Cities of Opportunity 7

Amsterdam
Beijing
Berlin
Bogotá
Chicago
Dubai
Hong Kong
Jakarta
Johannesburg
Kuala Lumpur
Lagos
London
Los Angeles
Madrid
Mexico City
Milan
Moscow
Mumbai
New York
Paris
Rio de Janeiro
San Francisco
São Paulo
Seoul
Shanghai
Singapore
Stockholm
Sydney
Tokyo
Toronto

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A walk in the city

Walking in a great city inspires wonder. Passing the Tower of London and crossing the bridge toward our offices on the South Bank of the Thames, you breathe the nature of a modern city. London rises over, amid, and around itself in a marvelous tangle of tradition and change, ambition, and imagination from futuristic, new skyscrapers to other walkers drawn, like you, to the city from all over the world. Other cities in the study are striking in different ways, but each reflects the great scale of modern urban challenges as well as the potential.

Complexity lies at the heart of it all. How does a city work, this system of complex systems—energy, transportation, healthcare, water and recycling, communications, technology, education, safety, governance, food supply, stores, and, ultimately, millions of people of different ages, occupations, and backgrounds? From London to Lagos, San Francisco to Shanghai, Tokyo to Toronto, city life gives us the opportunity to be the best we can be in terms of community, collaboration, and the chance to create common wellbeing. Learning more about how to develop that urban potential, and how to keep all the moving parts meshing smoothly, remains the heart of *Cities of Opportunity*.

In this seventh edition, we continue our approach of making transparent and consistent comparisons to understand urban patterns, based on data predominantly from 2014 and 2015. We've taken a step back to enrich our core research, adding 15 new variables and modifying or deleting another 12. Amsterdam, Bogotá, and Lagos also enter the study. And we focus on three issues critical to the everyday functioning and extreme challenges of urban life. These are the abilities to *withstand disaster and remain resilient* to natural, manmade, and disease risks; to *offer effective public transit* as people and jobs move further from the center of town; and to *knit together a tax system that works* for local needs.

In the results this year, London widens its lead from *Cities of Opportunity 6* and once more performs at the top of our cities based on data before the UK's June decision to exit the EU. The city is one of the most cosmopolitan in the world, a global hub with a large, flexible economy and rich human capital to keep building its future. If Brexit has effects on London, they will play out in a process over time in areas like talent mobility, trade and regulation. Singapore, the city-state renowned for its planned development, comes in second. Toronto, a city of quiet civility, finishes third. At fourth, Paris demonstrates that one benefit of a great city can be the resilience its systems confer. In the case of the City of Light, resilience is shown as Paris scores as high as it did in 2012 after nearly a decade of European financial pressure and dark intervals of manmade terror. Four hundred years after the Dutch founded New Amsterdam, the old world city has overtaken the new as Amsterdam, entering the study in this edition, finishes in fifth place over New York in sixth. Stockholm and San Francisco, two of our smallest cities, finish seventh and eighth, respectively. And from Asia and the Pacific, Hong Kong and Sydney round out the top 10, in that order.

Looking deeper into the relationships within our data, the study sustains our hypothesis that a city requires balanced social and economic strengths to work as a whole. Despite the fact that all our cities represent business centers, engines of the global or regional economies, the strongest relationships with overall success appear in areas like quality of living, senior wellbeing, housing, and disaster preparedness. Put differently, effectively dealing with human needs, both everyday and extraordinary ones, remains the essence of city success.

As in every edition, we speak with leaders of urban thought and action to deepen insight. *Jacob Wallenberg*, chairman of Investor AB, the Stockholm industrial holding company distinguished by its focus on long-term value and public-private collaboration, reflects on the qualities needed to attract talent and build healthy urban economies. *Carlo Ratti*, director of MIT's Senseable City Lab, defines what "smart cities" really mean. *A Tokyo transportation panel* details how a highly urbanized nation, beset by earthquakes and demographically challenged by an aging population, makes public transit work effectively, safely, and profitably. From Toronto, *Bruce McCuaig*, president and CEO of Metrolinx, discusses the challenges of keeping up with transit needs in a fast-growing city.

We speak with two front-line leaders in the fight to increase urban disaster preparedness. *Margareta Wahlström*, former special representative of the UN Secretary-General for disaster risk reduction, discusses tools to assess risk, raise awareness, and limit damage to people and property. *Henk Ovink* provides his experienced view as the Netherlands' special envoy for international water affairs. For a look at cutting-edge culture and its role in a downtown renaissance, we visit the *Brooklyn Academy of Music*. Rounding out the urban picture, *the governor of Jakarta, Basuki Tjahaja Purnama*, discusses the challenge of steering the burgeoning Asian megacity into a well-managed future.

At a time when cities drive world growth socially and economically, the ability to understand them is ever more important. That requires a wide range of credible and transparent data and a robust and realistic picture of city life. The goal of our report is to create that image for a few bellwether cities so lessons can be applied more broadly. We hope you benefit from the effort.

Sincerely,

Tim Ryan
US Chairman and Senior Partner PricewaterhouseCoopers LLP

"Cities contain the seeds of their own regeneration…"

Jane Jacobs wrote that 55 years ago in closing *The Death and Life of Great American Cities*. We agree. Our data, as well as common sense, support it. The health of cities rests on continuing investment by the businesses, policymakers, and citizens who build them. Notably, our results show that success in meeting basic human needs is closely associated with success in our study. And, when cities are put to the test—be it by nature, man, or disease—strong communities are the best prevention and antidote.

The heart of the city beats with a rhythm we all understand.

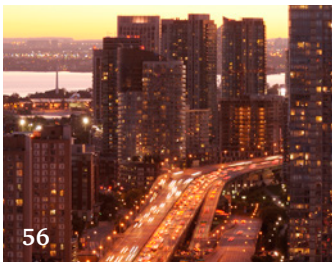
"

When Ericsson tries to recruit international, highly educated people in Stockholm, those individuals look at the city, as well as the workplace. They look at transportation, schools, cultural life, and sports. All these ingredients make a difference.

Quality of life

"Governments should use their funds to develop a bottom-up innovation ecosystem geared toward smart cities.

"Aging and decreasing population triggered a significant turning point when considering the opportunities offered by cities. Regional cities are finally realizing that merely building roads and increasing car traffic are insufficient.



"If you can't effectively serve that first or last mile, it doesn't matter how rapid your transit service is.

Quality of life

* *L'Express*, "Dans la peau de la Pomme," No. 3355, semaine du 21 au 27 octobre 2015.

"The water crisis is the number one global risk. It affects all of us and can create wars if you don't manage it right. It will have a devastating impact on cities all over the world in combination with climate change and manmade disasters.

"Our demographic is more robustly Brooklyn because this is the place for young, creative talent in all possible disciplines of culture.

Economics

“Every household has its own difficulty. That is why we want to unite them together as one community.

Reference

Overview

London

Our report's major headline this year is that London maintains its #1 ranking and, in fact, widens its lead over the rest of our 30 cities. But beyond the steady rise of the British capital since our first study in 2007, many other headlines lead to compelling stories. Most notably in *Cities of Opportunity 7*, we are struck by the close relationship between success in our study and a city's ability to provide services that citizens need—good quality of living, senior wellbeing, housing, and disaster preparedness among them.

A continuing, but reenergized approach

Before we summarize the main findings of this year's report, we need to add a few words about method. For context, basic benchmark scoring is based on data predominantly from 2014 and 2015, long before the UK's June 2016 vote to exit the European Union and any effects that may evolve.

This year, we maintain the organization of our 10 indicators initiated in *Cities of Opportunity 6*, separating them into three distinct groups. The first brings together the three indicators that best measure those "tools"—intellectual capital and innovation, technology readiness, and city gateway—that a city increasingly needs in a globally integrated, knowledge-based world. The second group assesses urbanites' quality of life through four indicators: transportation and infrastructure; health, safety, and security; sustainability and the natural environment; and demographics and livability. Our last cluster measures our cities' economic potency through the three indicators of economic clout, ease of doing business, and cost.

In line with continuing efforts to enhance our approach, our biggest change has been to bolster the study's research foundation. In order to make each of our 10 indicators ever more accurate and representative, we've increased our variables from 59 in our last report to 67 in this one and, in the process, added 15 entirely new variables while deleting or modifying another 12. While this enriches our information and strengthens the balance, a combination of our revised mix of measures, each city's own actions, and the relative performance of other cities all affect edition-on-edition comparisons.

For instance, New York goes from second overall in 2014 to sixth now. The city scores in the lower half in many of this edition's newly introduced measures, as well as being overtaken by other cities' gains in existing variables used in past editions. The cost indicator offers a good example. New York scores in the bottom half in the new affordability of rent (#18) and personal tax (#28) measures, and it loses ground relative to other cities' improvements in the existing cost of living and cost of business occupancy variables. Looking at sustainability and the natural environment, New York also finishes in the bottom half in the new natural disaster preparedness (#19) and water-related business risk measures (#23), and continues a slight downward trend in recycled waste (#24).

Paris' jump from sixth overall in 2014 to fourth place now includes a rise in four of the ten indicator groups. The city benefits from many of the new variables introduced in *Cities of Opportunity 7*—for example, the new city brand (#5) and YouthfulCities Index (#6) measures help Paris return to the top in demographics and livability, tied with New York. The city also shows genuine gains in our refreshed data in this edition, with improvements in international tourists and top 100 airports helping it gain 5 places in city gateway.

Beginning with context

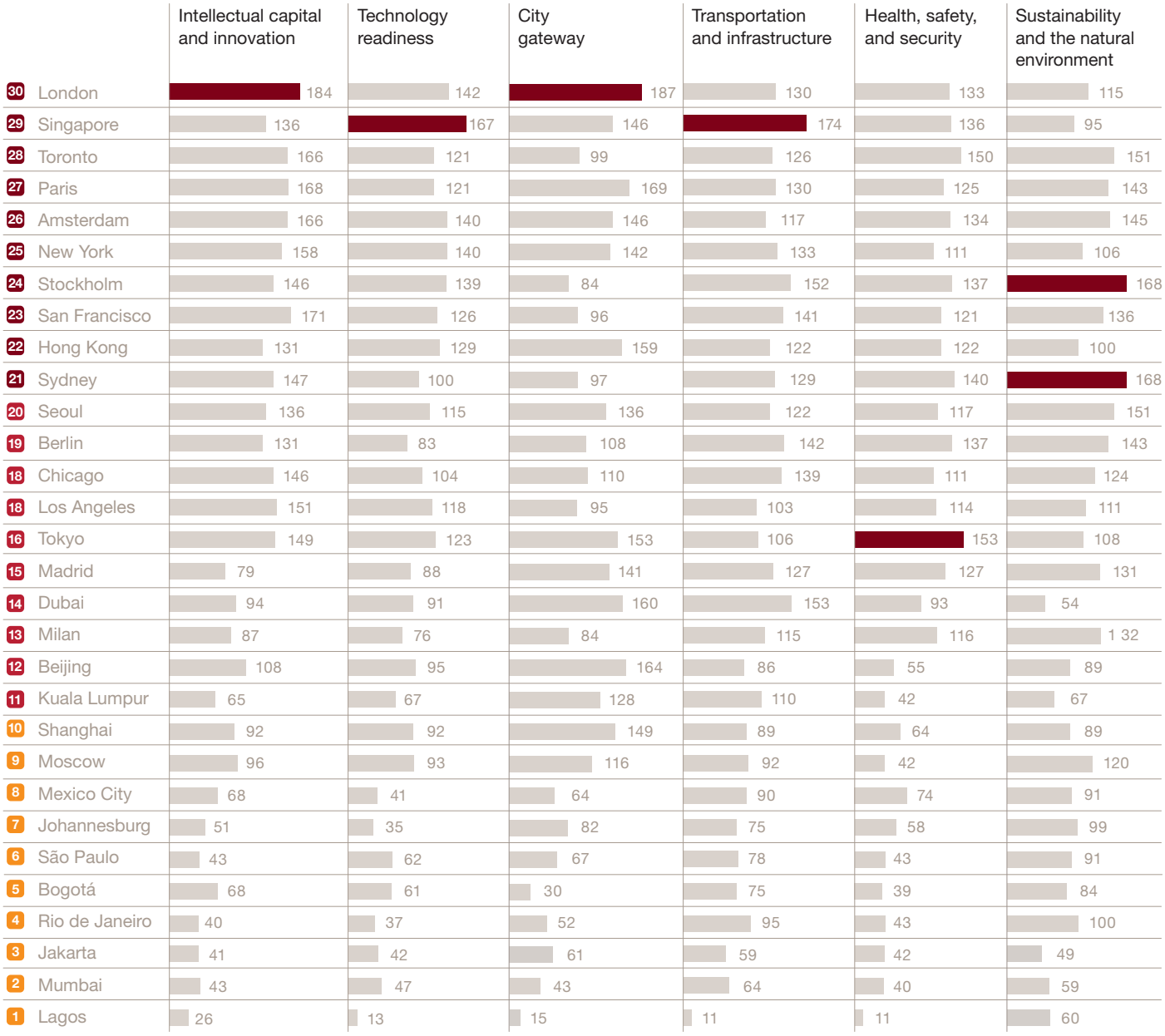
Looking for patterns within our data, as well as beyond them, in city economics and demographics, one finding strikes us as most notable:

- **Human values constitute the cornerstone of urban life.** Performance in the overall study exhibits a closely correlated relationship with variables for senior wellbeing, quality of living, housing, relocation attractiveness, workforce management risk, and natural disaster preparedness. While the relationships fall short of demonstrating causality, they are compelling and make sense.

In broadening our research this year, we've focused in greater detail on a few key areas—urban resilience, taxation, and public transport—each with its own message:

- **On disaster preparedness, the modern maelstrom is daunting and demands extra attention to building resilience** against natural disaster and manmade threats such as terrorism and cyber attack, as well as globally threatening diseases. The financial and human stakes are enormous for many of our cities. But the good news in the findings is that the most vulnerable—such as Tokyo in an earthquake zone or Amsterdam famously dealing with the sea—can be the most resilient.
- **On taxation, we see that approaches are driven by the local city environment.** Adding personal tax and system efficiency variables this year to corporate tax from previous issues, it appears our cities are succeeding as business capitals that follow a wide range of tax approaches.
- **Knitting together an effective metropolitan public transit mix also depends on customization to a city's circumstances**—demographic patterns, geography, traveler preferences, budgets, and jurisdictional alignments. Tangible challenges are added in that transit infrastructure is solid and takes time to build, and in the meantime, riders, destinations, and decision makers all may change.

Rankings at a glance

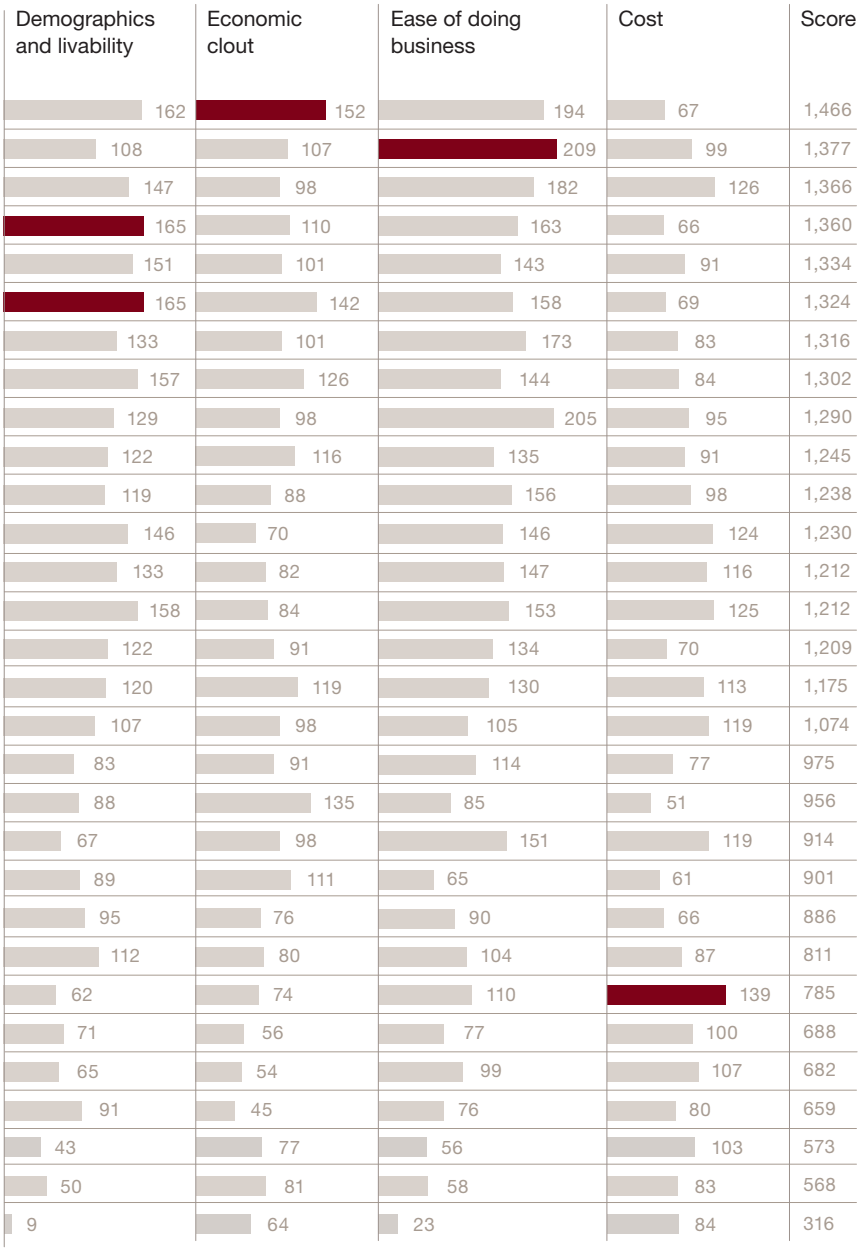


	Intellectual capital and innovation	Technology readiness	City gateway	Transportation and infrastructure	Health, safety, and security	Sustainability and the natural environment
30 London	184	142	187	130	133	115
29 Singapore	136	167	146	174	136	95
28 Toronto	166	121	99	126	150	151
27 Paris	168	121	169	130	125	143
26 Amsterdam	166	140	146	117	134	145
25 New York	158	140	142	133	111	106
24 Stockholm	146	139	84	152	137	168
23 San Francisco	171	126	96	141	121	136
22 Hong Kong	131	129	159	122	122	100
21 Sydney	147	100	97	129	140	168
20 Seoul	136	115	136	122	117	151
19 Berlin	131	83	108	142	137	143
18 Chicago	146	104	110	139	111	124
18 Los Angeles	151	118	95	103	114	111
16 Tokyo	149	123	153	106	153	108
15 Madrid	79	88	141	127	127	131
14 Dubai	94	91	160	153	93	54
13 Milan	87	76	84	115	116	1 32
12 Beijing	108	95	164	86	55	89
11 Kuala Lumpur	65	67	128	110	42	67
10 Shanghai	92	92	149	89	64	89
9 Moscow	96	93	116	92	42	120
8 Mexico City	68	41	64	90	74	91
7 Johannesburg	51	35	82	75	58	99
6 São Paulo	43	62	67	78	43	91
5 Bogotá	68	61	30	75	39	84
4 Rio de Janeiro	40	37	52	95	43	100
3 Jakarta	41	42	61	59	42	49
2 Mumbai	43	47	43	64	40	59
1 Lagos	26	13	15	11	11	60

London's rise continues

In terms of city performance, London's success in this report is strikingly consistent across all of our indicators, and, for those reasons, extremely impressive. Britain's capital comes first in three indicators, second in a fourth, and third in two others. In other words, the city ranks in one of the top three places in *six* out of our 10 indicators—and then finishes in the top 10 in two others. It manages to fall out of the top 10, but with a relatively decent score at #13, in sustainability and the natural environment but really only does poorly in one indicator: cost, in which it ranks #26—a very low score but hardly unexpected for a city that has been, for a variety of reasons, very much in global demand during the last decade or two.

Moreover, London manages to increase its margin of victory over the second-place city—Singapore this year and New York in 2014. Clearly, the UK's largest city is doing many things right and is not resting on its laurels.



Each city's score (here 1,466 to 316) is the sum of its rankings across variables. The city order from highest rank in each indicator 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each indicator

London essentially pulls away from other cities in our first group of indicators, tools for a changing world, which increasingly determine global success or failure in an urban world driven by knowledge and connectivity. London finishes first in intellectual capital and innovation and city gateway, second in technology readiness, and outscores the other top 10 cities overall by a substantial margin. London is often represented as a financial overachiever, but its dramatic success in the first of our indicator groupings confirms that its #1 ranking in this report goes much deeper than economic might.

It is also important to note that the UK's June 2016 vote to exit the European Union came long after the time period our data reflect. London's performance, as that of all our 30 cities, is based on data predominantly from 2014 and 2015. While we cannot predict what Brexit may mean to the future of London as a preeminent world city, we do know it is today one of the world's most cosmopolitan and well balanced cities, as shown by our research. Any effects Brexit may have on London will take place in a process that will evolve over time and not overnight. Questions on talent mobility and migration, trade, investment

#1 London

London's strengths are strikingly consistent in our study, and it remains to be seen what impact Brexit will have on this vibrant city as the process plays out over coming years.

#2 Singapore

Singapore's success has only continued as it rises to second from third in 2014 and seventh in 2012, buoyed by continued excellence in infrastructure and ease of doing business.

and regulation, among others, will need to be worked out. In future *Cities of Opportunity* editions, we will try to gauge the short- and medium-term impact of the vote to leave the EU, if any. But right now, the city remains the most European and global in the UK, and a major financial center with a rich foundation of human capital and flexible tradition to build on.

Singapore engineers excellence

There are, however, many other stories here that are equally significant. "Singapore represents a unique *ecology of the contemporary*," architect and Harvard professor Rem Koolhaas wrote in his classic on urbanization, *S, M, L, XL*, "[standing out] as a highly efficient alternative in a landscape of near universal pessimism about a makeable future, a pertinent can-do world of clearly defined ambitions…"[1] Today, 20 years after that was written and just over 50 years since full independence, Singapore's engineered growth has only continued as the island city-state moves to #2 overall in the study and comes in first in technology readiness, transportation and infrastructure and ease of doing business. These three indicator categories attest to Singapore's ability to plan and deliver results based on the focused commitment of Lee Kwan Yew, the city-state's first prime minister and founding father: "Singapore is a very small place in a very, very large, variable, changing world, and if it is not nimble, if it is not swift in making adjustments, it will perish…"[2]

In *Cities of Opportunity 7*, Singapore continues its rise from seventh in 2012 to third in the 2014 edition. The city-state is notable for combining successful approaches to business, infrastructure and quality of life needs. This is reflected in top scores in variables for housing, traffic congestion, intellectual property protection, mobile broadband speed, airport quality, health system performance, crime, and attraction of foreign direct investment (FDI); and second place finishes in math/science skills, broadband quality, Internet access in schools, digital security, ease of starting a business, ease of entry, minority shareholder protection, operational and workforce management risk and corporate total tax rate.

Toronto masters quality of living

What is most remarkable about the particular success of Toronto, rising one spot to third place in this edition from fourth in our 2014 study, is that it should be considered remarkable at all. Toronto, after all, finished second in 2011 in *Cities of Opportunity 4* and third in *Cities of Opportunity 5*. Canada's largest city has always been in the mix at the top of our rankings and has consistently scored in the top four overall. The city may be calm, cold a good bit of the year, and overshadowed by the "buzz" in US cities to the south, but its performance clearly shows that a strong economy and high quality of life can exist very happily a bit farther from the madding crowd (as Stockholm and Sydney also illustrate in seventh and tenth place, respectively).

Toronto is impressive not only in that it does so well in so many areas but in the company it keeps in doing so. The city's performance in our demographics and livability indicator is key in pinpointing that aspect of the city's success, since this is the indicator that assesses the bottom line in every urbanite's daily reality: livability.

Toronto finishes in the top 10 in the demographics and livability indicator, ranking #7, but what is more important is to take a look at the cities that are part of this elite group. Just above it lie New York, Paris, London, Los Angeles, San Francisco, and Amsterdam (in that order) and just below sit Berlin, Chicago, and Stockholm. All of the other cities here are, each in its own way, a global icon of urban culture. But Toronto not only competes with them, it outdoes them in critical areas of urban life. So while the city may perform less than maximally in entertainment and attractions (#15), it ranks #8 in relocation attractiveness, #7 in YouthfulCities Index, #2 in senior wellbeing, and #1 in the single most important variable here, quality of living—also the variable that shows the closest relationship at 91% with overall success in the study.

We need only add that Toronto ranks in the top 10 in seven of 10 indicators but does particularly well in those categories that speak to the daily needs and concerns of urban residents, finishing a

#3 Toronto

Toronto may be calm, cold and overshadowed by the buzz from US cities, but it shows a strong economy and high quality of life can exist very happily a bit farther from the madding crowd.

#4 Paris

The City of Light shines in this report, finishing in the top 10 in nine of 10 categories despite the terror it suffered and after eight years of crisis in the eurozone.

narrow second to Tokyo in health, safety, and security; second in cost; third in sustainability and the natural environment (tied with Seoul); and fourth in both, intellectual capital and innovation (tied with Amsterdam), and ease of doing business.

The City of Light radiates as brightly as ever

What might very well be the most genuinely surprising result in our report this year, however—especially given the serial horrors endured by the city in 2015—is the rise of Paris to #4 overall, up two places since 2014. In most ways, this is the most gratifying, and surely the most inspiring, result in *Cities of Opportunity 7*. In fact, it hearkens back to the origins of this study, which was initiated several years after the New York attacks of September 11, 2001, to examine cities' resiliency in the face of extraordinary and even violent challenges that ultimately put their cohesion as a community to the test.

Despite the terror and pain it suffered, but resolutely resisted and survived in 2015, the City of Light remains as brilliant and lustrous and, therefore, as appealing as ever. It certainly shines in this report.

First of all, this is as high a ranking the French capital has achieved in *Cities of Opportunity* since 2012 when it was also #4 just behind Toronto. Second, Paris attains this score after eight years of economic and political crisis in the eurozone that has deeply affected France and its most important city. Finally, Paris climbs to the top four of *Cities of Opportunity* this year in a singularly consistent performance in which it finishes in the top 10 in nine out of our 10 indicators—the *only* city to accomplish that extraordinary run, including first-place London. The sole indicator in which Paris finishes with a low score is—as with London—cost. But, once more, that is to be expected in a city that—as with London again—is in demand as a place to live. Paris, it should be noted, ranks first in demographics and livability, tying New York. Even more relevantly, it finishes fourth in quality of living—thus competing directly with the less "intense" and "mellower" cities of Stockholm, Sydney, and Toronto in that variable (#3, #2, and #1, respectively)—as opposed to London and New York, which finish #15 and #16, respectively, in a measure that is so central to every person's understanding of "the good life."

The Big Apple does not fall far from the Orange tree

For those who take a longer view of history, the most ironic result this year is the close scoring in fifth and sixth place of one of our newly added cities, Amsterdam, and one of this report's permanent powerhouses, New York—once upon a time in the 17th century, New Amsterdam. For New York, sixth is the lowest it has fallen in our rankings over the last few reports; for Amsterdam, fifth is an auspicious entry into the study.

The Netherlands' largest and most cosmopolitan city finishes in the top 10 in seven of 10 indicators, including the three that comprise our "tools for a changing world" grouping. Amsterdam finishes third in the technology readiness indicator, with #1 Internet access in schools, #2 in mobile broadband speed and #3 in ICT Usage. It ranks fourth in the intellectual capital and innovation category, taking second in percent population with higher education and fifth in Innovation Cities Index and intellectual property protection. And it finishes eighth in the city gateway indicator, measuring openness to the world.

Notably also, Amsterdam, our second most at-risk city for natural disasters, is among the most prepared to deal with them, finishing fifth in disaster preparedness as well as fifth in the overall sustainability and natural environment indicator. The lesson for other cities today is enormous. "It's about creating a culture of living with these [environmental] uncertainties in such a way that society becomes resilient socially, physically, governmentally, financially," explains Henk Ovink, Netherlands first special envoy for international water affairs, in a discussion with *Cities of Opportunity* (page 70).

#5 Amsterdam

Amsterdam makes an auspicious entry at fifth, finishing top 10 in seven of the 10 indicators.

#6 New York

Demographics and livability still shines in the Big Apple, but New York pays a price for high costs and other cities' relative improvement also takes a bite.

Amsterdam's success also adds to the cast of this year's top 5 cities, of which three are European. In 2014, by contrast, only one European city, London, was in the top 5. And if we extend our grouping to the top 7 this year, we add yet another European city, Stockholm, which makes four out of the first seven highest-ranked cities this year European.

Two important points need to be made about New York's drop from #2 in our last report. The first is that part of New York's weakening here is the result of other cities' improvement, which is to say that New York performs *relatively* worse in relation to the other cities. That said, the city performs worse this year in half of the indicators—and only ranked in the top 10 in seven of them. Cost performance notably worsened as the city fell 16 places from the top 10 (#9) in 2014 to the bottom ten (#25) this year. Taking a bite out of the Big Apple proved an expensive taste, particularly in two new variables, affordability of rent and personal tax, where the city sits at #18 and #28, respectively.

The second point is that a snapshot is different from a panoramic view. When we first began ranking our cities' overall performance in 2011, London finished sixth (out of 26 cities), not only behind New York's #1 but also (in descending order) Toronto, San Francisco, Stockholm, and Sydney—and virtually tied with Chicago. Paris did even worse that year, finishing eighth. One significant reason for the ups and downs, of course, is that we revise the mix of variables from report to report. But, usually, this continual effort to enhance our analytical method ends up validating prior results. The other important reason for our variations from one edition to the next is that ebbs and flows are part of any living organism, and nothing is more living than an urban community.

Assuming, therefore, that ups and downs are the normal patterns of life and of this study, it is shortsighted to look at a snapshot in time as a description of anything but itself, much less a projection of the future. New York should, of course, focus on the *specific and practical* issues that this report brings to the fore—but New Yorkers need not waste their time worrying over whether or not a sixth-place ranking this year bespeaks any deeper or more damaging issues. If anything, this report confirms that the city remains part of a global urban elite.

Taking a step back from the overall rankings at the top, it's important to note that eight different cities finish first in at least one indicator—and that one of them, Johannesburg, which tops all cities in competitiveness on cost, is not even in the top 10 overall. Moreover, 24 out of 30 cities, or over three-quarters, finish first in at least one of our 67 variables—which means many cities will have a competitive advantage in some niche, and depending on the category, that niche can benefit the most geographically diffused cities.

Indicators of singularity and strength

Perhaps what is most telling about the results at the top of our indicators is how utterly *intuitive* they are. All of our cities do well in those broad areas with which they have long been associated. London, for example, as stated above, scores first in intellectual capital and innovation, as a city gateway, and in economic clout. But then it is not surprising that London excels in education, with Oxford and Cambridge nearby and great universities and schools in the city itself; as a city gateway in the heart of a recently enormous empire; and in economic clout with London's worldwide capital markets and businesses. In the event, with its superior performance in these three indicators, London opens up a clear path to the top of our rankings.

The same holds true for the results in our other seven indicators. Singapore outscores all of the competition in three areas where engineered management can make a great difference in a relatively short period of time: technology readiness as well as transportation and infrastructure and ease of doing business, both of which Singapore led in our last two studies. Stockholm again tops sustainability and the natural environment (tied with Sydney).

#7 Stockholm

Stockholm again tops sustainability and the natural environment (tied with Sydney) and rises to third in transportation and infrastructure with an easy commute and little congestion.

#8 San Francisco

The City by the Bay may be small, but it embodies the notion of "smart money," finishing second in intellectual capital and innovation and fourth in economic clout.

But what makes more sense than the equation of Swedish (and in general Scandinavian) urban rationality and a seemingly bred-in-the-bone embrace of nature?

Again, the results confirm the innate *and widely recognized* strengths of a city and of the culture it has developed around certain robust resources.

Continuing on, Tokyo and Toronto come in a close first and second, respectively, in the health, safety, and security category. Both also finish among the top few in variables measuring health system performance and security and disease risk. In this case, Tokyo's performance bespeaks a strong cultural commitment to quality of living (where the city finishes #5) achieved despite a rapidly aging demographic and a range of risks (notably including the study's greatest natural disaster vulnerability coupled with the highest score in preparedness). And if any North American city were to beat Sydney (and a slew of European cities) in health, safety and security, many would expect it to lie north of the 49th parallel in a culture closely associated with high civility and human values. Former Mayor David Miller affirmed that in 2012 *Cities of Opportunity 5*, noting, "We are a city of newcomers; inclusion, social justice, and equity are core Canadian values." From that point, it's a short hop to prioritizing and attaining high quality in health and end-of-life care, crime levels, and political environment, all measured in the indicator.

Even more naturally perhaps, New York and Paris tie in demographics and livability. Many novels have been written and even more movies made about the connection of these two cities with quintessential urban living, so this result is also as unsurprising as any result can be. If there's any revelation here, it is that Paris far outscores New York in the quality of living variable (#4 to #16, respectively), although New York finishes better than Paris in both the senior wellbeing and YouthfulCities Index variables (#5 to #13 and #1 to #6, respectively).

And Johannesburg does best among all our cities in cost. So, the fact is that a city's reputation is usually the result of the realities on the ground. A city grows, develops, and progresses by building on its competitive strengths and then moving outward and upward into related areas of growth and competitive excellence, so that the one asset leads to the other.

Two urban truths

This all returns to two urban truths. The first involves the need for cities to possess balanced, ultimately reinforcing, qualities. We've described this in the past as "a virtuous circle of social and economic strengths"—or, put another way, a city's capacity to excel in many reinforcing aspects of urban community, to make complexity manageable, and to generate a high standard of life for as many people as possible. In 2012, the great biologist E.O. Wilson described this to us as an "autocatalytic reaction [where] the product itself becomes a catalyst. [And] the reaction speeds things up…and it just takes off exponentially."

That points to the second truth. While *Cities of Opportunity* primarily focuses on centers of business, finance, and commerce, it's the human element sitting at the center that pushes everything forward, makes it all work. Strong correlations point to this. Humans are the city, not an afterthought.

This is a good message to hold even as we rush around in the everyday urban chaos. Be it a grind on some days; a test of endurance, patience, and equanimity on others; or uplift and inspiration when we get lucky or take the time to notice, the city is always proof of human ability to build something great out of nothing. That thought never gets tiring.

1 Rem Koolhaas and Bruce Mau, *S,M,L, XL*, Random House, 1995, page 1011

2 *Straits Times*, May 27, 1990

Indicator rankings at a glance

Intellectual capital and innovation
page 34

Transportation and infrastructure
page 48

Health, safety, and security
page 60

Economic clout
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Ease of doing business
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The 30 cities are sorted from the best to the worst performing, with each receiving a score ranging from 30 for best to 1 for worst. In ties, cities are assigned the same score.

- High
- Medium
- Low

Approach

We refined and enriched our data, focused on resilience, transit, and tax but held to principals of transparency, simplicity, and balance

True to our purpose—and what, after seven editions, can fairly be called our established practice—of continually updating and improving our data and enriching our methodology, *Cities of Opportunity 7* is not a simple replication of *Cities of Opportunity 6*. There are changes not only in the details but in the broader arc of our analyses.

While our underlying approach of transparency, simplicity, consistency, and balance remains the same, *Cities of Opportunity* has never adhered to a fixed or inalterable process, predictable from edition to edition. We continually upgrade and enhance the research. In each edition, we try to develop the most comprehensive quantitative view of urban reality that we can in order to shed further light on the tools needed, and the directions to be taken, to support and sustain urban development.

In this year's edition, we bolstered both the depth and breadth of our core data variables (with details on refinements presented in the 10 indicator discussions). Separately, we also incorporated several new perspectives on our cities. These include a look at their economic and demographic profiles, as well as correlation analyses within the data to see which qualities are the strongest markers of overall urban success.

We took a step back in a few areas of the core data, which predominantly reflects 2014 and 2015 performance, to home in on particular issues of urban importance: disaster preparedness, taxation, and metropolitan transit. In the first two cases, we added data variables to create a more complete view, and we discuss the findings as a subtext of the main results. In the last instance, we gathered intracity mobility data into one grouping to develop a street-level picture.

- ***Urban resilience is an area that today demands critical attention across a wide front.*** Our variables begin with exposure to the wind, water, and earthquakes of natural disaster, measured by economic and human effect rather than the likelihood of occurrence, as we've done in the past. We add a separate measure of the risk of manmade threats and pandemics (including cyber attack, market crash, nuclear accident, oil price shock, sovereign default, terrorism, power outage, human pandemic, and plant pandemic). Then, with the help of PwC's actuarial and forensics practice members who also developed our natural disaster exposure variable, we factor in each city's natural disaster preparedness, accounting for active strategies and their implementation, and the robustness of municipal systems such as transport and health. All in all, we now present a fuller view of risk and preparedness than in past years.

- ***The tax picture builds from the corporate total tax rate*** included in previous reports. This time, we also engaged the PwC team that collaborates with the World Bank Group to produce the *Paying Taxes* report. It added personal tax and tax efficiency to our evaluation in order to reflect the tax assessment on citizens and provide a broad sense of wider systems and process effectiveness.

- ***To better reflect the reality of public transport***, we realigned and refined our mix of data to complement our perspective on system engineering and efficiency. We moved two variables, traffic congestion and ease of commute, to the transportation and infrastructure indicator to capture the reality of city life as experienced on the ground. And what was straightforward "cost of public transport" in our previous editions has now been adjusted to reflect affordability of public transport. We also removed a variable measuring the efficiency, reliability and safety of public transport systems to avoid overweighting the issue with the factors included in other measures such as mass transit coverage. In addition, we've revised the major construction activity variable, which is now derived from three equally weighted measures: number of buildings planned or under construction; number of properties sold; and construction employment.

- ***We also include cross-cutting analysis of the economic and demographic factors*** at work in our cities, and we look at relationship patterns within the data themselves, to enrich perspective on our cities and their signposts.

The basic study itself, however, remains essentially the same, although the devil is always in the details. So it is important to outline the report's bases, which are the three criteria that fundamentally govern our choice of cities and have never changed from report to report. These are:

Capital market centers. While many of our cities are hubs of commerce, communications, and culture, *all* of them are financial

centers in their respective regions. What this means in practice is that while each might play an important role locally, they all are also—and, for our purposes, even more significantly—vital links of a *global* economic network.

Broad geographic sampling. This second criterion is very closely related to the first. Functionally, in other words, although each of our cities is a center of finance and commerce regionally, they *collectively* form a representative international distribution.

Mature and emerging economies. Finally, it is critically important that just as there is broad geographic balance, there must also be an equilibrium between mature and emerging urban economies. 16 mature cities and 14 emerging ones are included this year, with three new cities—Amsterdam, Bogotá, and Lagos—replacing three cities from our previous report. Of course, distinctions between "developed" and "developing" economies—let alone societies—are often purely statistical. They certainly have no meaningful explanatory purpose other than as shorthand to indicate certain "benchmarks" reached, such as high income, low crime, good healthcare, or clean air, just to give four random examples. In the event, given the extremely rapid pace of urban evolution in the contemporary world—which is actually historically unprecedented—we utilize these distinctions carefully and warily.

With a total of 30 cities, as in our last report, our sample size remains compact, and flexible, enough to permit a study, and a series of analyses, that is broad but detailed. It is also comprehensive enough (in geographic breadth, magnitudes of population, and gross domestic product to be fully representative of global realities.

With 67 variables constituting our 10 indicator groups this year, we've added 15 new variables to our report, increasing the number from 59 in *Cities of Opportunity 6*. Moreover, 12 variables have been deleted or modified.

As *Cities of Opportunity* is based on publicly available information supported by extensive research, three main sources are used to collect the relevant data:

Global multilateral development organizations, such as the World Bank and the International Monetary Fund, ***national statistics organizations***, such as UK National Statistics and the US Census Bureau, and ***commercial data providers***. The data were collected between the second and fourth quarters of 2015. In the majority of cases, the data in the study refer to 2014 and 2015.

In some cases, national data are used as a proxy for city data. Use of national data tends to disadvantage the 30 cities in our study, all of which are either national or regional capitals of finance and business that tend to outperform national averages in measures of socioeconomic advancement. This effect might be more pronounced in developing economies and in those with larger rural populations. Nonetheless, because consistent comparisons across all cities are critical to maintain objectivity, country-level data are used when other consistent, highly reliable sources of publicly available data are not available for all 30 cities (as with math/science skills attainment, for example).

Our scoring methodology has been developed to ensure transparency and simplicity for readers, as well as comparability across cities. The output makes for a robust set of results and a strong foundation for analysis and discussion.

