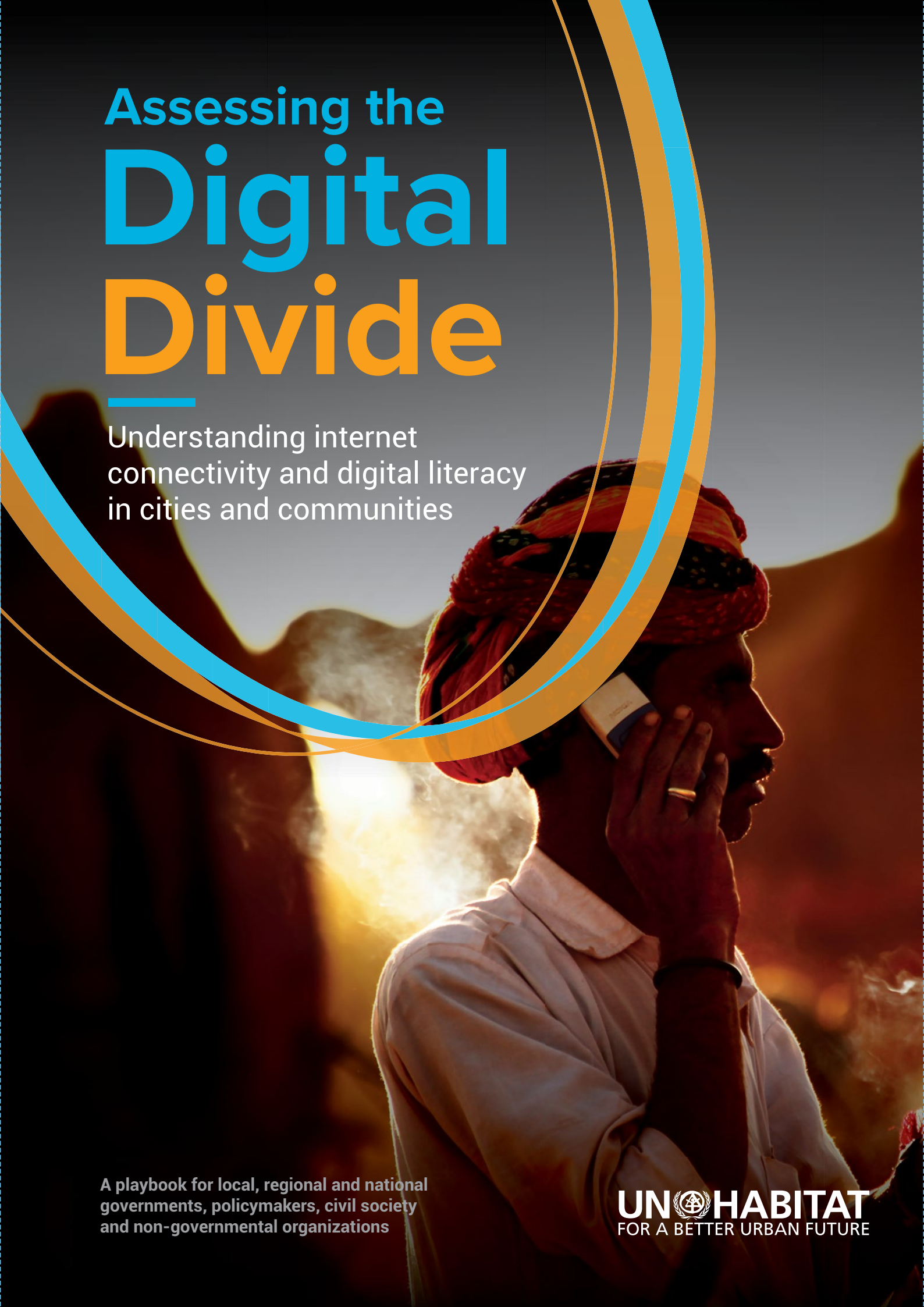
Assessing the Digital Divide

Understanding internet connectivity and digital literacy in cities and communities



A playbook for local, regional and national governments, policymakers, civil society and non-governmental organizations

UN HABITAT
FOR A BETTER URBAN FUTURE

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Assessing the Digital Divide
Understanding internet connectivity and digital literacy in cities and communities

United Nations Human Settlements Programme (UN-Habitat)
P.O. Box 30030 00100 Nairobi GPO KENYA
Tel: 254-020-7623120 (Central Office)
www.unhabitat.org

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Acknowledgements
Project supervisors: Katja Schaefer, Pontus Westerberg
Principal author: Emily Royall
Contributors: Daisy Jia Li, Livia Schaeffer Nonose, Isabel Wetzel
Peer reviewers: Igor Calzada, Calum Handforth, Sahifa Imran, Leandry Nkuidje, Vidar Vasko, Sara Thabit, Leonard Fleck, Giuseppe Tesoriere
Editing: Linnus Kimani, Pontus Westerberg
Design and layout: Austin Ogola

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Foreword

Ms. Maimunah Mohd Sharif

Under-Secretary-General and Executive Director, United Nations Human Settlements Programme (UN-Habitat)

As the agency with the mandate to coordinate urbanisation matters within the UN System, UN-Habitat often highlights that half the world's population - 3.5 billion people - now live in cities. The world is both urbanising and digitising at a rapid pace and we see that digital technologies have great potential to assist Member States in their efforts to achieve sustainable urban development. The 'smart city' as a concept is the lynchpin connecting these two global mega-trends. It can help Member States achieve positive transformative change by harnessing ICTs and digital technologies to improve urban efficiency, quality of life and sustainability.

Whilst digital technology can have enormous transformative potential for positive change, it can also perpetuate existing social and economic inequalities. In 2020, I saw many children struggle to get 'connected' including the students in my rural village with many missing out on their educational needs.

To address this yawning digital divide, the UN Secretary-General has made a strong case for human rights in digital spaces in his 2020 Roadmap for Digital Cooperation, which lays out key areas for action including universal connectivity, promoting digital public goods, and ensuring trust and security in the digital environment. Additionally, in the Connect 2030 Agenda, our colleagues at ITU commit to bridging the digital divide for an inclusive information society and enabling the provision of broadband access for all, leaving no one offline.

For UN-Habitat, the use of digital technologies in cities and by cities must be appropriate to ensure that the prosperity they bring is shared among urban residents, cities and regions. Ultimately, the deployment of technology needs to be grounded in the real needs of people. It should pay particular attention to underserved populations in order to address inequalities and bridge social and spatial divides. Our People-Centered Smart Cities flagship programme was launched in 2020 to provide strategic and technical advice to local, regional and national governments to enable them to take a strategic and proactive approach to digital transformation, while meaningfully engaging their residents and ensuring human rights in digital spaces.

We must address the elephant in the room. People-centered smart cities cannot be built when so many remain outside of the digital world. The People-Centered Smart Cities Playbook Series aims to help cities and communities ensure that urban digital transformation works for the benefit of all, driving sustainability, inclusion and prosperity in the process. Each Playbook in the series represents one of five Pillars of People-Centered Smart City development: Community, Digital Equity, Infrastructure, Security and Capacity. Collectively, the playbooks outline key activities, provide recommended actions, and policy toolkits that provide actionable guidance for cities seeking to ensure a more equitable, inclusive and sustainable future for smart cities.

About UN-Habitat

The United Nations Human Settlements Programme (UN-Habitat) is the United Nations programme working towards a better urban future. Our mission is to promote socially and environmentally sustainable human settlements development and the achievement of adequate shelter for all. We work with partners to build inclusive, safe, resilient and sustainable cities and communities and promote urbanization as a positive transformative force for people and communities, reducing inequality, discrimination and poverty. UN-Habitat provides technical assistance, policy advice, knowledge and capacity building to national and local governments in over 90 countries.

UN-Habitat is coordinating the implementation of the UN System-Wide Strategy on Sustainable Urban Development[1] and in close coordination with national and local governments, the agency leads the monitoring of Sustainable Development Goal 11 (SDG11) on sustainable cities and communities as well as the New Urban Agenda.

UN-Habitat's approach to people-centered smart cities

Launched in 2020, UN-Habitat's flagship programme "People-Centered Smart Cities" acknowledges the transformative potential that digital technologies can have for sustainable urban development. Through the People-Centered Smart Cities flagship programme, UN-Habitat provides strategic and technical support on digital transformation to national, regional and local governments.

Digital transformation is now critical to meet the demands of sustainable urban development. In the past decade, internet connectivity has become a requisite for full participation in society, including access to education, affordable housing, and critical government services -- yet 3.7 billion people were offline in 2019[2]. In recent years, digital innovations like civic technology, geographic information systems, the sharing economy, open data, and digital platforms have changed how people understand, manage and participate in cities. The COVID-19 pandemic introduced even greater urgency for local and national governments alike to bridge the digital divide especially for marginalized groups and informal settlement communities[3], build more efficient and secure data management systems, and protect citizens' privacy when using digital services. These activities are the foundation for inclusive and resilient smart cities.

Unfortunately, many 'smart city' initiatives have fallen short on sustainability, where technology has been applied uncritically, based on supply rather than demand. Investments in smart city projects that prioritize technology's capabilities over residents' needs have not delivered expected impact. Instead, we see trends towards surveillance, private ownership of digital public goods and infrastructure, and the perpetuation of discrimination through automated decision-making powered by artificial intelligence. As cities have become testbeds for these new technologies, there is growing concern about a lack of oversight, transparency, and potential human rights violations in smart city frameworks.

Smart cities can have a tremendous positive impact on people's lives, but only when people are at the center of the development process. This is why UN-Habitat is introducing the '**people-centered smart cities**' approach, which aims to show how smart cities can be an inclusive force for good, if implemented with a firm commitment to improving people's lives and building city systems that truly serve their communities. This requires engaging deeply with the needs of all residents and urban stakeholders through meaningful community participation, bridging the digital divide, developing essential digital infrastructure and governance, and building capacity through multi-stakeholder partnerships. It also requires governments to take a strategic approach to digital transformation, understanding its potential, and ensuring that it aligns with existing priorities as outlined in the 2030 Agenda for Sustainable Development, including sustainable transport, inclusive neighbourhood planning, providing affordable housing and reducing carbon emissions.

This new series of playbooks is a key normative component of UN-Habitat's People Centered Smart Cities flagship programme that aims to empower local governments to take a **multi-stakeholder approach to digital transformation that realizes sustainability, inclusivity, prosperity and human rights for the benefit of all.** To that end, local, regional and national governments will find pragmatic guidance for how to develop smart city strategies that are more inclusive, sustainable, and aligned to the actual needs of residents. We look forward to working with a wide variety of partners to implement the recommendations from the playbooks in a collaborative manner.

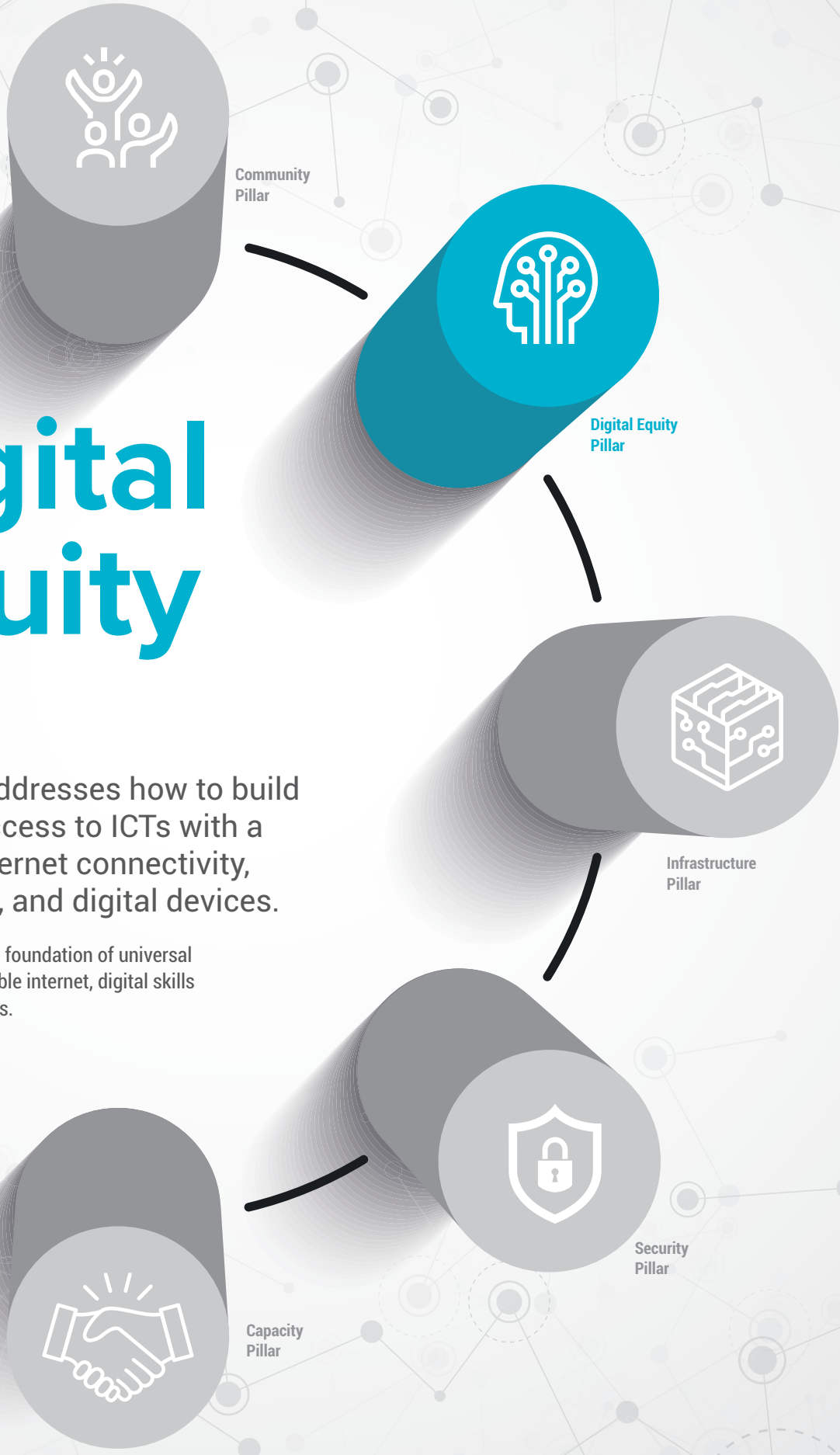
3.7 billion people

were offline in 2019

In the past decade, internet connectivity has become a requisite for full participation in society, including access to education, affordable housing, and critical government services.

The People-Centered Smart Cities framework

presents a holistic approach to developing smart cities that leverage data, technology, and services to empower people. The framework rests on five pillars: Community, Digital Equity, Infrastructure, Security, and Capacity. Each pillar consists of core values, key activities, and recommended actions compiled from international best practices in government, the private sector and civil society. These activities are outlined in a series of Playbooks which when taken together help local governments develop smart cities for people that are more inclusive, safe, and sustainable.



Digital Equity Pillar

This pillar addresses how to build equitable access to ICTs with a focus on internet connectivity, digital skills, and digital devices.

- **Activity 4:** Build a foundation of universal access to affordable internet, digital skills and digital devices.

Core Values

- Meaningful participation in today's digital age requires a high-speed broadband connection to the Internet.
- Bridging the digital divide requires tackling access to connectivity, skills and devices.
- Hyperconnectivity is not the same as digital inclusion. Connectivity is a vehicle for increasing access to ICTs, but digital inclusion is about opening doors, increasing knowledge, and broadening horizons to help communities become more proactive, engaged, and aware.


