



# SMART CITIES

A Citizen-Centric Approach

# IMPRINT

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# 1. INTRODUCTION

Smart Cities is a term that has been used in the urban development discourse for nearly 20 years. The term itself has become a blockbuster with many cities aspiring to be a smart city, citizens demanding a variety of smart services and national governments spending billions to support the implementation of smart cities. The term has reached a point of self-fulfilment to the point that not living in a smart city may imply the negative choice of living in a “stupid” city. There is, however, currently no clear definition of smart city. In broad terms, smart cities are generally cities that achieve sustainable urban development through participatory elaboration and usage of digital information and communication technologies (ICT), encompassing therefore all sectors related to urban space, including, for example, the provision of basic utility services, public services in form of e-government as well as sustainable mobility concepts.

The fundamental importance of digital transformation in the urban development is highlighted in the United Nation's New Urban Agenda, which states: “We commit ourselves to adopting a smart-city approach that makes use of opportunities from digitalization, clean energy and technologies, as well as innovative transport technologies, thus providing options for inhabitants to make more environmentally friendly choices and boost sustainable economic growth and enabling cities to improve their service delivery.”<sup>1</sup>

This working paper illustrates GIZ's understanding of the term smart cities from a citizen-centric perspective, the challenges for cities on their way to becoming smart cities and the role we play in their creation and support. GIZ's understanding is based on worldwide trends and the outcome of various national (e.g. the German Smart City Charter) and international policy forums (e.g. UN Habitat Forum). This paper also builds on previous GIZ smart cities literature that can be found in Annex 1.

Taking into consideration the above, GIZ's understanding is aligned with the following statement made at the German Habitat Forum 2016: “*Smart City is not a goal in itself, but an instrument towards sustainable and inclusive urban development.*” In this sense, smart cities can be characterised by the wide use of technologies, services and smart behaviour in potentially all sectors in the city, with the ability to reach beyond the geographical limits of the city.

As a development agency, GIZ adopts a broad and integrated definition of smart cities, based on the needs and priorities of our partner countries and also our funding agencies, including the German Federal Ministry of Economic Cooperation and Development (BMZ), Federal Ministry of Environment, Nature Conservation, Nuclear Safety and Consumer Protection (BMUV), Federal Ministry of the Interior and Community (BMI), Federal Ministry for Housing, Urban Development and Building (BMWSB), Federal Ministry of Education and Research (BMBF), Federal Foreign Office (AA) and the European Union (EU). A more in-depth overview of the above agencies' strategic approaches, projects and initiatives on smart cities can be found in Annex 2.

<sup>1</sup> United Nations (2017, p.19): *New Urban Agenda*





## 2. CHALLENGING TIMES FOR CITIES

Urbanisation is one of the megatrends of the 21st century - more than 6.5 billion people are expected to live in cities by 2050, thus representing an increase to roughly two thirds of the world population. Due to this rapid growth, cities, particularly in the Global South, are facing serious challenges ranging from environmental pollution to social segregation and informality. As a result, urban centres are required to not only provide adequate services and infrastructure, but also to find innovative and sustainable ways to deal with growth in all sectors. In addition, many of the challenges faced are exacerbated by the global climate crisis. Thus, cities must not only develop strategies for climate adaptation and dealing with the effects of climate change, but also take preventive, mitigating measures.

On a positive note, cities, as centres of life and human activity, also pool a large number of resources and harbour significant innovation potential. Globally, however, the crucial question is: how can cities harness this potential to successfully adapt in a sustainable and inclusive manner to increasing pressures on infrastructure and urban services?

The challenges facing cities can be divided according to the three sustainability criteria: environmental, social and economic. This is aligned with the UN Sustainable Development



Goal 11 which defines sustainable cities as those that are “*dedicated to achieving green sustainability, social sustainability and economic sustainability.*”

In the following three sections, challenges facing the cities are grouped according to the three above criteria (environmental, social, economic). Whilst these challenges are not meant as an exhaustive list, many of these challenges are complex cross-sectoral issues that vary from being inter-related, co-dependent as well as unique enough that they require tailor-made solutions. For the purposes of this paper in order to reduce complexity, some of these cross-sectoral issues have been allocated to only one “challenge group.”

Finally, for each challenge group, potential solutions and real-world examples will be presented that leverage the existing resources and potential of cities to create value for society and opportunities for prosperity. In doing so, this paper looks in particular at interconnected technologies and data-based solutions to improve the life quality of citizens, co-create innovative responses to their main challenges, and ensure their efficiency on a sustainable basis. By engaging citizens, digital components provide new ways of building social movements, strengthening civic rights, delivering public services, and creating lasting positive social impact.

The smart cities solutions below are presented in a simplified manner, with one potential solution being allocated per challenge.

## 2.1 ENVIRONMENTAL CHALLENGES

Cities are faced with a myriad of environmental challenges that they often struggle to deal with. With rapid urbanisation, air pollution has increasingly become a problem as a result of expanding industrial growth and the increased availability and usage of motorised transportation (ranging from buses, to personal cars, to motorcycles). Likewise, unreliable water access is heightened in rapidly growing cities, especially in arid regions lacking adequate resource management strategies. The World Resources Report “Unaffordable and Undrinkable: Rethinking Urban Water Access in the Global South” found that nearly half the population in 15 cities in the Global South lacked access to public piped water systems.<sup>2</sup> Furthermore, access to sanitation, effective wastewater treatment and waste management are significant problems, especially in overpopulated slum districts. Left uncontrolled, these can be the source of diseases and other serious health issues. Additionally, soil sealing is an acute problem in urban areas leading to flooding issues due to new housing and infrastructure. Other connected issues include urban heat islands and loss of biodiversity. Increased housing and infrastructure are furthermore just two factors propelling the immense energy consumption needs of growing cities.

All these issues are further undermined by climate change, with costly impacts on urban systems, services, infrastructure and housing due to the consequences of rising sea levels and increased extreme weather events (such as floods, droughts and storms). The cause-and-effect cycle is coming full circle: estimates suggest that 75% of global CO<sub>2</sub> emissions come from cities.<sup>3</sup>

### 2.1.1 POTENTIAL SOLUTION

One potential smart cities solution for these environmental challenges is in the form of an **urban management platform** (alternatively known as urban data platforms). These platforms are the basis for efficient management of urban supply systems (water, energy, waste, etc.). The integration of real-time data from different data sources (private and public) within those platforms can build the foundation of a smart city, with the aim to enhance the environmental sustainability, including energy consumption demands.<sup>4</sup> Benefits of integrated urban data platforms include increasing the efficiency of urban management and planning, using city modelling as evidence-based planning, reducing CO<sub>2</sub> emissions, decreasing the consumption of natural resources as well as spurring innovation and enabling better decision making. Similarly, these platforms can also help enhance resilience and tackle climate change related environmental disasters through usage of digital monitoring and early warning systems.

