



# Exploring Urban Agriculture Development As A Sustainable Urban Planning Solution In The Mekong Delta Region Of Vietnam

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## Abstract

Given its status as the rice bowl of Vietnam, the Mekong Delta region is now confronted with significant issues arising from fast urbanization and the escalating effects of climate change. This practice not only diminishes agricultural land but also has a substantial impact on food security and the livelihoods of millions of people. Within this particular framework, urban agriculture arises as a strategic remedy to uphold the equilibrium between urban growth and environmental preservation, while simultaneously strengthening the region's ability to withstand influences from climate change.

The present study undertakes an analysis of the prospective benefits of urban agriculture in terms of food provision, carbon emission reduction, and vegetation creation for urban inhabitants. Empirical urban agriculture models from other nations are examined and suggested for implementation in the Mekong Delta, with the goal of achieving sustainable and all-encompassing development. Ultimately, the paper provides suggestions on policies and planning, underscoring the need of including urban agriculture into sustainable urban planning. This integration serves the dual purpose of safeguarding natural resources and promoting long-term prosperity for the region, while also enhancing the quality of life for its residents.

**Keywords:** Sustainable urban planning, urban environment, sustainable development, climatic change, urban agriculture.

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## 1. Introduction

Amidst the backdrop of climate change and rapid urbanization, the Mekong Delta region, which is Vietnam's highly productive rice bowl and abundant in resources, is encountering unparalleled difficulties. Rising sea levels, salty intrusion, and unrelenting urbanization now pose a threat to the verdant fields that once provided sustenance to millions. Under the strain of development, agricultural land is diminishing, water supplies are becoming scarce, and distinct ecosystems are progressively vanishing.

Given the current circumstances, urban agriculture arises as a promising solution, providing a fresh approach to sustainable urban design in the Mekong Delta. This approach not only serves to sustain food production but also facilitates the restoration of green areas, enhancement of living conditions, and establishment of resilient communities in response to significant natural transformations.

The objective of this study is to examine the capacity of urban agriculture to transform urban structures in the Mekong Delta and suggest certain models and strategies to guarantee sustainable development in this area. It is imperative that we acknowledge urban agriculture not only as a component of urban planning strategy, but also as a crucial factor in safeguarding the future of one of Vietnam's strategic delta regions.

## **2. Content**

### **2.1. Definition and function of urban agriculture**

In urban settings, urban agriculture refers to the practice of cultivating crops and raising livestock directly within the residential areas of city residents. Urban agriculture include practices such as cultivating plants on rooftops, establishing community gardens, and utilizing innovative technology like hydroponics and aeroponics.

The function of urban agriculture goes beyond the provision of food to encompass other areas, including the enhancement of air quality, the reduction of the urban heat island effect, the promotion of community cohesiveness, and the facilitation of environmental science education.

### **2.2. Urban agriculture and integrated urban development**

Sustainable urban planning necessitates the maintenance of equilibrium between economic progress, preservation of the environment, and enhancement of the citizens' quality of life. Urban agriculture is essential for achieving this equilibrium by optimizing resource utilization, decreasing greenhouse gas emissions, and strengthening urban resilience to climate change.

Contemporary urban agriculture approaches, such as rooftop gardens, community farms, and greenhouse cultivation technologies, have demonstrated their efficacy in incorporating agriculture into metropolitan environments. Furthermore, these approaches not only enhance the urban environment but also generate fresh economic prospects while fostering community development.

### **2.3. Assessment of urbanization status and its influence on traditional agriculture in the Mekong Delta region.**

Vietnam's crucial agricultural region, the Mekong Delta, is seeing swift urbanization. In recent times, several cities and towns in the Mekong Delta, including Can Tho, My Tho, Long Xuyen, and Rach Gia, have undergone substantial growth, resulting in notable advancements in urban infrastructure, services, and industry. In addition to population increase, the rate of urbanization in the Mekong Delta is driven by the necessity for economic development and infrastructure to achieve the country's socio-economic development objectives.

The progress of urbanization has resulted in the transformation of land use from agriculture to construction, leading to a substantial decrease in the extent of open agricultural land in the region. Based on statistical data, a significant amount of highly productive agricultural land has been transformed into industrial parks, residential zones, and various other forms of infrastructure. The decrease in agricultural land area not only impacts food production but also precipitates significant repercussions for food security and the livelihoods of those in the region.

