

智慧城市發展趨勢

台灣大學城鄉所
2016/12/16

焦國安

世界銀行顧問

智慧城市股份有限公司董事長

同濟大學高密度區域智能城鎮化

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0920-208-020

Global Urban Population.. 1950



Urban Population

Greater than 75% ●

50% - 75% ●

25% - 50% ●

Less than 25% ●

Global Urban Population.. 1980



Urban Population

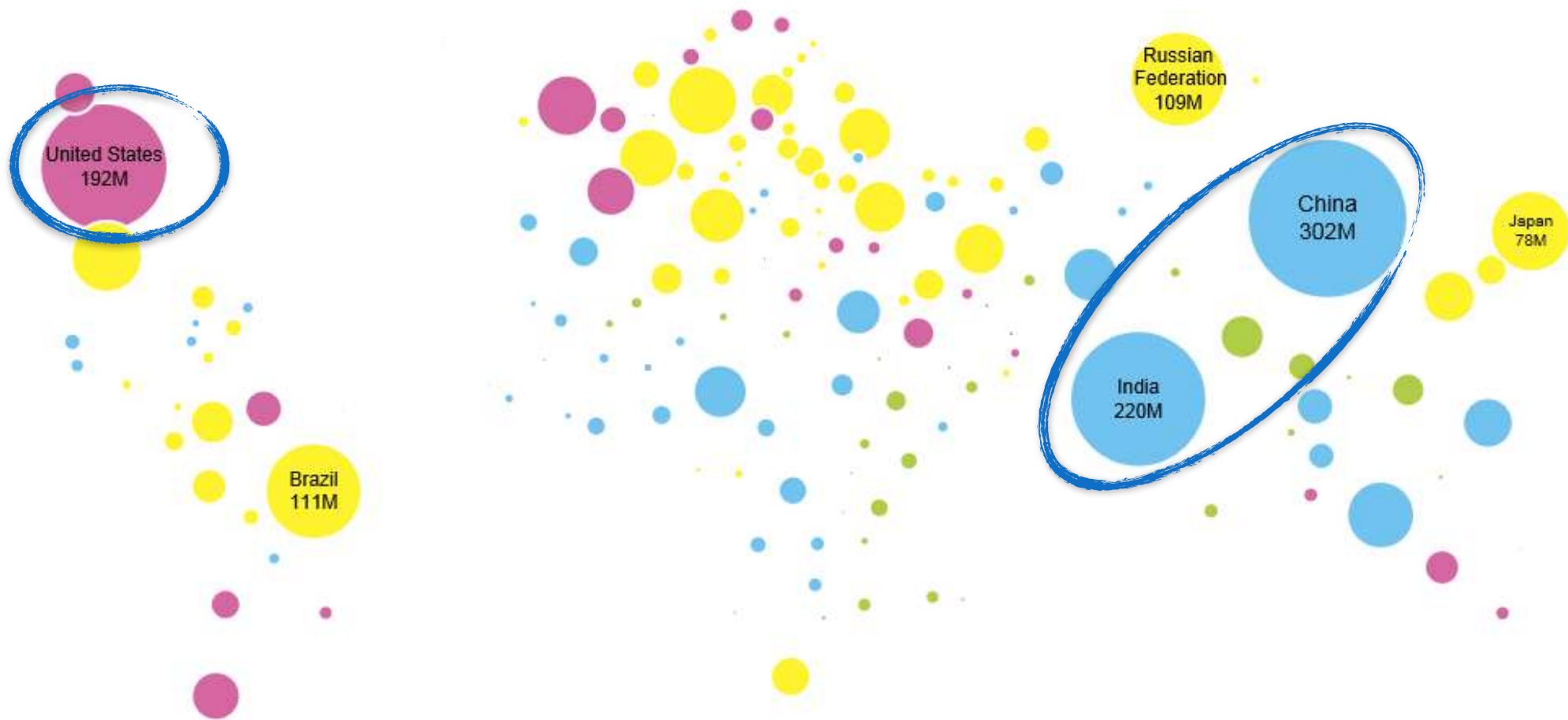
Greater than 75% ●

50% - 75% ●

25% - 50% ●

Less than 25% ●

Global Urban Population.. 1990



Urban Population

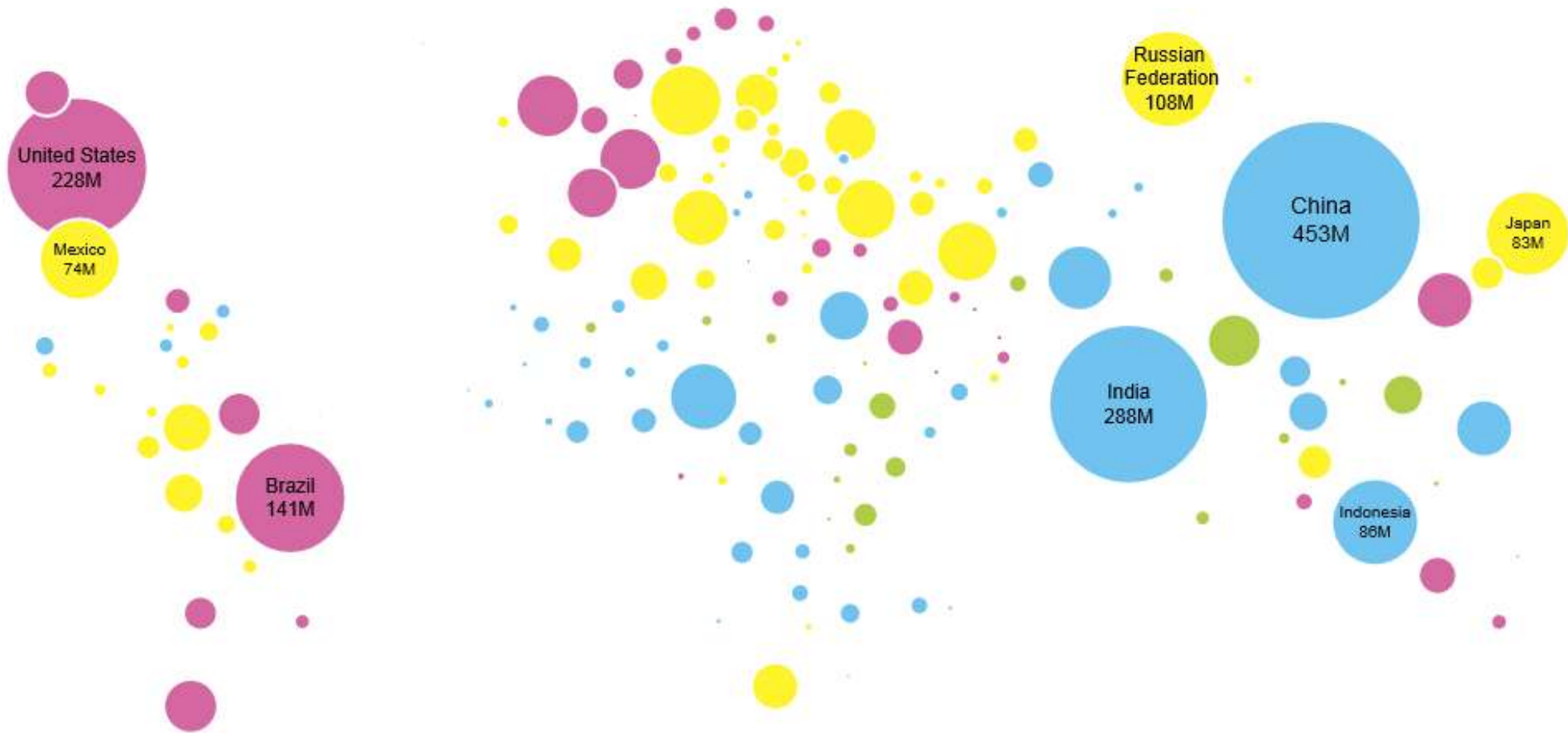
Greater than 75% ●

50% - 75% ●

25% - 50% ●

Less than 25% ●

Global Urban Population.. 2000



Urban Population

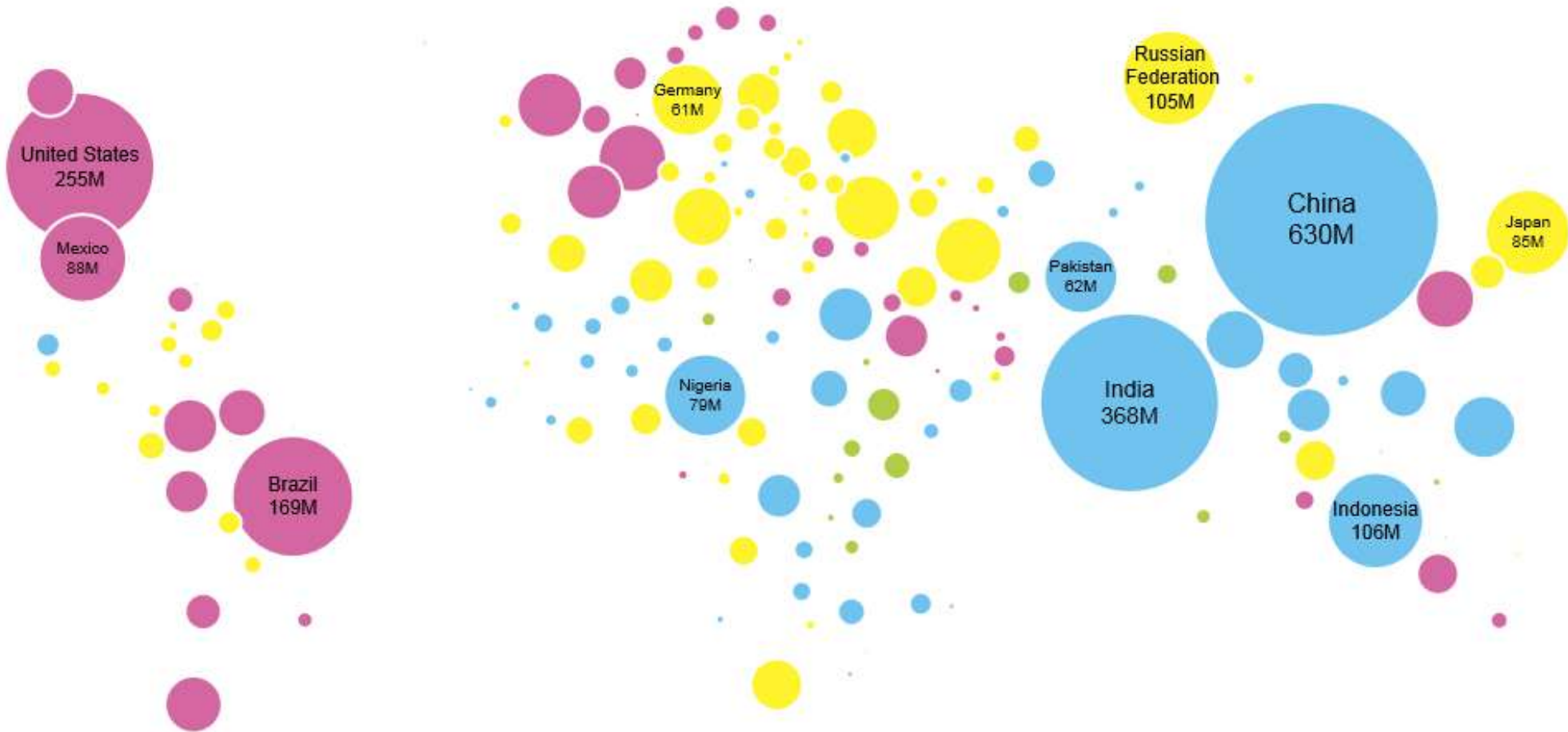
Greater than 75%

50% - 75%

25% - 50%

Less than 25%

Global Urban Population.. 2010



Urban Population

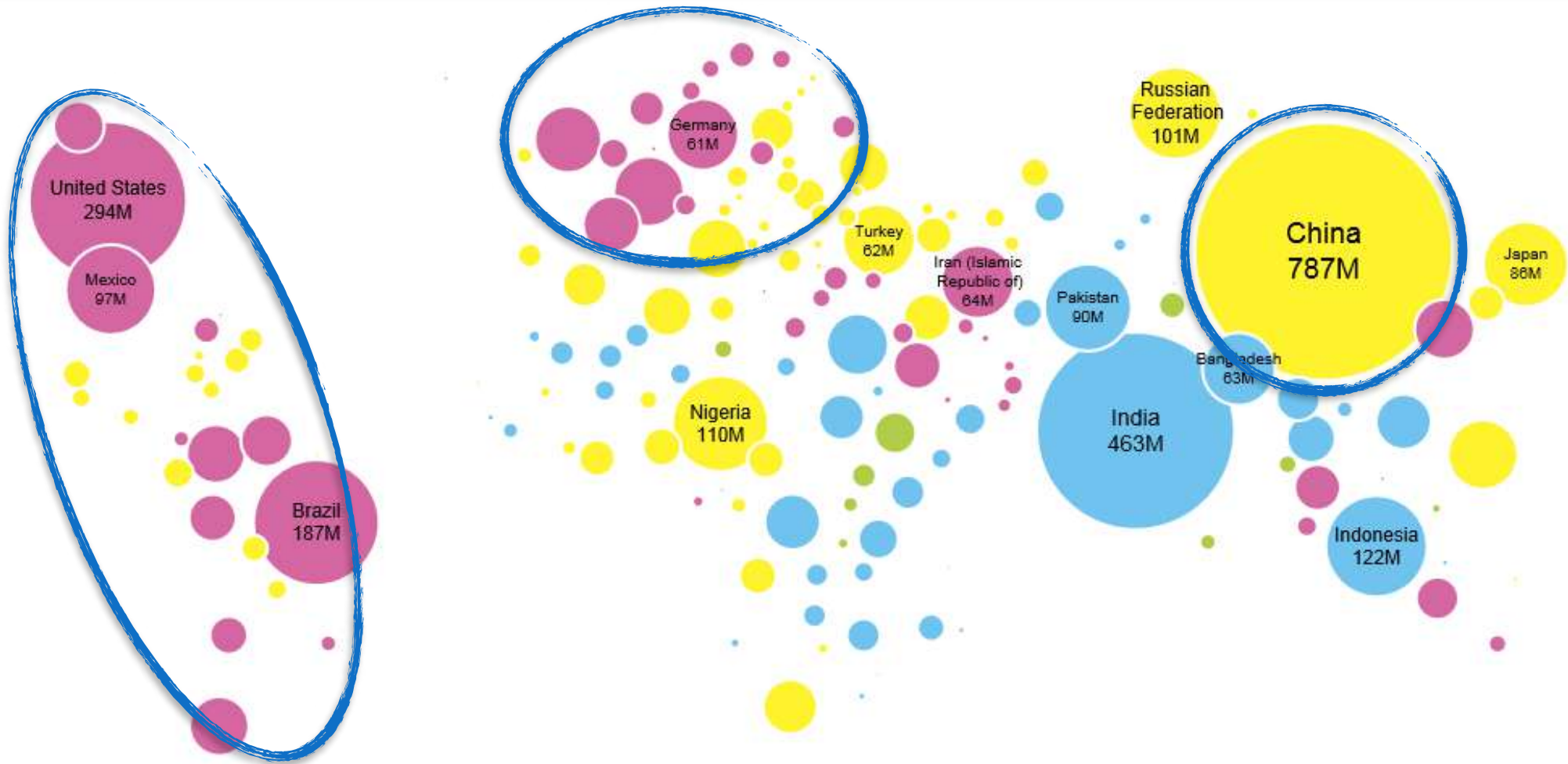
