KPMG

Benchmarking city services

Finding the courage to improve

KPMG in Ireland

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Foreword

It is hard to have the courage — to change, to innovate, to improve — when you don't have all the facts.

Around the world, cities are undergoing massive and fundamental change. Demand for city services is changing. Expectations are increasing. And costs are coming under pressure. Cities have no choice but to become more efficient and more effective in delivering services.

The problem is that nobody really knows what 'good' looks like when it comes to service efficiency and effectiveness, nor do city managers have the data needed to make effective trade-offs. There are no consistent global benchmarking systems that compare efficiency and effectiveness across countries and city service areas. There is no 'Big Book of Great Ideas' for cities.

This is not surprising. As this report illustrates, city benchmarking is a tremendously difficult and time-consuming exercise. In part, this is because no two cities measure the exact same things in the exact same way (in fact, in many cases, cities aren't measuring key indices at all). But it's also because each city faces a very different environmental, social, political and economic reality. And that has a direct impact on their specific costs and capabilities.

Benchmarking isn't easy. Yet we persevered. This report offers a summary of our findings. In total, 35 different cities participated, representing almost all geographic regions and sizes. Not all cities were able to collect data for all service areas. But those that could allowed KPMG professionals to start creating a much clearer and more consistent view of what 'good' might look like in city service delivery.

More importantly, our exercise went beyond the data to find out some of the key innovations, service improvements and trends facing these cities. And, in this report, we highlight some of the most impressive and impactful examples in the hope of inspiring other cities to evolve their current approach to city services.

This is not a ranking or competition. Rather, it is an effort to catalyze renewed debate about how city services are developed, delivered and measured. We hope it leads to better and more consistent measurement of city services. And we hope it raises new ideas and discussion at the city manager level.

On behalf of KPMG's global network of member firms, we would like to thank those cities that participated in this exercise and report. We recognize and appreciate the effort that went into your responses and hope that this report offers you new ideas, innovations, and insights. In particular, we would like to thank the City of Barcelona, the first city to join us on this journey,

for their early and continuous support of this project.

This is just the start of the journey to better understanding effective and efficient city service delivery. We intend to repeat this exercise regularly to give cities a proper time-series basis for comparison.

Where possible, we encourage other cities to try their own comparisons to see where they rank.

We invite you to join us on this journey and encourage you to tell us what you would like to see in future city benchmarking studies.

To discuss the issues raised in this report — or to participate in a future KPMG International city benchmarking exercise — please contact your local KPMG member firm or any of the contacts listed at the back of this publication. ■

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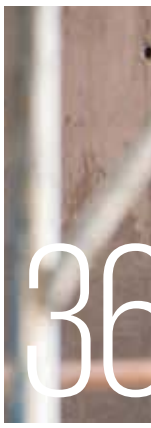
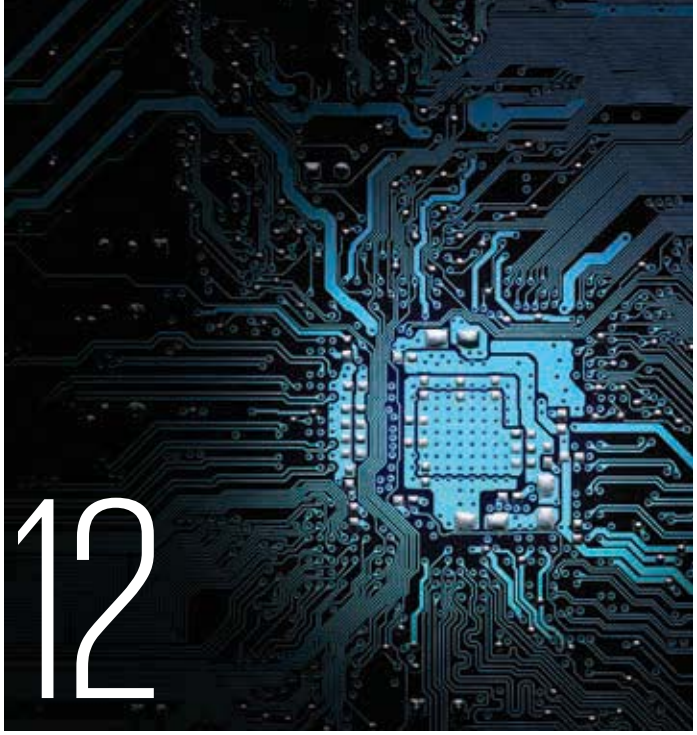
Contents

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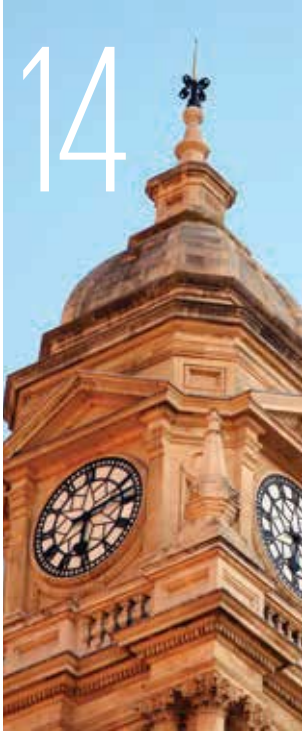

14


18


22


28


32


44


60


68


72

City benchmarking study highlights

Overview

Cities

Over 200+ cities were contacted, 53 agreed to participate, 35 cities were able to provide benchmark information

Countries

Global representation from 20 countries — across Europe, Asia-Pacific, North and South America, Africa/ Middle East

Services

Started with a list of 120+ public services (excluded internal services this round) and selected the top 12 based on city preferences

Respondents

Predominantly city managers or chief executives, directors of performance management, and/or department heads

Did you know…

Road access — The average cost per lane kilometer of road is slightly more than US$15,000. While many of these cities report that roads are in good condition, including several at 100 percent, why is it that vehicular accidents appear be higher in large northern cities? In addition, it's clear that climate and terrain are important factors in both road condition and vehicular accidents.

Transit — Average cost (opex and capex) is US$1.67 per transit trip. Of the cities that provide transit, we observed a distinct grouping of cities that cover 30–40 percent of their costs through fares. Decisions with respect to service quality — headway, mode, geographic coverage — need to be taken within an overall city/urban structure strategy.

Small and medium enterprise (SMEs) development — While on average it costs US$330 per consultation, few cities know if they are effective in increasing SME employment.

Building permit and enforcement — Building permits take 50 days to process on average. However, one city reports 684 days on average (almost 2 years) leading to contractors and developers routinely violating the development approval process. Along with facts on efficiency and effectiveness, the study identified innovations such as Cape Town, South Africa introducing electronic submissions of applications and plans.

Park access — At a cost of almost US$13,000 per hectare on average, most cities boast excellent park coverage (walking distance) to meet resident needs, but few cities know the extent of park usage. This makes it very difficult in a cash constrained environment to justify expenditures on this very important amenity.

Recreational facility access — Recreational facilities cost US$61 per program participant and in many cases don't cover this cost. This severely inhibits the city from operating and maintaining these facilities on a long term basis.

Drinking water — Drinking water costs US$1.14 per cubic meter on average. We observe a meaningful grouping around the 10 percent average but one city loses 65 percent of its water (from the time it is treated to the time it is supplied)! Causes could include leakage from faulty mains, theft or the provision of non-revenue water. How can a city afford to lose two-thirds of its water?

Wastewater removal — Only one city reported 100 percent of coverage of wastewater removal services. Costs averaged at US$47,000 per sewer kilometer (kilometer of wastewater network). Creative solutions about reducing wastewater discharged into the network are now starting to emerge as pumping and treatment costs increase with changing regulations.

Storm water drainage — Not many cities could provide the quantity of storm water drained but those that did reported costs ranging from a low of US$0.01 to a high of US$1.98 per cubic meter. Important to note is that cities need to accommodate storm surge capacity, not the mean storm water volume. With extreme weather events on the rise, keep an eye on how innovative this service will evolve in the years ahead.

Fire rescue — Fire response rates average just over 8.5 minutes but really effective cities are coming in at 7 minutes. Two thirds of survey participants respond between 7 and 8 minutes. Benefits are evident not only in the value proposition but also in insurance rates faced by property owners.

Garbage collection — While garbage costs range from US$30–US$580 per ton, three cities make money on garbage collection through direct charges. All cities should examine whether or not garbage collection should be funded out of general tax revenue or whether a specific charge should be levied.

Waste diversion — The average city diverts 37 percent of its waste but there is much to learn from one city that diverts 98 percent of its waste!

The value of this study is not in any specific statistic reported, but rather in the positioning of a city relative to its peers. The study is about seeking how peer cities might be innovative to enhance both efficiency and effectiveness of their approach.

The value of benchmarking cities

By Alan Mitchell, Executive Director, Cities Global Center of Excellence, KPMG International

There's a reason that private companies spend millions of dollars on competitive research and analysis. They know that — by comparing themselves against their peers — they can find new ways to improve their service levels, manage costs, allocate resources and, ultimately, increase customer satisfaction.

Our work and conversations with municipal government leaders suggest they would like to be doing the same thing.

City leaders would like to be benchmarking themselves against other cities to identify new ideas and innovations. They would like to be looking for opportunities to adapt successful examples of service improvements or cost reduction techniques. They would like to be comparing service levels and uncovering gaps to help improve their own service delivery capacity.

Yet few cities are currently able to benchmark their services against their peers. In many cases, this is due to a lack of consistent global benchmarking tools or surveys (a gap we hope to help fill with this report). Only a handful of cities have the resources, time or capacity to conduct their own large, global benchmarking review. Most are struggling simply to benchmark their internal performance, year-over-year and service-by-service.

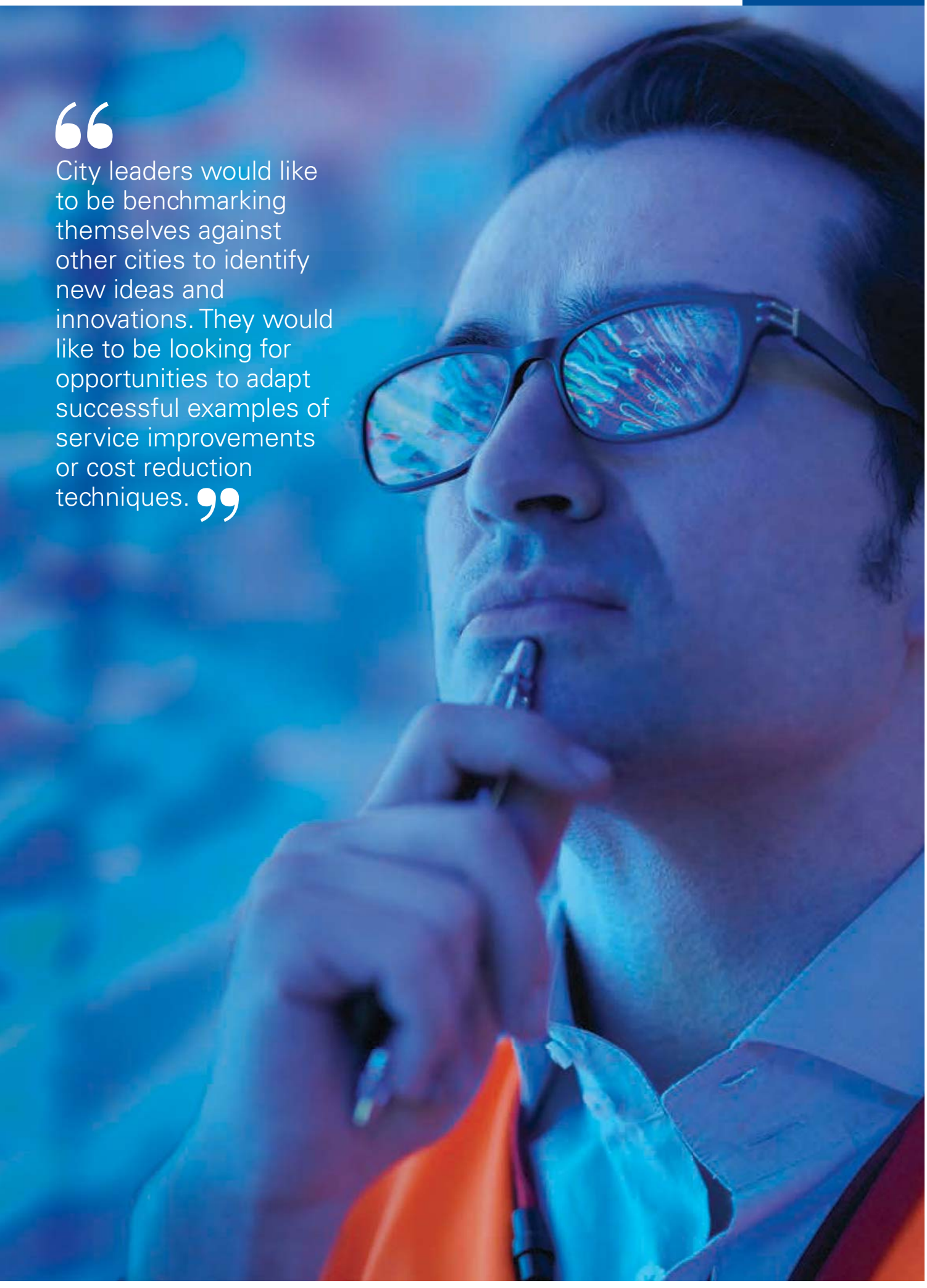
And that is what makes this report and benchmarking exercise so important. The cities that participated in this report were not trying to win a beauty contest or top a global ranking. Rather, they wanted to share their data and information in the hope of uncovering insights that would allow them to deliver their services more efficiently and effectively.

These cities recognize that 'customer/citizen' demand is changing and they want to respond to that change. They understand that their budgets are constrained and want to make smart, forward-looking changes. They know that new technologies and approaches are driving efficiency and effectiveness at the service level and they want to participate in it.

We hope that this report will act as a catalyst to improve service delivery by encouraging city leaders to undertake, participate in and encourage service benchmarking.

The exercise was not without difficulty and we will be the first to admit that the data provided in this report paints an incomplete picture of the true efficiency and effectiveness of city services.

But we believe this exercise has uncovered important findings about city service delivery and benchmarking that, properly applied, will help city leaders create real and lasting improvements. We look forward to your thoughts and feedback. ■



> City leaders would like to be benchmarking themselves against other cities to identify new ideas and innovations. They would like to be looking for opportunities to adapt successful examples of service improvements or cost reduction techniques.

> What city managers really need is better information. Indeed, if there is one thing that our benchmarking exercise made very clear, it's that very few cities have the data or the insights they require to make smart, evidence-based, long-term decisions.

Leaders wanted

By Stephen Beatty, Global Head of Cities, KPMG International

It's a great time to be a city manager. Technology and innovation have created massive new opportunities for cities to radically transform their efficiency and effectiveness. New funding mechanisms and private partnership opportunities are unlocking unprecedented opportunities for cost-effective service improvements. And everyone — from citizens through to politicians — is eager for change.

Yet it's also a very frustrating time to be a city manager. Few have the data they require to make confident long-term decisions. Most are too focused on delivering current service expectations against a backdrop of shrinking budgets to find the space to make the more fundamental changes required. Stationed between the strategic imperatives of city council and the public on one hand and the operational imperatives of city services on the other, most lead a very lonely existence, filled with uncertainty and unfulfilled visions.

What city managers really need is better information. Indeed, if there is one thing that this benchmarking exercise made very clear, it's that very few cities have the data or the insights they require to make smart, value-based long-term decisions. And that means that city managers are often left making major decisions (often with significant intergenerational impacts) based on little more than experience, outdated models and 'gut feel'.

Better information will enable city managers to be more effective stewards of city budgets. But it will also allow them to become more strategic change agents. Imagine the rich and informed debate that could be had when citizens understand the actual cost of keeping their roads in a certain condition. Or when decision makers are educated on the precise relationship between budget items and service outcomes. Or when city managers finally get a clear and reliable picture of future demand expectations.

In many cases, the problem may come down to a simple lack of data. KPMG's research certainly reinforces the fact that many cities suffer massive information gaps that severely limit their ability to develop any real or reliable insights about their efficiency or effectiveness. And, as Peter Drucker famously noted, "you can't manage what you can't measure".

The next big challenge is turning that data into information and actionable insights. Creating a reliable benchmark of historical performance and efficiency will be the first step. Overlaying other sources of data to uncover emerging trends, identify opportunities and predict changes in demand will unlock the next wave of strategic insight and capability.

What will it take to achieve this utopia? Lots of leadership and guts. Improved performance data will likely lead to some uncomfortable discussions as the opacity of 'gut feel' is replaced by the transparency of empirical evidence. New models and efficiency gains will require old models to be disrupted. City employees and politicians alike will need to learn to operate in a more evidence-based decision-making environment. And all of this will require clear vision, strong leadership and a willingness to drive real change.

We hope this benchmarking exercise serves as a wake-up call. It is possible to confidently make data-driven decisions; it is possible to predict future demand and service trends; it is possible to have meaningful debates with citizens and politicians about the future needs of the city. But it all starts with leadership. ■

City benchmarking isn't easy

By Alan Mitchell, Executive Director, Cities Global Center of Excellence, KPMG International and
Rohit Sabharwal, Associate Consultant, Infrastructure Modeling, Infrastructure Hub,
Deal Advisory, KPMG in India

It's not surprising that so few cities benchmark their service delivery. It's an extraordinarily difficult task. The journey, however, can also be tremendously rewarding.

When we first set out on this exercise, we expected it to be difficult. There were obvious reasons why nobody had ever attempted a survey of this size or scope before. We knew that collecting, collating and analyzing all of that data would take time and patience.

What KPMG professionals didn't expect to find, however, was such inconsistency in the way cities around the world measure and report their data.

Likely, the most common inconsistency came down to what people were measuring. For example, items that were included in the 'cost' section may or may not include things like energy (particularly if it's municipally supplied), labor or asset amortization, depending on how the city itself accounts for its costs.

In many cases, data was incomplete, unavailable or unreliable. Some of these gaps are understandable; measuring exactly how many citizens use city parks on an annual basis is notoriously difficult. But other data (basic measures like the number of lane kilometers of road in a city) are often just not collected or measured.

Even when they are measuring the same things, cities often use different scales and standards. When we asked cities to report their number of road accidents, some provided data for every minor accident reported to insurance, while others only reported accidents that resulted in injury or death. Some claimed their road quality to be at 100 percent — a veritable impossibility — while others seemed negatively biased about their road conditions.

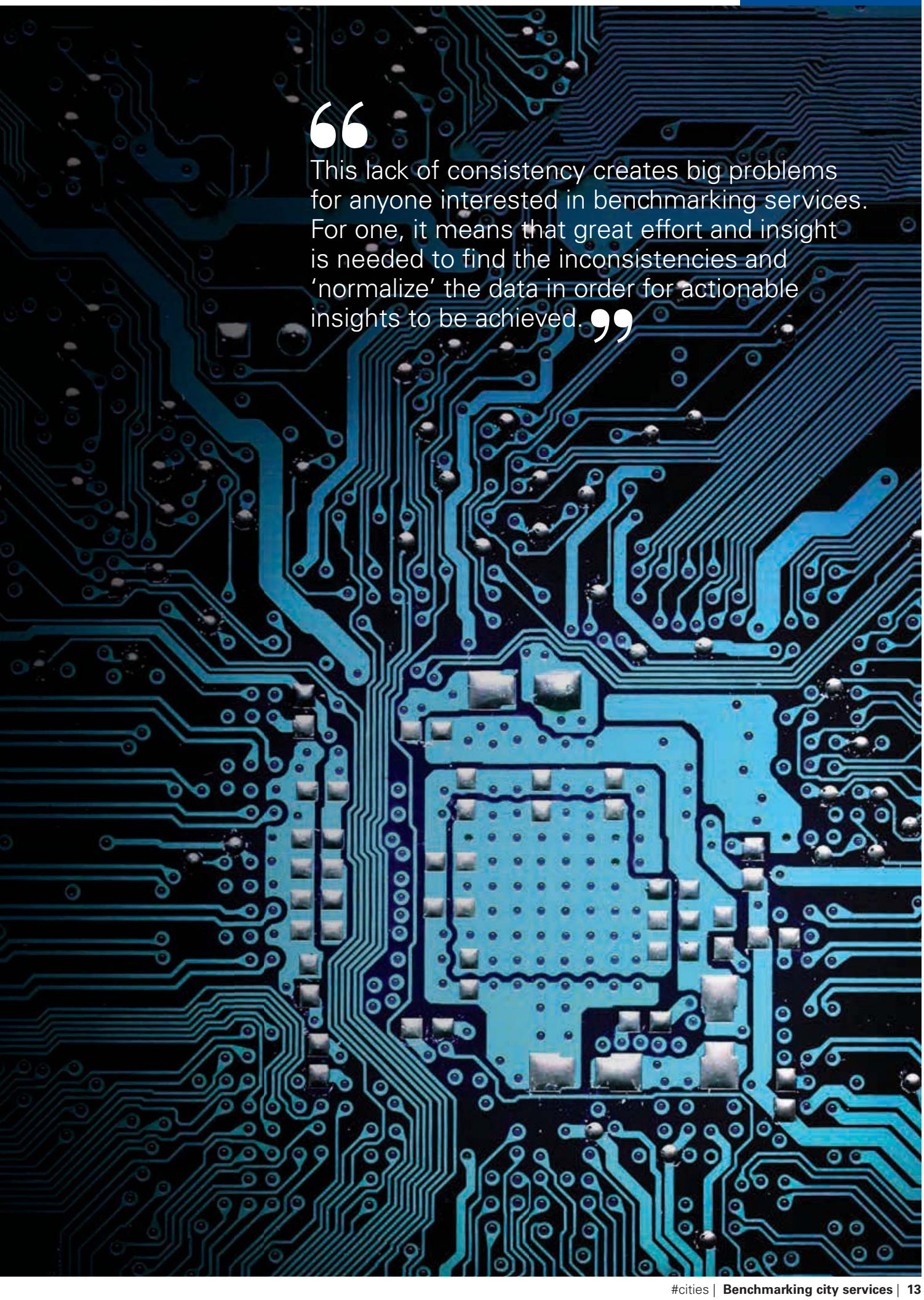
This lack of consistency creates big problems for anyone interested in benchmarking city services. For one, it means that great effort and insight is needed to find the inconsistencies and 'normalize' the data in order for actionable insights to be achieved. It also means that significant effort needs to be placed into understanding the underlying data and making the necessary conversions (miles to kilometers, pounds to dollars, or lakhs to 100,000s, for example).

The challenge for city leaders and their benchmarkers, therefore, is to create greater consistency in the way city services are measured and reported. Not only between cities but, critically, across city services as well.

KPMG member firms experience conducting this exercise suggests that few cities take a consistent approach to assessing the efficiency and effectiveness of their service delivery across the wide scope of city services. Those that do, tend to roll their measurement up to the departmental or divisional level, thereby forsaking any of the real insights that could come from understanding these measures on a service-level.

It speaks volumes that — of the cities that first indicated interest in participating in this exercise — almost one third had to back away once they realized they simply didn't have access to (or even measure) the basic information we were looking for.

In this report, we've used the Municipal Reference Model (explained in more detail on page 18) as our standard for identifying what services to benchmark and then the basis on which to assess and compare city services. But we hope that this publication encourages cities to come together to agree on a common set of standards. And then to use those standards to improve their own internal measurement and, ultimately, drive real and actionable improvements. ■



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About the research

As far as we can tell, this report is the world's first attempt to comprehensively benchmark city service efficiency and effectiveness around the world. And, as such, the authors of this survey and report focused on taking a collaborative approach to identifying and developing the research.

KPMG initially contacted to more than 200 cities and at one point received support from 53 cities who agreed to participate. KPMG professionals' talked to them about the process. We asked them what services they wanted to evaluate. And we got a sense of some of the indicators that mattered most to city leaders.

Ultimately, this work resulted in a list of a dozen distinct services where enough cities could provide the right amount of data to create a reliable benchmark. Recognizing the potential for wide variations in measurement and scope, the KPMG teams set about creating a clear glossary of terms, data standards and definitions.

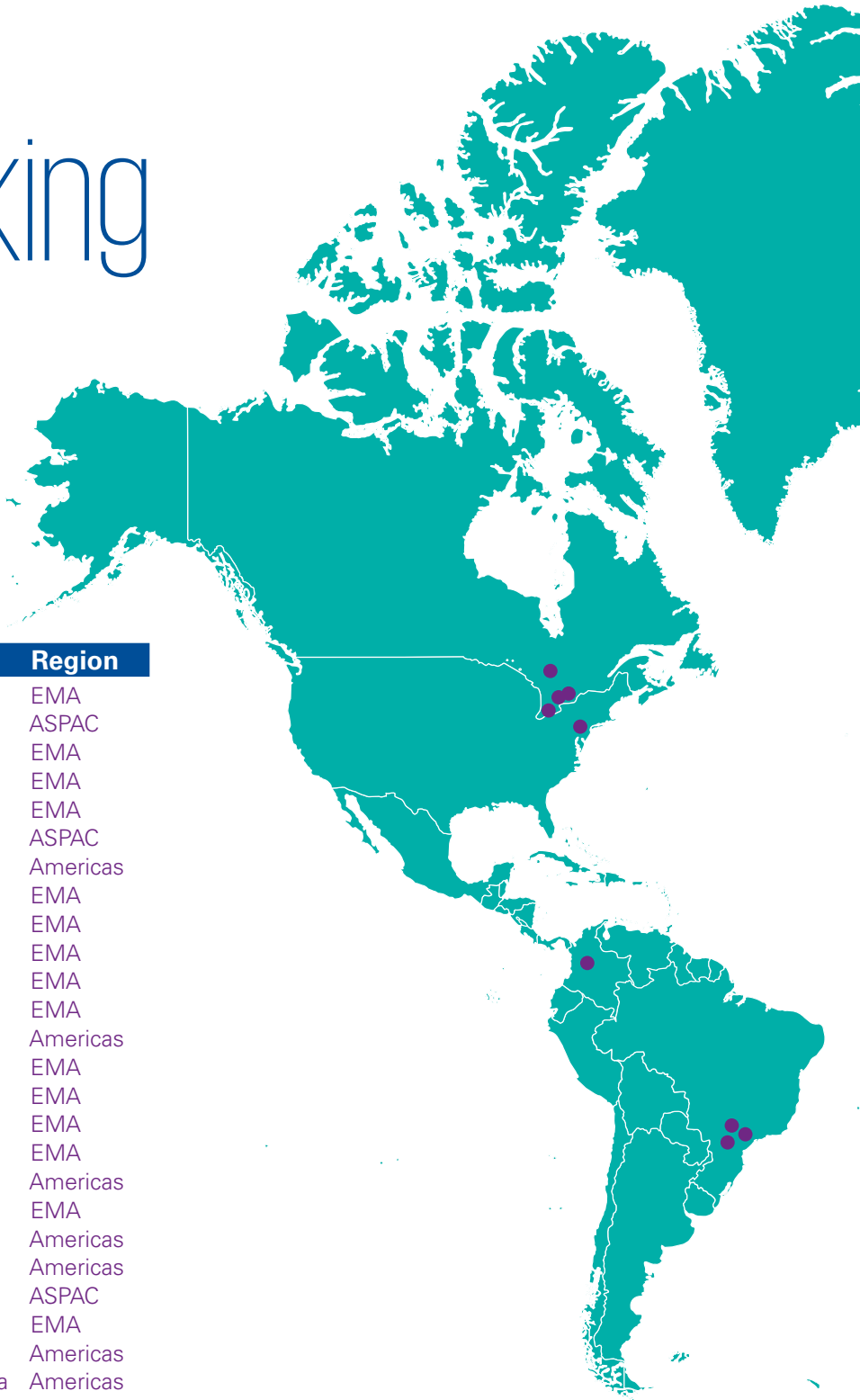
Data was collected between the beginning of January and end of April 2017 using a purpose-built data capture tool developed by KPMG. Importantly, the tool asked respondents to provide not only data, but also key innovations, service trends, challenges and successes that, in their opinion, differentiated their city.

Once the data was collected, we conducted a review of the data to identify outliers, assess potential reasons for variances and isolate trends. Unexplained outliers were removed to provide adjusted means.

Finally, KPMG gathered a set of global subject matter experts to review the final data and provide their opinions, insights and thoughts on the data and information provided by participants. You can find their perspectives attached to each of the services in the following sections.

For this report, KPMG professionals' identified at least one efficiency and one effectiveness indicator to provide a high-level view of the results. However, the research also delivered results across a number of other key indicators which can be presented to participants upon request. ■

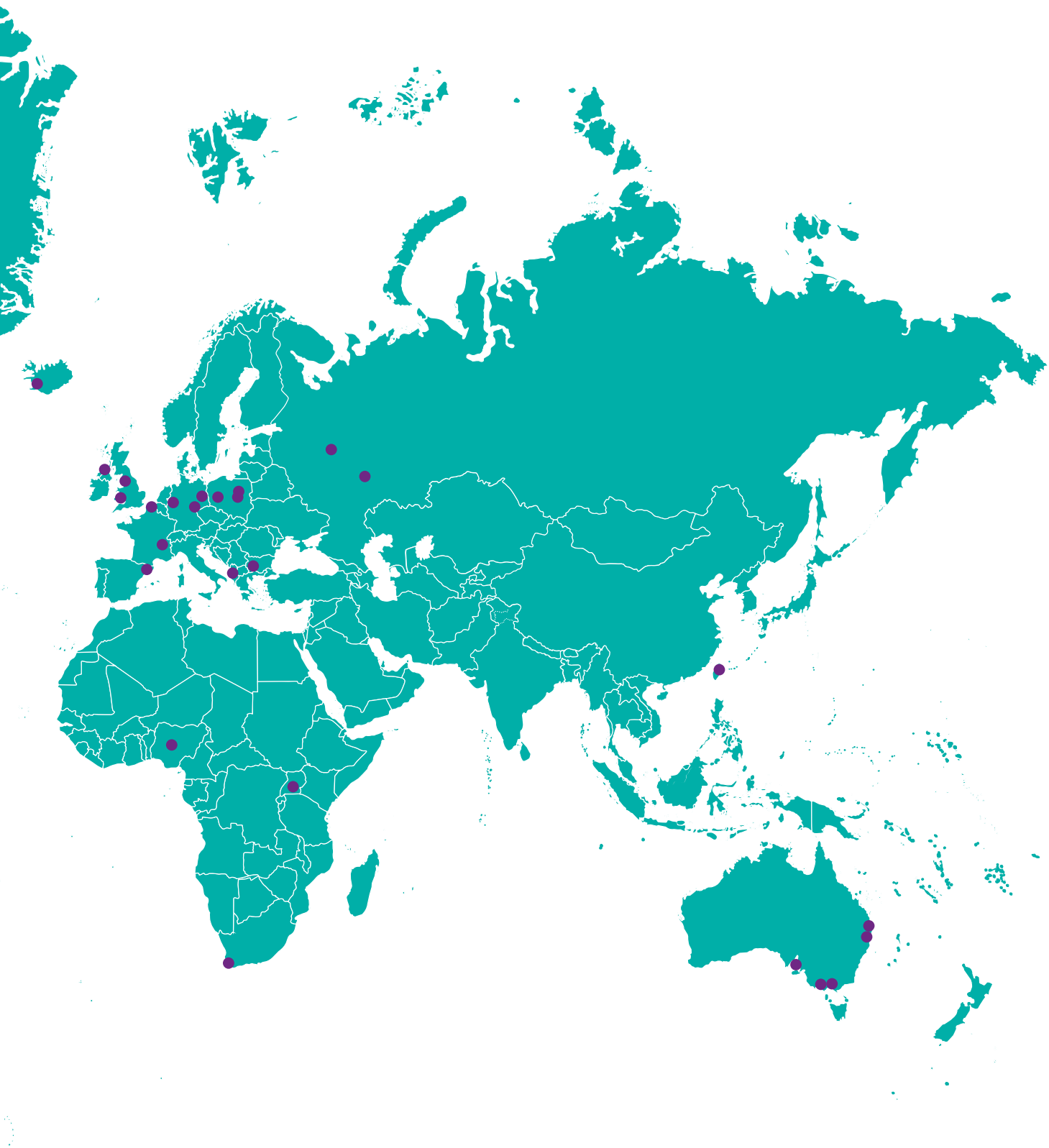
City benchmarking study



Participating cities

City	Country	Region
Abuja	Nigeria	EMA
Adelaide	Australia	ASPAC
Antwerp	Belgium	EMA
Barcelona	Spain	EMA
Belfast	Northern Ireland	EMA
Brisbane	Australia	ASPAC
Campinas	Brazil	Americas
Cape Town	South Africa	EMA
Cardiff	United Kingdom	EMA
Dresden	Germany	EMA
Düsseldorf	Germany	EMA
Greater Manchester	United Kingdom	EMA
Greater Sudbury	Canada	Americas
Kampala	Uganda	EMA
Kazan	Russian Federation	EMA
Leipzig	Germany	EMA
Łódź	Poland	EMA
Londrina	Brazil	Americas
Lyon	France	EMA
Medellín	Colombia	Americas
Mississauga	Canada	Americas
Mornington Peninsula	Australia	ASPAC
Moscow	Russian Federation	EMA
Peel	Canada	Americas
Philadelphia	United States of America	Americas
Poznań	Poland	EMA
Reykjavik	Iceland	EMA
São Paulo	Brazil	Americas
Sofia	Bulgaria	EMA
Sunshine Coast	Australia	ASPAC
Taoyuan	Taiwan	ASPAC
Tirana	Albania	EMA
Toronto	Canada	Americas
Warsaw	Poland	EMA
Wyndham	Australia	ASPAC

While readers may reference this list of participating cities, the actual data/results of the study have been anonymized. Participating cities have been randomly assigned a city number from 1–35 (e.g. City 1, City 2, etc.) with no relation to the order of this alphabetized list. The number assigned to each city will be consistent throughout the remainder of this publication.