In Hamburg, Germany,<sup>5</sup> for instance, the *Urban Data Platform* includes data ranging from traffic statistics, building plans, school information and occupancy of charging stations for e-cars.

In Porto Alegre, Brasil, an Open Data platform publishes city-related data ranging from administration and finances, culture and tourism to health and the environment. Users can, for example, visit the website to get a better understanding regarding the current state of green spaces in the city as well as new green urban projects.<sup>6</sup>

## 2.2 SOCIAL CHALLENGES

It is estimated that one billion of the world’s poor live in urban areas.<sup>7</sup> That is roughly a fifth of all city dwellers - a fact that is only exacerbated by a large portion of the urban poor consisting of those living in precarious slums and informal settlements which face, for example, higher exposure to natural disasters. Informal settlements are only set to expand with increasing rural exodus and a continuous influx of people due to displacement and migration leading to further urban growth. Here too, climate change plays a role. In the coming years it is expected that the number of people migrating due to climate change impacting their livelihoods or people displaced due to climate-induced disasters will only increase. Likewise, urban displacement/ gentrification and the high fluctuation rate have a negative impact on social cohesion and are therefore fertile ground for mistrust and resentment. Simultaneously these risks, which have become more pronounced during the COVID-19 pandemic, further enhance the social divisions in cities which can have profound long-term impacts on the social fabric. Due to the lack of urban services, infrastructure and job opportunities, informal settlements are heavily affected by organized crime and violence. In some regions, up to 70% of violence occurs in big cities. Violence in particular, disproportionately affects women: according to UN-Habitat “violence makes up at least 25-30% of urban crime and women – especially in developing countries – are twice as likely to be the victims of violent aggression.”<sup>8</sup>

### 2.2.1 POTENTIAL SOLUTION

A *smart cities solution* for social challenges can include **co-creation of urban services**. The involvement of the citizens is the core element behind this, whereby a user-centric solution is developed in an open and transparent innovation process. These solutions often include digital technol-

ogies, as they form a part of the everyday lives of most of the citizens. Sensitive issues related to digital solutions such as data protection, privacy, access to digital infrastructure and cybersecurity must also be taken into account. Co-created social services can aim at:

- Decreasing crime: e.g., smartphone enabled sharing of data and information to prevent crime.
- Increasing participation and community-building: e.g., building an online platform for citizens and providing them with continued digital engagement based on thematic or regional issues to ensure no one is left behind.
- Increasing public services: e.g., one stop shops that offer multiple services at one (digital) location.

In Heidelberg, Germany, the Politics and Transparency Portal, ("HeiPorT"), informs citizens quickly and transparently about all political decisions and developments and thus strengthens citizens' engagement and democracy.<sup>9</sup>

In Nairobi, Kenya, citizens of Kibera (the city's largest informal settlement) can make use of the digital platform *Huduma*. Via a simple text message, users can report on failed service delivery and get help faster. It also enables dialogue between government authorities, politicians and civil society whilst increasing accountability and reducing the risk of corruption.<sup>10</sup>

## 2.3 ECONOMIC CHALLENGES

The transition from agrarian-based economies to industrialised urban economies and the further shift to a knowledge society in the past century are ongoing trends, where structural changes have profound impacts on the economic livelihoods of many urban citizens. Whilst new digital business models flourish, the impact of the urban economy is unclear. Online service platform models (like

Uber, AirBnB) affect the urban economy and lead to an informalisation of the service sector and thus to increased precarious living conditions. Cities can also be the centre of unsustainable business models, for example, through human resource exploitation, excess waste creation and addictive consumption patterns.<sup>11</sup> At the same time, urban labour is more dependent on global trends. At the beginning of the COVID-19 pandemic in India, the urban unemployment rate shot from 9% to 20%.<sup>12</sup> The cost of competing for jobs in cities is heightened by the higher costs of living (and property) in urban areas, which results in the role of location providing a competitive advantage (or disadvantage) to certain businesses. Finally, cities are grappling with digital economic challenges, including the virtualisation of the economy and the accompanying demands for future-proof IT infrastructure and bandwidth. This latter demand will hit cities in the Global South the hardest. Of the top 30 global future-proof cities, there is not a single city from the Global South.<sup>13</sup>

### 2.3.1 POTENTIAL SOLUTION

A *smart cities solution* for economic challenges can include **urban innovation labs**. Cities are the key driver of national economy development innovation. Urban innovation labs are open, flexible, tech-driven platforms that include participation from across academia, the private sector, the public sector and the general public. The focus is on identifying urgent and pressing challenges, testing real-life solutions and turning these into real policy changes with positive economic impacts.

The smart city innovation center in Duisburg, Germany, demonstrates some of these characteristics through a private-sector approach which helps create innovative digital applications that increase the quality of life, economic attractiveness and sustainability in the city.<sup>14</sup>

In Mexico City, the *Laboratory for the City*<sup>15</sup> was a space for citizens, civil society, academia, the private sector and government to come together and explore urban solutions in an experimental and creative manner.

2 Unaffordable and Undrinkable: Rethinking Urban Water Access in the Global South | World Resources Institute (wri.org)

3 Cities and climate change | UNEP - UN Environment Programme

4 Digitally managed cities of the future – how close are we? - RSM Discovery

5 Urban Data Platform - Hamburg

6 Dados Abertos – Porto Alegre

7 Are we underestimating urban poverty? - ScienceDirect

8 UN-Habitat: Cities Free From Violence Against Women and Girls

9 heidelberg.de | Digitale Stadt - HeiPorT

10 Huduma Online Platform

11 Unsustainable business models – Recognising and resolving institutionalised social and environmental harm - ScienceDirect

12 Unemployment rate in urban areas rose to 13.3% in July-Sept 2020: Labour survey | Business News, The Indian Express

13 City Momentum Index 2018 (jll.de)

14 Smart City Duisburg Innovation Center (smartcity-innovationcenter.de)

15 Laboratorio para la Ciudad

## 3. WHAT GIZ DOES

GIZ supports the decision-making processes and policy-making around smart cities, which aims to overcome implementation gaps and promote self-sustaining structures and cross-sectoral strategies. GIZ's mandate is not to sell a technical solution or to operate a specific urban management system, but rather to focus on strategic, technical, policy and governance-related support surrounding these solutions.