The reduction in agricultural land area results in significant alterations in the agricultural production profile of the Mekong Delta. In order to adjust to new circumstances, numerous farmers have been compelled to either abandon or modify their conventional farming practices. Conventional agricultural practices, like the growing of rice, raising fruit trees, and aquaculture, are experiencing a decrease in productivity and economic effectiveness. In addition, urbanization has generated higher production costs as a result of escalating land prices and input expenses (such as fertilizers and pesticides), therefore diminishing farmers' earnings.

Urbanisation not only impacts the availability of land and agricultural output, but also disturbs the traditional rural communities. Numerous rural villages have experienced fragmentation or total

extinction due to the acquisition of their land for urban development. Individuals who experience the loss of agricultural land must transition to non-agricultural occupations, which are frequently characterized by inherent volatility and low pay, therefore resulting in economic and social instability within the community. Simultaneously, the traditional rural culture and way of life are also diminishing, since the preservation of rural cultural values is no longer possible considering the process of urbanization.

The process of urbanization in the Mekong Delta is exerting significant strain on the environment and natural resources. The growth of metropolitan regions and industrial zones frequently entails contamination of water, air, and soil. Inadequate drainage infrastructure and inefficient waste management result in recurrent flooding, which poses challenges for agricultural crop yield. Moreover, the development of urban infrastructure has heightened the vulnerability to ground subsidence and saline intrusion, therefore exerting adverse impacts on natural ecosystems and agricultural sectors.

The decrease in agricultural acreage and the sharp decline in agricultural output have posed a direct danger to food security, not only in the Mekong Delta but also across the entire country. The Mekong Delta is a crucial geographical region in Vietnam for food production, particularly for rice, making a substantial contribution to both exports and internal supply. Given the reduction in agricultural land area and the decline in production efficiency, the capacity to fulfill the nation's food requirements is also jeopardized, therefore heightening the likelihood of future food insecurity.

## **2.4. Ecological issues and urban development in the Mekong Delta region**

### ***2.4.1. The Mekong Delta: analysis of climate change challenges and implications***

Globally, the Mekong Delta is among the most susceptible areas to climate change, particularly the problem of rising sea levels. Empirical research indicates that sea levels have been and continue to rise rapidly, posing a direct threat to agricultural land and coastal forests. The combination of saline intrusion and heightened freshwater consumption for industrial and urban purposes has resulted in the deterioration of soil quality, decreased agricultural productivity, and forced several farming households into harsh economic conditions. This scenario has a dual impact on agricultural output and poses a significant risk to the food security of the whole region.

The Mekong Delta is experiencing prompt land subsidence as a result of excessive extraction of groundwater to meet the demands of urban and industrial sectors. When coupled with rising sea levels, this scenario has heightened the vulnerability to floods in certain regions, particularly during the seasonal period of heavy rainfall. Several metropolitan regions in the Mekong Delta are currently experiencing recurrent floods, which is causing disruptions to people's lives, adversely affecting economic activity, and intensifying infrastructural expenses.

Freshwater resources in the Mekong Delta are progressively diminishing as a result of the confluence of climate change, saline intrusion, and water contamination. The proliferation of industrial parks and urban neighbourhoods has led to a significant rise in the volume of untreated wastewater released into waterways, resulting in severe pollution. This has a dual impact on community health and agricultural output, particularly in the aquaculture and rice agriculture industries, which are the primary economic sectors of the Mekong Delta.

The natural ecosystems in the Mekong Delta, such as wetlands, mangrove forests, and rivers, have been greatly modified by climate change and urban settlement. The degradation of these ecosystems not only leads to the extinction of several uncommon animal and plant species but also diminishes the adaptive capacity of the whole region to environmental fluctuations. The decline in biodiversity is exerting severe repercussions on agriculture and fishing, two sectors heavily reliant on natural ecosystems.

### ***2.4.2. Obstacles in achieving sustainable urban planning***

The existing state of urban planning in the Mekong Delta is characterized by significant complications arising from a deficiency in comprehensiveness and sustainability. Numerous metropolitan regions in the Mekong Delta are undergoing development that prioritizes transportation infrastructure and industrial

parks, while neglecting environmental and community aspects. Consequently, there is a rise in environmental pollution, deterioration of land, and urban areas become inherently less sustainable when confronted with severe weather phenomena. Furthermore, this unsustainable planning exacerbates rural migration and unemployment by widening economic and social inequalities between urban and rural centres.

