Making Cities Smarter than Their Bankers

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Abstract
As complex organisms, modern cities monitor their financial health and longevity, like Olympic athletes and hospital patients. The banking system encircles and ensnares people, buildings and environments defining cities, credit rating some higher, no matter their quality of life, disaster mitigation, infrastructure buffers or exposures. This paper explores technologies for smart cities to use the banking system to better advantage, through more coherent measures, innovation policies and incentives for livability. Municipal banking, credit ratings, sustainability bonds, crowd-sourcing and crowd-funding solutions for smart cities are also discussed.

Urban Finance: Old School
Cities contextualize how people own, use and finance assets there. Home prices and vacancy rates reflect (1) physical, environmental and neighborhood assets (amenities), (2) expected mortgage and tax rates and other costs of ownership (total cost of ownership, TCO) and (3) expected resale prices (future value). Commercial real estate adds (4) the uncertainty of lease rental rates for business cycles, (5) idling costs of vacant space, and (6) operating cost inflation, so as to maximize the building’s total net revenues and competitiveness. Governments own and manage a portfolio of assets (streets, schools, parks, airports, hospitals, city halls, courts, police stations) that attract city dwellers who pay the taxes that pay interest on bonds that finance the city’s operating and capital budgets.

Years ago, the maze of a city’s credit rating, debt service, bond refinancing, self-insurance for its operations (think plaintiffs’ slip-and-fall jury awards), costs of extreme events (such as natural and manmade hazards), tax rates, and intergovernmental transfers from state and federal governments, was a Byzantine financial alchemy few knew or cared to explore. Taxes were taxes, and how they came to be so was simplified to citing the number of city public high school graduates who finished college. How banks financed city life went unseen as urban finance.

Urban Finance: Today
Today, urban finance is a game, where players succeed through literacy, transparency and practice. Home prices, tax assessments and trends are online. Real estate listings show buyers and tenants the cost of owning or renting urban space. Government budgets are available online, with crime rates, public school rankings, land use/environmental impact reports and other information readily available for anticipating city quality of life risks and threats for comparison to like-sized cities. And banks compete directly and through intermediating online brokers for home mortgages, car, credit card and other customers.

Reconnecting Banks with Urban Finance
The 2008-10 Credit Crisis and rolling state, county and sovereign debt destabilizations prove that what banks finance or refuse to finance, to whom and on what terms, can revive or wreak havoc on regional economic, social, environmental and geopolitical stability.1

Herein lies the disconnect: No matter how sustainable or transparent the city, its municipal bond rates reflect no discount.2 No matter how sustainable the family’s lifestyle, its mortgage, taxes and other costs reflect no discount. No matter how much consensus a neighborhood reaches to save energy, combat crime or feed and house their homeless or “working poor” so as to reduce their hospital, school, crime and social services costs, the neighborhood’s tax rate earns no discount. And certainly no dynamic mechanisms automate awarding, monitoring or withdrawing the discount as local efforts ebb and flow meritting it.

Can smart livable cities leverage their banking? Can

1 Nouriel Roubini [1] and other noted economists suggest that the recent uprisings in North Africa trace to rapid increases in oil and resulting food prices. Thus, urban farming and indigenous food supply offer “food security” for cities with the natural or innovation assets to harvest food.

2 Municipal bond buyers and credit rating agencies have yet to quantify municipal sustainability. While some municipal projects may be rated or sold for their attractiveness to sustainable investors, overall municipal sustainability credit ratings and methods are in their infancy. Contrast, VanScoy 2009 [2] with Leurig 2010 [3].
they mitigate global banking shocks? Can online sensors and artificial intelligence technologies change how banks rate city neighborhoods and their collateral value? What is and grows a “smart city?”

Smart Cities and their Technologies

Imagine windows automated to close or shade in the summer cooling season and let in the sun’s heat during the winter. The intelligent windows smooth spikes in air conditioning, reducing utility investments in standby generators just to cool a few peak summer days, thus strengthening the city’s electric utility and keeping the city’s energy rates lower. Such smart windows should reduce utility bills, mortgage interest rates or property taxes.

Sadly, as Philip Howard of Common Good [7] notes, government agencies have evolved to resist and impede commonsense efficiencies. What if a city rewired its agencies and utilities to leverage technology-assisted behavioral patterns and impacts? With so many devices web-enabled to generate terabytes of urban data, a smart city would use the sensor technologies to improve urban livability daily.

