
Agile Cities

May 2013

THE CLIMATE GROUP



metropolis ●

Technology Strategy Board
Driving Innovation

This is part of
THE CLEAN REVOLUTION

FASTER, SMARTER, GREENER:

The state of city innovation on climate change and other urban challenges

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CITIES MUST BE AGILE – FAST AND FLEXIBLE IN IDENTIFYING CHALLENGES AND IMPLEMENTING SOLUTIONS

EXECUTIVE SUMMARY

Cities have always faced challenges in how they function, grow and provide services to their citizens. Today, however, municipal governments are facing challenges of increasing complexity, including climate change and the need for sustainable, resilient and low carbon development. Dealing with these challenges requires two important shifts within city governments. First, it is now well understood that they must become 'smarter' in using information and communication technology (ICT) as both an enabler and a provider of city services. Secondly, they must also seek to become more 'agile' – faster and more flexible in identifying challenges, and sourcing and implementing new solutions. Smart technology and city agility are interlinked trends – each enabling the other to progress effectively – and both are clear prerequisites for the development of lower carbon, more liveable cities.

This report presents the findings from a survey and case study analysis of 50 diverse cities from around the world who are engaged in efforts to improve their performance through greater agility. The purpose of the research was to better understand how these cities are moving towards greater agility in their formal processes for addressing challenges. In particular, the research sought to understand: **how cities are identifying and communicating their challenges; how they are finding solutions to these challenges; and what barriers they face in implementing these solutions.**

KEY FINDINGS

The challenges cities face:

Environment, economy and mobility are the most frequently identified challenge areas for cities. Within each of these areas, CO₂ reduction, attracting inward investment and increasing the use of public transport rank as the most common challenges, respectively. City size (large vs small) has an important bearing on the ranking of challenges.

Actions cities are taking:

Cities are using a broad range of internal and external processes to identify and validate challenges. Civic participation, stakeholder consultation and internal commissions were frequently cited as mechanisms to identify and validate challenges.

There is no consistent mechanism for cities to source solutions. City webpages, internal communications and public strategic plans are the three most common means for surveyed cities to communicate their challenges. The use of consultants is the most common means of identifying solutions (70% of cities), but less than half of the cities surveyed publish external requests for proposals.

Internal and expert processes dominate evaluation and validation of solutions, with few formal processes to handle unsolicited solutions. Pilot projects, the use of internal commissions and the hiring of experts are used by more than three quarters of cities to evaluate possible solutions to their challenges. Only 14% of the cities surveyed have a formal process to accept unsolicited proposals from solutions providers.

Mobility and energy are the main areas for current solutions delivery. Of 101 project categories offered (across all sectors) in the survey, cities checked an average of 41 project categories each, covering conceptualization through to full deployment. Overall, approximately half of the project categories reported are at implementation stage, and half at some stage of conceptualization, piloting and scale-up.

Efforts to integrate solutions into existing systems are critical but limited. Over 80% of surveyed cities saw the opportunities from addressing their challenges through increased levels of integration of city systems and processes. Some 50%, however, highlighted that this was difficult to do this in practice. Despite the obstacles, nearly two thirds of survey cities reported large scale projects underway that cut across multiple city platforms.

Barriers cities face:

Departmental silos, financing and procurement processes are the main barriers to progress. Other significant barriers included problems with data sharing between city systems and the perceived lack of a credible business model to sustain new technologies.

CONCLUSIONS

Self-aware cities. Surveyed cities are self-aware and mindful of their challenges. This is important and encouraging, since solving any problem first requires the identification and appreciation of it. By being open and honest about their challenges, cities have a better chance of fixing them.

Consultative and open-sourced cities but with room for improvement. The popularity of a variety of open processes for communication, identification and validation, shows that surveyed cities understand the value of consultative and open-sourced engagement. At the same time, however, the continuing use of more closed-door methods for dealing with challenges and sourcing solutions indicates room for improvement.

Cities are embracing smart solutions but real potential is yet to be tapped. The adoption of ICT solutions across the full range of sectors demonstrates that the survey cities see value in these solutions. However, with only around half of current projects fully implemented, the untapped potential appears significant.

Cities understand that systems integration is key to smart city success but support is required. Surveyed cities fully appreciate that integration of systems helps drive efficiency and lower costs. They are taking steps to make this happen but are looking for help to make it work in practice.

Implementing new smart solutions ultimately requires addressing old and familiar barriers. Institutional inertia, finance, politics and people remain as important barriers to change as understanding how to integrate and use new technologies.

**OVER 80% OF SURVEYED
CITIES SEE THE
OPPORTUNITIES FROM
INCREASED SYSTEM
INTEGRATION**

Fragmented marketplace combined with lack of 'listening ability' affects good strategic decision making. Cities and solution providers are still trapped in a mismatch of communication due to a fragmented market and underdeveloped city processes for articulating challenges and receiving new ideas. This means that the right knowledge is not always available to make good strategic decisions.

Lack of trust increases perceived risk in innovation. Cities remain reliant on known and trusted solution providers at the expense of adopting new innovative solutions.

RECOMMENDATIONS

The report makes recommendations in three key areas of city government responsibility. We believe that cities should:

Apply leadership

- Champion the smart/agile city agenda at the leadership level.
- Establish senior leadership roles (e.g. Chief Innovation Officer) and cross-cutting innovation task forces for driving smart/agile city programs.
- Set city targets to act as drivers for innovative solutions.

Standardization of procurement

- Support the development of standards and certification schemes to make it easier to assess and offer smart solutions.
- Ensure a standard, transparent procurement process is in place across all departments.

Foster innovation

- Provide open access to key city datasets for internal and/or external developers.
- Provide reliable and timely feedback to solutions providers.
- Participate in validating and evaluating solutions and project references and make this information available to other cities to develop trusted market information.
- Ensure departments have the skills, knowledge and capacity to understand and work with innovative solutions and companies.

CITIES MUST LOOK HOLISTICALLY AT THEIR OBJECTIVES ACROSS A WIDE RANGE OF SERVICES

AGILITY IS EMERGING AS A CLEAR PREREQUISITE FOR LOW CARBON CITIES



BOX 1. THE POTENTIAL OF SMART ICT IN CITIES

The ability of ICT to drive dramatic productivity improvements through an economy is now well established. With technology continuing to become smarter and cheaper, the application of ICT solutions has also grown. In 2008, for example, The Climate Group and Global e-Sustainability Initiative (GeSI) *SMART 2020* report³ looked at the value of ICT specifically as a tool to reduce GHG emissions by 2020. It found a 7.8 gigaton (Gt) opportunity, valued at €600 billion (US\$790 billion) a year. A 2013 update report⁴ from GeSI, *SMARTer 2020*, increased this estimate to 9.1 Gt in GHG and US\$1.9 trillion in financial savings. The opportunities fall mainly in areas of energy efficiency, energy conservation and dematerialization, including smarter grids, buildings and logistics.

The ICT sector continues to push the boundaries on what is possible. Today, we are increasingly able to create, manage and store large datasets – so-called ‘big data’. We can collect data that make it possible to track and predict the behavior of people and systems in ways that were not possible just a few years ago. Using these data to create services such as pollution mapping or real time traffic information provides entirely new options for cities to improve the efficiency of their various infrastructure and service systems. It also drives down costs for cities and their businesses and citizens. Combining ‘big data’ with ICT offers cities the smart tools for dealing with the complex and interconnected problems they are increasingly required to address, whether in buildings, transportation, public health or elsewhere. And with local governments accounting for US\$4.5 trillion⁵ in annual global public procurement spending, cities have market-defining clout.

INTRODUCTION

This is the urban century. Today, more than half of the world’s population lives in cities. By the middle of the century more than two thirds of us will. But such growth comes with corresponding challenges. Sustainable job creation, efficient transportation and the urgency of dealing with climate change are just some of the complex issues that cities must deal with as demographics shift, resources become scarcer and extreme weather events increase. Dealing with these challenges will require the application of ‘smart’, low carbon technologies in combination with smarter, more agile city management.

THE IMPORTANCE OF SMART CITIES

It is estimated that the rapidly developing information and communications technology (ICT) sector has the potential to enable a 9.1 gigaton reduction in global greenhouse gas (GHG) emissions by 2020¹ compared to ‘business as usual’. Solutions to unlock this potential in other sectors include smart applications for managing power grids, buildings and logistics systems, or for ‘dematerializing’ products and services (for example, shifting from DVDs to movie downloads).

With more than 3 billion people within their jurisdictions, cities hold the key for much of this potential. Success will be determined by how effectively cities integrate ICT into the urban systems they control. While the emergence of ICT has added some complexity to city systems by multiplying the information that can be collected and processed, it has also offered increased public participation in government, as well as previously unimagined solutions to complicated and interdependent problems (see Box 1).

AGILITY FOR A SMART CITY FUTURE

The journey from here to the ICT-enabled, ‘smart’ city of the future is by no means straightforward. Two critical shifts in how cities approach their challenges and implement their solutions must take place.

First, in order to unlock low carbon potential, it is now well understood that cities must become ‘smart’ at harnessing ICT. In the cross-cutting world of open data, sensors and smart control systems, they must be able to look holistically at their objectives across a wide range of services such as mobility, waste management, emergency services, lighting and energy. To do this requires co-ordinating the procurement and roll-out of smart sensors, meters, controls and networks. And cities must also be able to open up access to their data sets to in-house or external developers, to create the ‘information marketplaces’ that will deliver new and innovative services for citizens.²

Second, cities must seek to become more ‘agile’ – to redesign the process of connecting real urban challenges to the best solutions available. Being agile means speeding up the identification, validation procurement and integration of new innovations that might otherwise fall through the net of large, centralized public procurement systems. In this process ICT is an enabler as well as a potential solution. It provides supporting tools and services to streamline stakeholder consultation and to better connect city challenges to solutions providers.

So, in order to become low carbon, cities must first become more agile. This is not to say that agility automatically leads to lower carbon – indeed for this to happen cities must also prioritize climate targets, and supportive national policy is required – but agility is emerging as a clear prerequisite for low carbon city success (see figure overleaf).

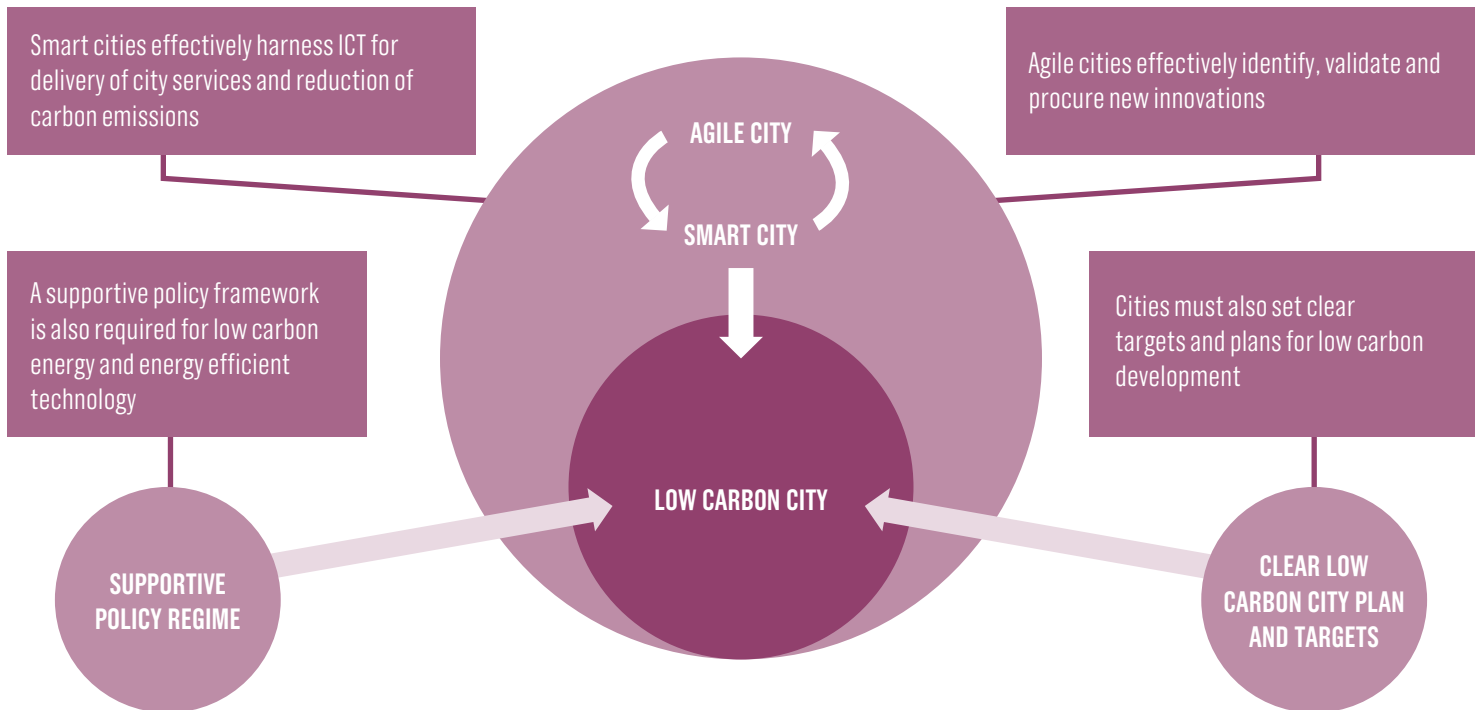
¹Global e-Sustainability Initiative (2013) *SMARTer2020* <http://gesi.org/SMARTer2020>