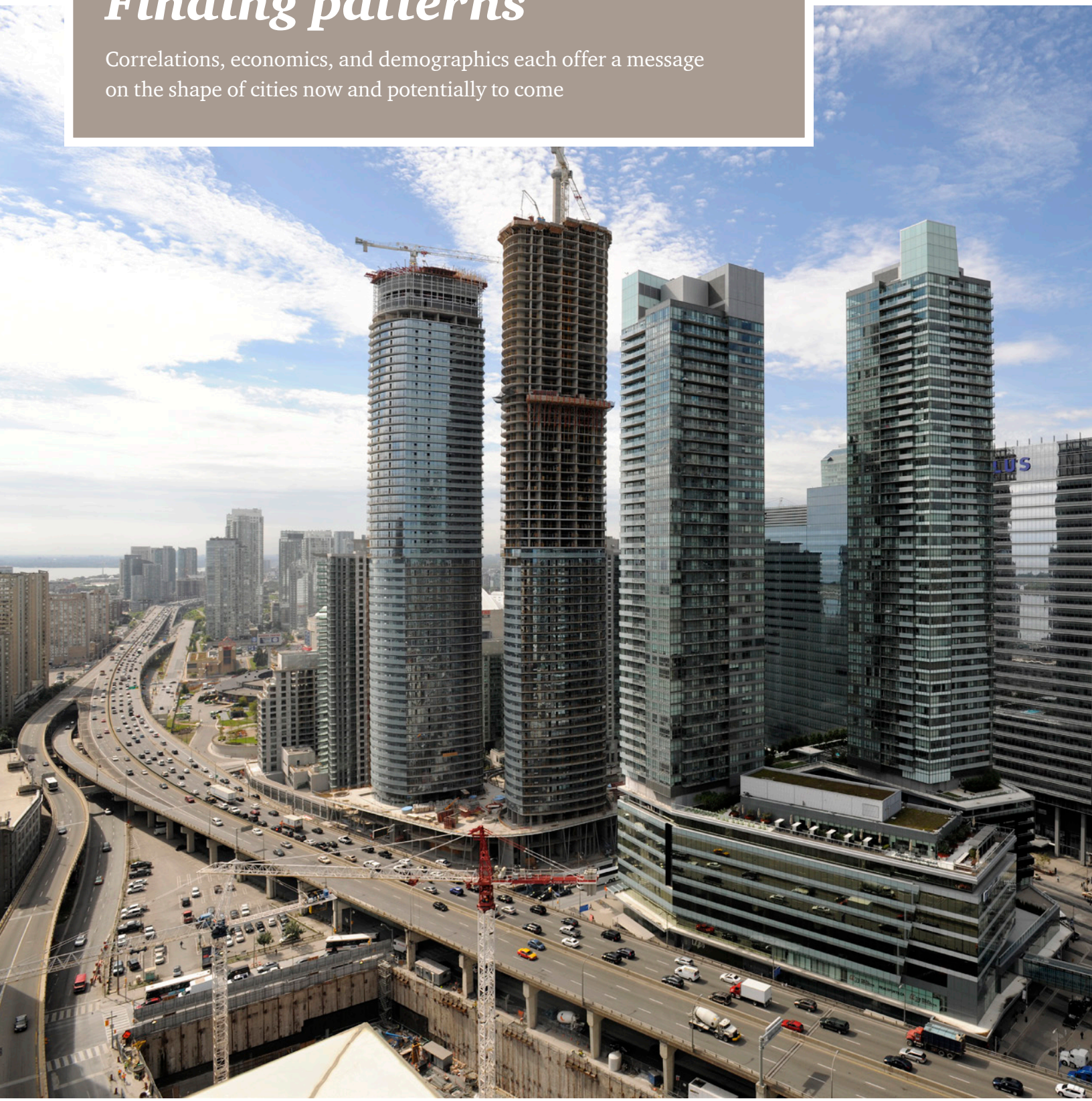
In attempting to score cities based on relative performance, we decided at the outset of our process, when we first initiated this study in 2007, that maximum transparency and simplicity required that we avoid overly complicated weightings of variables. Consequently, each one of the 67 in this report is treated with equal importance and, thus, weighted equally. This approach makes the study easy to understand and use by business leaders, public policymakers, academics, and laypersons alike.

Taking the data for each variable, the 30 cities are sorted from the best performing to the worst. They are then assigned a score from 30 (best performing) to 1 (worst performing). In the case of a tie, they are given the same score.

Once all 67 variables are ranked and scored, they are placed into their 10 indicators (for example, intellectual capital and innovation or ease of doing business). Within each group, the variable scores are then summed to produce an overall score for that indicator. This produces 10 indicator league tables that display the relative performance of our 30 cities. The overall table is the sum of performance in all 67 variables.

Finding patterns

Correlations, economics, and demographics each offer a message on the shape of cities now and potentially to come



Toronto

To create a broader context and deepen our examination of the results, here we sketch some highlights of the study and then examine the 30 cities in terms of projected economic growth and employment; their demographics in terms of age and income distribution; and how our 10 indicators, 67 variables, and different economic and demographic signposts correlate with successful cities. All data reflect *Cities of Opportunity* jurisdictional boundaries and are derived from local sources or deduced from national ones.

Results show what works

Balance works best in today's complex urban ecosystems. Education, transit, health, economics, and governance all have to line up for a city to lead. London proves this again as its balanced strengths create distance from advanced cities like New York, Paris, Toronto, and Singapore. Further, eight cities make the top 3 in two or more indicators—London, Toronto, Singapore, Paris, New York, Sydney, Stockholm and Beijing. This confirms cities need a good combination of social and economic strengths to succeed.

The good life is not a luxury. It's a basic requirement for cities and businesses to get and keep talent. Our quality of living variable shows the strongest relationship with overall success in the study, as well as with 10 other telltales of urban wellbeing.

A great city delivers on its responsibility to shared good. Senior wellbeing, housing, relocation attractiveness, workforce management risk, and natural disaster preparedness all relate strongly with overall score and top performance in a wide range of healthy measures. In other words, cities need to support real human needs to work as balanced ecosystems; a civilized society handles the tests and provides broadly.

The core of the modern city economy is intellectual work. Finance and business services contribute almost half to GDP growth of our cities from 2010 to 2015. And that doesn't count intellectual work in healthcare, life sciences, technology, communications, and other sectors. City people and business need good education to prosper.

Greater systemic resilience is one of the dividends of broad and strong foundations. A good example is offered by the top 10 cities across intellectual capital and innovation, technology readiness, and city gateway (collectively, our Tools for a Changing World). Paris and Amsterdam make the top 10 list in this grouping after almost a decade of financial turmoil in Europe. Tokyo remains in the top 10 after Japan's "lost two decades" of stagnation. Neither Rome, nor any of our top cities, were or will be built in a day. But the work is worth it.

A dependable workforce offers one key to city leadership. Low workforce management risk relates strongly with a range of healthy traits including high city productivity; ease of doing business; intellectual capital; technology readiness; health, safety, and security; and overall score. Clearly, a city that takes care of business on the office and shop floor has a better chance of success.

Taxes add another ingredient in the local recipe to consider, and the tax system in our three top cities, London, Singapore, and Toronto compare well. An analysis of corporate total tax rate, personal rate, and tax efficiency shows Dubai, Hong Kong, and Singapore have the lowest rates and highest efficiency collectively. But Toronto and London are not far behind. However, it's hard to take taxes out of the context in which they are paid in terms of economic, political, social, demographic, and environmental ecosystems and the needs of cities, their businesses, and citizens.

But findings also spotlight challenges

Achieving and sustaining resilience presents a major test for the urban world over a wide range of modern risks. Disaster preparedness must be intensified. If there is good news, it is that the most vulnerable cities can be the best prepared. Earthquake-prone Tokyo and flood-threatened Amsterdam display strong ability to manage risk. Beyond climate change, potential pandemics and manmade threats like cyber attack, market meltdown, and terrorism, all demand that cities heighten awareness, strategic and technological acumen, good governance, adaptability, and, perhaps most important, the commitment of institutions and the community to work together as one unit.

Disaster exposure is enormous in financial and human terms. Powerful cities like New York, Beijing, San Francisco, Paris, Los Angeles, Shanghai, and São Paulo fall in the middle or lower ranks of our triple measure of urban resilience—natural disaster exposure, natural disaster preparedness, and security and disease risk. All are significant world centers of economics, communications, technology, and population where major disaster can cripple the city and send ripples far beyond.

Lack of affordable housing could hold back cities. While housing quality exhibits a strong relationship with success, cities with the greatest economic strength today often have housing that is priced out of reach. Five of our top 10 cities in economic clout fall at midpoint or lower in rent affordability (London, New York, San Francisco, Beijing, and Shanghai). This foreshadows difficulty in talent attraction, retention, and, ultimately, cities possessing critical, hands-on skills they need.

Income distribution presents an issue for cities to be aware of and manage in terms of social and political impact and the ability to build and sustain resilient economies that include the wide range of occupations and salary levels that make cities run. While average, absolute income and number of middle-class households are projected to rise across our cities, they also show widely differing income distributions. For instance, US cities are among the top 10 with household income distributions earning less than 50% of median income.

Aging, slowing birth rates, and migration will realign public and private demands. Both the public and private sectors benefit if the city's quality of life attracts the talent needed to build the future.

All in all…

Cities are the future. They are not only where people are moving but where young people are moving. The healthiest cities are likely to win the global competition for talent and growth.

…But they also face demographic tests. Aging, slowing birth rates, and migration will realign public and private demands. Almost half of the increase in our cities' population by 2030 will be in those over 65 years old. Demographics challenge the growth and the finances of many cities with increasing pension, healthcare, and other service costs. Businesses gain opportunities to develop new services and products to respond to the changing pattern. Both the public and private sectors benefit if the city's quality of life attracts the talent needed to build the future.

Leading cities put together concerted strategies to understand their own strengths, weaknesses, and identities and then orchestrate growth to suit their own profile. Because cities are complex systems of systems—economic, demographic, technological, infrastructural, governance, social, and cultural—leadership will build from local identity, not formulas.

Businesses depend on city wellbeing and governments on healthy economies for shared success. They need to work together actively to help shape operating environments in a world where a continued urban renaissance is not guaranteed. The market will not necessarily resolve all issues cities face. Economic pictures can change fast. And governments often face tight resources. Successful cites align the private and public sectors into a potent force for shared prosperity.

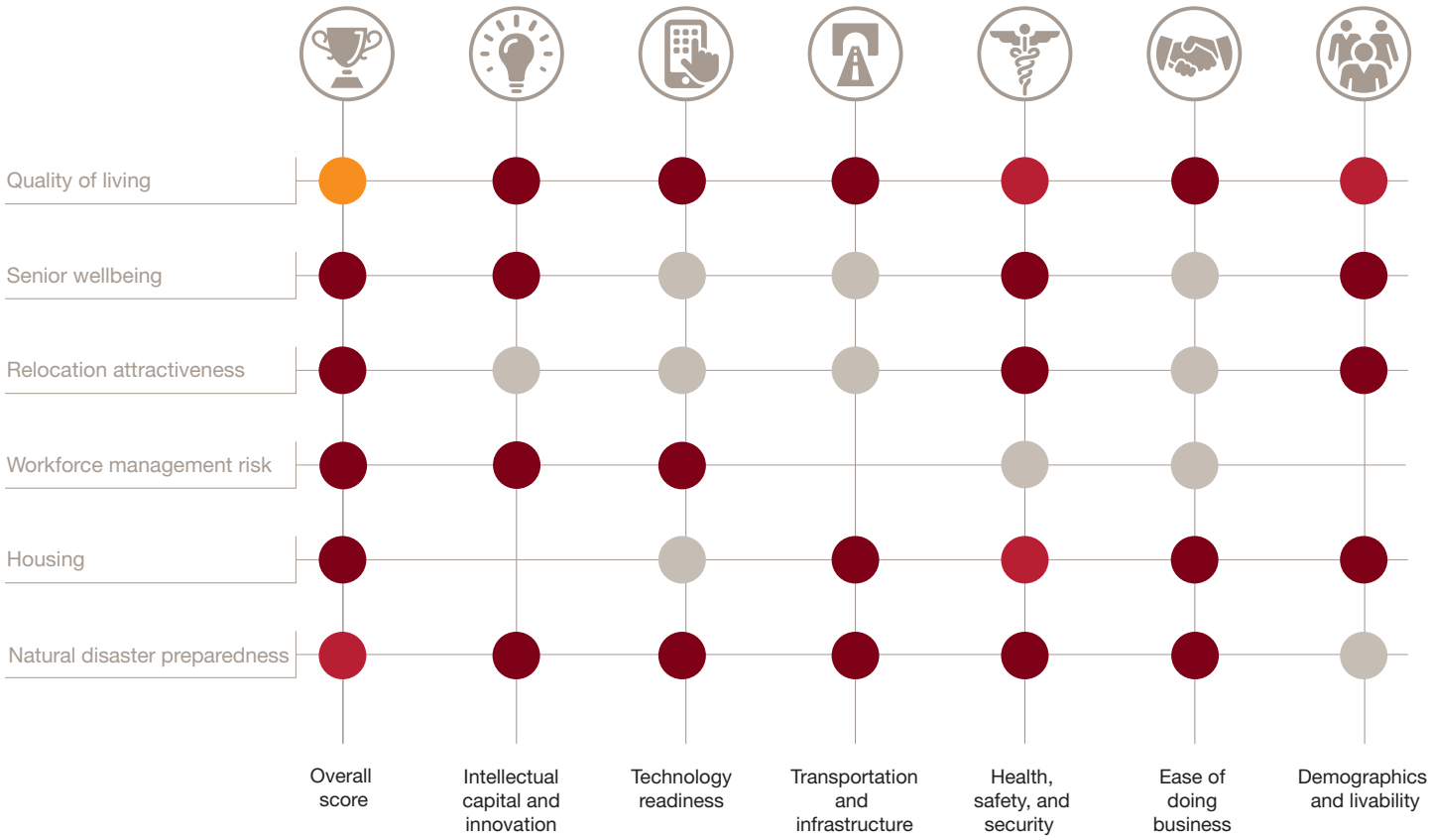
Build it for humans, and they will come:
Quality of life factors jump out in relation to urban success

Cities of Opportunity grows from the hypothesis that a balance of social and economic strengths is needed to create a virtuous circle of urban wellbeing, with tangible and intangible qualities reinforcing each other and driving healthy momentum. Or, as Jane Jacobs said, simply, in closing *The Death and Life of Great American Cities*, "Lively, diverse, intense cities contain the seeds of their own regeneration, with energy enough to carry over for problems and needs outside themselves."[1] We see this to an extraordinary, and even surprising, degree when we correlate the 67 variables, 10 indicator categories, and other economic and demographic qualities among themselves.

Fulfilling human needs jumps out of our study as the cornerstone of success in city life. Quality of living and senior wellbeing show striking relationships with excellent urban performance as reflected by 12 key measures, including overall score, six indicator categories, and five variables. Quality of living correlates at over 90% to 60% with all 11 key measures possible, posting a 91% correlation with success in the study. Senior wellbeing—essentially, how effectively older residents are woven into the community fabric—also exceeds 60% in strength of correlations 11 times. City relocation attractiveness correlates strongly with 11 key measures. Workforce management risk does so in 10 instances. And the availability, diversity, cost, and quality of housing, as well as natural disaster preparedness, a new variable this year, show a strong correlation 9 times.

The heart of the city beats with a rhythm we all understand

Six variables correlate* very strongly with the right stuff for urban wellbeing



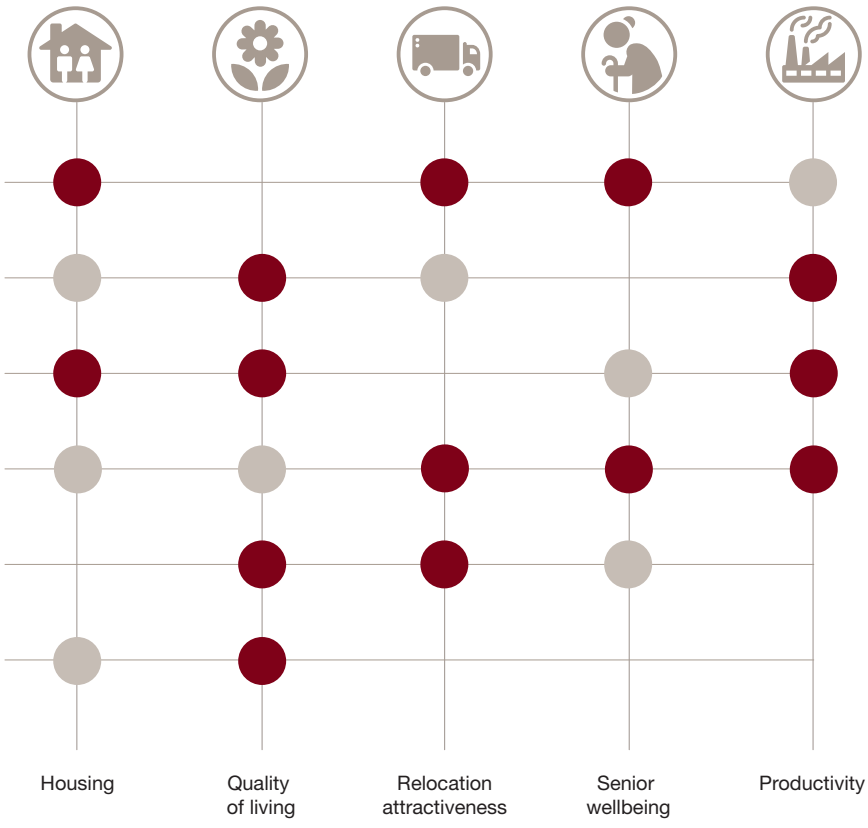
Source: PwC *Cities of Opportunity 7*, UUEPC

A range of messages can be drawn from the pattern. But most important, a well-functioning city delivers on its responsibility to shared wellbeing. The community stands resilient in the face of disaster and values older citizens and their needs. The city is a good place to live and hire workers. People want to move there.

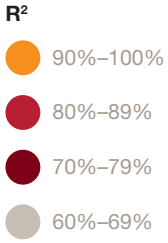
Considering our study focuses on cities that are global and regional capitals of business, finance, and commerce—the engines of the world economy—these relationships can appear eye-opening. But on an intuitive level, it makes sense that the true sign of a civilized city is how it cares for the weak, prepares for the worst, and deals with the necessities of everyday life. As Jane Jacobs wrote, "We human beings are the only city building creatures in the world…Cities are in a sense natural ecosystems for us…The humble, vital services performed by grace of good city streets and neighborhoods are probably as good a starting point as any"[2] to understand city ecology. The data say she's right.

1 Jane Jacobs, *The Death and Life of Great American Cities*, 1961; 1993 Modern Library Edition, page 585.

2 Ibid., *The Death and Life of Great American Cities*, Foreword to the Modern Library Edition, page xvii.



* A strong relationship refers to a statistically significant one measured as the coefficient of determination (R^2). The coefficient of determination measures the strength of the relationship between two variables and lies between 0–100% with a higher value representing a stronger relationship. Correlations reveal associations between two series of data and not causality. Put simply, R^2 represents the strength of the relationship between the two variables—the bigger the percent, the stronger the relationship.

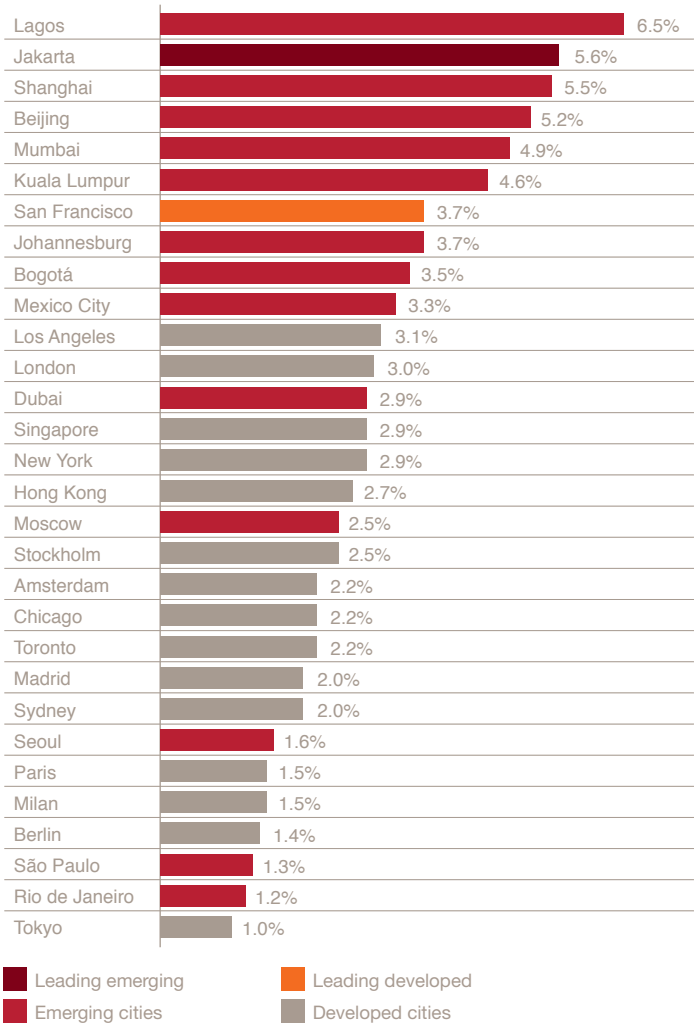


Growth, work, and the trends:
City economies should maintain momentum, while the urban jobs picture stresses intellectual skills

Projected growth stands out in Jakarta and San Francisco

Annual GDP growth* 2015–2030

Weak demand, low investment, and high debt levels have made it hard for developed cities to maintain growth in both public and consumer spending, limiting short- to medium-term growth. Despite current pressures, emerging city economies are projected to keep growing faster, from their smaller bases, increasing their total GDP share among our cities from 34% in 2015 to 40% in 2030. Jakarta and San Francisco are projected to lead among emerging and mature cities, respectively, through 2030.



* Growth projections reflect the middle-range forecast of Oxford Economics

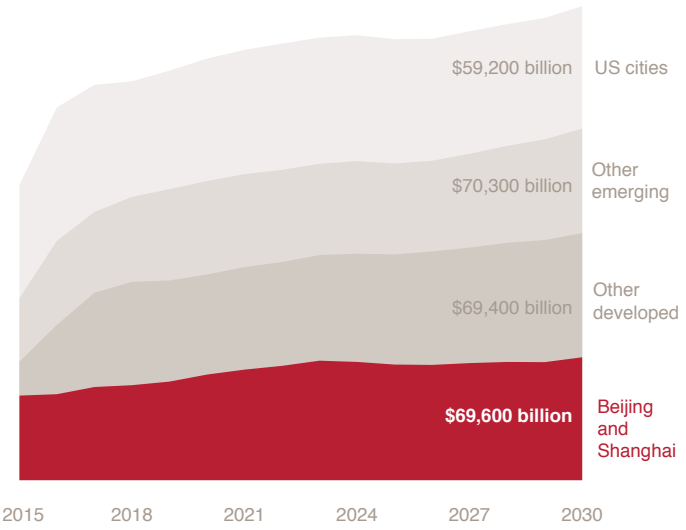
Source: Oxford Economics, UUEPC

Beijing and Shanghai are on course to power a quarter of our total economic growth

Contribution to aggregate GDP change 2015–2030

China needs to navigate financial market challenges, encourage greater levels of consumer spending to offset the necessary slowdown in investment, and deal with an aging population. But despite this, Beijing and Shanghai are expected to maintain significant economic weight among our cities based on GDP growth forecast to rise at 5.3% annually over the next 15 years as opposed to 9.9% over the past 15.

Change in GDP, $ billion, 2015 prices

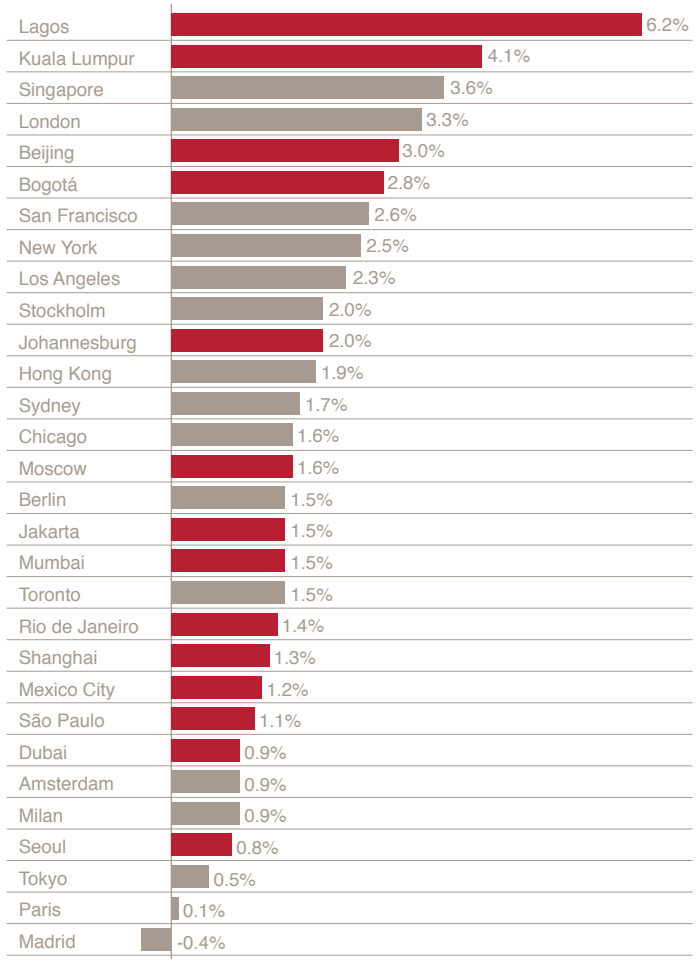


Source: Oxford Economics, UUEPC

Jobs growth varies across the cities, generally having recovered from the economic crisis over the past five years

Change in employment 2010–2015

Looking back to 2010 when the worst of the economic crisis had begun to ease for many of our cities, London and Singapore display strongest jobs growth among mature cities, Lagos and Kuala Lumpur among emerging ones. While Madrid lost jobs in the five-year period, for the past two years the city has begun to recover jobs lost during the economic crisis.



Source: Oxford Economics, UUEPC

I think, therefore I work: Finance and business services drive almost half of all employment growth

Contribution to overall GDP growth 2010–2015

Business and financial services account for almost half (45%) of GDP growth from 2010 to 2015. And other intellectually based jobs are increasingly important in areas like communications and healthcare. If current trends continue, digital and technology needs will increase. Human capital will continue to be in demand with good education. And requirements to navigate risk and regulatory complexity will increase along with the dominance of business and finance.

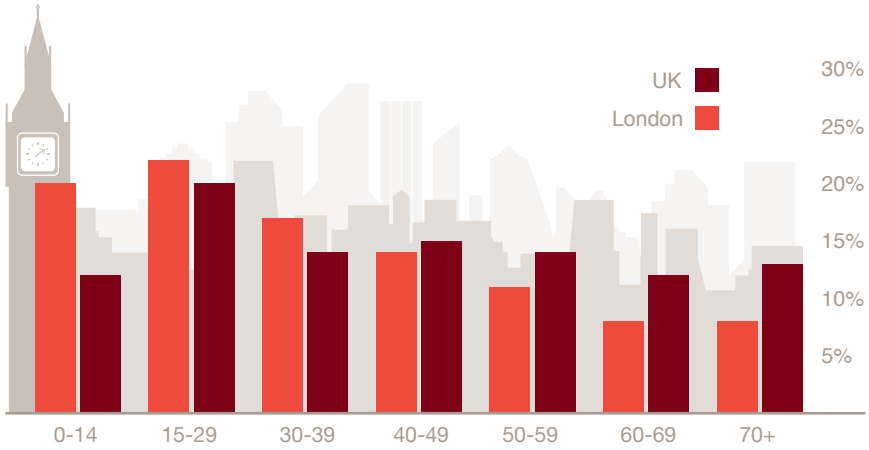
Based on Nomenclature of Economic Activities (NACE) job classifications
Source: Oxford Economics, UUEPC

Demographics and needs realign:
Slowing birth rates and longer lives increase pressure on workers to pull more weight and on cities to attract talent

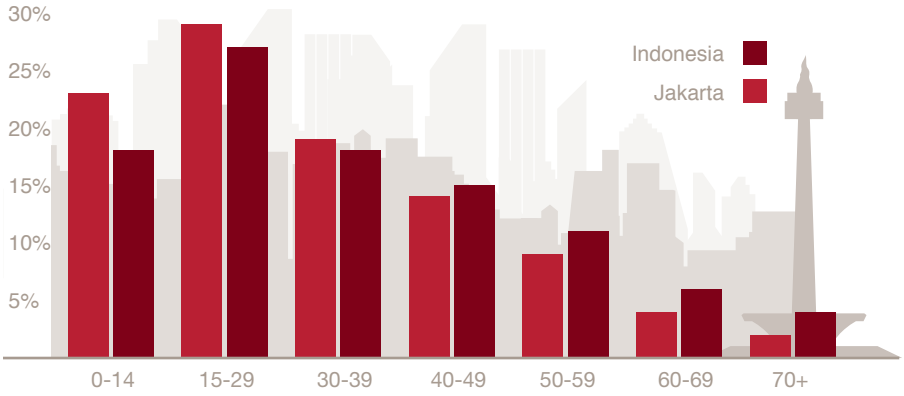
Youth often thinks it will be served by the good life in town…

Cities tend to attract younger populations than the rest of their nation, as London and Jakarta illustrate in their 15–39 age band compared with the UK and Indonesia, respectively.

Population distribution in the UK and London 2015



Population distribution in Jakarta and Indonesia 2015



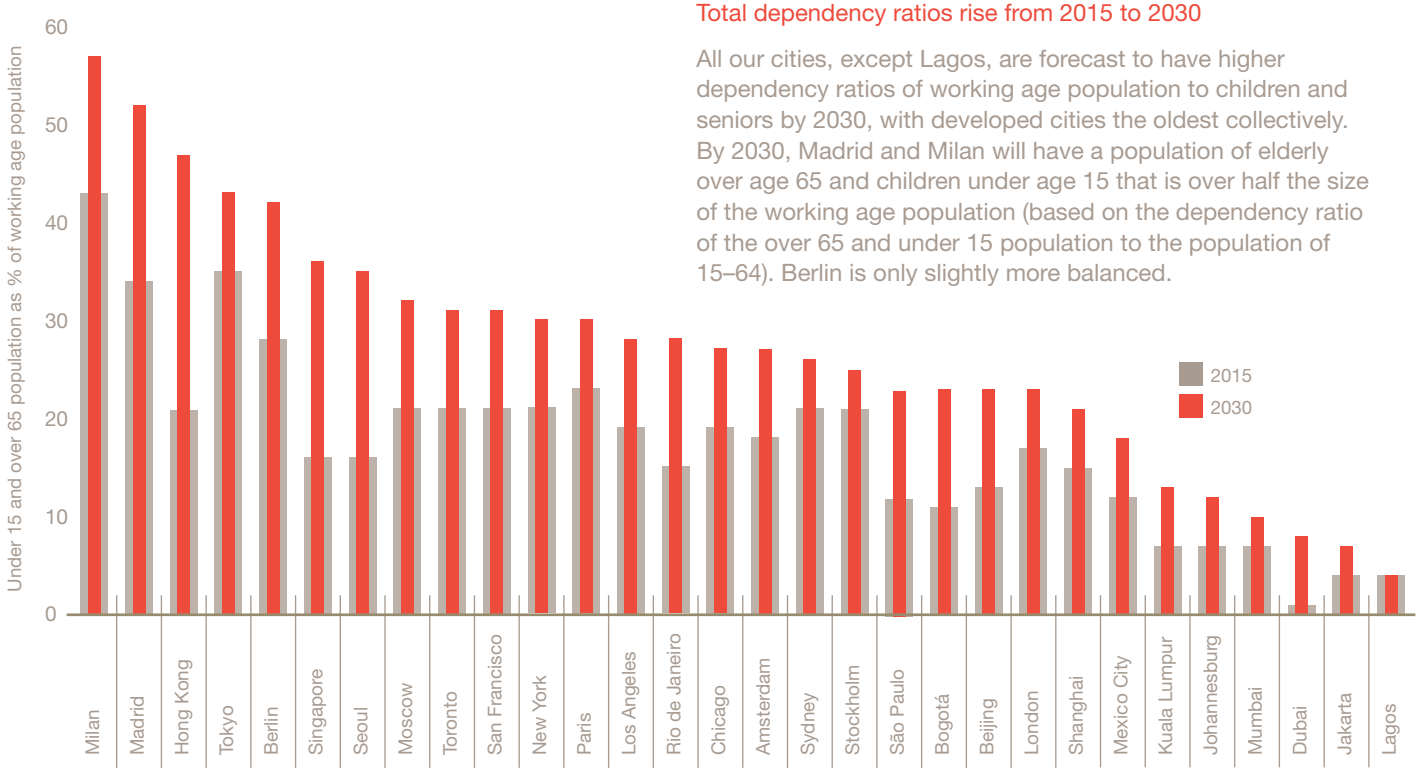
Overall, a majority of cities have a younger age profile—particularly having less residents over age 50. (Singapore and Hong Kong are not considered, without direct bases for national comparison.) The younger demographic is most consistent among developed cities, with the exceptions of Madrid and Milan, which have a higher proportion of seniors over age 70 than Spain and Italy.

Source: Oxford Economics, UUEPC

But slower birth rates and longer lives are expected to alter the urban fabric…

Total dependency ratios rise from 2015 to 2030

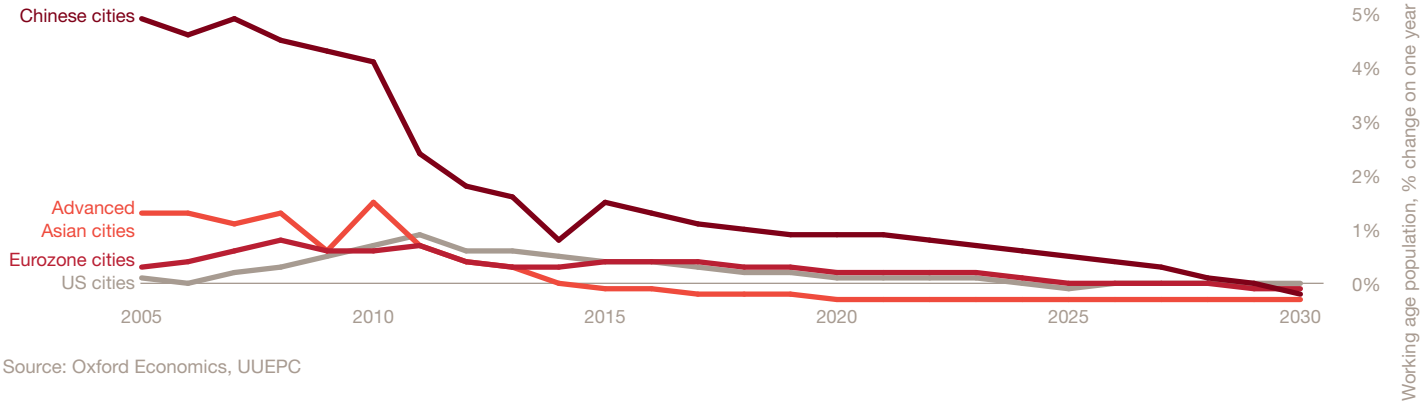
All our cities, except Lagos, are forecast to have higher dependency ratios of working age population to children and seniors by 2030, with developed cities the oldest collectively. By 2030, Madrid and Milan will have a population of elderly over age 65 and children under age 15 that is over half the size of the working age population (based on the dependency ratio of the over 65 and under 15 population to the population of 15–64). Berlin is only slightly more balanced.



Source: Oxford Economics, UUEPC

…And place more responsibility on a shrinking workforce

Working age growth rates slow from 2005 to 2030



Source: Oxford Economics, UUEPC

The pattern plays out across our 30 cities as working age population is projected to grow just 9% from 2015–2030 compared with the rise of 62% among over 65s. Some cities are already failing to keep pace with the need to replace workers, such as advanced Asian cities where working age population growth is already negative. All in all, an aging population and slower birth rates challenge the growth of many cities and test public finances with increasing pension and healthcare costs and a shrinking workforce and tax base. In this scenario, cities will need to attract more workers and will have to consider their allure as places to live. In addition, effective domestic and international migration policies must be developed. Businesses will also need to develop new services, products, and policies to respond to the changing pattern.

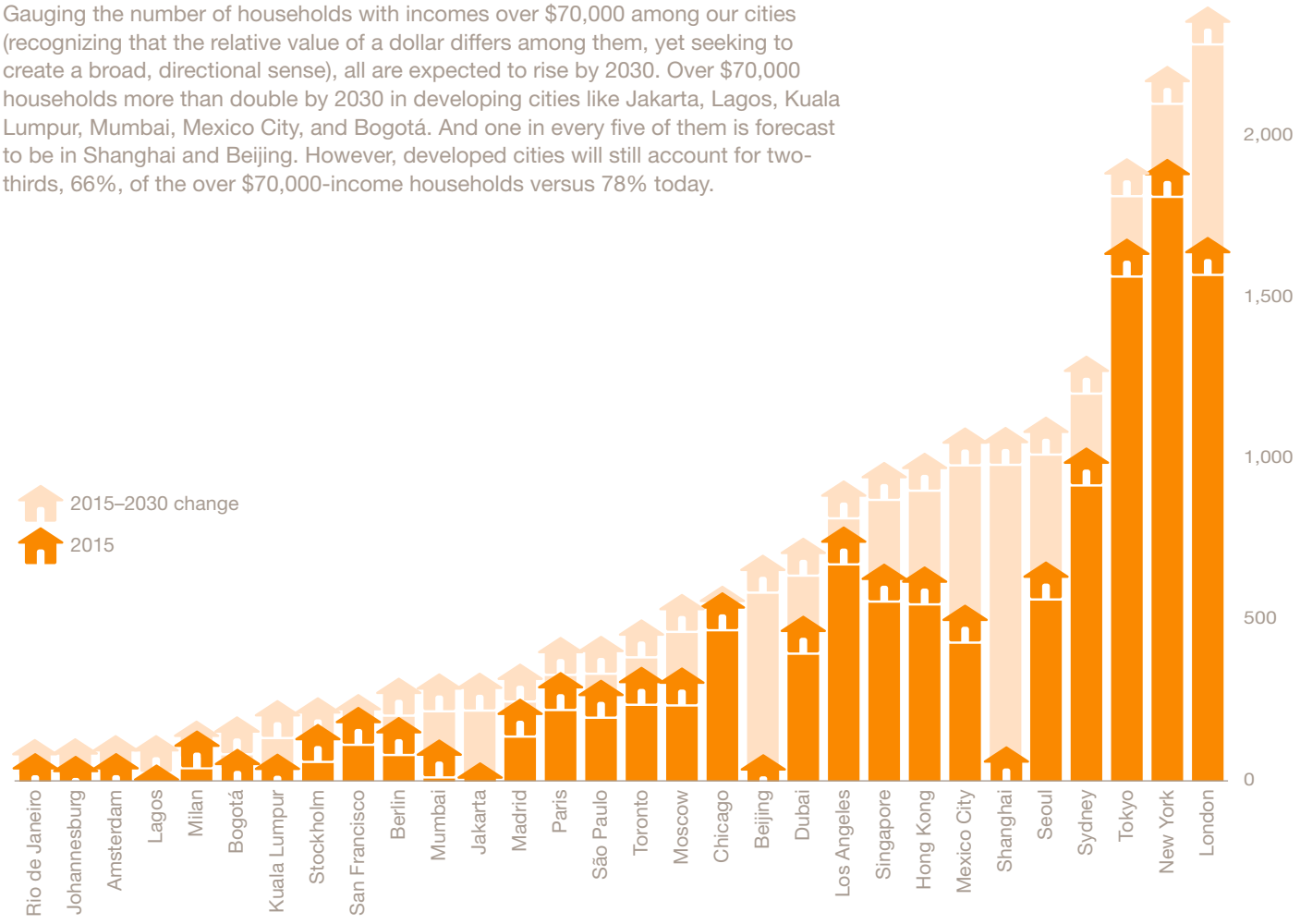
Profiling income distribution:
To each city, its own pattern in terms of polarity of rich and poor, robustness in the middle, and the sociopolitical impact

This section looks at income patterns and distributions to establish a sense of how the broad middle-income group stands, and with it where incomes are spread most evenly, and, thus, to begin thinking about cities as social and economic ecosystems that work for people with different skills and income levels and their need for living, consumption, and services.

Toward the top: Incomes over $70,000 are expected to grow

Households earning over $70,000 2015–2030

Gauging the number of households with incomes over $70,000 among our cities (recognizing that the relative value of a dollar differs among them, yet seeking to create a broad, directional sense), all are expected to rise by 2030. Over $70,000 households more than double by 2030 in developing cities like Jakarta, Lagos, Kuala Lumpur, Mumbai, Mexico City, and Bogotá. And one in every five of them is forecast to be in Shanghai and Beijing. However, developed cities will still account for two-thirds, 66%, of the over $70,000-income households versus 78% today.

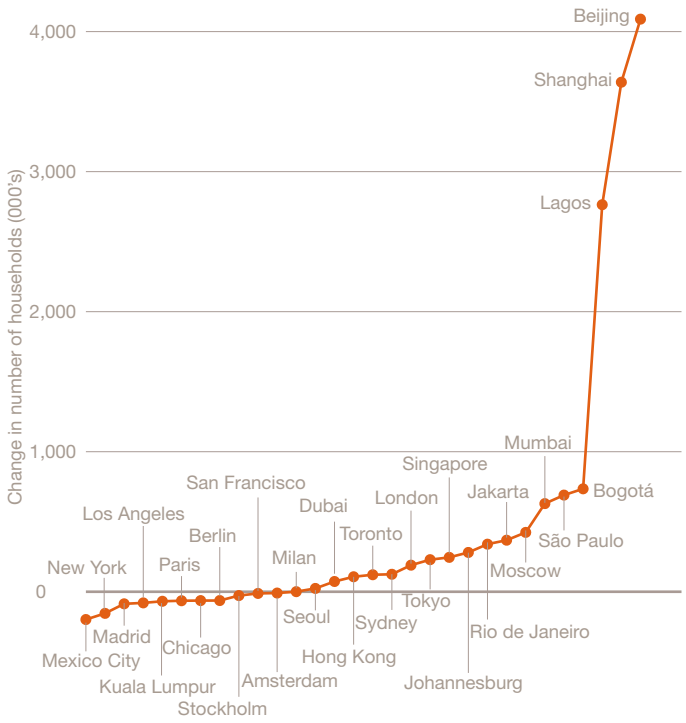


Source: Oxford Economics, UUEPC

In the broad middle: The $10,000 to $70,000 band is expected to grow fastest in Beijing, Shanghai, and Lagos

Change in number of $10,000 to $70,000 households 2015–2030

Beijing and Shanghai are expected to account for half the increase in the broad middle-income (excluding the poorest and richest income bands) among our 30 cities. Emerging cities should also create more middle-income households. Developed cities are forecast to move further into the high-income category. We frame the health of the broad middle income because the group, in a sense, represents the glue of community life, making the personal, day-to-day investment to build and sustain a city over time. But for perspective, it bears noting that the global middle income or middle class (on their own, terms that are hard to define) is smaller and poorer than originally believed. A 2015 Pew Research Center analysis* notes "the emergence of a truly global middle class is still more promise than reality," with those joining it in developing areas still experiencing modest standards of living compared with the developed world.



