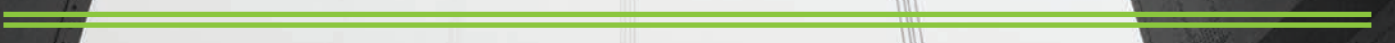
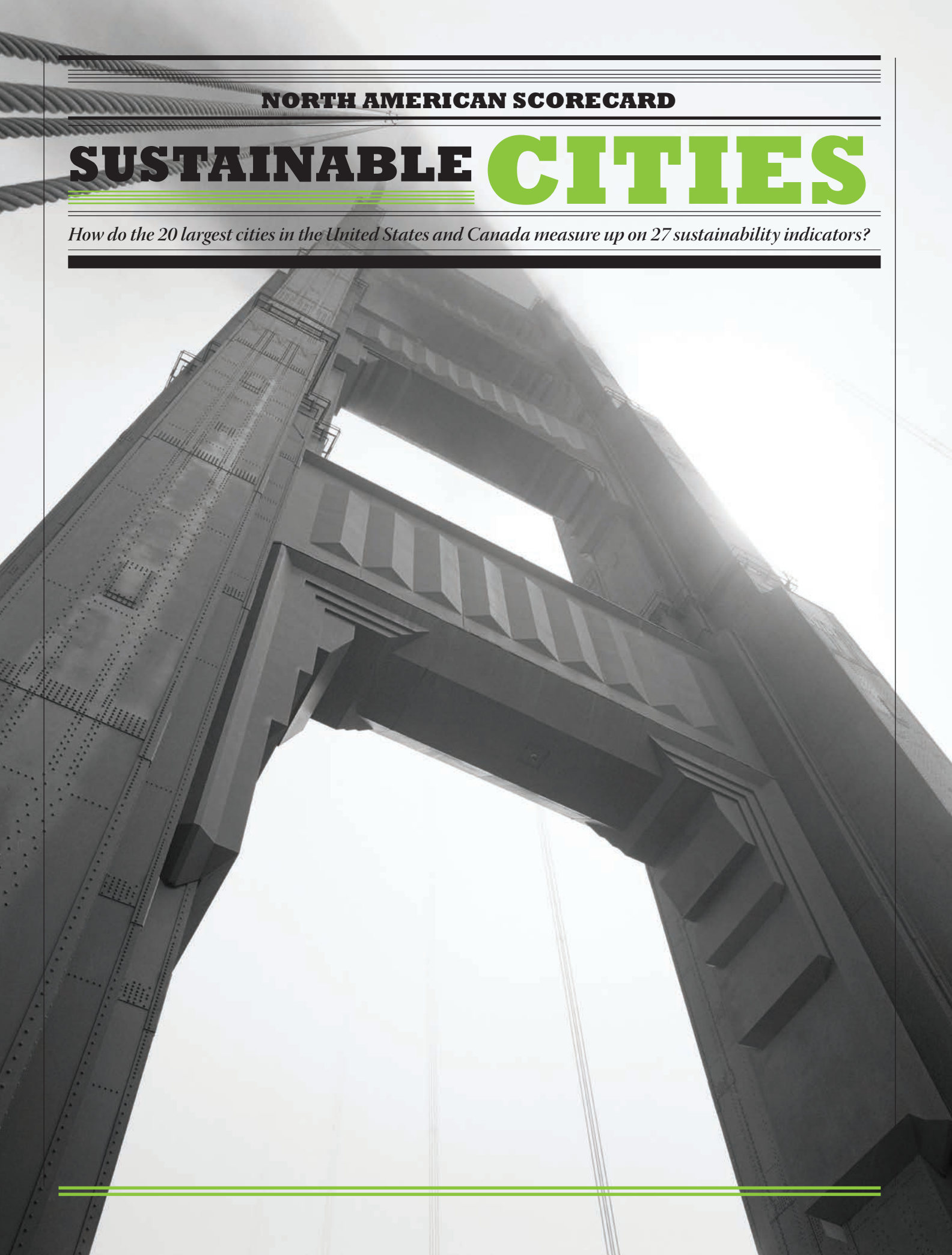

NORTH AMERICAN SCORECARD

SUSTAINABLE **CITIES**

How do the 20 largest cities in the United States and Canada measure up on 27 sustainability indicators?



By Darek Gondor and Tyler Hamilton
Research by Darek Gondor

San Francisco's Board of Supervisors took a big step in April when it recommended by unanimous vote that the city divest nearly \$600 million in fossil-fuel holdings from its \$16-billion pension fund.

As the biggest municipality in North America to take such action, San Francisco is nudging other major cities on the continent to reconsider their own fossil-fuel investments.

It's the kind of leadership many have come to expect from the "City by the Bay," and according to *Corporate Knights'* inaugural North American Sustainable Cities Scorecard, is indicative of San Francisco's sustainability performance.

Of the 20 largest cities in the United States and Canada, San Francisco came out tops when measured against 27 key performance indicators across five categories: environmental quality, economic security, governance and empowerment, infrastructure and energy, and social well-being.

Corporate Knights has been ranking large cities in Canada for several years, but this is our first effort to also assess major U.S. cities. Roughly half of the indicators used in our last Canadian cities ranking have been carried over to our new scorecard. These represent a core of traditional measures that include air pollution, household spending on shelter, population density and education.

But several new and unique indicators were added this time around, and our sources of data were broadened. We also slightly shifted our focus away from goal- or vision-oriented indicators toward measuring recent infrastructure and socio-technological change.

For example, new metrics that assess urban vehicle congestion, "walkability" and cycling infrastructure – including the availability of bike-sharing services – were incorporated as a measure of quality of life as well as economic and environmental performance.

Taken together, San Francisco led the pack, followed by Washington, Ottawa, Vancouver and Toronto. The bottom five included Houston, Atlanta, Phoenix, Los Angeles and – ranked lowest – Detroit.

(Cities in Mexico were excluded because of poor data availability.)

Ranking cities is a notoriously difficult task, as there are many limitations to contend with. Not all cities collect the same data, and where data does exist it is often out of date or not publicly available. Attempting to fill gaps, *Corporate Knights* sent surveys to all 20 cities and the response rate was only 50 per cent. To encourage disclosure, we awarded bonus points in our ranking to cities that made a best effort to complete our survey.

Another big problem is the different ways data are collected and represented. For example, there is not yet a standard way for cities to collect data on greenhouse gas emissions, which initiatives such as the Hestia Project at Arizona State University are trying to address using new technologies and methodologies. It's an issue the World Bank has run into when trying to collect consistent, reliable data on the world's largest urban areas.

"That lack of standardized and consistent data on city performance is one of the biggest barriers to creating sustainable cities," said Daniel Hoornweg, a municipal engineer who has advised the World Bank on urban issues for two decades.

Hoornweg said getting the data right is crucial. "Just like how doctors are quickly and reliably able to monitor a patient's health through blood pressure, temperature, cholesterol and EKG, and then compare results over time and across peers, city managers need reliable and consistent urban metrics," he said.

