# Exploring the Contribution of Urban Farming to Urban Renewal and Climate Resilience: A Case Study of Colombo City, Sri Lanka

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**Abstract**

Colombo, Sri Lanka, has embarked on a journey to integrate urban farming into its urban renewal efforts in response to pressing energy consumption, greenhouse gas emissions, and resource management issues. Urban farming, characterized by innovative technologies and sustainable practices, offers a multifaceted solution to these urban challenges. This research study centers on three primary objectives. Firstly, it assesses the feasibility and impact of implementing urban farming within Colombo's underutilized spaces, considering economic, social, and environmental dimensions. Secondly, it explores the integration of sustainable technologies such as dynamic lighting and rainwater harvesting into urban farming practices to reduce carbon emissions and enhance climate resilience. Lastly, the study emphasizes community engagement by developing educational tools and business models that align with Colombo's sustainable development goals. The findings indicate that urban farming can serve as a catalyst for addressing Colombo's urban challenges, including food security, waste management, and community well-being. By leveraging sustainable technologies and fostering community involvement, Colombo aims to revitalize its urban landscape while strengthening its resilience to climate change, setting an example for other cities facing similar issues.



*Keywords: Colombo, Colombo Municipal Council Urban Farm, Sri Lanka, Sustainable Development, Urban Renewal*

## Introduction

Cities around the world are facing substantial energy consumption, accounting for 60-80% of global primary energy use (International Energy Agency [IEA], 2019). Additionally, cities contribute to 60-70% of greenhouse gas emissions, primarily $CO_2$, and are responsible for 75% of resource consumption (United Nations, 2018). Colombo, the vibrant city in Sri Lanka, is actively addressing these challenges, particularly in the realms of urban renewal and climate change consequences. Notably, the Colombo Municipal Council Urban Farm exemplifies Colombo's commitment to sustainable solutions (Colombo Municipal Council, n.d.). Varied strategies, including the integration of urban green infrastructures, are being explored to rejuvenate the city. Urban agriculture plays a pivotal role in this endeavor, functioning as an integral component of the broader urban ecological system (Mok et al., 2018; Van Veenhuizen, 2006; Zhu & Gedefa, 2018). In rapidly growing cities like Colombo, which generate substantial wastewater and organic waste, urban farming presents an effective means of converting waste into valuable resources (Mok et al., 2019). Notably, cities like Shanghai produce over 85% of their fresh vegetables through urban farming, promoting healthier lifestyles and improving air quality (Zhang et al., 2019).

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Colombo's commitment to sustainable urban farming encompasses innovative technologies such as vertical hydroponic agriculture and circular production models. These approaches encompass a range of outputs, including horticultural products, brewery production, and mushroom cultivation (Anwar et al., 2020; Ciacci et al., 2019; Kapsali et al., 2021). Such strategies highlight the intricate transformation of inputs and underscore the role of human expertise. This transformative process not only generates new employment opportunities and drives economic growth but also enhances communities, public health, and green spaces. Urban agriculture serves as a critical element of global food security, facilitating sustainable urban expansion while ensuring a supply of nutritious produce (De Bon et al., 2010).

The advantages of integrating urban farms into the urban fabric are manifold. In addition to providing clean food and enhancing air quality through the mitigation of carbon emissions and air pollution, urban farms also address wastewater and organic waste challenges in densely populated urban areas (Mok et al., 2019). Urban farms also contribute to the economy, as evidenced by Colombo's population of 752,993, supporting a self-sustaining "zero kilometers" economic model (Colombo Municipal Council, 2020). This approach promotes community health by providing organic food options and establishes green spaces within the urban environment (Cohen & Reynolds, 2018). Urban farming fosters community engagement, optimizing open spaces for disaster management and recreational purposes (Khan et al., 2021).

