Smart LGU Assessment

Research

SmartCT
Citizens x Technology

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Philippines

This research is brought to you by SmartCT in partnership with Friedrich Naumann Foundation to show the different dimensions of a Smart City including Climate Change. We love to evolve and iterate. Feel free to contact us at assess@smartct.org.

What's inside?

01

Smart City Overview

SMART CITY OVERVIEW

The term 'smart city' was first used in the 1990s when information and communications technology (ICT) was burgeoning[i]. Today, the term “smart” has become strongly related to ICT. On the one hand, many agree that modern technology is the essence of being ‘smart’ while on the other hand, this view has been heavily critiqued by other experts because this tech-centric approach detaches from the organic concept of a city.

For some, the tech-centric approach leaves empty spaces in urban areas and fails to address unplanned circumstances. The smart cities of Songdo in South Korea, Masdar City in UAE, or PlanIT Valley in Portugal are examples of smart cities built from scratch, which focused more on the digital aspect than the community aspect of smart cities[ii]. Other questions also arise as more mature cities and economies strive to become smart while introducing a complex web of factors that affect their communitiy’s’ transformation into smart cities.

This chapter goes back to the fundamentals and provides a high-level view of what a Smart City is while recognizing the main goals that are common to all Smart City schools of thought [iii]:

1. The desire to enhance citizens' quality of life
2. The desire to provide high-quality service, sustainability and resilience
3. Enhanced social participation and inclusive leadership
4. Informed decision-making and decreased risk levels
5. Innovative, efficient and appropriate technology use

What is a Smart City?

There is no universal definition of what a smart city is and even the current definitions can still be considered as being in their developmental stages; andalthough there is a general agreement regarding the interplay of people and technology in smart city planning as well as the end goal of economic growth and better quality of life, the modes by which these end goals can be achieved vary, as seen in table 1.

Table 1. Examples of Smart City Definitions from Different Perspectives

Category	Source	Definitions/Features	Key concept/ Keywords
Academic	Marsal-Llacuna et al. (2014)	Smart Cities initiatives try to improve urban performance by using data, information and information technologies (IT) to provide more efficient services to citizens, to monitor and optimize existing infrastructure, to increase collaboration among different economic actors, and to encourage innovative business models in both the private and public sectors	Data, IT, collaboration, innovative, private and public sectors
Corporate	IBM (2013)	A smarter city uses technology to transform its core systems and optimize finite resources. At the highest levels of maturity, a smarter city is a knowledge-based system that provides real-time insights to stakeholders, as well as enabling decision-makers to proactively manage the city's subsystems. Effective information management is at the heart of this capability, and integration and analytics are the key enablers.	Technology, transform, optimize finite resources, real-time information, decision-making information, information management, integration, analytics
Government/ International organization	European Commission (2014)	Smart sustainable cities combine diverse technologies to reduce their environmental impact and offer citizens better lives. This is not, however, simply a technical challenge. Organizational change in governments – and indeed society at large – is just as essential. Making a city smart is therefore a very multidisciplinary chal-	Diverse technology, environment, quality of life, city officials, suppliers, policy makers, academics, civil society.

		lenge, bringing together city officials, innovative suppliers, national and EU policymakers, academics and civil society.	
Industry association	Smart Cities Council (2014)	The Council defines a Smart Sustainable City as one that has digital technology embedded across all city functions.	ICT, integrated, city functions.
Government	Japan Ministry of Internal Affairs and Communications (2013)	There are three major functions that "ICT Smart Town" is expected to contain. ICT to be used both in ordinary times and in times of disaster. ICT is used in order to contribute to self-sustaining town development in ordinary times, while it functions for disaster prevention and mitigation in times of disaster. Users, mainly local citizens, can participate in the Smart Town community using the ICT system through user-friendly and accessible interfaces such as mobile phones and TVs. New services resulting from the use of "Big Data", including the government-held (public) data, private sector data and real-time data, collected through sensors	Disaster, citizens, smart town, community, interfaces, government, real-time data.

