

Smart Infrastructure Unlocks Equity and Prosperity for Our Cities and Towns

How state and federal government can help cities of all sizes create greater equity – and prosperity – with technology that provides jobs for American workers



Smart infrastructure drives our future success

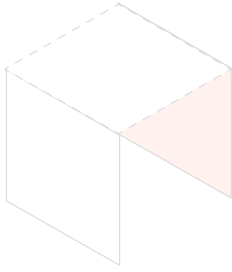


Smart infrastructure spurs innovation and inclusion



Smart infrastructure creates better-paying skilled jobs



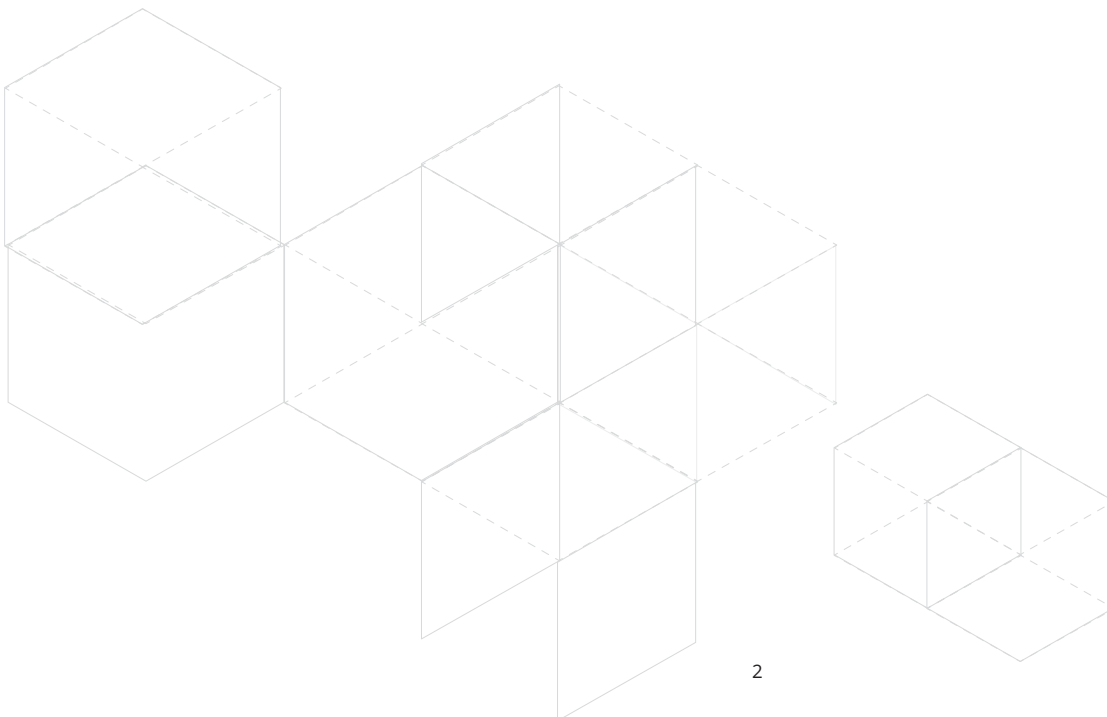


"In periods where there is no leadership, society stands still. Progress occurs when courageous, skillful leaders seize the opportunity to change things for the better."

—Harry S. Truman

"I do not mistrust the future; I do not fear what is ahead. For our problems are large, but our heart is larger."

—George H.W. Bush



 EXECUTIVE SUMMARY

Smart Infrastructure Unlocks Equity and Prosperity for Our Cities and Towns



How state and federal government can help cities of all sizes create greater equity – and prosperity – with technology that provides jobs for American workers.

The most remarkable advances in American history spurred both economic and social advantages, thanks to visionary leaders and thinkers who saw the possibilities – and acted upon them.

From the Golden Spike that completed the first transcontinental railroad in the 1860s to the early packet switching network that launched the first information super-highway a century later, these and other great turning points in our history were made possible by infrastructure investments.

And the return on those investments? Competitive advantages that persisted for decades.

As urbanist and writer Jane Jacobs argued in *Cities and the Wealth of Nations* (1984) – the engine of economic development is a city and its surroundings. Cities, not countries, she insisted, are the constituent elements of a developing economy and have been so from the dawn of civilization. Civilizations fail when their cities do.

Today we have the chance to create more advantages for our country, our

citizens, our cities and counties and towns, our business and industry – and along the way, our planet.

We can do all of that by investing in smart infrastructure.

By that we mean deploying proven information and communications technologies (ICT) – smart devices, sensors and software – that give our existing infrastructure the equivalent of digital eyes and ears. These intelligent devices enable more efficient and effective monitoring and control of our energy and water systems, transportation networks, human services, public safety operations – basically all core government functions.

Civilizations fail when their cities do.

—Jane Jacobs, urbanist

The time to focus on cities is now

As this election season focuses attention on national priorities, one thing is clear: we cannot wait. We must invest in smart infrastructure now because we cannot compete globally without it.

Smart infrastructure is the foundation for future success, better paying jobs and a new era of prosperity for all Americans.

And nowhere is the need more obvious than in our urban centers where swelling populations are putting increasing pressure on aging infrastructure. Yet we cannot ignore smaller cities and surrounding towns and counties and rural communities either. So many of them face infrastructure challenges, so many face food and water insecurities, so many are hampered by inefficient processes and policies, so many need jobs that provide livable wages. Yet so many of them are budget-constrained.

What they all need is for this generation's visionary leaders and thinkers at all levels of government to see the promise of smart infrastructure investments – and take action. No longer should the political dialog be about building more roads and bridges, more wastewater plants, more healthcare facilities. More is not the answer in 2016; we need to be smarter than that.

Triple bottom line returns

Consider how smart infrastructure investments can deliver benefits for society, for the economy and for the environment.



Reduce water leakage and save money: North Miami Beach, Florida was just mid-way through its deployment of smart water infrastructure equipped with leak detection technology and the utility had already identified and repaired 23 leaks, saving 27 million gallons of water and \$38,000 annually.

Reduce carbon dioxide emissions and save money: San Diego expects to save more than \$250,000 annually in electricity and maintenance costs

A ton of waste recycled creates 10x more jobs than a ton of waste dumped, according to the National Employment Law Project.

with its intelligent streetlight network that remotely accesses and controls 3,000 lights, improving public safety and reducing the city's carbon dioxide emissions.

Close the digital divide and save money: New York City is transforming 7,500 payphones into LinkNYC, a free municipal Wi-Fi network offering up to gigabit speeds, free phone charging and free national calling – all paid for by advertising. LinkNYC helps close the digital divide, raises visibility of local businesses and upcycles existing infrastructure.

In the pages to come you'll read many more examples of the triple bottom line benefits smart infrastructure is delivering in communities large and small across the U.S.



Better jobs for more workers

We know that simply building more inefficient infrastructure is not sustainable, nor is it a wise use of public funds. The same is true on the job front. In the 21st Century, the way to drive greater prosperity for more Americans is by innovating to include more people in our progress. This means:

- Creating better paying skilled jobs implementing and maintaining smart technologies
- Training more people for these jobs
- Creatively considering how to promote job creation in disadvantaged neighborhoods

We have done this before. Consider the smart grid projects funded through the 2009 American Recovery and Reinvestment Act. According to the Department of Energy, those projects created nearly 50,000 jobs. But what's important to note is that smart grid technology – smart meters, high voltage transmission lines, sensors and transformers – doesn't just mean jobs for engineers. The smart grid offers opportunities across engineering, communications, marketing and sales disciplines. In other words, jobs that pay well, are in demand, but also offer career advancement.

Infrastructure investments can contribute to jobs and economic growth

| | |
|------------------------------------|---|
| 13,000 jobs | for every \$1 billion invested in federal highway and transit infrastructure ¹ |
| 12,000 job-years of employment | for every \$1 billion investment in wireless infrastructure ² |
| Nearly 50,000 jobs | from smart grid projects ³ funded through the American Recovery and Reinvestment Act |
| 10-15 jobs | per \$1 million investment in alternative water supply projects ⁴ |
| 5-20 jobs | per \$1 million investment in storm water management |
| 12-22 jobs | per \$1 million investment in urban conservation and efficiency |
| 14.6 jobs | per \$1 million investment in agricultural efficiency and quality |
| 10-72 jobs | per \$1 million investment in restoration and remediation |
| 2.3 million potential jobs in 2030 | by diverting ⁵ 75% of waste from landfills to recycling facilities |

¹ See <http://www.fhwa.dot.gov/policy/otps/pubs/impacts/>

² See http://www.epi.org/publication/the_jobs_impact_of_a_telecommunications_merger/

³ See <http://energy.gov/oe/downloads/economic-impact-recovery-act-investments-smart-grid-report-april-2013>

⁴ See <http://pacinst.org/publication/sustainable-water-jobs/>

⁵ See http://nelp.3cdn.net/8daec8d7b0f27521d0_bhm6bpn6i.pdf



Unlocking barriers to adoption

How can elected officials and other policymakers accelerate the smart infrastructure investments that will trigger targeted job growth, national advantage and shared prosperity? By accepting that government-as-usual will not get the job done; that we must freshen dated policies and practices that impede progress. For example, we need to enable our cities and counties and towns to:

Develop the capacity to innovate – unlock innovation. Many city leaders are eager to use smart technologies, but they don't know how. They need access to knowledge, including best practices and case studies. Many cities are organized to deliver 19th century infrastructure – pour concrete, lay brick, erect poles, dig holes. But 21st century requirements – citizen services, resource efficiency and greater equity – need a different approach.

Aggregate demand – unlock legal boundaries. For ICT to deliver true benefits, a project needs scale – distributing costs and benefits over many users. Political boundaries, which were logical when developed, prevent governments from optimizing the lifecycle benefits of ICT.

Triple bottom line returns

The return cities are seeing on smart infrastructure investments are a classic example of triple bottom line benefits, thanks to the impact such projects can have on people, on profits and on the planet. Or put another way, they contribute to the social, financial and environmental well-being of communities.



Social: Improving the quality of life; lowering the cost of living; conquering the digital divide; enabling upward mobility for disadvantaged populations; ensuring safer streets and neighborhoods; providing greater access to healthcare and education; creating better paying jobs in growth industries; reducing food and water insecurity.



Financial: Operational efficiencies lower costs for cities, businesses and citizens; cities with a reliable electric grid and state-of-the-art telecommunications and mobility attract business and industry; lower crime rates lower the cost of doing business in a city; cities that promote smart mobility, smart payments, Wi-Fi, etc. appeal to tourists.



Environmental: Ability to monitor and control energy and water use to encourage conservation; smart devices help ensure cleaner water and air; smart mobility and energy efficient buildings reduce carbon emissions, recycling and upcycling lessen need for landfills; integration of more renewable energy into the energy mix.

Streamline procurement – unlock antiquated approaches that hamper efficiency. There are smarter, tech-enabled approaches available today that can streamline government procurement without side-stepping transparency and diligent stewardship of public funds.

Embrace new financing models – unlock municipal financing barriers. Local governments cannot count on traditional funding sources, so they need to adopt a mindset that is open to some of the newer and more creative financing strategies available today.

Benchmark results – unlock the limitations of one-dimensional metrics. By benchmarking results in an integrated way, cities can effectively remove the limitations of one-dimensional metrics. They can then justify larger investments in the right kinds of smart cities projects – and communicate benefits to their citizens more effectively.

The goal, of course, is to make our communities more livable, workable and sustainable. If we start by addressing how to make our physical infrastructure smarter, we can unlock the social and human potential within. 🏠





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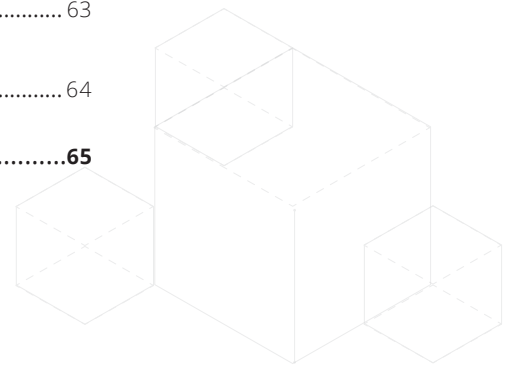
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FOREWORD

Some of today’s greatest cities benefitted from visionaries who – centuries ago – saw possibilities for civic betterment and made it happen.



A compelling example comes from leaders and doers back in the 1800s. Way before the phrase “urban sprawl” had entered our psyche, they committed to preserving vast amounts of open spaces for public use.

Think Central Park jutting through urban Manhattan, designed back in 1858. Or the historic National Mall in downtown Washington, D.C. – today part of the National Park Service that is celebrating its 100th anniversary this year.

Ultimately their actions were based

on a compelling vision – that as a nation, we can innovate to include. They extended the reach of government, not to pick winners – but to extend the benefits of good governance to all of us.

Our 19th century visionaries would not understand how we not only lost their vision, but also their courage to innovate. They left an amazing legacy for future generations.

Now it's our turn.

— Philip Bane,
Managing Director, Smart Cities Council

Innovating to include provides a holistic approach based on large hearts and creative minds.

About this project:

This policy brief is, first and foremost, a collaborative effort. We are grateful for the support and expertise of Smart Cities Council partners, most especially AT&T, Black & Veatch, Itron, Qualcomm Intelligent Solutions, Inc. and Sensus, whose passion for this project made it possible. We are also appreciative of contributions from David Witkowski, Executive Director of Joint Venture Silicon Valley's Wireless Communications Initiative; Kevin Juhring, Executive Director of U.S. Communities, and Joshua Franzel, Director of Policy Research, International City/County Management Association (ICMA). The views expressed in the report are the collective views of the SCC and are not attributable to any individual company.

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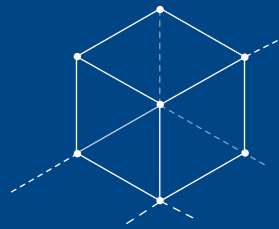
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Creating National Advantage Again— City by City



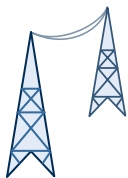
Creating National Advantage Again – City by City

The most remarkable advances in American history spurred both economic and social advantages, thanks to visionary leaders and thinkers who saw the possibilities – and acted upon them.

Milestones that Mattered



The transcontinental railroad authorized by Abraham Lincoln chugged \$50 million in freight coast to coast annually within 10 years of its completion. The benefits went beyond commerce; the railroad expanded communication and culture and finally united the United States.



The Rural Electrification Act signed in 1936 by Franklin Roosevelt brought electricity to isolated rural areas like the Tennessee Valley to improve the standard of living. The effort was a boon for the business community too as newly electrified families rushed out to buy electric radios and refrigerators.



