

# Smart City and IOT

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世界銀行顧問  
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台南應用科技大學管理學院專技教授  
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0920-208-020

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1

## Global Urban Population.. 1950

United States  
101M

China  
64M

India  
63M

### Urban Population

Greater than 75%

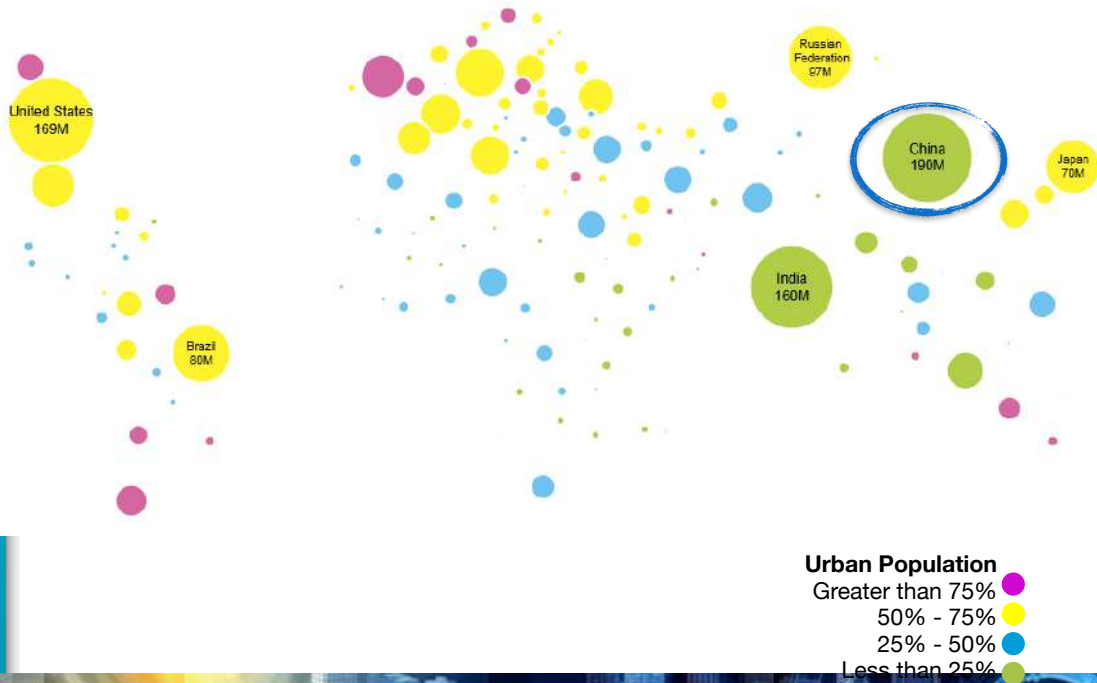
50% - 75%

25% - 50%

Less than 25%

2

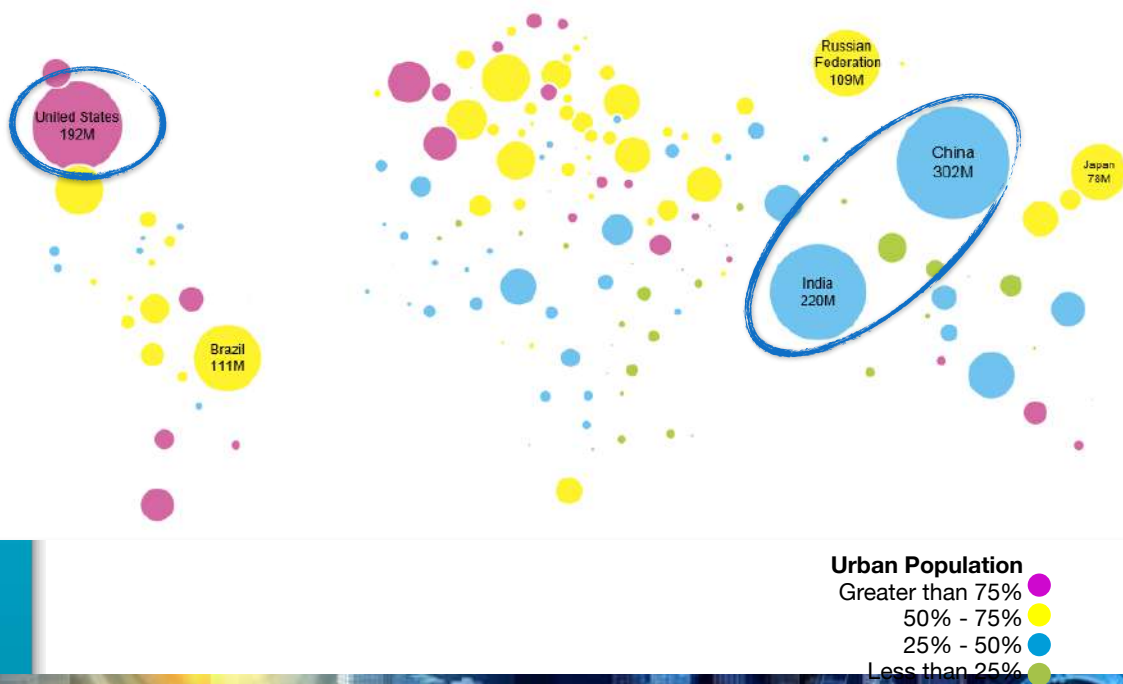
# Global Urban Population.. 1980



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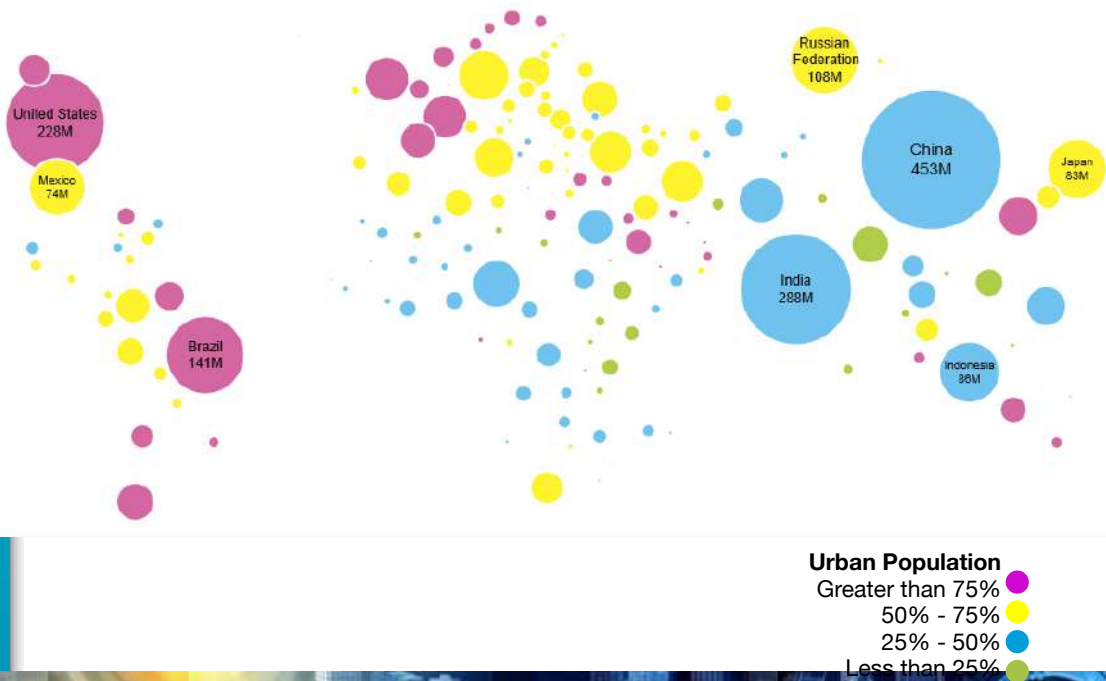
# Global Urban Population.. 1990



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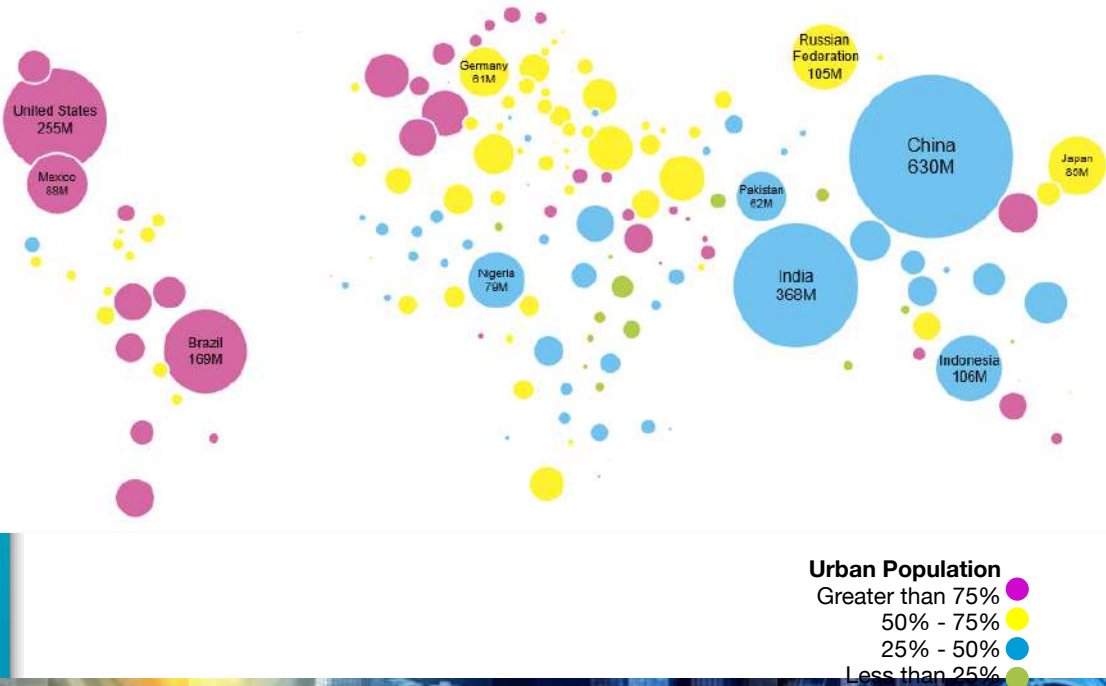
# Global Urban Population.. 2000