MIANZI
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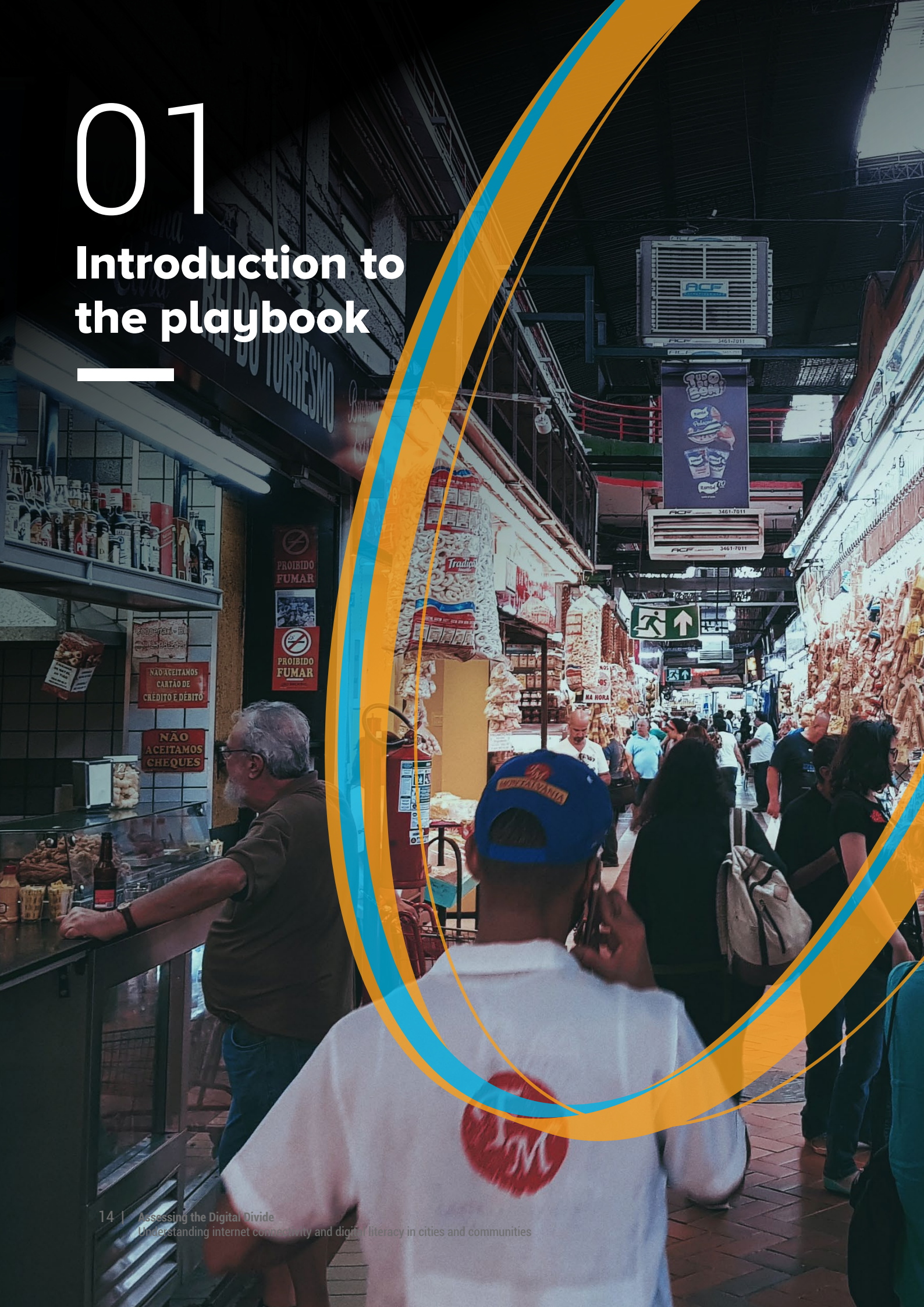
Who is this playbook for?

This playbook is for **local, regional and national governments, policymakers, civil society and non-governmental organizations** operating in urban and rural environments seeking to gather hyperlocal, "grassroots" data and evidence for decision making about the digital divide in their communities. This playbook provides these groups with support to contextualise their efforts within the broader framework of the UN's resolutions, the Sustainable Development Goals, the New Urban Agenda, and follows the core values outlined under the Digital Equity Pillar in *Centering People in Smart Cities: A Roadmap for Local and Regional Governments*. It also includes an evidence-based primer to help these organizations build a multi-dimensional understanding of the digital divide and those who experience it. Finally, the playbook prepares these organizations to build their own comprehensive assessments of the digital divide, including tips for surveying informality, sample surveys, and recommendations for data analysis and storytelling. At the end of this playbook, readers should have a basic understanding of the digital divide and be prepared to take the first steps towards addressing it based on assessing Internet connectivity and digital literacy in their own context.

01

Introduction to the playbook



Access to the internet, digital skills and devices is necessary for communities to thrive in today's world.

As governments and financial institutions deliver more services online and technological innovation creates opportunities to connect people to goods, services and each other in new ways, communities across the globe are finding internet connectivity to be a requisite for full participation in society. The global COVID-19 pandemic has taught us that **internet connectivity is no longer a luxury, but instead a cornerstone of resilient communities.** Likewise, increasing connectivity can introduce new vulnerabilities and burdens to marginalised groups that should be carefully considered when developing solutions to bridge the digital divide (See *Addressing the Digital Divide: Taking Action Towards Digital Inclusion).* Given the urgency of the issue, this playbook is intended to provide a pragmatic, agile approach to assessing the digital divide and will equip readers with crucial information they can use to establish a culture of digital inclusion within their organizations and communities.

The **digital divide** is the gap between those who have access to and use ICTs including internet connectivity, internet-enabled devices and digital literacy skills and those who do not. Access to all three are fundamental for communities to establish a robust and sustainable connection to the digital world, particularly as fundamental pillars of society such as education, workforce development and innovation move online. Internet connectivity is widely regarded as the foundation for participation in a digital society, and a pillar of **digital human rights**. Without robust, affordable, sustainable and inclusive internet connectivity, participation in digital society and access to digital service offerings remain systemically exclusive.

Globally, international organizations including the United Nations (UN) have recognised how internet connectivity can directly impact education, equity, innovation and economic development. The Sustainable Development Goals (2015), The New Urban Agenda (2016), The Connect 2030 Agenda (2018) and the UN Secretary General's Roadmap for Digital Cooperation (2020) all consider digital connectivity and digital inclusion to be crucial considerations in order to achieve sustainable development. These and other resolutions described in Section 02 of this playbook demonstrate an international ecosystem supportive of leveraging **digital inclusion** to achieve equitable outcomes for all.

The digital divide's impact is felt across many sectors including education, workforce development and financial inclusion. During the global Covid-19 pandemic, schools turned to the internet for remote instruction leaving behind an estimated 4 in 5 children without internet access in developing countries[4]. Lack of internet connectivity is also a structural barrier to reducing income inequality and access to broadband is necessary to attract business, industries and jobs to underserved communities[5]. The digital divide is a known barrier to financial inclusion, as it limits opportunities for empowering the public as savers, lenders, borrowers, investors and taxpayers[6]. Section 04 of this playbook provides an overview of these effects and evidence of several sectors of society that are impacted by the digital divide today.

The disconnected largely belong to historically disadvantaged communities. While every community is different, the digital divide consistently reflects and amplifies existing social, economic and cultural inequalities such as gender, age, race, income and ability. Section 05 of this playbook highlights and expands on the communities that are known to be disproportionately affected by the digital divide: women and girls, children and youth, older people, urban and rural poor, marginalised or minority communities, persons with disabilities, refugees and persons on the move and indigenous communities.

The first step towards establishing a plan to reduce or eliminate the digital divide is to study the contours of the problem locally. While national or regional estimates about broadband connectivity may exist, collecting **hyperlocal** "grassroots" data is critical for the design and implementation of successful digital inclusion programming and working with communities to identify and build solutions on their own terms. Helping cities build robust, scientific, hyperlocal data is at the heart of this playbook. Readers are offered a step-by-step process and recommendations for gathering such data about their community in Section 09.

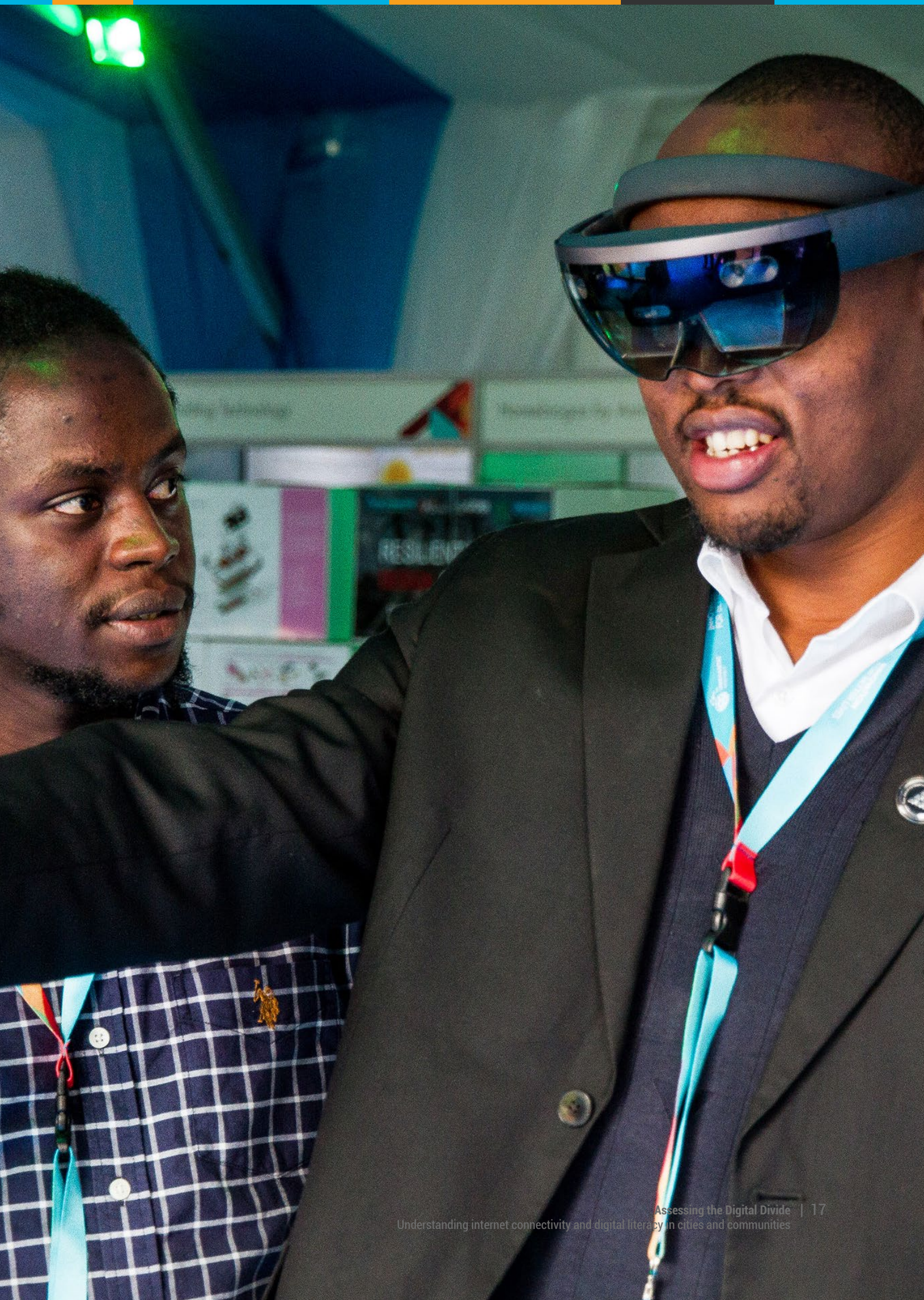
Readers will learn to identify three targets of a digital divide assessment: **location**, **gaps** and **roots**. Appropriate methods to survey community members using inclusive survey design, transparency, qualitative data and testimony are reviewed in Section 08. Readers will

also learn how to administer surveys paying special consideration to the nuances of their community including handling bias, data privacy, surveying with an equity lens, accounting for disability and building trust with indigenous groups, native communities, refugees and people on the move, LGBTQIA+ communities and other marginalised groups.

Data created by an assessment of the digital divide is a public service. As a **digital public good**, it is critical to consider how to provide access to this data in ways that are digestible, meaningful and *useful* to the public while respecting residents' privacy. Section 09 provides recommendations for how to leverage a "data-as-a-service" model including data storage, security and maintenance to ensure the data generated through this process is delivered to the community appropriately and sustainably. Data-as-a-service or DaaS, refers to data that is offered on-demand, typically over an internet network. Data collected by local governments should be supported by a data governance policy for the local government that creates standards for data ownership, privacy, security and overall management (See *Centering People in Smart Cities*).

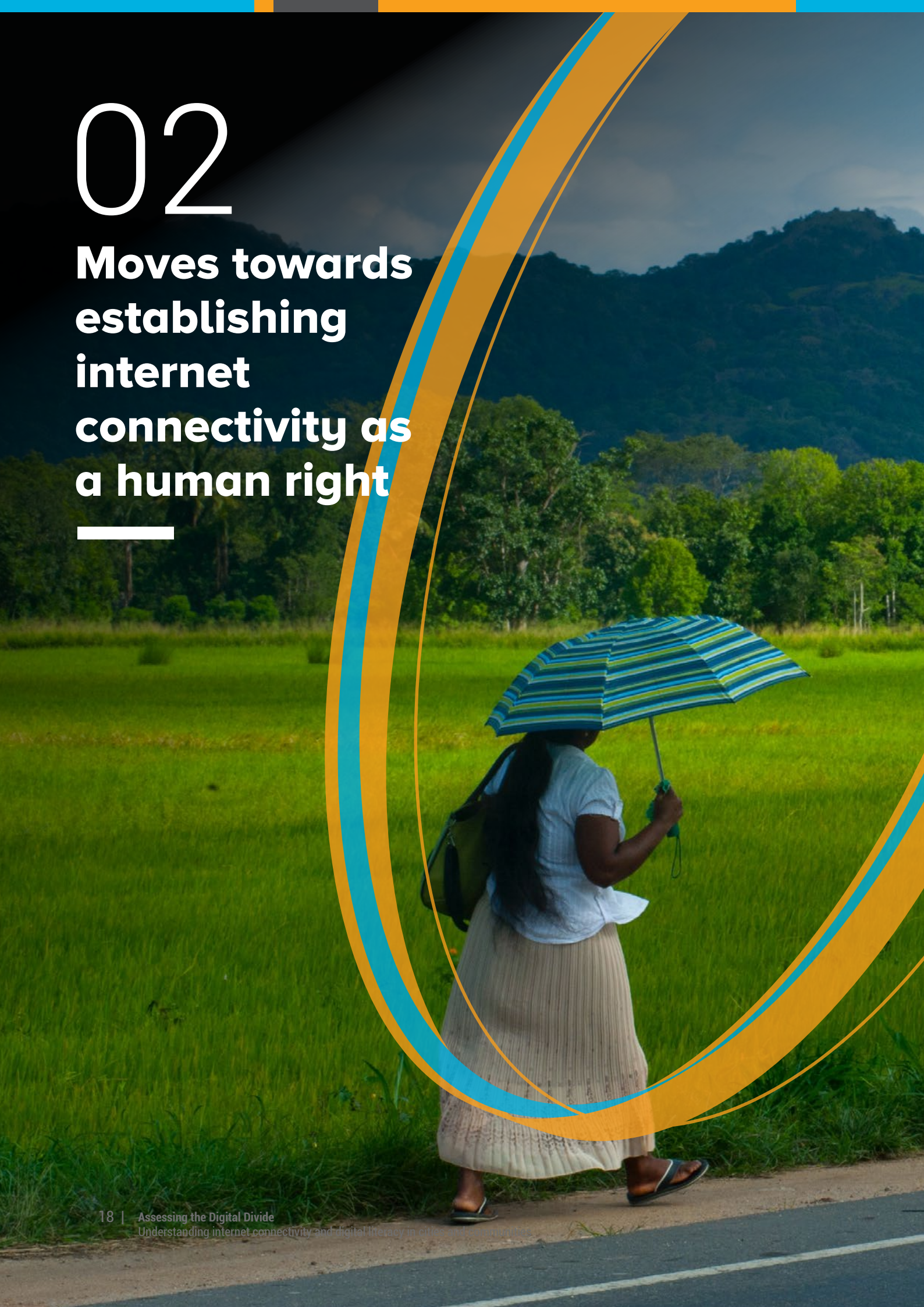
After the assessment, readers should be able to identify their community's "digital divide taxonomy," described in Section 11. This taxonomy will help readers identify the conditions of their community's digital divide so that they can take the appropriate steps to address them. Accompanying this playbook is a sequel, *Addressing the Digital Divide*, which outlines specific actions that can be taken to address a community's unique digital divide taxonomy.