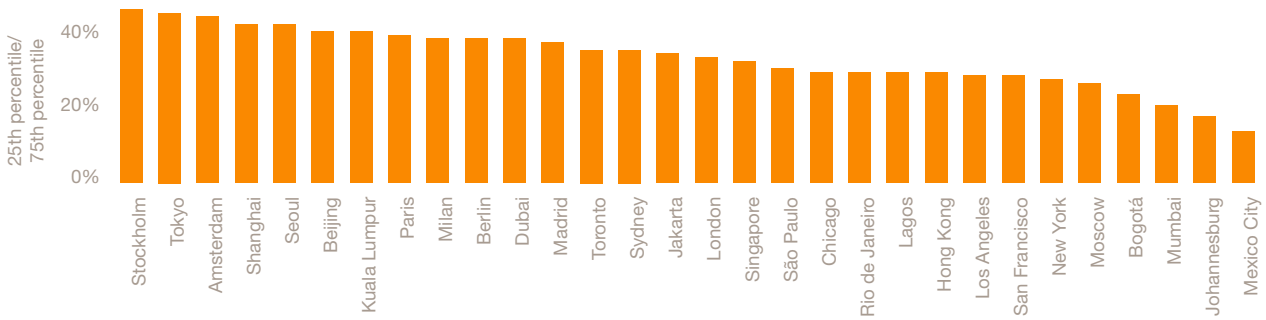
Source: Oxford Economics, UUEPC

* Kochhar, Rakesh, "A Global Middle Class Is More Promise than Reality: From 2001 to 2011, Nearly 700 Million Step Out of Poverty, but Most Only Barely." Washington, D.C.: Pew Research Center, July 8, 2015, http://www.pewglobal.org/files/2015/08/Global-Middle-Class-Report_8-12-15-final.pdf.

Income equality thrives best in Eurasian soils

Income of 25th percentile as % of 75th percentile in 2015

When it comes to income distribution within our cities, absolute measures such as household income in dollars (as previously shown) provide important perspective as a gauge on living standards. However, relative value measures such as the normalized comparison of incomes provide a context that standardizes differences among cities. Here, we take the lower earning 25th percentile of income and divide the value by that of the wealthier 75th percentile. For instance, the income of the 25th percentile in Stockholm is $43,300 and that of the 75th percentile is $92,500, resulting in a 47% ratio. The higher the percentage ratio that results, the higher the income equality in the city. The lower the value, the greater the income inequality—and with it the need to avoid the threat of wealth divisions fueling social and political tensions and income requirements forcing out working people who might otherwise call the city home. Stockholm, Tokyo, and Amsterdam show the greatest income equality and the smallest spread between richer and poorer. Mexico City, Johannesburg, Mumbai, Bogotá, and Moscow display the most unequal incomes. But developed US cities New York, San Francisco, and Los Angeles, as well as Hong Kong, are right behind the five emerging cities in terms of the polarity between rich and poor.



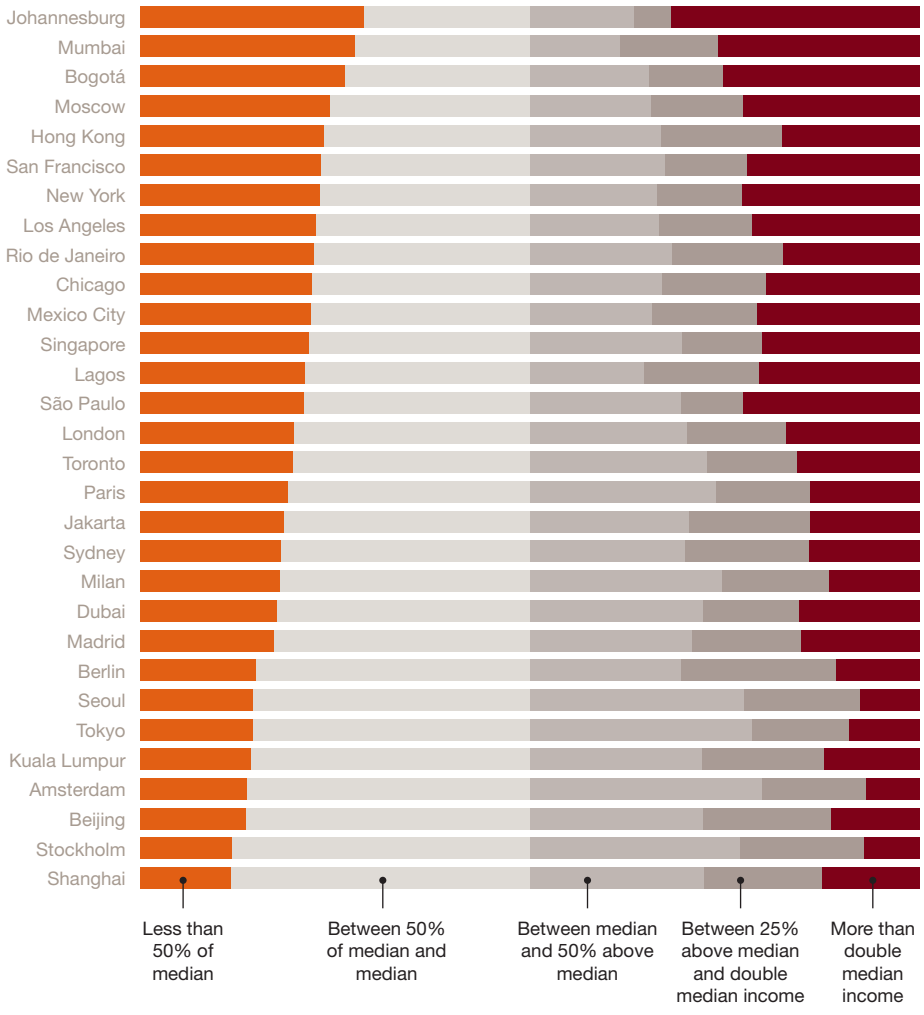
Source: Oxford Economics, UUEPC

Diverse policy and business needs: Middle-income spreads vary, but all cities need a range of living choices, goods, and services for everyday people

Divergence from median income 2015

Looking at standardized divergence from median to establish another relative view of income distribution, the picture that emerges is highly individual. It serves as a visual reminder that cities need good living choices and appropriate services for people across a wide spectrum of incomes and skills—from decision makers and analysts to artisans and engineers, to teachers, firefighters, and other public servants and the vast spending public who work, relax, go to school, travel, and pay taxes. Shanghai, Stockholm, Beijing, and Amsterdam have the smallest proportion of households earning less than 50% of their city's median income. Johannesburg, Mumbai, Bogotá, and Moscow have the highest proportion of households earning less than 50% of the median income, as well as the highest proportion of households with an income more than double the median. Developed cities occupy five of the top 10 places with regard to the proportion of households earning less than 50% of the city's median income, with US cities occupying four of those places. Stockholm, Amsterdam, Seoul, and Tokyo have the smallest proportion of households earning more than double their city's median household income.

We recognize that median income represents quite different levels of affluence in different cities and that distributions can look similar in cities with different social and economic patterns. For instance, Amsterdam, Beijing, Stockholm, and Shanghai reflect the smallest proportion under 50% of median with wide bands of "everyday people" between richest and poorest. The Chinese cities arrive there as many move from relative poverty into middle incomes and a wave of "first movers" benefit from taking advantage of China's growth to become wealthier as compared with the long-developed, slower growing European cities. Or, comparing Stockholm and San Francisco—our two smallest cities in population, each developed around sparkling harbors with great urban beauty—the Swedish capital reflects the Nordic model of egalitarian economic management, high taxes, and robust social services evening out the distributions. The City by the Bay, and the financial locus of Silicon Valley, shows greater proportions of rich and poor, with less people living near the median, to reflect that area's concentration of wealth and the ability of achieving the American dream at the top along with less of an economic safety net on the bottom.



Source: Oxford Economics, UUEPC

Paris

Tools for a changing world

Intellectual depth, technological strength, and physical openness nurture urban growth for an evolving economy

Shanghai

Beginning with *Cities of Opportunity 6*, we divided our 10 indicator groups into three sections that are both thematic and functional. The indicator discussions in this first section give a good sense of what we think constitute the tools necessary to be at the forefront of a digitally and physically connected world increasingly powered by knowledge work in finance and business services, healthcare, sciences, and technology.

The intellectual capital and innovation indicator focuses on education and, secondarily, the innovation that a highly educated society generates. Technology readiness, our second indicator, frames the technological potential of a really smart city—one that "uses digital intelligence to improve citizens' lives," as **Carlo Ratti, director of the MIT Senseable City Lab**, tells us.

Our third category, city gateway, calls for a bit more background. When this indicator was first introduced in *Cities of Opportunity 5* in 2012, we stated that "this indicator attempts to quantify a city's global connections and attraction beyond its local borders [and]…measure[s] a city's global draw…reflects the actual reality of today's networked world, and takes the pulse of a city's social, economic, and cultural magnetism internationally."

Perceived as a group, city gateway unlocks a physical door to a fluidly interconnected world, technological readiness opens a digital portal to it, and intellectual capital and innovation nurtures the creativity and achievement that will drive a city's future social and economic wellbeing.

In the spirit of taking strategic steps today that build long-lasting foundations, few perspectives could be as illuminating as that of Stockholm's Jacob Wallenberg, head of one of Europe's most prominent business families and Chairman of Investor AB, an industrial holding company with long-term, engaged ownership in companies such as ABB, AstraZeneca, Atlas Copco, Electrolux, and Ericsson. Wallenberg is a native of the Swedish capital who is at home in cities around the world, and clearly understands the mutual bond of public and private interests, as well as the challenge of staying the course for many years to achieve progress. A good city fits squarely in his equation: "When Ericsson tries to attract people to Stockholm, what do these individuals do? They look at the city, as well as the workplace. They look at…the whole life picture. Cities and employers have come to accept that all these ingredients do make a difference …Otherwise, it's not going to be a competitive city."

Five cities make the top 10 in all three indicators in this section. In 2014, only three cities managed to do so: London, New York, and Tokyo. London, Tokyo and New York repeat their feat from the last report and are now joined by Amsterdam and Paris.

Top-notch educational infrastructure, transnational hubs of technological innovation, and global gateways are all part of one integrated human, financial, and industrial structure that marks those cities that should flourish over the longest time.

All five cities are, of course, emblems of both cultural sophistication and economic productivity. London is, far and away, the most successful city in this section, coming in first in two indicators and second in the third (just as in 2014). No other city comes close to the British capital's performance here.

Notably, both Paris and Amsterdam (an addition this year) outscore New York as a whole. Amsterdam finishes third, fourth and eighth. Paris ranks second, third, and ninth in the three measures. What we are seeing here is two continental European cities that have weathered the worst economic crisis since the Great Depression excelling in the one section of our report specifically designed to mark out the tools that a truly international urban center needs to advance in the unfolding reality of contemporary global competition. The reason they do so is illustrated in the next section on quality of life, where we see the dividends that a city's long-term commitment to its residents continues to pay despite hard times.

In this section, however, we observe that top-notch educational infrastructure, transnational hubs of technological innovation, and global gateways are all part of one integrated human, financial, and industrial structure that marks those cities that will flourish over the longest time as economies transform from manufacturing to services.

Intellectual capital and innovation

Great cities are major intellectual centers, year in and year out

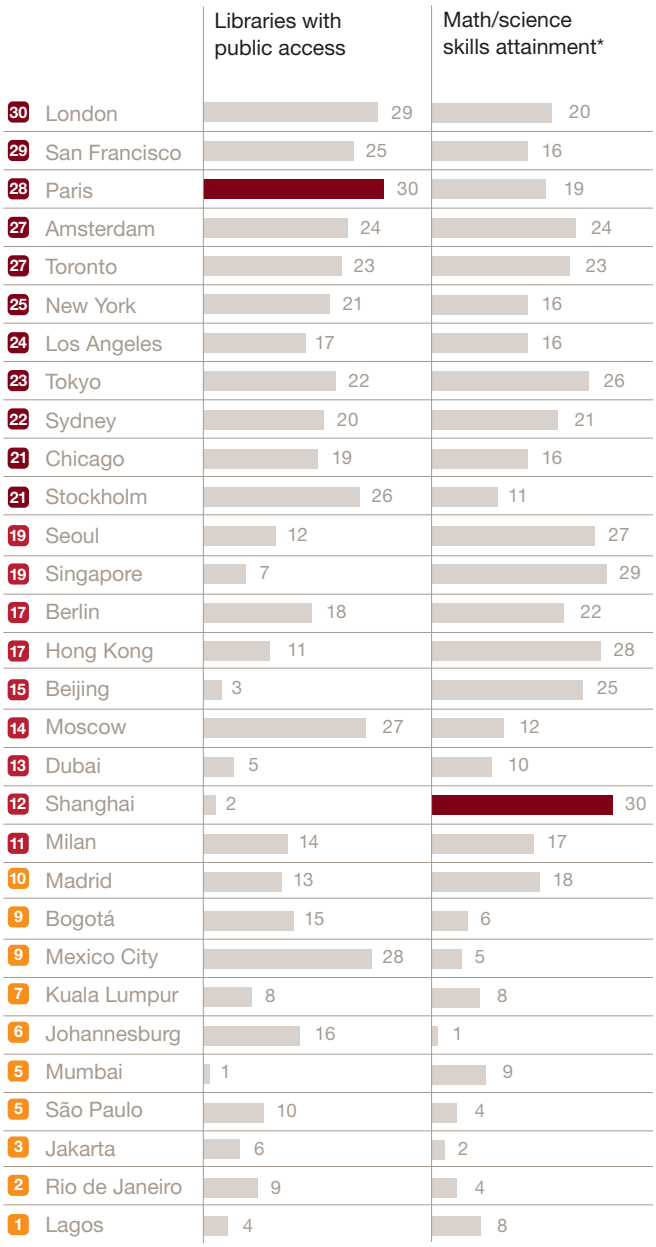
Having produced seven editions of our analysis with the same or similar family of indicators, there are some truths that are indeed self-evident. A fundamental one is that intellectual capital, a cornerstone of the modern urban ecosystem, doesn't "happen": It develops. Similarly, innovation is not a commodity: It is a process—and a very human one at that, which arises from the capacity of an intellectual environment to spark ideas, spread them among like minds, and support their growth.

This is the story told by this year's top 10 cities in intellectual capital and innovation. In 2014, the top 10 were, in descending order, Paris, London, San Francisco, Stockholm, Toronto, New York, Los Angeles, Sydney, Chicago, and Tokyo. This year, the corresponding cities are London, San Francisco, Paris, Amsterdam and Toronto tied in fourth, New York, Los Angeles, Tokyo, Sydney, and Stockholm and Chicago tied in tenth. The only essential difference in the group's composition is, of course, the inclusion of Amsterdam, one of our new cities this year. Looking deeper, Stockholm, category leader in 2012 and 2011, progressively dropped during the past five years in its overall ranking for intellectual capital and innovation. The overall decline and bottom-half performance in math/science skills attainment, an important lead indicator for innovation, has stirred concern in the city, leading to proactive measures being taken to address the downward trend.

The individual rankings at the top are not as critical as the trends they reveal. Most notably, the top 10 are all competitive whereas the overall difference between highest and lowest scores in this indicator is many times larger.

London's #1 ranking in this indicator is almost a case of *déjà vu*. London ranked #1 in world university rankings in our last report and does so again in this one. In the other six variables in this indicator, the city has a very similar performance between the last report and this one with just one score outside the top 10.

San Francisco is now #2 in this indicator's rankings after continually rising over the last few years (#4 in 2012, #3 in 2014). Its performance in population with higher education is particularly striking: It not only ranks #1 but does so robustly, according to our measurements, with over 51%, as opposed to its nearest challenger, Amsterdam, which scores 44%. As is only logical for a city about 40 miles from the heart of Silicon Valley and closely linked to it, San Francisco also scores first in the Innovation Cities Index.



Looking into the details of individual variables, refreshed data in percent of population with higher education drove Beijing and Dubai up 17 and 8 spots, respectively, and Madrid down 11. Moreover, new data led Shanghai down 12 places in libraries with public access.

Percent of population with higher education	World university rankings	Innovation Cities Index	Intellectual property protection*	Entrepreneurial environment*	Score
27	30	28	28	22	184
30	21	30	20	29	171
21	27	27	24	20	168
29	14	26	26	23	166
24	20	25	25	26	166
22	22	29	20	28	158
18	28	22	20	30	151
15	23	21	29	13	149
14	25	19	23	25	147
23	24	17	20	27	146
25	19	20	21	24	146
20	29	24	9	15	136
17	16	16	30	21	136
16	17	23	16	19	131
7	26	18	27	14	131
26	18	13	12	11	108
28	11	11	2	5	96
19	6	15	22	17	94
10	13	14	12	11	92
12	15	12	8	9	87
4	12	9	7	16	79
13	9	4	3	18	68
11	6	5	6	7	68
9	6	8	14	12	65
1	8	2	15	8	51
3	7	10	10	3	43
6	10	7	5	1	43
5	6	3	13	6	41
8	6	6	5	2	40
2	6	1	1	4	26

Each city's score (here 184 to 26) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each indicator

* Country-level data

Jacob Wallenberg

Jacob Wallenberg, head of one of Europe's greatest business groups

…explains how cities and corporations can help each other to compete

As chairman of Investor AB, Jacob Wallenberg leads one of the world's most prominent business families. In 1916, this Swedish industrial holding company was spun off from SEB, a bank that Wallenberg's great-great grandfather founded in 1856. Today, Investor owns significant interests in high-quality global companies, such as ABB, AstraZeneca, Atlas Copco, Electrolux, and Ericsson. Investor also embodies the Swedish corporate model of long-term, engaged ownership, buying to hold and develop companies—naturally sharing strategic interest in the success of the communities in which Investor does business. Here, he discusses the need for cities and companies to collaborate for the common good, applying dual lenses of his extensive global experience and local roots in Stockholm.

Companies like yours have become increasingly focused on corporate social responsibility and sustainability. Why?

Thirty or 40 years ago, very few businesses made a concerted effort to develop their relationship with society. Today, corporate social responsibility and sustainability are not only important but fashionable. Almost everyone pays tribute to this and focuses on it now. You could argue that this is just cynical business people responding to the flavor of the day. But I don't believe that's the case—at least, not from my perspective. To me, it's fundamental that you have to relate to your society if you're going to be a successful business. That means you have to relate to the people in society—to the citizens, to your employees, to your shareholders, to all kinds of constituencies. If you can get this in balance, you create the best chance of being successful over the long term; and if you fail in any of those areas, your performance will be less than optimal. It's very simple. By my logic, it's obvious that you have to deal with sustainability because otherwise you sub-optimize. But it's also a matter of morale.

Is this focus on sustainability more common in Nordic countries than elsewhere?

It's part of our tradition. But I also see it when I visit the United States. I was on the board of Coca-Cola, which is a terrific example of a company that works with sustainability from all the angles I touched upon. My experience is that all these core American companies like Boeing, General Electric, or Citigroup basically have the same attitude. After all, ask a manufacturer what can happen if it's accused of using child labor. They're almost out

> *When Ericsson tries to recruit international, highly educated people in Stockholm, those individuals look at the city, as well as the workplace. They look at transportation, schools, cultural life, and sports. All these ingredients make a difference.*

Ericsson headquarters in Stockholm.

of business because they have not paid respect to basic values. This is for real today, and we've all come to accept that this probably is for the good of the world.

How should the public and private sectors work together for the good of the cities where they're based?

The short answer is that the two have to collaborate because there's a mutual interest in helping each other. But in a place like Stockholm, business was not an integral part of the city's development over the last 30 or 40 years. However, over the last 10 years, a completely different picture has emerged, with large companies becoming much more engaged in discussions about how the city could best develop. The Stockholm Chamber of Commerce has led important initiatives, and there's a big seminar every spring called the Stockholm Meeting, where representatives from business and society engage for half a day. Things like this have really ballooned, and it's made a terrific difference. You have a more mature discussion between the parties today, a mutual exchange of information. This also leads to better decisions that are founded in a real need, not just something that politicians sort of believe is important. These are also important issues for employers. Take a company like Ericsson, where I'm on the board. Ericsson has more than 100,000 employees from 150 countries. When it tries to recruit international, highly educated people in Stockholm, those individuals look at the city, as well as the workplace. They look at transportation, schools for their children, cultural life, and sports—the whole life picture. Cities and employers have come to accept that all these ingredients do make a difference. So, all these parties have a common desire to deliver as well as possible on those different demands. Otherwise, it's not going to be a competitive city. You're not going to be able to attract those individuals from abroad.

What does Stockholm need to improve over the next five or 10 years?

There are a few absolutely fundamental issues, and this goes for most cities. In Stockholm, we have the whole question of traffic. We are underinvested in infrastructure. This is in the process of being addressed, but we have to see more action. Second, housing. We have a dysfunctional rental market in Sweden, with some laws left over from World War II that create a less-than-liquid market for rental apartments. This is a problem when you try to attract people for shorter periods, for a few years, which is what rental apartments are perfect for. We need significant developments legally, as well as more construction. The affordability of housing is becoming an issue, too. If you're going to buy an apartment, Stockholm is getting quite expensive. It's a matter of supply and demand. You have to increase the supply. That is very important. Another broader-based issue is education. Then there is the care system for the elderly and the ill. All these things could be improved.

How big a challenge is immigration?

We've had an enormous influx of immigrants and, in some cases, refugees fleeing from wars. Since the Arab Spring, we've seen this terrible situation in which many people are fleeing, either

Stockholm: a city of islands and bridges, known as "the Venice of the North."

from the war in Syria or for pure economic reasons. They have no future where they are, so they are fleeing to Europe. All this leads to a societal issue: How do we integrate this large number of foreigners coming in very rapidly, putting our societies under stress? Our systems—be it housing, schools, or welfare—are all under significant stress. This is not just a Stockholm question. It's more of a national issue, and it goes for all countries in Europe. Add to this that there are political parties that are dead set against immigration, regardless of the reasons, and you have a very potent political challenge for the foreseeable future.

Sweden has a strong commitment to community priorities like sustainability, education, and immigrant integration. Is this sense of shared values one reason for the success of Stockholm?

Any city has to be integrated to perform well. But integration is a much broader issue than just allowing foreigners to live here. For example, it also has to do with integrating people whether they're rich or poor or whether they're working in business or culture. Many pieces work pretty well together here to make it a more complete society. We've also had a very long period of peace in Sweden, which has helped to instill a sense of stability. You could argue that there is also a conservatism or a lack of desire for change, which is not always positive. We have a very conservative view on architecture in this city. You can build anything you please as long as it looks like it's from the 1700s. So, there are pluses and minuses.

Do urban issues affect the strategic decisions that Investor's companies make—for example, about where to locate their offices?

When our companies look at where to establish a regional head office or an important office, these issues we've been debating are fundamental. We try to put into numbers the pluses and minuses of the different candidate cities—and your *Cities of Opportunity* report is used extensively in that context. It's really important that any city that wants to attract companies must address all these issues. The city has to deliver on all the constituent parts or it will have a problem. We are acutely aware of this with our large, multinational companies, which work with a huge number of international people. The city where you locate an office has to be competitive or your employees will not go with you. They'll go elsewhere.

You've lived in several cities in our report, and Investor operates in all 30 of them. Do any of those cities particularly catch your eye in terms of business opportunities?

I think one of the great growth stories will be written in Jakarta. Indonesia has been fairly insular. But it's a huge country with a very ambitious government, and it's modernizing a lot. A number of our companies have been there for a long time, but they're truly growing there now. It's a less than well-developed place in many aspects but with high ambitions. So, I have high hopes. It has great potential.

You've spent a lot of time in American cities like New York and Philadelphia. How does life there compare with life in Stockholm?

You have better hoagies in Philadelphia! But no, what strikes me about the United States is always its multiculturalism. It's a country made up of people from all corners of the world, which is fascinating. It's a well-functioning society in one sense, but you're also left more to yourself, both for good and for bad. There's less government intervention. Most Americans don't mind that. The idea of America as the land of opportunity means something to everyone, regardless of their political attitude. But in Swedish

Sergel's Square in central Stockholm, fittingly named after an 18th century sculptor who worked in this city of water, light, art, and design.

> *"Over the last 10 years, a completely different picture has emerged, with large companies becoming much more engaged in discussions about how the city could best develop.*

society, we are brought up knowing that the government will always tell us what's right or wrong and what we should do and not do. It's a huge difference.

Is quality of life threatened today by the speed and distractions of modern society?

Absolutely. This is one of our single most important challenges. There is the whole question of how to deal with real-time information, with being hooked up the whole time. You never have time to reflect, and the information itself lacks quality. Journalists no longer have time to do fact finding. It's going to be an enormous challenge to ensure that people can make good decisions. There is also a genuine risk of people stressing themselves out and overworking themselves. This will be an even more significant issue as we move forward.

Sweden has an excellent educational system, but many of Investor's executives were educated abroad. Is that by design?

Historically, most Swedes were educated in Sweden. I was educated abroad myself, and I do think it's a great advantage to have spent time abroad. It's very important to understand that this little country is not the center of the world. Wherever you come from, it's a problem when you think your own country is the center of the world. And this country excels in that type of thinking. We tend to travel the world and tell people what is right and wrong, which is a bit unfortunate. But if you live abroad for a while, you realize that maybe you shouldn't have that attitude.

As a resident of Stockholm, how would you define what gives the city such a high quality of life?

It's a matter of safety, cleanliness, and great employers who can attract highly educated, highly skilled individuals. You also have access here to a wide range of restaurants, theaters, sporting events, and other activities. There has to be an active life available outside of work. To me, that's a great city.

Do you enjoy living in Stockholm?

Yes, I love it. It's great. I should add that I really enjoy the fact that you can bicycle almost anywhere. And you can walk. It's fantastic here.

Learn more
A full-length version of this condensed conversation is available at www.pwc.com/cities.

Technology readiness

An extensively revised indicator confirms past performance of most top 10 cities

This indicator has undergone substantial revision and enhancement and, above all, an expansion, in order to make the data here as representative and current as possible. The variables have increased from four to six. Moreover, one variable from the previous report has been dropped, another has been further refined, and three new variables have been added.

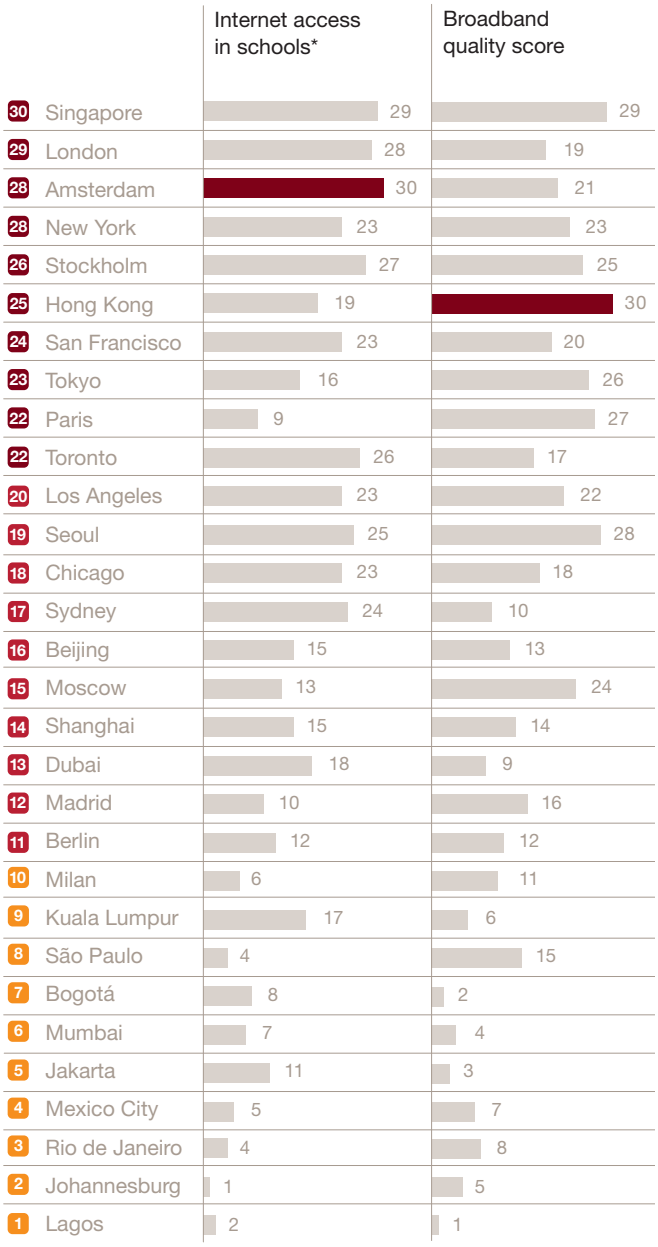
Specifically, we've broadened our approach to broadband quality. As opposed to the previous variable, which indeed only registered the "quality" of a broadband connection, our new, more expansive score now measures quality (or connection reliability), speed (upload/download), and value (cost). Our three new variables are mobile broadband speed (which clearly complements the broadband quality score), ICT usage, and digital security. Finally, we've dropped our digital economy variable, as it has proved impossible to update the data.

All told, with only two variables remaining basically unchanged, two-thirds of this indicator is essentially new. Interestingly, however, while the changes have resulted in some major alterations in the top 10, they are not as extensive as might be expected—which is a good confirmation of the indicator's fundamentally sound initial design. All told, seven of our cities in the top 10 in our last report remain within that elite group in this one, albeit with a different ranking.

The only real, and impressive, improvement with the revised measures is in the case of Singapore, which has risen from eighth place in our last report to first place in this one. Furthermore, its distance from #2 London is a substantial 25 points. Singapore's position as one of the world's leading smart cities is a result of a continued focus by leadership to provide the technological infrastructure and smart services that allow the city to continue to grow despite its limited available land. Technology helps Singapore to maintain high density without sacrificing quality of living.

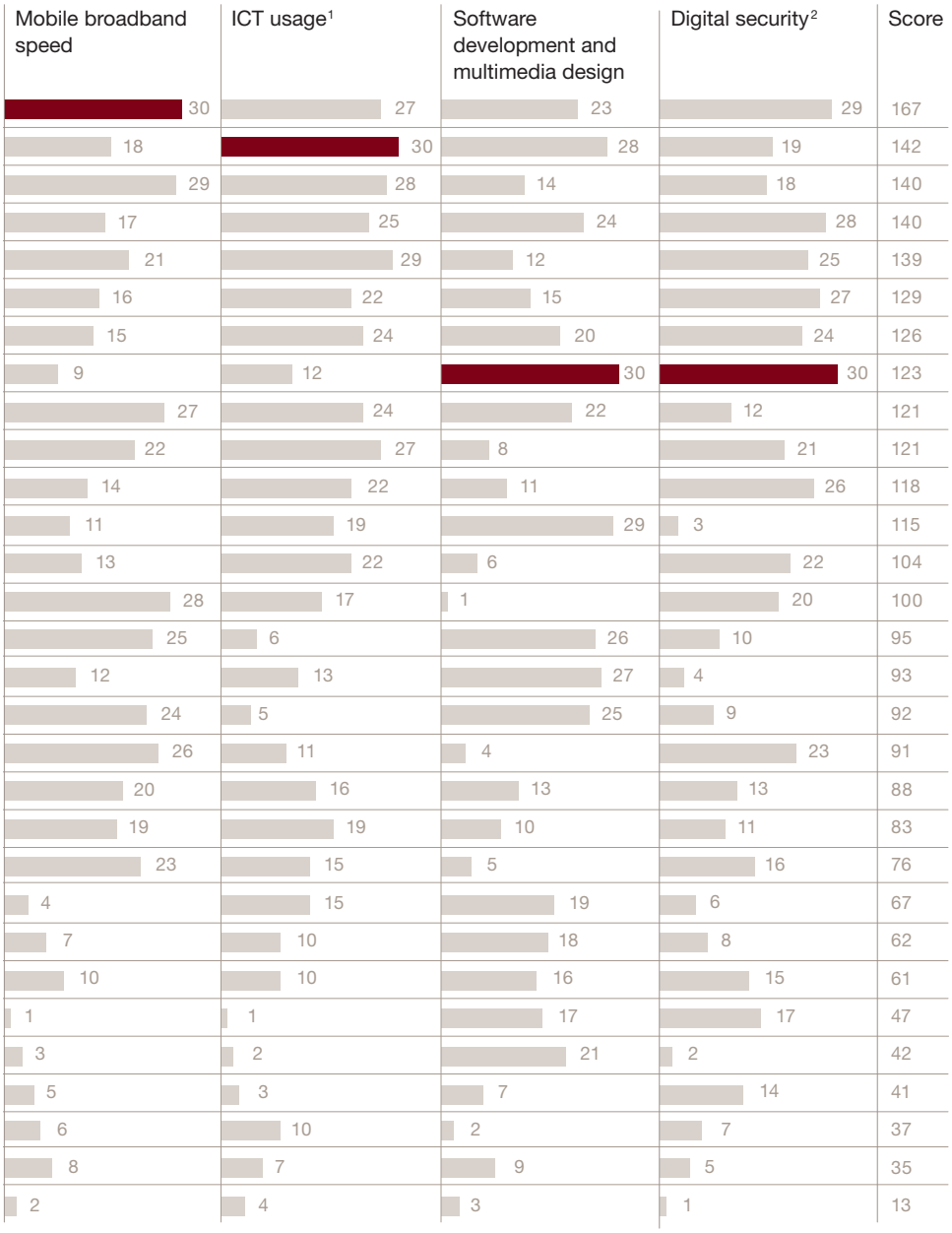
As for the other six cities within the top 10 both in our last report and in this one, London has gone from #1 in *Cities of Opportunity 6* to #2 here; Stockholm and Hong Kong have each fallen two places, from #3 to #5 and #4 to #6, respectively; and San Francisco has dropped slightly from #6 to #7. New York, meanwhile, has improved slightly, rising from fifth to tied 3rd place with Amsterdam, as has Tokyo, ascending from 10th place to eighth.

Two cities have broken into the top 10 since our last report: Paris and Toronto, moving up to tie for ninth after finishing #11 and #13, respectively in *Cities of Opportunity 6*. Conversely, two



American cities, Los Angeles and Chicago, both fell four places and therefore out of the top 10, dropping to #11 and #13, respectively.

There is one major casualty of this year's improved indicator, however: Although it was tied for first with London in *Cities of Opportunity 6*, this year Seoul falls to #12 in the rankings, mostly



Each city's score (here 167 to 13) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

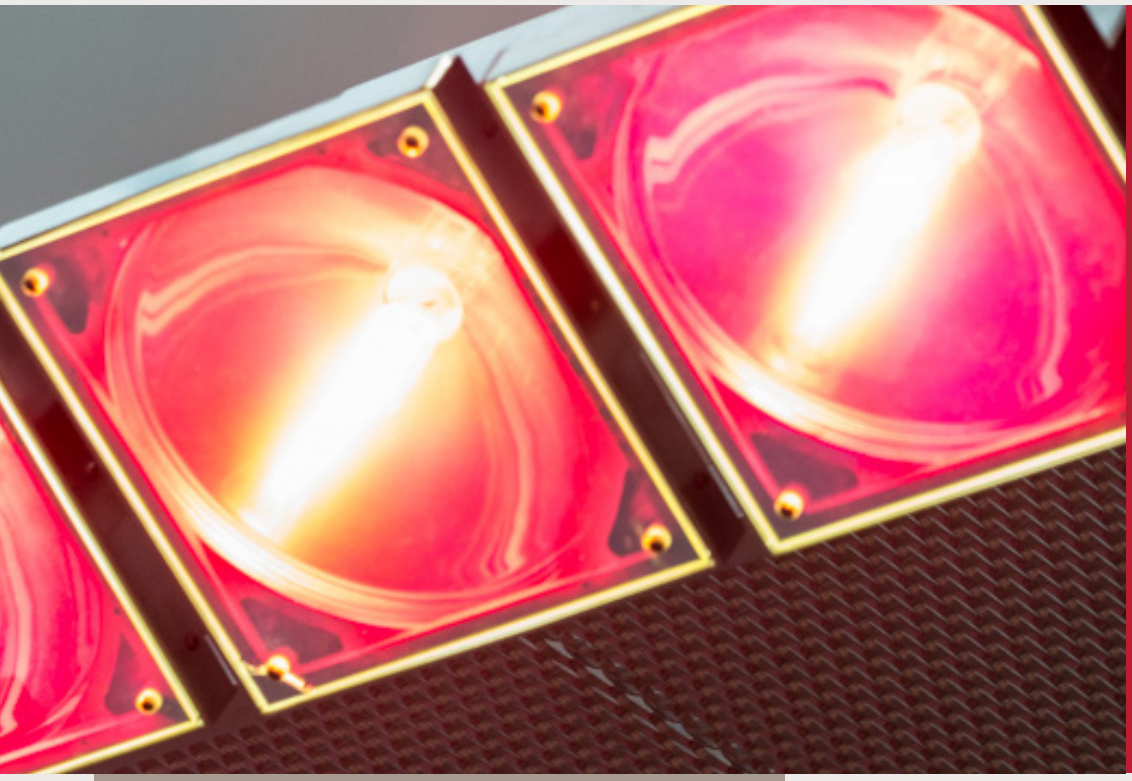
Highest rank in each indicator

* Country-level data

1. Sourced from Ericsson's Networked Society City Index 2014, the ICT usage score is based on three elements: technology use, individual use, and public and market use.
2. The Economist Intelligence Unit's Safe Cities Index measures a city's digital security based on factors such as dedicated cyber security teams (input) and the frequency of identity theft (output).

because it fell out of the top 10 in our three new variables (doing particularly badly in digital security, in which it currently ranks third from the bottom). On the other hand, Amsterdam, one of our new cities, immediately broke into the top 3 in this indicator.

New and revised measures for broadband quality, software development, and mobile broadband speed helped both Beijing and Shanghai rise 5 places to #15 and #17, respectively, since last edition.



Localized heating panels and people-sensitive cooling misters are two of many projects that use information to improve sustainability and quality of urban life.

Cities evolve as "computers in open air"

…and MIT's Carlo Ratti explores the potential for citizens and systems

Architect and engineer Carlo Ratti, director of MIT's Senseable City Lab, discusses the potential of smart cities and the need to develop bottom-up innovation ecosystems, as well as the enduring human need to share the physical space a city offers despite the possibilities of the virtual.

How do you define "smart cities?"

Here is a short definition: A smart city is a city that uses digital intelligence to improve citizens' lives. Over the past decade, digital technologies have begun to blanket our cities, forming the backbone of a large, intelligent infrastructure. Broadband fiber-optic and wireless telecommunications grids are supporting mobile phones, smartphones, and tablets that are increasingly affordable. At the same time, open databases—especially from the government—that people can read and add to are revealing all kinds of information, while public kiosks and displays are helping literate and illiterate people to access it. Add to this foundation a relentlessly growing network of sensors and digital-control technologies, all tied together by cheap, powerful computers, and our cities are quickly becoming like "computers in open air." In this context, we like to explore all of those applications that empower people—instead of focusing just on urban efficiency.

Why hasn't the digital age killed the importance of cities, of shared physical space?

Back in the '90s, many scholars speculated about the ongoing digital revolution's impact on cities and the possibility of replacing physical space with virtual space, or atoms with bits. They fantasized about the dark, sexy image of disappearing urban spaces, inhabited by individuals who would lead a mostly virtual life in cyberspace, engaging in digitally encoded interactions rather than face-to-face communication.

Yet, it became apparent in the years following the first wave of enthusiasm about "digitality" that this was not the destiny

> *Governments should use their funds to develop a bottom-up innovation ecosystem geared toward smart cities. Policymakers must go beyond supporting traditional incubators by producing and nurturing the regulatory frameworks that allow innovations to thrive.*

of either our digitally enhanced race or the constructed spaces and landscapes that accommodate our activities. In fact, cities have never prospered as much as they have in the past couple of decades. We are now living in a hybrid space, made of bits and atoms: a cyber-physical world. We do a lot of things in virtual spaces, but we still operate in the physical one. And we need cities to do the same.

What do you see as the roles of the public and private sectors, as well as collaboration between the two, in building smarter cities?

Governments should use their funds to develop a bottom-up innovation ecosystem geared toward smart cities, similar to the one that is growing in the US. Policymakers must go beyond supporting traditional incubators by producing and nurturing the regulatory frameworks that allow innovations to thrive. At the same time, governments should steer away from the temptation to play a more deterministic and top-down role.

When urban planners talk about cities, the approach tends to fall between two poles—technocratic or top-down solutions on one hand and vernacular or bottom-up ones on the other. Do you see a particular value in either approach?

The solitary, top-down, Promethean attitude of the architect has characterized most of 20th century architecture. Today, I believe that more collaborative approaches are coming back, rooted in Internet culture and in the new paradigms of online collaboration. We explore some of these issues in our latest book *Open Source Architecture*,[1] proposing the emergence of a "choral architect" who draws on participatory tools to shape design.

What do you see as the role of architecture in increasing the quality of urban life?

I side with Churchill: "We shape our buildings; thereafter, they shape us."

Looking at the economic side of city life, innovation and entrepreneurism are the engine of future prosperity in many cities. Do "smarter," more technologically savvy cities have an advantage in terms of generating new business growth?

