# SMART CITIES FINANCING GUIDE

*Expert analysis of 28 municipal finance tools for city leaders investing in the future*

Developed by the Center for Urban Innovation
at Arizona State University

SmartCitiesCouncil
LIVABILITY | WORKABILITY | SUSTAINABILITY

# Foreword

Cities everywhere are challenged by congestion, pollution, crime, aging infrastructure, falling budgets and many other issues. They need new strategies and new technologies to address those challenges.

Smart technology is a key piece of the solution.

But smart city projects come with price tags.

And many smart technologies are relatively new and haven't established the kind of track record financiers want to see, which makes securing capital investments even more challenging.

Happily, there are numerous financing tools available to help cities and regional governments pay for smart city projects.

This guide highlights 28 of the most promising — including alternatives to the traditional funding mechanisms municipalities have used for decades. It also includes:

- Detailed analyses of each option based on 10 characteristics to help decision makers easily identify the best tools for specific types of projects.
- Examples of how these tools are being used today..

The Smart Cities Council is grateful to the Arizona State University Center for Urban Innovation for the financial expertise and insights that made this Smart Cities Finance Guide possible. Please refer to page 76 to learn about the authors and the Center.

*Jesse Berst,*

*Chairman, Smart Cities Council*

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# Chapter 1: City Financial Challenges and Opportunities

In 2008, the world passed a milestone. That year, over half of the world's population lived in urban areas. There's no foreseeable end to the trend that has today's cities expanding at an unprecedented rate and new cities emerging. The world's total urban area is expected to triple between 2000 and 2030 and urban populations could double in that same timeframe.

Such rapid urbanization carries significant implications for the world's ecosystems as outlined in a 2012 United Nations report. Of critical concern is the growth in the number of mega-cities emerging in Asia, South America and Africa. In 2011, the World Bank listed 26 cities with an urban population over 10 million inhabitants and nine of them exceeded 20 million. These mega-cities – places like Tokyo, Mexico City, New York City, Mumbai, Karachi, and Beijing – are enormous. And they're expanding beyond traditional city boundaries into dynamic regional entities.

As critical economic hubs, cities contribute to national stability and growth. Yet they are typically resource-constrained – a reality that becomes increasingly burdensome as burgeoning populations put increasing pressure on often inadequate and outdated infrastructure, from water and sewer systems to transportation networks. And these cities will remain fragile and struggle under the demands of a swelling population unless we find ways to move the needle on making them more sustainable.

One solution we're seeing in pioneering cities around the world is the use of advanced information and communications technologies (ICT) to make infrastructure smarter and more sustainable. By design, ICT-enabled cities – or ***smart cities*** – are more resilient during times of distress due to effective resource allocation and infrastructure management.

## No one said infrastructure upgrades would be easy

Still, upgrading physical infrastructure with smart technologies is often a huge challenge for cities. One example is Mumbai, India's most populous city, where the physical infrastructure is already so fragile that simply keeping it relevant and usable in the face of an exploding population is an enormous undertaking. Finding the wherewithal to take it to the next level – to implement innovative technologies that are both sustainable and financially feasible – isn't easy.

Yet Mumbai is managing to do it. In 2012, smart meters from Itron, a Smart Cities Council Global Partner, were placed on the system that supplies tap water to Mumbai. The meters helped find leaks and discourage waste so more residents could get water. The system ultimately cut water losses by 50%.

Making city infrastructure operate more efficiently with advanced technologies, like the smart water meters installed in Mumbai, has become an imperative for public officials, scholars and citizens seeking solutions to the growing environmental ills and urban challenges that cities face. As advocates of smarter cities, they recognize the important role ICT plays in driving economic competitiveness, environmental sustainability and general livability.

They see how:

- Smart meters can monitor and incentivize energy and water conservation
- Electronic road pricing, sensors and tolling can regulate traffic and lower congestion
- Public safety departments can use predictive analytics to target crime hotspots

Integrating intelligent infrastructure with city-wide connectivity and data analytics – three foundations of a smart city – provides situational awareness that makes possible some amazing developments. For example, Singapore crunches data to predict traffic jams while there is still time to minimize their effects. Rio de Janeiro can predict just where flooding will occur from a particular storm, so emergency crews and evacuation teams know just where to go.

## Promise of smart cities vs. the challenge of paying for them

Clearly, the emergence of innovative technologies to help cities become smarter holds great promise. Yet a significant challenge remains: *finding ways to finance the much-needed infrastructure upgrades.*

Cities and other public entities hoping to upgrade infrastructure with smart technologies must find investors and financial institutions willing to finance smart projects in an environment still cautious after one of the most significant global economic crises in generations. Financing smart infrastructure projects is expensive and requires creative approaches that focus on both short-term and long-term goals.

Cities have been slower to emerge from the financial crisis and many are desperate for ways to bring in cash to offset depressed tax revenues and longer term cuts in federal support. Unfortunately, such desperation combined with limited financing information has led to some poor decisions on the part of public officials.

Wisely funding technology investments is critical to the realization of smarter cities. Certainly some technology investments are a one-time event, but most are operationalized in the context of projects. These projects are often complex undertakings, involving longtime horizons, multiple stakeholders and risk.

## Matching the project to the financial tool

Part of the challenge for cities is in selecting the right tool at the right time. As you read through this guide you can familiarize yourself with numerous financing options available for various types of smart city investments and see which ones are most appropriate for specific types of projects. For instance, the European Commission expects energy consumption to rise by 50% over the next 20 years. That increasing demand for energy and the need to reduce environmental pollution are issues cities everywhere must address. Renewable energy is one obvious solution — but renewable energy projects are extremely capital intensive. The nature of capital projects is that there is a large front-end investment with the benefits captured over the life of the project. Consequently, these are often financed with some kind of long-term financing package. Renewable projects, e.g., solar power also have other challenges; without some kind of subsidy, revenues can't cover operating costs and a return of and on capital. A public-private partnership may be a viable option with this sort of project.

### Chicago's tough lesson in finance

As we've said, many smart technologies are relatively new. Models that compare various financing tools to fund investments are not yet available. That forces instigators of smart projects to do the best they can with the knowledge and resources available. And costly mistakes can happen. That was the case in Chicago where a string of public goods were privatized so the city could receive immediate income. A particularly striking example was in 2008 when Chicago leased its parking meters to a private concessionaire for a 75-year period in return for about $1.2 billion in upfront cash; a sum the city's inspector general calculated was about $974 million less than the concession was worth, according to a Bloomberg report. The manner in which the deal was done caused a public uproar and the sudden and steep increase in parking fees triggered a lawsuit. In the end, the city had to pay a consortium of plaintiffs $8.9 million for procedural wrong-doing.

*Lack of due diligence in financial deals can be costly .*

The challenge with many of the newer smart city technologies is that would-be investors see them as high risk because the ROI is uncertain. On the other hand, Many projects that have uncertain ROIs can be financed through traditional sources, albeit with lower levels of debt financing. However, projects that embody some element of technology risk– first-of-a-kind projects, for instance – cannot attract debt financing and generally require guarantees or other forms of credit support (or all equity financing).

The financing options outlined in this guide generally fall outside the realm of early developmental venture capital. Rather, the tools highlighted in the pages that follow fall into four general approaches:

- Government-based financing tools
- Development exactions
- Public-private partnerships
- Private fund leveraging options

You'll see details about each tool, case studies where they are being used and a standard scheme for evaluating them as a potential tool for any given capital project, including common pros and cons with each.

But first, let's quickly consider "The Project."

## That's a capital idea

Financially viable capital projects play a starring role in sustainable development. We're referring, of course, to projects cities undertake to construct, retrofit, restore or upgrade capital assets. Municipal buildings, sewer lines or local roads are common examples. Capital projects are both important and

### Table 1: 28 Municipal Finance Tools at a Glance

| Government-based Finance Options | Development Exactions | Public and Private Options | Private Sector Leveraging |
|---|---|---|---|
| General Obligation Bonds | Dedication Requirements | Public-Private Partnerships | Loan Loss Reserve Funds |
| Revenue Bonds | Tap Fees | Pay for Performance | Debt Service Reserves |
| Industrial Revenue Bonds | Linkage Fees | Securitization and Structured Finance | Loan Guarantees |
| Green Bonds | Impact Fees | Catastrophe Bonds | On-Bill Financing |
| Qualified Energy Conservation Bonds | | | Pooled Bond Financing |
| Social Impact Bonds | | | Pooled Lease-Purchasing Finance |
| Public Benefit Funds | | | Value Capture |
| Linked Deposit Programs | | | Tax Increment Financing |
| Energy Efficiency Loans | | | |
| Property-Assessed Clean Energy Programs | | | |
| Greenhouse Emissions Allowance Auctions | | | |
| User Fees | | | |

*Historically in the U.S., the federal government shouldered the cost of major infrastructure  like the interstate highway system.*

challenging because, as the name implies, they require capital.

By their nature, these assets have a long expected life cycle. So the goal in financing them is to spread the payments over the life of the asset, which requires a revenue stream to cover the financing repayment as well as a return to investors.

Historically, public sector entities took on the financing of major physical infrastructure development. A familiar example is construction and repair of the U.S. interstate highway system, which is financed primarily by the federal government because the benefits accrue to the nation as a whole. Highways that crisscross the country facilitate travel for citizens, but also the movement of goods to market. Most would agree that economic development and aggregate wealth in the nation has risen due in large part to the interstate highway system.

Given today's political and budgetary climate, relying on historical support from either federal or state sources is not as viable an option for U.S. cities as once was the case. Nor does it seem likely we'll see another stimulus program like the 2009 American Recovery and Reinvestment Act anytime soon. The numbers below tell the story:

- From 2000-2010, the U.S. government averaged $300 billion per year in support to state and local governments solely for infrastructure maintenance
- Since 2010, that average has dropped to $150 billion at the same time public works specialists projected the amount should have been increased to $450 billion just to keep up with the current level of disrepair.

Many would argue this reduction in infrastructure support is the new reality in the U.S.

Yet cities are increasingly rising to the challenge in creative ways — exploring new opportunities to work together on shared infrastructures and investigating new funding tools and partnerships that rely more heavily on private investors and private sector sources.

## From the financier's perspective

When approached with a new project, financiers typically take a critical look at similar capital projects to understand the expected feasibility, viability and profitability. As we've mentioned, this can be a challenge for city leaders with capital intensive projects that leverage newer technologies. With limited information on how a new project might perform, risk associated with the investment increases. And with increased risk, the cost of capital will likely increase too. While this is true of any project requiring financing, the challenge is more acute with newer technologies that have yet to prove out or achieve scale.

That's where creative financing models enter the picture, as you'll see in the pages that follow.

# Chapter 2: 10 Characteristics of Finance Options

Never before have cities had quite so many new technologies to evaluate. Yet the speed and breadth of technology advances – exciting as they are – also pose some real challenges for decision makers: Which investment is the best for the community – and when? And how will the community pay for it?

While financing options are not evolving quite as fast as technology, they are evolving nonetheless. But before we drill down on specific options, let's look at the 10 characteristics that should help decision makers see how different types of projects in different types of communities demand different types of financing. This chapter will focus on these characteristics:

1. Sources of capital
2. Number of parties
3. Ease of securing financing
4. Duration of financing
5. Risk to investors
6. Risk to borrowers
7. Tax implications
8. Source of repayment
9. Advantages
10. Disadvantages

## 1. Sources of capital

A concern when considering finance options is the source of the capital generated by the tool. There are multiple possibilities ranging from dedicated fees for service, targeted tax tools, general tax sources, private investors or even philanthropic support.

Understanding the source of the capital is important for three reasons:

- Such awareness will help decision makers understand the institutional context of those responsible for the capital financing decision.
- This institutional understanding will help decision makers be as sensitive as possible to the risk concerns of investors.
- That risk concern will help in constructing the request for financing by highlighting certain aspects of the project that address risk drivers.

## 2. Number of parties

Rarely is financing for capital intensive infrastructure projects determined by one person. Normally boards are involved with various members bringing their values and concerns to the decision. Depending on the source of the capital, the parties involved in the financing decision may have conflicting goals or different values. For instance, in a public-private partnership, the values of the public officials will not be driven primarily by a profit motive, as it logically will be for private investors.

Understanding the number and identities of the parties involved in a financing decision will enable a clearer presentation of the project to address everyone's goals. Still, the more parties that are involved, the more challenging the financing is likely to be. The least challenging, of course, are those rare cases where an agency can self-finance its infrastructure investment without reliance on external funding.

## 3. Ease of securing financing

Not all finance mechanisms provide the same level of accessibility. Some are relatively easy compared to others, and much of the ease is dictated by how sensitive the option is to the risk associated with the project. Another factor that can make securing financing easier is the extent of control the financing agent (whether a utility, local government, limited partnership, etc.) has over the revenue stream dedicated to paying off the investors. The "safer" or more predictable the revenue stream dedicated to repaying the upfront financing is, the easier the financing will be.

For instance, in a tax increment financing (TIF) arrangement, the revenues to repay upfront financing are tied to future (and therefore speculative) increased land values or taxes. Because of this speculative aspect, local governments that seek financing based on TIF arrangements often have to back up the future revenues with promises of other revenues should the future development not materialize. That guarantee lowers the risk and eases the likelihood of financing in such a scenario. As discussed below, lower risk also lowers the cost of borrowing.

Ease also involves how stakeholders perceive the option. If stakeholders buy into the project and the financing model, securing the financing can be easier than when they do not. Some of this ease has to do with how the model and its transparency are communicated.

Each tool presented in the guide is scored on this "ease of securing finance" characteristic. The scoring ranges from one (very easy) to five (very difficult). The score takes into account factors such as control over dedicated revenue streams, how many parties are involved in the decision, risk elements and interest costs.

## 4. Duration of financing

Different kinds of projects will need different kinds of financing tied to them. Some projects are relatively short term, focusing for instance on material procurement only. In those situations, short-term financing tools will be most appropriate. Other situations may call for medium-term financing. For example, cities and transit agencies have to finance bus fleets. Such assets have a 12-year or a 500,000 mile recommended life expectancy (though currently the average retirement age for public transit buses has risen to 15.1 years due to budget pressures). Medium-term financing tools would be appropriate for replacing buses on schedule (or other similar capital assets). And this actually saves money in the long run since the maintenance costs for vehicles beyond their recommended life are 10% to 50% higher. Regardless, dedicated transit funding must be available to repay the costs of the upfront capital borrowing.

In situations involving financing an infrastructure asset, such as a major bridge or building, decision makers need access to financing tools with longer time horizons, as these assets have expected lifespans that often exceed 50 years. These projects also tend to have significant upfront costs for construction and thus will require access to deeper pools of finance capital.

For purposes of classifying each of the finance options, each tool is scored in terms of its most common duration usage:

- Quick tools are those that typically finance projects of a year's duration.
- Short-term tools are for projects of a two- to five-year duration.
- Medium-term tools fund projects with a six- to 15-year duration.
- Long-term tools target capital projects with lifespans that exceed 15 years.

Finally, some finance tools are actually ongoing sources that are supported with ongoing dedicated revenues, such as a surcharge on a fee for service collected by a utility. The revenue generated by the surcharge could be dedicated to ongoing infrastructure improvements, a practice common in the telecommunications industry.

## 5. Risk to investors

Investors want a return that is commensurate with the risk. Buyers of municipal revenue bonds buy based on an assessment (contained in the offering memorandum) of the revenues generated to pay bond principal and interest with the expectation that both will be repaid. Equity investors, for example in a public-private partnership project, take more risk and receive higher returns.

However, since infrastructure projects that utilize newer technologies are often perceived as riskier, public entities needing capital to finance them must still rely on transitional sources. The challenge is in communicating the project to the finance community in a way that convinces them the project is not only viable, but so is the fiscal health of the borrowing jurisdiction.

On that latter point, think about Detroit, Michigan or Stockton, California. Both cities have significant infrastructure investment opportunities, but their fiscal health will undermine investor confidence. In cities with serious financial challenges, even if an infrastructure project is a success — smart heating and cooling systems that yield real savings, for example — the jurisdiction's ability to repay on the debt incurred to install the systems is still an issue.

In a project that is expected to lower energy consumption costs, it's unlikely the savings projections alone will overcome investor concerns. What if the savings don't materialize? In situations like this, borrowers may need to spread the financing (and therefore the risk) across multiple sources. Perhaps it's a revenue bond in combination with available cash from the general fund (or private equity if a public-private partnership). Or as happens more commonly, borrowers may need to provide additional guarantees of payment from other revenue sources to alleviate investor unease.

Risks take many forms. For purposes of classifying each of the finance options we'll discuss in the following chapters, risk to investors is graded simply from very low risk (1) to very high risk (5). These scores take common aspects of risk into consideration to generate a relative score on that one-to-five scale.

## 6. Risk to borrowers

Investors aren't the only ones facing risk in a finance decision. Those borrowing the capital (or those they represent) also face risks that decision makers should keep in mind when determining the relative merit of one funding option versus another. Most of this risk relates to how commitments to pay back borrowed capital are structured relative to the likelihood that the new technology and/or infrastructure will generate the savings or revenues to the extent necessary to cover the borrowing costs.

If a jurisdiction borrows a significant amount of upfront capital for the construction of a bridge with the intent that tolls from bridge users will cover the payoff costs, then this can work fine under the assumption that demand for the bridge yields sufficient tolls. But many toll roads in the U.S. have failed to generate the toll revenues anticipated. And that means jurisdictions have to raise tolls (which drive more users away), dip into general funds to pay the difference, or sell the asset to try and get out from underneath the debt burden.

As with risk to investors, each finance tool is also scored on a five-point scale (very low to very high risk). The score takes into account various risk factors to provide a relative score that decision makers can use to compare against other tools.

*Investors look for a reasonable return at an acceptable risk level.*

## 7. Tax implications

It's important to understand the goals of all of the parties involved in financing smart technologies. For cities interested in creating more sustainable infrastructure, financing is a means to achieve that goal. For an investor, the financing goal is to achieve a reasonable return at an acceptable level of risk.

In some instances, finance markets are unable to overcome the risk-to-return ratio and governments may intercede to try to alter one or both sides of the ratio by mitigating risks and/or by increasing the likely return to the investor. To increase the appeal of investing in public sector projects involving infrastructure and smart technologies, governments have created a family of bonds that accomplish both. Here's how:

- The interest paid to investors on these kinds of bonds is exempt from federal taxation.
- If the buyer of the bond lives in the state where the bond is issued, then the buyer is also exempt from state income tax on the interest paid.
- The rate of return is slightly lower than non-tax exempt bonds, but historically municipal bonds have been insured against default so return is highly likely.

Many of the tools presented in the next chapter are tax exempt.

## 8. Source of repayment

Financing tools are basically instruments to facilitate borrowing today and repayment over some period in the future — plus interest. As capital is repaid, it and the interest become available for additional financing of other investment options which in turn fuels additional capital growth.

This system breaks down if repayment fails to materialize. It's the risk of this failure that investors want to minimize. Some instruments are evaluated and scored by ratings services — Moody's, Standard & Poor's and Fitch, for example — to help investors gauge how risky the borrower is. Meanwhile, some instruments are government-backed, but some governments are not good credit risks. In this guide each tool is also assessed on the source responsible for repayment of the obligation.

## 9-10. Advantages and disadvantages

In addition to the eight characteristics above, this guide also highlights some of the advantages and disadvantages of each of the tools. These are all tools that can be used individually or in coordination with other tools to provide capital financing for a wide range of evolving technologies and infrastructure needs. Therefore, one score across all six characteristics is not going to be truly useful as an indicator of the best tool to choose.

Rather, the best tool will depend on the project to be funded. So in addition to the evaluation scores, you'll see that each tool we highlight includes a brief description of the possible advantages and disadvantages associated with it.

## Financing tool availability can vary from city to state to country

The financing tools highlighted in this guide are available in the United States today. Most are also available in European Union nations as well, though some go by different names. But not all of the tools are available in every nation.

Furthermore, the tools may be limited to different kinds of projects from nation to nation. This is true even within the U.S., as some of the state-based tools apply only to certain types of investment projects.

So while this guide illustrates 28 tools, those interested in utilizing them should do their due diligence in learning if and how such tools can be used in their location.

## Success is not guaranteed; why failures happen

One final consideration before we get into the finance tool chapters. Any of the 28 tools presented in this guide have the possibility of success. But they can also fail. Here are four examples of why that happens:

- **Seeking benefits without doing adequate research can lead to higher costs and lower returns.** Here's a scenario: A facility engineer takes on a lighting replacement project that includes replacing 4,000 lamps and 1,000 fixtures with a new and seemingly better system. The new system does achieve lower lamp wattage with a higher lumen output and lower mercury content. But the engineer didn't know that the previous lamps lasted 35% longer than the replacements. He also didn't realize the mercury content in the new lamps were only a decimal point lower than the previous lamps. And he discovered that half of the fixtures did not fit so they were unusable. Bottom line, the project cost his organization more money than it needed to pay.
- **Market failures can be widespread and intrinsic.** Intrinsic features of a system can include information problems, imperfect competition and resource allocation based on existing information and experience and not on opportunities. In 2006, Nicholas Stern, author of the Stern Review, claimed that climate change is the world's biggest market failure ever. Since market prices are supposed to reflect the costs of production, the problem is that the market had not accounted for the costs of greenhouse gas emissions. To remedy the market failure, Stern called for mitigating actions to reduce emissions through a global carbon tax.
- **Funding and model mismatch can occur when funds are not structured or timed appropriately.** This can lead to elevated fixed costs, freezes in resources and lower project quality. Additional problems occur when the model isn't relevant to the local market or conditions. This often happens when adopting a model that had success elsewhere without taking into account localized information that considers the environment and economy. For instance, many refer to India's budding tech city, Bangalore, as the new Silicon Valley. Although growing, Bangalore is nowhere near the success of Silicon Valley. Many believe the reason for this is the adoption of a model that was not the best fit for India. Simply put, there are fewer Indian technology entrepreneurs when compared to the U.S. Many say this is because of educational style differences. Where the U.S. education system is more liberal and allows students to focus on their interests, the Indian education system is more rigid and less supportive of students pursuing their own paths.
- **Accountability to stakeholders is careless.** Not to be confused with control, accountability involves reporting on the development of the project and the achievement of pre-determined outcomes and impacts. Accountability assists with eliminating unrealistic expectations through the course of the project. Not managing expectations with stakeholders can give rise to situations such as the established funding period being too brief — a common problem with financing in the private sector.