As an intermediary within a diverse stakeholder landscape, we help urban stakeholders navigate and make the best use of available solutions with all their citizens. Our approach targets the various dimensions of urban development within the policy cycle steps: assessment, planning, implementation and evaluation. We advise institutions and other stakeholders in urban systems to improve their services with the help of smart solutions while also enabling them to better deal with conflicting interests and finally develop a shared vision for their smart city. We also engage in capacity building at citizen-level on technical know-how and co-creative processes. Furthermore, we support at national level the development of urban policy guidelines and strategies as well as ethical standards for artificial intelligence.

Our services tackle all types of challenges described in Section 3: environmental, social and economic. Furthermore, they are aligned with the international Principles for Digital Development and can be further tailored to a wide range of needs specific to the countries that we collaborate and cooperate with:

- E-governance / digitisation of public services: improving government services provision as well as facilitating a demand-oriented planning and operational monitoring by means of digital tools.
- E-participation: focusing on (digital) involvement of citizens and civil society in strategic, demand-oriented planning and decision-making processes.
- Open Data, Open Government – helping stakeholders in increasing transparency and exchange of open data, cooperative data analysis and utilisation, between civil society, private sector and government.
- (Participatory) design of smart city strategies: not only for individual cities but also for and within a multi-level framework at sub-national/national/regional level.
- Integrated urban development: planning and development processes are strengthened in their function and impact with the use of digital tools, especially in climate-friendly and resilient urban development.
- Data-/evidence-based decision-making, planning & monitoring: for the collection and analysis of data (e.g., geodata, big data) with the aim of evidence-based policy making, planning & monitoring including support in identifying relevant data sources and collection methods and in preparing complex data for decision makers.
- Reducing the digital divide and supporting vulnerable groups (in particular for persons with disabilities), following the leaving no one behind (LNOB) principle: enhancing accessibility of digital services, increasing digital literacy, improving access to municipal services and expanding availability of education opportunities.
- Implementing the 2030 Agenda: implementation principles (LNOB, Universality, Shared Responsibility, Accountability, and Integrated Approach (Indivisibility and Interconnectedness of the Goals)), accountability & SDG monitoring, implementation of SDGs, demand-oriented planning and operational monitoring by means of digital tools.
- Incorporate cyber security standards in digital solutions: digital tools and solutions must be cyber secure in order to reduce vulnerability and to increase trust.

To illustrate the above in real-life examples, below are selected GIZ projects that illustrate smart cities approaches, revolving around the three challenge groups: environmental, social, economic.





### ECONOMIC CHALLENGE: DIGITAL TRANSFORMATION IN RWANDA

As part of the BMZ-financed „Digital solutions for sustainable development – Rwanda Digital Transformation Center“ project (2021-2023), GIZ supports the Ministry of ICT and Innovation (MINICT) and the implementing organization RISA in building capacity to promote digital transformation in Rwanda. The Digital Transformation Center is an important bridge between the government, the economy and civil society. Since 2021, the project has increasingly focused on competence building, solutions development and partnerships between the public and private sector in the area of smart cities.

Particular attention was paid to the inclusion of disadvantaged groups in digital strategies and the promotion of innovation.



### ECONOMIC CHALLENGE: ONLINE MARKET SOLUTION / MEXICO

The BMWSB-financed “International Smart Cities Network (ISCN)” (2019-2022) aims to strengthen international dialogue to support the digital transformation of cities in the context of integrated urban development. Among several other activities, the project supports the development of an online sales platform that enables local retailers to offer their products even during the pandemic in Guadalajara, Mexico. The goal is to support urban and local centres as they are faced with COVID-19 related challenges.

Particular attention was paid to the social and cultural function of the local markets, creating jobs and supporting the local economy.



### ENVIRONMENTAL CHALLENGE: ADAPTATION TO CLIMATE CHANGE IN CITIES / INDIA

As a part of the BMWK-financed “ICT-based Adaptation to Climate Change in Cities” project (2017-2020), and in cooperation with BMWSB, GIZ supported setting up a GIS system for remote sensing and an app for crowd-sourcing for field collection to prevent urban flooding and improve public services in Bhubaneswar, India.

The co-created “CitySavior” App won awards from the Government of India and paid particular attention to the collection of different types of citizen-sourced data related to critical points of the city’s drainage system.



### ENVIRONMENTAL CHALLENGE: RESILIENT URBAN PLANNING IN BANGLADESH

As part of the BMZ-financed “Climate Resilient and Inclusive Smart Cities (CRISC)” project (2019-2023), GIZ supports cities of Bangladesh in their climate-sensitive development path. In particular geospatial data and mapping are used to help prepare urban master plans.

The project also focuses on incorporating citizens’ needs and climate risks in urban planning processes.

**FURTHER PROJECT EXAMPLES CAN BE FOUND IN ANNEX 3.**





## 4. CONCLUSION

This working paper builds on the international discourse around the subject of smart cities as well as previous GIZ smart cities literature (Annex 1) to illustrate our understanding of a citizen-centric approach for smart cities. GIZ understands smart cities as being characterised by the wide use of technologies in potentially all sectors in the city. As a development agency, GIZ adopts an inclusive definition of smart cities, based on the needs and priorities of our funding agencies, including a variety of German ministries as well as the European Union (an in-depth illustration of the definitions can be found in Annex 2).

Based upon the environmental, social and economic challenges that cities face, this document further highlights the work GIZ does in this area, including some of the smart cities approaches that have been supported, with further examples available in Annex 3.

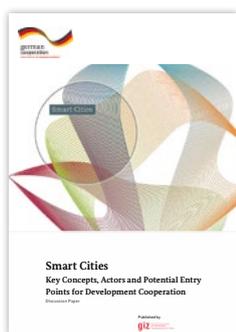
Finally, in Annex 4, a quick introduction on the topic of Smart Cities is provided through ten different sources.

## 5. ANNEXES

1. GIZ Smart Cities documents
2. Donor definitions
3. GIZ Project examples
4. Smart Cities Background Sources

## ANNEX 1: GIZ SMART CITIES DOCUMENTS

At the intersection of urban planning and (local) governance, climate & infrastructure and ICT & digitalization, concepts related to “smart cities” have been in use for several years. In December 2014, a first discussion paper was published by the Sector Project “Sustainable Development of Metropolitan Regions” focusing on understanding key concepts and actors and identifying potential entry points for German development cooperation. Since then, a few more internal and official publications have been produced.