Upon studying hundreds of definitions, however, the United Nation's Telecommunication arm, International Telecommunication Union (ITU) through its Focus Group – Smart Sustainable Cities and Communities (FG-SSC) on March 2014, agreed on the following definition, which encompasses the significant attributes of smart sustainable cities[iv]:

> *"A smart sustainable city (SSC) 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 and environmental aspects".*

02

State of Smart Cities in the Philippines

STATE OF SMART CITIES IN THE PHILIPPINES

Smart City Initiatives in the Philippines

The Philippines is faced with various challenges at all fronts: from natural disasters, the lack of government focus, complicated and even failed policy implementation, and so on. These continuing challenges, coupled with rapid urbanization and the current technological revolution, bring about more and more awareness to smart cities. Developing smart cities can be an answer for the government to address various pressing challenges such as meeting people's, achieving economic prosperity, a healthier environment, access to sustainable energy and water resources, and overall better quality of life.[v] This is why it is not surprising that the Philippines has also hopped on the smart city bandwagon evidenced by some notable smart city initiatives in the country as shown below:

National/Regional Level

Digital Cities 2025[vi]

- Digital Cities is an initiative by the Department of Information and Communication Technology through its Industry Development Bureau (IIDB) in partnership with Information Technology and Business Process Association of the Philippines (IBPAP) and Leechiu Property Consultants (LPC) to sustain the rapid growth of Information Technology and Business Process Management (IT-BPM) promoting countryside development.[vii]
- The 25 cities are [viii] Balanga City , Batangas City , Cabanatuan City, Dagupan City, General Santos City, Iligan City, Iriga City, Laguna Cluster (San Pablo, Calamba, and Los Baños), Laoag City, Legazpi City, Malolos City, Metro Cavite (Bacoor City, Imus, and General Trias), Metro Rizal (Taytay, Cainta, Antipolo City), Olongapo City, Puerto Princesa City, Roxas City, San Fernando La Union,

San Fernando City Pampanga, San Jose Del Monte City, Tacloban City, Tagbilaran City, Tarlac City, Tuguegarao City, Urdaneta City, and Zamboanga City

CALABARZON Region

- In 2015, 8 LGUs from the CALABARZON region started the talks on smart cities through attending the "Forum on Road to Smart City" which highlighted the conversion of urban centers into smart cities without drastically changing the locale's landscape. [ix]

- The surge of urban migration and traffic congestion is pushing the CALABARZON region to consider smart city solutions through technology. Despite their growing need to manage public spaces and real estate developments, the region is looking at creating smart cities to manage its present challenges.[x]

Local Government Level

Arteche Municipality

- The municipality of Arteche in Eastern Samar is set to launch a ride-hailing app for tricycles and delivery services as they continue to utilize technology in adapting to the new normal due to the coronavirus disease (COVID-19) pandemic.[xi]
- Initiated in 2018, the local government of Arteche banned the use of single-use plastics in the Municipal Hall premises. It mandated all employees and personnel to bring their own reusable utensils, cups, and canisters through EO 15 s. 2019. The EO also required students to collect plastic trash to create eco-bricks for constructing modular furniture, garden spaces, and full-scale buildings such as schools and houses.[xii]
- The local government of Arteche also recently signed a memorandum of agreement with SmartCT (SmartCitiesPH Inc.) to advance and support the community's digital transition by exchanging knowledge and implementing Small but Smart Initiative.[xiii]

Baguio City[xiv]

- Signed a Memorandum of Agreement (MOA) with DICT on September 25, 2020, to boost the city's construction of the first Smart City System in the country through the accelerated implementation and roll-out of the DICT's Free Wi-Fi for All – Free Public Internet Access Program;
- Plan to establish the City Broadband Network to connect backbone networks and provide a better connection for government offices.

Cebu City[xv]