The rapid expansion of metropolitan areas frequently results in a dearth of green spaces and ecological frameworks. Insufficient presence of parks, green trees, and environmental conservation areas in newly constructed metropolitan regions of the Mekong Delta is negatively impacting the quality of life for inhabitants and exacerbating air pollution levels. Green spaces fulfil a crucial function in enhancing the living environment, as well as in mitigating urban temperatures, enhancing air quality, and fostering communal spaces, thereby contributing to the development of a sustainable and environmentally-friendly living environment.

An inherent obstacle in urban design in the Mekong Delta is the lack of uniformity and efficiency in the drainage and waste treatment network. Recurrent inundation during the period of increased precipitation, coupled with inadequate drainage infrastructure, has intensified the issues of environmental contamination. The absence of adequate waste treatment facilities in several urban regions of the Mekong Delta results in the direct release of waste into rivers, therefore contaminating water supplies and negatively impacting the health of the local population.

The Mekong Delta is currently grappling with a significant paradox between the objectives of swift economic growth and stringent environmental conservation standards. Urban growth initiatives such as industrial parks and transportation infrastructure are exerting more strain on natural resources and the environment. In numerous instances, economic considerations have taken precedence over sustainability aspects, resulting in the depletion of agricultural land, deterioration of the ecosystem, and heightened vulnerability to natural disasters. This inconsistency poses a significant obstacle in guaranteeing sustainable growth for the whole region.

An inherent constraint of urban design in the Mekong Delta is the absence of effective measures to address the impacts of climate change. Despite being significantly affected by climate change, the urban plans in the Mekong Delta region still lack comprehensive integration of adaptation elements, including the construction of early warning systems, improvement of flood prevention infrastructure, and development of urban agriculture models. Insufficient implementation of adaptive planning has heightened vulnerabilities and diminished the ability of metropolitan regions to withstand severe weather phenomena.

## **2.5. Enhancing urban agriculture growth in the Mekong Delta: Potential solutions**

### ***2.5.1. Enhancing assistance programs and spatial planning for urban agriculture***

To ensure that urban agriculture becomes a significant component of sustainable urban planning, it is necessary to establish a tailored policy framework that is suitable for the unique conditions and features of each location. In order to promote investment in urban agriculture, it is imperative for the government and management agencies to implement policies such as capital support, tax reduction, or the provision of public land for agricultural projects. Simultaneously, it is imperative to adopt environmental and food safety regulations to guarantee the sustainable development of urban agriculture models without causing contamination to the environment.

Robust integration of urban agriculture is necessary in the comprehensive urban planning of the Mekong Delta region. This planning should encompass not only the organization of spaces specifically designated for urban agriculture but also guarantee integration with other regions such as residential zones, industrial parks, and infrastructure. This integration would facilitate the establishment of a sustainable urban ecosystem, in which urban agriculture serves the dual purpose of supplying food and contributing significantly to the preservation of the green environment, enhancement of air quality, and reduction of the effects of climate change.

An essential determinant for the effective growth of urban agriculture is the active involvement of the community. Local authorities should provide frameworks that facilitate the involvement of individuals, particularly households and small enterprises, in urban agricultural initiatives. The implementation of educational initiatives and community awareness campaigns regarding the advantages of urban agriculture, together with the provision of technical and financial assistance for these initiatives, can effectively stimulate public engagement. The active participation of the community not only guarantees the long-term viability of urban agriculture initiatives but also assists in fostering social solidarity within urban regions.

### ***2.5.2. Implementing cutting-edge technologies in urban agriculture***

Enhancing productivity and production efficiency in urban agriculture requires the implementation of cutting-edge technologies. Implementing smart agricultural technology such as automated irrigation systems, soil moisture sensors, and software-based crop management would enhance production efficiency and reduce resource consumption. The integration of agriculture with intelligent technology not only enhances productivity but also mitigates environmental consequences, such as minimizing water and fertilizer requirements, so promoting urban sustainability.

Within urban environments characterised by restricted land area, small-scale cultivation methods such as rooftop gardening, hanging gardens, and vertical gardens might serve as efficient remedies. These designs not only optimize the use of available space but also contribute to the cooling of living areas, enhancement of air quality, and promotion of urban vegetation. Hydroponics and aeroponics technologies are considered highly compatible with urban agriculture models due to their soilless nature and ability to be used in spatially constrained regions.