Increasing connectivity is not enough to solve the digital divide. Connectivity is a vehicle for increasing access to public services and enhancing opportunities for residents to become more active citizens, but digital inclusion is fundamentally about opening doors, increasing knowledge, and broadening horizons to help communities become more proactive, engaged and aware. The struggle to do so is what **transforms residents from being passive consumers of technologies and urban environments, to being active contributors to them.** Unlocking opportunities to do this across government activities pays dividends not just in terms of helping communities reap the benefits of digital services, but also in terms of elevating the innovation, education and economic outcomes needed for inclusive participation in smart cities.



02

Moves towards establishing internet connectivity as a human right



While internet connectivity is not formally adopted as a human right, with an increased recognition of the tremendous impact internet connectivity can have on equity, innovation and economic development, voices are being raised about the need to work towards a future where internet access is considered a human right.

Because so many fundamental aspects of society are now tied to internet access, accessible internet infrastructure has become an essential standard of living similar to water, energy and housing. In 2011, a report by the UN Special Rapporteur on the "Promotion and Protection of the Right to Freedom of Opinion and Expression" highlighted access to infrastructure, relevant content and digital literacy as vital elements of a rights-based definition of Internet access. Four years later in 2016, the UN Human Rights Council passed a non-binding resolution emphasising that denial of internet access is a violation of international human rights law.

The New Urban Agenda[7] calls for cities to develop national information and communications technology policies and e-government strategies, in order to make information and communications technologies accessible to the public. Additionally, the Sustainable Development Goals (Target 9.c)[8] call for a significant increase in access to information and communications technology globally, as well as the provision of universal and affordable access to the internet in **least developed countries (LDCs)**.

Likewise, the UN Secretary General's Roadmap for Digital Cooperation released in June 2020 highlights digital inclusion and digital human rights as key pillars of what it calls 'digital cooperation'[9]. The Roadmap notes that in today's world, where online violations can lead to offline abuses, the internet cannot be an ungoverned or ungovernable space – human rights exist online as they do offline and have to be respected in full. According to the Roadmap, digital inclusion efforts must focus on the lived realities of women and those with disabilities, while addressing intersectionality, social norms and language barriers along the way.

The International Telecommunications Union (ITU) has also adopted several digital inclusion resolutions[10] making commitments to women, children, the elderly and indigenous groups. ITU's "Connect 2030 Agenda for Global Telecommunication/ICT Development" focuses on how technological advances will contribute to accelerate the achievement of the UN Sustainable Development Goals (SDGs) by 2030. The Agenda aims to achieve five bold goals: Growth, Inclusiveness, Sustainability, Innovation and Partnerships.

HELPDESK

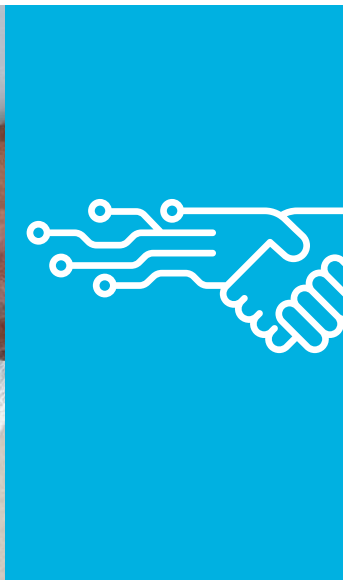
Introduction to the Digital Helpdesk

The Digital Rights & Governance Helpdesk is a technical and policy-related support service set up by UN Habitat and the Cities Coalition for Digital Rights, which helps local governments address inclusion and human rights aspects of their local digital strategies, policies, projects and services by providing contextual, tailored assistance and advice. The acceleration of digitalisation requires cities to consider how human rights relate to digital technologies but often lack capacity, tools and access to best practices. The Helpdesk reinforces a comprehensive governance-based approach towards people-centered smart cities, leaving no one and no place behind, to guide the development of these frameworks.

For more information Click here

Finally, the Cities Coalition for Digital Rights (CC4DR), an international network of cities advancing digital rights, has adopted universal access to the internet and digital literacy as a core principle in their Declaration[11].

Collectively, these commitments and goals reflect broad, international support for efforts taken to reduce or eliminate the digital divide, especially its impact on the well-being of women, children, older people and indigenous people. However, **the task remains for governments to act and deliver results to these communities that have yet to reap the benefit from internet connectivity.** Specifically, the role of governments should follow the "Respect, Protect, Fulfill" model, demonstrating respect for the boundaries of their influence, willingness to protect the public from harmful interference by bad actors and the ability to fill gaps in services that achieve greater quality of life for residents.



The UN Secretary General's Roadmap for Digital Cooperation released in June 2020 highlights

digital inclusion and digital human rights as key pillars of what it calls

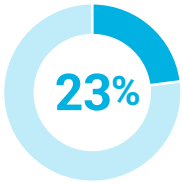
'digital cooperation'

03

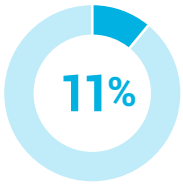
The state of the digital divide: global trends and statistics

The digital divide is a global phenomenon. Over 1 billion new internet users have been added over the last five years. However, nearly 3.7 billion people were offline in 2019[12]. Meanwhile, 5G subscriptions are forecasted to reach 3.5 billion in 2026, accounting for an estimated 54 percent of total mobile data[13]. Despite the promise of 5G for enterprise settings, by 2025 the majority of the world will still be on 4G (and likely 3G, or even 2G)[14].

1 Africa and the Commonwealth of Independent States (CIS) regions face the largest gaps.



- Africa is the region facing the biggest gap in connectivity, where 23 percent of the population has no access to a mobile-broadband network.



- Eastern Europe and the Commonwealth of Independent States (CIS) are the second regions with the largest gaps, with 11 percent of the population lacking access.

- Affordability remained a major barrier in LDCs to Internet uptake in 2020.

2 Much of the world's digital divide is urban/ rural.

- Many connectivity gaps persist in rural areas. In **LDCs** 17% of the rural population has no coverage at all, and the next 19% are covered by only a 2G network.

- Globally, 72% of households in urban areas had access to the internet in the home in 2019, almost twice as much as in rural areas (nearly 38%).

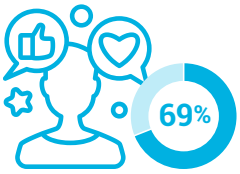
The digital divide persists within well-connected cities, megacities, and regional centers.

- Globally, 28% of urban households lack internet connectivity, and 37% do not have Internet access to a computer.

- In developed countries, 13% of urban households still do not have Internet connectivity at home, compared to 19% of rural households.

- Connectivity remains limited or absent in informal settlements around the world.

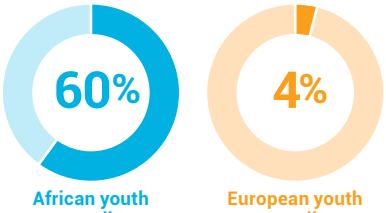
3 Youth and children feel the burden of the digital divide.



- At the end of 2019, just over half the world's population was using the Internet, but this proportion increased to over 69% among youth (15-24 year olds).

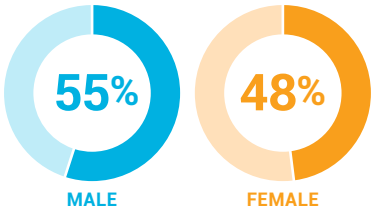
- In developing countries 66% of youth are online, compared to 98% in developed countries.

- One in three internet users is under the age of 18[15], yet there are still about 346 million children worldwide today that are not connected[16].



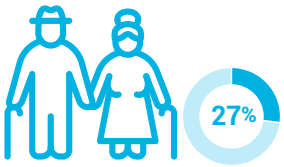
- African youth are the least connected. Around 60 percent are not online, compared with just 4 percent of youth in Europe.

4 Women are under-represented online.



- Globally, 55% of the male population is using the Internet, compared to 48% females in 2019.
- LDCs have the largest gender gaps including Africa and Arab States.

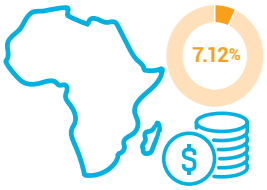
5 The elderly are disconnected.



- Studies have shown up to 27% of the urban elderly lack Internet connectivity[17].
- Older adults who are most vulnerable in terms of poor health and low economic status are least likely to be using computers.

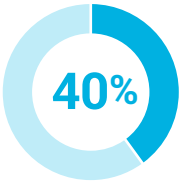
6 The global poor are disconnected.

- Four of the UN's six regions have Internet costs that exceed the Broadband Commission's affordability target.
- Fixed broadband access is unaffordable in 111 countries (56%).



- Across Africa, the average cost for 1GB of data is 7.12% of the average monthly salary[18].
- In some LDCs, 1GB of data costs as much as 20% of the average salary.

7 Digital illiteracy persists.



In 40% of countries reporting data, less than 40% of individuals reported being able to carry out a digital activity considered as a 'basic' **Information Communication Technology (ICT)** skill[19].

Globally, 72%
of households in urban areas had access to the internet in the home
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04

Why digital inclusion matters

The Internet has fundamentally transformed how we connect to the institutions that serve us and to each other. Over time, these digital services have become more deeply integrated into daily life in a way that threatens to exclude a significant proportion of the population. Industries fundamental to society like education, workforce development, finance, government, innovation and even community building now have online analogs that can provide greater convenience and opportunities to connect to critical information and services online. Those who lack Internet access are also obstructed from not only these services, but from developing and advocating for digital services that meet their unique needs.

Education

Education is the theme of SDG 4, which is to "ensure inclusive and equitable quality education and promote lifelong learning opportunities for all." The Internet has led to important innovations in both educational content and delivery, making a wide range of educational content accessible on demand. Open educational resources (OER) and massive online open courses (MOOCs) make content available internationally and on mobile devices. Mobile devices now account for half of total web traffic[20], with a significantly higher proportion of mobile traffic occurring in Africa. Analyses have shown that time spent online has a positive impact on educational attainment[21].

Despite the great potential of these innovations, the impact of the digital divide was still widely felt by families around the world during the Covid-19 pandemic. When many schools went completely online to avoid in-person contact, students around the world and in developed countries that lacked Internet access experienced limited to no participation in online schooling. In the United States, an estimated 15% of households with school age children are impacted by the digital divide[22]. Likewise, teachers without connectivity or digital literacy skills struggled to adapt to the new circumstances.

According to the OECD the **homework gap** or the gap between students with Internet connectivity and those without, persists within developed countries of the Global North, and more so in the countries of the Global South. However the nature of this gap varies. For example, in the Global North the concern focuses primarily on **digital literacy**, but for much of the Global South the fundamental concern is one of basic Internet access[23]. A recent study presented at the 2020 UN Conference on Trade and Development found that LDCs are the most vulnerable to the homework gap, as 4 in 5 people lacked access to the Internet during the pandemic in these countries[24].

Workforce development

As basic services and tools that are fundamental to upward mobility become increasingly digitised, lack of Internet connectivity becomes a structural barrier to reducing income inequality. Access to broadband is also necessary to attract business, industries and jobs to underserved communities. Likewise, the digital divide limits business development in low-income areas of both cities and in rural areas[25].

Internet connectivity is a critical component of finding a job in many countries today. In 2015 a majority of U.S. adults (54%) reported going online to look for job information, 45% applied for a job online, and in general are as likely to turn to the internet during their most recent employment search as to their personal or professional networks[26].

Financial inclusion

Mobile platforms and data analytics are making financial services more accessible and ubiquitous to those who benefit from an internet connection. Governments are digitising public finance, and personal banking has largely gone online. Millions of businesses worldwide now depend exclusively on online spending and having an online presence has become increasingly critical for the survival of small businesses. Ensuring fair participation in an economy taking place online requires examining access to connectivity and digital literacy. The World Bank defines financial inclusion as "individuals and businesses have access to useful and affordable financial products and services that meet their needs and are delivered in a responsible and sustainable way."

In August 2020, the UN Digital Financing Task Force reported that the digitization of the economy has the potential to empower more people to participate in finance, enabling them as savers, lenders, borrowers, investors, and taxpayers. However, the task force also identified that the lack of basic internet access and digital literacy impacting 750 million people internationally, is a barrier to financial inclusion[27].

Participation in digital services and e-government

In the past decade, many governments have explored offering digital services in some capacity, particularly as the digitization of processes and services can reduce the cost of facilities operation and provision of services. **E-government** has been shown to increase public trust by improving interactions with residents and their perceptions of responsiveness[28]. For example, Estonia has developed a robust E-Governance platform including a variety of digital services and online voting. Rwanda's Irembo digital platform provides digital access to a wide range of government services, including land registration, transport licenses and health services. The UN recently ranked Moscow as the top city for E-Government, where their Public Services Portal offers online payments and 24/7 technology support. Capetown's CityConnect portal offers e-services like permitting and job searches, an online procurement portal and open data portal. E-Governance also introduces opportunities for public ownership of digital assets. For example, the City of Barcelona's DECODE initiative piloted decentralised ownership of public data and digital service technologies using blockchain, among other tools.

However, public sector organizations that seek to reap the benefits of digitization risk reducing access to those services for people experiencing the digital divide. For example, a 2011 study found the uptake of e-government services to vary dramatically between rural and urban Java Indonesia, where rural residents visited government websites significantly less[29].

Innovation

Because the internet offers access to new knowledge, tools and social networks, its availability can have an impact on a community's opportunity to encourage collective action, accelerate innovation and attract investment[30]. The ITU highlights both direct and indirect effects of internet access on innovation. According to a 2016 ITU report, broadband internet access has a direct effect on innovation by enabling large-scale infrastructure investments that lead to increased economic activity; and indirectly, has long-term effects that spur innovation and productivity through improved broadband speeds[31].

Representation

Increasing internet connectivity enhances both people's visibility online and their ability to participate in digital services. One one hand, this can provide new opportunities for citizens to be represented in data who would otherwise be excluded from key analyses contributing to policy and program development. On the other hand, connectivity can also introduce new vulnerabilities to communities who may not directly benefit from visibility by the local government, such as undocumented immigrants and targets of state-sanctioned violence.

