

# High-Density City Green Sustainable Community Farm Planning Design-Based on the Poplar Area of East London

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**Abstract:** As global urbanization progresses, particularly in densely populated cities, a significant portion of land within urban areas is dedicated to non-food production. This allocation diminishes food production and supply capabilities, particularly in cities with lower economic levels, leading to food desertification. This article proposes green and sustainable community farms as an effective solution to alleviate urban pressures and enhance citizens' quality of life. Using the Poplar area in East London as a practical case study, the article presents an innovative approach to designing and planning green community farms. This approach includes the creation of vertical green spaces, community-shared areas, coastal riding areas, and regular leisure spaces, all of which contribute to accelerating urban ecological balance, fostering social interaction, and promoting economic sustainability.

**Keywords:** Sustainable Communities, Citizens Involved, Vertical Landscape, High-density Cities

## 1. Introduction

With the accelerating pace of global urbanization, densely populated cities are facing numerous challenges, including limited land resources, increased environmental pressures, and the undeniable contradiction between food production and urban development. In this context, green sustainable communities have gradually become an important direction in urban planning and design, aiming to protect the ecological environment and enhance residents' quality of life while promoting urban development. This study takes the Poplar area in London as a case study and proposes innovative methods to address the issue of food desertification arising from urbanization. The study aims to minimize the impact on existing community structures by integrating urban farms with community functions. This research provides innovative ideas and practical experience for the planning and design of green community farms in other densely populated cities, offering valuable insights for the future sustainable development of cities.

## 2. The Problems and Innovative Development of High-Density Cities

### 2.1 Food Desertification in High-Density Cities

The theoretical background of food desertification in high-density cities stems from the complex interaction between urbanization and land use changes. In high-density cities, the rapid development of various functional needs leads to a sharp increase in demand for land, resulting in extensive urban expansion and construction (The result is shown in Figure 1). As a consequence, land that was originally used for agricultural purposes gradually transforms into residential areas, commercial zones, and industrial areas, among other non-agricultural uses. This land use and demand shift exerts pressure on the land needed for agricultural food production. The replacement of agricultural land by other urban functions during urbanization limits the capacity for food production. Additionally, high-density cities often face traffic congestion and logistical challenges, posing difficulties in transporting food from surrounding or distant farmland to the city. Rising transportation costs may lead to the increase of food prices, affecting the food security of urban residents. With global temperatures rising, obtaining fresh produce becomes increasingly challenging. Decreases in crop yields and increases in transportation costs due to climate change also contribute to higher prices of fresh produce. In high-density cities, people's lifestyles may rely more on market shopping and external supplies, with fewer engaging in home

gardening or self-sufficiency activities. This increased dependency on food production exacerbates food desertification in economically disadvantaged areas within the city.<sup>[1]</sup>



Image Source: Author's own illustration

Figure 1: Process of Food Desertification in High-Density Cities

### 2.2 Innovative Development of Green Sustainable Community Farms

The innovative concept of green sustainable community farms has emerged in this context. It not only provides fresh and healthy food sources for residents in economically disadvantaged urban areas but also emphasizes the mitigation of urban environmental pressures through sustainable agriculture and innovative design. Integrating agricultural systems into urban communities can minimize food transportation distances, enhance urban food security, and create more green spaces and ecological corridors within urban communities. This innovative community farm planning and design aims to promote self-sufficiency within communities by implementing agricultural production internally, offering innovative solutions for urban sustainability<sup>[2]</sup>. Through in-depth research and planning, it aspires to find a balance between urbanization and the natural environment in high-density cities, which laying a solid foundation for the sustainable development of future cities.

## 3. The background of the Poplar Farm Community Project

### 3.1 Overview of Poplar, East London

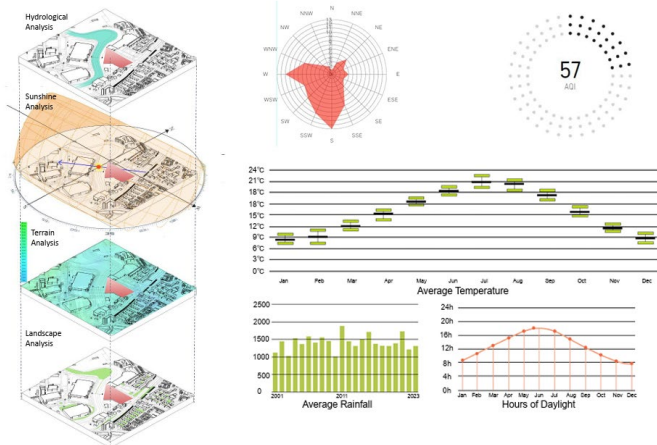
The project is located in the Poplar community of East London, alongside the River Poplar. Following through East London and joining the River Thames, the Tiver Poplar is a relatively short but bustling waterway. (The result is shown in Figure 2)