In the next few chapters we'll drill down on specific financing options in which federal, state and local governments, private sector and philanthropic interests can participate to bring smart technologies to their cities. The options fall into four general categories: government-based finance options, development exactions, public-private partnerships and private fund leveraging tools.

# Chapter 3: Government-based Financing Options for Cities

General funds in most cases are supported by a city's taxation authority as their primary source of revenue to pay for services citizens expect their city to provide. But general funds are usually only available to pay for regular annual operating expenditures.

Many city projects involving smart technologies represent infrastructure upgrades that last well beyond one year. So to protect citizens, cities also maintain capital funds separate from their operating funds. These are used to repay the financing of long-term investments in infrastructure with lifespans over many years.

Under the model of public finance, governments issue debt instruments with an agreement to pay back the debt, usually over the lifespan of the item being financed at some agreed-upon interest. By far the most common family of tools to pay for these kinds of capital costs is a government's bond activity.

Bonds are an important method of financing smart cities. Most bonds are issued by governments or corporations with an underwriter that provides the borrower with the full amount of the financing by buying all the bonds issued and then reselling them to investors at a profit on the open market. Of late, bonds have been used heavily to finance renewable energy initiatives.

In this chapter we'll focus on 12 government-based financing tools. Some will be familiar, some perhaps less so:

1. General obligation bonds
2. Revenue bonds
3. Industrial revenue bonds
4. Green bonds
5. Qualified energy conservation bonds
6. Social impact bonds
7. Public benefit bonds
8. Linked deposit programs
9. Energy efficiency loans
10. Property-Assessed Clean Energy Programs
11. Greenhouse emissions allowance auctions
12. User fees

## 1. General obligation bonds

General obligation (GO) bonds are one of two common types of municipal bond instruments. Such bonds are typically used to finance basic core infrastructure investments at the local level of government. These could be GO bonds to finance a new park, a new city hall, a new forensics crime lab, a library, a light rail line, a new school and so forth.

In the GO framework, the issuing entity — city, town, county, school district, etc. — backs the issuance of the bonds with the full faith and credit of the jurisdiction. In practice, this means that the jurisdiction will tap its tax revenues at a level sufficient to repay the bond buyers plus interest. Selling bonds yield capital immediately for project construction, with the repayment of the debt taking place over the life of the asset created.

The important distinction of GO bonds is that they are guaranteed with taxpayer revenues. For instance, one government in a metropolitan area might take the lead on investing in the creation of a new forensics crime lab. That government might enter into an intergovernmental agreement with other local governments in the region and provide access to the lab for a fee. Minus operating costs, those fees can serve as the basis for payments against the bond. Should those fees prove inadequate, then the issuing government will have to add its own tax money from its operating budget into the annual bond payment.

As long as the bonds are sold for the purpose of funding a capital asset with significant benefits for the community, GO bond interest is exempt from federal taxation. This exemption makes municipal GO bonds an appealing product for buyers. Bond ratings agencies such as Standard & Poor's, Moody's and Fitch evaluate and grade the risk of the bonds in terms of the fiscal health of the issuing jurisdiction. This rating influences the interest rate the jurisdiction will have to pay on the bonds (e.g., the cost of borrowing). The returns to investors are not as aggressive as other types of bonds. The spread on these bonds and resultant return to investors is lower reflecting the lower risk of default.

### California mixes GO bonds, public-private partnerships and existing revenues to initiate its Strategic Growth Plan

In January 2006, then-California Gov. Arnold Schwarzenegger unveiled his Strategic Growth Plan for the state. In it he outlined his expectation that California would grow by 30% over the next 20 years which would result in a $500 billion strain on the current infrastructure. He proposed a two-phased, 20-year investment, the first phase of which would leverage $68 billion in GO bonds as well as other federal and private sector monies. His plan: to invest $222 billion over 10 years in the state's transportation, education, water and health infrastructures.

California, like many states, has experienced an increase demand for services on its transportation infrastructure over the last two decades. California's transportation department, Caltrans, operates and maintains more roads than any other state, with about 50,500 lane-miles of highways, while cities and counties maintain approximately 327,000 lane-miles of local roads. California's traffic congestion and transportation infrastructure has been growing faster than revenues can meet. To deal with this challenge, in November 2006, voters passed a $37.3 billion GO bond package, the largest general obligation bond package ever offered on a single ballot. The money would go to transportation, housing, education and flood control.

*California is using GO bonds for transportation improvements.*

The transportation sector received $19.9 billion of the allocation. Those funds went to congestion reduction, highway and local road improvements, transit, air quality, safety and security. Transportation's proposed share of the Strategic Growth Plan's overall investment into California infrastructure was nearly half at $107 billion supported by existing revenues, public-private partnerships and two $6 billion bonds that were to be implemented with a 6% statutory cap on the state's debt service.

## Table 2: Summary Characteristics for General Obligation Bonds

| Characteristic | Score |
|---|---|
| **Source of capital** | Private bond buyers |
| **Number of parties** | 3: The issuing government, the bond broker and the investors buying the bonds |
| **Ease of financing** | 3 - medium: Varies based on the fiscal health of the issuing community |
| **Duration of financing** | Varies. Rarely used for quick financing, but very common for most long-term financing |
| **Risk to investors** | 2 - relatively low risk: Ratings help determine risk with higher returns on riskier purchases; could lose investment if jurisdiction became insolvent which is rare |
| **Risk to borrowers** | 2 - relatively low risk: As long as jurisdiction is not overstretched on other demands for its revenues |
| **Tax implications** | Tax exempt |
| **Source of repayment** | Usually tax revenue |
| **Advantages** | Relatively easy to use tool overall if the jurisdiction is fiscally healthy |
| **Disadvantages** | As long as the jurisdiction balances its long term debt obligations relative to revenues, the disadvantages are small (which is why GO bonds are so popular) |

## 2. Revenue bonds

A second popular form of municipal bond is the revenue bond. While the GO bond is guaranteed by tax revenues of the issuing jurisdiction, a revenue bond is paid back from revenues generated by the asset the bonds funded. Municipal projects that can generate revenues, such as a parking garage, can be financed with revenue bonds because parking fees can be dedicated to paying back the debt and interest.

With a revenue bond there is no guarantee that tax revenues will "back stop" any shortfall in bond payments should the asset revenues not be sufficient. As with GO bonds, selling revenue bonds yields capital immediately for project construction, and repayment should occur over the expected lifespan of the asset.

Here's an example from New Mexico, where schools received $20 million in energy efficiency upgrades through revenue bonds. They are required to allocate 90% of the savings that result from their upgrades to paying off the bonds. They can keep the remaining 10% for their own activities.

Like GO bonds, revenue bonds are also exempt from federal taxes if the bonds are sold for the purpose of funding a capital asset with significant benefits for the community. This exemption helps make municipal revenue bonds appealing to buyers, even though they are not typically backed by taxpayers. Bond ratings agencies also evaluate and grade the risk of revenue bonds in terms of the projected likelihood that the asset will be able to generate sufficient revenue to meet the debt obligation. Obviously, there is higher risk associated with revenue bonds than GO bonds and interest rates tend to be slightly higher on average as a result.

### Cincinnati considers revenue bonds for smart parking meters

A plan proposed by Cincinnati Mayor John Cranley to upgrade the city's parking meters and build a downtown parking garage involved up to $30 million in revenue bonds issued by the Port of Greater Cincinnati Development Authority.

*Mayor John Cranley*

Under the proposal, the smart meters would be installed on existing poles and accessible remotely by smartphone users. The improvements were expected to generate $6.3 million in revenue the first year and $7.6 million by the third year.

A contentious issue in Cincinnati, the city council eventually approved a less ambitious smart parking initiative.

### Table 3: Summary Characteristics for Revenue Bonds

| Characteristic | Score |
|---|---|
| **Source of capital** | Private bond buyers |
| **Number of parties** | 3: The issuing government, the bond broker and the investors buying the bonds |
| **Ease of financing** | 3 - medium: Varies based on the revenue generating capacity of the asset |
| **Duration of financing** | Varies: Rarely used for quick financing, but more common for medium-term financing |
| **Risk to investors** | 3 - medium risk: Ratings help determine risk with higher returns on riskier purchases; could lose investment if asset fails to generate sufficient revenue |
| **Risk to borrowers** | 2 - relatively low risk: As long as asset is reasonably projected to generate sufficient revenues to meet the debt obligations |
| **Tax implications** | Tax exempt |
| **Source of repayment** | Usually a fee related to the asset being financed (e.g., a toll for a new bridge) |
| **Advantages** | Relative easy to use tool overall if the asset is likely to generate sufficient revenues |
| **Disadvantages** | Added risk from lack of taxpayer backing increases the costs of borrowing relative to a GO bond |

## 3. Industrial revenue bonds

Industrial revenue bonds (IRB) are another bond instrument issued by both municipal jurisdictions and state governments. These are most commonly issued as part of an economic development initiative in which the local jurisdiction issues IRBs and gives the proceeds to a private firm for development. These might involve capital improvements, expansions, facility enhancements or renewable energy and renewable energy efficiency upgrades. The firm is ultimately responsible for paying back the debt. That means the debt does not influence the city's rating, since the city has no obligation to repay.

The jurisdiction holds the asset as collateral until the debt is repaid. Because of that, there is often no property tax on that asset. This can be a significant savings for the private firm and is why jurisdictions use IRB deals as incentives to encourage business expansions or relocations to the jurisdiction.

Another appealing aspect is the tax-exempt status of the IRB due to issuance by a government jurisdiction. This means private firms can get lower interest financing through IRBs.

Here's one example of how an IRB comes together. In Illinois, a $25 million IRB was issued to a private college to make campus housing improvements that reduced energy and water costs and achieved LEED certification. The bond is being repaid from additional fees paid by students who choose to live in the upgraded facilities. The college is responsible for ensuring that a sufficient number of students live in the facility to cover the bond debt.

### Affordable senior housing gets $44 million boost in Brookhaven

The town of Brookhaven on New York's Long Island announced late in 2013 that its Industrial Development Agency (IDA) approved up to $44 million in bond financing for BK at Lake Grove, LLC, which plans to build a 120,000 square-foot, 136-unit assisted living facility for senior citizens.

*Brookhaven uses revenue bonds to support affordable senior housing.*

Officials said the project qualified for tax-exempt industrial revenue bond financing because at least 20% of the units will be affordable, designated for people who earn less than 50% of the area's median income. The bonds will be repaid with revenues generated by the facility.

The IDA also approved a PILOT (Payment-in-Lieu-of-Taxes) agreement for the project that provides property tax abatements. Exemptions from mortgage recording and sales taxes on construction materials and equipment were also granted.

Said Brookhaven IDA Chairman Frederick C. Braun, III: "This project will meet the growing needs of a segment of the town's aging population who no longer are able to live alone, enhancing their quality of life while allowing them to remain close to their families in our town."

## Table 4: Summary Characteristics for Industrial Revenue Bonds

| Characteristic | Score |
|---|---|
| **Source of capital** | Private bond buyers |
| **Number of parties** | 4: The issuing government, the private firm handing the project, the bond broker and the investors buying the bonds |
| **Ease of financing** | 4 - moderately difficult: Varies based on the health of the firm ultimately responsible for repayment |
| **Duration of financing** | Varies: Sometimes used for quick financing, but more common for short- and medium-term |
| **Risk to investors** | 4 - moderate risk: Depends on health of the firm responsible for repayment, but tax exemption offsets some of the higher risk pricing; could lose investment if firm fails |
| **Risk to borrowers** | 3 - medium risk: Lower interest due to tax exempt status, but will add strain on firms carrying additional debt |
| **Tax implications** | Tax exempt |
| **Source of repayment** | Private firm for which the government issued the bond |
| **Advantages** | Useful tool for governments working with firms on relocation and expansion to create jobs; appealing for borrowers due to tax-exempt status of the bonds and property tax relief while asset held by city |
| **Disadvantages** | Added risk for investors; many states cap the amount available for IRB financing per firm |

## 4. Green bonds

Based on a practice begun in Europe, green bonds are instruments issued to raise capital for funding specific clean power, carbon-reducing projects. Since 2008, the World Bank has issued over $4.5 billion in green bonds. The U.S. federal government seeded a green bond fund with $2 billion in 2004 legislation. Here are more examples:

- The state of California purchased $300 million of World Bank green bonds in 2009 in support of the state's commitment to climate change mitigation.
- Massachusetts, taking its cue from the World Bank, in 2013 became the first American state to sell green bonds to pursue an array of energy efficiency projects.
- Toronto, Ontario, meanwhile, announced in 2013 that it plans to issue green bonds to fund an innovative green-certified transit project.

Green bonds can be more appealing than bank loans because they offer longer maturity periods, third-party credit enhancement and more flexible covenants. When issued by government entities, these are tax-exempt.

Green bonds offer a number of additional benefits, such as:

- Avoiding direct investment, which brings exposure to regulatory uncertainty and technology risk, plus there are limited investment grade opportunities of significant scale
- Providing an opportunity to meet investor demand for alternative ways to invest in the high-growth clean energy sector
- Affording a relatively easy place to integrate environmental investing policies into portfolio strategy due to the fixed-income structure
- Attracting investors partial to risk/return characteristics of conventional bonds
- Featuring design, risk and return similar to existing products in investment portfolio
- Providing the opportunity to integrate environmental, social and governance criteria throughout portfolio, and to signal commitment to stakeholders and policymakers
- Producing solid credit ratings, as international financial institutions and governments are principal issuers

### Swedish city first in the Nordic region to issue green bonds

With the issuance of a 500 million (in Swedish krona) green bond in the fall of 2013, Gothenburg, Sweden became a pioneer in the Nordic region for using the green bond financial framework, developed by Nordic financial group Skandinaviska Enskilda Banken (SEB) together with the World Bank and other Swedish investors. SEB facilitated the issuance.

According to SEB, the issuance is a breakthrough in the Nordics, where interest in green bonds continues to grow among investors. "They see that green bonds offer the same yield as other investments with similar conditions, but at the same time these bonds contribute to a better environment and higher awareness of climate-related challenges and solutions," noted Christopher Flensborg, head of sustainable investments at SEB.

*Gothenberg issued green bonds in 2013; a first in Sweden.*

Gothenburg intends to support various environmental projects on public transport, water management, energy and waste management.

"We have a thorough program for environmental projects in Gothenburg. The city intends to be an obvious choice for investors seeking green investments," said Gothenburg CFO Magnus Borelius.

## Table 5: Summary Characteristics for Green Bonds

| Characteristic | Score |
|---|---|
| **Source of capital** | Private bond buyers or public seed capital |
| **Number of Parties** | 3-4 (the issuing government, the firm/jurisdiction for whom the bonds are being sold, the bond broker and the investors buying the bonds) |
| **Ease of financing** | 5 - very difficult: Varies based on the health of the issuing jurisdiction, but lack of performance data on these instruments increases difficulty; that should decrease with more bonds performing |
| **Duration of financing** | Medium to long-term: Targeted at capital intensive projects with longer implementation and operational lifespans |
| **Risk to investors** | 5 - high risk: Lack of performance data increases the uncertainty for investors, both in terms of the bonding instruments and the new technologies that would be funded |
| **Risk to borrowers** | 4 - moderate risk: Ability to repay debt dependent on new technology with limited market performance information on which to base long term financing projections |
| **Tax implications** | Tax-exempt status depends on the issuer; if public, then tax exempt, if private, then not tax exempt |
| **Source of repayment** | Ultimately the issuing authority |
| **Advantages** | See above |
| **Disadvantages** | Relatively new finance tool and unclear how deep the demand from investors is for such bond instruments though successful bond issues doubled in 2013 over the previous year |

## 5. Qualified Energy Conservation Bonds

Established by the U.S. Energy Improvement and Extension Act of 2008, Qualified Energy Conservation Bonds (QECB) are another relatively new bond instrument designed specifically to, as the name implies, fund qualified energy conservation projects. For example:

- Reducing energy consumption in publicly owned buildings by at least 20%
- Upgrading a public facility with sustainable technologies such as solar panels, wind converters or biomass reclamation systems; upgrading private buildings can also quality as a public goal
- Financing demonstration projects and implementation of green building technologies
- Implementing smart grids to reduce peak energy usage

The appealing aspect of QECBs for local jurisdictions is they are good for lowering the costs of borrowing. Federally authorized states, cities and other jurisdictions that issue QECBs pay taxable interest to bondholders biannually and receive a cash rebate from the U.S. Treasury. The rebate is the lesser of: (1) the taxable rate of the bonds or (2) 70% of the U.S. Treasury's tax credit rate on the bond sale date. States and local governments still must pay interest and principal on QECBs, but the federal subsidy reduces their interest cost while ensuring that QECBs offer an interest rate attractive to potential investors.

### St. Louis County uses QECBs to fund energy efficiency loans

In 2011, St. Louis County, Missouri issued $10.4 million of QECBs to finance the Sustainable and Verifiable Energy Savings residential energy efficiency loan program – something that had not been done before. The county used $592,000 from its Energy Efficiency and Conservation Block Grant (EECBG) to support QECB issuance to create a QECB-funded loan pool. Loans were then offered to St. Louis County residents to finance energy upgrades.

As the first issuers of QECBs for an energy efficiency loan, St. Louis SAVES administrators were met with many challenges. Among them: federal interest rate arbitrage restrictions which restrict the return a QECB issuer can earn on loans in pooled loan programs. Loan origination fees, high issuance costs, historical preservation costs and the mandate that 10% of QECB proceeds should be used in the first six months also proved challenging.

*St. Louis County leverages QECBs to finance energy upgrades.*

## Table 6: Summary Characteristics for Qualifying Energy Conservation Bonds

| Characteristic | Score |
|---|---|
| **Source of capital** | Private bond buyers; partial federal subsidy |
| **Number of parties** | 4 to 5: The issuing jurisdiction, U.S. Treasury, the firm/jurisdiction doing the project, the bond broker, and the investors buying the bonds |
| **Ease of financing** | 5 - very difficult: These are relatively new instruments and are slow to sell on the market |
| **Duration of financing** | Medium-term: Targeted at capital projects specifically designed to improve conservation |
| **Risk to investors** | 3 - medium risk: While still new these bonds must be collateralized with public revenues, a separate GO bond, or an asset; not great return |
| **Risk to borrowers** | 3 - medium risk: Jurisdiction risks the collateral against the payments, but the federal subsidy lowers the borrowing costs which offsets some of that risk) |
| **Tax implications** | Jurisdictions receive an interest rate subsidy |
| **Source of repayment** | Borrower pays back principal and usually the government provides a federal tax credit in lieu of the traditional bond interest |
| **Advantages** | Good tool for low-cost borrowing targeted at energy conservation measures; provides access to the larger taxable bond market investor |
| **Disadvantages** | Slow to sell; taxable bond market investors still wary of public bonds instruments. |
| **Disadvantages** | Relatively new finance tool and unclear how deep the demand from investors is for such bond instruments though successful bond issues doubled in 2013 over the previous year |

## 6. Social impact bonds

Structured bonds are yet another option for financing capital projects. These bonds determine the value of capital at the bond's maturity. Social Impact Bonds (SIB), also known as Pay for Success, are unlike conventional bonds that offer a fixed rate of return. The SIB payment is contingent on the social outcomes agreed upon by the investor and the issuer.

Traditionally, the issuer receives funds based not on the amount of people they serve but how well they serve them and the outcomes associated with their service. Thus, the private investors assume the risk for improvements to social outcomes. If the goals are achieved, the private investor reaps the payoff of the bonds. If goals are not achieved, the investors lose their investment in the bonds.

SIBs create a mechanism for financial return for desirable improvements. But they are new and largely in a testing phase in places like the United Kingdom, Australia, Canada and more recently in New York, Massachusetts and Ohio.

Let's look at one SIB scenario: Goldman Sacks is working with New York City on a $10 million bond to reduce recidivism by 10% at Rikers Island, the city's biggest jail complex. It demonstrates how SIBs are ushering in a new phase of accountability and outcome-based funding – certainly noteworthy for states and municipalities as they continue experimenting with financing and implementation of green and smart technologies.

### UK initiates social impact bonds with focus on outcomes

The United Kingdom's Cabinet Office of Social Outcomes Fund and the Big Lottery Fund Commissioning Better Outcomes are two separate funds that support the development of Social Impact Bonds to confront the difficulty in assessing improved social outcomes in relation to costs.

In 2012, $98 million was allocated between both funds to facilitate the growth of SIB projects. The Social Outcomes Fund received over $32 million to catalyze innovative projects that lead to new approaches to public services in government agencies. In 2013, the Commissioning Better Outcomes Fund received $65 million to help people in need lead fulfilling lives .

Both funds focus on measuring outcomes, as they are the basis for payment. The funds assess whether the metrics associated with the projects are suitable and robust enough to effectively capture social impacts. For example, both funds expect to see:

- Impact of an intervention measured against what would have happened absent the intervention
- Outcome comparisons between the baseline, the effected group and the unaffected group
- Impact of the SIB on the service delivery of the project

*UK SIBs help improve outcomes for troubled kids.*

Here's a look at how an SIB is helping UK kids:

The Essex SIB supports young people ages 11 to 16 with troubled home lives or who are living away from their families. It provides help designed to improve these kids' long-term outcomes using a five-month, evidence-based therapeutic program called Multi-Systemic Therapy (MST). The program is delivered at home by qualified therapists who focus on improving parenting and rebuilding positive relationships within the family as well as the wider community. The SIB will fund two MST teams to work with approximately 380 adolescents. The key metric their pay will be based on is the number of care placement days saved for each MST cohort over a 30-month period, benchmarked against a historical comparison group. Other metrics will measure the broader improvement in social outcomes, such as school attendance and emotional well-being.