Greater than 75%

50% - 75%

25% - 50%

Less than 25%

Global Urban Population.. 2020



Urban Population

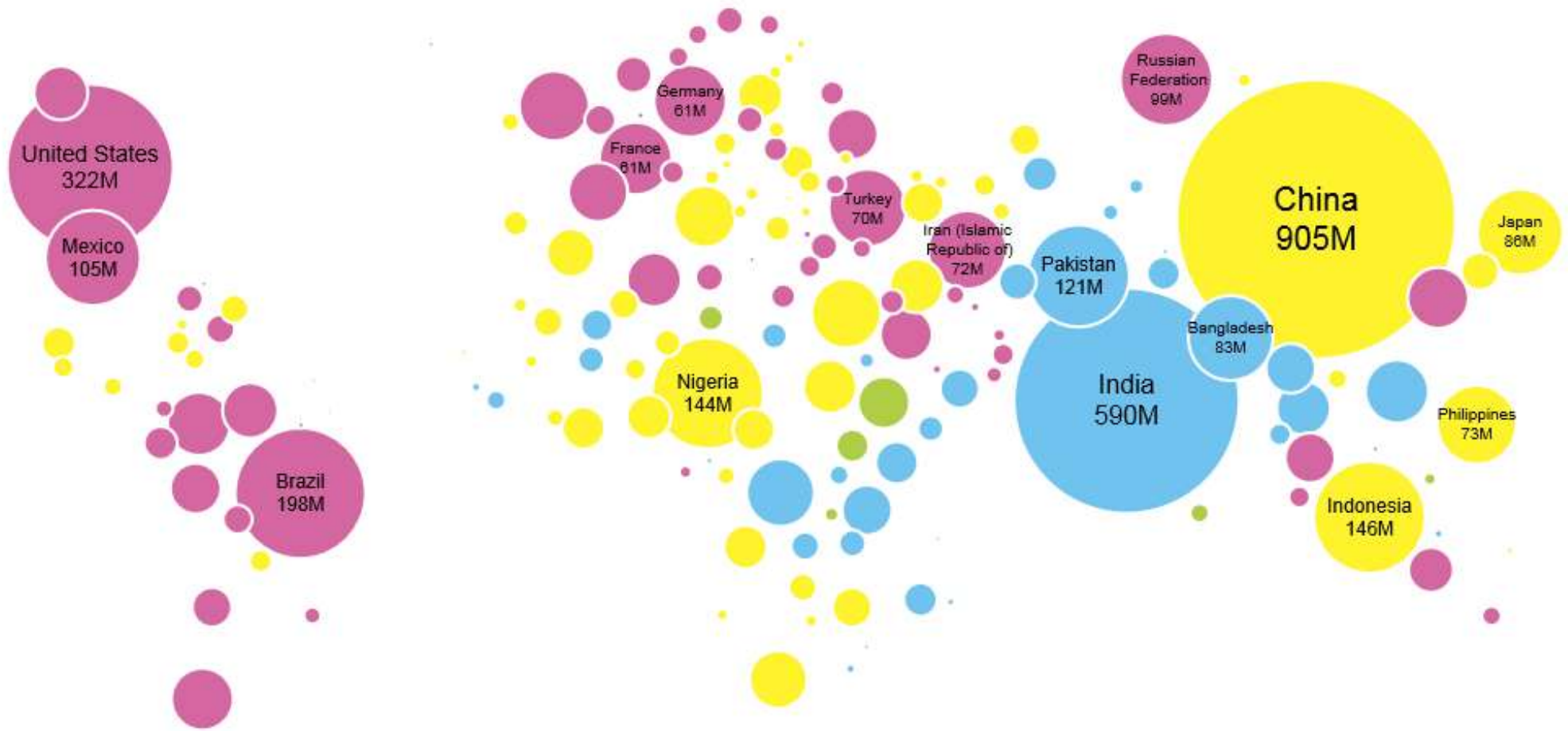
Greater than 75% ●

50% - 75% ●

25% - 50% ●

Less than 25% ●

Global Urban Population.. 2030



Urban Population

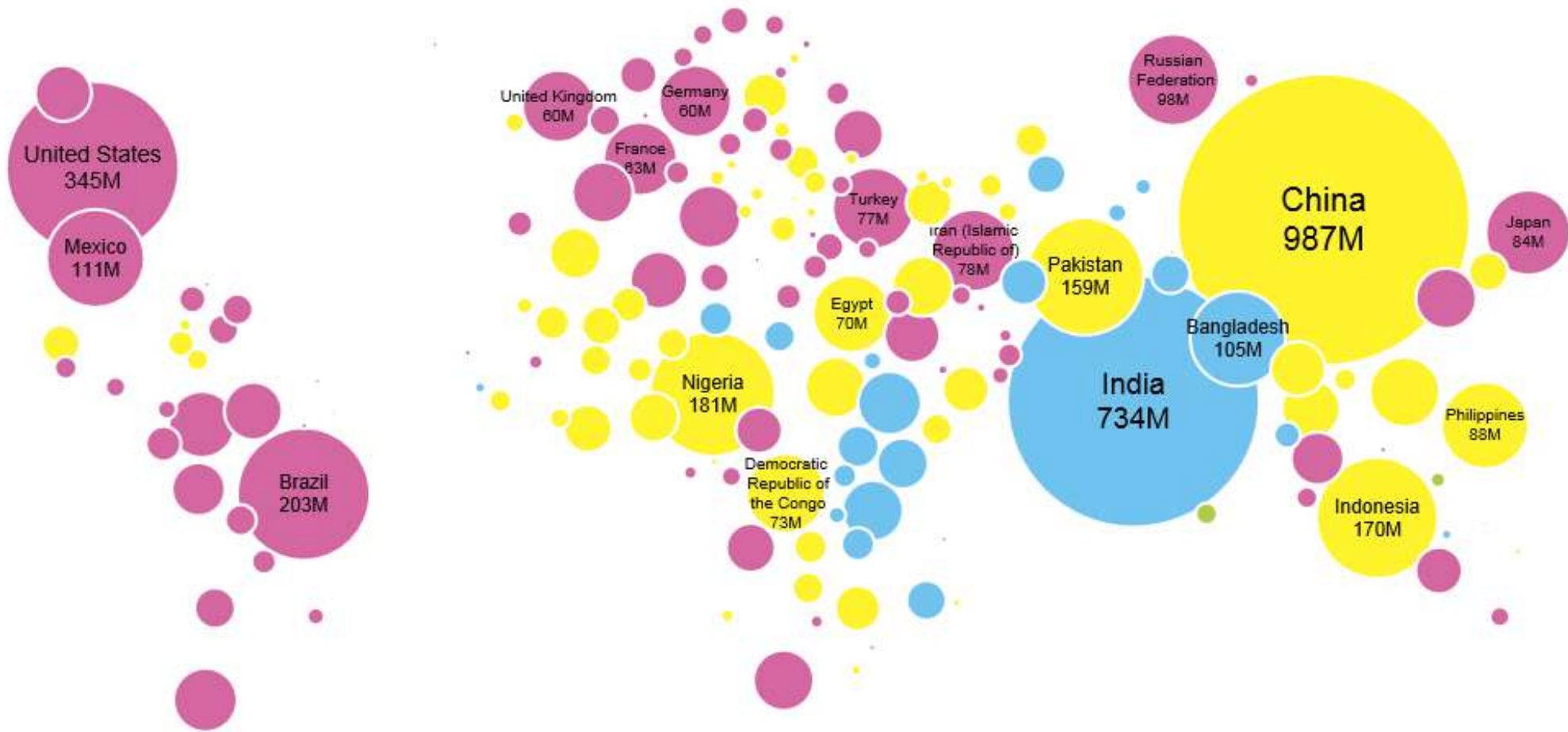
Greater than 75%

50% - 75%

25% - 50%

Less than 25%

Global Urban Population.. 2040



Urban Population

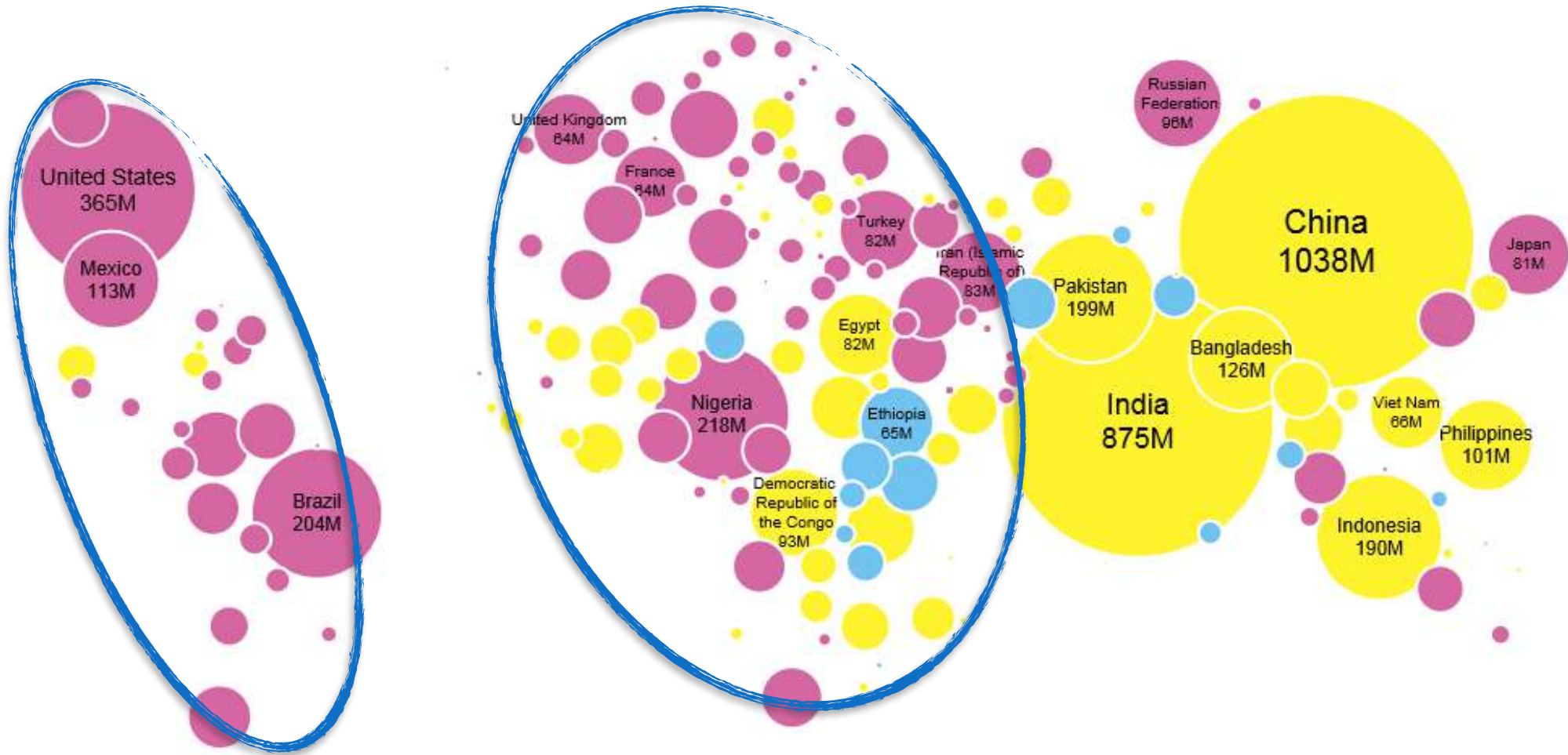
Greater than 75%

50% - 75%

25% - 50%

Less than 25%

Global Urban Population.. 2050



Urban Population

Greater than 75%

50% - 75%

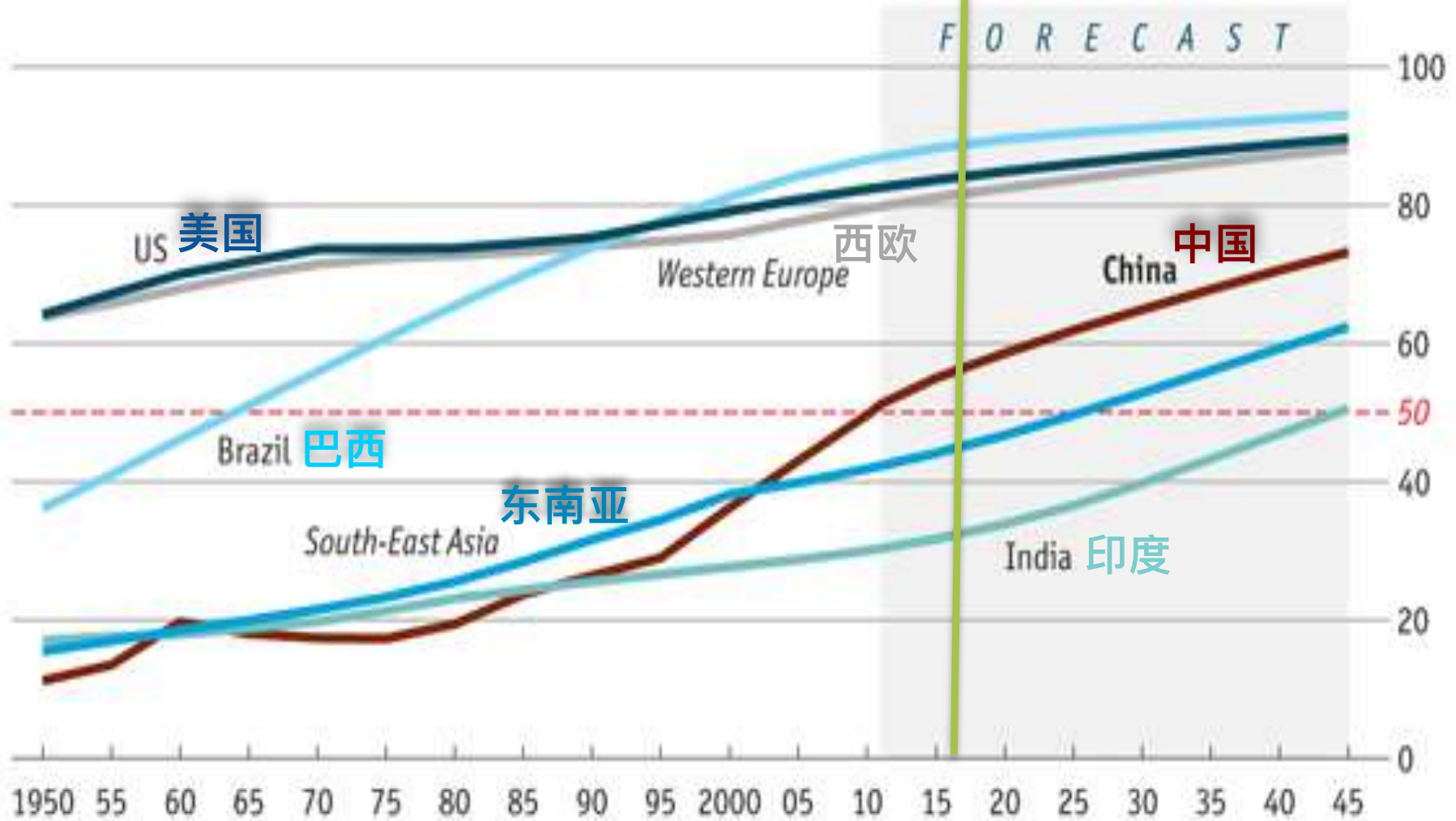
25% - 50%

Less than 25%

全球城市化人口比.. 1950 - 2045

Urbanisation

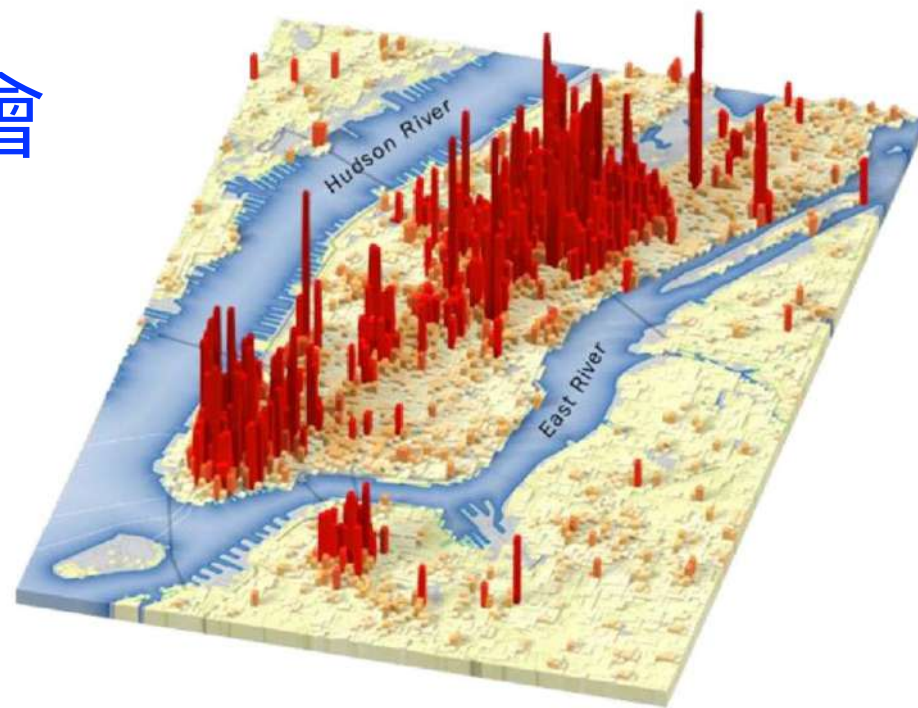
Population living in urban areas, % of total