The World Bank and others are putting their hopes in the Global City Indicators Facility (GCIF) at the University of Toronto. GCIF is finalizing an ISO-standard methodology for collection of city data, but progress has been slow.

Many large cities and urban areas have yet to become contributing members of GCIF, and many existing members are still not prepared to have their indicators publicly released. Cities generally don't like being scrutinized and ranked. "Several years may elapse before information is regularly published," according to a World Bank city data report released in 2012.

But even when data is publicly avail-

able and standardized, direct comparability among cities can still be a challenge. Is it fair, for example, to compare the per-capita energy use of cities in northern climates with use in southern climates? New research out of the University of Michigan, published in March in the journal *Environmental Research Letters*, found that energy demand in Minneapolis, Minnesota, is 3.5 times higher than energy demand in Miami, but not necessarily because citizens and businesses in Minneapolis are wasteful of energy.

The explanation is simple: "To the surprise of many, air conditioners are more energy efficient than furnaces or boilers," according to the study. To fairly compare cities on certain metrics, methods will need to be developed that take these geographic and climatic differences into account.

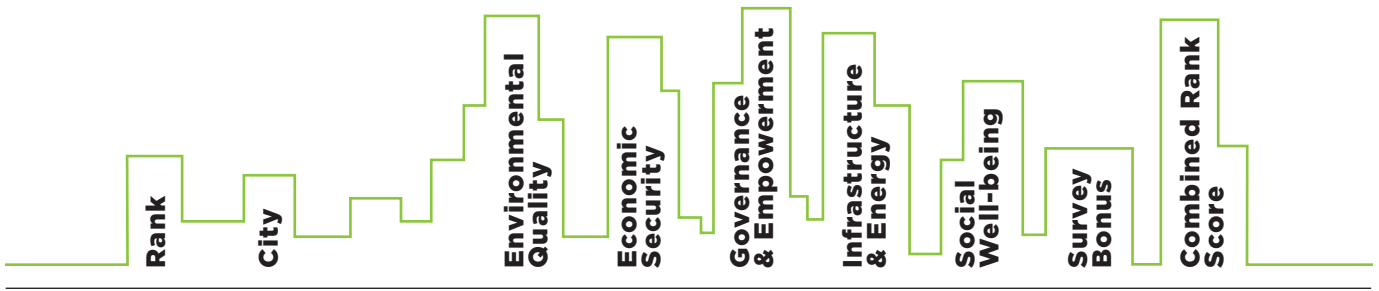
It should also be emphasized again that this ranking is not based on vision or established goals. Like legendary sports broadcaster Howard Cosell, we're just telling it like it is. Los Angeles may have committed to being a coal-free jurisdiction by 2025, but that laudable goal – and others that have come out recently from the City of Angels – doesn't reflect the reality on the ground. What matters in our cities scorecard is when city aspiration translates into measurable sustainability performance.

We recognize sustainability is a term most people have difficulty defining, much less measuring, but we expect most would agree that it demands a minimum standard of living; a safe, diverse social network; societal institutions that support what could be termed "the good life," for both existing and future generations; and an environment that promotes good physical and mental health.

Our scorecard does not and cannot capture every aspect of sustainability. But combining the results of the 27 indicators we have selected offers a strong sense of how our big cities perform relative to one another.

It goes without saying that, as city disclosure improves, standards emerge and data gathering becomes more frequent, the picture painted by the Sustainable Cities Scorecard will become clearer and the number of cities we track will grow. ♣

North American Scorecard



Rank	City	Environmental Quality	Economic Security	Governance & Empowerment	Infrastructure & Energy	Social Well-being	Survey Bonus	Combined Rank Score
1	San Francisco	4	12	1	3	5	N/A	25
2	Washington DC	9	2	11	4	2	N/A	28
3	Ottawa	1	7	2	13	11	-5	29
4	Vancouver	3	20	7	1	6	-5	32
5	Toronto	6	16	3	5	7	-5	32
6	Boston	4	1	16	9	3	N/A	33
7	Seattle	7	6	4	11	13	-5	36
8	Philadelphia	8	10	14	6	4	-5	37
9	New York City	2	18	12	2	8	N/A	42
10	Calgary	12	5	5	12	14	-5	43
11	Dallas-FW	11	3	13	16	10	-5	48
12	Chicago	13	9	10	7	12	N/A	51
13	Denver	20	4	8	10	9	N/A	51
14	Montreal	10	15	6	8	18	N/A	57
15	Miami	13	14	18	15	1	N/A	61
16	Houston	17	8	15	18	16	-5	69
17	Atlanta	19	17	9	17	17	-5	74
18	Phoenix	15	11	20	19	15	N/A	80
19	Los Angeles	18	13	19	14	19	N/A	83
20	Detroit	16	19	17	20	20	-5	87

Methodology

RESULTS: CK assessed the biggest five cities in Canada and 15 of the largest U.S. cities across 27 equally weighted indicators grouped into five categories (Denver was included instead of San Diego or Houston to achieve a better geographical balance). Indicators in each category were standardized on a scale of 0 to 10 and added up to determine category-level rank. To determine overall ranking, a city's rank number in each of the five categories was added up. The lower the score the higher the final ranking. The top city can be said to be the best performer across the 27 indicators when compared to all other cities measured. We can say the top city has on average met the criteria that is presented in our vision of a sustainable city. See corporateknights.com/report/citiesscorecard for more details.

Shifting from Grey to Green



North American cities suffer from a growing natural infrastructure deficit

Despite being a vast continent of forests, fields, farmland, mountains and ice, North America is an urban society.

In Canada, for example, 82 per cent of the population now lives in cities. The percentage of urban dwellers is slightly higher in the United States at 84 per cent, while Mexico sits at 78 per cent. According to the United Nations Department of Economic and Social Affairs, which tracks global urbanization trends, Canada and the U.S. now rank among the Top 50 urbanized countries – ahead of Germany, England, Italy and other Western European states.

Some cities may be experiencing booming growth, but public investment in urban infrastructure such as sewage and solid waste management, energy production and distribution, transit, and other built structures has lagged. As noted in a recent Canadian Centre for Policy Alternatives study, this growing urban infrastructure deficit is impossible to ignore:

"The evidence is clear, both in the statistics, and in the everyday experience of Canadians in every part of the country: in spine-jarring streets and highways; in mind-numbing and catastrophically wasteful traffic jams ... in the struggles of rapidly growing communities to keep up with the need for the basic nuts and bolts of urban civilization."

The study and other research show governments have responded to the infrastructure deficit during times of crisis, spending billions with economic stimulus programs to keep the construction industry going during economic downturns or when alarming episodes of crumbling expressways and sewage floods make headlines.

At the same time, a less obvious but incredibly valuable asset of cities – green infrastructure like urban forests, local parks, healthy waterways and beaches – has received comparatively little political attention or government funding, despite its enormous value to urban dwellers.