A better and more efficient city is certainly a business attractor. Also, the city can become a "living lab" to promote the development of new startups. Think about the role that San Francisco is having today across the Bay Area.

What projects do you view as bellwethers for cities worldwide to follow in healthcare and medicine, where service delivery seems like it could be aided by urban density?

I am not an expert in medicine. However, I would like to mention a recent project we started at the MIT Senseable City Lab called Underworlds. We are sampling wastewater across several cities and analyzing DNA from viruses, bacteria, and humans. We aim to extract a new world of information on human health and behavior. The main benefits lie in the real-time aspect of the technology, providing insight into the diseases circulating in a community even before people themselves are aware of them. Think about it as characterizing a city's microbiome and potentially "seeing epidemics before they happen."

How about transportation?

Just a few thoughts on cars. Cars are idle 95% of the time, so they are an ideal candidate for the sharing economy. …[Sharing-enabled] reductions in car numbers would dramatically lower the cost of our mobility infrastructure and the embodied energy associated with building and maintaining it. Fewer cars may also mean shorter travel times, less congestion, and a smaller environmental impact.

Among the 30 cities covered in our study—and any others you view as models—do any particular cities most impress you with their approach to urban planning, technology, or design?

I always get this question! I would like to reply taking inspiration from Georges Perec's ideal home—split across all the *arrondissements* of Paris. So, I would say that my ideal city has the climate of Naples, the topography of Cape Town, the fusion cooking of Sydney, the architecture of Manhattan, the frenzy of Hong Kong and…why not?—the exuberant nightlife of Rio de Janeiro!

1 Carlo Ratti with Matthew Claudel, *Open Source Architecture*, Thames & Hudson, June 2015.

Learn more
A full-length version of this condensed discussion is available at www.pwc.com/cities.

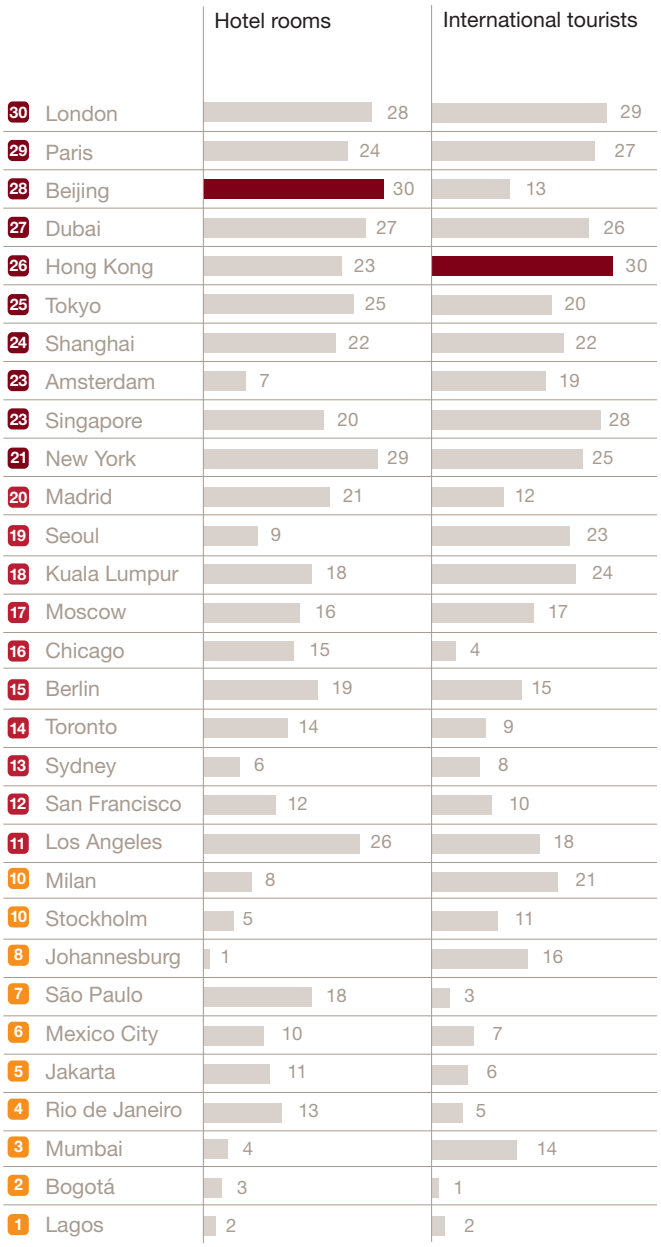
City gateway
London continues to lead as the world's hub

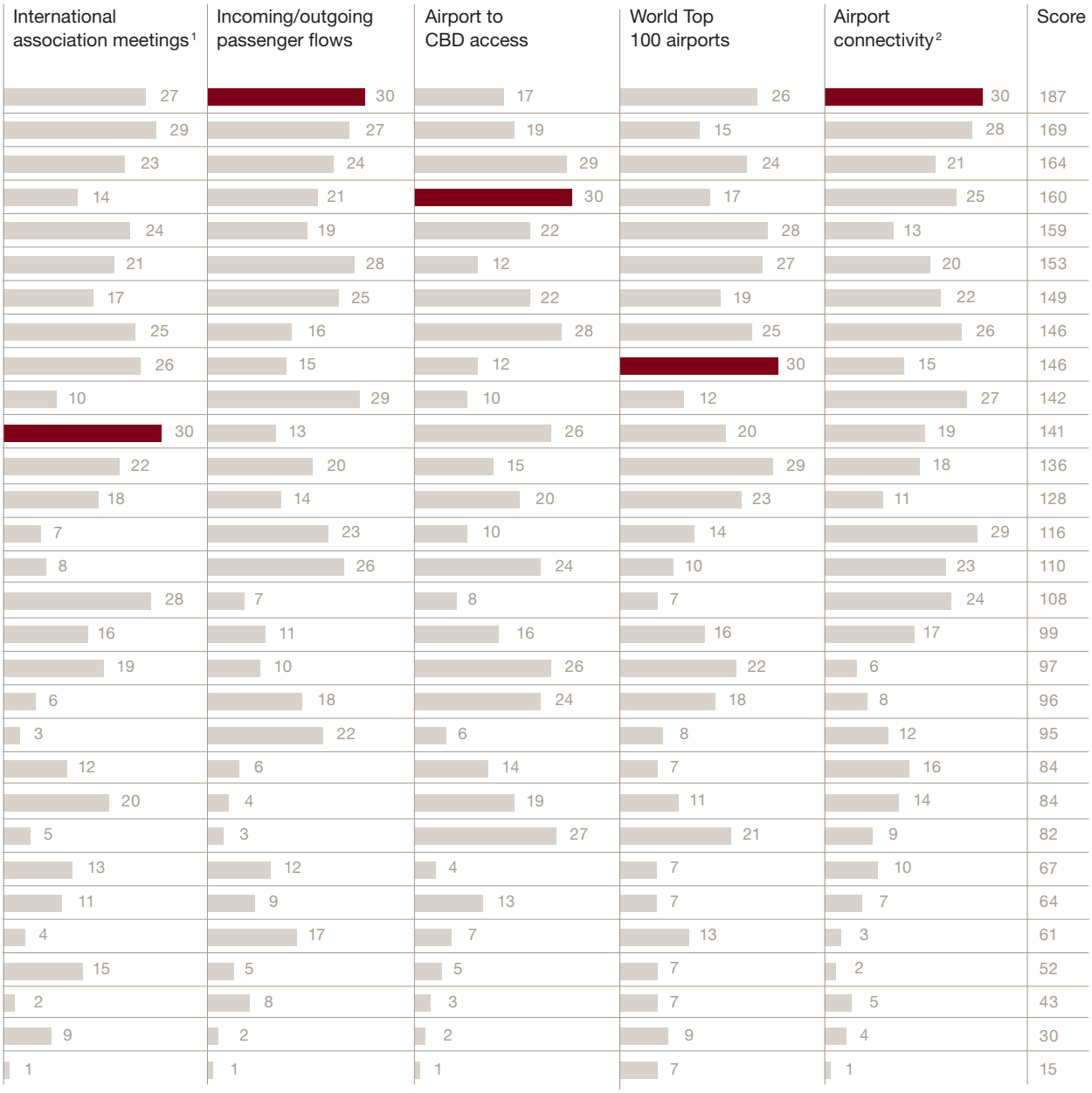
The major story in comparing cities as gateways to world travel is that London remains first in this indicator by a clear difference. As in *Cities of Opportunity 6*, the UK capital represents the supreme gateway city—not only to Europe but to many other regions of the world (Africa, the Middle East, and, for those flying west, the Americas) by a considerable margin based on data predominantly from 2014 and 2015. London's scores are impressive across the board here.

The other major story is Paris's success, as the French capital rises five places from #7 in 2014 to #2 this year. The big difference here is that the city performs very well in our new variable, airport connectivity, outscoring most other cities except London and Moscow. After leading in the last two reports, Paris goes #2 to Madrid in international association meetings (with growth now factored into our scoring equation). It finishes fourth in both international tourists and incoming/outgoing passenger flows, and is seventh in hotel rooms.

In terms of the data shaping this indicator in this edition, five of the seven variables remain unchanged. The last variable, airport connectivity, now replaces on-time flight departures because of the difficulties in gathering accurate and up-to-date data on that latter variable, as well as in interpreting (and standardizing) the multiple definitions of "on-time" performance used by various cities. In any event, nine of the cities that were in our top 10 in our last report remain here in this one, with the sole exception of Madrid, which falls from sixth place in 2014 to #11 this year. In notable moves, Beijing falls slightly to third place from second, Dubai climbs to fourth from eighth, and New York falls to 10th from its previous ninth-place tie with Shanghai.

In the case of New York, it continues a downward trend over the last few years. For many persons around the world, regardless of where they come from, New York remains the symbol of the gateway city. Yet, by our measures of global travel and tourism, it has been losing ground over the last three editions of our study. Meantime, Dubai rises in this category from last edition as the city gears up to receive 20 million tourists by 2020, the same year it will be hosting Expo 2020. On its path toward this objective, the city is strategically positioning itself as a global gateway through policies and capital investment programs to develop an ecosystem that provides a high-quality visitor journey. The city has put in place incentives to invest in new hotel capacity, and continues to operate a world class airport that is home to many successful airlines. In addition, the city has recently built upon this capacity further with the recent opening of another sizeable airport in South Dubai to accommodate even greater traffic.





Each city's score (here 187 to 15) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each indicator

1. A measure combining both the number of international association meetings per city in 2014 and the compound annual growth rate (CAGR) from 2009-2014. The meetings measured take place on a regular basis and rotate between a minimum of three countries. Figures provided by the International Congress and Convention Association.
2. A measure of the number of routes operating from the airports servicing a city, with greater weight given to international destinations.

Quality of life

No matter if it's effective transit, disaster preparedness, or senior wellbeing, the good life requires a shared, long-term commitment

Stockholm

From Adam Smith to John Stuart Mill to John Maynard Keynes, the essential point to economics has been enhancing "the good life" for as many people as possible. (It is often forgotten that Smith was professor of moral philosophy at the University of Glasgow and that his first great intellectual success, many years before *The Wealth of Nations*, was *The Theory of Moral Sentiments*.) Put differently, the basis for common wellbeing and prosperity begins with each urban resident's quality of life—which, ideally, should be part of a larger, and shared, wellbeing. The signs that every great city delivers on its responsibility to this shared wellbeing can be seen in the pattern of the results in our report.

When we correlate all our variables and indicators, we see that quality of living, senior wellbeing, housing, and natural disaster preparedness relate very strongly with a high overall score in the study, as well as with top performance in many indicators. This may seem surprising at first considering all the signs of economic and tangible achievement in our data, but, taking a step back, it makes intuitive sense. The true sign of a civilized society is how it cares for its most vulnerable and prepares for the worst, and how it addresses the most fundamental of human needs like having good shelter and enjoying life.

This section of indicators is the most important one of our three in understanding how to build the infrastructure that serves the public good. Its four indicators—transportation and infrastructure; health, safety, and security; sustainability and the natural environment; and demographics and livability—speak directly to the results of a number of urban policies in our 30 cities. It is also the one section that centers on the daily conditions of life for most of the residents of those cities.

This year, we have also focused in particular on natural disaster preparedness, which is especially hard to achieve but critical in a highly connected urban world. Cities face a sobering range of risks today. Extreme weather, potential pandemics, and manmade threats, such as terrorism, cyber-attacks, and nuclear accidents lead a long list of concerns. In addition to our preexisting variable gauging exposure to natural disaster, we've now added two new variables to this report. One compares preparedness for natural disaster, while the other measures urban threats to security and from disease.

If there is any good news in urban risk, it is that cities such as Tokyo and Amsterdam—famously vulnerable to the natural forces of the sea, wind, and earthquakes, yet among the most prepared to face them—show that it works to be aware, to think ahead strategically, to "sweat the details," maintain flexibility and vigilance, and engage the entire city. To shed light on the battle for disaster preparedness, we spoke with two leaders on the front lines: **Margareta Wahlström, the UN Secretary-General's special representative on disaster risk reduction** for seven years ending in 2015, and **Henk Ovink, the Netherlands' special envoy for international water affairs** and senior advisor to the US task force enhancing resilience after Superstorm Sandy. Their commentary is remarkably aligned on the need for cities to prepare thoroughly, plan pragmatically, and unite as communities. "Real resiliency makes you less vulnerable beforehand," says Ovink.

The true sign of a civilized society is how it cares for its most vulnerable and prepares for the worst, and how it addresses the most fundamental of human needs like having good shelter and enjoying life.

We've also intensified our attention to public transit, an area that increasingly tests cities as people and jobs sprawl beyond traditional boundaries, funding and jurisdictional challenges slow progress, and congestion freezes into gridlock. Therefore, in this edition, we aligned all measures of intracity mobility in our transportation and infrastructure indicator. And we took a step back to look closely at two cities at the intersection of the issues. **A panel of public and private leaders in Tokyo explains the dynamics** in the home of the *shinkansen* and of a transit system that pays its own way. **And from Toronto, Metrolinx president and CEO Bruce McCuaig** describes the hard road in managing transit in a fast-growing, fast-changing city.

Finally, as in every edition of this report, we step back from the hubbub of everyday city life to look at culture, an underpinning of urban life that is often underemphasized. This year, the creative and business leaders at the **Brooklyn Academy of Music tell us what it takes to make a cutting-edge performance space** in the New York borough that lies at the heart of the city's history and its future and what that effort means to the community as a whole.

Transportation and infrastructure

Urban mobility data top alters rankings, but Singapore retains the fast lane

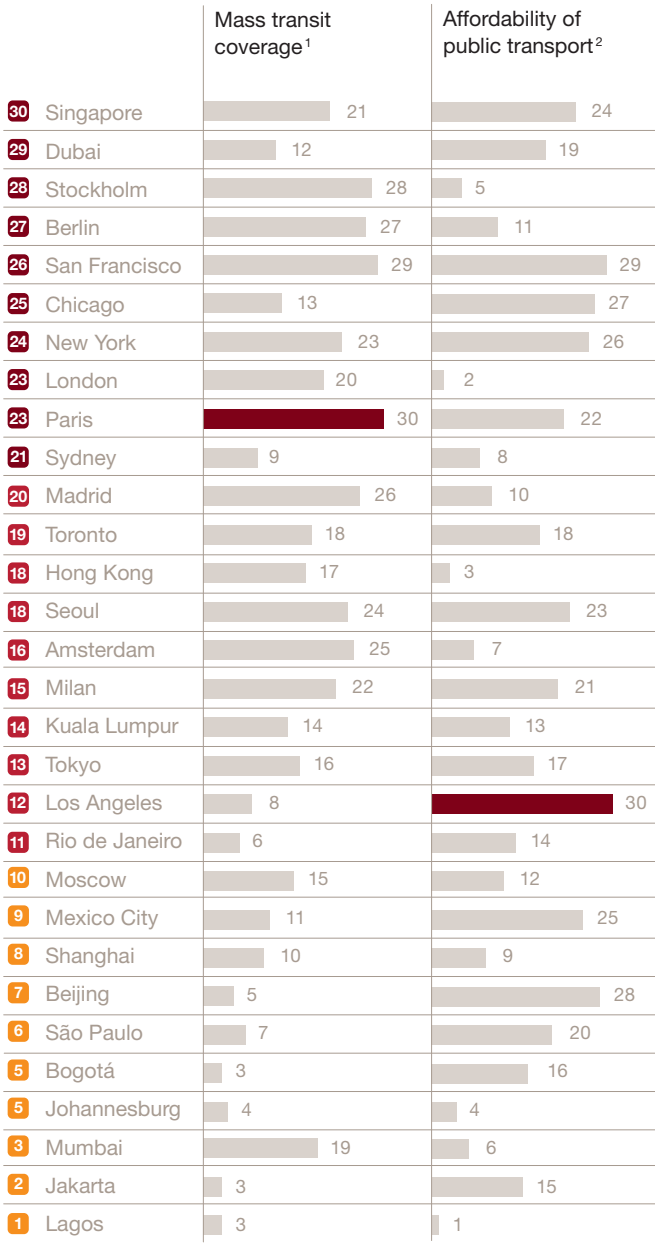
While this indicator has not undergone significant revision, it's been enhanced in a couple of different ways to complement our perspective on system engineering and efficiency and, thus, better reflect the reality of city life as experienced "on the ground." This has decidedly altered the ranking of our cities at the top.

What was straightforward "cost of public transport" in our previous editions has now been adjusted to reflect "affordability of public transport," gauged by the local average hourly wage to determine the amount of time a citizen needs to work to buy a rail ticket from the city's boundary to its central business district. While this trip offers a control across our cities allowing consistent comparison, we recognize that local travel patterns and discounts could create different affordability outcomes for any of our cities. For instance, in Sydney, Berowra is the outer station in the city train network to the north. Traveling from there to the city center costs more and perhaps draws less traffic than embarking from the closest major station (Hornsby), which some Sydneyites may even view as the "outer limits" of town. In addition, fare discounts and weekly caps on fares, such as the Opal fare card in Sydney, can influence affordability even further. Consistent and transparent benchmarking and a range of practical considerations, however, require a common formula and approach across our 30 cities.

In addition, we've moved two variables, traffic congestion and ease of commute, from our demographics and livability indicator, where they were in *Cities of Opportunity 6*, to this indicator now. Traffic congestion and ease of commute clearly affect a city's livability. Dialogue with business and government leaders around the world has, however, stressed the value in bringing all issues of urban mobility and transport together so they can be examined and assessed as a whole—as they would be by decision makers evaluating urban infrastructure for business location and investment. We also removed a variable measuring the efficiency, reliability and safety of public transport systems to avoid overweighting the issue with the factors included in other measures such as mass transit coverage.

This refinement of the indicator has led to a considerable realignment. While six of the cities currently in the top 10 were also in that group in our last report, a deeper analysis, shows that the integration of urban mobility data has altered relationships and rankings for cities including Dubai, Stockholm, Berlin, San Francisco, Chicago, New York and Sydney moving up and London, Paris, Madrid, Toronto and Seoul moving down.

Singapore still performs best with system engineering and practical results reinforcing each other and top housing adding to the mix (where it tied with Sydney as in last edition). But Dubai has improved markedly, rising from #10 in our last report to #2 in this one, scoring #6 in traffic congestion and housing, and #8 in ease of commute. Third-place Stockholm has sailed ahead from #8 in our last report, driven by excellence in ease of commute and traffic congestion, the two variables moved here from demographics and livability.



See **Transportation and infrastructure**, page 96

Licensed taxis	Major construction activity	Housing	Traffic congestion	Ease of commute[3]	Score
22	26	30	30	21	174
19	30	25	25	23	153
27	9	24	29	30	152
8	13	28	26	29	142
9	9	22	15	28	141
12	18	21	22	26	139
5	23	20	14	22	133
13	27	24	24	20	130
28	4	16	17	13	130
3	24	30	28	27	129
24	7	18	23	19	127
6	19	28	19	18	126
11	29	16	21	25	122
26	11	12	10	16	122
20	2	19	20	24	117
18	3	16	18	17	115
29	16	10	16	12	110
17	17	17	12	10	106
1	25	28	7	4	103
23	28	7	11	6	95
21	23	3	4	14	92
30	7	7	1	9	90
7	23	12	13	15	89
16	7	10	9	11	86
10	23	8	3	7	78
25	14	4	8	5	75
4	12	16	27	8	75
15	15	2	5	2	64
14	10	7	7	3	59
2	1	1	2	1	11

Each city's score (here 174 to 11) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each indicator

1. The kilometers of mass transit track for every 100 square kilometers of developed and developable land area within the city's strict municipal boundaries.
2. Average wages are factored to reflect the amount of time an average citizen has to work to be able to buy a single rail ticket from the central business district (CBD) to the city boundary.
3. PwC employees in each of the firm's offices in the 30 cities were instructed: "On a scale from 1 to 10, where 1 is difficult and 10 is easy, please rate your commute to work." Data provided by the PwC employee survey conducted for the *We, the urban people* study.

Where the rubber meets the road

Knitting together the mix of metropolitan transit requires artfulness to keep up with people, businesses, and budgets

Getting where you're going is at the core of modern urban life. On city streets themselves, few issues drive as much interest.

From a business perspective, Jacob Wallenberg, chairman of Investor AB, tells us good transit is one of Stockholm's priority needs. "When Ericsson [one of Investor's companies] tries to recruit international, highly educated people in Stockholm, those individuals look at the city, as well as the workplace. They look at transportation, schools for their children, cultural life, and sports—the whole life picture." For the city itself, he adds, "There are a few absolutely fundamental issues, and this goes for most cities. In Stockholm, we have the whole question of traffic. We are underinvested in infrastructure. This is in the process of being addressed, but we have to see more action. There is a lot more that can be done." Gaku Suzuki, senior officer of Hitachi Rail Systems, echoes Wallenberg's thought. "[Hitachi] operates globally. And infrastructure is the most significant factor [in determining company locations]. We like to establish our offices where our employees can commute easily, so we choose cities with good transportation infrastructure."

Among city officials themselves, in Jakarta—where our last edition calculated PwC professionals lose a list-topping 20 days commuting each year—Governor Basuki Tjahaja Purnama (popularly known as Pak Ahok) tells Julian Smith, PwC's lead global transportation partner, that the city's "infrastructure goals begin with providing better mass transportation. Regarding traffic jams, I cannot stop people from purchasing cars. Jakarta now has 17.5 million vehicles, including 13 million motorcycles, because we cannot provide low-cost transportation. This June [2015], we will establish one company as a provider of low-cost transportation. By the end of 2016, integration of all transportation systems will be accomplished."

For the public, complaining about the daily commute can seem like an urban team sport (unless one is walking or bicycling as part of the trip, where 15,000 PwC professionals reported finding the greatest satisfaction in our last edition). Bruce McCuaig, president and CEO of Metrolinx, created in 2006 to coordinate and integrate all modes of transportation in the greater Toronto region, explains that "transit is such an intensely personal thing that everybody has an opinion. And in a region of 6.6 million people, there are 6.6 million opinions about how to solve the problem."

No yellow bricks mark the road to urban transportation success. Each city faces its own challenges—organizing the system so downtowns, expanding metropolitan areas, and customers all feel well-served; planning for growth or contraction as shifting economic and employment, migration, birth, and aging patterns alter public transit needs; structuring fares, subsidies, and payment mechanisms easily and fairly; sustaining investment in development and maintenance over time; assuring frequent, reliable, safe, and convenient travel; improving the commuters' journey and attracting more riders; artfully balancing local options among rail, subways, light rapid transit, cars, bikes, and walking, and nodes connecting the legs of the trip; and finding the best ways to measure success, so leading practices and sore spots are easy to discern.

Knitting together a seamless metropolitan public transit mix bedevils cities with population and jobs sprawling far beyond traditional city borders. People are also moving to new areas unserved by public transit, adding cars to the congestion. Improving the transit situation is hard—requiring long-term funding and focus, alignment among administrations in cities and suburbs, and the ability to build a public network that offers convenience to most today, flexibility and foresight for tomorrow.

Toronto tells the story for many developed cities: Our #3 overall city this year behind London and Singapore, fast-growing Toronto is strong in many quality of life variables. Yet, when public transit ridership satisfaction is measured, the city scores at 13th in ease of commute and 12th in traffic congestion. Neither fixed rails nor roads engineered for the long term or resources and institutions that move at their own pace can keep up with the city's dynamic population and job patterns. Investment has lagged in recent

decades, as it has in many cities. It is difficult to raise long-term funding and maintain consensus among the over 30 regional municipalities with changing administrations.

"The story of Toronto is the story of a lot of metropolitan regions," Bruce McCuaig of Metrolinx tells *Cities of Opportunity* in a discussion with Stephen Martin of PwC's Toronto public sector practice. "We maintain a very vibrant downtown core. But we also have seen half to more than half of population and employment growth occurring outside the city of Toronto…What we haven't done in this region over the past 30 years is really serve the growing market of people connecting from a suburban residential location to a suburban employment node…We basically do not provide an efficient transit solution for those people. In essence, what we've done is forced these individuals to travel by car…It's not one solution fits every situation. You actually have to have a suite of solutions to apply to the kind of community you're serving…The two kernels of our plan [are] to increase our capacity to come to the traditional downtown area but also to start connecting all those nodes that are occurring in the new urban areas around the region. That way we start to give people choices."

"We should not have the cost/benefit discussions solely based on transport but need to look at the overall social benefit provided by transport," says Masashi Mori, mayor of Japan's only city in the Rockefeller Foundation Resilient Cities Network.

Private, profit-making ownership of transit sets Japan apart from many areas of the world—as does its preparedness for disaster and forward-looking adaptation of public transit to cities with shrinking population bases and many more seniors. According to Masaki Ogata, vice chairman of East Japan Railway (JR East), the private company that runs trains, buses, stations, and shopping areas in and around Tokyo, the business is able to operate without taxpayer subsidies because the "lifestyle services model" yields profits. And the high quality of service keeps 17 million passengers traveling on JR East every day. But a key to high ridership may be the convenience mapped into the network. "In Japan, and urban areas in particular, you can reach a railway station if you walk 1.5 kilometers at most. So, if you think about commuting for work, this provides a city where you can solely rely on railway as a means of door-to-door transport. The network is highly developed, which is very important," says Ogata.

With Japan at the leading edge of demographic change, its cities are also pioneering new approaches to the transit and infrastructure mix. Toyama, a coastal city 300 kilometers northwest of Tokyo, offers a case study in reimagining transit and quality of life benefits to better suit new demographics. According to Mayor Masashi Mori, "I believe the issue of aging and decreasing population triggered a significant turning point when considering the opportunities offered by cities. Regional cities are finally realizing that merely building roads and increasing car traffic are insufficient. I think renewing public transport is becoming a major issue." He adds, "We should not have the cost/benefit discussions solely based on transport but need to look at the overall social benefit provided by transport."

In the land of early urbanization and natural disaster, public and private Japan collaborates

…in pursuit of safe, convenient public transport as a pathway toward good quality of city life

Japan led the way in 20th century Asian urbanization, developed dense but livable cities in a region prone to natural disasters, and unveiled the world's first bullet train (or *shinkansen*) in 1964 connecting Tokyo and Osaka. Today, the commitment to seamless, environmentally friendly public transport remains strong as the nation's population ages, birth rate declines, and the need to maintain cutting-edge disaster preparedness endures. To understand the urban transportation dynamic, Yumiko Noda, head of PwC's Cities Solution Centre in Tokyo and former deputy mayor of Yokohama City, held a discussion among four leaders in Japan's urban transport mosaic. Kisaburo Ishii served through 2015 as vice minister of Japan's Ministry of Land, Infrastructure, Transport and Tourism (MLIT), the highly regarded national planning agency. Masaki Ogata is vice chairman of East Japan Railway (JR East), the private company that runs bullet trains, as well as a wide range of passenger and freight lines, buses, stations, and shopping areas. Gaku Suzuki, senior officer of Hitachi, Ltd., Rail Systems Company, adds the perspective of a global company at the forefront of transportation hardware and software development. Finally, Masashi Mori, mayor of Toyama City since 2002, has spearheaded that city's efforts to become more compact, with user-friendly public transport serving as a catalyst toward a better urban life for all, as recognized by the Rockefeller Foundation's choice of Toyama City as Japan's only member of its 100 Resilient Cities network.

Mr. Ishii, how does the Ministry of Land, Infrastructure, Transport and Tourism view infrastructure policy in terms of enhancing city life?

KI: Both transport and communications infrastructure are essential, minimum requirements for the presence of superior corporations and cultural leadership. But developing excellent infrastructure by a single corporation is rather difficult, and that makes public sector cooperation necessary.

What role has Japan Railway played in urban development for Tokyo and Japan?

MO: In Japan, the private sector has consistently built transport infrastructure. People overseas are surprised when I tell them that JR East has many competitors in Tokyo. They assume that it has a monopoly. I say, no. There are many competitors. They are all private enterprises. And they own and operate the infrastructure.

> *Aging and decreasing population triggered a significant turning point when considering the opportunities offered by cities. Regional cities are finally realizing that merely building roads and increasing car traffic are insufficient. Renewing public transport is becoming a major issue.*

Clockwise from left: Tohoku *shinkansen* bullet train; New Yamanote Line train in Tokyo; multipurpose tower building at JR East's Shinjuku station; JR East's ecute in-station retail facilities.

How does a private enterprise view investment risks related to town planning and building transport networks?

MO: The Japanese private sector has its own business model. It's been dubbed the Ichizo Kobayashi model by some [after the early 20th century founder of Hankyu Railway, as well as its related retail, entertainment, and residential businesses]. Particularly with respect to railways and cities, an extremely close relationship has developed.

The Japanese model is unique. It's not just railways but a lifestyle industry involving department stores and malls.

MO: One of the reasons the Japanese model succeeded was the long and narrow geography of Japan, where the population is concentrated in the plains. The private sector also played a huge role with its aim of being autonomous. In Europe, the sources of income involve the transport fare with the shortfall covered by taxes. However in Japan, basically, urban railway businesses are operating without subsidies. Development of the non-railway business, including the lifestyle services model, is a necessary consequence. Another point is that quantity changes quality. Our company carries 17 million passengers every day, and they are our assets, our valued customers. By carrying such massive numbers of passengers safely, quantity changes to quality. And it leads to my last point: We have the most demanding customer base in the world, and that helps us establish and adhere to the strictest requirements.

Mayor Mori, how does infrastructure help to improve Toyama City's livability and competitiveness?

MM: I believe the issue of aging and decreasing population triggered a significant turning point when considering the opportunities offered by cities. Regional cities are finally realizing that merely building roads and increasing car traffic are insufficient. I think renewing public transport is becoming a major issue.

Mr. Suzuki, how does Hitachi view the significance of urban infrastructure?

GS: We operate globally. And infrastructure is the most significant factor [in determining company locations]. We like to establish our offices where our employees can commute easily, so we choose cities with good transportation infrastructure.

What is the national government's approach to infrastructure policies as we enter an era of contraction from aging and a lower birth rate?

KI: During the high-growth period, we aimed for well-planned solid execution, preparing five-year plans every period. Now that we are entering a mature period, the issue is how to use infrastructure wisely; how to use the existing facilities efficiently, and as they grow older, how to maintain and manage them. More important, another issue is recognizing that public transport infrastructure may actually have become too broad. The mayor of Toyama City is making significant efforts in this area by performing a review not only from the perspective of public transport but also from the overall city vision, making it more compact in the current mature phase.

Mayor Mori, please tell us about Toyama City's specific "compact city" measures.

MM: In the past, we were committed to making an automobile-based society. Now we probably average one car per person. This may have been acceptable in a certain era; however, we have become spread out, and single-person elderly households left in a sprawling suburb have become a reality. Knowing that the population will decrease further, if we continue on the path of diffusive town planning, the burden on each person will increase significantly. We have been working 12 to 13 years motivated by the idea of investing to make public transport user friendly and high quality. We wondered if this could trigger a change to people's lifestyles. If we can gradually induce people to live where there is convenient transport, it will reduce the future burden on citizens. With this in mind, we have been promoting investment in transport, inducing residence in areas with convenient transport, and enhancing the appeal of the central business district—all three at the same time. When we started planning, 28% of the population lived in the recommended residential area. In the future, we would like to increase this to about 40%.

But many cities consider transport and other infrastructure separately.

MM: As the population decreases, it is important to engage people in various positions to realize one policy goal. It is also important to focus on one project creating a range of related benefits. And we should not have cost/benefit discussions solely based on transport but need to look at the overall social benefit provided by transport.

In Japan, regardless of your wealth, everyone uses the railways. I believe this may be unique.

MO: I think the Japanese model was correct as created by the pioneers who started building the railways merely five years after the Meiji Revolution [the 1868 restoration of Imperial rule that fueled Japan's emergence as a modern nation]. Southeast Asia, for example, has built a society centering on roads or highways. It was the same in the US. The US had close to 2,000 km of railways in Los Angeles but stripped them all off, replacing them with a highway model, and now everyone wants public transport again. But once a highway model is built, it's not easy to replace the social infrastructure.

Mr. Ishii, can you expand on the nation's transit-oriented development in terms of its success factors and explain why Japan was capable of making it happen?

KI: Japan may have been lucky in some aspects. Japan had megalopolises before serious motorization happened. But New York, for example, experienced considerable motorization during the city's development process. Japanese public transport was constructed well because our large cities were built when public transport was necessary. When considering a large city in terms of density of stations, I believe Tokyo has the most convenient public transport system in the world.

JR East manages the public transport of Tokyo, an extremely dense megacity. What are the critical success factors?

MO: For urban railway management, safety forms the foundation of trust and continuity. Then, naturally in terms of management, quantity changes quality or the nature of the challenge. We have mass transport with a degree of detail in operation that is rare in the world. Considering the high density, and with many customers taking the same train during morning rush hour, the operation cannot be managed without accuracy. A well-planned train schedule will not provide transport capacity if it is not carried out precisely. It must be quick and accurate. That is why I mentioned that volume changes quality. Of course, safety definitely comes first, but, second, I believe operation of dense, mass transport reliably on a daily basis requires a very significant management factor. And, third, but naturally, is the network. In Japan, and urban areas in particular, you can reach a railway station if you walk 1.5 km at most. So, if you think about commuting for work, this provides a city where you can solely rely on railway as a means of door-to-door transport. The network is highly developed, which is very important.

With the aging society approaching, I believe the horizontal, vertical, and psychological barrier-free access, or what I like to call "3D smoothness" is critical, and might be the key. It incorporates direct intercompany connections, escalators, elevators, barrier-free access, and smartfare and money cards that cross all systems.

How does management enhance safety and punctuality in Japan?

MO: JR East is a profit-making private enterprise, with investment capacities. Whether it is providing safety or punctuality, carrying passengers at great frequency, or improving comfort and capacity in urban areas, they all require investment capacity. Until now, we have made profits, returned some to the shareholders, and as we still have debt assumed from JNR [the predecessor company], we are repaying this and still have room to make investments. Other Tokyo railway companies that always operated in the private sector are all capable of making investments. I think this is very important.

"

In Japan, and urban areas in particular, you can reach a railway station if you walk 1.5 km at most. So, if you think about commuting, this provides a city where you can solely rely on railway as a means of door-to-door transport. The network is highly developed, which is very important.

User-friendly, attractive transport systems are becoming more important both for elderly residents and tourists. How are we handling this from a national policy perspective?

KI: The most obvious measure is implementing barrier-free access to reduce steps and stairs. This will not only be for the elderly but a universal benefit, including foreign travelers and people with disabilities. Software is another important point. We are developing smooth connections from the very first point of entry and an intuitive system that will provide information on how to get to where you want to go. Another point is how to promote health in the transport system. In metropolitan Tokyo, with the development of ring roads and public transport, private traffic is clearly decreasing. The next step is to reduce road lanes and offer space for pedestrians or cyclists.

There must be some challenges in building the consensus to narrow auto roadways and convert to bicycle lanes.

KI: The important point is to share with the public the town planning vision corresponding to economic and social trends. It's fine to have objections. But you must have a consensus on the general direction shared by the administration, corporations, citizens, and experts.

I understand that Hitachi is developing transport systems using big data analysis.

GS: We are trying to use big data for predictive, preventative maintenance. Primarily, it involves carriage maintenance. Various sensors will be installed on carriage equipment during maintenance, to gather information on operations, which will be analyzed at the depot. To give another example, we are currently

From left to right: Gaku Suzuki, Masashi Mori, Kisaburo Ishii, Masaki Ogata, and Yumiko Noda.

working with JR East to use Suica [smartfare card] information on where people are concentrated, or the flow of people, to decide where stairs should be located.

Japan experiences a large number of natural disasters. What is MLIT doing to create infrastructure that is resilient?

KI: March 11th, 2011 [the Great East Japan earthquake], was a serious disaster. To have overcome it with the damage we experienced, from a global viewpoint, illustrates Japan's significant resilience. But, of course, so many people lost their lives that our own resilience was not sufficient. In this respect, the Ministry of Land, Infrastructure, Transport and Tourism had tried to contain everything with infrastructure hardware, but we came to the understanding that there will always be things that are beyond the scope of assumption. We asked what measures we should take using predictive software. There was discussion about big data, and we actually gathered a large amount of data from March 11. Resilience is absolutely not about the likelihood of a disaster. It's about how to deal with disasters, whether the city is defensible. Or when a disaster occurs, how quickly the city can recover from it. I believe that Japan will be able to send messages out to the world as a leading issue resolver.

How is JR East building transport networks that are resilient to natural disasters?

MO: As countermeasures against an earthquake, for example, four technologies have been implemented for the bullet trains in order to avoid civil structure breakdowns, stop quickly, prevent derailing, and keep the train moving straight even after a derailment. I believe these measures themselves are very resilient. However, in a broader sense, when considering natural disasters, we must create an organization, society, and nation that is very resilient in the face of a disaster. To that end, we need education and training.

What measures is Toyama City taking to prepare for disasters, including hardware and software solutions?

MM: We've now reached a rare cooperative relationship in which about 300 hectares on cooperating farms have reduced the size of drain outlets. By doing this, the rice fields act as temporary dams and prevent flash flooding. This, in turn, prevents urban flooding downstream. In addition, Toyama was the only city selected from Japan by the Rockefeller Foundation [to join the 100 Resilient Cities network]. In our case, we were recognized for the measures taken to increase the number of healthy elderly citizens by reinforcing public transport, increasing the opportunity for excursions for the elderly, and enhancing the appeal of the regional community. It may seem like a roundabout way of doing things, but enhancing civic pride is essential. As a result, the appeal of the city increases, which, in turn, will attract people and corporations.

From the perspective of JR East's long and highly regarded dedication to excellent transport, what closing words can we provide based on Japan's urban experience?

MO: Globally, discussions frequently turn to lack of funding. But when I listen further, actually the funding is not necessarily unavailable. The real issue is the lack of good planning. Then in terms of urban infrastructure, each city has its own characteristics—it may be geographic, or the urban development stage, or the connectivity with surrounding areas. So, preparing a feasible plan that matches the city is critical.

Learn more
A full-length version of this condensed conversation is available at www.pwc.com/cities.

Clockwise from left: GO train with partial Toronto skyline and Bruce McCuaig, at a construction site and in his downtown office.

Transit challenges grow as downtown Toronto blends into a wide metropolitan area

…and Bruce McCuaig of Metrolinx describes the process of knitting together an effective system

With major urban centers fusing into suburbs and even nearby cities, metropolitan regions need to be networked within themselves and with the downtown core to maintain effective public transit. Toronto offers a good example of the challenges many cities face and the solutions they're pursuing. Here, Bruce McCuaig, president and CEO of Metrolinx, explains to Stephen Martin of the PwC Toronto public sector practice, the complex mosaic of communities and transit planning choices that his agency, created in 2006 to improve coordination and integration of all modes of transit in the Greater Toronto and Hamilton area, is facing.

What part of the Toronto transit picture is urban, what part is outlying cities or suburbs, and how do their needs differ?

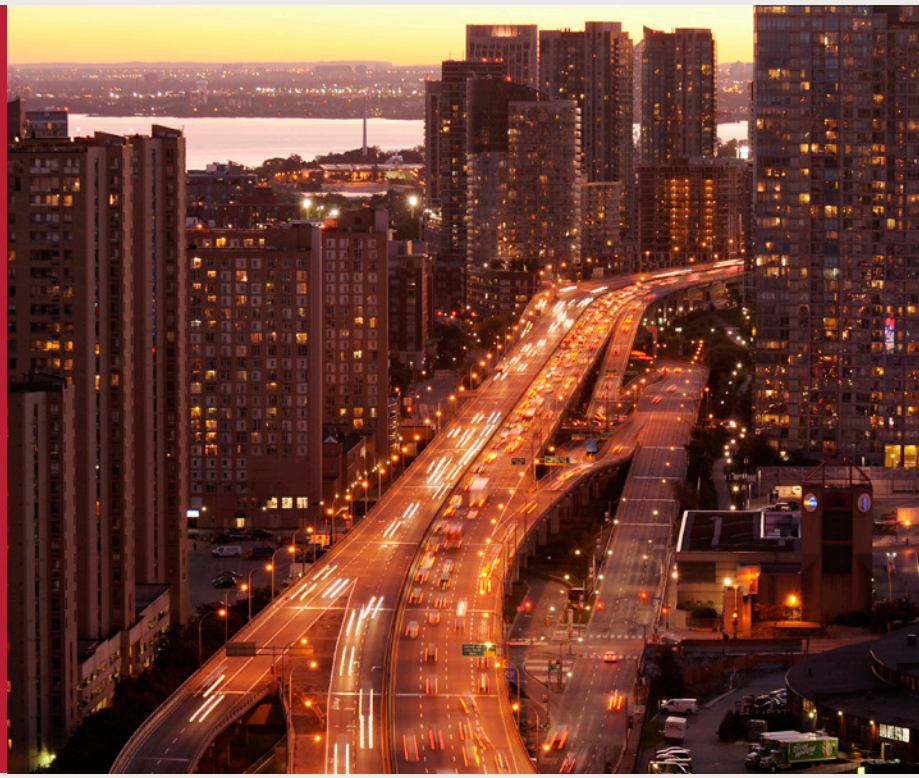
The Toronto region currently has a population of about 6.6 million, and it will be growing to about 9 million by 2031. It's adding to the region about 100,000 people each and every year. And about half of that growth is occurring not in the city of Toronto but in the areas that are around Toronto. The story of Toronto is the story of a lot of metropolitan regions. We maintain a very vibrant downtown core. But we also have seen half to more than half of population and employment growth occurring outside the city of Toronto.

