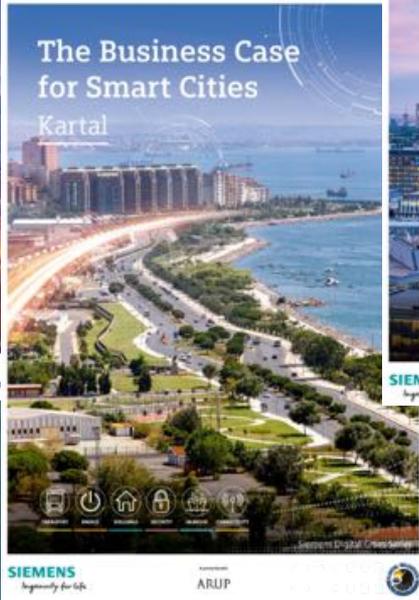
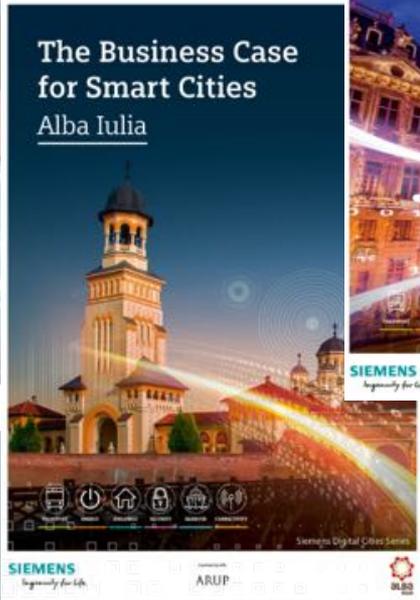
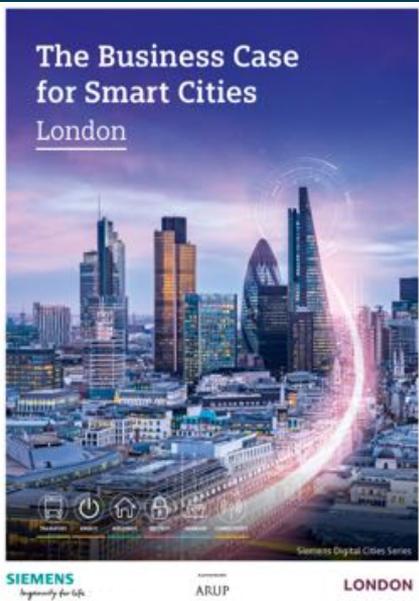
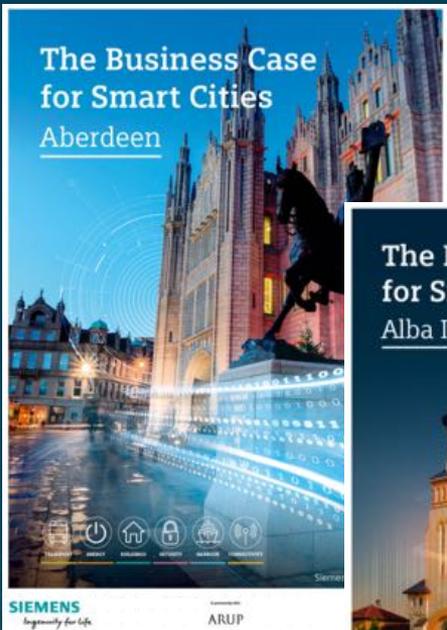


The Business Case for Smart Cities: Infrastructure Investment

Siemens Global Centre of Competence Cities

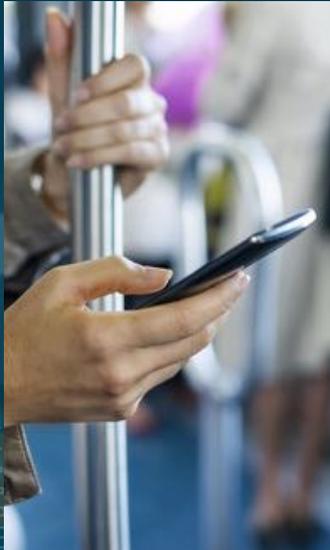
Julie Alexander @jacitytalks



Smarter cities for healthy city design

The potential for cities to transform themselves for the better has never been greater. Digital technologies enable the exchange of data on a vast scale to create cities that are:

- Smarter
- Faster
- Safer
- Cleaner
- Greener



About the five cities report

This report is the result of a research collaboration between Siemens and Arup to investigate the business case for smart cities.

