



CERTIFIED  
EXECUTIVE  
TRAINING  
ON GREEN ECONOMY

WGEO EXECUTIVE TRAINING COURSE  
ON SCALING UP TRANSITION TO  
A GREEN ECONOMY ON A PATH TOWARDS  
IMPLEMENTING THE UNITED NATIONS  
2030 SUSTAINABLE DEVELOPMENT AGENDA

MODULE DELIVERED BY



# GREEN + SMART CITIES

## PLANNING FOR A SUSTAINABLE URBAN FUTURE

### MODULE “GS”

*Ms. Shomi Kim*  
*Green Cities Analyst*  
*Global Green Growth Institute*  
*Email: [shomi.kim@gggi.org](mailto:shomi.kim@gggi.org)*

**COHORT THREE**  
25-26 June 2019  
Fortaleza, Brazil



# By the end of this module you will:



## Understand

The beneficial nexus of smart **and** green cities



## Know

How smart + green synergies work to benefit cities overall & support global sustainable development agendas in the areas of:

- i) Sustainable waste management infrastructure & services
- ii) Green buildings & infrastructure
- iii) Smart green mobility
- iv) Climate smart and resilient cities



## Be able to

Apply that understanding to specific and pressing urban development challenges

# GGGI at a Glance



Headquartered in Seoul, GGGI has 32 Members with operations in 33 countries

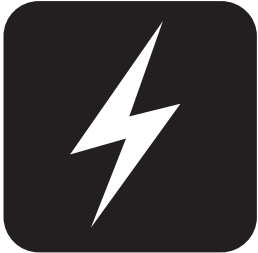


---

## GGGI's mission

*To help developing country governments transition towards a model of economic growth that is environmentally sustainable and socially inclusive*

# GGGI Services Value Chain



**Sustainable Energy**



**Water & Sanitation**



**Sustainable Landscapes**



**Green Cities**



**GGGI Value Chain**

# Supporting Partner Governments to achieve the SDGs and NDCs

33

Work with 33 developing country partner governments to achieve their Nationally Determined Contributions (NDCs)



PARIS2015  
UN CLIMATE CHANGE CONFERENCE  
COP21·CMP11

17

GGGI's 70 projects currently contribute to all of the 17 Sustainable Development Goals (SDGs)



# Green Cities

How to define green cities?



# For GGGI Green Cities are...



*“A city/town/city-region which pursues resource efficient, low-carbon, climate resilient and socially inclusive urban development, generating green job opportunities”*

# GGGI's urban sector – Priority areas to transform cities



## 1. Mainstreaming green growth into urban planning, management and finance.

- Green (secondary) cities strategic planning.
- Strengthened municipal finances.
- Increased green public spaces.
- Climate-resilient urban infrastructure.
- Green buildings, sustainable low-cost housing.



## 2. Supporting circular urban systems & economies

- Improved solid waste management.
- Waste-to-energy, waste-to-resource.
- Enhanced local livelihoods, jobs, investment



## 3. Sustainable urban infrastructure and transport to support connected & healthy cities

- Climate resilient and adaptive urban infrastructure
- Sustainable ecosystems and ecosystem services in urban & peri-urban areas
- Improved air quality through transport solutions

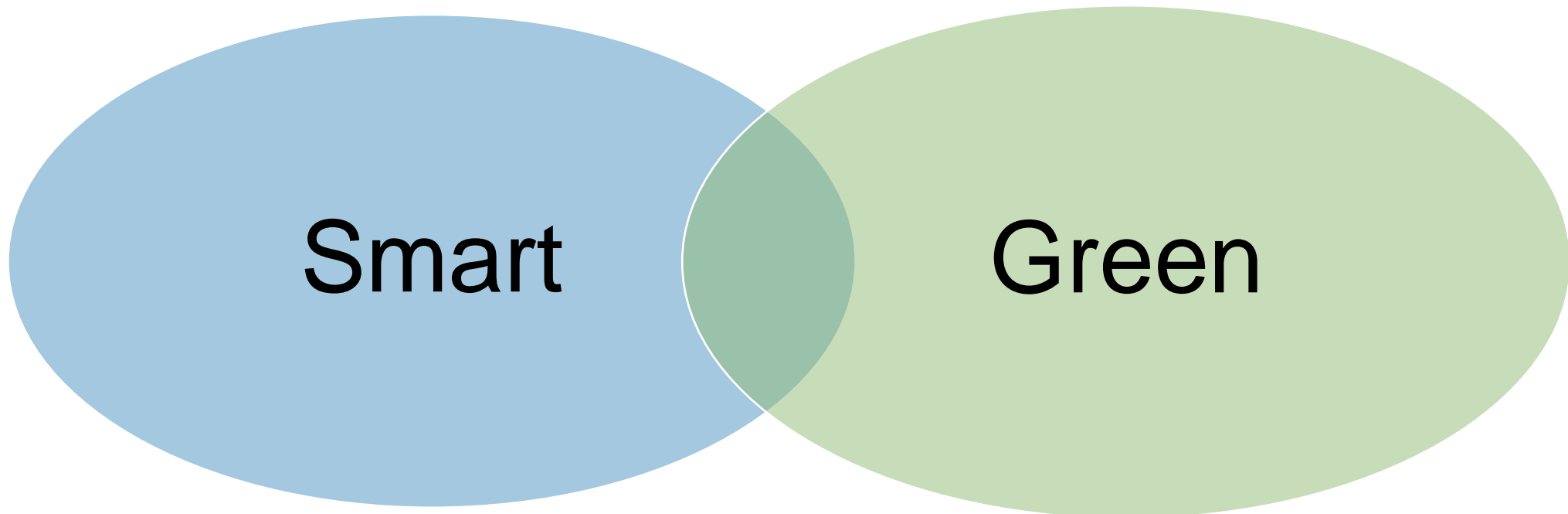


**Aligned to National Priorities**  
Secondary City Development



## Reflection:

How do we understand smart cities, green cities & smart+green cities?