What we've built up over the past 100 years in this region is a rapid transit system that's pretty efficient if you happen to live near a subway station or you happen to live near a GO Transit station [the regional public transit service for the Greater Toronto and Hamilton area]. But what we haven't done in this region over the past 30 years is really serve that growing market of people connecting from a suburban residential location to a suburban employment node. In essence, what we've done is forced these individuals to travel by car.

So, the travel patterns have changed?

Absolutely. Our demand for mobility has grown significantly. People want to get everywhere, anytime, as quickly as possible. And my impression is that human beings' need to travel is only growing, so that's been one part of the challenge.

“The story of Toronto is the story of a lot of metropolitan regions. We maintain a very vibrant downtown core. But we also have seen half to more than half of population and employment growth occurring outside the city of Toronto.



The Gardiner Expressway and downtown Toronto.

Do you think that Toronto’s transit picture is very different from other cities or more typical?

The challenge that Toronto has is that we’ve had about 100,000 people per year moving into the region. That’s been pretty consistent over 30 years. I’m not sure how many regions or cities in North America are growing this fast. We have two challenges: One is we did not invest in transport infrastructure for about 30 years, so we have to catch up to that 100,000 relentless number of people coming every year. And second, because the people are still coming, we have to keep up.

Do you think it’s economically feasible to give public transit alternatives to cars in this scenario?

Absolutely. I don’t think we have any other choice because with that growth, with that propensity, more people want to travel more. And we aren’t building any more road space. The solutions are not in mixed traffic because when you mix traffic, it slows down the operating speeds, reduces the reliability, makes it less comfortable for the customers. The transit solution in these suburban locations is not the traditional urban, high-density, heavy capacity system. But the alternatives are still reliable, comfortable, fast services. And those systems include car systems, transit systems. It’s not one solution fits every situation. You actually have to have a suite of solutions to apply to the kind of community you’re serving.

What would it take to actually realize that vision?

I would say the first thing is that transportation people tend to focus too much on transportation, when actually we solve most of our problems not by providing more service but by changing the way in which we arrange our services and changing the way in which people use our services. So, that goes to land use, and that goes to demand management. I would say over a 10-year period, we can get the most effective gain in the efficiency of how we move people and goods by looking at those two factors.

Do you think the balance of power in the city of Toronto and the broader Toronto metropolitan area needs to change so the city and the metropolitan area have more funding authority, more self-determination?

We need a stronger regional voice. When we think about economic growth and economic power, these are regional agglomerations, and we don’t have the institutional framework in North America to look at our systems on a regional basis. And it’s not just transportation. It’s economic development; it’s other forms of infrastructure; it’s conservation and recreational assets.

Are there really great transit modes you lean toward using or do you think the suite of transit modes depends on the fabric of the city?

You need it all is my key point. We have to expand our subway. We need to expand our light rail transit systems. We need to expand our bus systems, too, because the first mile and the last

Construction on the Union Pearson Express airport rail link rises above highways.

> *If you can't effectively serve people in that first or last mile, it doesn't matter how rapid your transit service is because people aren't going to use it.*

mile of every trip are pretty important parts of the trip. If you can't effectively serve people in that first or last mile, it doesn't matter how rapid your transit service is because people aren't going to use it.

Are you adapting any special ways to make public transit easier and more appealing?

Yes. We need to appeal to the broadest possible audience. We need different fare products. We're implementing a smart card-based system in this region right now that is going to be evolving to a mobile payment environment in the future. So, we need to make sure that we're evolving our fare policies. We have 10 fare policies in the Greater Toronto and Hamilton area right now, but we don't have an integrated fare solution. Once we've got the technology in place, I think our next step is to design a regional fare system and implement that on the technology platform that we've developed because, again, people are crossing municipal boundaries all the time. We shouldn't make a municipal boundary be a barrier to taking transit. And it is right now. We shouldn't make people pay two fares simply because you're crossing some invisible line in the ground.

So today it's not a seamless journey.

Right now, we're in the midst of implementing one card that gets you everywhere. That's a first step. But if that's all we do, I don't think that goes as far as people want. I think it's time to move away from having ten fare systems to having one fare system. And in the end, that's what our customers are looking for; that's I think what the region is looking for.

Regarding planning and the land use, does agglomeration at transit nodes fit in at all to decisions on where you would put a station?

Yes. We have an initiative that we started over the past five years that we call mobility hubs. We take these points where transit systems intersect—and transportation in the broadest sense, not just public transit, but active transportation like cars, trucks—and package it up with the land use in those areas. We're trying to do a complete solution that integrates people's experience of living and working in that space, as well as how they move in and out of that space. We've taken about 50 sites around this region, identified them as mobility hubs, and we're doing detailed planning in partnership with municipalities so that as we build out our transit system, we get more development. We're also in partnership with the development community as we're talking about those sites.

Do you think lack of maintenance is an issue for many cities? And do developed or North American cities need to spend some money on building infrastructure?

I would say yes to all of those things. Going back to one of my original hypotheses, we stopped building for about 30 years, not just in the Toronto area but in North America generally. That has had a significant impact on the fundamental capacity of the systems. One of the areas where we still have a challenge is life cycle maintenance. Once you build an asset and absorb that significant cost, you're only about halfway home. Over the next 50 or 60 years, you have to invest probably the same amount of money to keep it going and operating.

A GO Transit train runs alongside Toronto traffic; the new Union Pearson Express train linking Pearson Airport and downtown Toronto

It's sometimes easier to get governments to commit to a brand new project than it is to get them to commit to the maintenance and operating dollars you need to actually keep the system going over the 50 years that you've got that asset in place. Now, one of the things we've been trying to do as an organization is, every time we go to government and say that we want to build this and it's going to cost this much to build, we also say it's also going to cost this much to maintain and operate, and we need commitment to some of those numbers at the beginning in order for us to be strongly committed to the project. Because the worst thing to do is to build a project but not be committed to maintain it and operate it the way you should over its life cycle.

Do you think the Toronto regional area would gain in any way by turning over operations to a private transit company?

We do a lot of things using public-private partnerships in this region, so we don't necessarily privatize. By using a public-private partnership environment, we have been able to bring innovation to certain kinds of projects, discipline in terms of budget, and discipline in terms of schedule. Those are the three real benefits.

It seems to me that generally, in any city in the world, complaining about transit is almost an urban team sport.

Transit is such an intensely personal thing that everybody has an opinion. And in a region of 6.6 million people, there are 6.6 million opinions about how to solve the problem. We're trying to build a system that provides a variety of benefits across a very broad population, and it will take time for everybody to see the benefit of those solutions. We also have the challenge that by the time you put something in, you've grown that much further. And it looks like the system is as crowded the day after you started as it was the day before.

What lessons have you learned as a commuter yourself?

I feel that I'm a secret shopper, in a sense. I learn much more from being a user of the system than sitting in this office and having people come and talk with me about the system.

What would you do if you could wave a magic wand to make public transit smoother, more efficient, more effective?

The three things that I would do are, first of all, move as quickly as possible to having an integrated fare structure in our transit system. Number two is collectively [all of our transit authorities] raise the experience of our customers in terms of what their trip is like. And the third piece is when we make a decision, it's the decision, and we move on, and then we make the next decision. I'd like to get to the point where that's the way we operate and not spend as much time letting the perfect get in the way of accomplishing the good.

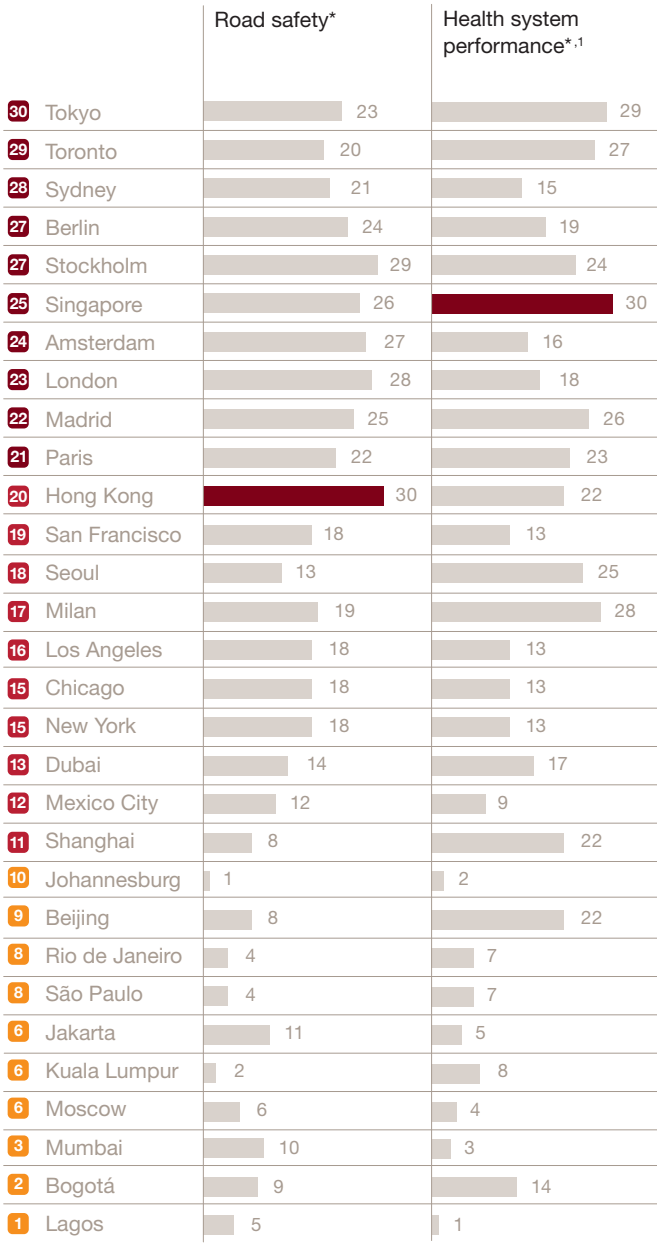
Learn more
A full-length version of this condensed discussion is available at www.pwc.com/cities.

Health, safety, and security
An advanced economy normally translates into advanced social security

While four health, safety, and security variables remain the same in this edition, we've added two new ones that add timely relevance to the vulnerabilities that threaten personal and collective wellbeing in a modern city—security and disease risk and road safety. We also deleted hospitals and health employment to remove the chance of penalizing well-resourced systems and rewarding those with large yet inefficient staffing.

The new security and disease risk variable measures the potential effect of nine possible threats—terrorism, cyber attack, market crash, nuclear accident, sovereign default, power outage, oil price shock, human pandemic, and plant pandemic—on a city's economic output. That is, this variable (taken from the Lloyd's City Risk Index 2015–2025) weighs a range of both manmade and disease risks to collective economic security—which is to say, social wellbeing in a very broad sense. (This new variable also complements two other measures in the sustainability and natural environment indicator that assess natural disaster risks and active city preparedness for dealing with them. Together, the three create a more comprehensive view of urban risk than in past editions, in which only the likelihood of natural disaster was included. See the following discussion of the three on page 64.) Road safety adds another practical element of the modern safety picture.

First-place Tokyo reflects the greatest change in performance in this edition. In addition to the removal of hospitals and health employment, where Tokyo finished three from the bottom, the city is buoyed by its #1 score in security and disease risk, #2 in health system performance and top 10 standing in all others except end of life care, where it finishes 13th. At the opposite end of the spectrum, unlike Tokyo, the removal of hospitals and health employment, where Stockholm finished second in the last edition, along with a #16 score in security and disease risk, pushed Sweden's capital down from #1 last time to tied #4 now with Berlin. US cities also fell a few spots, generally losing last edition's advantage of high health employment and, in the case of New York and Chicago, only achieving middle-range performance in security and disease risk.



End-of-life care*	Crime[2]	Political environment	Security and disease risk[3]	Score
18	27	26	30	153
21	25	28	29	150
29	26	25	24	140
28	16	29	21	137
17	22	30	15	137
20	30	18	12	136
27	23	28	13	134
30	19	18	20	133
13	21	16	26	127
22	14	25	19	125
14	29	16	11	122
26	20	22	22	121
16	24	14	25	117
15	17	23	14	116
26	12	22	23	114
26	14	22	18	111
26	15	22	17	111
19	28	9	6	93
8	5	12	28	74
3	18	6	7	64
12	2	14	27	58
3	9	5	8	55
10	3	10	9	43
10	4	8	10	43
6	11	4	5	42
11	8	11	2	42
7	7	2	16	42
5	10	8	4	40
4	6	3	3	39
1	1	2	1	11

Each city's score (here 153 to 11) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High

Medium

Low

Highest rank in each indicator

* Country-level data

1. Measurement of a country's health system performance made by comparing healthy life expectancy with healthcare expenditures per capita in that country, adjusted for average years of education (number of years of education is strongly associated with the health of populations in both mature and emerging countries).
2. Weighted combination of the Mercer *Quality of Living 2014* survey crime score (50%); intentional homicide rate per 100,000 of the city population (30%); and the Numbeo Crime Index, which is an estimation of the overall crime level in each city based on how safe citizens feel (20%).
3. A measurement of the potential effect of crises on economic output in each city, calculated by measuring the percentage of GDP at risk from a series of individual security and disease threats between 2015 and 2025. Nine particular threats were measured using data from the Lloyd's City Risk Index 2015–2025.

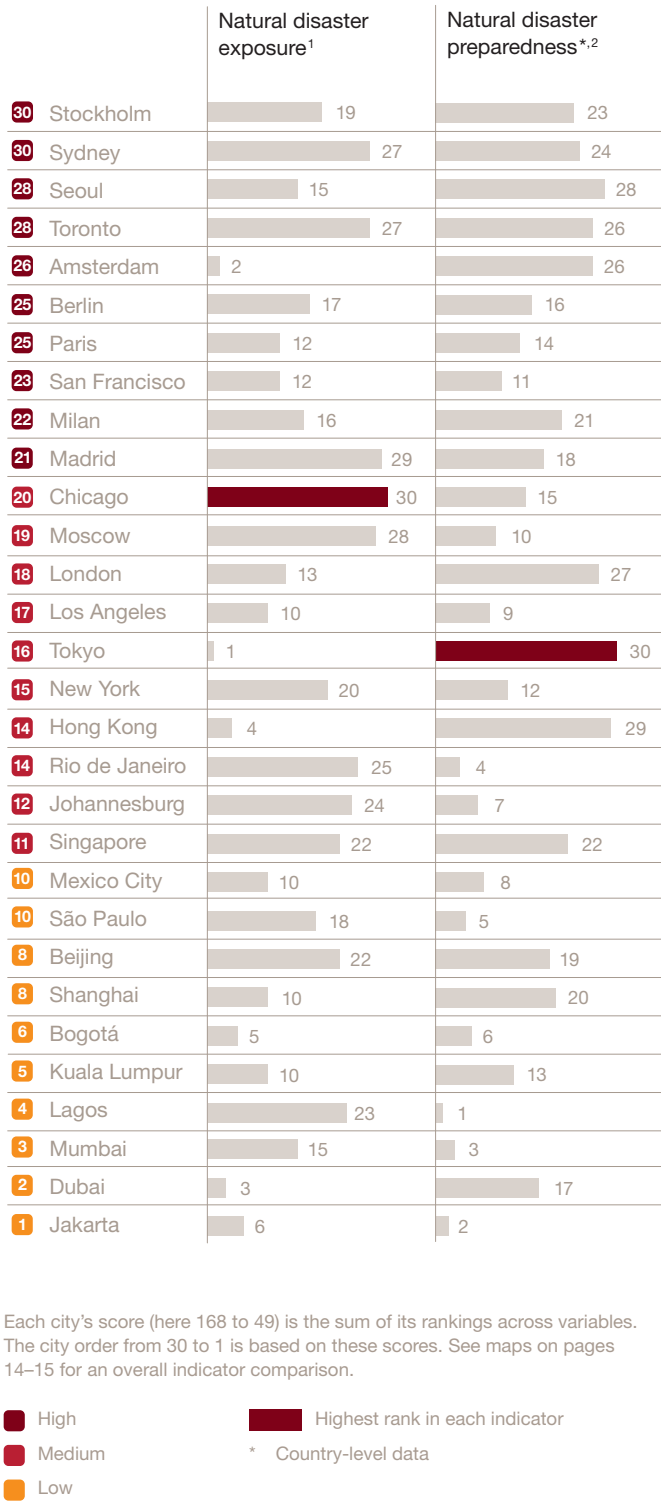
Sustainability and the natural environment
An urgent global issue gains greater focus

There is no indicator in this report that has occupied us more—and led us back to first principles time and time again—as this one. Sustainability is a concept that is both difficult to define in itself and to implement as a coherent public policy—especially as cities vary widely in terms of climate, geology, demographics, and economic development. The recent example of the United Nations taking over two decades to conclude the negotiations signed in December 2015 in Paris at the UN's conference on climate change (COP21), commonly referred to as the Paris Climate Conference, is the most vivid illustration of how difficult issues of environmental sustainability are.

Having said that, the urgency of sustainability to cities (and, of course, to the world) demands everyone's best efforts; in our case, that means continually trying to develop the most useful assessment we can in order to create knowledge and awareness of urban sustainability and of defenses against natural disaster. (For more on urban resiliency, see the separate analysis of three variables that cover natural disaster exposure, natural disaster preparedness, and security and disease risk.)

Our new report substantially expands and enhances both the data measured in this indicator and their quality. We've added two new variables: natural disaster preparedness and water-related business risk. The first one fundamentally complements our natural disaster exposure variable—which we've also renamed, redesigned, and improved by incorporating new data—by assessing a city's actions to contend with its environmental threats. In today's world, it is extremely important to know, and to be able to *quantify*, each city's ability to *respond to* the risks of natural disaster with which it is daily confronted. By redesigning our variables, we hope to provide a more complete picture.

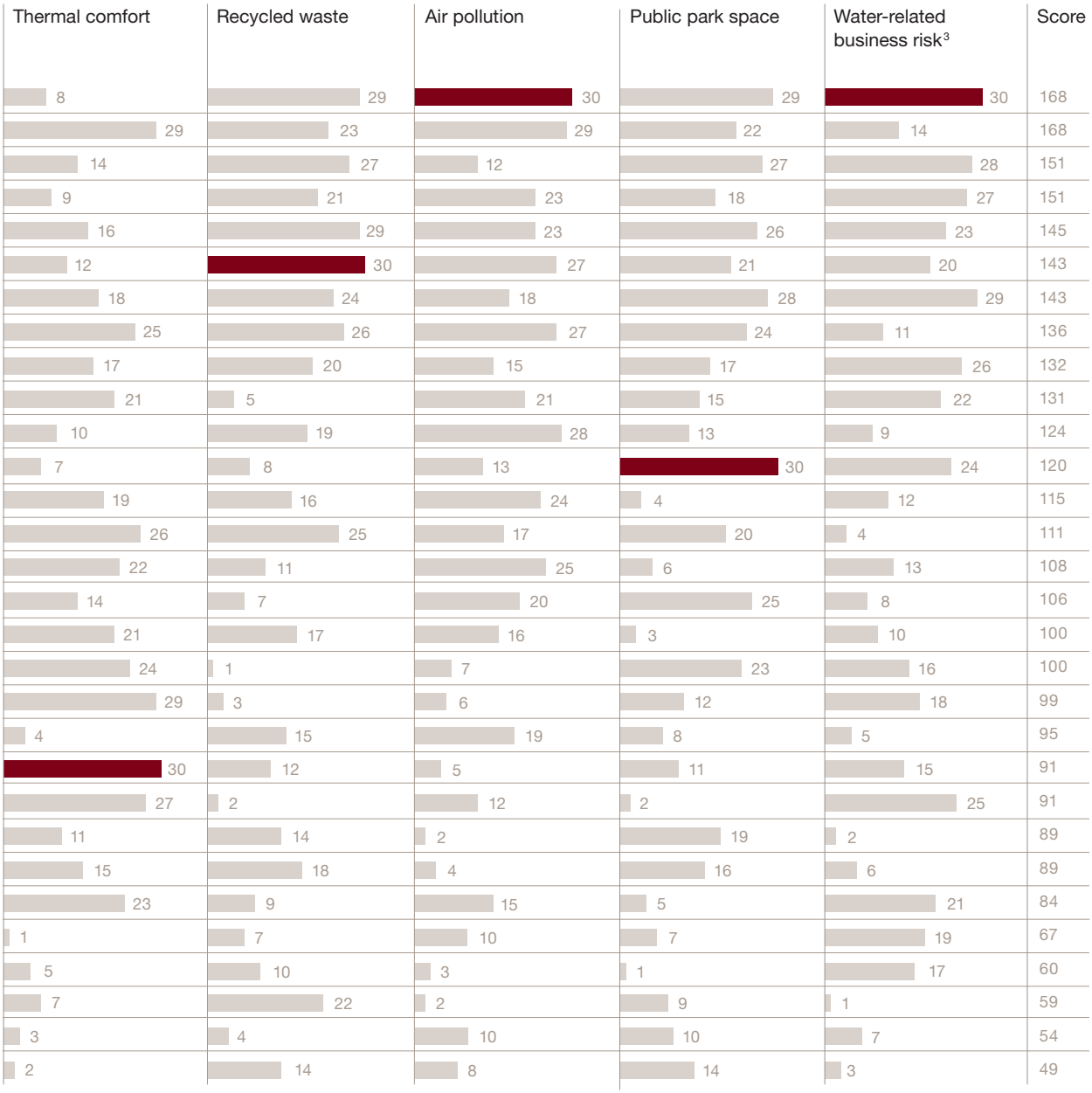
The fact that Tokyo is both the most vulnerable city to natural disaster, but also the best prepared of the 30 cities here to meet its risks, provides a good example of our new framework. The city is well aware of the dangers to which it is exposed from earthquakes and tsunamis and is ready to do what it takes to deal with them, from developing forward-looking plans and strategies to implementing advanced technologies to educating and testing its citizens in safety procedures. (For more on Tokyo's resilience, see the discussion with a panel of leaders from Japan's Ministry of Land, Infrastructure, Transport and Tourism, East Japan Railway, Hitachi Rail Systems, and the mayor of Toyama City, which has been recognized by the Rockefeller Foundation 100 Resilient Cities network for its actions in integrating infrastructure and urban development arising from a shrinking birth rate and aging population.)



Each city's score (here 168 to 49) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low
Highest rank in each indicator
* Country-level data

See **Sustainability**, page 96



1. A measurement of the economic and people effect of river and coastal floods, earthquakes, windstorms, and tsunamis. The economic effect is measured by lost GDP output in the immediate aftermath of an event relative to the country's GDP. The people effect is both the potential for fatalities and casualties, as well as people who need to be evacuated and are unable to access their home or workplace (in the immediate aftermath of an event) as a proportion of the population of the city.
2. This measure considers whether the city has put in place early warning systems, made efforts to reduce the underlying risk factors, regularly conducts training drills, and implements strategies to increase public awareness. Fifty percent of the score is taken at a country level from the UNISDR's web platform, PreventionWeb, which has collated national progress reports on the implementation of the UN's 10 year plan to make the world safer from natural hazards, the Hyogo Framework for Action. Each city's average performance in the variables of public transport systems, health system performance, and operational risk climate are also factored into the disaster preparedness measure as the remaining 50%.
3. A measurement of water risks in a city related to quality, quantity, and regulatory risk using analysis data produced by the World Resources Institute with Aqueduct.

Risk and resilience in the modern city

You don't need a weatherman to know cities must remain aware, prepared, and united to manage the worst of today's threats

Risk has pushed center stage among urban issues during the last decade, often with disruptive and frightening force in the form of extreme weather, terrorism, nuclear mishaps, and disease, to name a few threats. Safeguarding a city, its people and neighborhoods, its businesses, educational, health, and cultural resources claim an immediacy as never before.

Looking at our own results, we find natural disaster preparedness—a new measure developed for this edition—shows the second strongest relationship of all 67 variables with overall success in the study. It also links very tightly with the intellectual capital and innovation, technology readiness, transportation and infrastructure, ease of doing business, and demographics and livability indicators and the housing, and quality of living variables. While correlations do not show causality, the close associations are striking between disaster preparedness and having all the right stuff for healthy city life. And the connection makes sense.

On one level, the need for risk resilience is not new: Communities have managed through drought, flood, war, and plague since history began. But the stakes of disaster skyrocket today in a highly urbanized, globalized, and digital world. Population, economic, and intellectual strength concentrate in cities at historically high levels. Digital connections extend destructive pathways at the same time as they build bridges of enlightenment. Weather patterns snowball toward wild extremes, stopping the richest and poorest of our urban capitals in their tracks. As quick as you can say Zika or Ebola, potential pandemics hitch rides with us as we travel around the world. And most surreal and chilling, the threat of manmade terror cuts at the heart of ordinary people seeking a good life in the city.

Awareness begins the preparedness process by sending a wakeup call to do what it takes. That can mean rethinking building and land use codes to accommodate shifting population and industrial patterns and environmental threats; employing advanced technology, engineering, and ecological techniques to better deal with risk; or aligning all the human and institutional forces in a city on a risk strategy and drilling on the details.

To gain a better sense of where our cities stand, we deepened our research on natural disaster exposure and preparedness, as well as security and disease vulnerability. The triple measure presented here (drawn from our health, safety, and security and sustainability and the natural environment indicators, where they factor into the overall score) covers the waterfront of modern urban risks, particularly focusing on the catastrophic events that threaten to jolt the global and regional business capitals in this study—in each case cities that are complex, interdependent systems of systems where major disruptions portend tremendous human and capital loss. The goal is to provide a window into levels of exposure and show how prepared cities are to handle risk.

Our three risk measures collectively suggest that the most vulnerable cities, such as Tokyo, can be the most resilient. Anchored by a sense of purpose and disciplined approach, if a city aligns its institutions, policies, systems, infrastructure, and citizens, it's better equipped to weather the modern storm. And preparation does not depend entirely on a city's wealth. Of course, challenges arise from the explosive growth and relative lack of resources in cities like Jakarta, Mumbai, and Lagos. But stakes are enormous when it comes to maintaining resilience in the sophisticated economic, technical, and cultural capitals of New York, Paris, San Francisco, and Los Angeles. The good news is that resilience can be heightened through committed approaches and comprehensive action, not money alone. "A critical issue for success is really to engage people," says Margareta Wahlström, former special representative of the UN Secretary-General for disaster risk reduction for seven years ending in 2015. "…Approaches that are simple and not so costly make a significant difference between life and death and a better community."

Tokyo registers top exposure to disaster, as well as top ability to deal with it. Tokyo, and Amsterdam with second highest natural disaster vulnerability but fifth highest preparedness, prove that resilience is not simply about building walls to keep out the sea. Today, it's about vigilance, strategic preparation, technological expertise, governance, adaptability, and, perhaps most important, the resolve of institutions and the community to work together in a disciplined way as one unit—in short, embracing the lessons of two cities that have faced the threat of existential disaster since they became cities.

The financial and human stakes of disaster are enormous for powerful, business cities. For instance, New York, Los Angeles, Shanghai, and São Paulo all fall into the middle or lower ranks of our triple measure of urban resilience. In other words, each city bears tremendous risk exposure. As a gauge, looking at the total annual GDP at risk in these cities over 10 years, New York and Los Angeles both have an average of over $90 billion at risk annually. Shanghai stands at just over $78 billion to lose annually and nearly $63 billion is vulnerable in São Paulo.[1]

Looking just at US cities, New York falls in the middle of the pack at #14 (jointly with Beijing), San Francisco #17 (tied with Paris), and Los Angeles #20 when we compare natural disaster exposure, natural disaster preparedness, and security and disease

	Natural disaster exposure	Natural disaster preparedness	Security and disease risk	Score*
30 Toronto	27	26	29	82
29 Sydney	27	24	24	75
28 Madrid	29	18	26	73
27 Seoul	15	28	25	68
26 Chicago	30	15	18	63
25 Tokyo	1	30	30	61
24 London	13	27	20	60
23 Johannesburg	24	7	27	58
22 Stockholm	19	23	15	57
21 Singapore	22	22	12	56
20 Berlin	17	16	21	54
20 Moscow	28	10	16	54
18 Milan	16	21	14	51
17 Beijing	22	19	8	49
17 New York	20	12	17	49
15 Mexico City	10	8	28	46
14 Paris	12	14	19	45
14 San Francisco	12	11	22	45
12 Hong Kong	4	29	11	44
11 Los Angeles	10	9	23	42
10 Amsterdam	2	26	13	41
9 Rio de Janeiro	25	4	9	38
8 Shanghai	10	20	7	37
7 São Paulo	18	5	10	33
6 Dubai	3	17	6	26
5 Kuala Lumpur	10	13	2	25
5 Lagos	23	1	1	25
3 Mumbai	15	3	4	22
2 Bogotá	5	6	3	14
1 Jakarta	6	2	5	13

Each city's score (here 82 to 13) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each indicator

* The three variables here are presented for comparison of urban disaster exposure and preparedness. They are taken from the sustainability and natural environment and health, safety, and security indicators, where they factor into the overall score.

risk. Only Chicago finishes at #5, thanks in part to the lowest exposure among all 30 cities to natural disaster. On this scale, US and other big business cities still have their work cut out to lessen the economic and human toll of disaster and to catch up with the cities like Tokyo and Amsterdam that prepare early, coordinate all systems, and involve the entire city in taking action.

See **Risk and resilience**, page 73

Margareta Wahlström at the United Nations in New York.

It takes a city: Urban resilience builds from community roots

…explains Margareta Wahlström

Margareta Wahlström, former Special Representative of the UN Secretary-General for Disaster Risk Reduction, spent seven years until the end of 2015 at the helm of a global effort to better equip the world and its cities to manage extraordinary growth at the same time as we face climate change and extreme weather. Wahlström stands at the front lines of leaders creating tools to assess risk, raise awareness, and advocate urban policies to better limit damages to people, property, and businesses. Here she discusses the toll of disaster, strategies to manage it, and the critical role communities and individuals play in the effort.

What is the trend in disasters today?

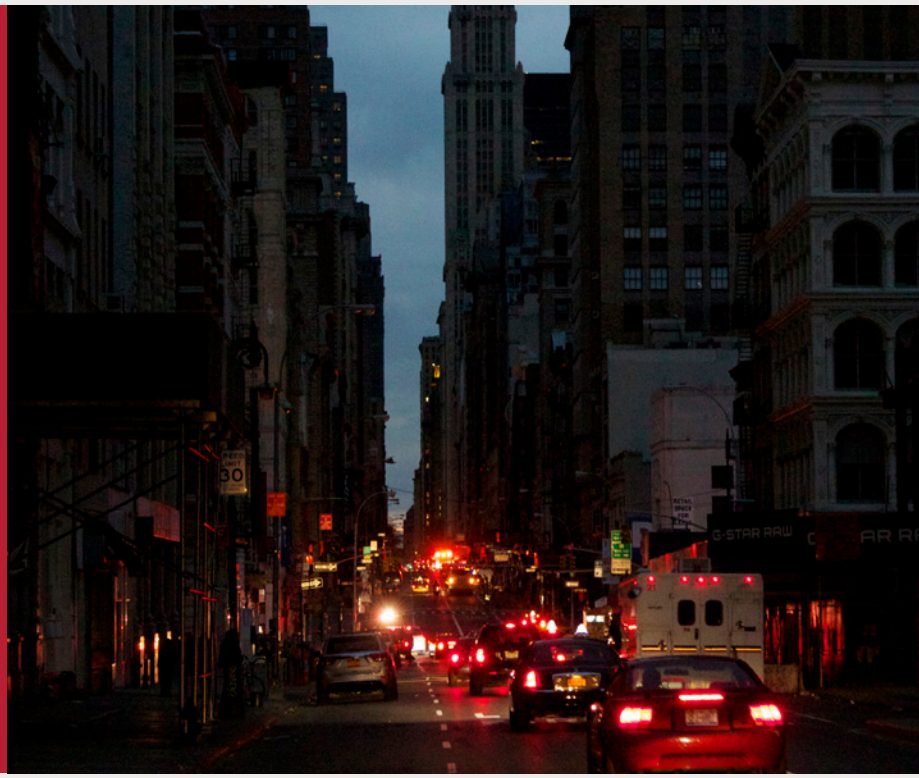
The trend is, unfortunately, quite negative. We can see the frequency is going up and the impact gets stronger, but we can't really blame nature for this. It's actually about the way we organize society, how we build, where we build, our understanding of the quality of building infrastructure, housing, urban areas. And the reason why economic losses to disasters keep increasing is, on the one hand, because the world is getting richer. We have a very steady and consistent increase in economic losses. And if we look at Europe, it's the region in the world that comes number three in economic losses, even though it's a relatively small area, but with the huge flooding and huge infrastructure impact, it faces a lot of business disruption. The economic losses are very high, even though it's not the poorest part of the world.

I think you can see just following the news the increasing frequency of urban flooding. A lot of people are exposed at coastal areas. Because exposure is high, the impact is high. Slightly better news is that with investments and work, the mortality from disasters is an area we can get under control. Fewer people, hopefully, will die in disasters because of better early warning systems and better preparedness. But all the economic and social costs for the time being are going up very quickly.

Where would you place the lion's share of the responsibility for action to lessen the risk?

In terms of authority, resources, and political capabilities, governments, of course. The private sector is critical also. But cities are very, very powerful because approximately 70 to 75%

> *We can't really blame nature for risk. It's actually about the way we organize society, how we build, where we build, our understanding of the quality of building infrastructure, housing, urban areas.*



Manhattan after dark is no longer glamorous following a few days of power failure, as shown here downtown after Superstorm Sandy in 2012.

of the global GDP is produced in cities. They also produce 70% of all the emissions. So, if cities decide to do something about disaster preparedness, the overall risk and exposure in the world will go down, and the losses will go down.

You made a point about European cities. They were built before weather was as extreme. What can they do?

The cities in Europe are interesting because they were established long before there were enough people on earth to start undermining the livability of this planet. And with the exception of cities like Amsterdam, for example, their realization of exposure and vulnerability has been a bit slow. But I would say over the past 10–15 years, the regular flooding that exposes Europe, the sea level rise, led to better understanding not of the future's uncertain climate impact but today's climate impact.

Of course, in the Netherlands, they have protected themselves for 500 years with dikes—and successfully so. What is very interesting about the Dutch model is that even from the beginning, they designed a system where the protection and the maintenance of the dikes was lodged with the communities that lived there. We can invest physically in our safety, but for longer term sustainability, we really have to invest socially in our safety. People's ownership—our individual understanding of risks and what to do about them—is a critical conduit for that longer term safety.

Is the Netherlands a lesson in terms of its communal approach?

Yes, definitely. And the fact that the Dutch managed to maintain this system and not dismantle it under the pressures of all kinds of positive and less positive trends over the past 50 years in particular is the most important lesson to truly understanding the clear link between the community's ownership and responsibility and the safety of the country to be ready to allow that system to continue. And we can see this on a smaller scale and in different models, of course, in many countries around the world where a community really takes charge of its own safety. But globally speaking, we lack in consistency and in keeping up practices for a long enough time to make it sustainable.

What are the first key steps you would see a city making to come to grips with where it stands, with managing itself, with becoming more resilient and prepared?

When we kicked off our Making Cities Resilient campaign five years ago, we actually asked participants what they needed, and, surprisingly, this group of mayors said they needed a handbook. So, I thought there must be lots of handbooks in the world. But they wanted exactly that, where do we start? So, we did something that is now called the Local Government Self-Assessment according to Ten Essential things to look at. And the Ten Essential things include social issues. Who are the most vulnerable people in your community? Where are they? It's the hard things, it's infrastructure. But it's also planning systems, responsibilities, and how you work together. That's the self-assessment.

On that basis, you would as a city, small or big, get a fairly good idea where your soft spots are. And after that, you can take the next step to a very detailed inventory. We have a scorecard where

> *Disaster preparedness is about saving lives. The basic instruments to save life are, first, an early warning system that increasingly many countries have; and, second, the warning has to lead to action.*

The toll of the 2011 great Tohoku earthquake and tsunami in Natori city, Japan, where more than 900 people were reported dead.

you do a plan and start working with where you actually are. Many cities have been doing that. It helps you with understanding where your sensitivities are. Then how do you make sure you've got the political will to actually address the sensitivities? It's a big risk to do a plan if you don't intend to implement it. [A city has to] think fully through, "Can we deal with these issues that we identify?" The planning in this sense also entails planning with your community.

If you're a very big city, of course, it's a big plan but it's more like the boroughs in New York need to plan for themselves and have a strong community network through which they can identify soft spots for safety, for people. Infrastructure is a really big issue in New York. The power supply was a big issue. I happened to be there during Sandy by coincidence, at the UN. I think New York was a serious lesson learned for many cities around the world: rich country, very sophisticated city—and the main vulnerability was our very sophisticated systems because we don't believe that they can collapse. We were not really thinking about it before. There's a great deal of attention now to understand the vulnerabilities of infrastructure—the IT, the power lines. We're building a very large system, so if a switch goes off on one end, it can basically knock out not just the city but half a country.

What policy tools do cities have in order to make a major difference in disaster preparedness?

The first policy tool is a recognition of risk. There's a human behavior that makes risk not nice to think about. "It's not going to happen to me. No." So, the first policy you actually have is to say, "Well, it did happen 20 years ago, and it actually can happen again." That's number one. Second is the embedding of the thought process. As you build flood management systems, you have to think about the risks. Build with a little bit higher standard than maybe you would, knowing that risks accrue to the future. Think of urban planning. Our colleagues in UN Habitat have standards for how much public space in a city should actually be accessible for all. If you build an accessible city, thinking of people who have some physical disability, you also have to think that if it's accessible for them, it's accessible for you and me. So, it becomes a better city to live in.

But the highest risks come from a different arena—the proximity of people settlement close to major industrial areas. As cities grow, we come closer and closer to what 30 years ago was a safe distance. But, today, it's not anymore.

Generally, one of the more critical areas is that you have to have a multi-sectoral planning mechanism. What you discover when you put different ministries or sectoral responsibilities together, there's always something between sectors that no one feels responsible for. And that's where the big new risks are emerging because institutions are tailored to do something very specific, and they don't necessarily think about, "Well, if I'm building my industrial plant here, what happens to human water?" They need industrial water. What happens to the agriculture? What happens…? And whoever is in charge of looking at agriculture doesn't necessarily feel responsible for reaching out.

Some of these things can be done through environmental risk assessment—and it is—but the risk that comes from the added element of natural hazards is very often not considered. And the worst example we have today is, of course, the impact on the Fukushima nuclear power plant by the 2011 earthquake and tsunami. The key element was the seawater that came into the

generator, so the generator stopped functioning. It was flooded. It stopped the nuclear elements. But whose responsibility is it to think about the sequential impact?

Do solutions tend to be difficult and expensive to implement, or are there pragmatic, commonsensical ways cities can go about disaster risk reduction?

The pragmatic, of course, is necessary in many parts of the world, but it's not enough. And even if you had the resources for the infrastructure, you need to think more about people. At the core, we are doing all these things because we want people to be healthy. So, I think a critical issue for success is really to engage people. There are many community leaders who do this really well. These approaches that are simple and not so costly make a significant difference between life and death and a better community.

In the case of a rich city like New York, it's been over three years since Sandy struck. But I haven't noticed timely, tangible preventive action against the next storm. What explains that?

What I've seen in Hoboken, across the Hudson River from New York City, is Rebuild by Design,[1] a big project I think funded by the federal government. But on the Manhattan side, I suspect that they have very firm plans but they are of the magnitude that in three years, you don't see the impact. I think there's no doubt that the political leadership of New York will want to keep New York at the top of global cities.

So, the answer is I should be patient?

Yes. Or, push a bit but don't give up.

Does disaster preparedness depend on how rich a city is?

No, not at all. It does not depend on that. Disaster preparedness is about saving lives. And the basic instruments to save life are, first, an early warning system that increasingly many countries have; and, second, the warning has to lead to action. And that action normally is evacuation of people to safety.

You need outreach to people, you need to make sure people understand what to do. But if you look at countries that in 10 or 20 years have made huge strides—China, Vietnam, the Philippines, Indonesia, the Caribbean Islands, the Pacific Islands—they all have systems now that allow them to get people out of harm's way. And this is a big success.

Let's talk about the human side of the equation. Schools and hospitals seem a potential point of vulnerability. Does something special need to be done?

Definitely. It's not acceptable to put kids and teachers at risk because you built a low-quality building in the wrong place. [Protecting children and teachers, patients and doctors] stands in itself as important, but schools and hospitals are also symbolic for how we should see everything that we have created in our societies. Both institutions are also critical in a crisis.

Do you view urban density as an advantage or a disadvantage?

It's definitely both. The disaster impact can be high because urban density is just a lot of people in the same place. They don't necessarily feel connected to each other because we are still in the period of history where we all came from somewhere else, we moved to a city, and we don't recreate our communities. After Sandy, my colleagues in New York mentioned how they went to find people sitting isolated in their apartments during a week or more because no one remembered them. That's what the downside is. If you get forgotten, if you are isolated, that is a magnifier of your personal risk.

You've written, "It's a matter of life and death if women and girls are not empowered to participate fully in disaster management and planning." Will you explain that?

From a very concrete perspective, a society must use the capability of all people to define for themselves what their needs are, what their input is. Exclusion creates marginalization that creates practical problems. It also creates morale problems and a sense of disempowerment.

What is the incentive for the powerful, the rich, the enfranchised to help?