We worked in partnership with five European cities:

1. London
2. Aberdeen
3. Brussels
4. Alba Iulia
5. Kartal, Istanbul



Each city nominated its top three infrastructure priorities from six themes:

					
					
Transport	Energy	Buildings	Security	Harbour	Connectivity

Aberdeen
Alba Iulia
Brussels
Kartal
London

X	X			X	
X	X				X
	X	X	X		
X	X	X			
X	X	X			

Digital Value Sphere

Methodology

We developed a “techno-economic” model, taking into account over 350 inputs: a combination of city and technology specific statistics.

DIRECT BENEFITS

(mostly direct ‘cash’ benefits)

e.g. transport services & energy savings

INDIRECT BENEFITS

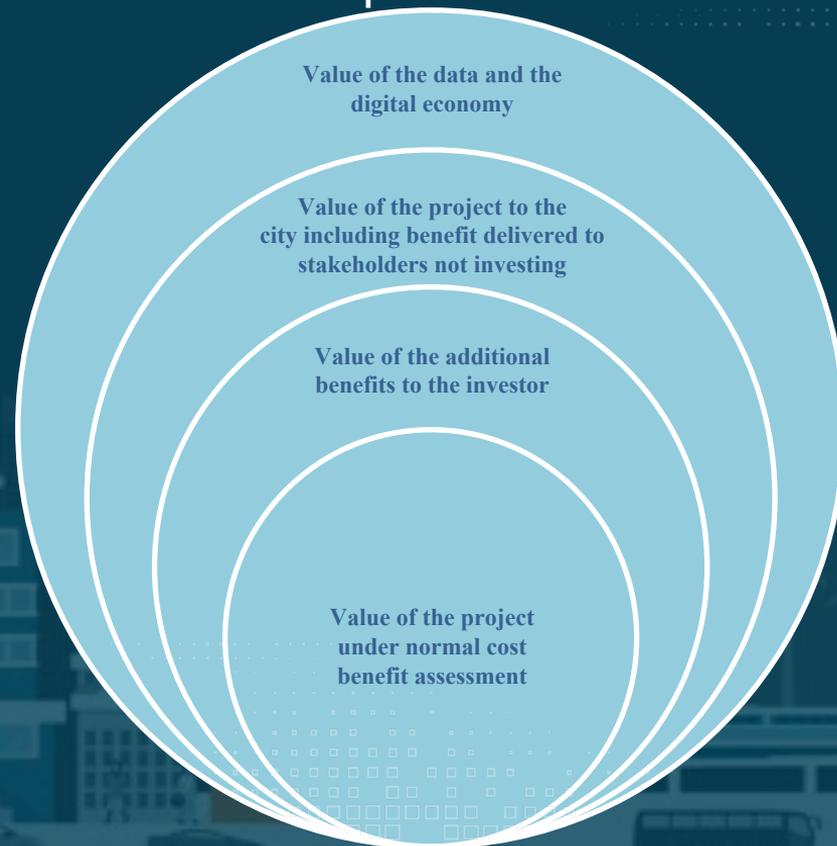
(wider socio economic benefits)

e.g. saved costs resulting from factors such as clean air, lower crime rates, better urban environment, new amenities etc.



COMBINED BENEFITS

(the combined value calculated in €)



