Lovely-Frances Domingo
lovely.f.domingo@gmail.com

Sample Writing – Independent study research for UW Jackson School International Policy Institute (IPI) Cybersecurity Fellowship and UW Information School advised by Dr. Jessica Beyer and Annie Searle

Urban Resilience through Smart Cities Initiatives in Southeast Asia

Urban resilience is defined as the "capacity of individuals, communities, institutions, businesses within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience."[1] In many cities in Southeast Asia, the rapid growth of cities and increasing rural to urban migration has led to the creation of mega-cities. The mega-cities have pushed the question of urban resilience for many governments, both on the local and national level.

In 2014, megacities were home to roughly 453 million people. By 2050, this number will increase up to 6.5 billion people.[1] According to the United Nations Development Programme (UNDP), by 2020, cities around the world, including those in Southeast Asia, will begin to adopt and implement integrated policies, plans and tools towards resource efficiency, risk mitigation, and overall disaster resilience[2]– giving rise to the growing interest of implementing smart city technology. Smart city technology is seen as the answer to address the challenges posed on Southeast Asian cities as a result of rapid urbanization.

Smart city technologies provide tools that can improve urban resilience for cities in Southeast Asia. The challenge is that cities will need to understand their own risks and develop a set of frameworks to develop cohesive and inclusive plans that will provide benefits to a greater majority of the population. Without significant investment in infrastructure and a humancentric approach that includes vulnerable populations in large-scale initiatives, smart city initiatives will amplify security and privacy risks and exacerbate the already deep sociopolitical? Economic? inequalities that impact the majority of Southeast Asian city populations. Smart city initiatives and implementation in Barcelona, Amsterdam, and Singapore highlight successes and challenges such as….. I analyze Smart Cities Initiatives plans for Manila and Hanoi as pilot cities for the ASEAN Smart City Network initiatives, while outlining risks and implications.

WHAT IS A "SMART CITY?"

The use of smart city technology is seen as a logical solution to improve people's lives. McKinsey reports that smart city technologies in Southeast Asia can improve quality of life by 10-30% by saving time, improving public health and safety, promoting cleaner and sustainable environment, and fostering a sense of community and civic engagement.[3] But what exactly is a "Smart City"? What makes a city "smart?" There is no widely accepted definition for what constitutes a smart city.[4] As such, because there is a lack of baseline definition--by extension understanding—of smart cities, there is also a lack of consensus on what components make up a smart city. Giffinger et al. (2007) defined a smart city as:

> A city that monitors and integrates conditions of all of its critical infrastructures, including roads, bridges, tunnels, rails, subways, airports, seaports, communications, water, power, even major buildings, can better organize its resources, plan its preventive maintenance activities, and monitor security aspects while maximizing services to its citizens.[5]

[1] Climate and Disaster Resilience. (n.d.). Retrieved from https://www.undp.org/content/undp/en/home/climate-and-disaster-resilience.html
[2] Ibid.
[3] Smart cities in Southeast Asia | McKinsey. (n.d.). Retrieved March 23, 2019, from https://www.mckinsey.com/industries/capital-projectsand-infrastructure/our-insights/smart-cities-in-southeast-asia
[4] Michael Fitzgerald. (2016). Data-Driven City Management. MIT Sloan Management Review. Retrieved from https://sloanreview.mit.edu/case-study/data-driven-city-management
[5] Ben Letaifa, S. (2015). How to strategize smart cities: Revealing the SMART model. Journal of Business Research, 68(7), 1414–1419. https://doi.org/10.1016/j.jbusres.2015.01.024

Meanwhile, scholars Saraju P. Mohanty, Uma Choppali, and Elias Kougianos (2013) identified nine components or characteristics often seen in a Smart City: smart infrastructure, smart buildings, smart energy, smart healthcare, smart technology, smart governance, smart education, and smart citizens.[6] Mohanty et al. note that cities do not need to implement all components to be considered a Smart City because cities vary on focus areas they want to address. What these two definitions highlight are the specific areas in government that is primed for Smart City investment.