I would say that the incentive is safety. You cannot buy safety just for a part of society. If the other part of society is unstable or unrestful and does not have enough to keep stability, it will have an impact even if you feel that you're well-protected.

Who are the people, what are the images that stay with you?

It's mostly local people. It's the ones who in their daily work see this effort as a major instrument for sustainability. Every time I leave my office and go and visit a city, it doesn't matter if it's a rich or a poor country, there are a number of passionate people, and it's a validation that this work matters.

1 In the aftermath of Superstorm Sandy, Rebuild by Design was launched by the US Department of Housing and Urban Development in conjunction with the private sector (http://www.rebuildbydesign.org/what-is-rebuild-by-design/). "What began as a new kind of design competition has transformed into an innovative process that places local communities and civic leaders at the heart of a robust, interdisciplinary, creative process to generate implementable solutions for a more resilient region."

Learn more
Video of this condensed conversation is available at www.pwc.com/cities, as is a full-length print version of the entire discussion.

Henk Ovink discussing a water project called Room for the River with teammates in Nijmegen, the Netherlands.

"Real resiliency makes you less vulnerable beforehand,"

…explains Henk Ovink, Netherlands' water envoy and post-Sandy advisor to the US

In 2012, New York was struck by Superstorm Sandy. In the wake of this devastation, Dutchman Henk Ovink became senior advisor to a task force created by President Obama to rethink the region's infrastructure and to enhance its resilience. He developed and led the Rebuild by Design competition to ignite innovative resilience solutions for the region's future. Ovink previously headed the Office of Spatial Planning and Water Management in the Netherlands. As *The New York Times* explained, "It was his job to keep the famously waterlogged country dry." Ovink is now his country's first special envoy for international water affairs. Here, he discusses how cities around the world can confront the urgent threats posed by water, which he describes as "the number one global risk."

What's the secret of the Netherlands' success in tackling the challenges of water management?

One core feature of Dutch culture is that it was built on living with water. Before the year zero, people already lived in this delta. A culture emerged in which people who built homes here worked on ways of dealing with water. They raised the land, building hills called *terps*. They put their farms on higher ground. They built dams, dikes, and flow structures. A thousand years later, in the 1100s, people found that these measures were strengthened if they collaborated across townships or communities. So, we developed this communal and collaborative approach, working together on a regional scale to solve the issue of water. In the Netherlands, we have four rivers and a sea, declining land, salty groundwater, and more and more extremes in rain events and droughts. You have to manage those risks and vulnerabilities—not only rises in sea level but surges, storms, and rainfall. We created more than 3,500 *polders*—tracts of manmade land that used to be water. We built 22,000 kilometers of dikes to protect us from the sea and rivers. Still, we kept making mistakes. If you live on the edge, you do things right and wrong during this learning process. You're never done. We totally embrace that this is the way we live and that conditions change every day. We don't look for silver bullets that will safeguard us for generations. We do this as an ongoing process, an approach that's resilient in itself.

> *The water crisis is the number one global risk. It affects all of us and can create wars if you don't manage it right. It will have a devastating impact on cities all over the world in combination with climate change and manmade disasters.*

How does that differ from the mindset you encounter in most countries?

It's a big difference. Mostly, we go around the world to help when disasters have already occurred. But we want to be there *before*, to move the world to a preparedness mode instead of a response mode. It's about creating a culture of living with these uncertainties in such a way that society becomes resilient socially, physically, governmentally, financially. This is what we've achieved in the Netherlands. We have the world's safest delta. Our dams, dikes, and levee systems can deal with storms that occur only once every 10,000 years. Over generations, we've become not only experts in building innovative solutions but in embracing a complex process, thinking on a systematic level, dealing with water on a regional scale, and finding ways for government to collaborate with businesses, communities, academia, and the research sector. We also try to bring this acceptance of complexity to other countries, which is what I did in New York when I joined President Obama's Superstorm Sandy rebuilding task force.

Sandy hit New York in 2012. Why haven't we seen more tangible action yet to protect the city against the next storm?

This takes time. The real question is whether a comprehensive long-term approach is in the making. Is there a new delta plan for the New York region? On some level, there is. With PlaNYC, Michael Bloomberg put in place a resiliency approach with hundreds of measures relating to policy and regulations. What was lacking was a real regional approach. There was no reach across the Hudson to New Jersey. From a resiliency perspective, that's a vulnerability. I set up a process with Rebuild by Design [a presidential Superstorm Sandy rebuilding task force administered by the US Department of Housing and Urban Development] where the aim was to find vulnerabilities, interdependencies, and opportunities on a regional scale. We worked with more than 500 organizations and thousands of people, raising awareness of water issues in such a way that everybody starts to understand that *my* vulnerability is a community vulnerability—and that the process of collaboration can deliver resiliency in the longer run.

The Netherlands is a small, rich nation. How can the Dutch approach be applied in poorer places, such as megacities in Asia and Latin America?

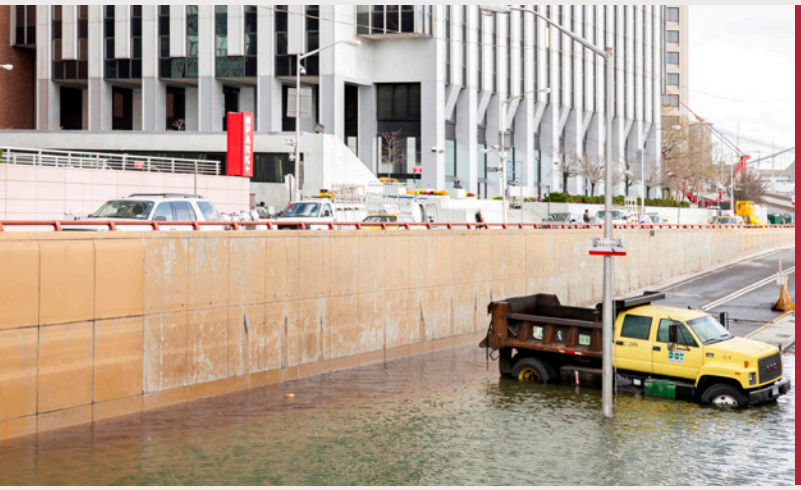
First, it's critical to take a long-term approach, a preparedness approach, that is combined with interventions. Second, we need both public and private financing, and this has to be managed in such a way that accountability and transparency are in place. We need better cost-benefit analyses, so we can monitor and evaluate these resiliency approaches in an open, transparent way. Third, it has to be an inclusive process in which institutional partners, government, and businesses collaborate with non-institutional partners, non-governmental organizations (NGO), and individuals. Fourth, it's critical to build capacity among government, institutions, NGOs, businesses, and individuals. They need to understand that climate change and water-related issues are here to stay, that the World Economic Forum's Global Risks[1] report saying that water is the number one global risk is not a fairy tale but a fact. It's about embracing that fact, building institutional capacity to stick to that message, not stopping after one intervention but continuing to invest and partner on research and development, to work on long-term goals and resiliency.

How do you define urban resiliency?

Resiliency is not a static condition. It's very dynamic and progressive. And it's on all levels—on a personal level, in the community, and on an institutional level. Some people say resiliency is about bouncing back after a disaster. But real resiliency makes you less vulnerable beforehand. Urban resiliency is now more critical than ever because 75% of the world's population will live in cities by 2050. Urbanization has an emancipatory capacity: Women work and kids learn. But water issues are putting these urbanizing places at higher risk, thus stressing the emancipatory curve. Our cities need to develop in ways that address urban water issues, including the safety, scarcity, and quality of water.

You've called Miami the new Atlantis. Why?

The fact that people in Florida continue to build right in the middle of a flood plain spotlights a problem in city building, which is how we choose where to build and also the financial returns from building there. How can you deal with that in a place like Miami, which has great real estate that's going to go underwater? There will be a time when there's a decision to leave or stay. If you want to stay, whatever you build has to be far more in line with the vulnerabilities. Stéphane Hallegatte, a World Bank economist,



Superstorm Sandy flooded subway and car tunnels in Lower Manhattan; Henk Ovink, center, visiting the Bay Park Sewage Treatment Plant in East Rockaway, New York.

estimated the value of what's at risk in 2050[2] because of sea level rise and surges due to climate change. Miami was top of the list of the world's most at-risk cities. Next came Guangzhou, New York, then New Orleans. It's not just about how much is at risk but about how you're going to deal with it—and whether you're able to mobilize businesses, investors, governments, society, eco-driven NGOs, and socially driven NGOs.

What water challenges do you see in Africa's largest city, Lagos?

Its population has moved from 11 million to 21 million since 2011. A lot of development is lacking when it comes to water—in terms of the availability, quality, and safety of water. But there's been a tremendous gain on two levels: first, on the level of the city's institutional capacity, where water management can become one of the primary goals; second, on a very local, community level. But this is only the beginning. Lagos is under enormous stress when it comes to water and sanitation. The city needs a combination of a long-term approach and short-term interventions, along with financing and a faster implementation process. Otherwise, Lagos will lag behind the demand for water a bit more every day, given its current growth rates.

Speaking more globally, do we still have plenty of time to take collective action on urban water issues—or does this need to be addressed yesterday?

Yesterday. We need a sense of urgency. It's not for nothing that the World Economic Forum concluded that the water crisis is the number one global risk. Water is energy, is food, is urbanization, is life. It affects all of us and can create wars if you don't manage it right. It will have a devastating impact on cities all over the world in combination with climate change and manmade disasters. There's no time to waste. But it will take a generation or more. This is a long process, but we have to start now. You can't wait.

> *"Resiliency is not a static condition. It's very dynamic and progressive. And it's on all levels—on a personal level, in the community, and on an institutional level.*

1 Global Risks Report, 2015 World Economic Forum, http://www.weforum.org/reports/global-risks-2015.

2 "The Cost of Climate Change in 2050," *National Geographic*, http://ngm.nationalgeographic.com/2015/02/climate-change-economics/coastal-cities-map.

Learn more
A full-length version of this condensed discussion is available at www.pwc.com/cities.

Risk and resilience

Continued from page 65

Discussions with those on the front lines of disaster preparedness confirm our findings. "The first policy tool is a recognition of risk," says Margareta Wahlström. "Second is the embedding of the thought process." Put differently, Wahlström explains resilience does not depend solely on how rich a city is. "Disaster preparedness is about saving lives. And the basic instruments to save life are an early warning system that increasingly many countries have; and, second, the warning has to lead to action."

Similar messages come from Amsterdam and Tokyo, long confronting the destructive power of water, wind, tsunami, and earthquake. Henk Ovink frames the challenge. The Netherlands' special envoy for international water affairs and senior advisor to the US task force for rethinking infrastructure and resilience after Superstorm Sandy, says: "We want to move the world to a preparedness mode instead of a response mode. People always ask, 'What's the silver bullet?' But when you're working with these uncertainties, with these vulnerabilities, you have to understand that it's not so much about a silver bullet. It's about a culture of living with these uncertainties in such a way that society becomes resilient socially, physically, governmentally, financially. This is exactly what we've achieved in the Netherlands."

East Japan Railway runs safe and reliable bullet trains, other passenger and freight lines, and buses in and around disaster-prone Tokyo. Masaki Ogata, JR East vice chairman, explains that technological countermeasures avoid breakdowns, help trains stop quickly, and prevent derailment even in the face of catastrophes like the Great East Japan earthquake in 2011. But he takes a step back to emphasize a holistic perspective: "In a broader sense, when considering natural disasters, we must create an organization, society, and nation that is very resilient in the face of a disaster. To that end, we need education and training." Kisaburo Ishii, Japan's vice minister of land, infrastructure, transport and tourism through 2015, adds, "Resilience is absolutely not about the likelihood of a disaster. It's about how to deal with disasters, whether the city is defensible. Or when a disaster occurs, how quickly the city can recover from it."

While the range and potential toll of urban risk is increasing, success lies in the potential of cities themselves to recognize challenges, adapt rigorous approaches, and unite all institutions and citizens into a potent force based on mutual self-interest. Systemic resilience is one of the dividends of strong urban foundations built and maintained over time. Neither Rome nor any of our top cities were, or will be, built in a day. The shared civilization and opportunity they represent are worth protecting.

1 Based on Lloyd's City Risk Index 2015-2025, which measures the potential effect of crises on economic output in each city, calculated by measuring the percentage of GDP at risk from a series of 18 natural and man-made threats between 2015 and 2025.

How we reflect urban risk and resilience

The three variables combined here from other parts of the study broadly test our cities' exposure and resilience in the face of catastrophic events. Whether traumatic disruption stems from flood, market, or nuclear meltdown, terror, or pandemic, our objective is to gauge risk exposure and preparedness in a way that captures the stakes and complex nature of the global and regional business capitals we cover. In terms of our methodology:

- **Risk likelihood lacks perspective without being weighed against steps toward resilience.** This year, we added a natural disaster preparedness variable that takes into account a city's risk management activities. Development follows the spirit of the AR!SE (Alliance for Disaster Resilient Societies) city disaster resilience scorecard, the United Nations Office for Disaster Risk Reduction (UNISDR) initiative to assess city resilience on which PwC collaborates to create risk-resilient societies by making investments risk sensitive.

  With AR!SE and UNISDR's Making Cities Resilient campaign as an orientation point, PwC's actuarial and forensics group in London developed this measure to consider whether a city has early warning systems, makes efforts to reduce the underlying risk factors, regularly conducts training drills, and implements strategies to increase public awareness. Half the score derives from the country-level UNISDR web platform, PreventionWeb, which collates Hyogo Framework for Action national progress reports on the implementation of the UN's 10-year plan to make the world safer from natural hazards. Another half of the score comes from each city's performance in variables measuring public transport systems, health system performance, and operational risk climate—all important planks of urban resilience.

- **We also added a new variable, security and disease risk, reflecting the potential effect of crises ranging from pandemic to a modern kaleidoscope of manmade threats**, including cyber attack, market crash, nuclear accident, oil price shock, sovereign default, terrorism, power outage, human pandemic, and plant pandemic. Risks are gauged by the effects of the crises on economic output from Lloyd's City Risk Index based on original research by the Cambridge Centre for Risk Studies, calculated by measuring the percentage of GDP at risk from a series of individual disease and security threats between 2015 and 2025.

- **Then we changed our natural disaster vulnerability approach from one that gauges likelihood of risk to one that measures risk exposure.** Here, PwC's actuarial and forensics practice used data from Swiss Re's CatNet GDP Loss Index and People Risk Index to calculate the economic and people effect of river and coastal floods, earthquakes, windstorms, and tsunamis on our 30 cities. The economic effect is measured by lost GDP output in the immediate aftermath of an event relative to the country's GDP. The people effect covers both the potential for fatalities and casualties, as well as people who need to be evacuated and are unable to access their home or workplace (in the immediate aftermath of an event) as a proportion of the population of the city. The indices are derived from Swiss Re's Mind the risk study.[2]

2. *Mind the Risk*: A global ranking of cities under threat from natural disasters, Swiss Re, 2014 (http://www.swissre.com/rethinking/climate_and_natural_disaster_risk/Mind_the_risk.html), results of which are available at CatNet (http://www.swissre.com/catnet).

Demographics and livability
North America and Europe top performance in this indicator

While the number of variables in this indicator has only increased from six to seven, the refinements here have actually been relatively extensive. As mentioned earlier in this report, we've moved two variables, traffic congestion and ease of commute, to the transportation and infrastructure indicator to evaluate all the issues of urban mobility and transport as part of the same (transparently integrated) urban transport network. In their place, we've added three new variables here—city brand, senior wellbeing, and YouthfulCities Index—which boost the performance of cities like Paris, New York and Los Angeles (6, 9, and 10 places respectively) and depress that of Singapore (12 places) since the last edition.

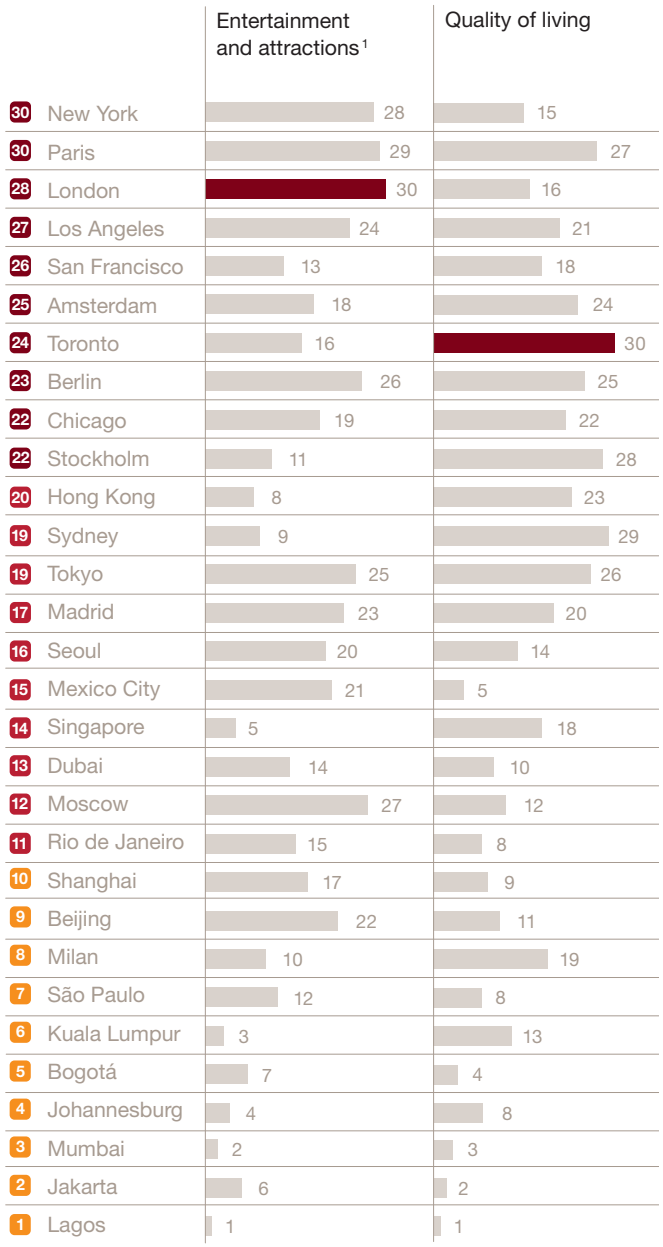
The first addition assesses two aspects of a city's "brand": "assets" (attractions, climate, infrastructure, safety, and economic prosperity) and "buzz" (determined through a combination of social media and media references). The second new variable, senior wellbeing, is taken from the Global AgeWatch Index, which compiles information on the elderly from 96 countries, including data on pensions, health, education, employment, and social environment. The last new variable, YouthfulCities Index, is based on a global database that ranks 55 of the largest cities in the world from a youth perspective (ages 15–29). Finally, we've also fine-tuned our entertainment and attractions variable (previously cultural vibrancy) to reflect the necessary breadth and balance of the cultural resources (including sporting events, museums, performing arts, and culinary variety) that any city requires to maintain both the attachment of its own citizens and its global appeal.

There is consistency at the top, which is natural given the time and energy needed to change essential qualities of even a small city. Eight of our top 10 cities repeat from our last report. But there is also additional consistency here in that all the cities in this high-performing group split evenly among North America or Europe, a remarkable validation, not only after so many years of recessionary economics in the case of Europe but also given the continuous, global competition with which the cities of these two continents have to contend.

It is also notable that three cities that scored extremely well in our last report fall out of the top 10 in this one. Twelfth-ranked Sydney, in fact, beat out London for #1 in 2014, while Hong Kong and Singapore, which tied for fifth place in our last report, now finish #11 in the former's case and #17 for Singapore—a noticeable drop of 12 places for a city that is normally so competitive in the majority of indicators.

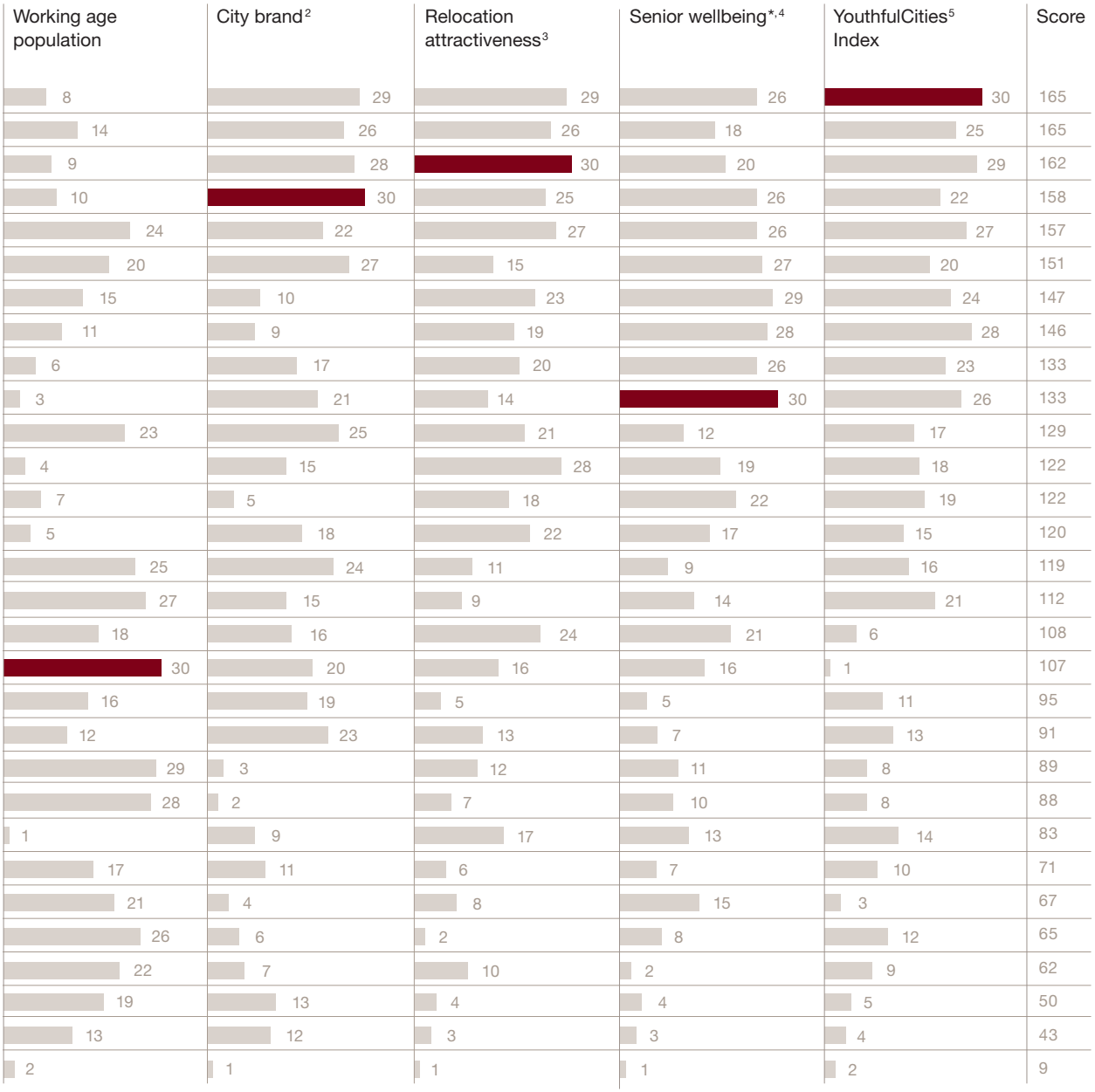
New York and Paris tie for first. For Paris, it is a return to the top of the indicator, having fallen to #7 in *Cities of Opportunity 6* from its #1 ranking in *Cities of Opportunity 5*. (The City of Light was boosted in this case by the transfer of the ease of commute variable to the transportation and infrastructure indicator.) For New York, it is an impressive climb up a steep ascent, from #12 (out of 27 cities) in 2012, to #10 in our last report, to the top of the rankings this year.

See **Demographics and livability**, page 96



Each city's score (here 165 to 9) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low
Highest rank in each indicator
* Country-level data



Working age population	City brand[2]	Relocation attractiveness[3]	Senior wellbeing*,[4]	YouthfulCities[5] Index	Score
8	29	29	26	30	165
14	26	26	18	25	165
9	28	30	20	29	162
10	30	25	26	22	158
24	22	27	26	27	157
20	27	15	27	20	151
15	10	23	29	24	147
11	9	19	28	28	146
6	17	20	26	23	133
3	21	14	30	26	133
23	25	21	12	17	129
4	15	28	19	18	122
7	5	18	22	19	122
5	18	22	17	15	120
25	24	11	9	16	119
27	15	9	14	21	112
18	16	24	21	6	108
30	20	16	16	1	107
16	19	5	5	11	95
12	23	13	7	13	91
29	3	12	11	8	89
28	2	7	10	8	88
1	9	17	13	14	83
17	11	6	7	10	71
21	4	8	15	3	67
26	6	2	8	12	65
22	7	10	2	9	62
19	13	4	4	5	50
13	12	3	3	4	43
2	1	1	1	2	9

1. A measure of the number of diverse attractions in a city, including the number of major sporting events a city hosts; the number of museums, performing arts venues, and culinary establishments; the number of international travelers and the number of sister city relationships as per the A.T. Kearney Global Cities Index.
2. *The Guardian* Cities global brand survey measures two aspects of a city's brand: its "assets"—attractions, climate, infrastructure (particularly transport), safety, and economic prosperity—and its "buzz," a combination of social media (Facebook likes and Twitter sentiment analysis) and media mentions.
3. PwC employees in each of the firm's offices in the 30 cities were instructed: "Based on the other 29 cities in *Cities of Opportunity*, please rank the top three cities that you would like to work in most." Data provided by the PwC employee survey conducted for the *We, the urban people* study.
4. Using the Global AgeWatch Index, this variable highlights which countries are doing best for their older populations and how this links with policies toward pensions, health, education, employment, and the social environment in which older people live.
5. The YouthfulCities Index analyzes the largest cities around the world from a unique youth perspective to rank them as best suited for young people aged 15–29. It looks at how youth live, work, and play in their urban setting in order to examine how cities are serving their youth.

Merce Cunningham's *Roaratoria* during the company's 2011 farewell tour at BAM.

Looking for Brooklyn cool? Adventuresome spirit meets old-school attitude

…at BAM, the anchor of a revitalized neighborhood

Over the last 10–15 years, Brooklyn has become a global, cultural magnet. It attracts newcomers and tourists alike seeking the hard edge of New York together with more space and sense of discovery than other parts of the city. Standing at the crossroads of downtown Brooklyn, the Brooklyn Academy of Music (BAM) embodies this spirit. Since coming to BAM over three decades ago to develop the Next Wave Festival, executive producer Joseph Melillo has been the creative force driving what many see as New York's most exciting center for theater, dance, and cinema. Over that time, the borough as a whole has blossomed with revitalized neighborhoods, new jobs, and businesses. Here, Melillo is joined by Keith Stubblefield, BAM's chief financial officer, as they discuss the relationship between culture and community, as well as the artistic and business sides of the organization.

What are a few of the memorable moments in your 33 years here at BAM?

JM: To begin with, *Einstein on the Beach* in 1984: That was a very important accomplishment by this institution because it was the second year of the Next Wave Festival, the first contemporary, nontraditional performing arts festival for the city of New York that this institution committed itself to craft, produce, and create. *Einstein on the Beach* was seen at the Metropolitan Opera House for two performances in 1976.[1] We then undertook the reconstruction of this mythic work by Robert Wilson and Philip Glass so that, by the festival's second year, the city was offered this exceptional reclamation of these two New York artists, who had created this extraordinary work of more than four hours in length. We sold out 10 performances in what is now the Howard Gilman Opera House, a 2,000-seat venue, for a contemporary, nontraditional work of duration.

So BAM became *the place to be*, here in the lobby of 30 Lafayette Avenue in December. It was thrilling. And everyone was talking about it. You couldn't go anyplace where contemporary culture was being experienced or considered without someone asking, "Have you seen *Einstein on the Beach*? Did you go see *Einstein on the Beach*?"

That was 1984. Then, in 1987, the Next Wave Festival opened the nine-hour *Mahabharata*, Peter Brook's legendary epic for the theater. What was different then was not only this extraordinary artistic work but its performance in what is now called the Harvey Theater, which, at that time, was considered a radical architectural experience. We call it a state-of-the-art ruin.

> *BAM became* the place to be *in December 1984. It was thrilling. You couldn't go anyplace… without someone asking, "Have you seen* Einstein on the Beach*?"*

Joe Melillo stands at right with some of the principal contributors to the 1997 Next Wave Festival. Included among those pictured are choreographer Bill T. Jones, standing rear center, below to the right musician Lou Reed, choreographer Pina Bausch, left of Melillo, benefactor Howard Gilman, above Ms. Bausch to the left, and in the first row, left to right from center, choreographers Merce Cunningham and Mark Morris, and Harvey Lichtenstein, former BAM president and founder of Next Wave.

The theater is a model of Peter Brook's theater in Paris, Des Bouffes Du Nord, and was the former Majestic Theatre, which was a part of the city of Brooklyn's entertainment area. So not only were people talking about Peter Brook's production, the other discussion was about this theater and the experience of it. And that, again, added to the conversations about having been to the *Mahabharata* or "surviving" the *Mahabharata*.

These productions became iconic and contributed to BAM becoming a destination—certainly for those people in Brooklyn who were innately curious about what was happening in these two theaters but also for Manhattanites, who came across the bridges and tunnels for an artistic and cultural engagement in the borough of Brooklyn and at this institution.

Do you think BAM could exist in Manhattan?

JM: No. I've thought this for a long time, and this question has been addressed to me. No, because we were allowed to do a kind of work here that, under the cloak of darkness, allowed us to get up onstage and surprise the audience, those who were smart enough to buy tickets to come to that surprise.

Do you see any danger of the neighborhood getting too rich and popular to nurture an institution that's as curious and adventurous as you are?

JM: No. The issue here today is that Brooklyn has fundamentally changed. So our demographic is more robustly Brooklyn because this is the place for young, creative talent in all possible disciplines of culture; they're here, and they want what I just said: to satisfy their curiosity.

KS: Can I just add a point here? We survey our audiences pretty thoroughly every three years, and I think that, about five years ago, we tipped from being majority Manhattan visitors to majority Brooklyn visitors. In 1983, 80% of our audience came from Manhattan and 20% from Brooklyn and the other boroughs.

Do you think BAM's modern growth is driven by Brooklyn's renaissance or by the energy and concentration of cultural centers in the area ranging from the Brooklyn Museum and Botanic Garden to the Barclays Center to Saint Ann's and even PS1 in nearby Queens?

JM: I think that, again, the renaissance of this institution began with a man named Harvey Lichtenstein. Because he was a former modern dancer and programmed what he knew, he invited choreographers to use the only space he really had for performance, which was the opera house of 2,000 seats.

And what happened was that this identity of being a maverick performing arts center took hold. We were an outpost. We were, oh, that place where they do all of this contemporary, strange work. That's how BAM's profile became defined in the city. It's important to understand that the performing arts are never static. They grow and mutate, and this institution learned to grow with the artistic community based in New York City and be responsive to it.

KS: The '80s, you know, were sort of the nadir of civic life here in New York City. Things were very bad. But as the Next Wave Festival came around and BAM started to really blossom into what you know it as today, it provided an anchor for this very neighborhood, which was in dire straits. And as BAM stabilized

Einstein on the Beach, 2012.

> *Brooklyn has fundamentally changed. So our demographic is more robustly Brooklyn because this is the place for young, creative talent in all possible disciplines of culture.*

and grew, it helped this neighborhood. It would not be this way without BAM.

What is the breakdown of your income stream?

JM: Our ratio of earned to unearned income is, generally speaking, 40–60, meaning we get 40% of our funding from ticket sales and 60% from fundraising from government, individual, corporate, and foundation sources.

In a lot of countries, it would all be funded by the government.

JM: Right. Let me be very clear. New York City is very generous to cultural organizations. I think the Department of Cultural Affairs gives away more than $150 million a year in operating money.[2] That is a lot, far more than any other city in this country.

KS: First of all, they are our landlords. They own our buildings. So, they pay for our utilities and then, on top of that, give us about $2–$2.5 million a year. Our budget is about $55 million. So that while, as a percentage, it's not huge, it's fairly steady, and there are not a lot of strings attached. It's pretty much an operating subsidy and probably the easiest money we see every year. So, while it's not a huge part of our budget, and pales in comparison with European governments, for the United States, in relative terms, it's quite generous.

And one more thing. The Richard B. Fisher building, for example [BAM Fisher, inaugurated in 2012, is the organization's most recent facility], was a $50 million project. We got $32 million of that from the city. So, that was very generous.

But don't you think a city needs to be rich to have a critical mass of wealthy individuals supporting cultural institutions?

JM: You do need leadership in financing for art and culture in your community because we don't have this kind of governmental involvement the way the European Union has. It is up to private citizens in any community in the United States to offer leadership. Philanthropy is important for art and culture.

Can you estimate the financial contribution that cultural activities make to New York or the neighborhood?

JM: As a number, I can't. But studies from Americans for the Arts have shown how large the contribution is.[3] I will say that New York gets 55 million tourists a year and 54 million of those are coming because there is culture and art here that they can't access anywhere else in the world.

Everybody knows this. Everybody understands it. It's part and parcel of generating tourism, generating economic activity. We're a big employer. We have 240 full-time people here. We're certainly the biggest employer in this neighborhood.

The Fisher building was a $50 million construction project. We kept construction workers busy for two years. It's a very real economic benefit. I think studies have shown in New York City that every dollar that's spent on culture from the government returns $8 back into the tax coffers. So, it's one of the wisest investments the government could ever make.

Do you think the BAM model, so to speak, is exportable to other cities?

JM: We're working on a Brooklyn-Paris exchange. These will be two projects in the Fisher building's Fishman Space, a 250-seat, completely flexible theater that we have. Two Brooklyn-based companies, in theater and dance, will make their Paris debut at the Théâtre de la Ville in the autumn of 2016, while two Paris-based theater and dance companies will have their New York City debut in Fishman. Paris is very interested in having a relationship with Brooklyn—not Manhattan but Brooklyn.



Clockwise from left, BAM Strong, scheduled to open in 2017, will add galleries and a café to the Academy's culture block in downtown Brooklyn; Joe Melillo with performance artist Laurie Anderson and musician Lou Reed at the 1999 Next Wave Festival's staging of Anderson's *Songs and Stories from Moby Dick*; BAM's "state-of-the art ruin," the Harvey Theatre; CFO Keith Stubblefield on the roof of BAM with the Fort Greene neighborhood below.

You said that BAM could not exist in any city. Is that because of the nature of New York and Brooklyn—so many immigrants, so many working people?

JM: No, no, no. We could do this extraordinary work because we were under the radar of Manhattan, which is considered the citadel of classical culture (Lincoln Center, the Metropolitan Museum of Art, Carnegie Hall). We were here. We were subterranean. We were the subversive ones. But guess what? We got excellent notices. Audiences loved our work. And this is the way the town worked in the days before social media: talk, talk, talk, talk, talk. This was when people were in bars and restaurants actually *being* social.

If you had all the financial resources you needed, what would you do?

JM: There are two things I've learned because I've been here such a long time. One, you give money to individual artists to make and produce their work. It's attached at the hip. It's not just giving them money to commission a work. It's the money to produce the work, to create the work. And the other part is that you give to the institutions throughout the country that are making the commitment to actually put that art on *their* stages. That is the essential need today: money for artists to conceptualize and create and produce work; and then, funds for institutions like BAM, the presenting and producing organizations that need the finances to actually put that work on their stages for their audiences.

Decades ago, the US was a major funder of artistic education and programming. Has that changed markedly over the years?

KS: In the United States, at a federal level, absolutely. The National Endowment for the Art's budget is paltry. They're not a player.

But the city of New York is okay?

KS: Yes, it is very, very powerful, and influential, and beneficent. The city's Department of Cultural Affairs was started in 1976 at the commissioner level and has been very supportive and robust since that time.

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1 *Einstein on the Beach* premiered in July 1976 at the Avignon Festival, France's famous annual arts gathering. Four months later, in November, it was presented at the Metropolitan Opera "by special invitation" for only two performances. See the review by James R. Oestreich of the second production of the work at BAM in 1992, "What's It All About, Alfie?" in *The New York Times*, November 8, 1992.

2 New York City's Department of Cultural Affairs (DCLA) is the largest cultural funding agency in the United States. Its expense budget for Fiscal Year 2015 was $159.4 million, of which $5.6 million went to operating expenses and the rest—about 96%—to cultural funding. See the department's website at http://www.nyc.gov/html/dcla/html/funding/funding.shtml, as well as the testimony by DCLA Commissioner Tom Finkelpearl to the New York City Council Committee on Cultural Affairs, Libraries, and International Intergroup Relations during the Fiscal Year 2015 preliminary budget hearings on March 20, 2015, at http://www.dance.nyc/uploads/FY16%20Prelim%20Budget%20Testimony%20FINAL.pdf.

3 According to the organization's last national report, *Arts and Economic Prosperity IV: The Economic Impact of Nonprofit Arts and Culture Organizations and Their Audiences*, which surveyed the US economy at a particularly inauspicious time for spending generally, in the midst of the global financial crisis, culture was an ongoing economic resource. To quote the report: "Despite the economic headwinds that our country faced in 2010, the results are impressive. Nationally, the industry generated $135.2 billion of economic activity—$61.1 billion by the nation's nonprofit arts and culture organizations in addition to $74.1 billion in event-related expenditures by their audiences." See the national report at http://www.americansforthearts.org/by-program/reports-and-data/research-studies-publications/arts-economic-prosperity-iv/download-the-report, specifically the introduction by Americans for the Arts President and CEO Robert L. Lynch, "The Arts Mean Business."

Learn more
A full-length version of this condensed conversation is available at www.pwc.com/cities.

Economics

Economic achievement proves the most open and diverse of any of our indicator families

New York

The economics section combines the three indicators that assess and analyze the aspects of urban economies that are directly related to growth and continuing durability, stability, and *capability* (a much more accurate term than "power" in describing economic potency and vigor)—that "spontaneous optimism," in other words, that Keynes famously dubbed an economy's "animal spirits."

But our indicators do more than just gauge "spirits." They try to measure the structural capacity and support that each urban economy offers to the forces that propel economic development. The ease of doing business and cost indicators, especially, evaluate the degree to which each of our 30 cities has *designed and put in place* an economic framework that will allow all kinds of entrepreneurial and innovative spirits to blossom and thrive.

This section is distinct from the previous two in terms of results. No city succeeds in breaking through to the top 10 in all three indicators (as New York, San Francisco, and Toronto did in 2014). While 9 cities do finish in the top 10 in at least two indicators, no city manages to "hit the trifecta." The cities that do best in at least two indicators are (in declining order of average ranking) London, Toronto, New York, Singapore, Los Angeles, Madrid, Paris, Kuala Lumpur, and Stockholm.

These 9 cities are followed by another 13 — Amsterdam, Beijing, Berlin, Bogotá, Chicago, Dubai, Hong Kong, Jakarta, Johannesburg, San Francisco, Seoul, Shanghai and Sydney — that rank in the top 10 in at least one indicator. This fact leads to another interesting distinction between this section and the previous two: It has the largest number, and therefore the greatest diversity, of cities finishing in the top 10 in at least one indicator. This result is open to various interpretations, but one truth can probably be inferred with minimal disagreement: namely, that economies are among the most "open" fields of competition.

That is to say, the notion of competitive advantage is a great equalizer. An economy is a wide-open structure: Almost every city can produce something, whether material products, knowledge, or culture, better than another city. (Interestingly, in French, luxury goods are still called "articles de Paris," faithful to a particular city's centuries-long tradition of producing high-end consumer products.) And, of course, most emerging cities actually compete on costs. But there's nothing wrong with that.

Indeed, most "advanced" cities advanced because they were originally competitive on prices, whether those concerned manufacturing or trading and logistical costs. Everyone has to start from somewhere, and usually what economists call starting from a "lower base" is the normal road to expansion. The open, even democratic, nature of economic achievement also serves as a warning to advanced cities. They are never guaranteed that their economic clout can be maintained in the face of the skills and resourcefulness of emerging cities.

No city succeeds in breaking into the top 10 in all three indicators. At the same time, this section has the greatest diversity of cities finishing in the top 10 in at least one indicator. One truth can probably be inferred from this: namely, that economies are among the most "open" fields of competition, and this can be a great equalizer.

But prowess in business also requires transparency in business practices. Here, we will leave the last word on the need for and commitment to good governance to **Basuki Tjahaja Purnama (popularly known as Pak Ahok), Governor of Jakarta**, one of Asia's fastest emerging economic centers. He tells us that "the most important point [for a bureaucrat] is not to accept bribery. Second, no partiality. Third, never be afraid."

Finally, we also present a special section on taxation to see what role tax plays in a city's success. We find that taxes do matter but that business also goes where there's opportunity. An analysis of corporate total tax rates, personal rates, and efficiency of tax systems shows Dubai, Hong Kong, and Singapore in the top three spots. But our overall top city, London, is not far behind at #6, with favorable corporate rates and efficient systems. Meanwhile, the bottom third in the tax package includes New York, Tokyo, Beijing, São Paulo, Shanghai, and Paris—all world business capitals. The moral: Tax can play a role in a city's success, but is part of a wider mosaic of policy and economic factors.

Economic clout

London reinforces its top spot, as Madrid advances to turn the spotlight on Europe

This indicator is arguably more thought-provoking—and more revealing—this year thanks in part to a new variable we've added to our preexisting five. Employment growth is a significant addition that registers a fundamental aspect of economic progress and is a bellwether of a robust economy.

