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Smart City Investments: A Rapid Decision Framework for Public Private Partnerships

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Abstract— The city of Syracuse in New York announced an ambitious smart city plan which, when fully implemented, promises to make it the most connected city in the northeastern US. Thanks to a strategic investment by the State of New York, the city is home to what is billed as the world’s first Drone Corridor for R&D. We outline a decision framework (The Syracuse Wheel) for public private partnership to help city leaders and private investors navigate the exciting implications stemming from these two strategic developments and the city’s environment to augment the priority areas of Autonomous Mobility and Connectivity. The Wheel positions Syracuse as a prime market for visionary Public Private Partnership (PPP) proposals given its infrastructure and assets specific to Unmanned Aerial Systems (UASs) and Autonomous Vehicle Testing. The research also suggests ways to mitigate the problems associated with data governance and IP governance that various large-scale PPPs have faced in the past. We conclude with a decision-making framework which facilitates a fast-track approval mechanism for investment proposals from private entities as Syracuse prepares for its future as leading-edge Smart City and UAS R&D hub.

Keywords—asset, connectivity, data governance, drones, fast-track approval, IP governance, infrastructure, environment, Autonomous Mobility, open API, public private partnership, smart city, unmanned aerial systems, winter testing

I. INTRODUCTION

Between 1840 and 1940, Syracuse City grew dramatically in both population and wealth. This was due to the city’s strategic location on the Erie Canal, which propelled its development as a manufacturing center. In this period of economic expansion, Syracuse ranked among the nation’s 30 most populous cities (Hevesi, 2004). But decline in manufacturing in the decades since saw Syracuse turn into a rust belt city. In 2018, Syracuse was declared one of the ten poorest in the US for its pockets of concentrated poverty (li, 2018). Two significant recent developments auger well for the city’s future. In 2017, the world’s first Drone Corridor was established by NY State; the Corridor is a 50-mile long Unmanned Aerial Systems (UAS) R&D and testing facility linking Syracuse and Rome, NY (Centerstateceo,

2018). Augmenting this investment is the Northeast UAS Airspace Integration Research (NUAIR) Alliance, which was subsequently established in Syracuse to coordinate UAS testing and R&D. The second development is the launch of the Smart City plan, with significant investment again from the state. When completed, Syracuse is projected to be the largest connected city in the northeast (Knauss, 2017). These developments set the stage for Public Private Partnership (PPP) investments in the city and motivate the decision framework (The Syracuse Wheel), which is introduced below.

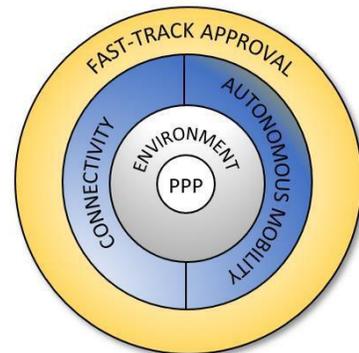


Figure 1 The Syracuse Wheel: A Decision Framework for PPP Investments

PPPs are contractual arrangements that are formed between public and private sector entities to provide a public asset or service to city residents. The Syracuse Wheel is intended as a tool for evaluating PPP proposals. A given proposal or opportunity can be evaluated primarily on its ability to leverage the environment, infrastructure and assets in the priority areas of Connectivity (inter-connecting platforms, systems and applications via the internet) and Autonomous Mobility (improving autonomous mobility products/services). The payoff from judicious decisions in these priority areas can transform the social and economic fabric of the city, and we recommend that city authorities focus on key catalysts such as fast track approvals -- for fostering PPP investments. The Syracuse Wheel also advises caution on two fronts: data governance and governance of intellectual property (IP). Without robust governance

mechanisms on these matters, we argue, the promise of urban revitalization – of a thriving smart and just city -- will be hampered. While PPPs are simple to understand conceptually, they can be difficult to implement operationally. It is expected that the city will need to evaluate many different types of investment alternatives, and as such will need a decision framework to ensure that the projects selected leverage the city's strategic assets and infrastructure to optimal effect.

