# MUNICIPAL TELECOMMUNICATIONS MASTER PLANNING TO ACHIEVE COMPETITIVE ADVANTAGE IN A GLOBAL ECONOMY

Michael F. Ziolkowski
Department of Business Administration and Economics
College at Brockport, State University of New York
350 New Campus Drive
Brockport, NY 14420
mziolkow@brockport.edu

## ABSTRACT

The global competitiveness of a city or region depends, in part, on the capabilities of its information and communications technology (ICT) linkages to the rest of the globe. If these connections are robust, affordable, and broadly available, then the residents and businesses in the municipality will be able to access the sources of creativity, knowledge, and information inputs needed to be productive and competitive. Administering the development of municipal level ICT networks is the domain of city managers (e.g. mayors, councils, supervisors, etc.), who generally cede the development of these networks to service providers. Typically, city managers are not in the business of developing ICT networks themselves; rather, they coordinate the development of networks or individual components of ICT infrastructure, as proposed by telecommunication service providers. This paper argues that a municipal Telecommunications Master Plan (TMP) can be a useful tool for city managers to guide the development of a telecommunications infrastructure in a coordinated and proactive rather than piecemeal way. The goal of a TMP is to facilitate the creation of an optimized municipal telecommunications network that is efficient, capable, and meets the long-term forecasted user requirements.

Key Words: Telecommunication Planning, Knowledge Economy, Technology Policy, Global Competitiveness

*The Industrial Geographer*, 2011, Volume 8, Issue 1, Pages 26-43.

## INTRODUCTION

This paper contests the way in which information and communications technology (ICT) networks are developed at the municipal level. Telecommunications play an important and growing role in our live – studying them can be pursued in a number of different directions. A familiar way of thinking about telecommunications is the interface that one has with a household appliance. These connections can be through smart phones, televisions, computers, and many other ways. A good deal of design consideration goes into ensuring that these appliances are ergonomic, beautiful, and easy to use (Hustwit 2009).

Another avenue of inquiry, not often considered by end users, but that could benefit from some of the design concepts embedded in smartphones is the design of the infrastructure behind the appliances with which we most directly interact (Malecki 2002; Dodge 2002). The Internet is a series of networks of coaxial and fiber optic cable, human users, computers, cell phones, and all manner of other ways of transmitting data. These components and networks are connected by agreements and protocols ranging from major peering hubs where transoceanic cables connect together to monthly invoices for end-users. The vast array of networks, and the independence of their growth and development, has led to an ad hoc approach to the provision of telecommunications services at the municipal level. More effort by communities to engage in planning and designing their telecommunications infrastructure in the form of a Telecommunications Master Plan (TMP) could ensure better societal outcomes.

Important public policy considerations arise from this line of research, including the role of ICT in economic development and unequal access based upon income, proximity to infrastructure, or the quality of the infrastructure (Hepworth 1989; Graham and Marvin 1996, 2001; Graham 1998; Kitchin 1998; Wheeler & O'Kelley 1999; Parker 2000; Lentz and Oden 2001; Strover 2001; Malecki 2002; Oinas and Malecki 2002) . These public policy issues lead to questions about the role that municipalities play in the development and diffusion of ICT infrastructure. This research contributes to a better understanding of how technology is adapted and diffused. It highlights the importance of ICTs to socio-economic development and locational competitiveness and explores the broader concept and need for TMPs in general. It is hoped that municipal planning of ICTs will lead to socially optimized outcomes, rather than merely profit-maximizing development for discrete market participants. To date, very few researchers have studied ICT planning and management at the municipal practitioner level. This article draws on lessons learned from observing the subject in the context of Grand Island, a community in the suburbs of Buffalo, New York, whose 1995 Master Plan is focused on land use, not ICT. The town, however, is now faced with a myriad of ICT issues.

It might seem obvious in 2010 that a municipality would plan for ICT infrastructure (Internet, telephone (wireline), and wireless) in much the same way that they continue to plan for water, sewer, roads, land use, and other infrastructure. Yet municipalities typically do not take a central role in planning ICT networks. Instead, they leave such planning functions to the private sector. There has been a good deal written about the Internet's major components (Oinas and Malecki 2002), but the documentation pertaining to executing municipal ICT projects to the last-mile, end-user, or node is much more scarce (Horan and Jordan 1998; National Research Council 2002; Techatassanasoontorn *et al.* 2010).

Paradoxically, the growth in wireless usage does not mean that the need for hardware infrastructure in close proximity to customers is eliminated. Indeed, Warf's (2006) work and interviews with Richard Comi of the Center for Municipal Solutions (Comi 2008) show that satellites are not a feasible wireless solution for the majority of users and cell towers are best linked by fiber optic cables rather than microwave relays. The volume of traffic and quality of the fiber-optic infrastructure supporting wireless antennae is more reliable than delivering high volumes of data via microwave relays.