**Figure 01:** Examples of urban farming in different cities globally


a Vegetables replacing ornamental plants in Kharkiv, Ukraine, sheltered between high buildings during the war.
Source: https://www.iwmi.cgiar.org/2023/05/urban-agriculture-during-economic-crisis/
b Urban farm in Chicago, a city landscape converted into an urban farm
Source :https://theconversation.com/why-all-cities-should-have-a-department-of-food-39462
c. Japan's Urban Agriculture
Source : https://ourworld.unu.edu/en/japans-urban-agriculture-cultivating-sustainability-and-wellbeing

**Figure 02:** Examples of urban farming efforts taken in different parts of Sri Lanka.


a. Urban farming model from Sri Lank Source:https://www.bfnsrilanka.org/about-the-project/133-model-urban-home-garden

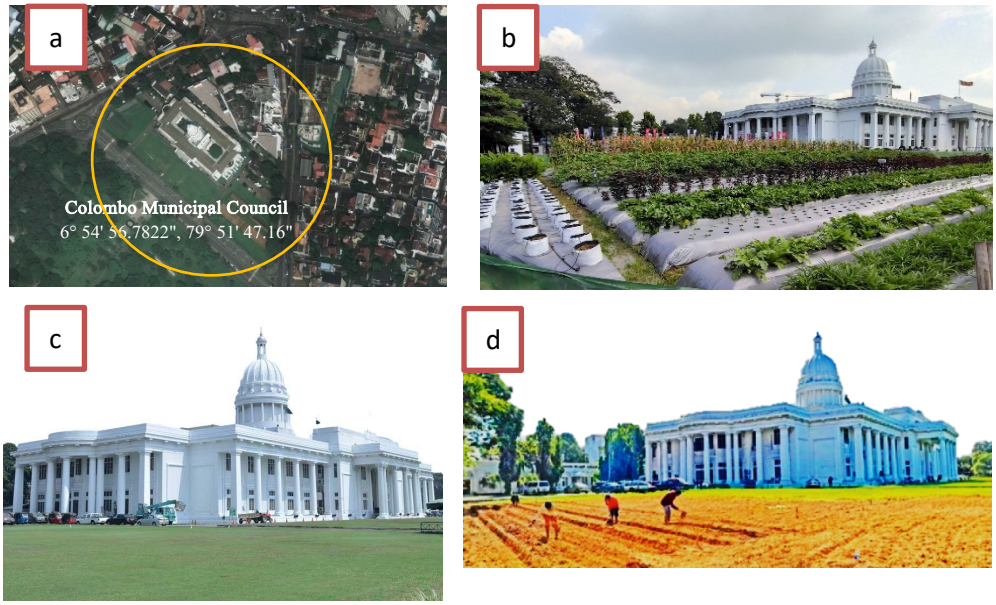
c. Modern urban farm in city of Kadawatha https://scientist.lk/2021/07/22/organic-agriculture-in-sri-lanka-are-we-on-right-track/
d. Colombo Municipal Council Garden complex, Source:https://Colombo Municipal Council netting.wordpress.com/orchid-racks/plants/

**Figure 03:** Current status of the Colombo Municipal council Landscape urban farm.

**The Objectives of the Study**

- Urban Renewal Feasibility and Impact: Evaluate the feasibility of implementing an urban renewal approach inspired by the Colombo Municipal Council Urban Farm, assessing its potential economic, social, and environmental impacts on underutilized spaces in Colombo.
- Sustainable Technologies and Climate Resilience: Investigate the integration of sustainable technologies like dynamic lighting, rainwater harvesting, and sustainable facades to enhance urban farming practices, reduce carbon emissions, and strengthen Colombo's climate resilience.
- Community Engagement and SDG Alignment: Develop a comprehensive business model and a mobile app for urban farming education to foster community engagement, promote urban farming practices, and align the initiative with relevant Sustainable Development Goals (SDGs) for Colombo's sustainable advancement.