Sources: CEIC; UN Population Division; *The Economist*

都市人口占总人口之比例

城市繼續作為希望和機會 的燈塔



城市化的遷移趨勢

將城市轉型為智慧、文化與金融中心。城市，也帶來了擁堵、污染和公共安全的問題。



城市化的遷移趨勢

- 54%的世界人口生活在城市地區，他們消耗了三分之二的世界能源。
- 到2050年，城市人口將增加到約63億（佔世界人口的66%）。



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%



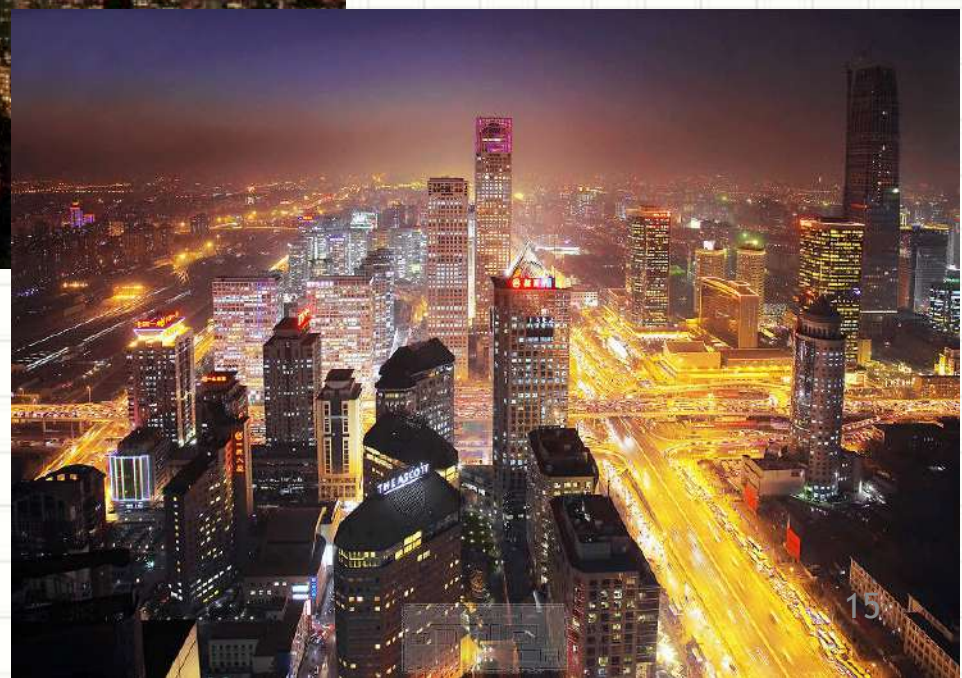
美國花了80年

United states took 80 years.



中國只花了20年

China took only 20 years



- 在接下來的 20 年，
每分鐘都會有 30 位
印度人離開鄉村前往
都市。



- 如果按照這種速度，
印度在未來廿年將會
需要大約 500 個新城
市。

持續的全球化和城市化已經測試了城市的醫療衛生、
電力、安全和運輸基礎設施的極限。



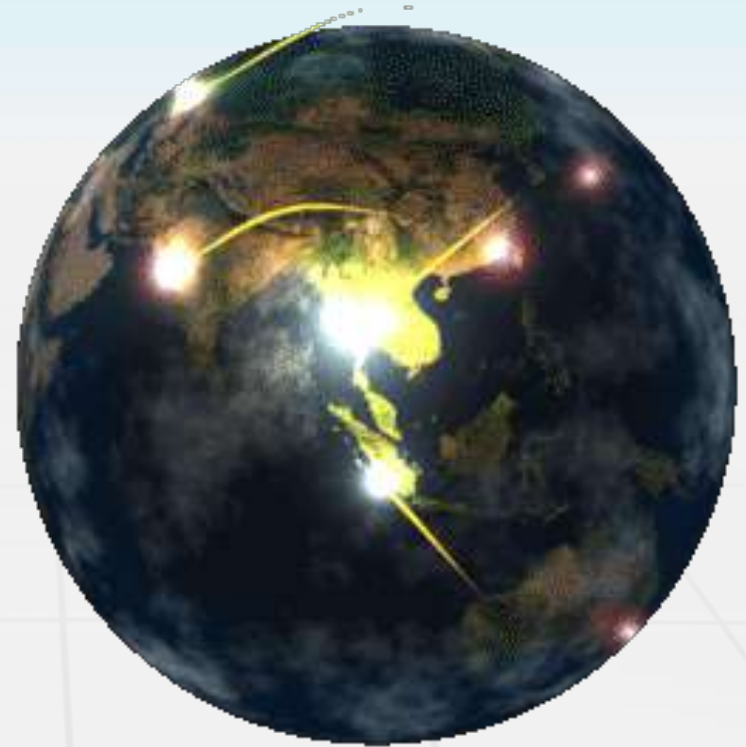
全球化改變了生產、銷售及消費的關係

- 只有少數有地方特性的城市在全球城市的競爭當中取得重要性。城市必須改善當地的特色以成為全球化的潛在競爭者。

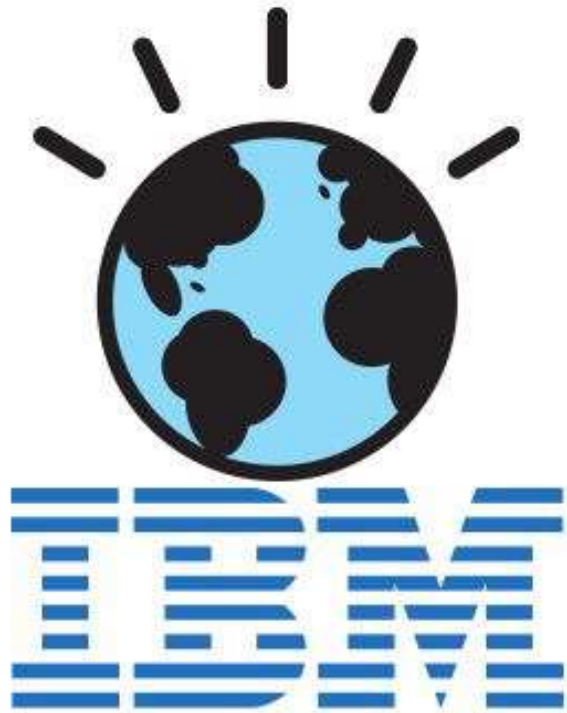


要成為全球化的潛在競爭者, 城市必須變得更有智慧

Cities must become smarter to be able to compete globally.



In 2008

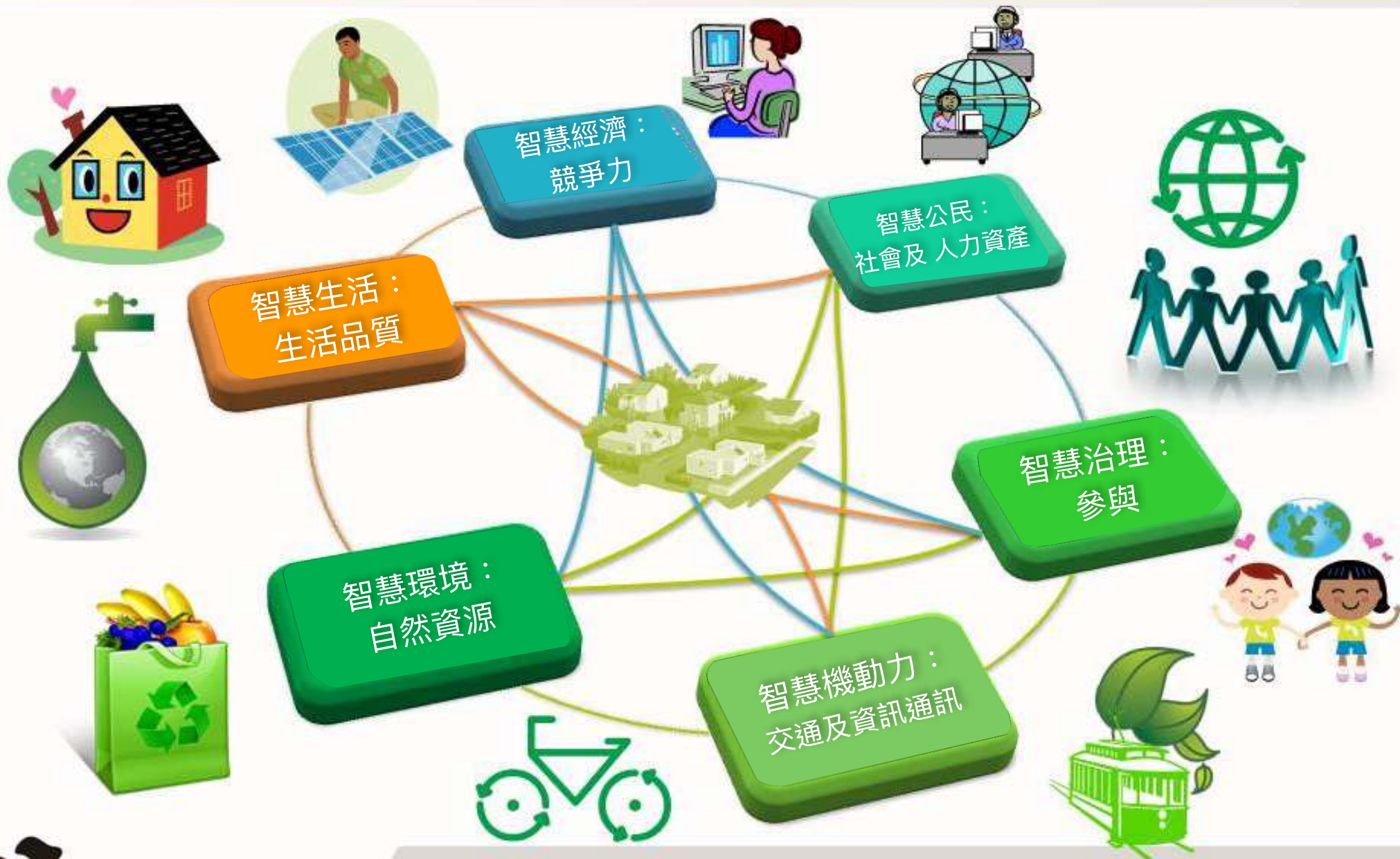


Smart Planet

Smart cities Ranking of European medium-sized cities



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。

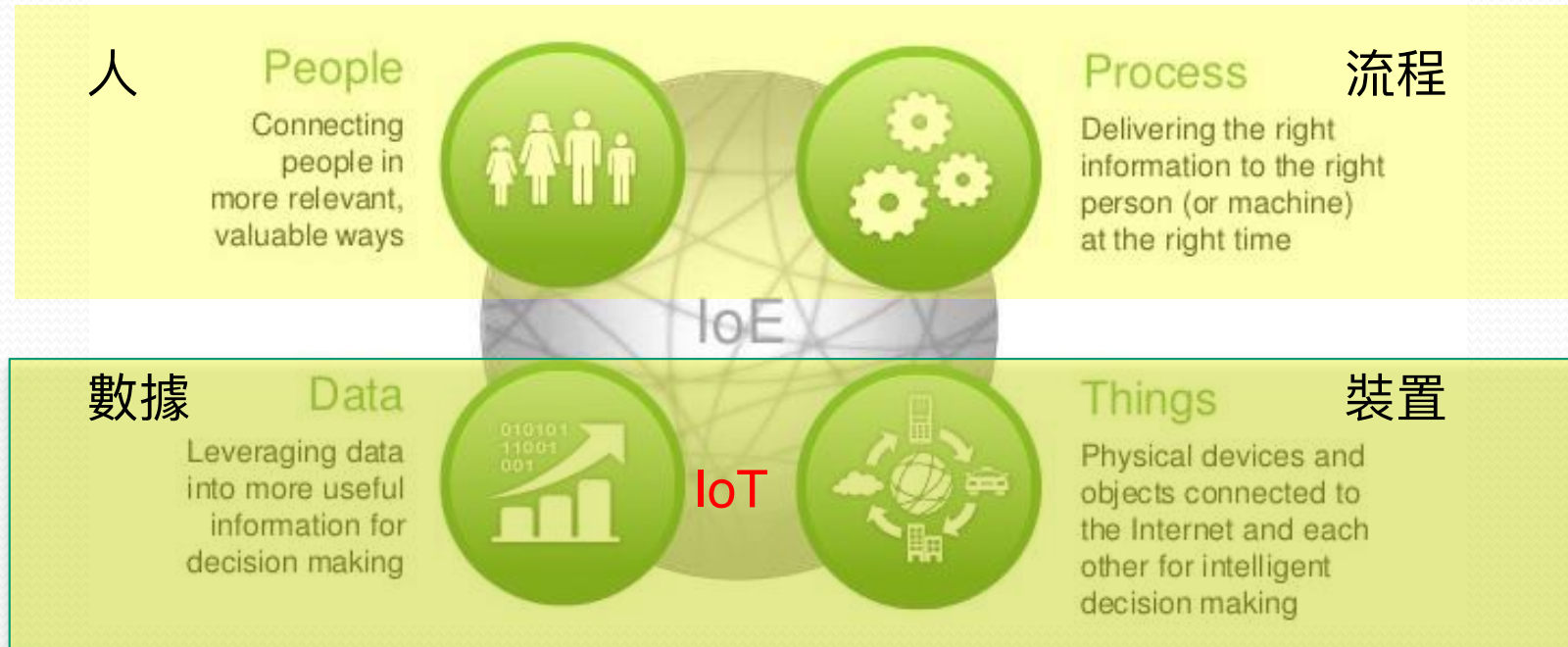
提高可持續發展的
城市競爭力。



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.

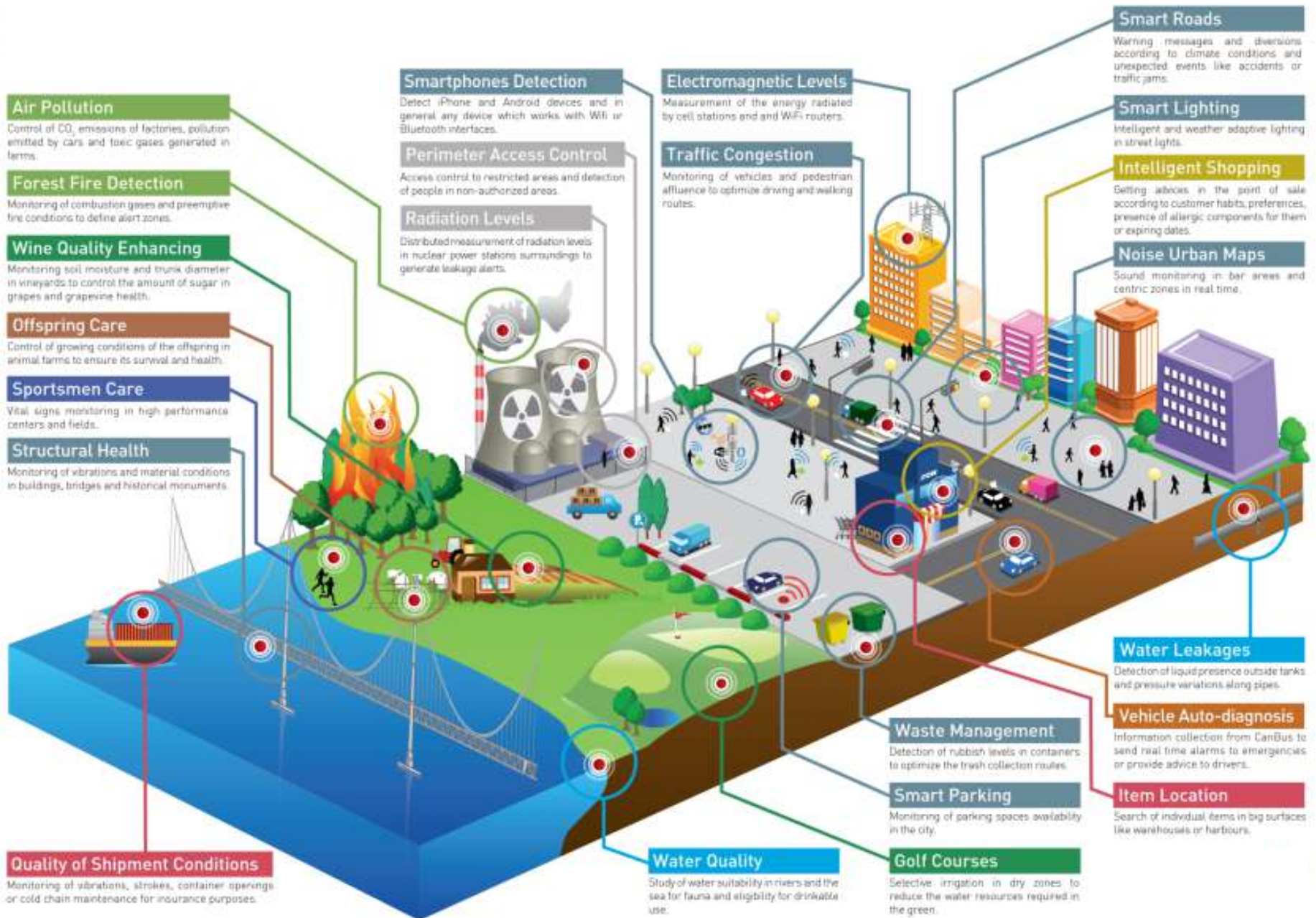


From IoT to IoE ..從物聯網到萬物互聯



. The three waves of connected device development.

