



ERICSSON

# NETWORKED SOCIETY CITY INDEX

Triple-bottom-line effects of accelerated  
ICT maturity in cities worldwide



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# 1. EXECUTIVE SUMMARY

The past 25 years have brought a digital age, massive computing power, high-speed data access and mobile communication. More recently, we have seen the emergence of the cloud, bringing communication and information technologies together in a new, emerging ICT industry. Over the next 25 years, advances in technology and infrastructure performance will continue to change our world. ICT has the potential to help us meet some of our great societal challenges. We call this new emerging society – of which we have so far only seen the beginning – the Networked Society.

ICT has an interesting multiple nature: both a service and a business in itself, it is also a means for society to allow new ideas to prosper and new, more efficient approaches to be developed. This multiple nature calls for new frameworks that give us a more complete view of its potential and allow us to realize these benefits. In this report, Ericsson presents a Networked Society City Index, which identifies the development of ICT-enabled benefits to cities. The aim is to create a broader discussion about the efficiency and innovation gains that ICT provides and to stimulate cross-sector dialog on successful strategies for realizing these benefits. A vital part in this ambition is the sharing of experiences, good and bad. The index and its component dimensions capture this ambition and identify the ways in which ICT enables triple-bottom-line development – social, economic and environmental – across society. The full index consists of three releases. The first release, as presented here, provides the city perspective. Two additional releases are planned for later this year, covering benefits from the “Life of Citizens” and “Life of Business” perspectives.

Assessing the effects and benefits of ICT maturity within a city framework brings several opportunities. Firstly, cities represent a more universally comparable context than the more commonly used nation-based frameworks. Comparing London and Shanghai makes more sense than comparing the UK and China. A city focus therefore provides opportunities for faster understanding and global best-practice sharing. Secondly, cities are already home to more than half the world’s population, with more than 50 percent of global GDP generated in the largest

600 cities. Trends suggest that more than 60 percent of all people will live in cities by 2030. Consequently cities will increasingly require effective ICT strategies to be implemented across a multitude of stakeholders in order to meet the needs of social, economic and environmental development. Finally, the city index framework provides city mayors, local authorities and decision-makers with a tool to measure and analyze their cities’ ICT maturity, as well as the triple-bottom-line results of their ICT investments.

## ‘Comparing London and Shanghai makes more sense than comparing the UK and China’

The index itself covers two main dimensions. The first shows a city-centric view of ICT maturity in the cities studied. This aspect represents investments made in ICT and captures availability, performance and usage levels for ICT. Momentum in this direction is typically set by the ICT investment climate and direct economic output. The second dimension of the index shows a benefit-oriented view across all three parts of the triple bottom line. This represents the benefits in terms of city attractiveness, in aspects such as healthcare, education, economic output, city efficiency and environmental performance. Momentum in this direction depends on complex interdependences and is captured using carefully selected indicators and qualitative case studies.

The list of cities used for the Networked Society City Index is based on the United Nations' list of the largest cities, with the addition of the capitals of the two leading nations in the Networked Readiness Index, published by the World Economic Forum. The addition is made to ensure that cities with strong ICT development are captured in the study. Additional adjustments have been made to ensure an appropriate geographical spread. A few cities have been excluded from the list because of a lack of available data. Looking at the findings from this first release of the index, the following key conclusions can be made:

- › **There is a strong connection between ICT maturity in cities and their triple-bottom-line development (as defined in the Networked Society City Index).**
- › **Return on investments in ICT, in terms of benefits to society, follows increased ICT maturity.**
- › **Cities at different stages of ICT maturity should apply different strategies in order to maximize ICT-driven advancement.**

Cities such as Tokyo and Moscow or Delhi and São Paulo show strong similarities in terms of the effort put into ICT while the output in terms of triple-bottom-line leverage varies significantly. Strong performers have typically built progress around the ability of people to use ICT. As maturity has increased, the stronger cities have gradually applied a more focused approach by targeting dedicated application areas such as health, education or intelligent traffic.