## DESIGN AND METHODOLOGY OF THIS RESEARCH

This paper provides an overview of the Grand Island, New York community where this case was studied over a three year period (2007-2010). Additionally, this paper offers an explanation that illustrates why telecommunications services are important to economic development and to the global competitiveness of firms and the surrounding local economy. Next, the study suggests the essential elements of a TMP in light of the community's user requirements. Some discussion will follow regarding efforts that have been tried in the past in various cities before honing in on findings from the case of Grand Island.

This case study research is based upon information gathered from dozens of meetings and public hearings run by the Grand Island Town Board, the zoning board, and the planning board, as well as from observations and interviews of local governmental officials, attorneys, consultants, citizens, academics, and service providers. This article summarizes the response of the local government to applications from ICT service providers and the public

The Town of Grand Island in western New York State, has a population of approximately 20,000, with an average household income of approximately $60,000 (United States Census Bureau 2000). The subject area is a bedroom community that has very little manufacturing employment. Economic activity on Grand Island is likewise service-related (e.g. architecture, design, retail, tourism and education) and is characterized by the need for robust connectivity. For example, interviews with executives at Cannon Design, a locally headquartered design firm with customers throughout the world, indicated that they collaborate extensively with partners who may connect to the Internet from anywhere in the world (Dlugosz 2009).

## LITERATURE REVIEW

ICT (and the Internet in particular) has been said to be a general-purpose technology (GPT) (Helpman 1998; Malecki 2002) that increases productivity downstream and, as such, is an important component of economic growth (Hardy 1980; Norton 1992; Lichtenberg 1995; Greenstein and Spiller 1996; Röller and Waverman 1996, 2001). In addition to increasing productivity, telecommunications provide security and entertainment and offer users access with the wider world.

Röller and Waverman (2001) remind us that telecommunications lead to growth through the actual purchase of the components of the telecommunications infrastructure. Additionally and more substantially, telecommunications infrastructure investments lead to reduced transaction costs, resulting in positive spillovers to other industrial sectors. This allows business units to increase the scale of their operations, produce more efficiently, and to do things in new and innovative ways. Low-cost leadership and differentiation are the two main ways that companies maintain their global competitiveness (Porter 2008), and ITC assists them in these efforts (Jorgenson 2001; Fornefeld, Delaunay, and Elixmann 2008).

Unlike roads, which suffer wear and tear from excessive usage, the returns on telecommunications investments increase when more nodes use the network. The greatest returns to telecommunications infrastructure are when near universal service is reached (Röller and Waverman (2001). Unfortunately, the telecommunications infrastructure is not evenly developed, creating "premium networked spaces" and "network ghettos" (Graham 1999; Graham and Marvin 2001). This is a legacy of the mostly private development of the telecommunications infrastructure (Gillespie and Robins 1989; Gabel 1996).

Economic development is predicated, in large measure, by the capabilities of the local work force and the commercial landscape. These elements make up part of what have been called National Innovation Systems (Lundvall and Maskell 2000). National Innovation Systems require the interaction of agents sharing and exchanging knowledge and know how (Woolcock 1998). These systems are at work at smaller scales (Oinas and Malecki 2002). Local firms, especially small and medium businesses, need to network with external resources to compensate for their lack of internal capabilities (MacPherson 1992, 1997). In fact, firms are able to overcome the constraints of being located in peripheral locations (such as Grand Island) by connecting and interacting with external resources (Alderman 1999; Vaessen and Wever 1993).

A contemporary workforce needs enhanced ICT infrastructure as a critical business facilitator in the global knowledge economy (Storper 2000). Moreover, ICT can enhance productivity (Jorgenson 2001). The government's role is to ensure that the benefits of ICT are maximized, equitable, competitive, and healthy (Porter 2008). A TMP can assist the government's efforts to achieve these goals in this dynamic environment.

Telecommunication service providers and municipal officials need to forecast and plan for increased data-carrying ability, whether wired or wireless, and to make certain that their network has the ability to 'switch' large amounts of traffic fast (Anderson, Daim, and Kim 2008). The average American now consumes 35 gigabytes of data per day (Bilton 2009). A TMP should seek to forecast the bandwidth demands of the community (wireline and wireless) in a 10- to 20-year time frame.

## ELEMENTS OF A TMP

Most telecom planning is not done in the way described in this paper (Horan and Jordan 1998). Rather, it is done at the institutional or business-unit level. For example, college campuses undergo telecommunications planning as part of their facilities requirements planning. School districts in New York State (NYS) are required to develop telecommunications plans as a part of their capital improvement programs. Examples exist of municipalities developing telecommunications plans for the internal information technology operations of the town (Waterloo, Iowa) or for specific elements of the total telecommunications landscape, such as wireless (Sammamish, Washington). Private sector telecommunications companies develop their own network plans, but these tend to be limited to a single type of platform (such as wireless or wireline), a specific customer (the installation of a proprietary fiber-optic line), and/or the roll out of a new technology (such as Verizon's Fiber-Optic System, called FiOS.). Interviews with ICT service providers indicated that they do not view the ICT landscape holistically but, rather, as a series of individual projects or components (for example, wireless and wireline). Private telecommunication companies generally treat their plans as proprietary and private. Yet few comprehensive TMPs exist that merge the end-user requirements with municipal and service provider plans (Santa Monica, CA, Plano, TX, Bee Hive, TX, Chicago's CivicNet, and New York City's DoITT). These plans, however, are not comprehensive but seek to solve more limited issues. They all display a bias for action.