Natural ecosystems and vegetative

technologies like green roofs and engineered wetlands extend the life of many types of traditional infrastructure by assisting, for example, with storm water management. They also provide a range of additional co-benefits that improve the health and well-being of urban communities. This includes reduced smog, enhanced habitat for biodiversity like songbirds and insect pollinators, increased workplace productivity, and even psychological and restorative benefits for urban dwellers, such as stress relief.

Yet, while leafy neighbourhoods still exist in older parts of major cities, such as Toronto and Chicago, most remain largely deforested. Experts have determined that a minimum 30 per cent forest cover is required to maintain a healthy local ecosystem, yet only 18 per cent of Toronto and an abysmal 5 per cent of some of its bedroom communities are covered in trees. Indeed, despite their critical value as natural assets, forests and other elements of green infrastructure continue to be dug up, drained and paved over to make way for more roads, strip malls and subdivisions.

The consequences of this decline and degradation are far reaching. They include higher built infrastructure costs associated with managing storm water and greater vulnerability to natural disturbances such as floods and storms, as Hurricane Sandy demonstrated. Furthermore, new research also shows that people living in neighbourhoods lacking in mature trees and other green infrastructure face increased depression and other health risks.


A recent U.S. Forest Service study found that widespread infestation of urban forests and tree-lined streets by the emerald ash borer, an invasive insect, has not only killed tens of millions of urban trees, but is contributing to higher rates of death from cardiovascular and lower respiratory tract illness among urban dwellers. These are the first and third most common causes of death in the U.S.

The direct causal relationship between

trees and human health is not fully understood, but scientists believe people living in urban areas are less active, suffer from greater stress levels and are exposed to poorer air quality in neighbourhoods lacking green infrastructure. Conversely, trees are so efficient at removing airborne pollutants like carbon monoxide, lead and nitrogen dioxide that Columbia University researchers estimate for every 343 trees added to a square kilometre, asthma rates in young people drop by about 25 per cent.

And let's not forget greenhouse gases. Another recent study by the U.S. Forest Service found that America's urban forests store an estimated 708 million tons of carbon, an environmental service with an estimated value of \$50 billion. Annually, net carbon uptake is estimated at 21 million tons, representing \$1.5 billion in annual economic benefits.

While higher levels of government have yet to catch on to the enormous value of sustaining and growing the stock of green infrastructure in our cities, leadership is happening at local levels. For example, the David Suzuki Foundation and more than a dozen local community groups have launched a cheeky new campaign to create Canada's first "Home-grown National Park" in downtown Toronto. This new crowdsourced green urban corridor will be located along one of the city's most notable "lost rivers," which now lies buried beneath asphalt and concrete. The project aims to enhance, restore and create urban green space and other green infrastructure through planting native trees and shrubs, cultivating bird- and bug-friendly gardens, and growing food in backyards and on balconies.

Continuing to ignore the green infrastructure needs of our cities, such as local parks and naturalized school grounds, is shortsighted. Green spaces complement traditional infrastructure, provide a multitude of ecological benefits and contribute to the health and well-being of urban populations. 

Jumbo Shrimp



North America's big cities are getting smaller relative to their peers on a growing world stage

Canadian and U.S. cities arrived early to the party and mingled with their friends from Europe, soon followed by those from Japan. Resources were plentiful. Spirits, for the most part, were high. Recently, cities like Jakarta, Sao Paulo, Mumbai, Johannesburg and Shanghai have added to the mix. And soon the really big players like Lagos (Nigeria), Kinshasa (Democratic Republic of the Congo) and Dar es Salaam (Tanzania) will join and really shake things up.

The world is undergoing an enormous wave of urbanization. Students graduating today will see a doubling of the world's urban populations within their careers. And almost all of the three billion new urban residents will live in the burgeoning cities of middle- and low-income countries – that is, “the south.” The world's rush to urbanize is already having profound impacts on Canadian and U.S. cities, especially the larger metropolitan urban areas.

Today, 15 of the world's 100 largest urban areas are in the U.S. and Canada. The Greater Toronto Area with 5.4 million people is the 50th largest city in the world and Montreal, the only other Top 100 Canadian city, is 87th. The U.S. has 13 cities in the Top 100 starting with New York City in sixth place.

Fast forward to 2050. Even though populations are expected to grow considerably in all cities, the U.S. and Canada will still lose three or four cities from the Top 100. Project further into the future and the Top 100 number drops even more. The projections are a little murky but a few things are clear. By 2100 Canada's only large city, Toronto, is barely in the Top 100 list, hanging by the nails in 96th spot. The U.S. has only six. New York City is still the largest but drops to 22nd place.

Toronto is a good example of how North American cities are running ever faster yet still falling behind their global large-city peers. Linked to Toronto's impressive growth, from 2001 to 2011 total

annual passengers at the city's Pearson International Airport increased from 28 million to 33.4 million. Despite this 20 per cent growth in annual traffic, in just a decade Canada's busiest airport (by far) dropped in the global ranking – to 38th from 26th.

The growth in Asian air traffic swamps anything today happening in North America or Europe, and Asia is a precursor for Africa. The African continent is just getting started on its urbanization path. By around 2050 Africa will have more people living in cities than all of East Asia, and by the end of the century Africa will have as many people living in the Top 100 cities as the rest of the world combined.

Roughly speaking, the volume of Canada's voice at the close of this century will be half what it is today, and most of the influence will come from Toronto. This is similar for the U.S., where most of the diminished remaining influence will be through New York City, Los Angeles, Chicago, Miami, Philadelphia and Dallas.

Clearly, Canadian and U.S. cities need a new approach if they are to continue to have global influence.

Not that bigger is always better, but when it comes to the global economy and international influence, large cities matter. Large cities are like stationary aircraft carriers within a country's global power base. Big cities are the vehicles through which countries most influence global events. Big cities finance the soldiers, weaponry and embassies abroad while at home they drive the economy, patents, higher education and innovation. The world talks through its cities, and bigger cities almost always have a louder voice.

The selection of Cardinal Jorge Mario Bergoglio from Buenos Aires as Pope Francis is another example of how economic heft and influence are shifting away from traditional power bases like Europe, Canada, the U.S. and Japan. This shift of power presents enormous opportunities but also threats to the U.S. and Canada.

The greatest opportunity is likely not the supply of commodities and agriculture products, but rather provision of urban services, institutional support, and working together with emerging markets to help cities develop and operate in a more sustainable way.

History repeating

The rise of North America's big cities is illustrative as history looks to repeat itself, only this time in Asia and Africa. Of the world's larger, more affluent countries Canada was one of the earliest and fastest to urbanize. Spurred by many young rural men enlisting (and heavy casualties in World War I), Canada surpassed the 50 per cent urban mark around 1921. The country's fast-paced urbanization manifested in many ways; for example, with so few rural workers, Canada became a world leader in tractors and mechanized farming. Parts of the United States followed the same path.

Canadian and U.S. cities also owe much of their affluence and global stature to large-scale infrastructure. Big projects like Canada's cross-continental Canadian Pacific Railway, the U.S. Interstate Highway System, Erie Canal, St. Lawrence Seaway, Hoover Dam, Tennessee Valley Authority, and the plentiful, reliable and cheap electricity from the Niagara River, for example, all led to tremendous economic strength.