Creating consistency: Using the Municipal Reference Model

When it comes to benchmarking, consistency is key. You need consistent terms and definitions for what you are measuring. You need consistent measurements and scales. And you need a consistent approach to analyzing the data. Yet, as this report makes abundantly clear, consistency is hard to come by in city reporting and benchmarking.

That is why KPMG professionals have used the Municipal Reference Model as the basis for our benchmarking exercise. The Municipal Reference Model provides city leaders with key structures and components to help improve the measurement and assessment of government services.

The Municipal Reference Model was first introduced in Canada in the early 1990s as a way to help city leaders understand and assess the performance of their service portfolio. Importantly, the model aims to clearly define a municipal 'service' versus a process or an organization unit, thereby providing an 'outputs and outcomes-based' view of city performance and efficiency.

At its most basic, there are four key components to the Municipal Reference Model that were instrumental for the City Benchmarking Study:

— *Service:* This reflects a commitment to provide service outputs that satisfy one or more recognized needs of a client. For example, the taxi licensing service delivers a taxi license to taxi cab operators to ensure compliance with safety regulations.

— *Service output:* Service output is defined as the unit of delivery of a service that addresses a recognized need. For example, a taxi operator receives the taxi license output to fulfill their need to operate a taxi.

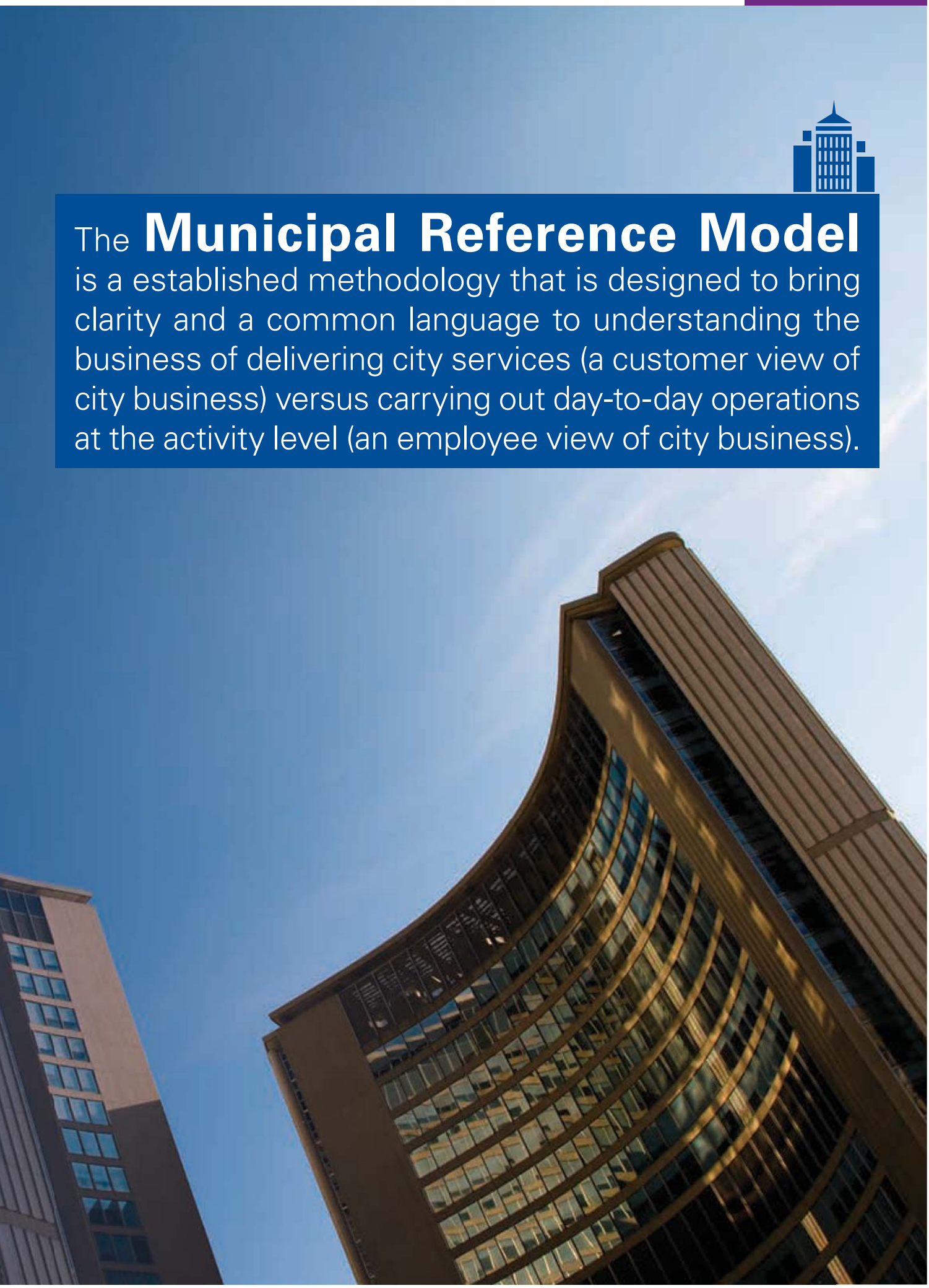
— *Efficiency Indicator:* This is a measure of productivity calculated by dividing the quantity of output (measured in units of delivery) by the quantity of resource inputs (usually measured in person hours per dollars). So, for example, how much it costs the city to process and approve a single taxi license.

— *Effectiveness indicator:* This measures the extent to which a service contributes to achieving desired outcomes. For example, the turnaround time to issue a taxi license or the taxi condition rating (viewed from the perspective of the taxi patron).

Over the past 20 years, the Municipal Reference Model has been tested by government organizations around the world. Today, it serves as the basis for assessing government performance and efficiency in many leading markets.

Want to know more about the Municipal Reference Model? Visit the MISA/ASIM Canada website (http://www.misa-asim.ca) or contact Alan Mitchell at KPMG's Global Cities Center of Excellence. ■

Municipal Information Systems Association (MISA) Canada is the owner of the Municipal Reference Model. KPMG's network has been granted rights to promote and apply the MRM concepts and methodology in countries around the world.



The **Municipal Reference Model** is a established methodology that is designed to bring clarity and a common language to understanding the business of delivering city services (a customer view of city business) versus carrying out day-to-day operations at the activity level (an employee view of city business).

Benchmarking city services

What to expect in the benchmarking report

To help readers navigate through the city benchmarking study report, we have prepared a brief outline of what you can expect in the upcoming sections.

Overview

Thirty-five cities from around the world have participated in the study, with global representation from 20 countries across Asia-Pacific, North and South America, Africa and the Middle East. The 12 most referenced services with the richest data were selected to be the focus of the survey. If you are interested in the data and analysis around a particular service, see page 21 to help you locate the information.

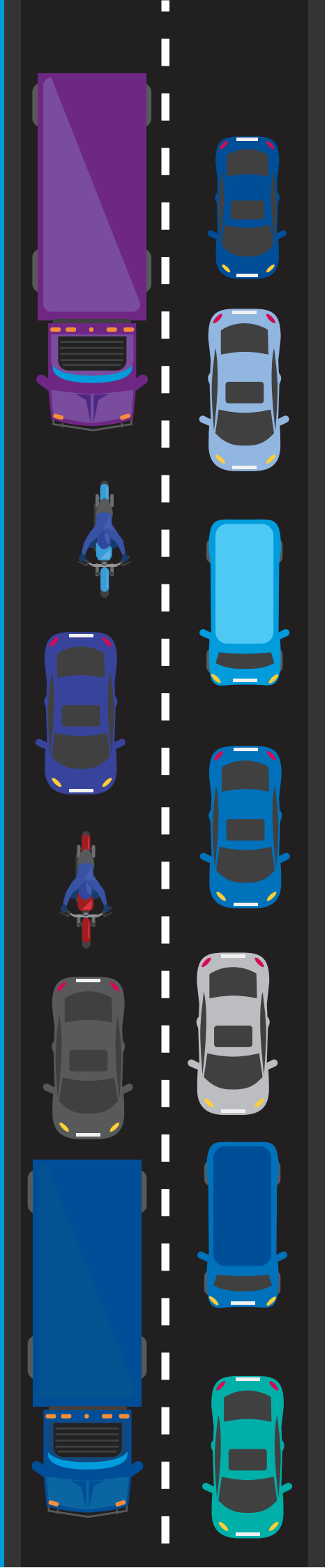
Notes on the data

- *Data anonymity.* While readers may reference a list of the cities that participated in the study on page16, we have anonymized the actual data/results of the study. Participating cities have been randomly assigned a city number from 1–35 (e.g. City 1, City 2, etc.). The number assigned to each city will be consistent throughout the entire publication.
- *City service data.* As mentioned earlier, the 12 most referenced services with the richest data were selected for the survey. However, not all 35 cities were able to provide details on all 12 services. Charts will clearly indicate how many cities shared data for the performance indicators of each service.
- *Currency.* All figures are expressed in US dollars (US$).
- *Recency of data.* Where possible KPMG professionals' tried to capture the most recent data for each performance indicator. For the most part, the report reflects data from 2016 and in some cases 2015 based on availability of data.

Navigating the report

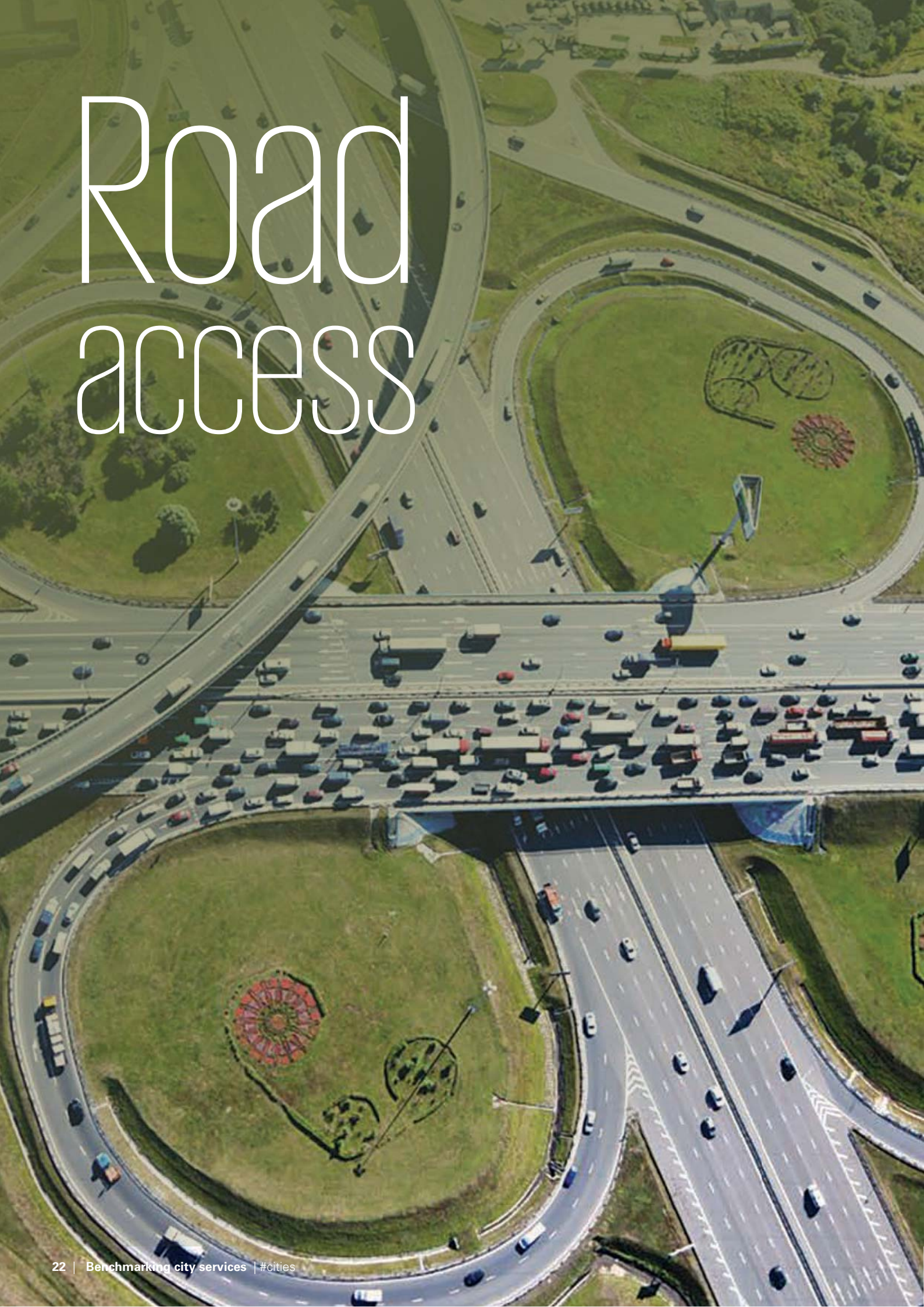
Below is a summary of what you can expect to see in each of the 12 service benchmarking sections. Please note that this is an overall structure, and there may be some differences between each service report, due to nature of the service and availability of the data.

- *Defining the service.* At the beginning of each service report you will see a definition of the city service being benchmarked.
- *Topline findings.* This provides a quick reference on key findings from the benchmarking exercise.
- *Efficiency and effectiveness.* For each of the 12 services, KPMG professionals' have attempted to capture at least one efficiency and one effectiveness indicator. In a few cases, there was not sufficient data to include information and analysis on either the efficiency or effectiveness indicator. In other cases, we analyze more than one performance indicator for efficiency or effectiveness where we obtained richer data.
  - *Defining the efficiency/effectiveness indicator.* For each performance indicator, we define the indicators that are analyzed for the specific service.
  - *Performance indicator charts.* For each city service, we attempted to include at least one chart for effectiveness and one for efficiency, reflecting data around each of the performance indicators selected.
  - *Points to consider.* This provides analysis and factors to take into consideration when looking at the benchmarking data and results. This is meant to be reviewed in conjunction with the accompanying data and charts.
- *Combined efficiency and effectiveness analysis.* In some cases where we have sufficient data, we provide a more in-depth analysis of efficiency and effectiveness measures. We include an extra bubble diagram that plots multiple indicators in one chart, and provide analysis indicating where cities may want to aim to be on the chart for optimal city service performance. This is meant to have cities begin to take a more sophisticated approach to benchmarking and service delivery.
- *Persistent problems.* Here we highlight some common challenges that cities face in the delivery of a particular city service.
- *Distinguishing cost factors.* Every city has different factors (environmental, political, etc.) that affect costs of delivering services. We list some of the key factors to consider that can contribute to the varied spend.
- *Innovative ideas.* To provide readers with some inspiration and ideas, we highlight some cities that are implementing innovative concepts to effectively and efficiently deliver a particular service.
- *Transformative trends.* This section provides insights around trends that are transforming the way city leaders and operators deliver and manage a particular service (e.g. evolving customer expectations, technology, etc.).
- *What else did we measure?* We highlight additional data that KPMG professionals' collected during the benchmarking exercise.
- *Subject matter expert insights.* To provide additional context, the report also includes insightful interviews with industry leaders as well as individuals from KPMG's global network of infrastructure and city professionals. ■



City services

Road access



Roads are much more than just asphalt and lights. They are vital arteries along which commerce, society and development thrive; they unlock the value of government services; and they allow citizens to lead more active, social and productive lives. But poorly planned or maintained road networks can create serious challenges for cities and their citizens.

Defining the service

Road access services incorporate the design, construction, maintenance, repair and operation of city and urban roads, bridges, tunnels and boulevards. Significant focus was placed on determining the 'lane kilometers of road' (calculated by multiplying the total kilometer (km) length of roadways by the number of lanes provided) to standardize benchmark results.

Topline findings

- The average city spends approximately US$15,400 per lane km of road.
- The median city boasts 73 percent of roads in good condition.
- Vehicle accident rates vary across the world but are exponentially higher in large cities.
- Different approaches to allocating capital costs significantly impact unit costs per lane km.

Efficiency

Operating and capital cost per lane km of road. This measure reflects the costs (both operating and capital) for city roads averaged out by the number of lane km of road in the city.

Points to consider

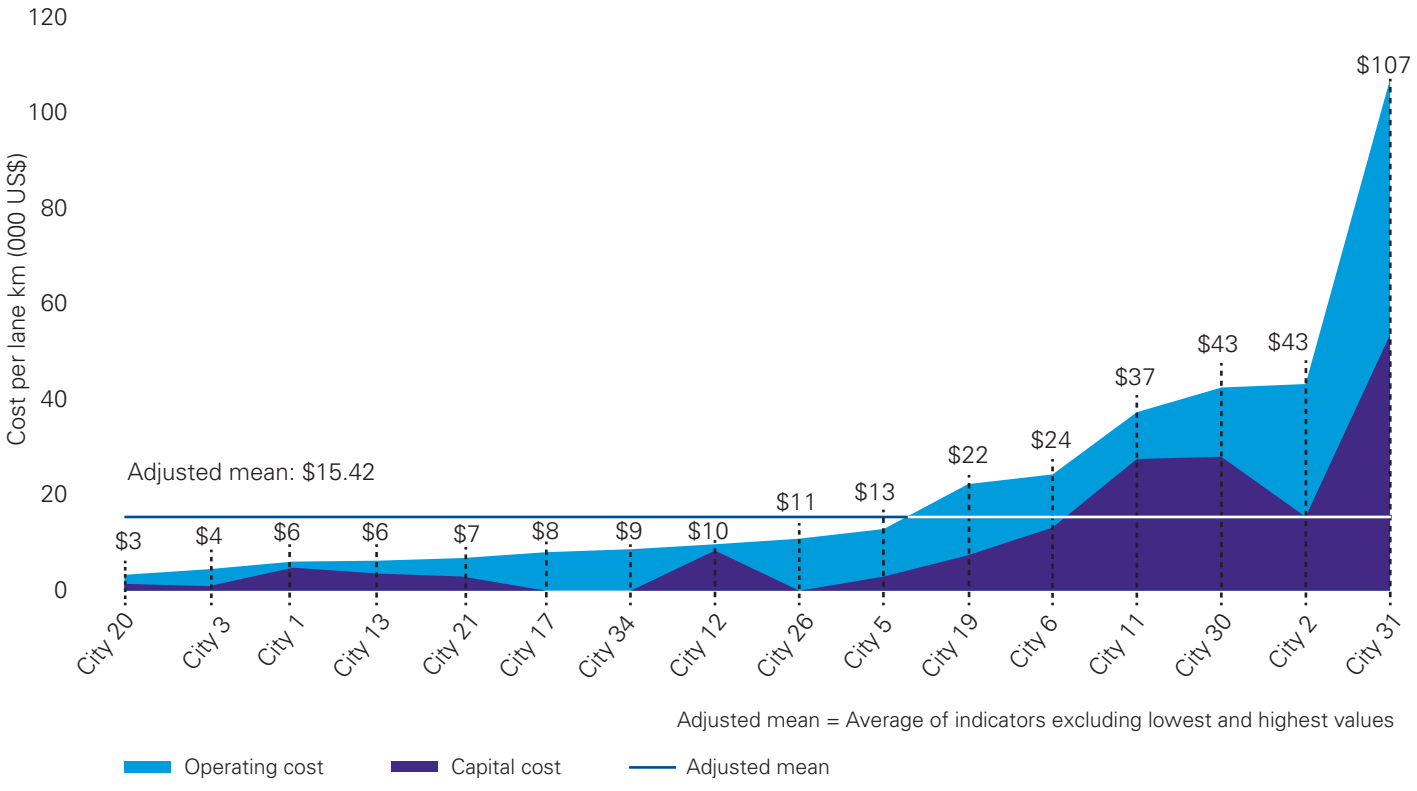
The combined operating and capital costs for a lane km of road range from US$3,000–US$107,000 depending on the city. When the operating and capital costs are separated, evidence suggests that some cities provided little to no capital costs while others spend more capital than operating funds.

For many of the 16 participating cities that provided road access data, there is a reasonable ratio of capital to operating costs, but what separates a city spending US$3,000 per lane km from another spending US$107,000 per lane km? One explanation can be attributed to the location of cities relative to extreme weather or potential long-deferred maintenance. For example, City 20 may not experience extreme winter conditions as a city with costs upwards of US$100,000.

Few if any cities qualified the cost information they provided by stipulating what was included/excluded. Some did inquire about whether they should include street lighting costs, but by and large cost information was provided in an unqualified manner. Further work in qualifying road costs would enable us to derive better cost indicators than available at this point.

Benchmarking the cost of roads is still in its early stages. Advice on the optimal cost for a lane km of road still requires further research where US$15,000 per lane km (adjusted mean) may be appropriate or biased based on those cities that participated and their operating and capital costs. More observations will aid in closing in on such a cost target.

Figure 1: Operating and capital cost per lane km of road (000 US$)



Effectiveness

Percent of roads in good condition. While the exact methodologies for assessing road conditions vary by city, this measure asked respondents to report the percentage of roads classified as being in 'good' or 'excellent' condition according to their specific rating system.

Points to consider

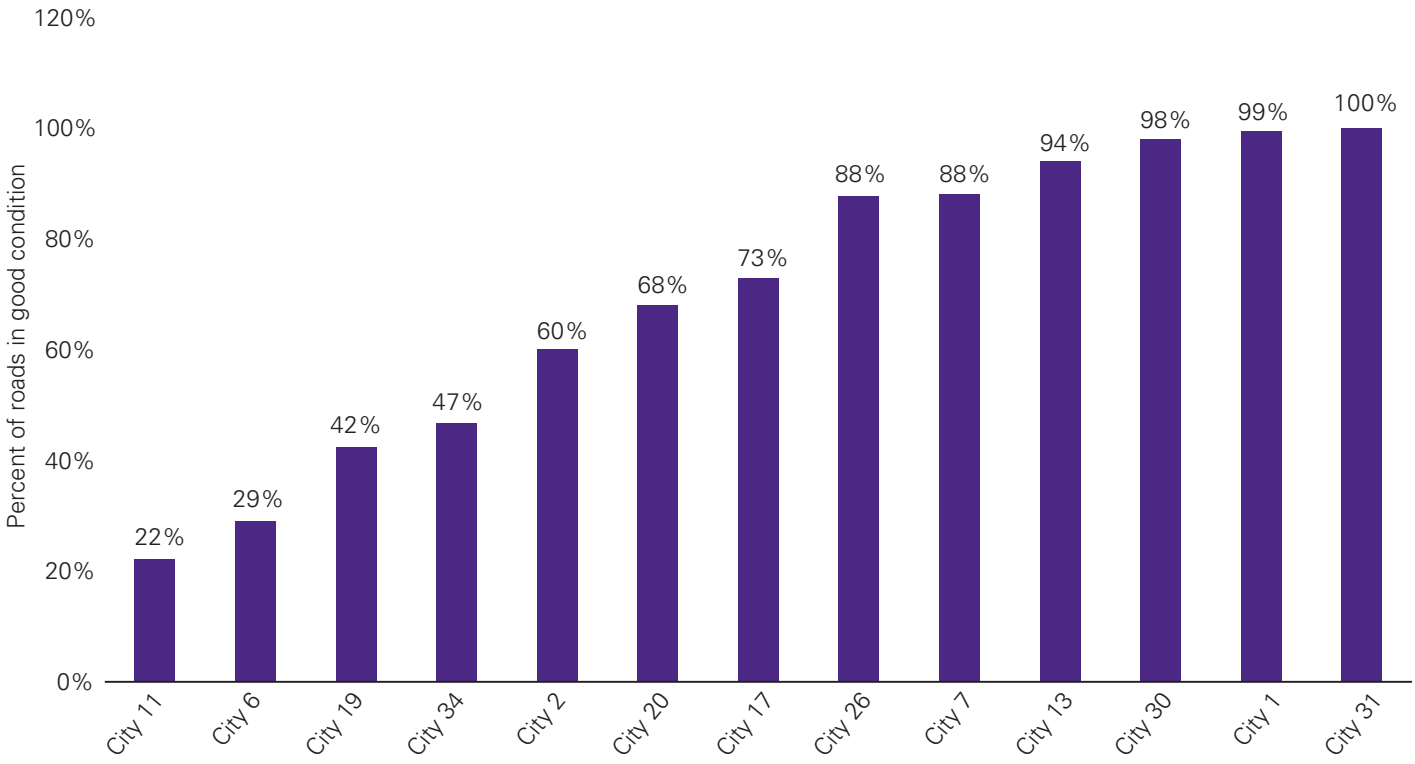
Clearly cities around the world will use different methods for ranking road condition. Unfortunately KPMG did not receive information about these methods. At one level, one might argue that we are comparing cities that use different techniques. However, at another level the good condition rating of a city in a developing country might equate to the same good condition rating for a city in a developed country where the perspective of 'good' may be substantially different in comparison.

One observation worth noting is that cities should be cautious in ranking all of their roads in good condition although some claim this to be case. Every city in the world is struggling to keep on top of road repair and reconstruction leading to road condition ratings that are below 100 percent in good condition. Furthermore, cities are struggling to justify sufficient capital expenditures to sustain their roads now and in the foreseeable future so road condition ratings clearly should suffer in years to come.

Developing an international standard for measuring road conditions would be extremely worthwhile. Who should develop such a standard and is there a role for KPMG member firms' to play in helping in such a collaboration?

Number of vehicle accidents. Traffic accidents for a given year have also been analyzed to observe any correlations with road conditions. If they occur frequently on city roads, it may be an indicator that the road design is flawed.

Figure 2: Percent of roads in good condition



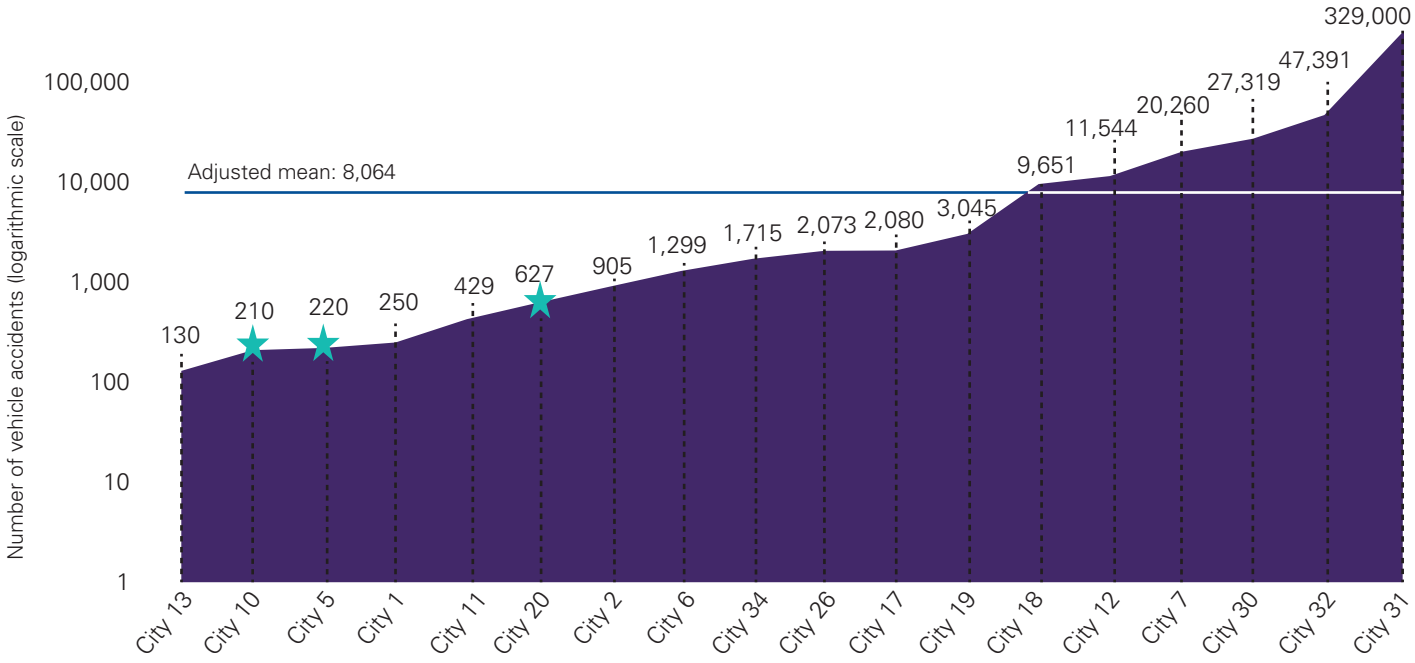
Points to consider

Eighteen cities reported the volume of traffic accidents as an effectiveness indicator for roads. The average number of traffic accidents across these cities is more than 8,000. The smallest number of accidents is 130 in a fairly small suburban municipality while one very large city reported 329,000 accidents. Attempts were made to normalize this accident information by the number of lane km provided, but unfortunately not all cities could provide such a statistic.

Regarding the number of traffic accidents, it was surprising to discover that there are two different types of traffic accidents reported in this study: those that cause injury/death; and all traffic accidents. There are differences between the two statistics that we look to analyze for subsequent road access benchmarking exercises.

Ironically, some cities that reported higher costs than others, with high percentages of roads in good condition also reported higher than average traffic accidents. This finding is completely contrary to traditional thinking but does raise the issue of whether vehicle operators might travel at higher speeds or drive more dangerously when roads are in good condition leading to more traffic accidents.

Figure 3: Number of vehicle accidents (annual)



Note: Values highlighted with a "star" symbol indicate number of vehicle accidents that resulted in injuries and not the total number of vehicle accidents.

Adjusted mean = Average of indicators excluding lowest and highest values

Persistent problems

— Underdeveloped road infrastructure
— Deteriorating road quality
— Congestion and increasing volume
— Tighter environmental requirements
— Shifting attitudes towards public transportation
— Short construction windows in climate-affected regions
— Aligning service contracts to outcome expectations
— Investing in human capital and capacity development

Distinguishing cost factors

— Weather-related impacts and maintenance requirements
— Capital costs and the degree of asset lifecycle replacement
— Service levels and corresponding technical considerations
— Density of city and congestion on roads
— Presence of tunnels, bridges and special road construction materials (e.g. cobblestone roads)
— Asset complexity and variation

Innovative ideas

— In **Kazan**, Russia, authorities have invested in an automated traffic control system that has helped the city increase road capacity by 15 to 20 percent and has improved average speeds by 25 percent.
— **Philadelphia**'s Vision Zero initiative aims to improve street safety and network integration through infrastructure improvements focused on traffic, pedestrian and bicycle safety.
— **Cape Town's** city council has approved the use of modified asphalts such as A-E2 and A-R1 on marginal pavements and is trialing grey water-resistant asphalt near informal settlements.
— Authorities in **Medellín**, Colombia are shifting to electric tramways and aerial cables to improve lane kilometers and reduce congestion.
— The **Sunshine Coast Council** publishes a 'schedule of work program' that provides citizens with timeframes for projects conducted as part of the city's annual road reseal and rehabilitation program.

Transformative trends

— *Shifting customer expectations and demand:* The widespread adoption of personal navigation apps, car sharing models and vehicle autonomy tools is changing demand for roads.
— *Adopting new approaches:* Traffic flow systems, free flow models and other alternative models can help reduce road volume and better manage new capital costs.
— *Promoting traffic safety:* Many cities are looking at ways to improve overall road safety for vehicles, pedestrians and bicycles while simultaneously improving traffic flow.
— *Improving outsourcing:* Municipalities are rethinking their existing outsourcing agreements to understand how value is created and captured.
— *Leveraging data:* As cities become smarter, many are using this data to drive improvements in operations, planning and investment.

What else did we measure?

For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to analyze in this report:

— Number of road service interruptions
— Revenue collected for roads.

Combined efficiency and effectiveness analysis

Points to consider

A new performance perspective on roads combines the efficiency and effectiveness indicators. The graph illustrated below combines the cost per lane kilometer (km) of road (efficiency) with the percent of roads in good condition (effectiveness) to demonstrate how cities might present a more compelling picture of performance. In this example, the cost per lane km of road (efficiency) is combined with the road condition rating (effectiveness). Twelve cities provided sufficient information to generate this fascinating picture of roads.