Source: Author's own illustration

Figure 2: Location Map of Poplar, East London Image

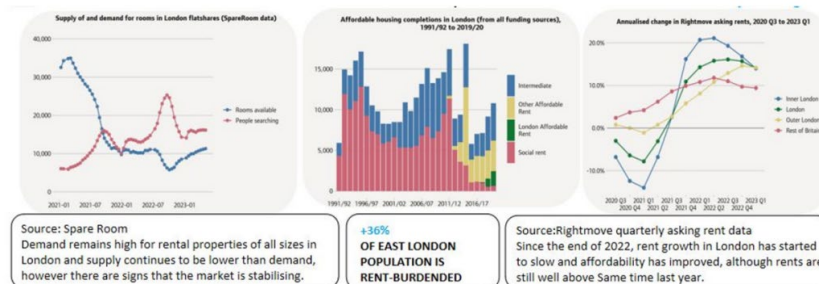
In East London, the length of a day varies throughout the year, with longer daylight hours in summer and shorter ones in winter. The height and density of surrounding buildings can affect the amount of sunlight received in the area, while the orientation of buildings will influence the amount of sunlight received on their front and back sides. Buildings facing south typically receive more sunlight. Compared to other areas of London, the terrain here is relatively flat, with elevations ranging from 1 to 10 meters above sea level. (The result is shown in Figure 3)



Source from: [www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages](http://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages)

Figure 3: Geographical Features Analysis of Poplar, East London

Research on housing in East London indicates the clear and persistent demand for various types of rental housing, with supply still lagging behind demand. However, there are signs that the market is beginning to stabilize. Additionally, due to growth in the real estate industry, although rents have continued to rise significantly compared to the same period last year, rental growth in London has started to slow down, which leading to improved affordability since the end of 2022.(The result is shown in Figure 4)



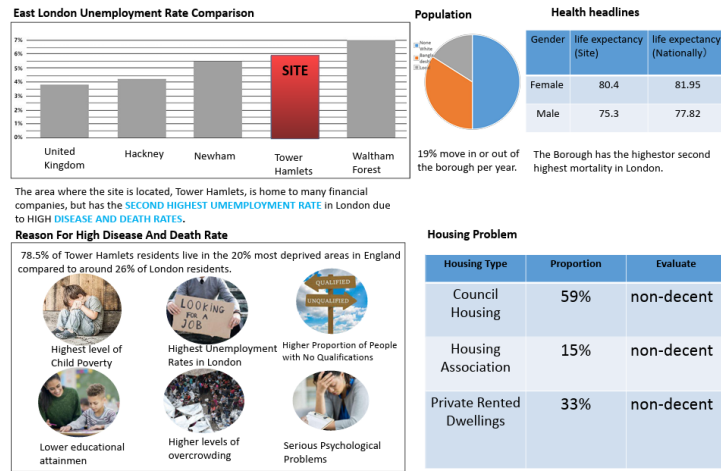
Source from: [www.ons.gov.uk](http://www.ons.gov.uk)

Figure 4: East London Poplar Housing Sales/Rental Analysis Chart

In later years, East London's Poplar evolved into a working-class community reliant on jobs at the Chelsea porcelain factory and docks. During this period, community life and living conditions were extremely difficult. The Poplar community in East London suffered severe attacks during World War II, with many buildings destroyed. After the war, the area underwent reconstruction, including housing renovations and infrastructure upgrading. By the end of the 20th century, the ports and docks in East London's Poplar area began to decline. However, in the 1980s, the Canary Wharf area in London underwent extensive redevelopment, leading to the transformation of parts of East London's Poplar into modern residential and commercial areas. The rise of East London as an industrial and port center, as well as the regeneration and reconstruction efforts undertaken in the face of various challenges, are all reflected in the history of East London's Poplar.