A Privacy Caution and Niche

Government use of citizens’ pattern-recognized digital lives poses privacy and civil liberties concerns. If one house sets its thermostat a few degrees lower overnight than the neighbors, does the utility or its marketing affiliate bombard the sleeping green citizen with 20% off coupons for blankets in an unwelcome coincidence of inevitable consequence? Can the data on behavioral patterns, once captured as footprints on digital sands, remain private or accessible only for its originally intended use?

Smart cities that enhance privacy by adopting a “we won’t spam you” citizen identity data anonymity policy may find a special niche as alcoves for living ad-free!

Optimizing Smart City Procurement

Cities are bulk procurement machines, they buy for thousands of people, programs, buildings, classrooms, acres, road miles and other municipal necessities and amenities. Government requests for proposal (RFPs) encode procurement specifications that either (1) specify pet technologies with a predestined successful bidders cartel, or (2) define interoperable functions and standards that shift whole industries to adopt changes in product manufacturing and features, so as to speed iterative product life cycles.

Public bidding processes generate a disconnected digital hubble of government shopping lists - procurement data that a smart city would mine to approach vendors, innovation labs and intergovernmental and public-private partners to reduce overall costs, upgrade technology or fast-changing functionality, and reduce the risk of government stand-alone systems. Visualizing and aligning RFP procurement patterns would encourage citizens, fiscal watchdogs, agency contracting officers, companies and nonprofits to propose innovations that stretch city budgets by increasing social returns on investment. With leaner procurement, banks would buy a smart city’s bonds at a premium, because its operating and capital costs decline from the efficiencies, and earn the city better credit ratings.

As government auction, gift and de-accession programs (even via eBay) prove, cities can buy too much of what they no longer need or what wasn’t the best bargain, technologies that won’t work with existing or planned interoperability purchases or “upgrades,” and then stuff old stuff in unproductive warehouse space to shrink from breakage, theft, obsolescence or decay. What if cities banded together to create their own version of GroupOn, with all the public bidding protections that decades of commonsense, sunlight law fairness and conflict of interest disclosure experience suggest? Everything from energy to prescription drugs have bulk procurement programs, what if a cooperative grouped multi-city/multi-agency buying power to grow the market for more products that improve urban sustainability? Conversely, what if instead of RFPs leading technology standards, cities deliberately lagged, using better impacts feedback, perhaps through more fine-grained sales tax rates, so that products (like hybrid cars) priced by the market as saving on energy, were awarded higher rankings in government procurements.

Smart Cities Use Their Clout With Bankers

Assume that the major questions for building a smart city were asked and answered, how would having a smart city change the dynamics of bank negotiations, function and systemic safety? Are smart cities better credit risks, and in the event of fiscal, manmade or natural hazard shock, can loans to smart cities be refinanced easier? The answers depend on making banks compete for city business.

Major cities differ widely in their banks’ competitiveness. Federal antitrust statistics use the concentration of deposits held by the largest banks, as an index to assess competitiveness. Ann Arbor Michigan scores 852 and San Francisco scores 1869, meaning that not only is San Francisco’s banking less than half as competitive, it’s nearly monopolarized (over 1800) following a succession of bank failures, mergers and acquisitions. When just a few banks control urban finance, cities, companies and citizens enjoy

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3 Governments already sell lifestyle data. U.S. Postal Service Change of Address filings and new car and driver registrations with state Departments of Motor Vehicles trigger marketing solicitations for insurance, home goods and direct mail advertisers products and services.


6 CASSIDI [8]

7 CASSIDI [9]
limited bank choices, raising their loan interest and fees, and giving bankers market power to limit credit access and refuse to restructure loans when the bank’s underwriting is stress-tested by business cycles of recession and expansion.

Smart cities try to reduce exposure to banks’ business cycle risk. As Figure 1 shows, wartime business cycles historically yield more expansion months, but recent business cycles – including the current recession – defy economic and social buoyancy through war-making. Clearly, cities can’t use war-making to moderate the cyclical threats to their economies or banks.

Cities are valued bank customers - as local comptroller’s reports and campaign finance contributions by banks and bankers show. In April 2007 at the beginning of the sub-prime mortgage crisis, New York City (NYC) [10] noticed that a lack of access to full service bank branches aligned closely with community calls to city agencies for help in preventing mortgage foreclosure and resulting neighborhood blight. The City used its modest clout as customer to force its major banks to restore full service branches.

Using a city’s clout as bank customer could instigate bank innovations that enhance smart city programs and behavior patterns. But that requires a city finance manager to see and effectively align operational program benefits and strategies across city agencies and agendas, unleashing radically fast collaborations. Consider a chief information officer for an Environmental Protection Department who convinces colleagues in the Real Property Assessment, Buildings and Land Use Departments to align procurements to enjoy the shared perspective and savings of interoperable geospatial information systems (GIS) across the city’s stakeholders in public and private sectors.