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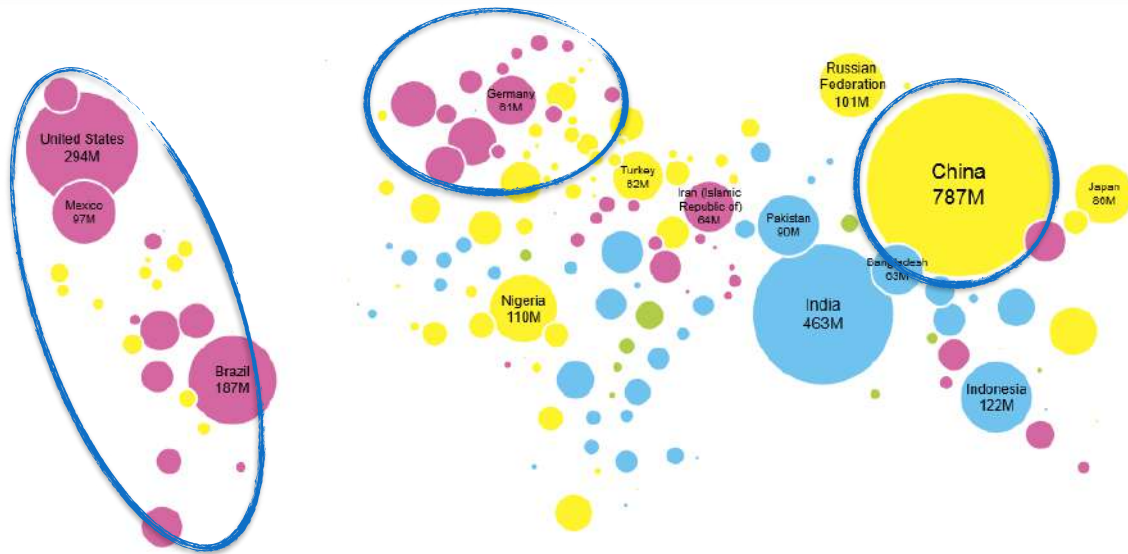
# Global Urban Population.. 2010



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6

# Global Urban Population.. 2020

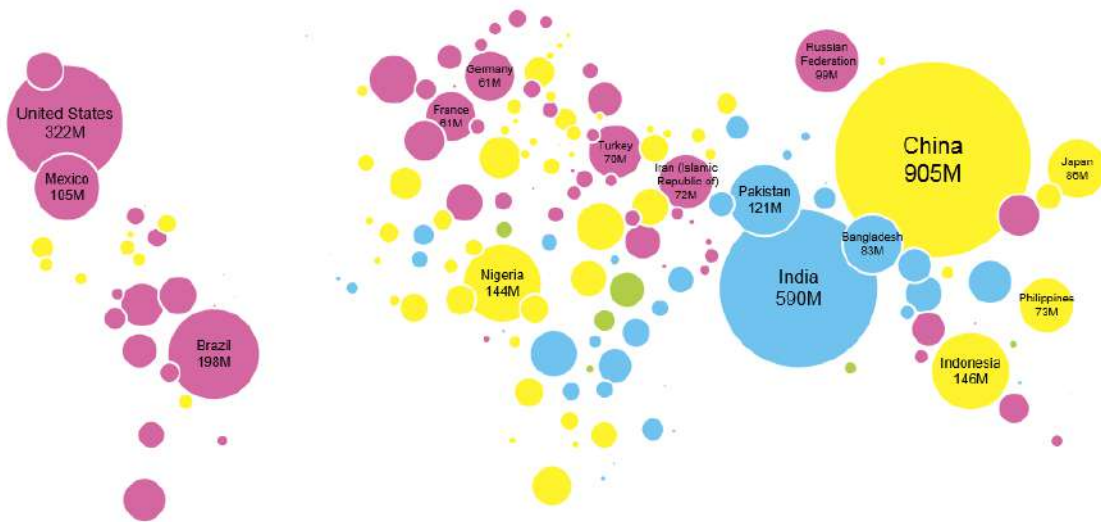


**Urban Population**  
 Greater than 75% ●  
 50% - 75% ●  
 25% - 50% ●  
 Less than 25% ●

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# Global Urban Population.. 2030

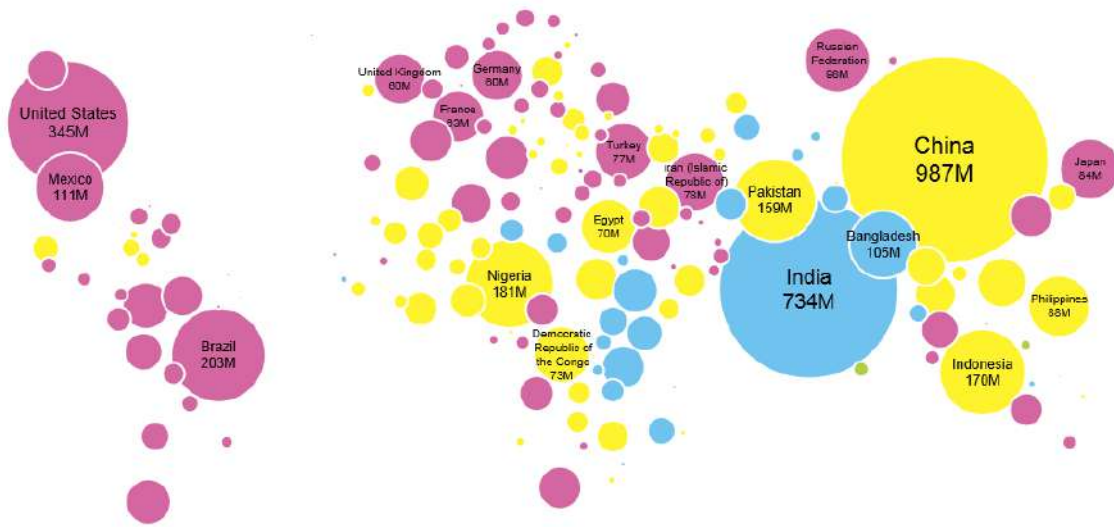


**Urban Population**  
 Greater than 75% ●  
 50% - 75% ●  
 25% - 50% ●  
 Less than 25% ●

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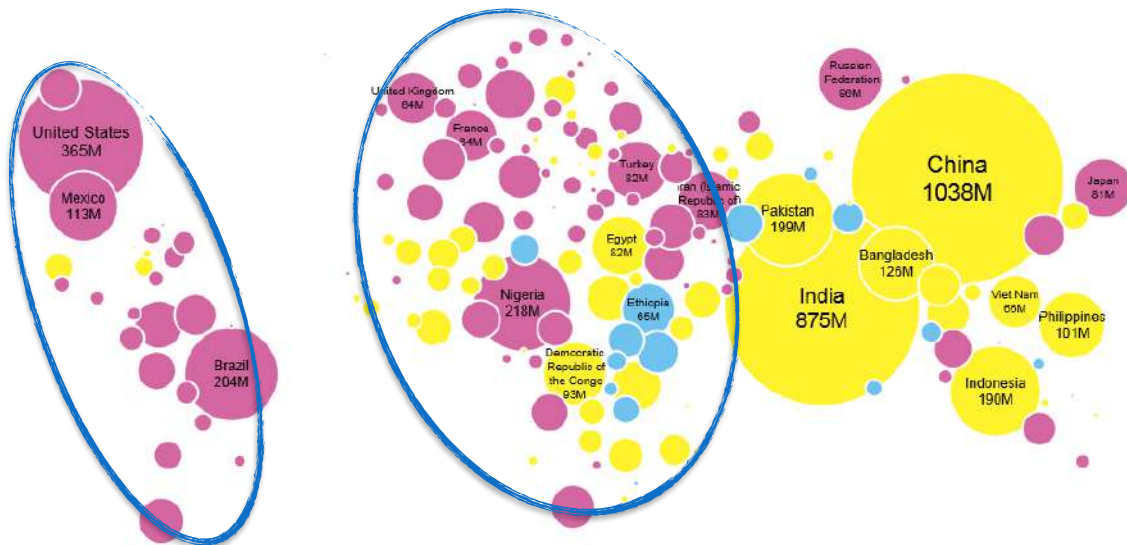
# Global Urban Population.. 2040



**Urban Population**  
 Greater than 75% (Purple)  
 50% - 75% (Yellow)  
 25% - 50% (Blue)  
 Less than 25% (Green)

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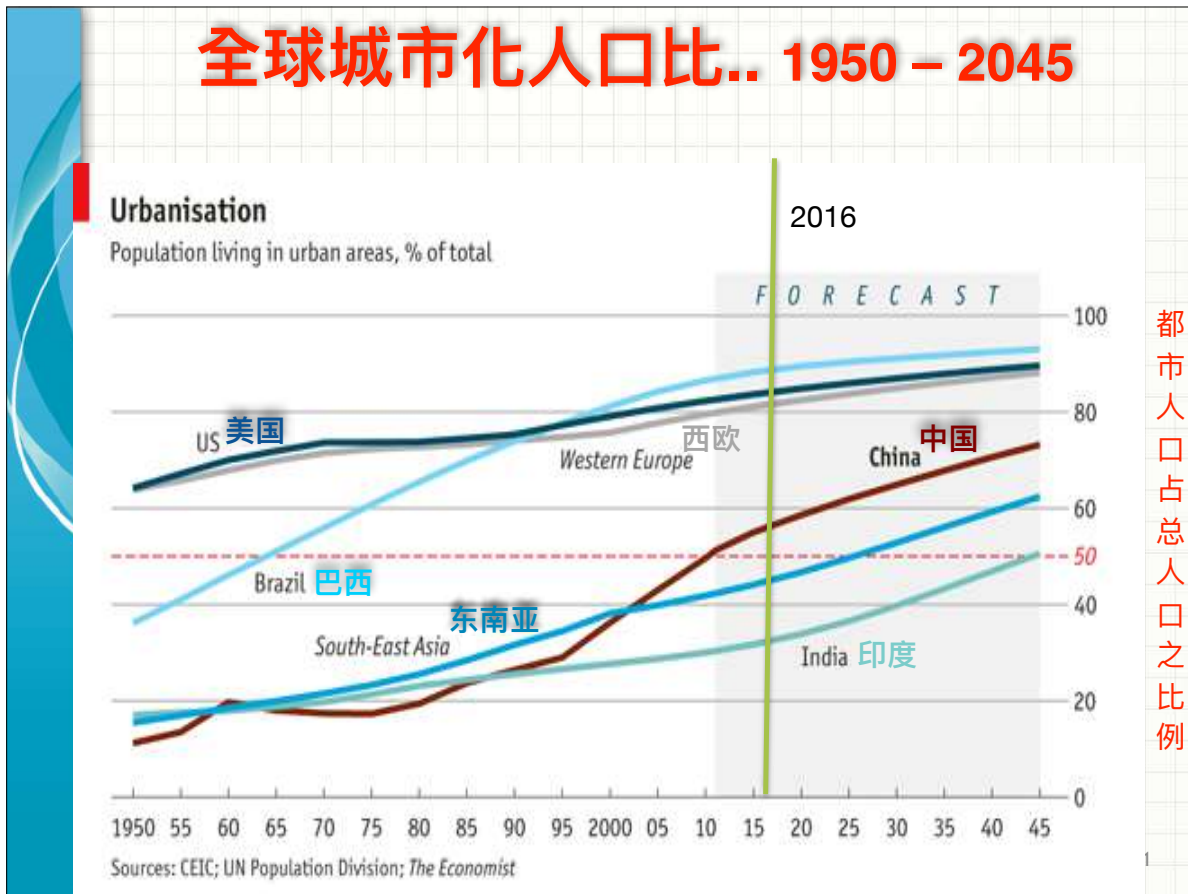
# Global Urban Population.. 2050