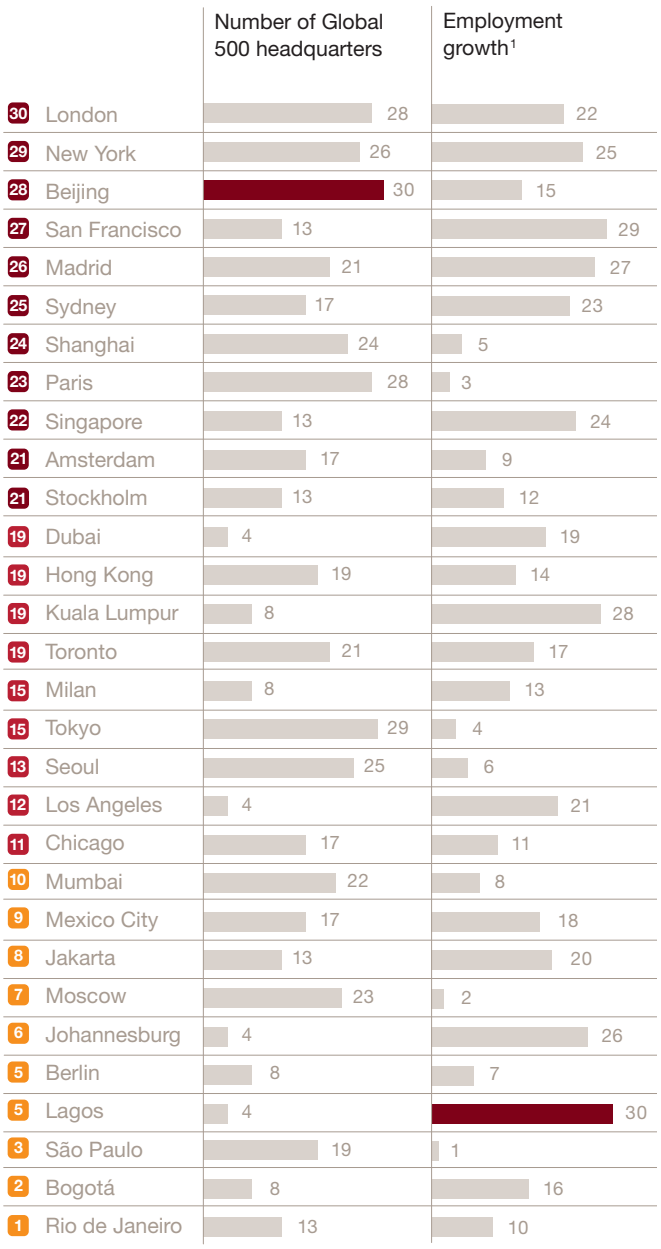
Generally, it seems again that life at the top of our report is remarkably stable: Seven of our cities in the top 10 repeat their achievement from *Cities of Opportunity 6*. A closer look at economic clout this year, however, discloses a surprising picture in at least a couple of ways.

But first of all, while the effects of the UK's decision to exit the European Union will play out over time, London remains top of the class in economic clout and does so with an even stronger performance than in the last edition based on 2014 and 2015 data. London opens up a bit of breathing space between it and second-place New York, which switches position with third-place Beijing (which was #2 in our last report to New York's #3). In 2014, the British capital outscored its nearest rival by only three points; this year, it does so by 10. And although it doesn't rank #1 in any variable, London is the only city of our 30 that finishes in the top 10 in every one of the six, again showing the balanced strengths it exhibited overall in our last report.

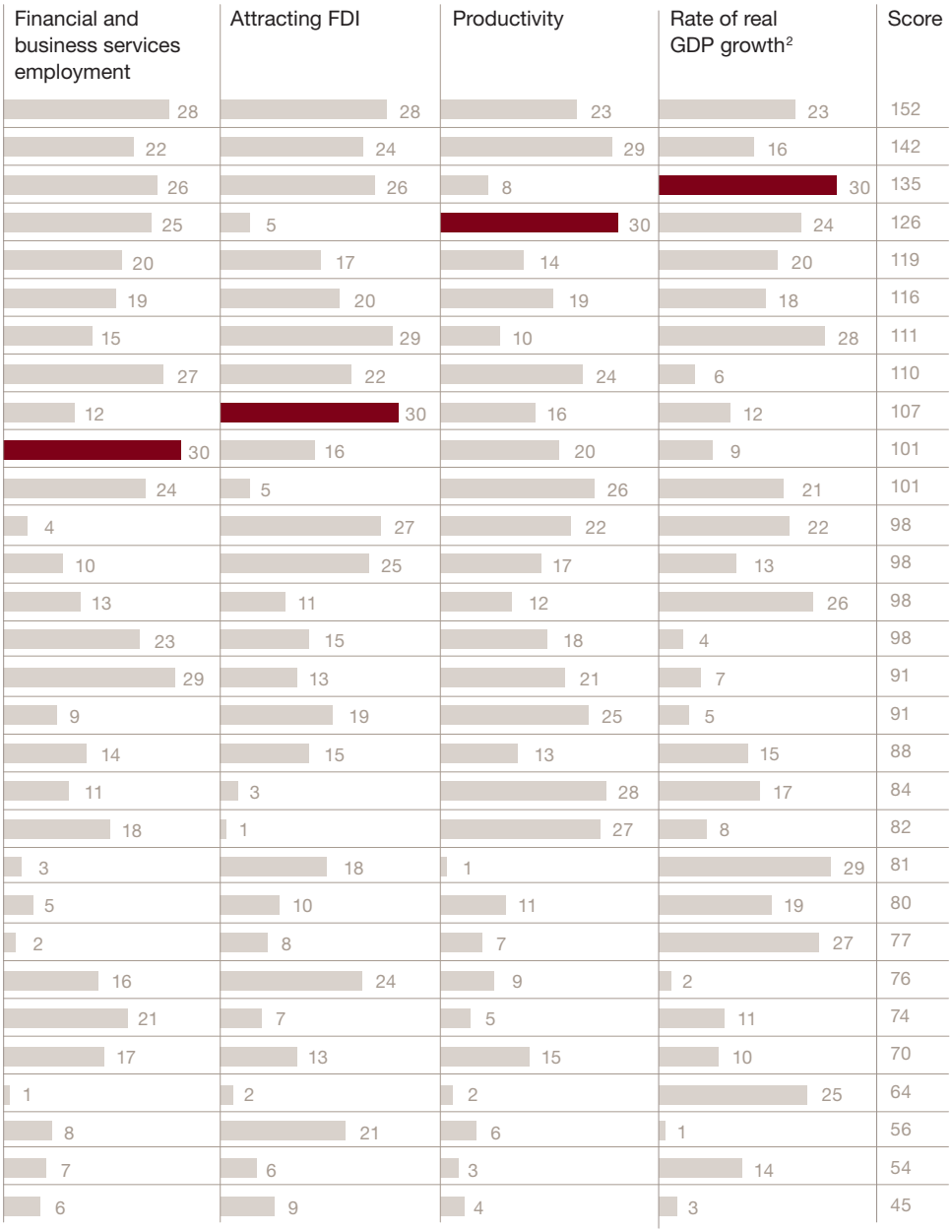
San Francisco, meanwhile, rises to fourth place from seventh and Sydney finishes sixth, up an impressive seven places since 2014, as Shanghai drops to seventh from fifth, Paris falls to eighth from fourth, and Singapore declines to ninth place from its previous sixth. Amsterdam, once again, finds itself in the top 10, ranking #10, tied with Stockholm.

The Swedish capital, along with Madrid, in fact, is part of the two most striking improvements in economic clout this year. Stockholm, which tied Spain's capital for #17 in the last edition, is in 10th place this year, with improved GDP growth helping. But Madrid has done even better, rising 12 spots to finish #5 out of 30 cities. In doing so, the Spanish capital went from dead last in GDP growth in our last report to edging the top 10 this time at #11. It also registers the best job growth of any European city, finishing fourth overall just behind Lagos, San Francisco, and Kuala Lumpur in this critical variable.

Madrid's success this year leads to another surprising finding. Looking at the top 10 cities again (actually, the top 11, as two tie for 10th place), we see that half—London, Madrid, Paris, Amsterdam, and Stockholm—are all European. In other words, Europe appears to have been weathering its seemingly perpetual crises since 2008.



This result underlines a basic truth: What actually makes an economy "advanced" is its institutional depth—everything from an autonomous central bank and transparent equity markets to a responsive social welfare system and genuinely free press. In times of crisis, all these factors have the ability to unlock vast resources



Each city's score (here 152 to 45) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each indicator

1. Annual growth rate of employment in a city, 2014–2016.
2. GDP annual growth rate 2014–2016 in real terms expressed in 2015 US$.

of financial and social support. While "resiliency" has become a fashionable word of late, used in many contexts, in the hard and practical terms of an economy, resiliency is truly the ability to tap deep resources that will function "countercyclically" (against the prevailing cycle) to restore an economy from recessionary crisis back to growth. "Automatic stabilizers," after all, can only be "automatic" in economies with advanced systems of both taxation and transfer payments.[1]

See **Economic clout**, page 97

Governor Basuki Tjahaja Purnama—popularly known as Pak Ahok—unveils infrastructure plans in Jakarta.

In Jakarta, clean government lays the foundation

…for a better future, explains Governor Basuki Tjahaja Purnama

Governor Basuki Tjahaja Purnama—popularly known as Pak Ahok—took the reins of the city in 2014 from now President Joko Widodo and continued the campaign for good government, better infrastructure, and quality of life. In a discussion with PwC's Julian Smith, lead global transportation partner based in Jakarta, the governor explains why official corruption is so corrosive for city life and what needs to be done to improve transit, education, housing, and parks.

What short- or long-term challenges are at the top of your priority list?

Our first priority is to reform the bureaucracy. We need the bureaucrat to become a servant. That is why we launched a one-stop service in all subdistrict and district offices. After four months, we faced some difficulties because if we take somebody's authority, there are vested interests to become a one-stop service, with no tipping fee, no need to bribe.

We are still having difficulties in construction licenses because there is a lot of money you can take from bribes. This June [2015] maybe, we will fire some of our bureaucrats if they do not want to help solve the construction license [problem], as an example of reform in the bureaucracy. We already launched a new salary package for our employees. Even the lowest bureaucrat will receive a monthly salary of at least 9 million rupiah (Rp).

Why did you start with the reform of the bureaucracy? It is the most difficult task.

Because we hold the authority. What we want to do is very difficult. If you are a corrupt official, what you will purchase is garbage and rubbish, so there is no use. That's why for me, the important thing is the bureaucrat.

How would you define your job as governor of the city?

For me, if the leader is clean and does not accept bribery, then your bureaucrats will not have the courage to do that.

> *The philosophy of developing our parks is very easy: Every household has its own difficulty. That is why we want to unite them together as one community.*

Jakarta traffic around Plaza Indonesia.

You have been described as direct, to the point, and not afraid to confront people and issues in order to accomplish your goals. Is that your natural way of doing things?

I would like to make a joke for this question. Do you have other options to solve the problems in Indonesia…Maybe not. So you have to follow me. That is my way.

How would you describe your city?

Jakarta is very *benang kusut*…complicated. Putting your finger on it is like finding a needle in a haystack. The first problem to solve is you have to have a clean, transparent, and professional bureaucrat. That is important. No bribery, no partiality, and never be afraid.

What is the city doing to address infrastructure problems?

Forty percent of economic activities [in Indonesia] are in Jakarta. Logistics cost is very expensive. But for us, our problem is we do not control even the harbor, seaport, Tanjung Priok. That is why our program is to use our own enterprise to get involved in the logistics business, so we will form a joint venture with Pelindo II (the state-owned port operator) and the train company. We also want to control many toll roads; that is why this year we will develop six city toll roads to improve logistics infrastructure, including transportation.

I think it is important for us in Jakarta to have good transportation. MRT [mass rapid transit] is already under construction. At the end of [2015], we will start the construction of Light Rapid Transit, seven corridors of it, connecting airports, malls, business centers, and middle-class real estate. We also want to provide bus rapid transit; this way every kind of bus transportation will be integrated into bus rapid transit. It is also important to get involved in the logistics business. We already have entered into an agreement with the train company to use its property near train stations. We want to have good logistics for food, and we will have a food station [distributor] company. We want to control this to better our competitiveness.

For me, infrastructure goals begin with providing better mass transportation. Regarding traffic jams, I cannot stop people from purchasing cars. Jakarta now has 17.5 million vehicles, including 13 million motorcycles, because we cannot provide low-cost transportation. This June [2015], we will establish one company as a provider of low-cost transportation. By the end of 2016, integration of all transportation systems will be accomplished. I think that is what Jakarta wants to do.

Is access from the airport important?

Yes. We've already developed a railroad system directly into Dukuh Atas. And also we will provide Light Rapid Transit from the airport to Pantai Indah Kapuk, the old city area to Ancol and Jakarta Expo into Kelapa Gading. We will also provide free, double-decker shuttle buses to get around business districts.

Governor Pak Ahok

> *Jakarta is very "benang kusut" … complicated. Putting your finger on it is like finding a needle in a haystack.*

What is Jakarta doing to improve education and skills?

The problem is poverty. The basic needs for singles is Rp 2.5 million monthly, and the basic salary is Rp 2.8 million. Just imagine, if you have three kids, you would need Rp 600,000 to 800,000 monthly to get them to school. That is why 40% of the young population cannot go to school. This year, we are providing scholarships for 489,000 students worth a total of Rp 2.4 trillion. But the students can draw only 50,000 weekly or use a cashless system. This July [2015], we will bring those 489,000 students to the book fair to buy school supplies. The city provides Rp 3 trillion for students so they are able to graduate from vocational high school.

What quality of life elements are you targeting to improve?

We just completed six integrated parks. We call them integrated parks because they have a kindergarten, playgroup, medical clinic, and library. We encourage the young and the old to interact because these public spaces are children- and elderly-friendly. We accomplished building six this month. We will build a total of 50 this year [2015] and 150 next year. The philosophy of developing these parks is very easy: Every household has its own difficulty. That is why we want to unite them together as one community.

In the slum area, the inhabitants need parks that will open from 5 a.m. to 12 a.m., complete with fences, adequate lighting, and Wi-Fi connection. We hire locals to manage these parks and also a women's organization, Family Welfare Movement (PKK) to help.

How did you develop this solution?

From brainstorming, Chinese philosophy, and the Church. I am a Christian, so most of my ideas come from the Church. We want to have a caring community, so when people come, we want to know who they are, where they came from. That is very important. So it is important in Jakarta to be united in one community.

How do you deal with the fact that you can only help a small percentage of those who need housing?

Housing for me is very easy. The poor will always be with you until the end of this world. That is why I stopped providing low-cost, subsidized apartments to sell. I do not want to sell them. That is a very wrong policy. The occupants will just sell them again, and you cannot control it. That is why I provide low-cost apartments and subsidize the lease price: only Rp 5,000, or about half a dollar daily. This serves as an incubator to the tenants.

What sectors of the economy are you targeting for development?

The services sector and the other one is tourism. Regarding manufacturing, we want to ask the manufacturer to move out of Jakarta.

Governor Pak Ahok and Julian Smith, PwC lead transportation partner.

Do you really think Jakarta can compete with Bangkok or Singapore for tourism?

I believe we could if we could solve the transportation problem.

As the leader of a city at the heart of the developing world, what lessons are you learning that might apply to other fast-growing cities?

I think the most important point is not to accept bribery. Bribery is very common in developing countries. They pass it off as business as usual. That is why you have to say that we do not accept bribery. Second, no partiality. You cannot be partial anymore, so no partiality.

Third, never be afraid to die because death is a gain. If you are afraid to die, somebody will oppress you, and you will be discouraged. I think these three things are important if you want to be a leader in a developing country. No bribery, no partiality, and have courage so you can say death is a gain.

Learn more
Video of this discussion is available at www.pwc.com/cities.

> *"The most important point is not to accept bribery. Second, no partiality. Third, never be afraid to die because death is a gain. If you are afraid to die, somebody will oppress you and you will be discouraged.*

Ease of doing business

Four years and two editions later, Singapore and Hong Kong are still at the top

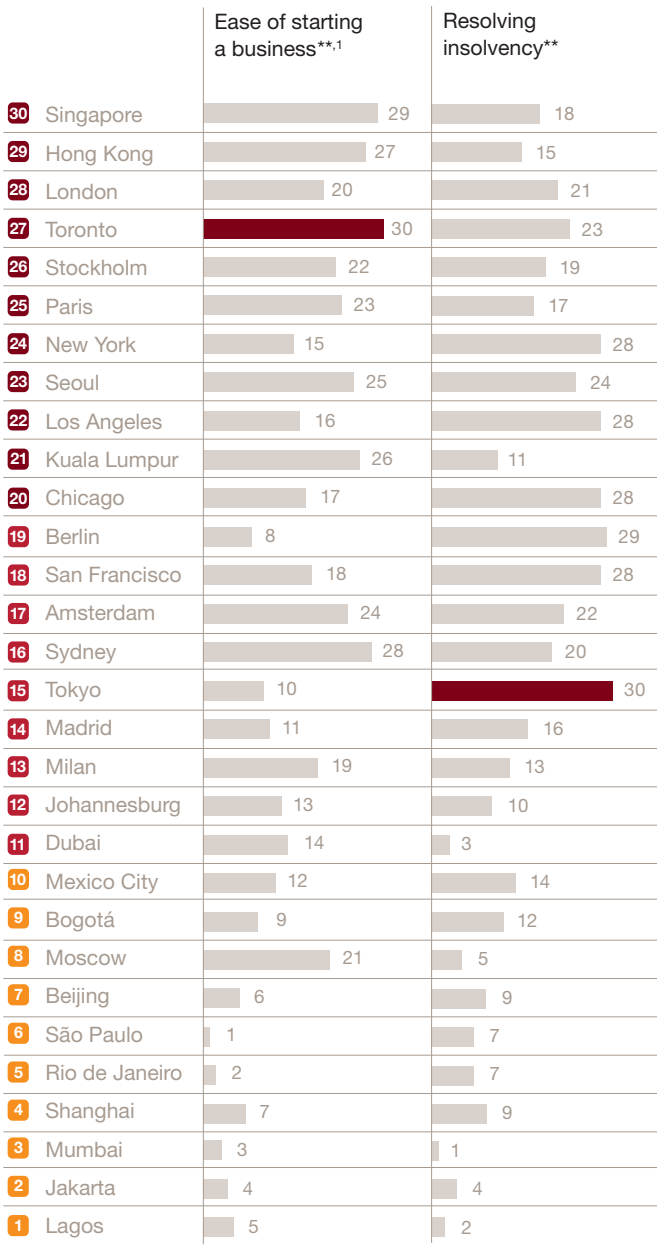
This indicator has undergone two changes this year. We've deleted the variable assessing the impact of employee regulations on business and replaced it with a new one, tax efficiency, which essentially gauges the ease of complying with tax regulations and the hours required to do so. We've added this variable because taxation *per se* is manifestly a major cost of doing business and might also reflect the broader nature of a city's business environment. If the (unnecessary) complexity of a tax system is more daunting—and even more costly—than the initial taxes themselves, it may serve as a sign of more roadblocks in the system as a whole.

As for removing employee regulations, we decided to do so for two reasons, one conceptual and one very pragmatic. A simple example from our last report serves to illustrate the point. Although London finished first of our 30 cities overall in *Cities of Opportunity 6*, it finished dead last in employee regulations—a conspicuous case of cognitive dissonance that distorted an otherwise extremely successful performance. (London ended up in fifth place in the ease of doing business indicator in 2014 but would have finished third and just one point behind second-place Hong Kong without the employee regulations variable.) In the event, we realized that the variable was too strongly weighted on one side (employer as opposed to employee), especially given the lack of a countervailing variable in the rest of the indicator.

Ultimately, however, while our continual fine-tuning of variables leads to more representative and accurate results, it hardly changes the underlying realities in any indicator. As we continually point out, in edition after edition and within this study, the consistency of our cities is remarkable despite the ongoing adjustments. Eight of the top 10 cities here this year were in the top 10 in our 2014 report. Even more to the point, Singapore is now first in this indicator for the third straight edition, with Hong Kong following in second place again for the third straight time. Indeed, these two Asian cities have finished #1 or #2 since 2008—clearly, the kind of rock-solid results that are built on years of success and achievement.

In fact, the only significant difference over the last few years is that, for the first time in the history of our report, New York falls out of the top 5 in ease of doing business, dropping to seventh place, due mostly to a precipitous drop (11 places) in ease of starting a business and a low score in tax efficiency (#20, just out of the bottom 10 in this variable), as well as the effect of the removal of the employee regulations variable, in which New York had finished #1 in 2014.

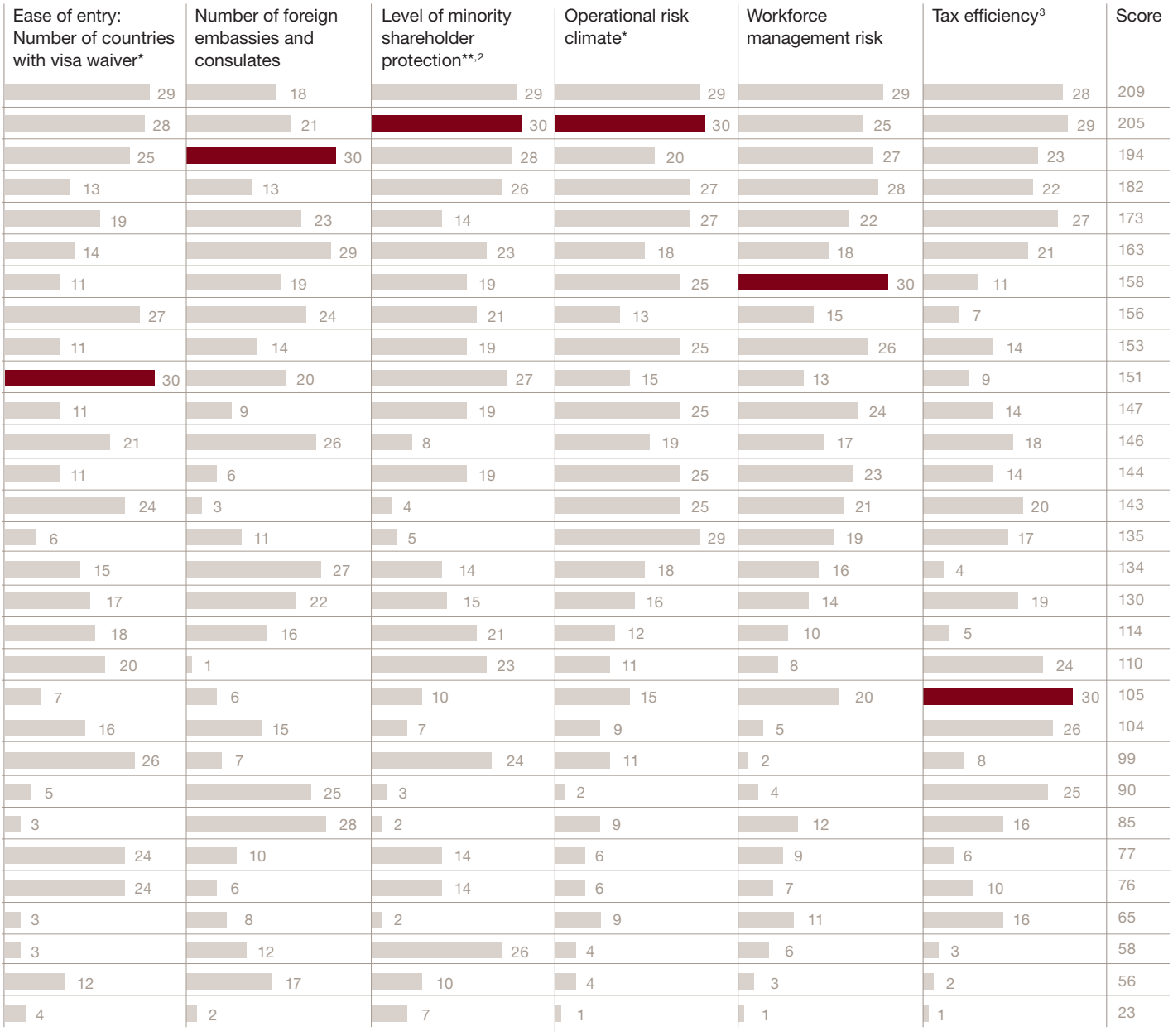
See **Ease of doing business**, page 97



Each city's score (here 209 to 23) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each indicator
* Country-level data
** Based on most populous city



1. Data are based on regulations relevant to the life cycle of a small- to medium-sized domestic business. It is assumed that the minimum time required for each procedure is one day. Although procedures may take place simultaneously, they cannot start on the same day.
2. The Strength of Minority Investor Protection Index is the average of indices that measure transparency of transactions, liability for self-dealing, and shareholders' ability to sue officers and directors for misconduct.
3. Combination of the number of tax payments and the time required to comply by businesses during their second year of operation. Data provided by PwC UK from *Paying Taxes 2016*; taxes are accurate for the year ended 31 December 2014. The *Paying Taxes 2016* report can be found at http://www.pwc.com/gx/en/paying-taxes/.

Cities and their taxes

The tax variables show a wide variety in the way tax systems are implemented in our cities and their impact on the individual and on business

All governments have to decide how to raise taxes. Around the world, we see different systems allowing a greater role in tax collection for cities (and regions) so that patterns of collection have become more complex. While there is some momentum toward more taxes being raised at local levels in certain jurisdictions, in order to provide greater autonomy to municipalities, in most countries consumption taxes, such as value-added tax, corporate taxes, and personal income taxes, are still levied at a national level.

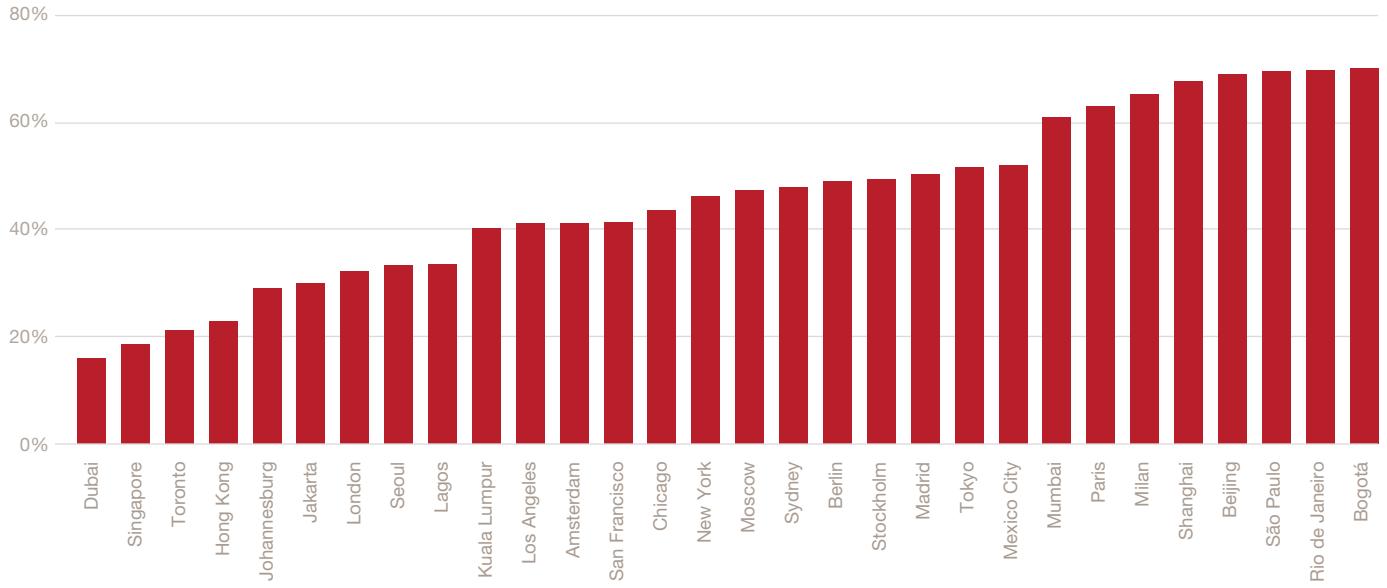
Taxes are, of course, of major interest to everyone. The increasing tax burden was a significant business risk identified by the world's corporate leaders in PwC's *19th Annual Global CEO Survey*.[1] The way in which a tax system is designed can have a significant impact on productivity, as the system may provide incentives for investment in equipment or research and development which are crucial for economic growth. For that reason, in this edition of *Cities of Opportunity* we present a broader, and richer, picture of the tax landscape across our cities.

One problem in discussing taxes dispassionately is the innate subjectivity in questions of "high" or "low," "fair" or "unfair," taxation. The evaluation of taxes in each of our cities tries to remove subjectivity from the analysis as much as possible by relying simply on the numbers to provide a like-for-like comparison. The study uses a measure of the total tax rate for a case-study company, along with the personal taxes of the employees in that company. Both variables are included in the cost indicator of this report (Page 94). In addition, we measure how efficiently a company can comply with the tax system in the tax efficiency variable in our study's ease of doing business indicator (Page 88).

The corporate total tax rate and tax efficiency data are based on the methodology used by the World Bank Group in *Paying Taxes 2016*, published jointly with PwC.[2] The corporate total tax rate is a measure of all taxes and mandatory contributions borne by the case-study company. It is not the headline corporate tax rate but a rate that provides a comprehensive measure of the cost *of all*

Corporate total tax rate

The distribution of the total tax rate between 15.9% in Dubai and 69.7% in Bogotá



Source: PwC and World Bank Group, *Paying Taxes 2016*[2]

	Corporate total tax rate	Personal tax	Tax efficiency	Score
30 Dubai	30	30	30	90
29 Hong Kong	27	28	29	84
28 Singapore	29	17	28	74
27 Johannesburg	26	22	24	72
26 Toronto	28	11	22	61
25 London	24	13	23	60
25 Moscow	15	20	25	60
23 Jakarta	25	29	2	56
23 Seoul	23	26	7	56
21 Mexico City	9	19	26	54
20 Kuala Lumpur	21	21	9	51
19 Madrid	11	14	19	44
18 Stockholm	12	4	27	43
17 Lagos	22	18	1	41
17 Los Angeles	20	7	14	41
17 Sydney	14	10	17	41
14 Amsterdam	19	1	20	40
14 Berlin	13	9	18	40
12 San Francisco	18	7	14	39
11 Rio de Janeiro	2	25	10	37
10 Bogotá	1	27	8	36
10 Chicago	17	5	14	36
10 Paris	7	8	21	36
10 Shanghai	5	15	16	36
6 Mumbai	8	23	3	34
6 São Paulo	3	25	6	34
4 Beijing	4	12	16	32
3 New York	16	3	11	30
3 Tokyo	10	16	4	30
1 Milan	6	2	5	13

Each city's score (here 90 to 13) is the sum of its rankings across the three variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low

Highest rank in each indicator

taxes borne by a business. It adds all those taxes together and converts them into a percentage of profit before all of those taxes. As for the personal tax variable, PwC calculates it as an average of the tax rate paid by the three grades of employees at the case-study company (workers, supervisors, and managers) based on local employment tax rules.

The third variable, tax efficiency, is a 50:50 weighted measure. It combines the *time* the case-study company takes to comply with three major taxes (corporate income, labor, and consumption taxes) with an index of *payments* that reflects the number of taxes, method of payment, and frequency of filing and payment. The time and payments data are again drawn from the World Bank Group *Paying Taxes 2016* study.

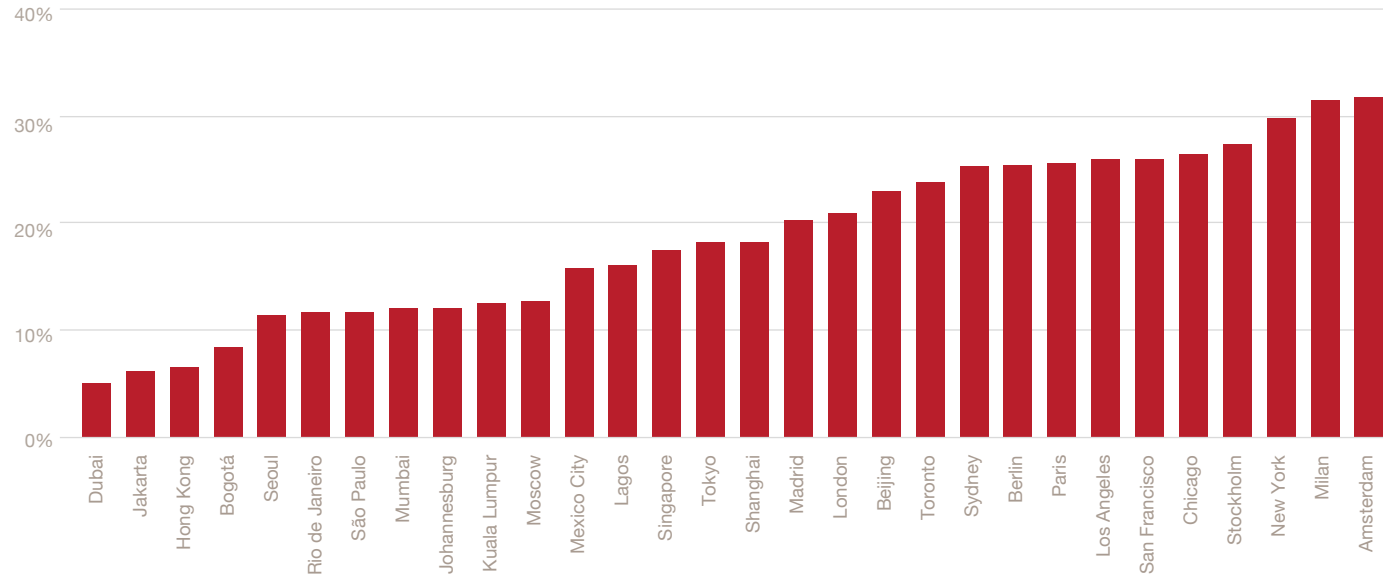
In line with all of our report's variables, the results for these tax variables are ordered from 30 to 1 (with 30 given to the lowest tax rates and most efficient systems) as part of our overall scoring in the study. It should be stressed, however, that, as opposed to the *Paying Taxes 2016* study, the rankings here of corporate and personal tax rates are only straightforward comparisons from lowest to highest rates. This is done for reasons of simplicity and transparency but also because both variables are part of our cost indicator (in which lower cost is preferable to higher cost). Consequently, there is no judgment being made here about the merits of low tax rates, recognising that they reflect a variety of different economic drivers.[3]

It is also useful to understand how the results extend across each variable (as shown in the three accompanying charts). Corporate rates are fairly evenly spread across the range from 15.9% in Dubai to 69.7% in Bogotá. The distribution of personal rates is also fairly even but with some concentration at certain levels. The distribution of the efficiency index, however, displays a rather different picture, with Dubai and Hong Kong performing particularly well, while the remaining cities are much more bunched together.

When looking at these variables, a challenge, of course, is always to keep the local context in mind in order to make best sense of the numbers. While this study provides a like-for-like comparison of taxes at a particular time, the different needs of particular jurisdictions or cities need to be borne in mind. Lower tax rates, for example, might not be possible depending on the alternative sources of revenue and the levels of demand for public services. The wider context for the tax variables is also relevant for business. While taxes are among the top business risks for CEOs, they also have other issues to consider. Taxes clearly matter, and they appear in the top 10 concerns of our CEO survey, but the top three threats are over-regulation, geopolitical uncertainty, and exchange rate volatility. The overall context in which taxes are paid is therefore very important and will vary according to the respective economic, political, social, demographic, and environmental ecosystems in which cities, their businesses, and citizens operate and live.

Personal tax rate

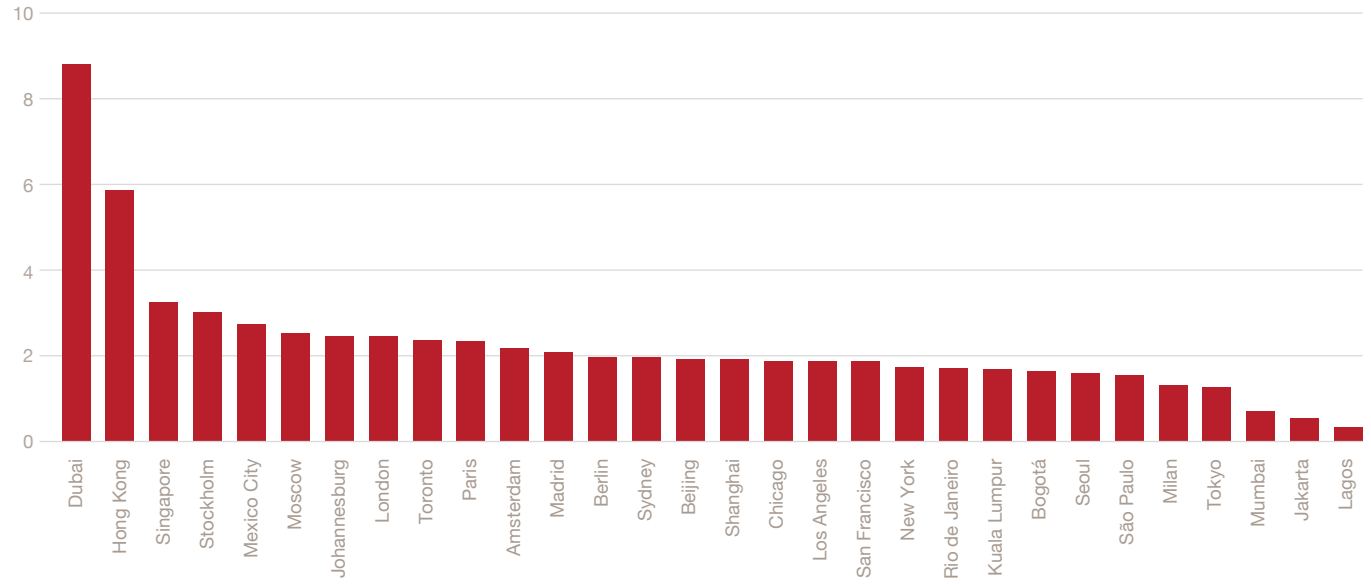
The distribution of the average personal tax rate between 5% in Dubai and 31.5% in Amsterdam



Source: PwC UK

Tax efficiency

The distribution of the tax efficiency score (based on number of payments and time required to comply) from Dubai (most efficient) to Lagos (least efficient)



Source: PwC and World Bank Group, *Paying Taxes 2016*[2]

Looking at the results of our tax variables overall, while Hong Kong is a fairly close second, Dubai leads all our cities in all three variables. It will be interesting to see whether this remains the case in future years, as governments in the Middle East that have so far not taxed corporate profits introduce such taxes and align more with worldwide tax profiles. Only three cities appear in the top 10 in all three variables (Dubai, Hong Kong, and Johannesburg), while six other cities appear in the top 10 in two of them (Singapore, Toronto, Jakarta, London, Seoul, and Kuala Lumpur).

Several noteworthy patterns also emerge when we examine the results for each variable. In the 10 cities with the lowest corporate total tax rates, Dubai is joined by several Asian cities, including Singapore, Hong Kong, Jakarta, Seoul, and Kuala Lumpur. Two African cities, Johannesburg and Lagos, also have low rates, while Toronto and London represent North America and Europe. The highest total tax rates for our case-study company are found in South America and China, while Paris and Milan have the highest rates of our European cities. A mix of labor taxes and other taxes, such as turnover taxes, drive corporate total tax rates higher in these cities.

As for the lowest average personal tax rates, they are again found in Dubai, joined by Jakarta, Hong Kong, Seoul, and Johannesburg. Lower rates, however, are also seen in our South American cities: Bogotá, Rio de Janeiro, and São Paulo. And while the highest rates are found in European and US cities, it is noteworthy that many of these cities rank in the top half overall in *Cities of Opportunity 7*.

On tax efficiency, Dubai achieves the top score once again, joined this time by Hong Kong and Singapore, with these cities doing well largely because of having fewer taxes generally, as well as the availability of electronic filing and payment capabilities. There are also several European cities in the top 10 in this particular variable, with London ranking between Stockholm and Paris. Moscow and Mexico City also appear here, achieving high scores largely driven by efficient tax systems supported by the business community's technology. The least efficient tax systems include those of South America's cities, joined by Lagos, Jakarta, and Mumbai, which have the lowest scores. These systems tend to have more taxes, with less electronic filing and payment systems available to our case-study company.

1 See the chart on page 7, PwC, *19th Annual Global CEO Survey,* January 2016: *Redefining business success in a changing world* at https://www.pwc.com/gx/en/ceo-survey/2016/landing-page/pwc-19th-annual-global-ceo-survey.pdf.

2 For information regarding the *Paying Taxes* methodology, please see Appendix 1, beginning on page 100 of *Paying Taxes 2016* at https://www.pwc.com/gx/en/paying-taxes-2016/paying-taxes-2016.pdf. Please also note that Chicago, San Francisco, and Milan do not appear in the World Bank Group Paying Taxes study. PwC offices have independently calculated the variables for these cities using the same methodology applied in the *Paying Taxes 2016* publication.

3 Unlike in *Paying Taxes 2016*, no lower threshold to limit the impact of lower tax rates is applied to the total rates included in *Cities of Opportunity 7*. The results, therefore, do not take into account whether or not ever lower tax rates are necessarily the optimal policy, since governments need to set tax rates with a variety of economic factors in mind.

Cost

Mature cities can be as competitive on costs as emerging ones, but the price of global allure can be high

Nothing is so mutable or elusive as the notion of the "cost" of daily life—whether in regard to individuals or businesses. What was a luxury (or even unheard of) a generation ago can become an essential, "overhead" expense a decade or two into the future (as we've seen with cable TV, Internet, electronic devices, and an expanding range of technologies). And, of course, the very notion of "basic costs"—rent, for example—can vary tremendously among cities as different as, say, London, Dubai, and Lagos. It is difficult, therefore, to assess basic expenses generally; it is equally difficult to create a comparative analytical framework that can ensure like-to-like correlation among urban societies as culturally different and spatially distant from each other as our 30 cities of opportunity.