### *Smart Cities - Key Concepts, Actors and Potential Entry Points for Development Cooperation*

Year: 2014

Author: Alexander Carius, Liana Giorgi and Lukas Schmid

Editor: SV Metropolitan Regions

#### **Key / relevant takeaways:**

- Study summarizes emerging smart technology solutions along different sectors, key actors and trends, smart cities and the development agenda, prospects for development policy, and concrete potential entry points for development cooperation
- Methodology used was desk-based review and expert interviews



### *Digitalisation and Urban Development in Asia – Summary of Case Studies Year: 2017*

Author: Renard Teipelke

Editor: Michael Petersik, Lennard Kehl, Carmen Vogt

#### **Key / relevant takeaways:**

- Publication brings four case studies of Asian Cities with different smart cities approaches. Cities: Kochi (India), Jakarta (Indonesia), Seberang (Malaysia), Saensuk (Thailand)
- The case studies focus on the governance aspects of the development and implementation of smart cities strategies, the goal is to look behind the shining smart cities visions and illustrate the processes of becoming a smart city



### *Let's talk digital - Case studies: using digital technologies in the context of governance and conflict*

Year: 2018

Author: Julia Manske and Andreas Pawelske

Editor: Governance and Conflict Department

Division: Lisa Hiemer-Maqoma, Arlett Stojanovic and Leonie Stoll

#### **Key / relevant takeaways:**

- This compilation gathered a wide range of practical experience in using digital technologies, in order to stimulate the exchange of ideas and mutual learning and to continue to provide effective and competent support for digital change in partner countries, with all its opportunities and challenges
- Relevant urban examples / case-studies are: geo-surveying and tax software in Ghana; citizen-oriented and transparent local government in Armenia and improving municipal services with digital solutions in Mauritania



### *Taking Advantage of the Potential of Digitisation for Urban Development (factsheet)*

Year: 2019

Author: Urban Catalyst

Editors: Integrated implementation of the 2030 Agenda in cities and city regions

#### **Key / relevant takeaways:**

- Factsheet highlights problems with current technological focus of the smart city concept against the need to put citizens at the centre and provides visual examples of Digitisation in Urban Development
- Two examples are briefly illustrated: Integrated and Sustainable Urban Transport Systems for Smart Cities in India; Development of a Digital Land Registry in Ghana



### *Position Paper: public participation in the digital age*

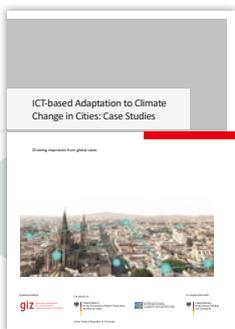
Year: 2020

Author: Annika Schönfeld and Lisa Hiemer-Maqoma / Competence Centre Democracy, Digital Governance, Urban Development (KC4C30)

#### **Key / relevant takeaways:**

GIZ positions:

- Digital (participation) approaches unfold their potential when combined with analogue participation concepts
- User-focused approaches in the designing of digital participation formats increase their acceptance and inclusiveness
- Data-minimizing digital participation formats ensure the protection of personal rights
- Strengthening state capacities ensures responsiveness and the capacity to absorb the results of digital participation processes
- Digital participation formats require a trained moderator to enable constructive dialogue between participants
- Digital participation formats offer the potential to improve the feedback loop on participation processes/procedures



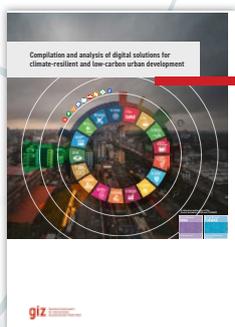
### *ICT-based Adaptation to Climate Change in Cities: Case Studies*

Year: 2019

Author: Bela Seeger / The Open Knowledge Foundation

#### **Key / relevant takeaways:**

- Compilation of case studies aims to provide guidance and inspiration to urban practitioners eager to integrate ICT-based approaches to climate change in their work
- Some examples that are not directly applicable to managing the consequences of climate change, have been included due to their potential in this sector



### *Compilation and analysis of digital solutions for climate-resilient and low-carbon urban development*

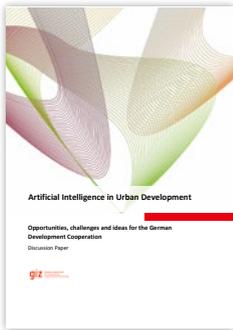
Year: 2020

Author: François van Schalkwyk;

Editor: Luciana Maia

#### **Key / relevant takeaways:**

- Builds upon the previously mentioned “Digital tools for implementing the sustainable development goals in Africa”
- Provides a sound assessment framework that works for any kind of project and brings inspiring examples from: Indonesia, Bangladesh and India
- Including two databases: digital tools along several Urban Development Actions as well as digital tools to deal with Covid19 in cities along the same Urban Development Actions (developed for TUrbOClC)



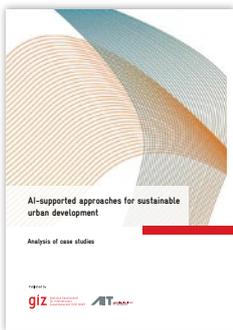
### *Artificial Intelligence in Urban Development: Opportunities, challenges and ideas for the German Development Cooperation*

Year: 2020

Author: Toni Kaatz-Dubberke, Lennard Kehl

#### **Key / relevant takeaways:**

- Internal paper compiling terms, relevant actors and technical prerequisites as well as the importance of AI for developing and emerging countries
- Recommendations for positioning German development cooperation and connecting points with initiatives already underway and possible implementation partners
- Orientation, ideas and impulses for all those who are thinking about the use of AI in urban spaces and sectors



### *AI-supported approaches for sustainable urban development*

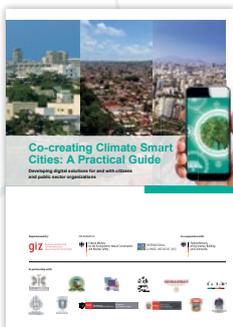
Year: 2021

Authors: Dr. Martin Traunmueller, Mag. Jan Peters-Anders, Anna Kozłowska, MSc., Dr. Adam Buruzs, Oleksandr Melnyk, MSc. (all Austrian Institute of Technology (AIT))

Editorial: Toni Kaatz-Dubberke, Lennard Kehl, Christian Gmelin, Björn Pfattheicher, Lea Gimpel (all GIZ) / Published by Sector Project “Integrated Implementation of 2030 Agenda in Cities and City-Regions”

#### **Key / relevant takeaways:**

- Goal of the study is to showcase Artificial Intelligence in Urban Development: Opportunities, challenges and ideas for the German Development Cooperation to assess what AI can already achieve in urban development today
- Success factors of different projects and recommendations for using AI applications in contexts of integrated sustainable urban development in low- and middle-income countries