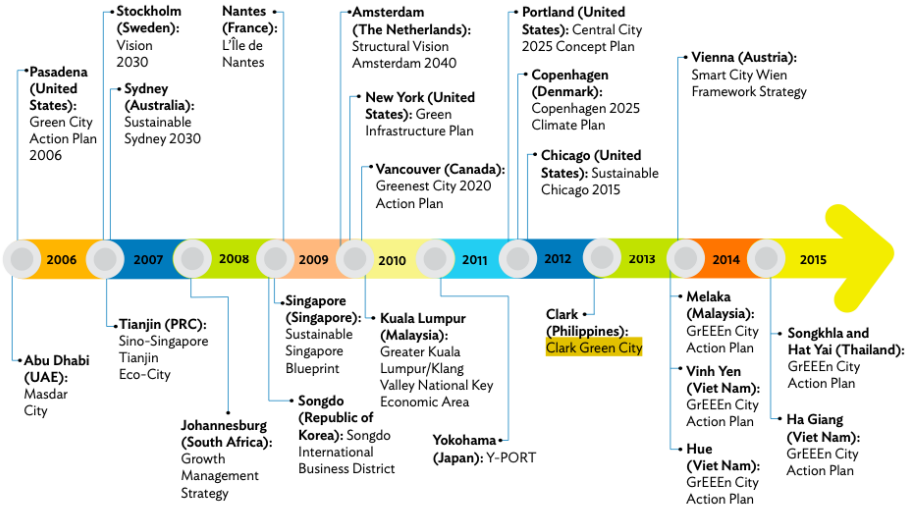
- Association of Southeast Asian Nations Smart Cities Network (ASCN) pilot city;
- Adaptation of sensors, monitoring equipment, and database infrastructure to support the operation of an intelligent traffic control system, improve traffic regulation enforcement and information collection and sharing;
- Establishment of the Bus Rapid Transit (BRT) System.

Clark Green City[xvi]

- The New Clark Green City or the Clark Green City is a 9,450-hectare Clark Special Economic Zone Property being developed in Capas, Tarlac, Philippines under the Bases Conversion and Development Authority (BCDA).
- The project started in 2016 with the Philippine Congress's support as the country's first smart, green, and resilient city.
- In 2017, a botanical garden and eco-tourism park was set to be established in the city.[xvii] The city also plans to adopt the features of a smart city such as compact walkable communities with generous open spaces, bike lanes, mass transportation, smart utilities, high-bandwidth connectivity, protected biodiversity, energy efficiency and urban farming.[xviii]
- Using locally sourced material called "lahar" or the volcanic mudflow to construct the buildings to make them more sustainable. Buildings will be set to comply with green technology such as greener energy sources like solar power, liquefied natural gas, and maximize waste-to-energy facilities. [xix]

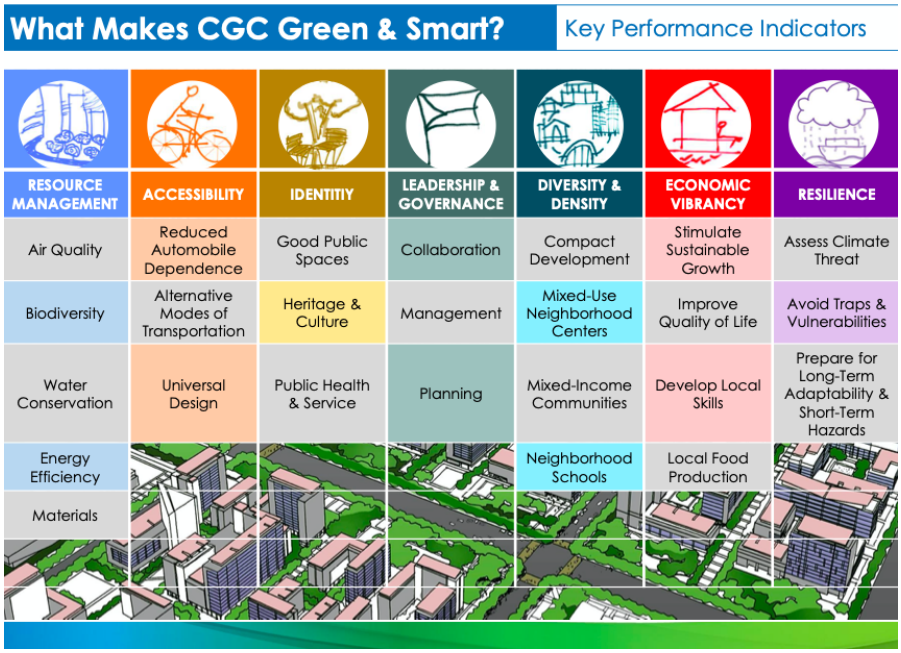
- The city also established an integrated operations center to coordinate all utility operations and facilitate remote management of various city operations. Along with this, an underground utility corridor will be used to house major utility lines for better installation, management, upgrading and protection from natural disasters such as flooding and earthquakes.[xx]
- Clark Green City is also part of the Asian Development Bank's examples for Integrated Urban Development under their GrEEEn Cities Operational Framework (GCOF)[xxi]

Figure 1.2: A Decade of Green City Examples for Integrated Urban Development



PRC = People's Republic of China, UAE = United Arab Emirates.
Source: Authors.