For this paper, I will use so-and-so's general definition of a Smart City as the "development and management of a city using information and communication technology (ICT) to connect, understand, and to control existing resources within a city for effective and efficient use."[7] The use of ICT technology and devices is incorporated into the city's physical infrastructure, networks, business processes, political and social fabric to leverage collective intelligence in order to solve public problems.[8] "Collective intelligence"[9] is drawn from the combined power of communication networks, wireless sensors, other intelligent management systems, and "active reliance on citizens for participation"[10] to address challenges of the present and anticipate future solutions. The combination of citizen participation, data, and digital technologies improve outcomes and processes that relate to sustainability and productivity of cities, as well as enhance the quality of lives of the people who live in it.[11] For example, in cities

with severe traffic problems, the use of interconnected sensors and traffic cameras that collect data on vehicle flow, road closures, and accidents can help improve circulation. Transportation officials can utilize the data collected from these sensors to acquire real-time traffic information to decide on where to deploy accident response personnel as necessary, and the public can the same information to decide on alternate routes to take. Public participation, if present in this scenario, can be activated through feedback mechanisms which is then added to the body of data already collected.

ANALYSIS OF SELECT SMART CITY IMPLEMENTATIONS

Increasingly over the last few years, the emergence of interconnected digital technologies and data analytics has opened up doors for Smart Cities Initiatives. Smart Cities leverage the use of interconnected digital technologies, commonly referred to as the "Internet of Things" (IoT), to manage, monitor, and maintain city resources effectively and more responsively. [12] IoT is an ecosystem of interconnected devices that is accessible through the internet, and is regarded as key to building effective solutions to everyday problems.[13] In consumer markets, they are often known as "Smart" devices, such as home appliances, lightbulbs, low-powered thermostats or sensors, among others, that can be connected to the internet. The goal for these Smart devices is to empower the consumer to monitor and/or control the device from virtually anywhere there is an internet connection. These IoT devices then are connected to specific software or service that act as a centralized hub to manage the device and to aggregate data from devices simultaneously.[14] The

[6] Mohanty, S. P., Choppali, U., & Kougianos, E. (2016). Everything you wanted to know about smart cities: The Internet of things is the backbone. IEEE Consumer Electronics Magazine, 5(3), 60–70. https://doi.org/10.1109/MCE.2016.2556879
[7] Arman, Arry & Abbas, Antragama & Hurriyati, Ratih. (2015). Analysis of Smart City Technology Initiatives for City Manager to Improve City Services and Quality of Life Based on ISO 37120.
[8] Mohanty, S. P., Choppali, U., & Kougianos, E. (2016). Everything you wanted to know about smart cities: The Internet of things is the backbone. IEEE Consumer Electronics Magazine, 5(3), 60–70. https://doi.org/10.1109/MCE.2016.2556879
[9] Arman, Arry & Abbas, Antragama & Hurriyati, Ratih. (2015). Analysis of Smart City Technology Initiatives for City Manager to Improve City Services and Quality of Life Based on ISO 37120.
[10] Dameri, R. P., & Ricciardi, F. (2017). Leveraging Smart City Projects for Benefitting Citizens: The Role of ICTs. In S. T. Rassia & P. M. Pardalos (Eds.), Smart City Networks (Vol. 125, pp. 111–128). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-31961313-0_7
[11] Smart cities in Southeast Asia | McKinsey. (n.d.). Retrieved March 23, 2019, from https://www.mckinsey.com/industries/capital-projectsand-infrastructure/our-insights/smart-cities-in-southeast-asia
[12] Mohanty, S. P., Choppali, U., & Kougianos, E. (2016). Everything you wanted to know about smart cities: The Internet of things is the backbone. IEEE Consumer Electronics Magazine, 5(3), 60–70. https://doi.org/10.1109/MCE.2016.2556879
[13] Savaram Ravindra. (2018, July 5). The Transformation That Barcelona Had Undergone To Become A Smart City. Retrieved from www.barcinno.com/barcelona-smart-city-technologies
[14] Sarin, G. (2017). Wireless Protocols for Smart Cities. In S. T. Rassia & P. M. Pardalos (Eds.), Smart City Networks (Vol. 125, pp. 87–109).

energy-conscientious consumer who is interested in monitoring and managing energy consumption may be interested in Smart lightbulbs, switches, or invest in Smart energy meters – doing so will enable them to turn devices on or off and regularly monitor how much electricity they consume, and ultimately reap any savings as a result.

Successful implementation of an IoT ecosystem relies heavily on the performance, speed, and reliability of available internet connections throughout the city's current ICT infrastructure.[15] Without a robust ICT infrastructure—presence of fiber optics, Wi-Fi networks or hotspots and other service-oriented information systems—transmission of data across IoT devices and services will be rendered ineffective and inefficient.

BARCELONA: INTERNET OF THINGS AND FAST INTERNET

Utilizing IoT devices as a way to monitor and manage resources is the same for cities but at a much larger scale and can be an integral part of urban planning and city management. The successful overlay of an IoT ecosystem over extensive ICT network is the case for Barcelona, Spain, where the city replaced old streetlamps throughout the city with a LED-based lighting system with a sensor network through their Barcelona Lighting Masterplan in 2012 as one of its Smart City initiatives.