## **A Smart City is Green & A Green City is Smart!**

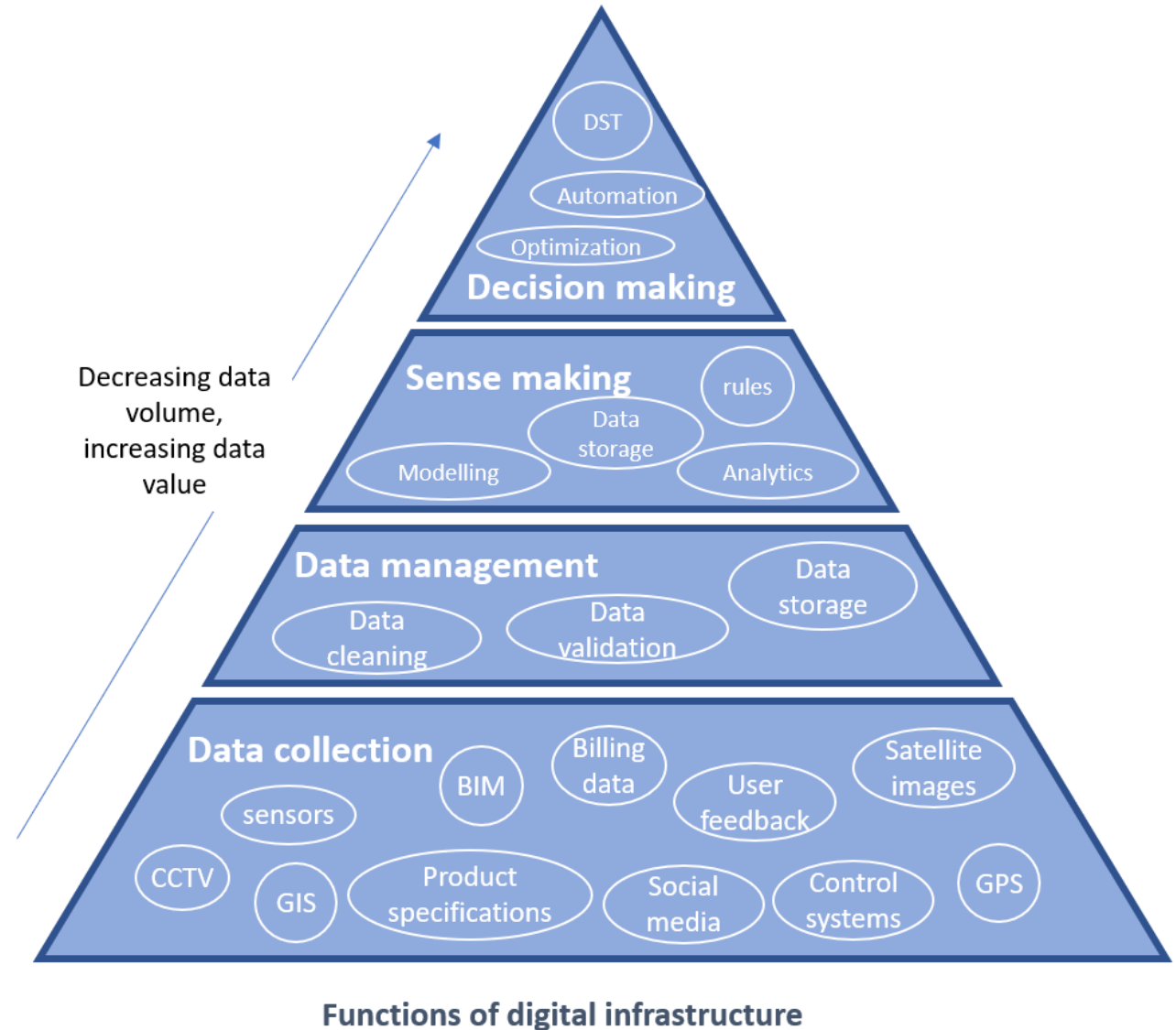
A smart green city is *well governed, inclusive, manages its eco-resources sustainably* through ICT.

It is *able to provide resource efficient, affordable and effective services to all* through '*smart approaches and systems*'.

## Applying data smartly

- Increased digitization
- Open source data
- Increased connectivity

*Smart cities: Value of data is in its use - interpretation towards decision-making*



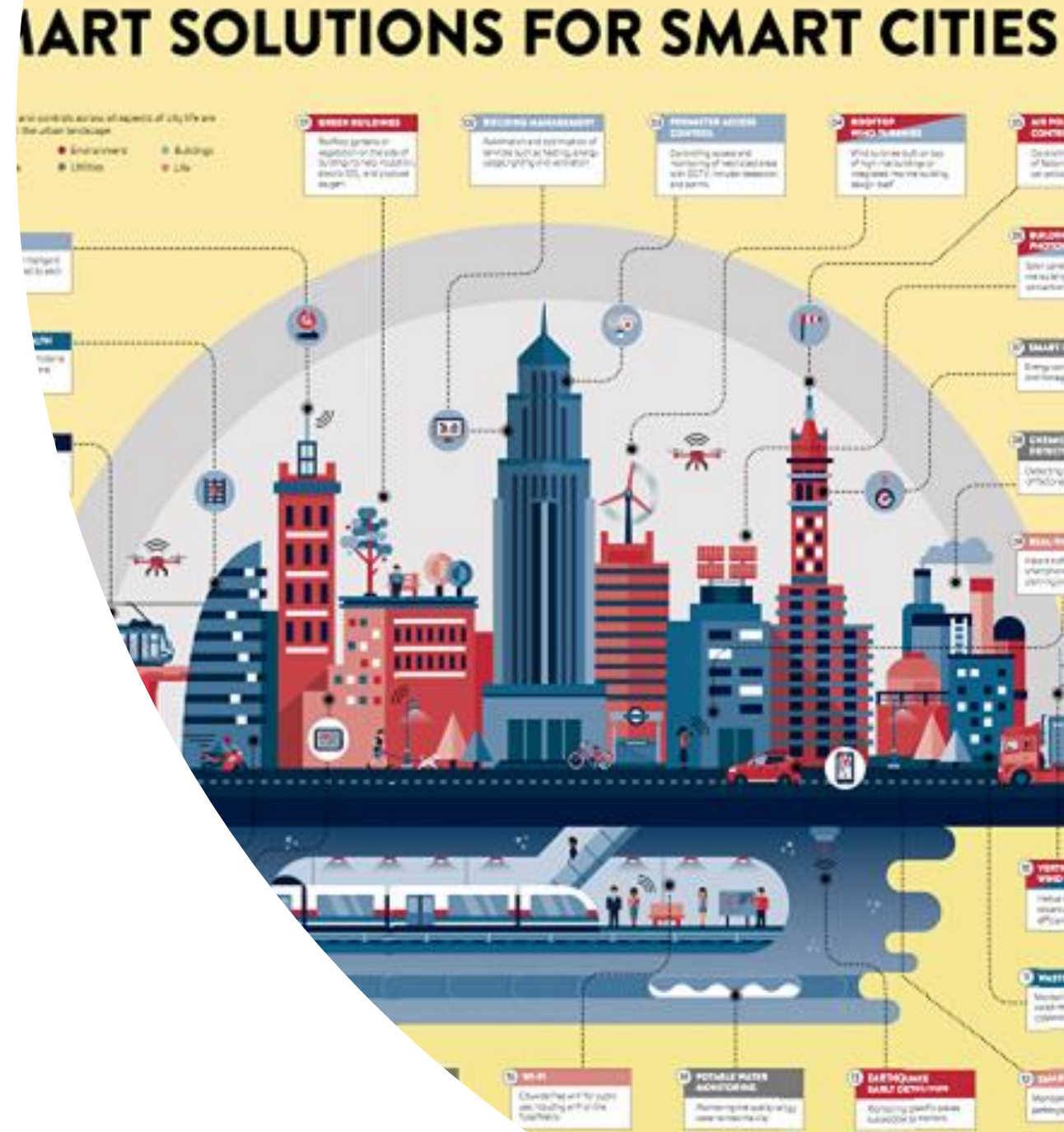
# The Limits of Separation



- Integration of Smart & Green is not automatic & benefits are not always clear
- For some a smart city is to foster a green/sustainable city through greater efficiency, cleaner production, decreased GHGs etc
- Digital-Green divides – and gaps: e.g. transport vs urban natural systems & resources
- Smart cities also may have environmental costs: a 'high-tech' city is energy hungry
- Energy consumption & e-Waste: the hidden face of our digital world
- The digital ecological footprint: computer+internet activity now greater than air transport energy emissions; by 2025 the digital energy footprint will be greater than road transport