²The Climate Group, Arup, Accenture & Horizon (2012) *Information Marketplaces* <http://www.theclimategroup.org/what-we-do/publications/information-marketplaces-the-new-economics-of-cities/>

³The Climate Group & GeSI (2008) *Smart2020* http://www.smart2020.org/_assets/files/02_Smart2020Report.pdf

⁴GeSI (2013) *SMARTer2020* http://gesi.org/assets/js/lib/tinymce/jscripts/tiny_mce/plugins/ajaxfilemanager/uploaded/SMARTer%202020%20-%20The%20Role%20of%20ICT%20in%20Driving%20a%20Sustainable%20Future%20-%20December%202012._2.pdf

⁵<http://agilecities.org/about-new/>



THE COMPONENTS OF CITY AGILITY

In this report we therefore focus on the processes by which leading cities are developing agility. It builds in part on earlier research that shows the value of creating information marketplaces in cities (see Box 2), and presents findings from a survey of 50 cities from around the world that are already engaged in becoming both more 'agile' and 'smart'. The survey sought to understand the challenges of these self-selected cities, the actions they were taking to address them (including through the use of smart ICT solutions) and the barriers they faced in doing this. Solving these challenges holds the key to establishing the smarter, lower carbon cities of the future.

BOX 2. THE VALUE IN BUILDING INFORMATION MARKETPLACES

In 2011, the *Information Marketplaces report*⁶ from The Climate Group, Arup, Accenture and Horizon, looked at the value to cities of investing in digital infrastructure – the means to collect and manage data. It found that by unlocking technology, infrastructure and public data, cities can open up new value chains that spawn innovative applications and information products that make city living and working better – and more sustainable. These information products result from a value chain starting from raw data collection (e.g. daily commuter numbers) to mobile or physical networking infrastructure (e.g. city broadband) to software development (e.g. smartphone apps).

The report showed that creating a marketplace for these information products holds enormous opportunities: they help uncover a 'surplus city' of value yet to be captured for citizens. Establishing functioning information marketplaces requires more than simply providing effective broadband coverage, and opening up city data is a critical step. The value chain needs to be supported so that an ecosystem of service and solution providers can be established. City governments have a key role to play in this in the same way they support other local industries.

The report makes a number of recommendations, including establishing appropriate systems and targets for driving the collection of data and making it publicly accessible in order to be fed into the value chain. It calls for the appointment of Chief Information Officers (CIOs) to identify innovation challenges and to create city strategies for managing big data. It also recommends procurement policies that support small businesses (SMEs) in recognition of their key role in creating information products.

⁶The Climate Group, Arup, Accenture and Horizon (2012) *Information Marketplaces* http://www.theclimategroup.org/_assets/files/information_marketplaces_05_12_11.pdf

ABOUT THE SURVEY

This report provides a snapshot of key findings from Phase I of the Agile Cities project, a six-month research program looking at the challenges, actions and barriers around city procurement processes, involving 50 global cities and 125 solutions providers (see graphic below for a list of cities). Research includes a detailed quantitative Survey that aims to provide a better picture of cities in three broad areas:

- The main economic, environmental and social **challenges** cities are facing.
- The **actions** cities are taking today to
 - identify their challenges;
 - find solutions to their challenges; and
 - integrate solutions smartly.
- The **barriers** that cities face in scaling up smart solutions.

The survey was developed in partnership with Citymart.com and the UK Technology Strategy Board with inputs from survey cities. It will be supplemented over the coming months by 30 individual city case studies, based on desktop research and detailed interviews with city practitioners from Africa, Asia, Europe and North America. A number of abbreviated case studies are also presented in this report to provide context for the survey findings and highlight areas of best practice within the survey group.

Alongside the questions to cities, we also asked service providers to comment on their experience of 'selling' to cities. Many of them are smaller businesses that are developing innovative city solutions.

SURVEY LIMITATIONS

The survey provides important insights from a broad range of international cities, which vary in size, geographical location and level of socio-economic development. However, the small sample size, selection bias towards self-defined leaders, as well as language interpretation challenges, means that this report represents a snapshot of views among leading cities rather than a comprehensive assessment of global smart city development. We will continue to supplement the findings of the survey through the production of more detailed case studies which will be posted on the [Agile Cities](#) and The Climate Group's [Clean Revolution](#) websites in the next few months, followed by updated conclusions and recommendations.



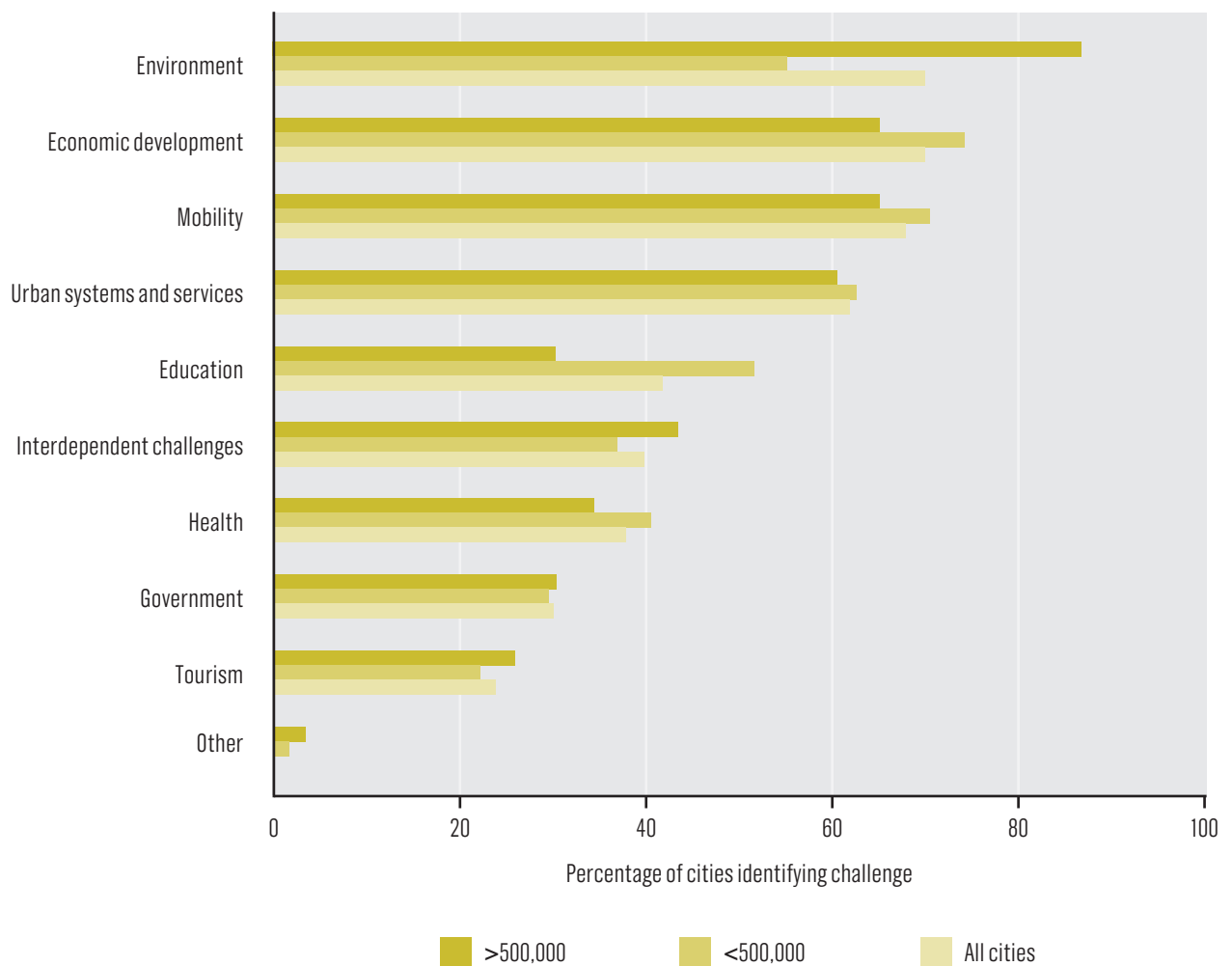
KEY FINDINGS

I. THE CHALLENGES CITIES FACE

Key finding 1: Environment, economy and mobility are the most frequently identified challenges

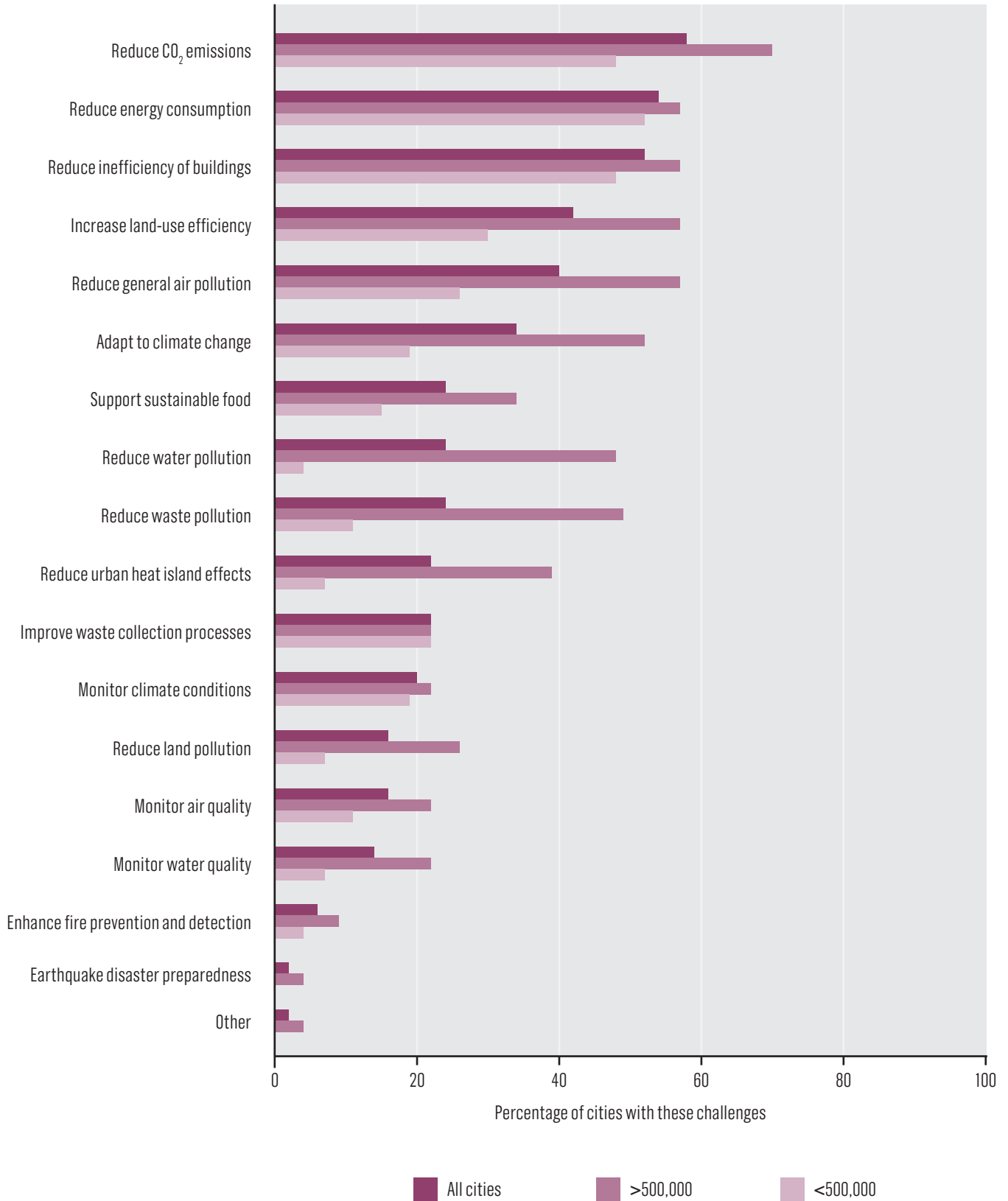
Across the 50 cities surveyed, environmental, economic and transport challenges were most frequently cited in their priority lists (see Figure 1). Environmental challenges were most frequently cited by larger cities (87% of cities over 500,000 people). For smaller cities, economic development was the most frequently identified concern (74% of cities less than 500,000 people). Regardless of city size, mobility challenges also ranked highly for most cities, selected by 68% of cities overall and perhaps reflecting transportation's critical role as the skeletal system of urban areas.