**Urban Population**  
 Greater than 75% (Purple)  
 50% - 75% (Yellow)  
 25% - 50% (Blue)  
 Less than 25% (Green)

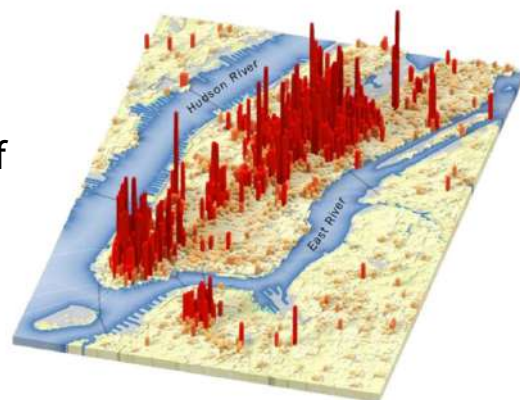
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# 全球城市化人口比.. 1950 - 2045



11

Cities continue to serve as shining beacons of hope and opportunity, and people from every corner of the world flock to these places to experience a higher standard of living, start families, and found businesses, causing a migration trend known as urbanization.



## 城市化的遷移趨勢 The Trend of Urbanization

This trend has converted cities into intellectual hubs and cultural and financial capitols. Cities also bring in congestion, pollution and public safety issues.



13

13

## 城市化的遷移趨勢 The Trend of Urbanization

Today, about 54% of the world's population lives in urban areas and consumes about 2/3 of world energy. And according to the United Nations forecast, this number will increase to about 6.3 billion (66% of the world's population) by 2050.



14

14

## China is Moving into urbanization with the speed of disappearing 100 villages a day

According to China Society Blue Book published on 11/3/2012, China's urbanization population has exceeded 50%, China's urban population for the first time over the agricultural population.



15

## 英國城市化進程從20%到40%花了120年

United Kingdom took 120 years to urbanization from 20% to 40%



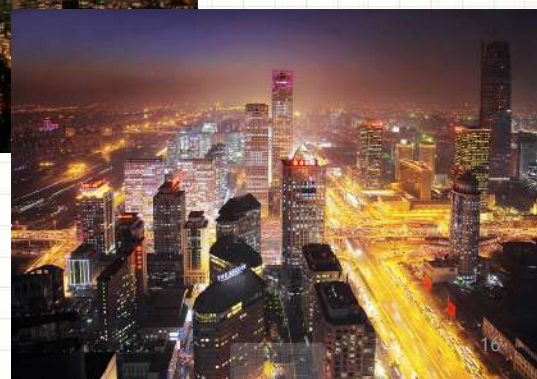
## 美國花了80年

United states took 80 years.



## 中國只花了20年

China took only 20 ye



16



- Continued globalization and urbanization have tested the limits of the city's health, power, safety and transport infrastructure.



17

17

## 全球化改變了生產、銷售及消費的關係

- Only a few cities with local characteristics are important in the global urban competition. Cities must improve local characteristics to become potential competitors for globalization.



18

18

要成為全球化的潛在競爭者, 城市必須變得更有智慧

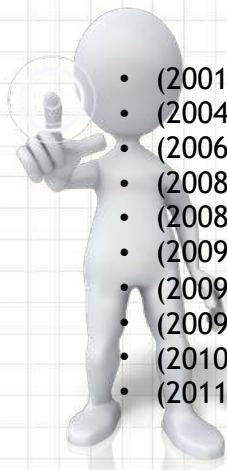
Cities must become smarter to be able to compete globally.



19

19

对人力，社会，以及传统的运输基础设施和现代通信网络的投资，已经成为许多城市确保他们在世界上竞争力的重要因素。

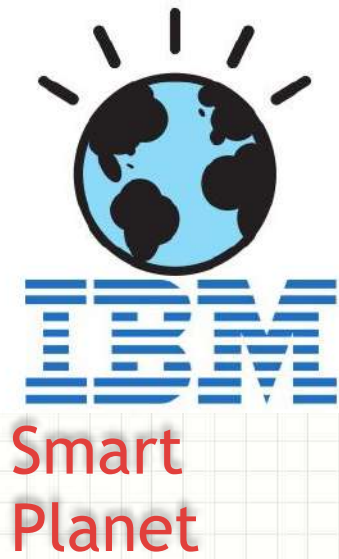


- (2001) City of Cape Town Smart City strategy,
- (2004) U-Korea IT893 Strategy,
- (2006) Singapore iN2015,
- (2008) Eco Smart City Stockholm,
- (2008) Smart Taiwan,
- (2009) i-Japan 2015 Strategy,
- (2009) Digital Britain,
- (2009) US Apps.gov,
- (2010) Amsterdam Smart City, and
- (2011) China Twelfth Five Year National Plan.

20

20

In 2008



Smart cities  
Ranking of European medium-sized cities



Final report, October 2007 21

21

# Smart City 智慧城市



# Smart City 智慧城市

In a smart city, smart citizen, living in a smart environment with smart life, using smart mobility to promote smart economy, and to participate in the smart governance.

- 一個智慧的城市, 有智慧的公民, 生活在智慧的環境中, 過著智慧的生活, 利用智慧的交通(資訊通訊), 推動智慧的經濟, 參與智慧政府的治理。

Improve the sustainable development of urban competitiveness.

提高可持續發展的城市競爭力。



23

23

The Internet of Things (IoT) is upon us  
物聯網已經無所不在

75 billion devices connected by 2020

到2020年將有750億個裝置設備連結



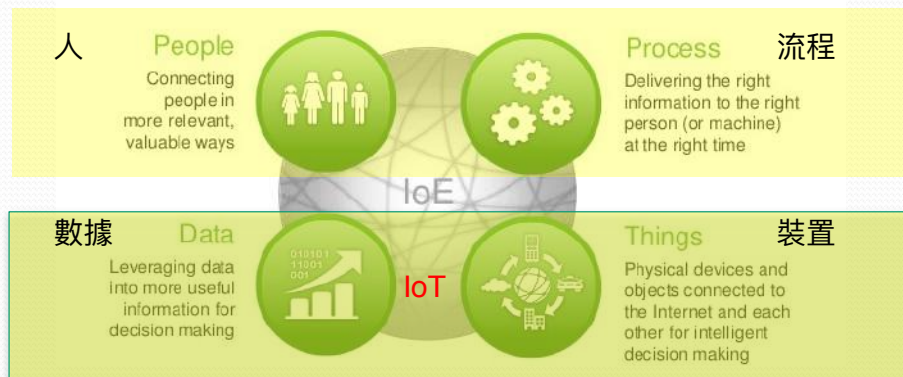
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24

# From IoT to IoE .. 從物聯網到萬物互聯

## Networked Connection of Everything

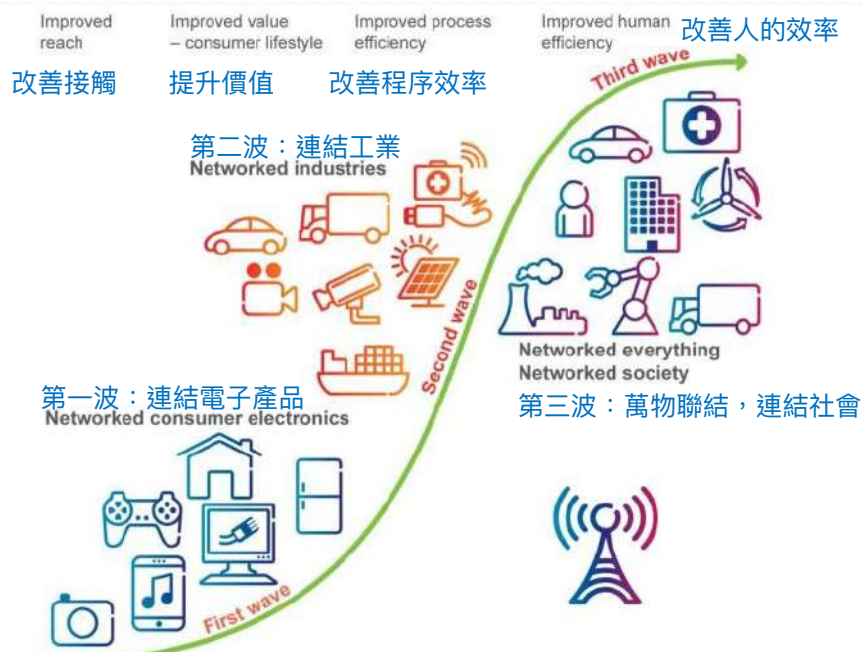
- 當一切都連接，數據/事件將呈爆發式增長。即時檢測，大數據分析，流程優化是趨勢，將改變每個人和企業的生活方式。
- When everything are connected, data/events will increase explosively. **Instant Detection**, **Big Data analysis**, **Process Optimization** are the trends and will change the life style for every individuals and enterprises.



25

25

# From IoT to IoE .. 從物聯網到萬物互聯

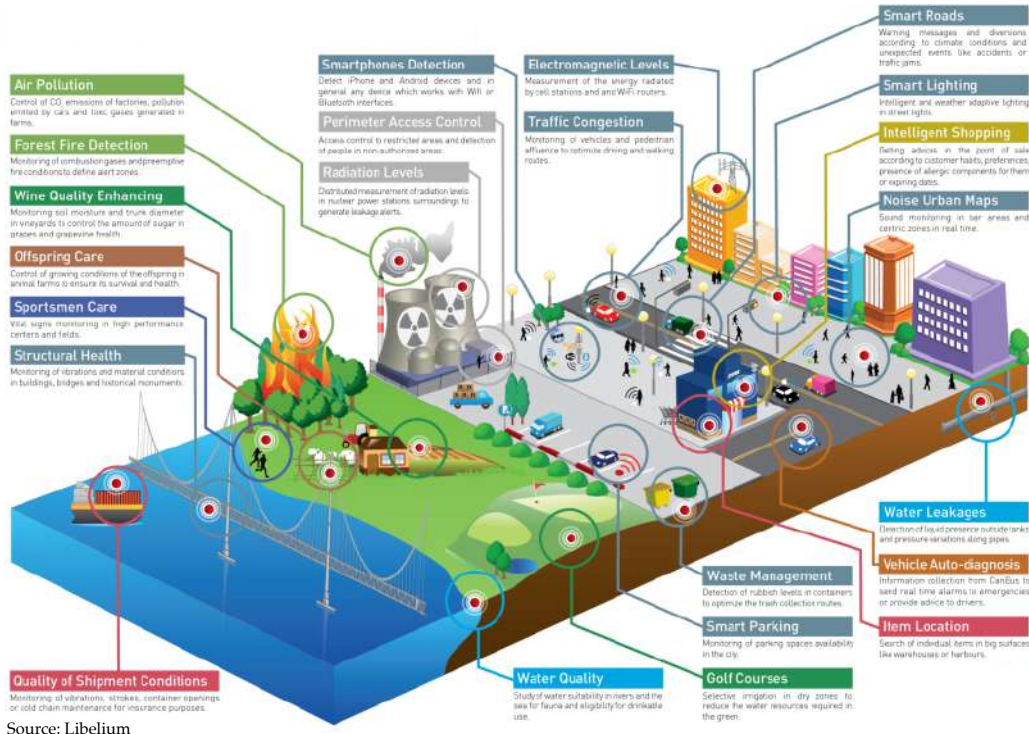


.The three waves of connected device development.