The Interstate Highway System championed by Dwight Eisenhower in the 1950s has been called the greatest public works project in our history. Likely every citizen has in some way been connected to the network of asphalt that crisscrosses America, either as a motorist driving it or as a consumer of goods transported across it.



The Arpanet (precursor to today's Internet) sent traffic along a different kind of highway – one that carried information. Developed in the late 1960s by visionary Bob Taylor of the U.S. Department of Defense and ushered in by Lyndon Johnson's administration, the Arpanet introduced the magic of machine-to-machine communication that has so dramatically changed lives and livelihoods to this day.

From the Golden Spike that completed the first transcontinental railroad in the 1860s to the early packet switching network that launched the first information super-highway a century later, these and other great turning points in our history were made possible by infrastructure investments.

And the return on those investments? Competitive advantages that persisted for decades.

Today we have the chance to create more advantages for our country, our citizens, our cities and towns, business and industry – and along the way, our planet. We can do all of that by investing in smart infrastructure.

But we must act now.

We cannot compete globally without smart infrastructure. It is the foundation for future success and a new era of prosperity for all Americans. If we fail to act, we fall behind those many countries that are racing to put this infrastructure in place.

Nowhere is the need more obvious than in our cities:

- **Cities are our economic engines** – they drive the national economy. They create jobs and cultivate innovation, culture and inclusion.
- **Cities are swelling** – a trend that will continue for decades. The [UN's 2014 World Urbanization Prospects report](#)¹ shows that 81% of U.S. residents live in urban areas, and this will increase to 87% by 2050. Seven cities crossed the 100,000 population threshold between 2014 and 2015 and another seven crossed the 50,000 mark.
- **Cities are challenged by growth** – and by budget constraints. City leaders are already grappling with aging infrastructure, widening economic disparity, water and food insecurity, increasing congestion and pollution, ramifications of climate change and concerns about violence and civil unrest.
- **Citizens have increasingly high expectations** – in a world where private companies like Amazon, Google, Uber, Lyft, DoorDash, etc. are delivering extremely useful goods and services for competitive prices, inefficient local governments suffer by comparison.
- **Cities can overcome challenges by embracing the Internet of Things and smart technologies** – from sensors that ease traffic congestion to smart devices that avert power outages to data analytics that help provide services to vulnerable populations when they need it most.

Clearly, cities need help. So, for that matter, do surrounding towns and counties and rural communities. So many of them face infrastructure challenges, so many face food and water insecurities, so many are hampered by inefficient processes and policies, so many need jobs that provide livable wages and so many of them are budget-constrained.

Triple bottom line returns

The return cities are seeing on smart infrastructure investments are a classic example of triple bottom line benefits, thanks to the impact such projects can have on people, on profits and on the planet. Or put another way, they contribute to the social, financial and environmental well-being of communities.



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Environmental: Ability to monitor and control energy and water usage to encourage conservation; smart devices help ensure cleaner water and air; smart mobility and energy efficient buildings reduce carbon emissions, recycling and upcycling lessen need for landfills; integration of more renewable energy into the energy mix.

¹ See <https://esa.un.org/unpd/wup/Publications/Files/WUP2014-Highlights.pdf>

What they all need is for this generation's visionary leaders and thinkers at all levels of government to see the promise of smart infrastructure investments – and take action.

Infrastructure for the 21st century

From now on, any conversation about infrastructure investment must take into account both the physical infrastructure and the digital layer that makes physical infrastructure smart.

Consider the electric grid. Its physical infrastructure includes power poles, transmission lines, transformers and substations. Those assets have been keeping lights on – most of the time – for more than 100 years. But that aging electric grid wasn't designed to accommodate 21st century demands, for example, the integration of renewables into the energy mix or swelling populations in urban centers.

The good news is we can transform the old electric grid into a modern smart grid by layering digital devices – sensors, communications networks, smart meters and the like – onto the existing physical infrastructure.

What we get when we do that is a pretty amazing system that knows in real time where a transformer has blown and automatically reroutes

power to keep the lights on in homes and businesses. It's a system that collects and manipulates data from those sensors and smart devices to give operators a complete view of the energy infrastructure – for instance, how much power solar installations are generating or when they need to signal a demand response call to buildings to help balance the load on the grid.

The smart grid industry also provides jobs that are stable, pay higher wages and, as a [Department of Energy analysis](#)² puts it, “ripple throughout the overall economy by creating demand down associated supply chains and across other service sectors.”

Proven technology, proven ROI

The electric grid is just one example of infrastructure sorely in need of a digital overhaul. Proven information and communications technologies can optimize our water and sewer systems, our roads and bridges, our homes and factories. We can have smarter farms, smarter football stadiums, smarter emergency response systems... the list goes on.

This sounds expensive.

However, using proven technology means we can super-charge the return on smart infrastructure investments.

² See https://www.smartgrid.gov/files/Smart_Grid_Economic_Impact_Report.pdf

As you'll read in the pages that follow, in many deployments we have seen strong triple bottom line results.

The goal in all of this, of course, is to make our cities and counties and towns more livable, workable and sustainable. If we start by making the physical infrastructure smarter, we will be able to unlock the social and human potential within.



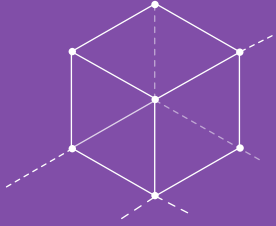
5 actions to unlock innovation

All levels of government play a critical role in unlocking the door to this new era of equity, innovation and prosperity we're describing. Just as we're giving old infrastructure a new life with smart devices, we also need to refresh government-as-usual with some smarter policies and approaches that will make it easier for communities large and small to prosper.

We propose five actions to unlock barriers to progress:

- 1 **Develop the capacity to innovate** –unlock innovation
- 2 **Aggregate demand** – unlock legal boundaries
- 3 **Streamline procurement** – unlock antiquated approaches that hamper efficiency
- 4 **Embrace new financing models** – unlock municipal financing barriers
- 5 **Benchmark results** – unlock the limitations of one-dimensional metrics

These important action items will be discussed in detail later, but first let's take a deeper dive into how smarter infrastructure improves lives and livelihoods – sometimes in very dramatic ways. 🍷



Smart Infrastructure 101



Smart Infrastructure 101

A town's first stoplight is often a matter of great community pride; a sign of progress. But at some point another stoplight becomes necessary, then a few more...

And so it goes until the town becomes a city with streets full of cars idling at those stoplights and sending exhaust into the atmosphere.

To combat that congestion, more roads and wider roads are built. More bridges and overpasses too. And still more cars come, clogging freeways intended to move more people faster.

Traffic planners try things like high-occupancy vehicle (HOV) lanes and toll roads to try to get motorists to kick their single-occupancy vehicle habit. The advent of light-rail trains and super-fast buses offer further enticement.

Yet today slowdowns and gridlock are still commonplace on roadways across the country. A 2014 report by the [National Economic Council and the President's Council of Economic Advisers](#)¹ indicates Americans spend 5.5 billion hours in traffic each year, costing families more than \$120 billion in extra fuel and lost time. American businesses, meanwhile, pay \$27 billion a year in extra freight transportation costs, increasing shipping delays and raising prices on everyday products.



The solution? It's not more traffic lights. Not more roads or wider roads. Probably not more bridges, either.

Rather, the solution is *smarter infrastructure*.

To get America moving efficiently and sustainably requires smarter transportation infrastructure. By that we mean infrastructure optimized with proven information and communications technologies (ICT) – smart devices and software that give infrastructure digital eyes and ears.

Smart infrastructure is optimized with proven information and communications technologies (ICT) – smart devices and software that give infrastructure digital eyes and ears.

In transportation, these can include:

- Intelligent transportation management software and roadway sensors that monitor freeway conditions and can re-route public transit when necessary

¹ See https://www.whitehouse.gov/sites/default/files/docs/economic_analysis_of_transportation_investments.pdf



- Apps like RideScout that enable users to find the quickest route to get where they're going on public transit or via sharing services
- Navigation apps and in-vehicle devices that display real-time traffic and point drivers to less congested routes
- Bike-sharing apps that enable users to unlock and pay with their mobile phones
- Networked traffic lights that communicate with each other and adapt to changing traffic patterns
- Smart parking apps that point drivers to available open spots, reducing time spent circling downtown blocks

**Smart infrastructure:
It's the real deal**

Transportation, of course, is just one piece of the public infrastructure pie that ICT optimizes to overcome pressures brought on by increasing population and/or outmoded or inadequate equipment.

For more than a decade now jurisdictions large and small in the U.S. and beyond have been successfully deploying ICT-enabled solutions to reap the benefits of smarter infrastructure. A starting point for many has been water infrastructure, since it's a basic need that impacts everyone on the planet.

Water utilities – and their customers – have long been plagued by water loss from leaks or theft, something referred to as non-revenue water loss. With drought



5.5 billion hours Time spent in traffic each year by American drivers

\$120 billion Resulting cost in extra fuel and lost time

\$27 billion Cost to American business due to increasing shipping delays

Smarter Infrastructure The Solution



City of North Miami Beach Leak Detection Technology

550 miles of pipeline
in system

23 leaks identified and
repaired before
detection system
even fully deployed

27 million gallons of
water saved

\$38k dollars saved
annually

conditions causing water insecurity in so many parts of the world today, stopping those losses takes on a new urgency. Many water utilities in recent years have created smarter water infrastructure with networks that offer two-way communications, giving customers and the utility real-time information on water usage. With smart water networks, utilities no longer have to wonder if they're losing water to leaks. The system detects and reports them as soon as they occur.

In the city of North Miami Beach, utility personnel would systematically inspect the water distribution system, going from one end of the 550-mile pipeline to the other in one-mile sections – taking one and a half years to get through the city's 25-square-mile service territory. While the city was able to maintain its system and identify leaks, the process was labor intensive. Mid-way through the deployment of Itron's AMI solution equipped with leak detection technology, the utility had already identified and repaired 23 leaks, saving 27 million gallons of water and \$38,000 annually.

More than a decade ago pioneering cities started using ICT devices to enable smarter infrastructure. In the years since they've been tested and proven in pilot after pilot and expanded into full-scale deployments time and again. And they work. Just ask people in North Miami Beach.

That last point is important to emphasize as our nation ponders future needs and priorities this election

1 See <https://www1.itron.com/na/PublishedContent/City%20of%20North%20Miami%20Beach-%2038K%20Saved%20Annually.pdf>

Providing equitable access and raising living standards of those typically left behind is the only way communities become truly livable, workable and sustainable.

year. Some would argue that America has been too focused on piloting these mature, scalable technologies rather than moving to full-scale deployments that can immediately improve lives and livelihoods on a much broader scale like many other countries have begun to do.

A reluctance to invest in smart infrastructure, they worry, is pushing our cities, towns and metro regions further behind competitors. After all, who chooses to locate their family or business in a region with horrendous transportation problems, poorly functioning water systems or inferior telecommunications assets when better options exist?

Enhancing livability, workability, sustainability

This move to smart infrastructure is not simply technology for technology's sake. That rarely serves a useful purpose.

Rather, as urban populations swell and pressure on resources increase, the integration of digital technology and intelligent design has very real benefits:



- **Enhanced livability** – a better quality of life for all residents. People can meet their basic human needs – ample food, clean water and air, affordable energy and housing – with access to a comfortable, clean, healthy and safe lifestyle.



- **Enhanced workability** – accelerated economic development that brings more jobs and better jobs along with increased local GDP that ensures all residents have access to the foundations of prosperity – educational opportunities and Internet access, for example.



- **Enhanced sustainability** – giving people access to the resources they need without compromising the ability of future generations to meet their own needs. This refers not just to the environment, but also economic realities – making infrastructure do more and last longer for less.



A robust, state-of-the-art telecommunications architecture is considered by many to be the foundation of smart cities and towns.

Providing equitable access and raising living standards of those typically left behind is the only way communities become truly livable, workable and sustainable. The good news is that the same digital technologies that improve infrastructure can also promote inclusivity and reduce human suffering across America.

Connectivity is an excellent example.

A robust, state-of-the-art telecommunications architecture is considered by many to be the foundation of smart cities and towns. And high-speed, high-reliability, high-availability broadband connectivity is absolutely essential for the digital lifestyles citizens enjoy today and the advanced communications and productivity capabilities that businesses demand.

Yet most people in developed nations like ours never think twice about the free Wi-Fi often available at libraries and other public buildings. For others, it can be life-changing.

That was the case with a homeless man in Boise, Idaho.

Ryan slept in a shelter at night. Most days he could be found at the local library hunched over his laptop. He used the [free Internet access](#)² available there via Wi-Fi – and books off the shelf – to teach himself to code videogames, which he'd always enjoyed playing as a child. Eventually he sold enough of the games he created to move out of the shelter and into a cheap apartment. Today his videogames win global awards and the company he heads is providing jobs in Boise.

It's clear that anyone without access to the Internet is at an educational and economic disadvantage today. By ensuring top-notch telecommunications available on an equitable basis, public officials help the disadvantaged level the playing field at the same time they're creating community-wide competitive advantage and convenience.

² See <http://builtinboise.com/nurface-games/>

The good news is that today we have the ability to merge multiple data streams and mine them for amazing insights.

A system of systems

The telecommunications discussion is an appropriate lead-in to the notion of smart cities, counties and towns as instrumented, interconnected and intelligent systems. In this respect, connectivity is an enabler – connecting sensors, switches and other smart devices to create networks across multiple departments and often multiple jurisdictions.

All of which makes a smart city or a smart county a system of systems where water, power, transportation, emergency response, built environment, etc. each affect all the others. The good news is that today we have the ability to merge multiple data streams and mine them for amazing insights.

The secret sauce in all of this is *interconnection*. It enables information sharing in real time beyond department walls, beyond jurisdictional boundaries. Public safety is a great example.

In most parts of the world, the following would be a pretty useless description of a bank robber: white male, 30-45 years old, with a bandage on the left side of his neck. Yet thanks to advanced database technology, that's all that

detectives in a North Carolina town needed to find their [Striped Hoodie Bandit](#)³. Their break came using technology developed by SunGard Public Sector that helps police agencies work smarter by working together. With the ability to share information with each other and the dedication of police officers to enter even small clues into the database, that seemingly vague description pointed to one man – and they got him.

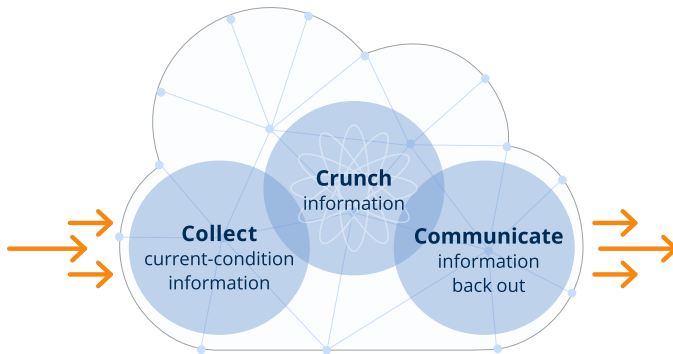
Of course there are also times when personnel from various agencies and disciplines may need to share information in real time. A truck carrying hazardous waste turns over and toxins leak into a nearby stream. Emergency crews, public health officials, environmental health experts, communications staff are among those with critical roles to play and being able to share information is essential.