Typically, a telecommunications service provider will present the local government with a proposal to build some telecommunications component, such as a wireless cell tower, or to install a fiber-optic line. Frequently, the municipality will react to that specific proposal and not regard it in a larger context within the municipal telecommunications topology, consisting of fixed line services, wireless services, the needs of emergency services, or other requirements. In the case of Grand Island, as in many other places, the internal capacity to plan and manage telecommunications holistically was underdeveloped and needed to be built (Techatassanasoontorn et al. 2010; Gross 2009). The TMP should be part of the municipality's larger comprehensive plan, indicating the community's goals for land conservation, development, and growth. The TMP should contain the community's vision for development and should cite the characteristics that the community values. Normatively, a TMP should include a discussion of opportunities and the barriers to achieving them. The TMP should be nested in community preferences documented in the municipality's comprehensive plan to ensure that various aspects of the plan are congruent. Other factors should be considered in the TMP as well, including sewers, schools, transportation, and the aesthetic and visual impact of telecommunication facilities. Various design options could be discussed to mitigate the aesthetic impacts (New York State Department of State 2001).

Creating and operationalizing a TMP in New York State is complex. The average town in New York State has several independent layers of government, including school boards, highway departments, fire departments, and town governments. On Grand Island, each of these governmental units has its own ICT requirements and development plans. Additionally, ICT service providers have their own goals and objectives financially and operationally to service their present and future customer demand. On Grand Island, Time Warner Cable is the predominant cable television and Internet provider operating a coaxial cable-based network that reaches almost every home and node on the Island. Notably, Grand Island Boulevard, the main commercial strip, is not completely serviced by terrestrial cable television and Internet because the utility poles are not tall enough to accept additional wires, the number of business units per mile is low, and the firm size is relatively small. For Time Warner to run its network along these poles, it would have to pay the cost of installing larger poles and moving other telecommunications service providers and utility wires as necessary. These businesses are serviced by Verizon's traditional copper wire telephone service, which is a legacy from the Bell System. The network is of such poor sound quality that it suffers from a hum, allegedly from electrical induction. Verizon does not offer DSL on the Island and says that it does not have any plans to install FiOS.

The main wireless providers in the United States are Verizon Wireless, AT&T, Sprint, and T-Mobile. They generally outsource tower development to third parties. Verizon Wireless is looking to significantly expand its network, causing a good deal of controversy with residents. The town can regulate telecommunications towers with its local zoning code but, based upon interviews, wishes to be pro-development, partly out of a laissez-faire world-view and partly because town officials feel as though they are not experts and the carriers are. One consultant stated that the average cell tower in the United States earns $900,000 in revenue per year. Landowners who lease space to cell tower providers receive between $10,000 and $30,000 per year, with leases potentially running for decades.

Optimally, a comprehensive TMP would synthesize all of the user requirements and would serve as a guidepost for municipal managers and telecommunications service providers. Collaboration by all stakeholders can lead to the right size and type of network for all users in the future. A TMP will highlight the difference between the current and normative states of ICT. With this gap analysis understood, the ICT goals and objectives become clearer.

The plan needs to anticipate the ICT requirements of the service providers and their expansion plans, with an eye on future developments. Given the independent nature of the actors, the creation of a comprehensive TMP requires considerable diplomacy and trust among players who may not feel that cooperation is in their self interest (e.g. political rivals; telecom providers). The Grand Island case is no exception. Carriers refused to share network maps and other specifics about their hardware with the town, and the town showed little appetite to try to force the issue. In the end, as in Chicago, unless the municipality wants to build its own network, it is going to have little negotiating power with service providers.

First-mover advantage is a pretty strong impediment to potential rivals. For a rival to enter the market, the service provider would need to offer exceptional service and a competitive price. Interviews with an outside service provider called Frontier Communications revealed that it is not interested in adding Grand Island because Time Warner is already there. It would be too costly a battle, with each carrier fighting for customers and driving down the price of services. Adding a second network divides the network too much, according to Frontier Communications executives. Moreover, the market is so dynamic that it is difficult to make long-term investments because, as telecommunications executives stated confidentially in an interview held January 5, 2010, "We are a wholesale provider of capacity on fiber-optic trunk lines. Our customers want five times the capacity in five years for the same price they pay now."

The average connection to a node, such as a home, is associated with both fixed and variable costs. Variably, the cost is

$1,200 to $1,500 per node, plus a fixed cost of $10,000 per mile in assets to get the network built throughout the town.[1] The average customer's income elasticity is limited, so the price of the service must be reasonable. The introduction of competition into the market could mean that neither carrier earns enough money to cover their market needs. Municipalities and governments may have to build and operate upgraded networks because the risk may be too great for private carriers.

