GREEN + SMART CITIES
PLANNING FOR A SUSTAINABLE URBAN FUTURE

MODULE “GS”

Ms. Aarsi Sagar
Green Cities Analyst
Global Green Growth Institute
Email:aarsi.sagar@gggi.org
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
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

Diagnosis
- Development, economic growth and sustainability diagnosis
- Sectoral green impact assessment and prioritization
- Macro economic impact assessment

Green impact assessment
- Policy and institutions analysis
- Analysis of costs and investment requirements
- Development of sectoral/sub-sectoral investment plans and selection

Sector/Sub-sector strategy & planning
- Design: Project and policy preparation
- Financing: Identification of possible financial structure
- Implementation
GGGI’s Activities

- Strengthening policy/regulatory frameworks
- Integrating with existing government processes
- Setting-up institutional structures and coordination mechanisms to implement NDC
- Building capacity of countries’ climate diplomacy
- Developing and implementing concrete NDC implementation plans
- Connecting-the-dots and integrating between various strategies, plans and commitments that are already in place
- Developing sectoral policies and incentives
- Developing and strengthening MRV systems in the context of their NDCs
- Developing quality control and quality assurance procedure and building MRV capacity of key stakeholders
- Addressing sectoral policies, gaps and regulatory risks
- Advising to correct market failures and policy failures where relevant to enhance investment conditions
- Designing policy relevant instruments such as tariffs, subsidies, power purchase agreements, etc.
- Facilitating mobilization of domestic/international resources
- Establishing/strengthening the National Financial Vehicles
- Supporting the development of bankable projects
- Designing risk-reducing instruments
- Accessing clean technologies
- Providing carbon trading partnership
- Strengthening country capacity through training programs with tools and methodologies
- Providing knowledge sharing platforms, including multi-stakeholders and private sector
Supporting Partner Governments to achieve the SDGs and NDCs

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

GGGI's 70 projects currently contribute to all of the 17 Sustainable Development Goals (SDGs)
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
Reflection:
How do we understand smart cities, green cities & smart+green cities?

Smart

Green
A Smart City is Green & A Green City is Smart!

A smart green city is well governed, inclusive, manages its eco-resources sustainably and through ICT is able to provide efficient, affordable and effective services to all through ‘smart approaches and systems’. It is able to efficiently use finances & generate investment to support its plans.
Applying data smartly

- Increased digitization
- Open source data
- Increased connectivity

Smart cities: Value of data is in its use - interpretation towards decision-making
Are Smart Cities Green Cities?

• Smart city applications can support innovations in transport; quality of life; economic competitiveness; planning; communication and ‘good governance’ etc.

• Most approaches to smart cities have shifted from ICT-centred to include people and quality of life.

• But are the benefits of ‘smart city solutions’ being realized in addressing major urban sustainability challenges?

• Smart city applications can gather data & create information platforms open to all: but how effectively is this used to shape sustainability agendas?
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
• 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.
Some applications of smart technology in urban infrastructure

- Sensors monitoring health of structures
- Public advisory signage, traffic updates
- Car park vacancy guide
- Automated lighting in parks
Share of smart commercial buildings by region

Smart building growth regions

North America
35.1% 2018, 32.7% 2023

Europe
27.1% 2018, 24.5% 2023

Latin America
6.8% 2018, 7.3% 2023

The Middle East & Africa
4.6% 2018, 5.1% 2023

Asia Pacific
26.3% 2018, 30.3% 2023

Fully automated building façade:
- Maximize natural lighting and thermal comfort.
- Reduce electricity use for ventilation, lighting, cooling & heating.
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
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).
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 as designated places by local governments, while sales and distribution of bags for business purposes are commissioned to private companies; Households uses 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 | Amazóniko: 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 programme 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
Smart & Green Mobility

- **Planned cities** – Need to plan for public & private transport – including NMT. Smart & Green includes accessible & connected cities

- **Technology** – incl. citywide infrastructure (Wi-Fi & adequate energy) to meet demand
Public & Private Smart and Green Transport

- **Private vehicles**: Use of Wi-fi to connect cars with GPS, manage traffic real time. Users connect via smartphones to access public transport data and connect own vehicles to real time GPS.

- **Electric Cars**: running on battery, Wi-fi-enabled, is the grid clean?

- **Future of smart vehicles**: Could be autonomous vehicles, are cities ready for this technology?

- **Challenges**: High infrastructure cost; data privacy; inadequate coordination between departments.
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
Case Study: Inclusive & Connected Green Mobility in Medellin

- 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
Case Study: Rwanda Bus Smart Card System

- Rwanda’s cashless Tap & Go system developed by a startup in Kigali & launched in 2015.
- Commuters can charge smart cards through their mobile money account or Tap & Go agents.
- Improved revenue collection rates for bus operators & reduced operational costs.
- Demand to export model to other countries and cities.
- Similar systems established in Kenya.
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, adaption
- ‘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.
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?
Towards Green + Smart Cities: Key Transformations

- **The way we plan**
  - To achieve smart, green & sustainable cities

- **The way buildings are designed & operated**
  - For a resource efficient & low carbon built environment

- **The energy produced & consumed**
  - Access to renewable energy & efficiency

- **Waste to resources**
  - Close the waste/resource loop

- **Water resource management**
  - Access to clean water and sanitation

- **The way people move and connect**
  - Connected & walkable/less motorized cities

- **Balancing expansion, growth & opportunity**
  - Pro-poor and inclusive cities

- **Enhance investment prospects for ‘green finance’**
  - Address how cities manage and account for their assets
Thank You