Source: Asian Development Bank, 2016[xxii]



Source: Clark Green City: Green, Intelligent, Global. Bases Conversion and Development Authority, June 2015[xxiii]

Cauayan City [xxiv]

- Recognized by the Department of Science and Technology (DOST) for its innovation in adopting science and technology development program through interactive and efficient city operation and services by applications and websites;
- Established the Digital Farmers Program in partnership with Department of Agriculture Agricultural Training Institute (DA-ATI) and Smart Communications, Inc. capacitating and empowering the farmers with basic digital tools and technologies particularly social media, climate and weather monitoring and e-farming applications;[xxv]
- In partnership with Smart Communications and PLDT, the city continuously expands its internet services through installation of fiber cables and provision of 5G services to the residents of the city.[xxvi]

Davao City[xxvii]

- Association of Southeast Asian Nations Smart Cities Network (ASCN) pilot city;
- Established Public Safety and Security Command Centre (PSSCC) featuring a variety of technological capabilities, including a city-wide CCTV surveillance

system and real-time data mapped out in GIS linked to the Philippine Center on Transnational Crime (PCTC);

- A Converged Command and Control (CCC) is being developed to upgrade the PSSCC enabling efficient city-wide, inter-agency linkages.

Iloilo City [xxviii]

- Deemed by DICT as one of the 25 Digital Cities in the Philippines to include the following digital cities framework: smart health care, building, digital infrastructure, education, safety and security, and governance;
- Named as one of the country's Next Wave Cities by the DICT and the Business Process Association of the Philippines (BPAP) because of its growing business process outsourcing (BPO) industry;
- Use of *eAssyscols*a software program used by Iloilo's Provincial Treasurer's Office and Provincial Assessor's Office to fast track the assessment of real properties and collection of taxes;

Iriga City

- Iriga City, Camarines Sur is one of the identified 25 Digital Cities to be monitored by the DICT for the next 3 years. The city is expected to optimize and encourage the growth of IT-BPM centers and provide more jobs. [xxix]
- As part of the Digital Cities program, Iriga City will be prioritized to have faster internet connectivity, digital education, training graduates and so on.[xxx]
- Launched the iContact, which is a contact tracing app generating a unique QR code to be used by the residents to enter establishments in the city. This initiative is part of the efforts to flatten the curve during the COVID 19 Pandemic.[xxxi]
- Maintaining a zero-casualty during typhoons employing effective disaster management and response practices.[xxxii]

Metro Manila[xxxiii]

- Association of Southeast Asian Nations Smart Cities Network (ASCN) pilot city;
- Development of e-learning through mobile phone based tutorial applications that would allow students to study or review lessons with tutor supervision;
- Digitization of Metro Manila's medical records and integrating overseas supervision of its operating rooms.

New Manila Bay City of Pearl

- One of the biggest reclamation project in the world and known as the biggest project born out of the Belt and Road Initiative as it aspires to be the first smart city in Southeast Asia with artificial intelligence integrated into the smart grid;
- Plans to develop driverless light rail transit for an environmental friendly and efficient mode of transportation

Pasig City[xxxiv]

- The UNFCCC secretariat (UN Climate Change) coined Pasig City as A Smart City with a Green Heart weaving different sectors like transportation and disaster emergency management together to achieve green development. Under the project with UNFCCC:
    - more than 225 surveillance cameras around the city to promote safety;
    - The city has a 24-hour phone and text hotline.
    - has installed 23 fully operational pumping stations in 22 flood-prone areas.

Mina, Iloilo

- The municipality received the Digital Governance Award in 2019 reflecting is best practices in ICT as an LGU *utilizing ICT for the effective and efficient delivery of public services to local communities and to business stakeholders*.[xxxv]
- The award is given by the DICT, the Department of Interior and Local Government (DILG), and the National ICT Confederation of the Philippines (NICP).