II. ENVIRONMENT

The city of Syracuse fosters a conducive environment, which can aid in the development of the above focal areas. Its features are as follows:

A. Physical Environment

Syracuse is blessed with all four seasons of spring, summer, fall and winter throughout the calendar year. We have a 50-mile corridor dedicated to drone testing which can be utilized by private companies to test their Unmanned Aerial Systems (UASs) in all the seasons. Syracuse, during winter, inhabits similar weather conditions like Arjeplog which can then be leveraged for autonomous vehicle winter testing.

B. Educational Environment

Private entities and government can collaborate with higher education institutions in Syracuse such as Syracuse University and SUNY college of environment and forestry to leverage valuable research for framing policies and regulations in the operations of unmanned aerial systems. Syracuse University faculty is working on potential UAS applications such as journalism, civil infrastructure monitoring, firefighting etc. (Unmanned Aerial Systems Research and Education at Syracuse University, n.d.). Also, Syracuse University's Center for Advanced Systems and Engineering, a campus-wide NY state center for Advanced Technology in Information-Intensive Systems supports university-industry collaborative research in many UAS-enabled technologies.

C. Economic Environment

Syracuse city is also surrounded with vast amount of country land suitable for the establishment of all-season testing facilities and the city provides suburban setting for residential and commercial land which makes rent cheaper as compared to other big cities in the northeast US. The city also has an urban outlook with a burgeoning downtown that has offices of private companies that are involved in various businesses and some are part of the unmanned aerial systems incubator framework and are supported through grants from Genius New York which is in The Tech Garden. The tech garden being the main incubator for startups in Syracuse, helps developers meet investors to bring new companies to life and thereby promoting entrepreneurship.

III. FOCAL AREAS

This section suggests how city of Syracuse can leverage its assets such as NUAIR, The Tech Garden, and higher

educational institutions and infrastructure such as MetroNet and smart grid poles to enhance the following focal areas. Throughout, existing local startups are used to illustrate promising areas for PPP investments. These examples are intended to be suggestive, not exhaustive.

A. Autonomous Mobility

According to an analysis conducted by the Department of Neighborhood and Business Development in the city of Syracuse (2018), the citywide income falls below the basic survival threshold, as 62% of households did not make enough to cover the basic cost of living in 2016 due to lack of economic opportunities. This research suggests leveraging the Autonomous Mobility sector to create a platform for PPPs and mitigate the above situation by taking the advantage of Syracuse's geographical location and creating avenues for winter automotive testing and drone testing facilities.

Every year, car manufacturers invest heavily in extensive testing to ensure their new car models work perfectly in all possible conditions such as extreme high and low temperatures. This requires these companies to partner up with local entrepreneurs that own garages, test facilities, storage facilities and cold chambers etc., in places that inhabit such weather conditions. A case in point is Arjeplog, which is a small town in Sweden with a total area of 1790 km square and approximately 8000 lakes. It accommodates a total of 5 months of winter testing. Argentis, a non-profit organization in Arjeplog, functions as an intermediary between service providers, original equipment manufacturers and the municipality. 78% of this organization is owned by the service providers and the rest 22% by the municipality. Like Argentis, Sweden has formed the Swedish Proving Grounds Association (SPGA) with 12-member companies to develop industry guidelines and best practices. Local service providers in Arjeplog have tied up with various automotive companies to facilitate their winter testing requirements (Sölvell, 2016). In winter, as the average temperature in Arjeplog goes as low as 14°F (-10°C), the population of Arjeplog doubles as 3,000 engineers from 30 auto companies arrive to take advantage of about 1,240 miles of test tracks. This generates an average of 150 million euros (\$163.8 million) for the local economy each year and also increases the profits in the hospitality industry (Gibbs, 2015). Syracuse also inhabits similar weather conditions as Arjeplog with average temperature during winter going as low as 17°F (-8.4°C) (Weatherspark, 2019). Based on this research, we recommend that a similar winter automotive testing PPP model can be implemented by Syracuse to boost the city's local economy. The best months for winter testing in Syracuse are December and January as they offer tougher conditions due to more rainfall and high wind speeds.