- › **High-scoring cities such as Singapore, Stockholm, Seoul, London and Paris can gain traction by exploiting ICT to fulfill the overall city vision, achieve targets within social, economic and environmental dimensions, and capitalize on ICT to spur innovation and citizen involvement in city development.**
- › **Medium-scoring cities such as Beijing, Sydney, Moscow, Buenos Aires and São Paulo ought to cherry-pick key city challenges that can be addressed with ICT-based solutions, and launch and coordinate focused initiatives.**
- › **Low-scoring cities such as Manila, Johannesburg, Dhaka, Karachi and Lagos can make progress by addressing the digital gap through digital access initiatives, ICT literacy training for the underprivileged, and ensuring the integration of ICT into public administration to improve efficiency.**

## 2. CITY CHALLENGES

Driven by the megatrend of urbanization, cities are shaping our lives more than ever. Today more than 50 percent of the world's population lives in urban areas, and by 2030 the proportion is expected to top 60 percent. There is a steady stream of people moving from the countryside to the city every day. Urban population increases by more than 5 million every month. Today more than 20 cities in the world are classed as megacities, cities with more than 10 million inhabitants. Tokyo, Mumbai and Mexico City are all examples. By 2020, the world will have at least eight more megacities, with half of all future megacities located in the developing countries of the world.

**‘No matter the path of economic development a country has chosen, urbanization remains an inevitable outcome of this effort across the world’**

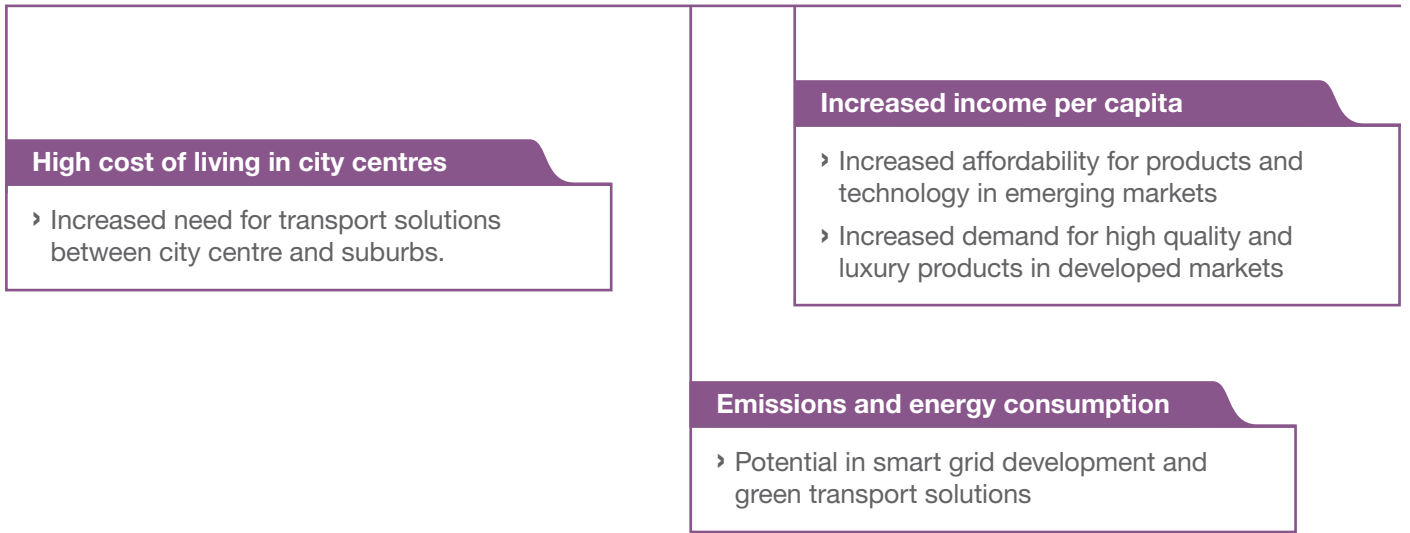
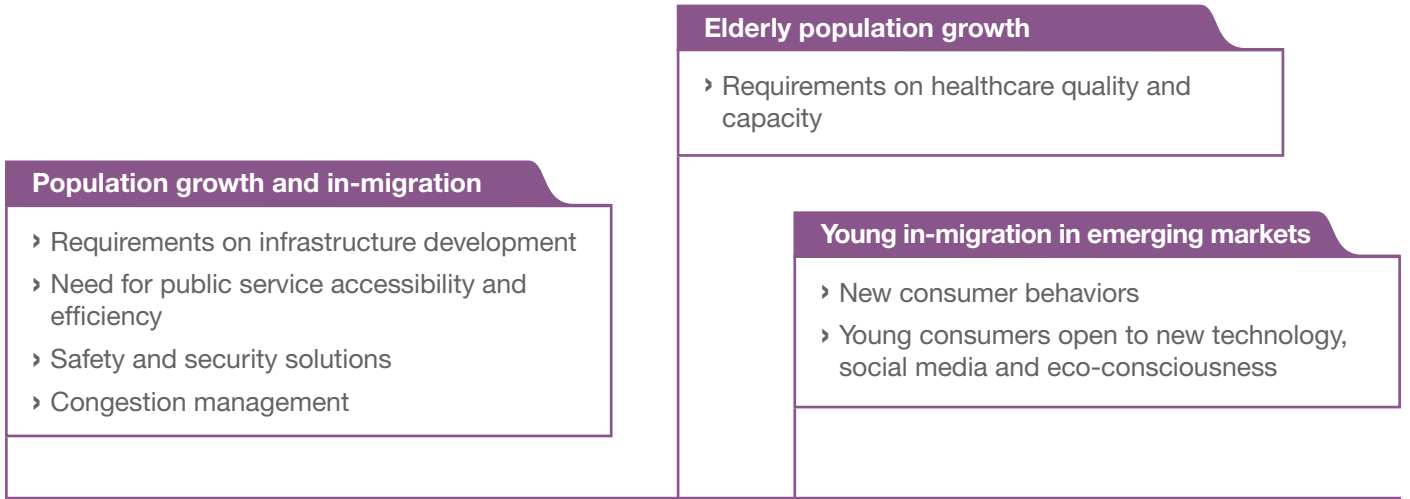
– UN-HABITAT, State of the World's Cities 2010/2011.

