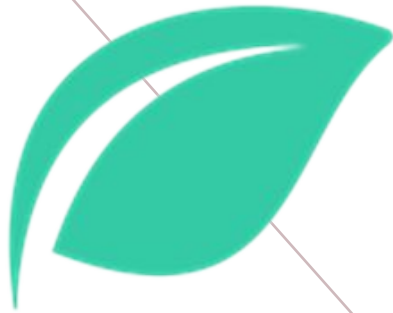




SMART AND SUSTAINABLE CITIES: ACHIEVING NET ZERO EMISSIONS



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AGENDA

- *Overview & Objectives*
- *Challenges*
- *Opportunities*
- *Shaping the future*



SMART AND SUSTAINABLE CITIES: AN OVERVIEW



WHAT ARE SMART AND SUSTAINABLE CITIES?

- **Smart Cities**

The concept involves the integration of digital technologies and various physical devices connected to the network (the Internet of Things or IoT) to optimize the efficiency of city operations and services and connect to citizens.

- **Sustainable Cities**

A Sustainable City is one that is designed with consideration for social, economic, and environmental impact, and is resilient to future challenges (UN).

- **Smart and Sustainable Cities**

Effective integration of physical, digital, and human systems in the built environment to deliver a sustainable, prosperous, and inclusive future for its citizens (BIS, 2014).

Research review article

Zhao, F., Fasola, O. I., Olorowaju, T. I., & Onwumere, I. (2021). Smart city research: A

WHY CITIES?

**70% OF CO₂ EMISSIONS*

**FAST URBANIZATION TREND, TWO
THIRD OF GLOBAL POPULATION*

** FOCUS OF NET-ZERO EMISSIONS*

WHAT DOES NET-ZERO EMISSION MEAN?

*GREENHOUSE GASES GOING INTO THE
ATMOSPHERE SHOULD BE BALANCED
BY THE REMOVAL OF GREENHOUSE
GASES OUT OF THE ATMOSPHERE
(FANKHAUSER ET AL., 2022).*



OBJECTIVES

**** TO INSPIRE AND MOBILIZE COMMUNITIES TO ACTIVELY PARTICIPATE IN CREATING SMART AND SUSTAINABLE CITIES.***

****. TO CONTRIBUTE TO ENVIRONMENTAL STEWARDSHIP TO ENSURE THE SUSTAINABILITY OF RESOURCES.***

**** TO ENCOURAGE SOCIAL INCLUSIVITY FOR ALL MEMBERS OF THE COMMUNITY.***

**** TO CONTRIBUTE TO A RESILIENT AND THRIVING URBAN FUTURE THROUGH COLLECTIVE ACTION.***



An aerial view of a city skyline at sunset. The sky is filled with soft, golden light and scattered clouds. The city below is densely packed with skyscrapers and buildings, with the sun's glow reflecting off their surfaces. The overall atmosphere is warm and dramatic.

***CHALLENGES & OPPORTUNITIES
IN NET ZERO - CASE STUDIES***

NEW YORK CITY (1)

Demographics - pop:18,937,000 ; GDP per capita: \$95,851

Emission profile:

- Buildings, approximately 70% of the city's total emissions
- Transportation, approximately 30% of total emissions

Measures taken

- * Green technologies Vertical Farming and Hydroponics
- * Building Retrofits and Energy Efficiency
- * Transportation Electrification



NEW YORK CITY (2)

Major Challenges

- legislations lack a specific regulatory roadmap, presenting challenges in public and legal scrutiny
- logistical and financial challenges
- Equity in Green Initiatives
- Energy Supply Transition



NEW YORK CITY (3)

Opportunities

- Green Economy Growth
- Technological Innovations & Scaling Up
- Expanding Public-Private Partnerships
- Engaging Communities in Sustainability Efforts



MELBOURNE (1)

Demographics - pop:5,235,407; GDP per capita: AU\$76,357

Emission profile:

- Gas & Electricity: 56% of emissions
- Transportation: 22% of emissions
- Industrial processes: 12% of emissions

Measures taken

- * Net Zero Emissions Strategy & Roadmap: achieving net zero emissions by 2050
- * Building efficiency standards
- * Sustainable transport
- * Waste reduction and recycling



MELBOURNE (2)

Major Challenges

- * **Urban Growth and Density**, becoming Australia's largest city.
- * **Transition to renewable energy** sources to reduce its reliance on fossil fuels requires significant investment in renewable energy infrastructure
- * **Improvements in public transportation infrastructure** and the development of policies and incentives to encourage sustainable transportation choices
- * **Retrofitting existing buildings**
- * Rising sea levels, more frequent and intense heatwaves, and other **climate-related challenges**



MELBOURNE (3)

Opportunities

- *Advancing Smart Infrastructure*
- *Expanding Public Transport Networks*
- *Digital Innovation and Data Use*
- *Partnerships with Startups and Universities*



COPENHAGEN (1)

Demographics - pop:1,381,005; GDP per capita: \$68,800

Emission profile:

Copenhagen has one of the lowest rates of emissions in Europe, approximately 2.2 tonnes per capita (2020), thanks in part to a shift to wind energy.

Energy consumption in buildings, energy production, and the transport sector, which are predominantly from fossil fuels.

Measures taken

City Administration initiatives like promoting renewable energy (wind farms), enhancing mobility through biking, and green retrofitting of building.

