Scaling Up Circular Economy Through: Sustainable Infrastructure

Green Buildings in Shenzhen, China

Case Study

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Contents

1 Introduction

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- **In the context of social and economic recovery from the impacts of the COVID-19 pandemic, large-scale infrastructure investment is a common and traditional economic recovery mechanism that can stimulate investment and create jobs.**
  - **Changing the economic growth model to achieve a circular economy**
  - **Ensuring the sustainability of infrastructure during its lifecycle**

Shenzhen

深圳市

✓ Achievement of advanced progress

✓ Pioneer status for Green Buildings

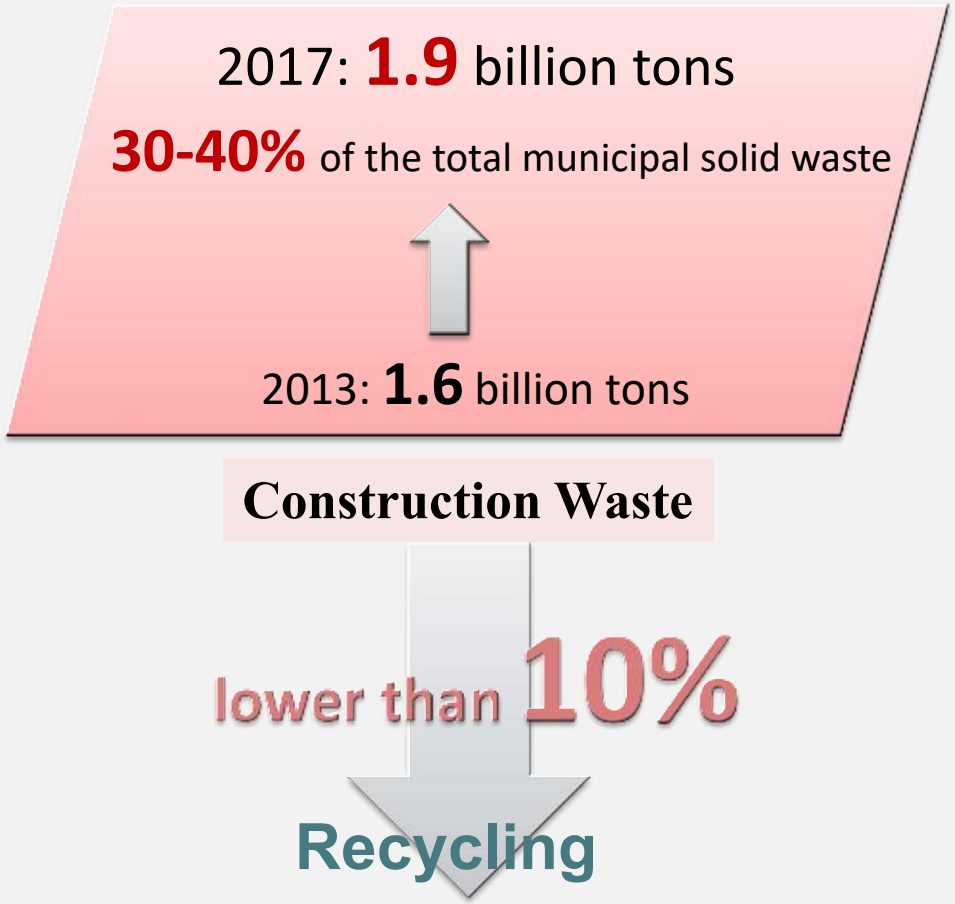
◆ Further Actions **◆ Broader Sustainable Infrastructure**

Green buildings are defined as high-quality buildings that save resources, protect the environment, reduce pollution, provide people with healthy, applicable and efficient use of space, and maximizes the realization of harmonious coexistence between human and nature. ("Assessment standard for green buildings (2019)" issued by the Ministry of Housing and Urban-Rural Development)

2 National Policy Background

2 National Policy Background

- China's urbanization and industrialization boosted the economy, but acute problems emerged.