Mapping What Cities Need Where

Geospatial intelligence applications promote smart city thinking. The next sections describe examples of new geospatial tools: sustainable resiliency, a Three-Layered Map of the World™ and Economy Mapping™.

Sustainable Resiliency

Every region has a cacophony of experts, championing metrics that reflect their domain expertise on economic, environmental, education, health, nutrition, transportation and other natural, social and built infrastructure systems. Sadly, the municipal budgeting process – taking cues from federal budgeting – is terribly inefficient at prioritizing thematic issues, and weighing innovations for realizing long-term savings through synergistic investments in mitigation and sustainability.

Post-disaster, hoards of performance benchmarks and their stewards arrive for humanitarian reasons, but also to reap the funding of disaster response, usually the most expensive "next disaster mitigation investment strategy."

What if, instead of post-disaster, a city fused their performance benchmarks into a coherent regional quality of life index, called sustainable resiliency, a Three-Layered Map of the World™ and Economy Mapping™.

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5 As a percentage of 2007 bank deposits ($379 billion), New York City government’s $2.3 billion constituted a mere six-tenths of one percent (0.61%). [11] As of June 30, 2007, municipal bank deposits stood at $2.3 billion, and the City’s portfolio of investments totaled $6.15 billion. [12]
tangible resiliency, its credit rating would improve, providing objective market validation of reduced risk and increased municipal efficiency. Cities with rising sustainable resiliency signal they are becoming cheaper to operate and manage over time, while cities with declining sustainable resiliency will face higher operating and capital expense, foreshadowing larger maintenance budgets, crime rates and municipal deficits.

Innovative solutions would become coins of the realm: Transit-oriented development restores inner city vitality, removing blight, traffic congestion and suburban sprawl. [13] Replanting mangroves to restore natural capital as flood protection for 100 years [14] costs less and is more efficient than building concrete seawalls and levees that crack in 30 years, only to be replaced at 30-year intervals, forever. As a differentiated fixed income instrument, municipal bonds rated for their sustainable resiliency impacts attract impact investors, socially-responsible mutual funds, and pension fund, insurance, university endowment and others with mission congruency mandates. In structuring sustainable resiliency bonds, the issuer (a government agency in this case) would covenant to regularly report on how the bonds’ proceeds launched or maintained sustainable resiliency projects. Such reporting would provide valuable smart living impacts data, and could be monetized by making a bond deferral, discount or other incentive pivot on timely, accurate periodic impact reports.

SubEx™: An Example of Sustainable Resiliency

Subways carry passengers, but could do more. SubEx would move small package freight by subway, another strategy to grow smart city sustainable resiliency.[15]

In the early 1900s pneumatic tubes on Wall Street carried traders’ orders, stock certificates and cash. Proposals for using subways for hauling freight seemed the next wave. Wharves along the City’s rivers brought freight to the railroads operating subways. Today, the wharves are long gone, and trucks clog highways, bridges, tunnels and city streets during rush hours.

SubEx would make dual use of subway infrastructure by pooling FedEx®, UPS® and other overnight courier packages, loading them in bins pre-sorted by office and apartment building addresses, putting the bins on special subway cars, and delivering the packages’ “last mile” by bicycle or eco-friendly transit. Gone would be the added air pollution, wear on street paving, extra potholes and double-parking of racing and idling delivery trucks, along with their congestion adding road rage at peak transit bridge and tunnel hours. Instead, freight franchise revenues would help offset the deficits of running a passenger-only subway infrastructure that is relatively unused at non-peak hours. Mathematically, adding freight use to 225 route miles of subway makes NYC’s 49,000 street lane miles and 30 regional bridges and tunnels more efficient and safer, thus avoiding the cost of building more roads to carry the same daily commuter plus freight load. [17]

Three-Layered Map of the World

Sustainable resiliency is like a barometer of regional quality of life equilibrium. Needs indigenously known or remotely sensed for health, sanitation and other concerns no longer depend on outside advocates (NGOs or contractors) to be seen and solved. Needs objectified by sensors and prioritized and advocated in local voices are more compelling. Likewise, a global wave of innovations by social entrepreneurs creates simpler capacities for meeting the needs, more effectively than large scale infrastructure or centrally-planned solutions that take years to build and finance, create risk of corruption, and are abandoned when found too hard to operate. Every region has formal and informal budgets – money allocated by national governments or multinational donors, money that too often is unaccountable once it hits the target country and its elites.

A global map consisting of three layers: needs, capacities to solve needs and money allocated to the region or need – a Three Layered Map of the World – would empower smart cities and their citizens to discover, adopt and implement innovations faster, cheaper and autonomously.