Community building and collective action

Inclusive and accessible digital spaces can create more opportunities for community building and collective action. Likewise, barriers to internet access exacerbated by existing socioeconomic inequalities limits the ability of low and middle-income groups to collectively organize and connect online. Research has shown a gap in digital activism among low income communities with fewer resources, less digital literacy education and less time. These factors create high costs of online participation for some groups[32]. Those lacking internet access may forgo opportunities to use technology to enhance their efforts towards collectively organising for change or connecting directly with the government.

For example, in the past decade in China, internet connectivity led to growing political awareness and motivation to participate in government among citizens. As a result, China's public experienced a rapid growth of self-organised activism, which enabled communities to appeal directly to central authorities in ways not previously experienced by the government[33].

05

Who experiences the digital divide?

Who experiences the digital divide is the fundamental question of a digital divide study. Global trends show several groups that are systematically excluded from internet connectivity.

Women and girls

Globally 55% of males and 48% of females use the internet. In 2018, 327 million fewer women than men have a smartphone and can access the mobile Internet[34]. Hurdles to access, affordability, lack of education as well as inherent biases and socio-cultural norms curtail women and girls' ability to benefit from the opportunities offered by the digital transformation.[35] The percentage of women using the internet lags behind the percentage of men using the internet in developing countries across all age groups. There is also a well documented gender gap in internet connectivity across low and middle-income countries. Those disparities extend to the ownership and use of digital devices[36]. In developing countries, women face even starker challenges.

The stakes are high.The digital inclusion of women can catalyse development by empowering them to pursue new professions, access critical government and private services and become more informed citizens. Providing women with education and access to digital economies has shown to benefit their broader community[37].

HELPDESK

The value of inclusion for digital governance

The inclusion of marginalised communities and vulnerable groups harnesses the potential of technology governance to drive social change, while mitigating risks that may arise from its use. Understanding the implications of digital technologies for the people who are affected by it is crucial to maintain human well-being, and to ensure that solutions address the needs of the population and the society at large.

For more information

Click here

Children and youth

It is estimated that 2.2 billion (or 2 in 3) children (3-17 years old) worldwide don't have access to the internet at home. The gap is largely economic, where globally 87 percent of children in high-income households have internet access at home, compared to just 6 percent of low-income households[38]. According to the ITU, 768 million children and young people 25 years or younger who lack internet access live in South Asia. In the regions of East Asia and Pacific, West and Central Africa and Eastern and Southern Africa, more than 300 million children and young people per region lack home internet access. The pandemic only expanded the urgency of eliminating the digital divide for youth worldwide, as an estimated 1.6 billion students were impacted by school closures.

Older people

Seniors, those aged 65 and older, are increasingly embracing digital technology. However, lack of digital literacy skills, disability, lack of resources and a fear of exposure to cyberattack are common reasons for older people to go without internet connectivity[39]. Therefore, empowering them to participate in a digital environment requires fostering digital skills, self-confidence and online safety skills. Several projects like ICTSkills4All[40] spanning EU and CIS partners, and +Simple in Argentina[41], focus digital inclusion efforts exclusively on older residents. Recognising the growing adoption for seniors, several technology companies have begun designing consumer devices like cell phones and tablets to have features that are more accessible to eldery populations.

Urban and rural poor

The cost of connectivity remains a barrier for much of the world, in both urban and rural areas. Though the average price for data and voice mobile packages are roughly consistent worldwide, there are large disparities in the ability for people to afford them. As of 2020, the cost of voice and mobile data baskets exceeds the GNI in every region except Europe and CIS (voice only)[42]. Surveys of the digital divide frequently show that the divide spatially maps on to existing income inequalities[43]. Low-income groups worldwide are consistently disadvantaged when it comes to digital connectivity. For example in the Ogun State and Yewa Local Government area of Nigeria, researchers found lack of internet access, affordability of computers and internet usage, poverty, lack of computer skills and poor infrastructures were contributors to the digital divide for low income populations[44].

Marginalised communities, minorities and people on the move

Minorities, marginalised groups, displaced persons and refugees are often subject to long standing socioeconomic inequalities that are further exacerbated by the digital divide. For example, in the United States almost twice as many Black people as White people have no internet access in the home[45]. For LGBTQIA+ communities, internet connectivity can introduce critical opportunities for connection and community organizing, but also expose these groups to online harassment[46]. For refugees, the 2015 refugee crisis in Europe expanded international dialogue about connectivity for these groups seeking critical resources and social cohesion. A recent report from the UN High Commissioner for Refugees (UNHCR) established that "displaced populations and communities that host them have the right, and the choice, to be part of a connected society, and have access to technology that enables them to build better futures for themselves, their families and the world[47]". Likewise, persons on the move including migrants, internally displaced persons, stateless persons and migrant workers also require connectivity to achieve their goals and participate in society. According to the International Organization for Migration (IOM) globally, there are an estimated 272 million international migrants, 164 million migrant workers, and 41.3 million internally displaced persons[48].

People with disabilities

The digital divide experienced by people with disabilities is largely one of access to assistive technology, or the technology that enables a successful use of internet enabled technology or digital devices. The cost and availability of assistive technologies for people with disabilities using ICTs are a major known barrier to digital inclusion[49]. To develop a more inclusive model, products and services targeting people with disabilities should reduce the physical limitations of the person and comply with existing international, federal or local accessibility standards. In Brazil, several national organizations conducted an annual survey of assistive technologies across the country including maps and classifications research, services and products in the area of assistive technology. Collecting this data allows for the development of national policies and standards for assistive technology, effectively making strides to close the digital divide for disabled groups in Brazil[50].

Indigenous communities

Digital inclusion is critical to first nations and indigenous communities. In the United States, only 60% percent of tribal lands in the lower 48 states had high-speed internet access. The **digital sovereignty** of these groups is important for educational attainment, achieving economic development goals and enacting sovereignty[51]. Owning and operating ICT infrastructure also supports Native Nations' sovereignty by concentrating wealth, power and data within their communities rather than relying on an external provider[52].

06

Key stakeholders in the digital divide terrain

There are several key stakeholders involved in building, operating, and maintaining internet connectivity infrastructure, delivering internet connectivity services, building public support for connectivity initiatives and taking action to assess and address the digital divide.

NATIONAL GOVERNMENTS

National governments provide legislative frameworks, regulations and policies along with the internet and physical infrastructure that shape local government intervention. The role of national governments varies from country to country, and it is important to understand the approach to multi-level governance in each location. For example, following the COVID-19 pandemic, the US Federal Government issued broad stimulus funding to support the development of internet infrastructure, but has largely left regulation of infrastructure development by private sector partners to state governments. By contrast, online access routes in China are owned by the People's Republic of China government, where private enterprises and individuals rent bandwidth from the state.

REGIONAL GOVERNMENTS

Regional governments such as states, provinces, regions or county governments have an important role to play in internet connectivity expansion[53]. For countries with strong national broadband policies, regional governments are sometimes responsible for the coordination of service delivery at the regional and local level. Regional policy can also shape the approach to building, maintaining or operating connectivity infrastructure in cities. Local governments that make up a region can also coordinate to form a regional broadband plan. This can have a strategic advantage for groupings of small or rural local governments that seek to attract resources to a designated region, and for sprawling megacities that consume smaller jurisdictions or fuse with other large cities in a region.

LOCAL GOVERNMENTS

Depending on the legislative framework in which they sit, local and municipal governments have a variety of tools for developing internet connectivity in their communities at their disposal. Such flexibility allows local governments to use several strategies to address the digital divide including government-owned networks, public private partnerships (P3s), or facilitating community networks. The digital divide takes several forms in cities (see Section 07) requiring a mix of tools and solutions, addressed in UN-Habitat's companion playbook Addressing the Digital Divide. In most cases, local governments should act as stewards of digital infrastructure plans and be the primary stewards of community engagement that drives improved services and connectivity. As the closest democratic institution to most residents in their community, local governments should work to protect digital assets (data and infrastructure) from exclusive private sector ownership, enable equitable access to ICT and open channels to harness residents' capacity and knowledge (regardless of demographics or class) to influence government activities, or to develop digital inclusion activities on their own terms.

PRIVATE SECTOR

The private sector operates at both large and small scales and is a key stakeholder in providing digital infrastructure. Large scale telecommunications companies can provide substantial investment in internet infrastructure and services. However, because the internet has largely been privatised throughout the world, infrastructure and service gaps have emerged in areas where it is not lucrative for private actors to deliver service. Additionally, internet affordability remains a challenge in several countries. Small scale businesses, local companies and start-ups can also support internet connectivity in a local context through business solutions such as mesh networks, WiFi, small cell deployment, and other combinations of innovative approaches using emerging technology. Large and small scale private businesses alike can provide consulting services to support the development of digital infrastructure plans, reports and expertise.

NONPROFITS, NGOS AND COMMUNITY-BASED ORGANIZATIONS

Nonprofits and NGOs play multiple roles in the digital inclusion space. Nonprofits seeking to satisfy a public-service mission typically work to improve access to ICTs by connecting communities to digital skills development opportunities, internet infrastructure or digital devices. Nonprofits, NGOs and community-based organizations are critical partners for local governments seeking to develop a localised plan for addressing the digital divide, as they have intimate knowledge of and relationships with the communities they serve. International NGOs can coordinate resources, tools and policy guidance to inform best practices at the local level.

EDUCATIONAL SECTOR

Schools, universities, colleges and research organizations can offer facilities, personnel and technical expertise about the digital divide to local governments. During the Covid-19 pandemic, many schools and school districts sought to leverage their infrastructure in order to increase connectivity for their students. In some cases, schools can provide infrastructure such as buildings or existing telecommunications infrastructure for the purpose of expanding WiFi signals or small cell deployment in partnership with the local government. Additionally, research organizations and institutions like universities can offer expertise in both studying the digital divide, collecting and analysing digital divide data and performing scientific analysis or policy recommendations for resolving it.

COOPERATIVES, COMMUNITY ADVISORY GROUPS, LOCAL ALLIANCES

Communities can successfully self-organize to develop their own solutions to the digital divide and the issues that stem from it. For example, citizens have formed cooperatives for the purpose of delivering internet in rural areas. These broadband cooperatives champion community ownership[54], but have shown to be more successful under conditions in which a critical mass of subscribers is guaranteed[55]. Local internet connectivity alliances and advocacy groups can also provide important contextual information and galvanise public support for connectivity initiatives. As discussed in Addressing the Digital Divide, Community Advisory Groups, made up of community members and expert stakeholders, should be formed to guide the development of any digital inclusion or digital infrastructure plan developed by a local government.


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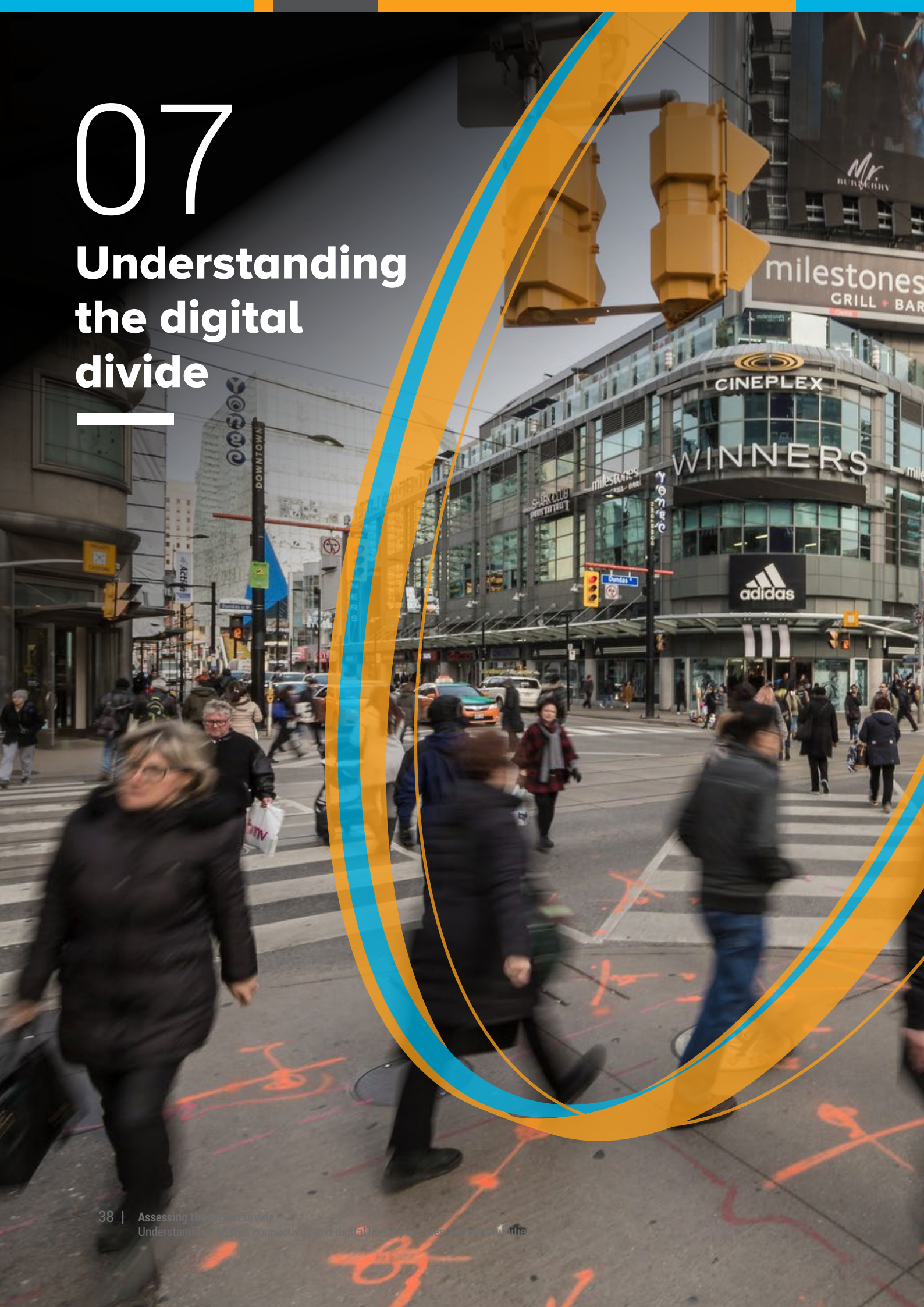
07

Understanding the digital divide



There are many dimensions of the digital divide, which can vary from the physical to the psychological. This playbook identifies six dimensions, but any city can display a combination of them. In order to take steps to study the digital divide and ultimately attempt to resolve some of its effects, it is important to have a fundamental awareness of the many ways that the digital divide can occur.

Dimensions of the digital divide

1. **Connectivity divide**

2. **Infrastructural divide**

3. **Socioeconomic divide**

4. **Demographic divide**

5. **Cultural divide**

6. **Literacy divide**

1 THE CONNECTIVITY DIVIDE: Intra-urban and urban vs. rural

The gap in connectivity between urban and rural areas is a global phenomenon. Globally, 72% of households in urban areas had access to the Internet at home in 2019, which is twice as much as those in rural areas[56]. In developing countries, the urban/rural connectivity gap is 2.3 times greater in terms of households, than it is in developed countries. In the United States, the Federal Communications Commission (FCC) found that 39 percent of the rural population (about 23.4 million Americans), compared to just 4 percent of the urban population, lacked access to what the FCC considers basic broadband Internet service[57]. In Africa, only 28 percent of households in urban areas had access to the Internet at home in 2019, which is 4.5 times as high as the percentage in rural areas.