- The Municipality of Mina utilizes the *Mina Municipal Agriculture Information System – Farmers Agriculture Resource Management System* (MAIS). It is an e-government platform established to manage the information system, data management, and agricultural extension programs management in the locality. MAIS is also utilized to monitor the production and facilitate the marketing of farm products in the municipality.[xxxvi]

San Fernando, La Union[xxxvii]

- Establishment of business process improvement through City Information Systems;
- Establishment of telehealth services for e-consultations, e-barangay systems, ;
- Establishment of a command center to support the city's aim to be a walkable city;
- Building of smarter telecoms and ICT infrastructure in partnership with PLDT and iGate Fiber Optic Technology

Tabaco City, Albay

- Tabaco City launched its SMS-based feedback service as part of their Citizens Action for Governance initiative called Tingog 2015 using their local term for "voice". *Tingog 2015 is an innovative feedback mechanism that aims to ensure delivery of services in order to fast track achievement of the MDGs by allowing citizens to report and monitor these services in their communities.*[xxxviii]
- Through the service, residents can report, monitor, and provide feedback via SMS on the delivery of public health services, *including the expanded program on immunization, maternal and reproductive health services, medical consultation, tuberculosis and nutrition.*[xxxix]

Tabuk City

- EO No. 11-2020 was issued to create the Tabuk City Information and Communications Technology (ICT) Council to *function as the primary planning and policy advisory body on development, promotion and application of national information and communications technology and e-commerce initiatives*.[xl]

- The council is also responsible for the following:[xli]
    - City's ICT Policy and Planning considering the emergence of new technology;
    - Promote ICT in all levels of education including vocational and technical institutions;
    - Improve public service through the establishment of operation and maintenance units of ICT Infrastructures;
    - Provide internet access for government offices and public areas;
    - Harmonize local ICT plans with the national strategies to ensure resource-sharing and capacity building in the city;
    - Assist in disseminating the City Disaster Risk Reduction Management (CDRRM) plans;
    - Provide guidelines for access of ICT facilities and resources;
    - Formulate governing policies for security management of the Tabuk City system; and
    - Identify and sanction violations, , prohibited acts, practices and misuse of ICT facilities.

South Cotabato

- 83 sites in South Cotabato have been chosen by the DICT to be prioritized under its "Free Wi-fi for all Program". The 83 locations include *municipal halls, barangay halls, schools, plazas, and other public places across the province*.[xlii]
- Executive Order, No.50 series of 2020 signed by Governor Reynaldo S. Tamayo Jr. called for the concerned government officials to aid in the implementation of the program. [xliii]
- The SOCCSKSARGEN region, which includes South Cotabato launched a domestic COVID 19 containment contact tracing app called South Cotabato COVID Contact Tracing System (SC-CCTS).[xliv]
- The SC-CCTS is used to enter establishments such as malls, government offices, hospitals and other establishments providing services via personal interface transactions. The app provides passports for residents and transients mov-

ing around the region. The information provided on the cards are recorded on mobile phones of anti-COVID 19 front liners.

Valenzuela City

- The first ever “DigiPalengke” technology was launched in Valenzuela in 2018 which equipped their public markets to accept mobile cashless payments. Citizens of Valenzuela can now enjoy the convenience of QR payments through the initiative of PayMaya, Primetech Solutions, Inc., and the City Government of Valenzuela. [xlv]
- The DigiPalengke System also accepts the “Valenzuela Ako Card ID” or VCard, an ID card for the residents of Valenzuela which can also be used as a payment card. [xlvi]
- The “Paspas Permit”, a 10-second online business permit system has been launched as part of the city’s technology-based governance. The Paspas Permit system enables applicants of business permit in Valenzuela to receive their provisionary permits to start their business in a matter of 10 seconds upon confirmation of payment. The actual business plates shall be delivered by Grab Express to their doorsteps.[xlvii]

Philippine Smart City Definition

Smart Cities in the Philippines continue to flourish despite many hindering factors such as lack of government funding, the Philippine bureaucracy, and planning priorities. With the help of growing awareness to refocus the attention into decongesting Metro Manila and the country's urban cities, the government is now looking into ways to provide a better quality of life for its population by improving its services on energy, transportation, and public utilities.