FIGURE 1. Top-line challenges for survey cities



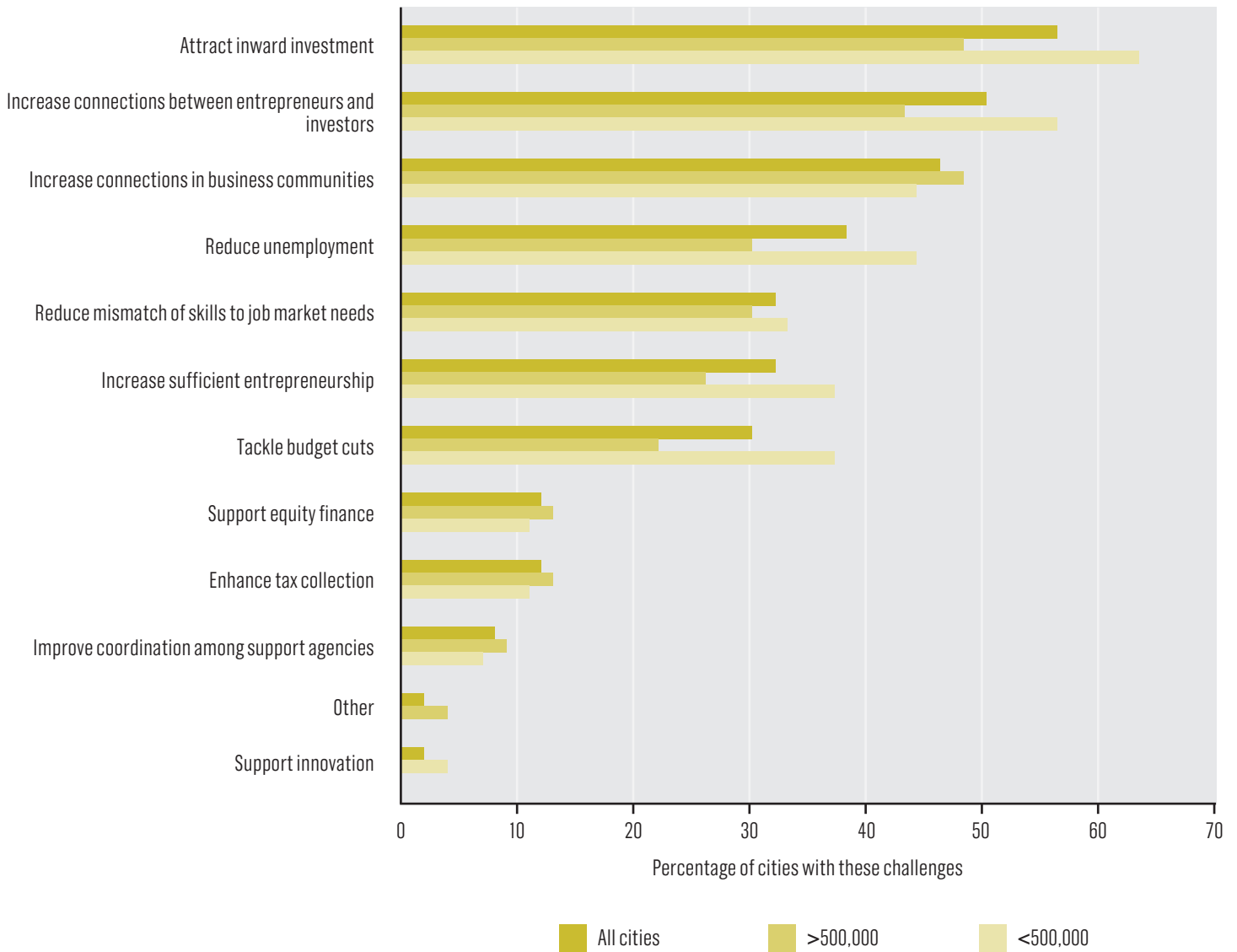
A more detailed breakdown of cities' environmental, pollution and climate change challenges (Figure 2) shows that reducing CO₂ emissions is the most frequently cited issue in this category, particularly among larger cities where 70% of respondents selected it. The related challenges of energy reduction and buildings efficiency also ranked highly. For the remainder of environmental challenges surveyed, there was often discrepancy between larger and smaller cities, with larger cities more frequently identifying specific environmental issues as a challenge. This likely reflects the more significant environmental challenges faced by larger cities, such as air pollution and 'urban heat island effect'.

FIGURE 2. Breakdown of environmental, pollution and climate change challenges



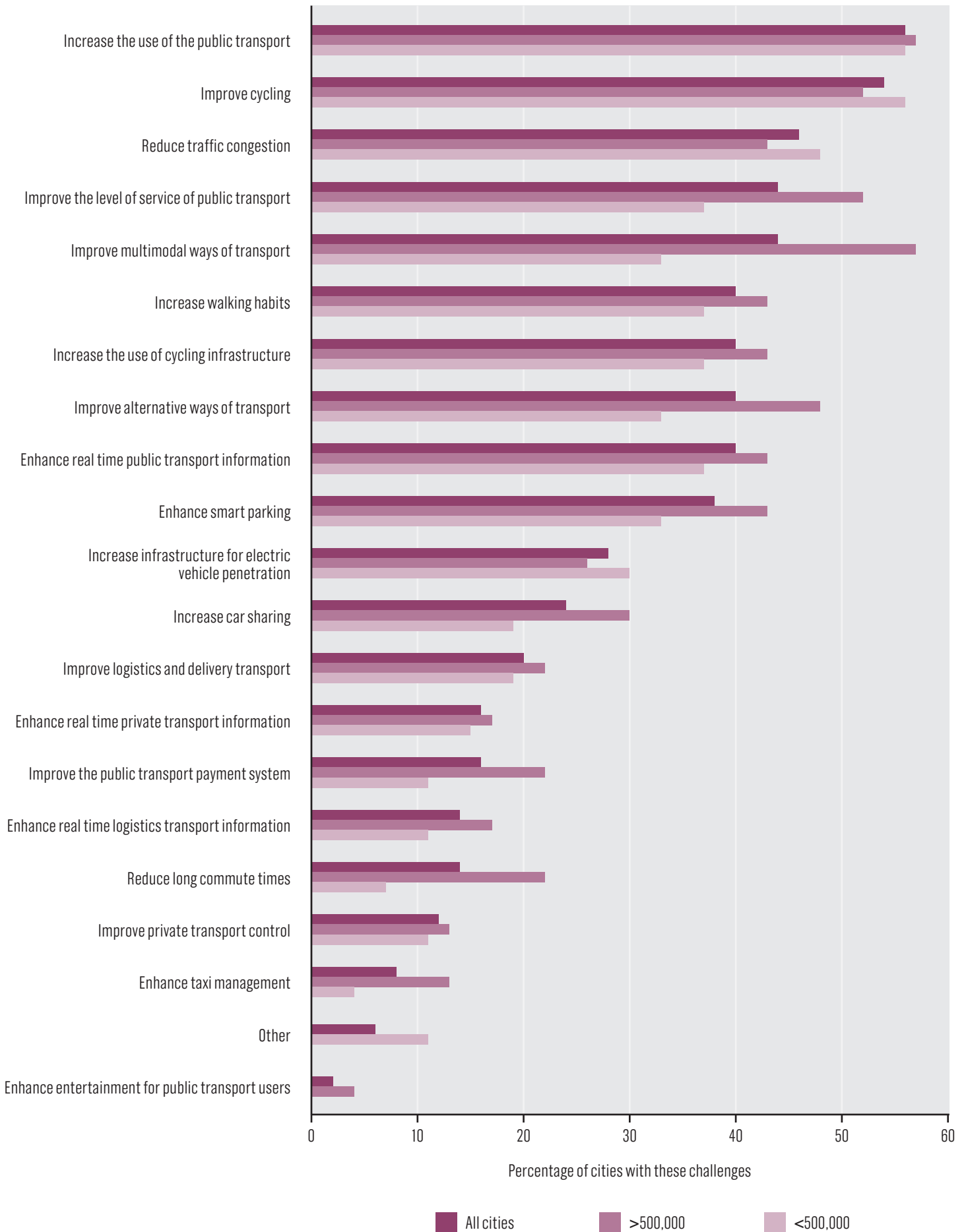
Examining cities' perceived economic development challenges in more detail (see Figure 3), it appears that smaller cities are more likely to place emphasis on the basics of economic development. This includes such things as attracting investment, reducing unemployment and improving connectivity between investors and businesses, and between businesses in the city.

FIGURE 3. Breakdown of cities' economic development and jobs challenges



In the area of mobility (Figure 4), cities most frequently selected challenges around improving use of public transport, cycling and walking, reducing traffic congestion and increasing citizens' ability to use multimodal transport to move around the city (all selected by 40-60% of survey cities). Measures around electric vehicles, logistics and improved information systems were less frequently cited, picked out by less than a third of cities in each case.

FIGURE 4. Breakdown of cities' mobility challenges



II. ACTIONS CITIES ARE TAKING

Key finding 2: Cities report using a broad range of internal and external processes to identify and validate challenges

We explored the processes that cities use to identify their challenges. In order for cities to adopt new, innovative solutions they must first define and disclose their most important challenges to the community of potential solutions providers. The survey showed that cities are using a wide range of approaches to identify and validate their challenges (Figures 5 and 6 respectively), with civic participation, stakeholder consultation and internal commissions frequently cited. This was backed up by case study research which highlights a number of examples of cities actively engaging citizens (Amsterdam, Kansas City), businesses (Helmond), regional city networks (Spain) and integrating city data (Birmingham, Glasgow) (see Box 3).

FIGURE 5. How are city challenges identified?