The digital divide is not limited to the urban/rural split however, and does occur in an intra-city context. The digital divide manifests within cities particularly in low-income areas with substantially lower broadband adoption rates. Such low-income areas often correlate to neighborhoods and districts with higher populations of marginalised groups[58].

There are several factors that contribute to the geospatial digital divide. Broadly, limited or outdated rural telecommunication infrastructure hinders regional development and ultimately affects the competitiveness of rural economies - and the cost and complexity of delivering such services in more remote settings. However, other factors significantly impact connectivity in rural areas, including youth migration, geographical isolation, and lack of economic resources in the case of rural communities[59]. Other socioeconomic factors that often characterise rural areas like lower education and higher poverty rates, influence the likelihood that rural populations will connect to the Internet.

BOX 9.1

China's prefectural digital divide

Today, China has the largest number of Internet users and the second-largest number of Internet providers in the world. The increasing use of ICTs has been an important factor in the diffusion of information and knowledge, reduction of transaction costs, transformation to streamline business operations, and improved quality of life in urban China. Despite the emerging importance of the digital economy in China, not everyone benefits equally from ICTs. Major evidence of China's digital divide was provided in a 2020 study by Zhouying Song, Chen Wang and Luke Bergmann who researched the digital divide across prefectural cities. The researchers identified three distinct orders of the digital divide: access to ICT, use of ICT and outcomes of ICT use.

A major challenge in the study was to pick measures of the divide that are coherent with each other and are equally available across all prefectures. The project eventually focused on commonly used measures such as computer penetration, internet service providers (ISPs) per capita, internet bandwidth per capita, broadband subscribers per capita, internet users per capita, state of e-commerce economy and online learning.

Using an index of digital development, researchers found a significant difference in digital divide prominence within the country, where prefectures with large metropolitan areas, including Shenzhen, Shanghai, Hangzhou, Beijing, Guangzhou, Suzhou and Ningbo had higher rates of digital development. Rural mountainous regions in western China showed the lowest rates of digital development, indicating fewer people had access to Internet services and infrastructure.

Overall, the study found access and use of ICT tends to be high in major economic hubs and smaller in remote continental cities in China. The study also found that the leading determinants of the digital divide are residential income, secondary education, and the working age population ratio. Collectively these determinants suggest that socio-economic problems must be solved for improving ICT use and outcomes in China.

BOX 9.2

Africa's urban/rural broadband infrastructure divide

Despite the increasing digitization, Africa remains one of the world's least connected regions. According to the World Bank , only one-third of the continent's population has broadband access, and 45 per cent of Africa's population is further than 10 km from fiber network infrastructure, which is a higher percentage than on any other continent. It is estimated that in order to close the digital divide, an investment of 100 billion USD is required continent-wide. The World Bank estimates that 46 per cent of new users in Africa will be urban, 46 per cent will be rural, and the remaining are considered “remote rural".

The development of Internet networks in rural and remote rural areas is complicated by the lack of other types of infrastructure, such as electricity supply. The challenge is most evident in Sub-Saharan Africa with some of the poorest and sparsely distributed settlements in the continent. Internet penetration rates range from 12 per cent in Middle Africa to 51 per cent in Southern Africa.

Besides the need for infrastructure, Internet affordability remains another significant issue. A study by Alliance for Affordable Internet in 2019 found that only 10 out of 45 countries researched had affordable Internet rates, defined as less than 1GB of data costing 2% of monthly income.

BOX 9.3

Yosano, Japan's transition to a smart green village

The town of Yosano, Japan, is situated in the Kyoto prefecture. Due to the rising average age of farmers and the need to cultivate high-quality premium rice, Yosano-cho adopted concepts that helped facilitate its transition to a smart green village.

The municipal government understood that the township faced two major concerns: 1) There is a gap in the transfer of needed skills to the next generation 2) climate change has altered the rice cultivation process, which has proved difficult for many farmers. To address these issues, the Yosano-cho municipal government installed LPWA, a low power wireless communication network that covers the entire region of Yosano. In combination with a high-speed communication network, LPWA was able to provide the population with digital technologies that meet different needs. Sensor nodes were placed at each production field to collect data that benefitted the cultivation process. E-kakachi, a newly developed tool, analysed the data to assist the farmers in better adapting to varying cultivation parameters.

Today, Yosano-cho sells a branded product that has consistently been rated as one of the highest grades of rice in Japan. Not only has Yosano-cho's transition to a smart green village helped gap the urban-rural digital divide in Japan, it has also solved some of the most prominent challenges faced by residents. To assess the digital divide effectively, local authorities must understand the concerns and inputs of residents, so that the process of digitization places at forefront the needs of the local population.

2 THE INFRASTRUCTURAL DIVIDE: Infrastructure and access

A connectivity divide can occur when it's politically, strategically or structurally challenging or less profitable to build infrastructure in a given location. Therefore the "infrastructure divide" does not only follow urban/rural lines, but also reflects political and economic choices. For example, informal settlements which are highly dense and often within or adjacent to large municipal areas are susceptible to a chronic lack of internet connectivity for reasons of challenging terrain, lack of existing infrastructure and lack of clarity on right-of-way permitting processes. Similarly, major cities often struggle to rollout connectivity that requires disruptive streetworks[60].

Governments are sometimes reluctant to extend public services including electricity and internet infrastructure to informal settlement areas they perceive as illegal or temporary[61]. As a result, non-profit organizations and community organizations have sometimes stepped in to support the development of community networks in informal settlement areas. Typically, an organization with facilities in the area will build a network "backbone" connecting these facilities to the internet, and invite residents to build informal networks or public wi-fi access points off the network.

3 THE SOCIOECONOMIC DIVIDE: Affordability

As previously mentioned, the cost of connectivity remains a barrier for much of the world, in both urban and rural areas. The price of connectivity includes not just the ability to afford subscription access to the internet, but also the ability to devote the time and resources needed to acquire digital literacy skills. According to ITU, as of 2020 the average price for mobile voice and data baskets are similar across the world. While this may signal a sense of equity, there are large disparities in purchasing power across the regions. In 2020, the UN Broadband Commission for Sustainable Development set as a 2025 target that entry-level broadband should be made affordable globally at less than 2% of monthly GNI per capita. To date, the cost of voice and mobile data baskets exceeds the GNI in every region except Europe and CIS (voice only).

BOX 9.4

Cape Town's VPUU community network

In South Africa, cable Internet infrastructure is sparse and is predominantly available in affluent areas. As a result, residents in low income neighborhoods have to rely on mobile Internet, a costly option that poses additional economic burdens on the poor and further deepens the existing digital divide.

To address the issue, VPUU (Violence Prevention Through Urban Upgrading) provides the Internet directly to the community through the "V-Net" project . V-Net is a community network that builds on a cable line and is accessible through a set of Wi-Fi points around the community of Khayelitsha. Each of the Wi-Fi points is connected to a common server. Users can access a local network's server, communicate with each other, and access the global Internet. Materials available on the server include videos for streaming, career development services, educational materials, electronic books, and services like Wikipedia. Videos available for streaming include TED talks, Khan Academy tutorials, WordPress and Moodle.

The goal of V-Net is to transition to a local service provider and use the revenue to support network maintenance and free digital literacy workshops in the community. The Internet is sold through a voucher system to local residents in order to further the community's digital economy and ICT development.

VPUU has also organized information sessions and hackathons where local residents could get involved, ask questions, and learn about the technology. A team of local residents was trained to maintain the network so that the community becomes its own steward of the technology it uses.

BOX 9.5

Pittsburgh's Every1Online Program

Despite the increasing digitization, Africa remains one of the world's least connected regions. According to the World Bank , only one-third of the continent's population has broadband access, and 45 per cent of Africa's population is further than 10 km from fiber network infrastructure, which is a higher percentage than on any other continent. It is estimated that in order to close the digital divide, an investment of 100 billion USD is required continent-wide. The World Bank estimates that 46 per cent of new users in Africa will be urban, 46 per cent will be rural, and the remaining are considered "remote rural".

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Besides the need for infrastructure, Internet affordability remains another significant issue. A study by Alliance for Affordable Internet in 2019 found that only 10 out of 45 countries researched had affordable Internet rates, defined as less than 1GB of data costing 2% of monthly income.

BOX 9.6

Electronic banking empowers women in India

As of 2021, more than two-thirds of urban Indian women use mobile banking services , making it the most popular payment mode ahead of cash and credit cards. Women hold the majority in the number of mobile banking users (6 out of 10 mobile bankers in India are women). Some of the most common reasons for switching to mobile banking include convenience, reliability, and easy money management. Many women reportedly plan to become completely cashless in the future .

According to the International Monetary Fund (IMF) , online banking allows women more freedom in managing their finances, as they do not have to hand over their cash earnings to their husbands or family members, and are not turned away by an in-person cashier as they perform transactions.

The share of online banking transactions is expected to rise as more women adopt the technology and, in turn, gain more financial independence . Many challenges still exist, such as the divide in adoption rates between working and non-working women.

6 out of 10 mobile bankers in India are women

4 THE DEMOGRAPHIC DIVIDE: Gender, ethnicity, age and disability

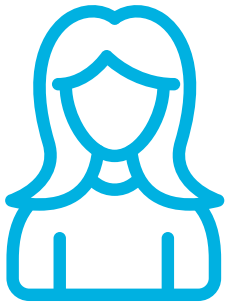
Internet connectivity remains elusive for many women, marginalised groups, the elderly and those with a disability. For a significant portion of immigrants, refugees and people on the move worldwide, language barriers impede access to local public information and government services. Section VII addresses information about each of these groups in detail. Broadly, global trends reflect that groups who are already marginalised face a perpetuation of their condition when it comes to internet connectivity and participation in virtual spaces.

5 THE CULTURAL DIVIDE: Motivation and social acceptability

Despite the internet's utility in providing access to information, education, opportunities and resources, a large segment of the offline population lacks compelling reasons to go online. Motivational, cultural, and occasionally, religious barriers to internet adoption include lack of awareness of the internet, lack of cultural acceptance, lack of demonstrated value and a lack of relevant (localised) content and services[62]. A study of residents in the Mathare informal settlement in Nairobi, Kenya reports that when given opportunities to connect to the internet, some residents were hesitant due to concerns of social acceptance[63], and a fear of becoming targets for theft. Culturally, and in some religious contexts, it may also be considered inappropriate for certain groups, often women, to use ICTs.

6 THE LITERACY DIVIDE: Awareness and education

Digital literacy is one of the most pervasive barriers to internet connectivity. Recognising this, SDG Target 4.4 calls for countries to track the percentage of youth and adults who have achieved at a minimum level of proficiency in digital literacy skills. Women, the elderly, disabled populations and rural residents have characteristically low digital literacy rates globally. In India, a recent National Family Health Survey found that over 60 percent of women in 12 states and union territories have never used the internet[64], posing significant challenges for workforce development. For those lacking digital literacy skills, today's job market is largely inaccessible due to both an inability to locate jobs on online platforms, and possess the necessary qualifications to obtain them.



In India, a recent study showed that

60%

of women in 12 states and union territories have never used the internet

08

Targets of a digital divide assessment

A study of the digital divide in your community should identify the symptoms of the digital divide, the location where a lack of connectivity or digital literacy is occurring and the underlying cause of the problem. We call these three key areas: Gaps, Locations, and Roots.

Key components of the digital divide

Gaps are the indicators or symptoms of the digital divide. Gaps are created in areas that have experienced a lack of investment in internet infrastructure or digital literacy as a result of geographic location, demographics or socioeconomic class. Public and private sector entities alike can create gaps through systemic disinvestment in such communities. Authorities internationally recognise three manifestations of the digital divide where gaps are felt: connectivity (access to physical infrastructure), digital literacy and devices (access to digital devices that use the internet).

- **Connectivity** – Access to usable broadband internet in the home or a means by which to conveniently and reliably access the internet whether by mobile phone or in a public service center such as a public library. As of 2020, usable internet is defined as a download speed of 10 megabits per second (Mbps). Remote learning or telecommuting typically requires between 5 and 25 Mbps[65].
- **Digital literacy** – Digital literacy is the ability to use information and communication technologies to find, evaluate, create and communicate information, requiring both cognitive and technical skills[66].
- **Access to devices** – Access to devices refers to affordable, sustainable access to internet-enabled devices that meet the needs of the user.

Remote learning or telecommuting typically requires between

5 & 25 Mbps

Location refers to where residents are experiencing the effects of the digital divide. This includes where residents experience a lack of connectivity, where residents live that suffer from low rates of digital literacy, or where residents live who lack convenient access to digital devices. Locations can include:

- **Political boundaries:** Political boundaries can include council districts, innovation zones, tribal divisions or voting districts. Surveying the digital divide within political boundaries can be instrumental to gather the political support needed to attract resources for solutions development.

- **Addresses:** Address location data is the most precise for determining household internet connectivity, however surveys should take into consideration privacy requirements when collecting address data, and provide residents with both the opportunity to consent or "opt-out" of data collection and a clear understanding of how the data will be used.

- **Geo-coordinates:** Geo-coordinates, or latitude/longitude is useful location data to collect for surveying informal settlements or remote rural areas where address data is not available.

- **Administrative boundaries:** Administrative boundaries are non-partisan boundaries set by organizations that administer services such as ZIP codes, prefectures, provinces or counties.

Roots are the root causes of the digital divide and address *why* some residents experience the effects of the digital divide. Root causes can be discerned through survey questions that address the following:

- **Geospatial conditions** – Limited access to connectivity infrastructure, skills and devices based on the availability of resources and infrastructure in rural areas, informal settlements or areas with unique topography.
- **Infrastructure accessibility and availability** – The accessibility of internet connectivity infrastructure due to physical location, historic lack of public or private sector investment, or informality.
- **Socioeconomic conditions** – Limited access to connectivity infrastructure, skills and devices based on affordability and need.
- **Demographic experiences** - Limited access to connectivity infrastructure, skills and devices based on gender, ethnicity, disability and age.
- **Cultural practices** – Limited access to connectivity infrastructure, skills and devices based on cultural practices, societal conditioning and perceived need as shaped by the experiences of a community or cultural group.
- **Education** - Limited access to connectivity infrastructure, skills and devices based on education level, awareness, familiarity with the internet and digital literacy levels.

BOX 10.1

Broadband public private partnerships: a gradient of risk, benefit and control

Broadband internet enables data transmission at high speeds and opens wide economic opportunities for communities with equitable access. Broadband is considered the most substantial form of internet connection to date, outperforming traditional dial-up, most wireless internet or mobile. However, the installation of broadband internet infrastructure is expensive and operationally complex. As a result, deployment of Broadband infrastructure often requires sustainable and innovative financing schemes that can be achieved through collaboration between municipalities and private internet service providers (ISPs).

These Public Private Partnerships (PPPs) have emerged in the past two decades as a vehicle to finance and scale broadband networks. PPPs can be structured in different ways that vary across three levers : 1) Risk, or the distribution of risk across the participating partners, 2) Control, or the level of control each partner has over various aspects of infrastructure deployment, maintenance, and operation, and 3) Benefit, or the level of benefit achieved for the community. Allocating responsibility for different phases of deployment is an important strategy municipalities can adopt that helps incentivise private sector partners to perform. For example, an ISP will be more likely to consider life-cycle costing during the construction phase when it is also responsible for later maintenance of the asset.