### *Co-creating Climate Smart Cities: A Practical Guide*

#### *Developing digital solutions for and with citizens and public sector organizations*

Year: 2020

Authors: Dr. Teresa Kerber, Ingrid Cornejo Reindl (both GIZ)

#### **Key / relevant takeaways:**

- Climate change, urbanization and digital transformation are the megatrends of our time and need to be addressed together
- Co-created digital solutions can support cities and their citizens to better adapt to climate change, to collaborate on achieving their countries' NDCs and SDGs, and to contribute to sustainable urban development in the partner cities
- When should we use which method? The citizen-centred innovation process is a set of methods based on agile methods with a human-centered approach
- Provides guidance for urban policymakers and practitioners on conducting a collaborative process of developing and implementing digital solutions for gathering and analyzing urban data and integrating it into urban planning to promote evidence-based decision making that will improve climate resilience and inclusion in cities



### *Data Strategies for Common-Good-oriented Urban Development*

Year: 2021

Published by: Federal Institute for Research on Building, Urban Affairs and Spatial Development (BBSR) within the Federal Office for Building and Regional Planning (BBR)

Contribution from: Dr. Teresa Kerber (GIZ)

#### **Key / relevant takeaways:**

- the National Dialogue Platform Smart Cities concretises the Smart City Charter published in 2017. It shows how data governance in municipalities can be used for integrated and sustainable urban development and how the associated challenges and risks can be addressed
- the aim of the guidelines and recommendations for action is to sensitise municipalities to the sustainable and inclusive use of data in the context of urban development for the common good



### *Pathfinder Social Innovation (Digital) Urban Development*

Year: 2022

Authors: Dr. Nadja Berseck, Simon Höher (both Hybrid City Lab, zero360)

Editorial: Dr. Teresa Kerber, Julia Brennauer, Sebastian Fritz (all GIZ)

#### **Key / relevant takeaways:**

- encourage urban innovators in local or national administrations to step forward and build their capacity to deliver ground-breaking social innovations
- empirically grounded guide looks at approaches & success stories for the successful implementation, scaling and spreading of ideas
- addresses the challenge of growing social innovations in urban development, provides guidance to avoid good ideas from failing and shows how choices under the control of the innovator can have a dramatic influence on success



### *Data Strategies for Common Good-Oriented Urban Development – International*

Year: 2022

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Editorial: Dr. Teresa Kerber, Julia Brennauer, Sebastian Fritz (all GIZ)

#### **Key / relevant takeaways:**

- To document, share and learn from international experiences and best practices for data strategies and data-based interventions oriented towards urban development

## ANNEX 2: SMART CITIES SELECTED DONOR DEFINITIONS & APPROACHES<sup>16</sup>

Client	Strategic approach	Project / initiative	Comments
BMZ	<ul style="list-style-type: none"> <li>• BMZ's digital agenda focus on five strategic objectives: Harnessing digital innovation, reinforcing democratic processes, helping displaced persons, creating future-proof jobs, safeguarding human rights and ensuring participation</li> <li>• No specific smart cities agenda, important entry point through participation and political process focus</li> <li>• More information <a href="#">here</a> and <a href="#">here</a> (in German)</li> <li>• <a href="#">Toolkit Digitalisierung</a> (5 approaches to smart development: platforms, digital innovation, e-learning, GovTech, Big Data and AI)</li> </ul>	<p>Bilateral projects:</p> <ul style="list-style-type: none"> <li>• India: Sustainable Urban Development – Smart Cities (SUD-SC)</li> <li>• Ecuador: Sustainable Intermediate Cities (CIS)</li> <li>• Ghana: Support for Decentralisation Reforms Programme (SfDR)</li> <li>• Cameroon: Support Programme for Municipal Development (PROMUD)</li> <li>• South Africa: Inclusive violence and crime prevention (VCP)</li> </ul>	<ul style="list-style-type: none"> <li>• BMZ propagates great potential for the use of digitalization</li> <li>• There is on-the-ground experience,</li> <li>• In-House expertise (especially department of digitalisation)</li> <li>• Seeking to integrate digital by default into urban programs</li> </ul>
BMI	<ul style="list-style-type: none"> <li>• BMI's digital strategy focuses on the following topics: network security at the highest level; modern administration that serves citizens and the economy, strong civil society that makes use of digitalization and ethical guidelines for digitalization and a modern data policy (German context)</li> <li>• More information <a href="#">here</a></li> <li>• <a href="#">Cyber Security Strategy Cyber Security Strategy for Germany 2021 (bund.de)</a></li> </ul>	<ul style="list-style-type: none"> <li>• Digitale Verwaltung (Digital Administration)</li> <li>• <a href="#">Smart City Charter</a> – Making digital transformation at the local level sustainable</li> </ul>	
BMU	<ul style="list-style-type: none"> <li>• BMU's digital agenda focuses on mobility, industry 4.0 and circular economy, nature conservation, land and water management and sustainable consumption</li> <li>• No specific smart cities agenda, but quite strong connection through the other fields</li> <li>• More information <a href="#">here</a>.</li> </ul>	<p>Some examples on the ground:</p> <ul style="list-style-type: none"> <li>• ICT-based adaptation to climate change (Global)</li> <li>• <a href="#">Climate Smart Cities (India): Climate Smart Cities Assessment Framework (CSCAF)</a></li> <li>• <a href="#">Climate Digital City Hub</a></li> </ul>	<ul style="list-style-type: none"> <li>• BMU believes in and promotes smart / digital solutions as a means to achieve climate goals (mitigation and adaptation).</li> <li>• On the ground experience and In-House expertise</li> <li>• Funds available for international cooperation via climate projects</li> </ul>
BMWSB	Responsible for Smart Cities (took over responsibility from BMI)	<ul style="list-style-type: none"> <li>• National dialogue on smart cities through the <a href="#">„National Dialogue Platform Smart Cities“</a> and the <a href="#">„Smart City Charter“</a></li> <li>• Promotion of „Smart Cities Made in Germany“ – <a href="#">Model project Smart Cities</a></li> <li>• International dialogue through the establishment of an <a href="#">International Smart Cities Network</a> (run by GIZ)</li> <li>• Cooperation within the EU through the project <a href="#">„Empowering Smart Cities – Approaches for European Networking“</a></li> <li>• Research Cluster Smart Cities</li> </ul>	<ul style="list-style-type: none"> <li>• BMWSB, as the ministry responsible for the urban development topic, coordinates and is responsible for the topic of smart cities from the German perspective, with some specific activities in development cooperation;</li> <li>• Sound normative guidance especially for the German context, as well as on the ground experience and In-House expertise</li> <li>• Funds are available for international cooperation</li> </ul>

<sup>16</sup> This table reflects the approaches and mandates of the German federal ministries as per November 2021.