Utilizing waste heat from power plants



COPENHAGEN (2)

Major Challenges

- * reliance on immature technology like carbon capture and storage (CCS), insufficient funding, and lack of accountability.*
- * socio-political challenges like public acceptance and legislative hurdles.*



COPENHAGEN (3)

Opportunities

- ** Being the world's first carbon free city by 2025*
- **Leading in Renewable Energy Innovations*
- *Citizen Participation and Open Data*
- *Integrated Urban Mobility Solutions (Smart Bikes and Pollution Mapping)*



SHANGHAI (1)

Demographics - pop: 29,210,808 ; GDP per capita: RMB 179,900 yuan (~USD25,670)

Emission profile:

Industrial sector, energy production (especially coal consumption), and the shipping industry

Measures taken

Promoting clean energy, developing carbon-reduction technologies, enhancing energy efficiency regulations, and employing financial measures to support low-carbon projects

Increasing the share of local renewable power in its energy mix from 1.6% in 2019 to 8% in 2025

New energy vehicles - 80% of buses and taxis by 2025



SHANGHAI (2)

Major Challenges

- *Producing and purchasing NEVs, establishing a **city-wide network** of charging and refuelling stations*
- *Large-scale green initiatives require substantial **funding** and supportive market regulations.*
- *Data **Privacy and Security** Concern*
- ***Public** understanding, cooperation, and changes in energy consumption behaviour.*



SHANGHAI (3)

Opportunities

- *World's No.1 Smart City (Juniper Research)*
- *Leadership in Digital Public Services*
- *Smart Grid Innovations*
- *Strategic Role as a Global Trade Hub*



RIO DE JANEIRO (1)

Demographics - pop: 13,728,000; GDP per capita: R\$49,000 (~USD10,000)

Emission profile:

- transport represents its largest emissions by source which is 35.9%, followed by building (35.6%), waste (15.8%), industrial (12.6%), and agriculture, forestry and other land use (0.1%).
- **Measures taken**

Climate Change Adaptation Strategy, the Neutral ISS Law, and the Centre for Tomorrow's Energy and Finance.

To replace 20% of bus transportation with zero-emission vehicles by 2030, expanded its cycling infrastructure

Waste treatment plant in Seropedica

International collaboration



RIO DE JANEIRO (2)

Major Challenges

- *Financial constraints affecting clean energy projects and public infrastructure improvements*
- *Urban Crime and Safety Concerns*
- *Aging Infrastructure*
- *The broader impacts of deforestation and climate change in Brazil.*



RIO DE JANEIRO (3)

Opportunities

- *Green and smart logistics (zero-tailpipe-emission electric trucks across Rio)*
- *Enhanced Public Safety and Disaster Management Systems:*
- *Smart Rio project (digitalization of essential services and improve traffic congestion, security, and sewage control)*



NAIROBI (1)

Demographics - pop:5,325,160; GDP per capita: \$6,561

Emission profile:

- transport sector 45% emissions, followed by the waste sector, 33%, and the stationary energy sector, 22%.
- private cars contributing 73% of the total CO₂ emissions in the Nairobi CBD

Measures taken

Climate Action Plan (CAP) 2020-2050: Create green jobs, restore ecosystems, and reduce the city's carbon footprint

Put polluters on notice

Build a Bus Rapid Transit (BRT) system to offer fast, comfortable, and efficient urban mobility

Smart city initiatives



NAIROBI (2)

Major Challenges

- *Fast-growing population and urbanization*
- *Multifaceted challenges from economic, environmental, social and political perspectives*
- *Housing and Infrastructure, Decarbonization and Pollution, Inequality and Poverty, Governance and Planning*



NAIROBI (3)

Opportunities

- *Leveraging Mobile Connectivity*
- *Smart Traffic Management Systems*
- *Konza Technopolis Synergy*



DISCUSSION – THEMES & LESSONS

1. Stationary energy sources and on-road transportation stand out as the primary sources of greenhouse gas (GHG) emissions in urban areas worldwide.
2. No one-size-fits-all solution to delivering net zero cities. Each city requires a unique *place-based* solution.
3. A holistic and collaborative approach needed
 - * Requires a multi-faceted approach that involves a combination of mechanisms, as well as strong policy and regulatory frameworks, public engagement, and collaboration across sectors and stakeholders.
 - * Moves beyond a siloed approach: multiple projects and initiatives need to be coordinated and integrated to achieve a common goal.
 - * Measuring and reducing **all 3 emissions** is crucial to achieving net-zero emissions and eco-systems.

KEY AREAS FOR FUTURE RESEARCH AND POLICY DEVELOPMENT

Measuring carbon emissions

Assessing progress towards decarbonization requires new metrics that account for the unique characteristics of each city.

Technological Integration and Systems Thinking

Holistic models that consider the interdependencies between urban systems and technologies to optimize efficiency and sustainability.

Social Equity and Inclusivity

How to ensure equitable access to the benefits of such cities, including affordable housing and clean energy, to prevent socioeconomic disparities.

Economic and Financial Models

Innovative financing models and economic incentives.

Policy and Regulatory Barriers

zoning laws, building codes, and energy regulations.

CONCLUSIONS – CLIMATE CHANGE

CLIMATE CHANGE IS AN INTRICATE, MULTI-DIMENSIONAL CRISIS THAT DEMANDS A ROBUST, COHESIVE RESPONSE, INTERTWINING AN ARRAY OF INTERDEPENDENT ELEMENTS AND PROCESSES. THIS GLOBAL EMERGENCY TRANSCENDS TRADITIONAL DISCIPLINARY BOUNDARIES, NECESSITATING A HOLISTIC INTEGRATION OF KNOWLEDGE FROM CLIMATE SCIENCE, ECOLOGY, ECONOMICS, SOCIAL SCIENCES, AND POLICYMAKING.





THANK YOU

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