In order to guarantee prompt and secure delivery of products to consumers, urban agriculture requires a highly effective food management and distribution infrastructure. The utilization of information and telecommunications technology, including supply chain management software and remote monitoring and surveillance systems, can enhance the efficiency of distribution operations and reduce inefficiencies. The construction of short supply chains, which directly link producers with customers, will simultaneously lower costs and enhance the value of urban agricultural products.

### ***2.5.3. Evolution of sustainable urban agricultural paradigms***

*Constructing contemporary urban organic agricultural models:*

Organic agriculture is a sustainable approach to urban agriculture that avoids the use of chemicals and maintains a natural equilibrium. It is imperative to establish urban organic agriculture models with the backing of local governments and non-governmental groups. Incorporating indigenous plant species, implementing ecological farming methods, and managing biodiversity will facilitate the sustainable development of these models and yield agricultural products of superior quality. Concurrently, these models have the potential to serve as eco-tourism destinations, therefore generating additional value for metropolitan regions.

**Table 1. Positive economic outcomes of urban agricultural models**

Urban Agriculture Model	Economic Benefits	Notes
Smart Agriculture	20-30% increase in productivity	Reduced production costs due to automation and resource optimization
Small-space Cultivation Techniques	15-25% increase in income	Utilizes limited space, lower investment costs compared to traditional models
Urban Organic Agriculture	30-50% increase in product value	Higher value products due to quality and consumer trends
Urban Farm combined with Eco-tourism	10-20% increase in tourism revenue	Combines production and tourism, creating diverse income sources
Community Gardens	10-15% reduction in food purchase costs	Provides fresh, clean food for the community, reducing living costs

*Urban agricultural concept integrated with eco-tourism:* Urban farms have the potential to serve as both food production facilities and eco-tourism destinations, therefore drawing tourists and promoting sustainable agriculture within surrounding communities. These farms may be specifically planned to cater to both agricultural and tourism objectives, with designated areas for growing, education, and experiential activities. By engaging in activities like as harvesting, crop care, or viewing flower beds and vegetable gardens, visitors can strengthen the link between urban and agricultural regions.

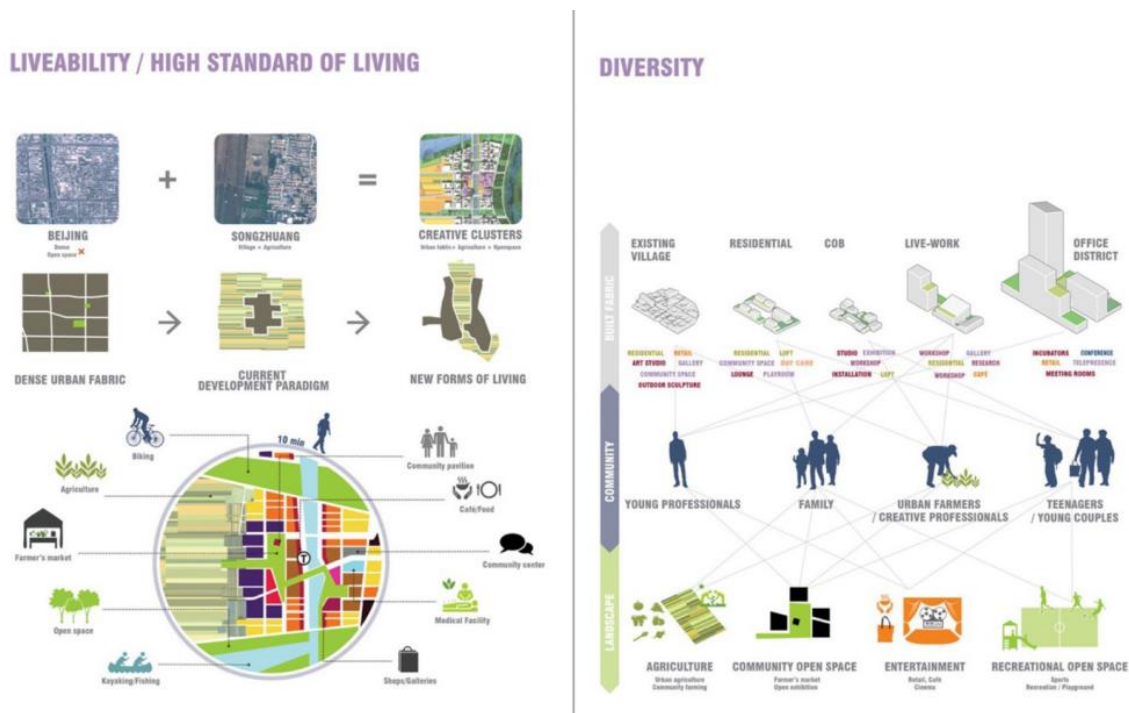
**Table 2. Advantages of integrate the Urban Farm Model with Eco-tourism**