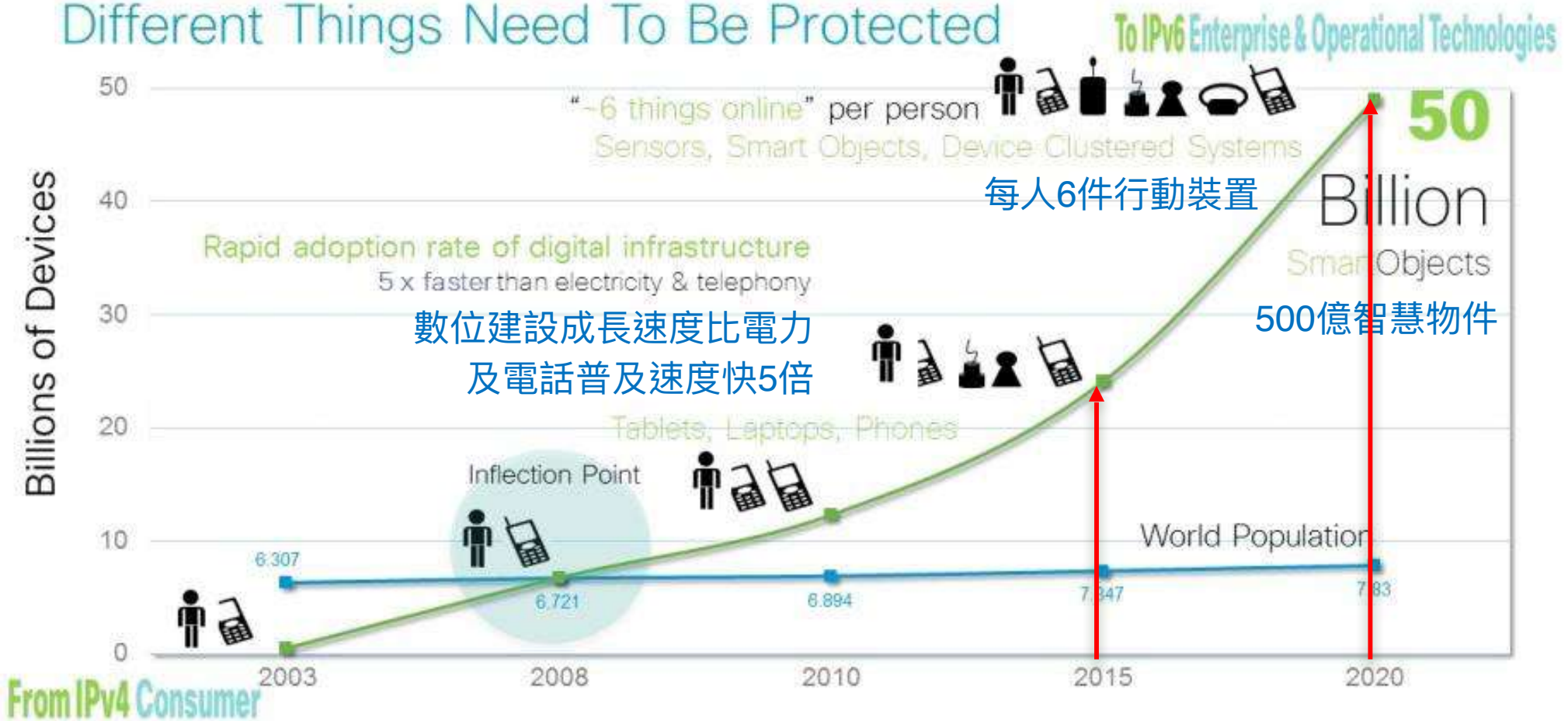
The Internet of Everything (IoE)



Source: Libelium

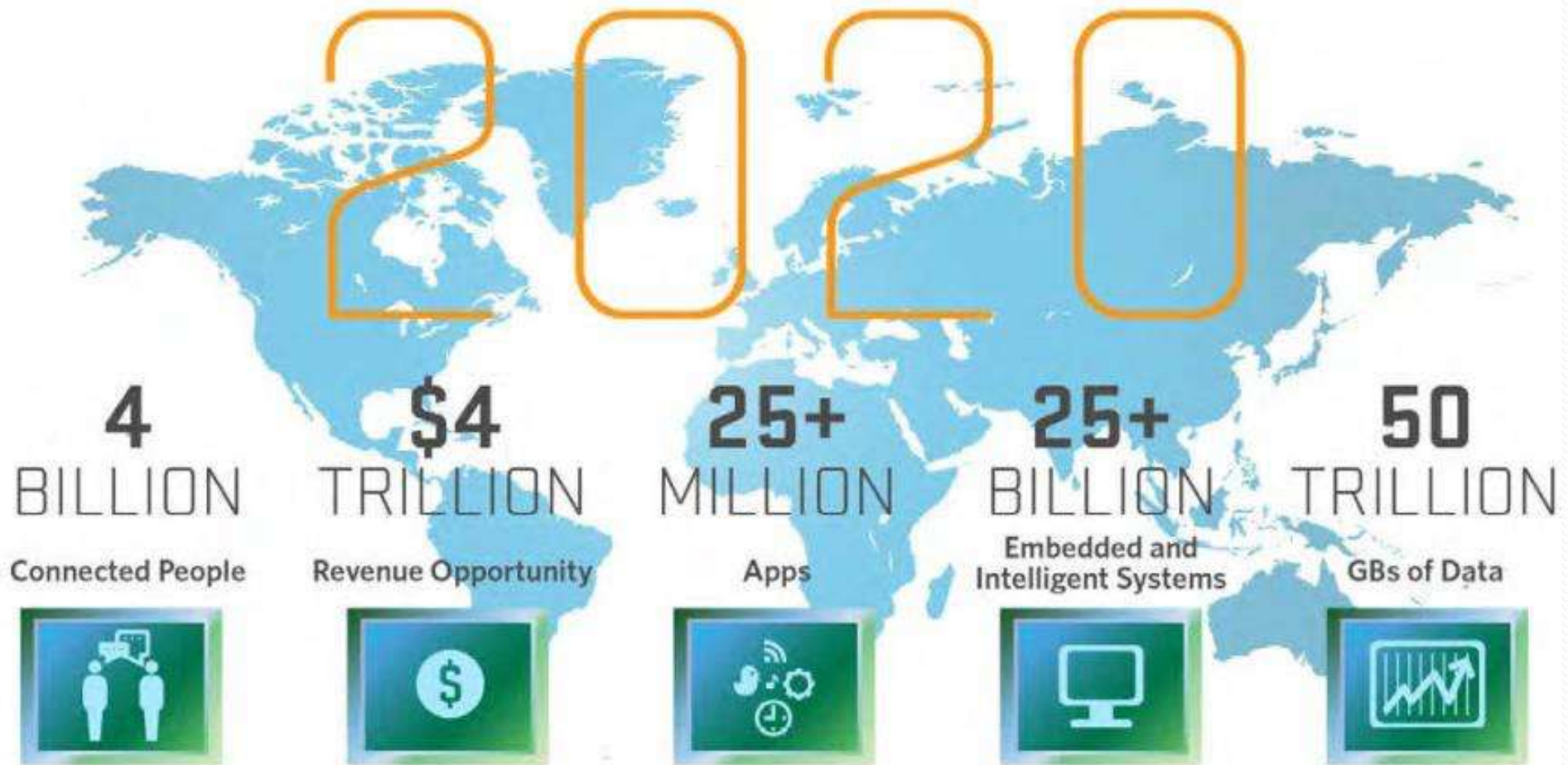
The Internet of Everything (IoE)

Different Things Need To Be Protected



Source: Cisco IBSG projections, UN Economic & Social Affairs <http://www.un.org/esa/population/publications/longrange2/WorldPop2300final.pdf>

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





The WORLD WITHOUT ENGINEERS

創建真實的數據智慧

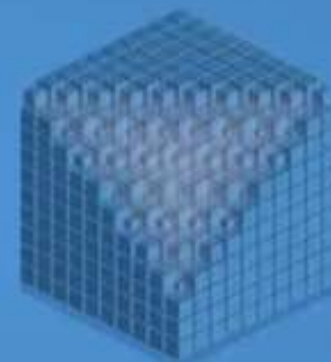
UPTO
40%
OF DATA



MISSING



INACCURATE

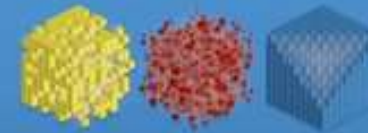


INCOMPLETE

創建真實的數據智慧

RISK

OF MAKING POOR DECISIONS
BASED ON POOR DATA





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

Collaboration Information Sharing



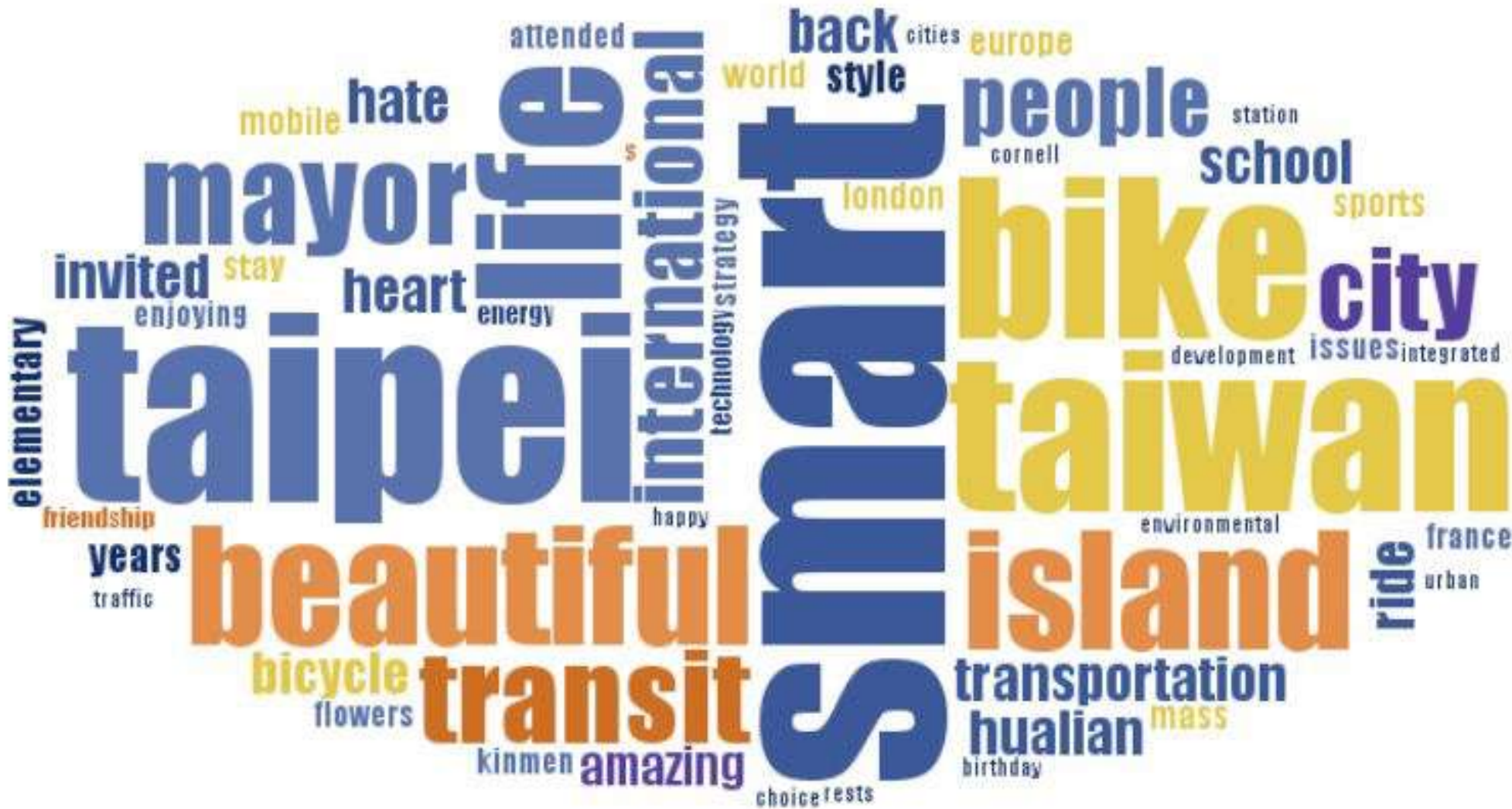
**Big data is like a treasure on an island
Can't be touched, and can't be used**
大數據就像在孤島上的寶藏，碰不到，也用不到



What is Big Data ?



This is the big data of my FB



Smart City and Smart Data

智慧城市與智慧數據

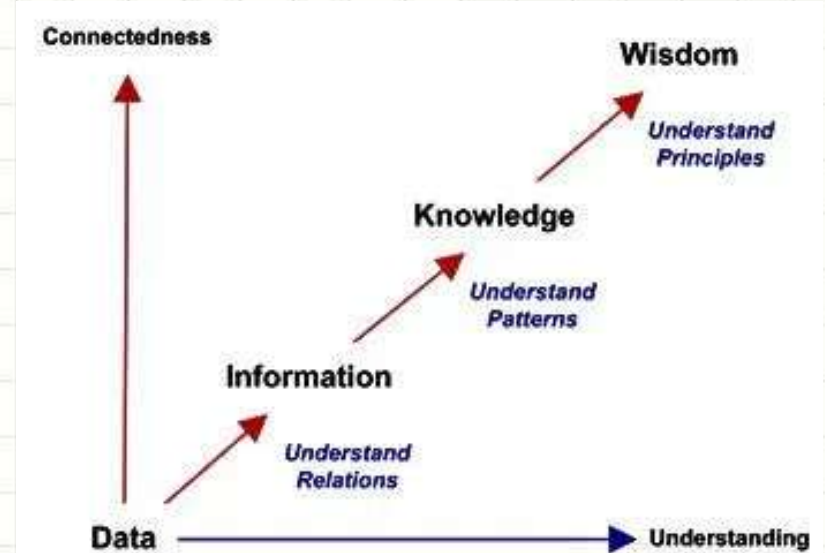
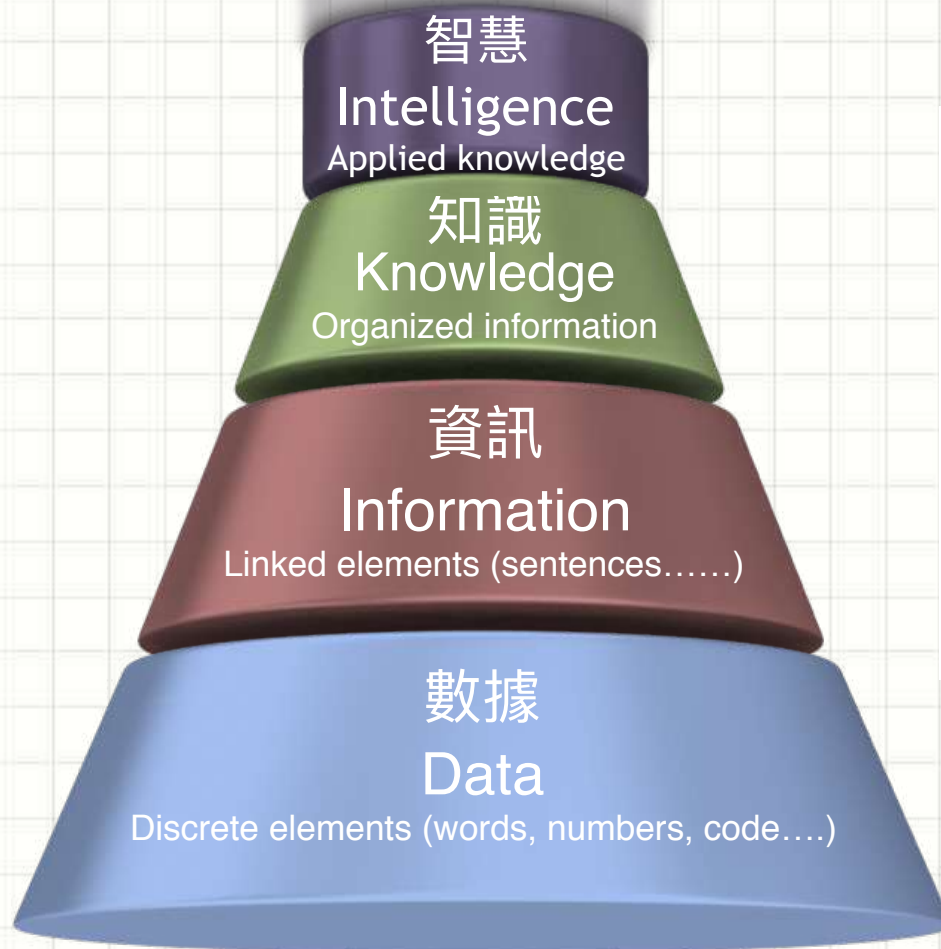