Using a network of sensors that collect "ambient data,"[16] Barcelona's lighting system is able to automatically adjust lighting levels based on the data collected from environment, such as humidity, temperature, pollution, noise, and presence of people.[17] Video sensors embedded in lampposts detect when pedestrians are nearby, and when streets are empty, lights automatically dim. Barcelona's IoT systems (more than 19,500 smart energy meters) are powered by its extensive fiber network—500 kilometers (roughly 310 miles) of fiber optic cable throughout the city, initiated 30 years ago, and is considered a backbone for Barcelona's integrated city systems, as well as provide free citywide Wi-Fi hotspots to residents and visitors.[18]

Barcelona's Lighting Masterplan is one of the city's "multi-modal strategy to utilize a 'network of networks,'"[20] and to engage local and regional stakeholders as well as public-private partnerships[19] to improve and increase the city's operations and understanding of the urban environment. Cumulatively, the city has produced 30 percent energy savings.[20] The city's continued investment, totaling $230 million in public funds, is apparent in its partnership with local technology companies to develop new IoT applications and technologies to utilize public data for good.[21] Although Barcelona's City Government has provided tools available to the public and currently support open data initiatives, further analysis entails that implementation is largely top-down and government-driven, and there is little to no citizen participation and engagement.[22]

Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-61313-0_6

[15] Mohanty, S. P., Choppali, U., & Kougianos, E. (2016). Everything you wanted to know about smart cities: The Internet of things is the backbone. IEEE Consumer Electronics Magazine, 5(3), 60–70. https://doi.org/10.1109/MCE.2016.2556879

[16] Sarin, G. (2017). Wireless Protocols for Smart Cities. In S. T. Rassia & P. M. Pardalos (Eds.), Smart City Networks (Vol. 125, pp. 87–109). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-61313-0_6

[17] Savaram Ravindra. (2018, July 5). The Transformation That Barcelona Had Undergone To Become A Smart City. Retrieved from www.barcinno.com/barcelona-smart-city-technologies

[18] Laura Adler. (2016, February 18). How Smart City Barcelona Brought the Internet of Things to Life. Retrieved from https://datasmart.ash.harvard.edu/news/article/how-smart-city-barcelona-brought-the-internet-of-things-to-life-789 [20] Ibid.

[19] Gascó-Hernandez, M. (2018). Building a smart city: lessons from Barcelona. Communications of the ACM, 61(4), 50–57. https://doi.org/10.1145/3117800

[20] Laura Adler. (2016, February 18). How Smart City Barcelona Brought the Internet of Things to Life. Retrieved from https://datasmart.ash.harvard.edu/news/article/how-smart-city-barcelona-brought-the-internet-of-things-to-life-789

[21] Ibid.

[22] Gascó-Hernandez, M. (2018). Building a smart city: lessons from Barcelona. Communications of the ACM, 61(4), 50–57. https://doi.org/10.1145/3117800

AMSTERDAM: OPEN DATA FOR THE COMMUNITY

Amsterdam leverages the use of data as the driving force in developing its Smart City, while incorporating a more bottom-up and community-driven strategy of engaging its citizens through the its extensive open data initiative and the Amsterdam Smart City (ASC) program. In 2014, Ger Baron, Amsterdam's chief technology officer, took on the herculean task of coordinating the effort of corralling the city's massive trove of data and conducting a massive data cleaning and inventory. The inventory contained 12,000 different datasets from 32 different departments.[23] According to Baron, "analytics don't have to be focused on big data to help cities be smarter... it can use small data, as long as it points toward better ways to help citizens."[24]

Data available through Amsterdam's City Data portal provide information on traffic and infrastructure, public and green spaces, energy, geography, population, etc.[25] Meanwhile, the ASC program is an online platform facilitates connection among citizens, government municipalities, academic institutions, and businesses to collaborate and contribute to solve urban problems. Key to the ASC is the city's exemplary field of open data which has been made available and accessible for partners to use in order to develop applications and solutions.

Since 2012, this program combined with Amsterdam's open data initiatives has powered roughly 90 Smart City projects and formed roughly 130 partners, [26] and engaged more than 400 organizations & 5000 individuals.[27] Availability of city data, big and small, has enabled the city to cultivate a strong startup culture within communities across Amsterdam, also known as "Living Labs,"[28] where partners can create and test unique solutions for their respective neighborhoods.