Maps make representing the TMP easier and are more effective than text. Maps should show where existing infrastructure is and where it is not. They should indicate the type and quality of the infrastructure, differentiating, for example, between fiber-optic, coaxial, and copper wireline, and utility poles versus buried cables. For wireless services, the maps should indicate the location of antennae, as well as radio-frequency propagation between PCS and voice. In the next section, we take a high-level look at the various user requirements.

## USER REQUIREMENTS

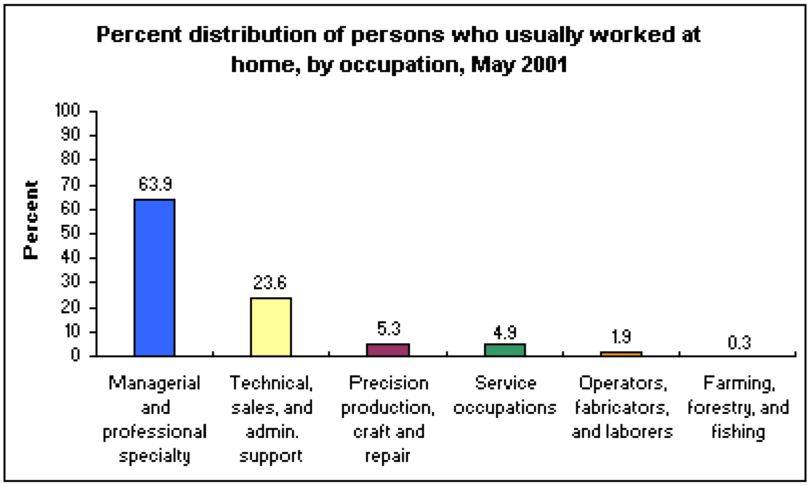
The ICT market is comprised of several segments with varying requirements. Commercial and residential users are a large and growing segment of the broadband market. As stated above, innovation, if fostered by the sharing of knowledge, can be enhanced through ICT investments. These investments can support the day-to-day operations of commercial customers and possibly make them more competitive through productivity enhancements and access to business inputs. Commercial (especially small dispersed firms) and residential customers can also be some of the most difficult and expensive to service (National Research Council 2002). For the largest commercial establishments on Grand Island, accomplishing their corporate telecommunication goals means procuring their own proprietary ITC equipment and agreements (hardware, software, and right-of-way) to establish their own networks. Some firms have even had to replace existing utility poles with larger ones to gain access to the right-of-way.

Residential users may be the single greatest source of demand for telecommunications services. This demand is growing because of personal use, gaming, streaming video and other reasons, but especially because of the expanding work-from-home phenomenon, also known as "telework" (Sharpe 2006; InnoVisions Canada 2011, Telework Coalition 2011). About 15 percent of people work from home these days (Bureau of Labor Statistics 2004) and need more capacity to do their job in real time. Without ITC capacity, the competitiveness of place may suffer.

The demographics of Grand Island are conducive to working from home because about 80 percent of Island residents are employed in the types of jobs (see Figure 1) that permit them to occasionally work from home (United States Census Bureau 2000). About three percent of Island residents work from home most of the time. Moreover, the fact that these workers are located on an island and occasionally constrained from physically going to work by sometimes lengthy delays caused by construction, accidents, or other problems on the bridges (or for other reasons such as physical handicaps and/or an inability to drive) means that ICT can serve as a substitute for driving to work. Integrating transportation, land use, and telecommunications planning

[1] The National Academies' report also quoted network costs close to these figures.

**Figure 1.** Occupational Distribution of Workers at Home, 2001




Source: United States Bureau of Labor Statistics.
http://www.bls.gov/opub/ted/2002/mar/wk1/art02.htm

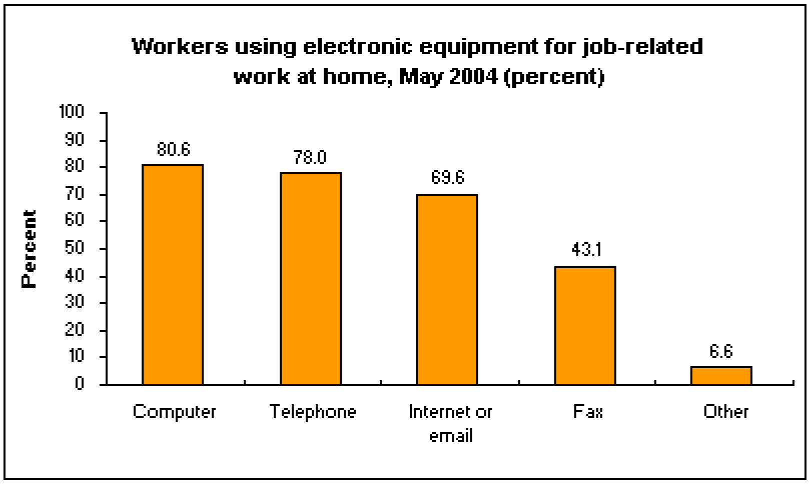
(Horan and Jordan 1998) makes sense especially if it leads to productivity increases for Island residents.