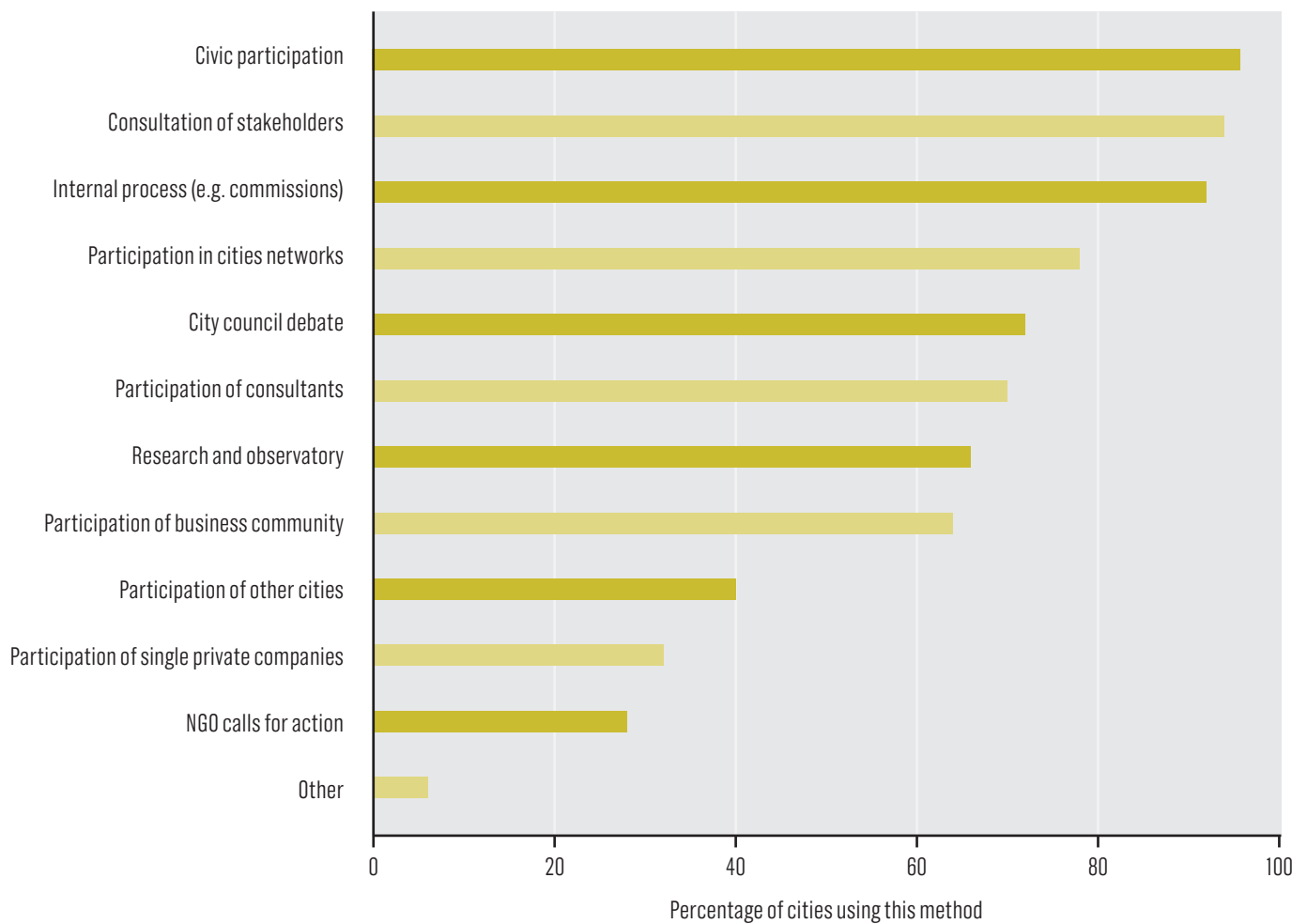
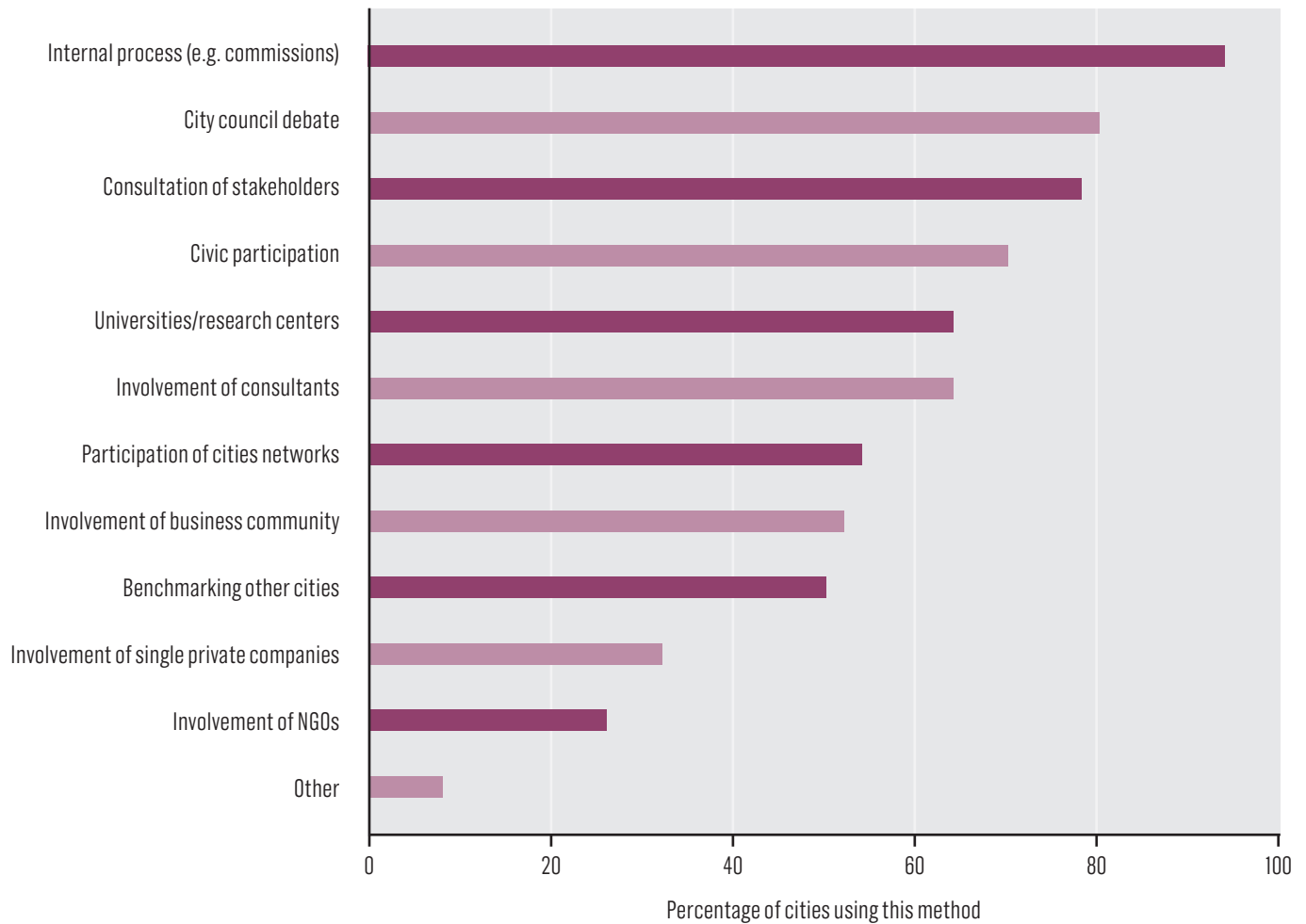


FIGURE 6. How are city challenges validated?

**BOX 3. HOW ARE CITIES IDENTIFYING CHALLENGES?****Engaging citizens: Amsterdam (Netherlands), Kansas City (USA) and Ottawa (Canada)**

The Amsterdam Smart City (ASC) partnership between business, authorities, research institutions and citizens spoke to 8,000 residents to understand the city's challenges and develop interventions. Many findings were unexpected, including the need for mobile phone charging facilities for the homeless. ASC's 'Climate Street' consultation with 140 small business owners led to the development of movement-activated low energy lighting that transformed the streetscape.

In 2006, Kansas City implemented a central city service enquiry phone number alongside a relationship management software (CRM) system. City managers use CRM data alongside customer surveys to assess the effectiveness of city services. The data is reviewed weekly to identify issues of most concern to citizens.

Open city data has also been championed by the city of Ottawa in Canada. Ottawa's citizens were asked to submit and prioritize the city data they would like access to. City departments were then asked to release data based on this prioritization and ease of data access.

Engaging industry: Helmond (Netherlands)

In Helmond, an automotive sector roadmap enabled a 20-partner business cluster to develop technologies to avoid traffic jams, make cars safer and reduce CO2 emissions. The roadmap allowed the city to focus resources, with the city government stepping in to provide a dedicated stretch of operational motorway for testing. It has also supported the testing of 'green wave' traffic lights to improve traffic flow, and has taken leadership in trialing intelligent systems in emergency service vehicles so that traffic lights respond to their needs.

Participating in city networks: Red Espanol de Cuidades Inteligentes (Spain)

Spain's Smart City Network, the Red Espanol de Cuidades Inteligentes (RECI), was formally constituted in June 2012. The network consists of 29 cities led by the Mayor of Santander and is supported by the Spanish Federation of Municipalities and Provinces, Fundatec and Telefonica. The network supports knowledge sharing, capacity building and best practice development, through five core working groups, as well as external events in which other cities and businesses can participate. According to the city of Alcorcon, participating in RECI and other smart city forums has already helped boost internal interest in, and understanding of, the potential of smart cities. The political importance of RECI has also been highlighted; visible commitments made through RECI by all major Spanish cities attracted national media attention and increased relevance of the issue for politicians.

Integrating city data: Glasgow and Birmingham (UK)

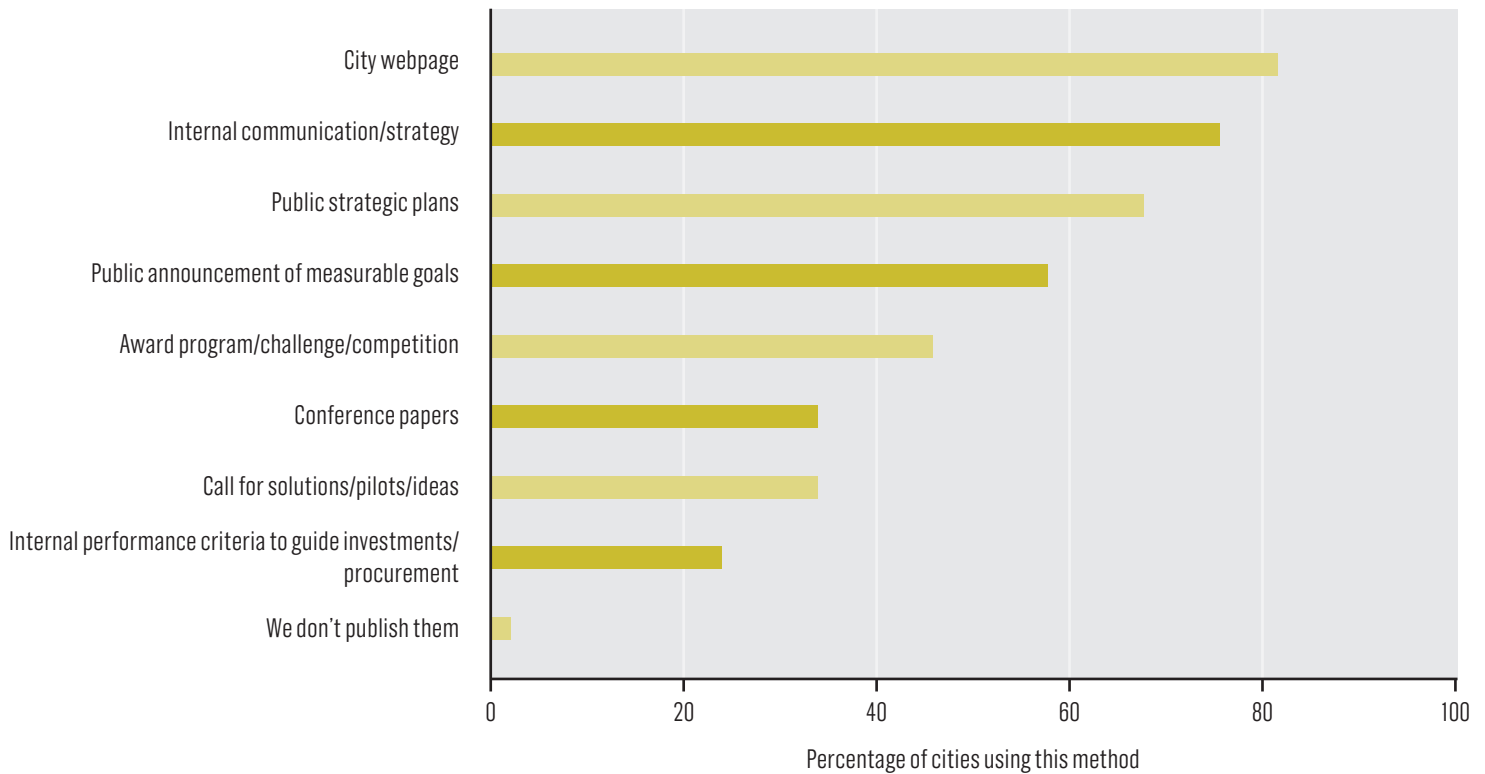
With 28% of Scotland's households in fuel poverty⁷, improved energy services are a key issue for Scottish cities like Glasgow. The city council worked with Strathclyde University to develop a data-based approach to diagnosing and targeting energy issues. This included carbon emission density mapping for the city and overlaying this data on maps of land use, tenure, investments and energy systems to identify areas with greatest improvement potential.

Birmingham's Smart City Commission aspires to create a centralized data platform and is exploring how to bring existing data sets together. It is developing an online digital property log of all social tenants (making up nearly 30% of Birmingham's population) and linking this to energy data metering and a £1.5 billion (US\$2.4 billion) investment retrofit program. In addition, the council is collating data to help troubled families as part of a national pilot, and aims to examine how data from health service commissioning can be used to benefit citizens and design new, more effective services.

Key finding 3: No consistent mechanism for cities to source solutions

Once cities have identified and characterized their main policy and service delivery challenges, they must effectively identify solutions to address these. We surveyed our cities on the mechanisms they used to communicate their challenges to potential solutions providers, how they discovered potential solutions and how they issued specific requests for proposals.