Smart Data
智慧數據



Data to the Intelligence Evolution Process

數據到智慧的演化過程

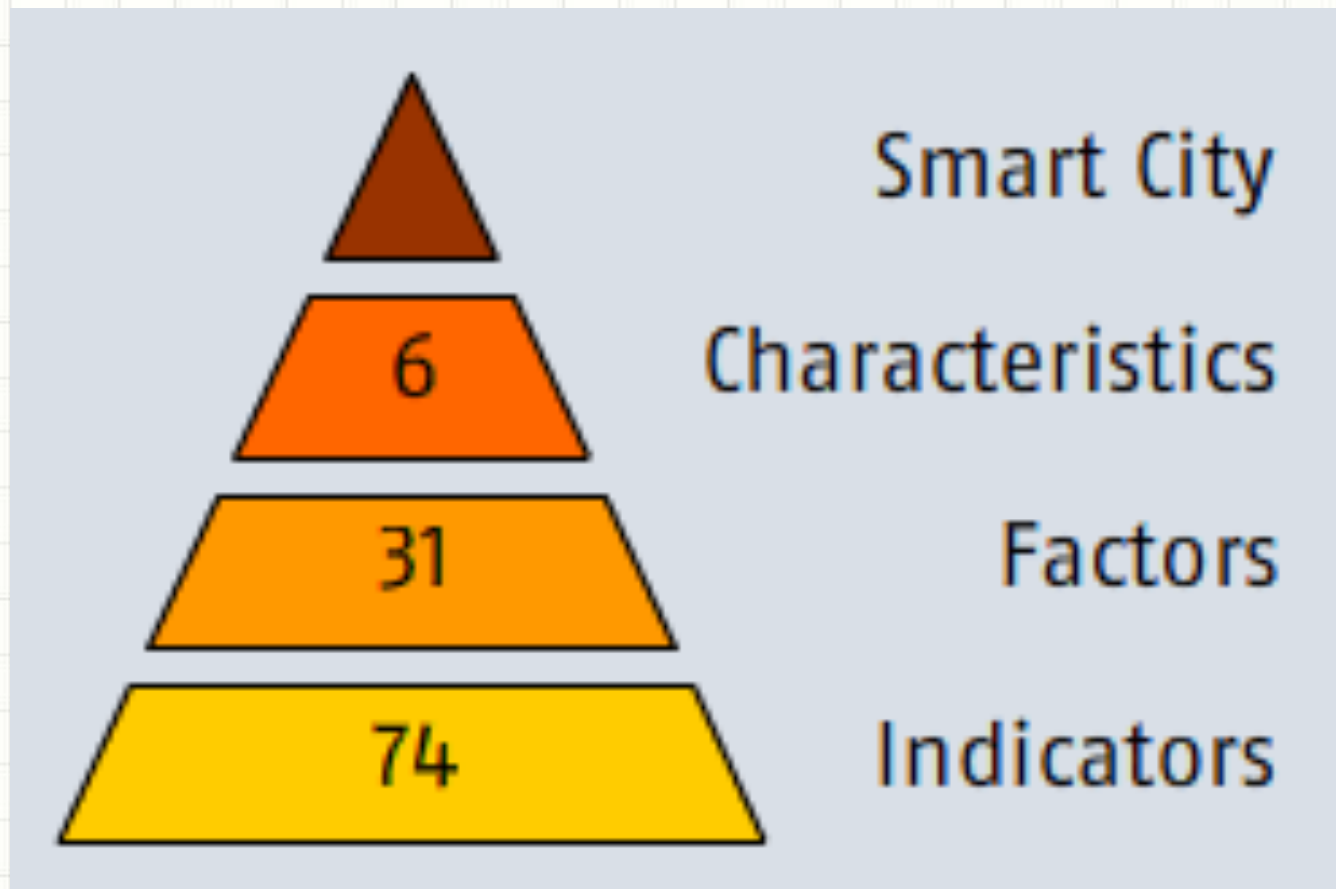


The Three Core Functions of a Smart City



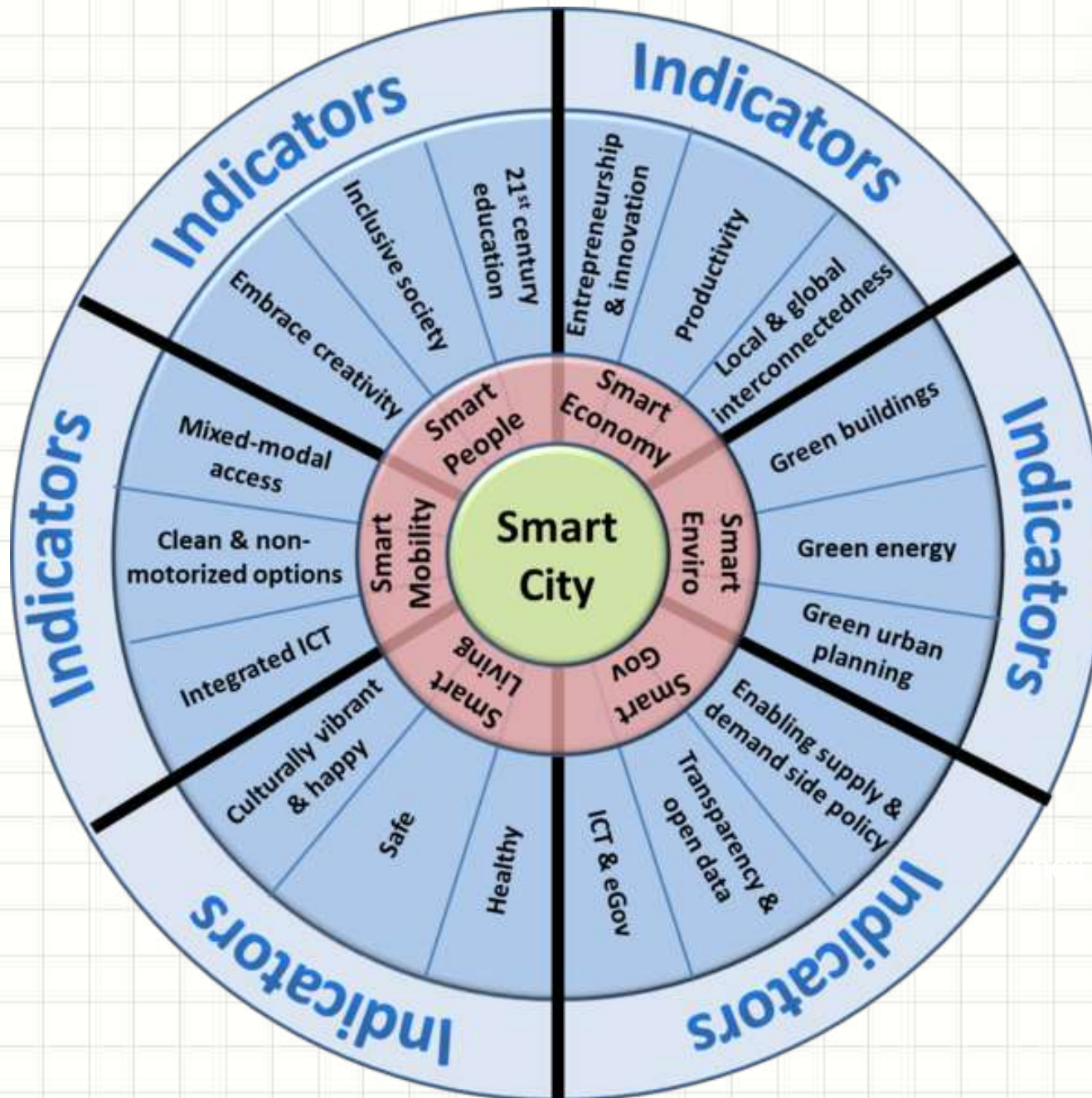
Smart Cities Council Readiness Guide

The smart city model

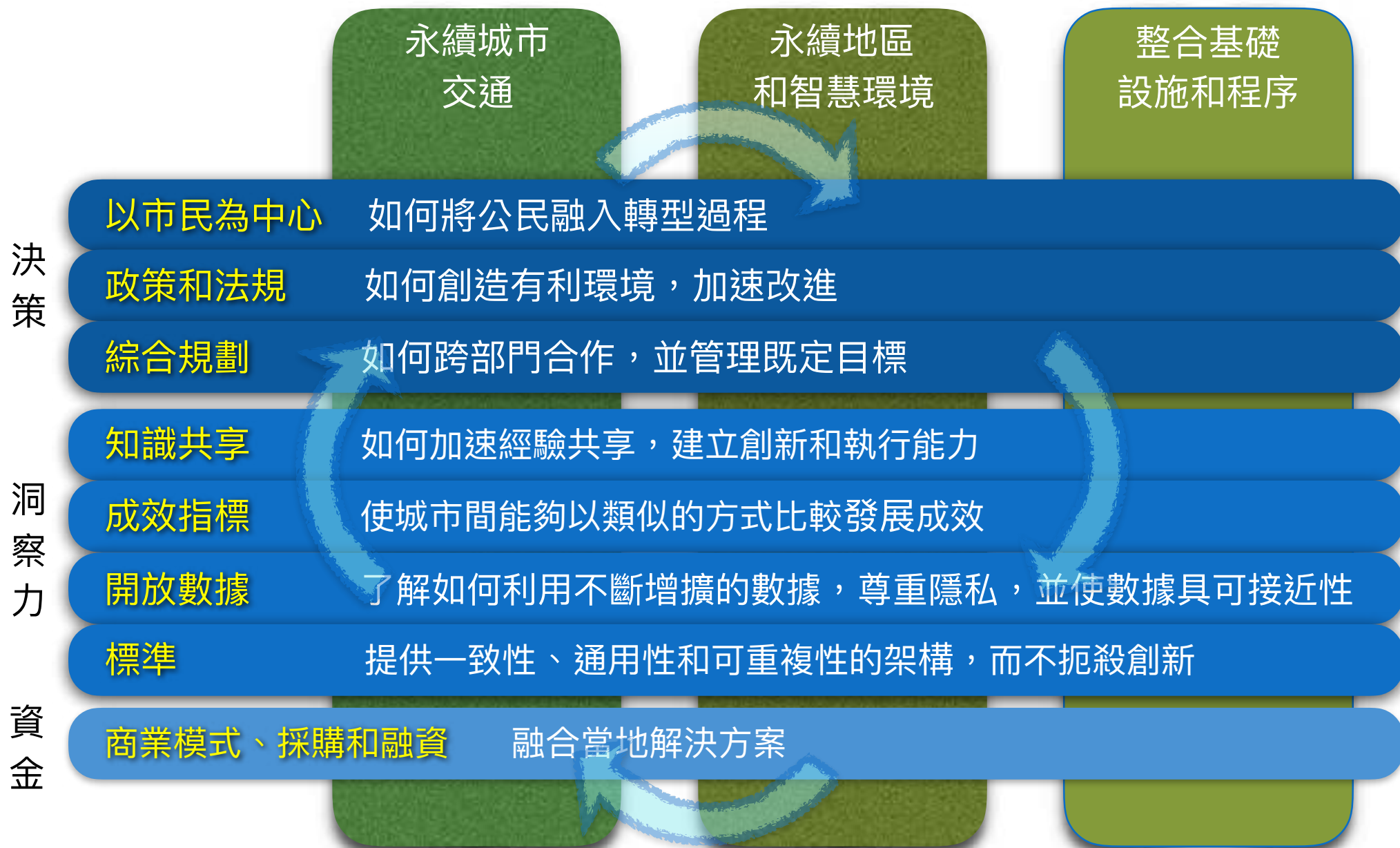


Business Guide

Smart City Wheel



智慧城市策略執行計畫重點元素



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



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



Industry 4.0



從工業1.0 到工業 4.0

From Industry 1.0 to Industry 4.0

First Industrial Revolution

based on the introduction of mechanical production equipment driven by water and steam power



First mechanical loom, 1784

Second Industrial Revolution

based on mass production achieved by division of labor concept and the use of electrical energy