Such as with Barcelona's fiber network infrastructure that powers its use of Smart City initiatives and IoT Network, Amsterdam relies on a strong Wi-Fi connectivity to support Living Labs and community-powered Smart City initiatives through its city-wide high-speed broadband and designated wide-area network specific to IoT network "labs." However, there is the question of both individual privacy and prospect of surveillance amidst Amsterdam's public-private data partnerships through the ASC, as a result of issues which emerged from implementation of WiFi trackers, cameras, and other surveillance technologies to deter unwanted behavior in other Dutch cities. For example, in Eindhoven, the city collects and stores data from microphones and trackers installed in street lamp-posts despite violating the Dutch Personal Data Protection Act.[29]

SINGAPORE: STRONG GOVERNMENT SUPPORT AND CLOUD INFRASTRUCTURE

Singapore is considered to be a preeminent Smart City in Southeast Asia as an early adopter of digital technology infrastructure since 2014. As a small city state, Singapore is looking to Smart City technology to address the needs of a rapidly growing population in a citystate that is both land and space constrained, with over six million people in an area that is less than 1000 km squared.[30]

Government legislation, beginning in the 1980s, launched six national ICT plans to computerize government agencies in order to enhance national competitiveness and upgrade the skills of its citizens. Singapore's Smart Nation aims to "transform Singapore through technology …

[23] Michael Fitzgerald. (2016). Data-Driven City Management. MIT Sloan Management Review. Retrieved from https://sloanreview.mit.edu/case-study/data-driven-city-management/

[24] Ibid.

[25] Amsterdam City Data. (n.d.). Retrieved from https://data.amsterdam.nl

[26] Jennife Guay. (2017, April 10). Amsterdam solves city problems with cross-sector platform. Apolitical. Retrieved from https://apolitical.co/solution_article/amsterdam-solves-city-problems-cross-sector-platform

[27] Herman an den Bosch. (2018, May 23). Amsterdam: better than 'smart.' Smart City HUB. Retrieved from https://smartcityhub.com/governance-economy/amsterdam-better-than-smart

[28] Cate Lawrence. (2017, October 25). Why Smart City Amsterdam Is the Home of Innovation. Retrieved from https://dzone.com/articles/whysmart-city-amsterdam-is-the-home-of-innovation

[29] David W. Smith. (2018, May 22). Amsterdam leads fight against data surveillance capitalism. Eureka. Retrieved from https://eureka.eu.com/gdpr/amsterdam-surveillance

[30] Iyengar, R. (2017). Asia's Cities: Necessity, Challenges and Solutions for Going 'Smart.' In Smart city networks: through the internet of things. New York, NY: Springer Science+Business Media.

by using it as a means to an end and to enable significant improvements in how people live work, and play."[31] As a whole, Singapore aims to utilize Smart City technology to focus on health, transportation, urban solutions, and education, and to do so by implementing digital transformation projects that the city state considers as foundational systems of the city: economy, government, and society.[32]

Compared to Barcelona and Amsterdam, Singapore is uniquely equipped with a much smaller area both geographically and politically (as a city state). It has a single layer of government which enables it to efficiently and effectively plan and administer digital and technical transformations both at a local and national scale.[33] The goal is to slowly build infrastructure to improve service delivery of major national projects.

As a major national project, Singapore's Smart Nation initiative has been a testbed for implementing and applying new technologies, as a result of strong government support and

commitment which supports sustainable research and development, as well early adoption of cloud computing infrastructure to transform various levels of government.[34] Since emergence of cloud technologies, adoption in 2013 has grown from 24.6% to 28.9% in two years.[35] Singapore utilizes its cloud infrastructure to sponsor geospatial projects such as "Virtual Singapore" to address its land use and urban planning challenges. This project integrates geospatial and geographic information system (GIS) data from government agencies, IoT devices and sensors to provide a realistic virtual 3D representation of Singapore, and contains landscape visualizations to help design road networks, public amenities, cycling networks, waste systems, etc.[36]

ASEAN SMART CITIES NETWORK PILOT CITIES

In Southeast Asia, megacities are struggling to address traffic congestion, water/air quality, poverty and increasing inequalities, security and safety.[37] How do these governments around the world address the needs of a rapidly growing population? In 2018, ten member nations of the Association of Southeast Asian Nations (ASEAN) joined together to form the ASEAN Smart Cities Network (ASCN). The goal of ASCN is to "improve the lives"[38] of ASEAN citizens by using technology as an "enabler"[39] in order to connect, understand, and manage existing resources within a city for effective and efficient use. As a collective, the ASCN aims to facilitate a collaborative and "inclusive approach to smart city development that is respectful of human rights and fundamental freedoms."[40] Seven out of ten ASCN member states are home to cities experiencing rapid urbanization and increasing rural-urban migration and with it, increasing challenges to address growing population: Jakarta, Manila, Yangon, Ho Chi Minh City, Bangkok, Kuala Lumpur, and Singapore.[41]