There was much fanfare last month as Toronto proper nudged past Chicago to become the fourth-largest city in North America. However, the Greater Toronto Area is still three million people smaller than Greater Chicago. Overall urban area is a much better measure of the economic and cultural heft of a city than the inner core alone.

A few strategies for U.S. and Canadian cities emerge as the world's centre of urban gravity shifts southward. If Toronto and Chicago strengthened partner-

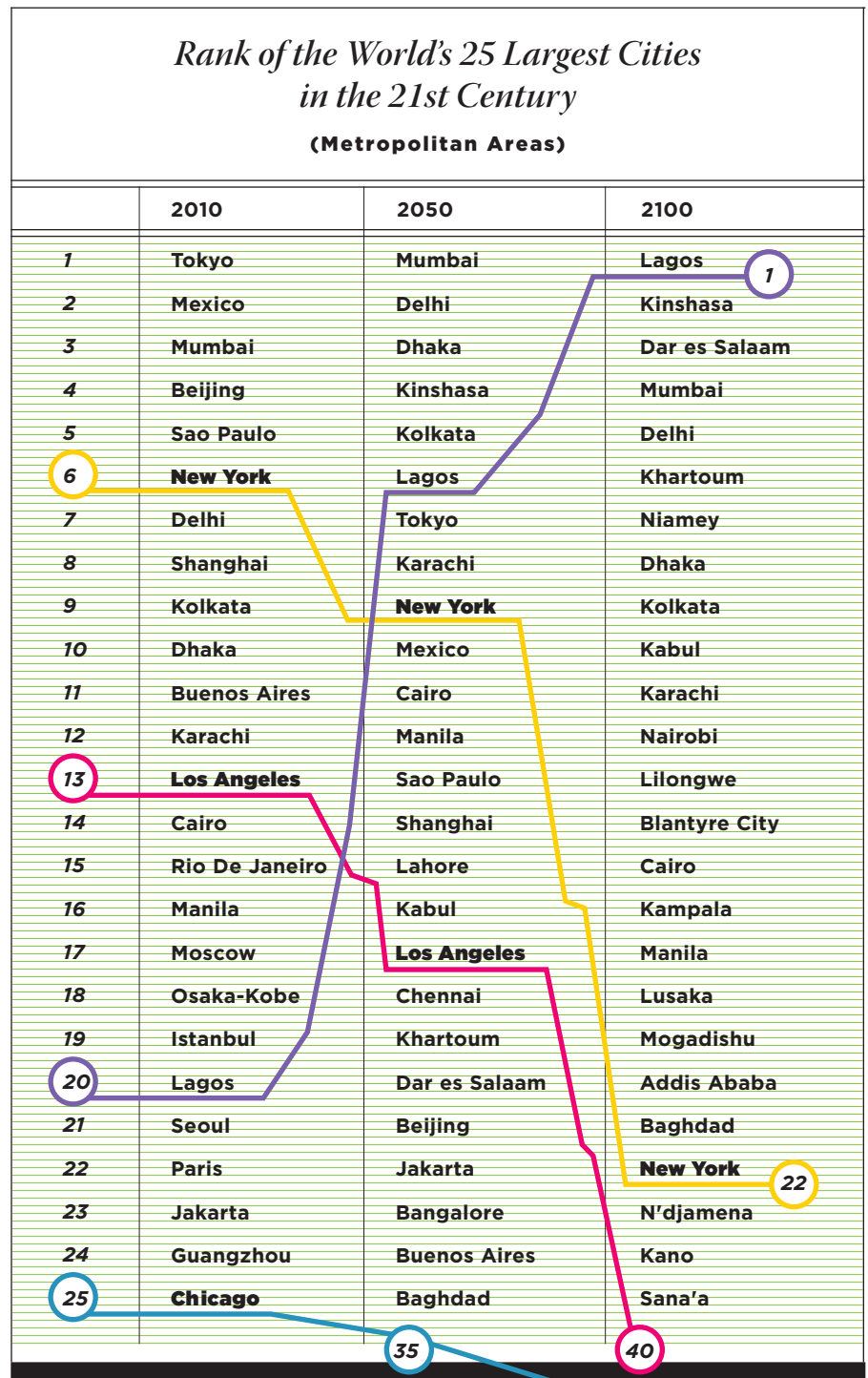
ships, for example, they would emerge as even more critical urban centres for their countries. Greater Toronto and the rest of Canada will also need to work more closely together as Canada faces increased geopolitical and climate turbulence. Miami, New York City and Philadelphia present particular vulnerabilities. Sea level is expected to rise by 0.5 to 1 metre by the end of the century and all three coastal cities are located in common hurricane track paths. Miami and New York City are respectively the world's first and third most threatened cities with \$5.7 trillion in combined assets likely exposed to coastal flooding by the 2070s.

On their own, with their provinces and states, and occasionally with the help of their national governments, as well as through city associations like C40, Metropolis and ICLEI, all larger Canadian and U.S. cities are working in some way toward greater sustainability. Their key sustainability objectives include enhanced resilience and risk reduction, securing basic service provision such as water, food and energy, strengthened community involvement in city functions and for many cities a much greater focus on transportation (as these large cities compete globally they will need to effectively mobilize as many residents as possible across the urban area).

A newly emerging sustainability priority is the building of stronger and more cooperative international partnerships. Watch for pragmatic partnerships between cities like Toronto, Chicago, Dallas and New York City with cities like Sao Paulo, Bogota, Seoul, Jakarta, Beijing, Dar es Salaam, Lagos and Johannesburg. As most of the larger-scale climate, economic and security threats to Canadian and U.S. cities are common across the world, cities have a greater incentive to cooperate.

Continued economic prosperity for North American cities is mainly conditional on how well they can integrate themselves globally; how well they are able to influence improved urban service provision around the world; and, how well the systems and institutions they develop to meet the needs of sustainable development are emulated and exported. When your voice is about to be halved it's important to ensure that your input is pragmatic, profitable for all parties and doubly persuasive.

One challenge all North American cities have in common is a severe infrastructure deficit. Cities like Chicago, Toronto, New York City and Philadelphia are like



middle-age players that became soft in the belly. Transportation deficiencies are the most noticeable, but power, water and wastewater systems are also often sclerotic. While the cities of the south need new infrastructure, North American cities need extensive and urgent improvements to existing infrastructure. As an example, Chicago Mayor Rahm Emanuel intends to spend \$7 billion over the next three years just to start addressing the city's backlog.

As the relative political influence of

Canadian and U.S. cities falls over the next several decades, a new opportunity arises. More cities in countries like China, India, Tanzania, Nigeria and Indonesia will need expertise in urban service provision. Building and rehabilitating cities is the world's fastest growing market and success benefits everyone. The worst thing North America's big cities can do now is rest on the past. Efforts need to be redoubled to build better cities in our own countries, and then to export this expertise.