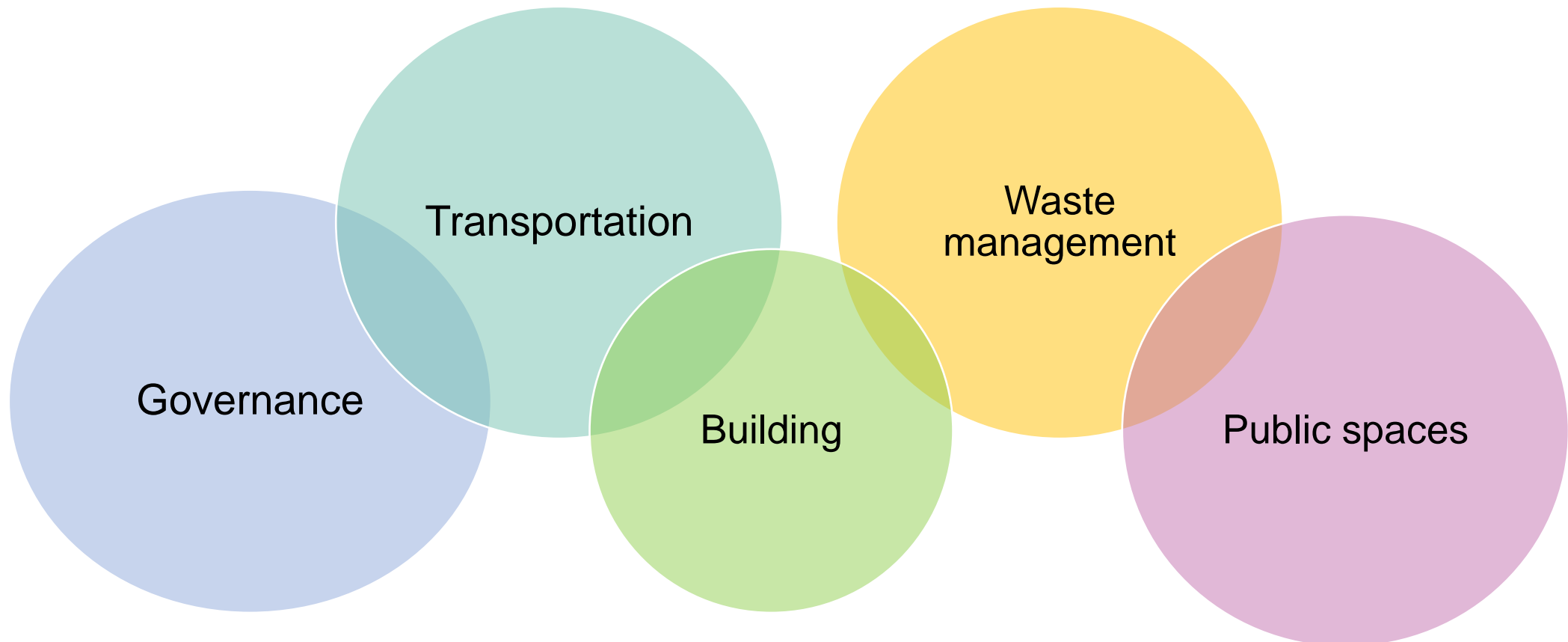
# Towards Green+Smart Cities

- No 'models' or single strategies: smart+green cities range from centralized to decentralized; technology-printed to collaborative; public-oriented to private/crowd-sourced
- What they share: integration & application of smart approaches & technology in supporting sustainability



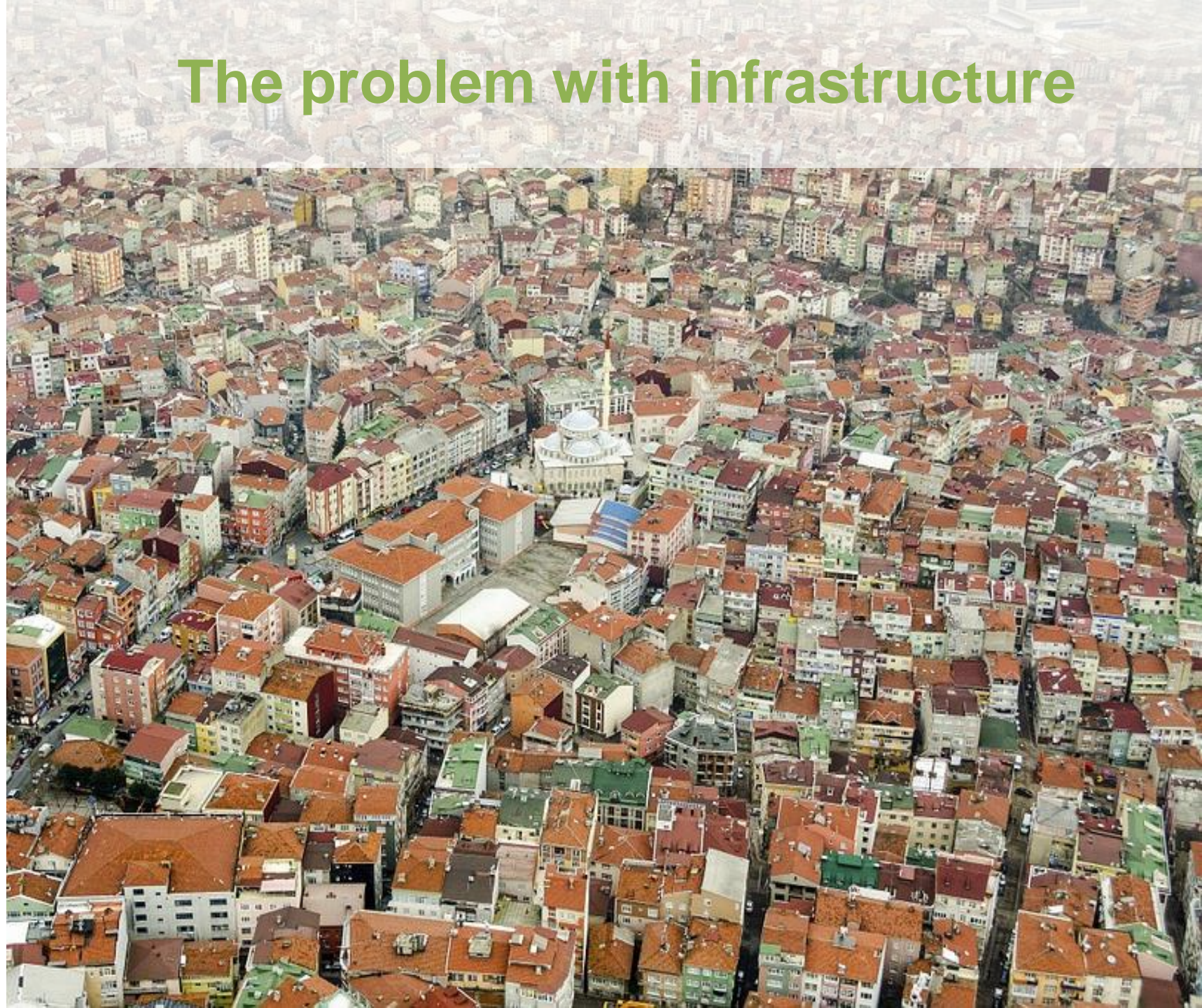
## Reflection:

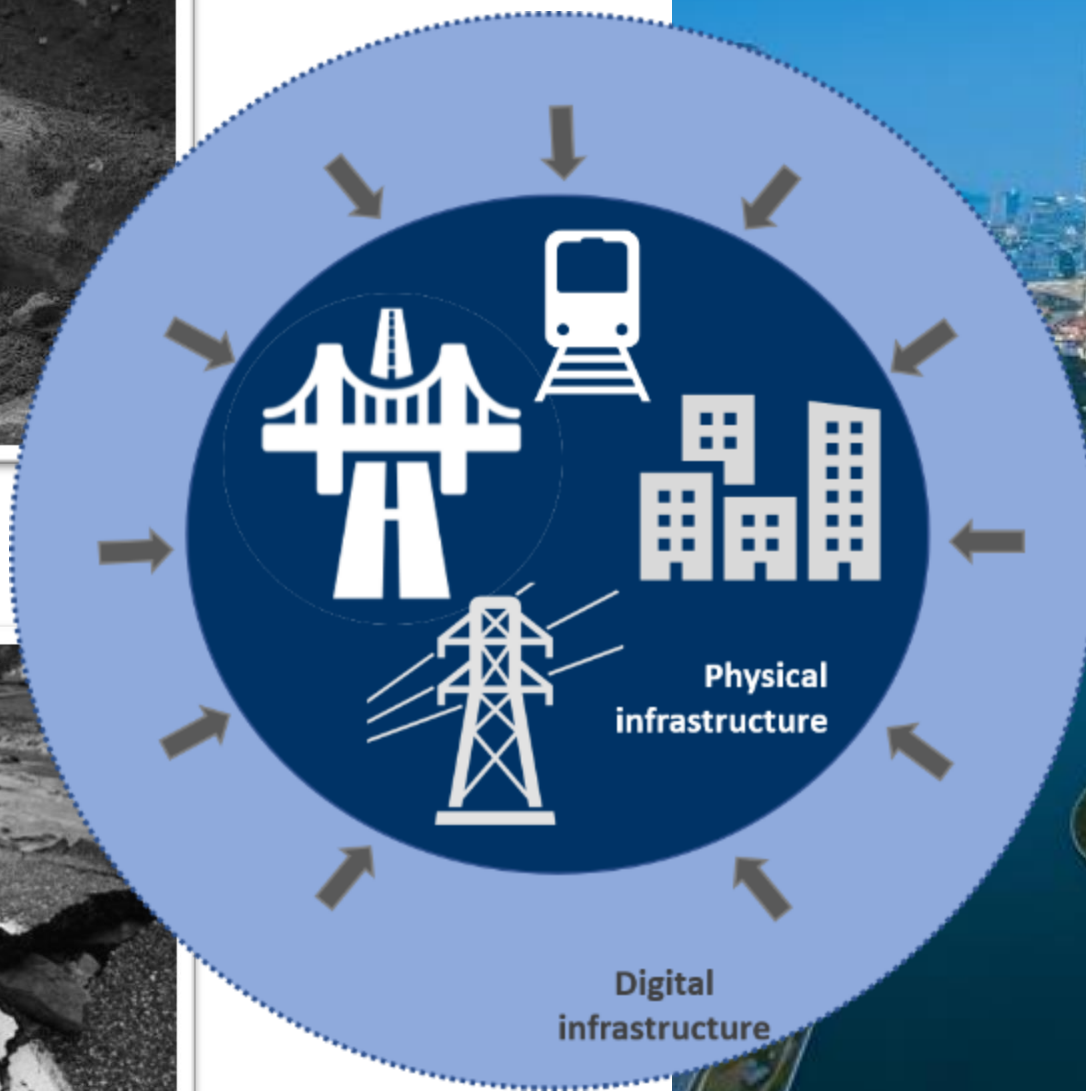
What are the priority sectors in your countries to implement smart green cities?



# The problem with infrastructure

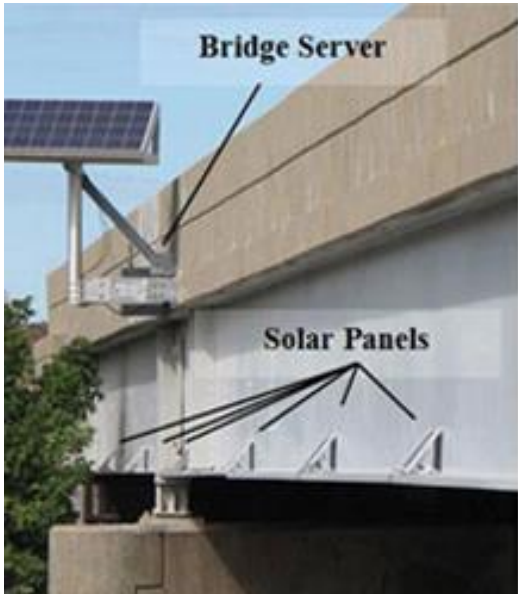
- Buildings and grey infrastructure consume **substantial energy** through their production and operations.
- As global population grows in numbers and wealth, **demand for new infrastructure** increases.
- In developed countries, **aging infrastructure** and extreme weather events push infrastructure systems to failure. Limited funds for maintenance.





Physical infrastructure enhanced in **capacity, efficiency, reliability** and **resilience**.