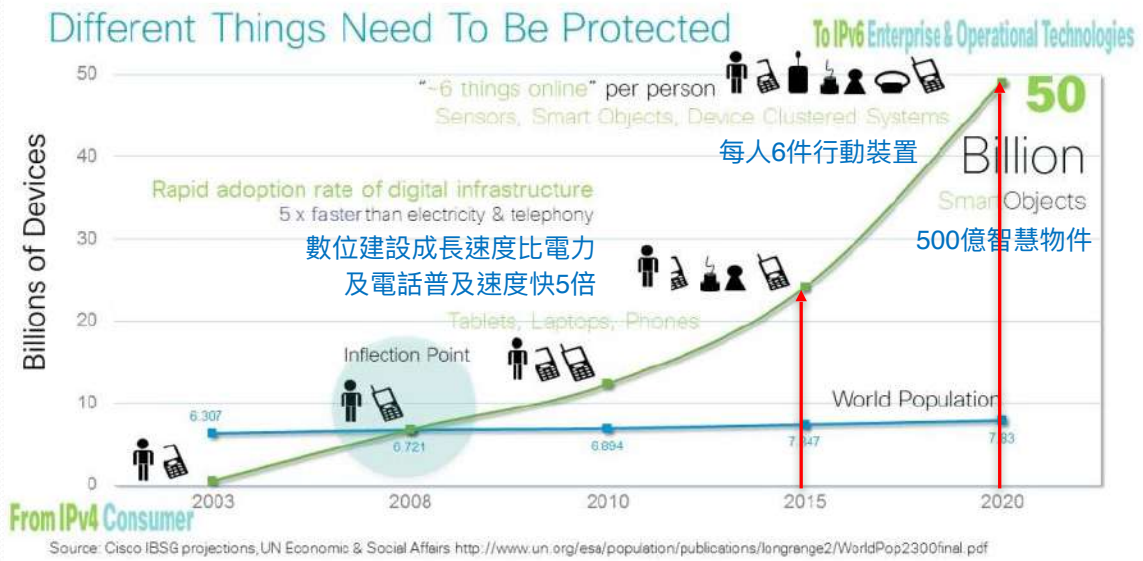
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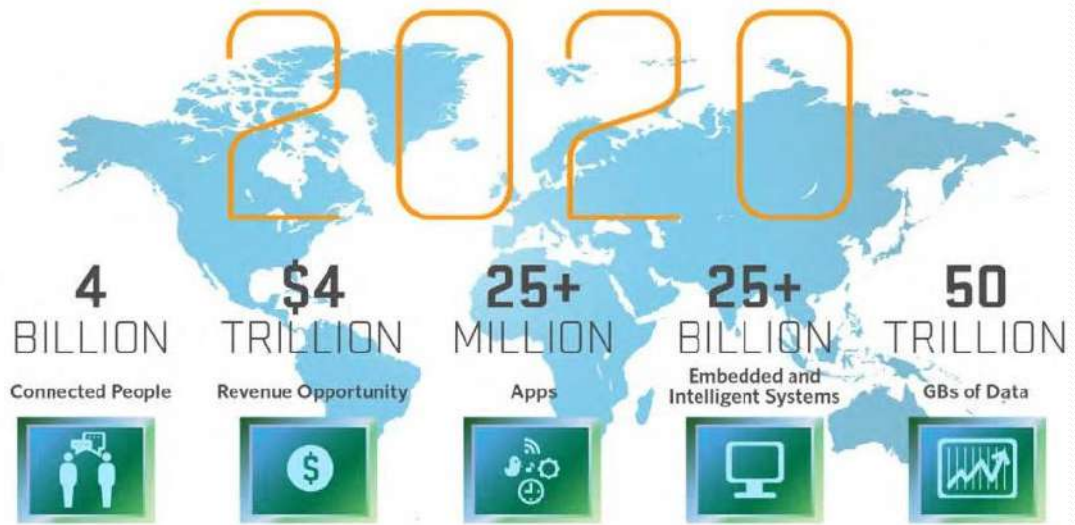
# The Internet of Everything (IoE)



# The Internet of Everything (IoE)



# The Internet of Everything (IoE)



Source: Mario Morales, IDC

40億人的連結    4兆美金商業機會    2千5百萬移動應用    250億智慧系統    50兆GB訊息

29

29



30



31

## 創建真實的數據智慧



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32



# 創建真實的數據智慧



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33



- **Interconnected** 互聯
- **Interchangeable** 可交換
- **Interoperable** 可互相操作
- **Interactive** 互動
- **Integrated** 整合

**Collaboration**  
**Information Sharing**



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34

34

**Big data is like a treasure on an island**  
**Can't be touched, and can't be used**  
大數據就像在孤島上的寶藏，碰不到，也用不到



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35

35

## What is Big Data ?

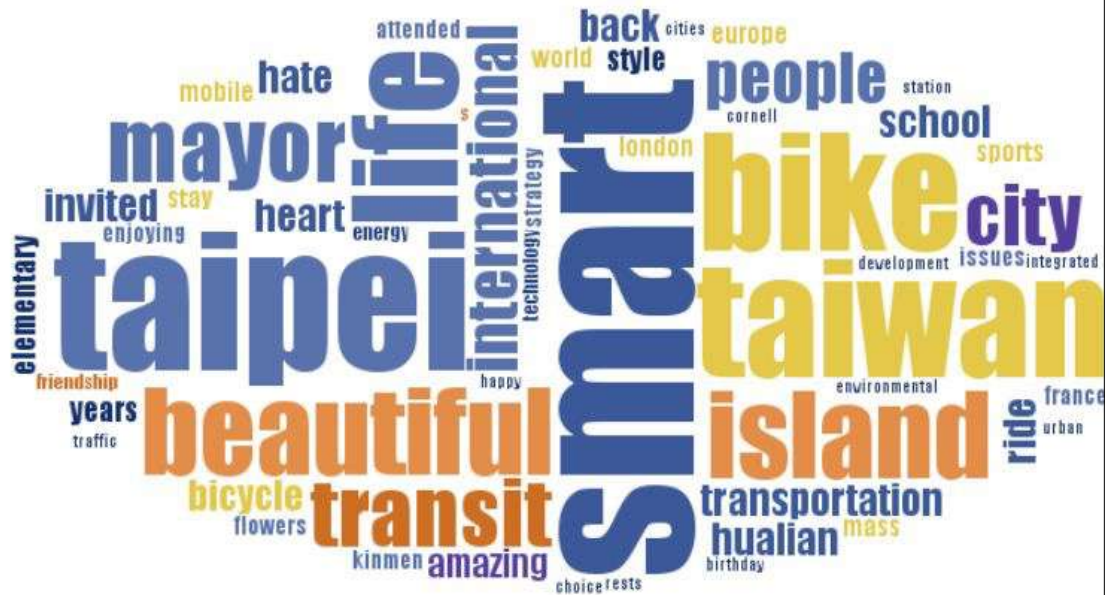


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36

36

## This is the big data of my FB



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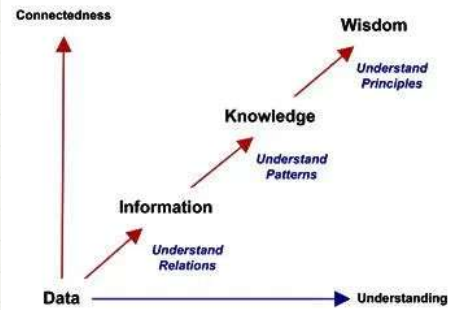
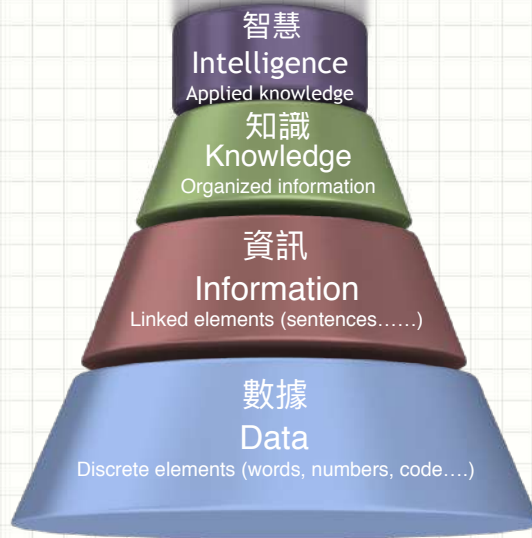
## Smart City and Smart Data 智慧城市與智慧數據



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38

# Data to the Intelligence Evolution Process 數據到智慧的演化過程



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39

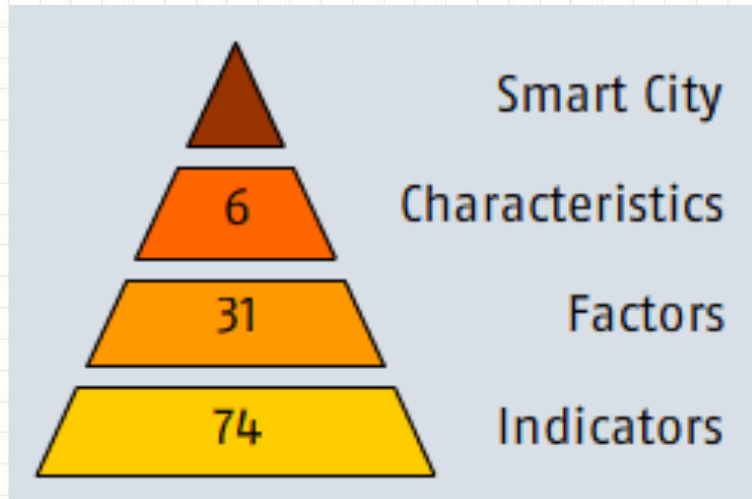
# The Three Core Functions of a Smart City