### 3.2 Analysis of Current Issues in Poplar, East London

Today, Poplar in East London is a diverse and rapidly expanding urban community. There are numerous daily activities available in the area. Residents of East London can visit urban farms, city ranches and cultural centers and participate in outdoor concerts. However, studies have shown that the area faces higher rates of disease and mortality. Several factors contribute to this phenomenon. The most notable factor is food desertification, which leads to deteriorating quality of life and food insecurity among residents, indirectly contributing to higher rates of cancer and childhood obesity in the area. Nevertheless, since the industrial era, this area has undergone modern urban development and obtained rich historical and cultural assets. Based on its vitality and potential, it can contribute to addressing these issues. ( The result is shown in Figure 5)



Source From: [www.ons.gov.uk](http://www.ons.gov.uk)

Figure 5: East London Poplar Health Condition Analysis Chart

Furthermore, economic uncertainty may negatively impact the implementation of community farms, such as rising raw material costs or decreasing market demand caused by unforeseen circumstances or human factors. Changes in urban planning policies could adversely affect farm design, highlighting the importance of close communication with local government and community management personnel. Climate change is another significant threat that could have unpredictable adverse effects on agricultural production, which necessitating adaptive measures.

#### 4. The application of green sustainable community design in Poplar, East London

The goal of the project is to transform the community of Popra in East London into a thriving and sustainable green community farm. After being covered in lush landscaping, it is planned to transform the area into residential apartments in the "Oasis style". To ensure sustainable community development, the urban fabric must be integrated with green nature. Due to the quality of the local population's life and the impact of the lower income level, the local population has serious psychological problems and is perceived to be suffering from social injustice and social isolation. Summarizing the needs of the residents of the area and incorporating local characteristics, the plan is to provide healthy and fresh food to the residents of the East London Popla community through self-sufficient green rural design, and to foster a sense of community through the community rural circular economy. The overall goal of the project is to turn the East London Popla neighbourhood into a prototype of a green neighbourhood that will serve as a model and inspiration for sustainable urban development in the direction of sustainable community design in the future. (The result is shown in Figure 6)



Source From: Author's own illustration

Figure 6: Floor plan of the Bopra Green Community Master Plan in East London

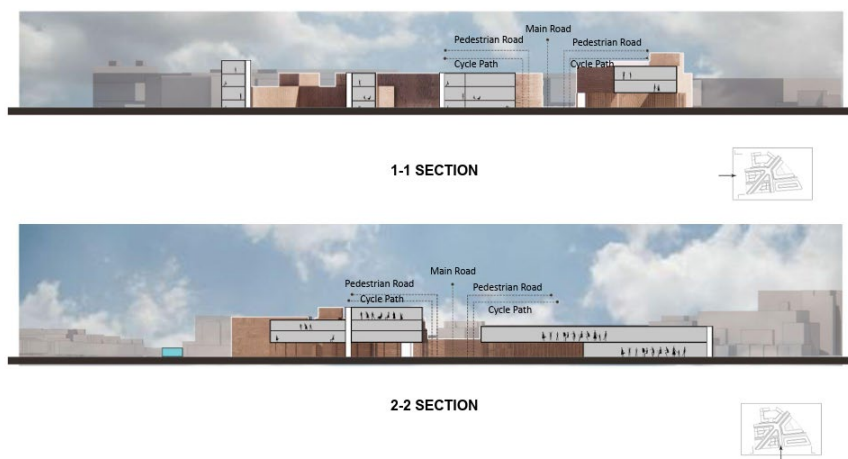
#### 4.1 Mix-use residence and commercial space

In the context of the sustainable green community of Poprah in East London, the integration of mixed-use residential and commercial spaces plays a key role in fostering a dynamic, connected, and environmentally friendly urban environment. [3] Architecturally, these spaces are designed with harmony in mind, which incorporating sustainable building materials and green design principles. The residential segment offers a variety of housing types, promoting inclusivity and accommodating different socioeconomic backgrounds. Community gardens and shared green spaces in residential areas enhance a sense of community and encourage sustainable practices such as urban farming. On the commercial side, the focus on local and sustainable businesses ensures support for the local economy and minimizes the ecological impact of long-distance cargo transport. Commercial spaces such as eco-friendly cafes and local markets not only help to energize the community but also promote sustainable consumption practices. With an emphasis on walk ability and accessibility, the design strategically plans pedestrian-friendly streetscapes, wide sidewalks, and mixed-use areas (The result is shown in Figure 7&8) to make daily necessities easily accessible on foot or by bike.