The NUAIR Alliance (Asset), headquartered in Syracuse, is not-for-profit coalition of more than 200 private and public entities and academic institutions working together to

operate and coordinate UAS testing and R&D using the Drone Corridor. New York State’s \$30 million “Upstate Revitalization Initiative” resulted in the establishment of the 50-mile Corridor, which will connect the city and Rome, NY (Margaritoff, 2018). This corridor acts as a major incentive for UAS based companies to perform advanced drone operations and research, and in turn provides operational and technical data to assist in efforts to integrate drones safely into the national airspace (Lee, 2019). According to LoopNet.com (2019) there are approximately 400 commercial spaces available for business in Syracuse. In order to boost the city’s prospects and tax base, the city is taking steps to attract UAS businesses with the lure of the Corridor and NUAIR’s expertise. The city and the region around it are home to several world class higher educational institutions, which provide a rich additional source of science and technology talent that the city, and new businesses, can tap. The following table lists city-based start-ups and initiatives to illustrate potential areas for PPP investments at the confluence of Smart City-UAS.

Table 1 Autonomous Mobility Sector Initiatives and PPP Investment Opportunities

Company	Use-case
TruWeather Solutions	Micro-weather modeling and data analytics to manage drone logistics
Prevision	3D geo-spatial mapping for livability
UsPLM	IoT’s and data analytics for UAS fleet management
Akrobotix and Vermeer	Development of self-contained autopilot systems for fully autonomous UAS
SkyOP	UAS operations training
ResilienX	Monitor health and integrity of UAS fleet management systems
Autonomous Mobility center @ Syracuse U	Academic research on UAS policy and governance
Quantifly	Simplification and reduction of the cost of parking and traffic studies through UAS

In summary, we see two priority areas in the Autonomous Mobility sector for the city: 1) Winter Automotive Testing sites and 2) Instrumented UAS Test Facilities. The benefits of such an investment regarding automotive testing and certification were discussed earlier in the Arjeplog section.

B. Connectivity

In 2015, the state of New York made the largest and most ambitious state broadband investment (Broadband for All) in the nation, \$500 million, to achieve statewide broadband access by 2018 promising internet download speeds of at least 100 megabits per second (Mbps) in most places, and 25 Mbps in the most remote, unserved parts of

the state, which includes the city of Syracuse (New York state, n.d.). Despite that, Syracuse has the lowest share of population with access to a computer with a broadband or DSL (Digital Subscriber Line) subscription at home of Upstate NY peer cities. Also, 22% of Syracuse residents lack access to both the Internet and a computer at home (Department of Neighborhood & Business Development, 2018). The research suggests that Syracuse consider a novel solution to address this alarming digital divide with tethered drones. Tethered drones are UASs that use a hardware tether (as thin as a headphone cord) from the ground to the craft to provide continuous power and a constant video feed. Powering both the drone and its sensors from the ground has several advantages. For one, flight time is extended from less than an hour (with most current UAS) to days. Additionally, a tether can supply more power than a battery, which means larger mortars and heavier payloads (Salmon, 2017). The following table compares the conventional infrastructure (e.g., muni Wi-Fi) and tethered drones for Internet connectivity:

Table 2 Wi-Fi Connectivity Infrastructure vs Tethered Drones

Conventional Infrastructure	Tethered Drones
Fixed and high cost of capital and maintenance	Mobile and low cost of capital and maintenance
Slow and hard to reconstruct after physical damage	Fast and easy to replace after physical damage
Powered by electricity which can be costly and prone to outages	Powered by batteries which are easily and quickly replaceable
Coverage footprint can be city-wide	Coverage footprint can be limited
Consistent availability	Availability can be spotty

The next question that arises is how Syracuse can implement a city-wide internet network to provide connectivity to the above-mentioned residents that fall in the 22% segment. The problem associated with the set-up of conventional internet infrastructure to facilitate a city-wide Wi-Fi network is heavy capital investment. Despite its limitations, we recommend the use of tethered drones as a feasible first step toward narrowing the city’s Digital Divide through targeted service in the neediest neighborhoods.