PPPs are challenging to bring about, often requiring a minimum of two years to develop. This is in part because such partnerships are vulnerable to various legal issues that must be addressed in advance. Issues such as access to public rights-of-way (PROW), clear financing expectations between the public and the private entity, and compliance with existing governmental regulation are common issues in PPPs. When properly configured in advance, PPPs have the greatest chance of achieving long term infrastructure benefits both for the public and the business sector.

09

Implementation, tools and methods

An assessment of your community's digital divide can take several forms based on resources and needs. The first step towards any assessment is to determine if you actually need one based on existing datasets available to you. If existing data is not satisfactory to address your programmatic needs, a survey assessment may be required. We recommend five steps to building a successful digital divide survey assessment

Five Steps to Building a Digital Divide Assessment

1 Identify gaps in existing data

2 Structure your survey using gaps, location, and roots

3 Administer your survey with key considerations

4 Reverse engineer the digital divide

5 Analyse and visualise your data "as-a-service"

1. Identify Gaps in Existing Data

Several data assets regarding the digital divide are available online. Depending on your region, there may be additional data available to you gathered by various organizations including NGOs, private and public internet connectivity providers, nonprofits, community advocacy groups, and other administrative or regional government data estimates. Below are some useful databases for digital divide assessments based on region.

International or Global Data

- "Measuring Digital Development- Facts & Figures 2020", International Telecommunication Union Development Sector (ITU-D), 2020
- World Development Report 2016: Digital Dividends
- The World Bank Internet Connectivity Data
- Global System for Mobile Communications Association (GSMA)
- The Internet Monitor, Harvard-Berkman Klein Center

US and Canada

- Government of Canada National Broadband Internet Service Availability Map
- Government of Canada National Broadband Internet Information
- National Digital Inclusion Alliance Broadband Research Database
- United States Census American Community Survey
- Form 477 Census Tract Data on Internet Access Services
- Fixed Broadband Deployment Data from FCC Form 477
- United States Department of Commerce National Telecommunications and Information Administration, Digital Nation Data Explorer

Eastern Europe & CIS

- DataReportal Eastern Europe
- Digital Divide in Multiethnic Russian Regions
- Digital Government in Estonia
- Bridging the digital divide in Ukraine
- Digital Divide Trends in Russia

Western Europe

- EuroStat Digital Economy & Society
- Fibre to the Home (FTTH) Council
- European Commision Broadband Connectivity

Asia and Pacific

- Mobile Internet Connectivity Southeast Asia (2020)
- Mobile Internet Connectivity South Asia (2020)
- Telecom Regulatory Authority of India
- China Internet Network Information Center Statistical Report on Internet Development in China (2019)
- China Internet Network Information Center

Arab Region

- The World Bank Data Middle East
- Telecommunications Regulation Authority - United Arab Emirates
- Arab Development Portal, UNDP
- Measuring digital development: Facts and figures 2020, ITU
- Digital trends in the Arab States region 2021, ITU

Latin America & Caribbean

- Broadband and Beyond in Latin America and the Caribbean - OECD
- Connected Society, Digital Inclusion in Latin America and the Caribbean, 2020 - GSMA
- CEPALSTAT - Open database of the Economic Commission for Latin America and the Caribbean (CEPAL) to access country and regional statistics and publications
- Digital Gender Inequality in Latin America and the Caribbean, 2020 - IICA, Inter-American Institute for Cooperation in Agriculture
- Sustainable and Digital Infrastructure for the Post-COVID-19 Economic Recovery of Latin America and the Caribbean: a roadmap to more jobs, integration and growth - Inter-American Development Bank

Africa

- Kenya Open Data
- Connecting Africa Through Broadband - ITU & UNESCO
- Mobile Broadband Connectivity Markets Dashboard - Xalam Analytics
- GSMA Mobile Coverage Maps - Africa

2. Structure your Survey using Gaps, Location, and Roots

The primary objective of your survey should be to identify the symptoms of the digital divide **(gap)**, where the problem is occurring (**locations**) and the suspected cause of the problem (**root**).

As discussed on Page 45, **Gaps** are the symptoms of the digital divide. Authorities internationally recognise three manifestations of the digital divide where "gaps" are felt: connectivity (access to physical infrastructure), digital literacy and devices (access to digital devices that use the Internet).

Location refers to where residents are experiencing the effects of the digital divide. This includes where residents experience a lack of connectivity; where residents live that suffer from low rates of digital literacy or where residents live who lack convenient access to digital devices.

Roots are the root causes of the digital divide and address why some residents experience the effects of the digital divide.

For a list of sample survey questions targeting gaps, locations and roots, please refer to the Appendix A: Survey considerations checklist.

For a Digital Divide Assessment example, see Box 11.6, "Processed data: San Antonio's digital divide assessment report cards."

3. How to administer your survey

Below we provide some information regarding tools and methods for administering a survey.

Survey by mail
Perhaps the most expensive option is to survey residents by mail. This can incur significant costs regarding design of the materials, printing and paid postage for returned survey responses. If the organization is already conducting a survey by mail, such as a census, then it may be more effective to include digital divide questions on an existing mail questionnaire. Mailed surveys are received without likely previous contact with the respondent. As a result, the response rate for this type of method is usually low, about 20%, depending on the content and length of the questionnaire. Because the response rate is low, you will need to collect a larger survey sample.

In-person interviews
For an assessment of the digital divide, in-person interviews should involve physically approaching respondents, either in public spaces or door-to-door. In this method, the surveyor typically asks the respondent a series of questions and enters their responses on a paper form or digital form. Digital survey apps filled out by the surveyor on a tablet or mobile device are a good approach for automatically recording survey responses in an online database, and several have the capability of running offline in areas with limited cell phone service. The response rate is also often higher than that of mailed surveys because the surveyor can engage the respondent personally. However, in-person interviews may incur significant expenses depending on the area of study, as they require dedicated, trained staff to carry out.

Telephone interviews
Telephone surveys are quicker and cheaper than mail or in-person interviewing and typically have a higher response rate than mailed surveys. Telephone interviews are a good option for surveying about the digital divide, however issues of inclusion with telephone surveys remain as many developing countries also lack basic electricity and phone-line services and issues can arise with this approach for engaging women in a household.

Online survey
Online surveys are not appropriate to survey the digital divide alone and must be supplemented by another survey method in order to reach those impacted by limited internet connectivity. Online surveys are beneficial for response rates however, because it is easier to market and promote them online. Online surveys can also be sent by SMS, which can have advantages for outreach if your organization has a text alerts system in place.

Pilot survey
Once you've developed your questionnaire and identified the appropriate survey method, you should test your survey on a small group of respondents in a pilot survey. This has the advantage of allowing you to identify any changes that need to be made to the survey for clarity, or changes that need to be made to the surveying process you've chosen.

Sampling methods
It is important that your survey results are representative of your population, otherwise you may not collect data that describes an accurate representation of the digital divide in your community. The demographics of your survey respondents should be roughly equal to the known demographic breakdown of your city's overall population. For example, if you know that 35% of your city's population belongs to a particular ethnic group, then about 35% of your survey respondents should also be from that ethnic group. If population statistics are available for specific geographic boundaries like neighborhoods or administrative districts, be sure that each district surveyed has a proportion of respondents representative of the known population statistics for that district. Random sampling is a useful technique for achieving this goal, where respondents are randomly selected from a list, however this requires that a database is available of local residents.

Sample size is critical when conducting a scientific survey. Generally, large samples with random selection are more powerful for accurate results, but data collection and analysis will proportionately take longer and be more expensive. Ultimately, sample size depends on three main factors: the resources available, the aim of the study, and the statistical quality needed for the survey[67]. If uncertain about what sample size you should aim for, consult a professional statistician.

Resources
The table below provides information about popular survey tools that can be used both online and in the field for in-person surveys.

Key Considerations

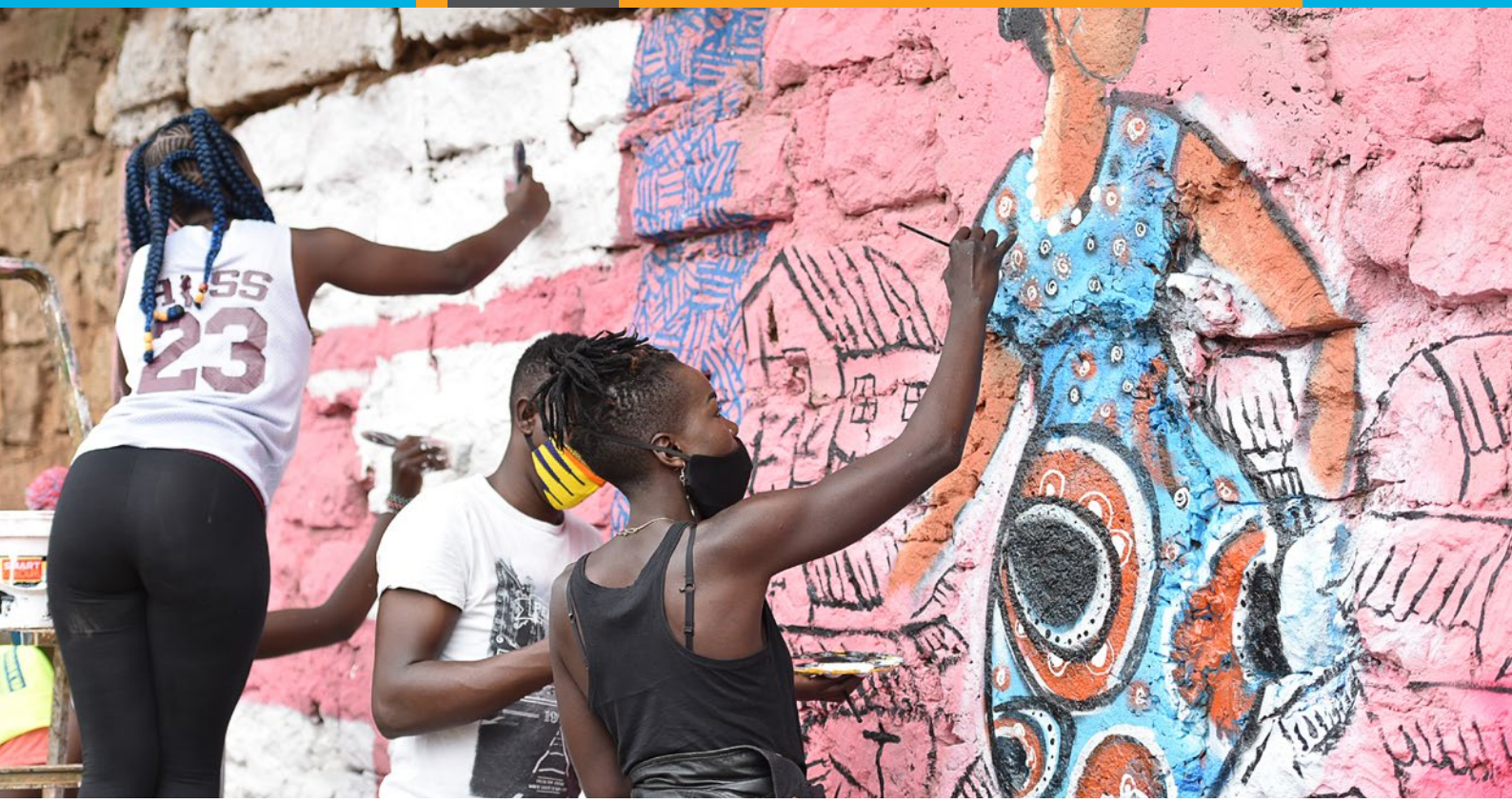
Possibly the greatest challenge for a digital divide assessment is that you cannot obtain reliable results by conducting the survey exclusively online. An assessment of the digital divide must be done both in person and online, introducing some important key considerations that should be addressed by anyone attempting a successful survey.

Boots on the ground – A successful digital divide survey assessment must be done in person. However, local governments and non-profit organizations are often limited in their personnel and capacity to administer the survey. Consider partnering with community organizations that serve the population you're interested in surveying. Through this partnership, look for opportunities to co-host events or participate in events and activities offered by the community organization to build trust within the community, and find more survey respondents.

Indigenous/ native communities – Indigenous and native communities or sovereign First Nations are often overlooked in survey assessments, however these

Table 1: Tools for online and field surveys

Tool	Description	Link
KoboTool Box	Free and open source mobile survey application with offline capability.	https://www.kobotoolbox.org/
ArcGIS Survey 123	Mobile survey application, requires a license.	https://survey123.arcgis.com/
Ushahidi	Mobile survey application and mapping tool with SMS and twitter capability.	https://www.ushahidi.com/
Google Forms	Free online survey tool without response limits.	https://www.google.co.uk/forms/about/



groups can be some of the most heavily impacted by a lack of investment in ICT infrastructure. Consider opportunities to partner with organizations that serve these communities in order to include representation from these groups in your survey.

Bias and equity – Social and economic inequality impact the opportunity and ability for marginalised groups to participate in a survey. Be sure to be inclusive of all neighborhoods and communities, and adjust your sample size accordingly. The demographics (age, gender, race, income) of survey respondents should mirror those of the city's entire population.

Familiarity with digital – Residents who are not familiar with the digital realm are precisely those that need to be surveyed. Avoid using technological lingo when creating your survey and be sure to provide an explanation of the survey's purpose, content and a time estimate for its completion. Be sure to have both paper and digital surveys available when surveying groups in person so residents less familiar with digital can participate using the paper survey.

Build trust – There are several ways organizations can build trust within their community. Build trust by:

- Partnering with trusted community groups and organizations when administering your survey.
- Providing a clear explanation of the data that will be collected and how it will be used, and where it will be stored.
- Providing a point of contact should the participant have any follow up questions.
- Using language that is familiar to respondents with respect to local dialect and cultural nuances.

Disability – Expand who can participate in your survey by making accommodations for deaf, blind and alternatively abled groups. Screen Readers are a common technology that makes digital material accessible to persons with disabilities. AccessibilityGO! A Guide to Action published by the World Blind Union and CBM Global Disability Inclusion provides actionable guidance for organizations seeking to build accessible digital services.

Language – Conduct your survey in an easy to understand language that respects regional dialects. Avoid using formal phrases and technology lingo, like “smart cities”. Translate your survey into multiple languages actually spoken by your community.

4. Reverse engineer the digital divide

If an assessment is not possible, or if you wish to supplement your assessment with additional data, consider "reverse engineering" the digital divide. You can do this by mapping the use of digital services and identify where the majority of residents accessing those services live. For example, if you offer an online form for applying for rental assistance, be sure to require that respondents provide a geographic identifier, such as a zip code or other administrative boundary. This will allow you to map the volume of online responses and identify potential gaps.

5. Analyse and visualise your data "as-a-service"

The data you gather from your survey assessment is a critical resource for your community. As such, consider treating this data as a service, which you provide to residents and community organizations, or the private sector. With access to this data, stakeholders can make more informed decisions and contextualise their experience, while community organizations can use it to deliver better quality services. Offering "data-as-a-service" or "daas" requires analysing it, visualising it and sharing it.

Analysing it

Gathering location data as previously discussed enables you to map your data, which provides an important geographic representation of where important trends are occurring. Alternatively, data-storytelling using interactive charts and graphs helps paint a complete picture of the issue. Consider supplementing your survey's results with other geospatial data that may be available to you, for example the location of key services or education outcomes.