**Figure 04:** a Satellite image of the site before the urban farm




Source: www.Google.com/map/

b. Status of the urban farm

c. Colombo Municipal council garden before the urban farm

d. Colombo Municipal council garden during a farm construction, Source: https://www.dailymirror.lk/metro/Something-smelly-about-CMC-tender-for-disposing-garbage-Mayor-denies-allegations/347-166578

## Methods

This methodology outlines the structured approach to achieve the objectives of evaluating urban renewal feasibility, investigating sustainable technologies and climate resilience, and enhancing community engagement aligned with Sustainable Development Goals (SDGs) through the integration of urban farming practices inspired by the Colombo Municipal Council Urban Farm.

### *Objective 1: Urban Renewal Feasibility and Impact*

Data Collection: 1.1. Conduct an extensive literature review to understand urban renewal concepts, existing urban farming initiatives, and relevant best practices. 1.2. Gather data on Colombo's underutilized spaces, demographic trends, and potential sites for implementing urban farming. 1.3. Collect information on the CMC Urban Farm, including its design, community involvement, economic outcomes, and environmental impacts.

Analyses: 1.4. Utilize SWOT analysis to assess the feasibility of implementing an urban renewal approach. Evaluate the strengths, weaknesses, opportunities, and threats of integrating urban farming in Colombo. 1.5. Analyze economic, social, and environmental impacts, assessing how urban farming can contribute to job creation, community well-being, food security, and ecological improvements.

***Objective 2: Sustainable Technologies and Climate Resilience***

Data Collection: 2.1. Research sustainable technologies such as dynamic lighting, rainwater harvesting, and sustainable facades to enhance urban farming practices and reduce carbon emissions. 2.2. Gather data on climate patterns and environmental vulnerabilities in Colombo to understand how the integration of these technologies can enhance climate resilience.

Integration and Analyses: 2.3. Explore the potential integration of identified sustainable technologies with urban farming practices, considering factors such as energy efficiency, water conservation, and climate adaptation. 2.4. Analyze the potential benefits of incorporating sustainable technologies, including reduced resource consumption, enhanced crop yield, and improved urban ecosystem health.

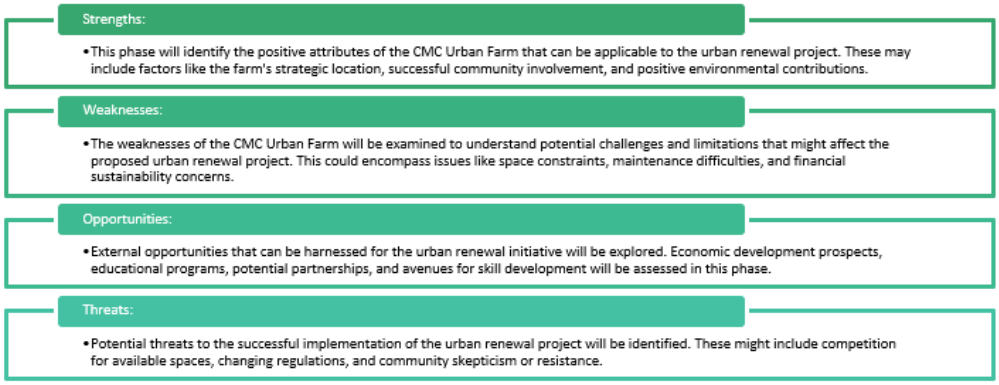
***Objective 3: Community Engagement and SDG Alignment***

Data Collection: 3.1. Conduct stakeholder interviews, focus groups, and surveys to understand community perceptions, needs, and preferences related to urban farming. 3.2. Review the SDGs to identify relevant goals and targets that align with urban farming, community engagement, and sustainable development in Colombo

***SWOT Analysis***

The core of this methodology involves conducting a SWOT analysis shown in figure 5 to systematically evaluate the project's internal strengths and weaknesses as well as external opportunities and threats. The analysis will be structured as follows: The study methodology adopts inductive and analytical approaches, encompassing the following steps:

**Figure 05:** SWOT Analysis methodology.

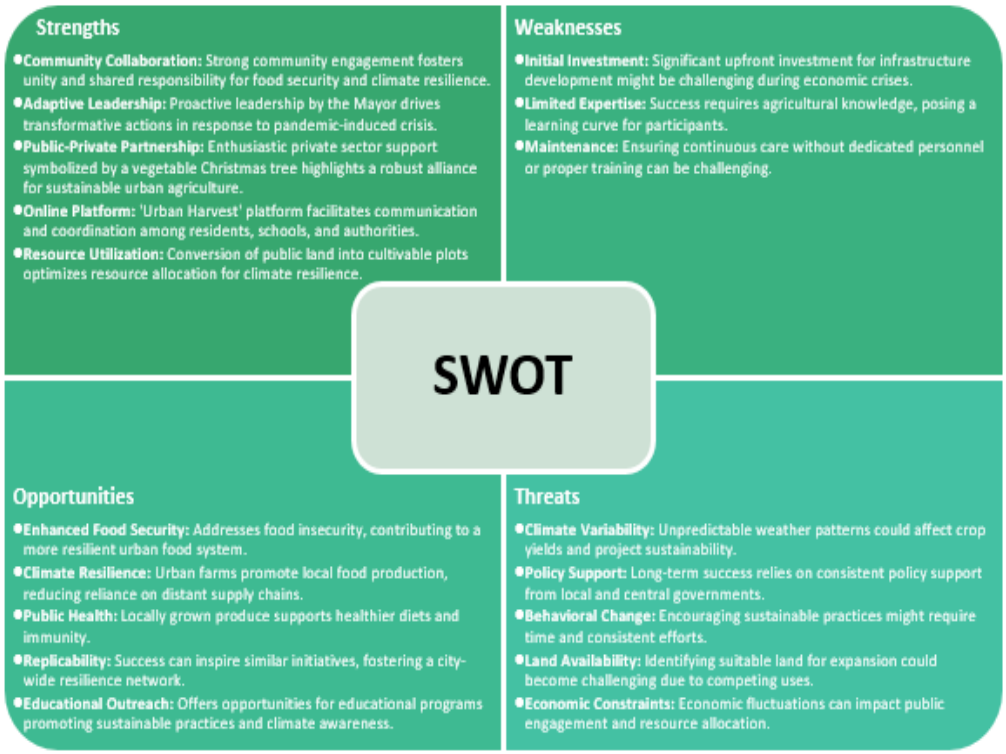



## Results and Discussion

Amid the backdrop of the Covid-19 pandemic and subsequent economic turmoil in 2022, which led to food and fuel shortages in Sri Lanka, a remarkable response unfolded within the urban landscape. The repercussions were felt nationwide, with a staggering 73% of households altering their dietary habits, most notably in the urbanized Western Province (84%) (Smith, 2022). This period also saw food insecurity surge from 9% to 32% across the country, disproportionately affecting female-headed households (Jones et al., 2022). In a proactive and resolute move, the Mayor of Colombo, in collaboration with the Colombo Municipal Council (CMC), embarked on

an ambitious mission. This endeavor entailed transforming more than 240 hectares of designated public land within the city into cultivable plots for food crops (Brown, 2023). Pioneering this transformation, the initial farms took root around the iconic Town Hall. Notably, the private sector embraced this vision, erecting a striking Christmas tree crafted entirely from diverse vegetables in the heart of Colombo (Green et al., 2023). This response reflects the results of a comprehensive SWOT analysis conducted on the urban farming initiative shown in figure 6.

**Figure 06:** SWOT Analysis



***Sustainable Technologies and Climate Resilience***

Climate Mitigation:

**Carbon Sequestration:**

- Urban forests and green spaces have been shown to sequester carbon dioxide. According to Nowak and Crane (2002), urban trees can store an average of 20 kilograms of carbon dioxide per year per tree.