## Table 7: Summary Characteristics for Social Impact Bonds

| Characteristic | Score |
|---|---|
| **Source of capital** | Private bond buyers |
| **Number of parties** | 3: The issuing jurisdiction, the bond broker and the investors buying the bonds |
| **Ease of financing** | 5 - very difficult: These are very new instruments and require negotiated criteria for measuring success in determining funding |
| **Duration of financing** | Short-term: While in this early phase, most SIBs have been quick or short-term projects |
| **Risk to investors** | 5 - high risk: These new instruments have almost no track record and given the varied nature of each offering it will be some time before markets will understand the instruments and be able to invest with confidence |
| **Risk to borrowers** | 5 - high risk: The nature of the performance requirements from certain kinds of investments may be influenced by factors outside the control of the issuer |
| **Tax implications** | Technically there is no bond; only an agreement between the government and the agency — so there is no exemption |
| **Source of repayment** | The supporting government will pay the guaranteed return on investment only if the goals are achieved |
| **Advantages** | Appealing new instrument for targeting socially oriented investors and those interested in alternative measures of financial performance |
| **Disadvantages** | New instrument with limited performance record; a complicated instrument |

## 7. Public benefit funds

Public Benefit Funds (PBF) typically support energy efficiency and renewable energy, although not in every case. PBFs were born out of the electric power industry's restructuring in the late 1990s as a way to fund initiatives that were inadequately supported by competitive electricity markets. They also reflect a desire on the part of states to create energy efficiency and renewable energy programs.

PBFs are essentially the collection of funds generated by a small surcharge on customers' electricity bills, no matter who the electricity provider is. The surcharge generally ensures that money is available to fund investments by publicly managed efficiency projects.

One drawback to PBFs is how they are allocated and reallocated. PBFs serve as tempting targets for state legislators and governors who need to fill state budget gaps. Although assumed to be earmarked for energy efficiency or renewable energy programs, legislators in most states control how the funds are spent. In 2003, for example, PBFs suffered raids by legislatures in four states: Connecticut, Illinois, Ohio and Wisconsin. PBFs supporting R&D and energy services for low-income citizens have been raided in California, Delaware and Massachusetts.

Although PBFs are usually established at the state level, municipalities may also establish a PBF through a dedicated surcharge or flat monthly fee to support programs.

PBFs in 17 states and Washington, D.C. provide nearly $1 billion annually for energy efficiency improvements and related programs, according to the Environmental Protection Agency.

In New York, a PBF that began in July 1998 is administered by the New York Energy Research and Development Authority (NYSERDA), a semi-independent organization set up by the state government in 1975. Through the use of PBFs over the years, NYSERDA has launched 25 complementary energy efficiency programs that address different sectors, measures and market niches. The programs run the gamut from energy efficiency and renewable energy to energy programs for low-income residents, R&D and environmental protection. NYSERDA has invested more than $350 million to support energy efficiency programs alone.

### Wisconsin acts to prevent PBF raiding

Wisconsin Focus on Energy supports statewide programs that promote energy efficiency and renewable energy by providing energy assistance programs for low-income residents. Originally authorized in 1999, the Wisconsin Department of Administration originally managed the PBF program and chose to switch over to third-party program administrators. Between 2002 and 2006, a total of $108 million was transferred out of the PBF to the state general fund for other uses. To prevent raiding, the program was overhauled in 2006 to require utilities to contract directly with third-party program administrators rather than passing funding through a state government account where it is vulnerable to raids.

*Wisconsin uses PBFs for energy assistance programs.*

## Table 8: Summary Characteristics for Public Benefit Funds

| Characteristic | Score |
|---|---|
| **Source of capital** | Consumer service surcharge (e.g., utility bill) |
| **Number of parties** | 1: The entity collecting the fee to use for costs |
| **Ease of financing** | 2 - moderately easy: Varies by regulations over agency |
| **Duration of financing** | Ongoing: fees provide ongoing revenue for infrastructure investment payments |
| **Risk to investors** | 2 - relatively low risk: Utility customers risk lost fees if agency fails |
| **Risk to Borrowers** | 2 - relatively low risk: As long as sufficient fees from customers continue, revenue stream is safe |
| **Tax implications** | Not applicable |
| **Source of repayment** | Not applicable |
| **Advantages** | Relatively easy to use tool overall if the agency has guaranteed access to fee revenues |
| **Disadvantages** | Vulnerable to revenue reallocation for other needs |

## 8. Linked deposit programs

State treasurers have some discretion regarding options for utilizing surplus state revenues. As the manager of state-generated funds, state treasurers have the authority to invest available state funds in secure loans, often at below-market interest rates, to a guaranteed return. The family of Linked Deposit Programs (LDPs) is one example. These bank loans are subsidized by corresponding "linked" state deposits.

LDPs allow state treasurers to place state funds in a financial institution with below-market interest rates and, in turn, the financial institution lends the funds to a borrower. The borrower makes payments to the financial institution and the financial institution pays money back to the state treasurer. This program is mutually beneficial because the state experiences low administrative costs and the borrower receives capital for costly projects at lower interest rates.

In 2009, the state of Missouri made $200 million in loans through LDPs. Sam's Carpet Cleaning and Repair in the city of St. Charles was granted a $575,000 loan through the First Bank of St. Charles to refinance its 17,850-square-foot building. Through the loan, the business owner was able to reduce his interest rate from nearly 30% to 2.15%. "Participating in the Missouri Linked Deposit program has allowed our business to lower our interest rate that will free up additional funds to invest in technology, training, and expansion," business owner Jeff Sams said.

LDPs can also be used to fund individual borrowers seeking to upgrade infrastructure. In 1998, for instance, the Maryland General Assembly changed the governing legislation for these programs to open the loans to individuals to use the low-interest loans for capital improvements on private homes that reduce non-point source pollution threatening Chesapeake Bay. The limitation of the Linked Deposit programs is that they can only be used to finance certain types of projects, and the types vary by state.

Using a similar approach, cities and counties have also established LDPs. Lucas County, Ohio, for example, offers an LDP to help area businesses, builders and developers expand. And the city of Wickliffe, also in Ohio, uses a LDP program to provide low-interest loan opportunities to businesses and property owners who are willing to make real property improvements.

### New York leads successful LDP for small businesses

In New York, LDPs assist manufacturers and small businesses obtain reduced-rate financing for projects that improve their competitiveness through better market access, product development, equipment modernization, facilities expansion and job creation. New York's program is offered as a public-private partnership that provides businesses with affordable capital based on bank loans at reduced interest rates which are then subsidized by corresponding "linked" state deposits. To make borrowing less expensive with a maximum loan of $2 million for four years, the program provides a 2% to 3% point savings on the prevailing interest rate for linked loans. In 2012, 187 firms received linked loans which totaled $77.4 million coming from 72 lenders. As a result of the LDP, some 562 jobs were created.

*New York LDPs provide small businesses with affordable capital.*

## Table 9: Summary Characteristics for Linked Deposit Programs

| Characteristic | Score |
|---|---|
| **Source of capital** | State tax surplus |
| **Number of parties** | 3: State provides investment capital, bank manages loans, businesses use loans for sustainable and other targeted upgrades |
| **Ease of financing** | 4 - moderately difficult: Not all states have these programs, some are quite limited in funding, some have strict limits on eligibility |
| **Duration of financing** | Short term: Usually for projects less than two years |
| **Risk to investors** | 3 – medium: However, the risk is managed by the bank which is responsible for loan approvals and is incentivized to seek credit worthiness |
| **Risk to borrowers** | 2 - relatively low: Businesses or governments face lower rates and as long as they have healthy revenues should be able to make payments |
| **Tax implications** | Not applicable |
| **Source of repayment** | Borrower repays government unit that issued the financing |
| **Advantages** | A win-win for state government with a guaranteed return on investment and a significantly below market interest rate for specific kinds of projects |
| **Disadvantages** | Only available to fund certain kinds of projects |

## 9. Energy efficiency loans

Another tool championed by an increasing number of state treasury departments is energy efficiency loans. These are low-interest loans to individuals who want to finance capital improvements to their homes. While the eligibility for types of improvements varies by state, the general intent is to lower the barriers for homeowners to upgrade their homes with more energy efficient heating and cooling systems, water recycling/reclamation equipment, insulation upgrades, door and/or window replacement and the like.

Under these plans, the government or a partnering bank makes the loan, using state money as the capital for the borrower to use in purchasing and installing the upgrades. Since the capital is state money, the interest rate can be below market rates while still covering inflation losses and yielding a small return on the investment.

The success of this model took a significant leap in 2013 when the state of Pennsylvania demonstrated the viability of a secondary market for these loans. The state bundled its 4,700 loans and sold them to a consortium of banks for cash and some deferred payments. This yielded an immediate return to the state and replenished the treasury, enabling additional loans so more citizens can take advantage of the program.

Cities are also in the business of helping fund energy efficiency upgrades. For example, Oklahoma City homeowners wanting to save money on their electric and gas bill by making their homes more energy efficient can apply for a green home loan offered through the city. Anaheim (California) Public Utilities offers low-cost financing to small businesses, some landlords and nonprofit organizations to help implement energy-efficiency measures.

### Asian Development Bank supports energy efficiency with EEF loans

Asia's share of the world's energy consumption is projected to rise from 30% in 2010 to over 50% by 2035.

The Asian Development Bank (ADB), an organization that aims to end poverty in Asia, has worked to curb the consumption rate by supporting and financing energy efficiency projects.

In 2013, the ADB initiated a loan worth $20 million for energy efficiency projects with Cofely Southeast Asia Pte. Ltd, a unit of France's GDF Suez. It was regarded as an innovative and flexible method of financing that allows Cofely to invest in building, upgrading and expanding energy efficiency infrastructure across the region.

The ADB sees energy efficiency upgrades as the most cost-effective and low-risk opportunity for sustainability. Yet energy efficiency financing can be difficult to obtain. Obstacles include scaling up investment due to a lack of awareness among business leaders and a lack of skilled experts and companies to manage the projects.

To overcome the challenges and catalyze direct investments in energy efficiency projects, Cofely leveraged a business model that provides companies with a full suite of services that includes financing for the design and delivery of energy savings and subsequent measurement and verification of results. Ultimately the loan is projected to save 150,000 megawatt hours of energy, avoid 90,000 tons of carbon emissions, and yield average annual net savings of $10 million by 2019.

*EEF loans are helping reduce energy consumption in Asia.*

In addition, ADB is implementing a $600,000 technical assistance program to raise awareness about energy efficiency across Southeast Asia. It will bring senior business owners and leaders together to discuss the role of energy efficiency in improving sustainability and growing businesses.

## Table 10: Summary Characteristics for Energy Efficiency Loans

| Characteristic | Score |
|---|---|
| **Source of capital** | State tax surplus |
| **Number of parties** | 2 or 3: State provides investment capital, state or bank partner manages loans, homeowners use loans for targeted home upgrades |
| **Ease of financing** | 3 – moderate: Not all states have these programs, some are quite limited in funding, some have strict limits on eligibility |
| **Duration of financing** | Short term: Usually for projects less than two years |
| **Risk to investors** | 3 – medium: State or bank is responsible for loan approvals and credit worthiness; loans are small |
| **Risk to borrowers** | 2 - relatively low: Homeowners face lower rates and as long as they have healthy incomes should be able to make payments |
| **Tax implications** | No exemptions |
| **Source of repayment** | Borrower repays the government unit that issued the financing |
| **Advantages** | A win-win for state government with a guaranteed returned on investment while incentivizing efficiency upgrades in homes |
| **Disadvantages** | Only available to fund certain kinds of projects; volume could be a barrier to state capacity to process and manage loans |

## 10. Property-Assessed Clean Energy

Property-Assessed Clean Energy (PACE) represents one of the newest mechanisms available for financing energy efficiency and renewable energy improvements. This program allows property owners to borrow against their property taxes to fund energy efficiency improvements. Between 2009 and 2010, 24 states authorized programs that allow local governments to create PACE financing programs. To date, only a few have taken advantage of this tool.

The loans are repaid primarily through assessments on the property under a contract between the local unit of government and the property owner. By allowing participating property owners to pay for energy improvements to their properties via a bond tied to a special assessment allows property owners to reduce energy costs with no upfront investment. In case of nonpayment, any interest or penalty on an assessment would constitute a lien against the property until paid in full. PACE assessments are secured by a lien on property and typically have the same priority as real estate taxes or are one step below, making them senior to any non-tax liens, including claims of the mortgage holder.

The largest benefit of the PACE program is that payments are bundled with a familiar bill (the property tax bill), which is a good indication of payment history. Also, longer repayment terms reduce the bill and the debt can even be structured to stay with the property through new ownership.

Drawbacks to the PACE program include the Federal Housing Finance Agency (FHFA) determination on lien status and mortgage industry resistance. In 2010, FHFA decided that programs with first liens (PACE would take priority over a mortgage in the event a homeowner defaulted on the assessment) were ineligible because they were contrary to the Fannie Mae-Freddie Mac Uniform Security Instrument. That decision put the program on hold in many PACE states. The terms of the Fannie Mae/Freddie Mac Uniform Security Instruments prohibit loans that have senior lien status to a mortgage.

In May 2011, the Vermont legislature modified its PACE program. In response to the FHFA determination on PACE liens, the legislation specified that PACE liens are subordinate to existing liens and first mortgages but superior to any other liens on the property recorded after the PACE lien is recorded (except for municipal liens, which also take precedence over the PACE lien). The legislature also created a state PACE reserve fund to reduce risk for potential investors interested in investing in a municipality to finance a PACE district. An amount equal to 5% of the assessment (not to exceed $1 million) is transferred from Regional Greenhouse Gas Initiative/Forward Capacity Market funds to an escrow account managed by the Vermont state treasurer. This is expected to provide funds to cover 90% of losses due to defaults of participating properties not covered by the reserve account.

### HERO program uses PACE as finance option for energy efficiency upgrades

Officials in California's Western Riverside County looked for affordable and reasonable ways to help homeowners finance energy efficiency upgrades and retrofits. The Western Riverside Council of Governments created the HERO Financing Program as a way for homeowners to finance and pay off energy upgrades over time. The program allows private property owners to pay for permanently affixed energy and water efficient products and renewable energy systems over time through their property taxes. This is possible because energy efficient upgrades improve home and property values, thus they are paid as an assessment on the property through the homeowner's tax bill over five to 20 years. The HERO program has a proven track record of successfully financing clean energy improvements. It is reportedly the largest and most successful privately funded residential PACE program in the country and has received more than 10,000 applications from homeowners, created 2,000 construction jobs and approved more than $194 million in financing.

*The PACE-funded HERO program has a successful track record.*

## Table 11: Summary Characteristics for Property-Assessed Clean Energy Programs

| Characteristic | Score |
|---|---|
| **Source of capital** | Local government |
| **Number of parties** | 2: The local government and the homeowner borrowing against property taxes |
| **Ease of financing** | 4 - moderately difficult: Requires significant coordination and additional monitoring upon completion of the voluntary assessment to be added to tax bill |
| **Duration of financing** | Short to medium term |
| **Risk to investors** | 4 - moderately high risk: Assessment ties to property on which a lien can be placed for nonpayment of the debt, but recent legal developments have raised concern on the order of PACE lien |
| **Risk to borrowers** | 4 - moderately high risk: Homeowner faces the added costs from assessment which if not paid can lead to loss of the home |
| **Tax implications** | Not applicable |
| **Source of repayment** | Property owner repays the debt on the bond usually in fixed payments as part of the tax bill on the property on which the improvements are being made |
| **Advantages** | Provides a tool for local governments to finance smart energy project loans using the homeowner's home equity as collateral |
| **Disadvantages** | Confusion in legislation over the lien order has dampened interest in this tool for the time being |

## 11. Greenhouse emissions allowance auctions

Recognizing climate change as a significant environmental problem for which traditional markets were not internalizing the costs, nine states — Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New York, Rhode Island and Vermont — decided to confront the issue by joining the Regional Greenhouse Gas Initiative (RGGI) cap-and-trade program launched in 2009.

The states pool their total emission allowances and sell them in an auction format, thus becoming a market-based entity for regulating greenhouse gas emissions. By capping power plant emissions and selling those emissions through auctions, the costs from pollutants are better internalized in the operations of the plants (and subsequently to the consumer through higher prices). By introducing the pricing for the negative externalities of the pollution into the energy product, producers have incentives to lower their emissions. States use revenues generated from the auctions to finance clean energy programs to offset and lower net pollutants.

In Delaware, approximately 65% of auction proceeds were used for a household and business sustainable energy program called Sustainable Energy Utility. In Connecticut, nearly $2 million went to sustainable and renewable energy programs. According to the RGGI, it has made a $617 million investment in the region's energy future by reducing energy bills, helping businesses become more competitive, accelerating the development of local clean and renewable energy sources and limiting the release of harmful pollutants into the air and atmosphere, while spurring the creation of jobs.

### Western Climate Initiative crosses national boundary with cap-and-trade program

California's Air Resources Board launched the state's cap-and-trade program to help curb greenhouse gas emissions. Compliance with emission guidelines began in 2013. Still in the early stages, California has already joined with Manitoba, Quebec, Ontario, and British Columbia in the Western Climate Initiative (WCI). Its goal is to align the cap-and-trade programs from each jurisdiction to establish a wide area covered by a standard program. These jurisdictions have formed a nonprofit to coordinate the trading programs in each area. California and Quebec's were aligned as of October, 2013. The work with the other jurisdictions in the WCI continues.

*California' program takes aim at greenhouse gas emissions.*

## Table 12: Summary Characteristics for Greenhouse Emissions Allowance Auctions

| Characteristic | Score |
|---|---|
| **Source of capital** | Private firms paying for allowances |
| **Number of parties** | 2: Firms buy the allowances; states collect revenues which can then be utilized to fund other projects |
| **Ease of financing** | 2 - relatively easy: Challenge is establishing the auction market initially |
| **Duration of financing** | Quick: Auction sales can be done very quickly |
| **Risk to investors** | 1 - very low risk: This is more of a mechanism to raise capital from polluters to pay for alternatives; there really are no investors per se |
| **Risk to borrowers** | 1 - very low risk: The firms buying the allowances are not technically borrowers as this is just a purchase |
| **Tax implications** | Not applicable |
| **Source of repayment** | No loan to repay; proceeds from auction are used to fund consumer assistance programs and other renewable energy initiatives |
| **Advantages** | This is a market-driven method for capturing negative externalities associated with pollution to build funding for programs to combat pollution; a relatively easy program to implement logistically |
| **Disadvantages** | Challenging to implement politically as high-polluting industries make an unfairness argument; lack of information on how revenues will be utilized due to quickly evolving state legislative efforts |

## 12. User fees

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. Taxes, on the other hand, are compulsory and support government operations across the board.

In addition to assigning project costs to project beneficiaries, the attractive thing about user fees is that they can be used to secure financing to fund all or parts of large capital projects.

According to the  National Association of State Budget Officers, states brought in an additional $1.5 billion in user fees from 2010 to 2013.  The benefits of user fees are obvious; the more fees that municipalities collect, more enhancements can be made to city infrastructure tied to those user fees.

However, user fees often face criticisms. Some citizens disagree with the idea that the individual who uses a road, for instance, should be the one to pay a toll (as opposed to the road being paid for by the community as a whole and thus subsidizing his/her individual usage costs). Given the positive externalities of many infrastructure projects, user fees raise some challenging issues. And not all citizens have the ability to pay, which can pose another challenge for cities promoting implementation of smart technologies.

### User fees help Toronto reduce $500 million budget deficit

In 2009, the city of Toronto experienced a $500 million budget deficit. Under Canadian law, cities cannot run a budget deficit, so the city had to either increase revenues through taxes and fees, or cut expenditures to balance its budget.

After considering other options, city leaders decided to implement user fees on a set of city services. In 2010, residents had to pay user fees for:

- The convenience of paying a parking ticket by phone or online. Residents paid $2 for the service — 50 cents more than the previous fee.
- Residents who bought a new home and needed to create a property tax account were charged a $50 fee.
- Residents with existing property tax accounts were charged $50 to make changes to their property tax bill, which was $15 more than it cost to make billing changes in 2009.
- The cost of taking a city-run program or renting a city-run facility cost about 3.7% more, and was projected to bring in $396.3 million in extra revenue.

*Toronto raised user fees for renting city facilities to help reduce a budget deficit.*

Other fee increases included a $50 registration for families signing up for city recreation programs, gym rental fees and drop-in swim fees.

### Table 13: Summary Characteristics for User Fees

| Characteristic | Score |
|---|---|
| **Source of capital** | Public |
| **Number of parties** | 2: Public jurisdiction effectively shoulders the costs of service/infrastructure investment and dedicates the fee stream from private users to repayment |
| **Ease of financing** | 1 - very easy: Jurisdiction uses available resources to effectively make the upgrade investment and then replenishes the costs by collecting user fees |
| **Duration of financing** | Scalable |
| **Risk to investors** | 2 - relatively low risk: As long as the jurisdiction is confident revenues from fees will be sufficient, then the upfront funding can be recouped over time after the costs of the upgrade |
| **Risk to borrowers** | 1 - very low risk: Users are not technically borrowing, they are paying for a service or use of infrastructure outside the tax system so no risk to them |
| **Tax implications** | Not applicable |
| **Source of repayment** | Users of the financed asset |
| **Advantages** | Ease of administration; speed of implementation; benefits principle as users see better the true costs of their services |
| **Disadvantages** | User fees need to be sufficient to repay upfront costs; ability for lower-income citizens to pay may raise fairness issues |

# Chapter 4: Development Exactions

Government-based financing tools are the most common for funding unproven smart technologies, but they are not the only options available for capital projects. A second set of financing tools highlight the regulatory power of governments to force developers to pay for the infrastructure services their developments will utilize. These developer exaction tools consist of conditions or financial obligations imposed on developers that help local governments cover the marginal cost increases and load burdens caused by the development. Some of the additional revenue can also be used to provide additional public facilities or services required due to the new growth.