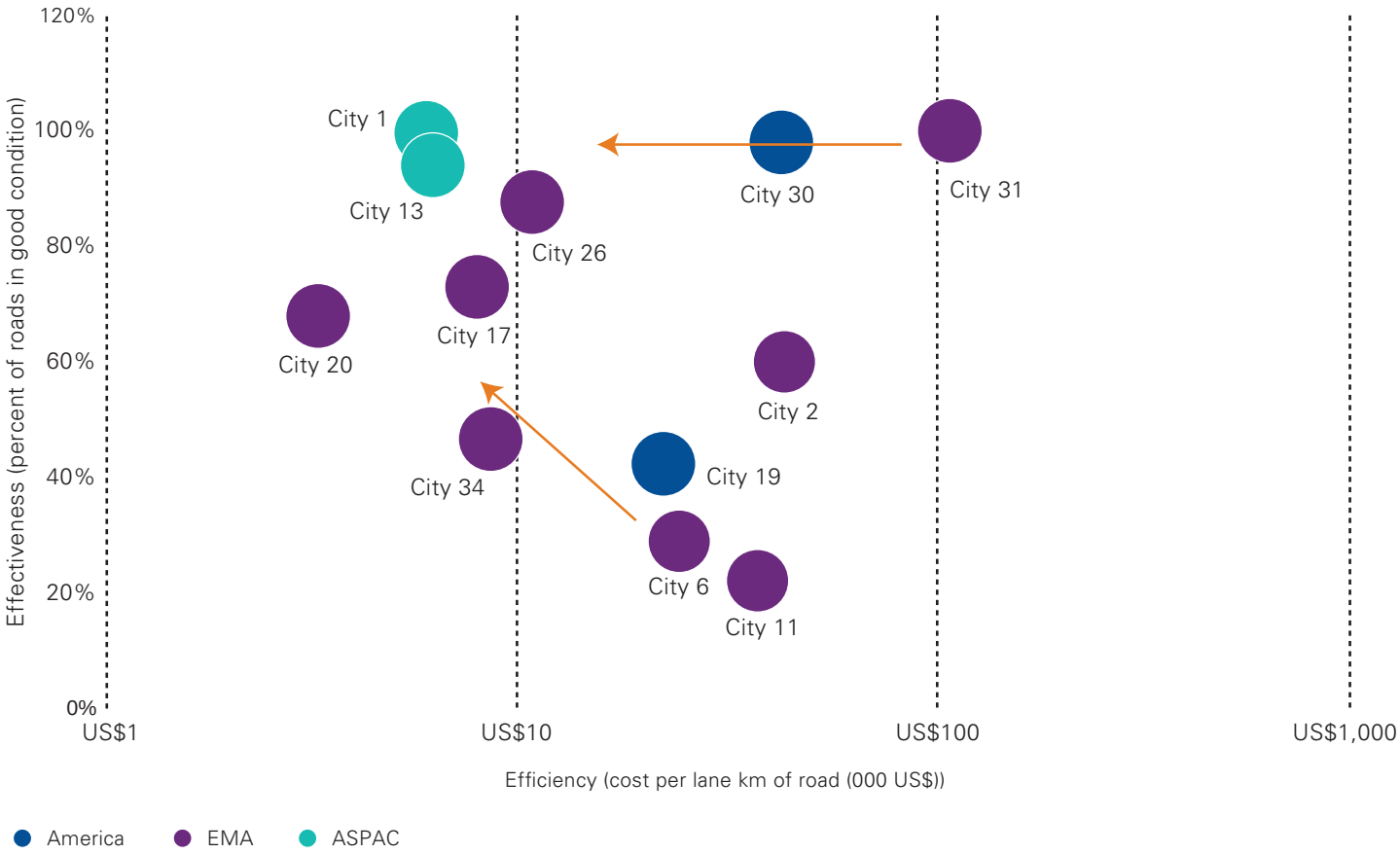
The ideal position in this chart is to be in the upper left quadrant, like cities 1 and 13. While one might question whether any city can attain 100 percent of its roads in good condition, this graph shows that not only was City 1 in this enviable position, but they were also really efficient spending less than US$10,000 per lane km of both capital and operating funds to achieve this state.

A city like City 34 may be spending the right amount of money but has more work ahead to improve the road condition rating. Similarly if you are City 30, your roads are in good condition but perhaps you are spending more capital and operating funds to achieve this state. One of the key points provided by this unique graph is the balancing act that cities face on satisfying customer demand while being thrifty in achieving satisfaction — a challenging dilemma that leading-edge cities can help to demystify.

Imagine what might be possible if we were able to cross reference efficiency and effectiveness against a third variable such as the number of traffic accidents!

Clearly there are cities that are in the ideal spot of the graph but the majority of cities have their work cut out for them to achieve this goal.

Figure 4: Road access — combined efficiency and effectiveness



Q&A with Cesar Diaz-Plaza Perez, Global Infrastructure Sector Lead, Roads, KPMG International

Cesar helps KPMG member firms' clients deliver mega road projects across the Americas, leveraging more than 15 years of hands-on experience running daily finance operations at a major road concession and project operator.

Q: In your opinion, is there value in benchmarking road access services across cities?

A: Clearly, there are massive differences in the way that cities measure and report road costs, quality and efficiency. And that often makes it difficult to compare data across cities, particularly in different countries or climates. But it's the underlying insights — the trends and ideas — that really drive value for cities, beyond the raw numbers. And that is what makes benchmarking so important.

Q: Do you see a correlation between cost per lane kilometer, road quality and effectiveness?

A: Interestingly, that is not as clear. One would intuitively expect that the more a city invests in its roads, the higher the quality and — therefore — the more effective they would be. But this research suggests that effectiveness is influenced by much more than just capital investment. It is also clearly influenced by factors such as population density, traffic safety, climate, labor costs and even the choice of material used.

Q: Are there ways that cities can reduce the overall cost of roads?

A: I think there are always ways to remove costs and leverage efficiencies, both in operations and in capital development. And benchmarking against other cities can help identify those. Some cities are now looking at both sides of the coin, reducing costs but also increasing revenues. And that can be done through tolls, congestion charges or special levies. Indeed, we are seeing many cities experimenting with various models aimed at reducing congestion which, in turn, helps manage both operating and capital costs.

Q: Has technology improved the way roads are planned and managed?

A: Absolutely. KPMG professionals' have helped cities around the world leverage the power of data and analytics (D&A) to create unprecedented insights that vastly improve their road management and cost structures. For example, some cities are using D&A to reduce maintenance cycles, to predict future demand and to identify road congestion. But technology is also changing the way consumers interact with their roads and that, in turn, is creating new challenges for city planners.

Q: Do all roads require the same level of investment and attention?

A: That very much depends on their quality, volume, use and composition. The real challenge for cities is how to prioritize the work that must be done each year. And that is where cities are now starting to use more robust approaches that take into account other factors such as quality of life, critical access requirements and future demand.

Q: What advice would you offer city leaders and roads authorities?

A: Regardless of the city, the real objective for roads authorities should be to improve mobility and reduce congestion. And there are many ways that you can achieve that. In some cases, it may involve building more roads. But you can also achieve some of these goals through other means — encouraging flexible work days, restricting roads access, implementing high occupancy vehicle (HOV) lanes and so on. You need to think laterally about the problem and be willing to borrow ideas from other cities. ■

Transit

Around the world, cities are pouring millions — sometimes billions — of dollars into developing and improving public transit. But our benchmarking exercise suggests that when it comes to comparing services against other transit authorities more work can be done to collect and compare ridership and route effectiveness indicators. And, as a result, investments may be flowing into ineffective routes, modes and assets.

Defining the service
Transit services — also known as public transit — includes a wide variety of modes including bus, streetcar, metro rail and light rail. For this report, the service includes the design, construction, maintenance, repair and operation of transit routes and vehicles and excludes the para transit service.

Topline findings
- The average city spends US$1.67 per transit trip (not counting any revenues).
- The average cost per km of transit route is US$24.70.
- There are no consistently used measures for effectiveness across cites or transit modes.

Efficiency

Operating and capital cost per transit trip. This measure combines total public transit operating costs (including internal support service costs and management costs) with the total capital costs and divides the sum by the number of reported transit trips.

Points to consider

The cost per transit trip varies from US$0.02 to US$4.72 for the 11 cities that were able to provide performance information. Further examination of the low cost may be explained by one city reporting total transit passenger trips but only measuring the operating and capital costs for a portion of the transit operations. Other operations may be provided by transit authorities that are separate from the city but operating within its boundaries.

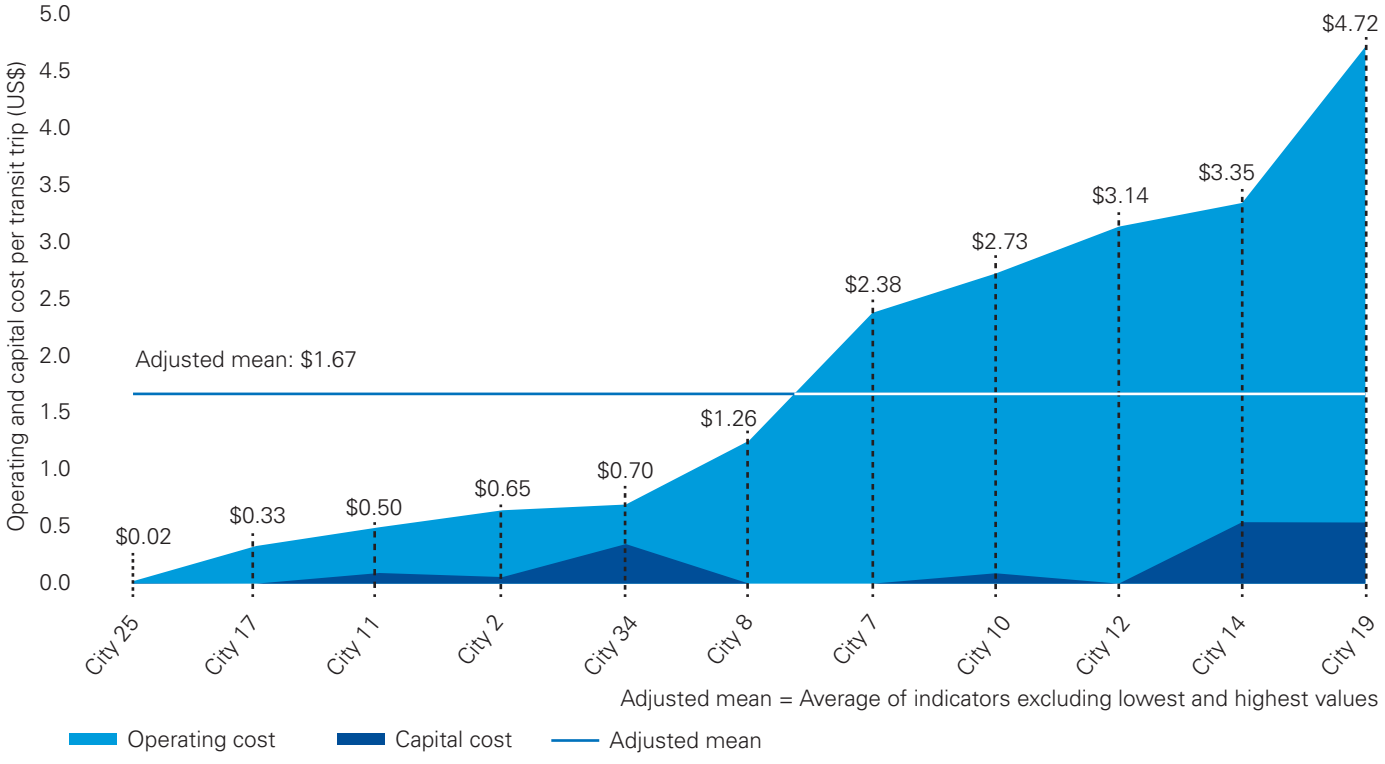
Few cities reported substantial capital budget amounts in support of transit. Is this because many are struggling to obtain funding for replacement, expansion or upgrades or are there other reasons that may be contributing to this fact?

The adjusted mean cost for transit is approximately US$1.70 per trip. This seems low but may be influenced by the currency conversion rates in respective countries, the cost of living in different countries, and a multitude of other factors. Variances may be explained by the passenger count information. Some cities are not entirely sure about the actual count of passengers as many passengers may use transit passes instead of individual tickets/tokens for their transit trip. Furthermore, a single passenger who takes multiple transit rides in the course of their commute may be double counted.

More and more cities are trying to increase transit ridership. Mature, developed cities have invested considerably in their transit network and provide a variety of transit vehicle options, while less mature, developing cities are struggling to expand their transit network, especially when it comes to light rail and metro options. Further still there are mega cities that struggle to meet transit demand resulting in gray and black market service providers popping into the picture.

Subsequent studies should focus on distinguishing costs between types of transit vehicles (e.g. buses, light rail, trams, metros, etc.). Future surveys may also reach out to transit associations that may operate in specific countries or regions to increase participation rates and to standardize on metrics that are readily available.

Figure 5: Operating and capital cost per transit trip (US$)



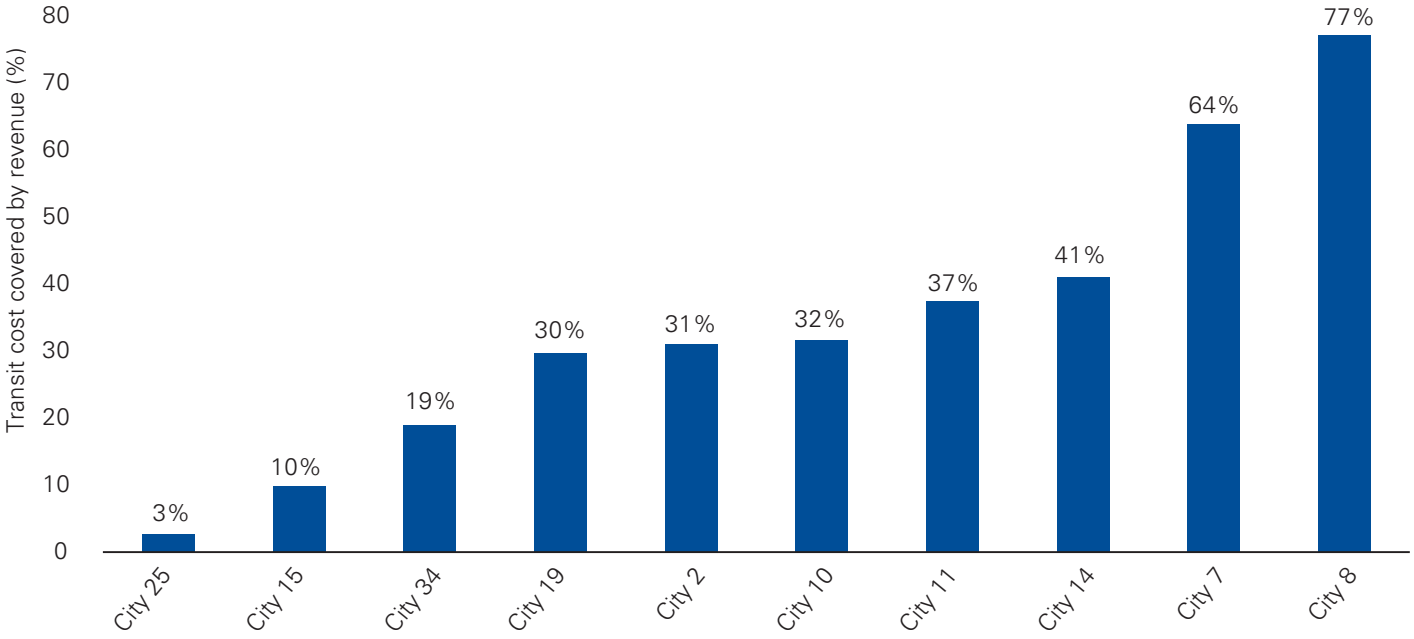
Percent of transit costs covered by revenue. The measure of how much operating and capital cost is covered by revenue.

For the 10 cities that provided costs and revenue, the percentage of costs covered by fees ranges from a low of 3 percent to a high of 77 percent. This wide variation cannot be readily explained. The lowest ratio comes from a well established European city (City 25) while the same can be said for the highest ratio (City 8). Clearly City 8 is in an enviable position where they seek a mere 23 percent top up to cover their costs. Half of the cities that responded appear to realize a cost recovery ratio of between 30–40 percent which means that two-thirds of the costs are covered off by funding beyond transit fares and likely from city financial resources or perhaps state supported grants.

The challenge with achieving full cost recovery is that it penalizes lower income families that desperately need an alternate source of transportation than the car. Conversely, a low cost recovery may inordinately penalize those commuters that don't wish to use the transit system, particularly if they support bicycle or walk to work commuting patterns.

Many cities are beginning to wonder what the impact of autonomous vehicles will have on their transit ridership. Will autonomous vehicles reduce transit ridership and increase traffic congestion? Will the cost per transit trip continue to compete with alternative forms of mobility? Regardless of the impact of disruptive technology, cities need to embrace change while continuing to supply affordable transit services.

Figure 6: Percent of transit costs covered by revenue



Effectiveness

It was surprising to find that few cities measure the average wait time between vehicles as an indicator of effectiveness. Indeed, with few consistent effectiveness measures being tracked across cities and transit modes, this exercise suggests that most cities are making transit investment and optimization decisions based on unreliable and incomplete data.

Persistent problems

— Improving travel times in the face of increasing road congestion
— Reducing environmental pollution and impact
— Increasing ridership as a percentage of total commuter trips
— Expanding capacity to meet growing demand
— Replacing outdated rolling stock and assets

Common cost factors

— Labor and operational staffing requirements
— Technology and rolling stock
— Fleet upgrades and network improvements
— Energy and oil inputs
— New capital investments and network expansions

Innovative ideas

— Responding to environmental concerns and targets, many cities — including **Dresden** — are working to replace existing bus rolling stock with e-buses and hybrid buses.
— Similarly, public transit authorities in **Philadelphia** are introducing new regenerative breaking electric vehicles to improve fuel efficiency and reduce greenhouse emissions.
— In **Łódź**, electronic passenger information boards have been installed at bus and trams stops, supported by in-vehicle GPS systems and locating devices.
— Authorities in **São Paulo** have created the Mobility Laboratory (MobiLab) to encourage innovation in public transit through partnerships with academics, entrepreneurs and private enterprises.
— To improve the efficiency of road-based transit, authorities in **Kazan** have implemented new automated traffic control systems and adaptive traffic management practices.

Transformative trends

— *Healthy lifestyles:* As populations seek more active and healthier lifestyles, demand for cycle paths and non-motorized transport options is rising.
— *Environmental stewardship:* Growing concerns about carbon emissions and new environmental policy targets are encouraging transit authorities to invest into low (or no) carbon transit alternatives and vehicles.
— *Capacity improvements:* Leveraging new technologies and process improvements, many cities are delaying new capital investments by focusing on improving the capacity of their existing assets and networks.
— *Intermodal connectivity:* Cities are increasingly focused on enhancing connections between various modes of transit in an effort to reduce passenger travel times and improve overall system effectiveness.

What else did we measure?

For this benchmarking exercise, KMPG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:

— Percent of population served within 500 meters of transit stops
— Peak period headway time (by type of vehicle)
— Revenue vehicle hours
— Cost per revenue vehicle hours.

Q&A with Hugh Jones, CEO, Steer Davies Gleave LLP

Hugh is the CEO of Steer Davis Gleave, a leading independent management consultancy specializing in the transport industry. Prior to joining the firm, Hugh served as a senior analyst with London Underground Limited.

Q: How has technology influenced transit services over the past decade?

A: We have seen significant investment into 'pre-digital' technologies such as at-stop or on-vehicle information and real-time traffic management systems, all of which have generally made transit easier to use, more accessible, more reliable and — over time — have allowed authorities to enhance efficiency and effectiveness. We are experiencing the digitalization of transport, but greater change is ahead as we move towards autonomous vehicles, more efficient battery and alternative fuel models, alongside a shift towards digitally-enabled demand responsive schedules and fare payment.

Q: How quickly do you expect fuel technologies to change?

A: We've already experienced a greater refinement to diesel products and the adoption of new fuels as a result of greater environmental emphasis. But most of these non-diesel products are still in development and are therefore rather bespoke which means they can lack widespread and diverse supplier support. The emergence of a preferred alternative fuel is still to be achieved.

Q: What role should the private sector play in delivering and operating public transit?

A: Unfortunately, there is no one-size-fits-all answer. The reality is that the public and private sector strengths and capabilities vary by location and circumstance. In many cases, the public sector might be better placed to execute the longer-term strategic planning, keeping in mind the wide spectrum of policy issues that inform those types of decisions. But we have also seen many examples of private sector players demonstrating great innovation in long-term planning. In almost every case, however, there is a role for both the private and public sectors to participate.

Q: How important is regulation in ensuring an effective public transit service?

A: Regulation can be very helpful, particularly when cities are seeking to encourage and protect public-private partnership (PPP) arrangements. Regulation can help provide long-term stability to suppliers. It can help moderate competition risk — for both revenue and road access — where performance, usage or revenue risks are transferred. And it can protect the consumer and enforce standards. That being said, there are certainly examples of unregulated transit markets that have proven capable of supporting effective service delivery and market participation.

Q: Are subsidies necessary to ensure high quality service?

A: Subsidies are not just a function of cost but also fare levels, revenues and the balance of cost recovery between users and tax payers. But if transit is to embrace new technology, meet higher passenger expectations and deliver additional capacity, some level of subsidy will likely be required. Indeed, the investment cycle and the 'lumpy' nature of additional capacity costs would suggest that subsidies may continue to be required for many transit networks.

Q: How can higher levels of government better support city-level transit development?

A: I think higher levels of government can help by lending their major project and PPP expertise to the various lower levels of city government. At the same time, transit needs stable and foreseeable funding arrangements which requires longer-term commitments from higher levels of government. The bottom line is that you can't seek to develop major transit investment within fixed short-term budgetary cycles. It takes a longer-term view and strategy. ■

Small and medium enterprise development

Small and medium enterprises are the engines that keep cities growing. In the European Union, they account for 99 percent of all enterprises, employ two-thirds of all workers and contribute more than 50 percent of a city's gross value added[1]. In the emerging markets, their value tends to be far higher. No wonder city leaders around the world are making small and medium enterprise development a high priority.

Defining the service

Small and medium enterprise (SME) development services are focused on helping new businesses — typically startups — establish and grow their enterprises. Services may include a wide range of activities from the provision of business advice and networking support through to the development of financial and non-financial incentives and investment into supportive resources and/or infrastructure.

Topline findings

- The average city spends US$330.10 per SME consultation.
- The median cost per SME consultation is between US$125.00 and US$430.00.
- Spend per consultation ranged from as low as US$1.16 to US$1,456.57.
- There is considerable variation in the range of SME development services provided by cities which directly influences cost.

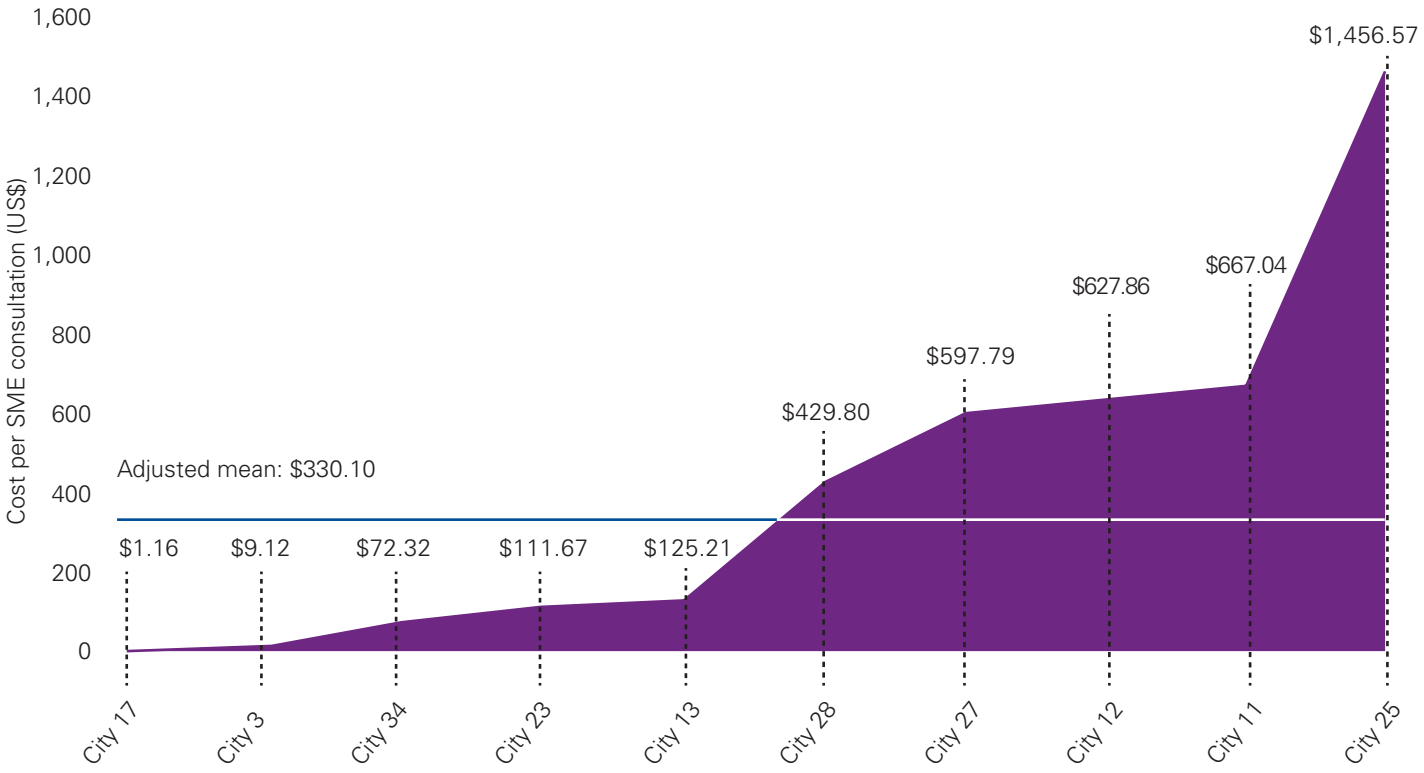
Efficiency

Operating and capital cost per SME consultation. This measure combines reported operating costs and capital costs for SME development services and divides the total by the number of reported consultations.

Points to consider

The cost per SME development consultation appears to range quite widely from a low of US$1.16 to a high of US$1,456.57. In trying to investigate the outliers associated with these costs, KPMG professionals' could only come to the conclusion that the type of service output offered by one city might vary considerably with that of other cities. For example, if a small firm had a telephone conversation about how they might seek financial support from the city, this might count as one consultation. Another city might include an in-depth analysis of the small firm's competition, specialized training on developing business plans, and grant money to raise investment monies. This latter example would clearly not be comparable to the simple telephone conversation but would count as a single interaction in the costing equation. The difference in consultation would clearly account for the difference in costs.

Figure 7: Operating and capital cost per small and medium enterprise (SME) consultation (US$)



Adjusted mean = Average of indicators excluding lowest and highest values

[1] "Growing the global economy through SMEs", Edinbugh Group, undated.

Effectiveness

Interestingly, very few cities participating in our benchmarking exercise seem to measure the annual change in employment created by SMEs. While other measures may be more readily available, this suggests that city leaders may not know the actual impacts of their investments and their influence on employment, tax revenues and service demand.

Few, if any, cities were able to capture this effectiveness indicator rendering our analysis unable to report a meaningful statistical count for comparison. While other effectiveness indicators may be more readily available, this statistic is fundamental in answering the question: "Are we making a difference?" Cities need to do more to provide the proof that SME development can be influenced by a city.

A study conducted by KPMG on *magnet cities* — cities that have turned their economy around — suggests that attracting young wealth creators is a guiding principle for success. SME development is the one service a city can offer that supports young wealth creators, but further research is required to understand the constantly evolving needs of these youth.

KPMG was able to capture some wonderful innovations being pursued by cities around the globe and hopes that these innovations make their way into more cities as they struggle to attract new employment and to invigorate economies that may be suffering from the impact of disruptive technologies or the fourth industrial revolution.

Persistent problems

— Coordinating support across multiple service areas
— Removing barriers to entry for startups
— Awareness by the enterprise that the city offers support services
— Increasing SME participation in local economies
— Reducing regulatory hurdles and streamlining processes
— Improving city digital service delivery capabilities
— Encouraging corporate investment into local SMEs

Distinguishing cost factors

— Sophistication and depth of service offering
— Extent to which financial supports are granted
— Level of private sector investment
— City's investment in SME development service

Innovative ideas

— SMEs in **Adelaide** enjoy a 'one-stop-shop' window that provides business advice and support to help entrepreneurs start and grow their business and navigate the applicable regulatory processes.
— Authorities in **Kazan** have arranged 'rent holidays' for small businesses, offering relief from rent on municipal properties for up to five years.
— Entrepreneurs in **Poznan** can use Poland's first 'free urban co-working space', a collaborative environment for around 30 people, supported with free Wi-Fi and a 'hot desk' to encourage collaboration while chilling out.
— The City of **Philadelphia** has created the Capital Consortium and Biz Coach programs to help increase investment into small (primarily minority-owned) neighborhood-based businesses. The city has also focused on high school and college students providing them a bridge to the business world through grants and supports.

Transformative trends

— *Integrating and electronic service delivery:* As part of the wider digital transformation of government, many cities are focused on shifting certain SME development services and processes to digital channels enabled by cloud computing.
— *Encouraging inter-government coordination:* City leaders are working closely with counterparts in regional and national government to improve SME supports such as tax incentives and infrastructure.
— *Evaluating success:* In an effort to improve the effectiveness of services, cities are introducing tools and mechanisms to track client progress following certain interventions.
— *Targeted supports:* City leaders are carefully analyzing the needs of their local SME ecosystem and creating supports that focus on achieving certain policy objectives.
— *Shifting to non-financial:* Facing rising budgetary pressures and widening service expectations, cities are moving away from providing blunt financial supports such as grants in favor of more advisory-based services.

What else did we measure?

For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:

— Change in employment of SMEs
— Revenue collected for SME development
— Capital costs for SME development.

Q&A with Alexey Nazarov, Partner and Head of Strategy and Operations, KPMG in Russia

Alexey is internationally recognized as a leading advisor on small and medium enterprise (SME) development services. With experience gained from several SME development projects globally, Alexey has received multiple awards for SME program design and development.

Q: Why is SME development high on the city agenda?

A: SMEs are key to a city's prosperity, vibrancy and livability. In most developed markets, SMEs make up almost half of a country's national GDP — and oftentimes more in the emerging markets. They encourage employment, drive innovation and improve competition. And they create important opportunities for individuals to create financial security. All of this is important to city leaders.

Q: What types of services should cities be delivering to SMEs?

A: It all depends on the outcomes they want to achieve. If they want to increase the number of SMEs active in the city, they may want to focus on services that reduce the barriers to entry and encourage entrepreneurs. But if the objective is to help existing SMEs grow and expand, the focus should be placed on helping businesses find and attract new sources of capital or new markets.

Q: What factors contribute to the wide variance in costs across different cities in our benchmarking exercise?

A: SME development services can encompass such a wide variety of sub-services and offerings, making it notoriously difficult to benchmark. A consultation can be as simple as a 15-minute telephone call to a shared-services resource. Or it could mean days of face-to-face discussions with highly specialized professionals. You just can't compare the costs on those very different interactions.

Q: How are SME development services changing?

A: One of the bigger trends we are seeing is a shift towards greater emphasis on non-financial support for SMEs. So instead of providing services grants and loans directly to startups, cities are shifting their focus towards providing services which tends to result in better outcomes that ultimately help entrepreneurs tap into private sources of funding.

Q: Are there other stakeholders that can help cities achieve their SME development objectives?

A: Certainly. Creating the right supports and environment for SMEs will require cooperation between all levels of government, particularly around tax incentives and regulation. Banks and investors will also play an important role. So, too, will bigger corporations that are seeking to expand their local supply chain and tap into new innovations.

Q: What can city leaders do to improve SME development services?

A: I think the most important thing is to make sure that SME development is part of the core city agenda. Leaders must encourage departments to work together to create a supportive environment for SMEs. They must build relationships with other stakeholders and levels of government. And they must ensure their economic development and SME development professionals have the right capabilities and service portfolio to meet their city objectives.

Q: How can cities improve the efficiency and effectiveness of their SME development services?

A: The most important step is to ensure that the services you are providing and the tools you are using are aligned to the outcomes you want to achieve. Moving from financial supports to non-financial services will also help improve the cost effectiveness of services overall. And, of course, the adoption and integration of new technologies — both in the front office and in the back office — will drive further efficiencies, particularly around processes. ■

Building permit and enforcement

Healthy cities continuously develop and evolve. Indeed, the economic prosperity of a city can often be judged solely on the number of cranes that loom over the skyline. But to keep those cranes from sitting idle, contractors and developers need fast and cost-efficient access to building permits. And that means a more efficient and effective building permit and enforcement service.

Defining the service

Building permission and enforcement services (also known as building permit services) issue building, demolition and alteration permits for new and existing structures in a city and conduct inspections of active sites to assess compliance. In some cases, occupancy permits issued by the local fire department have been included.