As of now, the central concept of a smart city in the Philippines revolves around digitalization. Digitalization, for most people, is the main component of what makes a smart city because it is the modern way to gather public data which can be used in planning, especially in disaster management and response.[xlviii]

The Department of Trade and Industry (DTI) acknowledges that smart cities do not have a hardline definition. However, as it evolves exponentially, technology is becoming more and more recognized as the standard of being "smart".[xlix] Moreover, DTI also insists that technology implementation should come with responsible governance and citizen-centric collaboration to maximize technology. To quote:

> *Within the cities, collaboration is critical both horizontally and vertically across domains, such as utility services, transportation, public services and built environment. A cross-disciplinary approach is very important for Smart Cities' success – because we do not want to build silo systems in Smart Cities. On the international level, successful experiments in one city should be shared and replicated to other cities where relevant and for the lessons learnt.*[l]

In relation to this, the Department of Science and Technology (DOST) defines smart city as one that "harnesses (sic) the use of science and technology and innovation to deliver good governance and services to be public."[li] Moreover, some articles from the DOST defines the smart city dream as "…empowered by the need to transform urban areas into technologically empowered and efficient cities anchored on sustainable and inclusive economic devel-

opment without compromising the natural set-up of each urban center."[lii] Evidently, there is an emphasis in the use of technology on both definitions.

DOST Philippine Council for Industry, Energy and Emerging Technology Research and Development (PCIEERD) Executive Director, Dr. Enrico Paringit considers data and information as central in good governance, which can only be efficiently gathered and processed through technology.[liii]

City Mayor Bernardo Dy of Cauayan City, one of the first cities in the Philippines deemed as "smart city" stated that "Smart cities can be as complex as having sensors in every street, in every aspect of the city. It can be as complicated and futuristic as having laws and ordinances passed to allow driverless, unmanned vehicles on the streets. But it can also be as simple as informing the farmers if it's going to rain or not…"[liv]

Digital Philippines is a program of the Department of Information and Communications Technology (DICT) in relation to creating smart cities in the country. The DICT defines smart city initiatives as "…important because they require various departments to work together to develop and maintain the necessary digital and technological infrastructure necessary for a digital state."[lv]

Today's Smart City Challenge in the Philippines

The investments and implementations of smart cities in the Philippines are increasing exponentially in developing new real estate properties, urban planning, and smart city technologies. The common practice among all these initiatives is the use of technologies, that is, digital transformation.

A fragmented approach can be observed among the Philippine smart city initiatives. Because of the lack of agreed national smart city parameters and definition and comprehensive take on smart city development, the risk of fragmented local government operations is becoming higher and higher wherein different offices and departments are handling specific functions, projects, services, and domains.

On top of the opportunities brought by the smart city movement, it also comes with significant risks. Smart Cities are highly interdependent, embodying the complexity of local governments. It spans a wide array of diverse populations, services, and disciplines. With this, **how can we ensure that the technology, resource, and vendor choices we made now are the right ones for decades ahead?**

While some local governments may look to implement one technology or smart city initiative at a time, we always have to go back to the goal of a smart city both technologically and socioeconomically. A smart city's goal is to better the lives of the residents through the use of technology. Still, these technologies should have a solid foundation, an overarching connected ecosystem of different technologies and systems. Collectively and interconnectedly, these tools can improve the efficiency, security, and sustainability of the local government.[lvi] Thus, for these smart city investments and initiatives to realize their full potential, we need to acknowledge the complexity of the services and elements of a Smart City that requires a systems approach rather than silos. Such a comprehensive approach must promote sharing, reuse open standards, and leverage the potential to use interoperable technologies and initiatives among various local governments.[lvii]

03

Smart LGU Guidance

SMART LGU GUIDANCE

Every Local Government Unit (LGU) needs to be able to assess its current level of growth and capacity in enabling smart initiatives before moving forward. This chapter's content is the basis for the development of the Smart LGU Assessment Tool[1].

The Smart LGU Assessment is developed to support any community in assessing the current level at which the LGU uses data and information to facilitate effective, efficient, sustainable, and strategic operations of its daily business and social activities. This evaluation is based on existing models – Climate Change Commission (CCC), British Standards Institute (BSI), International Data Corporation (IDC), European Union, International Telecommunication Union (ITU), Open Data Institute (ODI), and the Scottish Cities Alliance – and emphasizes a system approach in smart city development. This chapter provides brief guidance on below 11 vital smart LGU dimensions:

1. LGU strategy
2. Localizing Climate Change and Sustainability
3. Stakeholder Engagement & Communications
4. Operating Model & Service Delivery
5. Asset Management
6. Data Strategy
7. Access to Data
8. ICT Plan
9. Standards
10. Innovation Ecosystem
11. Performance Management

1 Visit smartct.org or use this link: https://smartct-assess.vercel.app/?fbclid=IwAR17j-SW1y_v_OhfbxlMuU5D6EKPf0GWjmazoRYauj31MNfOHyu7eHxGmPs#/
Alternatively, you may also email us at assess@smartct.org

1. Smart Local Government Unit (LGU) Strategy

As with any organization trying to achieve something, the first step of any endeavor is to have strategies or strategic plan that will define the significant steps and milestones needed to get a community from where they are today to a future state.