➢ Policies & Regulations

2006 China's **11th Five-Year Plan** for National Economic and Social Development (2006-2010)

2009 **Circular Economy Promotion Law**

- Entire life cycle of building materials and buildings
- Use of solid waste to produce buildings materials
- Extend the service life of buildings
- Comprehensive utilization of construction waste

2016 **13th Five-Year Plan** (2016-2020)

- Recognize the positive role of green buildings in green urbanization, resource and energy efficiency, and environmental protection.

2021 **14th Five-Year Plan** (2021-2025)

- Deepen the low-carbon transformation in the construction field

2 National Policy Background

➢ Green Buildings and Circular Economy In the Context of COVID-19

- In the covid-19 context, green buildings have advantages from a **health** perspective.

Ventilation	Clean Water	Waste Separation System
• Reduce the health risk from indoor air pollution and the novel coronavirus contamination	• Water sealing in the drainage systems prevents harmful substances in the gases from escaping into the rooms	• Ensure the separate collection, transportation, and treatment of medical waste, preventing secondary spread of viruses

- Investment in green buildings is considered to bring opportunities for a **greener recovery**.

Green Buildings

Market Size: 15 trillion yuan (2016)

Construction Waste Treatment and Recycling Industry

Increased from 27 billion yuan in 2017 to 30 billion in 2018

Green Building Materials

Account for 10% of all building materials, with an estimated market size of 350 billion yuan

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Shenzhen Green Buildings

3 Shenzhen Green Buildings

➢ Policies and measures of green buildings in Shenzhen

- In 2008, Shenzhen put forward the goal of "**creating a city of green buildings**".

Undertake National Pilot Tasks

- ✓ Large-scale public building energy consumption monitoring
- ✓ Renewable energy building applications
- ✓ Construction waste reduction and utilization
- ✓ Public building energy-saving renovation
- ✓ Prefabricated building applications

Shenzhen Building Energy Conservation Regulations	2006
Shenzhen Implementation Plan of System Development of Circular Economy	2006
Action plan for building a green building city	2008
Shenzhen Construction Waste Reduction and Utilization Regulations	2009
Twelfth Five-Year Plan" for Building Energy Efficiency and Green Buildings in Shenzhen	2011
Shenzhen Green Building Promotion Measures	2013
Shenzhen Construction Waste Management Measures	2013
Notice on the full implementation of green building standards in newly started housing construction projects	2013
Shenzhen's 13th Five-Year Plan for Circular Economy	2016
Shenzhen's 13th Five-Year Plan for Building Energy Efficiency and Green Buildings	2016
Shenzhen Green Building Quantity and Quality Upgrade Three-year Action Plan (2018-2020)	2018
Green Building Evaluation Standard	2018
Shenzhen Construction Waste Reduction and Comprehensive Utilization Incentive Measures	2020

Policy and Regulation Framework of Green Buildings in Shenzhen

3 Shenzhen Green Buildings

➢ Economic Incentives of Green Buildings

Special Fund Support

- Include a dedicated green building technology development section

Green Building and Construction Technology Innovation Award

- Green buildings that have passed assessment can apply for financial subsidies from the national and municipal level at the same time.

Construction Waste Management	Financial Subsidies
Land Use Arrangements	Rent Reduction & Exemption

➢ **Budget for the annual construction waste reduction and recycling: 375.8 million yuan**

Charge 20,000 to 300,000 yuan of fine

- ◆ Construction fails to meet the Assessment Standard for Green Building (2019)
- ◆ Indoor pollutant concentration and/or energy consumption are not properly monitored after delivery of construction

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➢ Measures & Results

Energy Saving

- **2018**: 187 public building energy-saving projects; renovation area of 8.32 million square meters; 80 million kWh can be saved each year

Renewable Energies

- Solar energy, biomass energy and geothermal energy
- **Promotion measures:** economic incentives, technical standards, life-cycle management, and communication strategies to the public

GHG Emissions

- Implement energy consumption quota standards
- By 2018, **carbon verification** of 913 government office buildings and large public buildings was completed, and 315 building **carbon quotas** were issued.