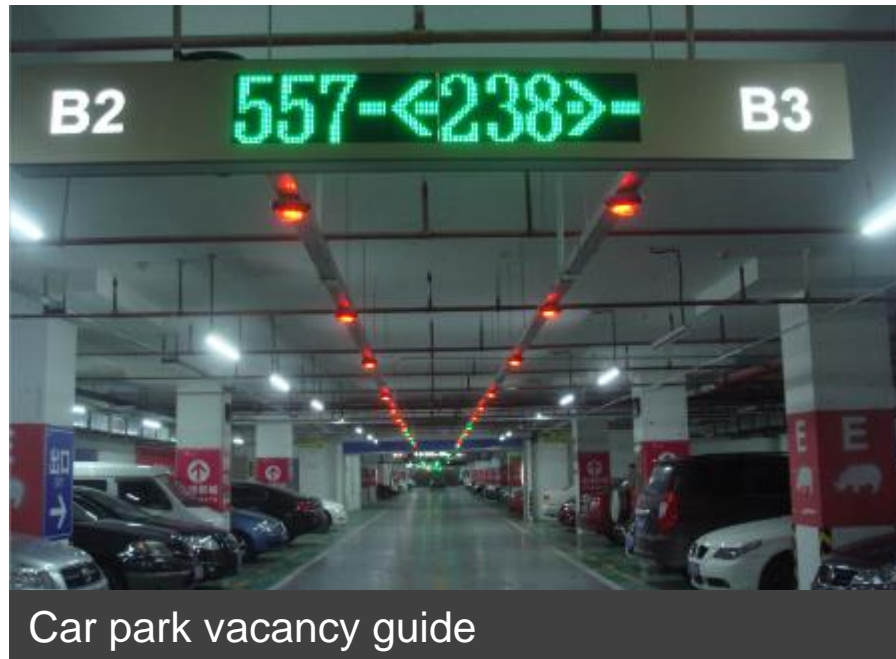


Sensors monitoring health of structures



Public advisory signage, traffic updates

Some applications of smart technology in urban infrastructure

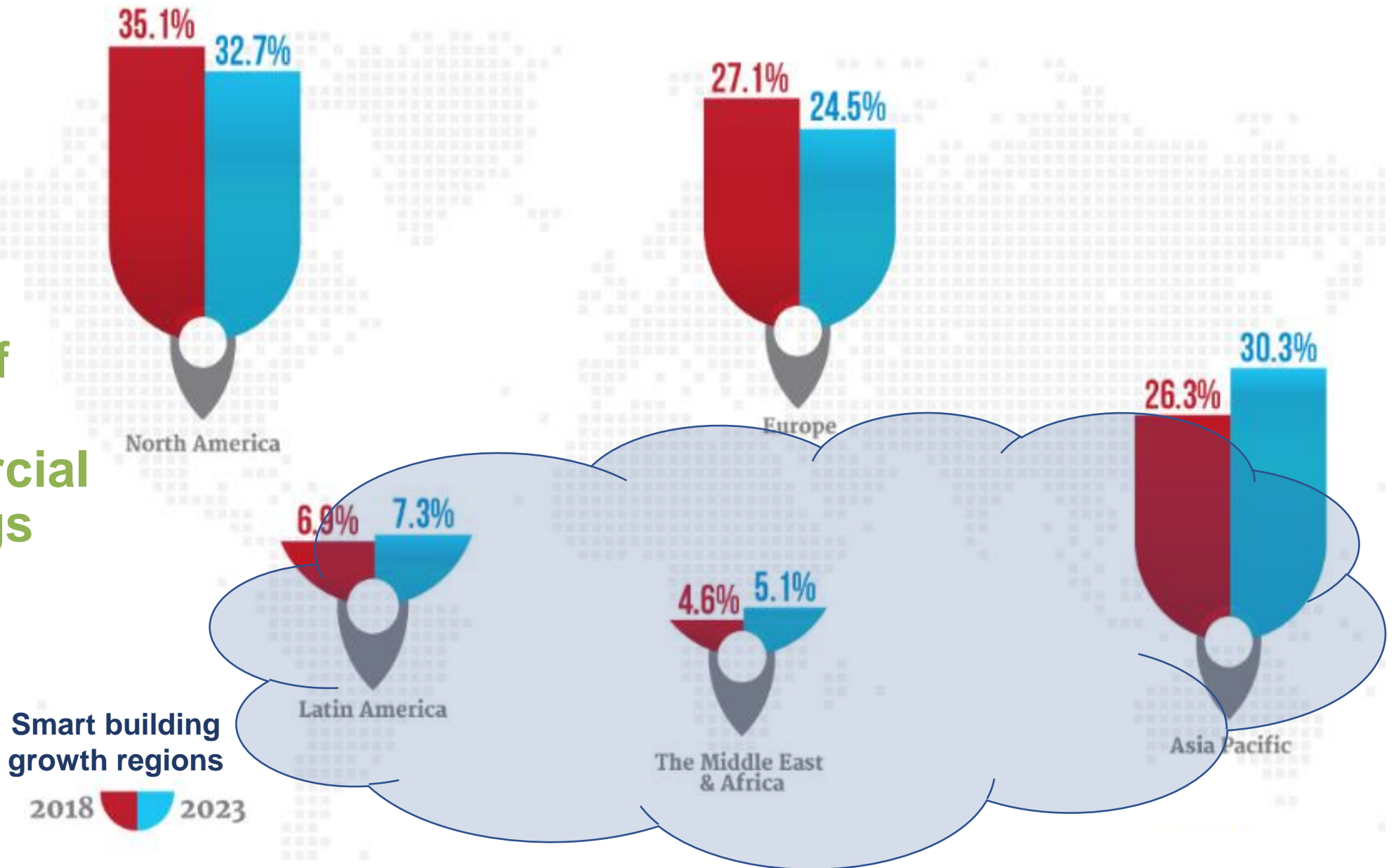


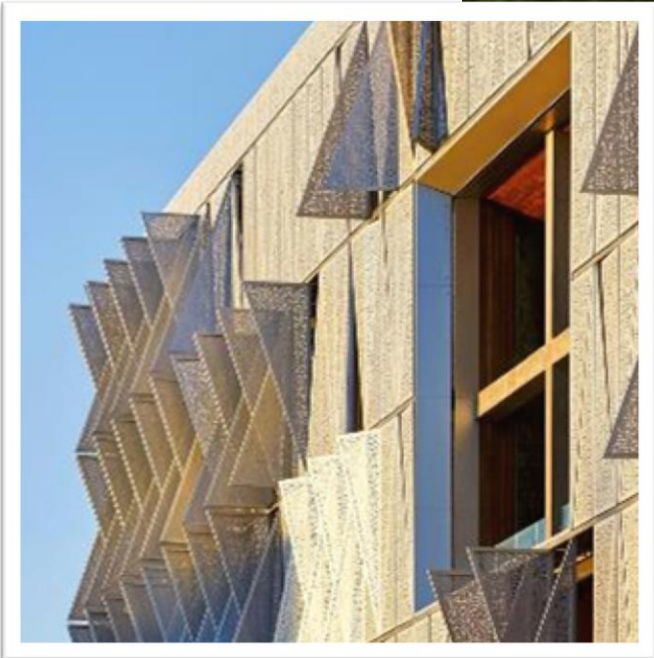
Car park vacancy guide



Automated lighting in parks

# Share of smart commercial buildings by region



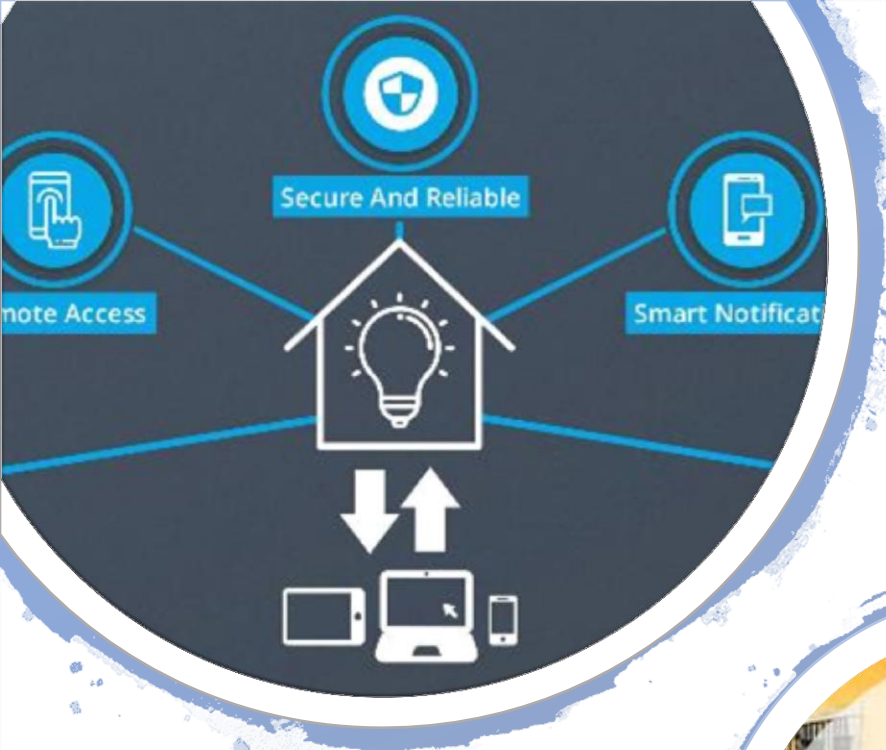


Fully automated building façade:

- Maximize **natural lighting** and **thermal comfort**.
- **Reduce electricity use** for ventilation, lighting, cooling & heating.