Digging into data, improving lives

It is easy to see how interconnected systems are essential on the front lines – what's going on is often pretty transparent. But it's also important to understand what happens behind-the-scenes to make smart infrastructure the foundation of more livable, workable and sustainable communities.

³ See <http://www.sungardps.com/sungard-public-sectors-police-2-police-database-helps-officers-identity-arrest-serial-bank-robber/>

3 Core Functions of a Smart City, County or Town



There are three core functions of a smart city, county or town:

- 1 **Collecting** information about current conditions in all of its areas of responsibility – power, water, traffic, wellness, etc.
- 2 **Communicating** information, sometimes to other devices, sometimes to a control center and sometimes to servers running powerful software.
- 3 **Crunching** data, analyzing it to present information, to perfect (optimize) operations and to predict what might happen next.

Certainly local governments can derive benefit by collecting, communicating and analyzing information from a single department. But even greater benefit comes when data is connected with multiple departments. Many cities, for example, combine historic traffic data with information about population growth and business expansion to know when and where to add or subtract bus and train routes. Others correlate multiple data sources to predict where crime is most likely to happen or where families are at risk of being evicted from their homes. These predictions, of course, spark preventive actions.

We saw one example of how sharing data with multiple law enforcement agencies can help catch bad guys. Casting an even wider net – sharing data collected locally with national and international authorities has also proven useful – from finding missing children to knowing the whereabouts of individuals suspected of having terrorist ties to tracking the path of life-threatening viruses.

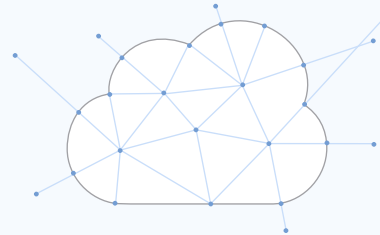
All of this information we collect, communicate and crunch, as you can see, contributes to safer, healthier and more prosperous communities. So in the case of data, it would make sense that more is better.

A few things about the Internet of Things

Consider the incredible ways technology has changed our lives in the last 40 or 50 years – microprocessors, ATMs, the World Wide Web, email, Google maps and smartphones and wearables, to name a few. Clearly we've been on a connectivity roll for a while. And it's not going to stop.

Today we are knee-deep in the Internet of Things (IoT) era where people talk to devices and devices talk to each other, creating what Gartner calls "an ecosystem of things, communication, applications and data analysis."

Someday, many believe, everything will be connected. In fact, networking giant Cisco estimates the IoT will grow exponentially to 50 billion devices connected to the Internet by 2020. And Gartner predicts that by 2020 government will be one of the top three verticals using IoT, along with utilities and manufacturing.



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Envision Charlotte: A public-private partnership to reduce energy use by 20%

60 buildings connected through city's commercial center

18% reduction in power usage to date

\$17 million+ energy cost savings for those buildings

So how, then, does the IoT intersect with the notion of smarter cities and towns? The quick answer is that the smart devices we've been talking about feed into the connected IoT universe, creating a bigger and better pool of data to crunch, insights to uncover and actions to take to enhance lives and livelihoods.

Charlotte, NC's public-private partnership known as *Envision Charlotte* connected more than 60 buildings in the city's commercial center through an effort to reduce energy use by 20%. Each building manager signed an energy pledge, allowing their data to be shared in aggregate and engaged in programs to reduce energy through behavior and equipment upgrades. To date buildings in the program have reduced their power usage by almost 18% and saved more than \$17 million.

Cities can leverage the Internet of Things for new projects. But IoT can also optimize existing infrastructure in a variety of ways, for instance for predictive maintenance. London's Heathrow Airport offers a perfect example. The airport's toilets were outfitted with sensors that anonymously count how many people have used them and send alerts to cleaners after a certain number is reached – improving both decision-making and customer service. 🍷

So what does dumb infrastructure look like?

Just to be clear about the benefits of smart infrastructure, let's finish up this section with a few examples of dumb infrastructure.

Reading
67,543 water
meters - on
foot - one at
a time?

Laredo, Texas, with a population approaching 250,000, has many more streets than during its frontier past. And that was a problem for the city's utility department. It was [walking those streets](#)¹ to read 67,543 water meters – which took a staff of 10 nearly an entire month. That changed when Laredo installed an automated meter reading system from Neptune Technology Group – and it also means customers don't have to wait to get their monthly water bills to learn they have a costly leak.

¹ See <http://smartcitiescouncil.com/resources/neptune%E2%80%99s-r450-system-helps-get-feet-streets-laredo>

Using street-
lights - only to
provide light?

San Diego streetlights used to do what most streetlights do – provide light. That's changing. Today downtown San Diego has a system GE calls "[Intelligent Environments for Cities](#)".¹ It's an example of connecting machines – in this case, LED street lamps – to the Industrial Internet, a network that links devices with software analytics and the data cloud. The project started with a wireless LightGrid system that can remotely assess and control 3,000 streetlights. As a result, the city expects to save more than \$250,000 annually in electricity and maintenance costs. Smarter still, the lights are equipped with sensors and computer-vision software that can pull parking and other data for real-time analysis.

¹ See http://www.gelighting.com/LightingWeb/na/images/33808-GE-LED-Roadway-Lighting-San-Diego-Sales-Slick_tcm201-67210.pdf

Is delaying
facility
maintenance
until budgets
loosen up the
only choice?

Moulton, Alabama's school district, like school districts most everywhere, has to fit ongoing facility maintenance and energy costs into what are often tight budgets. So renovations that might improve energy efficiency don't always get to the top of the list. By entering into an [energy savings performance contract](#)¹ (ESPC) with Schneider Electric, however, Lawrence County schools will get an extensive renovation that will ultimately result in a better environment for students and save the district a lot of money – some 29% – in energy costs. Improvements will include building automation district-wide, interior and exterior lighting upgrades, water system upgrades and more. One of the major benefits for the community is that the contract allows the district to get funding for the project that taxpayers won't be on the hook for.

¹ See <http://smartcitiescouncil.com/article/alabama-school-district-gets-energy-efficiency-and-saving-money>

Clearly there's a reason why we call it smart infrastructure. Next let's consider why it's also a smart investment.



Benefits of smart cities and towns 'by the numbers'



Benefits of smart cities and towns 'by the numbers'

It's been almost 230 years since signers of the Constitution set us on a path toward a more perfect union that would establish justice, ensure domestic tranquility, provide for the common defense, promote the general welfare and secure the blessings of liberty to ourselves and our posterity.



Of course back then Madison, Hamilton and the others weren't worried about things like climate change, the digital divide, congested freeways or competing with China. They had plenty to worry about, but those challenges weren't among them.

Still, the ideals the founders championed centuries ago ring true to this day. It's how to realize them that often gets mired in the complexities of modern life in our cities and towns.

Yet there are solutions – investing in smart infrastructure, unlocking equity, rethinking stale policies – that promote the general welfare, ensure domestic tranquility, etc. But we need a 21st Century spin on what that means for a modern society:

- **A better quality of life for all citizens** – inexpensive energy, convenient mass transit, good schools, faster emergency responses, clean water and air, lower crime, sufficient food, water and shelter
- **Accelerated and inclusive economic development** – more jobs and better jobs and opportunities for prosperity for all to fuel local and national competitiveness and success stories companies can use to expand into overseas markets
- **Fostering a sustainable planet** – providing access to resources people need without compromising the ability of future generations to do the same

What we've just described are the social, economic and environmental benefits of adopting a smart infrastructure action plan for our cities and towns and our nation.

No doubt you wonder how we can afford to do it? The better question is: can we afford *not* to?

Today's infrastructure by the numbers

Infrastructure across America is a mess – much of it is aging, inadequate and dumb. The World Economic Forum's 2014-2015 [Global Competitiveness Index](#)¹ (GCI) ranks the U.S. 12th overall for infrastructure. If that isn't troubling enough, a deeper dive reveals more startling results:

U.S. transportation infrastructure

- **No. 9** overall
- **No. 12** for quality of port infrastructure
- **No. 15** for quality of railroad infrastructure
- **No. 16** for quality of roads

U.S. electricity and telephony infrastructure

- **No. 26** overall
- **No. 24** for quality of electricity supply
- **No. 101** for mobile-cellular telephone subscriptions

These numbers may not surprise those who follow the progress reports on U.S. infrastructure compiled every four years by the American Society of Civil Engineers (ASCE). The most recent, issued in 2013, actually saw a slight improvement in America's cumulative infrastructure GPA – [up to a D⁺](#).



ASCE uses eight criteria in its assessments: capacity, condition, funding, future need, operation and maintenance, public safety, resilience and innovation. The grades in 2013 ranged from a high of B- for solid waste to a low of D- for inland waterways and levees. Energy earned a D+ and drinking water, wastewater and roads got Ds. Rail jumped from a C- to a C+.

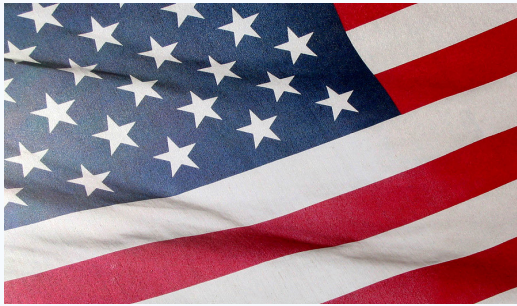
As the report states:

“We know that investing in infrastructure is essential to support healthy, vibrant communities. Infrastructure is also critical for long-term economic growth, increasing GDP, employment, household income and exports. The reverse is also true – without prioritizing our nation's infrastructure needs, deteriorating conditions can become a drag on the economy.”

ASCE's analysis suggests the U.S. needs to invest \$3.6 trillion in infrastructure by 2020. Not doing so, they maintain, could result in the loss of millions of jobs and businesses could lose \$1 trillion in sales annually.

¹ See <http://reports.weforum.org/global-competitiveness-report-2014-2015/rankings/>

² See <http://www.infrastructurereportcard.org/executive-summary/>



How the U.S. ranks in infrastructure

Infrastructure across America is a mess – much of it is aging, inadequate and dumb. The World Economic Forum’s 2014-2015 [Global Competitiveness Index¹ \(GCI\)](#) ranks the U.S. 12th overall for infrastructure.

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How the U.S. ranks in technological readiness and innovation

The World Economic Forum’s 2014-2015 Global Competitiveness Index assesses the competitiveness of 144 economies based on 12 “pillars” which include institutions, infrastructure, health and education, labor market efficiency, technological readiness, innovation and business sophistication. Two of particular relevance to our discussion of smart infrastructure investments are highlighted here.

U.S. technological readiness

- No. 16 overall
- No. 2 availability of latest technologies
- No. 7 technological adoption
- No. 16 internet users
- No. 20 information and communications technology use
- No. 42 internet bandwidth

U.S. innovation

- No. 5 overall
- No. 2 capacity for innovation
- No. 4 quality of scientific research institutions
- No. 2 university-industry collaboration in R&D
- No. 8 government procurement of advanced technology products
- No. 5 availability of scientists and engineers



Underinvestment in infrastructure costs us over 900,000 jobs, including more than 97,000 American manufacturing jobs, according to Duke University's Center on Globalization, Governance & Competitiveness.

In December 2015, President Obama signed a \$305 billion measure to fund roads, bridges and rail lines – \$61 billion a year for the next five years.

After a decade of short-term fixes, the multi-year [Fixing America's Surface Transportation Act](#)³ (FAST Act) was hailed as progress – including its bi-partisan support in Congress.

A misguided approach?

Nonetheless, others see the FAST Act as a drop in a very big bucket at a time when U.S. spending on infrastructure is declining. We're not alone in that; a new [McKinsey Global Institute study](#)⁴ lists the U.S. as one of 10 countries where infrastructure spending as a share of gross domestic product fell between 2008 and 2013. Joining us were the U.K., Italy, Australia, South Korea, Brazil, India, Russia, Mexico and Saudi Arabia.

China, meanwhile, spends more on infrastructure annually than North America and Western Europe combined, according to the report.

Exacerbating the decline in federal

³ See <http://www.fhwa.dot.gov/fastact/>

⁴ See <http://www.mckinsey.com/industries/infrastructure/our-insights/Bridging-global-infrastructure-gaps>

spending, state and local governments are also spending less on all types of capital, according to the [Center on Budget and Policy Priorities](#)⁵ dropping from a high of 3% of GDP in the late 1960s to less than 2% in 2014. Writes state budget and tax expert Elizabeth McNichol:

"But rather than identifying and making the infrastructure investments that provide the foundation for a strong economy, many states are cutting taxes and offering corporate subsidies in a misguided approach to boosting economic growth. Tax cuts will spur little to no economic growth and take money away from schools, universities and other public investments essential to producing the talented workforce that businesses need. This pattern of neglect of infrastructure by states – the primary stewards (along with their local government partners) of the nation's infrastructure – has serious consequences for the nation's growth and quality of life as roads crumble, school buildings become obsolete and outdated facilities jeopardize public health."

⁵ See <http://www.cbpp.org/research/state-budget-and-tax/its-time-for-states-to-invest-in-infrastructure>

Earlier we asked if we can afford to adopt a national action plan of smart infrastructure improvements. As we slide further behind, the answer is clear: We can't afford not to.



Duke University Center on Globalization, Governance & Competitiveness suggested in 2014 that **underinvestment in infrastructure**⁶ costs us over 900,000 jobs, including more than 97,000 American manufacturing jobs.

All told, the numbers are alarming – and embarrassing – for a nation that prides itself on being a world leader. Yet it's the toll on American citizens, including our most vulnerable, that makes the situation intolerable.

Earlier we asked if we can afford to adopt a national action plan of smart infrastructure improvements. As we slide further behind, the answer is clear: We can't afford not to.

What many may not realize is that, thanks to proven smart technologies, we can embrace that action plan without forcing our cities and towns to take on enormous risk. That's partly because the point of smart infrastructure is to stretch existing infrastructure and avoid the need to build more outmoded infrastructure. This can ultimately result in a major reduction of many kinds of infrastructure capital costs – while at the same time greatly increasing the ICT component of ex-

penditures. Today our cities and towns need to pinpoint the best types of smart infrastructure expenditures.

And when you understand the ROI – the triple bottom line benefits that can (and do!) result from smart infrastructure investments – you'll wonder why we've waited so long.