This ongoing trend of urbanization means the power of the city is increasing. According to the McKinsey Global Institute, the 600 largest cities account for more than 50 percent of the world's GDP but only 22 percent of global population.

Yet it is the middleweight cities – with populations ranging from 150 000 to 10 million – that are predicted to stand for the largest GDP growth up to 2025. It is not only the megacities that will drive development – many big cities will be part of shaping our future society.

Highly dense city environments act as a magnet for people, business and capital. However, the growth of cities is also a source of new challenges connected to increased demands for infrastructure, public service efficiency and coordination of complex systems (Figure 1).

**Figure 1.**  
Trends and development needs for larger cities





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**‘The bottom line is that the expanding cities, both new and mature, will present both tremendous challenges and tremendous opportunities for society.’**

Cities are evolving into complex ecosystems, stressing the importance of city management in diverse areas. Environmental management, public security, healthcare quality and education are just a few examples of areas in need of attention. In the complex ecosystems of large cities, ICT is becoming an increasingly important way to meet and mitigate these challenges. Not surprisingly, cities with high levels of ICT infrastructure and usage are better able to realize triple-bottom-line benefits than cities with lower levels. They are also better equipped for

the transformation required to meet a growth agenda that better balances increasing demands for sustainability and new lifestyle requirements.

The bottom line is that the expanding cities, both new and mature, will present both tremendous challenges and tremendous opportunities for society. The cities will drive development in all industries, and ICT will play a key role in a city’s ability to grow economically, socially and sustainably.



# 3. THE LINK BETWEEN ICT AND TRIPLE-BOTTOM-LINE DEVELOPMENT

Mobile communication may have started back in the 1990s as an exclusive service for high-earning segments but reality soon turned it into a true mass-market offering that today is serving almost 5 billion people. Among them, 3.8 billion are in emerging economies, where the mobile telecommunications industry has expanded fastest.

One key lesson learned from studying the introduction of mobile telephony in Africa, Latin America and Asia is that people with very low daily incomes (USD 1-2 per day) are prepared to make substantial financial sacrifices to get access to mobile voice and data services. People with daily incomes of USD 1-2 are spending as much as 10-20 percent of their incomes on mobile telecom services. Our research found that the main driver for this is the way mobile telephony services empower people to change their lives for the better. They improve access to people, in particular family and relatives, but also help people make and save money. Mobile services, particularly in low-earning segments, enable people to become more entrepreneurial. They can increase profits by, for instance, cutting out middlemen when selling their harvests, and save money by avoiding lengthy travel.

Another aspect is the environmental benefits made possible by ICT. In Kenya, an ICT-enabled Mobile Money solution, allowing long-distance financial transactions, is expected to reduce carbon emissions by a ratio of 1:65 over a 20-year period, while in Zagreb, Croatia, a new Healthcare Networking Information System has the potential to reduce carbon emissions by a ratio of 1:45 over the same period. In both cases ICT plays a significant role in reducing travel and vehicle use. These are some of the fundamental insights that have inspired us to extend the analytic framework into the city context and along the broader areas of triple-bottom-line benefits.