Topline findings

- The cost of building permits ranges from as low as US$218 to as high as $5,000 per permit.
- The median cost per permit is between US$860 and US$1,403.
- The median time required to issue a building permit is between 30 and 60 days.
- However, time to issue a building permit ranges from 6 days to 684 days.

Efficiency

Operating and capital cost per building permit. This measure combines reported operating costs and capital costs for all building permission and enforcement services and divides the total by the number of building permits issues and inspected.

Points to consider

It was challenging to justify some of the outliers for the cost of a building permit. Some cities show such a cost at less than US$500 while other cities suggested costs at US$5,000 or more. For the eight cities that did report costs, the adjusted mean works out to approximately US$1,700/permit.

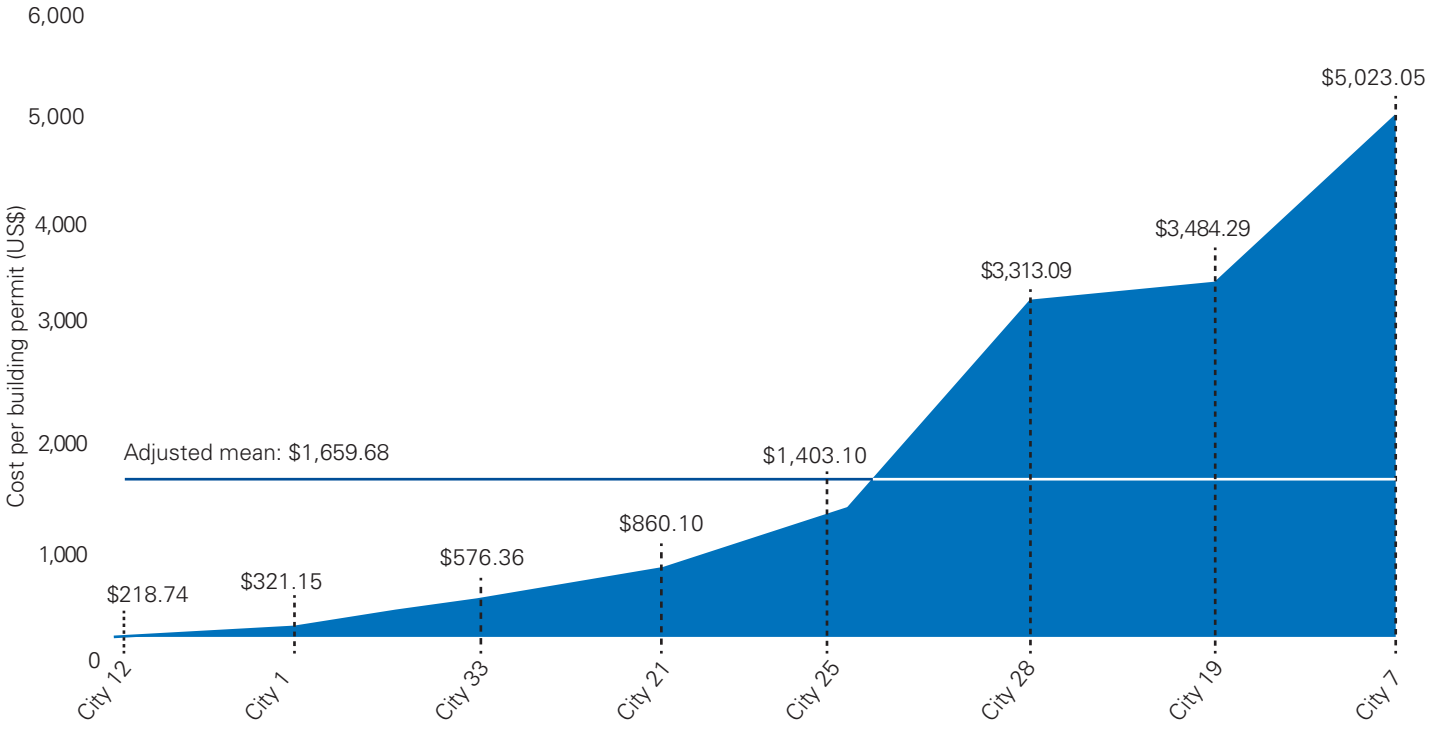
Cities will be quick to point out that the cost of issuing a permit for a single family dwelling bears no comparison to the cost of issuing a permit for a shopping mall or 50 story office building. Further refinement of costs would focus on distinguishing between the cost of different types of permits while not necessarily getting mired in too much detail.

Factors influencing the cost of building permits might include the complexity of the regulations governing the construction of buildings and how these may differ substantially between countries. Additional factors may be influenced by the age and density of the city, the degree of involvement of various departments in the approval process, and whether the city uses technology solutions, such as electronic submission of building permits as a means of speeding up the work flow.

In the Economic Cities Authority in Saudi Arabia (not a participant in this study), they were striving for issuing building permits within 60 minutes or 1 hour. Clearly such a fast turnaround time means that the effort on the part of staff to review such plans is reduced to an absolute minimum, or in the case of the Economic Cities, outsourced to qualified private sector plan examiners. These innovations are being considered and in some respects being used as economic development incentives to attract businesses to these new, greenfield cities.

The example from Saudi Arabia points to cost saving measures based on revolutionary thinking. While not every city will adopt such innovation, the example points to ideas that break the barrier of traditional thinking and seriously challenge laborious work flow approval processes.

Figure 8: Operating and capital cost per building permit (US$)



Adjusted mean = Average of indicators excluding lowest and highest values

Effectiveness

Average length of time to issue a building permit: This indicator captures the average length of time to issue a permit from the time an application was received.

Points to consider

When KPMG professionals' look at the length of time to issue a permit we note that on average it takes 50 days based on 12 observations. One city takes almost two years (684 days) to issue their building permits. This city might seek out innovations to reduce the average time to issue such permits, but it may also be mired in traditional bureaucratic processes that will require substantial changes to the culture in which this service operates.

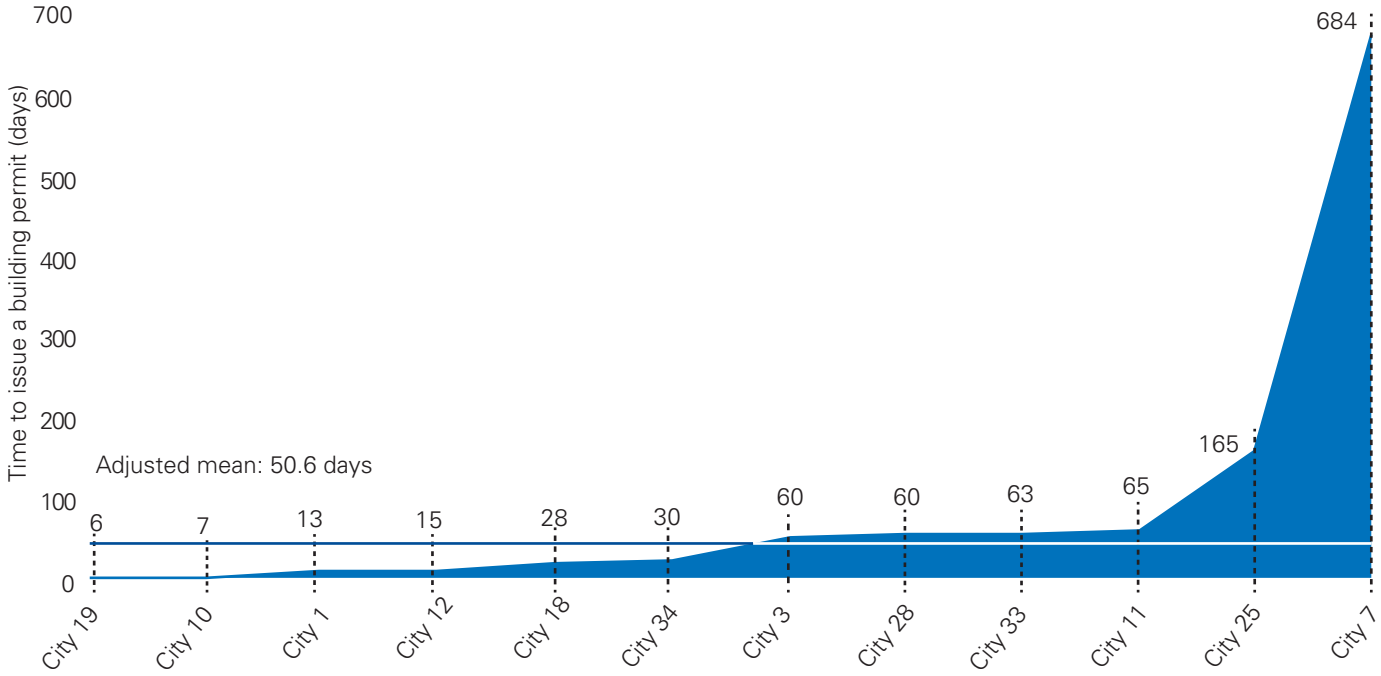
Many cities operate this service where permits are typically issued within 2–3 months. These same cities will point out that the length of time is frequently predicated on the cooperation of the contractor/developer in supplying the necessary supporting material in a timely fashion. Some cities actually monitor the percent of applications that are processed upon the initial application versus second and third submissions, and are working to increase this percentage by publishing more information about what might be expected of the application based on the type of building subject for approval.

The complexity of building permit applications and the regulations controlling new construction continue to be a source of concern and certainly an important factor in benchmarking. For example, a high rise building that has multiple uses — retail, office, residential and institutional — brings multiple construction code considerations to the table and in so doing this can involve different structural examiners prior to the final approval being awarded. Seeking out ways to speed up the process while not compromising the integrity of the review process is becoming increasingly important and more challenging.

Depending on the age of buildings within the city, there may be historical building considerations that will delay the permit approval process so as to ensure that the building's architectural and aesthetic qualities are preserved.

More and more cities are now accepting digital submission of building permit applications. This can allow for quicker distribution to all required departments and agencies to receive and comment on the application leading to faster processing times.

Figure 9: Time to issue a building permit (days)



Adjusted mean = Average of indicators excluding lowest and highest values

Persistent problems

- Managing rapid urban development and the associated increase in demand
- Improving inter-sectoral and inter-agency coordination
- Implementing new IT and back office systems
- Reducing overall permit processing times
- Increasing the number of permits approved upon initial application
- Enhancing customer experience
- Encouraging economic growth and development

Common cost factors

- Type of permit being issued
- The level of complexity of the project
- The complexity of the permit process and application
- The level of digitization

Innovative ideas

- In **Brisbane**, the Suburban Construction Management Team has used the new Planning Act and Environment Protection Act to adopt a stronger compliance focus, including training to facilitate the implementation of Prescribed Infringement Notices.
- Authorities in **São Paulo** have implemented a new Electronic Licensing System (SLCe) that should allow projects to be approved in less than five working days by unifying documents within a single permit.
- Over the coming year, the City of **Philadelphia** will introduce a new customer queuing system (that will enable customers

to schedule appointments) and a new IT system that should allow customers to submit and pay for permits online.
— Having split their applications into sub-categories, authorities in **Cape Town** are now introducing electronic submissions and registering users as business partners with the city.

Transformative trends

— *Reducing complexity:* A number of cities are currently exploring how they might reduce the overall complexity and burden of permit applications by streamlining processes and integrating applications.
— *Leveraging technology:* New IT systems and mobile platforms are helping building permit authorities improve effectiveness and enhance customer satisfaction.
— *Managing resources:* Rising demand for permits and — in some cities — citizen complaints have forced authorities to rethink the way their resources are deployed and supported.
— *Aligning revenues:* Cities are starting to take a more sophisticated approach to setting fees that reflect the complexity of the project, the resources required and the responsiveness of the contractors.
— *Improving approval rates:* Some cities are monitoring the number of applications that are approved after their first submission to identify further opportunities for improvement.

What else did we measure?

For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:

— Revenue collected for building permits
— Capital cost of building permits.

Q&A with Alan Mitchell, Executive Director, Cities Global Center of Excellence, KPMG International

Alan leads KPMG's Cities Global Center of Excellence where he is responsible for developing leading strategies to support KPMG member firms around the world. Alan is recognized globally for his work developing program/service models for cities and local authorities.

Q: With so much now on the city agenda, why should city leaders be focused on improving the efficiency and effectiveness of building permit and enforcement services?

A: The reality is that building permits generate lots of economic value for a city. And city leaders recognize they can help increase the pace of development by reducing some of the regulatory hurdles that an applicant must clear in order to turn their ideas into reality. A more efficient and effective building permit service means that economic value can be achieved much faster without compromising the safety of citizens.

Q: In your experience, why might the cost to issue a building permit vary between cities?

A: It is quite possible that the specific types of permits a city processes will directly affect the cost per permit. One might expect large cities with complex development applications for multi-story buildings to report higher costs per permit than those that process mostly permits for a single-family home, or a deck on the back of a home.

Q: Is there value in benchmarking building permit services against other cities?

A: Absolutely. But first you need a really clear understanding of the costs and inputs that underpin the different types of building permits that the city issues. You can't do this at an aggregate service level. City leaders also know that benchmarking is about more than just comparing data. It's also about uncovering new ideas, models and opportunities that can be adapted to their own situations.

Q: What are leading cities doing to improve the efficiency and effectiveness of this service?

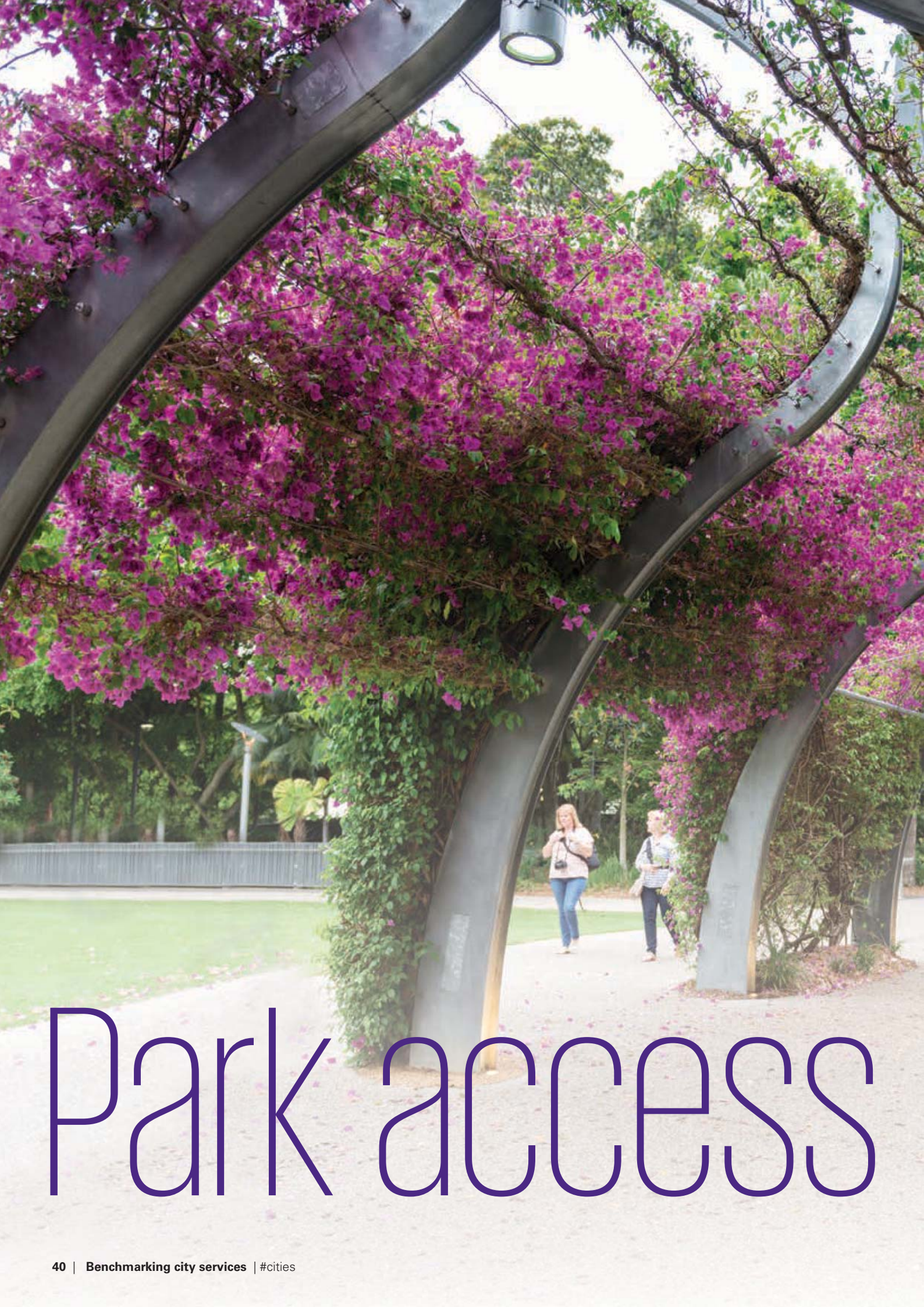
A: We've seen a lot of cities achieve incremental improvements by investing into productivity tools and workflow management solutions. And many cities are starting to really focus on monitoring, measuring and improving a wider set of key performance indicators than before. But the more radical improvements are coming from those cities willing to fundamentally rethink the status quo to create new models.

Q: What are some of the new models you are seeing emerge?

A: Some cities, particularly in the emerging markets, are questioning the fundamental roles and accountabilities of the building permit process. They are empowering the private sector to conduct certified inspections, pushing accountability to engineers and architects and creating new IT systems that allow permits to be processed in less than an hour. They are not only getting faster processing times and reduced costs, they are also shifting the accountability for structural integrity of buildings back to the developers and contractors.

Q: Is regulatory reform necessary for success?

A: Not always. But many of the cities we've worked with maintain incredibly complex approval processes — some permits require more than 100 approvals, depending on the nature of the building. Regulatory reform is one approach to reducing the burden for clients. Cities may also want to consider implementing a 'first in' system where the receiving authority assumes responsibility for coordinating data across the other agencies in the process. It's really all about rethinking the processes and finding ways to reduce the friction for clients. ■



Park access

Access to a park encourages healthy living and builds stronger communities. Yet few cities have a clear understanding of how many people actually use their parks. Few cities doubt the tremendous value that their parks provide, but unfortunately they find difficulties in sustaining their park budgets with only a partial picture of how parks are performing. It's time to take a closer look at our parks.

Defining the service

Park access services include the design, construction, maintenance, repair and operation of parks. These may include active parks and parkettes, sports fields and public open spaces such as ravine lands, urban forests and scrubland. Recreational facilities within parks may or may not be included.

Topline findings

- On average, cities spend US$12,730 per hectare of parkland.
- Spend on parks ranged from US$3,200 per hectare to US$54,900 per hectare.
- Most cities report at least 90 percent of population living within proximity to a park.

Efficiency

Operating and capital cost per hectare of park. This measure combines the total operating costs with the total capital costs and divides the total amount by the number of reported hectares of park within the city.

Points to consider

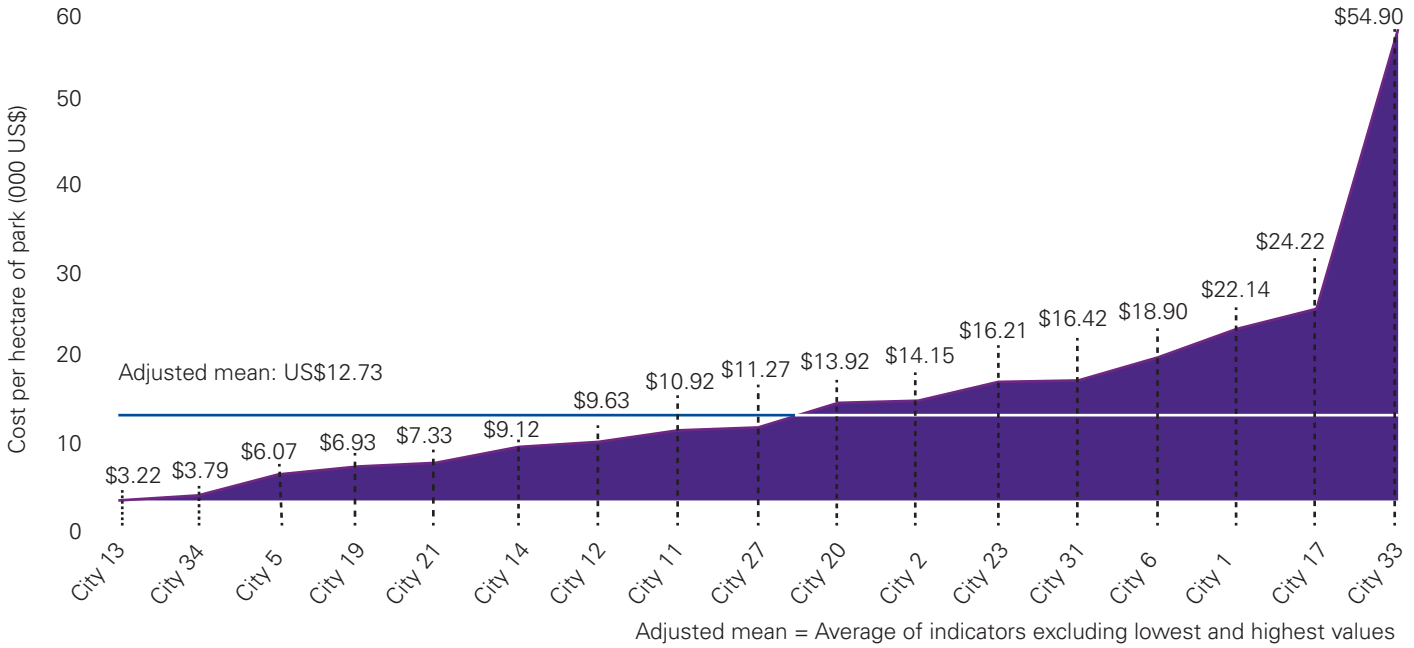
The high cost of US$55,000 per hectare does not appear to be an aberration but clearly this city spends considerably more on operating and capital costs than any other city — are parks more precious in this city?

Is US$3,200 per hectare far too low, or has this city actually sought out revolutionary cost saving measures to reduce operating and capital costs?

Is US$13,000 per hectare on average enough or should it be higher to cover off park infrastructure that may be in severe need of replacement or refurbishment?

Differences in park costs can be attributed to different types of parks that comprise a city's portfolio. If a city has a higher than average number of parks as unmaintained woodlots, ravines or bush lands, then their costs would be lower than a city with high-maintenance sports fields in their portfolio.

Figure 10: Operating and capital cost per hectare of park (000 US$)



Adjusted mean = Average of indicators excluding lowest and highest values

Effectiveness

Percent of residents within walking distance of parks. This measure indicates the accessibility of parks as a percentage of the total city population that lives within 800 meters (approximately a 10-minute walk) of a park.

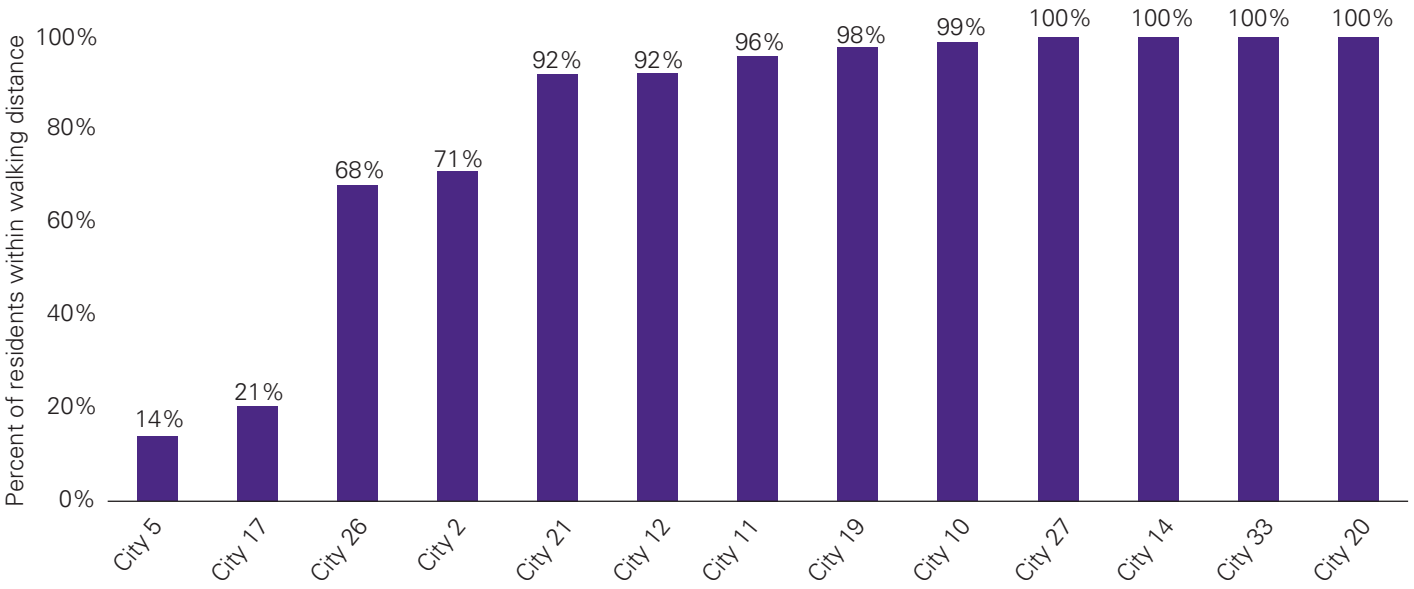
Points to consider

Regarding the percent of parks within walking distance of residents, ideally every city would be at 100 percent. Of the 13 cities that responded, more than half of the cities have achieved this goal.

Two cities fall below this target by a substantial margin at 14 percent and 21 percent respectively. Where a city is within close proximity to inland national parks that are not part of the city's service offerings, this would also increase the accessibility to parks within reasonable walking distance. This type of scenario would not be reflected in this study's data.

While the relative location of parks to residents is an important statistic, ideally cities would like a better idea of how many of these residents actually used the parks. KPMG attempted to capture the number of park users per annum but few cities could report this statistic. With the advent of new technology, some cities are exploring how they can capture such information either through mobile technology or "trip counters" located at strategic locations throughout the park.

Figure 11: Percent of residents within walking distance of parks



Persistent problems

— Changing demographics and park usage requirements
— Improving the effectiveness and attractiveness of park features
— Securing experienced park design and development services
— Increasing demand for connectivity and information and communication technology (ICT) infrastructure within parks
— Creating shared funding mechanisms between different levels of government

Common cost factors

— Type of parkland provided
— Sophistication and class of assets
— Maintenance requirements (grass cutting, horticultural care), etc.
— Energy and input costs (fertilizer, etc.)
— Climate and topography

Innovative ideas

— Wi-Fi and internet nodes have been installed in city parks in many cities including **Adelaide** and **Moscow** in order to encourage increased usage, particularly by millennials.
— Parks staff working for the **Sunshine Coast** authorities are enabled with mobile technologies that allow them to report and receive work orders while roaming on park sites.
— In **Moscow**, parks authorities are testing a variety of new park uses including providing places for psychological rest (such as paths created especially for barefoot walking), ethnographic discovery (a place for cultural dialogue) and 'extreme' amusement parks.
— In an effort to broaden access to parks in **CapeTown**, authorities have developed a 'Smart Parks' program that takes a principles-driven, community-centered and sustainable approach to the development of parks facilities.
— The city of **Kazan** has increased total park space by 50 percent over the past four years through the parks and public gardens project that saw the development of more than 50 new parks 'from scratch'.

Transformative trends

— *Rising expectations:* As residential density increases and citizens become more focused on health and environmental concerns, expectations for parks facility quality, access and service levels are rising.
— *Encouraging biodiversity:* By introducing native plants, meadows and un-maintained green space, cities are improving the diversity of park features, reducing costs and enhancing environmental sustainability.
— *Improving standards:* From asset quality standards through to environmental and maintenance standards, many cities are now focused on creating a more consistent quality of service across park assets.
— *Seeking new revenues:* Some cities are working to introduce and modernize retail facilities within parks as potential new sources of revenue.

What else did we measure?

For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:

— Park usage
— Revenue collected for parks.

Combined efficiency and effectiveness analysis

Points to consider

A new performance perspective on parks combines both one efficiency and one effectiveness indicator. In this example, the cost per hectare of park (efficiency) is combined with the percent of parks within walking distance (effectiveness). Twelve cities provided sufficient information to generate this fascinating picture of parks.

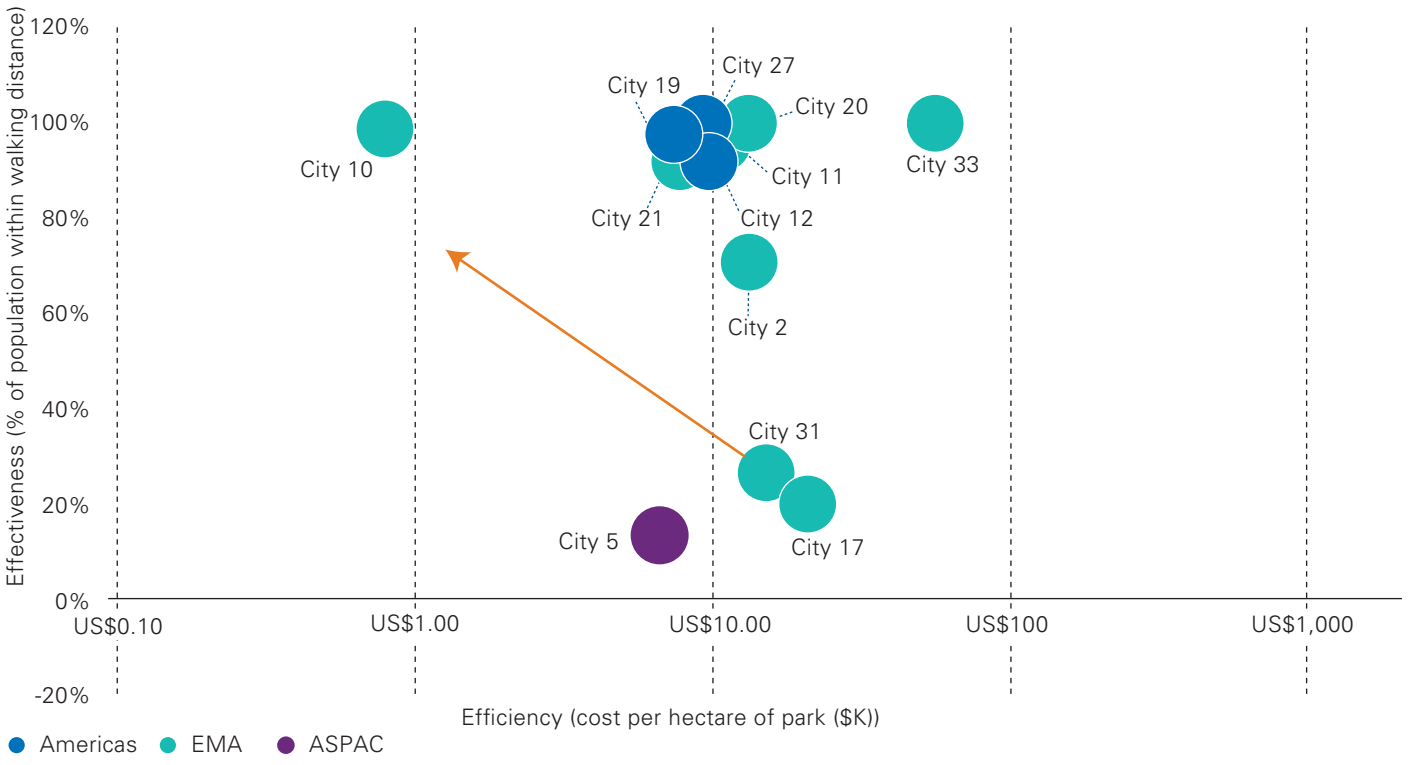
It is significant to note that there appears to be a cluster of cities that provide 100 percent (or nearly 100 percent) of their parks within walking distance at a price point of US$8,000–US$14,000 per hectare of park. City 10 boasts 100 percent coverage at less than US$1,000 per hectare but this requires closer scrutiny. If it stands the test of further analysis then City 10 can provide lessons to other cities about how to become more efficient.

City 33 may wish to focus on reducing costs while maintaining its "walk to park" appeal. Meanwhile, City 17 may be spending the right amount of money but access to parks appears to be an issue and there is room for improvement.

As previously mentioned, the context in which a city operates its own parks relative to other natural features (i.e. beaches, national parks) can directly influence costs and ease of access to parks. Sometimes this context is forgotten in the benchmarking comparisons and lends itself to incorrect conclusions about efficiency and effectiveness.

As the number of cities involved in such benchmarking studies expands, we believe that greater insights will be forthcoming.

Figure 12: Park access — combined efficiency and effectiveness



Q&A with Daniel Boulens, General Manager of Public Parks and Gardens, Lyon

Daniel is the General Manager of the Open and Green Spaces Department at the City of Lyon. He has served as Vice President of the French Association of Directors of Parks and Gardens and has won numerous awards for his work improving the parks of Lyon.