Infrastructure and job growth by the numbers

Over the years we've seen various figures on how infrastructure improvements contribute to jobs and economic growth. Given fluctuations in the labor market and economy, the following are mostly anecdotal for a point in time. But they do illustrate the level of impact infrastructure investments can represent.

- **The White House Council of Economic Advisers** determined several years back that every \$1 billion in federal highway and **transit infrastructure investment**⁷ creates 13,000 jobs.
- **The Economic Policy Institute** determined in 2011 that a \$1 billion **investment in wireless infrastructure**⁸ could create an additional 12,000

⁶ See https://s.bsd.net/aamweb/main/page/file/9d937012edb12326c4_7vm-62z7l5.pdf

⁷ See <http://www.fhwa.dot.gov/policy/otps/pubs/impacts/>

⁸ See http://www.epi.org/publication/the_jobs_impact_of_a_telecommunications_merger/



| | |
|--------------------------------|---|
| 13,000 jobs | for every \$1 billion invested in federal highway and transit infrastructure |
| 12,000 job-years of employment | for every \$1 billion investment in wireless infrastructure |
| 50,000 jobs | from smart grid projects funded through the American Recovery and Reinvestment Act (ARRA) |
| 10-15 jobs | \$1 million investment in alternative water supply projects |
| 5-20 jobs | \$1 million investment in storm water management |
| 12-22 jobs | \$1 million investment in urban conservation and efficiency |
| 14.6 jobs | \$1 million investment in agricultural efficiency and quality |
| 10-72 jobs | \$1 million investment in restoration and remediation |

2.3M potential jobs in 2030 By diverting 75% of waste from landfills to recycling facilities

job-years of employment, which includes direct jobs in primary industries, jobs in supplier industries and jobs from re-spending by newly hired workers.

- **Smart grid projects** funded through the American Recovery and Reinvestment Act (ARRA) created nearly \$7 billion in total economic output, nearly 50,000 jobs, and over \$1 billion in government tax revenue, according to the [Department of Energy](#)⁹.
- **A Pacific Institute study** on proactive investments to increase [efficient water use and re-use](#)¹⁰ found an investment of \$1 million in alternative water supply projects yields 10-15 jobs; in storm water management, 5-20 jobs; in urban conservation and efficiency, 12-22 jobs; in agricultural efficiency and quality, 14.6 jobs; in restoration and remediation, 10-72 jobs. The Value of Water Coalition says that [every job we create in the water](#)¹¹ sector helps add another 3.68 jobs in the national economy.
- **Recycling creates 10 times as many jobs** per ton of waste as landfills, so diverting 75% of waste from landfills and into recycling facilities could create 2.3 million jobs in 2030, according to the [National Employment Law Project](#).¹²
- **Moody's** estimated that as of the beginning of 2015, after a number of years of economic recovery, an additional dollar of infrastructure investment would [increase GDP](#) by \$0.86.¹³

⁹ See <http://energy.gov/oe/downloads/economic-impact-recovery-act-investments-smart-grid-report-april-2013>
¹⁰ See <http://pacinst.org/publication/sustainable-water-jobs/>
¹¹ See <http://thevalueofwater.org/the-facts/waters-value>
¹² See http://nelp.3cdn.net/8daec8d7b0f27521d0_bhm6bpn6i.pdf
¹³ See <http://images.politico.com/global/2014/05/05/sp-usinfrastructure201405.html>

...the point of smart infrastructure is to stretch existing infrastructure and avoid the need to build more outmoded infrastructure. This can ultimately result in a major reduction of many kinds of infrastructure capital costs

A 2014 report from Brookings Institution found infrastructure jobs tend to pay 30% more to lower income workers relative to all jobs nationally. From [the report](#)¹⁴:

“Infrastructure occupations not only employ thousands of workers with a high school diploma or less, but they also frequently offer higher wages compared to many other jobs, particularly those involved in sales, maintenance, production and other support activities. For example, paving equipment operators, recyclable material collectors and industrial truck operators are among the largest infrastructure occupations that fall into this category, paying significantly more to workers without an advanced degree who might otherwise be employed as assemblers, counter attendants or cashiers. Plumbers, bus drivers and electrical power-line installers illustrate these patterns as well.”

What that suggests is that infrastructure investments can raise the standard of living for many workers. But building more infrastructure simply to create more jobs isn't the answer. We need to be much smarter about it. We need

to squeeze more value from every dollar we spend on infrastructure.

Here's an example of how we can do that.

The smart grid, as we've mentioned, refers to a specialized communications network that moves electricity and data to balance supply and demand and maintain reliable service. Sensors, smart meters and the like alert utility operators to problems in real time so they can respond accordingly.

So how does an investment in a smart grid align with triple bottom line benefits?

- **Social** – providing more jobs and better jobs that lead to a higher standard of living; enabling people to control their energy consumption and reduce their utility bills; fewer power outages and faster restoration times when power does go out.
- **Financial** – economic losses from power outages can be devastating, so businesses in cities with modern, ultra-reliable energy systems have a competitive advantage; renewable energy and local energy typically produce more local jobs than

¹⁴ See <https://www.brookings.edu/blog/the-avenue/2014/06/23/the-enormous-wage-potential-of-infrastructure-jobs/>

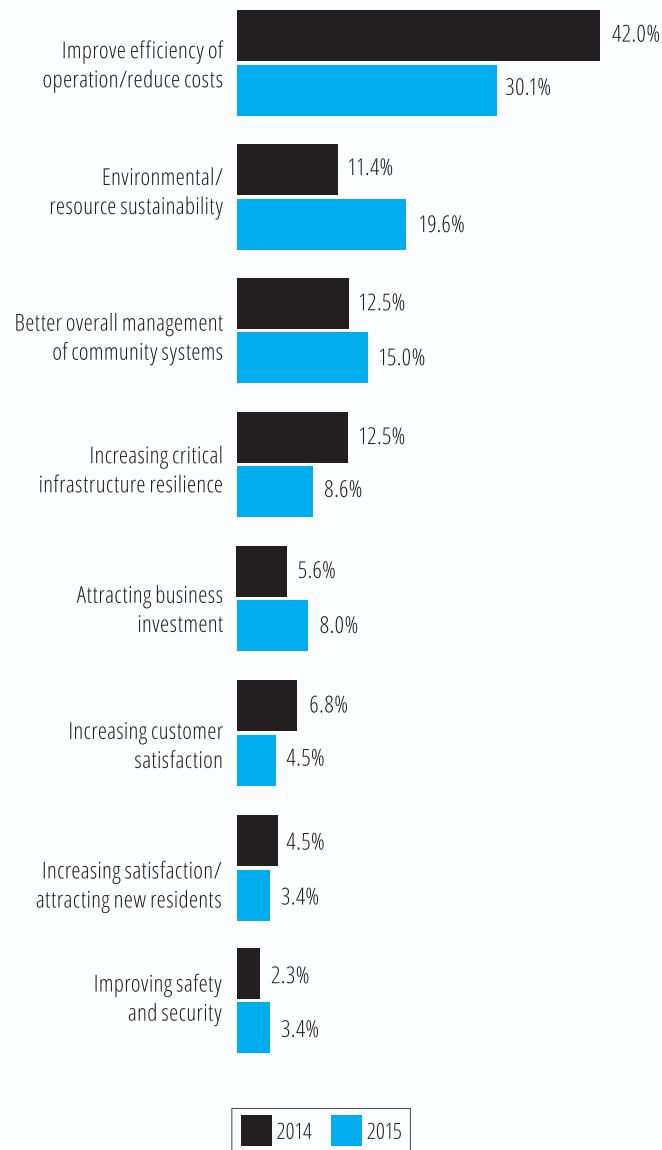
“traditional” energy; one study found that cities with a smart grid have an annual GDP growth rate that is 0.7% higher than those without.

- **Environmental** – it’s easier to integrate wind, solar and other clean renewable sources and waste less energy during transmission and delivery; it’s also far easier for customers to generate energy on premise (for instance, via rooftop solar) and trade it back and forth with the grid; sensors and monitors report on the actual condition of expensive equipment, leading to longer lifespans for assets without compromising safety; ability to charge electric vehicles, reducing dependence on oil.

For its **2016 Strategic Directives: Smart City/Smart Utility Report**¹⁵, Black & Veatch surveyed 778 qualified utility, municipal, commercial and community stakeholders in the fall of 2015. Asked what they see as the primary driver for cities/communities to implement smart city initiatives, a significant number said to improve efficiency of operations/ reduce costs. But as you can see in the accompanying chart, there are a number of other drivers. 📦

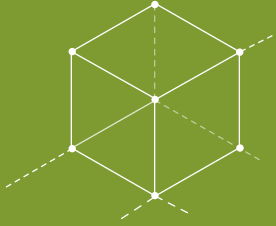
What do you see as the primary driver for cities/communities to implement smart city initiatives?

(Select one choice) [Government/Municipalities Only]



Source: Black & Veatch

¹⁵ See <http://bv.com/reports/2016/smart-cities>



Unlocking American Innovation



Unlocking American innovation

We can only get maximum benefit from smart infrastructure investments if we innovate to include more knowledgeable customers with an efficient procurement process, unlocking new business models using multi-dimensional benchmarks.

Barriers to smart city technology implementation, according to county and municipal administrators

42% described budget limitations as a *"very significant barrier"*

93% suggested complexity of procurement is a barrier

37.3% considered the need for more supportive policies as a *moderate barrier*

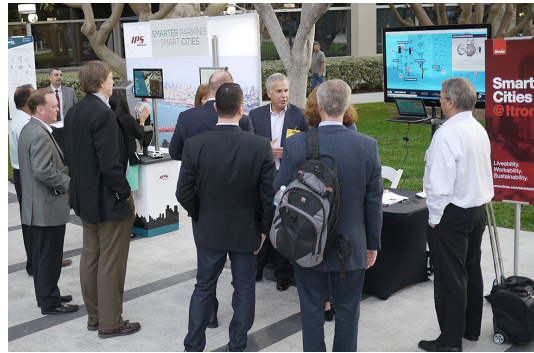
25% considered the need for more supportive policies as a *very significant barrier*

A survey conducted by the International City/County Management Association (ICMA) and Smart Cities Council and released in September, 2016, asked county and municipal administrators about barriers to implementing smart city technologies in their jurisdictions. Among the findings:

- **Budget limitations as a barrier** – 42% of respondents described budget limitations as a "very significant barrier" and another 32% called it a "significant" barrier.
- **Complexity of procurement as a barrier** – only 7% suggested procurement is not a barrier.
- **Need for more supportive policies as a barrier** – the majority of respondents (37.2%) consider it a moderate barrier while 25% describe it as a very significant or significant barrier.

To enable our cities and counties and towns to realize the benefits of smart technologies, we need to refresh dated policies and practices that impede progress. Specifically, we need to help them:

- 1 **Develop capacity** – unlock innovation
- 2 **Aggregate demand** – unlock legal boundaries
- 3 **Streamline procurement** – unlock antiquated approaches that hamper efficiency
- 4 **Embrace new financing models** – unlock municipal financing barriers
- 5 **Benchmark results** – unlock the limitations of one-dimensional metrics



Capacity development

Federal and state governments offer a unique coordinating role for developing the capacity of cities, counties and towns to learn about and implement smart solutions. Given that these solutions can be used in almost any size community anywhere, the key to successful implementation is to:

- Provide guidance and resources for cataloging solutions, case studies and best practices to demonstrate the value and utility of these solutions
- Provide assistance and guidance through educational outreach with workshops and programs to assist cities and towns in aggregating demand and benchmarking results
- Encourage industry-led standards and interoperability development
- Encourage streamlining of procurement through supporting policies

The Smart Cities Council has considerable experience educating cities – given the thousands of downloads of our landmark Smart Cities Readiness

Guide, the rich library of articles and case studies available on our website and the hundreds of public officials who attend Council-hosted workshops and conferences .

A key approach is to help a city transition to a smart city, at its own pace and on its own terms.

Overall we've seen that successful cities:

- Think big... but start small
- Work together... but move fast
- Emphasize synergies and interdependencies
- Borrow from the best
- Harvest good ideas

Aggregate demand

For information and communications technologies (ICT) to deliver true benefits, a project needs scale – distributing costs and benefits over many users. Legal boundaries, which were logical when developed, prevent governments from optimizing the lifecycle benefits of ICT.



Historical precedents for demand aggregation

Electricity and telecommunications are two of the greatest benefits technology has provided over the last 120 years. Each prospered because of demand aggregation.

Electricity

Scientists like Maxwell, Faraday and Tesla tamed Franklin's lightning bolt, and entrepreneurs like Westinghouse and Edison pioneered the technology on which the grid was built. But it was Edison's employee Samuel Insull who made it commercially viable in 1897 by aggregating demand and offering tiered rates based on usage. This approach reduced the electrical bills for Chicago Edison Company customers and spread out the cost of building the needed electrical infrastructure among many users.

Adoption of electricity in the United States was initially slow. Commercially available in 1873, it would be 46 years before 25% of the American population had electricity. In 1936 the rate was about 75%, mostly in urban areas. In 1936 Congress passed a law creating the Rural Electrification Administration, which was authorized to make low-interest loans to states for installation of electrical wiring and fixtures in rural homes and barns.

Telecommunications

The first telephone exchange was launched 1877 in Boston. Adoption of the telephone by U.S. households initially outpaced electricity, but fell behind in 1920. The Communications Act of 1934 created the Federal Communications Commission and made the concept of universal service the law of the land. At the time, rural telephone systems were installed and maintained by cooperatives, and poor service was the norm. Even by the start of World War II rural telephone service was so substandard that there were fewer rural telephones in 1940 than there were in 1920. Rates were low, so capital was unavailable to upgrade the networks. In 1944 the Congress, taking a cue from the success of the Rural Electrification Act, created the Rural Telephone Administration which made low-interest loans to rural telephone cooperatives.

Rural telephone cooperatives joined forces via industry associations, and over time were aggregated under AT&T –

aka “Ma Bell” – which ruled until the 1980s when a federally ordered breakup created seven “Baby Bells” that were free to offer data services and networking, and were also required to allow attachment by users of any lawful device – thus paving the way for answering machines, fax machines, data modems and ultimately DSL gateways. Competition kicked in, prices dropped and consumers benefitted. Ultimately demand was again aggregated as AT&T rose like a phoenix from the ashes of Judge Green's gavel. Over time the tiered rate system of local and long-distance calling gave way to flat-rate plans.

Wireless telephony followed a similar path. The FCC lottery of the mid-1980s bestowed spectrum rights on a diverse and sometimes odd list of people as early cellular prospectors encouraged their families and friends to submit lottery applications. The winners were then courted by the prospectors to sell their rights over to regional network builders and operators. In the early days of cellular, it wasn't uncommon to buy service from carriers that provided coverage over only a couple dozen square miles. Leave that area and you could get service via roaming – which was often an expensive proposition.