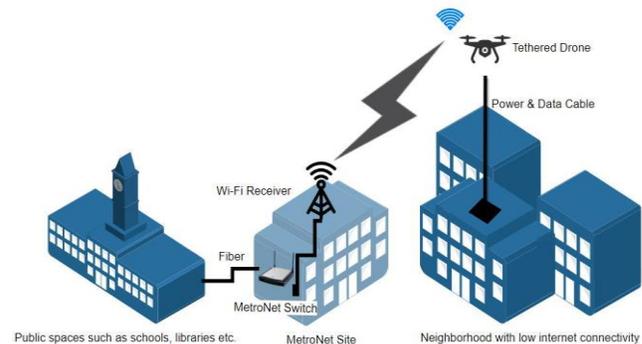


Figure 2 Tethered Drones Can Narrow the Accessibility Gap in the Neediest Neighborhoods

Syracuse MetroNet (Infrastructure), a gigabit-speed fiber broadband municipal area network, is a nonprofit consortium of local educational, health care and government organizations whose purpose is to use advanced technology to positively impact economic opportunity, equity of access, and quality of life in the city. At present, MetroNet connects 200 institutional user sites in the city (MetroNet, n.d.). The city can harness the MetroNet’s fiber infrastructure and couple it with the advantages of tethered drones to provide connectivity. As illustrated in Figure 2, low-income residents in the city’s subsidized housing high-rises get connected through a tethered drone. The drone connects (a) wirelessly to the MetroNet user site and (b) is then connected to the MetroNet high-speed switch, which is connected in turn to the Internet. This model is designed to serve low-income housing in the least connected areas of the city. Local UAS start-ups like Fotokite can help the city and the MetroNet evaluate tethered drones for connectivity applications as a prelude to attracting PPP investments.

The city is currently exploring 4G and 5G technology as part of its plan to become the best-connected city in the northeastern US. Recently, the city bought access to 17,000 grid poles (Infrastructure) for its Smart City project, and a sub-set of these poles will be smart poles equipped for mobile and WiFi connectivity (Baker, 2018). These are significant steps toward enhancing digital connectivity in the city overall. Tethered drones can effectively complement these efforts in the city’s poorest areas while also leveraging the sunk investment of the MetroNet infrastructure. As New York State’s ambitious Broadband for All plan takes shape, the tethered drone solution may still be an integral part of the city’s response to the Digital Divide problem as a way to enhance connectivity where demand is high, or where access to connectivity is spotty or low in absolute terms.

IV. RAPID DECISION FRAMEWORK OVERVIEW

The initial approval should be followed by city consultation which involves joint table meetings with stakeholders, city government, NUAIR, Tech Garden, MetroNet and Higher Education institutions to determine a mutually beneficial business case framework for the project. This is then followed by a three-sided evaluation of the project as a whole. (Grossman, 2010) The major metrics here include:

- Return on Investment (ROI) which is the financial evaluation on the proposed economic and business development for both private and public entities.
- Organizational Management and Capability (OMC) which encompasses evaluation of the transparency and communication capability, trust and social capital measurements, budget support, identification and management of agreements versus disagreements between both entities,

management longevity, culture of growth and development, collaboration capability, and effective ways to rebound from failures to deliver.

- Quality of Life (QOL), guided by the project vision statement, considers the socioeconomic quantity and quality changes that can be brought at each stage of project implementation.

Once the financial evaluation is completed and the terms are accepted by all parties, the process moves to the legal phase where the legislative agreement is created, and the public private partnership agreement is signed off on. Incentives to the private entity such as tax breaks shall be granted based on how the talks unfold and whether the private entity is willing to share important data with the public for use and transparency through data trusts and policy education. Therefore, this framework enables the city to evaluate alternatives and make decisions without delay with the help of catalysts.