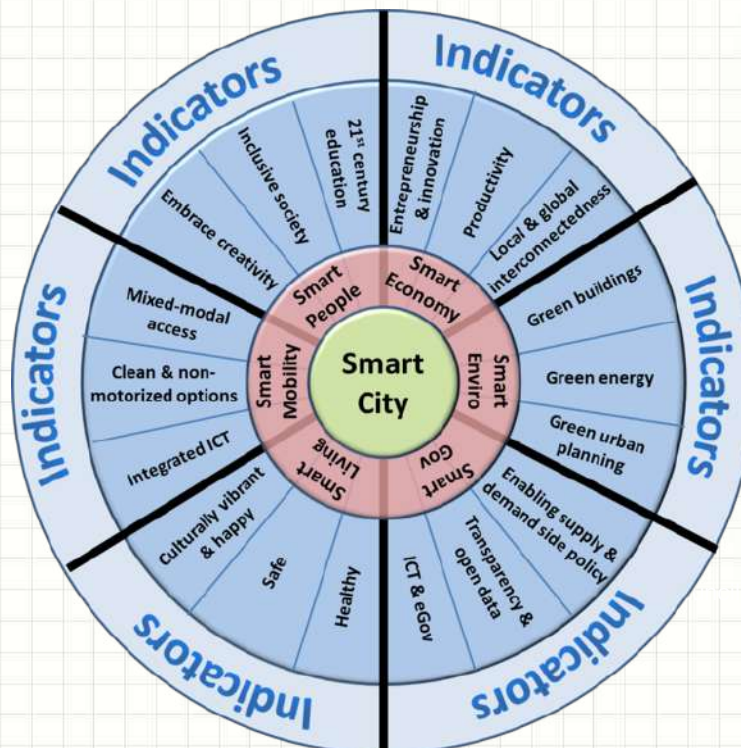
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40

# The smart city model



# Smart City Wheel



## European Initiative on Smart Cities

### Strategic objective

To demonstrate the feasibility of rapidly progressing towards our energy and climate objectives at a local level while proving to citizens that their quality of life and local economies can be improved through investments in energy efficiency and reduction of carbon emissions.

This Initiative will foster the dissemination throughout Europe of the most efficient models and strategies to progress towards a low carbon future.

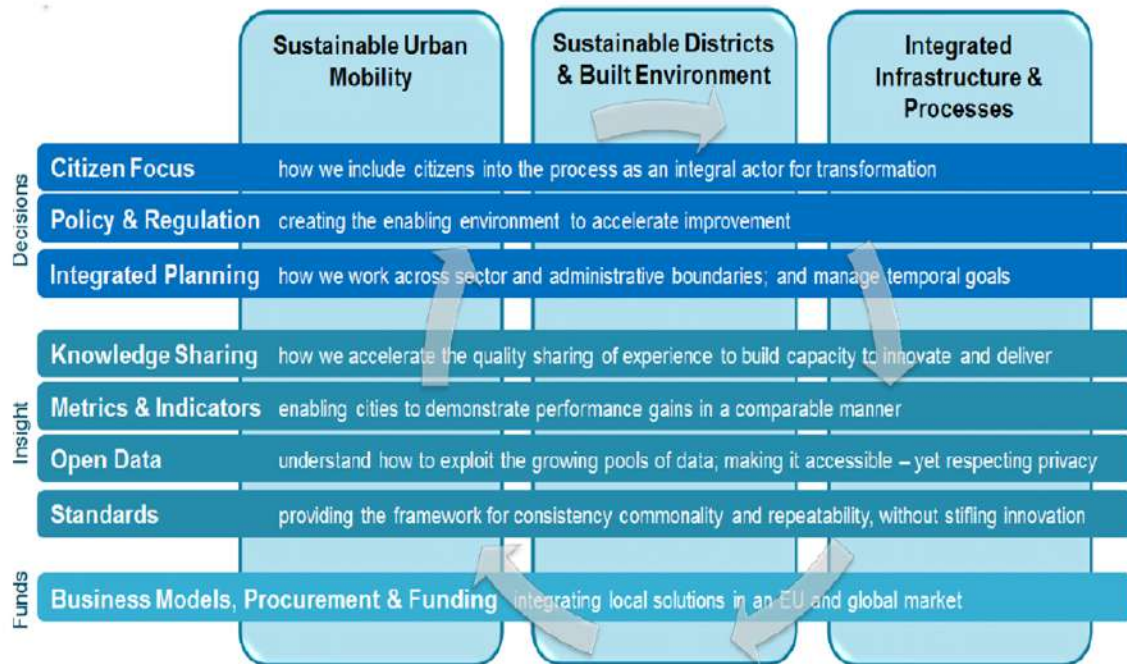
## The European Innovation Partnership on Smart Cities and Communities (EIP-SCC)

An initiative supported by the European Commission bringing together cities, industry, SMEs, banks, research and other smart city actors.

It intends to:

- Improve citizens' quality of life
- Increase competitiveness of Europe's industry and innovative SMEs
- Make our cities more competitive and better places to live in
- Share knowledge to prevent mistakes being repeated
- Reach our energy and climate targets
- Support you in finding the right partners and solutions It's about achieving social, environmental and economic sustainability for our cities.

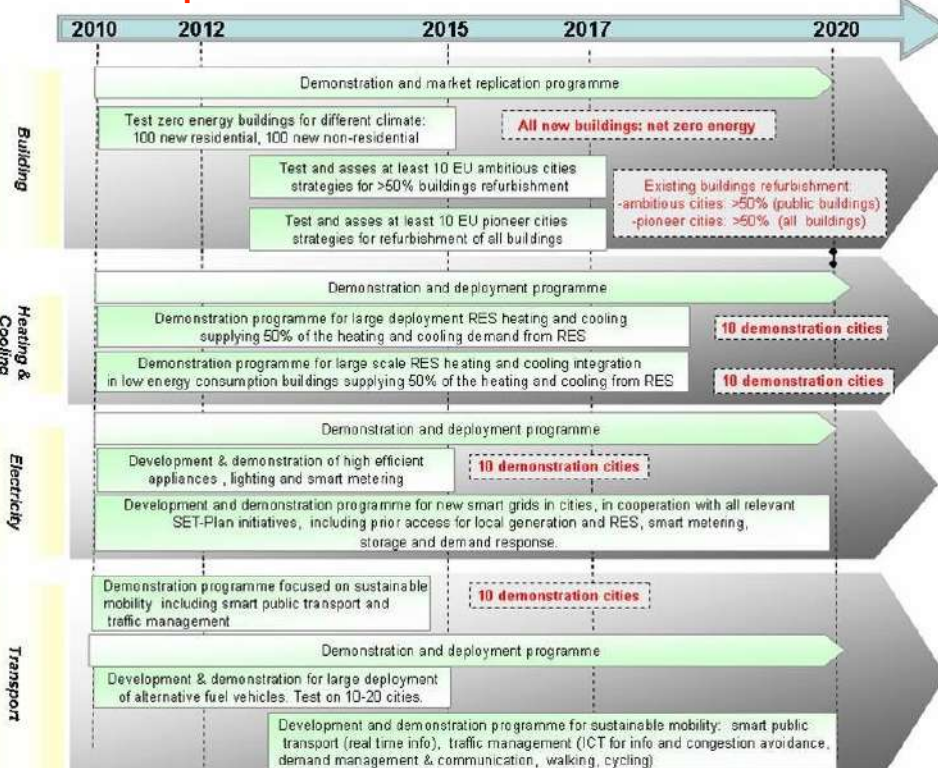
Priority areas defined in the Strategic Implementation Plan of the European Innovation Partnership on Smart Cities and Communities.



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45

## European Initiative on Smart Cities



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46

## 智慧城市論壇組織 (Intelligent Community Forum) 智慧城市指標 Smart City Indicators



- 寬頻連接 Broadband Connectivity
- **知識勞動力 Knowledge Workforce**
- 創新 Innovation
- 數位共融 Digital Inclusion
- 市場行銷和宣傳 Marketing and Advocacy

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## Smart City Success Factors



- **協同合作 Collaboration**
  - Government、Business、Schools、Civil Groups
- **領導能力 Leadership**
  - Identify challenges、Set priority、Communicate vision
- **永續發展 Sustainability**
  - Increase revenue & long term investment
  - Setup policy for land use and transportation infrastructure to become livable community
  - Invest projects balancing economic development and environment

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# Industry 4.0



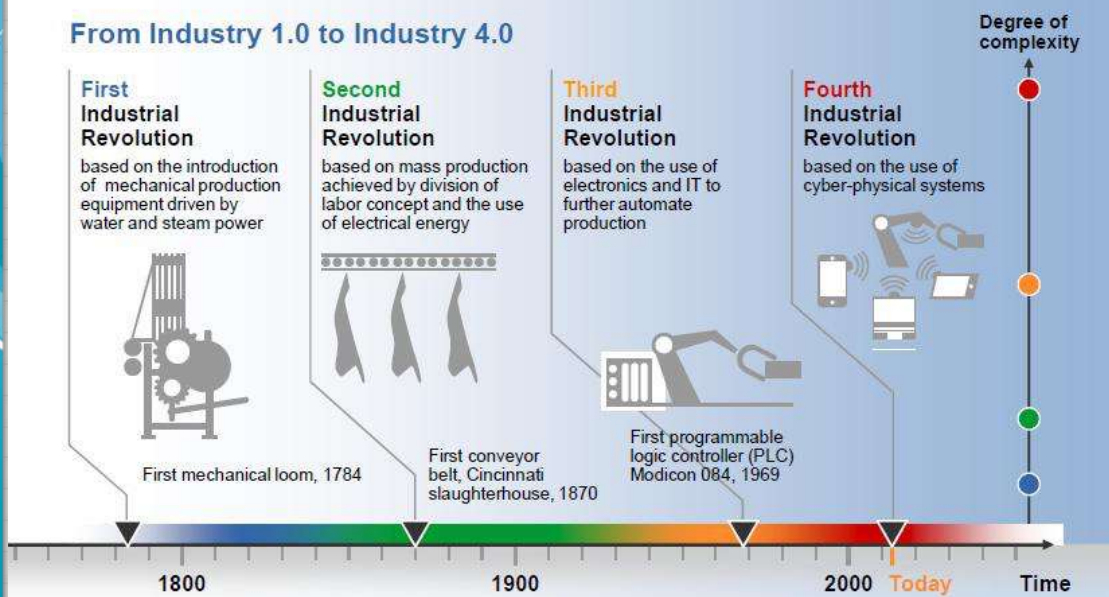
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49