**University of Southern Denmark** Kolding Campus

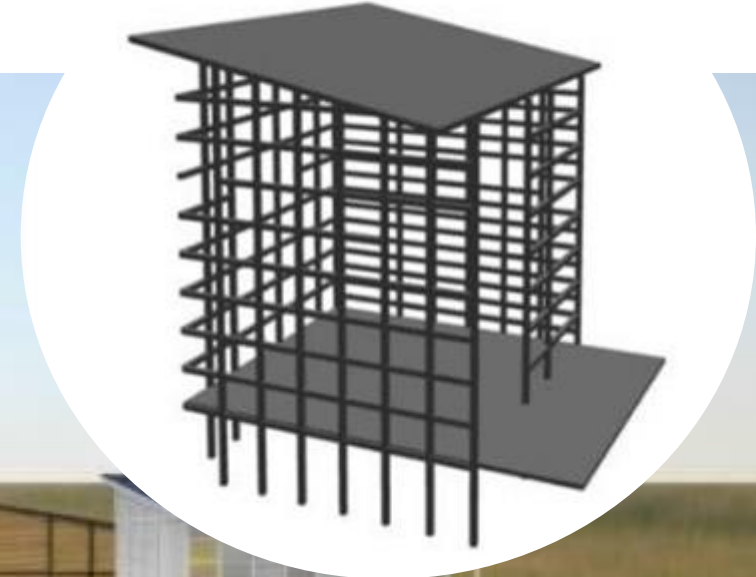
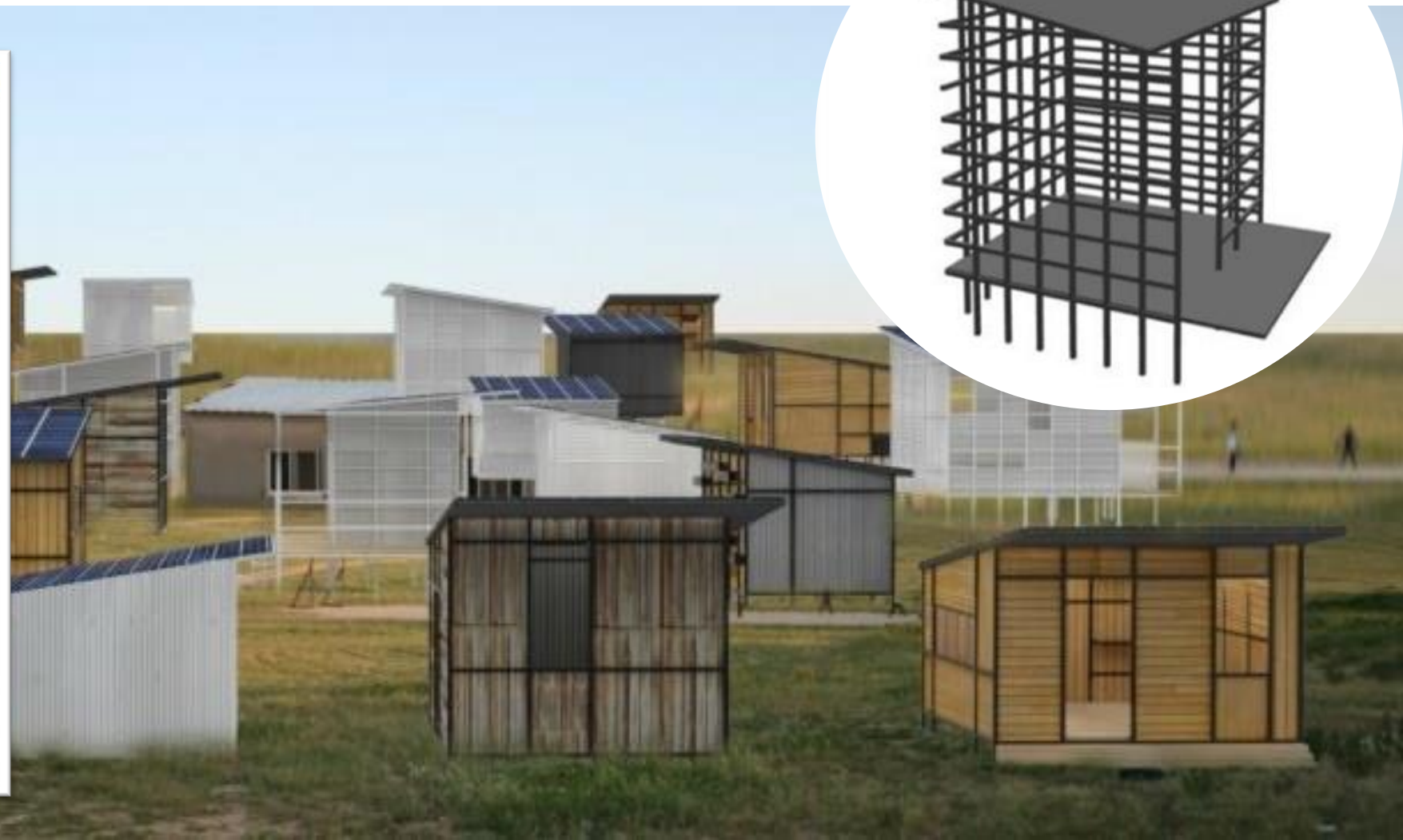
# Smart Affordable Homes



- **Smart lighting** – sensor control, remote control.
- **Security systems** – locks, alarms, CCTV.
- **Heating systems** – thermostat-controlled house heating.
- **Water pipe sensors** – monitoring pipe leakages.
- **Climate smart & adaptive homes & materials**



# Affordable Housing Design – User-friendly computer application



# Waste: From Crisis to Opportunity

- BAU: Serious resource impacts for local/municipal government
- Estimated 20-50% of municipal budgets
- Relying on conventional way of "Collect & Dump" approaches
- Geographical limits of landfill systems

- But – greater understanding of value, development of business models & investment windows
- High proportion of organic waste provides opportunities for economy
- Appetite for change

