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Modernising infrastructure through the lens of smart cities and connected communities

BY CLINT VINCE AND JENNIFER MORRISSEY

We find ourselves in the midst of one of the most turbulent eras in recent memory. A convergence of coronavirus (COVID-19), climate change and cyber security challenges, along with severe economic and social disruption everywhere from Minneapolis to Hong Kong, are providing the world with a masterclass on the imperative need to modernise our infrastructure.

This goes beyond just physical infrastructure, although that is crucially important. Physical, digital and social infrastructure must be addressed simultaneously. To achieve this, we must

inject a new sense of urgency to the development of smart cities and connected communities.

In addition to post-COVID-19 economic disruption and social disparity, massive cyber intrusion, aging physical infrastructure and wholly inadequate social infrastructure, we are dealing with turbulent weather and sea-level rise due to climate change, polluted and over-fished oceans, depleted forests, severe food security problems, potable water deficiency, exponential population increase and massive urban migration.

This extraordinary confluence of threats and imminent crises requires an entirely

new paradigm than the one provided in the current world order. Coordinated globalism has been devolving into extreme nationalism, with political divides intensifying rather than diminishing. The world needs the leadership equivalent of Marshall Plans and multilateral approaches to climate, rule of law, health, protection of intellectual property and trade. We also must face up to divisive national level leadership and partisanship that has placed a disproportionate burden on leadership at the subnational level.

Cities and communities are on the frontline with respect to these issues but are underfunded and frequently pre-empted

by national misdirected dominance, and in many cases, no effective direction at all. What cities and communities especially are seeking is resilience and sustainability, recovery of human, economic, environmental and social health, and importantly, leadership, all on an integrated basis.

In the US, the good news is that the new Biden administration has signalled its intent to take these crises seriously and is already taking steps to work toward solutions. There is real potential for success because there is bipartisan support for infrastructure improvements. The bad news is that here, as elsewhere, most cities and communities are not moving fast enough to effectively prepare for the extraordinary scale of what needs to be done. In cities and communities everywhere, physical and social infrastructure woefully lag behind, and digital advancement has not been integrated with a holistic game plan. Without strong leadership and broad integration at all levels, the gap will continue to widen. We also need to build inclusive coalitions to address the issues at hand.

In terms of improved liveability, bike lanes and street lights are positive developments, but the scale of modernisation that is required is far broader and more immediate. Some cities around the world are anticipating 40 to 50 percent increases in population in the next decades without adequate infrastructure. Even those not undergoing population increases are facing significant problems. In addition to the crises listed above, cities and communities are grappling with shrinking budgets, economic turmoil, traffic congestion and mobility challenges, rapidly-deteriorating electricity, natural gas and water systems, and a growing equality gap in opportunity and in delivery of, and access to, services. We must declare a global emergency and pick up the pace exponentially in order to meet the needs and challenges faced by communities across the planet.

How do we approach this daunting problem? Solutions to the exigencies of 21st century communities are frequently discussed under the rubric of ‘smart cities’, although just what constitutes a ‘smart’

city or a ‘connected’ community is elusive. Some rebuff ‘smart cities’ as a technology-for-technology’s sake play – a sales pitch by tech companies peddling solutions in search of problems to fix. Others view it as a diversion of scarce resources away from priorities high on the agendas of most city leaders and residents such as public spaces, parks, education and opportunity. However, a ‘smart city’ approach, done well, can further not only these priorities but so many more, for the betterment of the lives of all of the community’s inhabitants.

Simply stated, a smart and connected community is one where advances in technology are leveraged to modernise physical, digital and social infrastructure in an integrated manner in order to make delivery of essential services more efficient, sustainable, cost-effective, interconnected, secure and equitable. Forward-looking municipal leaders around the globe recognise that harnessing advanced technology to implement smart growth and operations strategies will improve liveability in their communities, while giving them a competitive advantage.

There are several simultaneous starting points for any smart and connected community. One key starting point is the grid, as we transition from a century-old single directional system to one that is multidirectional. The electrical system powering advanced telecommunications technologies is the nerve centre for all other infrastructure. The grid interconnects with, and both supports and is supported by, a host of sensors and devices that amass and analyse data in real time. Through predictive analytics, machine learning, clean technology and multidirectional communications, the grid optimises city operations, connects citizens, fosters sustainability and improves quality of life. As advanced telecommunications, transportation and other critical infrastructure is layered into the modernisation process, it is vital that development is integrated and highly coordinated.

Another starting point for a smart and connected community is its social infrastructure. Just as a smart city is more than a technology play, infrastructure

modernisation goes far beyond the grid, advanced telecommunications and mobility. A successful smart strategy will be a holistic approach encompassing people, institutions, structures and operations across the connected ecosystem that makes up the city or community. As events of the past year have demonstrated so graphically, the social fabric that weaves a community together is every bit as essential as the physical and digital assets of that community. A ‘smart’ approach breaks down organisational and administrative silos that inhibit connectivity and modernisation. So, too, must systemic injustice and lack of inclusion be addressed as primary mandates in a smart and connected strategy in order for community leaders and innovators to earn the social licence necessary to implement beneficial modernisation initiatives across platforms.

There are a number of megatrends that will accelerate the development of smart and connected communities. One is the growing interest in creating ‘15 minute cities’. This is an approach to urban design that aims to cut down on time spent commuting to and from work or other activities by developing communities where everything the resident needs can be accessed within a distance that can be covered in 15 to 20 minutes – housing, businesses, shops, schools, healthcare, parks, arts and culture, and more.

The shift to remote working and learning that occurred as a result of the COVID-19 pandemic has provided an initial roadmap on how this can be achieved. Clearly not every business can operate remotely, but many will take advantage of the opportunity to reduce overhead costs by providing services over virtual platforms and allowing employees to telecommute. Numerous commercial sites will be repurposed, city dwellers will see their neighbourhoods reinvigorated, and bedroom communities may see an awakening into more vibrant neighbourhoods. Buildings and city planning based on data gathered through the physical infrastructure itself will enhance these spaces and make them more efficient, sustainable and smarter.

In the digital space, the availability of dedicated spectrum for critical

infrastructure will enable the development of exclusive long term evolution (LTE) networks which help with cyber protections and physical resilience. These private, wireless networks can host applications that will give physical infrastructure operators unparalleled visibility into their systems, allowing not only system reliability, but also protection in the event of natural disasters such as wildfire or other catastrophic events, or of human-initiated attacks. A plethora of transformative advanced telecommunication initiatives already are underway.

Mobility is at the dawn of a new era. Electric vehicles, and ultimately, autonomous vehicles, are poised to become

a megatrend much sooner than many realise. Personal car ownership is declining at the same time that there is a decline in costs of electrification of vehicles and an increase in the distances they can travel. But to get there, we need to build relationships between the public and private sector.

In the US, all of this is taking place against a background of a race to achieve net-zero emissions in the electricity sector within the next two decades as a baseline for the rest of the economy's decarbonisation. The decision of the Biden administration to rejoin the Paris Accord is an important symbolic statement, but is not enough. Any climate action plan must be pragmatic and touch all aspects of

the innovation agenda, from research and development, to breakthrough technologies to politics and business models. On a global stage, the themes of climate, sustainability and resilience need to be more omnipresent. Approached constructively, these challenges represent tremendous opportunities for infrastructure development. ■

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