Over time the local wireless carriers, like their rural telephone forefathers, formed cooperatives that were ultimately absorbed into the nationwide networks we have today, and the looming specter of roaming charges no longer haunts us. It should be noted that this aggregation process is still not complete – in rural communities there are still approximately five dozen local wireless cellular companies.

With these historic precedents in mind and 21st Century ICT developing ‘pay for usage’ models for cloud data storage and networks delivering greater value based on the number of users, today we are poised (as in 1897) to take advantage of smart technologies – but only if we aggregate demand by unlocking jurisdictional limitations on procuring, deploying and operating ICT integrated smart infrastructure.

"In the future, cities that work together will find themselves having unleashed a lot more innovation than those that don't, because collaboration means you can port innovation and services from one city to another. If you don't collaborate, that is hard."

–Carl Piva,
Vice President of Strategic Programs
and Head of the Smart City Forum

Examples of the effect of scaling ICT projects include:

- **Collaborating leads to greater innovation.** As Carl Piva, Vice President of Strategic Programs and head of the Smart City Forum, puts it so well: "The need for cities to collaborate is greater than ever. In the future, cities that work together will find themselves having unleashed a lot more innovation than those that don't, because collaboration means you can port innovation and services from one city to another. If you don't collaborate, that is hard."
- **Scaling leads to inclusion.** The wider the net, the more opportunity is created. Suppliers or technologies that may not be known to one city may be well known to county staff or officials in a nearby town. Scaling results in broader market insight for all jurisdictions involved, but also creates opportunities for more vendors to participate.
- **Reducing duplication of effort.** When cities and towns confine their ICT procurement to intra-city departments and to their own internal operations, numerous functions are needlessly repeated. When cities and towns in a region agree in advance on common requirements and make an effort to share planning, procurement and deployment – costs are shared among a greater number of parties and benefits extended to a greater number of users.
- **Reducing costs through infrastructure sharing.** There are many opportunities to share costs not only within cities but between and among cities and even private sector operators who have already deployed networks and services, specifically:
 - › Geographical information systems (GIS)
 - › Communications networks
 - › Cybersecurity designs and implementations
 - › Database management systems
 - › Enterprise service buses
 - › Workforce and field crew management architecture, and operations centers



- **Increasing economies of scale.** By agreeing on universal standards and specifications, cities can often lower their purchasing costs while increasing interoperability. Otherwise, each city and often each city department makes its own small, slightly different order with diminished bargaining power.
- **Squeezing maximum value from assets.** Electronically monitoring the condition of assets helps predict when maintenance is needed.

Today we lock out neighborhoods, towns and smaller cities from the prosperity of our big cities by not supporting aggregation of demand – or scale – across legal boundaries. Often cities and towns of all sizes have legal and policy limitations on their ability to authorize expenditures beyond their legal borders. Most of these limitations are the logical result of responsible government attending to fiscal discipline – in an analog or mechanical universe where machines

and people were not connected. The result when it comes to ICT deployment is that the rich and tech-savvy get richer, leaving neighboring jurisdictions with antiquated, unconnected and in some cases mechanical or analog systems.

Streamline procurement

We want our public-sector agencies to be transparent – particularly when it comes to how they spend taxpayer dollars. We expect our leaders to look after our best interests through competitive bidding processes that ensure they’re getting the most bang from our buck.

As a result, over the years governments have instituted rules and processes for procurement intended to ensure those demands are met; that there is oversight and accountability at every step of the process. Centralized purchasing became a thing. And directives aimed at ensuring small businesses could compete for government contracts against the big guys and that minority-owned businesses were not overlooked. All are important, certainly.

Investment in public infrastructure has declined at a time when some would argue the need has never been greater...

But they also added layer upon layer of complexity to what are often antiquated procurement processes to begin with. As a result, in some cases it can take months if not years to finally ink a government contract.

On top of those challenges, the technology sector has changed so rapidly and so dramatically in the last 20 or so years that government agencies are challenged to know what to buy when – or from whom. Sluggish procurement cycles could see them taking delivery on products that are out of date before they're out of the box.

Additionally, old-school approaches that have procurement departments deciding what to buy can lead to trouble if they don't consult with in-house experts from IT, relevant department staff and/or outside subject matter experts if needed. The importance of interoperability can't be understated.

Cities also need be results oriented and have systems to understand and focus on what works, using data and evidence of impact to drive their decisions. The focus should be on outcomes, not just vendor activities.

Finally, government agencies run the risk of locking out some of the attractive new financing alternatives if their procurement and funding practices aren't updated or flexible enough to accommodate them.

But it doesn't have to be this way.

There are smarter approaches available today that can streamline government procurement without side-stepping transparency and diligent stewardship of public funds.

- **Collaborative purchasing.** There are a number of organizations that assist governments in cooperative purchasing, aggregating demand to get them better prices. U.S. Communities, which has been around since 1996, awarded its Technology Products, Services, Solutions and Related Products and Services contract in May, 2016, after the lead public agency, Fairfax County, Virginia, completed an open, competitive solicitation and thorough evaluation process. The exclusive contract, which runs through April 2019 with the option of four, one-year renewals, gives more



E-Procurement Statistics

(as of September 2016)

| | |
|----------------------------------|------------------|
| Purchase Orders (PO) issued | 5,349,209 |
| Total PO value | \$34,921,582,863 |
| Total vendors | 40,552 |
| Total purchasing users | 11,415 |
| Purchasing entities using system | 171 |

than 90,000 public sector entities such as state agencies, local governments, special districts, school districts, higher education institutions and nonprofit organizations access to leading technologies from the awarded suppliers and supplier partners – Microsoft, Panasonic, Cisco and a host of other well-respected technology companies. These jurisdictions basically piggyback on the Fairfax County contract, which means they avoid the RFP process, saving time and money. And the contract can be modified to meet an agency’s specific IT needs. “We are confident that we have identified the best technology companies as partners to assist public agencies with driving organizational success and cost savings,” said Cathy Muse, Fairfax County CPPO; Director/ Purchasing Agent, Department of Purchasing & Supply Management, [when the contract was announced](#)¹. “We are excited that Fairfax County is able to provide the contract vehicle for this powerful offering on a nationwide basis.”

- e-Procurement portals.** One example of electronic procurement at the government level can be found in North Carolina, where the state enables government entities to aggregate their purchases to get better prices from suppliers – what the state considers an innovative, cost-saving and efficient method of purchasing. According to the site: “[NC E-Procurement](#)² provides suppliers

¹ See http://www.uscommunities.org/news-events/news/article/?tx_news_pi1%5Bnews%5D=72&tx_news_pi1%5Bcontroller%5D=News&tx_news_pi1%5Baction%5D=detail&cHash=010778233129cab3f820be3f32af109f

² See <http://eprocurement.nc.gov/>



with increased access to markets without additional supplier marketing efforts, a single point of access for North Carolina government organizations, a faster and more efficient method for quoting (eQuote), and increased order accuracy through receipt of electronic orders with a consistent purchase order format. Overall, NC E-Procurement can help realize processing, marketing and administrative cost savings.” As of September, 2016, the site had 171 entities using the system, 40,552 vendors and has issued 5,349,209 purchase orders with a total value of \$34,921,582,863.

- **Online libraries of bids and specs.** Why re-invent the wheel when you want to buy the same set of widgets that another agency recently purchased? You can find templates and copies of bids, RFPs and specifications other agencies have written at a number of sites online. One such knowledge-sharing site is the Onvia Exchange, a library that procurement professionals can freely search for what Onvia says are [millions of examples](#)³ of project bids

³ See http://www.onvia.com/exchange/?utm_source=website&utm_medi-

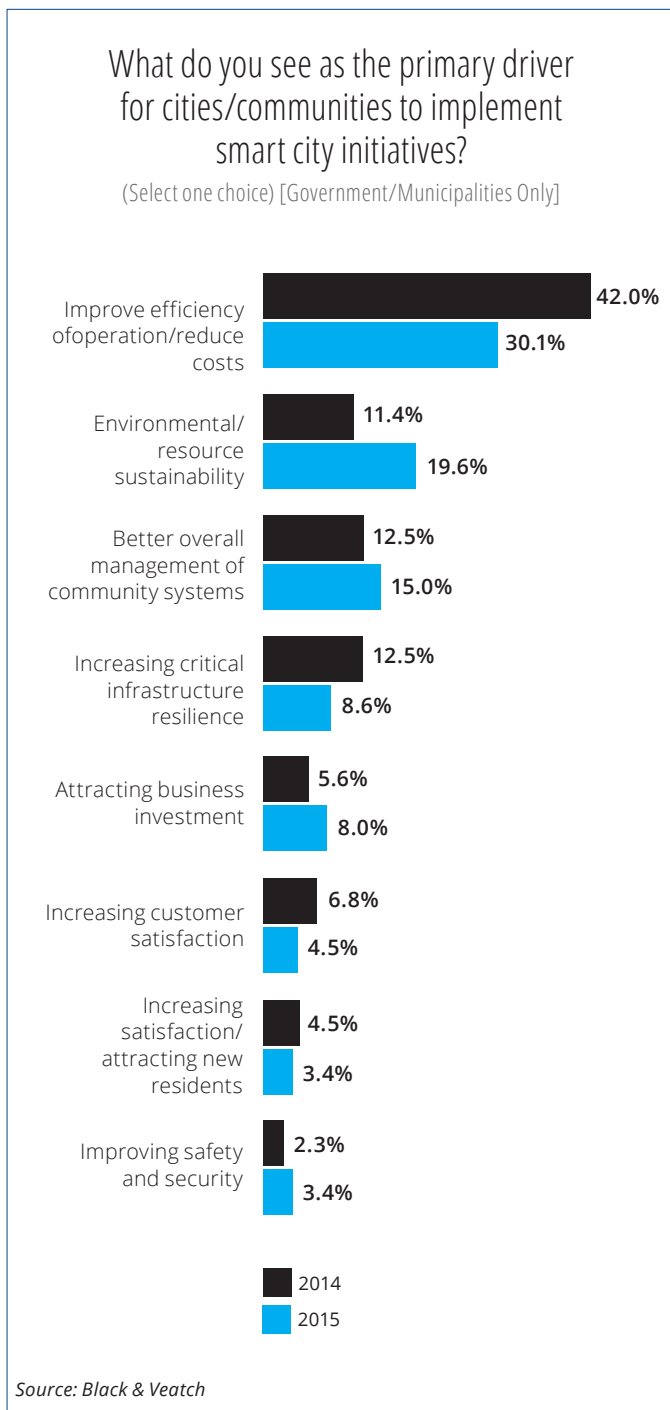
and RFPs with specifications written by their peers. “Onvia Exchange is designed as a win-win where you gain free access to hard-to-find information and Onvia benefits from the award data contributed by you,” according to the site.

- **Software and cloud solutions.** The list of vendors that offer automated electronic procurement options is a lengthy one. Dubbed an e-procurement pioneer, Sacramento County piloted the free Public Purchase software from The Public Group with several staff and then began rolling it out in 2011. A [National Association of Counties report](#)⁴ on the county’s experience says the free software:
 - › Reduced staff training costs
 - › Eliminated an estimated 40,000 pages of paper per year
 - › Improved staff efficiency
 - › Reduced processing time in all phases of procurement

By unlocking antiquated purchasing practices and embracing modern,

⁴ See <http://www.naco.org/sites/default/files/documents/Sacramento%20County,%20CA%20is%20e-Procurement%20Pioneer.pdf>

Another challenge is unlocking barriers built into procurement processes and adopting a new mindset that is open to new and creative finance strategies



tech-enabled processes that maximize efficiency without losing sight of transparency and inclusion, government agencies win – and so do their taxpayers.

Embrace new financing models

Investment in public infrastructure has declined at a time when some would argue the need has never been greater, with populations surging and so much of our existing infrastructure in a state of decline.

But with monetary relief from state and federal agencies rarely a given, local governments need new strategies to finance the smart infrastructure improvements they so sorely need. In its *2016 Strategic Directions: U.S. Smart City/Smart Utility Report*⁵ mentioned earlier, Black & Veatch found that nearly 70% of government respondents, and 44% of smart service providers, labeled budget constraints as an acute inhibitor of smart city initiatives. More options in their financing arsenal can only help.

It's not a matter of tossing out traditional funding mechanisms. Bond measures and tax increases are still viable – at least sometimes. Rather,

⁵ See <http://bv.com/reports/2016/smart-cities>

“For us, this was like a mini-stimulus.
We created 400 jobs to do this.”

– Judge Clay Jenkins, Dallas County



it’s about expanding a city or county’s options with some of the alternative funding tools available today. Part of that challenge is selecting the right tool at the right time.

Another challenge is unlocking barriers built into procurement processes and adopting a new mindset that is open to new and creative finance strategies.

One of the most promising – pay-for-performance contracts – have seen great success for some time now. Here’s a quick example from Texas:

Judge Clay Jenkins was elected in 2011 to lead Dallas County, Texas. Among other initiatives, he focused on energy. “We were getting killed on energy bills,” he said at a Smart Cities Council event, noting his county has a large inventory of old buildings and a lot of deferred maintenance.

What to do?

The county started energy efficiency upgrades and an energy performance contract with Schneider Electric and has seen energy bills drop from \$12 million a year to \$8.2 million. Schneider and its

partners took much of the upfront risk and expense, and are being repaid from the energy savings they help create.

“For us, this was like a mini-stimulus,” Jenkins said. “We created 400 jobs to do this.”

Bottom line, the county took a budget-neutral approach to smart infrastructure improvements without any tax rate change for taxpayers and is realizing savings that can be used for other initiatives. “A big win-win,” as Jenkins put it.

That’s one type of public-private partnership – or P3 – which more and more local governments are embracing for smart infrastructure projects. Such partnerships can take many forms, but they generally seek to balance responsibilities, risks and rewards among all parties involved – the public sector agency and a private sector entity. P3s typically align the public good with commercial objectives designed to enhance the private sector’s bottom line. Governments can help by ensuring policies are in place that encourage and promote P3s.

As this country's economic engines, it is to everyone's benefit to see cities stay competitive.