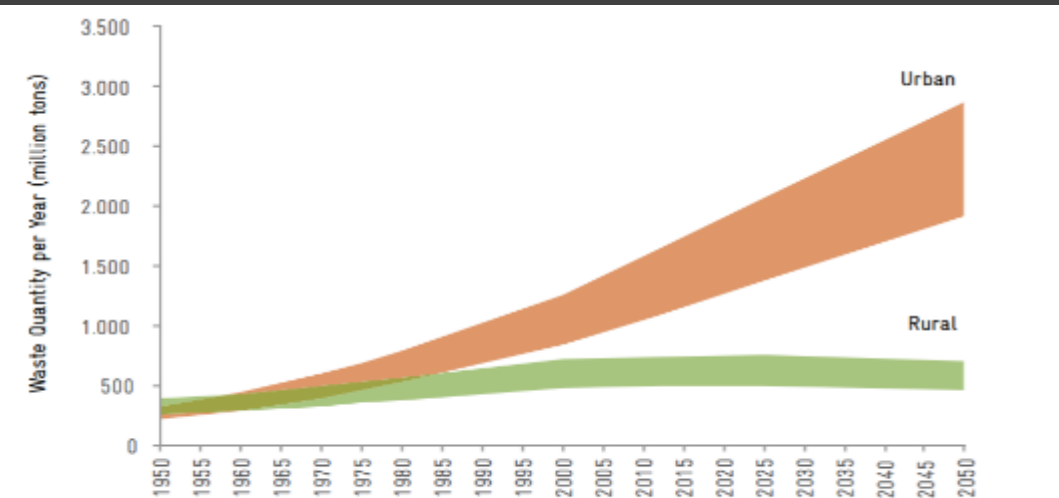
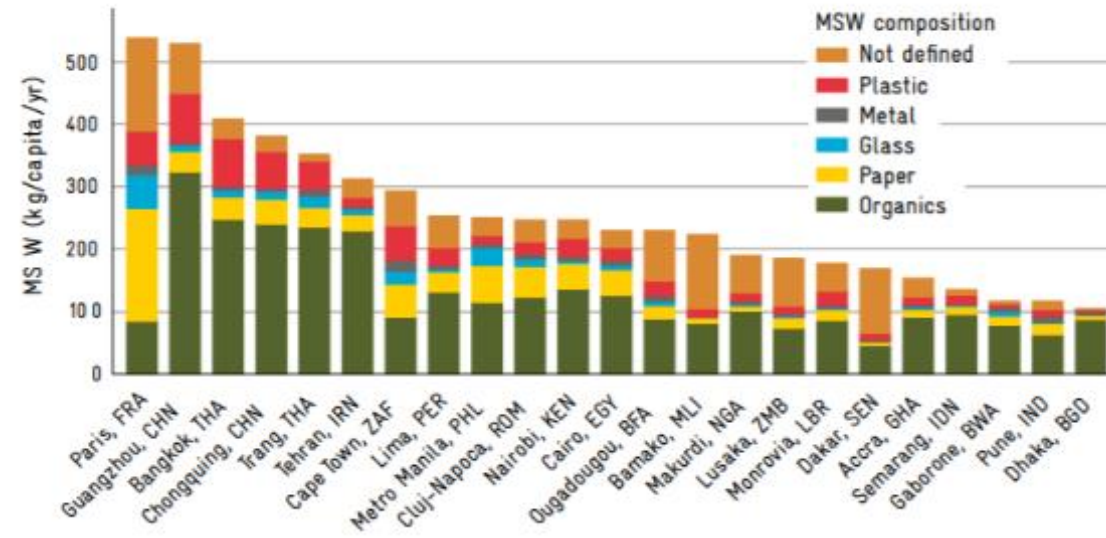


Figure 1: Projection of the development of urban and rural waste quantities of the world, 1950–2050. Based on UN-data [3] [4] [5] [6] and a daily waste production per person between 0.8 and 1.2kg in urban areas and between 0.4 and 0.6kg in rural areas.



If the landfill (dumpsite) is closed tomorrow, what measures will you take?



# Transforming waste systems by integrating smart solutions and technology.

1. Urgently address **separation at source** while minimizing waste generation; apply digitalized volume-based waste collection systems.
2. Support existing and new economies around recycling and **valorization of recyclables** by creating online platforms to connect waste generators and local recyclable collectors
3. Establish **economic opportunities around organic waste** by collecting separated organic waste at source through sensor-based organic waste bins.
4. Converting local informal dumpsites into material recovery centres with **integrated resource management solutions** (e.g. smart sorting, processing, and information system).





# CASE | Volume-based Waste Fee

Seoul, Republic of Korea

- 👉 Users pay according to the amount of garbage they generate by having to purchase bags required to dispose of household waste
- 👉 The standard bags also vary in colour and size according to their intended purpose;
- 👉 The bags are purchased at designated places by local governments, while sales and distribution of bags for business purposes are commissioned to private companies; Households use special cards to pay for disposing of food waste at the food waste machine.
- 👉 The VBWF system reduced the amount of waste generation by 16.6% & increased the recycling rate from 15.7% to 43% (1994-2001)



District information on waste generation and disposal is automatically collected through sales of waste bags. Weight scale food waste machine encourages households to reduce food waste generation.



# CASE | Amazónico: smart waste recycling WebApp

Bogota, Colombia



A multifunctional recycling WebApp with a comprehensive toolkit on waste recycling and collection, as well as the point management system rewarding points from the collected recycles and redeemable for products produced from the collected materials and discounts in associated brands.



**Social impact:** Provides 200 jobs and Improved their health and safety conditions; Supports sustainable consumption and choices



**Environmental aspect:** Reduced the landfill by 900kg of plastic, 600kg of metals, and 550kg of paper products during its pilot programe alone.



**Economic aspect:** Markets green products through a rewards scheme; Provides reliable incomes to waste management sector workers.



Using Webapp as a platform to connect the service providers and waste generators more effectively



# CASE | Sensor-based organic waste boxes

Turin, Italy



Organic waste box distributed by the municipal government has an information chip to send an information to the collection companies when it is placed outside for collection.



The information chip also monitors waste separation at source by analyzing the waste composition in the boxes.



This prevents the stealing of organic waste boxes.



Digitalized organic waste boxes cost only 5 Euro.



Using a simple information technology to increase adequate separation/collection of organic waste

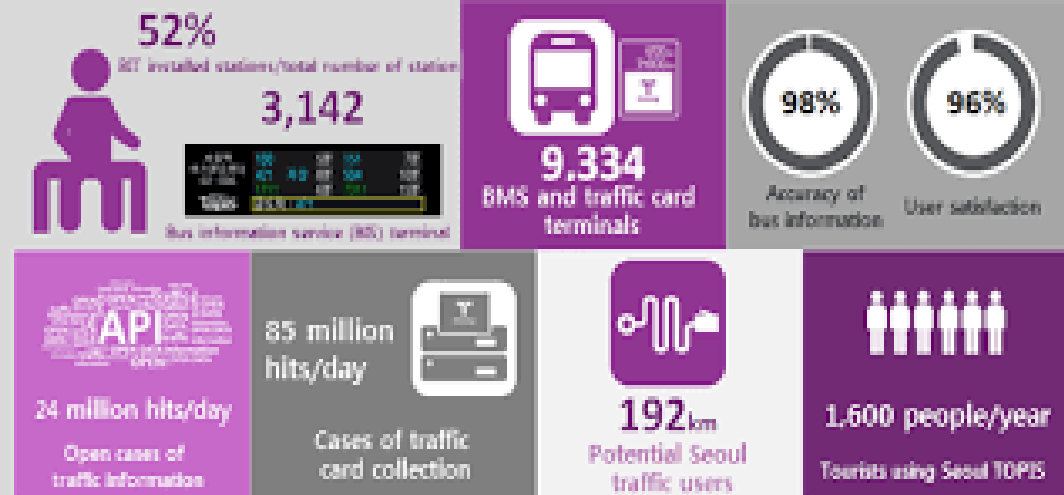


# Smart & Green Mobility



# Case Study: Seoul Transport Hub

- Seoul had poor transport infrastructure in 1950s and 1960s
- Increasing number of cars led to congestion & calls for public transportation
- Smart systems introduced over time: bus lanes, smart traffic cards, public transportation information system, control center
- Real time data collection - Bus information accuracy up to 98%, public satisfaction rate 96%
- Result: greater use & reliability. reduced congestion, improved air quality, reduced GHG emissions and overall integration