The PACE Makers

Figuring out how to pay for energy-efficiency retrofits is a major barrier, but some cities have figured out how to break through

America's most visible octogenarian is on a power diet. The Empire State Building, built in 1931 and reigning as the world's tallest building for 40 years, has gone through an efficiency makeover. The 140-storey skyscraper is now a poster child for the building energy movement.

Part of a \$500-million retrofit that began in 2009, the initiative has already exceeded its performance target. When interior renovations are completed, total savings of \$4.4 million a year are expected on what will amount to a \$20-million investment. That's excluding the 250 jobs the retrofit created and the 50 per cent premium that can now be charged to tenants.

The fact a return like that was possible for such a big old building offers a lesson for all property owners: energy efficiency pays. Unfortunately, major barriers remain, at least in the minds of those who control the purse strings.

A 2012 survey by industrial conglomerate Johnson Controls found that 26 per cent of commercial property decision-makers considered "lack of funding" as the biggest barrier to going ahead with big energy-efficiency projects. It may be a drop from 30 per cent in 2011, but funding challenges have remained the top concern since Johnson Controls launched the annual survey seven years ago.

This puts energy efficiency low on the

list of items to tackle, particularly when property owners are often already skeptical about the payback. "People are not certain of the savings opportunities, and there's the fact that natural gas prices are pretty low right now," said Mary Pickering, vice-president of the Toronto Atmospheric Fund, an agency that oversees emission-reduction programs for North America's fourth-largest city.

Getting over the funding barrier is essential from a climate change perspective. Buildings represent as much as a third of total global greenhouse gas emissions, according to the United Nations Environment Programme, and most of those buildings are located in big cities.

In the United States, commercial and residential buildings together consumed 74 per cent of all electricity and represented 41 per cent of primary energy consumption in 2010, according to the U.S. Department of Energy. Nearly three-quarters of that energy came from fossil fuels, making the GHG footprint of buildings massive. (In Canada, buildings consume a comparable portion of total primary energy.)

In other words, there is tremendous potential to shrink that footprint. So much, in fact, that President Obama has called for a doubling of U.S. energy efficiency by 2030. It can be done, says the

Alliance Commission on National Energy Efficiency Policy, which considers building retrofits an important part of getting there. The alliance estimated that a \$72-billion investment in building-related energy-efficiency measures would result in \$167 billion in energy savings in 2030. So where does that \$72 billion come from?

Municipal lending

It may come as a surprise to some, but a big part of the answer may lie with a creative financing approach pioneered in the 1990s in – of all places – the Yukon, a sparsely populated territory in northern Canada known for its mountains, caribou and salmon fishing.

In the Yukon, as in other states and provinces, municipalities already used a financial tool called a local improvement charge, or LIC, to recover the cost of services that only benefit a certain neighbourhood – for example, new playground equipment in a park or a new sidewalk. The upfront cost, initially covered by the government, is typically divided across all property owners who are expected to directly benefit from the project. Those property owners then pay back the funds over 10, 15, even 20 years through an additional line item on their municipal property tax bills.



The Yukon government decided in 1998 to use that same approach to fund on-site, off-grid renewable energy systems and eventually energy-efficiency retrofits for specific buildings. The twist is that the property owner alone would be responsible for repayment via a surcharge added to their annual property tax bill. The program proved quite effective.

The idea, however, really didn't catch on until several years later, when some Canadian environmental groups and, soon after, Berkeley and other progressive municipalities in California began to seriously consider LICs as a way to break through the funding barrier that was holding back the potential of energy efficiency. The first U.S. pilot programs emerged around 2007 under the name Property Assessed Clean Energy, or PACE.

David Gabrielson, executive director of PACENow, a not-for-profit advocacy group for PACE programs, said this novel use of LICs in the U.S. began with a focus on the residential market. "In a way, the concept spread virally throughout the U.S.," said Gabrielson, explaining that municipalities with climate action programs saw PACE as a way to drive a significant reduction in emissions. "It spread through 24 states in 24 months."

Officials found it attractive for a number of reasons. First, it wasn't based on

"People are not certain of the savings opportunities, and there's the fact natural gas prices are pretty low right now... It's (also) the newness that some home owners are unsure of."

subsidies. Instead, municipalities would simply leverage their ability to borrow money (through a bond issue) at a low interest rate, then turn around and offer low-rate loans to property owners. Second, repayment of those loans (plus interest and perhaps a modest charge for administering the program) could be collected over 10 years or more through an existing billing mechanism already in place for property taxes. Third, if the property sold, the lien related to that loan would simply transfer to the new owner.

If designed properly, the idea is that annual energy savings from a retrofit would more than cover the added charge on the property bill. It would be painless for the property owner, painless for the municipality, and would achieve the dual goal of reducing city emissions and creating local jobs that would result from the increased economic activity. Win-win-win.

Then in July 2010 it came to a halt. The U.S. Federal Housing Finance Agency (FHFA), created in 2008 to oversee mortgage finance giants Fannie Mae and Freddie Mac, said it didn't like PACE. The concern was that the added debt burden on homeowners would increase the likelihood of a default on mortgage payments. Also, the lien related to the energy-efficiency loan had priority over the mortgage. If a homeowner defaulted,

the municipality would be repaid before mortgage lenders.

“This position certainly put a damper on the enthusiastic development of residential PACE programs,” Gabrielson said. Some municipalities, such as Babylon, New York, frustrated by having Fannie Mae and Freddie Mac meddle with local or state affairs, continue with their programs despite the threat. They’re betting the FHFA won’t have the stomach to go after them. “It’s like, I dare you to come after me,” said Gabrielson, adding that the FHFA just won’t acknowledge the over-arching benefits of the programs. “So there’s a lot of bitterness out there.”

Meanwhile, U.S. interest in the PACE program model has shifted from the residential to commercial space, where Fannie Mae and Freddie Mac have little if any jurisdiction and the commercial lending community has been more open to the idea. Gabrielson said there are 16 commercial PACE programs across seven U.S. states in early stages of development, and all have emerged in the past 18 months. “They are just now beginning to take applications for funding and getting approval from lenders. So 2013 is shaping up to be a very good build on the baby steps

that have been taken so far. We’re starting to develop some serious momentum.”

Programs in San Francisco, Washington, D.C., and Toledo, Ohio, are among the most advanced. The size of the loans issued to commercial building owners can range from \$50,000 up to \$5 million, and they can be paid back over 10 years or more – terms that a private lender would never accept. “The programs have potential to help building owners solve many challenges,” according to a report from the Johnson Controls Institute for Building Efficiency.

“For example, efficient lighting, upgraded wall and roof insulation, high-efficiency HVAC systems, solar panels, and many other improvement measures are eligible,” the report said. “Under all programs, all improvements have to be permanently affixed to the building.” With many programs, projects must achieve energy savings of 10 per cent or more to qualify.