Here are a few more tools that local governments may find appropriate for smart infrastructure projects:

- **Green bonds** are instruments issued to raise capital to fund environmentally beneficial projects – green infrastructure, renewable energy, clean water and eco-friendly transportation, for example. In 2013, Massachusetts became the first American state to sell green bonds to pursue an array of energy efficiency initiatives. When issued by government entities, green bonds are tax-exempt.
- **User fees** allow cities and other local jurisdictions to impose fees to cover the cost associated with funding services and enhancements to increase the quality of life and cover administrative and regulatory processes. Not to be confused with taxes, user fees are paid by choice, for example, paying a toll to drive in highway express lanes.
- **Pooled bond financing** helps generate new capital and is particularly useful for smaller jurisdictions. Predominantly for state and local governments, nonprofits and private companies can benefit from pooled bond financing too. With this tool, a sponsor sells an issue of bonds, the

proceeds from which are used by a number of state or local jurisdictions, or other tax-exempt organizations

- **Social impact bonds**, or Pay for Success, are at the simplest level performance-based contracts often used in human services where there is opportunity to do prevention work to move high-cost populations into lower-cost services. Earlier this year, the city and county of Denver launched the Denver Social Impact Bond program to help hundreds of homeless people in the community with housing and case management services. Because they are both high risk and low return, social impact bonds won't typically attract private dollars, but foundations are often supportive.

As this country's economic engines, it is to everyone's benefit to see cities stay competitive. Unlocking barriers to new financing strategies and encouraging greater private sector participation is essential.

Benchmark results

Around the world, citizens and shareholders alike are demanding greater sustainability and resilience from cities and corporations alike. Increasingly,

Unlocking barriers to new financing strategies and encouraging greater private sector participation is essential.

companies are defining their ROI across multiple forms of capital – financial, manufactured, human, social, intellectual and natural. [International Integrated Reporting Council](#)⁶ (IIRC) is engaging many leading enterprises in regular reporting on value creation across these multiple forms of capital.

Cities seeking to optimize their ROI from smart technology investments have new opportunities to look beyond lowest initial cost bidding for products and services. The current approach often shores up short-term budgets at the expense of collaboration, innovation and long-term value creation. Smart cities can start employing a data-driven, holistic evaluation of many types of benefits over the entire life-cycle of a technology deployment.

There are many tools, frameworks, and indicators for measuring integrated ROI:

- The new ISO 37120:2014 standard for Sustainable Development Communities – Indicators for City Services and Quality of Life provides 100 indicators across [17 key city themes](#).⁷
- These indicators are now being reported by dozens of cities under the guidance of the [World Council](#)

[on City Data](#)⁸ (WCCD). This provides an invaluable resource for benchmarking against any relevant group of cities.

- The Institute for Sustainable Infrastructure has developed the [Envision rating system](#)⁹, which provides a holistic evaluation framework for community, environmental and economic benefits for all types and sizes of infrastructure projects.
- Global Infrastructure Basel has released the [SuRe Standard for Sustainable and Resilient Infrastructure](#)¹⁰ covering 14 themes and 65 criteria across governance, social and environmental factors. It is designed to translate multiple benefit streams into a form that attract more favorable financing.
- The [EcoDistricts Protocol](#)¹¹ provides a global performance standard for district-scale development centered on climate, equity and resilience.

Smart cities projects should be assessed using the same rigorous integrated ROI criteria that thoughtful [cities apply to any project](#). Do they

⁸ See <http://www.dataforcities.org/>

⁹ See <http://sustainableinfrastructure.org/envision>

¹⁰ See <http://www.gib-foundation.org/sure-standard/>

¹¹ See https://ecodistricts.org/wp-content/uploads/2013/03/EcoDistricts_Protocol_Executive_Summary_ISSUE_6.242.pdf

⁶ See <http://integratedreporting.org/>

⁷ See http://www.iso.org/iso/catalogue_detail?csnumber=62436



Being able to explicitly account for a project’s “public benefits” can be very important for securing public support for projects.

deliver tangible benefits to residents and visitors – particularly to those most marginalized? Do they provide climate, air pollution reduction, water quality, biodiversity and other environmental benefits? Do they provide solid financial returns over the project lifecycle? Integrating smart technologies project returns across multiple benefits provides complex measurement, reporting and management challenges. However, it allows much more effective investment decisions to be made.

One approach is to create a balanced scorecard assessing a range of Key Performance Indicators within multiple types of capital. Another is to assign equivalent financial values to at least some components of human, social, intellectual and natural capital. Either approach allows for more integrated decision making. This allows a shift from arbitrarily selecting a set of products and services and seeking low cost bids to carefully optimizing a complementary set of technologies against a transparent set of measures. Being able to explicitly account for a project’s “public benefits” can be very important for securing public support for projects.

- **Itron has developed a comprehensive approach** to evaluating the equivalent cost savings per meter per year for switching to an Advanced Metering Infrastructure (AMI) system. For publicly filed business cases, these savings average \$20.04 for meter operations and field savings; \$3.09 for administration; \$15.01 for uncollected revenues; \$3.82 for avoided capital; \$18.03 for peak load and energy reduction; \$1.50 for grid reliability and efficiency; and \$1.76 for other environmental and social benefits.
- **Smart buildings provide multiple benefits.** For instance, the 350,000 square foot Genzyme Center in Cambridge, MA features integrated building controls with energy monitoring and management systems designed by Schneider Electric. The building reduced energy usage by 42%, water usage by 34%, and facilities staff by 25%. Social benefits include a reduction of sick time by 5%, improved well-being reported by 88% of employees, and improved alertness and productivity reported

By benchmarking results in an integrated way, cities can effectively remove the limitations of one-dimensional metrics, and then justify larger investments in the right kinds of smart cities projects – and communicate benefits to their citizens more effectively.

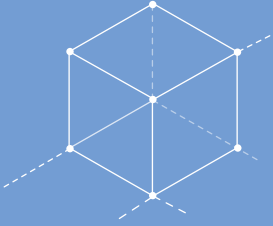
Itron's comprehensive approach to evaluating the equivalent cost savings per meter per year for switching to an Advanced Metering Infrastructure system, includes measurements for environmental and societal benefits as seen below.

| Saving Category | Weighted Average (Public) | Public % of Total | Industry Identified Benefits | Industry % of Total |
|--|---------------------------|-------------------|------------------------------|---------------------|
| Meter Reading/Meter Operations | \$15.72 | 25% | \$13.68 | 17% |
| Field Service Savings | \$4.32 | 7% | \$9.20 | 11% |
| Back Office / Administrative | \$3.09 | 4% | \$3.45 | 4% |
| Theft / Uncollectibles | \$25.01 | 24% | \$10.50 | 12% |
| Total Operational Savings | \$38.14 | 60% | \$36.83 | 44% |
| Avoided Capital | \$3.82 | 6% | \$4.87 | 6% |
| Peak Load + Energy Reduction | \$18.03 | 29% | \$3.19 | 4% |
| Grid Reliability and Efficiency | \$1.50 | 2% | \$19.51 | 24% |
| Environmental / Societal | \$1.76 | 3% | \$1.17 | 79% |
| Total Identified Utility Savings | \$63.25 | 100% | \$65.57 | 79% |
| Customer Benefits | – | 0% | \$10.64 | 13% |
| Ancillary Services (Market Sell Back) | – | 0% | \$6.65 | 8% |
| Total Identified Project Benefits | \$63.25 | 100% | \$83.86 | 100% |

by 72% of employees. This has led to enhanced recruiting and retention of employees while contributing to a significantly more valuable real estate asset.

- **A wide range of smart technologies** – ranging across built environment, energy, water, mobility, waste management, public safety and beyond – have similarly strong and well-documented financial, social and environmental benefits. This makes them particularly attractive public investments.

By benchmarking results in an integrated way, cities can effectively remove the limitations of one-dimensional metrics. They can then justify larger investments in the right kinds of smart cities projects – and communicate benefits to their citizens more effectively. 📦



Smart Infrastructure ROI in Action



Smart infrastructure ROI in action

11 case studies from around the world

- 1 New York City:**
Setting the standard for urban connectivity
- 2 Orlando:**
Building retrofits drive an energy efficient future
- 3 University:**
Gets an A for illuminating next-gen public safety
- 4 Worcester:**
Utility customers pitch in to save energy and money with remarkable results
- 5 Las Vegas:**
Using wireless connectivity to conserve water
- 6 San Diego:**
Electric 'superhighway' brings clean energy to San Diego
- 7 Gresham:**
Achieving energy net-zero in wastewater treatment
- 8 Barcelona:**
Taking the Internet of Things to new levels
- 9 Medellin:**
Driving mobility with inclusion and intelligence
- 10 Dubai:**
Embracing smart technology for a happier city
- 11 Chattanooga**
Smart grid and gigabit service bring jobs

New York City: Setting the standard for urban connectivity

Despite being one of the most advanced cities in the world, New York City has an antiquated and broken communications infrastructure with approximately 7,500 payphones located throughout its five boroughs.



The city recognized an opportunity to utilize this real estate to transform NYC into a smart city platform to provide services and bridge the digital divide by making Wi-Fi more accessible to its citizens.

To turn this vision into a reality, the city awarded a contract to CityBridge – a consortium of leading companies comprised of Qualcomm Incorporated, Civiq Smartscapes and Intersection – to create LinkNYC. LinkNYC will be the world's largest and fastest free municipal Wi-Fi network, offering up to gigabit speeds and paid for by advertising. These structures, called Links, will not only provide wireless connectivity throughout the boroughs, they will also provide free national calls, rapid charging stations and access to city services.

However, this is just the beginning – LinkNYC will also provide an open platform that businesses, academic institutions and municipalities can utilize to produce original content and apps that can spur a new generation of data-centric startups, or to tap into information to help steer public policy.

There are Link units currently installed across Manhattan, Bronx and Queens with more units going up every week and additional boroughs to follow. On average, 30,000 people register to

utilize the free Wi-Fi every week, with over 20 million sessions to date.

To ensure that it stays at the forefront, the LinkNYC network will support both hardware and software updates over time. Additionally, through advertising screens located on certain Links, the city will generate more than \$500 million over the next 12 years. LinkNYC will usher in a new generation of technology and set the standard for connectivity in urban environments globally.

NEW YORK CITY: REAL IMPACT

Social: Free Wi-Fi helps close the digital divide; free national calling benefits the disadvantaged and lowers the cost of living; rapid charging stations located around the city add convenience for visitors and residents alike; city services are easily accessible and there's opportunity for citizens to participate virtually in public policy discussions.

Financial: State-of-the-art connectivity combined with an open platform make the city more attractive to businesses and startups; city generates revenue through advertising that pays for the network.

Environmental: The city is able to upcycle existing assets – its old payphone booths – and create a convenient network of sustainable services with the ability to update both hardware and software.

Source: *Qualcomm*¹ and *LinkNYC*²

¹ See <https://www.qualcomm.com/news/onq/2016/02/09/qualcomm-solutions-support-free-public-wi-fi-linknyc>
² See <https://www.link.nyc/>

Orlando: Building retrofits drive an energy efficient future

Orlando, Florida is a popular destination for fun seekers, sports fans and business travelers. It was also the destination of \$2.6 million in stimulus money in 2009 through the Energy Efficiency and Conservation Block Grant Program.



In most large American cities, experts say, buildings account for the majority of energy use and carbon pollution – up to 75%.

Orlando used much of its grant to retrofit 28 city buildings – from senior centers to fire stations. Many of the retrofits included advanced controls that enable facility staff to track energy consumption in real-time and receive alerts when abnormalities are detected to enable quick response.

Orlando also participates in the [City Energy Project](#)¹ (CEP), a 10-city initiative of the National Resources Defense Council (NRDC) and the Institute for Market Transformation, to improve energy performance in large public and private sector buildings.

Working in partnership, CEP and participating cities support innovative and practical solutions that reduce pollution, boost local economies and create healthier environments – and to share lessons learned with other communities.

Orlando's goal is to reduce energy use by 5% and greenhouse gas emissions by 25% city-wide by 2018 (from a 2010 baseline). And it's making progress.

As of summer 2015, the city had made an \$18 million energy efficiency investment in public buildings, conducting audits and retrofits in more than 55 municipal buildings. At completion, the project is expected to save the city up to \$2.5 million per year in energy costs.

The NRDC pointed to Orlando's success at Leu Gardens, noting that

¹ See <http://www.cityoforlando.net/greenworks/cep/>

the city's museum and park was recognized in 2015 as a top overall finisher out of more than 5,500 buildings that participated in the U.S. Environmental Protection Agency's Energy Star Battle of the Buildings.

"Leu Gardens is an expansive 50-acre botanical oasis and was one of 24 city facilities to receive energy efficiency upgrades and renovations such as air conditioning equipment and building automation systems," according to a NRDC post. Due to the improvements, the facility reduced energy use by 45% compared to the previous year.

The city portfolio of buildings in total, NRDC said, has experienced 30% energy savings and has avoided nearly \$1.1 million in energy costs to the city's operations.

SMART ORLANDO: REAL IMPACT

Social: Creating jobs in a range of fields and skill levels to implement efficiency efforts; lowering energy bills and the cost of living for residents; improving quality of life.

Financial: Retrofitting city buildings for energy efficiency resulted in 30% in energy savings and the city avoided more than \$1 million in energy costs; property values increase as high-efficiency buildings are in demand; lowering energy bills and the cost of doing business.

Environmental: Reducing energy consumption and indoor air quality in public buildings with controls and monitoring; improving outdoor air quality due to reduction in carbon emissions; reducing the need to build more power plants; making city more resilient during energy-related crises.

Source: *Inter-American Development Bank*¹ and *NRDC*²

¹ See <https://publications.iadb.org/bitstream/handle/11319/7725/International-Case-Studies-of-Smart-Cities-Orlando-United-States-of-America.pdf?sequence=1>

² See <https://www.nrdc.org/experts/shelley-poticha/southeastern-cities-take-charge-embrace-energy-efficiency-save-money-and>



University gets an A for illuminating next-gen public safety

Streetlights help pedestrians and drivers see better while feeling safer at night. They also provide more security in neighborhoods and assist police patrols.



Today's smart lighting solutions offer even more security. Now police officers responding to suspicious activity can flash or brighten streetlights from patrol car laptops. Emergency dispatchers can also improve response times by flashing the streetlights near the reported incident. In high crime areas, communities can create "safety zones" where lighting levels are increased to deter criminals.

But it's not just downtowns and neighborhoods where smart streetlights can make a difference.

It's also true on college campuses where large numbers of students and faculty walk day and night, between buildings, dorms and in parking structures. Smart street lights can help ensure their safety.

A major university in the Southeast, for example, is deploying the Sensus VantagePoint® Lighting Control Solution. Some 1,800 modules have been installed on the university's LED fixtures; that number is expected to double by the end of 2016.

Upgrading to smart lighting means that parking lots and exterior areas get the right level of lighting based on the time of day and level of traffic. The university's projected savings include \$25,000 in energy costs for parking decks during summer breaks.

Given the number of campus shootings in recent years, the potential to save lives rather than just dollars is the real benefit. Flashing outdoor lights, for instance, can notify students and staff of a campus safety alert.

There is also the opportunity to make smart lighting do even more via smart sensors. Mounted on light poles, these connected devices can detect gunshots and alert authorities to the triangulated location. With adjustable lighting and motion sensors, areas can be dimmed when there is no activity and brightened when motion is detected.