# Bus-equipped unmanned enforcement



## Fixed unmanned enforcement system (308)

- 1) Automatic enforcement of illegally parked or stopped vehicles within 200m of the device
- 2) Enforcement of vehicles in bus or bicycle lanes

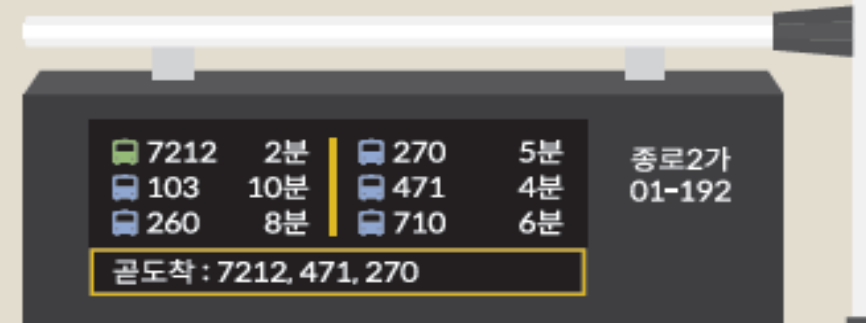
## Bus-equipped unmanned enforcement system (7 routes, 28 buses)

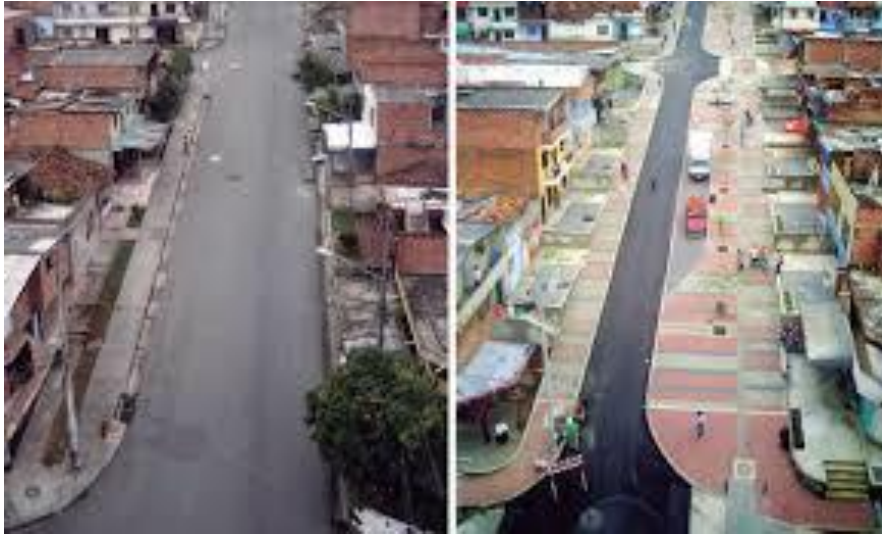
- 1) Automatic enforcement of vehicles in violation through unmanned enforcement cameras on buses
- 2) Enforcement on all roads where buses operate

# Late Night Bus (Owl Bus) – Utilizing Big Data

- Seoul Metropolitan Government used the big data in collaboration with the mobile carriers to determine the most popular routes between midnight to 5 am.
- This is to ensure citizens' convenience and safe return to their destinations when public transportation is not typically available.

✓ People can check the information about late night bus stops, intervals, arrival time, locations and bus numbers with Bus Information Terminal (BIT) at bus stops and Transportation Information Center Mobile (<http://m.bus.go.kr>) and homepage (<http://bus.go.kr/nBusMain.jsp>).





## Case Study: Inclusive & Connected Green Mobility in Medellín

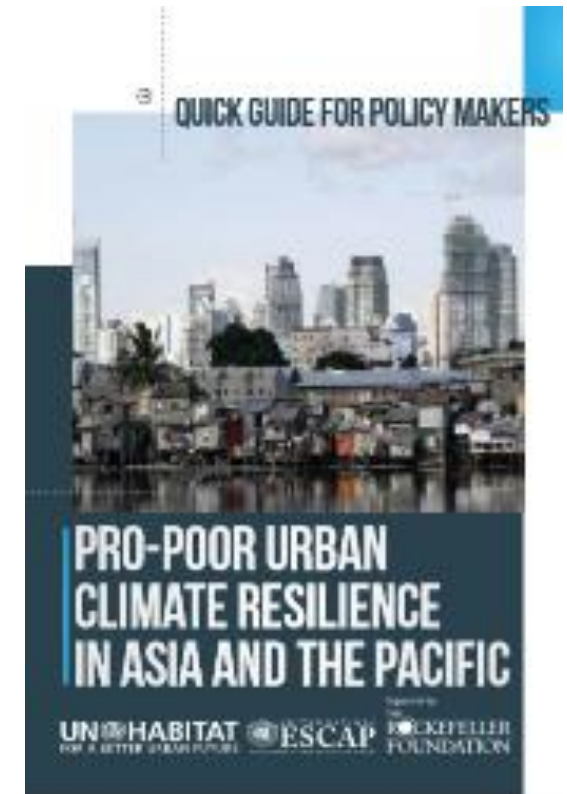
---

- Integrated mobility network designed for the city, transit-oriented development
- Network consists of metro, cable car, BRT, public bicycle sharing, and tram
- For successful delivery, have masterplans for each mode
- Innovation & implementation key to keep up with climate change
- Results: decreased crime rates, reduced congestion. Increased walking and cycling = green



# Climate Smart & Resilient Cities

- On the frontline: Cities represent concentrated vulnerabilities (of assets, infrastructure and people)
- What does it take to be a climate smart green city?
- Co-advancement of resilience, mitigation, adaptation
- ‘Climate Smart’ cities: integrated systems which avoid cascading failure
- Smart city applications: support adaptation/shift away from sector approaches & fragmented planning & investment responses (role of AI)
- Co-benefits: low-carbon infrastructure, adaptive ‘smart’ systems & data + empowered communities
- Smart climate resilient cities also invest in resilience of their communities – especially the most vulnerable



## Singapore Marina Barrage

- Tidal and flood control barrier.
- Inland freshwater reservoir.
- Urban recreational space.
- Sensors continually monitoring pressure on structure.



**Climate resilient smart infrastructure**

# Group Exercise/Discussion

Please choose the category of the topics that are most relevant to the area your expertise and discuss the following questions with your group (20 mins)



**City Planning** – Identify a priority sector that your city is driving for application of smart technology? How could you use the smart technology to promote “green and inclusive urban growth”?



**Waste Management** – Design a simple web-based innovative solution to promote waste separation at source in your city. How will you apply market & service driven approaches?



**Green building & built environment** – What are the opportunities in promoting green building and green public spaces with smart technology? What policy options would you suggest to tackle the impediments?



**Sustainable transportation & mobility** – How could you use big data to improve mobility and connectivity in your city?

# Three Key Takeaways



## Co-dependency

Green and Smart Cities are **co-dependent** on each other in sustainable city planning and implementation



## Observation through evidence based data

Smart cities are not always high-technology based but it is more about using the **evidence-based data and information** to design cities more climate resilient, inclusive, low-carbon, and resource efficient.



## Transformation

Transform the way we **plan, manage** resources, **design** urban infrastructure, **communicate** with urban dwellers, **invest** urban finance to make our cities greener and smarter.



Global  
Green Growth  
Institute

**Obrigado**

# Towards Green + Smart Cities: Key Transformations