First conveyor belt, Cincinnati slaughterhouse, 1870

Third Industrial Revolution

based on the use of electronics and IT to further automate production



First programmable logic controller (PLC) Modicon 084, 1969

Fourth Industrial Revolution

based on the use of cyber-physical systems



Degree of complexity



1800

1900

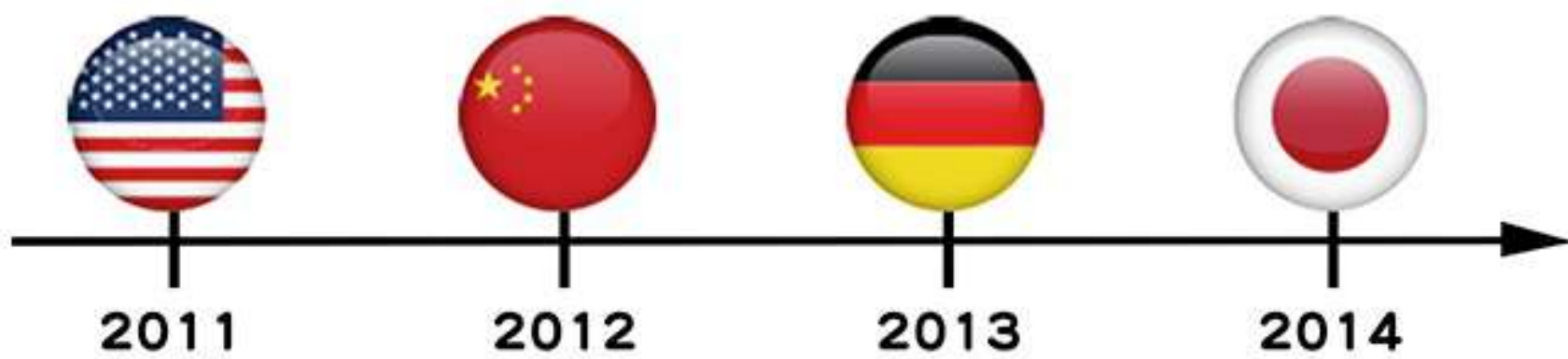
2000

Today

Time

- 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





美國AMP

製造業回流

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

**大陸
製造2025計畫**

智能製造

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

**德國
工業4.0**

智慧工廠

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

**日本
機器人新戰略**

人機共存
未來工廠

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

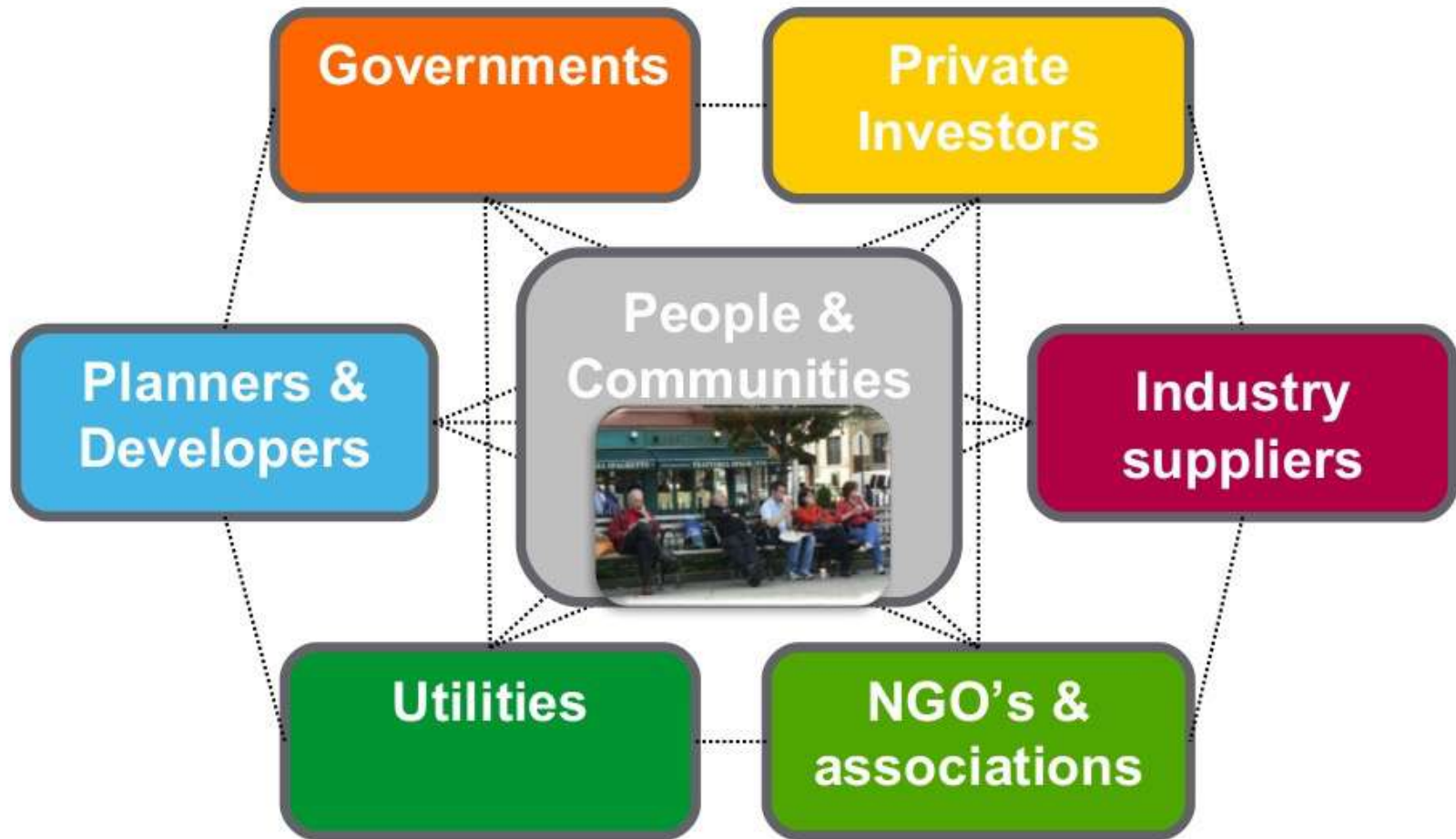
China's 'Internet Plus' Strategy



Baidu, Alibaba Group, and Tencent Holdings,

流媒体网www.lmtw.com

This requires stakeholders collaboration



DIGITAL CITY ECOSYSTEM COMPONENTS



SMART SERVICES

EDUCATION



SAFETY, SECURITY
ENVIRONMENT



ENERGY AND
UTILITIES



ENTERTAINMENT
AND RETAIL



HEALTH



TRANSPORTATION



GOVERNMENT



NEXT-GEN INFRASTRUCTURE



CITY CONNECTIVITY INFRASTRUCTURE



CITY DIGITAL INFRASTRUCTURE



CITY DIGITAL SECURITY INFRASTRUCTURE

DIGITAL ENABLING LEVERS

GOVERNANCE



OPEN GOVERNMENT
AND ANALYTICS



INNOVATION AND
ENTREPRENEURSHIP



HUMAN CAPITAL



CYBERSECURITY



POLICIES AND
STANDARDS



STRATEGIC
COMMUNICATION



PUBLIC-PRIVATE
PARTNERSHIPS



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



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



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



智慧芝加哥有三個主要的重點領域：

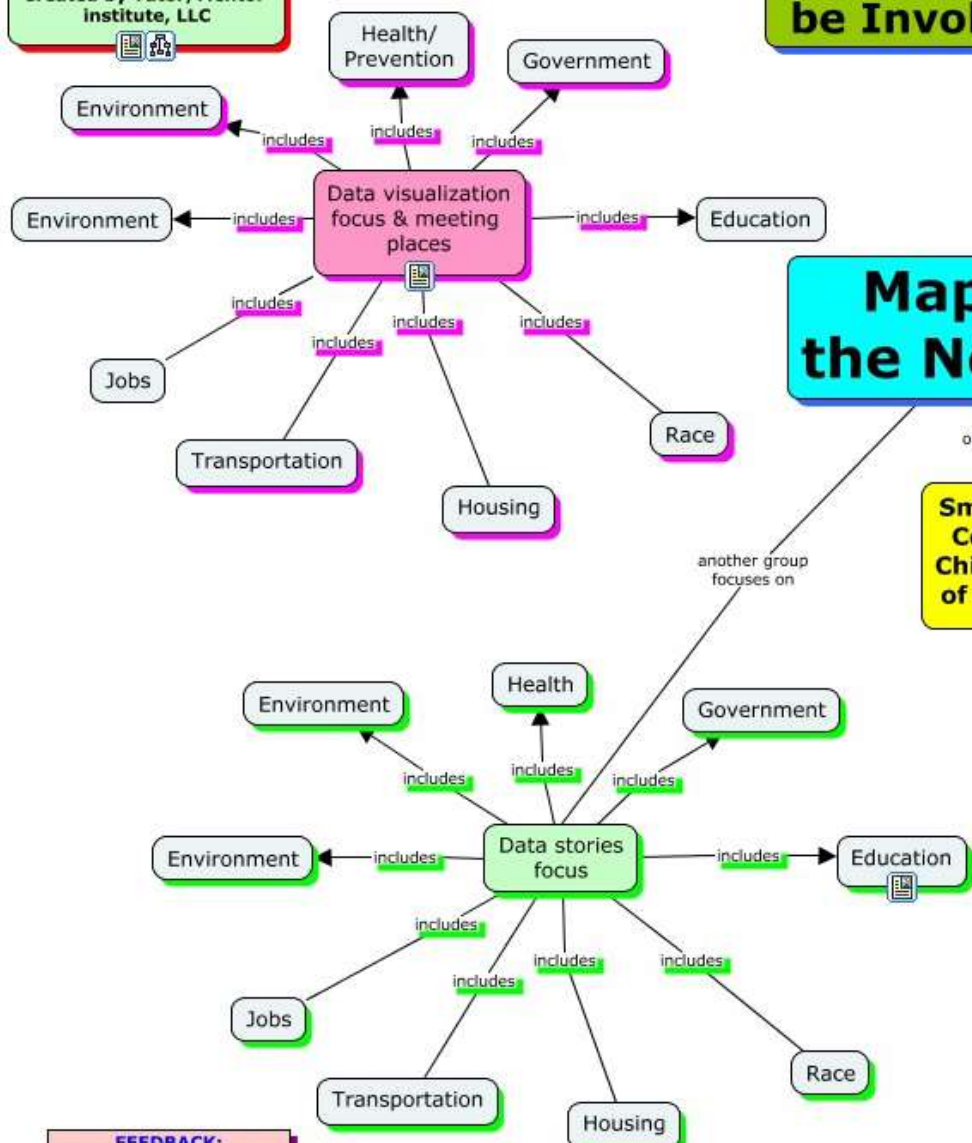
1. 接觸互聯網和技術，
2. 可以接觸互聯網後，使用技術的能力
3. 數據，也是一旦你可以接觸互聯網，並有使用技術的能力後，我們讓事情變得有意義的東西。



Understanding the Network

Who Needs to be Involved?

Created by Tutor/Mentor Institute, LLC

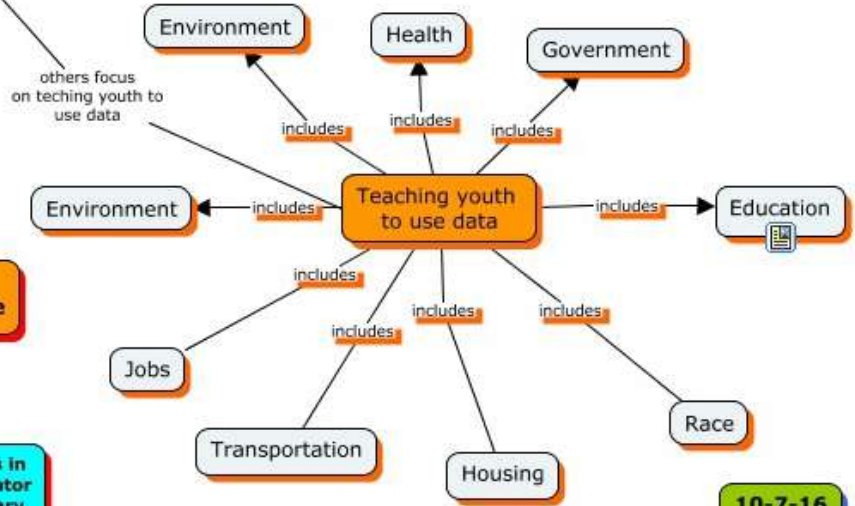
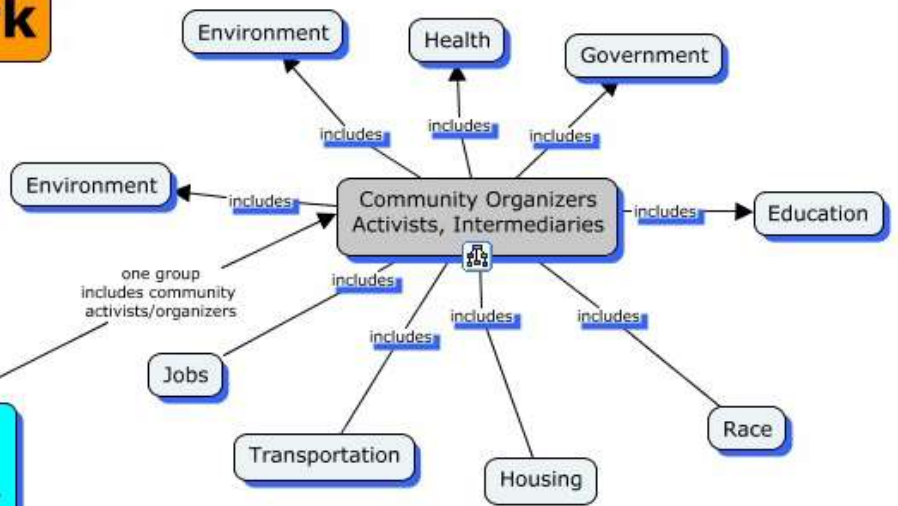


Mapping the Network

Smart Chicago Collaborative Chicago School of Data (2015)

Organizations Listed on Web site

Tech Orgs in Tutor/Mentor Web Library



FEEDBACK:
Use this contact form to let us know you viewed this map.

A worksheet or concept map could be created for members of the collaborative to show what their primary area of focus is (housing, environment, etc.) and what their primary role is (collecting data, mapping, stories, organizing, etc.)

Links in each node point to the web site of each member, encouraging collaboration and communications within focus areas, and across.

10-7-16

Smart Chicago

COLLABORATIVE



It's as easy as...

1. FIND



2. PAY



3. PARK

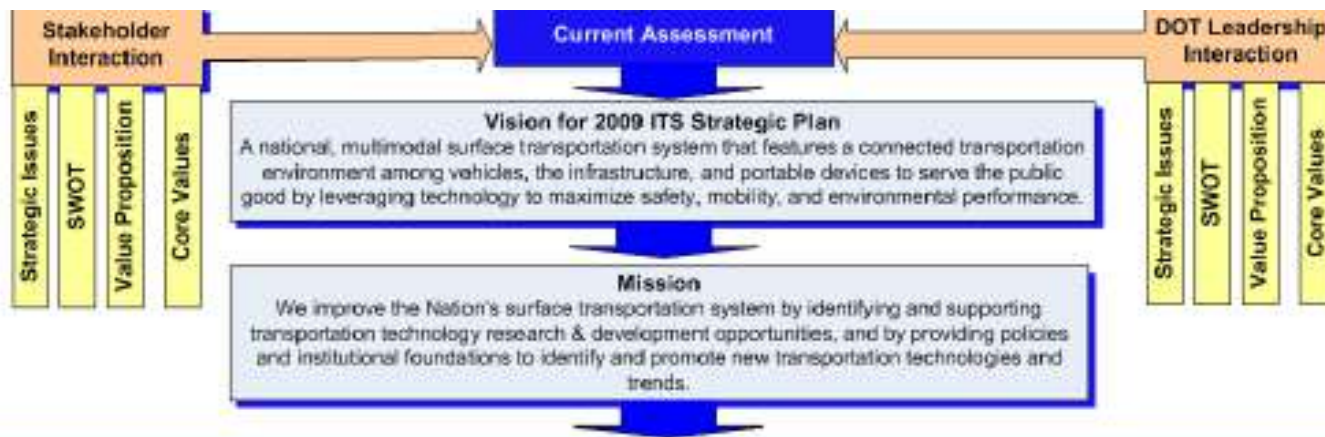


Boston



- **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。

US ITS Strategies 2009-2014



Strategic Initiatives

Safety	Mobility			Environment	Policy Foundation for Deployment
<p>Goal: Transformative safety through vehicle and infrastructure connectivity</p> <p>OBJECTIVES</p> <ul style="list-style-type: none"> Enable active and passive safety applications (i.e., applications designed to assist vehicle operators in avoiding imminent crashes and which require low latency communications). Improve safety by providing in-vehicle advisories which do not require low latency communications. Perform testing necessary to support regulatory and advisory activities, evaluations of system performance effectiveness, and the development and validation of standards. Provide a foundation for technologies to enable partial or full vehicle control. Enable vehicle-based applications such that they achieve program objectives without negatively impacting driver focus. Harmonize standards and architecture internationally around the vehicle platform. 	<p>Goal: Capture complete, real-time information on all roads and all modes to support transformational system performance.</p> <p>OBJECTIVES</p> <ul style="list-style-type: none"> Capture real-time data from connected vehicles, mobile devices and infrastructure. Capture real-time system cost information across all modes. Develop a technology framework that enables the integration of real-time data from all sources for use in transportation management and performance measurement. 	<p>Goal: Achieve transformational transportation management and system performance through vehicle and infrastructure connectivity.</p> <p>OBJECTIVES</p> <ul style="list-style-type: none"> Create applications and strategies for the use of real-time mobility and cost data for use by transportation managers to ensure the safe, efficient, and secure movement of people and goods. Utilize real-time mobility and cost data for dynamic decision-making by transportation users. 	<p>Goal: Realize "next generation" electronic payment systems that support transformational system performance.</p> <p>OBJECTIVES</p> <ul style="list-style-type: none"> Create interoperability of electronic payment systems across modes (parking, transit, pricing, tolls, etc.). Define technology framework to support emerging state and national policy for transportation financing. 	<p>Goal: Enable environmental management through vehicle and infrastructure connectivity.</p> <p>OBJECTIVES</p> <ul style="list-style-type: none"> Capture real-time environmental data from vehicles. Integrate real-time environmental data from all sources for use in transportation management and performance improvement. Create applications that use real-time data on environmental impact for use by transportation managers. Create information from real-time data on environmental impact for use in traveler information. 	<p>Goal: Establish an institutional foundation for deployment of safety, mobility, and environmental applications based on vehicle and infrastructure connectivity.</p> <p>OBJECTIVES</p> <ul style="list-style-type: none"> Identify and research solutions to address institutional foundations, governance, privacy issues, potential regulations, and policies, both nationally and internationally, to implement transportation technologies. Address social equity in all goal areas to ensure that all users benefit from transportation solutions.
Performance Measures	Performance Measures	Performance Measures	Performance Measures	Performance Measures	Performance Measures
Action Plans	Action Plans	Action Plans	Action Plans	Action Plans	Action Plans