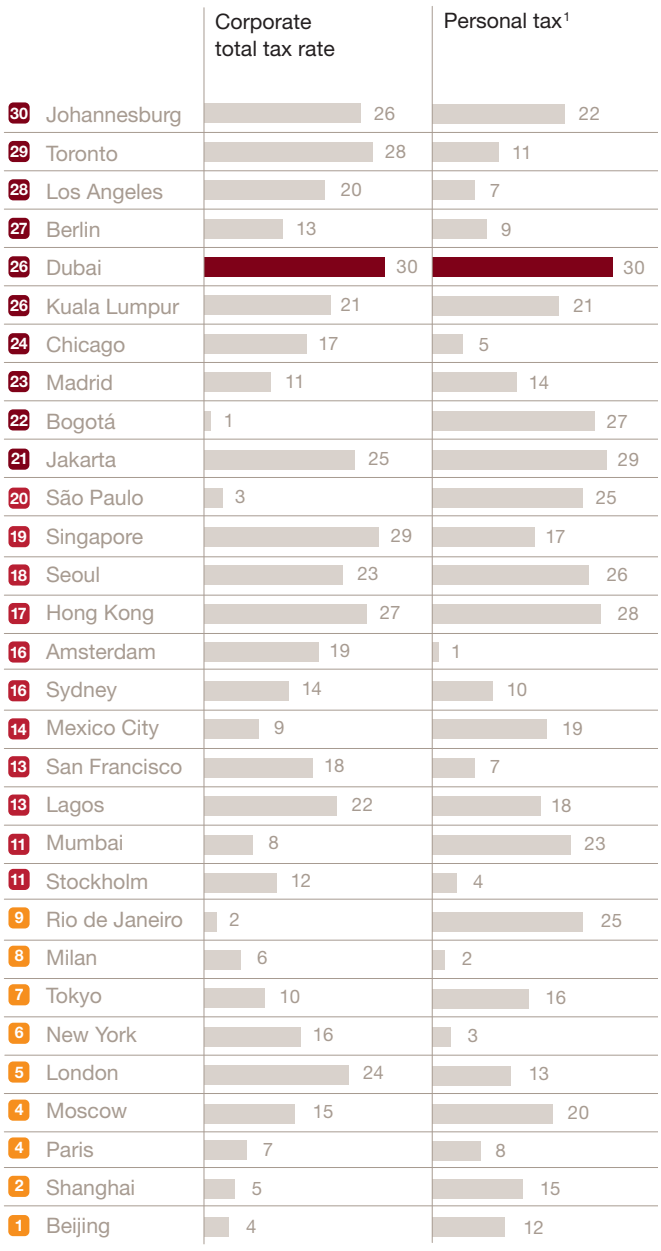
That is why no indicator continually changes so much as this one. The only variable that has remained constant in our three reports since *Cities of Opportunity 4* is cost of business occupancy. Two data points, personal tax and affordability of rent, are new comers this year, and the iPhone Index has been removed. As a result, this indicator now totals six variables, as opposed to the previous five, and creates a slightly different, expanded view of cost.

Nonetheless, consistency remains at the top, where 7 of the top 10 in 2014—Johannesburg, Toronto, Los Angeles, Berlin, Dubai, Kuala Lumpur and Chicago—repeat in a slightly altered order. A different story emerges looking at some of the more expensive cities.

The inclusion of housing and personal tax costs have underlined the high price of life in some of the world's most in-demand cities, and spotlighted the issue of affordability if cities hope to keep attracting talented young people and serving as a home for the middle-income. New York tumbles from #9 last time to #25 now. This is New York's worst performance in any of the 10 indicators, and it scores considerably lower than any other US city including San Francisco, which went from #6 in 2014 to #18 now. Both cities are national and global magnets for talent, as shown by our 2014 study *We, the urban people*, finishing second and fourth, respectively, when 15,000 PwC professionals were asked which cities among our 30 would be most alluring for relocation.

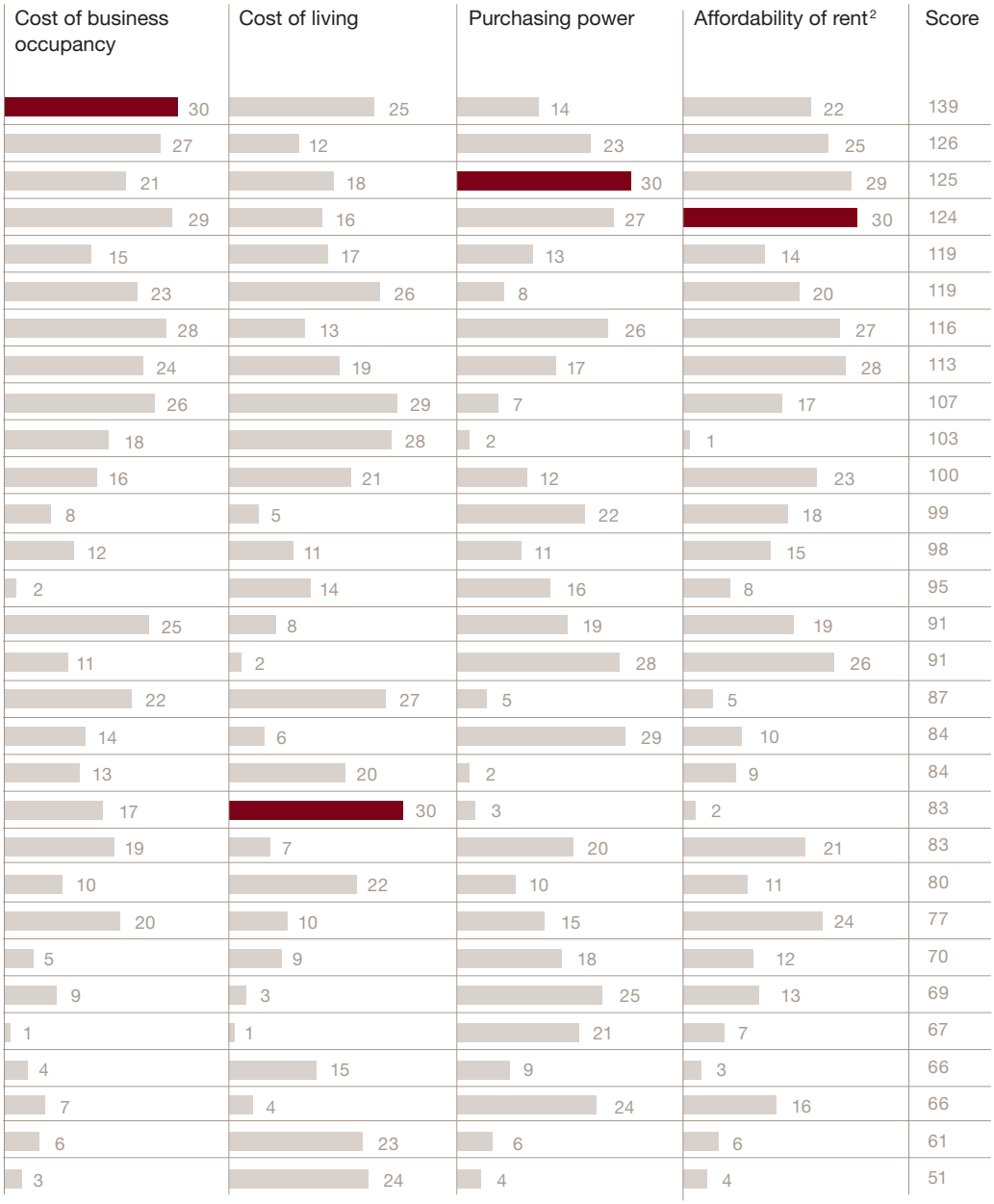
London, the most attractive city for our professionals in that survey, falls from #15 in our last edition to #26 now. This is also the British capital's worst performance in the 10 indicators. And Paris does worst of all among the traditional triad of cosmopolitan Western cities, finishing 27th out of 30—again, its worst performance. What all three cities share is a low performance in personal tax rates, cost of business occupancy, cost of living, and affordability of rent.

See **Cost**, page 97



Each city's score (here 139 to 51) is the sum of its rankings across variables. The city order from 30 to 1 is based on these scores. See maps on pages 14–15 for an overall indicator comparison.

High
Medium
Low
Highest rank in each indicator



1. The personal tax data reflect the average employee effective tax rate across manager, assistant, and support staff levels in each city economy. The employee effective tax rates were generated by PwC UK using data supplied for *Paying Taxes 2016*. Taxes are accurate for year ended 31 December 2014. The *Paying Taxes 2016* report can be found at http://www.pwc.com/gx/en/paying-taxes/.

2. A measure of the affordability of rental accommodation in a city, calculated by offsetting the monthly rental cost of a 120m² apartment against a city's average wages. Rental prices were sourced from the Global Property Guide. Where the cost of a 120m² apartment was not available, the closest equivalent was used.

Transportation and infrastructure

Continued from page 48

Berlin also moved up from #9 to fourth place in this edition, and Sydney jumped from #25 to tenth driven by good system performance.

Both Chicago and San Francisco have jumped since our last report. The City by the Bay is now in fifth place (from #21) and the Windy City is now #6 (from #18). Both cities profited from our adjustment of affordability of public transport and the transfer of ease of commute to this indicator.

The very least that one can say about the balance in performance at the top is that the most successful global cities have good transport systems, given that seven of the top 10 cities here also are in the top 10 overall in our report.

On the other hand, Toronto fell substantially, from second to twelfth when traffic congestion and ease of commute was factored in. (This confirms the city's commuter issues, as assessed by our own *We, the urban people* study in 2014, in which PwC staff in Toronto ranked fourth in describing their city as "gridlocked" and in pinpointing transit as a critical area needing improvement.) Seoul this year drops 10 places, tying for #13 from its #3 tie in our last report. As with Toronto, Seoul's final ranking almost entirely results from transferring the traffic congestion and ease of commute variables from our demographics and livability indicator to this one.

Sustainability

Continued from page 62

Our second new variable, water-related business risk, joins the recycled waste and air pollution variables to provide a more complete image of each city's environmental profile. Taken together with public park space, these four variables provide a basic gauge—and a baseline—of the current sustainability of our cities' respective urban environments.

The story here confirms that major cities do not change overnight. It also shows that our approach—providing balanced measurement on a robust scale—works in marking broad urban directions. Seven of our top 10 cities currently were in the top 10 in our last report despite the addition of the two new variables. What is really remarkable is that Stockholm and Sydney, which tie for first place this year, were tied for first place in our previous report. This demonstrates that even cities that lie almost half a world apart, with very different climatological and geographical characteristics, can develop municipal policies to maximize and secure their sustainability.

But there is one notable exception this year to our 2014 report: Seoul rises from #23 two years ago to a tie for #3 with Toronto, a perennial top 10 sustainable city, based on its improved performance in air pollution and newly revised data on public park space. South Korea's capital not only ranks third in our two new variables—natural disaster preparedness and water-related business risk—but significantly improves its score from our last report in several other areas, including air pollution, natural disaster exposure, and public park space. It should be noted, however, that the improvement in the last two variables is partly due to the redefinition of one (natural disaster exposure now measures actual *cost* to a municipality, both in terms of human and economic impacts) and the substantive improvement of data available in the other (public parks).

As with Tokyo's preparedness for earthquakes, our new city Amsterdam (as well as all of the Netherlands) faces an enormous (and perpetual) threat from the sea and has been working communally for centuries to manage it. Success is shown by Amsterdam breaking into the top five out of 30 cities here. (For more on Dutch preparedness strategies, see the interviews with Henk Ovink, the Netherlands' special envoy for international water affairs, and Margareta Wahlström, former special representative of the UN Secretary-General for disaster risk reduction.)

Berlin and Paris tie again this year, as they did in our last report, but this time they fall to #6 from #3, while San Francisco drops to #8 from #5 in 2014. Milan, however, rises to #9 from #12 in our last report, while Madrid remains #10 overall. Seoul is the only Asian city to break into the top 10. The next highest-ranking Asian city in this indicator, Tokyo, ranks #15.

Finally, mention should be made of New York's poor performance here. The city drops five places from #11 in 2014 to #16 this year—its second worst performance in any indicator in the study. With the exception of Mexico City, New York is the only European or North American city to score so poorly here. Given its recent experiences—most disastrously in October 2012 with Superstorm Sandy—and the ongoing challenges of climate change, it is particularly worrisome that a city with so many resources, and lying so firmly at the center of the world's economic structure, does not perform better and in a more forward-looking way in environmental sustainability.

Demographics and livability

Continued from page 74

Once again, there is a lesson here. For a city such as New York, or Paris, or London (in third place by just three points, based on data mainly from 2014 and 2015), this is an extremely important indicator because it both points to the future (the demographics of its citizens) and speaks to the achievements of the present (its livability). That is also why Los Angeles's rise to fourth place here—shooting up 10 places from #14 in 2014—is also very impressive. Taken together, strong demographics and livability also go a long way toward attracting and retaining the highly educated, globally mobile, and creative persons who will invest and innovate to keep a city prospering. New York's excellent results here—edging out London and tying Paris—illustrate that success

is not an abstract "achievement" but a continual *evolution* of facts "on the ground." Similarly in the case of London, demographics and livability is by its nature a living measure and any effects of June 2016's vote to exit the European Union on our top magnet for talent and entertainment and attractions will play out over time.

Our findings also show that New York maintains enormous potential resources to return to competitive form overall in the study (which it topped in our first five editions). Finishing first in the YouthfulCities Index, second in city brand and (not coincidentally) relocation attractiveness, and third in entertainment and attractions confirms that the Big Apple is still a part of the urban Garden of Eden in terms of its allure—and that it retains the seeds of future socioeconomic richness. This is especially true if the city can improve its score in working age population, which should not be so difficult given its powerful assets and singular appeal to immigrants—or more accurately in local context, to *prospective New Yorkers* of all classes and nations and continents.

Economic clout

Continued from page 83

And the same holds true, for similar reasons, with another interesting result: the apparent economic success of New York in finishing second in this indicator. Going back to 2010, New York had never finished higher than third. The fact that it's climbed yet another small step to the top is, therefore, not an insignificant accomplishment, especially given its formidable competition and the difficult global economic environment.

It also offers a very different perspective to New York's fall to sixth place overall in our report. As a standard of obvious comparison, suffice it to say that as recently as a mere five years ago, London had finished sixth overall among a smaller field (of 26 cities), not only behind #1 New York but also Toronto, San Francisco, Stockholm, and Sydney—not exactly the cities that normally come to mind as the British capital's global competition.

Finally, it should be noted that three cities that were in the top 10 here in our previous report—Hong Kong, Toronto, and Tokyo—have dropped out of this group this year. As all three are extremely powerful economic engines in their respective regions, time will tell if the current results are a temporary blip or something more.

1 According to the Tax Policy Center (a joint venture of the Urban Institute and the Brookings Institution): "Automatic stabilizers are features of the tax and transfer systems that tend…to offset fluctuations in economic activity without direct intervention by policymakers. When incomes are high, tax liabilities rise and eligibility for government benefits falls…Conversely, when incomes slip, tax liabilities drop and more families become eligible for government transfer programs, such as food stamps and unemployment insurance, that help buttress their income." The most famous example of an automatic stabilizer that acts countercyclically is, of course, unemployment insurance. Other European examples are healthcare, day care, and, especially, the child benefit. Regarding unemployment insurance, the Tax Policy Center has stated that it "is estimated to be eight times as effective per dollar of lost revenue because more of the money is spent rather than saved." See "Economic Stimulus: How do automatic stabilizers work," Tax Policy Center at http://www.taxpolicycenter.org/briefing-book/background/stimulus/stabilizers.cfm.

Ease of doing business

Continued from page 88

New York has now been replaced as #3 by London, which climbs two places and also finishes in the top 10 in six out of eight variables and #11 in the other two. Toronto remains in fourth place but is followed by two European cities that have risen significantly since our last report.

Fifth-place Stockholm climbs five places (from #10 in 2014), while sixth-place Paris ascends an even more impressive eight places (from #14 in 2014), as both cities rise above New York. Stockholm improves appreciably in ease of starting a business, while Paris also improves in starting a business, as well as in resolving insolvency, and more than doubles its previous score and finishes #8 (from #20 in 2014) in level of minority shareholder protection. Both European capitals also do well in the new variable, Stockholm ranking fourth and Paris 10th in tax efficiency. Moreover, just as New York is affected negatively by the removal of the employee regulations variable, Stockholm and Paris, as part of European employee-oriented regulatory environments, are clearly affected positively.

Two Asian cities have also improved their rankings since our last report. Both Seoul and Kuala Lumpur rise one place, South Korea's capital stepping up from #9 in 2014 to #8 this year, while the Malaysian capital has gone from #11 to 10th place.

Finally, in regard to the ease of doing business indicator, it should be pointed out that New York is not the only US city to fail to maintain its ranking since our last report. Quite the opposite, all four US cities in the top 10 in 2014 fare worse in 2016. Los Angeles drops from sixth place to ninth, while Chicago falls from a tie with San Francisco for seventh place to #11. San Francisco, however, suffers the worst decline, descending from #7 in our last report to #13 in this one, driven in part by drops in scores for ease of starting a business and minority shareholder protection.

Two things are clear regarding US cities: None of them rank in the top 10 in tax efficiency, all 4 US cities sitting in the bottom half of this variable; and, again, removing employee regulations from the indicator hurt all four cities, as New York, Los Angeles, Chicago, and San Francisco ranked, respectively, #1, #2, #3, and #4 in that variable in our previous edition.

Cost

Continued from page 94

Needless to say, the combination of high personal tax rates, high cost of living, and high costs of rent for both businesses and individuals adds up to a challenging environment for these cities—especially if these trends are not moderated. It is particularly important that this continual rise in costs be kept from spreading beyond the traditionally expensive urban enclaves of the high street and the highest-rent residential areas—or, at least, that it be tempered as it does so, so that young persons, middle-income earners and seniors can all afford to live in and help to build great cities.

Key to the variables

Affordability of public transport
The affordability of the longest mass transit rail trip from a city's boundary to the central business district (CBD), calculated by using a city's average hourly wage to determine the amount of time a citizen needs to work to be able to buy a single ticket. The cost of a bus trip is used in cities where there are no rail systems.

Affordability of rent
A measure of the affordability of rental accommodation in a city, calculated by offsetting the monthly rental cost of a 120m² apartment against a city's average wages. Rental prices were sourced from the Global Property Guide. Where the cost of a 120m² apartment was not available, the closest equivalent was used.

Air pollution
Combination of measures of particulate matter 10 micrometers (PM10) outdoor air pollution levels from the World Health Organization (WHO) and the Numbeo Pollution Index of overall pollution in each city. The WHO's Public Health and Environment database provides annual mean concentrations of PM10 in diameters or less, reflecting the degree to which urban populations are exposed to this fine matter. The Numbeo Pollution Index is generated via survey-based data. Numbeo attributes the biggest weight to air pollution, then to water pollution/accessibility as the two main pollution factors. A small weight is given to other pollution types.

Airport connectivity
A measure of the number of routes operating from the airports servicing a city as identified by World Airport Codes. A greater weight is given to international destinations, but domestic routes are also included so as not to penalize countries with larger land areas.

Airport to CBD access
A measure of the ease of using public transit to travel between a city's central business district and the international terminal of its busiest airport in terms of international passenger traffic. Cities are separated into categories according to whether a direct rail link exists: if so, the number of transfers required; and if not, whether there is a public express bus route to the airport. Cities with direct rail links are preferred to those with express bus services. Cities with rail links with the fewest transfers are ranked higher than those with more. Within categories, cities are ranked against one another according to the cost of a single one-way, adult weekday trip and the length of the trip, with each factor weighted equally.

Attracting FDI
Combined variable ranking the number of greenfield (new job-creating) projects plus the total US$ value of greenfield capital investment activities in a city that are funded by foreign direct investment (FDI). Data cover the period from January 2005 through December 2014 provided by fDi Intelligence.

Broadband quality score
Based on millions of recent test results from Pingtest.net, this global broadband index from Ookla compares and ranks consumer broadband connections around the globe. Our overall broadband index score encompasses the following weighted metrics that were collated over a six-month period to generate an average: upload speed (40%), download speed (40%), quality of connection (10%), and value/cost (10%).

City brand
The Guardian Cities global brand survey measures two aspects of a city's brand: its "assets"—attractions, climate, infrastructure (particularly transport), safety, and economic prosperity—and its "buzz," a combination of social media (Facebook likes and Twitter sentiment analysis) and media mentions. The assets and buzz elements were both given a score out of 10; the numbers were then added to produce a total score.

Corporate total tax rate
The corporate total tax rate measures the amount of taxes and mandatory contributions payable by the businesses in the second year of operation, expressed as a share of commercial profits. The corporate total tax rate is designed to provide a comprehensive measure of the cost of all the taxes a business bears. Data provided by PwC UK from *Paying Taxes 2016*; taxes are accurate for the year ended 31 December 2014. Some cities that were not included in the *Paying Taxes 2016* study were calculated separately by our PwC local office using the through-the-cycle methodology. The *Paying Taxes 2016* report can be found at http://www.pwc.com/gx/en/paying-taxes/.

Cost of business occupancy
Annual gross rent divided by square feet of Class A office space. Gross rent includes lease rates, property taxes, and maintenance and management costs. Data produced by CBRE Global Office Rents in US$.

Cost of living
A relative measure of the price of consumer goods by location, including groceries, restaurants, transportation, and utilities. The Consumer Price Index measure does not include accommodation expenses such as rent or mortgage. Figures provided by Numbeo.

Crime
Weighted combination of the Mercer *Quality of Living 2014* survey crime score (50%); intentional homicide rate per 100,000 of the city population (30%); and the Numbeo Crime Index, which is an estimation of the overall crime level in each city based on how safe citizens feel (20%).

Digital security
This variable measures a city's levels of digital security based on factors such as dedicated cyber security teams (input) and the frequency of identity theft (output). Input metrics measured are privacy policy, citizen awareness of digital threats, public-private partnerships, level of technology employed, and dedicated cyber security teams. Output metrics are frequency of identity theft, percentage of computers infected, and percentage with Internet access. Data are produced by the Economist Intelligence Unit's Safe Cities Index 2015.

Ease of commute
PwC employees in each of the firm's offices in the 30 cities were instructed: "On a scale from 1 to 10, where 1 is difficult and 10 is easy, please rate your commute to work." Data provided by the PwC employee survey conducted for the *We, the urban people* study.

*Ease of entry: Number of countries with visa waiver**
Number of nationalities able to enter the country for a tourist or business visit without a visa. Excludes those nationalities for whom only those with biometric, diplomatic, or official passports may enter without a visa.

*Ease of starting a business***
Assessment of the bureaucratic and legal hurdles an entrepreneur must overcome to incorporate and register a new firm. Accounts for the number of procedures required to register a firm; the amount of time in days required to register a firm; the cost (as a percentage of per capita income) of official fees and fees for legally mandated legal or professional services; and the minimum amount of capital (as a percentage of per capita income) that an entrepreneur must deposit in a bank or with a notary before registration and up to three months following incorporation. Assessment scores gathered from *Doing Business 2015* report, the World Bank Group. U.S. cities were differentiated from each other using the *United States Small Business Friendliness Survey* by Thumbtack.com in partnership with Kauffman Foundation.

Employment growth
2014–2016 annual growth rate of employment in a city. Data provided by Oxford Economics.

*End-of-life care**
Ranking of countries according to their provision of end-of-life care. The Quality of Death Index by the Economist Intelligence Unit assesses the availability, affordability, and quality of palliative care for adults in 80 countries around the world. The index scores countries across 20 indicators grouped in five categories: palliative and healthcare environment, human resources, affordability of care, quality of care, and community engagement. These indicators are grouped into qualitative and quantitative categories and are normalized to form an overall index score.

Entertainment and attractions
Cultural experience from the A.T. Kearney Global Cities Index is measured by the number of diverse attractions in a city, including the number of major sporting events a city hosts; the number of museums, performing arts venues, and culinary establishments; the number of international travelers; and the number of sister city relationships.

*Entrepreneurial environment**
The Global Entrepreneurship and Development Index measures the 3A's of entrepreneurial development: attitudes, aspirations, and activity. The index was created by the Global Entrepreneurship and Development Institute to help provide better understanding of economic development by analyzing the contextual nature of business formation, expansion, and growth.

Financial and business services employment
The number of jobs in financial and business services activity as a share of total employment in the city. Financial services includes banking and finance, insurance and pension funding, and activities auxiliary to financial intermediation. Business services includes a mix of activities across the following subsectors: real estate and renting activities; information technology and computer related; research and development; architectural, engineering, and other technical activities; legal, accounting, bookkeeping, and auditing activities; tax and consultancy; advertising; professional scientific and technical services; and business services where not elsewhere classified. Data provided by Oxford Economics.

*Health system performance**
Measurement of a country's health system performance made by comparing healthy life expectancy with healthcare expenditures per capita in that country, adjusted for average years of education (years of education is strongly associated with the health of populations in both developed and developing countries). PwC Global Healthcare team adapted methodology from the WHO discussion paper "Comparative efficiency of national health systems: cross-national econometric analysis".

Hotel rooms
Count of all hotel rooms within each city.

Housing
Measure of availability, diversity, cost, and quality of housing, household appliances, and furniture, as well as household maintenance and repair. This measure is based on the Mercer *Quality of Living 2014* survey. Tied cities were differentiated by looking at the annual percentage change in house prices.

ICT usage
Ericsson's Networked Society City Index 2014 measures the performance of 40 cities from two perspectives: their maturity in information and communications technology (ICT) and triple bottom line, specifically sustainable urban development in a connected society. The ICT usage score is based on three variables—technology use, individual use, and public and market use. Within technology use, the following metrics were analyzed: mobile phone subscriptions per 100 habitants, number of smartphones per capita, percentage with a computer at home, and number of tablets per capita. Within individual use, the following metrics were considered: Internet usage as a percentage of the population and social networking penetration. Within public and market use, the following metrics were analyzed: open data and web presence, and electronic and mobile phone payments.

Incoming/outgoing passenger flows
Total number of incoming and outgoing passengers, including originating, terminating, transfer, and transit passengers in each of the major airports servicing a city. Transfer and transit passengers are counted twice. Transit passengers are defined as air travelers coming from different ports of departure who stay at the airport for brief periods, usually one hour, with the intention of proceeding to their first port of destination (includes sea, air, and other transport hubs).

Innovation Cities Index
The 2thinknow Innovation Cities Index is composed of 445 cities selected from 1,540 cities based on basic factors of health, wealth, population, and geography. The selected cities had data extracted from a city benchmarking data program on 162 indicators. Each of the benchmarking data was scored by analysts using best available qualitative analysis and quantitative statistics. (Where data were unavailable, national or state estimates were used). Data were then trend balanced against 21 global trends. The final index had a zeitgeist (analyst confidence) factor added and the score reduced to a three-factor score for cultural assets, human infrastructure, and networked markets. For city classification, these scores were competitively graded into five bands (Nexus, Hub, Node, Influencer, Upstart). The top 33% of Nexus and Hub (and selected Node cities of future interest) final graded scores were ranked by analysts based on trends over two to five years. A Node ranking is considered globally competitive.

*Intellectual property protection**
Leading business executives' responses to the question in the World Economic Forum's *Global Competitiveness Report 2014–15* that asks, "In your country, how strong is the protection of intellectual property, including anti-counterfeiting measures?" [1 = extremely weak; 7 = extremely strong]. The 2014 edition of the survey captured the opinions of more than 14,000 business leaders in 148 economies between February and June 2014.

International association meetings
A measure combining both the number of international association meetings per city in 2014 and the compound annual growth rate (CAGR) from 2009-2014. The meetings measured take place on a regular basis and rotate between a minimum of three countries. Figures provided by the International Congress and Convention Association.

International tourists
Annual international tourist arrivals for 100 cities collected by Euromonitor International. Euromonitor's figures include travelers who pass through a city, as well as actual visitors to the city.

*Internet access in schools**
Leading business executives' responses to the question in the World Economic Forum's *Global Competitiveness Report 2014–15* that asks, "In your country, how widespread is Internet access in schools?" [1 = nonexistent; 7 = extremely widespread] The 2014 edition of the survey captured the opinions of more than 14,000 business leaders in 148 economies between February and June 2014.

*Level of minority shareholder protection***
Measurement of the strength of minority shareholder protection against misuse of corporate assets by directors for their personal gain. The Strength of Minority Investor Protection Index is the average of indices that measure transparency of transactions, liability for self-dealing, and shareholders' ability to sue officers and directors for misconduct. Assessment scores gathered from *Doing Business 2015*, the World Bank Group.

Libraries with public access
Number of libraries within each city that are open to the public divided by the total population and then multiplied by 100,000.

Licensed taxis
Number of officially licensed taxis in each city divided by the total population and then multiplied by 1,000.

Major construction activity
Major construction activity is composed of three equally weighted measures: the number of planned and under construction buildings in the Emporis database; the number of properties sold and recorded by Real Capital Analytics' database; and construction employment from Oxford Economics. The Emporis database is the count of planned and under construction buildings categorized as a high rise, skyscraper, low rise, hall, or stadium; the number of properties sold is based on the number of properties valued at more than $10 million, recorded between February and July 2015; and construction employment is taken as a percentage of total employment.

Mass transit coverage
Ratio of kilometers of mass transit track to every 100 square kilometers of the developed and developable portions of a city's land area. A city's developable land area is derived by subtracting green space and governmentally protected natural areas from total land area.

*Math/science skills attainment**
Top performers' combined mean scores on the math and science components of the Program for International Student Assessment (PISA), an Organisation for Economic Co-operation and Development (OECD) assessment of 15-year-olds' academic preparedness. Top performers are defined as those students who achieved in the top two proficiency levels (Level 5 and Level 6) on the math and science portions of the test. Comparable examinations are used wherever possible to place cities not included in the OECD assessment.

Mobile broadband speed
Based on millions of recent cellular test results from Ookla Speedtest iOS and Android apps, this index compares and ranks cellular upload and download speeds around the globe. Each city receives a score based on the rolling mean speed in megabits per second over the previous 30 days. Only tests taken within 300 miles of the server are eligible for inclusion in the index. Data were collected and averaged over a three-month period in 2015.

Natural disaster exposure
A measure of a city's exposure to natural disaster risk, calculated by PwC's actuarial and forensics practice using data from Swiss Re's CatNet GDP Loss Index and the People Risk Index. This variable measures the economic and people effect of river and coastal floods, earthquakes, windstorms, and tsunamis. The economic effect is measured by lost GDP output in the immediate aftermath of an event relative to the country's GDP. The people effect is both the potential for fatalities and casualties, as well as people who need to be evacuated and are unable to access their home or workplace (in the immediate aftermath of an event) as a proportion of the population of the city. The indices are derived from Swiss Re's Mind the risk study (http://www.swissre.com/rethinking/climate_and_natural_disaster_risk/Mind_the_risk.html), results of which are available at CatNet (http://www.swissre.com/clients/client_tools/about_catnet.html).

*Natural disaster preparedness**
This measure takes into account each city's disaster preparedness. Using a method developed by PwC's actuarial and forensics practice, each city receives a score based on its preparedness. This measure considers whether the city has put in place early warning systems, made efforts to reduce the underlying risk factors, regularly conducts training drills, and implements strategies to increase public awareness. Fifty percent of the score is taken at a country level from the UNISDR's web platform, PreventionWeb, which has collated national progress reports on the implementation of the UN's 10-year plan to make the world safer from natural hazards, the Hyogo Framework for Action. Each city's average performance in the variables of public transport systems, health system performance, and operational risk climate are also factored into the disaster preparedness measure to make up the remaining 50%.

Number of foreign embassies and consulates
Number of countries that are represented by an embassy, consulate, high commission, deputy high commission, or representative office in each city. Figures sourced from EmbassyPages.com.

Number of Global 500 headquarters
Number of Global 500 headquarters located in each city, as per the Fortune Global 500 list.

*Operational risk climate**
Quantitative assessment of the risks to business profitability in each of the countries. Assessment accounts for present conditions and expectations for the coming two years. The operational risk model considers 10 separate risk criteria: security, political stability, government effectiveness, legal and regulatory environment, macroeconomic risks, foreign trade and payment issues, labor markets, financial risks, tax policy, and standard of local infrastructure. The model uses 66 variables, of which about one-third are quantitative. Data produced by the Economist Intelligence Unit's Risk Briefing.

Percent of population with higher education
Number of people who have completed at least a university-level education divided by the population aged 15+. A university-level education is set equivalent to a bachelor's degree or higher from a US undergraduate institution.

Personal tax
The personal tax data reflect the average employee effective tax rate across manager, assistant, and support staff levels in each city economy. The employee effective tax rates were generated by PwC UK using data supplied for *Paying Taxes 2016*. Taxes are accurate for year ended 31 December 2014. The *Paying Taxes 2016* report can be found at http://www.pwc.com/gx/en/paying-taxes/.

Political environment
Measure of a nation's relationship with foreign countries, internal stability, law enforcement, limitations on personal freedom and media censorship. Data are from the Mercer *Quality of Living 2014* survey.

Productivity
Productivity is calculated by dividing GDP in 2015 US$ by employment in the city. Data provided by Oxford Economics.

Public park space
Proportion of a city's land area designated as public recreational and green spaces to the total land area. Excludes undeveloped rugged terrain or wilderness that is either not easily accessible or not conducive to use as public open space.

Purchasing power
Domestic purchasing power is measured by an index of net hourly wages (where New York = 100), excluding rent prices. Net hourly wages are divided by the cost of the entire basket of goods and services, excluding rent. The basket of goods relates to 122 goods and services. Data sourced from *UBS Prices and Earnings 2015*.

Quality of living
Score based on more than 30 factors across five categories: socio-political stability, healthcare, culture and natural environment, education and infrastructure. Each city receives a rating of either acceptable, tolerable, uncomfortable, undesirable, or intolerable for each variable. For qualitative indicators, ratings are awarded based on the Economist Intelligence Unit analysts' and city contributors' judgments. For quantitative indicators, ratings are calculated based on cities' relative performances on a number of external data points. Data sourced from the Economist Intelligence Unit's livability ranking.

Rate of real GDP growth
2014–2016 GDP annual growth rate in real terms expressed in 2015 US$. Data provided by Oxford Economics.

Recycled waste
Percentage of municipal solid waste diverted from landfill. This includes, but is not limited to, recycling and captures other methods such as waste-to-energy.

Relocation attractiveness
PwC employees in each of the firm's offices in the 30 cities were instructed: "Based on the other 29 cities in *Cities of Opportunity*, please rank the top three cities that you would like to work in most." Data provided by the PwC employee survey conducted for the *We, the urban people* study.

*Resolving insolvency***
This topic identifies weaknesses in existing bankruptcy law and the main procedural and administrative bottlenecks in the bankruptcy process. Assessment scores gathered from *Doing Business 2015*, the World Bank Group.

*Road safety**
A count of the estimated number of road deaths in each country per 100,000 inhabitants. Raw figures are calculated by the World Health Organisation based on 2013 survey data and are published in the Global Status Report on Road Safety 2015.

Security and disease risk
An analysis of the potential effects of crises on economic output in each city, calculated by measuring the percentage of GDP at risk from a series of individual health and security threats between 2015 and 2025. The nine threats measured were cyber attack, market crash, nuclear accident, oil price shock, sovereign default, terrorism, power outage, human pandemic, and plant pandemic. Data are taken from the Lloyd's City Risk Index 2015–2025.

*Senior wellbeing**
The Global AgeWatch Index presents a unique snapshot of the situation of older people in 96 countries. It highlights which countries are doing best for their older populations and how this links with policies toward pensions, health, education, employment, and the social environment in which older people live. The overall score takes account of income security, capability, enabling environment, and health status of the over 60s.

Software development and multimedia design
Combination of scores for each city in *fDi* Magazine's Best Cities for Software Development and Best Cities for Multimedia Design Centres. Both *fDi* indices weight a city's performance 70% based on the quality of the location and 30% based on the cost of the location. The Software development index is based on an assessment of 120 quality competitiveness indicators. These indicators include availability and track record in ICT, availability of specialized skills professionals such as scientists and engineers, access to venture capital, R&D capabilities, software experts, quality of ICT infrastructure, and specialization in software development. The multimedia design centre rankings are based on an assessment of 120 quality competitiveness indicators, including the size of the location's leisure and entertainment sector, its specialization and track record, information technology infrastructure, quality of life, and skills availability.

Tax efficiency
Combination of the number of tax payments and the time required to comply by businesses during their second year of operation. The tax payments element reflects the total number of taxes and contributions paid, the method of payment, the frequency of payment, the frequency of filing, and the number of agencies involved for the case-study company. Time to comply measures the time taken to prepare, file, and pay three major types of taxes (corporate income taxes, value-added taxes, and labor taxes). Data provided by PwC UK from *Paying Taxes 2016*; taxes are accurate for the year ended 31 December 2014. The *Paying Taxes 2016* report can be found at http://www.pwc.com/gx/en/paying-taxes/.

Thermal comfort
A thermal comfort score was created for each city by calculating the average deviation from optimal room temperature (72 degrees Fahrenheit). January, April, July, and October heat indices were calculated for each city using an online tool that integrates average high temperature and corresponding relative evening humidity during each month. A final thermal comfort score was derived by first taking the difference between a city's heat index for each month and optimal room temperature and then averaging the absolute values of these differences.

Traffic congestion
Measure of traffic congestion and congestion policies for each city scored on the level of congestion, as well as the modernity, reliability, and efficiency of public transport. Assessment based on the Mercer *Quality of Living 2014* survey. Tied cities were differentiated using the ease of commute variable.

Water-related business risk
Water risks in a city related to quality, quantity, and regulatory risk. Quality risks are defined as the exposure to changes in water quality that may impact industrial production systems, resulting in the need for further investment or an increase in the operational costs of water treatment. Risks related to quantity are defined as the exposure to changes in water quantity (e.g., droughts or floods) that may impact a company's direct operations, supply chains, and/or logistics. Regulatory risk refers to the unpredictability of regulations within the business environment. These risks arise when an unexpected change in water-related law or regulation increases a business's operating costs, reduces the attractiveness of an investment, or changes its competitive landscape. Data produced by the World Resources Institute with Aqueduct.

Workforce management risk
Ranking based on staffing risk in each city associated with recruitment, employment, restructuring, retirement, and retrenchment. Risk was assessed based on 30 factors grouped into five indicator areas: demographic risks associated with labor supply, the economy, and the society; risks related to governmental policies that help or hinder the management of people; education risk factors associated with finding qualified professionals in a given city; talent development risk factors related to the quality and availability of recruiting and training resources; and risks associated with employment practices. A lower score indicates a lower degree of overall staffing risk. Rank scores sourced from the 2013 People Risk Index produced by Aon Consulting.

Working age population
Proportion of a city's population aged 15–64 to the total population of the city.

World Top 100 Airports
Each city receives a score based on the ranking of that city's top airport in the World's Top 100 Airports ranking, compiled by Skytrax. The World Airport awards are based on survey questionnaires completed by more than 13 million airline customers between May 2014 and January 2015 across 550 airports worldwide. The survey evaluates travelers' experiences across different airport service and performance indicators from check-in, arrivals, transfers, shopping, security and immigration, to departure at the gate.

World university rankings
The *Times Higher Education* World University Rankings 2014–2015 powered by Thomson Reuters are the only global university performance tables to judge world-class universities across all of their core missions—teaching, research, knowledge transfer, and international outlook. The top university rankings employ 13 carefully calibrated performance indicators to provide the most comprehensive and balanced comparisons available, which are trusted by students, academics, university leaders, industry, and governments.

YouthfulCities Index
A global database that measures, compares, and ranks 55 cities across 20 urban attributes using a total of 101 indicators. The indicators consist of primary and secondary data that Urban Decoders (a globally dispersed team of young urban researchers) collect locally and submit using collaborative, cloud-based research workbooks. The YouthfulCities Index is an ambitious collaborative effort to analyze the largest cities around the world from a unique youth perspective to rank them as best suited for young people aged 15–29. It looks at how youth live, work, and play in their urban setting in order to examine how cities are serving their youth. It asks how youth can be better integrated and engaged in their cities.

* Country-level data

** Based on most populous city

For more information

On research…

Sabrina McCotter
sabrina.c.mccotter@uk.pwc.com
+44 (0) 2890 415598

Russell A. Donaldson
russell.a.donaldson@uk.pwc.com
+44 (0) 2890 415194

On media inquiries…

Megan DiSciullo
megan.disciullo@pwc.com
+1 312 298 2203

On business implications…

Hazem Galal
Cities & Local Government Sector Global Leader
hazem.galal@ae.pwc.com
+971 (4) 3043393

Yumiko Noda
Cities Solution Centre
yumiko.y.noda@jp.pwc.com
+81 (3) 3546 8512

Rollie Quinn
Global Leader, Government & Public Services
rollie.quinn@pwc.com
+1 703 762 7252

Egon de Haas
Global Director, Government & Public Services
egon.de.haas@nl.pwc.com
+31 (0) 2056 86162

Peter Raymond
US Leader, Capital Projects and Infrastructure
peter.raymond@us.pwc.com
+1 703 918 1580

Contributors

Strategic direction

Brendan Dougher
Hazem Galal
John Sviokla

Project direction

William Sand, communications and operations
william.k.sand@us.pwc.com
+1 646 471 4470

Sabrina McCotter, research
sabrina.c.mccotter@uk.pwc.com
+44 (0) 2890 415598

Core team

PwC
Cristina Ampil
Russell Donaldson
Yana Goot
Margareta Irenaeus
Ryo Ishii
Rachael McBrien
Sabrina McCotter
Colin McIlheney
Hidetomo Nagata
Lisa Ocasio
Peter Pappas
David Patterson
Christian Regnaudot
William Sand
Ciara Shufflebottom
Greg M. Smith

Economics
Ulster University Economic Policy Centre:*
Neil Gibson
Mark Magill

Design
Lily Leong
Karen Montgomery
Beata Rutkowski

Photography:

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