With exactions, the intent is to protect the public from the negative effects associated with growth. Exactions also protect the community from the increased cost of providing infrastructure by passing a portion of the cost on to the developer at the time of development to synchronize the payment of infrastructure.

Cities are increasingly relying on exactions to help finance the impacts of new growth on public facilities due to budget shortfalls, cuts in state aid and taxpayers' unwillingness to increase tax rates. Studies have indicated that many of the fees and increased costs developers pay are ultimately passed on to consumers.

All exactions are types of impact fees that require developers to pay for the impact their new development has on the community. Impact fees can also serve as a strategy to implement new policies and plans for sustainable growth. For example, the state of Florida is considering mobility fees which essentially reward developments that are located closer to urban centers. Those farther out will pay more and ideally those fees will contribute to the future development of sidewalks and bus service in areas targeted for increased density.

Although there are a number of ways to extract fees from developers, there are limits to local government exactions. There are numerous examples of developers suing jurisdictions over excessive fees. The onus is on local governments to demonstrate the need for and impact of any fee they want to impose on a developer. Jurisdictions must also have a standard way to measure the impact of such fees.

It's important to understand the unintended consequences of exactions. For instance, inter-generational inequity can occur if developers are disproportionately paying for long-term facilities. In other words, newcomers may not be paying enough in fees and the developers may be paying too much. To have successful impact fee programs, jurisdictions must ensure that they are considering the long-term needs of their community and adequately estimating how to meet them.

In this chapter we'll look at four types of exaction fees:

1. Developer dedication requirements
2. Tap fees
3. Linkage fees
4. Impact fees

*There are a number of examples of developers suing governments over excessive fees.*

## Notable cases put exaction laws on trial

Laws surrounding development exactions in the U.S. have been largely contested and continue to evolve as more individuals litigate issues of adjudicative or legislative exactions. The most commonly cited rulings are Nollan v. California Coastal Commission and Dolan v. City of Tigard in which both plaintiffs questioned whether certain exactions were constitutional under the Fifth Amendment's Takings Clause and if certain exactions are improper or excessive.

In the case of Nollan v. California Coastal Commission, California's Coastal Commission allowed the replacement of a small beachfront bungalow by landowners but required them to grant a public easement across their property on the beach. The Commission argued the new, larger house would interfere with visual access and create a "psychological barrier" to using the beach. The Supreme Court found that the condition was unconstitutional in that it had no logical connection to the harm the Coastal Commission sought to address by requiring an easement to provide access to people already on the beach.

In the case of Dolan v. City of Tigard, Dolan was the owner and operator of a plumbing and electrical supply store. She applied for permit approval to expand her business, but approval was conditioned on her 1) dedicating a portion of her land to a greenway for drainage along a creek because her property was in a flood plain and 2) developing a bike path the city said was needed to ease traffic congestion. The Supreme Court agreed with the city that there was a connection between the drainage and pathway; however ruled the exaction unconstitutional, suggesting the city failed to show that the conditions were "roughly proportional" to the negative impacts caused by expanding her business.

These are just two of many exaction cases that have gone to court with mixed outcomes.

*A Tigard, Oregon exaction fee dispute went all the way to the Supreme Court.*

## 1. Developer dedication requirements

Dedication requirements are commonly found in city and town ordinances as part of the land use and zoning regulations for new development. Typically these ordinances require developers to donate land and/or facilities for public use. For example, a city might make approval of a new subdivision contingent on the developer creating a new park, dedicated open space, sidewalks or cash-in-lieu of these costs.

The thinking on dedications is the city's existing residents should not subsidize developers who bring in new residents. Rather, the additional infrastructure costs demanded by the new subdivision should fall to the developer and its new residents.

This logic suggests that dedication requirements could extend to smart growth technologies. For instance, a city could require that streets within a development be constructed with specific kinds of materials, that the development not exceed a certain threshold of non-permeable ground cover (to mitigate stormwater runoff), or that water reclamation systems be installed in the homes in water-challenged areas so gray water could be recycled for watering public spaces. These requirements internalize the environmental impact costs associated with new development. They could go even further to require (as opposed to simply incentivizing) smart, green and/or intelligent design technologies in new residential and business developments.

### How two jurisdictions impose developer dedication requirements

Dedication requirements vary across communities and states. Here are two examples of their use:

Colleyville, Texas set a goal of 12.93 acres of park land for every 1,000 new residents. As a result, the city requires one acre of park land be dedicated to the city for every 25 new residential dwelling units. Colleyville also requires that non-residential developments provide dedicated parks and/or reserved open space at a ratio of one acre of park land for every 56 non-residential gross acres of development or prorated portion thereof.

Douglas County, Colorado requires all adjacent roads around a new development be paid for by the developer. In addition, the county requires

*Governments often use dedication requirements to obtain additional parks.*

the dedication of park space (or cash-in-lieu) at a rate that achieves the county's goal of 15 acres/1000 population:

- Local park = Dwelling units x 0.015 acres/unit
- Regional park = Dwelling units x 0.030 acres/unit
- Total = Dwelling units x 0.045 acres/unit

## Table 13: Summary Characteristics for Developer Dedication Requirements

| Characteristic | Score |
|---|---|
| **Source of capital** | Private developers and new residents |
| **Number of parties** | 2: Local jurisdiction receiving the dedication and the developers that provide the dedication |
| **Ease of financing** | 3 - medium easy: Once ordinances are in place the tool is easy; getting the ordinances in place is challenging due to resistance from the developer community |
| **Duration of financing** | Quick: Dedication available during development |
| **Risk to investors** | 3 - medium risk: Those investing in the new development risk higher prices per unit due to the dedication demands and this can push the price point up on new housing and slow sales |
| **Risk to borrowers** | 1 - very low risk: Approval of new developments are contingent on the delivery of the new asset to the jurisdiction; not tied to the success of the development |
| **Tax implications** | None relative to any borrower, though the land dedicated to public use may be removed from the tax rolls and represent foregone tax revenue |
| **Source of repayment** | No repayment; the dedication of additional land for public use is an additional cost for the developer who will likely pass it along to buyers |
| **Advantages** | An easy tool to use once adopted as a local land use practice; codifies a balance between development and growth goals with amenity and infrastructure needs |
| **Disadvantages** | Often meets with resistance from developers; can interfere with growth plans if nearby communities do not have similar requirements |

## 2. Tap fees

Tap fees are another option local jurisdictions use to force upfront payments to cover costs associated with growth. These utility connection fees are used to fund capital improvements and recover the cost of integrating new development into existing infrastructure. The primary use of tap fees is to cover the cost of tying water meters for new connections to existing lines. Some jurisdictions also use tap fees to cover the cost of sewer line inspections.

The amount charged for tap fees vary. In South Carolina, the Charleston Water System charges a $500 tap fee for a ¾" water line tap (typical for most residential homes) and $200 for a sewer line tap of six inches or smaller.

Other communities use flat fees or fees scaled by unit size or scaled by lot size. Avon, Colorado uses a combination in which all residential units pay a tap fee of $4,000 for a 3,000 square foot home and an additional $2 per square foot is tacked on after that.

### Michigan city waives tap fees to spur residential development

City council members in Tecumseh, Michigan went along with a recommendation from their city manager to temporarily waive sewer and water tap fees as an incentive to residential builders.

"It would be kind of an experiment, because I don't believe we've ever done this before and not too many communities have," City Manager Kevin Welch said in a Tecumseh Herald report. "I'd like to suggest that we offer this program whether it's a construction company or a homeowner who builds a new residential home."

Noting the city has incentives for industrial development but not residential, he suggested waiving fees is one of the few things Tecumseh can offer to help stimulate development.

*Kevin Welch*

Fee waivers began in April 2013 and will continue through June, 2016. For one year after that they would be 50% of what they were before the waiver and then effective July 2017 the tap fees will revert to what they were in March 2013.

## Table 14: Summary Characteristics for Tap Fees

| Characteristic | Score |
|---|---|
| **Source of capital** | Private developers and new residents |
| **Number of parties** | 2: Local jurisdiction receiving the fee and the developers who pay it |
| **Ease of financing** | 3 - medium easy: Once ordinances are in place the tool is easy; getting the ordinances in place is challenging due to resistance from the developer community |
| **Duration of financing** | Quick: fee available during development |
| **Risk to investors** | 3 - medium risk: Those investing in the new development risk higher prices per unit due to the tap fee demands and this can push the price point up on new housing and slow sales |
| **Risk to borrowers** | 1 - very low risk: Approval of new developments are contingent on the delivery of the tap fee to the jurisdiction; not tied explicitly to the success of the development |
| **Tax implications** | Not applicable |
| **Source of repayment** | No repayment; the cost of the tap fee is an additional cost on the developer who will likely pass it along to buyers |
| **Advantages** | An easy tool to use once adopted into local land use practice; codifies a balance between development and growth goals with amenity and infrastructure needs |
| **Disadvantages** | Often meets with resistance from developers; can interfere with growth plans if nearby communities do not have similar requirements |

## 3. Linkage fees

A third type of developer exaction is the linkage fee, which has been a tool in use across many communities for over 20 years. With this approach, the city charges developers a fee for a new development, usually based on percentage of sales price.

Unlike dedications and tap fees that pay costs directly related to the development project, linkage fees pay for the secondary effects of development. Examples might include charging housing developers to offset traffic increases or commercial developers to help fund affordable housing so the people who work in the new buildings can afford to live in the community.

Linkage fees are commonly (though not always) collected from large-scale commercial, industrial and multi-family developments. Some cities do not use linkage fees as a way to keep costs down to attract new development. Others use them aggressively.

In November, 2013, the San Diego (California) City Council voted to increase linkage fees fivefold over a three-year period to raise capital to develop affordable housing, which the city lacks.

### Boston linkage fees: "One of the best tools we have for creating affordable housing in the city"

Boston, Massachusetts began collecting a linkage fee in 1984 after grassroots organizations in the city pushed for them out of growing frustration with inequities between the city's downtown/big business area and its neighborhoods.

It requires new commercial developments over 100,000 square feet that require zoning relief to pay linkage fees that support the Neighborhood Housing Trust and the Neighborhood Jobs Trust fund. In 2001, then-Mayor Tom Menino called the linkage fee "one of the best tools we have for creating affordable housing in the city."

Despite legal challenges early on that forced the Commonwealth of Massachusetts to pass legislation allowing the fee to be implemented, the program has been a success, collecting $45 million for affordable housing and jobs since its implementation.

*Boston linkage fees support affordable housing and jobs.*

## Table 15: Summary Characteristics for Linkage Fees

| Characteristic | Score |
|---|---|
| **Source of capital** | Private developers and business owners |
| **Number of parties** | 2: Local jurisdiction receiving the fee and the developers that provide the fee |
| **Ease of financing** | 3 - medium easy: once ordinances are in place the tool is easy; getting the ordinances in place is challenging due to resistance from developers |
| **Duration of financing** | Quick: Fee available during development |
| **Risk to investors** | 3 - medium risk: Those investing in the new development risk higher prices per unit due to the linkage fee demands and this can push the price point up on new housing and slow sales |
| **Risk to borrowers** | 2 - relatively low risk: Approval of new developments are contingent on the delivery of the fee to the jurisdiction; not tied explicitly to the success of the development |
| **Tax implications** | Not applicable |
| **Source of repayment** | No repayment, though the cost of the linkage fee is an additional cost on the developer who will likely pass it along |
| **Advantages** | An easy tool to use once adopted into local land use practice; codifies a balance between development and growth goals with amenity and infrastructure needs |
| **Disadvantages** | Often meets with resistance from developers; can interfere with growth plans if nearby communities do not have similar requirements |

## 4. Impact fees

As with other developer exactions, impact fees impose a fee on developers to fund additional service capacity required by the development. The intent is to offset the additional costs to a community caused by new growth.

This tool has been around since the middle of the 20th century but its use has steadily increased in recent decades as federal support to local governments decreased. Initially designed to offset environmental costs associated with new development – sewer capacity increases and storm water runoff, for example – impact fees have evolved. Over time their use has expanded to cover the cost of new roads, additional public safety staff, more schools, etc. that are needed as a result of new development.

The size of these fees varies across communities. Some do not charge impact fees. Other communities charge significant impact fees. But in most places, the fee is capped at the maximum cost to provide the infrastructure targeted by impact fee enabling legislation passed by state government. Even within a state's cap, impact fee structure varies widely among communities.

Legislation also typically limits impact fees to infrastructure (broadly construed) and not to other public programs or city operating costs. However, conversion costs to smart and green technologies that are part of a city's broader initiative to implement advanced technologies for infrastructure upgrades would likely apply.

### Philadelphia levies impact fees for stormwater program

Traditional methods of levying fees for public works have changed in recent years to align with more environmentally sustainable policies. In 1972, the U.S. Congress passed the Clean Water Act (CWA), which regulates the discharge of pollutants in water. The CWA made municipalities responsible for preventing stormwater runoff from polluting rivers and streams. This launched stormwater programs across the country.

The city of Philadelphia, Pennsylvania, for example, sought to capture rainwater before it enters the city's 3,000-mile sewer network. So Philadelphia implemented a parcel-based stormwater billing practice. It stopped charging property owners by their water usage and began assessing fees based on the ratio of the property's impervious surface area that either constricts or prevents water absorption into the soil (roofs, paved area, hardscapes, compacted dirt, gravel) to its absorbent surface (grass, rain gardens, ponds). To lower fees, business owners were encouraged to retrofit their properties to qualify for a credit available to property owners who could demonstrate management or retention of the first inch of stormwater.

The program didn't go over well in Philadelphia's business community, which experienced skyrocketing fees and no upfront funds to retrofit their property. One business owner saw his stormwater management bill jump from $15,000 to $120,000.

*Philadelphia implemented parcel-based stormwater billing.*

So the Unified Business Owners Association of Philadelphia proposed changes in the stormwater billing program, namely capping fee hikes at 10% annually. That didn't solve all of the problems though. Some business owners lacked the capital to retrofit their properties and couldn't qualify for credits. New initiatives often require a number of attempts to strike an appropriate balance — and along the way they provide valuable "lessons learned" for others.

## Table 16: Summary Characteristics for Impact Fees

| Characteristic | Score |
|---|---|
| **Source of capital** | Private developers and home buyers |
| **Number of parties** | 2: Local jurisdiction receiving the fee and the developers that provide it |
| **Ease of financing** | 2 - relatively easy: Once ordinances are in place the tool is easy; getting the ordinances in place is challenging due to resistance among the developer community |
| **Duration of financing** | Quick: Fee available during development |
| **Risk to investors** | 3 - medium risk: Those investing in the new development risk higher prices per unit due to impact fee demands and this can push the price point up on new housing and slow sales |
| **Risk to borrowers** | 2 - relatively low risk: Approval of new developments are contingent on the delivery of the fee to the jurisdiction; not tied explicitly to the success of the development |
| **Tax implications** | Not applicable |
| **Source of repayment** | No repayment, though the cost of the impact fee is an additional cost on the developer who will likely pass it along |
| **Advantages** | An easy tool to use and one that has become commonplace in the development community; codifies a balance between development and growth goals with infrastructure and service needs |
| **Disadvantages** | Developers argue that these fees hurt their bottom line and limit their ability to do additional developments, thus undermining local economic development efforts |

# Chapter 5: Bringing the Public and Private Sectors Together

Between federal government support waning and lingering effects of the global financial crisis, fiscal strain has become a mainstay for many public agencies. Yet the increasing challenges of urbanization make it imperative that the public sector find creative ways to finance smarter, more sustainable cities.

With this fourth type of financing option we shift from the coercive role of government jurisdictions to a more collaborative approach where public sector and private sector interests work together on a shared project.

This partnering approach has received increasing attention over the last 25 years. Public officials recognize that the private sector traditionally has access to larger pools of capital — human, knowledge and financial. And working with the public sector has distinct advantages for the private sector in terms of zoning and access to public spaces.

Today the challenge in many areas is determining which services or parts of service delivery are best managed by the public sector and which might be better managed by private or nonprofit partners.

New arrangements involving partnerships with the private sector, nonprofits and international non-governmental organizations are emerging with increasing regularity. Here are two examples:

- The Philippines established the Public Private Partnership Center as an extension of the national government to aid in the formation of government-private sector collaborations for public infrastructure delivery. One project has transportation officials working with private vendors to replace a magnetic-based ticketing system for collecting transit fares on light rail lines with contact-less smart card technology.
- The Republic of South Africa created a Public Private Partnership Unit as part of the National Treasury to support collaborations between private vendors and government units. For instance, the city of Johannesburg partnered with a local firm for the procurement and operation of an alternative waste treatment facility.

We'll look at four public-private financing vehicles in this section:

1. Public-private partnerships
2. Pay for performance
3. Securitization and structured finance
4. Catastrophe bonds

## 1. Public-private partnerships

Public-private partnerships – sometimes referred to as PPP or P3 — are agreements between a public agency (federal, state or local) and a private-sector entity that uses the specific skills and assets of each sector for the delivery of a service for the general public. P3s are probably the most complicated and least understood financing tool available to cities, but one that more and more cities are embracing.

These partnerships can take many forms, but they generally seek to balance responsibilities, risks and rewards among all parties involved. They align the public good with commercial objectives designed to enhance the private sector's bottom line.

Cities interested in investing in smart technologies, for instance the contact-less transit ticketing system mentioned earlier, face substantial upfront costs. For most jurisdictions this poses a challenge due to constrained budgets. Yet partnerships with private sector companies are particularly useful because they can offer technical support, capital funding and oversight of operations. This was the case when the city of Dallas Water Utilities (DWU) partnered with Ameresco, an energy efficiency and renewable energy company, to open an innovative biogas energy recovery facility. Dallas expects to save at least $1.5 million annually, and offset approximately 60% of the electricity that the DWU pulls from the grid.

P3s are not without challenges. They require sound financial management, project evaluation, clear procedures and responsibilities and allocation of risk. When those elements are lacking, P3s can fail. Consider Mexico's P3 venture on an ambitious road concession program widely regarded as a dramatic failure. Between 1987 and 1995, it awarded 52 concessions totaling over 3,293 miles of toll road. By 1993, many of the concessions had to be renegotiated and in 1995, the government was forced to take over 23 of them, creating a large and immediate financial burden. This was caused in part by construction costs that ran 25% over budget and revenues that ran 30% below forecasts. In the end, lack of supervision over the partnerships undertaken in the toll program resulted in a government bailout that cost the country $9.9 billion. Clearly, upfront planning and ongoing oversight are critical factors for successful public-private partnerships.

### How Quincy is using creative problem solving to revitalize its downtown core

One of the oldest cities in the U.S. – Quincy, Massachusetts – formed a public-private partnership to revitalize the city's declining central business district into a model of the future. The city's partner, Street-Works, is a development firm that specializes in the creation of mixed-use districts and public spaces. Quincy partnered with Street-Works with a vision of financing the infrastructure improvements through new income generated by development-specific revenue and supplemented with parking garage revenues.

Targeted to begin construction in 2015, Street-Works expects completion in 2020. The $1.6 billion development with $340 million of public improvements includes 700,000 square feet of retail space, 1,400 residential units, over 1 million square feet of office space, and two hotels.

Prior to entering the partnership, Street-Works spent more than $18 million purchasing land. The firm also assumed the upfront risk for permitting and building the public improvements, securing rights to all private land in the development area, guaranteeing a 4-to-1 ratio of private-to-public dollars in the overall project, and leasing tenant space in advance.

*This rendering shows Quincy's ambitious downtown project.*

This is a non-traditional approach; typically municipalities pay for public improvements before the private sector starts construction. Instead, Quincy will purchase the infrastructure from Street-Works for $289 million. This public-private partnership has enabled both entities to acquire financing for the public improvements sooner and more easily than they could have on their own.

Strong leadership and a trust relationship between both entities is a hallmark of this public-private partnership. Yes Quincy assumes some risk, but the benefits that will accrue from this public-private partnership outweigh it.

## Table 17: Summary Characteristics for Public-Private Partnerships

| Characteristic | Score |
|---|---|
| **Source of capital** | Combination of public and private funding |
| **Number of parties** | 2 or more: Partnerships can involve at least one government and at least one private or nonprofit entity |
| **Ease of financing** | 5 - very difficult: Striking a balance between all parties in terms of risk exposure and shared benefits can be a lucrative endeavor but challenging to bring together with high oversight requirements |
| **Duration of financing** | Varies: Usually short- and medium-term arrangements |
| **Risk to investors** | Varies: Depends on the source of the funding each party brings to the joint project; risk should be determined by those finance options combined with an assessment of the likelihood the partnership will succeed |
| **Risk to borrowers** | Varies: Depends on the source of the funding each party brings to the joint project and the exposure to risk if the partner fails to succeed in their contribution to the project |
| **Tax implications** | Not applicable |
| **Source of repayment** | P3s typically do not involve loans requiring repayments but are more often characterized by contractual arrangements that specify possible fees for service |
| **Advantages** | Well-structured P3s can provide public entities good access to private capital and talent; can have political value |
| **Disadvantages** | Structuring P3s is challenging in trying to spread risk; public entities must recognize private motivations and must include costs for overseeing the project |

## 2. Pay for performance

Pay-for-performance contracts (or performance contracts) are similar to the social impact bonds discussed in Chapter 3. They are commonly used today for energy-related projects. Performance contracts usually involve a private-public partnership where the private sector works with the public sector to implement a new more efficient or more sustainable technology. In most cases, the private sector business will offer financing for equipment, repairs and new developments. In exchange, both entities enter into a performance contract where the private partner identifies and recommends efficiencies that can be paid for through the savings realized. Typically upgrades are guaranteed to the point that savings will meet or exceed annual payments and cover all project costs. Should the anticipated savings not materialize, then the private partner pays the difference.