49

## 從工業 1.0 到工業 4.0

### From Industry 1.0 to Industry 4.0



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50

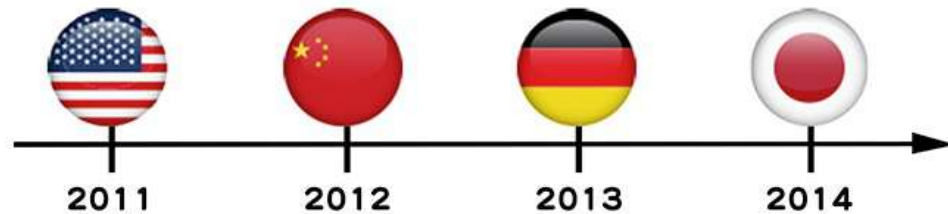
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- Complex industrial processes could be controlled by a small iPad
- 繁雜的工業生產流程可以由一台小小的PAD全程操控



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51



2011	2012	2013	2014
<b>美國AMP</b>	<b>大陸 製造2025計畫</b>	<b>德國 工業4.0</b>	<b>日本 機器人新戰略</b>
<b>製造業回流</b>	<b>智能製造</b>	<b>智慧工廠</b>	<b>人機共存 未來工廠</b>
強化先進材料、 生產技術、先進 製程、數據資料 與設計等產業 共通基礎	發展智能製造設 備、新一代移動 通信、三網融合 物聯網、雲端運 算等戰略性產業 技術	以物聯網為範 疇、發展水平整 合價值網路、終 端對終端流程整 合、垂直整合製 造網路、工作站 基礎及CPS等 技術	感測器、控制/ 驅動系統、雲端 運算、人工智慧 等技術發展機器 人、且讓其相互 聯網

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52

# China's 'Internet Plus' Strategy

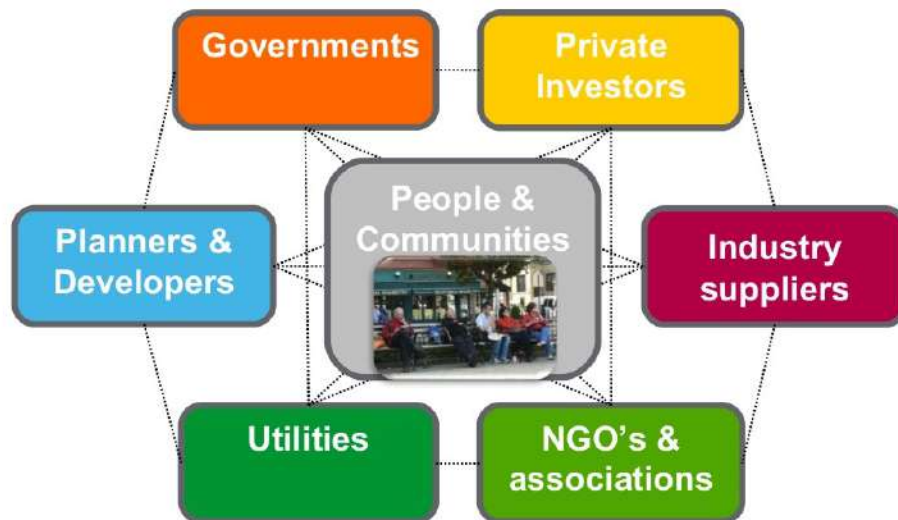


**Baidu, Alibaba Group, and Tencent Holdings,**

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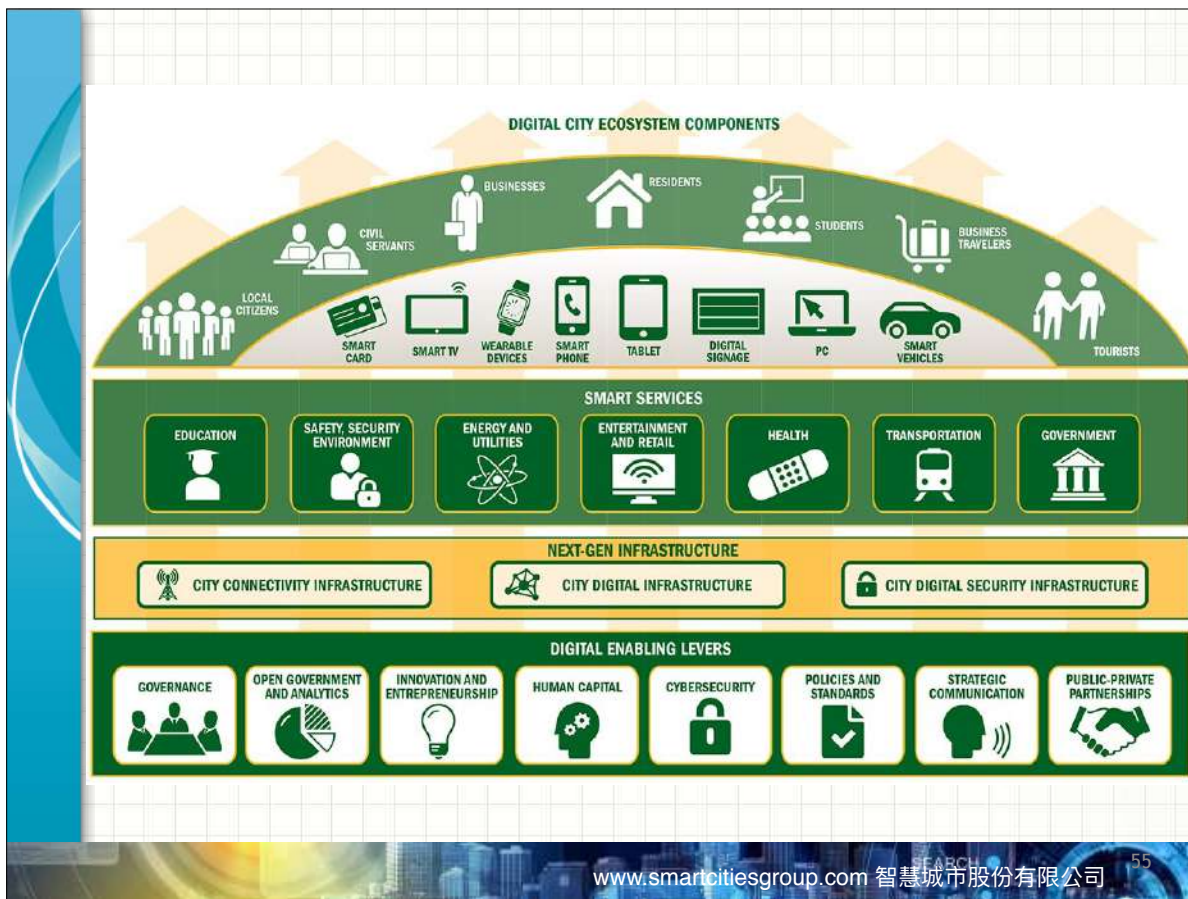
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This requires stakeholders collaboration

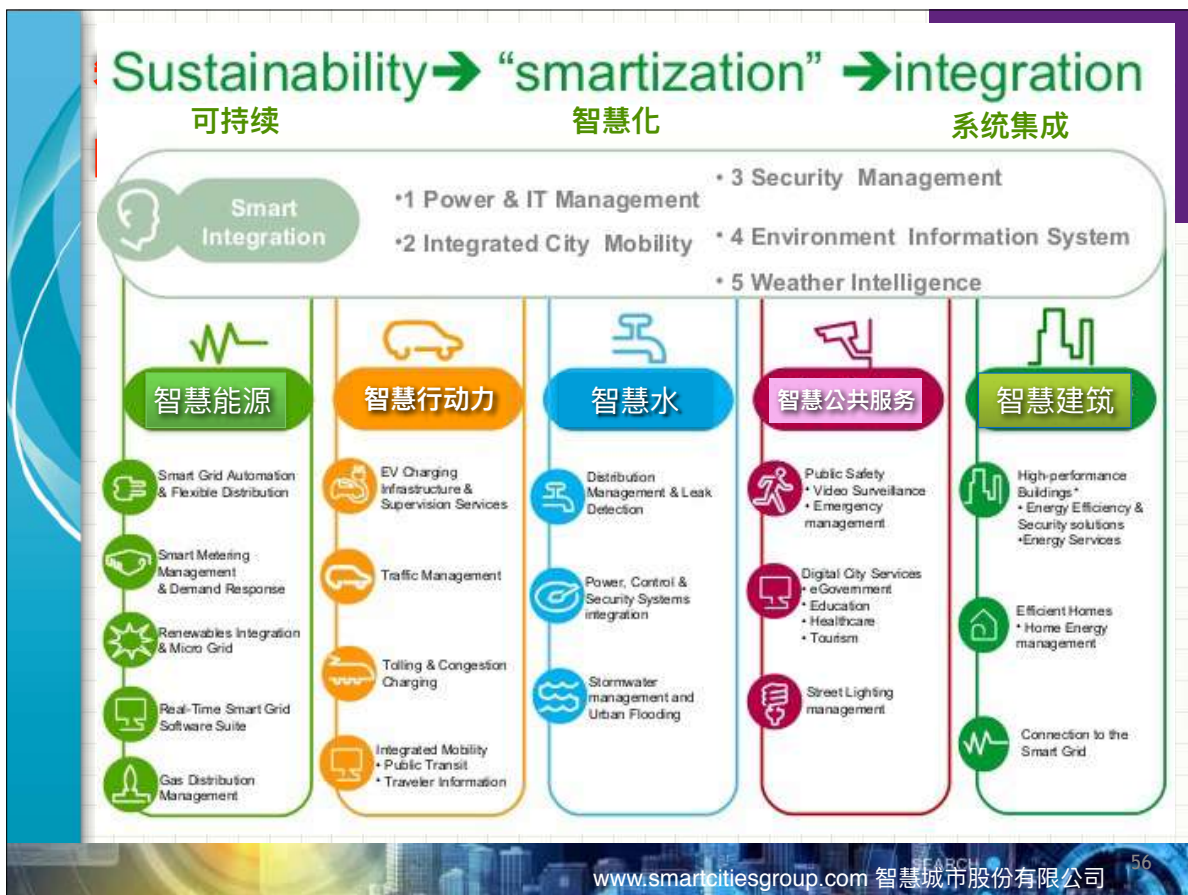


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54



55



56

## IBM Smart Cities Planning and management solutions

City leaders must design and implement a city plan to realize full potential for citizens and businesses while efficiently running daily operations

### Public safety solutions

- Intelligent Operations Center for Emergency Management
- Integrated intelligence analysis
- Tactical lead generation
- Intelligent Video Analytics
- Content analytics

### Smarter buildings and urban planning solutions

- Energy optimization
- Enterprise Asset Management
- Facilities management
- Smarter stadiums solution

### Government and agency administration solutions

- Geographic information systems for government from IBM and ESRI
- Performance management for government
- Cloud computing for regional and local governments
- Smart Cloud Social Collaboration for Government



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57

57

## IBM Smart Cities Infrastructure solutions

City leaders must provide the fundamental infrastructure to deliver services such as water, energy and transportation while making the city a desirable place to live.