Q: In your opinion, why might costs for city parks access vary within a single city?

A: There are many factors that could result in different costs for parks within a city. For example, the size and location of the park can have a massive impact on costs. Smaller spaces are generally more expensive to upkeep, as are those in more densely populated areas where usage may be high. The composition of the park is also important. Natural spaces are often cheaper to develop but cleaning costs can be higher depending on the terrain.

Q: Do higher costs translate into higher quality parks?

A: The level of quality is certainly very important as it has a direct impact on the quality of life, wellbeing and attractiveness of a city. In Lyon, we plant a lot of flowers in strategic locations. The costs of flowers may be higher than lawns or perennials, but the results in terms of quality are also quite different. But I think a lot depends on what is included in the cost accounting. We hold a lot of events in our parks — free of charge — and that is included in our overall costs.

Q: Is demand for parks changing?

A: We are certainly seeing a rise in demand for parks in Lyon, particularly parkettes or proximity parks with trees, playgrounds, benches and fountains. Residents and city leaders recognize that green spaces can act as very social environments within a city which, in turn, improves livability and quality of life. An attractive city is good for business, for industry, for culture, for leisure and for tourism. So demand is constantly rising.

Q: What are the challenges with meeting this rising demand?

A: Like most other cities, we face significant cost and budget pressures. And the problem is that, while parks contribute to the wealth of a city, they do not tend to generate direct revenues for the parks. So while we are under pressure to improve parks access and quality, our budgets are not going up. That means we need to find alternative techniques for maximizing our existing budget.

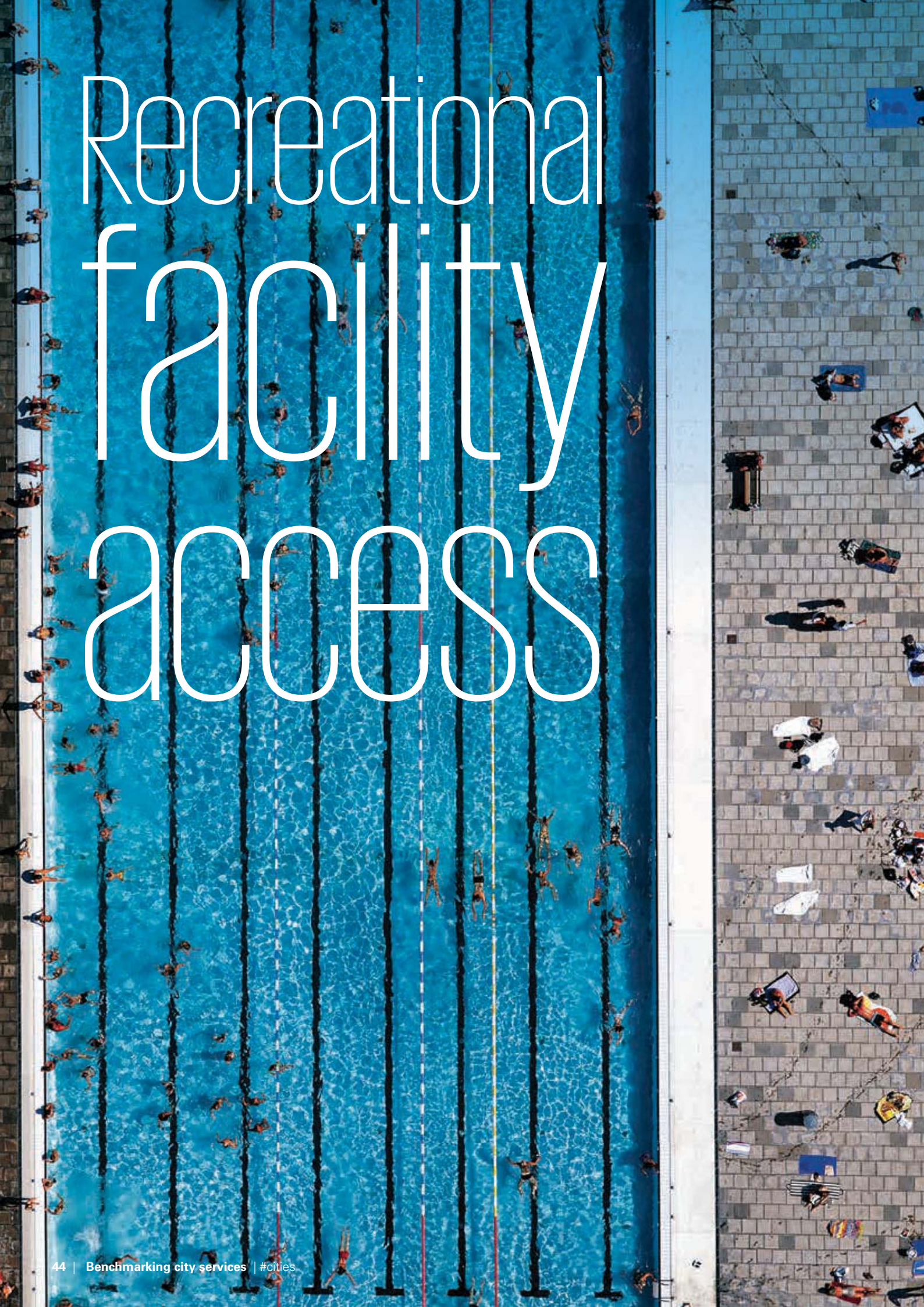
Q: What are you doing to help improve park efficiency and effectiveness?

A: We put a lot of effort into measuring and improving our efficiency. We have spent time really understanding the different types and compositions of our parks in order to improve our maintenance and have more informed discussions with politicians and residents. We focus on reducing our impact on the environment through reduced energy use, water use and maintenance. And we put significant effort into improving access to parks by promoting them in the community and by organizing educational and environmental programs.

Q: What advice would you offer policy makers and park leaders?

A: I think policy makers need to focus on having smart discussions with the population about costs, maintenance, value and benefits of city parks. We need to encourage the public to become more involved in the maintenance and management of our parks. Parks managers need to support this effort by talking about parks in accessible and understandable language that promotes efficiency and drives value. Most importantly, they need to count everything. If you don't count, you don't count. ■

Recreational facility access



Recreational and sports facilities add to a city's quality of life. They encourage socialization, healthy living and civic participation. They celebrate culture, bring people together and build community cohesion. But — as demographics shift and assets age — many municipalities seem to be struggling to forecast and then deliver against current and future demand.

Defining the service

Recreational facility access refers to city-owned recreational facilities such as buildings, swimming pools, community centers, sports fields and arenas. For this report, we made a distinction between recreational facility access and recreational programming.

Topline findings

— The average city spends around US$114 per revenue hour but only collects US$15 in revenue from fees.
— Labor and utility costs account for the greatest variances.

Efficiency

Cost of recreational facilities per hour. This measure reflects the cost per hour of recreational facility per program hour of operation. This cost is equal to the operating and capital cost of designing, building, operating and maintaining recreational facilities divided by the hours of program usage of the recreational facility. Recreational facility per program usage is the number of hours of operation of the facility and programs.

Points to consider

Cost of recreational facilities per hour

Of nine cities reporting costs, one city reported costs of less than US$1 while another reported costs in excess of US$270 per hour of recreational facility usage. Further examination of both city submissions did not reveal any evidence of incorrect reporting. However, dropping these two outliers results in an adjusted mean of US$114 per hour of recreational facility usage.

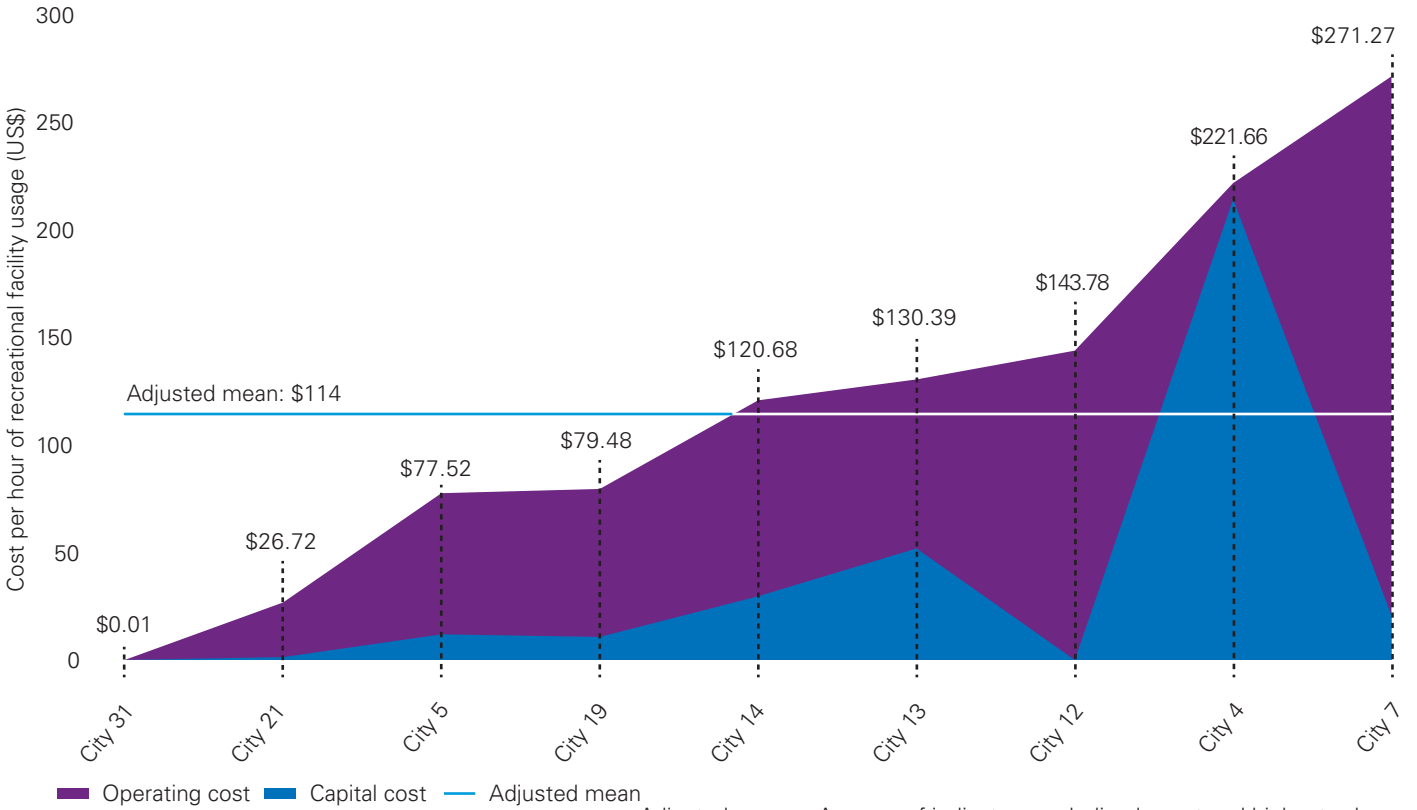
When operating and capital costs are separated, one city reported extremely low operating costs versus its capital expenditures raising questions about whether the costs they reported may be in error. Setting aside observations out of the norm, cities report between 5–40 percent capital of total costs. Costs for any given year may be influenced by a significant capital expenditure. Ideally a five-year average would normalize such fluctuations.

Different cities provide different features in their recreational facilities. For example, some cities might provide swimming pools, gymnasiums, ballparks, ice rinks, etc. while others might provide fewer features. Different facilities have different costs and the proportion of more expensive facilities will obviously tilt them towards the higher cost side of the graph.

Despite efforts to separate the costs of recreational facility access from recreational programming, many cities have clearly combined the two in their cost submissions. This may be a result of the challenge they have in separating the costs.

Can cities maintain, on average, their recreational facilities at US$110–US$115 per hour of recreational facility usage? If so then are they charging revenue to offset this hourly charge sufficient to cover these costs? The answer is that many cities do not, particularly given the fact that they provide these facilities to level the playing field for those participants who can ill afford to pay for privately operated facilities.

Figure 13: Operating and capital cost per hour of recreational facility usage (US$)



Adjusted mean = Average of indicators excluding lowest and highest values

Points to consider

Cost of recreational facilities per program participant

Eight cities reported the cost per program participant — a slightly different perspective on efficiency from the cost per hour of recreational facility usage. Costs range from a low of US$2 to a high of US$280. On average the cost per participant was US$61. The intention behind this indicator was to illustrate the true cost of servicing program participants regardless of the fee that may be charged to recuperate costs.

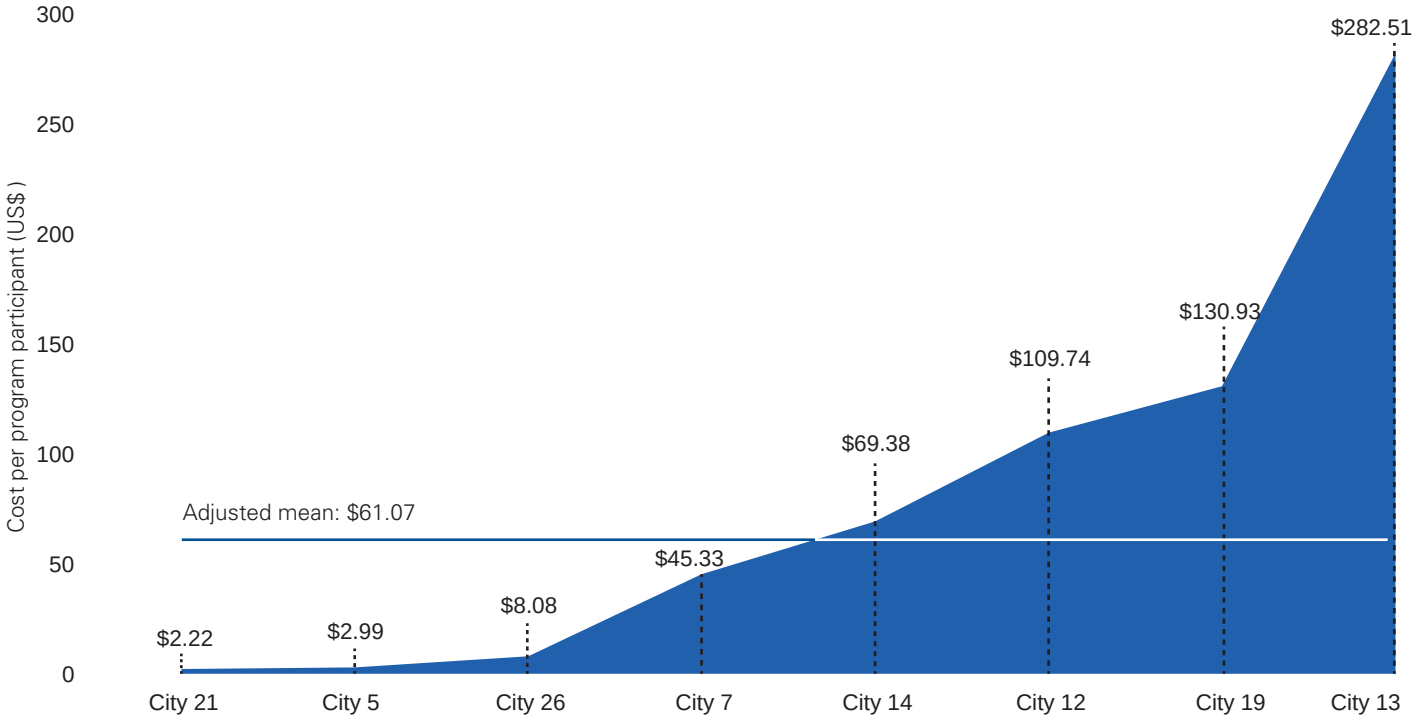
This indicator does not refer to the city providing the programs but rather to other organizations, such as football, hockey, baseball and cricket clubs, running the programs within a city facility. A key component in the formula for this indicator is the number of participants. These participants would be the registrants in the clubs' programs and not all cities capture this information.

In future, capturing both the participants and the attendees will help to clarify this distinction. However, if the number of participants actually reflects attendees and not participants, then the implication would be a much lower cost as reflected in some of the calculations.

Variations in cost may be explained by a city that included a large capital cost in their reporting year which would have translated into an overall higher cost per participant.

As costs to run facilities begin to mount year over year, the challenge for recreation departments is to balance the challenge of recovering as much of the costs as possible through fees while not restricting participation in recreational activities which is a key outcome of the recreation program.

Figure 14: Operating and capital cost per program participant (US$)



Adjusted mean = Average of indicators excluding lowest and highest values

Effectiveness

We would have liked to capture data around effectiveness, specifically on revenue generated per hour of usage. Many cities either did not monitor this data or did not have it readily available at this time.

Cost per program participant. This measure calculates the operating and the capital cost (less revenue) for the recreational facility service, divided by the number of recreational participants.

Persistent problems

— Limited capital budgets
— Natural resource (particularly water) scarcity
— Low public awareness
— Inconsistent access to facilities
— Aging infrastructure and equipment
— Legacy back office technologies
— Facility renovation and revitalization

Common cost factors

— Labor costs and benefits
— Type of facilities and sophistication of assets
— Degree of asset depreciation and associated capital costs
— Equipment and supply costs
— Asset renovation and rejuvenation requirements
— Service level requirements or volume

Innovative ideas

— To ease the strain on existing sports facilities, **Mornington Peninsula** created a partnership with local schools where access to grounds is provided in exchange for maintenance and capital works.
— **Moscow's** digital Leisure and Recreation services portal allows citizens to sign up for clubs, register for events, provide feedback and vote for the creation of new clubs and services.

— Recognizing growing water constraints, **CapeTown's** recreational facility leaders have installed water-efficient 'spray parks' and synthetic sports fields across the city.
— **Sunshine Coast Council**, where pools represent a key service, has operations delivered by outsourced service providers, and tenure renewals are aligned to management models.
— **Mississauga** is creating operational innovation through its IT Roadmap that, amongst other benefits, better connects residents with recreational programs and services.

Transformative trends

— *Cost recovery:* Many municipalities are starting to move towards a greater focus on cost recovery to support ongoing renewal, maintenance and revitalization of assets and programs.
— *Demographic shifts:* Greater female participation in sports, shifting demographic demands and aging populations are forcing municipalities to rethink their portfolio of assets and services.
— *Private participation:* Municipalities are increasingly looking for ways to improve efficiency and service levels by working with private operators and contractors.
— *Connected populations:* Cities are finding new ways to connect with their citizens to encourage active lifestyles and improve participation in recreational and sports programs.
— *Asset management:* Particularly in more mature cities, greater focus is being placed on updating and revitalizing aging assets and facilities to respond to new demands and improve costs.

What else did we measure?

— For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:
  — Percent of recreational facility usage (hours) of total operating time (hours)
  — Percent of recreational participants of total population
  — Percent of city's population served by recreational facilities per programs within one km of residence of total population.

Q&A with Bernie Asbell, Vice President of Sport Operations, WinSport Canada

Bernie is one of the world's leading recreational facility experts with deep experience advising municipalities and operators on facility development and operations WinSport Canada.

Q: Why are leading cities focused on providing good recreational facilities?
A: Cities recognize that recreational facilities are a great way to get people participating in their communities and to encourage healthier lifestyles. They add to the vibrancy, the diversity and the strength of the community. I think that municipal leaders increasingly view recreational facilities as an essential component to encouraging community development and pride.

Q: What can cities do to improve their recreational facility efficiency and effectiveness?
A: One of the first things you should do is find out what others are doing. There is always something to learn and something that can be adapted. So benchmarking exercises — like this one — are very important. But, at the same time, cities still need to be true to the culture and expectations of their citizens. It's about finding new ideas, not complete solutions.

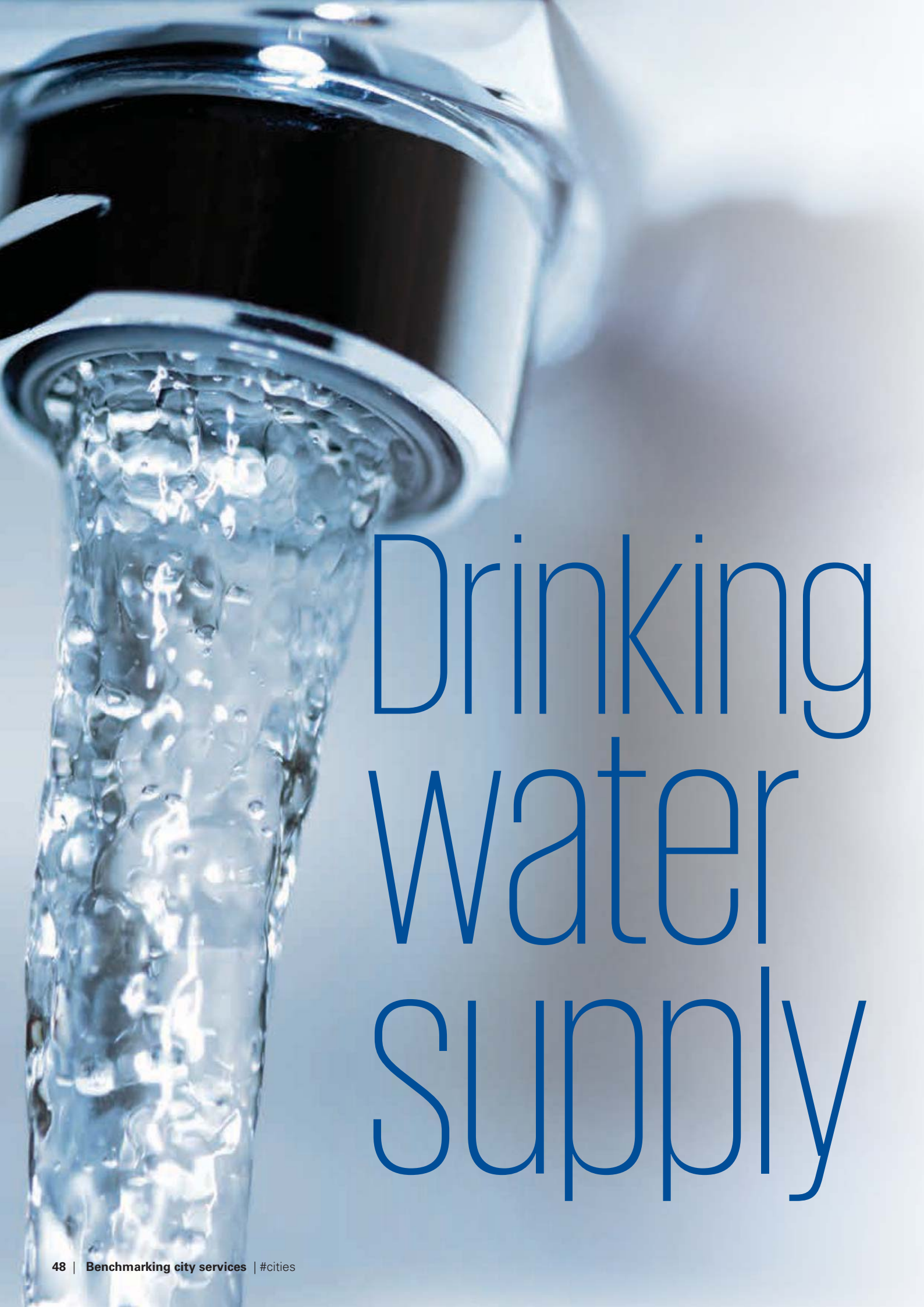
Q: Should municipalities be focused on revenue generation or social benefits?
A: A lot of municipalities are starting to realize that they can generate some revenues and then put that back into revitalizing and modernizing their facilities. But there also needs to be a balance. It's okay to make a profit from recreational facilities, as long as the community and social benefits are protected, ideally with a proper legal contract that defines services, delivery models and commitments.

Q: Does that mean private operators?
A: Not necessarily. I do think that municipalities are starting to recognize the value that can be added by involving private sector operators — private operators can often be more efficient and are usually more entrepreneurial in the way they deliver services. But that is generally easier to implement in more sophisticated facilities that are already generating some revenue — arenas and aquatic centers, for example.

Q: How can municipalities adjust to changes in demand and demographics?
A: Many cities are starting to recognize that recreational services and infrastructure can be a catalyst to renewal. And so there is a desire to continuously update and modernize recreational facilities to keep current with shifts in demand. But I don't think there is a single roadmap to renewal. Each community needs to assess what would be best for them and what is going to add value today and in the future. And that needs to be based on proper studies and research.

Q: What role does technology play in that equation?
A: Technology is extremely important. Whether it is speeding up processes or making activities more accessible, I think cities recognize that technology is a critical enabler to improved use, efficiency and effectiveness. Going forward, I suspect the ability to manage a facility by touch will become increasingly important, allowing operators to gain better control over their facilities and costs. Whether it's facility management, customer engagement or process improvements, technology is key.

Q:What advice would you offer municipal leaders?
A: I think the key is to remain relevant and to always be future-forecasting so that you can deliver services that work for the city you live in today and want to live in tomorrow, rather than the city you knew in the past. That's the tricky part. ■



Drinking water supply

Access to safe drinking water may be a recognized human right, but that doesn't make it easy or cost efficient to deliver. It is a capital intensive sector with many parts of the world finding it costly to get water from the source to end users. At the same time, quality standards and expectations are rising. Urbanization and development are creating new demand. And, all the while, assets are aging. The need for efficiency has never been stronger.

Defining the service

Drinking water supply services encompass the design, construction, maintenance, repair and operation of water treatment and water distribution systems, regardless of the source — lake, river, well or salt water. This may also include customer billing, internal support services and management costs.

Topline findings

- A cubic meter of water costs the average city US$1.14 to treat and deliver.
- Cities report spending anywhere from US$0.08 to US$5.97 per cubic meter of water.
- The average city loses between 10 to 13 percent of water to leakage and other non-revenue sources.

Efficiency

Operating and capital cost per cubic meter of water supplied. This measure combines the total drinking water supply operating costs with the total capital costs and divides the sum by the number of reported cubic meters of water supplied.

Points to consider

Most cities spend the bulk of their operating budgets on the energy required for transmission and distribution, which is directly influenced by the size, density and topography of the service area.

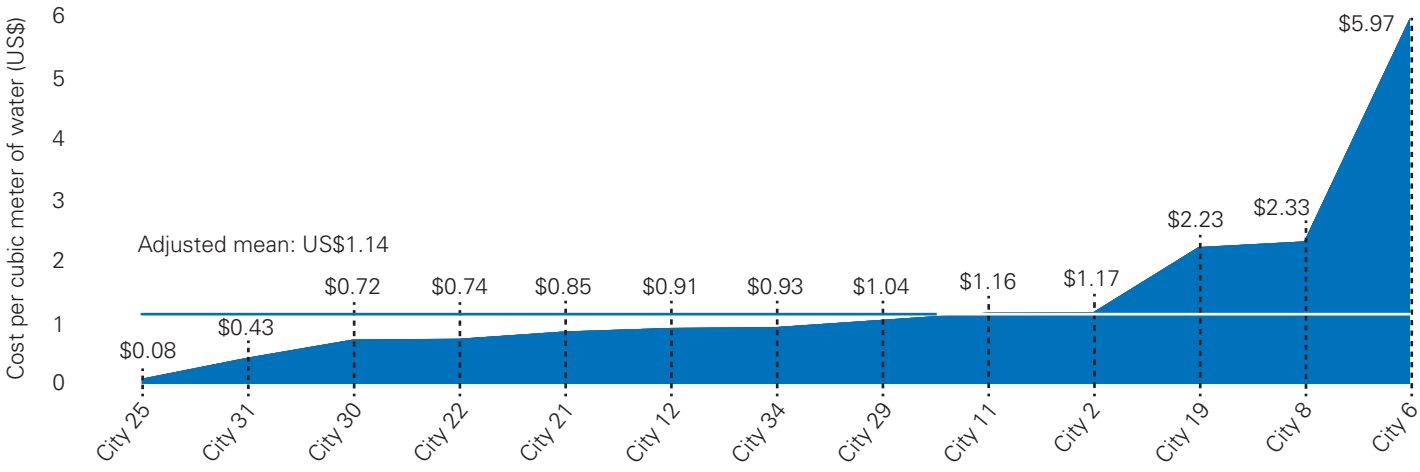
With a range of US$0.08–$5.97 per cubic meter to supply water, such a range begs further clarification. When we review this range with the adjusted mean of US$1.14 we might speculate that the high cost could have been influenced by a city that spent a considerable amount upgrading their water treatment plant or their distribution infrastructure. On the low side, it is difficult to imagine a city that only spends $0.08 per cubic meter, particularly when this includes operating and capital expenditures.

One of the factors that clearly contributes to the cost of water supply is the source of water. There are various sources that cities use including lake based, river based, ocean/sea based and well/aquifer based supply. Each of these different sources requires different treatment techniques where ocean/sea based water supply requires desalination plants that are extremely expensive to operate. Clearly subsequent studies should consider the source of water supply as an important consideration in cost.

An additional factor that can influence cost might include the terrain of a city. A city with an undulating landscape will have to pump water over the hills to its customers. Given that energy costs are the single most expensive ingredient to water supply, then a city that has to pump water over its uphill terrain will experience higher costs.

Drinking water meets one of our basic physiological needs. Fortunately today the cost and price of drinking water are still reasonable but the future demand for water may change this equation — something that cities need to watch closely.

Figure 15: Operating and capital cost per cubic meter of water supplied (US$)



Adjusted mean = Average of indicators excluding lowest and highest values

Effectiveness

Water leakage as a percent of water supplied. This measure calculates the difference between the amount of drinking water treated and the amount supplied to identify how much water is being lost during transmission.

Points to consider

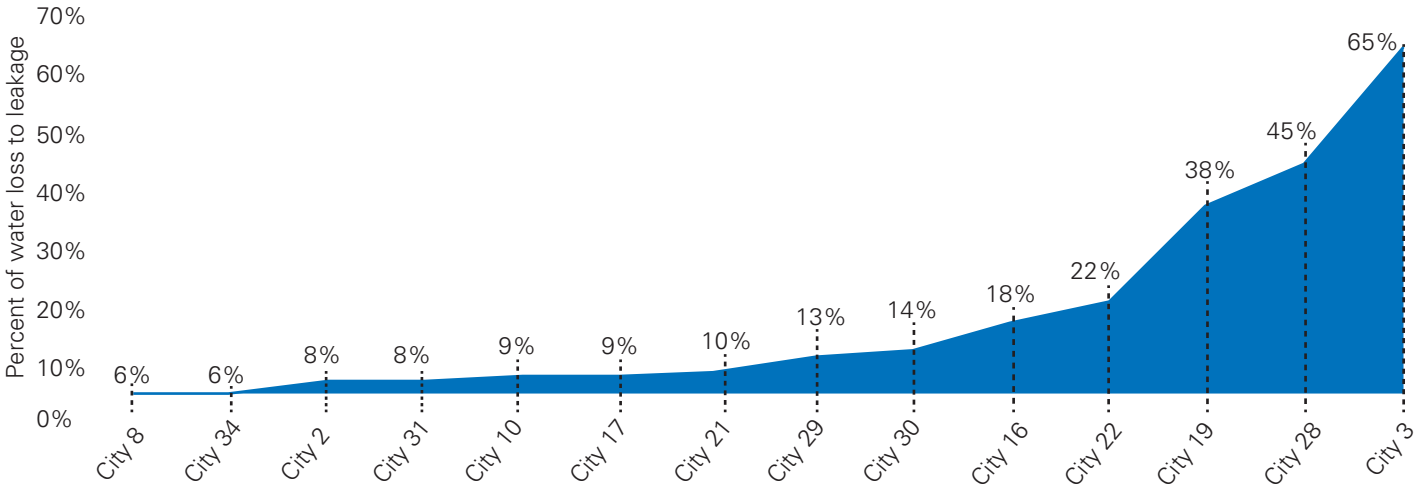
One of the more profound discoveries occurred when we collected the percent of water loss through leakage. While the majority of cities lose less that 15 percent of their water, one city loses 65 percent of its water through either a combination of leakage or theft. Not too far behind this city is another city that loses 45 percent. Finally one northern city loses 38 percent. Clearly the focus of these three cities must be how to stop the leakage/theft.

Reasons for water loss may vary from a simple explanation of not enough investment in aging infrastructure to severe weather causing water main breaks, to the struggling poor population who can't afford to purchase water. In discussions with one Indian city (not a participant in this study) they identified "non-revenue water loss" as a key focus for their attention. As water becomes more and more scarce, water theft will increase. Not providing affordable water supply is definitely not an option.

Tariff prices also influence consumption and behavior (for instance, it is easier to waste water when it is more abundant at low cost).

Sitting back and examining cities with high water loss is easy. For cities facing this challenge, how do they get funding for a service that is invisible because its buried in the ground? This is true for a number of infrastructure services. How do we convince elected officials to make the investment when councilors are more inclined to pay attention to ratepayer complaints than systemic issues in basic services?