Methodology

Technology Benefits

- **Performance enhancements**

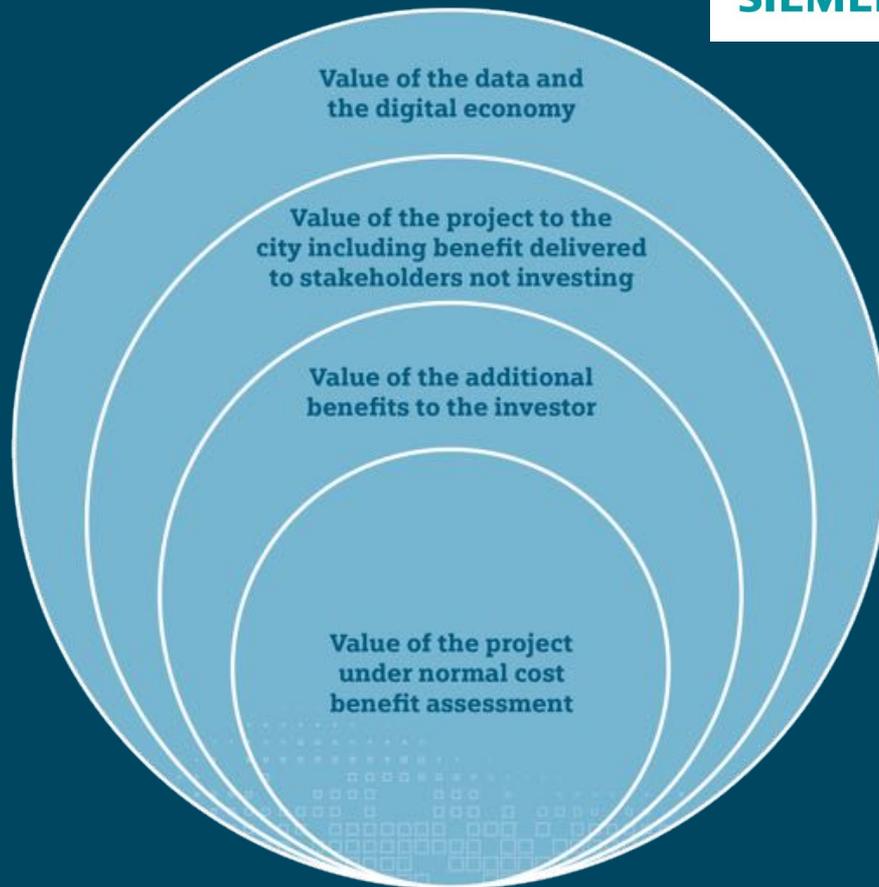
Eg greater efficiency of systems, greater output, optimal service

- **Management enhancements**

Eg better control, accurate maintenance regimes, more effective responses, better transport frequency

- **Operational enhancement**

Eg longer life, reduced risk, asset knowledge



Methodology

Indirect Benefits

• Environmental enhancements

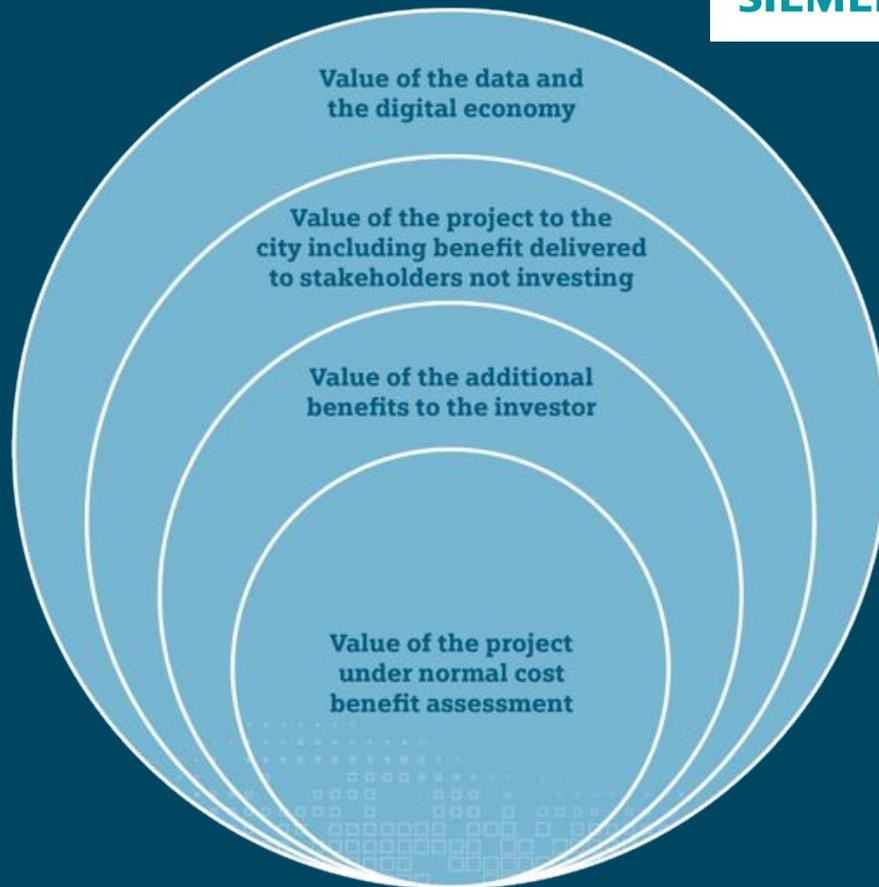
Eg reduced carbon emissions, improved air quality