Have a clear vision

One of the critical decisions that have to be made at the beginning of any smart city effort is establishing a vision. A vision is the true north of any smart city initiatives. It serves as the guide for almost all smart city-related decisions in the future. The vision should address the needs of the area and its residents.

Align the governance structure with the needs and vision

Various analytical methods[lviii] can be used in determining governance structures and creating a more detailed action plan. These methods include Horizon scanning, PEST (Political, Economic, Social, and Technological) analysis and SWOT (Strengths, Weaknesses, Opportunities, and Threats) among others[lix].

Multi-stakeholder approach

It should also be noted that given the changing environments, a Smart LGU plan and strategy has to be adaptive and flexible enough by having constant revisits and monitoring strategies. Simultaneously, this strategy needs to preserve its continuity to ensure that all stakeholders remain involved in the long-term vision[lx] [lxi].

2. Climate Change and SDG

Smart city initiatives, including technologies, have the potential to accelerate the achievement of all seventeen United Nations Sustainable Development Goals (UN SDGs), including SDG 11, which aims to achieve sustainable cities and communities.

The SDGs should be monitored and assessed through their indicators. Many of these indicators can be localized by gathering data at the territorial level. Multi-level governance mechanisms should also be used for the implementation and monitoring of the SDGs.

Multi-level governance is the “decision-making system to define and implement public policies produced by a collaborative relationship either vertical (between different levels of government, including national, federal, regional or local) or horizontal (within the same level, e.g. between ministries or between local governments) or both.”[lxii] Three components for its success are as follows:

1. subsidiarity
2. respect for local autonomy, and mutual loyalty
3. trust and structured dialogue between actors

3. Stakeholder Engagement & Communication

The success or failure of any smart city project depends on the buy-in from the stakeholder community. Without the stakeholders' approval and the communities' support, it would be almost impossible to transform the strategic vision into sustained action. The LGU should recognize the suggestions and feedback from the stakeholders.

In 2018, the Urban Loop released a result of its smart city stakeholder analysis. These stakeholders are interdependent with each other [lxiii]

Stakeholder	Description	Contributions	Expectations
Users	Active participants and users of the goods and services	Participate in smart city programs, empower fellow citizens, and improve their own standard of living	Better experience of the city from the more accessible information and services. Includes ease of access to gov't programs, affordability, work, tourism, interaction, and sustainability.
Drivers	Build sustainable solutions	Create suitable products and services, set achievable objectives derived from a larger vision, and rapidly innovate	Build platforms as basis for innovation, aggregation of data, and quality assurance. Drive economic growth and provide essential products and services for residents. Create jobs and support the standardization of services
Resource Providers	Conduct research, drive innovation, and augment knowledge	Engage academics and professionals to conduct R&D and manage knowledge distribution	Conduct research and provide new technologies and methods for implementing smart city services
Framework Enablers	Create a vision, enable resources, and promote an environment for innovation	Build a vision, allocate resources, provide strategic leadership, promote networking, and inspire	Balance authority and enhance synergy of city stakeholders. Ensure the financial and political smoothnes for smart city initiatives to be successful. Encourage investment and drive innovation.

Stakeholder	Examples
Users	Citizens, tourists, NGO's, & public intersest groups
Drivers	Tech, manufacturing, utility, consulting, & business firms
Resource Providers	Universities, urban planners, think tanks, & tech companies
Framework Enablers	City councils, elected officials, standards committees, & financial organizations

Source: UrbanLoop website: https://www.theurbanloop.com/smart-city-stakeholders%EF%BB%BF/. 2018

4. Operating Model & Service Delivery

Currently, the Philippines' service distribution and delivery of smart city initiatives and technologies appear to be fragmented. Often providers generate solutions based on their own data and standards. These stand-alone and closed systems do not form part of a system with a single data entry point.