Figure 16: Water leakage as a percent of water supplied



Persistent problems

— Managing peak demand
— Maintaining aging pipes and infrastructure
— Meeting treatment standards and environmental regulation
— Reducing leakage and water loss
— Ensuring universal access

Common cost factors

— Source location, type and quality (river, lake or ocean)
— Energy for transmission and distribution
— Maintenance and repairs of underground assets
— Capital investment and renewal requirements
— Topography and rainfall trends

Innovative ideas

— In **Kazan**, authorities have undertaken a major plant reconstruction and implemented new electrolytic sodium hypochlorite production facilities, thereby enabling elimination of liquid chlorine improving overall organoleptic characteristics.
— **Philadelphia's** Water Department has just started a new project to fully replace customer-owned lead service lines that still exist between the main and the property's water meter.
— New automated and connected water meters are being rolled out in cities around the world, including in **Toronto** where authorities are engaged in a program to replace all outdated water meters and install new meters where flat rates had existed before.
— Following a five-year capital investment program co-financed by the EU, the City of **Warsaw** has seen significant improvements in the quality of water and the reliability of the overall system.

Transformative trends

— *Rising standards:* In many regions, regulators and authorities are tightening the base drinking water standards, testing and reporting requirements.
— *Prioritizing replacement:* More established cities are working to replace and upgrade their aging underground infrastructure and assets.
— *Seeking innovation:* Rather than tearing up city streets, many water authorities are exploring new approaches for strengthening and expanding the capability of their current assets.
— *Declining customer complaints:* As water meters become more sophisticated, many water authorities are seeing their rates of meter-related customer complaints fall.
— *Growing policy issue:* In many regions, disagreements over water rights and ownership will lead to growing political tensions and potential security challenges as populations migrate to find more reliable sources of potable water.

What else did we measure?

For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:

— Kilometers of water distribution network
— Cost per km of water distribution network
— Number of boil water advisories
— Percent of properties served by water supply of total properties.

Combined efficiency and effectiveness analysis

Points to consider

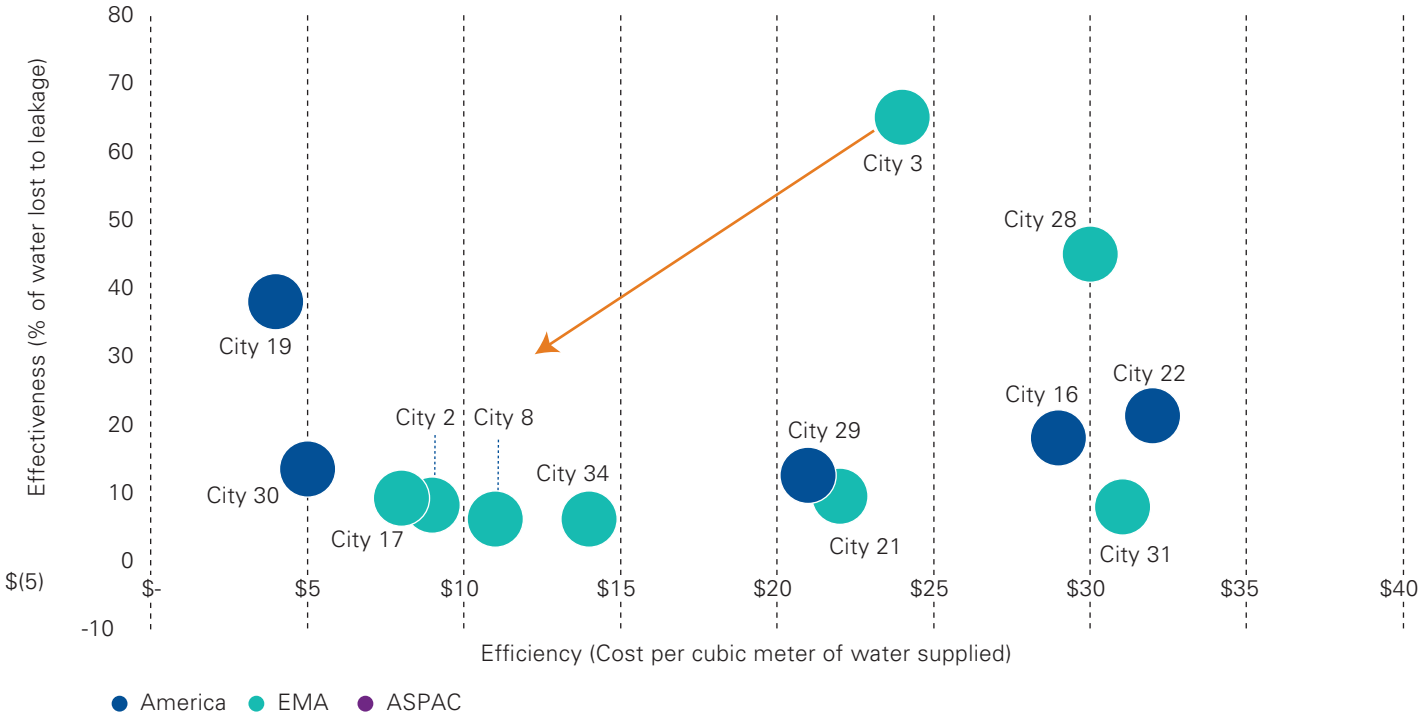
Combining efficiency and effectiveness in one graph provides an altogether new and exciting perspective to performance measures for the drinking water supply service. In this graph, the desired quadrant is the lower left quadrant where water leakage is at a minimum and so are costs. An ideal position is illustrated by Cities 30, 17, 2 and 8.

City 3 is clearly having serious problems with water leakage but not enough money is being spent to address water leakage even though it has a fairly high cost per cubic meter. We expect that its higher costs than most can be attributed to dealing with water loss and the damage this may cause. Leakage may be caused by the city growing faster than the capacity of the transmission and distribution system, by watermain breaks in an aging system and/or by water theft. Regardless of the cause, more capital expenditures are required to reduce leakage. In the longer term this may reduce the cost but not before costs will increase to overcome the water loss failures.

A cluster of cities are found in a sweet spot that can be described as relatively low leakage rates for reasonable cost per cubic meter of water supplied (approximately US$5–15 per cubic meter). They are lower than another cluster that spends US$20–30 per cubic meter, leading us to believe they may not be spending the right amount of money on sustainable lifecycle management.

No city can achieve 0 percent water leakage; it's practically impossible. Achieving next to 0 percent water leakage also comes with a price that few cities are prepared to pay.

Figure 17: Drinking water supply — combined efficiency and effectiveness



Q&A with Bastien Simeon, Global Infrastructure Sector Lead, Water, KPMG International

Bastien — a partner in KPMG's French firm — is a seasoned water specialist with more than 15 years of experience covering potable water production and distribution, desalination plants, wastewater collection, treatment and reuse, and irrigation. He has worked with many of the largest players in the industry — developers, operators and investors — with his main focus on public-private partnerships and merger and acquisition transactions.

Q: Were you surprised by the range of costs cities reported for drinking water?

A: Clearly, there are some outliers that suggest there may be problems in a few cities. Either their costs are severely out of line with the averages, or their measurement and reporting is faulty. Neither are a good sign. The remaining variation is simply a factor of environment: the quality of the source water, the terrain of the city, rainfall levels and so on. I think this shows that there is actually a significant amount of benefit that could be achieved through benchmarking cities in this service area.

Q: What other factors should cities be measuring in order to benchmark their drinking water services?

A: Quality is a big one. Cities with a higher standard of quality will likely spend more on treatment assets and consumables than those with lower standards. I think you also need to look at the service level that is being delivered, possibly by measuring supply shortages or outages. Data on rates of urbanization and population density can also provide very important insights when comparing cities and service levels.

Q: How has technology helped improve overall network efficiency and effectiveness?

A: By now, most large cities have implemented fairly sophisticated supervisory control and data acquisition (SCADA) solutions that have allowed them to automate many of their processes and remotely monitor their assets. And they've seen great benefits from that, particularly in the cost of labor. But I think we are rapidly moving towards a '2.0' control environment that will combine IoT (Internet of Things), sensor technologies and algorithms to achieve a whole new level of automation and efficiency. And I suspect that newer and greenfield cities will have a real opportunity to leapfrog their more established peers when it comes to the efficiency and effectiveness of their drinking water service.

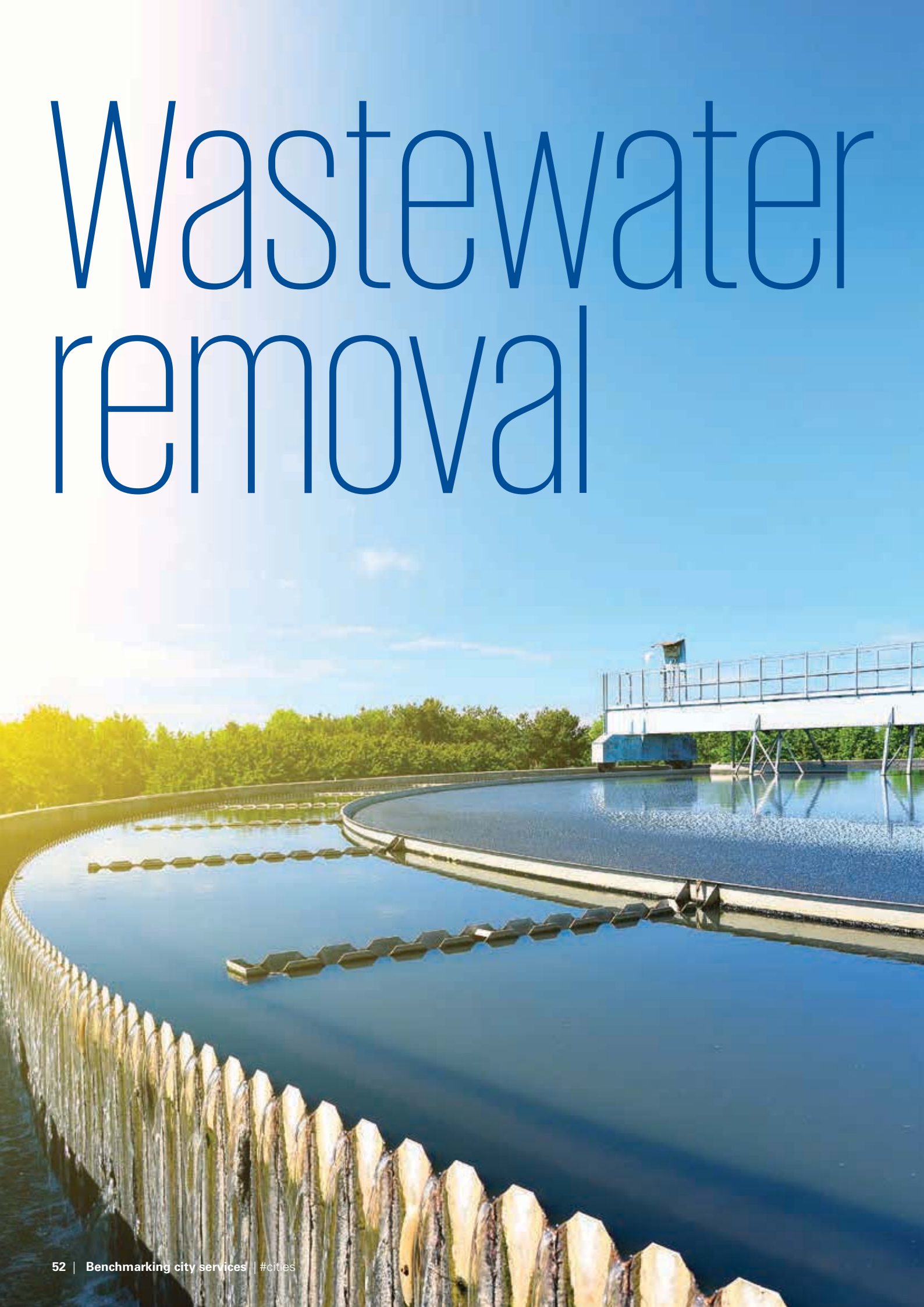
Q: Some water leakage is inevitable in a large city system, but why might some cities report significantly higher rates than others?

A: A lot of the leakage comes down to problems with the existing infrastructure and assets. In some cases, it's simply a matter of age. But in other cities, growth rates have outstripped capacity, forcing authorities to add more pressure into the system which, in turn, depletes the life of the assets and creates breaks and leakages. At the same time, there are many non-operational factors that can contribute to water loss. In some developing markets, for example, lack of access or high water rates have led to major issues with water theft.

Q: Can cities raise rates in order to improve cost recovery?

A: When it comes to drinking water, rates are a very sensitive topic. And water authorities and policy makers want to walk a fine line between creating an incentive for consumers to reduce their use and providing universal access. For many cities, however, I think the smarter move would be to focus on capturing the lost revenue that drips out of their system through leakage and theft. The data suggests most cities could see a 15 to 20 percent revenue lift just by closing leaky taps. The problem, of course, is that this requires significant capital investment and few cities have that type of flexibility in their budget today. As a result, we expect to see the need for continued subsidies and grants in this area, particularly from higher levels of government. ■

Wastewater removal



Governments spend billions of dollars on wastewater collection around the world. Yet, every year, more than 3.4 million people die as a result of water-related diseases. No wonder city leaders are particularly concerned about the efficiency and effectiveness of their wastewater collection and treatment services.

Defining the service

Wastewater removal services include the design, construction, maintenance, repair and operation of wastewater collection and treatment systems. This may include industrial, commercial and residential wastewater removal, as well as the disposal of bio-solids, backflow prevention and sewer systems.

Topline findings

— The average city spends US$1.21 and receives US$0.94 per cubic meter of wastewater collected and treated.
— Cities report spending anywhere from US$0.37 to US$2.92 per cubic meter of water.
— Only one city reported 100 percent coverage for wastewater removal services.

Efficiency

Total cost per km of wastewater network. This measure reflects the combined operating and capital cost for wastewater collection and treatment divided by the total number of km of network.

Points to consider

Total cost per cubic meter of wastewater collected and treated

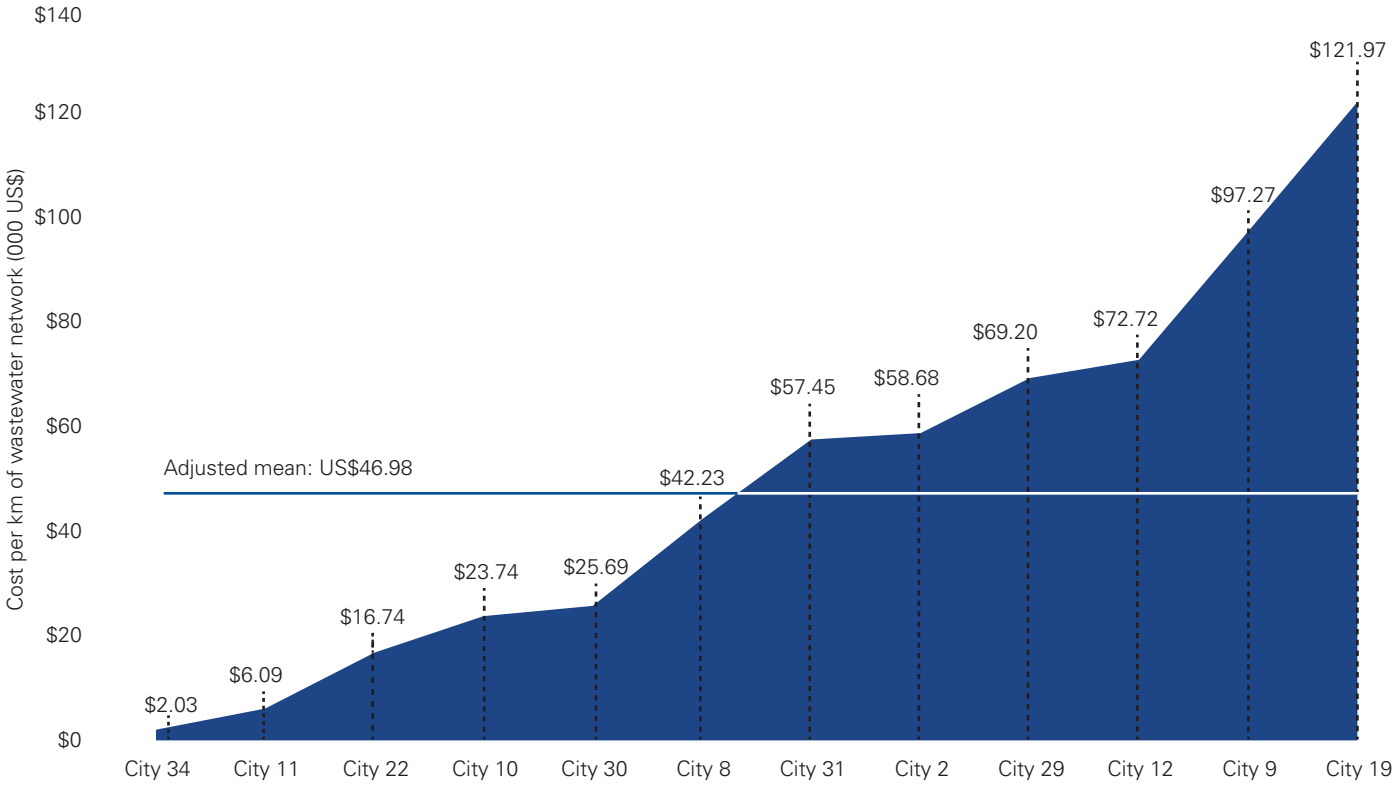
Perhaps the most consistent of all of the indicators in this study relates to the wastewater removal service where the cost per cubic meter ranges from US$0.37 to US$2.92 per cubic meter. The adjusted mean is calculated at US$1.20 per cubic meter. Cities below the mean may be spending too little on the reconstruction and replacement plans, while cities greater than the mean are taking care to make those investments but incurring higher costs.

Revenue information was also collected for this benchmarking exercise. While not provided in this graph, the adjusted mean calculation for revenue is calculated at US$0.94 per cubic meter. The difference between cost and revenue equates to US$0.26 per cubic meter. that must be picked up by general revenue sources within the city. One city in Europe actually generates more revenue than its costs and may be an excellent candidate for further study.

Additional factors that may influence cost may include:

— Higher than average energy costs in a city where the cost of pumping wastewater is a large component of a city's cost.
— Similar to drinking water supply, the terrain of a city can have a huge impact on cost, particularly if the city needs to compensate by more pumping that gravitational forces.
— Aging infrastructure may result in a higher than normal cost for repair or reactive maintenance, not to mention the capital costs to replace or reconstruct the network.
— The amount of wastewater production can also be reduced by cities that are seeking reuse of wastewater, such as the growing trend to reuse gray water for non-consumptive purposes.
— Wastewater removal can be more neglected than other underground infrastructure-based services when it comes time for capital investments, simply because it is not glamorous. Greater effort is required by wastewater service providers to convince elected officials of the risks associated with not making appropriate investments, especially investments that may span more than the term of an elected official.

Figure 18: Cost per km of wastewater network (000 US$)



Adjusted mean = Average of indicators excluding lowest and highest values

Total cost per cubic meter of wastewater collected and treated. This measure reflects the combined operating and capital costs for wastewater removal, divided by the total reported number of cubic meters of wastewater removed.

Points to consider

To demonstrate how certain services may have two important cost efficiency indicators, we also requested the cost per km of wastewater network. Although different from the customer oriented "cost per cubic meter of wastewater removed", this cost indicator focuses on the extent to which a city needs to draw wastewater from across its domain.

The adjusted mean of US$47,000 per km is useful should the department accountable for this service wish to predict future costs based on the expansion of their network, although a good portion of the cost of delivering this service would be attributed to the treatment plants and not the network. In future, separating the cost of collection from treatment would overcome this challenge and again provide a useful tool to gauge future costs.

One might ask why the cost per km ranges from US$2,000–US$122,000. Factors may include the degree to which a city is reconstructing or replacing its assets according to full lifecycle costs, or not. Clearly those cities on the low end of the range may be foregoing the costs, but this will catch up to them eventually and present additional, often more costly ramifications.

Other reasons may include:

— One time capital cost incurred in the reporting year that may have skewed the capital costs, such as a new wastewater treatment plant:
— The geographic coverage of a city where some cities are low density but span thousands of square miles and the wastewater network becomes quite extensive
— Age of infrastructure where older infrastructure may require more reactive maintenance than might normally be expected in a relatively newer network.

Effectiveness

Percent of properties served by wastewater removal service. This measure indicates how many properties are directly connected to the wastewater collection network as a percentage of total city properties.

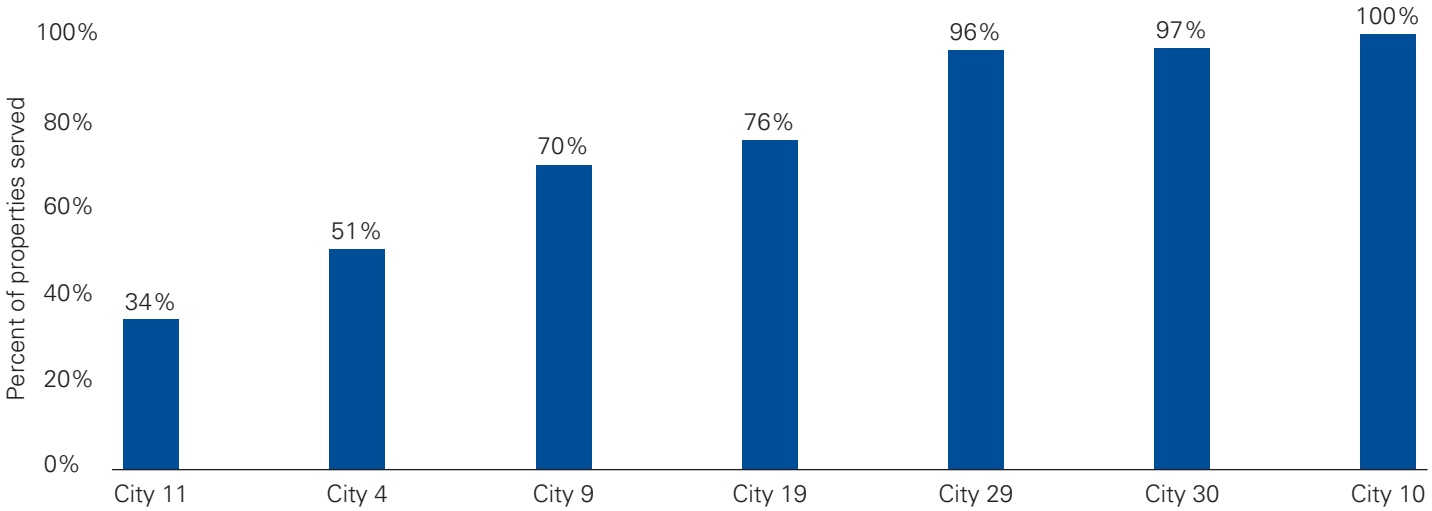
Points to consider

Regarding the appropriate effectiveness metric for the wastewater removal service, there are several. Information on the outflow quality of wastewater treated was not requested because there may be different standards in different countries. We agree that this quality of wastewater outflow is an important indicator of effectiveness. Other indicators we asked for included the number of wastewater main breaks, also known as sewer main breaks. We did receive some information back from cities but not a sufficient sample size to report any meaningful statistics.

One effectiveness indicator that was provided relates to the percent of properties that are covered within a city by the wastewater removal service. In some developing countries, this is a very significant indicator of how well the city is performing in hooking households up to the wastewater collection and treatment network.

While not all cities could provide the percentage of properties served, for those that did report this information, we noted that one community serves only 34 percent of its properties — perhaps due to septic systems offering an alternative to public wastewater treatment. Only one city reported that it served 100 percent of its properties, and this city is located in a developed country.

Figure 19: Percent of properties served by wastewater removal service



One of the emerging challenges relates to the intensification of development in cities where greater concentrations of residents places pressure on the collection and treatment capacities of sewer systems. How does an established city with increasing road congestion replace and upgrade its underground wastewater network, especially when most of this network is located within the road allowance?

Persistent problems

— Tightening environmental regulations
— Decoupling combined storm and wastewater assets
— Maintaining investment and development targets
— Attracting new talent
— Protecting the hydrological network and watersheds.

Common cost factors

— Treatment chemicals and consumables
— Collection and pumping costs
— Maintenance and repairs of underground assets
— Capital investment, renewal and separation requirements
— Level of pre-collection treatment for industrial and commercial wastewater.

Innovative ideas

— **Moscow** has seen significant investment into its water treatment facilities with the construction of one of the world's largest UV radiation disinfection facilities that boasts enough capacity to treat around 80 percent of the city's current sewage and waste water.
— In **Dresden**, a newly installed fouling complex has helped the wastewater network achieve a high degree of power self-sustainability.
— Last year, the **Philadelphia** Water Department met the first milestones of their 25-year Green City Clean Waters plan which aims to reduce the amount of storm water entering the city's combined sewer system through the use of green infrastructure.
— In **Toronto**, authorities are taking aggressive action to fill the looming talent gap by creating focused talent and development plans for key staff and their future workforce.

Transformative trends

— *Treatment innovation:* Many cities are exploring new approaches for treating wastewater and managing biomass that reduce treatment costs, improve efficiency and better manage unwanted byproducts and odors.
— *Wastewater reuse:* Changing attitudes now see the reuse of treated wastewater as an untapped resource
— *Upgrading the network:* From new treatment plants and reservoirs through to upgraded collection assets and infrastructure, cities are investing significant capital to expand and modernize their wastewater network.
— *Decreasing volumes:* While overall volumes may be increasing, some cities note the per-capita volume is decreasing as people adopt more conservationist approaches.
— *Building the future workforce:* Recognizing the growing challenge of attracting new talent to the wastewater sector, a growing number of cities are now thinking about how they might entice millennials into the workforce.

What else did we measure?

For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:

— Kilometers of wastewater collection and treatment network
— Cost per km of wastewater collection and treatment network
— Revenue collected from wastewater collection and treatment
— Number of sewer main breaks or collapses.

Q&A with Bastien Simeon, Global Infrastructure Sector Lead, Water, KPMG International

Bastien leads KPMG's Global Water Sector where he is responsible for assisting water and wastewater authorities around the world on addressing investment decisions for major infrastructure restructuring and construction projects.

Q: What factors influence cost efficiency in the wastewater sector?

A: I think the biggest consideration is the outflow water quality. Every region has somewhat different standards for the quality of the treated water that can be returned into the hydrological network and that has a tremendous impact on the operational costs that would be involved. One city in Namibia injects its treated wastewater directly into the potable water network. Other variations in operational and capital costs depending on the city's terrain. Those that enjoy natural hydraulics and drainage will spend less on pumping waste than those dealing with undulating terrain. At the other end of the spectrum, cities are facing very different capital investment programs, depending on their asset mix and age. So there are a lot of factors that could influence cost efficiency on a cost for volume basis.

Q: Why might wastewater authorities be struggling with large capital requirements today?

A: There are three main reasons. The first is that many cities, particularly the more established ones, are facing large asset renewal and replacement requirements. The second reason has more to do with the growing desire to separate wastewater assets from storm water, in part to better manage capacity but also to improve treatment costs. And the third reason relates to the constantly changing quality standards that wastewater must conform to; retrofitting a treatment plant to meet a higher standard can be a costly proposition. Let's face it, making investments in a sewer system are not all that glamorous compared with other more visible infrastructure investments.

Q: Should cities be striving for 100 percent service coverage?

A: It all depends on the city and its ability to absorb wastewater in other ways. In many older cities, septic systems are common and industry and commercial properties are required to — at the very least — treat their wastewater prior to city collection. Mandating septic systems is clearly not a realistic response, but it does suggest that there are other ways that a city can reduce their reliance on centralized wastewater assets. At the same time, however, we are seeing many 'greenfield' cities developing very innovative approaches that would suggest that 100 percent coverage is not only possible, but that it may prove the most efficient approach in some cases.

Q: Has technology helped improve efficiency in the wastewater sector?

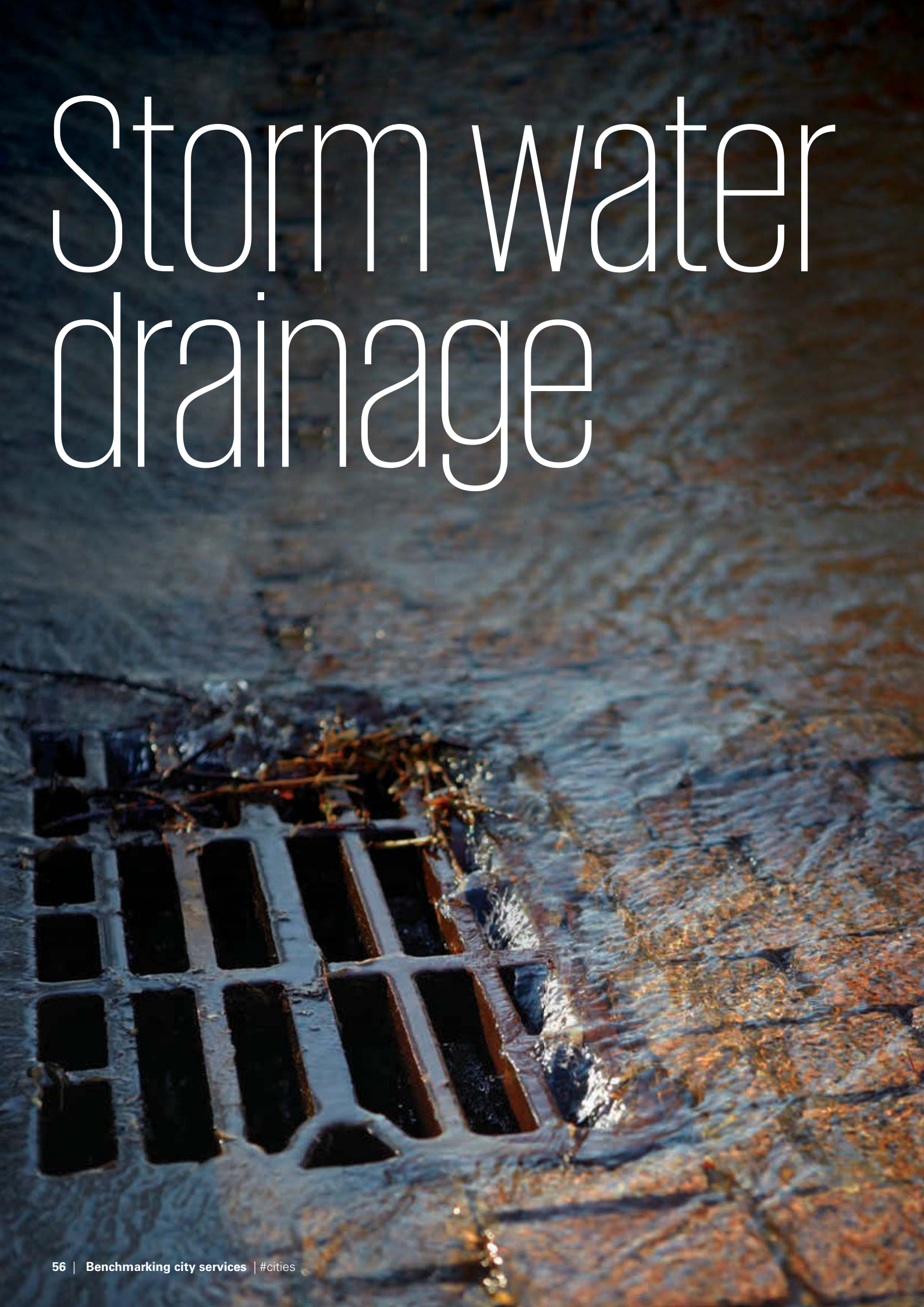
A: Much like similar operations in drinking water and storm water, many of the more established cities have implemented SCADA-(supervisory control and data acquisition) type systems that have helped to bring a higher level of automation to wastewater collection and treatment. And now, as the technology environment evolves, we are also seeing operators move towards the adoption of sensor technologies and remote monitoring systems to support operations, as well as more predictive analytics to support forecasting and risk assessment. And, as a result, they are able to use their SCADA systems as a proactive tool to help identify problems and risks before they become service interruptions or compliance issues.

Q: What advice would you offer wastewater authorities?

A: I think it all comes down to robust planning. If you are aggressive about your planning and are able to predict demand, you will know how much capacity you need to build and where your maintenance budgets would be best spent. My experience suggests that the cities that are aggressive in their planning are the ones that are ahead of the game, from both an effectiveness and an efficiency perspective.

Finally, we need to change our attitude towards wastewater where treated wastewater is seen as a resource that can be reused — for irrigation, industry, or even aquifer recharge. ■

Storm water drainage



Flooding can devastate a city by compromising city services and destroying property and city assets. So while flooding events might be unpredictable, city leaders recognize the growing number of such extreme weather events and are now turning their attention to storm water drainage as an investment into the sustainability, resilience and livability of their city.

Defining the service
Storm water drainage services include the design, construction, maintenance, repair and operations of storm water collection and treatment systems, including everything from culverts and ditches through to sophisticated storm water treatment plants and reservoir systems.

Topline findings
- On average, cities spend US$0.65 per cubic meter of storm water drained.
- The average city spends US$11,283 per km of storm water network.
- The vast majority of cities provide storm water drainage services to 100 percent of their properties.