Building owners, once they understand how PACE works, typically embrace the model. Not only can energy-efficiency projects increase property value and allow for the charging of higher tenant rents – as the Empire State Building proj-

ect demonstrated – but a PACE model also makes it possible for the landlord to pass on loan repayment obligations to tenants. “In this way, PACE structures overcome the landlord-tenant split incentives barrier to building efficiency projects,” states the report. “The building owner incurs no current costs and acquires permanent property improvements.”

Canada wakes up

Despite the fact that the PACE concept seemed to originate from the Yukon territory, the use of LICs to fund energy efficiency in homes and buildings has not yet grabbed hold in Canada. The one exception is a pilot project in Halifax, Nova Scotia, that supports the purchase and installation of domestic solar hot water systems.

Around 2010, however, interest in the PACE model (sometimes called Property Assessed Payments for Energy Retrofits, or PAPER) began to grow in the province of Ontario, sparked in part by a series of reports funded by the David Suzuki Foundation. Sonja Persram, a consultant who wrote the reports for the foundation, said the papers spearheaded an education

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campaign that caught the attention of officials at all levels of government, including city councillors in Toronto.

The big break came in spring 2012 when Ontario's Ministry of Municipal Affairs and Housing tabled amendments to provincial legislation that defined how municipalities could use LICs. The proposed changes called for "flexibility" in the application of LICs for projects "including, but not limited to renewable energy and water conservation." It left the door open for energy-efficiency retrofits as well.

The proposed amendments were signed into law by then-minister Kathleen Wynne, just two weeks before she stepped down from her cabinet post to run as premier of Ontario, a contest she won in January. PAPER proponents are encouraged that the woman who empowered Ontario municipalities with her signature is now running the province.

Pickering said the Toronto Atmospheric Fund immediately stepped in to ensure the opportunity was managed properly. "We said, let's not all run off in different directions and figure this out for ourselves. Let's get collaborative, pool our money, and get some common testing structure together," she said. "I was surprised at how fast

municipalities came to the table."


What resulted was the creation of the Collaboration on Home Energy Efficiency Retrofits in Ontario, or CHEERIO, a partnership of 22 municipalities (and growing) that is examining different aspects of PAPER program design, legal issues and communications challenges. It's also doing market research to find out what homeowners across the province think about the new funding mechanism, and what lessons can be learned from efforts in the United States.

Research to date indicates that homeowners are somewhat skeptical, both with the idea of cities acting as a lender and the suggestion that annual energy savings will exceed any surcharge on property taxes. "It's the newness that some homeowners are unsure of," said Pickering, adding that there's a lingering perception that the surcharge (lien) will affect home resale. "People are a little bugged about that."

Still, municipalities are determined to move forward, with Toronto likely to be the first city to pilot a program, possibly by this fall. Pickering said PAPER/PACE programs are timely financing tools for what she called the "post-incentive" era, where the federal and provincial govern-

ments have stopped offering rebate programs to spur conservation and energy efficiency. "It's discouraging we have lost those incentives. They drove activity for the past 10 years," she said. But now cities in Ontario are empowered to fill that funding gap. "Incentives come and go, but it will be nice to have something we can rely on that's always available."

Ontario has been less focused on the commercial retrofit opportunity, but proponents are closely watching how commercial PACE programs roll out in the U.S. Gabrielson is careful not to position PACE as a silver bullet. Like Ontario homeowners, many commercial building owners are still uncertain and skeptical. "It's not the core business objective of most building owners to make their buildings more energy efficient. They've got other things on their mind," he said. "Second, they're not convinced if they do X, Y and Z it's going to save them money. And third, we've just gone through a period where all building values got smashed."

The federal government has also failed to set the tone of discussion, he said. "There's no coherent, consistent national imperative behind it." In the United States and Canada, perhaps there should be. 

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2012 SUSTAINABILITY REPORT 

Making the Difficult Transition



Cities are complex beasts. To build sustainability into their DNA, some are embracing a longer term, more holistic approach to urban development

Like it or not, the city is becoming the lifestyle model for most of humanity. And you are forgiven if your first image is of condo-residing, transit-commuting hipsters sipping on their morning lattes.

The reality, however, is quite different. The United Nations estimates that 93 per cent of urban growth will occur in developing countries, with 80 per cent in Asia and Africa. Not to suggest the urbanization trend is not strong in the developed world. In the United States, for example, for every free spirit that gives up her city profession for a bit of the country life, more leave for the city – and that, in a country that is already 84 per cent urbanized.

Many cities have taken advantage of proximity to each other with an eye to realizing efficiencies in economics, transportation and land use. Yet for some, the social and environmental benefits are limited, as CK's 2013 Sustainable Cities Scorecard illustrates.

So what, then, makes a city sustainable? Academics and policy-makers have come to realize that the single-solution, plan-and-implement model is weak. This has some cities looking at a *transition management* framework, a European import that recognizes the complexity of a modern society. Our cities evolve through interactions between technology, culture, institutions and other forces that sometimes do good, but this often locks us into predetermined outcomes through inertia and vested interests. If you don't believe it, ask yourself why you are not plugging your car into a socket instead of still pumping \$75 of petroleum at every fill-up.

In complex systems like city operations there is a high level of uncertainty, making it difficult for city planners to determine the best course of action. Rather than guessing what may work and risk being wrong, a transition management approach would start by converging ideas across a long-term vision (rather than short-term goals) with an effort at reaching broad agreement. In the case of the Netherlands, the government there facilitated multi-stakeholder forums. In such a collaborative environment, the focus widens from problem solving to mutual learning. The aim is to overcome reliance on quick technical fixes. What's embraced instead are incremental experiments in business strategy, or policies that do not all need to work but – for the few that do – can steer societal change in the desired direction, ideally aligning diverse interests.

The transition management approach can be more effective because it doesn't attempt to solve a problem with one solution. Basically, it's a grand instrument in transformation.

Phoenix, in partnership with Arizona State University's School of Sustainability, is an example of one North American city that has used the framework to update its general plan. "If we can create sustainability in Phoenix, we can create it anywhere," says ASU professor Arnim Wiek. "The (city's) problems range from car-dependent urban sprawl to a lack of public space for physical activities, in addition to the problem of extended droughts for a desert city like ours," explains Wiek. "Phoenix has in the past embraced a lot of features that are unsustainable. That's why it's a great city to get something started."

Faced with severe budget cuts and an unworkable planning document for the city, former Phoenix planning manager Carol Johnson bought into the transition a management model and eventually got in touch with Wiek. Together they developed a transitional vision for Phoenix and strategies to reach it. An early draft pursues a strong local economy, a mix of global and local businesses, industry focus on medical R&D, and businesses participating in civic engagement.

The project is city-led, lending it political legitimacy. It involves professors as well as graduate students, giving them an opportunity to work on solution-oriented, practical research. Wiek says the process is fully supported by Phoenix mayor Greg Stanton, who has committed to a stronger urban sustainability agenda under his leadership.

Wiek underscores the transformational character of the endeavour. "Sustainability is still dominated by problem-focused approaches that analyze what is the status quo. Here, we focus on solutions exploring which transition pathways are viable for complex urban systems in collaboration with stakeholders across the city," he explains. "It fosters social learning."