Increases in energy costs and technological advances, coupled with employers' desires to limit fixed assets, increase productivity, and hire the best employees, no matter where they live, have resulted in more work being performed at home (Sharpe 2006). Better connectivity via affordable price and speed (Correa 2007) positions teleworkers to compete for jobs globally. The Bureau of Labor Statistics (2005) reports that of those people who reported working from home in the United States, about 80 percent used a computer and about 70 percent used the Internet or email to perform this work (see Figure 2).

The incorporation of technology into educational settings is not merely an area for curricular content but can allow for more productive operations. School districts are large and growing users of educational technology. Specific school needs include fiber-optic upgrades in video surveillance, access controls, and motion detectors. Wireless connectivity is necessary for tasks, such as transportation and public-event management and facilities services. Many schools now offer studios for producing videos, accessing libraries, and live-streaming events, such as meetings and breaking news. Likewise, the administrative functions of municipalities require a robust telecommunication infrastructure to operate. From public online access to governmental services, to running the operations of various governmental departments, exchanging and accessing data is necessary.

Telecommunications technology provides the means to either prevent or to disrupt crime. New York State has tried and failed to create a statewide wireless system in support of emergency services (Williams 2009). Cellular communications networks, however, may present a better opportunity for an emergency response wireless network because it would be complimentary to the commercial state of the art. There are additional capabilities with cellular technology that make it appealing to emergency responders, such as location awareness and monitoring, as well as

**Figure 2.** Electronic Equipment and Job-Related Work at Home




Source: United States Bureau of Labor Statistics. http://www.bls.gov/opub/ted/2005/oct/wk1/art01.htm

sharing large amounts of data between emergency responders in the field with headquarters or the hospital, for instance. Sensor technology embedded in pipelines, overhead wires and other contexts can help manage the operations of utilities.

A TMP can have a feedback looping effect that strengthens and informs the municipality's zoning code. For example, if the planning process identified Distributed Antenna Systems (DAS) as the highest potential for meeting the municipality's service requirements, then the zoning code could be amended to restrict cellular tower construction. Optimally, the end-state telecommunications network should leverage the existing infrastructure, maintain property values, and enhance the aesthetics of the community, while meeting the forecasted service requirements.

## CASE STUDY FINDINGS

Predicted exponential growth in data volume in some segments of the telecommunications sector highlights the importance of ICT planning (Wortham 2009). The proposed development of numerous new cell towers on Grand Island, the public's opposition to them, and the uncertainty as to how many more towers would be needed in the future, caused telecommunications to become one of the most pressing development issues on the Island in the past decade.

Grand Island's town government consists of a town supervisor and a four-member town board, all of whom serve four-year terms. Given the need to increase the tax base to contain always rising costs, predominantly in the form of wages and benefits for labor, the town board maintains a pro-development stance. The most engagement by the citizens of the town in the past three years has been in reaction to the proposal for a series of cell towers on the Island.

While there are other telecommunications issues on Grand Island, which will be described below, the catalyst for TMP is the growth of the use of wireless devices and the desire of Verizon Wireless to site three cell towers as close to centers of population clusters as possible while covering the greatest amount of cellular geography. Three years after the initial permit applications were submitted these towers remain unbuilt.

The three towers form part of a larger plan, including collocation and other future sites (see Figure 3). Each cell node provides coverage resembling honeycomb shapes. At least two of these were to mitigate signal spillover to Canada, which is regulated by a 1994 treaty between the United States and Canada called "Arrangement F" (see Figure 4). Under this treaty, a new border area is established pertaining to radio frequency transmissions that extends 140 km from either side of the international political border. In this sector, Canada controls a portion of the radio frequency spectrum into U.S. territory. In other sectors along the border, the United States controls a portion of the radio frequency spectrum into Canadian territory.