Efficiency

Operating and capital cost per cubic meter of storm water drained. This measure combines the total storm water drainage operating costs with the total capital costs and divides the sum by the number of reported cubic meters of storm water drained.

Points to consider

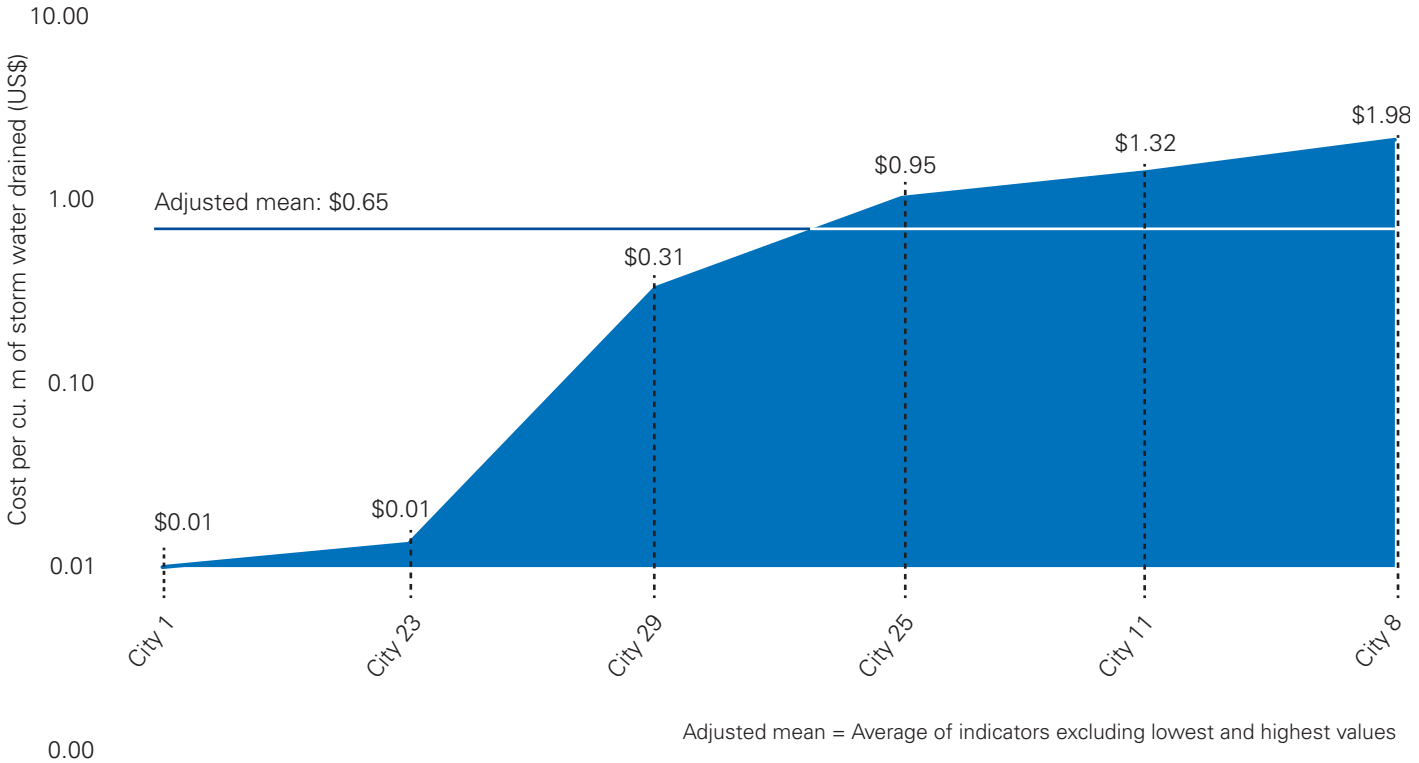
Storm water drainage, as a service is still emerging in many cities, largely because storm water was considered more of a nuisance than something deserving specific attention, creative solutions and financial commitment. Little wonder when we reached out to cities to see what services they might want to benchmark that this service popped up on our radar. Unfortunately when we asked for specific information necessary to calculate efficiency and effectiveness indicators, only six cities were able to respond.

There are two cities that appear to be outliers because of their low cost per cubic meter of storm water drained. City 1 and 23 show the cost per cubic meter of storm water drained at pennies on the dollar compared with US$1.98 for City 8. When we reviewed the outliers, we expect that the amount of storm water drained is the major reason for the low cost cities. We believe that these cities reported large quantities of storm water (denominator) and relatively small operating and capital costs. In other words, these are valid observations but certainly point to a concern that perhaps cities need to invest more and more in storm water drainage networks than they do today.

KPMG professionals' experienced challenges in capturing the volume of storm water drained. Few cities actually measure the volume of storm water they collect. In part this is due to the fact that only recently are cities beginning to handle storm water in a manner similar to drinking water and wastewater. Recently cities have been introducing storm water drainage fees where the calculation may be either a flat rate charge or one that is determined by the percentage of a property that is non-permeable.

As cities experience more extreme weather events, regardless of their cause, they need to spend more on storm water drainage and seriously consider innovative ways in which to divert water, protect property, and prevent damage to valuable environmental features.

Figure 20: Operating and capital cost per cubic meter of storm water drained (US$)



Adjusted mean = Average of indicators excluding lowest and highest values

Effectiveness

Percent of properties served by storm water drainage service. This measure divides the number of properties directly connected to the storm water drainage network by the total number of properties that can be connected.

Points to consider

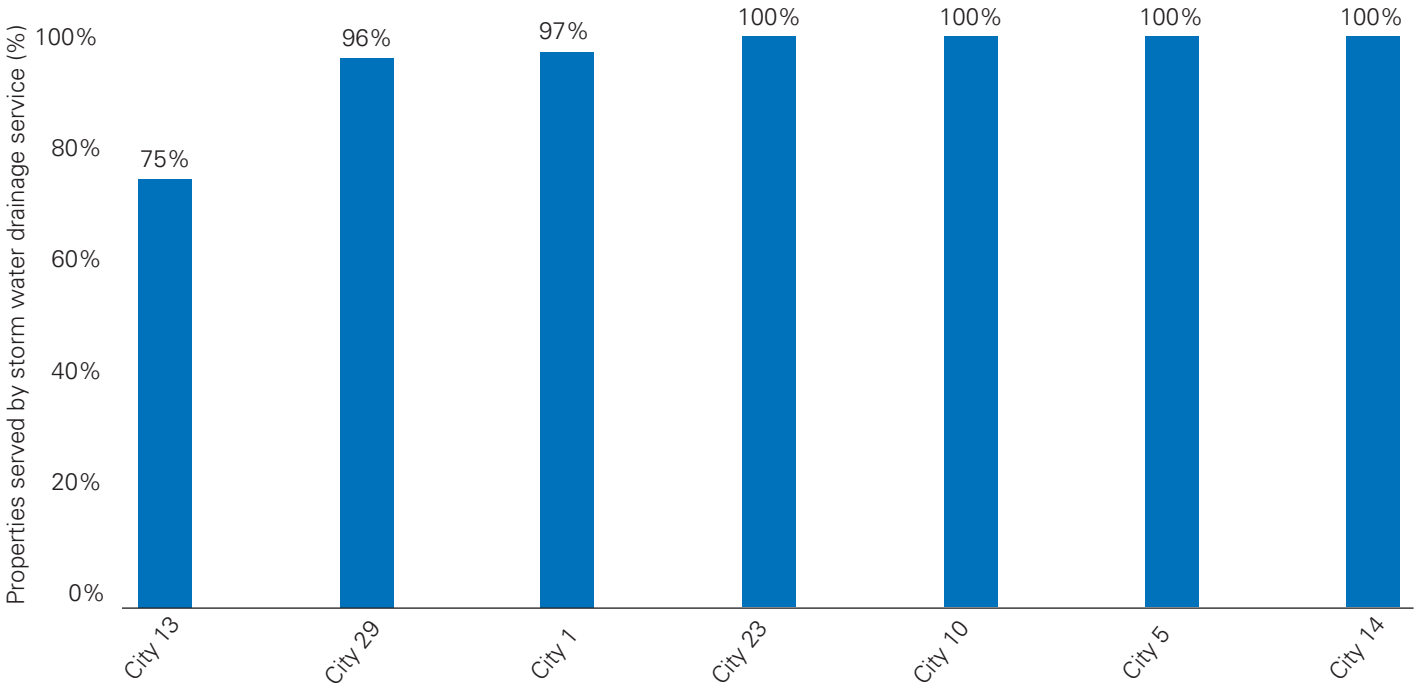
Seven cities provided sufficient information to calculate this metric. With the exception of one city, all cities are effectively providing storm water drainage to properties in their city. The one city that only supports 75 percent of the properties with this service may well be in the process of developing its storm water drainage network as a newer, more modern suburban municipality.

As cities begin to charge storm water drainage fees/charges, the likelihood of greater coverage and reduced storm water damage will improve.

Some cities are providing development credits or storm water drainage charge reductions when developers build special storm water holding tanks that mitigate large surface areas from contributing to large quantities of storm water, such as parking lots around shopping malls or multi-residential properties. Other credits deal with property owners that control the storm water quality so that "deleterious substances" do not make it into natural water courses. Residential property owners can use a variety of different techniques to control storm water flow, including: rain barrels, cisterns and infiltration galleries.

Future studies of storm water drainage may also include different techniques for calculating storm water drainage fees and/or rebates on fees. Because this service aims to prevent flooding, future studies should examine the number of flooding incidents and/or the damage caused by floods. This information may need to be supplied by insurance companies who may/may not cover the costs of flood damage.

Figure 21: Percent of properties served by storm water drainage service



Persistent problems

- Planning for rising severity and frequency of storm events
- Meeting storm water treatment requirements
- Maintaining aging pipes and infrastructure
- Improving asset management discipline
- Aligning to future city development plans

Common cost factors

- Frequency and severity of storm events
- Capital requirements for maintenance and upgrades
- Treatment and discharge requirements
- Topography and ground cover/land use
- More stringent regulatory requirements
- New development costs

Innovative ideas

- Supported by rebates from city council, more than 90,000 new domestic rainwater tanks were installed by **Brisbane** residents during the Millennium Drought event.
- Authorities in **Dresden** have optimized their sewer system control to help better manage storm water during storm events.
- In **Mornington Peninsula**, storm water authorities have implemented the Local Integrated Drainage Scheme (LIDS) to enhance and deliver flood mitigation works, and to reduce the risk of flooding to the population.
- **Toronto** is considering a new storm water charge policy that would separate storm water services from water consumption in order to provide customers with greater fee transparency.

— In neighboring **Mississauga**, authorities have introduced a credit program that provides financial recognition for private, on-site storm water measures that deliver direct benefits to the city's storm water system.

Transformative trends

— *Increasing risk:* The frequency and severity of storm events is rising causing many cities to rethink their 'design storm' scenarios.
— *Rising regulation:* Environmental regulators, planners and policy makers are increasingly focused on ensuring that storm water discharge is treated and managed in a way that preserves the local environment and reduces the risk of flooding.
— *Splitting services:* Cities that have historically relied upon shared storm water and waste water infrastructure are now working to separate the two in order to improve efficiency and ensure proper treatment guidelines are being followed.
— *Changing funding models:* Many cities are exploring new ways to shift the cost of storm water services away from the public budget through user fees and other charges.

What else did we measure?

For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:

— Kilometers of storm water drainage network
— Number of storm water overflows
— Number of storm sewer breaks
— Revenue collected for storm water drainage.

Q&A with Ross Homeniuk, Director, Global Infrastructure advisory practice, KPMG International

Working with governments, utilities and private sector organizations, Ross leads KPMG's Canadian asset management practice where he integrates his deep business and technical expertise with best practice and supporting technologies to help strengthen municipal asset management.

Q: How is storm water drainage changing?

A: As the rate of urbanization increases and people become more focused on protecting the natural environment, we have seen cities become much more sophisticated in their approach to storm water drainage and treatment. Older cities are now working to separate their waste water and storm water systems. Other cities are working to introduce new technologies into the network. We're also seeing lots of different treatment options being implemented — from end-of-pipe oil and grit separators through to centrally treated systems.

Q: Many cities are shifting towards fees for storm water drainage. What are some of the challenges with implementing fees?

A: The reality is that, in most cities, storm water drainage has traditionally been a public work and therefore funded by the general tax base. More recently, many cities have been working with their local water utilities to collect storm water drainage fees as part of their customer billing which, essentially, shifts the costs off the tax base and onto users. So the big challenge is really around public perception. But in my experience, people are not opposed to paying more for a service, as long as they understand why they are paying more and what they are getting in return.

Q: How can cities improve the efficiency and effectiveness of their storm water systems?

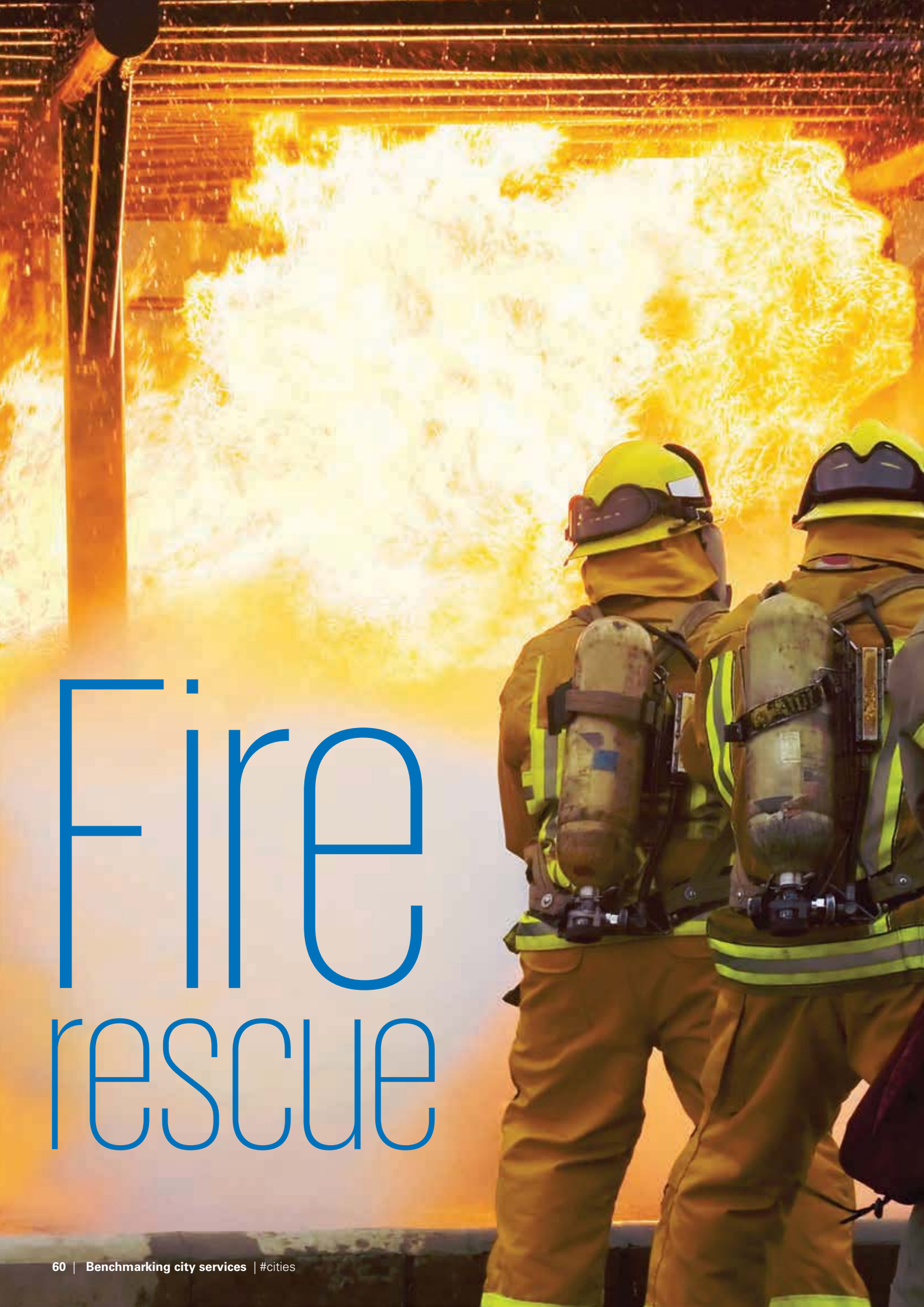
A: There are many ways to improve, depending on your current asset mix, investment levels and demand volume. But one of the bigger problems we see are systems that focus too much on the 'build' and not enough on the 'maintain' part of the asset lifecycle. There are many storm water pipes in older cities that have not been cleared in decades. I know of cities that still have 100-year old wooden pipes as part of their network. You need to put as much focus on maintaining and optimizing your network as you do on building out new capacity.

Q: Are there other players that can help drive improvements?

A: Certainly. At the city level, I think executives need to recognize that storm water interacts with a wide variety of different city services — everything from the way roads and parks are designed through to the way a city plans development influences the volume of storm water and therefore the efficiency of the network. Businesses and individuals can also play vital roles by investing into storm water capture approaches and reducing the amount of impervious land on their properties. We need to think clearly about how our current decisions will impact our ability to manage storm water in the future.

Q: What advice would you offer city managers and storm water drainage leaders?

A: I think everyone now recognizes that storm water is going to become a much bigger problem as weather events become more unpredictable and more severe. In this environment, city leaders need to reassess their drivers for investment into storm water drainage and then identify the best solution for the city's future needs and environmental realities. But remember, what worked in the past will not necessarily work in the future. This isn't about building more, but rather about being smarter. ■



Fire rescue

Governments' primary responsibility is to serve and protect its citizens. And that means providing effective and efficient fire suppression and rescue services when incidents occur. Yet, as the urban landscape evolves and cities become more complex and congested, many are finding it increasingly difficult to maintain response times and effectiveness in the face of static (in many cases shrinking) budget allocations.

Defining the service

Fire rescue services are generally provided by fire departments to respond to emergency and non-emergency incidents such as structural fires, vehicular accidents, medical assists, rescues and hazardous materials response. For the purposes of this report, the service does not include fire prevention activities or fire safety inspection services.

Topline findings

- The average city spends US$6,320 per fire rescue incident.
- However, costs range from as low as US$116 to as high as US$14,000 per incident.
- The average city takes just over 8.5 minutes to respond to an incident.
- The vast majority of respondents report fewer than 7 lives lost to fires in the past year.

Efficiency

Operating and capital costs per fire rescue incident. This measure combines reported operating costs and capital costs for all relevant fire rescue services and divides the total by the number of reported incidents.

Points to consider

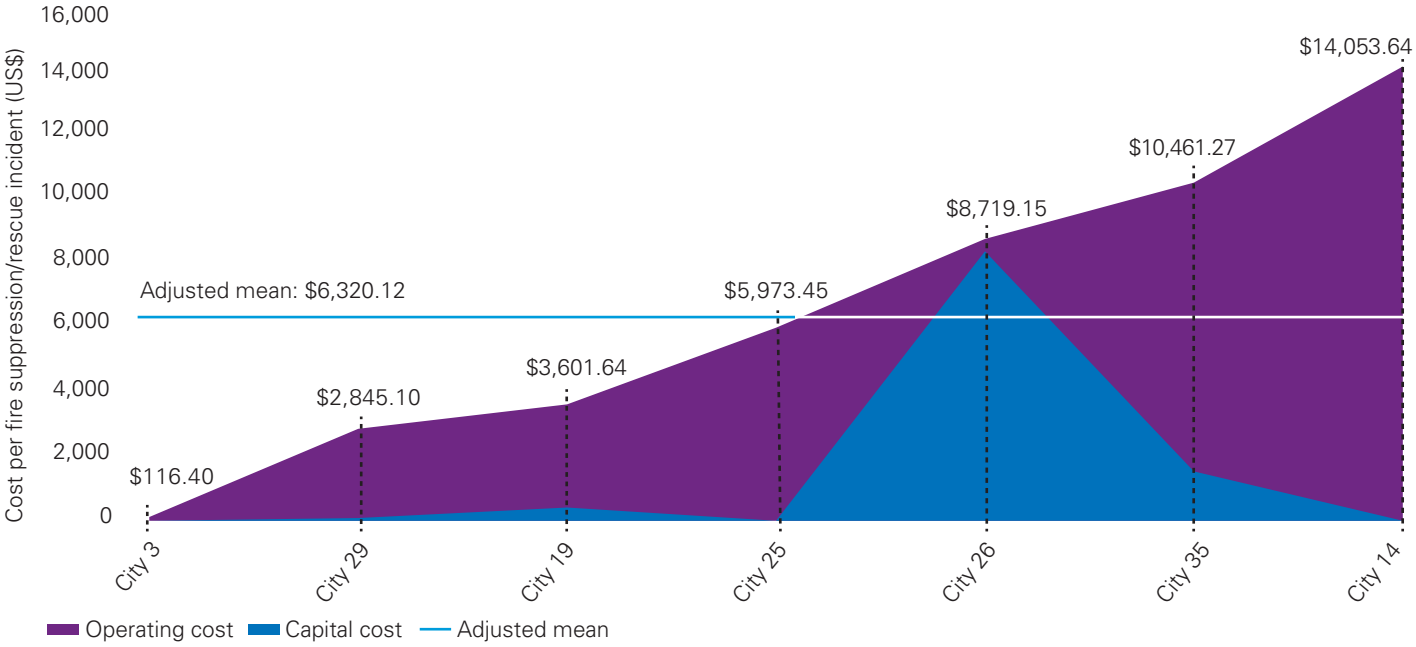
When interpreting the graph below, being less costly may not necessarily be desirable. For example, City 3 has the lowest cost at US$116 per incident. When we examine the components of cost/output, this raises the question: Does this city actually have more incidents than other cities while the operating and capital costs are the same? If this is the case then this is not a desirable state. Similarly, a city like City 14 where the cost per incident is US$14,000, might suggest that this city's fire prevention service(s) are effective and incidents have been reduced.

One of the surprising discoveries when we reached out to participating cities was that not all countries have transferred the mandate to deliver the fire rescue service to cities. This mandate is covered either by national or state governments in these respective countries. This is a clear example of a service that may be challenging to capture comparable information outside of the current jurisdiction when requesting benchmark data.

Fire officials will be quick to point out that the cost per incident is directly related to innumerable categories of incidents that are bundled into the calculation and it is very important to note that if the city in question is a low rise, suburban city, that the costs will be considerably less than those realized by large, densely populated cities with high rise buildings. In addition, some cities may be supported by volunteer fire fighting units which can have a direct impact on service costs. But even with such knowledge in hand, one has to ask the question: Is it better to have a higher cost per incident than a lower cost? This may seem counter intuitive but consider for a moment that a city that has fewer incidents (for whatever reason) will have a higher cost. Is this not the goal? Similarly, if a fire department spends more money on the fire prevention service and thereby reduces the cost of the fire rescue service, isn't this a more reasonable way to spend the city's money?

A cost comparison for the fire rescue service would be well served if the "response" service is compared with the "prevention" service, thereby providing a more fulsome overview of efficiency. Future studies will explore this question.

Figure 22: Operating and capital cost per fire rescue incident (US$)



Adjusted mean = Average of indicators excluding lowest and highest values

Effectiveness

Average response time to fire/rescue incident. This measure reflects the average time to respond to a fire or rescue incident, as reported by respondents.

Points to consider

In most cases, response time reflects the time for fire services to arrive at a specific address and does not include the 'vertical response' time required for high-rises and office complexes.

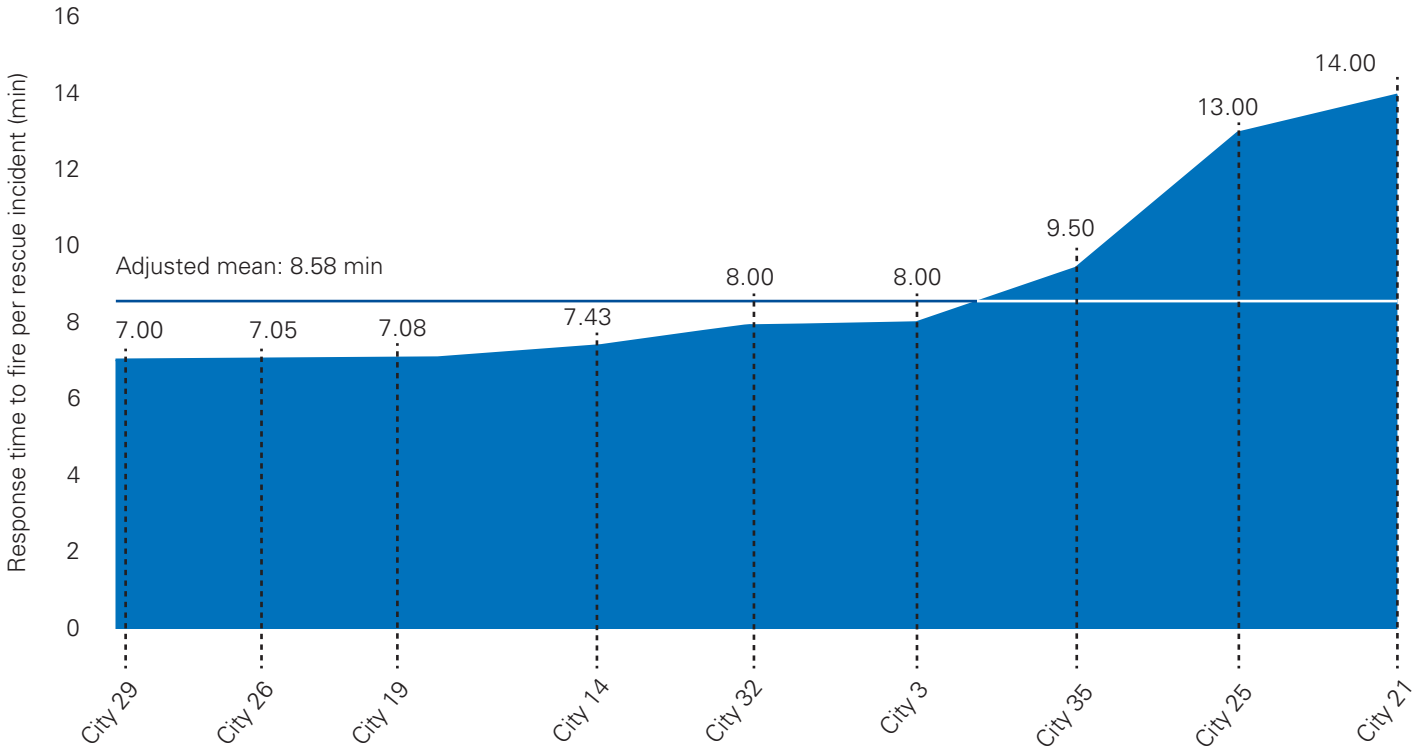
Nine cities provided response time to fire rescue incidents. On average response times of 9 minutes are achieved across all cities, with City 29 showing the best response time at 7 minutes and City 21 double that at 14 minutes.

Regarding factors that may influence response time, cities that are more congested with streets that are almost impossible to traverse during the day are clearly going to challenge fire departments in their response time. Other factors might include the layout of the city (i.e. narrow and convoluted street layouts present a challenge) and the density of fire stations. One city suggested they were considering building 1–2 person fire stations in the downtown core in order to have someone on the premise sooner and to establish whether the "alarm" was indeed valid or not.

Refinements in subsequent studies might include a focus on qualifying the density of the city, understanding how long it takes to respond with the first fire truck, and other effectiveness indicators related to the number of injuries/deaths and/or the amount of property saved from fire damage.

Clearly the faster a fire department can respond to an incident the more lives and property can be saved. Focusing on becoming more effective by responding quicker needs to be balanced with more proactive services, such as fire safety inspections and fire prevention education. Fire-fighting professionals know this and are trying to find the right balance.

Figure 23: Response time to fire rescue incident (minutes)



Adjusted mean = Average of indicators excluding lowest and highest values

Persistent problems

- Responding to rapid rates of new development and urbanization
- Maintaining response rates as density increases
- Managing labor costs and resource allocation
- Sustaining service levels without new investment
- Leveraging technology to improve efficiency
- Improving collaboration with aligned functions

Common cost factors

- Labor and benefits
- Rolling stock and equipment
- Land and asset amortization
- Shared services costs

Innovative ideas

- In **Toronto**, countdown clocks have been installed in the bays to help crews assess their turnout times and monthly report cards are distributed across the city to encourage healthy competition between crews.
- The City of **Toronto** has also used a series of process improvements to reduce their call processing time from 1 minute 23 seconds in 2013 to just 50 seconds in 2016.
- Fire authorities in **Antwerp** have improved response times by centralizing dispatching across the city.

Transformative trends

— *Dissecting risks:* As the urban landscape changes and fire suppression and rescue needs change, cities are beginning to get more 'granular' in their understanding and assessment of risks, particularly at the industrial and commercial level.
— *Distributing the footprint:* Some cities are considering how they might move services closer to demand by placing 'storefront' locations within specific hotspots such as office complexes and housing developments.
— *Shifting to prevention:* Recognizing that fire prevention is more cost effective than fire suppression, cities are exploring how they might shift resources towards encouraging prevention services without impacting the effectiveness of suppression services.
— *Improving resource value:* In response to the shift towards prevention and the need to do more with less, some cities are looking for opportunities to improve the value of their existing assets (both human and capital) by, for example, adding more personnel to each piece of equipment.
— *Measuring real response times:* As developments become increasingly vertical, fire authorities are looking for ways to better measure their time of response to the scene of the incident rather than the street location.

What else did we measure?

For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:

— lost lives due to fire
— cost of lost lives/property lost due to fire and other incidents
— cost of lives/property saved from fire or other incidents.

Q&A with Debbie Higgins, Deputy Fire Chief, Toronto Fire Services, City of Toronto

As deputy fire chief for Toronto Fire Services, Debbie is currently responsible for employee training, emergency planning, health and safety and the department's fleet and equipment. Prior to assuming the role in 2010, Debbie had spent 10 years serving as executive officer at the Toronto Fire Services.

Q: Why might two cities report widely different costs per incident?

A: At one level, it really depends on what is included in the costs and what is not. Some cities may include big capital projects while others may only be thinking of ongoing equipment costs. But the urban landscape also has a major influence on cost per incident. And that makes it really difficult to find true comparator cities to benchmark against.

Q: How is the changing urban landscape influencing fire service effectiveness?

A: We're seeing a growing disparity between the time our trucks arrive at an address and the time they actually arrive at the incident. And that means that we need to think differently about how we measure our arrival times. In Toronto, we have started to measure the 'A2' — the arrival time at the scene — so that we can not only find ways to improve our effectiveness, but also better manage people's expectations about realistic response times in certain scenarios.

Q: How has this influenced strategic planning for fire services?

A: Most cities recognize that there is not an endless supply of money. And that has led to some pretty new thinking about how fire services need to be organized and delivered in the future. Right now, we tend to locate fire halls based on road response times. But wouldn't it make more sense to put the resources as close as possible to where the emergencies are more likely to be? We're thinking about how we might create 'storefront' fire response services at the bottom of large office complexes, for example.

Q: How has the shift in focus from suppression to prevention impacted service and demand?

A: The challenge here is that investments into prevention take time to deliver value. So you can't just start pulling investment away from suppression and putting it into prevention. I think we all recognize that we want to be moving towards a balance that is much more heavily weighted towards prevention, but I also think it will take time to get there. In Toronto, we have recently started to train firefighters in basic fire prevention and public education techniques. Down the road, we hope this allows them to take on more of a prevention focus as demand evolves.

Q: How is the Toronto Fire Services using technology to improve efficiency and effectiveness?

A: We've made a lot of improvements across the service to improve dispatch times, turn out times, cost efficiency and effectiveness. But we've found that the biggest improvements often come when we share data. We installed turn out clocks in our firehalls so that employees can actually visualize their data. We share results across fire halls so that everyone can compare their effectiveness. And that drives a significant amount of improvement on its own.

Q: What can policy makers do in order to help improve the efficiency and effectiveness of fire services?

A: At the top level, I think the biggest value will come from improving coordination between the various departments that support fire services. We work very closely with EMT professionals, for example, but they report up to the Ministry of Health while we report up to the Ministry of Correctional Services. Reducing the red tape between different departments might unlock unexpected value ■

Garbage collection

Nobody wants to live amongst garbage and waste. It is an environmental and health hazard. It is a blight on a city's natural beauty. And it is often perceived as being indicative of poor city administration and planning. Thankfully, new approaches and innovative ideas are emerging that hold the potential to improve garbage collection efficiency and effectiveness.

Defining the service

Garbage collection services refers to the collection and removal of waste that cannot be recycled or reused. For this exercise, waste disposal services (such as landfill site operations) were not included in calculations. Waste diversion programs (such as recycling) were also separated and are presented on page 72 of this report.

Topline findings

- The average city spends US$201 to collect a ton of garbage
- Costs range from as low as US$31 per ton to as high as US$582 per ton
- At least half of the cities in our research report 100 percent coverage of properties
- Many cities charge fees for collection.

Efficiency

Cost and revenue of collecting a ton of garbage. These measures reflect the total costs (operating and capital) for garbage collection and the total revenue collected (through fees and other charges), divided by the number of reported tons of garbage collected during the period. For this indicator, we separated costs from revenue and compared them side by side (see below).