### Water and energy solutions

- IBM Intelligent Water
- IBM Enterprise Asset Management for water utilities
- IBM Intelligent Utility Network Solution
- Customer operations transformation
- Smart metering and beyond
- IBM Enterprise Asset Management for energy and utilities
- Energy optimization

### Transportation solutions

- Intelligent transportation
- Integrated fare management for transportation
- Airport Operations Management Systems solution from IBM
- Video correlation and analysis suite from IBM
- Fleet optimization for travel and transportation
- IBM ILOG optimization solutions for travel and transportation
- Asset management and maintenance



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58

58

# IBM Smart Cities Human solutions

City leaders must provide services that support the social, health and educational needs of citizens.

## Social programs solutions

- IBM Cúram solution for disability management
- IBM Cúram solution for employment
- IBM Cúram solution for pensions
- IBM Cúram solution for family services
- IBM Cúram solution for social assistance
- IBM Cúram Solution for Healthcare Reform

## Healthcare solutions

- IBM Watson Health
- IBM Care Management
- Asset management and maintenance solutions from IBM
- Fraud and abuse management for payers
- Healthcare asset management
- Member 360 for healthcare
- Business analytics for healthcare

## Education solutions

- Framework for smarter education from IBM
- Technology solutions for the education industry
- School solutions from IBM
- IBM VCL Solutions for Cloud
- Innovation in research
- Administrative solutions for education from IBM
- Asset management for education
- Campus solutions for higher education from IBM
- Enterprise risk management for higher education



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59

# Smart Chicago

COLLABORATIVE

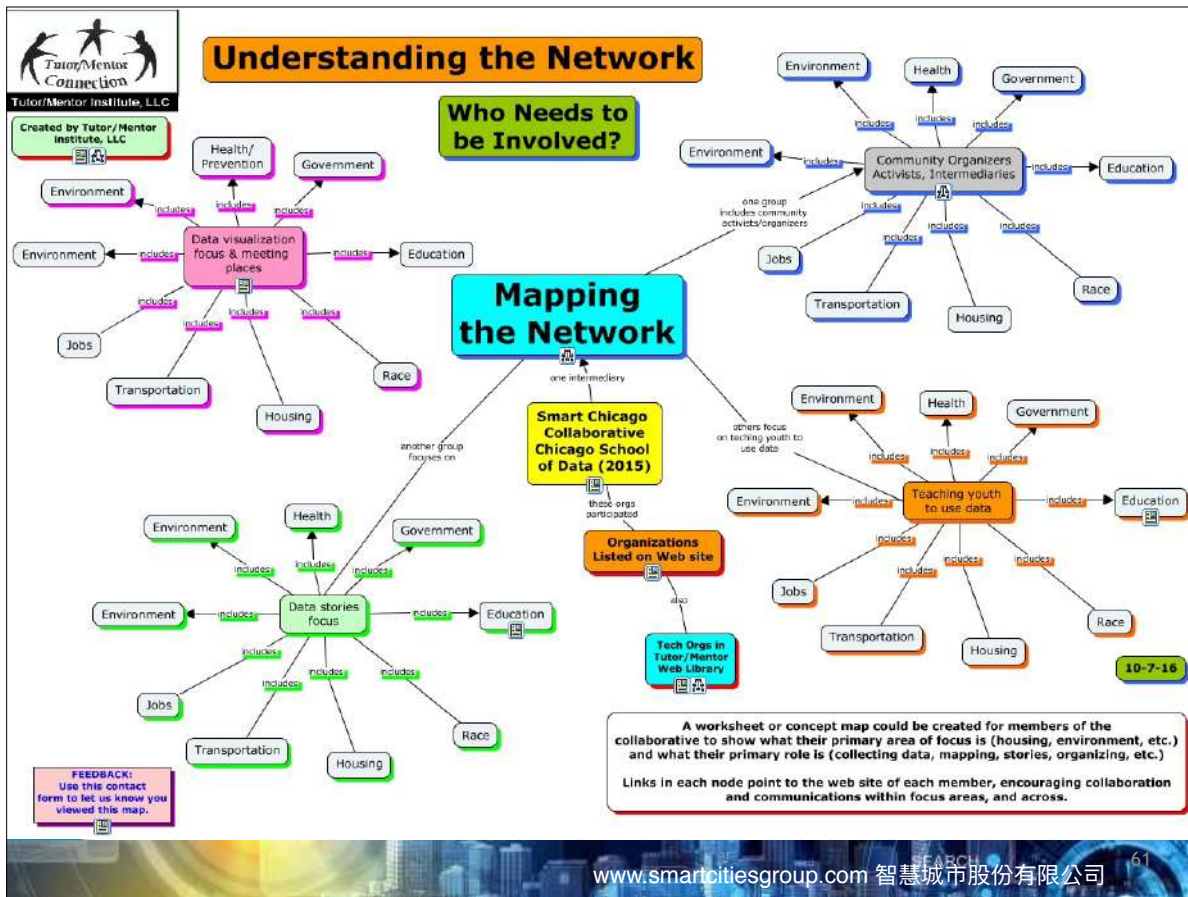
Smart Chicago has three primary areas of focus under which we organize all of our work:

- Access to the Internet & technology,
- Skills to use technology once you've got access, and
- Data, which we construe as something meaningful to look at once you have access and skills.



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60



61

**Smart Chicago COLLABORATIVE**

It's as easy as...

**1. FIND** **2. PAY** **3. PARK**

**OpenGrid**

**RESERVE NOW**

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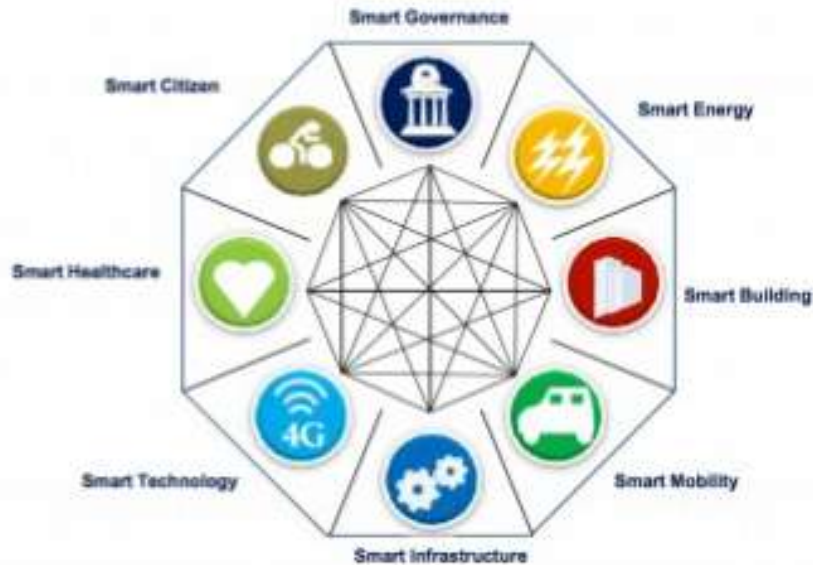
62

*From transport to mobility*

## Mobility and Smart Cities



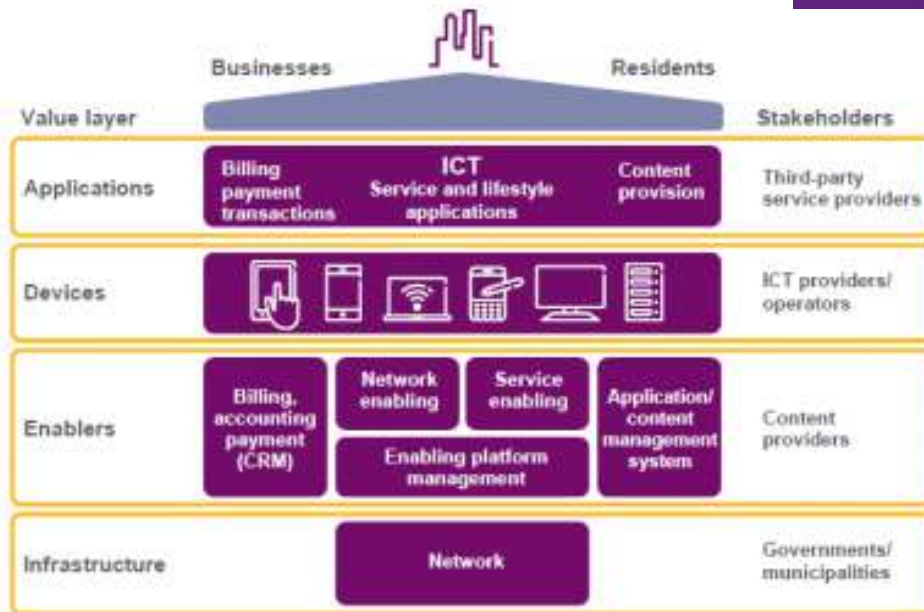
*Happy mobile citizens  
Paving the way for innovation*