Source From: Author's own illustration

Figure 7: East London Poplar Green Community Ground Floor Function Plan



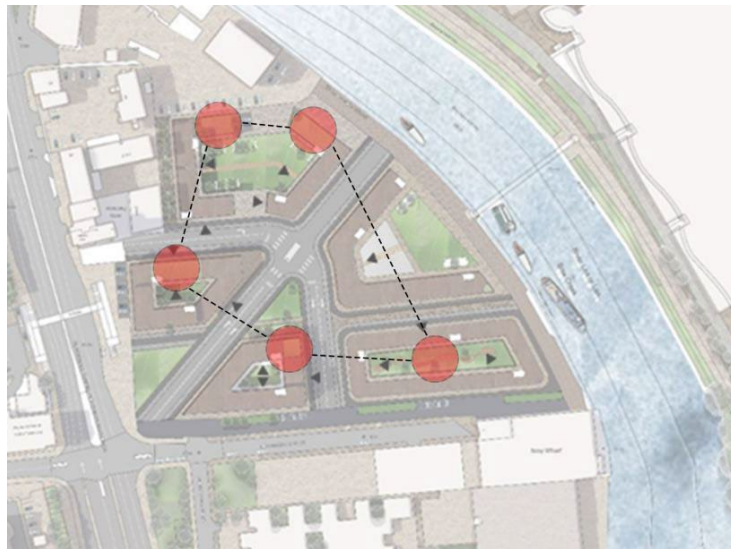
Source From: Author's own illustration

Figure 8: East London Poplar Green Community Cross-Section Road Diagram

#### 4.2 Sustainable vertical green space

The design of Poplar Farm neighbourhood in East London was designed to consider a number of innovative approaches in the distribution of sustainable green space. Among them, the vertical green

space is an important and interesting direction. Firstly, the introduction of vertical green spaces, such as community vertical gardens and green walls, can increase the greening rate of a community within a limited land area. This design not only beautifies the community but also provides additional air purification and ecosystem services to the community through vertical space design practices. By incorporating green roofs into buildings and structures (The result is shown in Figure 9), communities can achieve better energy efficiency and temperature regulations. Green roofs help to reduce the cooling and heating costs of buildings while also providing additional outdoor recreational space. This not only provides a pleasant place for residents to socialize, but also improves the urban heat island effect. At the same time, the community could consider introducing a vertical farming system to transform building facades and public areas into sustainable farming spaces.<sup>[4]</sup> This innovative agricultural design not only provides a fresh source of food, but also promotes social interaction among community residents.



*Source From: Author's own illustration*

*Figure 9: Green Roof Node, Poplar Green Community, East London*

Overall, the design for the Poplar Farm neighbourhood in East London creates a community 'first-floor greenhouse' (The result is shown in Figure 10) by introducing vertical green space, designed to be constructed on the first floor of the structure using natural and spontaneous building techniques, influenced by the sunlight and environment required for a 'first-floor greenhouse'. The greenhouse will be influenced by the environment. Through natural ventilation, natural lighting, and selective shading, the project demonstrates sustainability by ensuring the thermal comfort of the green space on the first floor, utilizing the use of materials and climate.



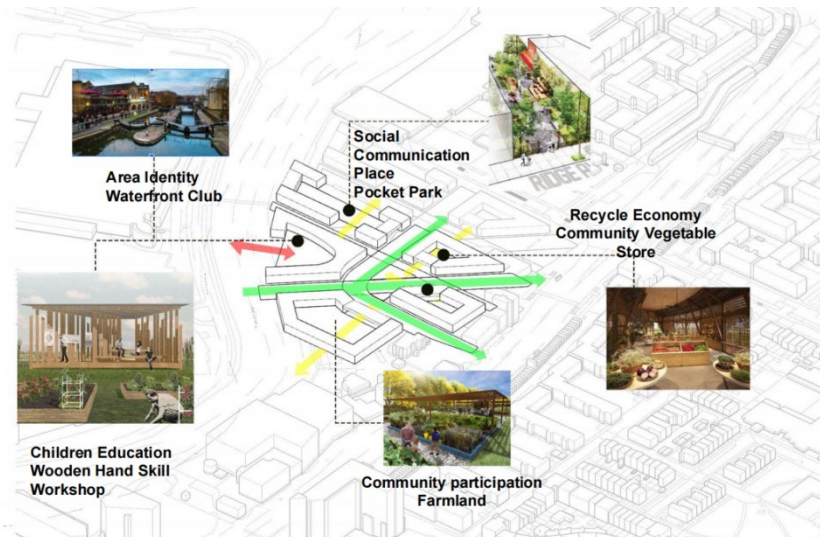
*Source From: Author's own illustration*