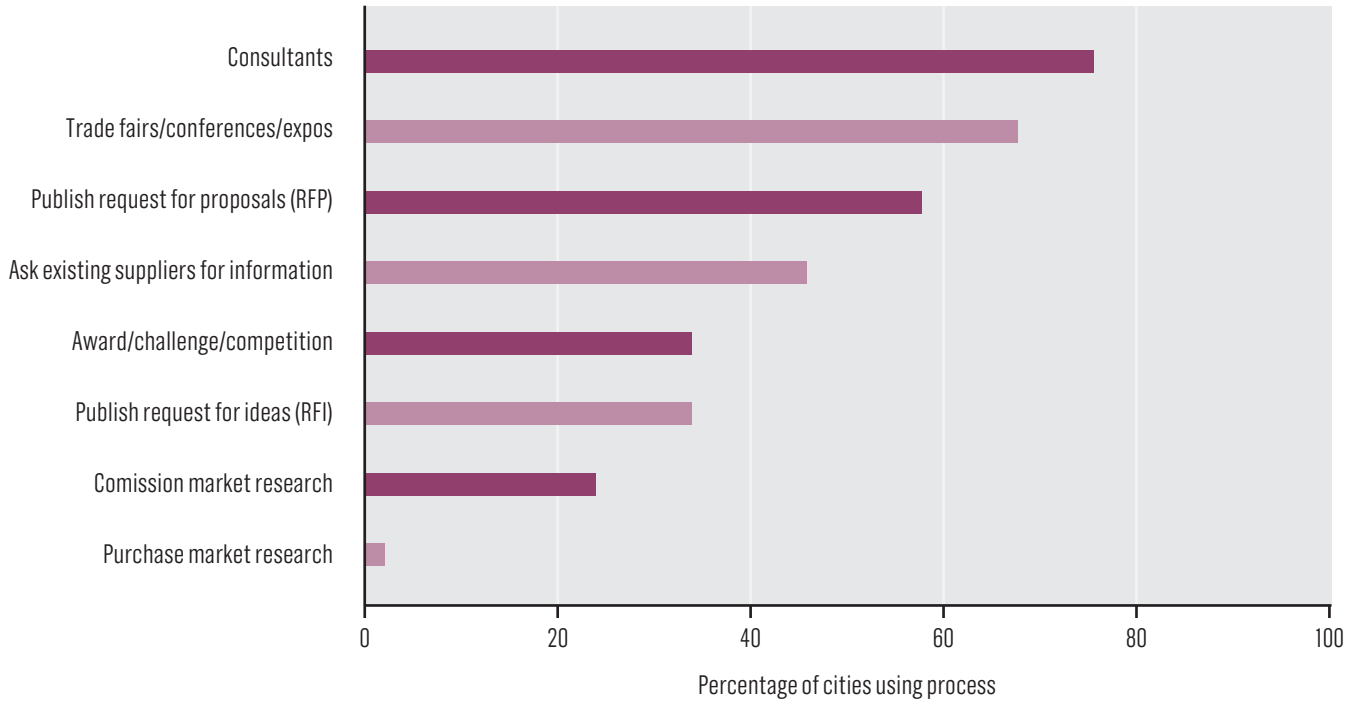
⁷<http://www.scotland.gov.uk/Topics/Statistics/Browse/Housing-Regeneration/TrendFuelPoverty>

FIGURE 7. How does your city communicate its challenges?

City webpages, internal communications and public strategic plans are the three most common means for surveyed cities to communicate their challenges to stakeholders (Figure 7). It is worth noting that while more than 80% of cities indicated that they publish their challenges online, a brief review into the accessibility of cities' online information, together with anecdotal feedback from suppliers, indicates that it is frequently not easy for solutions providers to find the information required and establish connections with cities.

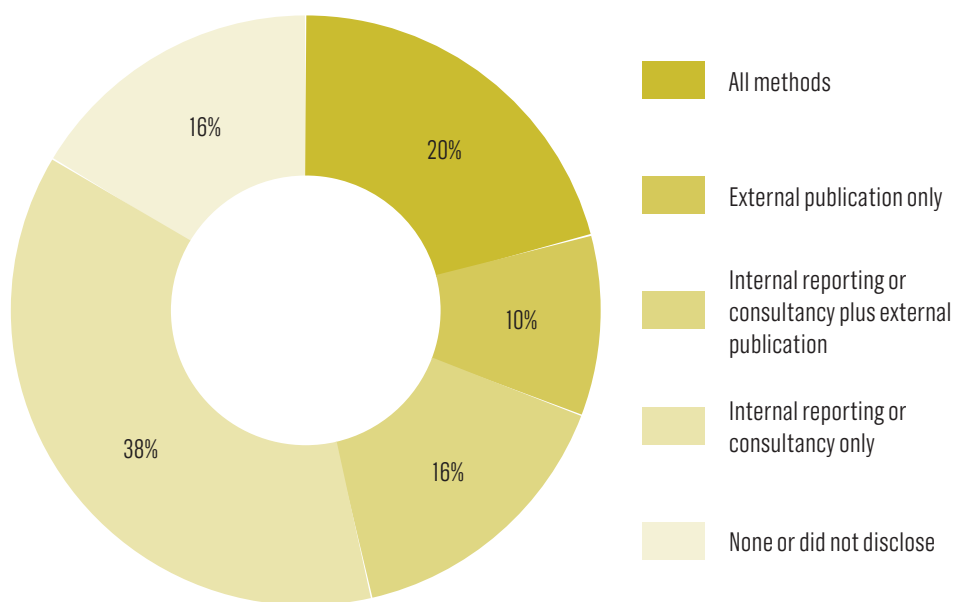
Our survey showed that consultants are also used by over 70% of cities in helping to find the solutions to their challenges (Figure 8). The use of trade fairs, conferences, and requests for proposals (RFPs) are the next most common approaches but are used by significantly fewer cities (between 50-60%). Less than a quarter of cities purchase market analysis data to help identify solutions (Figure 8).

FIGURE 8. Processes used by cities to identify solutions to challenges



Of the cities surveyed over half did not externally communicate requests for proposals (Figure 9), highlighting the challenges faced by new, smaller businesses in responding to city challenges even within this group of engaged cities. Some 38% of cities relied on internal reporting or consultancy only, while 16% said they had no process in place or did not disclose. Cities actively working to streamline procurement processes include Lavasa and Amsterdam (Box 4).

FIGURE 9. How are cities communicating requests for proposals (RFPs)?



BOX 4. HOW ARE CITIES STREAMLINING PROCUREMENT?

Streamlining procurement through business development: Lavasa (India)

Lavasa’s Business Development department brings businesses into the city from sectors including education, tourism and health. In sourcing new products the department works with the city’s environment team to assess benefits, find quotations and review procurement logistics. Reports are presented monthly to heads of department and the president before being elevated to the board of governors. This process helps bypass departmental procurement procedures, streamlining the route to implementing solutions.

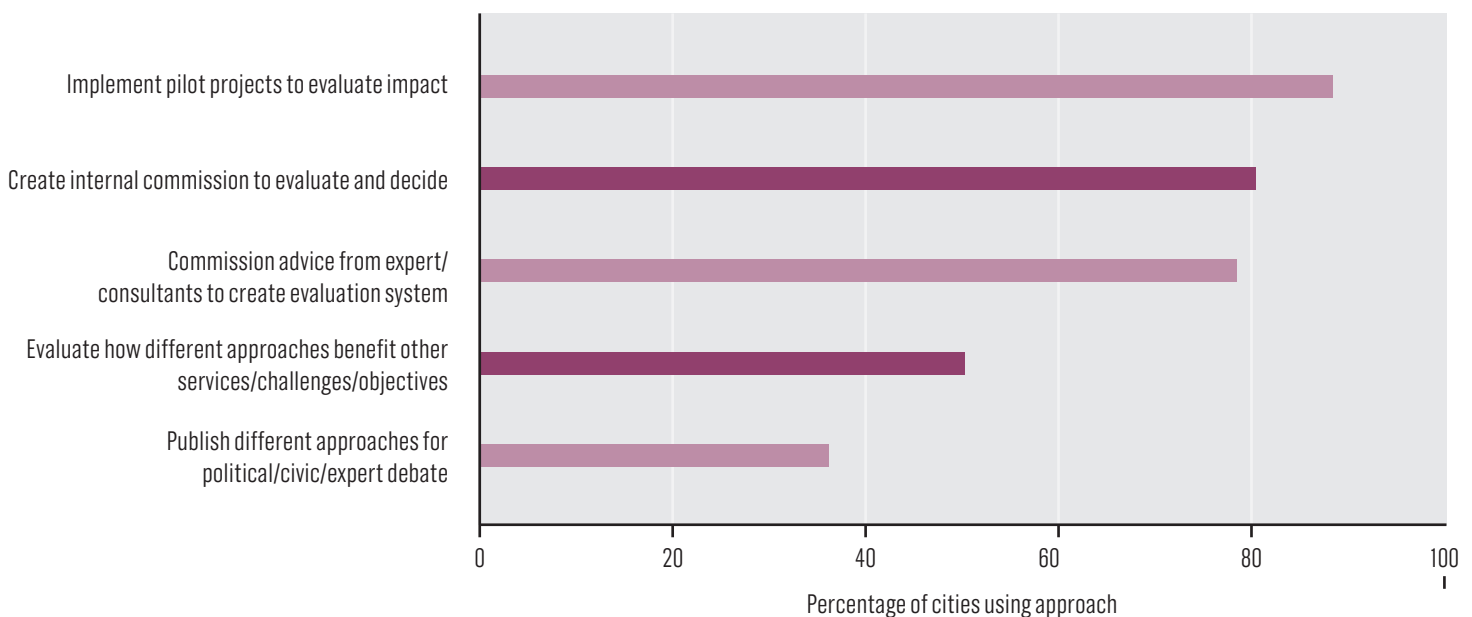
Refocusing supplier relationships: Amsterdam (Netherlands)

Amsterdam works to ensure that prospective suppliers deal with only one city contact, and that partnerships are backed up by sustainable long-term business models. The need for long-term models is illustrated in the city’s ‘Car to go’ EV rental service pilot, where users can drop their electric car anywhere in the city and Amsterdam provides the electricity and car parking. However, the cars were donated by Daimler Benz who may not be renewing their gift. If either the city or Daimler decides to charge for the service at any time, the project could fail. While this pilot was large scale, it wasn’t based on a future profitable business model; now a priority for Amsterdam.

Key finding 4: Internal and expert processes dominate evaluation and validation of solutions, with few formal processes to handle unsolicited solutions

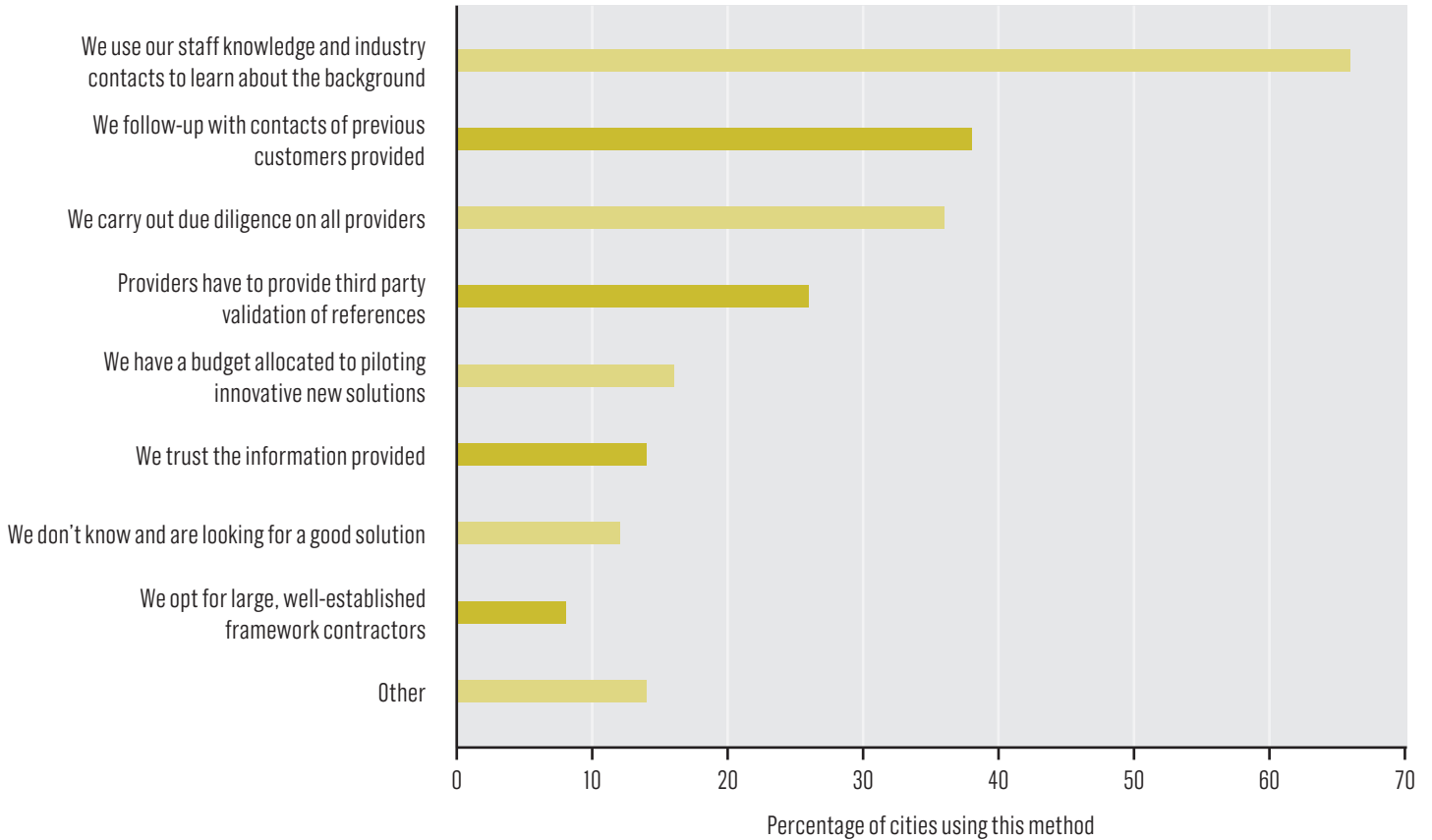
Upon sourcing proposals from solutions providers, pilot projects, the use of internal commissions and the hiring of experts are used by more than three quarters of cities to evaluate possible solutions to their challenges (Figure 10). Half of the cities said they factor in the benefits and challenges for other city services from a proposed solution. Only around a third of surveyed cities publish these approaches for external debate, however.