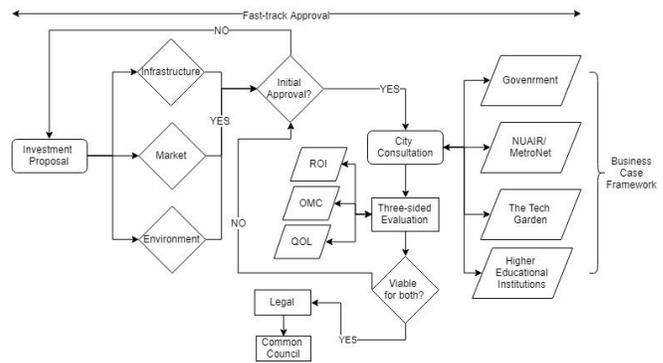


Figure 3 The Rapid Decision Framework Flow

Catalysts include a fast track approval process. A good example for fast track approvals and business growth is the city of Boston contracting with Verizon Wireless Inc., to install fiber poles in most of the neighborhoods in the city for cable television. The current term of the agreement is for 10 years, with automatic renewal for another 10 years. All approvals were granted by the Boston city officials within 10 business days of Verizon submitting proposals to them (Boston, n.d.). Another great example of catalysts includes open APIs. A fine example to encourage public use and access to data by providing Open APIs for developers is the Dublin city’s Open Data Strategy. The Open Data Strategy aims to create an environment where, by opening up government data, new opportunities for research, innovation, transparency, engagement and greater efficiency are delivered and realized by public bodies, businesses, researchers and citizens (City of Guelph, n.d.). The strategy follows the approach of publishing important datasets in a website for reusability via APIs. As Syracuse prepares to leverage its assets and infrastructures to become a Smart City, we recommend that the city work with higher educational institutions, investors and vendors to define

open APIs and data strategy. PPP applications in the focal areas of Autonomous Mobility and Connectivity will count on the availability of such resources to establish and grow their business. These resources will help the city administration to provide its own services more efficiently and effectively based on smart targeting of opportunities and needs.

Syracuse can benefit from such fast track approval mechanisms. Private companies will appreciate the transparency and readiness of city government officials to act upon decisions. This quickness should however not neglect data governance and public access to data for participatory decision making. The Tech Garden (asset), which is a technology incubator based in Syracuse, and MetroNet (infrastructure) can be utilized to invite public to have a discourse based on what benefits they would gain, how data collection is done and how can public access their data. Private companies will also like the fact that this is transparent, involves public opinion thereby generating trust and faster response for their proposals. The materialization of this vision will, we argue, depend on how the city manage the problems associated with data governance and IP governance and leverages catalysts to foster PPP investments.

When city governments partner with private companies for various projects, there can be considerable ambiguity of who owns the data; whether public have access to this data and whether public have a say in how their data is being used either by the city government or the private company. City governments must take the responsibility to acknowledge and address this issue. Generally, there is an absence of government policy related to data privacy in public private partnership settings. Hence, private entities are filling the vacuum. Private companies market their software and code in such a way that they are attractive and conducive to modern urbanism. Public are then often left confounded when it comes to data. They do not know what data gets collected off them and most importantly why it is being collected. Hence basic questions around the fundamentals of smart city remain: How does the Internet of Things work? How is it kept secure? How does surveillance work? How will data be shared with law enforcement? Which laws will govern smart city data — regardless of their vintage or readiness? How might the residents' data contribute to intellectual property? Will consumer protection laws protect smart city residents? (Wylie, 2018). A classic cautionary example of ambiguity with regards to governance of public data can be seen when Sidewalk Labs, a subsidiary company of Google Inc., tried to design a district in Toronto's Eastern Waterfront to tackle the challenges of urban growth, working in partnership with the tri-government agency Waterfront Toronto and the local community (Doctoroff, 2018). The company in none of its public meetings and press conferences had stated with clarity about what its data governance strategy was going to be, who owned what data, whether members of the public could access the data, what Sidewalk was going to do with

the data and how it would be monetized. Also, the fact that the current agreement between the city and Sidewalk Labs left data ownership issues for later suggests that the agreement was not drafted with due diligence (Press, 2018). One possible effect of haste in this matter could be that patents derived from the data would default to Google. This possibility has raised issues in the minds of citizens and the people involved in the project. Delays in release of development funds and loss of key staff have contributed to deadlocking the project, according to reports (Summers, 2018). The importance of data and IP governance in PPP is important as investment scenarios to mitigate the risks associated with data ownership and investigate data ownership questions such contractual agreements usually face. The Sidewalk Labs case explains why it is important for PPPs to set the rules around the issues of data and IP governance to make the data open and accessible to people while offering privacy protection and ensuring that private companies do not receive any special status or rights when it comes to data access.