Pay-for-performance contracts can be very beneficial for both public and private partners. The contracts provide financing as well as project development and implementation costs. The owner gets the immediate advantage of savings from reduced consumption without making a capital investment or assuming debt.

But there are drawbacks to performance contracts. Projects financed with performance contracts are more expensive and less capital efficient. The owner will pay higher (non-tax exempt) interest rates – two to three times higher than tax-exempt rates by relying on performance contract financing.

In 2012, the World Bank convened the Methane Finance Study Group to examine pay for performance as a potential financing mechanism to incentivize reductions in methane emissions. Its report highlights numerous opportunities for structuring these programs to lower capital costs and achieve lower emissions with funding from international development banks with or without public sector participation.

Ameresco, an energy efficiency and renewable energy company, signed an Energy Savings Performance Contract (ESPC) with the Kalispell (Montana) School District in 2013. School administrators wanted upgrades to the district's cooling and heating systems but did not want to impact taxpayers. As part of the ESPC, Ameresco agreed to install over $3.29 million worth of energy efficiency improvements in 12 public school buildings. The district expects annual savings of $140,569 as a result. In this arrangement, Ameresco coordinated the upfront project costs and the district will repay that investment with its energy savings over time.

### Unexploited solar potential leads to $1 billion in international investments

Developers of commercially unproven technologies can find it difficult to enter into their respective competitive market. Assistance furthering such technologies largely comes from government subventions and private investments. According to the International Energy Agency, concentrated solar power (CSP) technology has enormous unexploited potential as a reliable source of renewable energy. This is especially true in the Middle East and North Africa region, which has plentiful solar resources and good proximity to European Union energy demand.

The government of Morocco, a group of development banks and private-sector developers came together to develop the first phase of a 500mW, $1.3 billion CSP facility. The partnership's contractual arrangements require in part that the facility achieve specific performance benchmarks in terms of solar contribution to the plant's overall power generation. The World Bank, African Development Bank, European Investment Bank, Germany's KfW and the Clean Technology Fund are all supporting Morocco's solar plans with loans over $1 billion. When complete, the full complex will be one of the largest CSP systems in the world.

*Morocco's CSP facility will be one of the world's largest.*

## Table 18: Summary Characteristics for Pay for Performance

| Characteristic | Score |
|---|---|
| **Source of capital** | Public funds project with projected savings and private partner covers difference if savings fail to materialize |
| **Number of parties** | 2: One government and at least one private or nonprofit entity |
| **Ease of Financing** | 2 - relatively easy: Uses other public financing for capital but backstops payback from private partner if savings from investment project fail to cover debt payments |
| **Duration of financing** | Varies: Determined by source of primary public funding |
| **Risk to investors** | 3 - medium risk: Depends on the source of the primary public funding but is mitigated somewhat with the performance guarantee from the private partner to ensure debt payments if the jurisdiction cannot pay from the project savings |
| **Risk to borrowers** | 2 - relatively low risk: Public's risk is mitigated by partnership with private partner; private partner's exposure is on the estimation of the savings expected to the public jurisdiction from which it pays the debt |
| **Tax implications** | Not tax exempt |
| **Source of repayment** | Savings from the improvements being financed are supposed to cover the repayment costs, but if the savings fail to reach that point, the borrower covers the difference |
| **Advantages** | Can lower risk from public's perspective while providing public entities good access to private capital and talent |
| **Disadvantages** | Estimates of expected savings from the investment needs to be realistic in order to establish primary public financing; such contracts are usually more expensive sources of capital |

## 3. Securitization and structured finance

Evidenced by the 2008-2009 global financial crisis, financing projects can pose a significant risk to public and private investors alike. Increasingly today investors are mitigating their risks by using financing instruments that secure their investments and lessen their risk. This can be done a number of ways but a key instrument is securitization through structured financing.

Though this method of financing carries significant risk when not regulated properly, it's an option that states, municipalities and private sector investors can select to support clean technologies. In 2011, Barclays and Accenture estimated that $1.9 trillion in financing could be created for low-carbon technology (LCT) through securitization of long-term LCT loans and leases as asset-backed securities. (See Green Bonds section in Chapter 3.)

Structured finance is a complex financial transaction by entities with financing needs that do not match traditional loan structures. A popular structured finance tool is securitization. Securitization is the pooling of various revenue-generating assets and selling shares to investors. After the mortgage collapse of 2008 and 2009 and the ensuing financial crisis, securitization was heavily criticized for its inherent complexity and limited ability for investors to monitor risks, thus playing an integral role in the U.S. subprime mortgage crisis.

The concept behind securitization is that similar investments such as commercial mortgages, credit card debt or auto loans can be packaged in a larger portfolio to generate immediate revenue from long-term revenue streams as well as diversify risks. This is a particularly useful instrument in implementing new technologies because the cost of individual investments may be too much, but a group of investments together makes more financing sense. For example, the renewable energy industry's enormous need for capital offers an attractive investment opportunity and solar securitization could be the right solution for investors.

Securitization typically requires a package of loans that meet a certain monetary threshold (e.g., $100 million). Meeting the threshold can be difficult for technology projects, unless one is considering large-scale development of new cities. For instance, real estate developers Sorouh Real Estate of Abu Dhabi marketed a $1.9 billion securitization of future contract receivables to monetize future cash flows from the sale of real estate plots to fund the eventual development of 28 mid- and high-rise residential, commercial, hotel and serviced apartment buildings.

If there is not sufficient project volume to create robust pools of projects, then investors are not able to leverage those pools. Also, venturing into asset-backed securities is new for individuals in the sustainability business. As a new asset class, there is little default or foreclosure experience to rely on in developing an expected loss proxy. Also, understanding and consensus on methods of accurately rating new technologies can impede securitization. Even once there is a consensus on rating new technologies, the question becomes whether there will be buyers. Other concerns include risk of default, system underperformance, low rate of return from new systems, market fluctuations and trouble designing financial practices that cover multiple technologies.

*Solar securitization could be an attractive option for investors.*

## Table 19: Summary Characteristics for Securitization and Structured Finance

| Characteristic | Score |
|---|---|
| **Source of capital** | Private investors |
| **Number of parties** | Multiple: Groups of jurisdictions working with developers and at least one investment bank to pool the similarly classed investment opportunities |
| **Ease of financing** | 5 - very difficult: Primarily this is a reflection of the risks, but also there is no known market for this approach at this time |
| **Duration of financing** | Varies: Likely good for short- and medium-term arrangements |
| **Risk to investors** | 4 - moderately risky: This is somewhat high risk due to the still-new technologies being financed with this tool since some will likely fail; but by packaging multiple similar projects the risk of complete failure is mitigated |
| **Risk to borrowers** | 4 - moderately risky: Risk for public and private borrowers derives from the newness of the technologies being funded; if a specific project fails then the securitization for that project could be lost and taxpayers would be exposed |
| **Tax implications** | Varies based on the specifics of the structured arrangement |
| **Source of repayment** | Varies based on the specifics of the structured arrangement |
| **Advantages** | This tool represents an opportunity to tap deep pools of capital for investment while spreading the risk associated with each individual project |
| **Disadvantages** | These will be complex instruments and given the problems they exhibited in the home mortgage crisis will require significant oversight |

## 4. Catastrophe bonds

In the early 1990s, catastrophe bonds were developed by insurers in response to increasingly damaging hurricanes that were striking highly urbanized areas in southern Florida. Insurers were not willing to take on the risk so, as an alternative to traditional reinsurance where risk is spread to a secondary insurer, insurers issued catastrophe bonds to private investors willing to assume the risk of losing their investment for the opportunity to earn substantial interest.

Catastrophe bonds have not been issued for smart infrastructure projects, though it may be a consideration for developers of utility-scale projects. As the number of natural disasters increases worldwide and as large-scale renewable energy development expands into new geographic areas, more large-scale developers and utilities may look to catastrophe bonds to address large risk concentrations while implementing smart grids and other infrastructure improvements designed to bolster resilience to natural and man-made threats.

### Pension funds impact catastrophe bond market

The $30 trillion global pension fund industry is starting to infringe on traditional reinsurers seeking to finance protection against natural disasters as interest rates near record lows. Pension funds provide alternative capital to the insurance industry. While many nations seeking to spread disaster burdens welcome capital from pension funds, a Bloomberg report details how pension investment is pushing down prices at the same time reinsurers are pushing for higher rates to compensate for the increase in extreme weather events.

New Zealand's Superannuation Fund (or pension fund) announced in 2013 that it will double its holdings in catastrophe bonds and other insurance-like assets. Other employee pension funds such as the Royal Bank of Scotland Group Plc and PGGM NV in the Netherlands will also increase their reinsurance investments.

Ontario, Canada's Teachers' Pension Plan has been investing in catastrophe bonds since 2005.

*Catastrophe bond returns can vary from 2% to 15%.*

Reinsurance is so appealing to pension funds because of their low correlation to equity and bond markets. Catastrophe bond returns can vary from 2% to 15% — some customized contracts can yield as much as 40%.

### Table 20: Summary Characteristics for Catastrophe Bonds

| Characteristic | Score |
|---|---|
| **Source of capital** | Private investors |
| **Number of parties** | 2 or more: Currently these are tools used primarily by insurers working with an investment bank to issue the bonds |
| **Ease of Financing** | 4 - moderately difficult: The bonds have a high cost and are risky, though if no catastrophe strikes during the coverage period then the payout is high to the investors |
| **Duration of financing** | Short- and medium-term |
| **Risk to investors** | 5 - high risk: If a catastrophe strikes during the coverage period then the insurance company that sold the bonds will take the proceeds to pay claims not covered by the premiums of those insured and investors could get nothing |
| **Risk to borrowers** | 2 - relatively low risk: The point of catastrophe bonds is to spread the risk of an event overwhelming the assets and premiums of the company though they must be able to pay off the bonds at maturity if no event occurs |
| **Tax implications** | The bonds are issued by the insurer which is typically created as a nonprofit entity and therefore the bonds are often tax-exempt |
| **Source of repayment** | If there is no catastrophe requiring the payout of the insurance, then the insurer that issued the bond repays at the fixed rate with funds collected from the investment of the bond money |
| **Advantages** | Spreads risk for borrowers |
| **Disadvantages** | High risk for investors |

# Chapter 6: Tapping the Private Sector


Government-led financing, development exactions and public-private partnerships are all groups of financing tools in which public sector money plays a significant role. The challenge in recent years has been attracting more private investment dollars into the finance market for smart infrastructure projects.

Leveraging private sector funds, which are potentially larger pools of finance capital, can be useful for financing projects that will improve livability and have long-term impacts on a city's economy.

State governments often invest in private sector funds as a way to diversify their investment portfolios.

For the private investors, investing in new technologies can improve their company's bottom line by attracting consumers and reducing costs.

It's important to note that there can be some unintended consequences in leveraging private sector funds, such as excessive or unbalanced risk exposure or insufficient returns.

In this chapter we'll discuss 11 finance tools that tap the private sector:

1. Loan Loss Reserve Fund (LRF)
2. Debt service reserves
3. Loan guarantees
4. On-bill financing
5. Pooled bond financing
6. Pooled lease-purchasing finance
7. Value capture
8. Tax increment financing
9. Philanthropic opportunities
10. International non-governmental organizations
11. Thinking more broadly: combining financing options

## 1. Loan Loss Reserve Fund (LRF)

Under the Dodd-Frank Wall Street Reform and Consumer Protection Act, President Obama signed the Loan Loss Reserve Fund (LRF) in 2009. Although LRFs are not a new banking concept, LRFs help improve under-banked consumers' small-dollar loan options by expanding the number of responsible lenders and products available in the marketplace.

LRFs are useful in markets where financial institutions make a series of small loans for projects such as energy efficiency improvements. One example is Oregon-based Clean Energy Works Portland, which set a 10% loan loss reserve for its energy efficiency retrofit program. Between spring 2010 and spring 2011, Clean Energy Works granted 500 homeowners long-term, low-cost loans to retrofit their homes. With a small amount of state funds to safeguard against risk, the private and public sector partnered to create a pilot loan portfolio of $8 million that resulted in 450 home retrofits with an expected combined life of 30 years for the energy improvements.

### New York City gets creative to hit energy and climate action goals

To support its energy and climate action goals, the New York City Energy Efficiency Corporation (NYCEEC) began administering a credit enhancement program through a public-private partnership in 2011. One of NYC's action goals was to finance energy retrofits for properties in various NYC real estate sectors. NYCEEC was seeded $37.5 million in federal stimulus money granted under the Department of Energy's Energy Efficiency and Conservation Block Grant (EECBG) program, as well as some private sector and philanthropic capital.

NYCEEC utilized its seed funds partially as a loan loss reserve with the intent of leveraging a portion of the $37.5 million to raise several hundred million dollars in debt and equity financing for energy efficiency retrofits in the city.

Using a credit enhancement approach allowed NYCEEC to reduce the risk and cost of capital associated with unsecured lending to commercial real estate owners. This approach was the simplest strategy to draw investment from commercial lenders while abating their reluctance to invest capital in efficiency retrofits with payback based solely on future energy savings as collateral. This method provided lenders with the comfort they needed to finance energy retrofits which, in turn, created a track record of project performance with energy savings and financial returns that began laying the groundwork for increased future lending in the energy efficiency sector.

*NYC found a creative way to finance energy retrofits.*

## Table 21: Summary Characteristics for Loan Loss Reserve Funds

| Characteristic | Score |
|---|---|
| **Source of capital** | Public sector and private banks |
| **Number of parties** | 3: Public jurisdiction funds back private loans from banks to individuals seeking loans for certain activities |
| **Ease of financing** | 2 - relatively easy: Public jurisdiction back stopping primary loan means banks can take slightly more risk in awarding the relatively small loans for these kinds of projects |
| **Duration of financing** | Medium and long-term |
| **Risk to investors** | 2 - relatively low risk: Public covers any losses from the fund if borrower fails to pay the debt, thus leveraging additional capital looking for lower risk options |
| **Risk to borrowers** | 3 – medium: Individual consumers must still make the payments on the terms of the loan; most technology upgrades will not see net savings for several years while the debt is being repaid by the borrower |
| **Tax implications** | Not applicable |
| **Source of repayment** | Borrowers repay the loan generated for the improvements, often through the utility bill |
| **Advantages** | Public participation lowers the risk for private investors and increases their tolerance for these small loans |
| **Disadvantages** | Removes money from jurisdiction while in the reserve fund; public assumes some of the risk in exchange for incentivizing more efficiency investments by homeowners |

## 2. Debt service reserves

Debt service reserves allow states and local jurisdictions to set aside cash reserves to guarantee the payment of the principal and interest of a bond. Much like a loan loss reserve fund for private loans, this service is useful for bond issuers who want to boost the security of their bonds and states or local jurisdictions that want to expand the market for their bonds while reducing the bond coupon rate.

Under the Energy Tax Incentives Act of 2005, debt service reserves can be applied to bonds such as Clean Renewable Energy Bonds (CREB) and the Qualified Energy Conservation Bonds (QECB) (see Chapter 3). Federal law has allowed the Federal Transit Administration to allow its grant recipients to use federal transit funding to reimburse up to 80% of the deposits in a debt service reserve if created for financing transit capital projects. The goal, as with other leveraging tools, is to help borrowers get better bond ratings and lower the costs of capital.

### Kansas City finally gets a green light on its streetcar project

After a year's delay caused by lawsuits over how Kansas City, Missouri's 2.2-mile streetcar line would be funded, in January 2014 the city council approved issuing up to $124.5 million worth of special obligation bonds. Of that, as much as $71.5 million would go to the downtown streetcar project in a Series2014A fund that will pay to acquire and construct the streetcar system. It will also fund a debt service reserve fund for the bonds and pay certain costs related to the issuance of the bonds, according to the Kansas City Business Journal.

As outlined in the KC Business Journal, the city's plan for financing the streetcar line – which aims to create jobs and boost business opportunities in the region – includes:

- $62.9 million of special obligation bonds for construction with the remaining $8.6 million, if needed, toward the cost of issuance and as a reserve fund for debt services.
- Kansas City's Water Services Department will contribute $14 million to help pay for water utility relocation under the streetcar route.
- Federal grants including Kansas City's $20 million Transportation Investment Generating
- Economic Recovery (TIGER) grant will total

*Kansas City's streetcar, rendered here, will be backed by a variety of financing mechanisms.*

$37.1 million.

The federal TIGER grant, announced in August 2013, targets major national and regional transportation projects that are often difficult to pursue through other government funding programs, according to U.S. Senator Claire McCaskill, who represents Missouri. Selected projects must foster job creation, show strong economic benefits, and promote communities that are safer, cleaner, and more livable.

Added McCaskill: "This streetcar project will encourage housing, construction, and business development in the city — and that will mean more jobs across the region."

The streetcar project is expected to be operational by late 2015 or early 2016.

## Table 22: Summary Characteristics for Loan Loss Reserve Funds

| Characteristic | Score |
|---|---|
| **Source of capital** | Public sector and private banks |
| **Number of parties** | 3: Public jurisdiction funds a reserve to back private bonds from banks to individuals seeking capital for certain targeted and qualifying activities |
| **Ease of financing** | 2 - relatively easy: Public jurisdiction back stopping bond debt means banks can take slightly more risk in selling bonds targeted at qualifying projects |
| **Duration of financing** | Medium and long-term |
| **Risk to investors** | 2 - relatively low risk: Public covers bond debt if needed, thus lowering risk to private investors and encouraging lower cost capital availability; risk to public of losing capital reserve money if issuer defaults on the bonds |
| **Risk to borrowers** | 3 – medium: Normal risk for bond issuers as long as revenue stream covers bond payment; backing by public runs risk of moral hazard though there is no systematic evidence of this |
| **Tax implications** | Depends on the bonds that are being secured (with other bonds) |
| **Source of repayment** | Bond issuer repays, but at lower cost due to the use of the reserve |
| **Advantages** | Public participation lowers the risk for private investors and increases their tolerance for those buying these bonds and providing capital for targeted smart and green projects |
| **Disadvantages** | Removes money from jurisdiction while in the reserve fund; public assumes some of the risk in exchange for incentivizing more efficiency investments by bond issuers |

## 3. Loan guarantees

One method that U.S. states and many nations use to minimize risk for private investments is guaranteeing the repayment of a loan in case of default. Similar in logic to the loan loss reserve funds, loan guarantees allow the federal government to work with private companies and lenders to mitigate the financing risks associated with new projects.

The U.S. Department of Energy (DOE) has awarded billions of dollars in loan guarantees for a wide variety of clean energy projects. Among them was BrightSource Energy's Ivanpah project – a solar thermal plant in the desert of Southern California. The 392 megawatt project officially opened in early 2014 and its three large-scale solar towers are providing enough energy to Southern California Edison and Pacific Gas & Electric to power 140,000 homes per year, according to BrightSource.

The DOE provided a $1.6 billion loan for the Ivanpah project in 2011 and the effort also drew backing from Google and NRG Energy. Bechtel, a Council Lead Partner, constructed the massive facility.

The DOE loan guarantee program has its share of critics. After several companies that received loans went bankrupt, the department was taken to task for lack of oversight. But the program continues.

### Loan guarantees support innovative SMEs around the world

The European Investment Fund and BPCE Group in France agreed to a $410 million loan agreement for innovative small and medium-sized enterprises (SMEs) in 2013. The agreement uses the Risk Sharing Instrument (RSI) launched by the European Commission and European Investment Bank Group to ease access to financing for SMEs and increase competitiveness.

In 2013, the African Guarantee Fund (AGF) committed to a $2.3 million loan guarantee with the Commercial Bank of Kenya and the Pan African SME Fund in Nairobi. AGF regards SMEs as a source of economic growth across Africa and as a strong driver of the country's economic vision of achieving 10% growth annually in its underperforming economy.

*Loan guarantees boost economic growth.*

Malta Enterprise will provide loan guarantees of up to $100,000 for SMEs that can provide collateral to cover 10% of their investment. And Romania's government passed a $613.85 million loan guarantee for SMEs to ensure that businesses have access to capital.

### Table 23: Summary Characteristics for Loan Guarantees

| Characteristic | Score |
|---|---|
| **Source of capital** | Federal government and private lenders |
| **Number of parties** | 3: Public jurisdiction funds a reserve to back private loans from lenders to other firms seeking capital for certain targeted and qualifying activities |
| **Ease of financing** | 2 - relatively easy: Public jurisdiction back-stopping loan guarantee means banks can take slightly more risk in providing loans targeted at qualifying projects |
| **Duration of financing** | Medium- and long-term |
| **Risk to investors** | 3 - medium risk: Funding large-scale new technologies carries relatively high risk, mitigated somewhat with the loan guarantee from the federal government, thus lowering risk to private investors and encouraging lower cost capital availability; risk to public of losing capital reserve money if borrower defaults on the loan |
| **Risk to borrowers** | 3 – medium: Normal risk for loan borrowers as long as revenue stream covers loan payment; backing by public runs risk of moral hazard though there is no systematic evidence of this |
| **Tax implications** | Not applicable |
| **Source of repayment** | Borrower is responsible for repayment, though this is backed by a government agency that has issued the guarantee |
| **Advantages** | Federal participation lowers the risk for private investors and increases their tolerance for the size of the loans necessary to bring new technologies to scale |
| **Disadvantages** | Public assumes some of the risk in exchange for incentivizing innovations to bring new technologies to scale through private borrowing; risk through federal government spread over entire population |

## 4. On-bill financing

When smart cities encourage their citizens to adopt new green technologies, public-private partnerships can often be leveraged for the best possible outcome. Yet citizens are often slow to adopt new technologies due to lack of upfront funds to pay for them, reluctance to adopt something unfamiliar, unforeseeable savings and high financing costs. In such cases, two types of programs are available to citizens to accelerate adoption: utility-enabled financing and repayment and user fees, which were discussed in Chapter 3.