FIGURE 10. How does your city evaluate different approaches to solving its challenges?



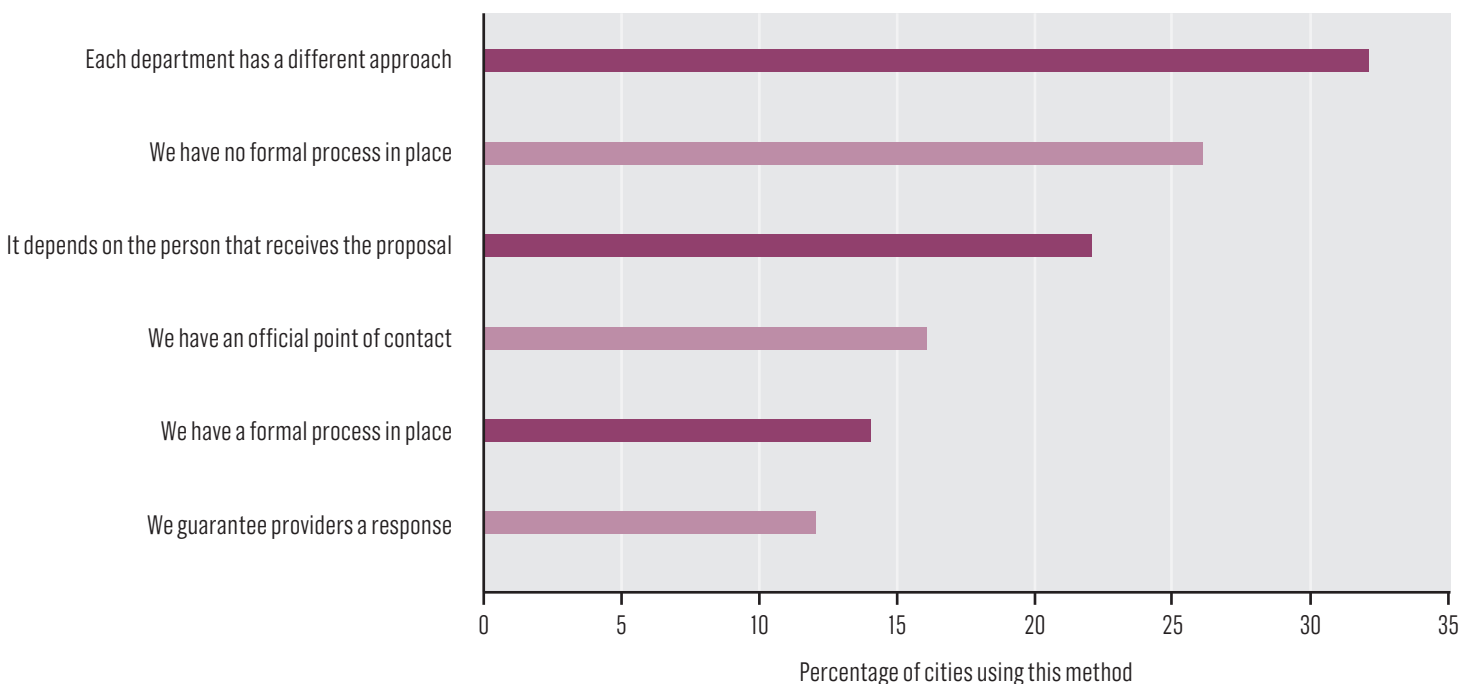
The majority of cities (around two-thirds) use internal staff expertise and industry contacts to validate the track record and competence of solution suppliers (Figure 11). Less than 40% check with previous customers of the supplier or conduct a formal due diligence process.

FIGURE 11. How do you validate supplier references to establish a track record and competence?



Only 14% of the cities surveyed have a formal process to accept unsolicited proposals from solutions providers (Figure 11). The remainder are potentially underutilizing new ideas and valuable capacity-building information from SMEs and larger corporates alike. Two cities that are leading the way are Toronto and Barcelona, the latter working in partnership with Citymart.com (see Box 5).

FIGURE 12. Methods used by cities to handle unsolicited proposals



OVER 85% OF SURVEY CITIES USE CIVIC PARTICIPATION TO IDENTIFY CHALLENGES

BOX 5. HOW ARE CITIES APPROACHING EVALUATION AND VALIDATION OF SOLUTIONS?

Developing a comprehensive search and evaluation system: Toronto (Canada)

The city of Toronto in Canada has created a system to search between innovation and project teams, to identify the skills shared between them on outreach, technology and validation. The city then develops evaluation systems drawing on specialist knowledge of the various teams.

City challenges: Barcelona (Spain) and Citymart.com

BCNI Open Challenge is a new program to open up the city administration and services to businesses and entrepreneurs, delivering solutions that can transform and improve public services, create a more inclusive city, accelerate innovation and leverage public spending more effectively to deliver better services. Announced in May 2013 by the city of Barcelona and Citymart.com, the challenge consists of three actions: a call for businesses to present innovations that can improve the quality of services in the city backed by a commitment to implement the best innovations; the creation of a €1 million Innovation Fund to support municipal procurement and implementation; and incentives to winning companies including space, tax breaks, support services and certified references.

BOX 6. THE VIEW FROM THE OTHER SIDE: THE IMPORTANCE OF INDEPENDENT VALIDATION TO SMES

As part of the Agile Cities research program, Citymart.com carried out a survey of 125 businesses providing smart solutions to cities. Small and medium-sized enterprises (SMEs) made up nearly 75% of respondents. The aim of the survey was to better understand the challenges facing SMEs in selling their products to cities, particularly with respect to the validation of an SME's track record and project references. The main findings of the survey were:

- Nearly 70% of the businesses surveyed agreed that third party validation of their track record and project references would help improve their chances of winning new business with cities.
- Cities and national governments were identified as the most respected bodies for providing third party validation. Validation from other stakeholders engaged in projects, from internationally recognized experts and from international government bodies also ranked highly.
- The median number of requests for proposals (RFPs) responded to by surveyed businesses was 30 a year. However, over 100 proposals a year are submitted by 44% of businesses, with many of these being SMEs.
- Businesses submitted an average of five project references per RFP response.

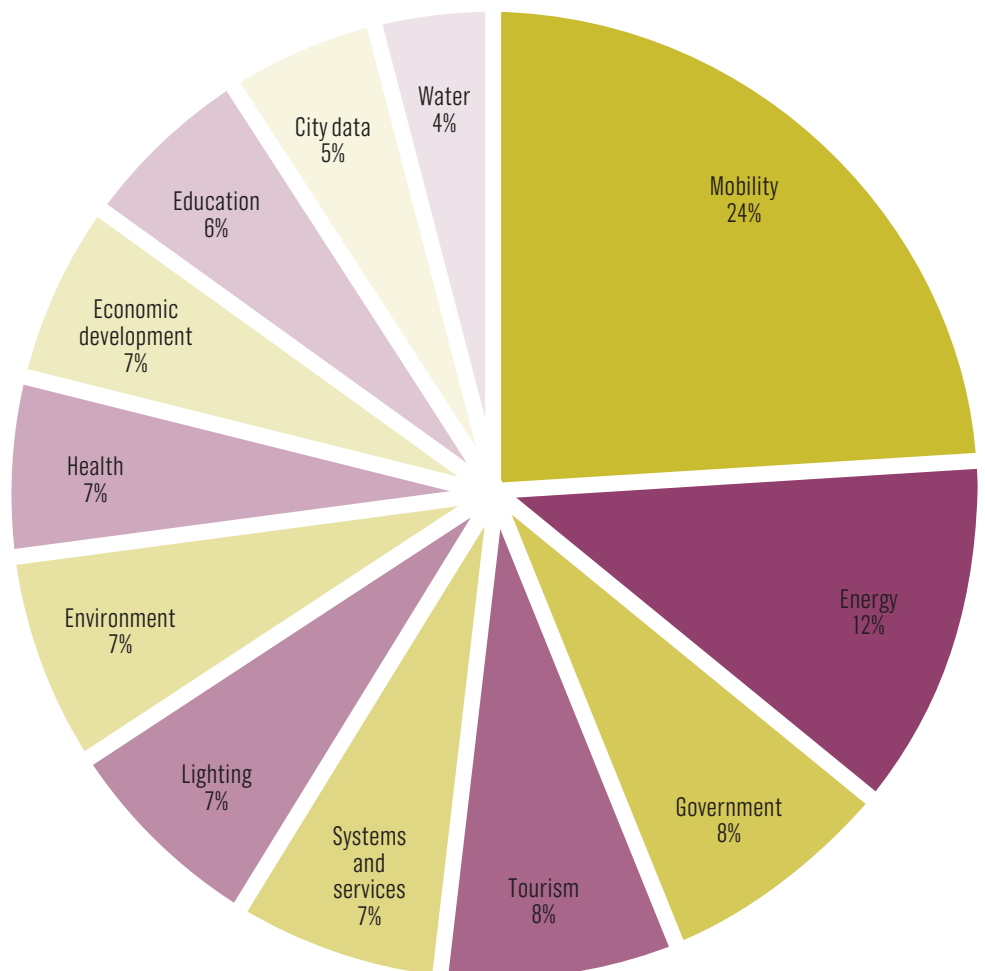
These findings support the need for more streamlined city procurement processes, and standardization of the validation process to reduce the administrative burden on SMEs in the tendering process.

50% OF SURVEY CITIES FACTOR IN THE IMPLICATIONS FOR OTHER CITY SERVICES FROM A PROPOSED SOLUTION

Key finding 5: Mobility and energy are the main areas for current solutions delivery