• Service based enhancements

Eg added network capacity, reduced crime rates, less congestion, real time information

• Functional enhancements

Eg greater throughput at ports, increased availability of assets, improved user experience



Methodology

Financial Benefits

•Direct payback

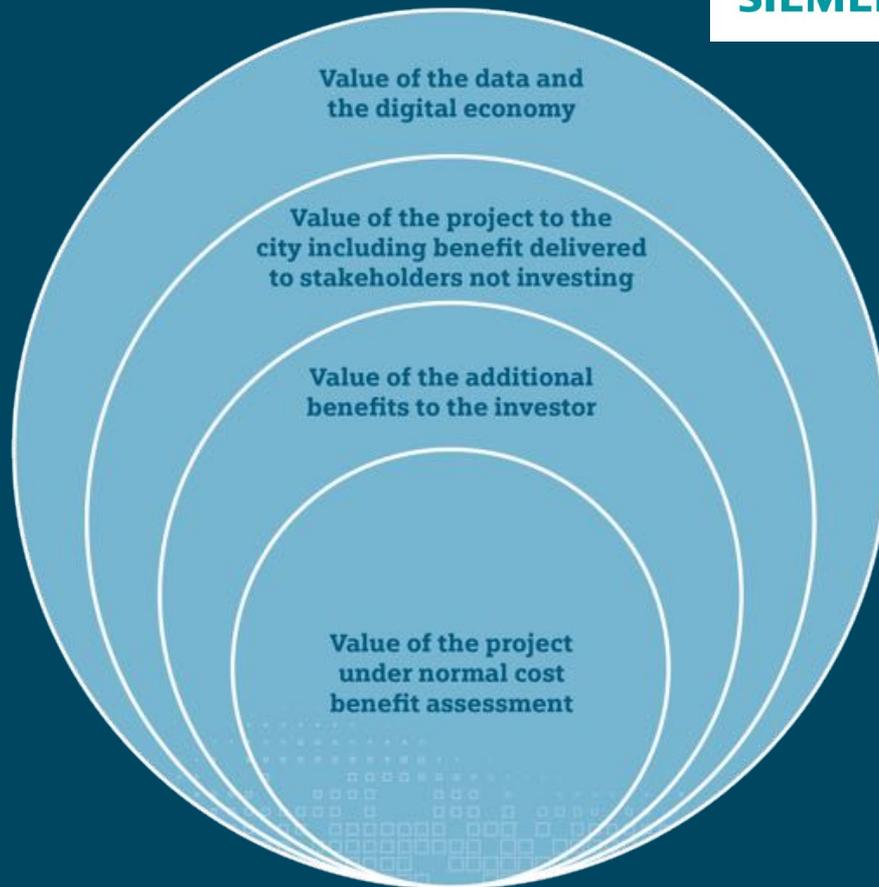
Eg user payments including payments from increased capacity, service revenues

•Savings based

Eg operational savings due to improved efficiencies, reduced consumption, improved maintenance

•New opportunities

Eg 'data based' service models, new operational models



SIEMENS

A range of smart grid management, distributed generation and storage technologies promise to transform cities' energy use, cutting electricity consumption and emissions, leading to substantial cost savings and cleaner air.



Brussels:

Smart grid

Energy storage

Smart Meters

Smart street lighting



The Siemens logo, featuring the word "SIEMENS" in a bold, teal, sans-serif font, set against a white rectangular background. The background of the slide is dark grey with a pattern of small, light grey squares and dots.