Client	Strategic approach	Project / initiative	Comments
BMDV	<ul style="list-style-type: none"> <li>Automated and connected driving</li> <li>Intelligent transport systems in the field of road transport</li> </ul>	<ul style="list-style-type: none"> <li>Smart City Simulation Game <a href="#">BMDV – Smart City Simulation Game (bmvi.de)</a></li> <li>Digital Test Beds <a href="#">BMDV – Digital Test Beds (bmvi.de)</a></li> <li>Smart Mobility and Logistics Ecosystems – a Big Data Cloud platform for Mobility 4.0 – SMiLE (in German): <a href="#">BMDV – Smart Mobility and Logistics Ecosystems – eine Big Data Cloud-Plattform für Mobility 4.0 – SMiLE (bmvi.de)</a></li> <li>AI projects at BMDV (in German): <a href="#">BMDV – KI-Projekte in der Mobilität (bmvi.de)</a></li> <li>Digital platform for unmanned aviation: <a href="#">Digitale Plattform Unbemannte Luftfahrt   dipul</a></li> </ul>	<ul style="list-style-type: none"> <li>Focus on smart mobility</li> <li>Knowledge on mobility, autonomous/automated/connected vehicles, unmanned aviation, “Flug-taxis” (Air Taxi), AI</li> </ul>
BMBF	<ul style="list-style-type: none"> <li>BMBF’s digital strategy builds upon the following goals: living, doing business and working better and sustainably; Strengthen digital education and training and its institutions; Creating knowledge and innovation from data; Securing technological sovereignty and scientific leadership for Germany; Creating trust and providing security</li> <li>More information <a href="#">here</a></li> </ul>	<ul style="list-style-type: none"> <li><a href="#">Zukunftsstadt / Smart Service Stadt</a>, bilateral cooperation research project on the topic with India</li> <li>The flagship initiative will provide new digital tools for climate change-adapted urban planning by 2025. By 2030, we will provide users in cities and regions with further digital tools that make climate and environmental information from research usable</li> </ul>	<ul style="list-style-type: none"> <li>BMBF has been financing research projects on topics related to smart cities for a couple of years, also looking at projects with countries in the Global South.</li> <li>On the ground experience and In-House expertise available</li> </ul>
AA	<ul style="list-style-type: none"> <li>The Federal Foreign Office (Auswärtiges Amt) focuses on important policy topics such as Agenda 2030, urbanization, and international cyber policy</li> <li>No specific smart cities agenda</li> <li>More information on the work on sustainable urbanization <a href="#">here</a></li> </ul>	Good coordination and collaboration with other ministries (BMZ, BMI, BMU) in order to find new partners for different topics regarding sustainable urbanization	Not focusing on normative guidance or projects on the ground, but on partnerships for mastering the major challenges of urbanisation (e.g. supporting bilateral urbanisation partnerships)
EU	<ul style="list-style-type: none"> <li>Different entry points via EU institutions/ strategies</li> <li>EU – Digital strategy:</li> <li>EU – Regional and Urban Development – <a href="#">cities and urban development topic</a></li> <li><a href="#">New Leipzig Charta</a> (NLC) – sets a framework for how urban development should take place in Europe across the different layers of governance. The Charta highlights digitalization as a cross-cutting issue</li> </ul>	<ul style="list-style-type: none"> <li>Overarching: <a href="#">Urban Agenda for the EU</a></li> <li>Priority themes: <a href="#">Digital transition in cities</a> (areas: strategies and policies, Urban data and studies, Funding opportunities and advice, Awards, Project examples, EU legislation)</li> <li>City Initiatives <a href="#">Smart Cities / Smart Cities Marketplace</a></li> <li>Projects <a href="#">Mission area: Climate-neutral and smart cities</a></li> <li><a href="#">Strategic Energy Technology Information System</a></li> <li><a href="#">Smarter together</a> (focus on data management, eco-refurbishment and e-mobility)</li> <li><a href="#">Grow Smarter</a> (focus on low energy districts, integrated infrastructure, sustainable urban mobility)</li> <li><a href="#">100 Intelligent Cities Challenge</a> (follower of Digital Cities Challenge, includes the topic of <a href="#">Citizen participation and government services</a>)</li> </ul>	<ul style="list-style-type: none"> <li>Normative guidance (NLC)</li> <li>On the ground experience (several projects, initiatives)</li> <li>In-House expertise</li> <li>Funds available for international cooperation: Several EU funds schemes available: support to cities, including advice on implementation (e.g., URBACT, Urban Innovative Actions, URBIS, Horizon, etc)</li> <li>Fund for international cooperation: <a href="#">HORIZON 2020</a></li> <li><a href="#">Smart Cities Marketplace (overview)</a></li> </ul>

## ANNEX 3: SMART CITIES GIZ PROJECTS AND INITIATIVES

Project(s)	Country	Cities	Solution / Approach
<a href="#">Climate Smart Cities</a>	India	Kochi, Coimbatore and Bhubaneswar	Help desk and an online tool guide and monitor the cities for the <a href="#">Climate Smart Cities Assessment Framework</a> / MRV systems for selected climate-relevant solutions. Goal: Assessment of more than 100 cities within the Indian Smart City Mission – framework to move from assessment to action to become climate smart cities.
<a href="#">Good Governance for Local Development (GGLD) in South Caucasus</a>	Armenia	More than 270 cities	"Management Information System" (MMIS) for the development of local self-government. Tools for efficient and citizen-oriented self-government – from information material, directories and E-Services components to internal and external communication tools. As a web-based system, the MMIS also enables the operation of the official website of the municipalities, including various online participation mechanisms. Goal: Improve transparency, efficiency and participation, provide access to budget and property management systems, seamless data exchange between municipal, regional and national administrations.
<a href="#">ICT-based Adaptation to Climate Change in Cities</a>	India	Kochi, Bhubaneswar	<a href="#">Mu.CitySavior (I am the city savior)</a> : combination of GIS for remote sensing and an app for crowd-sourcing for field collection – for an analysis system that creates alerts about critical areas that need cleaning in their vicinity, and prioritises cleaning schedules as recommendations for city officials, integrated into the command and control center. Goal: Prevent urban flooding and improve public services.
	Mexico	Metropolitan Area of Guadalajara, Guadalajara, Zapopan	<a href="#">Árboil IoT (Internet of Trees)</a> – cross-platform composed of a mobile and web app, and a network of low-cost sensors that allows citizens to contribute to the urban tree inventory and monitor the pollutants suspended in the environment, weather and noise on a street scale. Goal: Improve quantity and quality of urban trees as well as engaging citizens in urban tree mapping and environmental monitoring.
	Peru	Chiclayo, Trujillo	<a href="#">AYULLUDAMOS (We help)</a> – combination of meteorological station with sensors as part of early warning system crowd-sourcing for field collection via mobile app with geolocation. Goal: Real-time data on urban flooding in different parts of town.
<a href="#">Inclusive violence and crime prevention (VCP)</a>	South Africa	Johannesburg	Participatory EndStreet NorthPark upgrading with online and offline activities. Together with UN Habitat, approach to use the computer game "Minecraft" to virtually redesign the park. With the help of photos, construction plans and digital maps, the park was recreated in virtual form as a "Minecraft" landscape. The participants expressed their ideas and wishes through play in self-created "Minecraft" worlds. Their results were handed over to the commissioned landscape architect, who took them into account in his detailed design. Goal: pilot a participatory and integrated approach to park development.
<a href="#">Integrated implementation of the 2030 Agenda in cities and city regions</a>	Ecuador	Portoviejo	Guardians of the Hill – semi-digital community system for early warning of landslide events. Goal: Reduce the vulnerability of inhabitants and knowledge products will help to disseminate contributions of the neighbourhood organization to combat climate change.
Cities Challenge	Serbia	Belgrade	<a href="#">The food shifters</a> : Innovative Scheme for Sustainable Urban Food Waste Management: Voluntary, digital-based scheme for sustainable food waste management amongst businesses and the public sector in Belgrade. Goal: Identify main food waste generators, i.e., retailers, restaurants, or public institutions like kindergartens and hospitals, as well as waste quantities and positioning tracking by GPS for all value chain actors. Vulnerable urban groups will gain easier access to food surplus redistribution from retail.