MOBILITY AS A SERVICE FRAMEWORK



服務架構



Penghu Low Carbon Smart Transportation & Tourism

澎湖低碳交通智慧旅遊 智慧低碳驛站



Penghu Low Carbon Smart Transportation & Tourism

澎湖低碳交通智慧旅遊 智慧網路系統架構



Penghu Low Carbon Smart Transportation & Tourism

澎湖低碳交通智慧旅遊 驛站&360度環景服務架構



Penghu Low Carbon Smart Transportation & Tourism

澎湖低碳交通智慧旅遊 驛站服務情境



Penghu Low Carbon Smart Transportation & Tourism

澎湖低碳交通智慧旅遊 360度環景CCTV景點示意圖



風櫃風景點



中屯風車景點



林投公園驛站&景點



山水沙灘驛站&景點



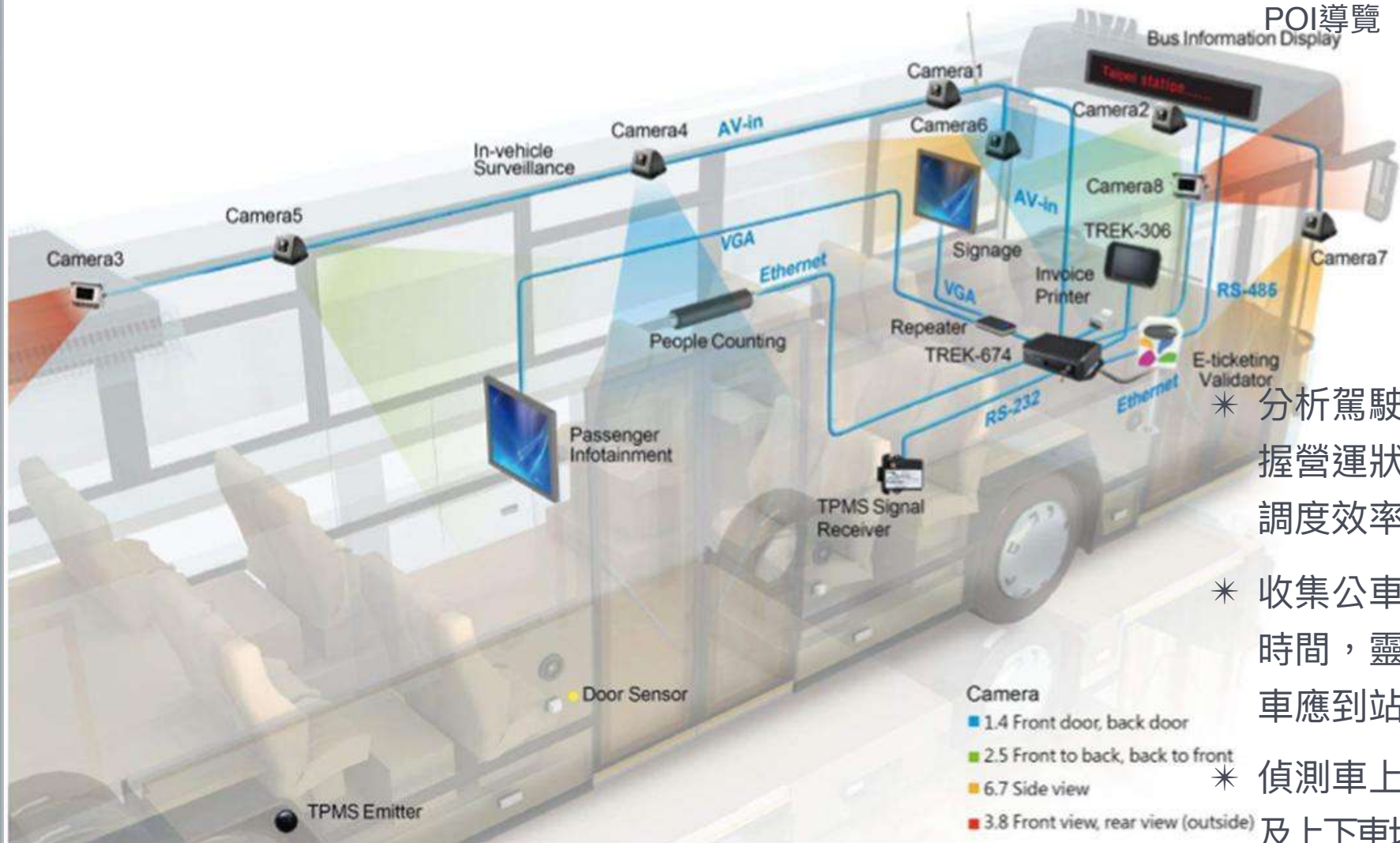
Penghu Low Carbon Smart Transportation & Tourism 澎湖低碳交通智慧旅遊

澎湖低碳交通智慧旅遊 智慧觀光公車

發展City Wi-Fi服務
到車上，提供無縫連
線服務

* 提供車上多媒體影音

POI導覽



* 分析駕駛行為，掌
握營運狀況，提升
調度效率

* 收集公車實際到站
時間，靈活調度公
車應到站時間

* 偵測車上乘客密度
及上下車地點分佈，
優化班次班距

Penghu Low Carbon Smart Transportation & Tourism

澎湖低碳交通智慧旅遊 智慧LCD公車站牌



4G無線通訊模組：工規設計高穩定性，支援防火牆可防止駭客攻擊



強化玻璃，抗UV
防塵防水達IP65



站牌多媒體控制器：工業級運作溫度達70°C，具保護機制可自動重啟

外型/尺寸/材質可依實際需求

38"LCD工業級顯示器：畫素1920x540，亮度1000nits，平均故障間隔時間達10萬小時，具日夜調整模式

電子票證查詢功能



Penghu Low Carbon Smart Transportation & Tourism 澎湖低碳交通智慧旅遊 多元化計程車 Shared Taxi

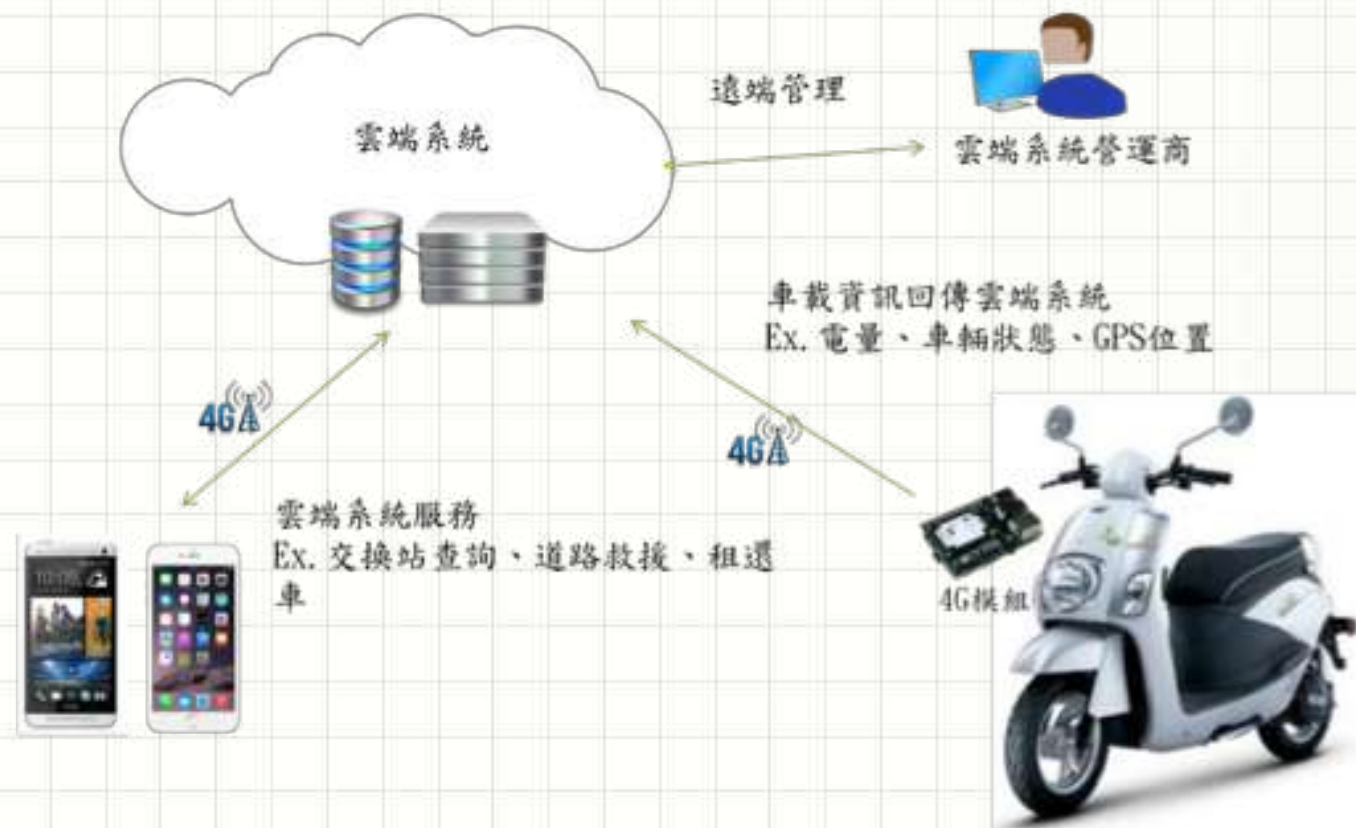
避免為了容受旺季流量而增設 大型運具造成淡季閒置的資源浪費，與淡季乘客不足出動大型運 具造成的不合效益，我們將納入共享經濟共享資源的概念，增設 多元化計程車，提供車輛共享服務，讓閒置未使用的車作為計程 車或是未坐滿的車與他人同乘，將車輛閒置率降低。



Penghu Low Carbon Smart Transportation & Tourism

澎湖低碳交通智慧旅遊 綠能電動車 E-Motorcycle

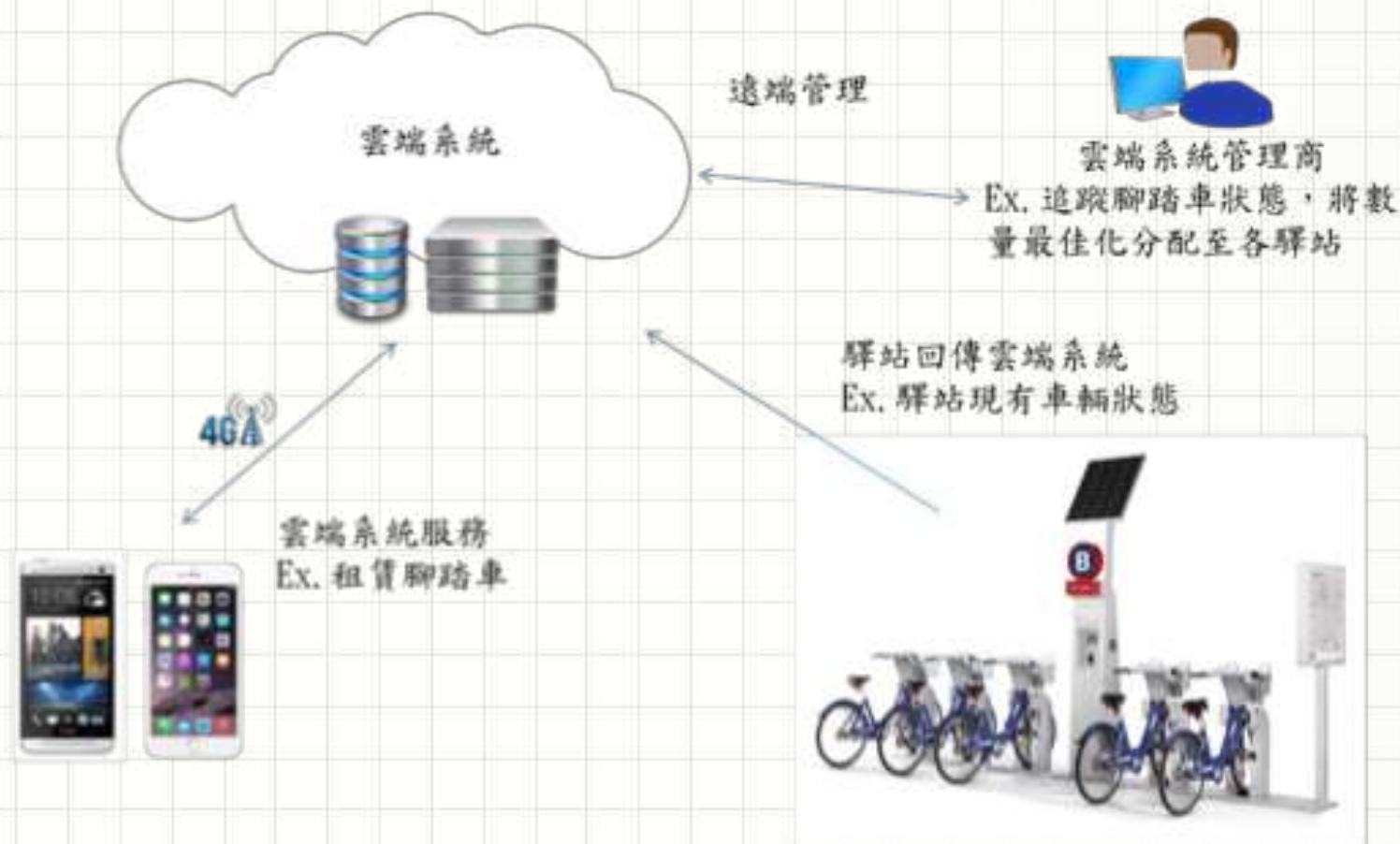
目前澎湖許多租車業皆提供電動機車的租賃，澎湖縣政府也設置了 300 多座的充電柱提供電動機車使用。電動車應結合車聯網的概念，將綠能電動車更近一步的以 4G 車機系統連結，提供更智慧與節能的綠能電動車應用服務。



Penghu Low Carbon Smart Transportation & Tourism

澎湖低碳交通智慧旅遊 公共自行車 Public Bike

提供腳踏車租賃服務，使用「澎湖觀光護照 APP」即可即時連線各驛站之單車資訊，了解剩餘數量於使用狀況，透過多卡通租借腳踏車。並可在智慧驛站獲得周全的單車建議路線與景點導覽資訊。



公館商圈8月起試辦慢行/徒步區

臺北好行

公車、停車、道路、微笑單車



回快捷頁



市區轉乘



建議事項



我的最愛



系統說明

welfare.ntpc.gov.tw

9 種情境、135 個福利項目

新北市政府
福利補助自己查

福利項目搜尋...



熱門：生育獎勵金、父母未就業育兒津貼、保母托育費用補助



福利項目一覽表

請問您 遭遇到什麼樣的問題？



生活困難

您因經濟收入不穩定或其他因素，以致生活遇到困難嗎？



工作相關

您目前有失業、創業或其他工作相關的問題嗎？



銀髮福利

您想知道有關銀髮族相關的福利嗎？



醫療與照護

您或您的家人有醫療需求或需要他人照顧嗎？



育兒相關

您身為或即將成為父母嗎？



社會教育

您想要進修學習相關的需求嗎？



居住或車位

您有租屋、購屋或停車位租借的需求嗎？



教育扶助

您目前仍在就學中且需要學費或其他相關協助嗎？



查查看您具有那些福利資格

您是否具有特定福利資格呢(如低收入,中低收入...)?