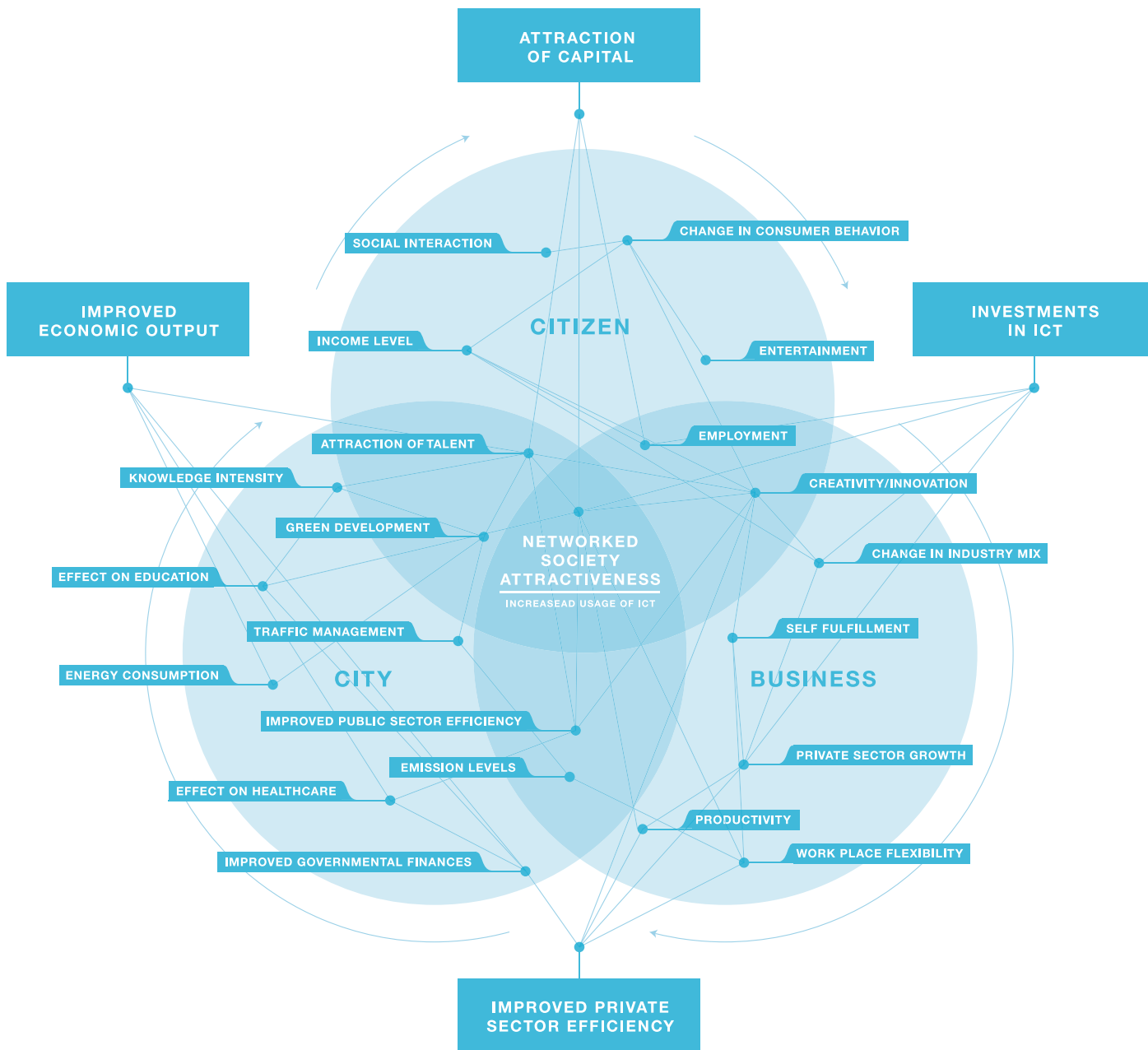
In general, socioeconomic factors and corresponding cause-and-effect relationships are complex and intertwined. Effects in one part of a society produce effects in other parts through a complicated web of linkages and interdependencies. Studies of ICT effects on society are themselves complex and the exact dynamics of how and to what extent ICT development affects societies are hard or even impossible to understand in detail. However there is a large and well-established global fact base regarding the effects of ICT on society, effects that are continuously investigated within Ericsson.