# City of Stockholm

One of the most connected cities in the world



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65

65

# Boston

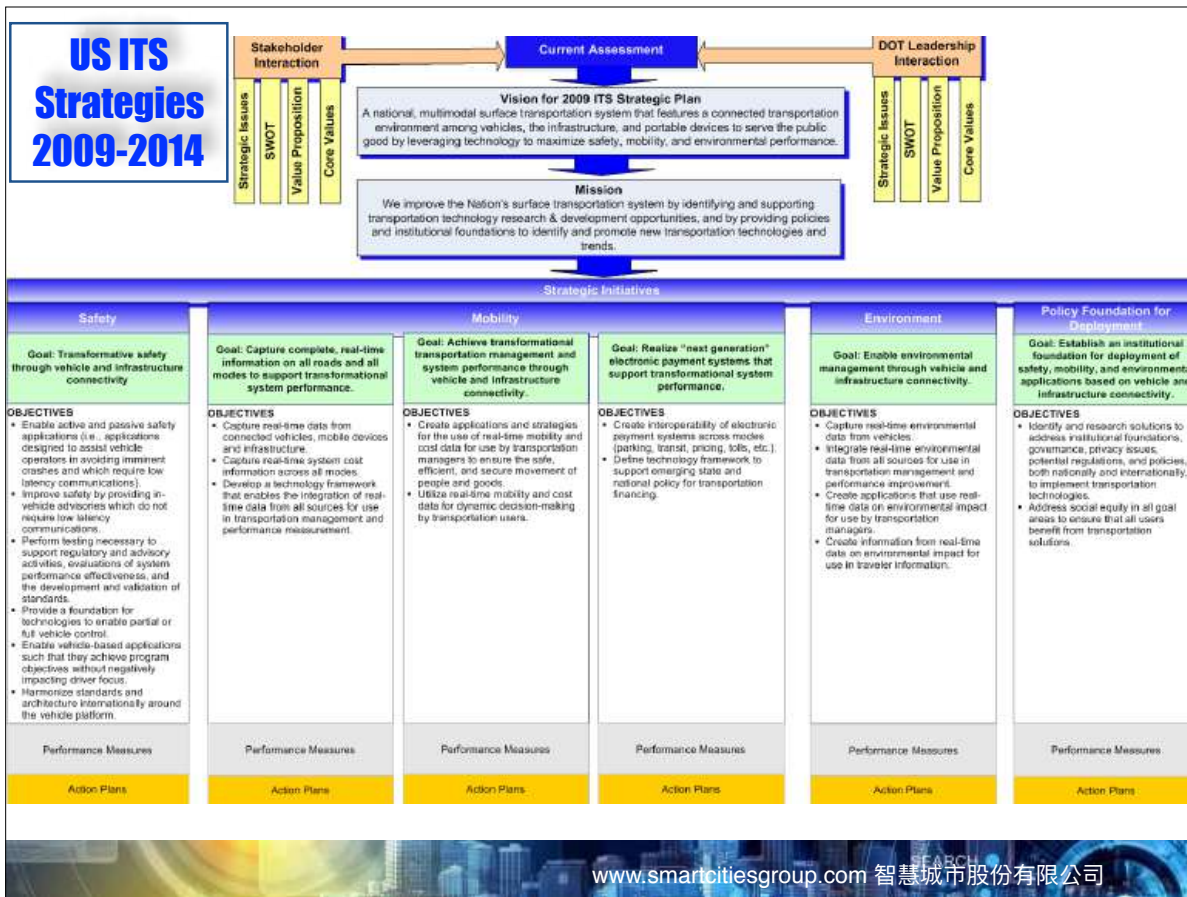


- **Participatory Urbanism**：利用智慧科技培育公民參與，包括 Citizens Connect（回報社區內服務問題之智慧裝置應用程式）、Community PlanIt（提供居民參加社區會議之網路平台）、Innovation District: Welcome home challenge（吸引企業聚集之商業競賽）、Participatory Chinatown（邀請民眾參與審議規劃與發展之電玩平台）。
- **Clicks and Bricks**：聯合設計師與政府官員，調查如何興建城市與如何管理城市間之連結，具體措施如 Redesigning the Trash System（以人本設計探討此議題）、Street Bump（蒐集鋪面狀況之手機app）、City Worker（資產管理與回應民眾需求之手機app）、Adopt-A-Hydrant（為消防栓除雪之手機app）、Complete Streets（讓城市交通基礎建設綠化、智慧化和多運具化）
- **21st Century Learning**：本方案強調市民之線上、終生學習，開發如 Boston One Card（單一票證使用所有學習資源）、Discover BPS（瀏覽可選擇之公立學校）、Where My School Bus（可即時掌握校車位置）、Autism App/ Assistive Technologies（幫助自閉症兒童學習）、Classtalk（讓老師以簡訊通知學生作業與考試）之應用程式。
- **Open Data**：機關視開放資料為智慧城市工項之核心元素，且為培育創新之機制。

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66

66



67



68



69

## Smart Islands, Smart Bay A Smart City Strategic Plan for Penghu

運用智慧科技，創造澎湖起飛的動力，發展宜居生活、永續生態、多元生產的海洋人文幸福島嶼。



70

70

## Smart Tourism 智慧旅遊 –

Transform Tourism to be Smart, Easy and Relax

把旅遊轉型成智慧，輕鬆與舒爽的生活體驗



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71

## Smart Tourist Passport 智慧觀光護照 –

Provides real time and coordinated data with information on weather, transportation, lodging, restaurants, cultural attractions. 提供實時天氣，交通，住宿，餐飲，文化景點等數據



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72

# Smart Travel Services 智慧旅遊服務

on the road 在路上



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73

# Smart Travel Services 智慧旅遊服務

on the beach 在海灘

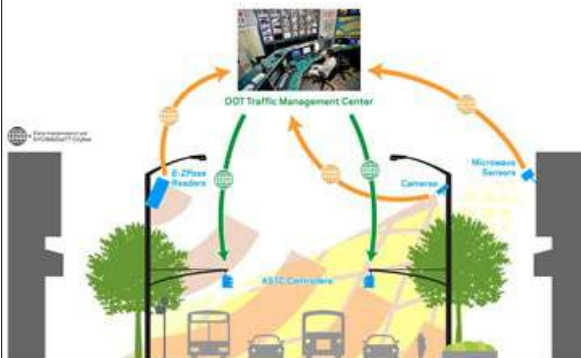


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74

## New York City Mid-in-Town

### Adaptive Traffic Signal Control



- Use e-tag ZPass and onsite microwave devices to detect traffic flow and congestion
- 270 blocks, 210 microwave sensors, 56 traffic video camera, and 59 ZPass reader

## Mid-town Moves, New York City Moves

- Improve travel time by 10%

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75

## Smart Parking Technology



Source: NYC DOT

- Wireless parking sensors providing real-time information about free parking spots
- Enforcement-cost reductions
- Possibility of (demand-responsive) dynamic pricing - It's being done in San Francisco
- Parking pricing as a tool to reduce congestion

76

76

## Combining sensor parking & smartphones



Real-time parking availability information

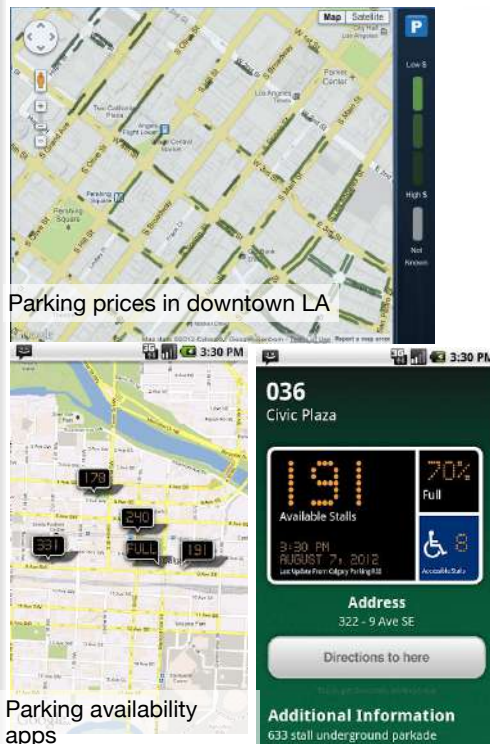
Smart parking-time management + longer parking limits

Making payments more convenient

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77

## Benefits of Smart Parking Tech

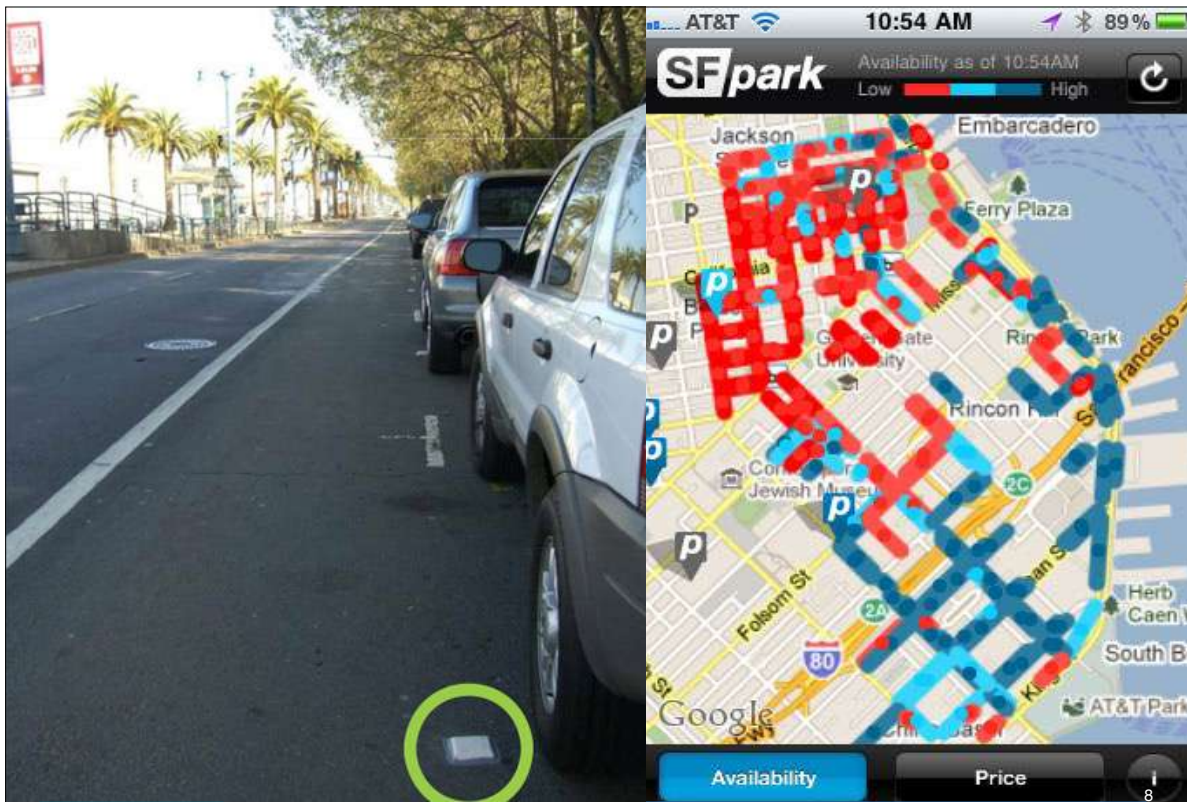


Better parking information reduces cruising, congestion, emissions, and time losses

Parking is a tool to rationalize the use of car (avoid its use when unnecessary)

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78



**SFMTA** Demand Management **Demand Pricing Parking & Roads**

79

## San Francisco Demand Management

**Travel Choice**

**Demand Pricing**

**Smart Land Use**

**Infrastructure Support**

**Intelligent Transit**

**Smart Street**

**Intelligent Vehicles**

**SFMTA** Transportation Strategy **Two-tiered strategy for the transport system**

80





SFMTA Demand Management **Travel Choice \ Information & Payment**

81



SFMTA Demand Management **Travel Choices, Information & Payment**

82

Placemeter extracts measurable data from a live video stream, counting the number of people walking into a given venue and calculate how heavy traffic is on a stretch of street.



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83

## NYC 24/7

City24/7: A Platform for Informing, Protecting, and Revitalizing



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84

# 城市新媒體服務系統 New Media Service System

## SO + LO + MO

Social Network

社交

Location Base

分享

Mobility

便捷

## O2O 線上線下聯結活動

On-line To Off-line

服務

85

85

## So, are you ready to play a role in the Fast Changing Smart Cities?



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86

86



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