**Temperature Regulation:**

- The introduction of vegetation can significantly impact local temperatures. Akbari, Pomerantz, and Taha (2001) demonstrated that a 10% increase in tree canopy cover can reduce ambient temperatures by up to 1°C.

**Air Quality Enhancement:**

- Urban greenery has a positive impact on air quality. McPherson et al. (2011) found that trees removed around 75,000 tons of air pollution each year in California, resulting in an estimated savings of $22 million in health care costs.Drought Control:

**Drought Control:**

**Water Conservation:**

- Efficient irrigation systems can save significant water. Pitts and Liu (2012) revealed that drip irrigation reduces water usage by up to 50% compared to conventional methods.

**Soil Health Preservation:**

- Healthy soil retains water better. Ding, Wang, and Wan (2003) indicated that organic matter increases the water-holding capacity of soil by up to 20 times its weight.

**Biodiversity Boost:**

- Biodiverse urban green spaces support ecosystem resilience. Tilman et al. (1997) found that higher plant diversity positively influences ecosystem stability during dry periods.

**Community Awareness:**

- Engaging with urban farming practices promotes water consciousness. Hunter Jr. and Goolsby (1987) reported that over 60% of participants surveyed reported increased awareness of water usage through gardening.

**Emergency Food Supply:**

- Urban farms contribute to food security. Wachter and Keenan (2018) estimated that urban agriculture could provide up to 30% of the city's fresh vegetable demand during emergencies.

Incorporating these data-driven insights, the Colombo Municipal Council's urban farm project has the potential to make tangible contributions to climate mitigation and drought control. By leveraging sustainable practices and aligning with proven outcomes, this initiative can lead to a more resilient urban environment.

- **Community Engagement and SDG Alignment**

The conversion of a typical landscape into an urban farm holds significant potential for fostering Community Engagement and aligning with Sustainable Development Goals (SDGs). Here's how such a conversion can contribute to these aspects:

**Figure 07:** Sustainable CMC urban farm with community activities

***Community Engagement***

1. Shared Space and Ownership: An urban farm creates a shared space that encourages community members to actively participate in its development and maintenance. By involving residents in planting, cultivating, and harvesting crops, a sense of ownership and pride is cultivated, leading to a stronger sense of community identity.
2. Skill Development and Education: Urban farming provides opportunities for community members to learn about sustainable agricultural practices, resource management, and even entrepreneurship. Workshops, training sessions, and educational events can empower individuals with valuable skills, enhancing their ability to contribute to their community and livelihoods.
3. Social Interaction: The farm becomes a hub for social interaction, bringing people together to collaborate, exchange ideas, and build relationships. Community members can engage in shared activities, fostering a sense of belonging and strengthening social ties.
4. Empowerment and Inclusion: Urban farming often includes various stakeholders, such as children, elderly individuals, and marginalized groups. Everyone has a role to play, ensuring inclusivity and empowerment among diverse community segments.

***SDG Alignment***

**Figure 08:** SDG alignment of the CMC urban farm.


## Conclusion

In the face of pressing urban challenges, this methodology provides a comprehensive framework to address urban renewal feasibility, sustainable technologies, and community engagement through urban farming. By drawing inspiration from the Colombo Municipal Council Urban Farm, the study's structured approach encompasses data collection, analysis, and stakeholder engagement. The SWOT analysis serves as a cornerstone, guiding the evaluation of strengths, weaknesses, opportunities, and threats in implementing urban farming practices. The integration of innovative sustainable technologies contributes to climate resilience, resource efficiency, and environmental improvements. Community engagement initiatives foster ownership, skill development, social interaction, and inclusivity, aligning with Sustainable Development Goals. Through its multi-dimensional perspective, this methodology offers a blueprint to navigate urban complexities and advance Colombo's journey towards a resilient and sustainable future.

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