We strongly recommend that the city of Syracuse take steps to implement a comprehensive data and IP governance policy to guide PPP investment strategy. A great deal of transparency can be achieved by taking the advantage of a data governance mechanism called data trust. Data trusts are contracts that give a trustee, or a group of trustees the authority to make decisions as to how an asset such as data can be used on behalf of a group of people (Wylie & McDonald, 2018). Data trusts can lead, maintain and manage how data is used and shared – from who is allowed to access it, and under what terms, and how (Wylie & McDonald, 2018). Data trusts cannot be used solitarily to manage or govern data, but they become an integral part of the whole which includes laws, policies and rules, if defined effectively. A good example for data trust practices is a city in Canada called Guelph where American cities or any city in the world can adopt from their framework of Open Government. According to the Guelph city government (2018), Open Government means to govern with people rather than govern at people. The city of Guelph developed what it calls a Civic Accelerator Program. The program has three parts and the first consists of analyzing and sharing the problems people have such as parking, water consumption, waste management etc. The second part involves developing a solution together with the bid winning companies and collaborating on every stage of the project. The third part and final part is the evaluation and decision-making part where the city government decides whether to purchase, stop or extend the acceleration period based on the results after working the private entities four months without any money changing hands (Wylie, 2016).

Also, policy education is crucial to win public trust and maintain integrity of public data. This will bring realization to the people that they too have a say on how their data is being handled by the government and it builds trust so that the government will be careful not to unknowingly compromise data into the hands of the private entity without the consent of the people. Public libraries and higher

educational institutions (asset) such as Syracuse University can and are playing a huge role in educating the people about their rights with regards to their data (Wylie, 2018). Another way, we think, to address the predicament associated with the regulation of Data & IP governance in PPPs is to appoint a board of directors which would include expert representatives from the public entity, private companies and the people associated with the data being collected. This solution necessitates the formation of consortiums with companies that are pioneers in the field pertaining to the nature of PPP to lay down the industry's best practices and guidelines that need to be followed or enforced. Data protection and personal data usage regulation will not put corporate entities in a disadvantage. In fact, it will foster innovation on part of the private entity to have greater participation in digital infrastructure in an efficient way. It also saves companies against lawsuits brought about by unintentional customer data protection disasters. Companies will also target their research and development activities to better serve the needs of customers.

V. CONCLUSION

The Syracuse Wheel sees through the eyes of Public Private Partnerships (PPP) which the city of Syracuse can form with private entities to leverage its gifted environment, assets and infrastructure and therefore enhance the focal areas of Autonomous Mobility and Connectivity. The research concludes that PPPs in Winter Automotive Testing and Unmanned Aerial System (UAS) Testing can utilize the city's environment and its recent development of the NUAIR corridor respectively to enhance the Autonomous Mobility sector. The research also concludes that the formation of PPPs with private entities that manufacture tethered drones can help the city unfurl the potential of its existing (MetroNet) and envisioned (Smart grid poles) internet infrastructure and consequently enhance the connectivity sector. Furthermore, the research proposes a Rapid Decision Framework which incorporates all the aspects of the Syracuse Wheel and draws a roadmap to a successful PPP formation. This decision framework provides both entities the ease of flexibility, transparency and speed. The modular nature of the decision framework minimizes the consequences of a project failure and allows an efficient method for the city to evaluate PPP alternatives and make decisions without any delay. This fast-track approval process can be stopped or paused and continued at any stage which ensures efficient allocation of resources. The iterations of the cycle can happen any number of times as long as the parties to the agreement are willing to discuss and negotiate terms. However, this vision cannot be achieved without diligent data governance and IP governance policies which can be attained through data trusts, consortiums and policy education.