Project(s)	Country	Cities	Solution / Approach
Digital Ideas Competition #Solutions-ForCities of the International Smart Cities Network (ISCN) and Smart Cities model projects	Germany	Kaiser-slautern & Wolfsburg	Hello Again by Capalogic GmbH – Easy-to-use video communication app adapted to the needs of the elderly that can be managed remotely by relatives. Goal: Keeping in touch during times of social distancing.
	Germany	Amt Süderbrarup	WeCreate Süderbrarup by WeCreate from Leipzig – Providing a digital interface for engagement, networking and project management, which builds on offered analogue workshops and networking events. Goal: Empower digital literacy to increase participation.
	India	Coimbatore	safergreen by zora – Zozmann & Karutz GbR from Leipzig, Germany and Red Dot Foundation Global from Columbia, USA. Easy-to-use information and warning app that provides citizens with details about the location, condition, and visitor traffic of green spaces and playgrounds. Citizens can submit alerts about the safety situation and required maintenance, which will benefit user-centric greenspace management. Goal: Empowering urban dwellers to harness green space benefits and overcome access barriers to these spaces.
	Germany	Kassel	Implementing a digital participation platform to complement a holistic strategy of on- and offline participation, dedicated communication strategies and targeted stakeholder involvement around the topic of Smart City. Goal: Holistic and sustainable citizen participation.
	Mexico	Guadalajara	Online Market Solution “Mi Mercado AMG” by Kampala Capital City Authority from Kampala, Uganda – The online sales platform enables local retailers to offer their products even during the pandemic. A sustainable delivery service guarantees the population to avoid physical contact. Goal: Strengthening the local market.
	Peru	Miraflores	PIMUS Platform for Citizen Proposal Digital Inventory and CaminAPP by Municipalities Tecate & Tijuana and the federal state Baja California from Mexico – Citizen have the opportunity to report problems, such as overcrowded squares or run-down streets, and suggest possible solutions to the city administration. In this way, citizens, experts and the city administration can work together on solutions. Goal: Efficiently manage overcrowded public spaces (sidewalks, parks etc.) by people and micro-mobility vehicles to improve infrastructure demands.
	Peru	Miraflores	Cityparking.io by Life is Hard S.A. from Cluj-Napoca, Romania – The mobile app provides real-time data on the current parking situation and offers live navigation. A dedicated dashboard allows the municipality access to data and statistics on parking usage. Goal: Optimizing the use of parking for residents and commuters to improve the quality of life.
	Germany	Bamberg	Smart Tourism – A Data and Services Platform 4 Citizens by Engineering DSS GmbH from Düsseldorf, Germany, based on the Open-Source Platform of FIWARE – The number of pedestrians at certain public spaces in Bamberg is detected by sensors and displayed in real time via an app and public display boards. Visitors can be guided to points of interest (PoI) via a navigation service. Goal: Avoid overcrowding in highly frequented, touristic areas.
	Germany	Bamberg	Developing a Sustainable Development Goals (SDG) Indicator Dashboard. Goal: Developing a Sustainable Development Goals (SDG) Indicator Dashboard.
	Brazil	Fortaleza	Uptown Contact Trace – by Coherence Systems and Silicon Harlem from New York City, USA – A unified system designed to empower contact tracers to collect and deliver secure anonymous data. It provides a safe, secure, data framework that improves collection and dissemination of data between public health and social services agencies. Goal: Using insights on the COVID-19 situation for evidence-based decision making.

Project(s)	Country	Cities	Solution / Approach
	India	Kochi	From Disaster Risk Reduction (DRR) to Sustainable Growth by Digitalization – by SEE NOW et al. – A transdisciplinary urban resilience system improving stakeholders’ decision-making process by aggregated data and data driven forecasting models, along with an automated funding infrastructure for PPP financing, investments, and sustainable economic growth. Goal: Mitigation of adverse impact of disaster risk and pollution on the long-term growth potential of coastal areas
Climate Resilient and Inclusive Smart Cities (CRISC) <a href="#">Climate Resilient Inclusive Smart Cities (CRISC) (giz.de)</a>	Bangladesh	Sirajganj and Satkhira	Developing a national methodology to integrate climate risks and inclusive development in Bangladeshi cities through the usage of the model of “climate resilient and inclusive master plan.” These master plans include creating geospatial data and mapping through drones. Furthermore, supporting the integration of cost-benefit analysis that take into consideration climate risks and citizens’ needs. Finally, supporting The Digital Learning and Exchange Platform (DELP) which focuses on peer-to-peer learning and knowledge management. Goal: Developing urban master plans using modern and participatory tools.