BOX 11.1

Surveying informality: Using machine learning to map informal settlements in Honduras

Monitoring of populations living in slums in Latin America is complicated for a number of reasons: national censuses are conducted every 10 years on average while informal settlements grow significantly faster; manual mappings is also a costly and time-consuming process; and safety issues in some informal settlement areas prevent volunteers from efficiently collecting relevant data.

Tegucigalpa, with the population of 1,143,373 residents and an area of 201.5 square kilometers, is the largest urban area in Honduras. Despite significant issues of poverty and expanding informal settlements, the City did not have a comprehensive mapping of them as late as 2018, which significantly impacted the policymaking process. To address this issue, local NGO TECHO partnered with Dymaxion labs to leverage machine learning to help map informal settlements .

The Dymaxion Labs team used a "classifier neural network" (a machine learning algorithm) that had been previously used to map informality in other Latin American cities. The technology made it possible to accurately infer locations of informal settlements by scanning satellite images. As a result, 161 informal settlement areas were identified, accounting for approximately 42,000 families. The satellite mapping was used to inform census survey volunteers conducting field surveys to enhance their ability to correctly survey informal areas, develop policy, plan services, and in some cases relocate residents living in hazardous locations.

Visualising it
Several tools exist for data visualization and analysis, several of which are listed in the table below with a brief analysis on their capabilities.

Sharing it
When developing DaaS, consider your audience as you choose how you will present the data. Who will be using this data? What is the most convenient format for them to receive it in? These are all important considerations as you determine how you will share your data.

There are two main formats for sharing data: processed and unprocessed. Processed data has been analysed by you or your team—it tells a story you've previously discovered in the data. Unprocessed data is "raw," and simply contains the results of the survey without any analysis. Unprocessed data has value in that it empowers communities (who possess the necessary skills) to analyse it themselves without interference from governments or other groups. Releasing or sharing this data is useful for building trust within your community, as well as with media organizations. Unprocessed data is typically released as open data on an open data platform.

Processed data is valuable for those who do not possess these skills and trust your organization to provide them with the key takeaways from your assessment. Processed data allows you to deliver a message using the data you obtained. Processed data can take the form of dashboards, online reports or video testimonies.

Table 2: Tools for geospatial mapping and data visualization

Tool	Description	Price	Link
ArcGISOnline	Possibly the most widely used geospatial mapping tool. Includes data visualization tools, API integration, and ability to create a team of collaborators. Features robust data security and cloud-based analytics.	$$$	https://www.esri.com/en-us/arcgis/products/arcgis-online/overview
QGIS	Free and open source GIS software for Apple/Mac users only. Mimics most of the features of ArcGIS.	Free	https://qgis.org/en/site/
Ushahidi	Free and open source mapping software. Ushahidi maps survey responses, but does not provide data visualization tools like the production of charts and graphs.	Free	https://www.ushahidi.com/
CARTO	Intuitive and user friendly mapping software with a high degree of UX design. Subscription required. CARTO can easily integrate APIs, and includes access to data sets of choice for your region.	$$$	https://carto.com/
Tableau	Tableau provides both mapping and data visualization. The tool is very accessible for almost anyone, and includes easy to use tutorials.	Free version and paid version that unlocks additional features.	https://public.tableau.com/en-us/s/
Mapbox	Mapbox is a mapping tool that allows you to integrate your data with other map sources like satellite imagery. Mapbox is heavily customizable, and maps can be published to mobile, web, and even AR.	Free version and paid version that unlocks additional features	https://www.mapbox.com
R	R is a statistical software that allows you to perform complex statistical calculations on data in a "terminal" interface. R requires that you learn the "R" coding language. Outputs include standard statistical data visualizations.	Free and Open Source	https://www.r-project.org

BOX 11.2

San Antonio's digital divide in the context of CoVID-19

Like so many cities, residents of San Antonio, Texas were tremendously impacted by the global pandemic. San Antonio is one of the fastest growing in the United States, and has the country's 7th largest population. However, San Antonio also has one of the largest poverty rates in the country, and a significant digital divide. In 2019 the City of San Antonio's Office of Innovation conducted a study of the digital divide and found that nearly 20% of residents don't have broadband Internet access in the home. The impact of these figures was not felt until however, until 2020 when the City transitioned to offering the bulk of its services online during the global pandemic. Critical public health information, and innovative public health services were largely delivered digitally, potentially leaving out the population lacking Internet access.

In March of 2020, the City offered an online self-screening tool, helping residents identify their symptoms and determine whether they needed to get tested for CoVID-19. In order to determine how many people were using the service, the City asked residents who used the service to provide their ZIP code when using the application. Service uptake was then mapped city-wide revealing a stark reality: the map of service uptake looked very similar to the City's known digital divide map. This prompted the City's public health staff to deploy door-to-door information campaigns delivering information directly to residents in person. Teams were delegated to specific neighborhoods based on the City's digital divide map, and Equity Atlas. By mapping the uptake of a digital service, the City was able to "reverse engineer" the digital divide, to discover where populations were lacking the connectivity required to use the service successfully. The door-to-door campaign proved successful, and offered a lesson that in-person outreach was necessary for documented populations lacking Internet connectivity.

HELPDESK

Data-sharing systems for digital cooperation

As a foundational pillar of people-centered smart cities, effective data management is critical to ensuring the integrity, transparency and usability of data as a public asset. The ability to safely share data across organisations and information systems based on interoperability and privacy standards is an opportunity for governments to support effective communication and collaboration between different teams, the community, private sector and with other stakeholders. Such evidence-based data can be also applied to build best practices with the regional and international community. Data collected about the digital divide, when integrated in an interoperable system, can foster innovative approaches and accelerate digital transformation.

For more information Click here

BOX 11.3

Mapping Britain's broadband connectivity

Visualising digital divide data has a storytelling effect, helping people connect to the issue by being able to visualise its impact, geographic location, and scale. In the case of Britain, data reporters at the Financial Times uncovered that the digital divide in the UK was not simply split between urban and rural regions of the country. Instead, visual analysis revealed the digital divide was more prominent between the inner city which lacked access compared to the suburbs, where great strides in digital infrastructure investment had been made.

The study relied on public data sources from the region's main communications regulation authority Ofcom, which provided broadband speeds for 1.6 million postal codes in England, Wales and Scotland. Additional layers for the map were obtained from publicly accessible data sources including the Consumer Data Research Centre, and the public corporation Ordnance Survey. Analysts calculated estimates of broadband speeds for each postal code based on the broadband speeds available for surrounding postal codes. Finally, they added a layer of building footprints, and classified them according to the broadband speeds estimated for the postal code in which they exist.

The result is a high-resolution interactive map, published using MapBox. Users can search for their own postal code, to learn about the broadband speeds estimated for their area, and identify regional trends in broadband availability.

Mapping broadband connectivity to this degree of resolution requires the availability of many public data sets, which is not accessible to all regions. Some communities may have to develop their own methods for mapping their regions and subsequently digitising these maps. Ultimately, any boundary created by a public authority can contain data that is represented within it. For digital divide assessments, first attempt to use existing map layers (shapefiles) that represent your city, town, or region. When conducting your survey, be sure to codify your responses in such a way that they can be organized by the features of your map layer.

BOX 11.4

Mapping Shreveport's digital divide with GPS data

Determining the extent of internet infrastructure that exists is an ongoing challenge for local governments. As a result, some cities have taken innovative and cost-effective approaches to mapping the digital divide using a combination of technologies. For example, the City of Shreveport, Louisiana developed a low cost way to produce a map of the digital divide for the city and surrounding neighborhoods. By automating this process, the City was able to reduce the costs of sending volunteers to survey the entire city on foot. The City used GPS detectors to pick up the location of domestic wi-fi networks from the public right of way. These detectors were attached to trash trucks during their routes, which allowed the authorities to obtain detailed network information for nearly all neighborhoods. The GPS sensors consisted of a battery and a standard GPS chip programmed with open-source software, making the technology cheap to replicate in several trucks.

By collecting information on the availability of private wi-fi spots and comparing that with demographic and socioeconomic information, the City was able to decipher the affordability of broadband networks at a granular level. The information was gathered, analysed and reported on the city's website. By mapping this data, the City was better able to allocate broadband grant funds to the communities most in need. The city is also planning several community-wide networks and digital skills training programs to supplement its connectivity initiatives.

BOX 11.5

Building mapping infrastructure from scratch: City Planning Labs initiative in Denpasar, Indonesia

Most cities operating in developing nations, or with a significant informal settlement population, struggle to find data resources that are geographically specific and can inform data collection and planning initiatives at a local level. In situations where digital map layers don't exist, public authorities have to build mapping infrastructure from scratch.

In the case of Kota Denpasar, the capital city of the Indonesian province of Bali, the tourism industry led to an explosion of migrants and transient labor forces arriving largely from Java and other nearby islands to participate in the economy. Migrants unable to afford local housing, resorted to building informal settlements, which over decades, expanded and solidified within and around the city. This posed a significant challenge for the municipality, which sought to provide services including public housing, utilities, internet connectivity and solid waste services to these residents. To do so, Kota Denpasar required formal, digitised mapping of these areas.

A team of researchers from Singapore University of Technology and Design, and research consultants City Form Labs were funded by the World Bank to help Kota Denpasar build a Geographic Information Systems (GIS) program from scratch. The initiative began with funding the development of a geospatial laboratory, "City Planning Lab," including two computers and an internet connection. Subsequently, technology trainings were held for staff to learn how to use GIS. These staff, along with City Form Lab consultants then held a workshop with community leaders to identify the main challenges experienced by slum settlement residents. These challenges became the subject of mapping efforts, which involved collecting data door-to-door on the subjects of concern. Aerial footage from Google Earth and other sources were used to help map individual dwellings, roads and other amenities in the area.

A customised administrative boundary respectful of the community's cultural structure was also designed. In the context of Indonesian Government administration, Denpasar is divided into four Kecamatans (districts), each headed by a Camat (civil servant). Each Kecamatan in turn is divided into Desas (villages) headed by a Kepala Desa (village head). GIS layers representing the Kecamatans, were developed in collaboration with each Kepala Desa.

Mapping a community inherently makes it "legible" to public authorities and the public at large. Doing so can have tremendous advantages for the planning and allocation of critical public health and infrastructure services, especially in slum settlements. However, such data collection must respect both the privacy of residents, and their unique cultural structure. Here, Kota Denpasar took caution to respect the administrative structure of the Desas when digitising their geographic boundaries. Doing so allows future data to be captured and organized in a way that respects the reality and lived experiences of residents.

BOX 11.6

Processed data: San Antonio's digital divide assessment report cards

The City of San Antonio conducted an assessment of the Digital Divide in 2019. The survey was structured to capture data about the community's connectivity, access to devices, and competency of digital skills. Over 6,000 community members responded both online and in-person, representing over 200 hours of community engagement work. The City of San Antonio partnered with a local university (The University of Texas at San Antonio) to develop the survey, administer it, and report its findings.

Findings were reported in four main ways: a standard public report, a published scientific research paper in the Academic journal Cities, a broadband connection map (pp.10 of the report), and City Council District Report cards.

Data was collected by ZIP code, a common geographic boundary that could be mapped onto Council Districts, an important political boundary for the community. In the City of San Antonio, elected city council officials represent each Council District, and sharing the data aggregated by Council District was strategic to create both awareness and urgency of the issue for elected officials. Each Council District's data was reported as a "report card" which provided an overall "grade" for the district, and highlighted the most critical information about that District's connectivity. Grades were based on survey responses tied to that District and were organized by results for connectivity, access to devices, and digital literacy. The Grades given were similar to those for school age children, where "A+" was the highest achievement, and "D" was the lowest achievement. Organizing the findings in this way was instrumental to effectively communicate the issue to elected officials in a common language that was easy to understand and visualise.

10

Capacity: partnerships and resources for city governments

The digital divide is a monumental challenge facing communities across the globe. Local governments alone often suffer from a lack of funding, expertise, or capacity to carry out a scientific assessment of the digital divide on their own. This is why strategic partnerships are critical for a successful assessment. Partnerships can take many different forms including partnerships with universities, private sector consultants, non-profits or community organizations and crowdsourcing.

Universities: Local universities are excellent partners for scientific assessments of the digital divide. You can typically rely on universities to provide support with scientific analysis, correlations and mapping of your data. Often, universities will request permission to publish their findings publicly. It is recommended to have a Memorandum of Understanding (MOU) and a Data Sharing Agreement in place with a university to specify the conditions under which data will be shared, used, and distributed during the project. Request the university to package raw data, maps or analyse it in a format you can use and distribute to your community.

Private sector consultants: Private consultants often have significant staffing, technical and financial resources that they can contribute to an assessment, however these resources will come with a price tag, and the company may be less familiar with the nuances of your community. Again, it is recommended to have a data sharing agreement in place to specify the conditions under which data will be shared, used, and distributed during the project. Request the consultant to package raw data, maps, or analyses in a format you can use independently.

Civil society organizations: While the resources of these groups to carry out an assessment vary, local non-profit and community organizations may have invaluable knowledge about the community you seek to survey, which they may serve on a daily basis. Non-profit partners and community organizations can excel in assisting you with administering a survey and as such can be an excellent partner paired with an analytics team from a university or consultant.

Crowdsourcing: In addition to these efforts, or when resources are scarce, it's a good idea to solicit the public to contribute to an open dialogue, survey or mapping activity. For digital divide activities, targeting youth through apps and open platforms can be a great way to crowdsource survey responses as they can survey their networks, friends and family.

Common challenges for city governments assessing the digital divide

In 2021, the UN-Habitat team surveyed a group of cities and civil society as well as non-profit entities representing or operating across the UN regions. Findings indicated that cost, capacity, and lack of available data were some of the greatest barriers to studying the digital divide. In budget-strapped environments, local governments tend to prioritise digital literacy measures through educational programming and information campaigns, over large scale expensive infrastructure investments in internet connectivity.

Gathering data: Cost (43.5%) and lack of available data (43.5%) were cited as the two greatest roadblocks to collecting data about the digital divide for survey respondents. Capacity in terms of staff and expertise (35%) and lack of available technology (35%) were the second greatest barriers.