A range of smart grid management, distributed generation and storage technologies promise to transform cities' energy use, cutting electricity consumption and emissions, leading to substantial cost savings and cleaner air.

An aerial night view of Brussels, Belgium, showing illuminated buildings and the prominent dome of St. Michael's Church in the foreground. A semi-transparent teal box is overlaid on the right side of the image, containing text.

Brussels:

Decrease in transmission losses 44.5 GWh

Verification of network operations 194.8 GWh

Energy savings equivalent to demand of 77,000 homes

Investment – €712 million

Direct & indirect benefit - €4.2 billion

Smart street lighting brings 10 times the ROI

Payback – 11 years



€1.56bn

Average value of cumulative return – both direct and indirect benefits – from smart energy measures across five cities



4x

Average return on investment from energy measures across five cities



20GWh

Average annual energy savings from smart street lighting

€110m

Average net direct benefit from smart street lighting, representing an average ROI of

5x



Transport

SIEMENS

Digital technologies can have one of the greatest impacts of all on transport, cutting congestion, speeding transit times, helping improve use of existing road and other transport assets, while slashing operating budgets, air pollution and CO₂ emissions.

Kartal:

Improved bus services based on:

E-ticketing

Traffic control centre

Active traffic management

Electronic parking systems

Road pricing



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Kartal:

Improved bus services based on:

E-ticketing

Traffic control centre

Active traffic management

Smart parking systems

Investment - €56million

Direct & Indirect benefit over 35 years - €730m

Payback – 6 years with indirect benefits



Transport

SIEMENS



20x

Average return on Investment from transport measures across four cities

€566m

Average value of total cumulative return from smart transport systems across four cities



74%

Of the benefits from transport measures come through reducing delays and time savings

P

7 years

Average payback time on investment in smart on-street parking (including full detection technology and payments system implementation)



Buildings



SIEMENS

Smarter building energy management, on-site generation and storage can deliver substantial cuts in energy use and avoid the need for infrastructure upgrades, providing high potential savings.



London:

Domestic Building Energy Management Systems

Non-Domestic Building Energy Management Systems

On-site generation

Battery Storage

15 GWh electricity savings

111 GWh heat savings

Buildings

SIEMENS

Smarter building energy management, on-site generation and storage can deliver substantial cuts in energy use and avoid the need for infrastructure upgrades, providing high potential savings.

London:

Domestic Building Energy Management Systems

Non-Domestic Building Energy Management Systems

On-site generation

Battery Storage

Investment- €53m

Direct & indirect benefits over 35 years - €518m

Payback - 5 years



14x

Average return on investment from smarter buildings across three cities



29%

Of the benefits from using smart technology in buildings are from carbon emissions reduction

€4.2bn

Average value of cumulative return – both direct and indirect benefits – from smart buildings measures across three cities

4.3 years

Average payback time on investment in commercial building energy management systems

Security

SIEMENS

The challenge for authorities is to target and cut crime while maintaining public trust and avoiding alienating affected communities as a result of security responses. Direct cost savings and much greater indirect savings – due to the substantial value associated with avoided crime – can be made.

Brussels:

- Video surveillance camera network
- Crime analytics
- Central security operations centre



IMM: Kix
Model: Sportage
Year: 2019
Colour: Black
Class: Private & light goods
Fuel Type: Diesel
CO2 emissions: 148 g/km

IMM: London Taxis Int.
Model: TX4 Elegance
Year: 2011

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IMM1: London Taxis Int.
Model: TX4 Elegance
Year: 2011

Brussels:

Video surveillance camera network

Crime analytics

Central security operations centre

Investment - €482m

Direct benefits - €1.9bn

Indirect benefits - €14 bn

Payback - 2 years



32x

*Return on investment
in smart security
infrastructure in
one city*



11%

*Reduction in police costs through
predictive
policing and savings in responding
to crime*



86%

*Of the benefits come from
measures to avoid crime
taking place*



Harbour

SIEMENS

Harbours can benefit from a range of smart technologies that can help port operators increase efficiency, cut human error, optimise energy use and improve air quality in and around ports where diesel pollution from vessels' on-board power systems can be a serious problem.