Project(s)	Country	Cities	Solution / Approach
<a href="#">Online Advisory Programme (OAP) &amp; Case Clinics of the ISCN</a>	Brasil Germany India Mexico Peru	ISCN Partner Cities	The OAP is designed to provide the opportunity to connect and exchange with other network partners from different ISCN partner countries and cities, to follow and learn from the steps and activities of the implementation process of the digital solution in the ISCN partner country Mexico (winning solution of the digital ideas competition #SolutionsForCities, see above) and to receive demand-oriented expert inputs on trending topics around the Smart City. In addition, the OAP is complemented by the Case Clinic to strengthen peer to peer exchange and support partners to jointly discuss current challenges. In a case clinic, the case giver presents a specific case to a small group of peers for which he or she needs assistance.
<a href="#">Local Governance Reform Programme</a>	Palestinian territories	Nablus	Local internet platform (news portal, exchange platform and "watchdog" at the same time) Dooz. Platform and accompanying Facebook site informs citizens about relevant topics in the Nablus region, involves them in political discussions and thus promotes political participation. Goal: increase the accountability of administration and politics and contribute to improving basic services for the local population.
<a href="#">Support Programme for Municipal Development (PROMUD)</a>	Cameroon	Several	#access4all: A New Telecentre Model for Municipal Development: Telecentres offer a new Digital Service Platform that includes e-government services, educational content and communication functions accessible via community hotspots that are part of local mesh networks. Goal: Reduce the digital divide by increasing citizen participation through improved digital literacy and access to the internet and digital services.
<a href="#">Support for Decentralisation Reforms Programme (SfDR)</a>	Ghana	Several	Data District Development Data Platform: Digitalization of data at the local level is expected to introduce improvements in efficiency and productivity of civil servants as well as enhanced accessibility of the data to both the district officials, other departments and ministries as well as the public. Goal: Digital tool to monitor and evaluate how district-level governments are achieving their local development goals and thereby contributing to implementing the SDGs.
<a href="#">Sustainable Intermediate Cities (CIS)</a>	Ecuador	Latacunga	TOSCA: Toolkit for Open and Sustainable City Planning and Analysis – GIZ based interactive touch tables to support participatory decision-making with spatial analysis and scenarios as well as the consolidation of data from various city departments. Goal: Develop collective solutions for volcanic risk governance.
<a href="#">Sustainable Urban Development – Smart Cities (SUD-SC)</a>	India	Bhubaneswar	TOSCA: Toolkit for Open and Sustainable City Planning and Analysis – GIZ based interactive touch tables to support participatory decision-making with spatial analysis and scenarios as well as the consolidation of data from various city departments. Goal: Identify land for the construction of affordable housing.
<a href="#">Digital solutions for sustainable development – Rwanda Digital Transformation Center</a>	Rwanda	Several	The Digital Transformation Center promotes digital transformation in Rwanda and is an important bridge between the government, the economy and civil society. Since 2021, it has increasingly supported the Rwandan government in the area of smart cities. Goal: Digital transformation in Rwanda is being taken forward and generating innovative and sustainable solutions. Partner organisations, the population and the economy have better digital skills.

## ANNEX 4: SMART CITIES: A QUICK INTRO

	Type of source	Content	Source
1	Info Page	This info page by „TWI-Global“ provides a good overview of the complexities around Smart Cities. Furthermore, it provides examples of different cities around the world, which can be called Smart Cities due to their technological developments.	<a href="https://www.twi-global.com/technical-knowledge/faqs/what-is-a-smart-city">https://www.twi-global.com/technical-knowledge/faqs/what-is-a-smart-city</a>
2	Ted Talk	This Ted Talk by Prof. Dr. Gesa Ziemer of HCU Hamburg presents new insights on data-based trust building for people-centered smart cities. Prof. Ziemer especially sheds light on the human centered aspects of smart cities.	<a href="https://www.youtube.com/watch?v=g80i26ojMAU">https://www.youtube.com/watch?v=g80i26ojMAU</a>
3	Ted Talk	Paula Kwan explores the concept of smart cities beyond its technological realm. Kwan focuses on advancements in the community’s experience inside a smart city, using the fictional example of Marvel’s Wakanda.	<a href="https://www.youtube.com/watch?v=I0n33Mla7QE">https://www.youtube.com/watch?v=I0n33Mla7QE</a>
4	Podcast	Smart Cities World provides this podcast about smart city projects and initiatives around the world. Listen to gain new insights about the technologies that make cities smart.	<a href="https://smartcitiesworld.podbean.com/">https://smartcitiesworld.podbean.com/</a>
5	Podcast	The Smart City Podcast by ARC Advisory Group breaks down the latest discussions around different facets of smart cities, like energy or transportation.	<a href="https://www.arcweb.com/blog/arc-smart-city-podcasts-april-2020">https://www.arcweb.com/blog/arc-smart-city-podcasts-april-2020</a>
6	Info Page	Thales Group provides a technology-centered approach on smart cities. It especially sheds a light on IoT technology and shows examples of smart cities from around the world.	<a href="https://www.thalesgroup.com/en/markets/digital-identity-and-security/iot/inspired/smart-cities">https://www.thalesgroup.com/en/markets/digital-identity-and-security/iot/inspired/smart-cities</a>
7	Video-Playlist	This playlist by DW Shift ranges from smart farming & smart energy to smart mobility and big data ins smart cities.	<a href="https://www.youtube.com/playlist?list=PLGql0oqieK-V03QbFNYURtzt9jYbLCdq-Q">https://www.youtube.com/playlist?list=PLGql0oqieK-V03QbFNYURtzt9jYbLCdq-Q</a>
8	Paper	This paper was prepared in the context of the OECD Programme on Smart Cities and Inclusive Growth. It provides a mixture of discussions held at the 1st OECD Roundtable on Smart Cities and Inclusive Growth and analytical research on the topic of smart cities.	<a href="https://www.oecd.org/cfe/cities/OECD_Policy_Paper_Smart_Cities_and_Inclusive_Growth.pdf">https://www.oecd.org/cfe/cities/OECD_Policy_Paper_Smart_Cities_and_Inclusive_Growth.pdf</a>
9	Paper	This White Paper reflects on the possible role of Gaia-X in the European smart cities domain. As Gaia-X is a key player in the European data policy and infrastructure domain, this paper is more focused on the technological aspects of smart cities.	<a href="https://gaia-x.eu/sites/default/files/2021-10/Gaia-X%20SCC%20white%20paper.pdf">https://gaia-x.eu/sites/default/files/2021-10/Gaia-X%20SCC%20white%20paper.pdf</a>
10	Paper	This article presents an overview of the emergence of smart cities, the characteristics and components of smart cities, as well as the architecture and challenges of smart cities. It also has a special focus on the IoT and its connection to the smart city concept.	<a href="https://www.tandfonline.com/doi/pdf/10.1080/15228053.2019.1587572">https://www.tandfonline.com/doi/pdf/10.1080/15228053.2019.1587572</a>





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