Waste Management

- Transition with water transport, comprehensive utilization, engineering backfill, temporary and fixed disposal in landfill sites

Green and Recycled Building Materials

- **Recycled materials** are certified and prioritized for procurement in public buildings
- Whitelist of certified green building materials

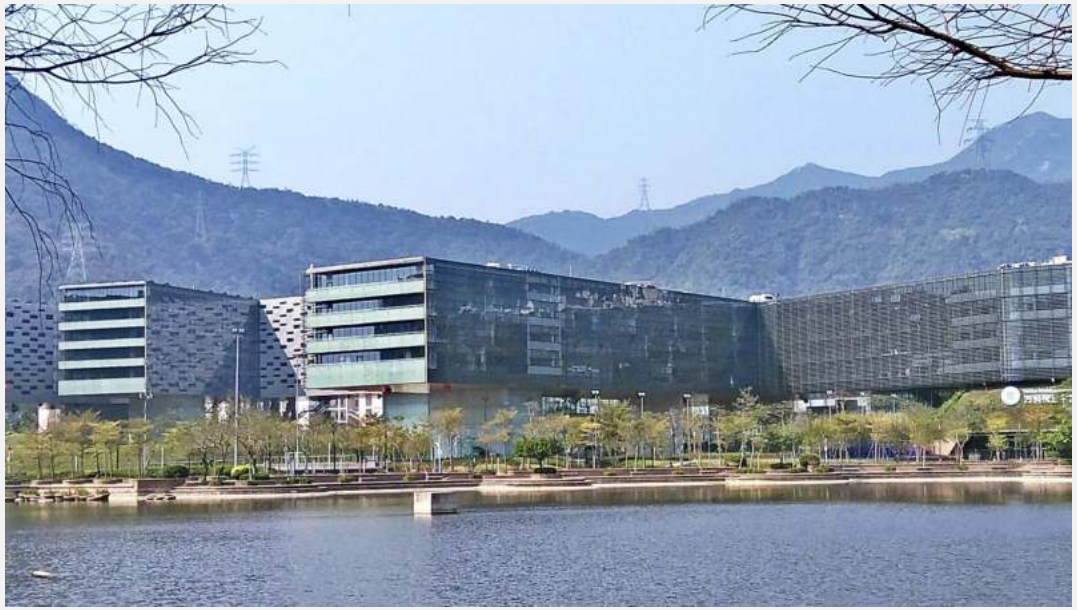
Water Saving and Recycling

- Water for landscape purposes is mainly rainwater collected from rooftops
- Constructed wetlands collect used water and purify them through bio-degradation

Digital Solutions

- **Real-time online platform** monitoring the building energy consumption of 599 public buildings