On-bill financing (also known as utility-enabled financing and repayment) allows the local utility to decide the best upgrade package that can be reasonably financed. The utility then oversees the upgrades and customers are assessed a fixed monthly charge on their utility bills to pay for the upgrade.

The Rural Energy Savings Program based in South Carolina is one such program. Its aim is to alleviate problems rural communities face in saving energy and cutting household utility bills. By reducing greenhouse gas emissions through residential energy efficiency improvements, the Rural Energy Savings Program financed low-cost loans to residents that they repaid through on-bill financing.

### National Grid uses on-bill financing to offer multiple customer incentives

National Grid is a British multinational utility that delivers electricity and gas to Britain and the Northeastern United States (and a Smart Cities Council Lead Partner). The utility's on-bill financing (OBF) program goes well beyond traditional OBF incentives by helping customers finance big-ticket energy conservation upgrades and overcome financial barriers.

National Grid pays 40% to 70% of the project cost and the customer pays the rest over a period of one to 24 months, with the amount appearing as a line item on the customer's utility bill. The interest rate is 0%, and for small business customers, the utility discounts the amount by 15% if the business repays the loan in one month.


*National Grid helps customers finance energy upgrades.*

Since billing is on the regular monthly utility bill there are lower instances of defaults. Also, offering the loan at 0% decreases the complexity of the transaction. And finally, loan repayment is not secured by the property so default will not result in a lien against the property.

## Table 24: Summary Characteristics for On-Bill Financing

| Characteristic | Score |
|---|---|
| **Source of capital** | Public, private, or nonprofit utility |
| **Number of parties** | 2: Utility provides upfront costs for upgrades and bills the customer |
| **Ease of financing** | 1 - very easy: Utility uses available resources to effectively make the upgrade investment then replenishes the costs by billing the consumer directly |
| **Duration of financing** | Short- to medium-term |
| **Risk to investors** | 2 - relatively low risk: As long as the utility can guarantee a customer will be paying, then the funding can be collected over time after the costs of the upgrade |
| **Risk to borrowers** | 2 - relatively low risk: Customer is not technically borrowing so credit scores are not at risk any more than the risk of not paying one's utility bill; still it is a cost that customers must plan for |
| **Tax implications** | None |
| **Source of repayment** | Homeowner repays through utility billing |
| **Advantages** | Ease of administration; speed of implementation |
| **Disadvantages** | Customers must be aware of their options; not all green and smart technologies are available from every utility |

## 5. Pooled bond financing

Pooled bond financing is another option that helps generate new capital. 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.

The goal is usually to help smaller borrowers (e.g., small towns) get access to capital with lower costs than they might be able to on their own, given their credit ratings. The bond program features a common debt service reserve fund, which is funded from proceeds from each bond sale and kept at a level equal to 5% of the principal amounts on each individual loan. The common debt service reserve fund is meant to enhance the credit strength of the program so that it is greater than the credit of individual borrowers.

Using bond insurance, premiums are allocated to each borrower based on their credit strength, so no borrower is subsidizing any other borrower. In 2004, the Virginia Municipal League and the Virginia Association of Counties jointly sponsored an issue of $40.5 million in tax-exempt revenue bonds. Pooling the resources into a single offering helped keep the borrowing costs low for participating jurisdictions due to the pool bond program's triple-A rating.

### Program pools funds for Czech Republic cities

Created in 1994, the Municipal Finance Company (MUFIS) was a part of a USAID municipal infrastructure finance program. The program was designed to catalyze the integration of municipal infrastructure finance in capital and financial markets where municipalities and townships lacked sufficient funds and knowledge of how to build capital for projects.

MUFIS served as a joint stock company where shares in MUFIS were owned by the Ministry of France (49%), the Czech and Moravian Guaranty and Development Bank (49%), the Association of Czech Municipalities and the Union of Towns and Communities (2%).

MUFIS borrowed $44 million from U.S. investors backed by U.S. government guarantees and subsequently lent the funds to commercial banks. Municipalities then borrowed funds from the banks for periods between 7 to 15 years to finance housing-related infrastructure projects.

*Pooled funds support Czech Republic. housing projects.*

## Table 25: Summary Characteristics for Pooled Bond Financing

| Characteristic | Score |
|---|---|
| **Source of capital** | Private bond buyers |
| **Number of parties** | 3 or more: At least two borrowing entities and one sponsor to issue the pooled bonds |
| **Ease of financing** | 2 - moderately easy: Coordination with the sponsor issuing the bonds and ensuring the fairness |
| **Duration of financing** | Medium-term |
| **Risk to investors** | 2 - relatively low risk: Pooling the bonds from multiple borrowers has the effect of pooling the risk that any one borrower defaulting would hurt the overall package |
| **Risk to borrowers** | 2 - relatively low risk: As long as funding from each participant in pool reasonably projects to generate sufficient revenues to meet their debt obligations |
| **Tax implications** | Depends on the ultimate issuer of the bonds; if a government, then the bonds are tax-exempt |
| **Source of repayment** | Government recipient of bond proceeds (usually a smaller jurisdiction that is part of the pool) must repay the bond which is usually a basic revenue bond |
| **Advantages** | Provides a low cost fixed-rate option for jurisdictions, nonprofits and certain businesses to secure capital and can be tailored for smart infrastructure projects |
| **Disadvantages** | Pool of participants needs to be diverse in order to make sure payments are made and protect the rating of the sponsor that issues the bonds |

## 6. Pooled lease-purchasing

With pooled-lease purchase financing, a government agency purchases property or equipment on an annually renewable contract. Financing can come from either a financing institution or the government may issue certificates of participation where investors can purchase a share of the lease revenues. At the end of the lease, the agency that issued the debt can sell the property or equipment to the jurisdiction for a minimal amount.

This financing mechanism is particularly beneficial to states because smaller projects can be combined to receive longer loan terms and lower interest rates. However, forming a pooling agreement can be difficult when attempting to combine projects at the same time for financing.

### TVA uses $1 billion lease purchase for Tennessee plant

In 2012, The Tennessee Valley Authority (TVA) completed a $1 billion lease-purchase transaction for a natural gas-fired plant in Rogersville, TN. The transaction provided financing support for the development of the plant and cleaner energy. Financing for the lease purchase included a $100 million equity investment and a $900 million bond issue, both of which were secured by TVA's rental payments. Morgan Stanley, Bank of America, Merrill Lynch and Barclays Capital served as lead underwriters. TVA will lease the plant to John Sevier Combined Cycle Generation LLC, for which it will receive $1 billion in proceeds.

*Pooled-lease purchasing supports cleaner energy.*

## Table 26: Summary Characteristics for Pooled Lease Purchasing

| Characteristic | Score |
|---|---|
| **Source of capital** | Public sector or private investors |
| **Number of parties** | 4 or more: The purchasing agency, at least two leasers, and at least one private purchaser of shares of the lease revenues |
| **Ease of financing** | 4 - moderately difficult: Coordination costs are relatively high setting up the purchase and lease arrangements in addition to selling shares of the lease revenues |
| **Duration of financing** | Short- to medium-term |
| **Risk to investors** | 2 - relatively low risk: Leases are for fixed periods which lowers uncertainty of the debt payment |
| **Risk to borrowers** | 3 - medium risk: Sponsoring agency must ensure adequate leasing to meet repayment obligations |
| **Tax implications** | Not applicable |
| **Source of repayment** | Borrowing jurisdiction repays though it may have the option of selling the asset at the end of the lease period |
| **Advantages** | Does not affect statutory debt limitations of public sector participants; lowers borrowing costs due to use of tax exempt funds; smaller equipment that is not normally fundable can be financed |
| **Disadvantages** | Relatively few; no guarantee to participants on price of equipment at end of lease period |

## 7. Value capture

Guided by the principle that those who benefit from public infrastructure should pay for it, value capture is the identification and capture of increased land value from resulting public investment in infrastructure.

Local governments have widely used value capture instruments to incentivize and/or invest in infrastructure improvement in blighted areas where private investment risk would be high. Using special taxes and community improvement fees, local jurisdictions can capture part of the value created for private investors as a result of the jurisdiction's investment in improvements.

For instance, an improvement in a city's public transit system that upgrades the system's efficiency and accessibility is a benefit to neighboring properties. This benefit is the increase in higher land values and, perhaps, an increase in business for property owners. Since they benefit from the improvements made to the transit system, they should pay for receiving those benefits through the city's choice of assessment, which could be an imposition of public transit impact fees, land-value taxation or capture of property tax increments through TIFs (which are explained in the next section).

### Value capture drives Virginia transportation improvements

Counties in Virginia have been using value capture to support their transportation infrastructure for nearly 25 years. In the 1980s, Fairfax and Loudoun Counties established special assessments on commercial and industrial property to upgrade Route 28 to a grade-separated highway. That enabled the development of retail centers as well as improved access to Dulles International Airport.

In the 1990s, Virginia funded highway and bridge projects, Metrorail expansions and station access improvements using recordation taxes (also known as a transfer tax). These are taxes imposed by the state for the privilege of recording an instrument in the Land Records.

Major successes include:

- The Dulles Corridor Metrorail project, the Silver Line, is funded by special assessments on commercial and multi-family residential property and increased toll charges. The first phase of the Silver Line opened in 2013 costing Fairfax County $400 million.

*Dulles Corridor Silver Line is funded by special assessments.*

- The City of Alexandria used a multi-faceted value capture program that included the use of special assessments and bonds to fund the Potomac Yards Metrorail Station near Ronald Reagan Washington National Airport, which was projected to cost $240 million in 2010.
- The Tysons Corner Local Transportation Development Program in Fairfax County will receive $3.1 billion in funding for new roads and transit via creation of a service district that covers 6,000 commercial and residential properties.

## Table 27: Summary Characteristics for Value Capture

| Characteristic | Score |
|---|---|
| **Source of capital** | Local government initially, recouped from taxed private activity in the benefits catchment area |
| **Number of parties** | 2 or more: The local jurisdiction and at least one private entity in the benefits catchment area |
| **Ease of financing** | 4 - moderately difficult: Special assessments and special tax district creation can be highly political |
| **Duration of financing** | Short- to medium-term |
| **Risk to investors** | 3 - medium risk: The local jurisdiction can make the upfront investment in the new infrastructure and may rely on another funding mechanism initially, dedicating the revenues from an assessment or special tax as the repayment; public officials face potential political costs |
| **Risk to borrowers** | 3 - medium risk: Though not technically borrowers, those living in the assessment/tax district may face unexpected high increases in taxes with a lagged benefit to their property value from the infrastructure investment |
| **Tax implications** | Not applicable |
| **Source of repayment** | Not applicable |
| **Advantages** | Addresses the fundamental fairness principle that those deriving the greatest benefit from a service should pay the most for it |
| **Disadvantages** | Drawing the district that derives the benefits from such infrastructure investments can be challenging and open to alternative interpretations from those along the edges |

## 8. Tax increment financing

Tax increment financing (TIF) is a public financing method that essentially finances debt in anticipation of future tax revenues. TIFs allow cities to begin infrastructure and community improvement projects with borrowed funds with a promise to pay those funds back with additional tax revenues generated from the increased property value in the area around the development.

In many areas where TIFs are used, the area of proposed improvement is categorized as underdeveloped, blighted and as a site with potential to save and/or bring in money if developed. TIFs usually pay for streets, sewers, parking facilities, land acquisition, planning expenses, job training, demolition and clean-up costs. In most cases, cities consider TIF projects a viable option because the proposed development of the area is anticipated to spark an increase in property values. The logic of this form of financing can be applied to smart infrastructure projects as well.

The most lauded benefits of TIF loans is that they do not cost the taxpayer anything upfront, they attract private investments, strengthen the tax base and increase economic activity. The repayment comes solely from revenue generated through new taxes from within the new development area. When areas are developed or re-developed, new property taxes are generated. The original property taxes on the area before development are paid to the city and the balance goes into a special fund that subsidizes portions of the new development. TIFs offer cities flexibility in times of financial hardship.

In the U.S., 49 states have approved the use of TIFs — Arizona being the lone hold-out — but there are many who oppose TIFs. Among other arguments, detractors see them as a means of gentrification and of unduly condemning private property under eminent domain statutes. They argue that TIFs can actually cost a city more money because of the need for increased public services that new developments bring. They also point to the risks if developers become insolvent or otherwise drop the ball, which does happen.

In *Kelo vs. the City of New London* heard by the U.S. Supreme Court in 2005, the city of New London, Connecticut used eminent domain laws to seize private property for redevelopment to create jobs and increase tax revenues. And the developer of the project abandoned it midstream without financing, which left the property a temporary dump.

### Walmart TIFs in Missouri

Missouri is one of many states where Tax Increment Financing (TIF) is authorized to combat blight and foster economic development due to its ability to take new taxes that new developments generate and direct a portion to repay the cost of the project itself.

TIFs encourage developers to undertake projects in areas that need a stimulus and allow the local government to reimburse developers for some of their project's cost. This was the case in two suburbs in St. Louis: Saint Ann and Bridgeton. In 2010, Walmart announced it would close two stores located in those suburbs and open a new store in Bridgeton. This move allowed Bridgeton to capture money through a TIF that would have gone to other tax entities — in this case, to subsidize the Walmart replacing the existing Walmart. Additionally, Walmart had the possibility of capturing $7 million in subsidies that were projected to be diverted away from public schools and other taxing districts.


*Cities can use TIFs as an economic development tool.*

Meanwhile, in 2013 the city of Shrewsbury, MO voted not to allow a TIF to help pay for a new Walmart ($15 million over 23 years). Detractors noted that $3 million of those funds would typically go to area schools and that a Walmart would take business away from other shopping. Those in favor asserted that the proposed new Walmart site was located in a blighted area and that it could bring in $62 million in sales in its first year, thus increasing sales tax and attracting other business.

## Table 28: Summary Characteristics for Tax Increment Financing

| Characteristic | Score |
|---|---|
| **Source of capital** | Local government initially, recouped from private property owners |
| **Number of parties** | 2 or more: The local jurisdiction and at least one property owner in the benefits catchment area |
| **Ease of financing** | 1 - very easy: Upfront costs to start a project are minimal and the tax increment can be collected starting immediately |
| **Duration of financing** | Medium- to long-term |
| **Risk to investors** | 3 - medium risk: The local jurisdiction can make the upfront investment in the new infrastructure and may rely on another funding mechanism initially, dedicating the revenues from the tax on the incremental increase in property value as the repayment; public officials face low political costs since the tax is only on any increased value; infrastructure may not generate increased property values |
| **Risk to borrowers** | 2 - medium risk |
| **Tax implications** | If the jurisdiction reimburses developer, there are no tax benefits; if the jurisdiction issues TIF bonds to provide the upfront financing, those buying the bonds receive tax-exempt status on the interest |
| **Source of repayment** | Developer repays usually through the increased taxes generated by the increased property value |
| **Advantages** | Low upfront costs; spreads payment over an area; relies primarily on those that benefit the most as measured by their increased property value created by the infrastructure |
| **Disadvantages** | May encourage gentrification in certain areas. Though not technically borrowers, those living in the area affected by the increased value from the infrastructure improvements may face higher property taxes and be forced to relocate if unable to pay |

## 9. Philanthropic opportunities

Many of the previous financing options have highlighted the role of the private sector as a source of capital needed to implement smart technologies in municipal settings. But there is a growing interest among philanthropic organizations – both local and global — to participate in smart city investments from the municipal level down to the individual homeowner level.

Private foundations as well as a range of nonprofit organizations are developing funding pools from which homeowners, community groups and entire municipalities can compete for grants or other philanthropic gifts aimed at helping achieve more sustainable cities. As cities deliberate financing options, they should consider competing for these awards as yet another funding option or as a component of a funding package. These funding sources can be idiosyncratic and may focus their financial awards in a relatively narrow field within the environmental sustainability arena. Others may have wider interests and field multiple asks.

One example is the Funders' Network for Smart Growth and Livable Communities. It partnered with the Urban Sustainability Directors Network to create a Local Sustainability Matching Fund. Launched with help from several other foundations, it provides a funding pool available on a competitive basis to communities able to raise additional funds to help with the project, thereby allowing resources to stretch further. Projects must achieve the goal of advancing specific sustainability goals (with demonstrated community support and engagement) in line with the Fund's focus on energy-efficient retrofits, green design (related to LEED certifications) and urban sustainability planning.

Another example is Enterprise Community Partners, which is a nonprofit foundation whose primary mission centers on providing affordable low- to moderate-income housing options in cities. Unlike most other housing groups, however, Enterprise integrates its commitment to green buildings into the projects they support. The homes they help finance must meet certain energy-efficiency standards. In 2012, Enterprise invested $2.4 billion in the financing of over 16,800 affordable homes.

With smart technology financing — and public infrastructure financing more generally — the greater the risk with the investment, the more challenging it can be to locate a funding source. Green buildings and energy efficient homes are important components in continuing the move towards greater sustainability in urban areas, but the more cutting-edge technologies in development require funders with greater tolerance for risk than most community foundations can manage. In these situations, some smart technology investments have sought and secured financing from corporate philanthropies.

One great example of this: The IBM International Foundation's Smarter Cities Challenge. This initiative, seeded initially with $50 million, was designed to help cities inventory their current smart assets and develop plans to move to smarter operations with the aid of IBM's support teams. Over the initial three-year life of the Challenge, IBM provided support to 100 municipalities in over two dozen nations and has announced the much-heralded initiative will continue beyond its initial three-year timeframe. IBM is a Smart Cities Council Lead Partner.

Microsoft, another Council Lead Partner, is best known for its software and co-founder Bill Gates for his foundation's philanthropic efforts to improve access to healthcare in developing nations. But Microsoft Corporation is also investing in sustainability. In late 2013 the company announced it would buy all of the output from a Texas wind farm for 20 years to help power one of its data centers. In fact the Environmental Protection Agency recognized Microsoft as the second largest purchaser of green power in the U.S. in 2013 and the company doubled its purchase of renewable energy from 1.1 billion kWh to 2.3 billion kWh. The company was also an investor in a $1 billion green bond from the International Finance Corporation that aims to support "climate smart" investments in emerging markets.

*Private sector companies are increasingly engaged in investments that encourage more alternative energy.*

IBM and Microsoft are just two examples of how the private sector is playing a significant role not only in the financing of smart technologies, but also in direct investments to further alternative energy, increased energy efficiencies and overall sustainability practices. Municipalities should consider partnering with such organizations or their philanthropic arms when looking for creative and innovative ways to advance a smart city agenda.

## 10. International non-governmental organizations (NGOs)

While not a finance tool specifically, there has been significant growth in the number and size of environmental, sustainability and climate change focused organizations around the world. Led by efforts such as those at the World Bank, the Organization for Economic Cooperation and Development (OECD) and the Climate Investment Funds (CIF), these non-governmental organizations (NGOs) are providing financing for the development of a wide range of sustainable practices, alternative energies and smart technologies in highly industrialized urban centers to remote regions of underdeveloped nations. They are also providing technical expertise to governments and communities around the globe on how best to implement these changes in ways that integrate local customs and practices.

The World Bank is probably the best known of these organizations. And while it is not a bank in the traditional sense of the word, the World Bank does provide extensive assistance in pulling together significant levels of financial support for projects across an array of issue areas (including economic and environmental development). It provides or helps facilitate various financing options through its various partnerships with other trust funds based on bilateral and multilateral donors. Many World Bank projects include co-financing with the host nation's government, private sector partners and export credit agencies.

But the World Bank is only one such actor on the international stage. CIF is another group focused on the developmental support of alternative energies and sustainable practices, particularly in the developing world. Like the World Bank, CIF works with partner nations and multilateral development banks to pool funds targeted at projects centered on climate change practices. The support is both financial and technical, and one of CIF's primary goals is disseminating best practices in these areas to other developing countries. CIF is based on two different trust funds. The first is the Clean Technology Fund designed to support scaled-up projects in countries where gains are likely in reducing greenhouse gases. The second is the Strategic Climate Fund, which finances three district piloting programs: the Forest Investment Program, the Program for Scaling up Renewable Energy in Low-Income Countries, and the Pilot Program for Climate Resilience. CIF uses grants, concessional funds and various risk mitigation tools that help leverage additional financing from private investors, development banks and other financial partners. The pay-for-performance solar project in Morocco discussed earlier is an example of an initiative involved the World Bank, CIF and others as technical and financial partners.

Besides all of the NGOs operating around the world, many nations also are home to private or quasi-governmental export credit agencies (ECAs). These organizations often serve as a line of credit to local exporters. Some also provide guarantees and insurance for exported items. The goal of these organizations is to mitigate the risk to exporters when operating on international markets, taking a premium for assuming that risk. Again, this isn't the same type of tool featured in this chapter. But using or establishing an ECA to support local businesses engaged in trade with international partners for materials related to smart technologies and sustainable practices could have positive spillover effects in the local economy and help promote their use.