*Figure 10: First Floor Conservatory, Poplar Green Community, East London*

#### **4.3 Social Sharing-green sustainable planting space**

It is necessary to mix residents planting areas, community green spaces, community social areas, community agricultural product sales, and children's education areas into the community planning design. (The result is shown in Figure 11). This design approach could not only provide the community with more public green space but also make the community more sustainable according to the design of

the mixed-use area. The public green space will also provide residents with more job opportunities by selling and planting community agricultural products.[5] Residents will be invited to participate in the maintenance of the community farm to enhance their sense of community involvement. By creating a ranch, selling or becoming self-sufficient, not only will local employment be increased, but an environmentally friendly, co-managed farm will be established in the city. At the same time, we organize child-friendly workshops (The result is shown in Figure 12), adhere to sustainable education, encourage local residents to actively participate in the farm, and organize projects such as carpentry and horticultural art. This not only develops children's environmental awareness, but also helps them understand how things are made. The heightened awareness helps them in their future careers, as well as connecting with the community, truly realizing the goal of sustainable education.



Source From: Author's own illustration

Figure 11: Social Function Layout Diagram



Source From: Author's own Illustration

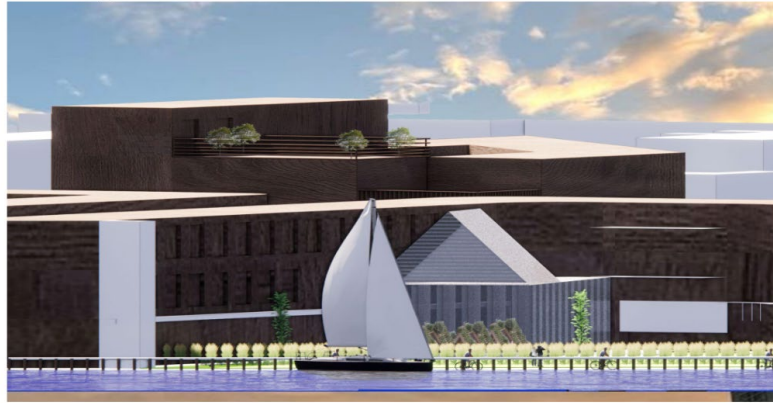
Figure 12: Children Handmade Workshop

#### 4.4 Mix-use coastal leisure space

The leisure space benefits the spiritual needs of the residents, influenced by the uniqueness of the British pub and canal culture, and the uniqueness of the location around the lake gives the area the opportunity to be an excellent area for residents to relax and unwind. Due to the unique maritime culture of the area, the canals are mainly used for transport, industry, and leisure. As well as creating a locally sustainable mode of transport and recreation, I would like to create a dedicated canal route where people can spend their free time on narrow boats and (as in Figure 13) enjoy the natural beauty of the English countryside. During the day, it transforms into a children's workshop on the lakeside, increasing community engagement and enriching of children's lives in the local area, and in the evening, it becomes a pub, giving people a space to mentally unwind.