Type of Benefit	Detailed Description	Notes
Economic	Increase in revenue from eco-tourism (10-20% compared to traditional farms)	Combines income from agricultural products and tourism services
Employment	Creates additional jobs for local people in tourism and agriculture	Creates jobs for workers in both rural and urban areas
Education and Awareness Raising	Provides learning and experience opportunities for visitors about sustainable agriculture and environmental protection	Contributes to raising community awareness about environmental protection
Environmental Protection	Increases green areas, improves air quality and reduces urban heat island effect	Contributes to creating green and sustainable living spaces
Social	Enhances community cohesion through joint activities between residents and visitors	Builds strong relationships between local residents and tourists
Sustainable Development	Supports sustainable urban development by integrating agricultural production and nature conservation	Contributes to sustainable urban planning and climate change adaptation

**Table 3. Ecological advantages of urban agricultural models**

Urban Agriculture Model	Environmental Benefits	Notes
Smart Agriculture	20% reduction in water use	Automation and optimization of irrigation processes
Small-space Cultivation Techniques	30% reduction in CO2 emissions	Utilizes green spaces, improves air quality
Urban Organic Agriculture	100% reduction in agricultural chemicals	No use of chemical fertilizers and pesticides
Urban Farm combined with Eco-tourism	15% increase in green area	Combines production and eco-tourism, creates new green spaces
Community Gardens	10% reduction in urban temperature	Creates green patches, reduces urban heat island effect

**Figure 1. Landscape serves as the fundamental foundation for incorporating all changes and advancements across agriculture.**



*Planning and establishing community gardens:* Community gardens provide a viable means to make use of vacant lands in metropolitan regions and establish verdant spaces for the local population. The management of these gardens might be undertaken by resident groups or non-profit organizations, with the backing of municipal authorities. In addition to providing fresh, clean vegetables and fruits, community gardens also enhance social cohesiveness, promote mental health among inhabitants, and assist preserve the urban environment. Furthermore, these gardens have the potential to serve as instructional venues for younger generations, focusing on sustainable agriculture and environmental conservation.

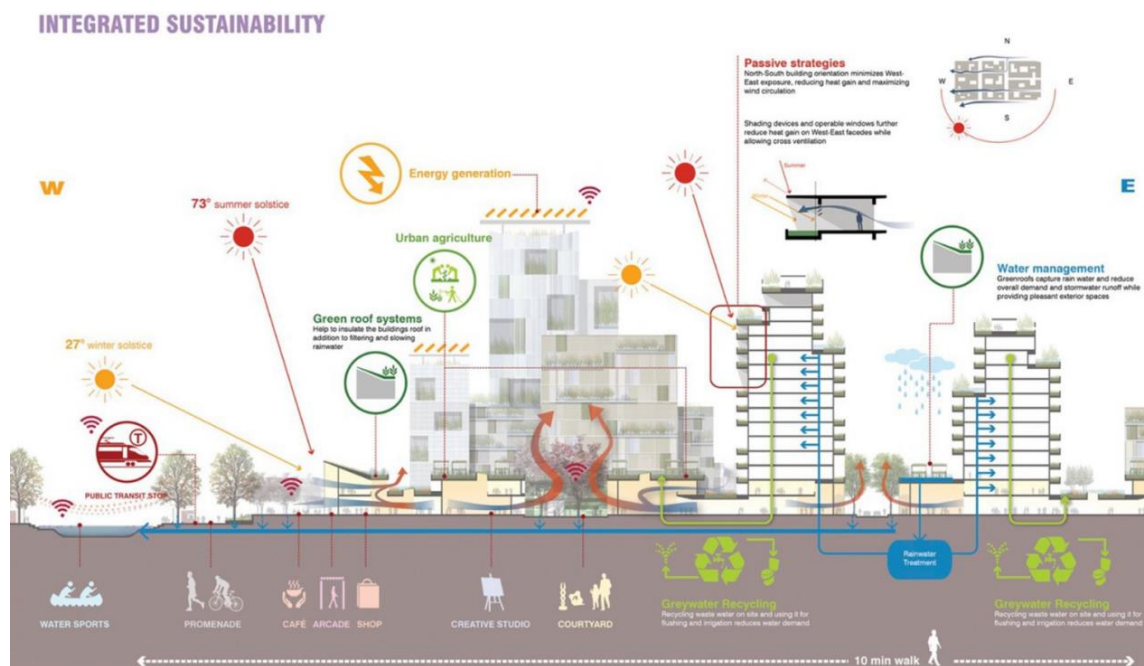
*Integrated spatial approach:* The core procedure in the integrated landscape method involves doing a thorough evaluation of both the natural environment and human aspects of the site. Following a thorough appropriateness investigation, urban planners have determined that the Mekong Delta is a distinctive location for the conversion of urban areas into urban agriculture.