**‘Mobile services, particularly in low-earning segments, enable people to become more entrepreneurial’**



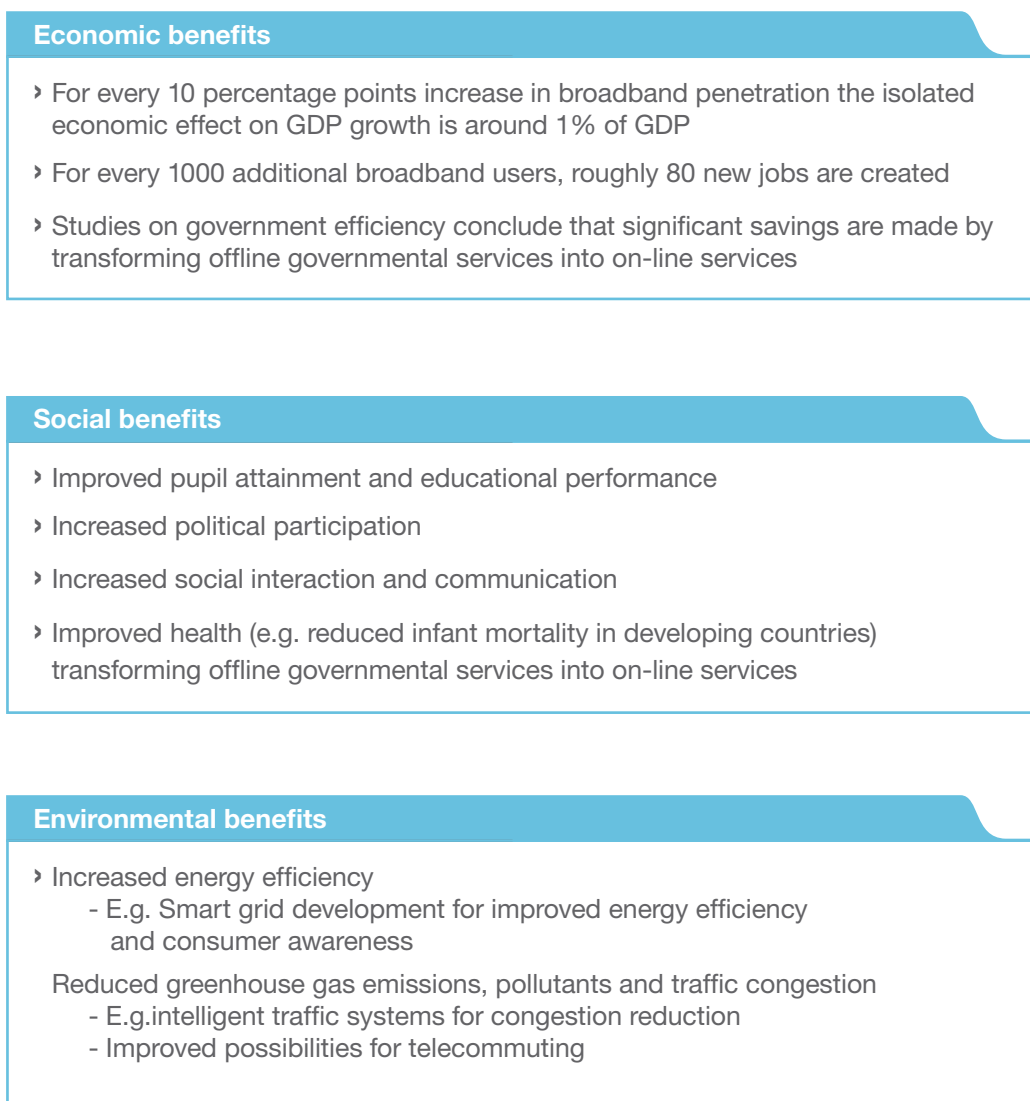
Figure 2.

Linkages and interdependencies between ICT development and triple-bottom-line development in a city environment.



A simplified overview of the interdependencies between ICT and its effects on society is shown above (figure 2).

In a recent global study covering a detailed review of more than 120 academic reports from leading research institutions and business papers, Ericsson drew a number of qualitative and quantitative conclusions regarding the triple-bottom-line effects of ICT investments. Overall conclusions from this study have served as important guidance for the development of the Networked Society City Index and the two coming releases. Key conclusions from this study are summarized in figure 3 below.



**Figure 3.**  
ICT-derived impacts on the economic, social and environmental dimensions of society.



# 4. NETWORKED SOCIETY INDEX

The Networked Society City Index is a framework designed to provide city mayors, local authorities and decision-makers with information and benchmark material regarding their city's ICT maturity as well as the city-wide triple-bottom-line return on ICT investments.