The next step – an initiative called "Reinvent Phoenix" – has already been set in motion with the help of a \$2.9-million grant from the U.S. Department of Housing and Urban Development. It will build on the previous effort, focusing on improvements to the city's light rail corridor to meet its vision of transit-oriented development.

It's an experiment for other cities to watch, and emulate. 

Donut Filling



Sprawl is a big problem, but there are a number of policies built around pricing that cities can embrace to foster urban density

Nobody wants to live in a city that is unsustainable. A truly sustainable city can be defined as one that does not impose excessive environmental damage, that has a healthy fiscal balance and that has a strong enough economy to sustain a healthy population with a good quality of life.

Currently, the vast majority of North American cities are failing on environmental performance. Across the continent we see vast sprawling suburbs that lock in automobile dependency and thus fossil fuel consumption with its climate change and smog emissions.

The health and environmental impacts that result from sprawl are well known. Obesity and high blood pressure, for example, are correlated with sprawl. On average, people in sprawling areas are six pounds heavier. Sprawl is also responsible for the loss of Class 1 farmland. Less discussed but equally alarming are the economic and productivity effects of sprawl. The traffic congestion resulting from sprawl inflates shipping costs and reduces overall economic productivity.

At the same time, local economies are held back by a lack of vigorous and vibrant core business areas. Such areas provide greater choice for workers and firms, raising employment and productivity. Urban density fosters innovation-boosting knowledge spillovers, and allows businesses and households to reap savings from greater sharing of servicing costs. Yet for every such area enjoying these “economies of agglomeration,” there are dozens of hollowed-out “donut” cities with stagnant economies based on suburban discount retail.

Finally, city governments are taking on major financial liabilities with every new subdivision approval. Infrastructure is built out to service new sprawling areas, often using grants from higher orders of government. The financial burden of maintaining and eventually rehabilitating that

infrastructure, however, will fall to cities. Those costs will be enormous, and many cities will prove incapable of meeting them.

Not surprisingly, given the costs of sprawl, cities are increasingly establishing goals of reducing further sprawl and building denser urban areas. This can be accomplished with well-designed public policy.

The key to choosing the right policy instruments is to focus on the causes. Suburban sprawl is taking place because prices encourage it. Businesses are setting up outside of cities because the costs are cheaper than in urban areas. Homebuyers continue to “drive until they qualify.”

Yes, zoning regulations and municipal development plans allow for sprawling subdivisions to be built. But they don’t create demand for sprawl. Prices do that.

Of course, prices are not the simple result of producer supply and consumer demand, as markets don’t exist in a vacuum. In the real world, prices and markets are strongly influenced by government policies, taxes and subsidies. The market for new suburban development is no different. It enjoys significant subsidies, while residents and businesses in established areas pick up the bills.


Impact fees (sometimes termed development charges) are intended to recover some of the municipal costs of new developments. However, they are often levied at a flat rate that fails to reflect the higher capital cost of distant subdivisions, let alone their future costs of infrastructure maintenance or renewal. Similarly, water and wastewater utility fees are often set at a flat rate, despite significantly higher pumping costs to and from far-flung suburbs. Public spending on free-to-use roads provides a subsidy to motoring that makes sprawl possible. The failure to charge for using the atmosphere as an emissions dump also artificially reduces the costs of automobile use.

In this context, well-designed policy

focuses squarely on prices. The aim is to eliminate the subsidies and turn the prices around until they pull in the direction of a city’s urban density goals. Prices are powerful influences on decisions; with the right pricing, developers will fall over each other to build dense, livable communities, and home buyers will flock to them.

There are a number of ways that municipal and other governments can reduce the subsidies to sprawl. Impact fees and utility fees can be adjusted to reflect the higher costs of infrastructure needed for low-density fringe developments, or to encourage developments that reduce automobile trips – as Portland, Oregon, has done. Property tax rates can be adjusted to reduce the costs of infill housing and industrial and commercial redevelopment. Spending on new roads can be reduced, with emphasis turning to repair and maintenance of existing roads. Fuel taxes in North America – currently a fraction of those in the rest of the developed world – can be raised to more competitive levels. Annual road user fees can be established; Austin, Texas, for example, provides an exemption for people who don’t drive.

The new revenues generated from using such pricing instruments can bolster municipal fiscal health. They can be used to provide improved transit services as well as social programs to support lower income people. At the same time, the greater density they bring about will help firms take advantage of economies of agglomeration – the knowledge spillovers that boost economic growth.

With well-designed pricing policies, cities can secure and improve existing levels of environmental, fiscal and economic performance while also generating a social return. Will it be easy? Nothing worth striving for has ever been easy. But the rewards are large and well worth the effort. Getting the prices right will unleash a wave of creativity that puts those rewards within reach. 

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Pay as You Drive



As cities get more crowded, rewarding those who drive the least and charging those who drive the most may be the best way to tackle gridlock

When Bern Grush co-founded the company Skymeter in 2002 he thought his GPS-based smart metering system for vehicles would be a big hit with municipalities and regional governments.

Road congestion is a chronic problem in big cities, getting worse, and already resulting in billions of dollars in lost productivity annually. The Texas A&M Transportation Institute estimated in 2009 it was costing the U.S. economy \$87.2 billion a year, resulting in 2.8 billion gallons of fuel being unnecessarily burned.

At the same time, many municipalities are cash-strapped and looking for ways to fund road repairs and new transit infrastructure. Combine that with urban smog problems, not to mention the need to tackle greenhouse gas emissions, and the argument for taking action is difficult to deny. Offering a way to charge drivers based on the distance they drive, where they drive and the time they drive seemed for Grush like something cities didn't just need, but should desperately want.

There was just one problem: Drivers are generally suspicious of such advanced road tolling schemes, particularly if it's imposed. It's a tax grab, they say with justification, because for the most part talk of road tolling in the U.S. has been about alternative ways of raising revenue, not helping the environment. Drivers also argue that it's just another way for Big Brother to track citizens, and many object to what's considered an added limit on free movement.

Fact is, said Grush, people like their privacy and freedom, and don't like having to pony up for something they feel they already pay for. "If you want them to move off of that spot, they will resist," he said. Few politicians are willing to pick that fight. Instead, they go back to talking about raising gas taxes. Still controversial, yes, but politically safer.

Having spent \$9 million on marketing, going to conferences, doing demon-

stration projects, and trying to educate government officials and transportation economists, it finally sunk in for the wide-eyed folks at Skymeter. "We were dreamers," conceded Grush, who was forced to throw in the towel last fall. The company, insolvent after spending years pursuing the dream, was shuttered and all assets were put on sale.

Few deny road-tolling works. One need only point to Stockholm, which in 2006 placed tolls at all access points into the city as part of an ambitious congestion-pricing system. Jonas Eliasson, director of the Centre for Transport Studies at Sweden's Royal Institute of Technology, said during a presentation at a TEDx event last September that traffic volume during rush hour fell 20 per cent as soon as the charge, set at just €1 to €2, went into effect. "It's now six and a half years ago since the congestion charge was introduced in Stockholm and we essentially have the same low traffic flows," said Eliasson, adding that 70 per cent of Stockholm residents were against the toll when it was introduced. Today, 70 per cent want to keep it.

