LabRio*²¹ is run by a group of young people who caught the mayor’s attention when they used social media to organise protests about bus fares. The Lab now supports citizens in challenging the decision-making processes in Rio City Hall to make them more participative. Lab Rio now manages several different programs, including *Mapeando*, mentioned above.

15 “*Polisdigitocracy: digital technology, citizen engagement and climate action*”, C40 and Arup, November 2015

16 “*Polisdigitocracy: digital technology, citizen engagement and climate action*”, C40 and Arup, November 2015

17 <http://www.streetbump.org/about>

18 <http://mapeando.rio.gov.br/#/>

19 <http://www.nesta.org.uk/news/10-people-centred-smart-city-initiatives/madame-mayor-i-have-idea>

20 <http://talklondon.london.gov.uk/>

21 <http://www.labrio.cc/>

An interesting example of open-data competition is *Climathon*, a hackathon on climate issues that took place simultaneously in 20 cities around the world in 2015. The objective was to tackle climate change issues by leveraging participants' talents. Each participating city set specific climate challenges (e.g. the increase in the take up of solar panels in Beijing), which were then tackled by local participants.

Responding to external pressure

Private companies and community groups are able to leverage digital platforms to make their voices heard, lobby government and hold them to account for their climate commitments and other responsibilities. This new form of external pressure through digital technology is beginning to prove disruptive to city systems, requiring city governments to reassess existing policies as well as manage often very controversial change. One example is Uber, the mobile platform that allows users to 'source' rides by communicating with private vehicle drivers, which has proved disruptive for taxi providers in cities across the world. In Mexico City, where there are 140,000 registered taxis in operation, the introduction of Uber was extremely controversial and incited mass demonstrations. In response the government's CityLab, LabCDMX, hosted a debate with 50 figures from both sides, as well as transportation experts. The core recommendation emerging from this debate was to reduce and simplify fees and formalities aimed at regulating taxis.

3.3. KEY SUCCESS FACTORS FOR SCALING UP INNOVATIVE USES OF TECHNOLOGY FOR COMMUNITY ENGAGEMENT

C40 and Arup's report also identified four building blocks²² that need to be addressed by city governments that seek to develop robust and sustainable digital engagement programs:

- Let everyone participate: raising awareness of and fighting against the digital divide
- Use data effectively: making the right data accessible

²² "Polisdigitocracy: digital technology, citizen engagement and climate action", C40 and Arup, November 2015

- Create capacity to try new things: learning from others to drive innovation
- Work out how to pay for it: encouraging innovative financing and partnerships

Let everyone participate

While digital technologies present an opportunity to increase citizen engagement, not everyone has access to this technology or is comfortable using it. Furthermore, many cities don't have adequate ICT infrastructure to allow the effective use of digital technologies. Cities must seek to reduce the digital divide on the one hand and increase the number of digitally literate people on the other.

Many marginalized groups do not have the political, social, educational or technological capital to raise their voices through social media. On the contrary, other voices may be amplified through social media despite being non-representative. A major challenge for cities is thus to minimize the impact of the digital divide when implementing digital participation. To address this, some cities, like Mexico, Buenos Aires, Paris and New York, combine digital and physical engagement – for example, organizing neighbourhood meetings and consultations in addition to seeking citizen input via an online platform – so as to mitigate the digital divide and have a more inclusive dialogue.

Cities also try to leverage social media and consider the factors responsible for a high take up of social media among citizens in order to foster wider digital participation. For instance, some cities have found that crowdfunding projects for a civic activity tend to be more engaging than city-hosted discussion forums. This is because the former utilizes social media platforms, like Facebook and Twitter, where people are already actively participating, rather than creating separate platforms.

Use data effectively

The second building block is to use data effectively, streamlining and efficiently sharing data across various government agencies and platforms while managing issues around data protection, privacy and maintenance. Privacy and data protection issues can pose a significant challenge and have been a barrier to the implementation of digital programs in some cities.