Furthermore, city mayors, local authorities and decision-makers will gain valuable inspiration from successful ICT initiatives around the world. By sharing this knowledge, Ericsson aims to contribute to the understanding of ICT as an important enabler for growth, infrastructure and triple-bottom-line development for city regions around the world.

The Networked Society City Index provides a map of world cities and their positions along the ICT road to city progress. The index is designed to describe the development status of cities worldwide in terms of ICT maturity and triple-bottom-line effects derived from ICT. The index is based on two dimensions:

## **A horizontal dimension to capture measures of cities ICT maturity**

The ICT maturity dimension is determined by availability and performance of ICT infrastructure, the cost at which services are provided and actual usage levels. The logic and design is similar to the Network Readiness Index at country level published annually by the World Economic Forum, but with a more direct focus on measurable ICT maturity and less on prerequisite components. A total of 14 indicators capture the maturity dimension.

Cities located in Northern Europe, North America and parts of East Asia have a longer track record of investing in ICT and consequently score higher in the maturity dimension. Three ICT maturity clusters can be identified, with Singapore, Stockholm and London leading the high- maturity group, Sydney, Buenos Aires and Istanbul leading the mid-maturity group, and Jakarta, Dhaka and Karachi leading the group with lower maturity.

## **A vertical dimension representing indicators of progress corresponding to triple-bottom-line benefits from ICT investments**

A city's triple-bottom-line benefits from ICT are evaluated in the three main dimensions of social, economic and environmental results. For each of these dimensions, important indicators have been chosen and weighted together to reflect a total measure of triple-bottom-line benefits derived from ICT investments in a particular city. Each indicator has a logical connection to ICT investments and the usage of ICT, and is chosen to capture the main conclusions from previous findings and Ericsson research on the triple-bottom-line effects of ICT.

The environmental benefits of ICT are particularly challenging. This is partly due a lack of established and globally agreed methodologies for assessing the ICT contribution. Additionally, many promising initiatives such as smart grids and intelligent transportation are in the early stages of implementation or planning and their achieved large-scale impacts are hard to assess. Here we are currently limited to case study references. A total of 12 indicators measure the benefits dimension of the index

A position above the trend line and with high ICT maturity, which is the case for cities such as Singapore, Tokyo, Sydney and Mexico City, would indicate that the combined efforts in these cities are generating a good return on ICT investments made, while players in cities above the trend line and more to the left, such as Sydney and Mexico City, have probably underinvested in ICT. Correspondingly a position below the trend line – which is the case for cities such as Karachi, Delhi. and Moscow – would indicate that these cities are more focused on developing their actual ICT infrastructure, and should as a next step focus on getting more out of investments made.



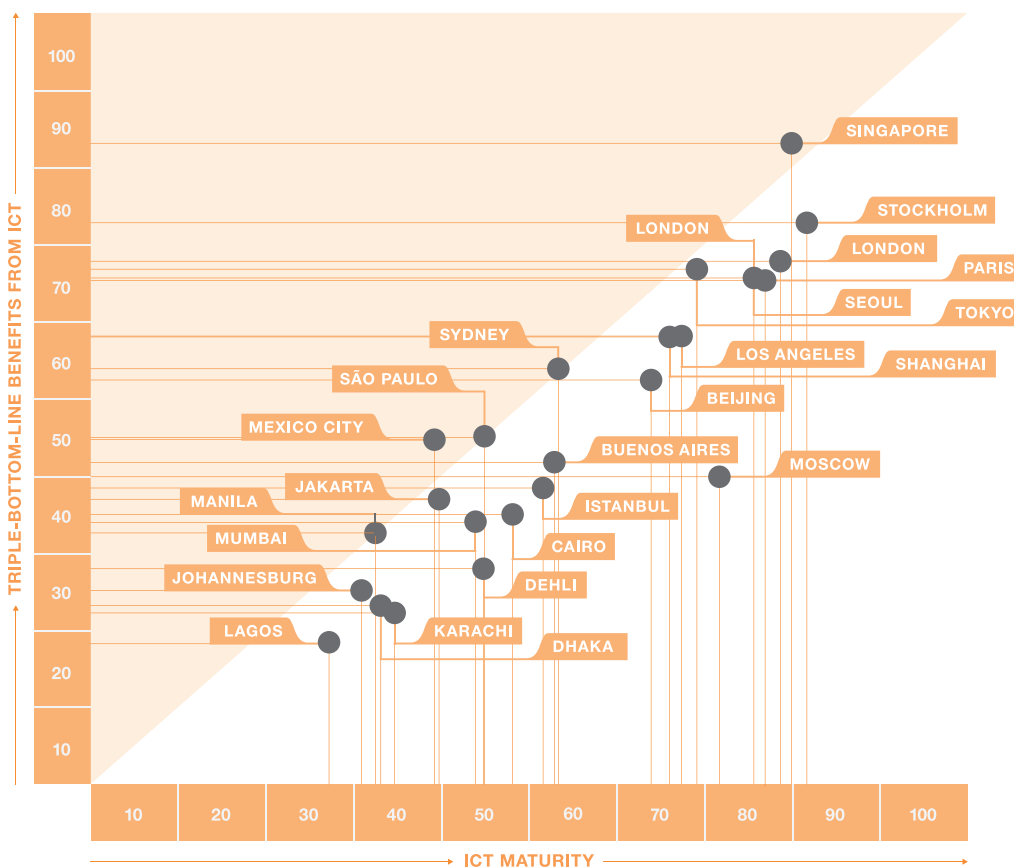
**‘When one person connects their life changes,  
With everything connected our world changes’**