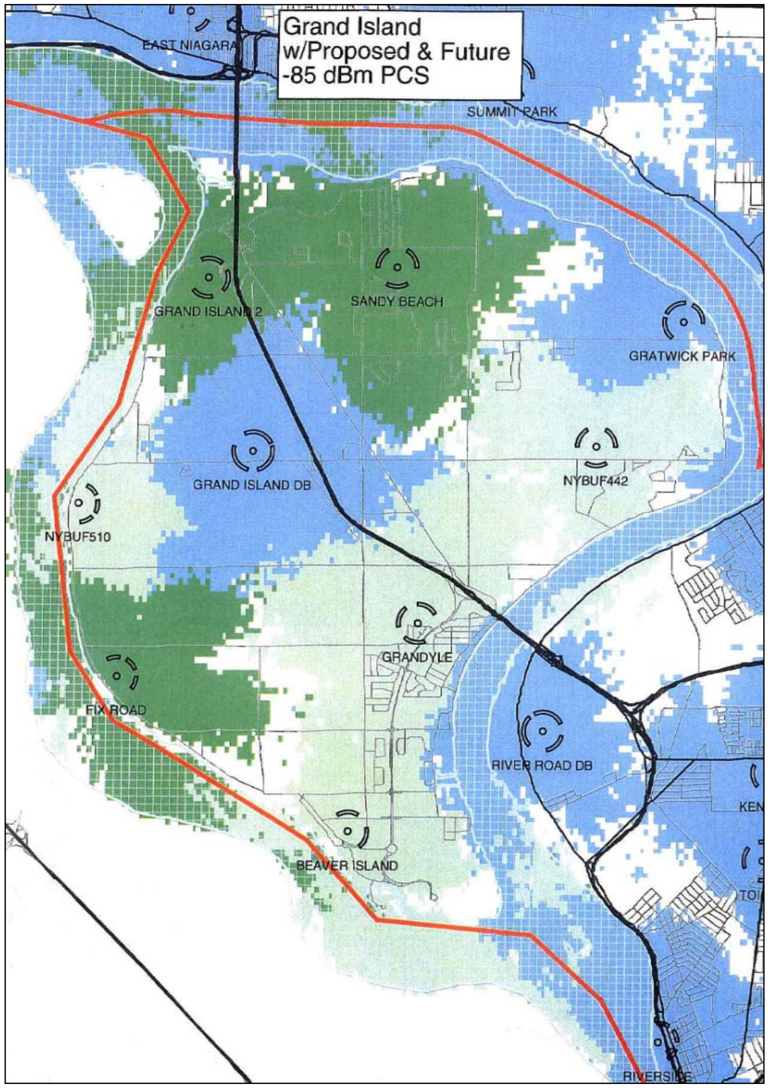
The Town Board has a process to approve telecommunications towers. The Town Board determines whether the proposed project may have a significant environmental impact, and if so, is requires to prepare an Environmental Impact Statement ("EIS"). It is at this stage that the TMP may add value to the town's deliberations over cellular wireless developments. The town's Planning Board is meant to ensure that projects meet the town's zoning and building codes. Any deviation from the town's zoning code must be passed by the town's Zoning Board of Appeals. They are a first step in the approval process if the zoning code is not followed.

The town board was advised by its attorney, who previously had been counsel to wireless telecommunications providers, that service providers should be treated as a utility and given anything they want. That is, the town ceded to the wishes of the telecommunications providers on the theory that the providers have the legal standing equating them to the power of eminent domain. In the end, perhaps the town should have sought a neutral opinion from an independent consultant.

The Telecommunications Act of 1996 gives municipalities the right to hire independent telecommunications consultants and to bill the services to the developers of cellular communications networks. Independent consulting fees can go up to tens of thousands of dollars per year so ITC service providers do not like them especially if the consultants end up contradicting the service provider paying the bill. It was the citizens of the Island that brought this opportunity to the attention of the Town. The town supervisor's first reaction was to deny that they could hire a consultant at the applicant's expense. This is shocking because other towns in the same county were using telecommunications consultants.

Indeed, a group of residents found a consulting firm, CMS, that specializes in advising municipalities on telecommunication issues but the town attorney disliked CMS because he had once sued CMS and lost. At first, the town denied that this was the law and then finally capitulated and hired one. Instead, the town hired and paid its telecommunications consultant through the Verizon attorney. In fact, to circumvent the town's purchasing rules and to avoid sending the acquisition of telecommunications consulting services to an open bidding process (request for proposal or RFP), the town divided the payments to the consultant into amounts of less than $3,000 each. The town's