MANILA, PHILIPPINES: NEW CLARK CITY

Manila is one of the pilot cities chosen for the ASEAN Smart Cities Network (ASCN)

[31] Smart Nation: The Way Forward Executive Summary. (2018, November). Retrieved from https://www.smartnation.sg/docs/defaultsource/default-document-library/smart-nation-strategy_nov2018.pdf
[32] Ibid.
[33] Ibid.
[34] Iyengar, R. (2017). Asia's Cities: Necessity, Challenges and Solutions for Going 'Smart.' In Smart city networks: through the internet of things. New York, NY: Springer Science+Business Media.
[35] Ibid, p. 34
[36] Ananya Narain. (2018, July 13). Geospatial initiatives lay foundation for Singapore's Smart Nation. Geospatial World. Retrieved from https://www.geospatialworld.net/blogs/singapores-smart-nation
[37] ASEAN Smart Cities Framework. (n.d.). ASEAN. Retrieved from https://asean.org/storage/2012/05/ASEAN-Smart-Cities-Framework.pdf
[38] Ibid.
[39] ASEAN Smart Cities Network. (n.d.). Retrieved from https://www.asean2018.sg/Newsroom/ASCN
[40] Ibid.
[41] Smart cities in Southeast Asia | McKinsey. (n.d.). Retrieved March 23, 2019, from https://www.mckinsey.com/industries/capital-projectsand-infrastructure/our-insights/smart-cities-in-southeast-asia

Initiative. As a country located in one of the most disaster-prone regions on the planet,[42] the Philippines (and Manila) is considered among the top three countries in the world most vulnerable to climate change.[43] In the last five years alone, three category 5 typhoons have ravaged the country, bringing with them severe flooding, mudslides, and destruction in urban areas. New Clark City is meant to address Manila's challenges tied to rapid urbanization and poor disaster resilience. It is a mixed-development city located in the province of Tarlac, roughly

106 kilometers away from Manila. It is a $162 billion-dollar investment touting a "smart, green, and disaster resilient"[44] city, meant to be pollution-free, and resilient in the face of typhoons, flooding, and earthquakes. The location is strategically chosen to withstand disasters, with higher elevation, protected by mountain ranges, and away from fault lines.[45] Once built, New Clark City will be the new seat for the Philippine government, a back-up city where government offices can still function if Manila succumbs to disaster.[48] Currently available plans for New Clark City showcase additional investment in drones, driverless cars, and technology meant to reduce water and energy use?, with extensive green spaces,[46] but without mention of specific information community technology infrastructure, despite mention of day-to-day functions managed by integrated operations center.[47]

The goal for building a Smart City outside of Manila is to mitigate the impact of the 12 million people living in the city on Manila's resources and to entice residents to move away from the strained urban environment. Hopes for New Clark City is that it will shuttle at least two million commuter trips out of Manila and provide relief to its congested roads and highways.[48]

"Chaos can be seen in the fast-developing cities such as Manila where automobile gridlock brings the city to a standstill. The ability to move efficiently through an urban space is paramount to generate more opportunity and work more efficiently."[49] It's important to consider that much of the population living in Asian megacities who are below poverty line in slums and squatter settlements where they lack minimum requirements for water, drainage, sanitation, quality health care and education facilities.[50] It is unclear whether New Clark City will alleviate the burden of challenges faced by this population, but rather, the enhanced focus on New Clark City may take away resources meant to address challenges faced by vulnerable populations that already exist in Manila. State spending can be skewed in the direction and support for new cities and projects, and away from meeting basic needs and services of the poor.[51] It is also not clear or addressed in any Smart City initiatives tied to New Clark City whether the pilot program will benefit the "burgeoning middle class with aspirations of better living standards"[52] rather than those impacted the most.