To address these fragmented operating model and delivery, public procurement and financing of smart cities should be revisited. Below are a few best practices:

Public procurement[lxiv]

- Regular review of procurement policies with supplier engagement;
- Development of technology, solution and service design requirements in collaboration with suppliers and users;
- Trialing delivery models by promoting collaborative solutions such as joint ventures, partnerships between cities, academia, and industry;
- Interoperability as part of the procurements process;
- Short-term flexible contracts; and
- Performance contracting and co-development as part of the supplier and contractor relationship

Financing [lxv]

- small-scale projects seem to mainly leverage international/regional/national funds, as well as adopt less traditional sources of financing, like crowdfunding
- Medium-size projects mostly rely on venture capitalists to have their solutions financed
- large-scale projects are the ones which mainly benefit of private financing and public support mechanisms

5. Asset Management

There are two main assets to be considered in smart cities – Physical Assets and Digital Assets. Physical Assets refer to the physical infrastructures public spaces, road, buildings, etc. while digital assets refer mainly to wired and wireless connectivity infrastructure; sensor network and any and all systems which require data security and privacy methods. The LGUs need to map their assets and use data analytics or predictive modeling. These provide a competitive advantage when managing urban change and developing LGU infrastructure.

6. Data Strategy

Having well-defined data management is crucial with any data strategy. Data management incorporates the harvesting, cleaning, and structuring of data. The LGU should manage any data from its systems such as sensor data, social networks, satellite imaging, etc. These raw data are then processed and transformed into knowledge using methods like data analytics, data mining, and similar techniques.

Taking advantage of the power of data better to understand people's needs or even the demographic pattern is a vital part of any smart city transformation. The local government should ensure that it has the data needed from various sources to create a complete visual overlay of the LGU.

7. Access to Data

Open Data allows the Government to be more transparent and accountable, and it also creates opportunities for innovation, services, and business models. With international and national policies influencing the data sets that should be available for free, the Local Data Portals or Exchanges are proliferating. These Portals or Exchanges combine the current open data, data from the private sector, and data from smart city projects and making them available for use.

8. ICT Plan

Several studies show that ICT infrastructure can be one of the requirements for the success of a smart city transformation. Collecting vast quantities of data from all these linked devices and analyzing the data efficiently can only occur with a secure and resilient ICT framework[lxvi].

9. Standards

British Standards Institute (BSI), International Data Corporation (IDC), European Union, International Telecommunication Union (ITU), and the Scottish Cities Alliance are few of the bodies which released several smart city standards thus far. Standards guide designing, agreeing and delivering smart city strategies. Standards should guide the LGUs to:

- connect systems, networks, and technologies
- avoid vendor lock-in as interoperability will be one of the essential requirements which will ensure fair market

10. Innovation Ecosystem

A critical success factor for smart city growth is innovation engagement. A platform for innovation should be used to promote collaboration between the various LGU stakeholders and empower entrepreneurs and private companies to invest in local innovations.

The LGUs must provide organizational, interaction, and communication mechanisms with various actors and players. LGUs should position themselves to actively recognize and involve local players to promote their innovation agenda. An example of such is having a local innovation space to incubate ideas and innovators.

11. Performance Management

The LGU need to measure its performance based on the agreed targets and implement its strategy based in its vision. Indicators need to be in place to help assess the development of the goals and monitor how the vision and strategy is performing. Key Performance Indices can also be created based on the LGU's strategy.

04

Conclusion

CONCLUSION

Evident with the various definitions and implementation of smart city initiatives in the Philippines is that technological and socio-economic factors are key dimensions in the implementation of Smart City. However, a fragmented approach can be observed among the Philippine smart city initiatives.

For these smart city investments and initiatives to realize its full potential, we need to acknowledge the complexity of the services and elements involved within a Smart City which requires a system approach rather than in silos. Such a comprehensive approach must promote sharing, reuse of open standards and leverage the potential from use of interoperable technologies and initiatives among various local governments.[lxvii]

With the above, 11 vital dimensions have been distinguished to guide any local government in the smart city transformation. This dimensions are based on existing models – Climate Change Commission (CCC), British Standards Institute (BSI), International Data Corporation (IDC), European Union, International Telecommunication Union (ITU), Open Data Institute (ODI), and the Scottish Cities Alliance – and emphasizes a system approach in smart city development:

1. LGU strategy
2. Localizing Climate Change and Sustainability
3. Stakeholder Engagement & Communications
4. Operating Model & Service Delivery
5. Asset Management
6. Data Strategy
7. Access to Data
8. ICT Plan
9. Standards
10. Innovation Ecosystem
11. Performance Management

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