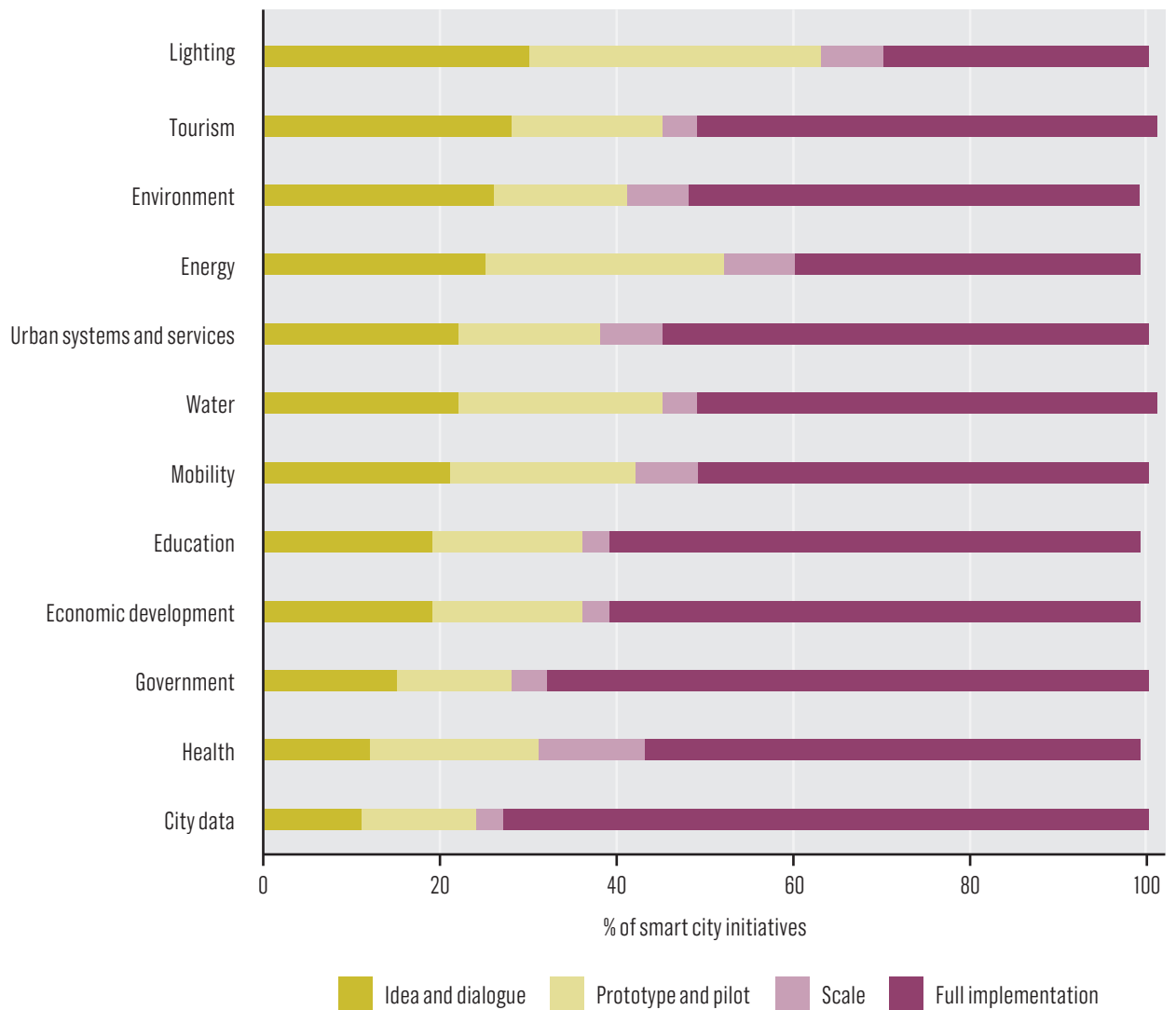
Surveyed cities are already implementing a range of smart solutions, with initiatives in various phases of development from initial dialogue through to full implementation. Figure 13 highlights the key sectors where these investments are being made. Of 101 project categories offered to cities participating in the survey, cities checked an average of 41 project categories each, covering conceptualization through to full deployment (note that this potentially double counts integrated projects covering more than one category of solution). Mobility, energy and government sectors comprise the top three areas. Figure 14 presents the breakdown of the project 'pipeline' for each category of solution, from idea development to full implementation. The highest proportion of early stage project development to full implementation appeared in lighting, likely reflecting the rapid emergence of light-emitting diode (LED) street lighting and smart control systems as a viable solution to a range of energy, climate and other urban challenges.⁸ Overall, approximately half of the project categories reported were at implementation stage, and half at some stage of conceptualization, piloting and scale-up.

FIGURE 13. Breakdown by sector of where cities are implementing current smart solutions



⁸For further information on the status of LED street lighting in cities, please refer to The Climate Group (2012) Lighting the Clean Revolution, the rise of LEDs and what it means for cities. <http://thecleanrevolution.org/publications/lighting-the-clean-revolution-the-rise-of-leds-and-what-it-means-for-cities>

FIGURE 14. Breakdown of current smart city solutions by stage of implementation



BOX 7. SMART MOBILITY SOLUTIONS: TWO CASE STUDIES

CitySolver, Barcelona (Spain)

One innovative transport solution that is being scaled up in Barcelona, Spain, is BitCarrier's CitySolver visualization platform, which offers a viable and efficient way to manage urban travel through real-time traffic information. Seven months after selecting CitySolver based on a successful pilot, Barcelona invested in a larger deployment of the traffic sensor system.

Skybus, Lavasa (India)

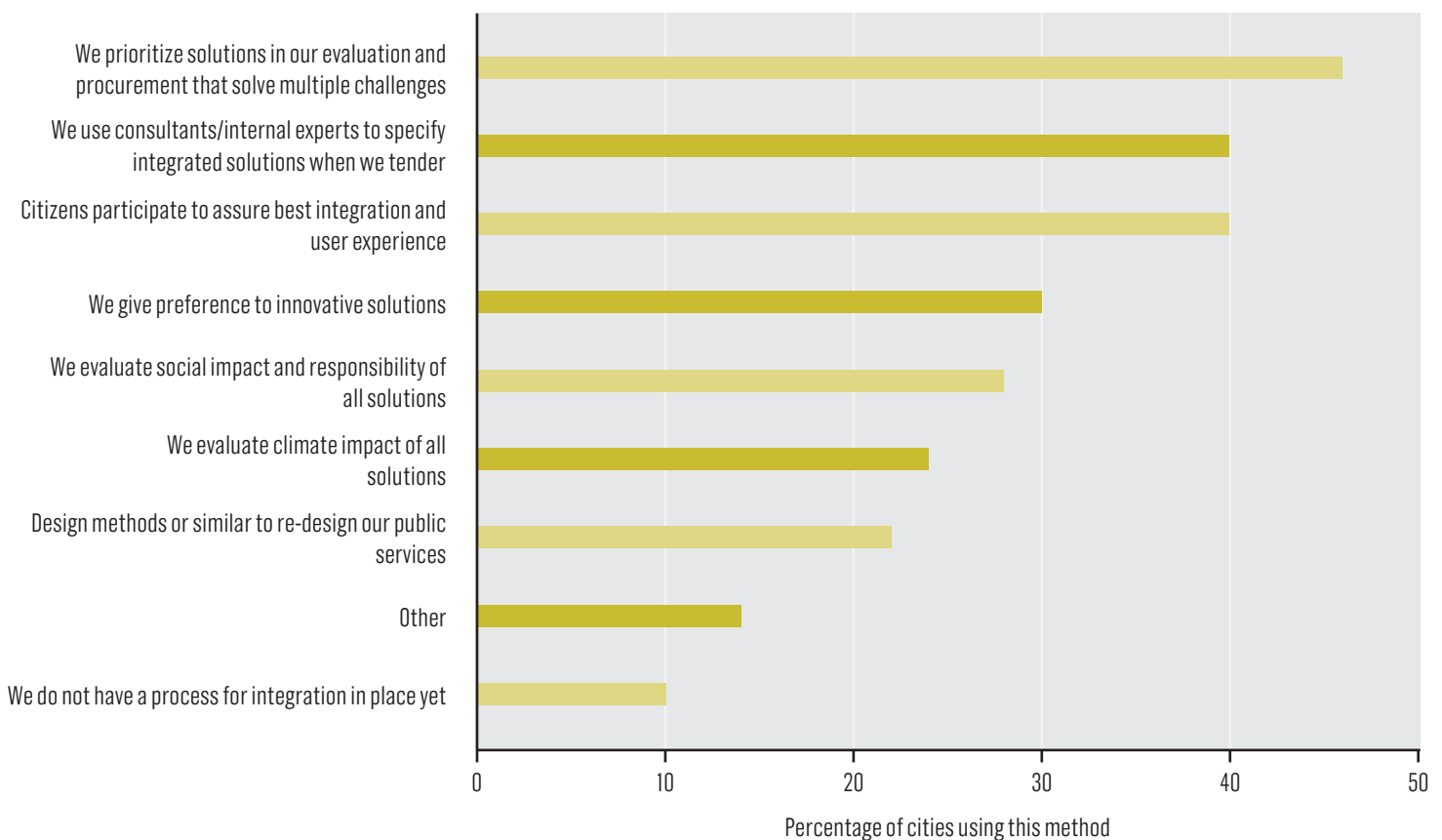
Lavasa in India is also benefitting from a smart transport solution called Skybus, a microbus service which offers a personalized, convenient, low-cost and sustainable alternative to commuting. Skybus uses a platform that manages web and mobile requests, allocates them to vehicles and adapts routes in real-time, taking passengers to destinations in the fastest possible way and by sharing similar trips.

Key finding 6: Cities recognize the value of integrated systems and are working to implement these

Over 80% of surveyed cities saw the opportunities from addressing their challenges through increased levels of city system integration. Some 50%, however, highlighted that it was difficult to do this in practice. Despite the obstacles, nearly two thirds of cities have large scale projects underway that cut across multiple city platforms.

Reflecting the top challenges identified earlier, the main areas or systems included in multi-system projects are energy, mobility, environment and economic development. Digital infrastructure was the fifth most common system integrated into large scale projects. The most popular means of improving integration (selected by around 45% of surveyed cities) was to prioritize solutions that solved multiple challenges (Figure 15). Some 40% of cities said that citizen participation was used to assure best integration and user experience. Less than a quarter of cities systematically evaluated the climate impact of solutions, and a significant 10% of cities stated that they had no process in place for integrating systems (Figure 15). A number of private sector players including Telefonica and Cisco are running initiatives to assist cities with the integration process (see Box 8).

FIGURE 15. How cities integrate innovative solutions into city service architecture



BOX 8. BUSINESSES ARE ASSISTING CITIES WITH THEIR INTEGRATION CHALLENGES**Case study: M2M Technology in Santander (Spain)**

Spanish communications company Telefonica is testing its integration platform in the Spanish city of Santander. The company is contributing M2M (machine to machine) technology to the city to create a test-bed for researchers and companies, as part of the government's plan to make Santander a pioneering smart city. To find information that will help improve the lives of its citizens, 12,000 smart sensors are being installed in public spaces to gather and share data. Soon, researchers around the world will be able to lease the platform to develop projects and validate solutions, while companies will also profit from paid applications and open data. Similarly, the city will benefit from new technological and commercial investment.

Case study: The City Protocol

As well as competing to become industry frontrunners in identifying the needs of cities, solution providers are also focusing their efforts on developing standards that support service integration. One such company is Cisco, which has played a key role in the development of the City Protocol.⁹ The protocol was launched by a coalition including Cisco, GDF Suez Barcelona, as the first certification system for smart cities. It will deliver agreements designed to tackle sustainability issues raised by the community, which will in turn lead to city programs, policies and certifications, as well as recommendations and standards for industries.

**74% OF CITIES
IDENTIFY
DEPARTMENTAL
SILOS AS A
BARRIER TO
CHANGE**

III. THE BARRIERS CITIES FACE**Key finding 7: Departmental silos, financing and procurement processes are the main barriers to progress**

We asked the survey cities to identify the main barriers to progress in their ability to find and deploy smarter solutions to their challenges (Figure 15). Most frequently cited barriers were: requiring internal city departments to align (74% of cities), accessing financing for deployment and funding for pilots (64% each), and design of the procurement process itself (44%). Cities are beginning to address the challenge of co-ordinating departments, which was also highlighted in the 2012 *Information Marketplaces* report. Potential solutions include appointing a lead Chief Innovation/Information Officer role in the city, establishing a dedicated interdepartmental commission or task force, and working through district development corporations (see Box 9).

FIGURE 16. Barriers to progress identified by survey cities

ISSUE	# CITIES	% CITIES
PROCUREMENT		
Procurement processes are not designed for quick uptake of 'new' solutions	22	44%
FINANCE		
Partnerships with the private sector were required but difficult to manage	8	16%
Finance (or it is difficult to get priority around the limited financing options available)	32	64%
Pilots require funding that is difficult to obtain	32	64%
DATA SHARING		
City systems don't 'talk to' one another (I can't share data between them)	16	32%

⁹www.cityprotocol.org

ONLY 14% OF THE SURVEYED CITIES HAVE A FORMAL PROCESS TO ACCEPT UNSOLICITED PROPOSALS

BUSINESS MODEL		
It was not possible with existing data to create a strong value case for the city investment	7	14%
Relevant city operators were not aware of the full benefits	11	22%
Too great a focus on short term benefits rather than longer term sustainability	13	26%
Many technologies or systems lack a credible business model to sustain them.	15	30%
PEOPLE AND POLITICS		
We can't be the first movers to test new technologies, there is too much risk for politicians	5	10%
Departments or employees resist implementation of disruptive systems	17	34%
Progress is slowed by elections or other political cycle challenges	19	38%
The solution required multiple departments to align	37	74%
OTHER		
	3	6%

BOX 9. STEPS CITIES ARE TAKING TO OVERCOME BARRIERS TO CHANGE

Case study: Creating leaders for innovation: San Francisco (USA), and Barcelona and Terrassa (Spain)

In January 2012 San Francisco's Mayor appointed a Chief Innovation Officer to "introduce new ideas and approaches to make city government more transparent, efficient and focused on our customers".

Barcelona's Director of Strategy and Innovation role sits within its highest budget department, the social services unit. The city hired an experienced management professional from the non-profit sector with experience in social innovation and who is well connected to national and international networks. The unit brings project ideas to other city departments and is developing a social return on investment model to guide spending.