To try to overcome these challenges, the City Council of Melbourne has convened a "risk board", populated by different representatives of the council, in order to build a consensus on how to manage risk around the city's Open Data Platform.

The *Digital Catapult Trust Framework*²³ has taken another approach to address this issue. It is a voluntary service established by the UK's *Digital Catapult*, part of a network of innovation centers in the UK. The framework enables individuals to unlock the value of their personal data by sharing it freely with the public and private sector.

Create capacity to innovate

Cities also need to ensure that there are mechanisms within city government to take risks and innovate around service provision if they want to foster the use of digital technology. For this, collaboration amongst cities is a powerful tool. Cities are working collaboratively,

²³ <https://www.digitalcatapultcentre.org.uk/open-calls/trust-framework/>

“MAYORS ARE BEGINNING TO REALIZE THE BENEFITS OF INCORPORATING CITIZENS INTO THEIR CITY PROCESSES USING DIGITAL TECHNOLOGY.”

including through C40, to share their experiences and results, and support one another in driving innovative projects.

In Boston, MONUM (*Mayor's Office of New Urban Mechanics*²⁴) acts as a civic innovation incubator and R&D lab organized as a network of innovation groups that connect residents and governments to improve services and opportunities for all. Philadelphia and Utah Valley adopted the same initiative, and the three cities now share *Citizens Connect*, a mobile application incubated at MONUM. Through the application residents can report public issues directly from their smartphones into the city's work order management system so that each problem gets to the right person in City Hall who can fix it.

In Latin America, Mexico City, Buenos Aires and Rio de Janeiro have also decided to join forces and launch a *City Labs* network to support one another in driving innovative projects.

Work out how to pay for it

Finally, innovative financing and partnerships are crucial for the implementation of effective "*polisdigitocracy*". For example, Stockholm used a €70 million budget surplus to create a central pot of money for innovative ICT projects proposed by different city departments which are now able to pitch their ideas to the central budget holder.

In Chicago, the city council partnered with the MacArthur Foundation, which is one of the largest philanthropic foundations in the US, and with the Chicago Community Trust to form the *Smart Chicago Collaborative*, a civic organization focused on technologies so as to improve the quality of life in the city. This partnership enabled the leveraging of funds from the public and third sector to support city government objectives.

²⁴ <http://newurbanmechanics.org/>

CONCLUSION

As cities increasingly face the impacts of climate change and simultaneously scale-up their action to combat it, they will need every tool available to them. ICT and digital technologies are powerful ones, offering cities the opportunity to make efficiency and economy gains in the delivery of services and development of low-carbon infrastructure. But a focus on technology alone fails to address the political element of a "smart city." Engaging citizens and facilitating their participation in city programs through the use of digital technology is key for the success of these programs and for climate action more broadly. This approach, referred to as "polisdigitocracy" by C40 Chair, Mayor Eduardo Paes of Rio de Janeiro, offers a new form of governance for cities seeking to deepen the interest and participation of their citizens in urban policy.

A number of C40 cities are developing more inclusive and effective digital participation programs as a means of tackling climate change. Key factors influencing the success of these programs include broad participation (overcoming the digital divide), the effective use of data, fostering the capacity to innovate within city agencies, and pursuing creative financing options. C40 and Arup will continue to support their city partners to learn from and collaborate with cities around the world in order to scale-up "polisdigitocracy" initiatives to drive deeper, more participatory, and more durable climate action – ultimately creating more livable, sustainable and equitable cities.

“STRIVING TO LET EVERYONE PARTICIPATE, USING DATA EFFECTIVELY, CREATING CAPACITY TO INNOVATE AND ELABORATING INNOVATIVE FINANCING PARTNERSHIPS APPEAR AS THE FOUR MAJOR KEY SUCCESS FACTORS THAT NEED TO BE ADDRESSED BY CITIES, WHEN DESIGNING AND IMPLEMENTING DIGITAL, PARTICIPATORY CLIMATE ACTIONS TODAY.”