智慧城市旗艦計畫

Smart Taoyuan

執行構面



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。



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



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



Smart Travel Services 智慧旅遊服務

on the road 在路上



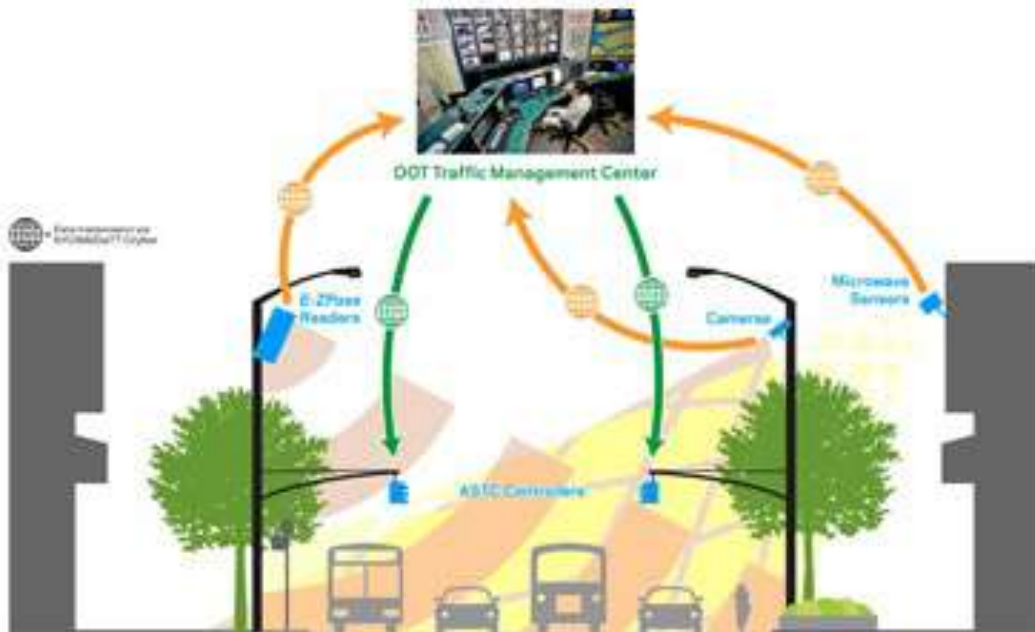
Smart Travel Services 智慧旅遊服務

on the beach 在海灘



New York City Mid-in-Town

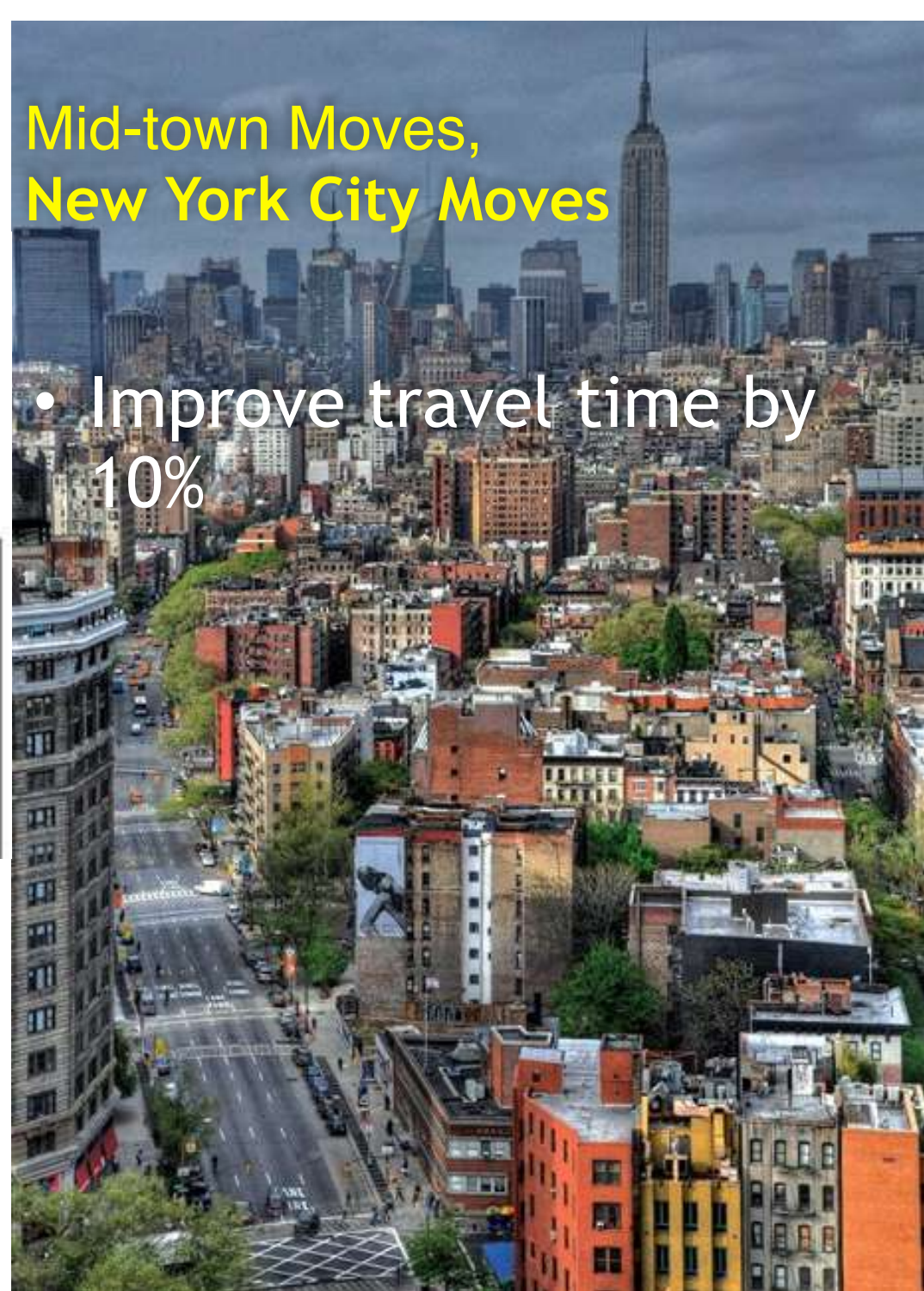
Adaptive Traffic Signal Control



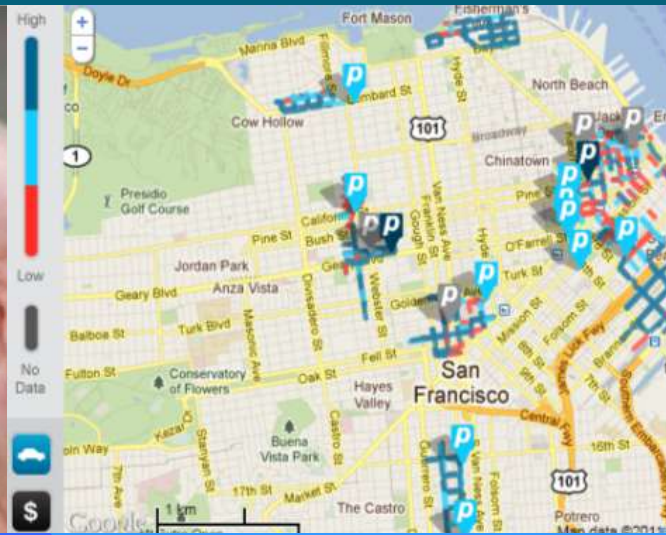
- Use e-tag ZPass and onsite microwave devices to detect traffic flow and congestion
- 270 blocks, 210 microwave sensors, 56 traffic video camera, and 59 ZPass reader

Mid-town Moves, New York City Moves

- Improve travel time by 10%



San Francisco Demand Management



Travel Choice

Demand Pricing

Smart Land Use

Infrastructure Support



Intelligent Transit

Smart Street

Intelligent Vehicles

Transportation Strategy

Two-tiered strategy for the transport system





摩拜单车散点扩散模拟图



上海设计科创实验室



摩拜单车

编辑：郑迪 孙慧（上规院）
数据：李凯克（上规院）吴题（摩拜）
指导：钱欣（上规院景观分院院长）
邮箱：64507122@qq.com

摩拜在晚间的使用频率明显高于日间，工作日的使用频率高于休息日，晴天的使用频率高于雨天。

摩拜轨交接驳热力图



上海设计科创实验室



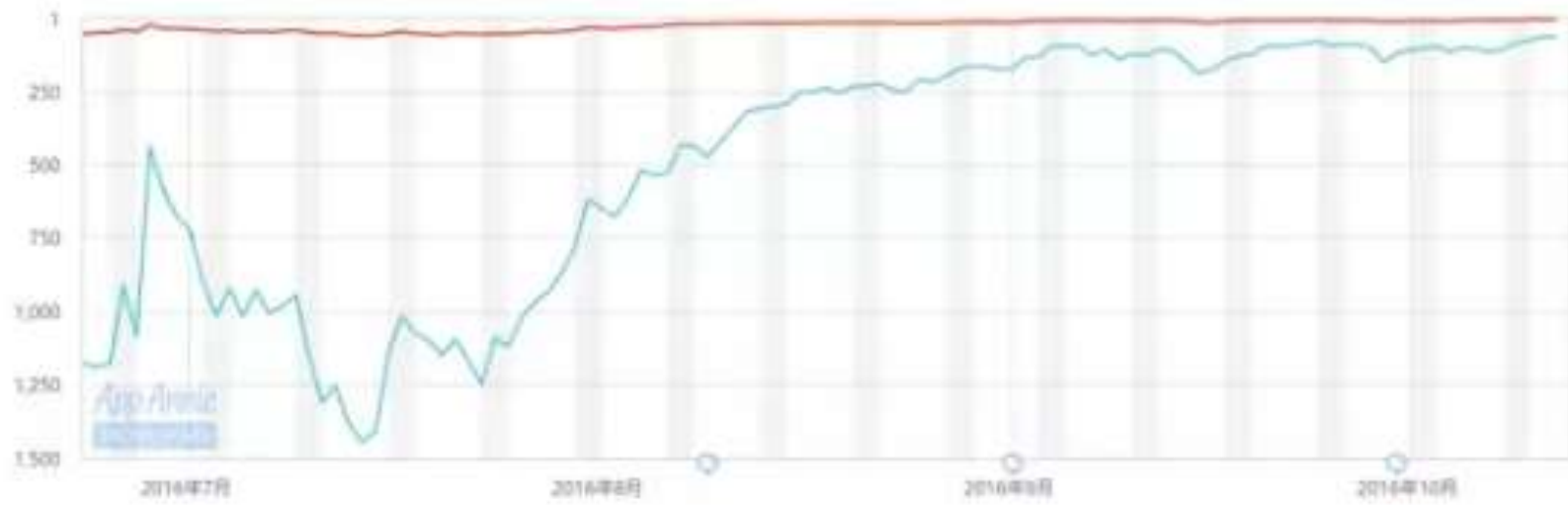
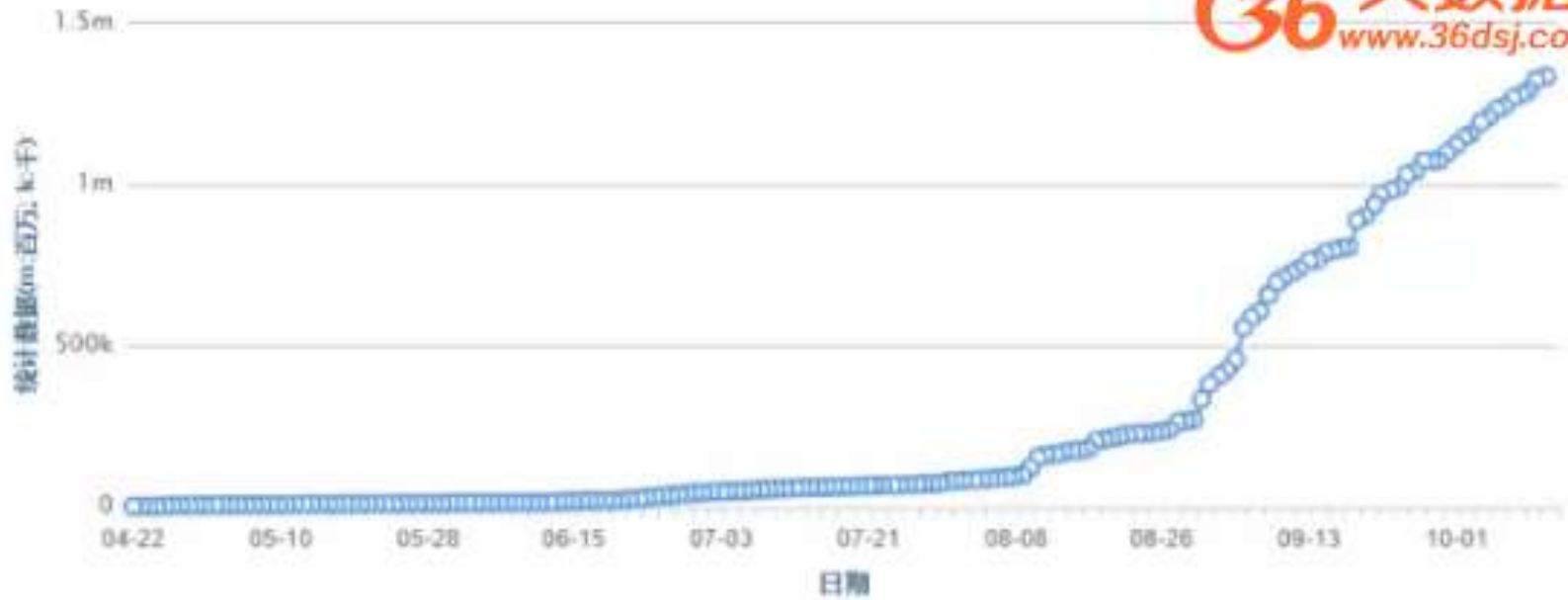
摩拜单车

编辑：郑迪 孙慧（上规院）

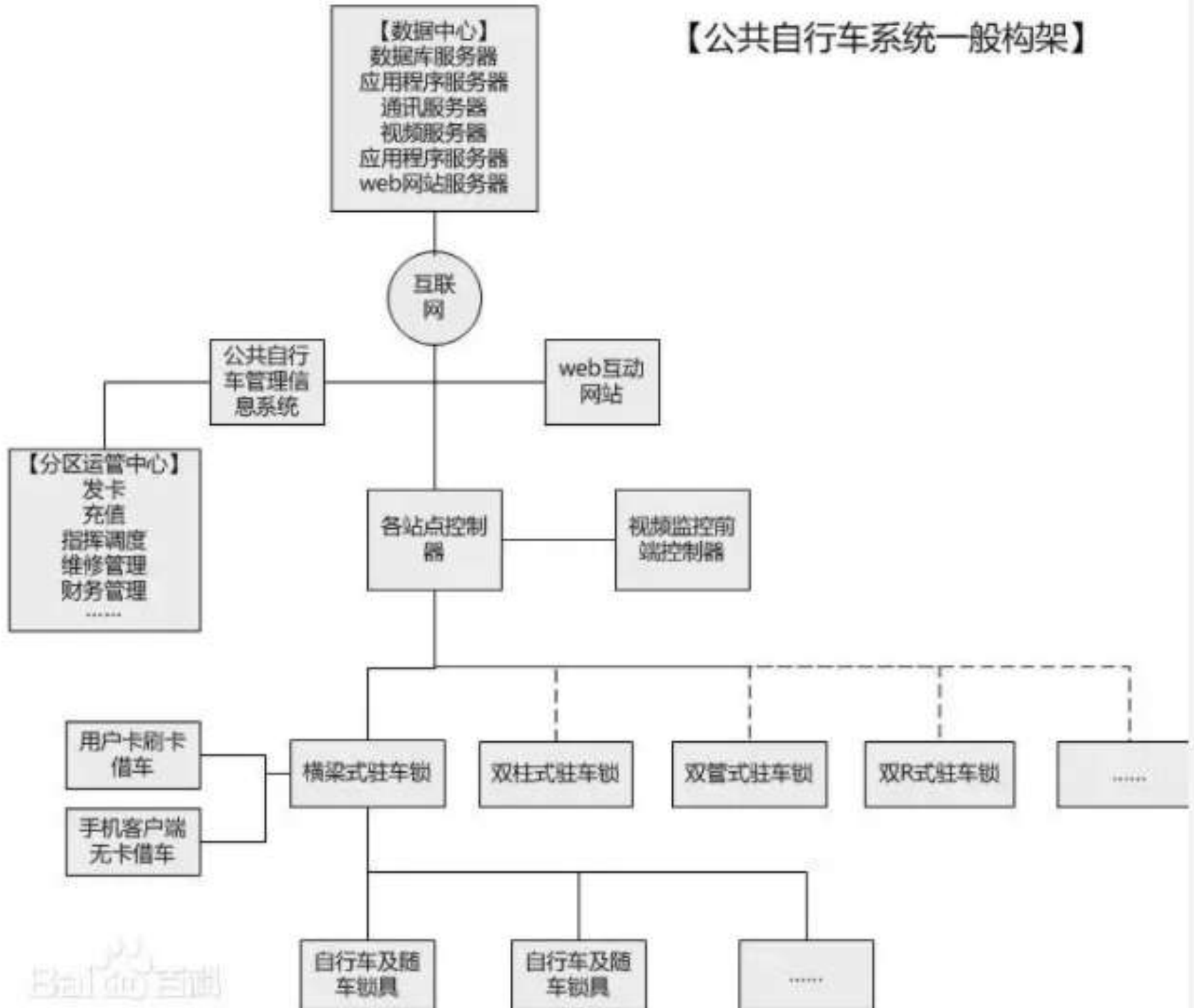
数据：李凯克（上规院）吴题（摩拜）

指导：钱欣（上规院景观分院院长）

邮箱：64507122@qq.com



【公共自行车系统一般构架】





Transit? 5 min walk
Next train 7 min/10 min ride
\$2.00 one way



Your Bike?
20-25 min ride
Bike parking available



Your Feet?
40-45 min walk



Taxi? next taxi in 3 min
20 min drive



CarShare? 2 min walk
Car is available
\$7.00 hour/20 min drive

Edit Trip

Calculate GHGs

New regulations aim to bring the D.C. taxi industry into the digital age



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.



NYC 24/7

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



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

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





焦國安

世界銀行顧問

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同濟大學高密度區域智能城鎮化
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0920-208-020

T3 智慧城市股份有限公司
Smart Cities Consulting

Embrace Healthier Life, Build Livable Community
讓人們更樂活。讓城市更美好

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