[42] Jane Bracher. (2018, July 22). The Philippines is building a green, disaster-resilient city. CNN. Retrieved from https://www.cnn.com/style/article/new-clark-city-philippines/index.html

[43] Helen Flores. (2018, March 21). Climate change vulnerability: Philippines ranks 3rd. PhilStar Global. Retrieved from https://www.philstar.com/headlines/2018/03/21/1798866/climate-change-vulnerability-philippines-ranks-3rd

[44] Eijas Ariffin. (2018, August 16). Smart City Spotlight: Hanoi. The ASEAN Post. Retrieved from https://theaseanpost.com/article/smart-cityspotlight-hanoi

[45] Jane Bracher. (2018, July 22). The Philippines is building a green, disaster-resilient city. CNN. Retrieved from https://www.cnn.com/style/article/new-clark-city-philippines/index.html [48] Ibid.

[46] Manila is the most crowded city in the world — here's what life is like. (n.d.). Retrieved from https://www.businessinsider.com/manilaworlds-most-crowded-city-2016-8

[47] Smart cities - Hitachi. (2013). Hitachi Brand Channel. Retrieved from https://youtu.be/Uy9r7pOz3NQ

[48] Jane Bracher. (2018, July 22). The Philippines is building a green, disaster-resilient city. CNN. Retrieved from https://www.cnn.com/style/article/new-clark-city-philippines/index.html

[49] Iyengar, R. (2017). Asia's Cities: Necessity, Challenges and Solutions for Going 'Smart.' In Smart city networks: through the internet of things. New York, NY: Springer Science+Business Media.

[50] Iyengar, R. (2017). Asia's Cities: Necessity, Challenges and Solutions for Going 'Smart.' In Smart city networks: through the internet of things. New York, NY: Springer Science+Business Media.

[51] Watson, V. (2013). African urban fantasies: dreams or nightmares? Environment and Urbanization, 26(1), 215–231. https://doi.org/10.1177/0956247813513705

[52] AFP. (2014, December 16). India's "smart" cities plan risks leaving millions behind. Deccan Chronicle. Retrieved from https://www.deccanchronicle.com/141216/nation-current-affairs/article/indias-smart-cities-plan-risks-leaving-millions-behind [56]

HANOI, VIETNAM

Prime Minister, Nguyen Xuan Phuc, approved the master plan for Vietnam's Smart and Sustainable City strategies for 2018-2025.[56] In this plan, Hanoi, as one of Vietnam's pilot ASCN cities, plan to raise support from foreign investors who are already investing in the country such as Japan for its information technology solutions and South Korea for its electronics and energy products. Through the Hanoi Smart Development plan, these investments are expected to focus on areas such as infrastructure, healthcare, education, energy, housing developments and mitigation of Hanoi's urban pollution.[53] Plans for the Hanoi Smart City seems to prioritize building core ICT infrastructure and development of smart applications in healthcare, education, transportation and tourism. Current plans also indicate public-private partnership with Microsoft to provide technology for e-government, healthcare, and data collection using a combined estimated budget of $3 billion dollars of private and public funds.

For Hanoi, it's important to consider that private companies do not often know how cities work. While private-public partnerships are essential components of Smart Cities initiatives, such as the overwhelming success of this in Amsterdam's Smart City, local government officials must carefully maintain balance to ensure that interests of corporate partners do not overwhelm civic interests by cultivating diverse stakeholders in local government, research, grassroots organizations, and community members.

RISKS AND IMPLICATIONS

Smart City implementation around the world have shown tremendous promise in alleviating urban challenges and have grown significantly as a result of emerging technologies such as the "Internet of Things" (IoT) and big data analytics, with vast improvements in speed,

---

latency, and reliability of information communication technology (ICT) networks, such as fiber and cable internet and Wi-Fi networks. Analyses of Smart City implementations in Barcelona, Amsterdam, and Singapore highlight a number of critical considerations for the nation members of ASEAN Smart Cities Network (ASCN) planning to implement Smart Cities in their respective countries.

Securing the Infrastructure

As more Smart Cities technologies become more integrated to city management and urban life, Southeast Asian cities must be conscientious of how they invest in infrastructure which supports delivery of critical city services. Cyber Physical Systems (CPS) are the integration of computation and networking to physical entities.[54] This can include a city's information communication technology connections, Wi-Fi connectivity, IoT network, cloud infrastructure, etc. Smart Cities in Southeast Asia must carefully invest in a robust CPS infrastructure, consider defining CPS as anything physical, electrical, and digital[55] as critical infrastructure. Securing, monitoring, and managing a Smart City's infrastructure is paramount to urban and disaster resilience, as well as the safety and security of its populations. As a result of dependencies, disruptions in infrastructure can escalate to other critical systems—and the effects of these disruptions can vary depending on scale, scope, and consequence.[56] For instance, because smart transportation systems and other transportation-related services overlaid on ICT and geospatial technologies provide real-time processing and geographic

---

Bich Thuy. (2018, September 25). Hanoi opens doors to smart city future. Vietnam Investment Review. Retrieved from https://www.vir.com.vn/hanoi-opens-doors-to-smart-city-future-62632.html

[53] Ibid.