Aberdeen:

Crane automation

Logistics management

Asset tagging of containers

Onshore energy supply



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SIEMENS

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Aberdeen:

Crane automation & logistics management

Asset tagging of containers

Onshore energy supply

Investment - €58 million

Direct benefits - €198 million

Payback period - 9 years (inc indirect benefits)



Harbour

SIEMENS



39%

Level of overall benefits that are positive indirect effects: reduced carbon emissions and improved air quality

€1.6m

Annual financial revenues from a smart terminal management system

51%

Just over half of the benefits from smart harbour measures come from electricity savings and revenue



Connectivity

SIEMENS

It is said that digital information is the fuel of mobility. Better connectivity offers new transport options that did not exist before the internet and smartphone era, for example rental e-bike networks that increasing the range users can travel.

It also improves the visitor experience, allowing visitors to interact with their local environment.

Alba Iulia:

Expanding free WiFi connections

Expanding the range of e-bikes for rent

Geospatial beacons to provide location-specific information

Expanding the E-ticket range to regional cities



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Alba Iulia:

Expanding free WiFi connections

Expanding the range of e-bikes for rent

Geospatial beacons to provide location-specific information

Expanding the E-ticket range to regional cities

Investment over four years - €7m

Direct and indirect benefits - €70m

Payback - 10 years



Connectivity

SIEMENS



3 years

*Payback time on investment in
free
Wi-Fi provision*

94%

*Proportion of benefits
that come from higher
tourist revenues*

10x

*The total cumulative return
from connectivity measures
is over 10 times the
investment required*

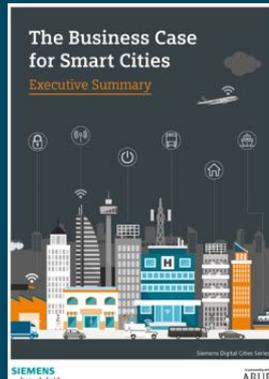
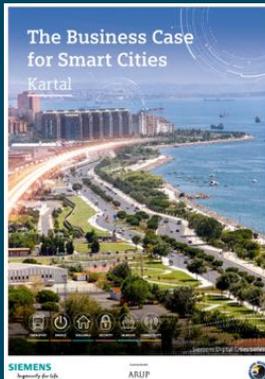
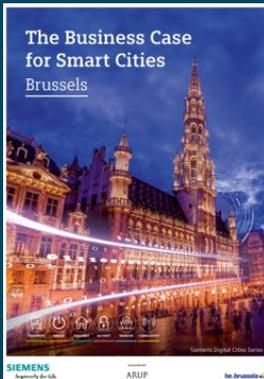
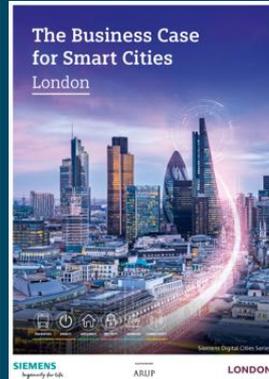
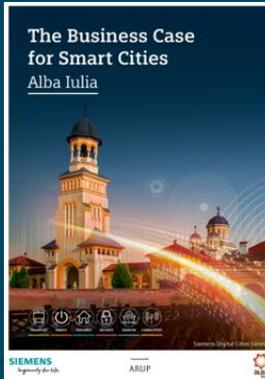
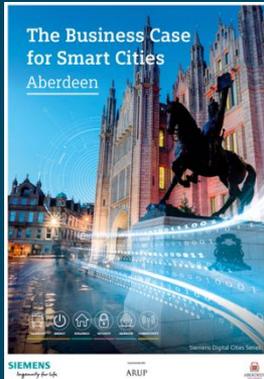
Conclusion

Investing in digital technologies can yield significant economic and financial benefits for a smart city, and the tools are available to capture enough of those benefits to support the business case for investment.

Key findings relevant to all cities include:

- Data sharing should open opportunities for new players
- The built environment needs the right policy incentives
- Security offers the strongest direct and indirect economic opportunities
- Smart lighting has potential beyond energy savings
- Indirect benefits transform the business case

Thank you for your attention
www.siemens.com/intelligent-infrastructure



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