*NGOs are providing financing for the development of a wide range of sustainable practices, alternative energies and smart technologies in highly industrialized urban centers to remote regions of underdeveloped nations.*

## 11. Thinking more broadly: combining financing options

Those in the financial industry are aware that many projects actually rely on multiple funding sources. This is more likely to be true depending on two primary considerations: the number of disparate components making up the asset, and the expected longevity of each of those components. Airlines, for example, are financed through a complex array of sources. Seats are financed with relative short-term debt instruments because they face significant wear and tear and are replaced more often. The fuselage, on the other hand, has a very long life expectancy and is financed over a much longer period of time. Avionics, wiring, landing gear are similarly financed separately. Airplanes are not generally financed as one unit.

Similarly, many smart technologies and sustainability initiatives being contemplated by cities around the world have multiple components. Public transit systems have a multitude of components, such as buses, rail and rail cars. But each has different life expectancies. Buses are depreciated based on a 12-year lifecycle. Light rail cars have a 25-year expected lifespan. Heavy rail cars have a 35-year life expectancy. And rail lines themselves are financed based on a 100-year life cycle.  Even the components within each of these could be financed on a shorter schedule than that used for the overall unit. Components in a smart power grid may be quite amenable to creative component financing as well.

Local administrators and elective representatives should consider not only the sum of the parts of their projects, but the parts themselves. Communities may be able to achieve significant savings when breaking down the components and financing them discretely as opposed to lumping short-term components in with long-term components and paying for such items far beyond their lifespan, or paying for long-term components on too short a payback schedule for optimal efficiency.

*Cities may achieve significant savings by breaking down project components and financing them discretely.*

Combinations of financing tools may provide additional flexibility to local officials. These combinations could include a number of the tools presented in this guide, from direct payments by government units from taxes, to some form of bond, to a development exaction, to a public-private partnership, to a grant or other source of private or philanthropic support. Smart technologies are at the forefront of innovation and local administrators need to think creatively to use the many financing tools at their disposal.

# Chapter 7: Conclusions and Additional Resources

Governments around the world are coming to terms with the realities associated with the population explosion on the way and the urbanization it will spawn. Innovations in technology will dramatically improve the livability, workability and sustainability of tomorrow's cities. New ideas for matching solutions to problems through partnerships between the public, nonprofit and private sectors are emerging every day.

The challenges presented by increased urbanization are not insurmountable, but do require entrepreneurial approaches that bring to bear the creativity of the private sector with the commitment of public officials. As we've emphasized, the single greatest barrier to meeting these challenges is financing.

In this report we focused on 28 financing tools available to decision makers looking for the right financing option for their project. Not every tool is available in every jurisdiction around the world, but the collection serves as a starting point for exploring options. And city leaders will need to consider some of the nontraditional financing arrangements that may prove a better fit for the kinds of smart technologies they want to see in their communities.

Like hammers and screw drivers, these tools are good for different kinds of investment activities. Some require several partners and more coordination. Others rely on the coercive powers of government. Still others try to tap the deeper reservoirs of private capital to help build the smarter infrastructures needed for tomorrow's cities.

## ADDITIONAL RESOURCES

***Infrastructure Financing Options for Transit-Oriented Development:*** Developed for the Environmental Protection Agency by Council Associate Partner CH2M HILL, this guide focuses on financing infrastructure needed to support the denser development enabled by the extension of transit lines. Most of the 30 financing options addressed can more broadly support other types of smart cities development as well. Learn more >

***Self-Funded Public-Private Partnership Model for Citizen Services Delivery:*** To help governments improve service delivery, Council Associate Partner Imex Systems Inc. is pioneering a public-private partnership model where governments can obtain multi-channel service delivery infrastructure at no cost or minimal capital and operating costs. Learn more >

***Finance and procurement tools:*** Visit the Smart Cities Council website for more on procurement strategies, vendor strategies, contract tips, project management techniques and other recommendations. Learn more >

# About the Authors

***The Smart Cities Finance Guide was developed for the Smart Cities Council by the Center for Urban Innovation at Arizona State University.***


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Degree Program at the University of North Carolina. Prior to that, he was director of the UNC-Charlotte Master of Public Administration program as well as MPA director at Clemson University. Swindell received his doctorate from Indiana University in Public Policy. His primary research and teaching interests focus on community and economic development, especially public financing of sports facilities, the contribution of sports facilities to the economic development of urban space, the role of nonprofit community and neighborhood-based organizations as mechanisms for service delivery, and citizen satisfaction and performance measurement standards for public management and decision making. His research has been published in Public Administration Review, Economic Development Quarterly, Journal of Urban Affairs, Social Science Quarterly, the American Review of Public Administration, Public Productivity and Management Review, Public Administration Quarterly, the Journal of Sports Management, Johnson's Minor League Baseball and Local Economic Development, Rosentraub's Major League Losers, and The Brooking Institution's Sports, Jobs, and Taxes. Swindell's other sport-related activities have included working with local communities to understand the implications of such public investments. He has testified to federal, state, and local legislative bodies on a range of issues related to community and economic development. Swindell's other technical policy studies include numerous citizen satisfaction survey reports, models for involving various nonprofits in urban service delivery, various public program evaluations, estimation methodologies for light rail ridership from special event generators, and business retention strategies for local governments.

**Jonathan GS Koppell** is the Dean of the College of Public Programs and the Lattie and Elva Coor Presidential Chair in the School of Public Affairs. Koppell has focused on preparing students for lives of community engagement and public service while promoting use-inspired research by faculty and research centers aimed at making our communities more prosperous, healthy and resilient. He has emphasized the transcendent focus on "public goods" that unifies the specializations of college's four distinct schools (criminal justice, community development, public administration and policy, and social work) while connecting the college to the broad range of relevant ASU programs. Koppell's research and writing broadly examines the design and administration of complex organizations in the public, private and nonprofit sectors. His book World Rule: Accountability, Legitimacy and the Design of Global Governance reveals the hidden world of "global governance organizations" such as the World Trade Organization, the International Organization for Standardization and the International Accounting Standards Board that have more effect on our daily lives than we might imagine. Both his academic articles and previous book, The Politics of Quasi-Government address many of the key policy issues of the moment; including government involvement in for-profit enterprise, regulation of financial institutions and corporate governance. Koppell joined Arizona State University in 2010 as Director of the School of Public Affairs, from the Yale School of Management where he also directed the Millstein Center for Corporate Governance and Performance. In addition to scholarly publications, Koppell has written numerous opinion pieces for the New York Times, Wall Street Journal, Washington Post and other leading publications. He holds a doctorate in political science from the University of California, Berkeley and a Bachelor of Arts degree from Harvard. In 2012, he was inducted as a Fellow of the National Academy of Public Administration (NAPA).

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# About the Center

The Center for Urban Innovation at Arizona State University develops news ways for public officials, private entrepreneurs, nonprofit agencies, and citizens to work together in addressing the challenges that confront metropolitan areas around the nation, from the neighborhood to the regional level. The primary research mission addresses questions of public leadership, meaningful democracy, and the reform of governance through new structures and processes such a regional cooperatives and neighborhood empowerment. Bringing together urban scholars, policy practitioners, and graduate students, the Center designs innovative and sustainable solutions for today's practical applications, but that are flexible to serve tomorrow's needs.

The Center serves as Arizona State University's focal point for research on urban affairs in the School of Public Affairs and the College of Public Programs. The center seeks to accomplish its goals through basic and applied research in books, journal articles, research reports, and public testimony, as well as through training and development activities for local government officials. The Center is committed to innovative education and training, critical research and community involvement in the continuing effort to assist communities establish their collective goals, mobilize the necessary resources, implement the policies to achieve their goals and deliver services effectively and efficiently that improve the quality of life.

For more information about the Center, visit:

http://urbaninnovation.asu.edu

# 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, sustainable and prosperous cities. We work to create cities that exemplify our three core values: livability, workability and sustainability.

The Smart Cities Readiness Guide, launched by the Council in November, 2013, is one example of how we are enabling leaders to assess their city's current state of technology and its readiness to become a smart city. Learn more about the Readiness Guide.

SmartCitiesCouncil
LIVABILITY | WORKABILITY | SUSTAINABILITY

## Council Partners

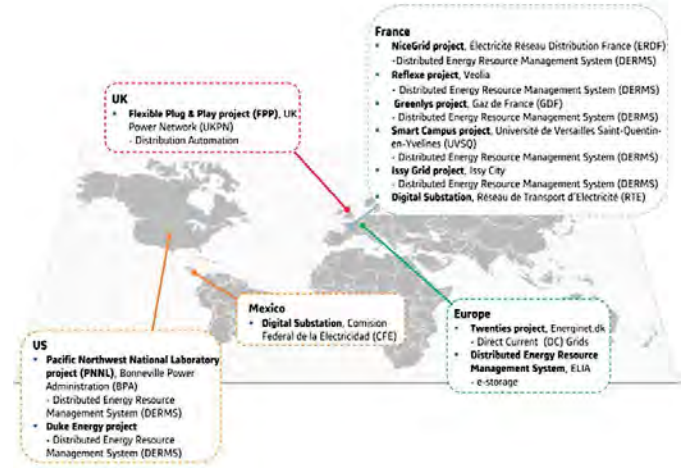
On the pages that follow, you will meet our Partners and Advisors. We invite you to join us too. Learn more by contacting Council Executive Director James Whittaker:

Smart Cities Council

# INTRODUCING SMART CITIES COUNCIL LEAD PARTNERS

*Council Lead Partners are for-profit companies that are global leaders in their sectors. Learn more about them on the pages that follow.*

> *Alstom developed a number of demonstration projects in leading smart grid countries, in partnership with governments, utilities, industries, academic and research institutions.*




**As a leading producer of smart technologies and services, Alstom Grid is pleased to lend its expertise to the Smart Cities Council's efforts to support and educate city leaders, planners and citizens.**

To meet today's increasing global energy demands and challenges, networks must evolve and become smarter. Alstom Grid enables an efficient transmission and distribution of electricity and supports the development of Smart Grids and Supergrids with engineered solutions for applications in utility and industry settings; updating existing grids, integrating and customizing solutions such as alternating current and direct current substations, from medium up to ultra-high voltages. Alstom Grid is a key player in developing and implementing solutions to manage electric grids in the new era of increasing renewable energies and distributed energy resources, by enabling real-time, two-way management of electricity and information.

At the heart of the Smart Grid revolution, its solutions provide immediate benefits in many eco-city projects, thus enabling end-consumers to benefit from better energy consumption. Alstom Grid's knowhow is displayed in over 30 large scale demonstration projects in the US and Europe, with partners from both the public and private sectors.

The North Carolina Smart Grid Project in the USA led by the US Department of Energy (DoE) is designed to integrate distributed energy resources into the electrical grid efficiently in order to help the DoE reach its smart grid targets for 2030, including a 40% improvement in system efficiency. The NiceGrid smart district project developed with the French Distribution System Operator ERDF, located in the city of Nice (French Riviera), aims at developing several microgrids with integrated renewable energy sources and electricity storage with a scalable and cloud-based IT platform.

*Clean grid*

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*Electrical network systems*

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*Video overview*

*See video* >

**Bechtel is pleased to support the Smart Cities Council's aspirations to foster the creation of smarter cities around the world by sharing our experience delivering major infrastructure projects and knowledge of planning, financing and sustainable solutions.**

As a company, we work hard to build a more sustainable world. In our work with cities and governments we enhance local communities and improve the quality of life for people around the world. Time and again our work has demonstrated that the only limits on human achievement are those that we place on ourselves.

Bechtel is a global leader in engineering, procurement, construction and project management. Bechtel's diverse portfolio encompasses energy, transportation, communications, mining, oil and gas and government services.

We have been privileged to contribute towards some of the most significant urban infrastructure projects around the world, including the Channel Tunnel, Hong Kong International Airport, the Athens Metro system and work on more than 20 new cities and communities. In order to deliver projects of such magnitude successfully, we combine smart planning, technical know-how and an integrated approach to make visions become a reality. We look forward to sharing the benefits of this experience and our knowledge of planning, financing and sustainable solutions, to support the Council's aspirations to foster the creation of smarter cities around the world.

Since its founding in 1898, Bechtel has worked on more than 22,000 projects in 140 countries on all seven continents. Today, our 53,000 employees team with customers, partners and suppliers on diverse projects in nearly 50 countries. We stand apart for our ability to get the job done right - no matter how big, how complex or how remote. www.bechtel.com

*Bechtel is working with the President of Gabon to build a sustainable, mixed-use housing and neighborhood development in Angondje, Libreville.*

*Learn more about Bechtel's infrastructure work in Gabon here.*

Learn more >

*Jim Dutton, Bechtel's Programme Director in Gabon, explains to Project magazine how Bechtel is contributing to Gabon's sustainable development.*

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As world populations shift to urban areas, community leaders are pressed for answers to related problems. These include overcrowding, pollution, budget and resource constraints, inadequate infrastructures and the need for continuing growth. Cisco Smart+Connected Communities solutions use intelligent networking capabilities to bring together people, services, community assets and information to help community leaders address these world challenges. By connecting the unconnected, we can do amazing things to address these real world challenges and create a more sustainable environment.

*Cisco Smart+Connected Communities -- help transform physical communities to connected communities and achieve economic, social and environmental sustainability.*

*Transforming communities* >

*Retro-fitting existing cities with smart solutions is the urban challenge of the 21st century.*

*Learn more* >

> *City transforms economic sustainability with public cloud.*

The Electricite de France Group, one of the world's leading electric utilities, has a mission "to bring sustainable energy solutions home to everyone." With sustainability at the core of its strategy, the group is creating ways to cut CO2 emissions by developing alternatives to fossil fuels; by building safer power grids; by fostering innovations with tangible benefits to customers; and by reducing environmental impact, especially on biodiversity.

EDF Group believe that the application of innovation to industrial expertise will transform how our cities use energy, optimising our collective resources and massively reducing carbon emissions. Today, EDF R&D teams across the world are exploring the technologies of the future while also developing solutions for today, including energy efficiency in buildings, electric transport, smart grids and the integration of renewables into the energy system.

*EDF website*

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*The energy mix for a greener future*

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*Access to energy remains a global issue*

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*Marine current energy: a resource for the future*

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> *Together we are building a Free-$CO_2$ future.*

Enel is a multinational group based in Italy, a leading integrated player in the power and gas markets of Europe and Latin America, operating in 40 countries across 4 continents overseeing power generation from over 98 GW of net installed capacity and distributing electricity and gas through a network spanning around 1.9 million km to serve approximately 61 million customers.

Enel was the first utility in the world to replace the traditional electromechanical meters with smart meters that make it possible to measure consumption in real time and manage contractual relationships remotely. This innovative tool is key to the development of smart grids, smart cities and electric mobility.

Enel is strongly committed to renewable energy sources and to the research and development of new environmentally friendly technologies and operates wind, geothermal, solar, biomass and co-generation sources in Europe and the Americas.

*Enel's smart grid initiatives are at the forefront on the Italian, European and international scene. The aim is to continuously improve energy distribution mechanisms and upgrade the process of operation management.*

*Learn more >*

*The Enel Group uses cutting-edge technologies to develop highly efficient street lighting in the countries where it operates.*

*Learn more >*

*The electricity network allows greater integration of energy produced by renewable power plants into the system while services such as active demand and electric mobility offer more to consumers. It is thanks to the work experience of Enel that the idea of the smart city is becoming a reality.*

*Learn more*

GE
Digital Energy

GE's Digital Energy business is a global leader in protection and control, communications, power sensing and power quality solutions. Its products and services increase the reliability of electrical power networks and critical equipment for utility, industrial and large commercial customers. From protecting and optimizing assets such as generators, transmission lines and motors, to ensuring secure wireless data transmission and providing uninterruptible power, GE's Digital Energy business delivers industry-leading technologies to solve the unique challenges of each customer. For more information, visit http://www.gedigitalenergy.com.

*Empowering the Industrial Internet with software and analytics solutions to provide utilities with big data management and predictive intelligence.*

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*Providing HV transmission solutions for a safe, reliable and secure electrical grid.*

*Learn more* >

*GE raises the bar on electrical system performance and reliability.*

*Learn more* >

> *We enable utilities with solutions to monitor and control the generation, transmission, distribution and use of power.*

**As a leading producer of smart technologies and services, IBM is pleased to lend its expertise to the Smart Cities Council's efforts to support and educate city leaders, planners and citizens.**

IBM is helping cities around the world use the vast amount of information already available to deliver more efficient citizen services. IBM's experience with cities continuously fuels more effective solutions and best practices to help city leaders transform their communities.

*IBM Smarter Cities Press Kit*

*Press Kit* >

*IBM Smarter Cities Web Page*

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*White Paper: Smarter, More Competitive Cities*

*Cities* >

*People for Smarter Cities*

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*IBM Smarter Cities You Tube Channel*

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> *IBM worked with Rio de Janeiro to design a command center that integrates over 20 city departments to improve emergency response management and collaboration across the city. Predictive analytics capabilities use information to decide how to best react to current events and how to best plan for what is likely to happen in the future in order to minimize impact on citizens.*

*Tianjin, China Eco-City: Itron's technology will enable conservation and consumer engagement efforts.*

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**"By enabling cities to better manage energy and water resources, Itron believes that, with collaboration and innovation, we can help cities not only adapt to address challenges, but also thrive. By drawing on today's best minds and technology, the Smart Cities Council and its members are committed to achieving just that." –Russ Vanos, Itron's senior vice president of strategy and business development.**

Itron is a global technology company. We build solutions that help utilities measure, manage and analyze energy and water. Our broad product portfolio includes electricity, gas, water and thermal energy measurement, sensing and control technology; communications systems; software; and professional services. With thousands of employees doing business in more than 130 countries, Itron empowers the world's utilities, cities and citizens to responsibly and efficiently manage energy and water resources.

As a founding member and lead partner in the Smart Cities Council, Itron is advancing smart cities initiatives through collaboration, innovation and leadership. We see energy and water—and their convergence, the energy-water nexus—as the building blocks for smarter cities. Our continued livelihood and sustainability will depend on creative solutions and a new brand of resourcefulness.

*Itron's Stephen Johnson discusses Itron Embedded Sensing, a measurement, monitoring and control platform for intelligent edge devices.*

Itron Embedded Sensing >

*Itron's leak detection solution helps Providence Water recover nearly 1 percent of unaccounted for water through proactive detection and mitigation.*

Read more >

*Itron's water AMI solution helps Houston utility achieve ambitious operational and customer service goals.*

Read more >

**MasterCard shares the Smart Cities Council's vision of a world where digital technologies and intelligent design are harnessed to create smart, sustainable cities with high-quality living and high-quality jobs.**

MasterCard is a global payments and technology company. We operate the world's fastest payments processing network, connecting consumers, financial institutions, merchants, governments, cities and businesses in more than 210 countries and territories.

Our products and solutions are advancing the way consumer and business cardholders around the world shop, dine, travel, and manage their money, enabling transactions that drive global commerce and improve peoples' lives.

Passionate about innovation, MasterCard is constantly seeking to develop and test new payment channels and digital solutions that are safe, simple and smart.

Cities are becoming smarter, and whether it is to simplify internal processes, facilitate micro payments (transit, commerce...), optimize collection of funds or improve disbursement methods, MasterCard is developing inventive ways to support Cities digital strategy, drive local business growth, fuel commercial development, increase citizen's satisfaction and reduce costs.

Special and Unique Offers with MasterCard Priceless Cities. www.priceless.com

> *London bus passengers speed up their journey times with contactless card payments.*

*London bus cards* >

*The global journey from cash to cashless: boosting economic growth and advancing financial inclusion.*

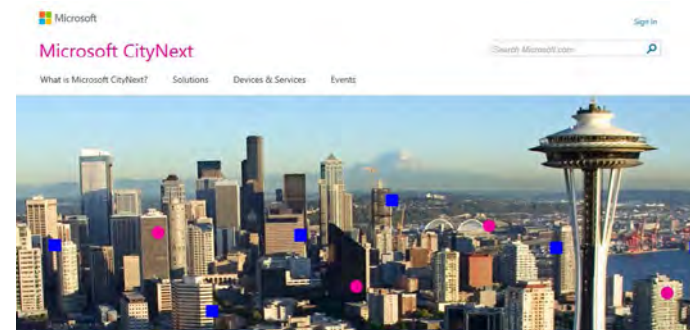
*Learn more* >

*Digital sharing and trust project: understanding the five online personas.*

*Learn more* >

Microsoft

*Learn more about how Microsoft and our partners are helping cities innovate with a people-first approach at [http://microsoft.com/citynext](http://microsoft.com/citynext)*




Founded in 1975, Microsoft is the worldwide leader in software, services and solutions that help people and businesses realize their full potential. Microsoft CityNext is an extension of that vision with a people-first approach to innovation that empowers government, businesses and citizens to shape the future of their city. People-first means harnessing all the ideas, energy and expertise of a city's people as they create a healthier, safer, more sustainable place to live.

With a broad devices and services platform, a vast global network of partners, and a history of successful education and social programs, Microsoft helps cities find the right answers for their local challenges and opportunities. Together with our partners, we are committed to helping cities

- **Transform operations and infrastructure** by improving city functions with innovative partner solutions, leveraging the power of cloud computing to reduce costs and increase efficiencies, empowering employees with enterprise grade devices and apps, and enabling innovation on your terms with a modern solutions and big data platform.
- **Engage citizens and businesses** by delivering personalized services and apps with a people-centric approach, enabling real-time dialogue via social media and spurring city app development and economic growth with open data initiatives.
- **Accelerate innovation and opportunity** through programs that empower youth with 21st century learning and personal development opportunities, expand digital inclusion with access and skills training, and nurture new businesses and innovators with resources and support to help cities compete in the global marketplace.

Through a people-first approach and strategic partnerships, cities can enable sustainable cycles of innovation, opportunity, and progress for years to come.