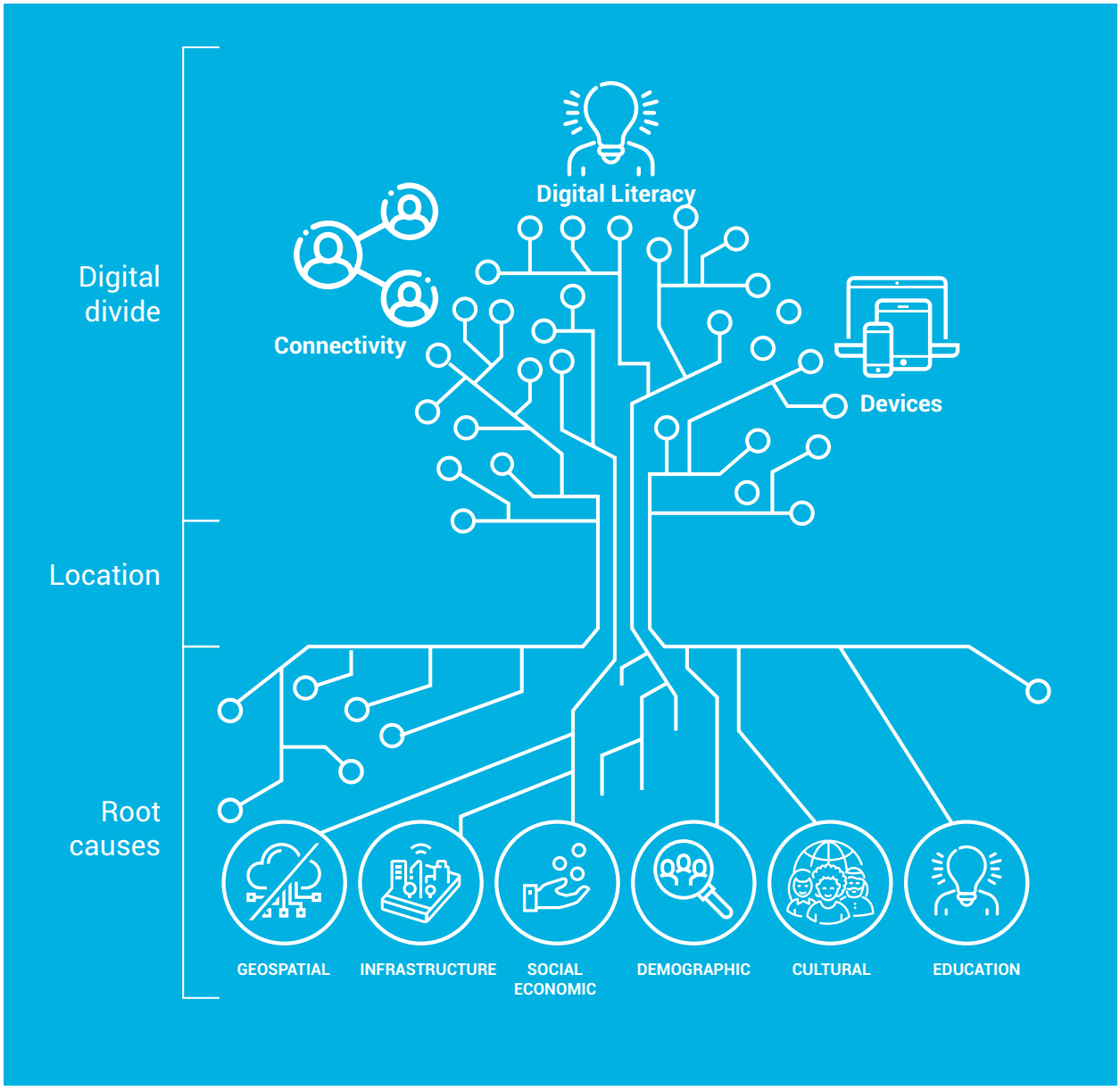
Prioritising digital inclusion activities over infrastructure: More than half (67%) of respondents said their city has taken steps to increase access to the internet, digital skills or devices for residents. The majority said digital skills training (39%) or another activity "other" (26%), was the primary vehicle by which cities addressed the digital divide in their communities. Last mile connectivity (26%) and subsidised internet access (21%) were the next most frequently cited offerings. 26% of cities also said they had no offerings to date.

Funding & capacity: When it comes to expertise or funding for digital inclusion initiatives, most respondents (81%) said they relied on private sector partners. 38% said they used partnerships with the national, state, or regional government, and 28% said they partnered with NGOs, community advocacy groups or non-profits. Cost is the greatest barrier (78%) for city governments seeking to take on digital inclusion initiatives, according to respondents of this survey. Lack of internal capacity (52%) and lack of access to technology infrastructure (48%) were the next most cited roadblocks. Notably, a mix of private internet service providers were the most typical internet service providers in the communities surveyed.

11

After the assessment: identifying your community's digital divide taxonomy

Once you've completed your assessment, you should be able to identify the gap, location, and root of the digital divide experienced by your community. This is your digital divide taxonomy. Keep in mind there may be more than one of each. By mapping out your digital divide taxonomy you can begin to visualise the conditions of your community's unique situation. The next playbook, Addressing the Digital Divide: Taking Action Towards Digital Inclusion identifies key steps your organization can take to address the digital divide based on your Taxonomy.



12

Conclusion and next steps

The first step towards building a coordinated approach to a smart city strategy that places people at the center of digital transformation is to ensure that everyone has affordable, convenient access to the internet.

Without equitable internet connectivity, all people cannot equally participate in digital society. Digital society has expanded in recent years and after the pandemic to include fundamental aspects of life. Banking, voting, applying for jobs, paying rent, shopping, education, creativity, community and collective activism all have online analogues that are increasingly more prevalent than their physical counterparts.

This playbook offers a guide for local governments, policymakers, civil society and non-governmental organizations seeking to take the first step towards bridging the digital divide: studying it. Without reliable, hyperlocal data about the digital divide in their communities, local governments, nonprofits and NGOs cannot design effective solutions to combat it. This playbook outlines a step-by-step process whereby these organizations can collect local data about the digital divide in their communities, while respecting their community's privacy. The elements presented in this playbook follow the principles outlined in the Digital Equity Pillar presented in Centering People in Smart Cities: A Guidance Note for local and regional governments.

The digital divide is both a symptom and perpetuator of income inequality, and the disconnected largely belong to historically disadvantaged communities. While every community is different, the digital divide consistently reflects and amplifies existing social, economic and cultural inequalities such as gender, age, race, income, and ability. Known groups to be disproportionately affected by the digital divide are: women and girls, children and youth, the elderly, urban and rural poor, marginalised or minority communities, persons with disabilities and indigenous communities.

Increasing connectivity is not enough to solve the digital divide. The digital divide is not just about increasing connectivity, but rather about creating opportunities for residents to enhance their knowledge, improve their economic mobility and ultimately become more proactive, engaged, and aware. Through the process of studying the digital divide, gathering grassroots data and sharing usable data with the community as a public resource, **local governments can initiate a process to transform residents from being passive consumers of technology, to being active users of it.** Unlocking opportunities to do this across government activities is the foundation of building inclusive participation in smart cities.

Local governments, policymakers, civil society and non-governmental organizations using this playbook have a roadmap to identify the gap, location and root of their digital divide. Doing so enables them to design effective solutions that target the nuances of how the digital divide takes shape in their community.

The second playbook in this series, Addressing the Digital Divide: Taking Action towards Digital Inclusion, builds upon this work to help organizations create customised digital inclusion solutions using cost-reducing strategies that place their community at the center of the transformation.

13 Appendix

DIGITAL DIVIDE ASSESSMENT:
Survey Considerations Checklist

The primary objective of your survey should be to identify the symptoms of the digital divide (gap), where the problem is occurring (locus), and the suspected cause of the problem (root). Below are sample survey questions that address each. Your survey should design questions that address each of the items in the checklist.

Survey questions that identify gaps

Gaps are the symptoms of the digital divide. Authorities internationally recognize three manifestations of the digital divide where "gaps" are felt: connectivity (access to physical infrastructure), digital literacy, and devices (access to digital devices that use the Internet).

2 Survey questions that identify locus

Locus refers to where residents are experiencing the effects of the digital divide. This includes where residents experience a lack of connectivity; where residents live that suffer from low rates of digital literacy, or where residents live who lack convenient access to digital devices.

3 Survey questions that identify roots

Roots are the root causes of the digital divide and address why some residents experience the effects of the digital divide.

Connectivity

- [ ] Does the respondent have access to usable broadband Internet in the home?
- [ ] Does the respondent have a means by which to conveniently and reliably access the Internet?
- [ ] Does the respondent rely on a public service center such as a public library for Internet connectivity?
- [ ] Does the respondent travel to a location to connect to the Internet?
- [ ] What kind of activities can the respondent perform using the Internet connectivity speed they have access to?

Digital Literacy

- [ ] Does the respondent feel confident in their ability to use the Internet to accomplish their goals?
- [ ] Does the respondent feel confident in their ability to use a digital device to accomplish their goals?
- [ ] How frequently does the respondent use the Internet?
- [ ] Is the respondent familiar with privacy issues?
- [ ] Is the respondent familiar with cyber security issues, including password management or phishing attempts?
- [ ] Does the respondent feel confident in their ability to create and share content online?
- [ ] Does the respondent feel confident in their ability to use social media?
- [ ] Does the respondent feel confident in their ability to fill out online forms for employment?
- [ ] Does the respondent access or use online educational platforms?

Access to Devices

- [ ] What device does the resident use to access the Internet?
- [ ] How many Internet-enabled devices does the individual have access to?
- [ ] Is it a smart device?

Additionally, consider gathering qualitative information in addition to survey responses. Images and stories from respondents can be important qualitative information that can help tell a powerful story about the impact of Internet connectivity and digital services on the lives of communities you seek to serve.

1 — 2 — 3

Survey questions that identify gaps

Gaps are the symptoms of the digital divide. Authorities internationally recognize three manifestations of the digital divide where "gaps" are felt: connectivity (access to physical infrastructure), digital literacy, and devices (access to digital devices that use the Internet).

Survey questions that identify locus

Locus refers to where residents are experiencing the effects of the digital divide. This includes where residents experience a lack of connectivity; where residents live that suffer from low rates of digital literacy, or where residents live who lack convenient access to digital devices.

Survey questions that identify roots

Roots are the root causes of the digital divide and address why some residents experience the effects of the digital divide.

Survey questions should ask for residents to identify one of the following geolocations of their residence:

- A political boundary ☐
- An address ☐
- A geo-coordinate ☐
- An administrative boundary ☐

Collecting individuals' addresses may raise privacy concerns. If collecting addresses, consult with local or regional privacy laws before doing so.

1 — 2

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Survey questions that identify roots

Roots are the root causes of the digital divide and address why some residents experience the effects of the digital divide.

Geospatial Conditions

- Does the individual reside in an informal settlement? ☐
- Does the individual reside in a rural area? ☐
- Does the individual have access to broadband Internet in the home? ☐

Infrastructure Accessibility and Availability

- Does the location or neighborhood being surveyed suffer from historic lack of investment? ☐
- Are other types of public services available in the area being surveyed i.e., electricity, sewage, trash pick-up? ☐
- What is the nearest location of active internet infrastructure or broadband connection? ☐

Socioeconomic Conditions

- Can the individual afford an Internet subscription to broadband Internet in the home? ☐
- Can the individual afford a mobile data/voice package? ☐
- Does the individual sometimes have to prioritize Internet access for other things like groceries or rent? ☐

Demographic Experiences

- How does the individual identify their gender, race, ethnicity? ☐
- What is the age of the survey respondent? ☐
- Does the respondent have a disability? ☐

Cultural Practices

- Does the respondent believe their life could improve with Internet access? ☐
- Does the respondent feel that their friends and family will accept their use of the Internet or Internet-able devices? ☐
- Does the respondent's friends and family have their own way to access the Internet or devices? ☐

Education

- What is the education level of the respondent? ☐
- Has the respondent ever participated in digital literacy classes? ☐
- Is there an area of digital literacy that the respondent feels a lack of proficiency or wants to learn more about? ☐


GRACIOUS
SALON
ALL SCRATCH CARD MCHELE
SODA
BARIDI
MAFUTA - TAA HAPA
Airtel Money Hapa

Endnotes

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Terms

Data divide
The gap among those who have the resources and ability to access and use open government data and those who have not.

Data sharing agreement
A formal contract that specifies the requirements for sharing data between two parties. The contract clearly documents what data is being shared and sets parameters for the use of data, data transmission, security, storage and destruction between any two parties that collect and/or manage data.

Data storytelling
Using data to tell a story visually, often through the use of informational graphics or mapping.

Digital divide
The gap between those who have access to and use Internet connectivity, digital literacy skills and internet-enabled devices and those who do not. While every community is different, the digital divide consistently reflects and amplifies existing social, economic and cultural inequalities such as gender, age, race, income, and ability. Access is multidimensional and includes the physical, spatial, cultural, demographic and socioeconomic conditions of accessibility.

Digital divide taxonomy
A classification of different types of the digital divide varying by the gaps exhibited, the location, and the root cause.

Digital human rights
Digital human rights are human rights as they exist in online and digital spaces. Digital technologies have the potential to advocate, defend and exercise human rights, but they can also be used to suppress, limit and violate human rights. Existing human rights treaties were signed in a pre-digital era, but online violations can today lead to offline abuses and, as highlighted by the UN Secretary-General, human rights exist online as they do offline and have to be respected in full. Of particular concern to the UN are data protection and privacy, digital identity, surveillance technologies including facial recognition and online harassment. In these areas, technlogies are increasingly being used to violate and erode human rights, deepen inequalities and exacerbate existing discrimination, especially of people who are already vulnerable or left behind.

Digital inclusion
The gap between those who have access to, and use Information Communication Technologies (ICTs) including Internet connectivity, digital literacy skills, and Internet-enabled devices, and those who do not. While every community is different, the digital divide consistently reflects and amplifies existing social, economic and cultural inequalities such as gender, age, race, income, and ability. Access is multidimensional and includes the physical, spatial, cultural, demographic and socioeconomic conditions of accessibility.

Digital literacy
The ability to use information and communication technologies to find, evaluate, create, and communicate information, requiring both cognitive and technical skills.

Digital public goods
Open source software, open data, open AI models, open standards and open content that adhere to privacy and other applicable laws and best practices, do no harm, and help attain the SDGs.

Digital services
The electronic delivery of information including data and content across multiple platforms and devices like web or mobile. Digital services can be provided by any sector, public or private, that uses the internet to deliver information.

Digital sovereignty
The authority to independently control, protect, and manage digital data.

Digital twin
A digital representation of a real-world entity or system. The implementation of a digital twin is an encapsulated software object or model that mirrors a unique physical object, process, organization, person or other abstraction. Data from multiple digital twins can be aggregated for a composite view across a number of real-world entities, such as a power plant or a city, and their related processes.

E-government
The use of ICTs for improving the efficiency of government agencies and delivering better public services - including by providing government services online.

Gaps
The indicators or symptoms of the digital divide. Gaps are created in areas that have experienced a lack of investment in internet infrastructure or digital literacy resources as a result of geographic location, demographics, or socioeconomic class. Public and private sector entities alike can create gaps through systemic disinvestment in such communities. Authorities internationally recognise three manifestations of the digital divide where gaps are felt: connectivity (access to physical infrastructure), digital literacy, and devices (access to digital devices that use the Internet).

Homework gap
The gap between students with internet connectivity and those without.

Hyperlocal
Granular information or data related to a specific local community

Information and communication technology
All communication technologies, including the internet, wireless networks, cell phones, computers, software, middleware such as video-conferencing, social networking, and other media applications and services enabling users to access, retrieve, store, transmit, and manipulate information in a digital form.

Locations
Refers to where residents are experiencing the effects of the digital divide. This includes where residents experience a lack of connectivity; where residents live that suffer from low rates of digital literacy, or where residents live who lack convenient access to digital devices as determined by the residents themselves.

Least developed countries (LDCs)
Least developed countries (LDCs) are low-income countries confronting severe structural impediments to sustainable development. They are highly vulnerable to economic and environmental shocks and have low levels of human assets. There are currently 46 countries on the list of LDCs which are reviewed every three years by the UN Committee for Development (CDP).

Open data
Data that is freely available online for anyone to use and republish for any purpose.

Roots
The root causes of the digital divide are the reasons why people experience the effects of the digital divide. Root causes can be complex and include geospatial conditions, infrastructure accessibility and availability, socioeconomic conditions, demographic experiences, cultural practices, and education.

Smart sustainable cities
A smart sustainable city is an innovative city that uses information and communication technologies (ICTs) and other means to improve quality of life, efficiency of urban operation and services, and competitiveness, while ensuring that it meets the needs of present and future generations with respect to economic, social, environmental as well as cultural aspects.

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UNITED NATIONS HUMAN SETTLEMENTS PROGRAMME
P.O. Box 30030, Nairobi 00100, Kenya
T: +254-20-76263120
E: infohabitat@unhabitat.org

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