3 Shenzhen Green Buildings

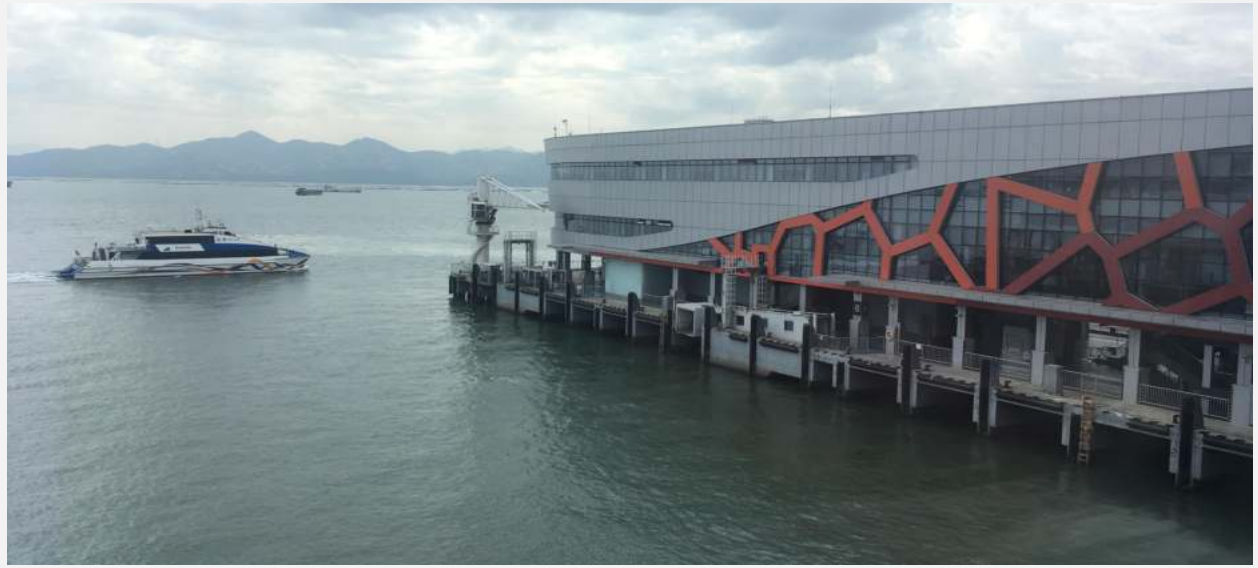


Horizontal Skyscraper – Vanke Center

The material saving is realized through the use of high-performing reinforced concrete and the recycling (45%) of construction wastes during construction. 29.4% of construction material is recycled building materials. Interior design also includes many green building materials e.g. bamboos.

Shekou Cruise Center

Considering energy-saving elevator, water-saving appliances, water-saving irrigation and other green building measures, this building can save 1,735,400 kWh of energy and 89,000 m^3 of water per year, reducing 2.13 million yuan annually.



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➢ Professional Development and Capacity Building

- In 2014, the Shenzhen Green Building Association established the **Professional Qualifications Evaluation Scheme** for granting professional titles for green building engineers.
- Up until 2018, there were a total of 277 technical personnel accredited.
- Shenzhen Construction Science and Technology Committee has recruited 18 green buildings **experts** in the field of architecture, HVAC, electrical automation, water supply and drainage, structure, and building physics.
- Shenzhen Green Building Association recruited over 300 **experts**.

➢ Collaboration & Outreach

Cooperation with:

- British Building Research Institute (BRE)
- German Energy Agency (dena)

Organize, participate in, and carry out

- New Technology and Product Expo
- International Low Carbon City Forum
- China International High-tech Achievement Fair
- International Green Building and Building Energy Conservation Conference

3 Shenzhen Green Buildings

➢ Challenges

- Construction waste recycling projects are usually built next to construction waste landfills. Other garbage are mixed with construction waste, making the sorting and reuse process difficult and **inefficient**.
- Construction waste recycling plants are relatively small in scale and the power consumption is high for waste crushing, making the **costs** of recycled building materials relatively high.
- The incentives and policy support are relatively macro. The lack of specific implementation methods and **coordinated management** makes it difficult to implement.

◆ Further Advancing:

Source Control
- Government KPI
- Review and Auditing System
- Fee and Fine system

Recycling
- land Use Policy
- Recycled Goods Standards
- Demonstration Projects

Recycled Material Use
- Product Certification and Promotion
- Green Public Procurement

4 Summary and Outlook

4 Summary and Outlook

- In the past 15 years, the development of green buildings in Shenzhen has shown **multiple synergetic benefits** in economic growth, social inclusion, jobs creation and environmental protection.
- **Further Opportunities**: break through traditional linear infrastructure business models; make the socio-economy more resilient.
- Other cities and provinces in China have also learned from Shenzhen's experiences and lessons, and have **replicated** this development model.
- Shenzhen is exploring multiple pathways to tackle the challenges and further boost the industry through strengthening the policy implementation with integrated approaches.

Targeted Support

Subsidy Reform

Private Sector Engagement

Sustainable Urban Planning

Thanks for Attending!

Any Questions?

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