Economy Mapping

As municipal assets, slums have negative value: Displaced there, squatters pay no taxes, but consume municipal services. There the human toll of disaster risk looms large: deaths, dismemberment, orphaning, disability and lost incomes. Yet, the post-disaster fate of slums persists through benign neglect. Natural disasters de facto clear slums, without political or court opposition de jure.

An Economy Map plots a truer value of disaster mitigation, reflecting (1) fiscal costs borne pre-disaster for the slum’s residents, (2) sustainable resiliency needed to assure their survival in place or elsewhere pre- or post-disaster, and (3) ways to reduce impacts of a disaster in the slums that then radiate out regionally or nationally.

Istanbul straddles the Anatolian and Eurasian tectonic plates comprising the North Anatolian Fault Zone, creating frequent risks of earthquakes and tsunamis. The 7.4 Izmit/Kocaeli Earthquake of August 17, 1999, killed 17,127 people, injured another 43,959 and structurally weakened 120,000 buildings. The magnitude 7.5 earthquake in Istanbul expected by 2040 would kill 50,000, damage 40,000 buildings and cost upwards of $11 billion. [18, 19] More than 40% of Istanbul’s 12 million residents live in informal settlements (slums) non-resilient structures. 50% of Istanbul’s government sponsored enterprises (GSEs) revenues comes from gas pipelines, [20] some running under inadequate slums built along seismic fault lines, that would collapse post-earthquake, vanishing such revenues for a time, and in turn, jeopardizing the 40% of Turkey’s sovereign debt rating tied to Istanbul’s. Thus, disaster mitigation of slums might insulate sovereign ratings.

Mitigating Istanbul’s gas pipeline slum vulnerability is

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9 SubEx was a finalist in the 2009 Buckminster Fuller Design Challenge. [15] A parallel concept is being piloted by City transit and state energy agencies. [16]
just one benefit monetized on an Economy Map. Pandemic risks reduced by cleaner legal housing in former slums protect the entire city from disease. Better educational and social infrastructure reduces poverty, crime, terrorism and the inevitable social instability of have-nots demanding solutions that the wealthy refuse them. Using Economy Mapping, credit agencies can rate municipal bonds higher, saving debt service that the smart city can invest in mitigation.

Smart Businesses Like Smart Cities

Corporations embrace sustainability, for brand enhancement and employee satisfaction. They attract conscious consumers, socially-responsible investors, and government contracts, grants and tax incentives for “clean energy,” “pollution abatement” and other progressive activities. Through ISO 9000 and 14001 certifications, and emerging industry standards (e.g., LEED® for green buildings and ENERGY STAR® for electronics), corporate manufacturing processes are improving energy, environmental and transportation efficiencies. Independent reports (e.g., the Carbon Disclosure Project [21]) make the public aware of corporate sustainability practices.

With global insurance losses and premiums rising, businesses seek to control insurance costs for property, casualty, business interruption and healthcare. Climate change flood risks forecast for desirable coastal and waterfront cities require city managers to design and clearly explain proactive strategies for mitigation. Seismically-active regions exposed to earthquake or tsunami flooding are especially prone to insurability disadvantages. Prudent corporate risk managers seek urban collaborations.

Smart cities that attract triple bottom line companies (profit, planet, people) find corporate balance sheets willing to match local funding for multi-dimensional sustainable resiliency projects. State bond banks and county/local economic development bond programs can provide tax-exempt funding for corporate investments that upgrade sustainable resiliency. As corporate social responsibility (CSR) ratings drive employee and management involvement in local quality of life issues, corporate human and institutional resources become allies in improving neglected neighborhoods, schools and other challenges.

Crowdsourcing Urban Solutions & Funding

People congregate in cities for the planned and random power of synergies catalyzed there. Silicon Valley companies owe much of their success to such synergies.

Smart cities sponsor and leverage online communities built for crowdsourcing and funding solutions. For instance, Challenge.gov [22], OpenIDEO [23] and OpenAction [24] identify intractable issues, and encourage stakeholders to pool solutions. Crowd-funding11 for a city’s innovators, from web services like Kickstarter [26], let people directly fund new businesses and solutions they believe in. A smart city would create an investment fund to match public-private funding of crowd-sourced solutions to speed adaptive innovation.

Social Capital & Complementary Currency

Improving slums and fragile neighborhoods and restoring urban economic growth requires smarter financial and social capital. Better rated, lower interest sustainable resiliency bonds and local business borrowing and insurance rates, as described above, save financial capital.