According to Sensus, areas with improved lighting have seen on average a 21% reduction in crime.

Beyond physical safety, sensors can also contribute to public health. Air quality sensors mounted on light poles collect data to provide insights on things like pollution levels and pollen counts. And in the Dutch city of Eindhoven, the street lights can be programmed to flash red in order to warn residents of approaching storms or floods. This same feature might also serve to indicate an emergency evacuation route in the event of natural disasters.

SMART UNIVERSITY: REAL IMPACT

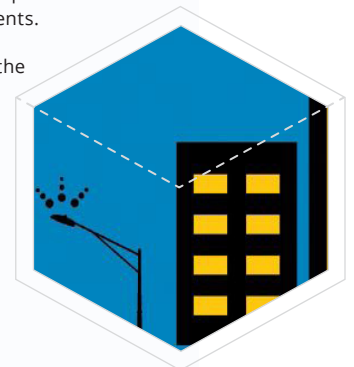
Social: People feel safer and more secure; better visibility for pedestrians, bicyclists, drivers; university officials can quickly communicate urgent warnings via flashing alerts; improves quality of life on campus.

Financial: Energy savings, including a \$25,000 reduction in energy costs for parking decks during summer breaks; less money spent on truck rolls and maintenance; a well-lit and safe campus is attractive to potential students and their parents.

Environmental: Reduction in the university's carbon footprint; safer streets and walkways for pedestrians and bicyclists can result in fewer cars on campus; additional sensors can be added that collect information on air quality.

Source: Sensus¹

¹ See <http://sensus.com/solutions/vantagepoint-lighting-control/>



Worcester: Utility customers pitch in to save energy and money with remarkable results

After the first year of its Smart Energy Solutions (SES) program in Worcester, MA, National Grid announced some stunning results in early 2016.

Findings from approximately 11,000 customers revealed that in 2015 the utility's SES program achieved a 98% retention rate, a 72% customer satisfaction rate and total customer savings of \$1.25 million on their electric bills.

Participating customers also experienced remarkable energy savings: collectively, customers saved a total of 2,300 megawatt-hours – enough to power a local library in their city for nearly a year. Additionally, the average customer reduced their usage by nearly 4% during peak periods of electricity demand.

The project, which utilizes Itron's advanced metering infrastructure and meter data management, Home Area Networking and advanced communication technology, was designed to provide participating customers a new level of choice and control over their energy use through advanced technology.

WORCESTER: REAL IMPACT

Social: Consumers have more control over their energy consumption; opportunity for additional incentives and redeemable awards; lower cost of living with energy savings; chance to be part of a solution that's good for the community and the planet.

Financial: During two major events the technology helped reduce the length of power interruptions, which can be very costly to business and industrial customers, by more than 75%; a resilient electric grid gives a city a leg up when competing for new business.

Environmental: Collectively, customers saved a total of 2,300 megawatt-hours; reducing the electricity load during peak demand through dynamic pricing also reduces the need to build more power plants.

Source: *National Grid*¹

¹ See https://www9.nationalgridus.com/aboutus/a3-1_news2.asp?document=10213

National Grid says the most important phase of the SES program began in early 2015 with the activation of two dynamic pricing plans: Smart Rewards

Pricing and Conservation Day Rebate. Both these plans provided participants with opportunities to lower their energy bills. During the summer of 2015, National Grid notified customers of 20 conservation days, days when demand for energy was expected to be high. On these hot and humid days, the price of electricity increased during designated hours, called peak events.

During peak events, customers utilizing no-cost in-home technologies (digital picture frames, smart thermostats, smart plugs and the online energy portal) were able to reduce energy usage upwards of 30%. The most popular action was to avoid using energy-intensive appliances during peak events.

The average residential customer using the Smart Rewards Pricing plan saved more than \$100 during 2015. The average residential customer taking the Conservation Day Rebate plan received a total of \$20 in credits for reducing their usage during the 20 conservation days. Collectively, participants in both plans saved a total of \$1.25 million in 2015.



Las Vegas: Using wireless connectivity to conserve water

Throughout the U.S., water districts and utilities face a number of critical challenges including aging pipeline infrastructure, drought, funding shortages and an aging workforce in sole possession of critical system information.



These challenges are forcing water utilities to adopt strategies that will help them evaluate and better manage the future operation of their systems.

For most utilities, buried water pipelines represent the largest value asset within their system and typically carry replacement costs

in excess of \$1,000,000 per mile. A significant amount of these assets were installed in the 1950s and are now reaching the end of their useful service life. Water main breaks are the first visible impacts of aging water infrastructure, wreaking havoc on municipalities as pipes reach the end of their service lives.

The Las Vegas Valley Water District (LVVWD) is a not-for-profit agency that began providing water to the Las Vegas Valley in 1954. The water district helped build the city's water delivery system and now provides water to more than 1 million people in Southern Nevada.

To find leaks on its large pipelines, the district would manually survey critical pipelines using sophisticated leak correlation equipment. But now, newer more advanced LTE-enabled acoustical sounding technology is enabling the district to permanently monitor for leaks on one of the community's older and most in demand water lines located in the heart of the Las Vegas Strip. Installed in the 1960s, the 30-inch water main supplies up to 7.5 million gallons of water per day to resorts, casinos and attractions.

In a Global City Teams Challenge project administered by the U.S. Department of Commerce's

National Institute of Standards and Technology, LVVWD partnered with AT&T, IBM, Mueller Water Products and the Nevada Center of Excellence to deploy Mueller's EchoShore®-TX permanent leak detection platform.

The smart technology enabled LVVWD to better understand and manage the critical water supply pipeline and to reduce any potential water loss due to leakage. The monitoring platform combines proven acoustic leak detection technology with leading-edge AT&T wireless connectivity and visual end-user dashboards to create a cost-effective monitoring solution. In Las Vegas, 13 permanent acoustic sensors are monitoring several miles of the aging pipeline installed under Las Vegas Boulevard.

"This technology allows us to be proactive," said Charles Scott, LVVWD's Engineering Project Manager. "It saves the valley water by detecting those leaks and being able to fix them before they go on for potentially years unnoticed. It puts us on the cutting edge of leak detection technology in the world."

SMART LAS VEGAS: REAL IMPACT

Social: Quicker leak detection can reduce customers' bills and lower their cost of living; reducing water loss from leaks makes it available for other needs.

Financial: Allows the water district to get more out of its aging infrastructure affordably; eliminates at least for the near term the need to dig up and replace pipes – and disrupt business and tourism – on the Last Vegas Strip; reduces the amount of non-revenue water loss.

Environmental: Since 2004, LVVWD has detected more than 1,600 underground leaks, saving an estimated 290 million gallons of water in a region severely impacted by drought conditions; also enables district to prolong use of existing assets.

Source: *Mueller Water Products*¹

¹ See <http://www.muellerwaterproducts.com/content/echologics-cutting-edge-leak-detection-las-vegas-valley-water-district-att-and-ibm>

SDG&E: Electric ‘superhighway’ brings clean energy to San Diego

The Sunrise Powerlink Project is considered the largest and most significant infrastructure project in San Diego Gas & Electric’s (SDG&E) history.



The 117-mile, 500,000 volt electric transmission line links San Diego to the Imperial Valley, one of the most renewable energy-rich regions in California.

The completion of the project in 2012 was the result of a rigorous, five-year environmental review and permitting process. This process was followed by 18 months of construction of both overhead and underground transmission infrastructure.

As SDG&E notes on its website, a reliable power grid is a cornerstone of San Diego’s \$160 billion economy and high quality of life. The Sunrise Powerlink helps keep the lights on for homes and businesses and the region moving forward.

The greatest challenge on the project was not knowing what they would encounter during the course of the construction, explained Forest Rong, Engineering Manager with Black & Veatch. “As the lead underground transmission design company for the project,” he said, “we had a deep understanding of SDG&E’s project requirements. Our engineering team worked proactively with SDG&E, material suppliers and the construction contractor to come up with unique construction solutions.”

Fiber optics were included in the 6.2-mile, 230 kilovolt (kV) underground cable system design that is part of the 117-mile system. The fiber optics are used to monitor the thermal performance of the high-voltage cable system in real time. The temperature information collected by

the fiber optics provides first-hand cable insight. This allows SDG&E to maximize power transfer capacity safely and efficiently.

In late 2014, SDG&E announced that more than 1,000 megawatts of renewable power is being delivered to the San Diego region, made possible by the transmission line. The project transmits enough energy from the Imperial Valley to power 650,000 homes.

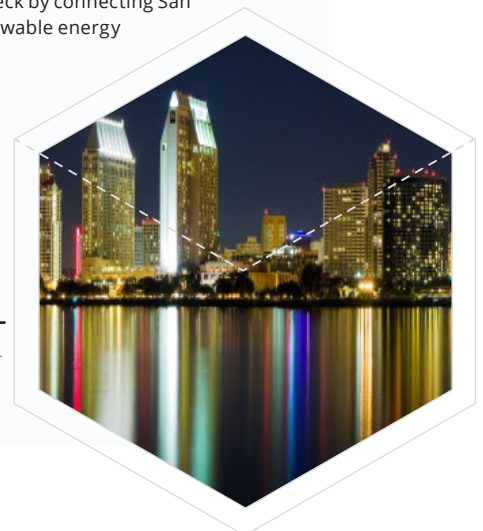
SMART SDG&E: REAL IMPACT

Social: By limiting the need to run old, inefficient power plants, the Sunrise Powerlink saves SDG&E customers over \$100 million each year in energy costs, lowering their cost of living; improves power reliability in the region; creates job opportunities in a growth industry.

Financial: Improves reliability of the electric grid, which San Diego’s economy depends on; \$1.7 billion economic investment in the U.S. and more than \$300 million in direct labor expenditures; created green jobs in Imperial Valley.

Environmental: Transmission line can tap into valuable renewable resources generated from the sun, wind, geothermal heat and other sources; helps battle climate change and keeps greenhouse gas emissions in check by connecting San Diego to clean, renewable energy supplies.

Source: *Black & Veatch¹ and SDG&E²*



¹ See <http://bv.com/Projects/sdge-sunrise-powerlink-project>
² See <http://regarchive.sdge.com/sunrisepowerlink/>

Gresham: Achieving energy net-zero in wastewater treatment

There's a good reason why Gresham, Oregon, a city of about 109,000 located east of Portland, wins awards and worldwide recognition for its wastewater treatment plant.



In 2015 the plant – which treats 13 million gallons of water daily and serves 114,000 customers – reached energy net zero. It now produces more energy than it uses, saving the city an estimated \$500,000 a year in electricity costs.

several more processes – aeration, secondary clarification and disinfection to meet EPA water quality standards – and after all of that it is discharged into the nearby Columbia River.

"Here's the awesome thing," says Gresham Mayor Shane Bemis. "What we did here is not a secret formula. It is replicable at thousands of treatment plants all over the United States."

How they do it is pretty fascinating, believe it or not. And what's especially remarkable is that just 10 or so years ago the city's wastewater treatment plant was the city's biggest energy guzzler. In a public-private partnership with Veolia North America, the city turned that around by turning methane and carbon dioxide from sewage, fats, oil and grease into heat and electricity.

Here's how the city describes the process: Wastewater enters the treatment plant, flows through a screen, which removes large objects that could damage equipment. The remaining solids are minute particles that fall to the bottom of a sedimentation tank. The particles form a mass of solids called biosolids or sludge. This sludge is removed and converted to biogas which is fed into two powerful co-generation engines that convert the biogas into heat and electricity.

The organic matter fuels about 92% of the plant's power; a 1,902-panel solar array located on-site contributes another 8% annually.

To increase its supply of biogas, fats, oils and grease are trucked to the plant from local food service establishments; the city collects a tipping fee for taking and recycling the waste. According to OregonLive.com, in a 12-month period the city made more than \$250,000 from 8,720 gallons a day of restaurant waste hauled to the plant.

The wastewater, meanwhile, goes through

SMART GRESHAM: REAL IMPACT

Social: Provides inspiration and best practices for other cities small and large; electricity not used by the plant helps families that receive energy assistance from the local utility; saves ratepayer and taxpayer dollars; helps reduce the amount of future wastewater rate increases; civic pride.

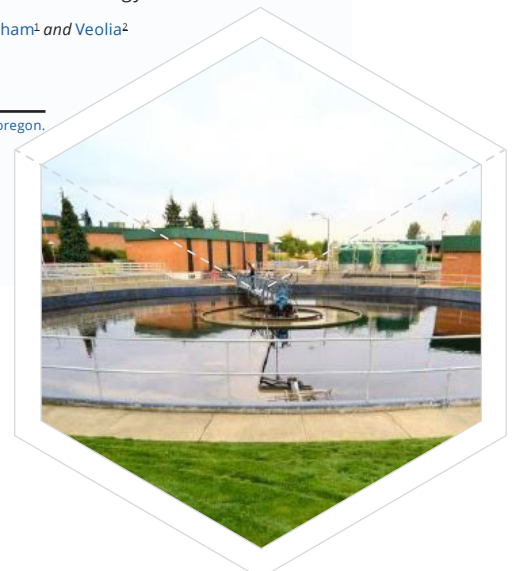
Financial: City saves an estimated \$500,000 a year in electricity costs; earns about \$250,000 annually from fees for recycling restaurant waste; provides restaurant industry a solution for its waste; saves tax dollars for other uses.

Environmental: Generates renewable energy from waste products; energy efficient; reduces emissions; uses solar power for a portion of its energy mix.

Source: City of Gresham¹ and Veolia²

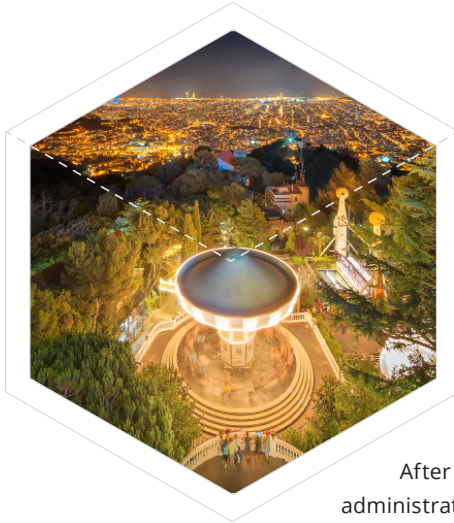
¹ See <https://greshamoregon.gov/Wastewater-Treatment-Plant/>

² See <http://www.veolianorthamerica.com/en/gresham-ore>



Barcelona: Taking the Internet of Things to new levels

The seed for Barcelona's Smart City program began more than 30 years ago when the city first installed fiber-optic lines to connect two municipal buildings. Since that time, the city has continued to develop its fiber-optic network.



In 2011, Xavier Trias i Vidal de Llobatera made integration of city technology a key component of his mayoral election platform.