Points to consider

Seventeen cities provided information to determine the efficiency of garbage collection. When we look at the raw costs (operating and capital), costs can range from US$31–US$582 per ton. However when we look at the net cost, an interesting picture emerges where three cities actually make money from the garbage collection service — yes, revenue from fees per ton exceed the cost per ton.

Interesting to note that not all cities charge fees, or at least given the information provided. Four cities did not report revenue. Reviewing those specific cities did not reveal any geographic evidence that fees are not acceptable in specific countries. So why then do certain cities charge fees and other do not? Do some cities feel that the cost of garbage collection is something that property taxes should cover? In addition to the four that don't generate revenue, five other cities only collect a nominal amount of revenue and certainly not enough to come anywhere near the cost of the service.

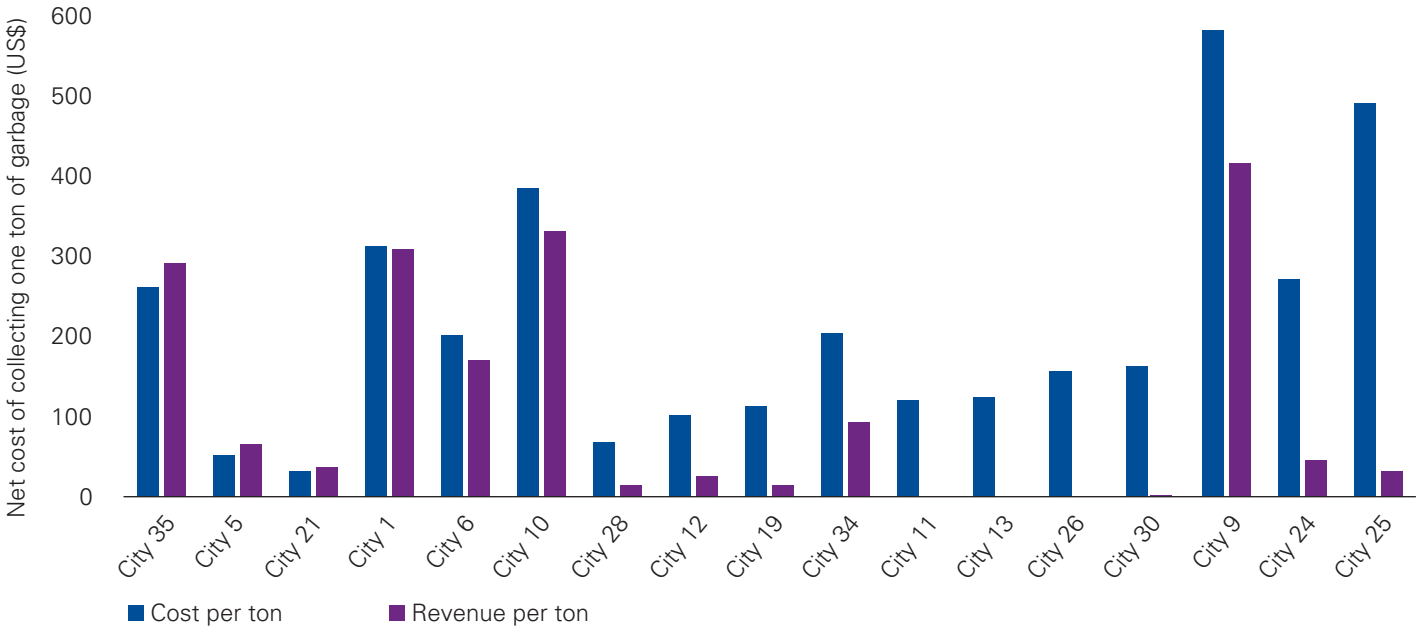
Costs can vary for those cities that are more congested and those with convoluted streets, such as those one might find in large urban centers and older cities with narrow streets.

Some cities have included the cost of waste disposal in their costs of garbage collection, whereas other cities have not. Waste disposal facilities are the single most expensive component of the waste program and these costs continue to increase as environmental regulations become more stringent.

In Taiwan cities use classical music on their garbage trucks to notify their residents they are coming and then residents rush out with the solid waste and recycling. Residents wait for trucks to come by and must pay for residual waste in city bags while recycled and organic waste is free.

Garbage collection, in combination with garbage disposal, will only become more expensive as cities grow unless cities adopt fairly aggressive waste diversion targets. Combining garbage collection, garbage disposal and waste diversion services into a full view of waste is becoming the norm for many cities — measuring their efficiency and effectiveness in combination should be the goal.

Figure 24: Cost and revenue of collecting one ton of garbage (US$)



Effectiveness

Percent of properties served by garbage collection services. This measure reflects the percentage of serviceable properties that receive regular garbage collection. This may represent all properties (residential, commercial and industrial) in a city or — where services are limited to residential properties — just residential.

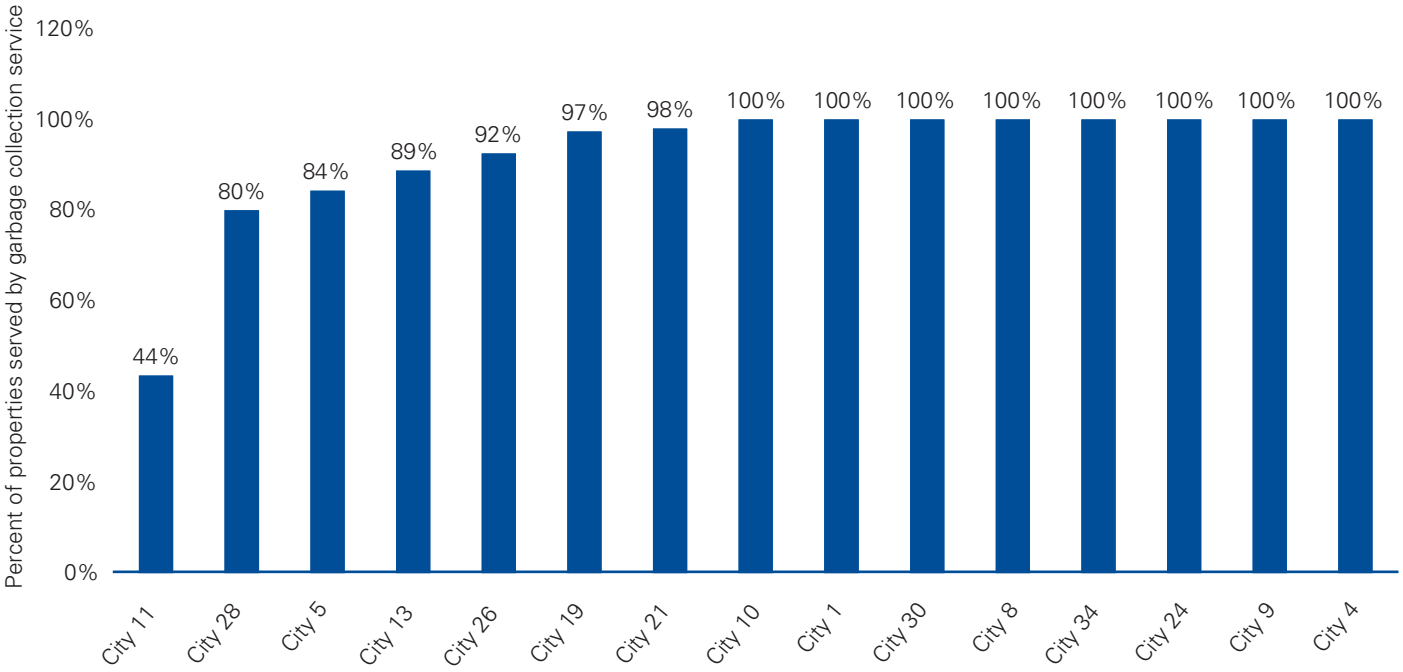
Points to consider

Of the fifteen cities that provided data, most reported a high percentage of garbage collection throughout their jurisdiction. One city stands out at 44 percent. A reasonable explanation as to why this city is so low may be a result of the term "property" which may be treated differently in this jurisdiction.

Many cities do not collect garbage from business establishments and focus primarily on residential properties. Some cities may pick up garbage from multi-residential buildings and a few actually collect garbage from retail establishments that have residents above.

Some cities may collect garbage weekly or more frequently which will directly impact costs. Finally, some cities have large poor communities (i.e. slums, favelas, human settlements) that are not serviced well by city services, including garbage collection, and therefore these cities can skew the efficiency and effectiveness indicators.

Figure 25: Percent of properties served by garbage collection service



Persistent problems

- Changing public garbage habits and expectations
- Poorly maintained or outdated equipment and assets
- Growing environmental concerns and awareness
- Rising service level expectations
- Reducing rubbish dumping and illegal disposal
- Encouraging waste diversion
- Physical constraints to waste separation in buildings

Common cost factors

- Outsourcing or contracted waste collection arrangements
- Rolling stock and equipment
- Frequency of collection and scope of services
- Input costs (oil, gas, etc.)

Innovative ideas

- In an effort to raise revenues and support broader waste avoidance and diversion efforts, the City of **Dresden** has instituted a pay-as-you-throw charge system for residential waste.
- The City of **Belfast** has implemented a new route optimization software platform that is already improving efficiency on refuse collection routes.
- The Streets Department in **Philadelphia** is part of a multi-departmental task force aimed at creating a combined and comprehensive approach to reducing litter and increasing waste diversion at the street level.
- Leveraging 'smart city' models, garbage collection authorities in **Antwerp** are using 'big belly' bins and real-time monitoring systems to improve waste management efficiency.

Transformative trends

— *Increasing demand:* Growing urban populations and changing urban landscapes are forcing garbage collection authorities to continuously optimize their waste collection routes and forecasts.
— *Overcoming resistance:* Evidence suggests that some cities continue to struggle to convince local residents of the value of waste diversion and recycling programs, resulting in missed targets and additional investment requirements.
— *Responding to regulation:* In many markets — the European Union in particular — new waste diversion and recycling targets are creating new pressures on existing garbage collection systems.
— *Reducing streams:* By limiting the types of material that can be collected, some cities are reducing the number of waste streams they must manage and separate.

What else did we measure?

For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:

— number of complaints about uncollected garbage

Q&A with Dirk Vrancken, Director and Head of Facility, Property and Fleet management, KPMG in Belgium

With more than 25 years' experience coaching and supporting facility, property and fleet management, Dirk has deep experience working with public and private waste authorities to help improve efficiency and enhance effectiveness of waste, diversion and recycling systems.

Q: In your experience, why might costs for garbage collection vary between cities?

A: A lot will depend on the scope of the service that the city provides. Weekly door-to-door collection through small city streets will cost more than bi-weekly collection at centralized depots. Cities that limit the number of waste streams they collect will also likely have lower costs. But a lot of the costs are actually incurred 'on the road', transporting waste from one location to another, so factors like congestion, distance and road conditions also matter.

Q: What are cities doing to reduce their overall garbage collection costs?

A: Besides investing in newer equipment and assets, we've seen significant investment go into new fleet technologies that help improve vehicle routing, sensor technologies that improve collection efficiency and analytics technologies that help speed up processes. But we are also seeing more fundamental model change; in Western Europe, for example, many cities are shifting towards centralized collection for certain waste streams, thereby reducing transportation and sorting costs.

Q: What are some of the key considerations when developing new revenue streams from waste collection?

A: I think you need to recognize that this is not 'revenue' as much as it is 'cost containment'. Unlike in waste diversion and recycling, it is very difficult to monetize residential garbage, meaning that any income must be achieved through some sort of user pay mechanism. Cost neutrality is certainly a worthy goal but any excess revenues should likely be reinvested back into improving the system.

Q: What advice would you give city garbage collection leaders?

A: I would suggest that they start really thinking about data and analytics and how they can harness technology to improve their current processes. That includes data at the operational level — from route enhancements through to fill levels on containers — and at the customer level to understand future trends, expectations and shifts in demand.

They also need to be rethinking how they incentivize citizens to behave differently when dealing with waste, finding ways to reward good behaviors rather than simply penalizing undesirable activities. It's really all about performance management — improving performance at the operational and at the customer level.

Q: Do you expect to see significant change in the way waste is managed in the near future?

A: I firmly believe that we will move towards greater adoption of waste diversion programs and the utilization of mono-stream waste programs. We will also likely see some major changes in the technologies we use to dispose of waste, possibly at the household level. The reality is that garbage collection is very much part of the 'linear economy' and the world is moving to a more circular economy. Disruption is inevitable. Even in garbage collection. ■

Waste diversion and recycled waste collection

As governments and citizens become increasingly aware of their impact on the environment, demand for recycling and waste diversion programs is growing. Recycling tends to enjoy fairly reliable revenue streams from the sale of recycled waste collected, yet few cities seem to have achieved revenue neutrality. A greater focus on measuring and improving efficiency and effectiveness will be key as cities move towards a more circular economy.

Defining the service

Waste diversion and recycled waste collection services provide residential, commercial and/or industrial waste recycling and reuse services. Separate to garbage collection services (presented on page 64 of this report), this service may include the collection and recycling of items such as paper, glass, organics, construction material, appliances and electronics.

Topline findings

- The average city spends US$210 per ton of waste diverted.
- Costs range from as low as US$32 per ton to as high as US$1,177 per ton.
- Revenues range from US$24 to US$215 per ton.
- While there are notable exceptions, most cities divert around a third of their waste.

Efficiency

Cost per ton of waste diverted. This measure reflects the total cost (operating and capital) for waste diversion services, divided by the number of reported tons of waste diverted during the period.

Points to consider

Cost per ton of waste diverted

Ask any city in the world what they are doing to reduce the cost of waste disposal and almost all of them will talk about the three "Rs" — Reduce, Reuse and Recycle. Clearly the reduction of residual solid waste in landfill sites is an incredibly important goal given the cost of seeking approval for and operating such sites.

The average cost of diverting waste is estimated at US$210 per ton across 16 cities. The costs range from a high of US$1,177.46 per ton to a low of US$32.42 per ton. These variations may be attributed to the degree of maturity of waste diversion where cities that have recently introduced waste diversion may still be paying for the infrastructure. A number of Australian cities make up the lower cost per ton begging more details as to why their costs are lower.

As with garbage collection, costs for collection are significantly influenced by the condition of roads, accessibility of the curbside/collection facilities and the state of collection equipment.

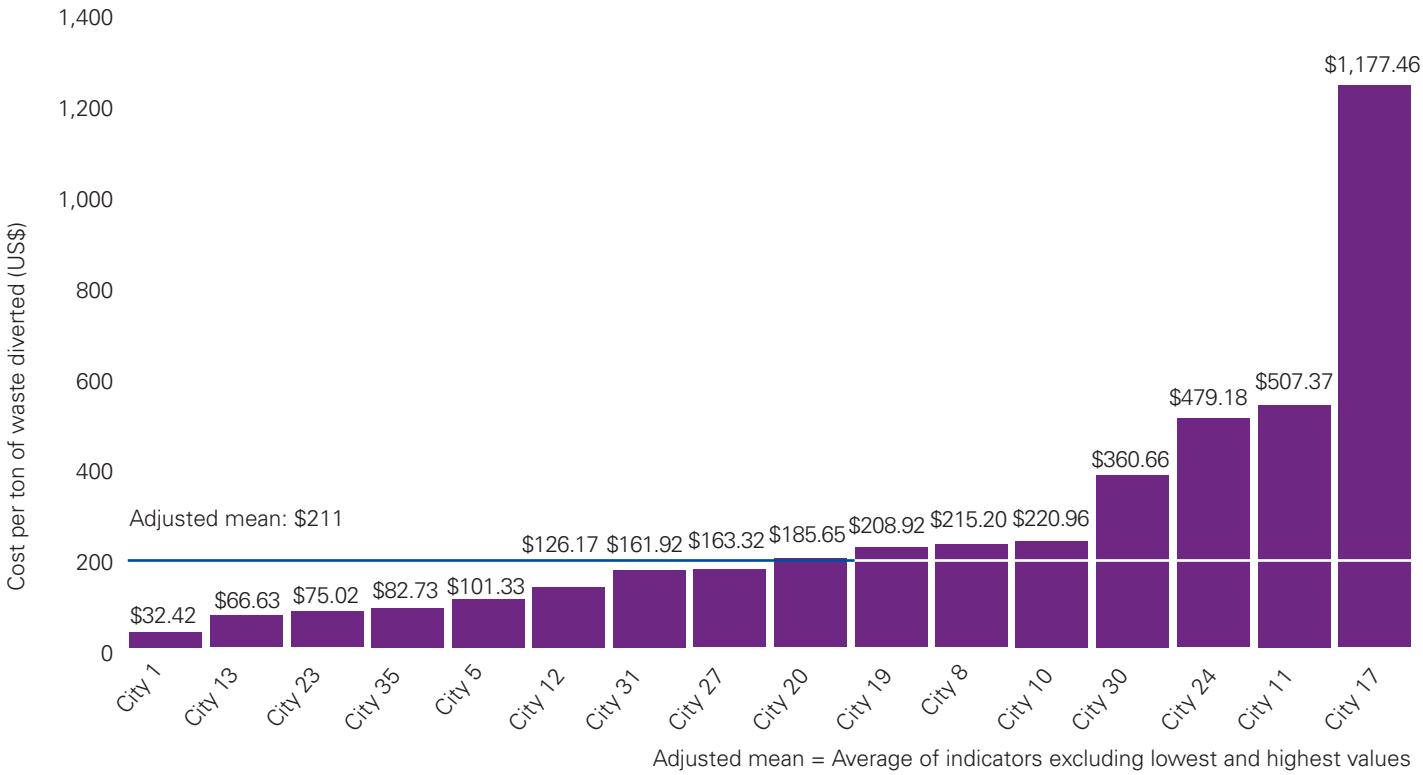
Revenue per ton of waste diverted

We also examined revenue collected for the waste diversion service and note that the adjusted mean is approximately US$65 per ton for the 11 cities that provided such information.

While not all cities that reported costs reported revenue from waste diversion, we expect that the revenue is associated with selling the recycled waste (i.e. glass, paper, cardboard, aluminum, etc.) to firms interested in using recycled material as part of their production process. Revenue likely did not come from collection fees as this would be counter-productive in attracting more participation.

Clearly the revenue collected at US$65 per ton doesn't come near meeting the cost of US$210 per ton. However, the value of diverting waste does not factor the cost avoidance of diverting the solid waste away from the landfill sites. The value of diverting waste is priceless!

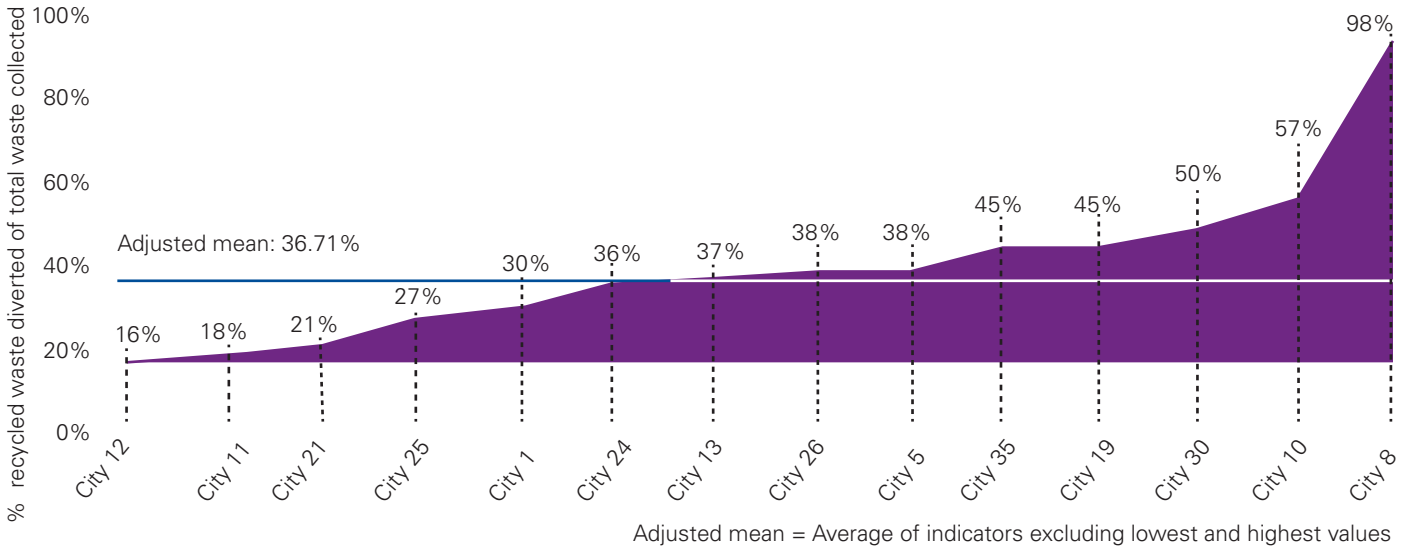
Figure 26: Operating and capital cost per ton of waste diverted (US$)



Adjusted mean = Average of indicators excluding lowest and highest values

Effectiveness

Figure 27: Percent recycled waste of total waste collected



Adjusted mean = Average of indicators excluding lowest and highest values

Percent recycled waste of total waste collected. This outcome metric reflects the percentage of all collected solid waste that is recycled or diverted from waste disposal sites.

Points to consider

Public perception and participation levels can have a significant impact on the effectiveness of recycling programs.

Generally speaking, waste diversion service effectiveness is often related to the maturity of the recycling program.

Some cities are encouraging retailers and businesses to move to mono-stream packaging to improve recycling effectiveness.

The inclusion of a wider range of streams — including organic recycling and large appliance recycling — can influence the percentage of waste recycled.

In many markets, the informal sector (such as garbage pickers) plays a significant role.

Persistent problems

— Increasing public demand for recycling services
— Managing volatile secondary market prices
— Eliminating unauthorized non-residential dumping
— Enhancing public education and awareness
— Managing outsourcing costs
— Accommodating waste separation streams in older buildings

Common cost factors

— Road congestion and maneuvering collection vehicles around narrow and convoluted streets
— Rolling stock and equipment
— Outsourcing costs and obligations
— Frequency of collection and variety of acceptable streams
— Input costs (oil, gas, etc.)

Innovative ideas

— Authorities in **Wyndham** have installed recycling receptacles that dispense vouchers, competition entries or charity donations when recyclable materials are deposited.
— **Philadelphia's** Streets Department has created targeted education and outreach initiatives aimed at residential multi-family structures in lower-performing areas of the city.
— **Moscow** has developed a centralized solid municipal waste management system that rationalizes the number of providers in the city and encourages new investment using long-term contracts and agreements.
— With recycling and organics collected weekly, the City of **Cardiff** has implemented restrictions on the quantity of residual waste that residents can present for collection every fortnight.
— The City of **Dresden** has opened its eighth 'bring center' for the collection of waste and recyclables.
— In **Brisbane**, authorities have launched the Rethink your Rubbish program supported by an integrated marketing and communications campaign and heightened focus on school programs.

Transformative trends

— *Civic environmentalism:* Inspired by environmental concerns and a growing desire to participate in global climate change targets, many citizens are demanding increased recycling efficiency and effectiveness.
— *Increasing reuse:* Particularly in industrial and commercial settings, organizations are working harder to reuse secondary materials which, in turn, impacts disposal volumes.
— *Innovative approaches:* A growing number of cities are exploring new approaches for collecting, handling, separating and storing recyclable materials, particularly in sensitive urban areas.
— *Promoting mono-stream packaging:* In an effort to reduce the number of recycling streams, some cities are working with retailers and manufacturers to encourage the adoption of mono-stream packaging.

What else did we measure?

For this benchmarking exercise, KPMG professionals' collected a wide variety of data on the effectiveness and efficiency of this service area. The following indicators lacked sufficient data or respondents to illustrate in this report:

— Number of complaints about uncollected recycled waste
— Percent of properties served by waste diversion and recycling services.

Combined efficiency and effectiveness analysis

Points to consider

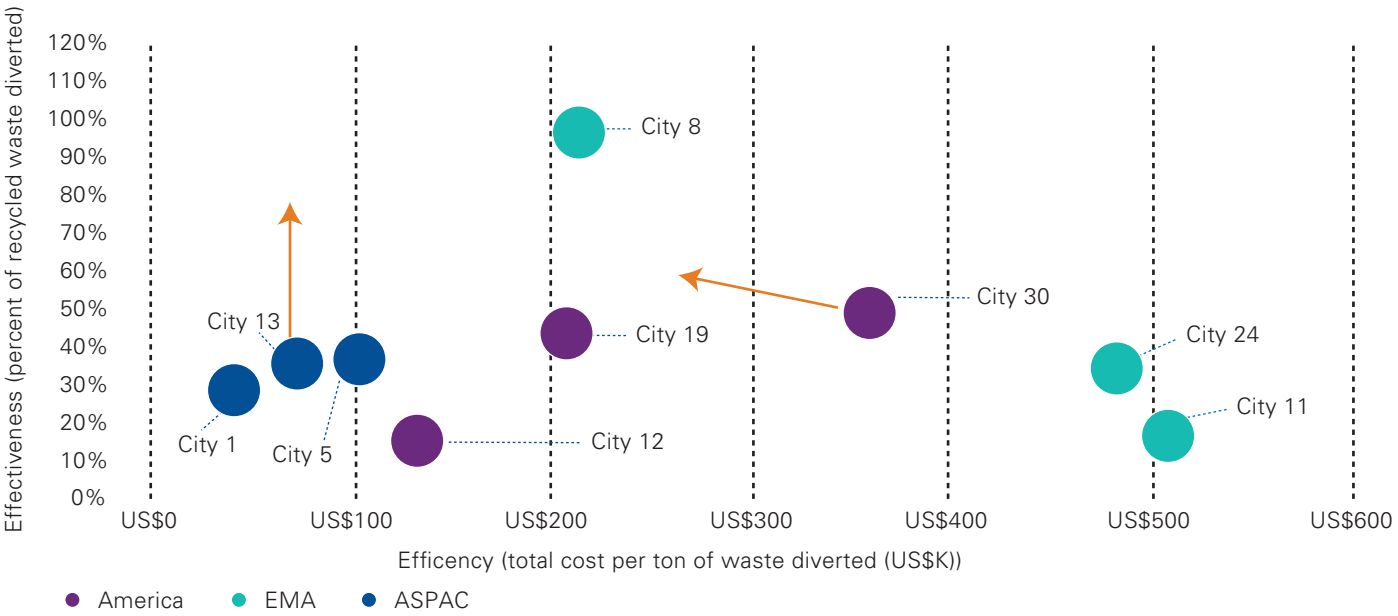
We have combined both the cost per ton of waste diverted (efficiency) and percent of waste diverted (effectiveness) to see how cities are faring with regard to the question of "value for money". The chart below combines the cost per ton of waste diverted (efficiency) with the percent of waste diverted of total waste collected (effectiveness) to demonstrate how cities might present a more compelling picture of performance.

When reviewing the chart, the ideal location is in the upper left quadrant where City 8 is providing a reasonably low cost for an exceptionally high diversion rate.

Cities 1, 13, 5 and 12 are clearly in the preferred location of the graph when it comes to cost but need to work on diverting more waste, while Cities 24 and 11 can reduce costs and increase the amount of waste diverted.

Due to the relative newness of such a graph in municipal circles, we don't yet understand what factors can readily shift a city from its current positioning to a more preferred "value for money" position. However, further knowledge about how to influence service levels will certainly help cities move in the right direction.

Figure 29: Waste diversion — combined efficiency and effectiveness



Q&A with Dirk Vrancken, Director and Head of Facility, Property and Fleet management, KPMG in Belgium

With more than 25 years' experience coaching and supporting facility, property and fleet management, Dirk has deep experience working with public and private waste authorities to help improve efficiency and enhance effectiveness of waste, diversion and recycling systems.

Q: In your experience, why might costs for waste diversion vary between cities?

A: On the collection side, waste diversion costs are influenced by many factors, such as road conditions, congestion, oil prices and labor costs. But they are also influenced by the types of materials that are accepted within the program. Large appliances and electronics recycling often costs more than paper and aluminum recycling. Those with larger, more inclusive programs will therefore likely see higher costs.

Q: How might authorities drive greater adoption of recycling and waste diversion programs?

A: I think we need to start thinking about how we reward and incentivize good behavior and habits amongst the population. Today, most cities employ negative incentives to encourage diversion — fees for garbage or fines for infractions — rather than creating positive incentives that help shift public perceptions. People should want to recycle, not feel that they are forced to.

Q: Can public engagement drive down costs?

A: Absolutely. Putting aside the obvious scale advantages that would come with greater volume, public engagement is also critically important when making changes to existing programs and services. A growing number of cities are moving towards centralized collection points as part of their cost containment efforts and that requires citizens to be engaged enough to collect, sort and transport their own recyclables. This approach would never work without an engaged public.

Q: How might recycling and waste diversion change in the near future?

A: This is going to be one area of city services that will see significant change and disruption over the coming years. Recycling is at the very heart of the so-called circular economy and both governments and citizens recognize that we face a very tough future if we don't get better at recycling and reusing waste. To me, this is one of the most difficult challenges that cities will face as they evolve and develop.

Q: What advice would you offer waste diversion and recycling authorities?

A: There are really three areas that waste diversion leaders should focus on. The first is data; authorities need very clear insight into their efficiency and effectiveness if they hope to achieve continuous improvement. The second is communication; being able to educate and inspire people to participate in the program is key. And the third is performance management, not only through better route planning and collection, but also through improved customer management. ■

Looking to the future: A call to action

By **Stephen Beatty**, Global Head of Cities, KPMG International

If you believe the pundits, the city of the future will be virtually unrecognizable from today's urban constructs.

People will live in massive vertical 'hubs' served by storefront city services; primary health care facilities, garbage collection, power generation, water services, fire, police and social services will all sit right at the citizen's front door.

Outside, vast parks and recreational facilities will replace the urban decay that will occur when new transit technologies make distances between places functionally irrelevant. And people will think nothing of traveling massive distances for work or leisure, essentially creating a global urban network.

This very well may be our future. But it may not. Indeed, nobody truly knows what the future will hold and how cities, citizens and governments will respond. The odds of the above scenario coming true are as likely as any.

But here's what we do know. We know that citizens will continue to demand more effective and efficient city services. We know that governments will need to make difficult and long-lasting decisions about where to invest tax dollars. And we know that new approaches and new innovations will continue to disrupt the status quo.

KPMG member firms' also hope that, in the future, data and analytics will underpin all civic and municipal services. Decisions will be based — not solely on historical data and experience — but rather include real-time operational metrics and accurate demand predictions. City managers will use this data to understand exactly how to influence efficiency and effectiveness measures to meet their objectives. Citizens will use it to decide how they consume and interact with municipal services and infrastructure.

This is a future we can prepare for. But it starts with increasingly sophisticated insight into key efficiency and effectiveness measures. For the short term, the focus will simply be on identifying, supporting and reporting the right efficiency and effectiveness measures. In the medium term, however, cities will need to align and integrate these data points to provide a much more holistic and realistic view of actual performance.

Next steps

KPMG International's first foray into measuring services identified 12 services as the most frequently referenced. Should the next study extend the service coverage? More public services? Add internal services to the mix?

KPMG International focused on one efficiency and one effectiveness indicator. Should the next study expand the indicators?

A critical objective of benchmarking is rooted in service improvement. Should KPMG International spend more time profiling specific city innovations as a point of discovery?

KPMG International sees a 'community of benchmarking cities' emerging as a result of this study where cities conduct in-depth discussion and dialogue focused on services. Is your city interested in participating in such a community?

KPMG International reached out in 2017 to see if cities had the courage to improve — 35 cities stepped forward! Now the question is whether more cities have the courage and commitment to join the early adopters!

We hope this benchmarking exercise and accompanying report catalyzes cities to think more clearly about the way they develop, deliver and measure city services. We hope it inspires city leaders to rethink and reevaluate their current efficiency and effectiveness indicators. And we hope that it creates a platform for cities to share new ideas, innovations and approaches for improving city services.

To discuss the issues raised in this report — or to participate in future KPMG city benchmarking exercises — we encourage you to contact your local KPMG member firm. ■

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About KPMG Cities Global Center of Excellence

Formed in 2012, KPMG's Cities Global Center of Excellence brings together subject matter experts and industry professionals from around the world to share leading practices, knowledge and experience. We're there to help you navigate through the complexity of organizational and legal structures, to find the most effective ways to target key decision-makers with relevant offerings.

Mission: to support sustainable development of cities and effective provision of city services.

Clients: cities, other levels of government that interact with or give cities the mandate to operate their programs and services and private sector firms that work/partner with cities.

Skills: the center is staffed by experienced individuals with in-depth knowledge about how cities operate and how they're governed. We know the programs and services that different cities offer and can identify the key stakeholders.

KPMG professionals' research and knowledge base is extensive. We can respond swiftly to queries on issues as diverse as new infrastructure tenders, policy changes, smart city initiatives and organizational changes like shared services and outsourcing.

KPMG's database supplements local municipal information and research gained from supporting hundreds of engagements worldwide.

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