REFERENCES

- [1] Baker, C. (2018). *City plan to buy 17,000 streetlights could save Syracuse \$3M a year*. Retrieved from https://www.syracuse.com/news/index.ssf/2018/08/city_streetlights_pro_posal_syracuse.html
- [2] Boston. (n.d.). *Final term sheet*. Retrieved from https://www.boston.gov/sites/default/files/document-file-04-2017/verizon_license_agreement.pdf
- [3] Centerstateceo. (2018). *Break through: Annual report 2017-2018*. Retrieved from: http://www.centerstateceo.com/sites/default/files/AnnualReport_4.18.17.pdf
- [4] City of Guelph. (2018). *Open government*. Retrieved from <https://guelph.ca/city-hall/open-government/>
- [5] Doctoroff, D. (2018). Retrieved from https://www.reddit.com/r/toronto/comments/7p8wf9/hi_im_dan_doctoroff_ceo_of_sidewalk_labs_ask_me/
- [6] Gibbs, N. (2015). *Sweden's hot spot for winter testing: Brutal conditions prove ideal for use by automakers, suppliers*. Retrieved from <https://www.autonews.com/article/20150601/OEM/306019952/sweden-s-hot-spot-for-winter-testing>
- [7] Grossman, S. (2010). *Performance measurements for public private partnerships*. Retrieved from <https://www.state.nj.us/treas/pprm/panel2-4.pdf>
- [8] Hevesi, A. (2004). *Population trends in New York state's citites*. Retrieved from https://www.osc.state.ny.us/localgov/pubs/research/pop_trends.pdf
- [9] Knauss, T. (2017). *NY state's \$500m to 'transform' cny economy: More hope than results so far*. Retrieved from: https://www.syracuse.com/news/index.ssf/2017/06/ny_states_500m_pledge_to_transform_syracuses_economy_more_hype_than_jobs_so_far.html
- [10] Loopnet. (2019). *Syracuse, NY commercial real estate for sale and lease*. Retrieved from <https://www.loopnet.com/new-york/syracuse-commercial-real-estate/16/>
- [11] Margaritoff, M. (2018). *Unify to provide unmanned traffic management system for New York drone testing corridor*. Retrieved from <http://www.thedrive.com/tech/23247/unify-to-provide-unmanned-traffic-management-system-for-new-york-drone-testing-corridor>
- [12] Metronet. (n.d.). *Syracuse metronet history*. Retrieved from <http://www.syracusemetronet.org/History.html>
- [13] New York state. (n.d.). *Broadband for all*. Retrieved from <https://www.ny.gov/programs/broadband-all>
- [14] Press, A. (2018). *Google's first urban development raises data concerns*. Retrieved from <https://www.financialexpress.com/industry/technology/googles-first-urban-development-raises-data-concerns/1334584/>
- [15] Salmon, J. (2017). *The power of tethered drones*. Retrieved from <https://www.xyht.com/aerialuas/the-power-of-tethered-drones/>
- [16] Sölvell, Ö. (2016). *Arjeplog car testing emergence of a cluster*. Retrieved from http://www.clusterobservatory.eu/permalink/fl_eba89c-3ee7-11e7-a7a3-4b82e643446b.pdf
- [17] Summers, N. (2018). *Google's smart city dream is turning into a privacy nightmare*. Retrieved from <https://www.engadget.com/2018/10/26/sidewalk-labs-ann-cavoukian-smart-city/>
- [18] Weatherspark. (2019). *Comparison of average weather in Arjeplog and Syracuse*. Retrieved from <https://weatherspark.com/compare/v/82940~22184/Comparison-of-the-Average-Weather-in-Arjeplog-and-Syracuse>
- [19] Wylie, B. (2016). *How government it projects can avoid repeating the same mistakes by looking at procurement*. Retrieved from <https://torontoist.com/2016/09/government-it-project-mistakes-civic-tech-toronto-guelph/>
- [20] Wylie, B. (2018). *Governance vacuums and how code is becoming law*. Retrieved from <https://www.cigionline.org/articles/governance-vacuums-and-how-code-becoming-law>
- [21] Wylie, B. (2018). *Searching for the smart city's democratic future*. Retrieved from <https://www.cigionline.org/articles/searching-smart-citys-democratic-future>
- [22] Wylie, B., McDonald, S. (2018). *What is a data trust*. Retrieved from <https://www.cigionline.org/articles/what-data-trust>