A parallel currency – the social capital of neighbor helping neighbor - is abundant everywhere. Habitat for Humanity [27] and Mexico’s Patrimonio Hoy [28] sweat equity initiatives teach homeowners and neighborhoods to rebuild stronger, safer houses. Typically, construction industry partners contribute time, materials and skills training to the project, making tangible their humanitarian concern and “good neighbor” commitment.

Clueless as to how to reinstall a double-pane window, or start advertising your new business on the web? Services like TimeBanks [30] let citizens find an hour from citizen-mentors willing to share their expertise. At some exchange rate, Time Bank credits would cost the smart city less than sending city work crews or contractors to rebuild their housing, or pay jobless benefits to budding entrepreneurs. Such exchange could be effected as tax credits, merchant-sponsored coupons or discounts, free movie or museum admissions, or other forms of complementary currency that publicly dignify and reward civic behaviors. [31] Complementary currency flows abundantly in smart cities.

High-Transparency Banks, not Ostriches

Banks are the air traffic controllers of urban lifestyle data. Peet’s Coffee sells a latte and swipes payment from a credit card. A contractor buys supplies at Home Depot to green the local Peet’s store, using a credit card. A manager pays the tuition by bank transfer for his employee’s high school equivalency class as a job benefit. Millions of such transactions flow daily through the digital channels of bank operations. Bailouts of predatory Industrial Age banks left their knowledge of community impacts camouflaged, and their marketing-by-demographic-profiling intact.

Imagine a high-transparency ethical bank, GoodBank™(IO), built for the Information Age, that gives cus-

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11 Federal and state securities law barriers are being challenged so as to improve the job-creating capacities of crowd-funded small to medium-sized enterprises. [25]
tomers constant feedback as to the regional, environmental and social impacts of saving, spending, investing, borrowing and donating. [32, 33] The bank as community would reflect sustainable resiliency impacts in clients’ relationship pricing and as its CSR. By living financial lives truer to their ethical goals, customers reconnect meaning and money, earning complementary currency rewards. Enhanced social financial literacy and behavior could improve systemic bank safety and soundness. High-transparency banks quantify impacts, so they align smart city empowerment strategies in enduring and new ways.

Publicly-Owned Banks

If the bankers fail to fairly value a smart city and its citizens and businesses, the city could buy or form a bank.

The history of government-owned banks is fairly thin and distant. Private sector banks seem as evolutionarily inevitable as the air we breathe. The United States and its major trading partners have (or had) banks wholly or partially owned by government. [34] Whether public or private banks navigate the ups and downs of business cycles better is beyond the scope of this paper.

Cities and their networks of people, businesses and infrastructure generate bank deposits. They require loans independent of the business cycle (regionally/nationally) and independent of bank risk-taking elsewhere. Loans and other financial services in smaller cities should not become more expensive or vanish as (1) international regulations require “Too Big To Fail” money center banks [36] to post higher reserves [Basel III 37], or (2) the Federal Deposit Insurance Corporation imposes higher deposit insurance premiums to replenish its depleted fund. [38] Major banks’ disregard for local economic development, housing equity (mortgage access), education (student loans), farming (agriculture) and other capital needs historically justified forming publicly-owned banks (e.g., The Bank of North Dakota that still exists.) [39, 40]

Healthy banks thrive through constant adaptation. Publicly-owned banks also must master political adaptation. When well-managed, such banks assure competition in a region whose private banks are too small or not competitive. City banks serve as “local Federal Reserve” to customers constant feedback as to the regional, environmental and social impacts of saving, spending, investing, borrowing and donating. [32, 33] The bank as community would reflect sustainable resiliency impacts in clients’ relationship pricing and as its CSR. By living financial lives truer to their ethical goals, customers reconnect meaning and money, earning complementary currency rewards. Enhanced social financial literacy and behavior could improve systemic bank safety and soundness. High-transparency banks quantify impacts, so they align smart city empowerment strategies in enduring and new ways.

### Conclusion

Smart cities can use sustainability and resiliency innovations to recast their banking and credit options. The uncertain longevity and ownership of banks, large and small, suggest that cities create a range of financial allies at local levels, and reconceive their credit quality proactively. Business cycles challenge banks’ appraisal and underwriting assumptions. Regulators often merge unhealthy banks into larger banks. The monopolization of local banking hurts people and businesses, impacts that smart cities as bank customers can reverse. The shift from predatory banking in the Industrial Age to high-transparency banking in the Information Age would leverage innovations and data available in abundance to smart cities.

### References


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12 GoodBank is a design for a bank in the process of organizing.
13 The U.S. has experienced eleven recessions of varying severity and durations since World War II. [35]