[54] Mohanty, S. P., Choppali, U., & Kougianos, E. (2016). Everything you wanted to know about smart cities: The Internet of things is the backbone. IEEE Consumer Electronics Magazine, 5(3), 60–70. https://doi.org/10.1109/MCE.2016.2556879

[55] Ibid.

[56] Tolone, W. J. (2009). Interactive visualizations for critical infrastructure analysis. International Journal of Critical Infrastructure Protection, 2(3), 124–134. https://doi.org/10.1016/j.ijcip.2009.07.004

locations of vehicles and pedestrians in a city at any given time, protecting this information from malicious actors and cyberattacks must be a tantamount priority. Developing an asset inventory for Smart City CPS infrastructure, devices, and components is important to ensure availability, confidentiality, and integrity of communications of various systems.

Mitigating Impact on Vulnerable Populations

Smart Cities inspire what scholar Vanessa Watson calls "new urban visions" of city life and urban development that often disregard populations living in poverty and informal settlements.[57] Development plans for Smart Cities in Southeast Asia seem to promote the luxury of a technology-powered city and emphasis on innovations and futuristic designs to the

emerging upper-to-middle class, but fail to consider the exclusionary effects on those who cannot afford it. In India, Smart City development have had deleterious impacts on the city of Patna Bihar where 63% of the population live in slums and 93% have historically been disenfranchised and oppressed.[58] Furthermore, the Indian government have begun to overtake urban land demolishing houses and other informal dwellings in the name of Smart Cities, violating constitutional rights of farmers, tribes, and other indigenous groups in the city.[59] Globally, such as in Southeast Asia, one in eight people live in such area as in Patna Bihar, and face issues of housing, access to drinking water, waste management, and other basic urban services.[64] Smart Cities should carefully consider human-centered approaches to problems of respective city environments. Singapore's emphasis on empowering its people through the

Smart Nation program may be an approach that can be leveraged for New Clark City and

Hanoi. As a part of Singapore's Digital Readiness plan, Singapore seeks to empower its citizens through digital literacy efforts to promote engagement and competitiveness of its populations. Complementing Smart City technology implementation with inclusive human-centered approach provides a stronger case for building urban resilience.

[57] Watson, V. (2013). African urban fantasies: dreams or nightmares? Environment and Urbanization, 26(1), 215–231. https://doi.org/10.1177/0956247813513705
[58] Sujeet Kumar. (2019, January 2). India's smart city scheme has no space for the poor. *Quartz*. Retrieved from https://qz.com/india/1513922/indias-smart-city-scheme-has-no-space-for-the-poor
[59] Ibid.
[64] Ibid.

WORKS CITED

100 Resilient Cities. (n.d.). Retrieved from https://www.100resilientcities.org

AFP. (2014, December 16). India's "smart" cities plan risks leaving millions behind. Deccan Chronicle. Retrieved from https://www.deccanchronicle.com/141216/nation-currentaffairs/article/indias-smart-cities-plan-risks-leaving-millions-behind

Amsterdam City Data. (n.d.). Retrieved from https://data.amsterdam.nl

Ananya Narain. (2018, July 13). Geospatial initiatives lay foundation for Singapore's Smart Nation. Geospatial World. Retrieved from https://www.geospatialworld.net/blogs/singaporessmart-nation

Arman, Arry & Abbas, Antragama & Hurriyati, Ratih. (2015). Analysis of Smart City Technology Initiatives for City Manager to Improve City Services and Quality of Life Based on ISO 37120.

ASEAN Smart Cities Framework. (n.d.). ASEAN. Retrieved from https://asean.org/storage/2012/05/ASEAN-Smart-Cities-Framework.pdf

ASEAN Smart Cities Network. (n.d.). Retrieved from https://www.asean2018.sg/Newsroom/ASCN

Ben Letaifa, S. (2015). How to strategize smart cities: Revealing the SMART model. Journal of Business Research, 68(7), 1414–1419. https://doi.org/10.1016/j.jbusres.2015.01.024

Bich Thuy. (2018, September 25). Hanoi opens doors to smart city future. Vietnam Investment Review. Retrieved from https://www.vir.com.vn/hanoi-opens-doors-to-smart-city-future62632.html