**Figure 3.** Map of Grand Island's Telecommunications Facilities

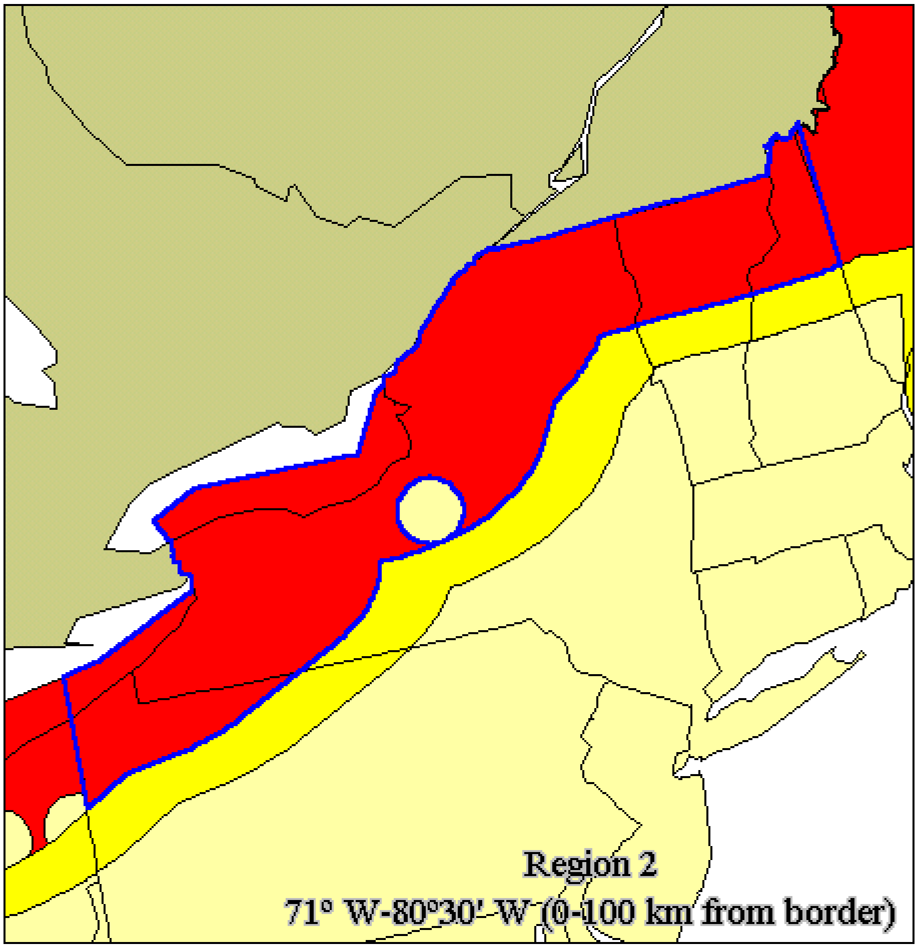



Source: Verizon Wireless (2007)

consultant verified Verizon's plan without modification.

At a public meeting, when Verizon presented a plan for a DAS network and offered all of the reasons as to why the DAS network was not a good fit for Verizon (cost, reliability, and risk), the consultant from CMS, who had been sponsored by the residents' group spoke on their behalf. Town board members then informed the general public that CMS had a "sketchy record." They did not several challenges to Verizon's information was a very tense encounter, giving the town board another reason to refuse the residents' requests to hire CMS. Residents then argued that the town should seek another truly independent consultant. Town board members cautioned that the process could become endless. Other consultants refused to participate once they realized

**Figure 4.** United States Border Zone Established Under Arrangement F




Source: Federal Communications Commission
http://www.fcc.gov/oet/info/maps/bdrfreq/rgn2.gif

that they would be pitted against other consultants.

The residents ended up learning about DAS systems, cell tower revenue streams, and the taxability of cell towers when they hired their own telecommunications consultant. Residents invited the town supervisor to join a conference call with their consultant, and the consultant informed the group about some of the economics of wireless telecommunications and what communities can do to regulate them (see Table 1).

Cell towers are often built on speculation (Comi 2009). The industry is growing fast, and space for cell towers is difficult to acquire. So building towers in anticipation of a future need locks up cellular space. The economics of cellular space is dependent upon the human and natural environment in the area surrounding the cell tower. This will be a function of the difficulty in acquiring a location for a cellular antenna in a place, the extent or limit of the radio frequency reach of the antenna based upon the terrain, the number of customers and their revenue stream, and the presence of competitors or other substitutes already servicing an area.

The average cell tower in the United States generates about $900,000 in revenue per year, according to Richard Comi of CMS (Comi 2009) Towns cannot tax the transmissions from the cellular antennae but they can tax the equipment, which is often valued at several hundred thousand dollars. Often, they do not tax this equipment out of ignorance (Comi 2009).

Each cell tower is designed to provide signal coverage to a specific area. Wireless space is valuable. Since appropriate locations are limited by the landscape, terrain, and the availability of suitable land of a place, towers can become commodities with long-term sources of revenue accruing to tower owners. First mover advantage is an important competitive advantage especially since, as this case illustrates, it is difficult to get a cell tower built.

Grand Island's zoning code is typical of many communities in that the code prefers siting of telecommunications towers to collocation. The zoning code also limits the proximity of towers to residential properties. One proposed site on the north end of the Island was on vacant land behind a church within 500 feet of some residential properties in violation of the town zoning code. The residents protested vigorously, the town board requested that Verizon look for alternative sites to deliver its service. After searching for appropriate sites near the operationally optimal point Verizon and the town agreed to place the tower in the town's Veterans Park. This set off protests from citizens, who did not want to see a 125 foot industrial tower in the park. A key take away from this is that communities are running out of places to put telecommunications towers (Cellco Partnership 2006, Page 10) and service providers are going to need to adjust their mode of operating. Residents simply do not like having these towers in sight, near their homes, and they worry about the health effects of the high energy radio waves that the towers emit.

The town appeared to underestimate the ferocity of the residents' complaints. With an election year approaching, approving the sites and getting these debates of the community's agenda was a priority for the board. Town Board members tacitly approved the concept of a TMP but eventually grew tired of the whole debate about cell towers and pushed through approvals for two of the most controversial towers. The third one has received little public scrutiny because of its proposed location on land zoned for industrial use. One Town Board member said that the Board had grown weary and figured that no matter what they do the public will not like it but felt confident that the whole issue would be forgotten as time goes by (Roesch 2010). Litigation has delayed building the towers.