IBM, which was the main technology provider behind the Stockholm system – and similar systems in Singapore, London and Brisbane – believes it's only a matter of time before GPS-based vehicle metering gains traction. This suggests that Skymeter may have simply been ahead of its time.

Eric-Mark Huitema, who leads IBM's smarter transportation business in Europe, said a six-month trial in Eindhoven, Netherlands, two years ago showed that GPS-based road pricing not only met technical expectations, it was successful in getting 70 per cent of participants to avoid rush-hour driving. NXP Semiconductors, the telematics technology provider that partnered on the trial with IBM, said the project "vastly exceeded" expectations. "There is a direct relationship between the number of cars on the road and the price of the road," Huitema said. IBM

estimated that the system would reduce CO2 emissions from road transportation by at least 10 per cent if rolled out across the Netherlands.

The advantage of using GPS, versus a system of camera- and sensor-equipped gantries as in Stockholm, is that it doesn't have to be confined to a particular area. Instead of charging a flat fee in exchange for access to a defined zone, drivers can be charged by the number of kilometres driven. More than that, it can be a variable charge based on the vehicle's emissions profile, the time of day, specific locations and pollution levels. The flexibility means GPS-enhanced road tolling can be a municipal, regional, countrywide or even transnational system.

Germany has been charging trucks this way since 2005, the first in the world to do so using satellite tracking. More than 720,000 trucks, most originating from other European countries, are now equipped with onboard units used to charge the vehicles 18 to 36 cents per kilometre, depending on truck classification. The effect was almost immediate: The number of inefficient "dirty" trucks entering Germany has plummeted.

The network, operated by the company Toll Collect, stretches more than 13,000 kilometres and has generated about €30 billion so far for the German government. A different version of the system, called Toll2go, was launched in fall 2011 to cover trucks travelling through both Germany and Austria. "You're seeing movement of this now to other countries," said Huitema, adding that the next milestone is to apply the technology to personal vehicles. "But it starts with trucks."

Commercial trucks are an easier sell. But at the consumer level, concerns over Big Brother, even in socialist Europe, remain a sticking point. The IBM Netherlands trial was supposed to lead to a nationwide tolling system for trucks and passenger vehicles starting in 2012. "But the program was suspended before

it was implemented because of privacy concerns,” according to a December report on mileage-based vehicle fees from the U.S. Government Accountability Office (GAO), which was looking at ways to replace or supplement federal Highway Trust Fund revenues.

No major U.S. city has yet implemented a simple gantry system, let alone one that uses satellite tracking and charges based on mileage. Michael Bloomberg, mayor of New York City, proposed a Stockholm-style system in 2008 and it died a quick death. One can imagine the uproar of forcing car owners to install a device with the potential to track their every movement. “The perception that these technologies will be used to track privately owned vehicles and infringe upon individual privacy currently appears to be an insurmountable challenge,” according to the GAO report.

The systems can be designed to minimize the threat, perceived or real, to personal privacy. Programs can be run by an independent third party – we trust banks and credit-card companies, after all – and the information collected doesn’t have to track exactly where people go, just how far they’ve driven and what general class of road they have travelled on.

But even that is unlikely to earn the public’s trust if GPS-based road tolling programs are introduced as mandatory. That’s why most experts say the programs need to be voluntary from the start. As Facebook has shown, people have no problem opening up their lives when the decision is theirs alone. “The government would give you a choice,” explained Huitema. “You either pay a fixed tax, which is high, or a variable tax that requires installation of a small box in your car.” The idea is to set the variable rates such that drivers, if they altered their driving patterns, would voluntarily sign up in an effort to save money.

Bern Grush agrees the voluntary approach is the only way to go, but with one caveat: The offer must come from the private sector, not the government, and it needs to deliver what individual consumers value, not what citizens are expected to accept for the common good.

“You have to make it so people want to enroll in a program,” said Grush, who despite the failures of Skymeter is giving it another shot. Late last year he trans-

ferred the defunct company’s intellectual property to a new venture called Applied Telemetrics. “We do the same things with the technology, but our market emphasis has changed. We’re far more interested in insurance and premium parking applications, and not so much focusing on tolling.”

The emphasis on parking makes sense, given the frustration of trying to park in a downtown core – and the congestion that results. It’s not uncommon for drivers to circle a block several times, or “cruise,” as they look for cheap or free street parking. Donald Shoup, urban planning professor at University of California, Los Ange-



les, spent a year studying one Los Angeles neighbourhood and calculated that drivers cruising for on-street parking clocked 950,000 additional vehicle miles. Imagine what the figure is when applied to every neighbourhood in every major city on the globe.

Grush wants to ease that driver frustration (and city congestion) by offering a service called Park Wallet, a personal account pre-loaded with money or credit card information that would be linked to a network of registered parking lots in a city. “As you’re driving and come close to your destination you hit a button on your smart phone to indicate you’re looking for parking,” explained Grush, who owns a patent for GPS-based parking. “Up will come a list of available spots and prices. You choose one and park in it.”

The prices for spots would change throughout the day, based on demand and time of day, with an eye to maximiz-

ing revenues for lot owners. The city itself could join the network, making it possible to generate more income from street parking. Even homeowners could register a driveway left empty during the day. The end effect would be a dramatic reduction in cruising, which is directly related to congestion and emissions.

Users of the service, meanwhile, would benefit from the convenience of always finding a spot, never having to search for spare change, and not having to rush out early from an important meeting to put quarters in the street meter and avoid getting a ticket. That alone might be enough

to motivate drivers to voluntarily put a tracking device in their car. But for Grush, it’s just the start – Park Wallet is only one of many “apps” that the device could enable, including insurance plans that charge for when, where and how far a person drives.

Pay-per-mile insurance is readily available in Europe, but has been slow to get going in North America. Quebec-based insurance provider Industrial Alliance offers a version of it, but geared to new drivers looking for savings. The company’s product, called Mobiliz, tracks kilometres driven and driving behaviour such as speed, abrupt braking and aggressive acceleration. “Just having the device in the cars changes behaviour,” said Michel Laurin, president and chief executive of Industrial Alliance Auto

and Home Insurance. “Customers tells us they save on their insurance premium but also on gas.” California startup MetroMile offers pay-per-mile insurance for “low-mileage” drivers in Oregon, but different state insurance regulations have made it challenging to enter new jurisdictions.

But the potential is there, and if one box can provide what people want, that paves the way for the introduction of congestion tolling, said Grush. It begins to reframe people’s thinking about vehicle metering and larger societal benefits. “Once these meters are, say, in 52 per cent of vehicles, then the government can more easily step in and say, let’s start congestion charging. But first you have to create value for people.”

As Eliasson from Sweden’s technology institute concluded in his TEDx presentation: “If you do it right, people will actually embrace the change. And if you do it right, people will actually even like it.”