Cate Lawrence. (2017, October 25). Why Smart City Amsterdam Is the Home of Innovation. Retrieved from https://dzone.com/articles/why-smart-city-amsterdam-is-the-home-of-innovation

Climate and Disaster Resilience. (n.d.). Retrieved from https://www.undp.org/content/undp/en/home/climate-and-disaster-resilience.html

Dameri, R. P., & Ricciardi, F. (2017). Leveraging Smart City Projects for Benefitting Citizens: The Role of ICTs. In S. T. Rassia & P. M. Pardalos (Eds.), Smart City Networks (Vol. 125, pp. 111–128). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-61313-0_7

David W. Smith. (2018, May 22). Amsterdam leads fight against data surveillance capitalism. Eureka. Retrieved from https://eureka.eu.com/gdpr/amsterdam-surveillance

Eijas Ariffin. (2018, August 16). Smart City Spotlight: Hanoi. The ASEAN Post. Retrieved from https://theaseanpost.com/article/smart-city-spotlight-hanoi

Gascó-Hernandez, M. (2018). Building a smart city: lessons from Barcelona. Communications of the ACM, 61(4), 50–57. https://doi.org/10.1145/3117800

Helen Flores. (2018, March 21). Climate change vulnerability: Philippines ranks 3rd. PhilStar Global. Retrieved from https://www.philstar.com/headlines/2018/03/21/1798866/climate-changevulnerability-philippines-ranks-3rd

Herman an den Bosch. (2018, May 23). Amsterdam: better than 'smart.' Smart City HUB. Retrieved from https://smartcityhub.com/governance-economy/amsterdam-better-than-smart

Iyengar, R. (2017). Asia's Cities: Necessity, Challenges and Solutions for Going 'Smart.' In Smart city networks: through the internet of things. New York, NY: Springer Science+Business Media.

Jane Bracher. (2018, July 22). The Philippines is building a green, disaster-resilient city. CNN. Retrieved from https://www.cnn.com/style/article/new-clark-city-philippines/index.html

Jennifer Guay. (2017, April 10). Amsterdam solves city problems with cross-sector platform. Apolitical. Retrieved from https://apolitical.co/solution_article/amsterdam-solves-city-problemscross-sector-platform

Laura Adler. (2016, February 18). How Smart City Barcelona Brought the Internet of Things to Life. Retrieved from https://datasmart.ash.harvard.edu/news/article/how-smart-city-barcelonabrought-the-internet-of-things-to-life-789

Manila is the most crowded city in the world — here's what life is like. (n.d.). Retrieved from https://www.businessinsider.com/manila-worlds-most-crowded-city-2016-8

Michael Fitzgerald. (2016). Data-Driven City Management. MIT Sloan Management Review. Retrieved from https://sloanreview.mit.edu/case-study/data-driven-city-management/

Mohanty, S. P., Choppali, U., & Kougianos, E. (2016). Everything you wanted to know about smart cities: The Internet of things is the backbone. IEEE Consumer Electronics Magazine, 5(3), 60–70. https://doi.org/10.1109/MCE.2016.2556879

Sarin, G. (2017). Wireless Protocols for Smart Cities. In S. T. Rassia & P. M. Pardalos (Eds.), Smart City Networks (Vol. 125, pp. 87–109). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-61313-0_6

Savaram Ravindra. (2018, July 5). The Transformation That Barcelona Had Undergone To Become A Smart City. Retrieved from www.barcinno.com/barcelona-smart-city-technologies

Smart cities - Hitachi. (2013). Hitachi Brand Channel. Retrieved from https://youtu.be/Uy9r7pOz3NQ

Smart cities in Southeast Asia | McKinsey. (n.d.). Retrieved March 23, 2019, from https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/smartcities-in-southeast-asia

Sujeet Kumar. (2019, January 2). India's smart city scheme has no space for the poor. *Quartz*. Retrieved from https://qz.com/india/1513922/indias-smart-city-scheme-has-no-space-for-thepoor

Smart Nation: The Way Forward Executive Summary. (2018, November). Retrieved from https://www.smartnation.sg/docs/default-source/default-document-library/smart-nationstrategy_nov2018.pdf

Tolone, W. J. (2009). Interactive visualizations for critical infrastructure analysis. International Journal of Critical Infrastructure Protection, 2(3), 124–134. https://doi.org/10.1016/j.ijcip.2009.07.004

Watson, V. (2013). African urban fantasies: dreams or nightmares? Environment and Urbanization, 26(1), 215–231. https://doi.org/10.1177/0956247813513705