After taking office, his administration immediately began implementing a comprehensive Barcelona Smart City program.

The first overarching goal was to improve efficiency of city services and to address sustainability and environmental concerns. According to Julia Lopez, who was coordinator of the city's smart city strategy at the time, the mayor wanted "to transform the lives of our citizens ... [and] the companies who are part of the city." The Barcelona Smart City program aims to provide city services at multiple levels to all citizens based on the use of Internet and telecommunications technology – taking the Internet of Things to new levels.

The Barcelona model identifies 12 areas under which smart city projects are initiated: environmental, ICT, mobility, water, energy, waste, nature, built domain, public space, open government, information flows, and services. In 2014, the city had 22 major programs and 83 separate projects that fit into one or more of those 12 areas. Some of these projects include smart lighting, smart parking, smart water management and smart waste management.

Along the way, the city's Deputy Mayor Antoni Vives said that by 2014 these efforts had resulted in 47,000 new jobs in the city.

Barcelona has structured its various smart city projects in three technological layers:

The first layer consists of sensors that have been deployed throughout the city in conjunction with the various projects.

The second layer is the City OS, a platform to aggregate and analyze data gathered from various city applications.

The third layer of the "urban platform" is the sharing of data and analytics provided by the City OS with both clients within the city government and external data users.

SMART BARCELONA: REAL IMPACT

Social: Smart lighting improves public safety and convenience; free 24/7 telecare service helps improve the lives of elderly and disabled citizens; zero emission mobility initiative and air and noise sensors reduce pollution and improve quality of life; lower water bills contribute to lower cost of living; free Wi-Fi access points improve access to the Internet; parking apps and bike sharing improve urban mobility for citizens and tourists.

Financial: 47,000 new jobs created through smart city efforts as of 2014; savings of \$58 million annually from smart water technology; parking-fee revenue up \$50 million annually with smart parking system.

Environmental: Smart meters increase energy efficiency; zero-emission mobility options, smart parking and transportation management reduce congestion and carbon emissions; remote irrigation control for green spaces enables water efficiency and conservation;

Source: *City of Barcelona*¹ and *Cisco*²

¹ See <http://smartcity.bcn.cat/en>

² http://www.cisco.com/assets/global/ZA/tomorrow-starts-here/pdf/barcelona_jurisdiction_profile_zs.pdf

Medellin: Driving mobility with inclusion and intelligence

Medellin was once known for cocaine barons and murder, but Mayor Sergio Fajardo and his predecessors led such a transformation that in 2013 Citigroup ranked it the world's most innovative city.



A year later, the capital of Colombia's mountainous Antioquia province and the country's second most populous city, made Business Insider's list of most innovative cities. Business Insider

noted that Medellín "was once one of the world's most violent places, but the South American city is now a case study in urban revival. One example: Clever city planning, including the use of gondolas and escalators, has cut hours-long commute times to minutes."

And Boyd Cohen, who has been using a [Smart Cities Wheel](#)¹ to evaluate world cities for the past several years, writes in Fast Company about Medellín's progress: "The much talked about (and deservedly so) introduction of gondolas and electric staircases implemented to support the integration of the poorer hillside communities with the rest of the city have become an icon for inclusion and smart transit."

The city's smart mobility system – Sistema Integrado de Movilidad de Medellín, or SIMM – has through monitors and controls at its operations center improved mobility in the city of nearly 2.4 million. It's also credited with reducing accidents and improving incident response times.

SIMM integrates information and communications technologies with its transportation infrastructure and various models of transport. Among its capabilities are closed circuit television cameras and road sensors for traffic monitoring and real-time incident detection; variable messaging panels on high-traffic road-

ways, traffic light network controls and online and mobile user information.

Another important piece of the SIMM effort to improve mobility is a fleet management requirement that buses are equipped with digital devices that enable real-time collection and transmittal of data so they can be monitored for compliance with speed limits, approved routes, passenger pick-up zones, etc.

SMART MEDELLIN: REAL IMPACT

Social: Traffic infractions reduced by 80% in monitored sites; 14% to 24% fewer accidents for every 10,000 vehicles (depending on type of monitoring systems); improved mobility options due to real-time messaging on roadways and via online and mobile apps; 7% reduction in response times to traffic incidents and 193,840 hours of congestion saved in 2014 over 2010 as a result of the reduction in response times; 74% fewer drivers fined for speeding and 69% fewer fined for running red lights; safer, more secure roads; reduced trip time;

Financial: The Mobility Secretariat uses public-private partnerships and collects a percentage of fees for registering drivers and vehicles, also for infractions and the like; revenue grew from US\$9.3 million in 2011 to US\$14.2 million in 2014; cities with quality transportation systems are sought after by business and industry which can boost tax and employment bases.

Environmental: Smart transportation management makes roadways more efficient, reducing pollution and fuel consumption; more convenient and accessible public transportation attracts more riders, again reducing roadway congestion; smart technologies allow cities to spend resources wisely and prioritize future needs based on demand; monitoring and analytics enable better asset management.

Source: [Inter-American Development Bank](#)¹

¹ See <https://publications.iadb.org/bitstream/handle/11319/7716/International-Case-Studies-of-Smart-Cities-Medellin-Colombia.pdf?sequence=2>

¹ See <http://www.cityoflando.net/greenworks/cep/>

Dubai: Embracing smart technology for a happier city

Dubai, the bustling, ultra-modern city of 2.5 million in the United Arab Emirates, already boasts a growing list of smart city credits – free citywide Wi-Fi, a mobile government initiative, parking apps, smart healthcare programs among them.

But it's not done yet. Dubai will host World Expo 2020 and will use it as a platform to unveil its vision of leveraging the Internet of Things to become the world's most connected and sustainable city.

Organizers say the Expo will create 277,000 new jobs in the UAE, bring 25 million visitors and spur an economic infusion that could reach \$40 billion.

But perhaps most noteworthy about Dubai's smart city agenda is the motivation behind it. His Highness Sheikh Mohammed Bin Rashid Al Maktoum, Prime Minister of the UAE and Ruler of Dubai, has made it clear he wants Dubai to be the happiest city on earth by the end of the decade.

SMART DUBAI: REAL IMPACT

Social: Car sharing and smart parking apps improve mobility and reduce both costs and emotional stress associated with driving on congested roads; free citywide Wi-Fi provides 24/7 Internet access; open data promotes transparency and opportunity for citizens; smart apps and government health insurance help ensure all residents have access to medical care; improved mental well-being from living in a society focused on happiness.

Financial: Dubai Government saved 4.3 billion dirham (Dh) between 2003 and 2015 by adopting smart initiatives; Dh5.6 was saved for every Dh1 spent; efforts to streamline urban mobility and free citywide Wi-Fi are attractive to business; encouraging public-private partnerships drive economic growth and value; motion detecting smart streetlights reduce operational costs.

Environmental: Smart parking app was downloaded 120,000 times in first six months with usage reducing congestion, emissions and fuel usage; motion detecting smart streetlights lower energy use and carbon impact; 97% of Dubai water and electric customers receive their bills digitally, helping the utility eliminate over 1,000 tonnes of carbon dioxide emissions since 2012 and reducing the number of trees required for paper bills.

Source: Smart Dubai Office¹

¹ See <http://www.smartdubai.ae/story060202.php>

To make that happen: “The Happiness Agenda will pursue a scientific framework to enable the city to: provide opportunities that lead to positive emotions and feelings such as fun, joy, and other hedonistic pleasures; allow people the ability to access services in an easy, efficient, convenient and seamless way; help people achieve a high sense of well-being and satisfaction with their lives; support people in engaging and meaningful activities that maximize their sense of purpose and pleasure.”



To gauge the level of happiness among its citizenry, Dubai uses the Happiness Meter – a live, citywide sentiment capture engine. As the city explains it, with its centralized data dashboard a map of happiness across the city can be created, which allows private sector and government entity hosts of Happiness Meter touch points to relate and rank customer experiences – satisfied, neutral or dissatisfied -- within industry sectors and geographic areas, as well as differentiate between direct and web-based interactions.

Gulf News reported¹ in May 2016 that during a nine-month period, government services in Dubai scored 89% on the happiness index, based on feedback from more than two million customers across 38 entities. Dubai Customs was deemed the best government entity at achieving happy customers. The customs department, after implementing smart systems to improve the customer experience, installed devices in 46 customs locations and centers to collect daily indications of how happy the visiting customers are. Minimizing its transaction completion time to just 20 seconds for valid, risk-free transactions was no doubt one reason for its high ranking.

¹ See <http://gulfnews.com/news/uae/government/dubai-government-services-score-89-on-happiness-index-1.1836426>

Chattanooga: Smart grid and gigabit service bring jobs

When Chattanooga's municipal utility, EPB, needed better connectivity for its self-healing smart grid, the city used the same fiber optic backbone to provide ultra-fast broadband connectivity.



A 2015 study by a University of Tennessee economist found that Chattanooga's much heralded smart grid and citywide gigabit Internet service had resulted in at least 2,800 new jobs and added \$865.3 million to the local

economy. The study also indicated a reduction in power outages and better

Internet services attract new businesses.

EPB spent some \$220 million to install fiber optic cable throughout its service territory and received a \$111.7 million federal stimulus grant to help develop its smart grid.

"This analysis suggests that the true economic value of the fiber infrastructure is much greater than the cost of installing and maintaining the infrastructure," study author Dr. Bento Lobo told the [Times Free Press](#)¹.

Beyond the jobs and economic advantages, when Chattanooga's smart grid was installed in 2011, it became the backbone for a variety of smart city functions:

- Ultra-high-speed Internet, voice and video access to all residents
- A citywide Wi-Fi network for use by the city and the utility
- Streetlight controls
- Surveillance cameras
- Enhanced police and fire response

And the smart grid is no slouch either, offering high-speed grid monitoring and control system along with S&C Electric's IntelliRupter circuit reclosers at key points along the power lines.

¹ See <http://www.timesfreepress.com/news/business/aroundregion/story/2015/sep/15/study-finds-epb-fiber-optics-generates-over-865-million-benefits-chattanooga/325235/>

Those smart switches allow operators to pinpoint the location of an outage, cutting down on the need for physical inspectors while saving hours or even days.

When a large storm hit in July 2012, the utility saw a 55% reduction in outage duration – an estimated 58 million avoided minutes of customer interruption. Thousands of customers had their outages restored remotely, doing away with the need to roll a truck and crew. Expedited restoration saved EPB \$1.4 million for that one storm, not counting the benefits to residents and businesses. The city estimates that reduced outage times will save EPB \$6 to \$7 million per year in costs while saving area businesses \$40 to \$45 million.

The University of Tennessee at Chattanooga has projected the total economic and social benefits at \$600 million over the first 10 years.

SMART CHATTANOOGA: REAL IMPACT

Social: High-speed Internet access for all residents as well as education and healthcare facilities; increase in job opportunities; fewer power outages and shorter duration when they do occur; ability to monitor energy consumption and reduce utility bills; enhanced public safety; better quality of life.

Financial: Addition of 2,800 new jobs and \$865.3 million to the local economy; high-speed Internet improves business productivity; attracts new business and in-demand skilled workers; saves area businesses \$40 to \$45 million in reduced power outages and duration; expedited power restoration saves EPB millions; smart meters and other devices promote greater energy efficiency and cost savings.

Environmental: Ability to integrate renewable energy; reducing need to build more power plants; smart metering enables greater energy efficiency that cuts carbon emissions and reduces air pollution.

Source: [Times Free Press](#)² and [Smart Cities Council](#)²

¹ See <http://www.timesfreepress.com/news/business/aroundregion/story/2015/sep/15/study-finds-epb-fiber-optics-generates-over-865-million-benefits-chattanooga/325235/>

² See <http://smartcitiescouncil.com/resources/smart-grid-backbone-smart-city>

APPENDIX



About the Smart Cities Council

There is no other organization like the Smart Cities Council. We act as a market accelerator and advisor to cities – advocating for the transformation of urban areas into more livable, workable and sustainable communities. The Council is a coalition of leading technology companies with deep expertise in areas such as energy, water, communications and transportation. We have come together to provide a collaborative, vendor-neutral framework to guide cities through their smart city planning and implementation. We envision a world where technology and intelligent design are harnessed to create smart and sustainable cities where compassion and inclusivity reduce suffering and bring prosperity to all.

The Smart Cities Readiness Guide¹ is intended for mayors, city managers, city planners and their staffs. It helps cities help themselves by providing objective, vendor-neutral information to make confident, educated choices about the technologies that can transform a city.

The Smart Cities Readiness Program² provides a comprehensive menu of training and events, workshops, and action planning that enable cities to transform.

1 See <http://readinessguide.smartcitiescouncil.com/>
 2 See <http://smartcitiescouncil.com/article/smart-cities-council-readiness-program>

The Global Alliance of Smart Cities Councils³ includes regional councils in India and Australia/ New Zealand and is currently considering proposals from other regions interested in joining our network.

The Compassionate Cities initiative⁴ launched in early 2016 aims to reduce suffering in cities by educating leaders and other community stakeholders on how to apply existing smart technologies – from data analytics to social media – to improve living standards for all citizens.

3 See <http://smartcitiescouncil.com/readiness-guide/introducing-global-alliance-smart-cities-councils>
 4 See <http://smartcitiescouncil.com/article/compassionate-cities>



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Smart Cities Council 2017 commitments to White House include 5 Challenge grants

As part of the Obama Administration's efforts to accelerate development of smart cities, the Smart Cities Council will award five Challenge grants to help five American cities apply smart technologies to improve urban livability, workability and sustainability. For each of the five winning cities, the Council will deliver a tailored one-day Readiness Program during the 2017 calendar year. A number of Council partners and advisors have also committed to support the effort as follows:

Ameresco will consult with each of the five cities on optimizing smart street lighting

AT&T will provide up to 25 AT&T IoT Starter Kits

CH2M and Qualcomm Intelligent Solutions, Inc. will host a one-day follow-on workshop for each city to develop and deploy a smart cities ecosystem

Computing Technology Industry Association (CompTIA) will provide training, software and access to educational materials

Dow Building and Construction will provide consultation on optimizing building design as part of a smart cities ecosystem

IDC will provide each city with a comprehensive Smart City maturity benchmark

Sensus will provide each city a hosted smart city communication network

Telit will provide each city free access to the Telit IoT platform

TM Forum will provide its expertise and its Smart City Maturity and Benchmark model

Transdev will provide up to three days of technical assistance to look at ways of providing new and more efficient mobility options

SmartCitiesCouncil

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To tap into the transformative power of smart technologies, cities need trusted, neutral guidance. The Council's network of world-class Partner companies and Advisors provides that help.

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Pew Charitable Trusts, American Cities Project
Pedro Ortiz, Senior Urban Consultant, World Bank
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