*Find out how Microsoft and our partners are enabling cities worldwide to harness the new era of innovation.*

*Learn more >*

*Microsoft CityNext helps dynamic city leaders turn their smart city vision into reality.*

*Watch here >*

*Learn how Microsoft cloud services and devices play a role In Barcelona's innovative initiatives.*

*Read more >*

*Read why Frankfurt am Main, Germany is consolidating its highly decentralized IT infrastructure.*

*Read more >*

*Auckland, New Zealand, is using Microsoft technologies to provide new transportation services.*

*Read more >*

nationalgrid

National Grid is a British multinational utility that delivers electricity and gas to Britain and the Northeastern United States. As one of the largest investor-owned energy companies in the world, National Grid is at the heart of the need to create sustainable energy solutions for the future and lay a foundation for economic prosperity in the 21st century. To that end, National Grid is working to address energy needs while meeting the challenges posed by climate change.

*New England's first-of-its-kind Sustainability Hub opened its doors in October, 2013, in Worcester, Mass. and is now providing hands-on education about energy efficiency and emerging energy technologies for National Grid's customers and the community at large. The 2,200 square foot interactive space was donated by Clark University and is an integral part of National Grid's Smart Energy Solutions Program, the largest and most comprehensive smart grid program in Massachusetts.*

*Learn more >*

*National Grid's vision is to deploy smart grid technology in order to optimize the flow of green energy resources, enhance the performance of the electric distribution grid, and provide customers with the ability to make informed decisions about how they use energy. A smart grid will be the fundamental service platform for future years. It will help towards reducing energy consumption and greenhouse gas emissions while enhancing the reliability of National Grid's infrastructure.*

*Learn more >*


*The Sustainability Hub houses interactive exhibits and demonstrations to help people maximize their energy savings.*

> *For local, state and federal government personnel, good situational awareness can help save lives and better protect assets.*

Qualcomm Incorporated is the world leader in 3G, 4G and next-generation wireless technologies. Qualcomm Incorporated includes Qualcomm's licensing business, QTL, and the vast majority of its patent portfolio. Qualcomm Technologies, Inc., a wholly-owned subsidiary of Qualcomm Incorporated, operates, along with its subsidiaries, substantially all of Qualcomm's engineering, research and development functions, and substantially all of its products and services businesses, including its semiconductor business, QCT. For more than 25 years, Qualcomm ideas and inventions have driven the evolution of digital communications, linking people everywhere more closely to information, entertainment and each other. Qualcomm innovation and technology can be used by cities worldwide to provide smart, efficient and sustainable services, including:

**Cellular Grid Connectivity**- ubiquitous consumer coverage, high bandwidth and real-time communications of 3G and LTE cellular networks that enable critical smart grid functionality such as advanced smart metering, demand response, distribution automation, and outage management.

**Home Area Connectivity-** unsurpassed whole home coverage, performance and reliability in an energy efficient manner.

**Connected Vehicle-** anywhere/anytime emergency assistance services, remote monitoring and diagnostics, advanced driver assistance features, GPS and GLONASS-enabled position-location features and services.

**Wireless Electric Vehicle Charging-** a simple, no fuss way to charge your electric vehicle. No cables, no wires, just park and charge.

**Mobile and Wireless Health-** broadband technologies enabling mHealth devices and services for chronic disease management, remote patient monitoring, diagnostic care, as well as products associated with general health, wellness, fitness, and aging.

**Mobile Learning-** mobile broadband technologies enabling personalized experiences within collaborative communities, transforming the work of teachers/students in K-20 schooling.

*Qualcomm Government Technologies leverages Qualcomm's wireless expertise, innovative technologies and vast industry reach to provide capabilities and services that enable government customers – federal, state, and local.*

Learn more >

*Real-time situational awareness.*

Learn more >

*Next-generation wireless.*

Learn more >

*Secure wireless communications.*

Learn more >

**S&C is proud to support the Smart Cities Council as it seeks to accelerate the transition to smart, sustainable cities.**

S&C, with global headquarters in Chicago, USA, is applying its heritage of innovation to address challenges facing the world's power grids. S&C's innovative solutions for power delivery are helping cities transition to the cleaner, more reliable supply of electricity required in the 21st century. S&C's solutions reduce the length and frequency of power outages, improve energy efficiency, support smart microgrids, and make it practical to use intermittent renewable energy sources like wind and solar power on a larger scale. S&C has introduced ground-breaking technology to make power grids self-healing, allow use of grid-scale energy storage, and advance microgrid systems. Additional information is available at sandc.com.

*From Old Grid to Smart Grid: The Economic Impact on Electricity Customers*

*Watch video* >

*Chattanooga Shows Smart Grid Can Deliver Results*

*Case Study* >

*Microgrids: An Old Idea with New Potential*

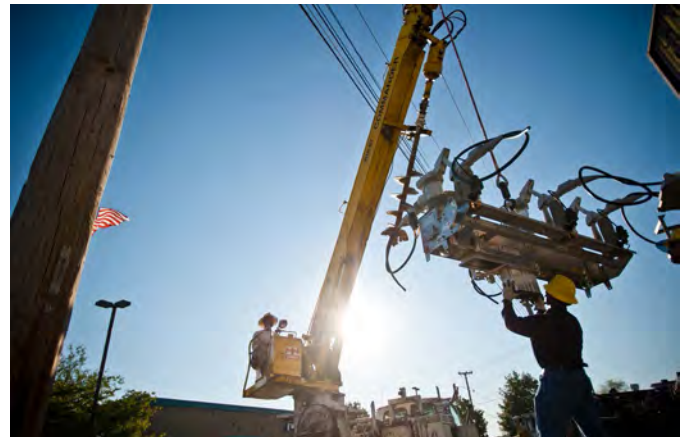
*Read more* >

*The Role of Energy Storage in Smart Microgrids*

*Read more* >

*Perfect Power at Illinois Institute of Technology*

*Case study* >



*Chattanooga, USA deployed S&C's self-healing smart grid solution to improve power reliability. The system is exceeding outage reduction goals of 40%.*

Smart Cities Council

# INTRODUCING SMART CITIES COUNCIL ASSOCIATE PARTNERS

*Council Lead Partners are for-profit companies that are leaders in their sectors. Learn more about them on the pages that follow.*

**ABB strongly supports the Smart Cities Council's goals of livability, workability and sustainability"**

"Cities today are home to over 50 percent of the world's population and account for 80 percent of global GDP. By 2050, an additional 2.9 billion people will be living in cities, and urban dwellers will represent 70 percent of the world's population. About 90 percent of this growth will be in developing economies as people are drawn to urban areas by the perceived economic advantages. These cities will need new and intelligent infrastructure to meet the needs of their citizens and businesses.

Other cities that are not facing dramatic population increases are setting goals to ensure their long-term prosperity. With businesses and workforce becoming increasingly mobile, they are shaping their futures around competitiveness, liveability and sustainability.

An effective way to support these city goals is by using technology to more intelligently monitor, optimize and control key systems and infrastructure. In other words, to operate as a 'smart city'.

Many intelligent power and automation solutions already exist to enable cities to automate their key public and industrial services in the areas of:

– City Communication Platforms

– Electricity Grids

– Water Networks

– Transport

– Buildings

– District Heating and Cooling

ABB's heritage in power and automation is one of continued innovation and delivery on behalf of our customers, spanning over 125 years. Our products and solutions are at the heart of a city's critical infrastructure, relied upon for everything from the supply of power, water and heat, to the automation of factories and the buildings we live and work in.

*ABB Smart Cities portal*

*Smart Cities* >

*ABB Smart Grids portal:*

*Smart Grids* >

**As a leading producer of smart technologies and services, Alphinat is pleased to contribute to the Smart Cities Council Readiness Guide and other materials to help accelerate the move to smart, sustainable cities.**

Alphinat is a software editor of SmartGuide® the leading "one stop" Web, Mobile and Cloud Solution Development Platform that enable cities to easily create, deploy and manage intelligent personalized web applications. With our partners we are looking to give client cities constituents a simpler user experience that can, guide them to an optimal experience in a mobile or traditional browser-based environment. SmartGuide provides organizations and other software editors with the agility to quickly deliver efficient online services to their stakeholders unleashing the full value of existing IT assets. An Alphinat partner is delivering intelligent e-services for municipalities in the Netherlands in SaaS and on-premises modes incorporating SmartGuide® into their suite giving municipal clients the ability to quickly deploy intelligent online services. Citizens no longer need to fill in data already known to the government. Furthermore, these online services are accessible on Smartphone or tablets. SmartGuide allows municipalities to deliver e-services with personalized, real time data exchange. With these intelligent e-services, municipalities greatly enhance the quality of their online service delivery and increase citizen satisfaction. The e-services offered automatically determine whether a citizen is entitled to a particular service such as a tax refund or a parking permit. These complex real-time validations delivered by the digital service bureau result in tremendous time savings for citizens and the community. Alphinat technology can benefit city of all sizes by helping them modernize, automate and render cost-effective a many business processes at a fraction of the cost associated with conventional customized solutions. Alphinat is headquartered in Montreal, Quebec, with offices in Paris, New York and Zurich. For more information, visit http://www.alphinat.com or http://www.alphinat.com/en/files/Alphinat_DGME_Case_Study.pdf.


BehaviorMatrix measures, tracks and analyzes mass amounts of structured and unstructured data, mined from public digital conversation, providing organizations with valuable insight into key behavioral and emotional metrics that drive perception.

We are an applied behavioral analytics company founded by veteran technology entrepreneurs, visionaries and cognitive behavioral experts. BehaviorMatrix offers a suite of customized data and analysis services that measure consumer emotion in a whole new way, unlocking valuable insights for organizations and public figures. Products include:

**Emotional Indexes:** Our unique, carefully crafted algorithms turn mountains of social signals into one, simple to understand, indexed value. Learn more >>

**EmScape Reports:** Based on the same algorithms that power our Emotional Indexes, an EmScape report gives you a 10,000 foot view of a wide range of emotional measures of your brand. Learn more >>

**EmPower Reports:** These explore the full range of perceptions, emotional connections, motivational influences and social momentum responsible for the consumer behavior. This report explores more than 100 different human emotions, and is customized to zero in on the topics that you are most interested in. Learn more >>

BehaviorMatrix website >>


Camgian is a leader in combining innovative technologies in the areas of low-power microelectronics, sensors, wireless communications and data analysis to provide solutions that provide valuable decision analytics for customers in the government and commercial markets.

The company's sensor fusion engine -- Quantus -- unlocks data from critical operational assets and drives valuable business intelligence that enables improvements in operational efficiency and profitability. Quantus utilizes an integrated, flexible architecture of low-power sensors, wireless communications and secure, cloud-based analytics and reporting that enables organizations with a real-time, unified view of diverse operations of interest.

Applications for smart cities can include:

- **Intelligent and weather adaptive lighting to save energy costs**
- **Monitoring of parking spaces available in highly crowded metropolitan areas**
- **Monitoring of material conditions in buildings and bridges for structural health**

Camgian Microsystems website >>

**As a global leader in consulting, design, design-build, operations, and program management, CH2M HILL has the human and technical resources, the international footprint, and the depth of know-how and experience to help clients achieve success in any corner of the world.**

CH2M HILL provides multidisciplinary services to markets diversified by both industry and geography. With our full-service capabilities and global footprint, our market scope is wide, yet our expertise in each market we serve is strong and focused.

We partner with clients in energy, water, environment, transportation and infrastructure to design integrated solutions that deliver lasting value. Learn more about how we help clients public and private in these vital markets:

- ***Energy***
- ***Water***
- ***Environment***
- ***Transportation***
- ***Infrastructure***

From major sewerage programs in London and Abu Dhabi to super cleanrooms in China, from nuclear cleanup in Scotland to major highways and airports in the United States, CH2M HILL's project experience is as diverse as the world itself.

Our staff works hard to provide clean drinking water, efficient transportation, lean production facilities, environmental remediation and safe energy, offering communities sustainable economic and social benefits.

***Learn more at our website >***

**3000 energy experts in DNV GL deliver world-renowned testing and game changing expertise for the energy value chain, including renewables and energy efficiency.**

"Serving the needs of the current generation without compromising the needs of the future" is often used as a definition of sustainability. Access to affordable energy is a fundamental need for the well-being of the world's population as well as for economic development.

DNV GL offers a comprehensive range of strategies and solutions to help clients plan and evolve into a 'Utility of the Future.' We help clients address the challenges of integrating new and emerging advanced metering and communications, distribution automation systems, and information technologies with utility engineering and work management systems.

We also assist clients with strategy development, related procurement, deployment and process change projects, to more fully realize automation's effectiveness and cost reduction benefits enterprise-wide.

DNV GL is not aligned with any specific vendor solution, be it hardware, equipment, or supporting software. Our impartiality enables us to provide insightful points of view and objective recommendations, solely directed to the best interests of each client.

Our global presence includes a broad and deep technical and business knowledge of utility operations, and a comprehensive understanding of required technologies, methods and tools for utility solutions. This allows DNV GL to be very effective in assisting utilities to develop strategies, design solutions and implement technologies that best meet their needs while minimizing technical, operational and business risks.

Read about our work in:

- ***Smart grid innovations >***
- ***Sustainable energy integration >***
- ***Energy storage >***
- ***Energy efficiency and emission reduction >***

**GRID20/20, Inc. wholeheartedly endorses and supports the Smart Cities Council efforts to enhance our world's metropolitan areas through more efficient, productive, enjoyable, and sustainable living experiences.**

GRID20/20, Inc. provides electric utilities with essential Distribution Transformer Monitoring. Using a patented hardware device known as the OptaNODETM DTM GP, we capture a robust set of data points such as Energy, Current, and Voltage from transformer assets. Each OptaNODETM DTM GP device carries onboard communications module options including GSM, and RF Mesh for a virtual plug and play experience, and RF LAN for autonomous collaboration with a predominant AMI provider. The GRID20/20 turnkey solution includes highly accurate patented hardware sensing, a DNP3 headend repository for SCADA, MDM, or AMI collection engine integrations, plus OptaNODETM INSIGHT advanced analytics.

The OptaNODETM DTM GP device is the easiest to install in the world. GRID20/20 provides a wide range of value propositions addressing Asset Loading, Power Theft Identification, Outage Notification/Restoration Enhancement, Conservation Voltage Reduction, Peak Contribution for Targeted Demand Response, Bi-directional energy recognition from distributed generation sources, and Preventive Maintenance awareness. GRID20/20 drives critical, timely management data from within the heart of the distribution grid to utility operators. The ROI benefits are supported by direct and immediate cost savings, and enhanced electric customer service experiences.

*GRID20/20 website >*

*Integrated distribution transformer monitoring for advanced grid intelligence.*

*Learn more >*

**At Imex Systes, we understand the public sector. We recognize government challenges and help to align and integrate people, processes and technology to become efficient and citizen centric.**

Our products and services help governments to provide "**Any Time, Any Where, Any Device** and **Any Channel**" convenience for citizens to access government services.

**iGov** provides Multi-channel Service Delivery, Multi-channel Communications, Business Process Automation, and Citizen Relationship Management. Channels include: Online, Mobile, Contact Center, Walk-in Service Center, Kiosk and IVR. iGov brings siloed systems together through data sharing and collaboration. iGov also provides a powerful portal solution with citizen-centric information and service access.

**iCity -** a local government implementation of iGov that includes a suite of ready-made online and mobile services. The e-Services modules address almost every service a local government provides: Property Taxes, Utility Bills, Parking Tickets, Traffic Fines, Building Permits, Inspections, Pet Licenses, Recreation Program Registrations, Facility Bookings, Tourism services, Economic Development services, and many more. Another important aspect of iCity is community collaboration.

i**Pay -** a versatile multi-channel payment management system that helps governments receive electronic payments from credit cards, debit cards, and mobile wallets, as well as cash and cheques. The channels supported include: Online, Mobile, Over the Counter, Over the Phone, IVR and Kiosk.

**miGov -** a versatile Mobile App for governments. miGov is a Mobile Citizen Service Delivery platform for governments that helps deliver information and services, accepts mobile payments, and can seamlessly integrate with various back end applications. miGov provides the security and reliability essential for government mobile applications. miGov also supports location-based services and advanced messaging. miGov is supported both on smartphones and tablets.

*Imex Systems website >*

MaxWest Environmental Systems Inc. is a leading renewable energy company that offers local governments and private wastewater treatment companies a safe, cost effective and environmentally friendly alternative for sustainable biosolids disposal. To achieve this, the MaxWest Gasification System captures wastewater biosolid's energy, reducing its volume by over 95% and potentially benefiting from future greenhouse gas and carbon credits. It is the first full-scale commercialized gasification technology that converts bio-solids into green, recyclable thermal energy, provides a long-term stabilized biosolids cost, reduces the production of greenhouse gases and improves the facility's carbon footprint.

*Municipalities face unique challenges of serving federal, civilian and dedicated environmental groups that require operation within tightly controlled budget constraints, meeting increasing environmental regulations and maintaining a positive relation-ship with members of the communities which they serve. A biogasification system allows them to save costs while meeting emission requirements and enhancing sustainability.*

Learn more >

*Cities facing regulatory and environmental issues relating to biosolids management and disposal will want to know how Sanford, Florida worked with MaxWest Environmental Systems to create a biosolids gasification system expected to result in long-term cost savings that could reach $10 million.*

Learn more >

**As a leading producer of innovative technologies and services, Opower is pleased to lend its expertise to the Smart Cities Council's efforts to support and educate city leaders, planners and citizens.**

Working with 85 utility partners and serving more than 18 million consumers across seven countries, Opower is the world's leading provider of customer engagement solutions for the utility industry. By providing the tools, information and incentives con-sumers need to make smarter decisions about their energy use, Opower's engagement platform and solution suite, Opower 4, enables utilities to involve their customers in programs that support energy efficiency goals, smart grid and new rate structures, brand loyalty and lowering the cost of service. Proven to drive behavioral change at scale, Opower has helped its utility partners achieve more than 2.7 TWhs in energy savings, and drives significant increases in customer program participation and overall customer satisfaction. Founded in 2007 and privately held, Opower is headquartered in Arlington, Virginia, with offices in San Francisco, London and Singapore.

Opower website >

*5 Universal Truths about Energy Consumers.*

Learn more >

*Behavioral demand response.*

Learn more >

**Schneider Electric is a global specialist in energy management and efficiency technologies. In January 2014, the company acquired Invensys and its leading automation and information technology, systems, software, and services for production, manufacturing and infrastructure industries.**

Through our Wonderware® software product line and partner ecosystem, we provide unique, modern industrial software solutions and systems that help improve critical infrastructure operations for cities of any size. These solutions help cities and municipalities provide essential, life-sustaining services like clean drinking water, sanitary wastewater treatment, reliable electricity, safe and efficient transportation, and many other services.=

With Wonderware software, cities are able to utilize critical data to make better, faster decisions, and they can design response mechanisms that promote efficiencies based on economic and environmental considerations. They can securely manage their entire infrastructure systems from ONE integrated platform, viewing real-time operational information of practically any kind from anywhere at any time and provide it to anyone. Wonderware software's flexible, open, scalable software architecture integrates and connects with virtually any legacy system, allowing cities to leverage existing investments and build on in-place infrastructure.

At Schneider Electric, we are committed to helping cities transform their operations – to be smarter, more sustainable and more innovative now and into the future.

*Schneider Electric Site >*

*Wonderware Software for Smart Cities >*

*Carson City Public Works Leverages Smart City Technology in the U.S. >*

*Wonderware Software Facilitates Unprecedented Spanish Airport Expansion >*

**SunGard Public Sector is a leading provider of software and services for local governments, public safety and justice agencies and nonprofits. More than 150 million citizens in North America live in municipalities that rely on our products and services. For more than 30 years, SunGard Public Sector has leveraged ground-breaking technology and our innate understanding of the needs of the public sector toward the development of public administration and public safety software. SunGard Public Sector's products enable our customers to experience the future happening today. Visit us online at** www.sungardps.com**.**

SunGard Public Sector's software products not only enhance the way municipalities, public safety and justice agencies, and nonprofits conduct business—they redefine the way citizens and employees interact with government.

*Leesburg, Florida has been a model for community-centered government for over 150 years. Just hours from the heart of Orlando, the community that made a name for itself in the citrus industry is now a full-service city responsible for providing utilities not only for itself, but for parts of the county as well. To manage its workload while maintaining efficiency, Leesburg has chosen SunGard Public Sector's Click2Gov Customer Information System. Click2Gov offers up-to-date, online views of customer utility accounts. Citizens may now easily view their account information and make their monthly payments by choosing from several convenient payment methods, including over-thephone, bank drafts, or online.*

*Read more*

*The City of Elk Grove is located just south of the state's capital, Sacramento. Because of its small size, city officials knew they did not want to employ a large IT staff to operate its information systems. Elk Grove needed one simple system that could be accessed by all the departments. The solution was SunGard HTE's Naviline software, powered by IBM's System i hardware.*

*Read more*


**As the world's leading car sharing network, Zipcar is pleased to lend its expertise in smart transportation to the Smart Cities Council's efforts to support and educate city leaders, planners and citizens about the need for innovative and efficient technologies and services.**

Founded in 2000, Zipcar operates the world's leading car sharing network with operations in urban areas and college campuses throughout the United States, Canada, the United Kingdom, Spain and Austria. Zipcar provides the freedom of "wheels when you want them" to its members by giving them a convenient, cost-effective and enjoyable alternative to car ownership. Since inception, Zipcar has been invested in bringing smart, simple and convenient transportation solutions to cities and campus and continues to be at the forefront of an evolution in urban transportation. Zipcar's self-service vehicles are available on-demand in conveniently-located reserved parking spots in neighborhoods where members live and work. Members can reserve cars, choosing from 30 different makes and models, by the hour or by the day at rates that include gas, insurance and other costs associated with car ownership. Zipcar is a subsidiary of Avis Budget Group, Inc. (Nasdaq: CAR), a leading global provider of vehicle rental services. More information is available at www.zipcar.com.

*2013 Millennials & Technology Survey results:*

*See results* >

SmartCitiesCouncil

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