Smaller cities like Terrassa, Spain, are also appointing innovation leads. Terrassa's Director works to co-ordinate departments involved in projects such as mobility, remote water monitoring and open data, to extract the maximum possible benefit for the city.

Case study: Smart City Commission, Birmingham (UK)

Birmingham's Smart City Commission was founded in 2012 to address high population growth, youth unemployment and skills shortages, and energy dependency issues. The Commission's role is to highlight how ICT can contribute to green growth in the city, with a strong focus on bringing data together to develop predictive analysis and scenario building. It convenes stakeholders including the city council, communication specialists, technology and built environment firms and the city's universities. The Commission will also develop a 'Smart City Roadmap' to guide the city's strategy in using technology to address its challenges.

Case study: Waterfront Development Corporation, Toronto (Canada)

Development corporations can be effective in bringing new service innovations into cities as they are often more agile in structure than city departments. The Toronto Waterfront Development Corporation has been effective in developing smart city services, including: innovative water treatment; LED lighting; heating, ventilation and air-conditioning (HVAC) systems; and smart video analytics to detect vandalism. The corporation's Department of Environment and Innovation sets policy objectives based on triple bottom line (environmental, social and economic) metrics. It works to find solutions to meet these objectives and integrate these into Corporation programs. It is currently looking to develop a smart city app development platform.

**OVER 60% OF
CITIES SURVEYED
SEE CHALLENGES
IN CORE
AREAS OF THE
ENVIRONMENT,
ECONOMIC
DEVELOPMENT,
MOBILITY AND
URBAN SERVICES**

What can we conclude about how the surveyed cities are approaching and dealing with their range of challenges?

SELF-AWARE CITIES

First, and perhaps most importantly, it is clear that cities are self-aware and cognisant of their challenges. Over 60% of cities see challenges in core areas of the environment, economic development, mobility and urban services. This is encouraging and a key first step, since any solution first requires the identification and appreciation of the problem. It is also relevant that the four main challenge areas are by definition cross-cutting in terms of causes and impacts, and therefore more complex in nature. This points to a clear need for solutions that are more sophisticated, both in their development and application, going forward.

CONSULTATIVE AND OPEN-SOURCED CITIES BUT WITH ROOM FOR IMPROVEMENT

The survey also points to a group of city governments that is consultative and accepting of open-sourced approaches, given the variety of public engagement mechanisms cited. This applies to the identification and validation of both challenges and solutions. Civic participation, stakeholder consultation and the use of city websites is almost ubiquitous in terms of identifying and communicating challenges.

However, while 80% of cities report publishing their challenges on their webpages, there is little evidence that challenges are in fact published in a coherent and accessible manner. Typically, challenges are presented as high-level goals such as long-term emission goals – often not providing quantifiable measures or clear problem statements that create tangible openings for solutions. Through its Urban Lab website,¹⁰ the city of Barcelona in Spain is perhaps leading the way on the open, online publication of challenges to solutions providers, and Citymart.com has developed a centralized platform for Barcelona and a further 38 cities to publish challenges and seek solutions.

Our survey also shows that the use of internal city government processes and consultants remains high, suggesting that the process of problem solving may not be as open as it could be. The risk of some cities missing out on innovative ideas and solutions is underlined by the fact that only around 55% publish requests for proposals (RFPs) when seeking to identify solutions to their challenges. This clearly limits their potential pool of options.

Cities appear to be compounding the problem further during the evaluation and validation of proposed solutions. The popularity of using staff knowledge and industry contacts to validate supplier references, and the general lack - or inconsistency - of approach to handling unsolicited proposals, reinforces the likelihood that cities will be stuck with known solutions rather than be exposed to more impactful innovations.

CITIES ARE EMBRACING SMART SOLUTIONS BUT REAL POTENTIAL IS YET TO BE TAPPED

The adoption of smart ICT solutions across the full range of sectors is encouraging and demonstrates that cities are beginning to recognize the value of these solutions. Of the approximately 2,000 project categories¹¹ disclosed by the 50 cities, approximately half were still at the conceptual, pilot or scale up stage and half were fully implemented. This suggests that significant potential might remain to be tapped from the pipeline of solutions still in development.

¹⁰The Urban Lab web pages can be viewed at the 22@Barcelona site www.22barcelona.com

¹¹The survey asked cities to identify whether they were implementing projects in a range of 101 prompted project categories, and at what level in each category. The 50 cities checked an average of 41 categories each, totaling 2057 category 'checks' in the survey.

SYSTEM INTEGRATION IS KEY TO SMART CITY SUCCESS

CITIES UNDERSTAND THAT SYSTEM INTEGRATION IS KEY TO SMART CITY SUCCESS BUT SUPPORT IS REQUIRED

The high proportion of cities recognizing the opportunities from system integration underlines that this aspect of smart city design has already been well absorbed. Where cities still need help and support is in the practical process of system integration, given the difficulty a large proportion of cities associate with this. The solutions in this regard require further investigation but options may include high-level activities such as the sharing of experiences by those cities who have already implemented integrated systems, as well as more specific interventions such as the mandatory consideration of cross-cutting benefits and inter-operability of systems when proposed solutions are evaluated.

IMPLEMENTING NEW SMART SOLUTIONS ULTIMATELY REQUIRES ADDRESSING OLD AND FAMILIAR BARRIERS

While the solutions required for creating smart and agile cities are likely to be new and novel, the survey clearly demonstrates that the key barriers to change may in fact be old and familiar. The needs to achieve inter-departmental alignment and source adequate finance have arguably tormented city managers as long as town halls have existed. Institutional inertia, as characterized by the difficulty in changing procurement processes to take account of 'new' solutions, is another barrier common to many change processes.

Although some important technical barriers do exist – notably the inability of many city smart systems to 'talk' to each other – the majority of barriers relate to people and processes. This means that the solutions lie with management and leadership systems, rather than technical ones. Although change of any kind can be hard to implement, city leaders should be confident that they hold some of the most important levers for action to unlocking smart city systems.

FRAGMENTED MARKETPLACE COMBINED WITH LACK OF 'LISTENING ABILITY'

Unlike other markets, cities are unlikely to consolidate, meaning that the market will remain fragmented. Combined with the lack of processes to receive and analyze new ideas and proposals, cities and providers are trapped in a mismatch of communications. This means that it is highly unlikely that the right knowledge is always available to take good strategic decisions.

LESS THAN HALF OF SURVEY CITIES EXTERNALLY PUBLISH THEIR RFPS

LACK OF TRUST INCREASES PERCEIVED RISK IN INNOVATION

Only 15% of surveyed cities report that they trust the information provided by suppliers. Cities even within this leading group are therefore still relying heavily on known providers at the expense of adopting new innovative solutions, especially by smaller providers.

CITIES SHOULD CONSIDER DEDICATED SENIOR ROLES AND COMMISSIONS TO LEAD INNOVATION

RECOMMENDATIONS

The findings and conclusions of this report point to a range of recommendations in three key areas of city government responsibility: leadership, standardization of procurement and fostering of innovation.

LEADERSHIP

Many of the barriers to adopting innovative smart solutions identified are organizational in nature. Strong and targeted leadership is therefore an important lever of change.

- Senior city leaders should personally champion the use of smart city solutions and communicate what this means in practice, including the processes required to make change happen.
- Cities should consider creating specific senior roles (e.g. a Chief Innovation Officer) with the necessary authority to coordinate and drive smart city solutions, and/or appoint an inter-departmental commission responsible for co-ordination of innovation and 'smart' procurement.
- Cities should set relevant city targets that act as the drivers for innovative solutions, including for carbon emissions.

STANDARDIZATION OF PROCUREMENT

With cities using a variety of processes to identify, communicate and validate their challenges and solutions, plus the difficulties many survey cities voiced in integrating solutions, there is a clear need to standardize key areas of the procurement process.

- Cities should support and take part in the development of standards and certification schemes that make it easier a) for city officials to compare and assess innovative solutions, and b) simpler for solution providers to such offer solutions.
- Cities should ensure a standard procurement process is in place across city departments, including a formal system for handling unsolicited solutions.

FOSTERING OF INNOVATION

The development of smart city solutions will happen much faster if cities provide an environment that is conducive to innovation. This applies both to the supply (from business) and demand (within government) for innovative solutions.

- Cities should provide public access to key city data sets, such as transport data.
- Cities should provide reliable and timely feedback to providers to re-assure them about decision-making and help them improve solutions.
- Cities should formally participate in validating and evaluating solutions and project references to help other cities take more informed decisions and contribute trusted information to the market.
- Cities should ensure their departments have the knowledge, skills and organizational capacity to understand and deal with innovative solutions and companies.

THERE IS A CLEAR NEED TO STANDARDIZE KEY AREAS OF THE PROCUREMENT PROCESS

ACKNOWLEDGEMENTS

This report and the research behind it would not have been possible without the help and support of a range of individuals and organizations. Special thanks goes to: the team at Citymart.com and Living Labs Global Award (LLGA), particularly Sascha Haselmayer and Luca Donadoni who helped develop and implement the survey; Scott Cain and Richard Miller at the Technology Strategy Board; the team at Metropolis, the third key Agile Cities partner; all the participating cities and especially the individuals who took time to answer survey and case study questions; all the companies that participated in the business survey; and Nicoletta Landi who helped support the case study research for the report.

PARTICIPATING CITIES

The Agile Cities survey was made possible by the participation of the following cities: Aachen; Aberdeen; Alcorcon; Amsterdam; Austin; Barcelona; Berlin; Bhubaneswar; Birmingham; Bottrop; Bristol; Cape Town; Cesena; Chicago; Cologne; Constance; Donostia San Sebastian; Eindhoven; Friedrichshafen; Fukuoka; Furesø Kommune; Guarulhos; HafenCity Hamburg; Helmond; Kansas City, Missouri; Kista Science City; Kortrijk; Lagos; Lausanne; Lavasa; Lyon; Maipu; Manchester; Melbourne; Odense; Ottawa; Paredes; Rio de Janeiro; Rotterdam; Sacramento; San Francisco; Sant Cugat Del Valles; Seoul; Tarragona; Terrassa; Toronto; Vienna; Vitoria-Gasteiz; Zurich.

BUSINESS SURVEY COMPANIES

The Citymart.com survey of solutions providers included the following businesses: Connectings; AMPLA; Abertis Telecom; Advanced Computer Systems; Alpha Pricing Co.; Altran Spain; Appear; Autolib; Axia Sustentabilidade; BMW AG; Bitcarrier, S.L.; Blue Cross & Blue Shield Uruguay; CETIEX; CitiVox; Commonground; Cornell University; Domotys; Deneb; Designyc; ECOMove; Embedia; Earthlinked Technologies. Inc; Eco-cty; Energy Floors; E-real; Estudi Ramon Folch i Associats; Falcon Road Maintenance Equipment, Inc.; Ferroviaria; Flooting; Fundosa Technosite; GIZ; Gumdrop Ltd; Green Proposals; HearPlanet; IBM Danmark ApS; ICEconsult; IE Business School; Ingenieria Urbotica; Instituto de Ciencia y Tecnologia Del D.F; Illumination Network Systems GmbH; Industry Technology Research Institute; Institute for Information Industry; Instituto Embratel; Instituto i3G; Intercomunale Leiedal; Järvelin Design Oy; Keppel Seghers, Inc.; Knowledge Innovation Market; Leit-werk Ltd MAD emergent art center; MindMixer; Mobility in chain; MyMind; Netown; New City Ventures Inc.; PlaceSpeak; Pajat Solutions; Paradox Engineering; Philips; Philips Lighting; Place Partners; Ramboll Energy; SCY; SEaB Energy; SGE; Silentsoft SA; Sirma Mobile; Skybus; Smartstreets Ltd; Steria France; Stetzer UK; Susteco AB; TDN - Consultoria, Comunicação e marketing; Technofi; Tecnocampus; TMS; Tempeest; Tempohousing Nigeria; Tiramisu Transit & Carnegie Mellon University; Toozla; Trip Convergence Ltd; UNIC; Urbiótica; Walkonomics; Wilkins Engineering Limited; World Cities Network; and Ziadad.

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THE AGILE CITY INITIATIVE AND PARTNERS

The Agile Cities Initiative was formed to better address the challenges of smart city innovation. The program is led by The Climate Group and Citymart.com with partners Metropolis and the UK Technology Strategy Board. Its objective is to understand and overcome barriers to procuring smart ICT products and services in cities through a two-phase program. Phase I aims to highlight barriers to market development and opportunities for market development activity, while Phase II is designed to implement a discrete set of market development activities. For more information please visit <http://agilecities.org>

THE CLIMATE GROUP

THE CLIMATE GROUP

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Driving Innovation

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