The cell tower issue is not the first telecommunications issue to that remains unresolved. Another opportunity for the nexus of municipal leadership and the telecommunications industry is with the cable television franchise. Cable television is undergoing a transformation from television service only to Internet and home telephone service. Verizon has built their FiOS™ network in the wealthier suburbs of Buffalo but not Grand Island. Demand is increasing and competition in broadband may be near.

Meanwhile, the town's cable franchise agreement with Time Warner Cable (TW) has expired, but the town has been told by their legal advisors and the Public Service Commission that there is little that they can do to force TW into a new agreement.

**Table 1.** Towers and Wireless Facilities: Factors That a Community Can Control

| | |
|---|---|
| 1. Cost of Expert Assistance - Can be required to be paid for by Applicant (No Cost to Community) | 13. Lighting can be prohibited |
| 2. No towers on 'Speculation', i.e. without a service provider who can prove the need for the facility | 14. Setback |
| 3. Verification/Determination of actual Need (How do you know that the Tower or Wireless Facility is really needed? You'd probably be surprised at how many times there is no provable need.) | 15. Signage |
| 4. Location (You can prioritize preferred locations . . . without violating the prohibition against "zoning them out") | 16. Screening |
| 5. Height (Does it really have to be as tall as the service provider says? Almost never!) | 17. Structural Adequacy and Integrity |
| 6. Appearance/Aesthetics | 18. Site Security |
| 7. Required co-location of facilities (to minimize the number of towers) | 19. Utilities (Underground versus Aerial) |
| 8. Number of Sites in the Community | 20. Removal Bond (In the event the facility is ever abandoned) |
| 9. Application Fees - Amount | 21. Indemnification for use of municipally-owned property |
| 10. Non-tax Revenue (Different than Fees) | 22. Insurance |
| 11. Verification of compliance with the FCC's RF Emission Standards | 23. Interference with other communications & electronic devices |
| 12. Aesthetics/Appearance (It doesn't have to be recognizable as a wireless facility) | 24. Inspection to assure that what is constructed is what was permitted |

Source: The Center for Municipal Solutions
http://www.telecomsol.com/24_items.html

The franchise agreement is "boilerplate" language that is standard in New York State. TW provides the town with 5 percent of the revenue or about $200,000 a year from cable TV subscriptions and the home shopping network sales from Grand Island. This does not include revenues from TW's Internet and telephone services.

Grand Island's leadership appears to have no desire to be pioneers in TMP. Legal advisors counsel the town that telecommunications companies are akin to utilities and that the best course of action is to allow the telecommunications companies to develop their networks with as little regulation as possible. A TMP may be too radical a concept at this stage. The overall risk, however of not developing a comprehensive TMP may leave the municipality with a sub-optimized telecommunications network, which fails to meet the present and future requirements of the constituents, is unsustainable, and, in the long run, may further erode the competitiveness of the town as a supplier of production factors. The town can amend the zoning code for telecommunications towers, recruit or delay signing a cable franchise agreement, build its own network or partner with an entity that will, and/or expand the existing municipal Wi-Fi system located in Town Hall.

## DISCUSSION AND CONCLUSION

The major goal of this article has been to highlight the need for objective municipal and/or regional ICT planning. Without high-level visibility and coordination, ICT development may exacerbate inequalities between high- and low-income locations, create spaces void of quality infrastructure, and unequal access to work and sources of knowledge. Disjointed components that serve only the service provider and their most profitable customers may be built, rather than a system capable of supporting all facets of the longer-term community ICT requirements. The aesthetic and natural environments may be harmed needlessly by overbuilding redundant ICT infrastructure.

This article proposes that municipalities develop a TMP that can be used to guide the development of telecommunications in a coordinated way by inventorying the various components of the municipality's telecommunications infrastructure, projecting the trajectory of the technology, and cataloging municipal requirements. The ability to conduct such planning is hindered without the collaboration with corporate service providers who may wish to keep their plans secret. Interagency and inter-municipal cooperation may be easier to write about than actually to accomplish. Last, there is little that a local government can do to enforce the adoption and/or adherence to a TMP once one is created. Developing a municipally owned telecommunications network may be the only alternative if service providers do not wish to participate in providing ICT services. Some states have laws restricting municipalities from operating their own ICT networks.

High-capacity municipal broadband networks are an essential prerequisite of sustaining and growing productivity levels in the global economy. Ideally, regions should consider their multi-modal telecommunication needs in a systematic way and compare this to their current state of affairs to understand the gaps. Regions with strong TMPs will be better positioned to take advantage of the full spectrum of options and opportunities. When a community examines its ICT infrastructure requirements and plans for them systematically, it demonstrates that it demands thorough and quality responses from ICT service providers.

In conclusion, it is important to note that ICT issues are multifaceted and so technologically, economically, and legally complicated that, to ensure optimal societal outcomes (such as universal service, support of commercial enterprises, low cost, minimal environmental impact, scalability, emergency services, etc.), municipalities should plan for ICT prior to seeking or accepting ICT-developer proposals.[2] Planning for ICT may seem obvious, but it is not at all common.

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