First, the climate of the Mekong Delta is characterised by extended, moderate, and humid summers and dry, sunny winters. Moreover, the Mekong Delta has abundant natural resources very conducive to agricultural cultivation. Furthermore, this area is abundant in water resources, to the extent that more than 80 percent of the town's farmed land is supplied with water by primary streams and smaller rivers. Highly fertile and extensive land, together with excellent genetic resources, provide the high quality and plentiful production of crops.

Second, the inhabitants of the Mekong Delta express a profound reliance and emotional connection to the land as a result of the extensive historical background in agricultural culture and traditions. Over an extended period, the cooperative farming model has consistently offered reliable labor assistance and upkeep for the advancement of peri-urban agriculture.

Through the examination of site conditions, the planning places significant importance on achieving a harmonious spatial integration of agricultural production, landscape, and urban systems, with a prime focus on ecological considerations. The recommended approach to accomplish this objective is a spatial urban-rural development framework known as "Two Belts and Two Districts" (refer to Figure 1). The "Two Belts" denote a cultural and recreational international exchange zone, as well as a rural landscape zone spanning two canals. The "Two Districts" refer to an arts district and a core district that depend on agricultural production to sustain industrial activities and offer integrated services. The intensive development concept adheres to the ecological boundaries of farmland preservation, guaranteeing the preservation of a robust ecosystem (refer to Figure 2), therefore enabling more efficient synchronization between agricultural operations and human endeavors (Scherr và McNeely, 2008). This intricate interconnected blue-green ecological network serves as the basis for fostering thriving regions.

**Figure 2. Integrated approach connecting agricultural output with human activities.**



The system of ecological landscapes: This strategy aims to complete the enhancement of water and green areas by addressing the correlation between natural ecology and urban development. A prominent characteristic of the region is the rigorous safeguarding of ecological elements and agricultural land. First and foremost, agricultural landscapes are acknowledged as an essential element of the ecological landscape system. The objective is to improve the quality of agricultural land, maximize the effectiveness of agricultural land layout, and integrate agricultural land into a cohesive block. Then, a participatory land use-based artistic landscape is created by incorporating agricultural land, woods, and distinctive artistic features (see Figure 3). Furthermore, the emphasis is placed on the thorough utilisation of both urban and rural green spaces. The primary strategy involves significantly expanding the overall green area by utilizing the ecological spatial framework of "One Belt, Five Corridors, and Multiple Nodes" and developing designated green pathways along rivers and major green corridors. The plan stipulates that by 2035, the region will attain complete coverage of park and green route services within a 500-meter radius, with a total of 110 kilometers of green routes to be constructed. Moreover, it is vital to optimize the utilization of the water resources in the region to construct water-friendly environments (refer to Figure 3).

**Figure 3. Buitenschot Land Art Park is an amusement park equipped with noise-reducing elements that effectively mitigate airplane noise while simultaneously offering a venue for various events and entertainment.**



### 3. Conclude

Urban agriculture is an essential and viable approach to tackle the issues associated with sustainable urban design, particularly in the Mekong Delta, considering the impact of climate change. The incorporation of urban agriculture into urban planning procedures yields substantial economic and environmental advantages, therefore enhancing the overall well-being of urban inhabitants. The establishment of supportive policies, promotion of community involvement, and ongoing study and adaptation of successful models from other regions are crucial for ensuring sustainable development in the Mekong Delta.

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