# 5. KEY RESULTS

Ericsson has performed a comprehensive study of 26 indicators, analyzing 25 cities around the world. The selection covers large cities, with an emphasis on geographical and economic diversity. ICT leadership aspects have also been considered.

The Networked Society City Index (Figure 4) summarizes the results of this analysis. All 25 cities have been plotted according to their ICT maturity (X axis) and the corresponding triple-bottom-line benefits from ICT (Y axis).



Rank	City	Score
1	SINGAPORE	66
2	STOCKHOLM	59
3	SEOUL	53
4	LONDON	53
5	PARIS	50
6	NEW YORK	50
7	TOKYO	46
8	LOS ANGELES	39
9	SHANGHAI	38
10	BEIJING	33
11	SYDNEY	29
12	MOSCOW	28
13	BUENOS AIRES	22
14	SÃO PAULO	20
15	ISTANBUL	20
16	MEXICO CITY	17
17	CAIRO	17
18	MUMBAI	15
19	JAKARTA	14
20	DELHI	12
21	MANILA	11
22	JOHANNESBURG	8
23	DHAKA	8
24	KARACHI	8
25	LAGOS	5

The cities represent large parts of the world and are therefore naturally spread across the ICT development curve. Cities located in Northern Europe, North America and parts of East Asia have a longer tradition of producing and using ICT equipment, and have therefore been able to benefit from their investments over a longer time. This can be seen in the Networked Society City Index, where cities with a combination of high ICT maturity and ICT leverage (return on investments) generally fall within these geographical areas.

From the quantitative data and qualitative analysis, the following conclusions can be made:

**There is a strong connection between ICT maturity and triple-bottom-line benefits**

The City Index clearly shows a strong connection between ICT maturity and triple-bottom-line development. Few cities are found outside the typical trend line of ICT-induced triple-bottom-line benefits. The trend line clearly represents the development path towards the Networked City.

### **Increased ICT maturity enhances triple-bottom-line leverage**

The Networked Society City Index also highlights the fact that increased ICT maturity enhances triple-bottom-line leverage at the same pace all along the development path. There is no sign of decline in triple-bottom-line leverage for cities with greater ICT maturity, implying that even the most ICT-mature cities would benefit from continued investment in ICT.

### **Dependence on smart initiatives**

Complementary qualitative studies of ongoing ICT-driven development initiatives within the cities indicate that the level of triple-bottom-line leverage depends on smart initiatives to capitalize on the ICT infrastructure.

### **Holistic city planning is essential – Singapore leads the way**

Singapore is the global leader, characterized by high ICT maturity and extraordinary ICT leverage. Part of the explanation seems to be the high level of governmental involvement and focus on ICT as an enabler for city development.

In 2006, Singapore's Infocomm Development Authority established a holistic strategy to attract foreign investment and sustain long-term GDP growth through the ICT industry, called the iN2015 plan. The strategy aims to build Singapore into an intelligent nation and a global city powered by ICT through infrastructure development, industrial and telecommunications sector development, and knowledge creation. These types of comprehensive metropolitan ICT development plans exist in only a few other cities – Istanbul's Digital City Vision can be mentioned as an example, although the overall scope is somewhat different from that of Singapore. Stockholm and Singapore have similar ICT maturity levels, but the former lacks the level of detailed holistic planning for ICT development shown by Singapore.

The strong commitment to turning Singapore into a global city powered by ICT is supported by a large number of programs and initiatives under the iN2015 master plan, ranging from e-health and education to industrial development. The effects of the initiatives are closely monitored and publicly posted in terms of employment, growth and industrial value added. The high ambition level of Singapore's holistic metropolitan (and nationwide) deployment plan is surely a major reason for Singapore's success in leveraging ICT investments more than other cities.

### **A structured approach to ICT can foster innovation**

In the Networked Society City Index, New York, Tokyo, Paris and London are found in the same part of the index characterized by relatively high ICT maturity and triple-bottom-line leverage. A closer investigation of one of the cities, Paris, suggests that one success factor is the ability to foster innovations based on ICT.

Examination of ICT-driven initiatives within the city of Paris reveals diversified usage areas and a structured approach to using ICT to foster innovations. An interesting and potentially trend-setting initiative is the ongoing creation of the first citywide car-sharing program for electric vehicles, which will go live at the end of 2011. The initiative could be the start of a new era of public transport solutions with ICT as a major enabler. The municipality is also collaborating with Paris Innovation Labs on the development of high-tech urban outdoor furniture. Making previously internal municipal data sets (such as detailed statistics and maps) available to the public is another initiative aiming to spur innovative solutions and improve delivery of public services, already seen in London and New York. There are direct benefits to making metropolitan data sets available in terms of smart applications for citizens as well as business opportunities for local small and medium-sized software developers.

### **Use of ICT in public administration has great potential**

In the Networked Society City Index, São Paulo is represented in the middle segment of the matrix, but with comparably higher ICT leverage than other cities with similar ICT maturity (such as Mumbai and Delhi). São Paulo has previously been awarded several national and international awards for e-inclusion programs.

Although the fame of São Paulo currently seems to lie in the development of vast e-inclusion programs, attention should also be given to current efforts using ICT to improve efficiency in public administration. A new e-governance organization, Coordenadoria de Governo Eletrônico e Gestão da Informação, has been established to identify, spread and support implementation of successful models and ICT concepts within the city of São Paulo. An interesting municipally initiated concept is the electronic invoice (NF-e) document aimed to replace traditional invoices. The NF-e is a document issued and stored in a system hosted by the Municipality of São Paulo. Use of the NF-e document allows the user to benefit from services connected to tax registration, autocomplete data-policy services and more. Besides improved efficiency and management control, user benefits include a rebate of up to 50 percent on property tax as an incentive to use the system.

Other interesting e-solutions provided by the city include the Electronic Licensing System helping to reduce the complexity to set up a business and the information system Infoloc@I providing georeferenced maps of the socioeconomic environment, indicators and analyses serving public policy-makers and politicians as well as the public. Overall, ICT is clearly already providing benefits and offers even greater potential for improved economic and governmental efficiency in São Paulo.

### **Education is a prerequisite for efficient leverage of ICT in the developing world**

Manila is one of the cities identified in the lower range of the ICT development scale. It is also the world's most active SMS/text-messaging city, presenting a similar pattern to many African cities due to high mobile-phone use and comparatively low computer penetration. However Manila is well ahead of African cities such as Johannesburg and Lagos on the ICT development curve.

The Philippine Commission on Information & Communications Technology (CICT) has had an important role in creating nationwide initiatives to support ICT development in the Philippines. The Philippines cyberservices corridor has been established for many years, with Manila as the main hub for attracting foreign investors within ICT. However securing ICT knowledge among the future workforce is essential for realizing the vision of being a hub for business-process outsourcing, voice services and software development.

Capability development is supported by both public and private initiatives. One is the public iSchool learning initiative, which has equipped 4500 public schools with iSchool learning centers and appropriate training. In higher education, the Manila State University is collaborating with a private partner in a technology hub with a focus on ICT. There are also several other initiatives, such as the e-Science Grid, which is working to create a grid infrastructure to support a collaborative environment between research institutions.



# 6. CONCLUSIONS AND NEXT STEPS

The Networked Society City Index is a tool that can help city authorities and decision-makers monitor the position and progress of cities along the ICT development curve. It should be read as the starting point in an open dialog rather than the final word on how cities can make triple-bottom-line progress.

Ericsson invites city-level authorities to engage in discussions on how best to use ICT investments. It should be remembered that the city perspective is only one vantage point for viewing this development. Subsequent releases of the index will focus on other dimensions of city life, namely “Life of Citizens” and “Life of Business.”

**‘We hope the Networked Society City Index can serve as inspiration for one of our planet’s greatest challenges today, the continued journey towards the Networked Society’**