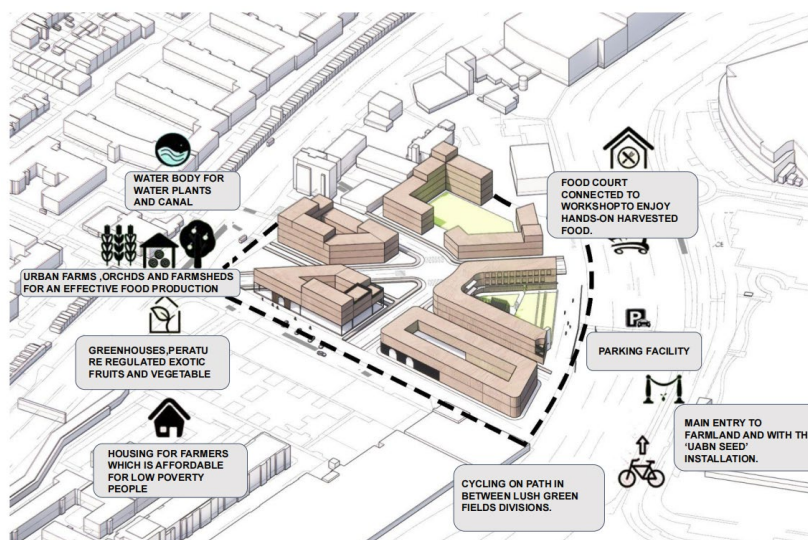
In the design of a multi-functional leisure space on the waterfront in the Poplar area of East London, the emphasis on multi-functionality aims to create a comprehensive space that takes into account the diverse needs of the residents. Primary consideration was given to a diverse range of recreational facilities,

including open outdoor recreational areas such as craft workshops and outdoor cafes to cater to the recreational needs of community residents of different ages, thus creating a vibrant environment on the seafront. At the same time, the introduction of cultural and entertainment areas, such as outdoor theaters and other facilities, provides a rich and varied cultural and entertainment experience for community residents and promotes social interaction and cultural exchange. The multi-functionality of the space is reflected in the design of the social interaction facilities. Creating social spaces such as public squares provides space for residents to gather and facilitates the organization of various cultural and social activities in the community. Such social interaction areas not only enhance community cohesion, but also promote interaction between neighbours, creating a warm and humane community atmosphere.



Source From: Author's own Illustration

Figure 13: Green Community coastal citizens' activities in East London



Source From: Author's own Illustration

Figure 14: Design point Summary for Poplar in East London

## 5. Design Implications for Green Sustainable Community Farms

### 5.1 Meeting Critical functional needs of community farms

In today's society, urban green farms are emerging as engines of sustainable urban development. These farms are more than simple food producers; they are multi-faceted agents that fulfill the needs of multifaceted urban functions. Firstly, by providing fresh, organic, and local food, urban green farms promote food security in cities by providing residents with safe and healthy eating options. By reducing reliance on long-distance supply chains, the farms also mitigate potential problems in food transport and increase the city's resilience to fluctuations in external food markets. Urban green farms bring positive environmental improvements to cities through ecosystem services. Vegetation cover and the presence of farmland help to clean the air, absorb harmful gases, and improve air quality. This has a direct impact on



the health and quality of life of urban residents. Farms can also improve water quality in cities and promote the sustainable use of water resources through rational water management and waste treatment. The introduction of urban green farms can also help mitigate the urban heat island effect and create a cooler and more pleasant urban environment. In addition, urban green farms are an important opportunity for community co-development. Through residents' participation in agricultural activities, it promotes interaction and socialization among community residents. Participating in the operation of the farm together and sharing the experience of agricultural products not only enhances the neighbourhood relationship, but also fosters the spirit of community co-construction. This culture of shared experience adds vitality and cohesion to urban communities.

### ***5.2 Promoting community cohesion and mental health***

The existence of green and sustainable community farms has a profound impact on the mental health of urban residents and on community cohesion. Firstly, these farms provide a unique and nature-friendly space for urban residents to escape from the hustle and bustle of the city. Amidst the lush green fields, people can escape from the stress of work, relax, and breathe in the fresh air. This natural healing effect helps relieve anxiety and tension and improves the mental health of individuals. Community farms foster strong ties between neighbors. Residents build a sense of community identity by participating in agricultural activities and working together to care for and manage the farm. The experience of sharing agricultural products is not just a material exchange, but also an emotional resonance that enhances friendship and trust between neighbors. In this process of collective endeavor, community cohesion is gradually strengthened and a mutually supportive social network is formed.<sup>[6]</sup> In addition, community farms are important places for knowledge and cultural transmission. Residents learn about plant growth, seasonal changes, and sustainable agriculture by participating in agricultural activities. This learning experience not only provides residents with practical skills, but also fosters a deeper understanding of the environment, food, and agriculture. This transfer of knowledge contributes to a community culture with a healthy lifestyle and a sustainable mindset.

### ***5.3 Increased socio-economic dynamism and sustainable development***

Green and sustainable community farms play a crucial role in the development of social needs. Firstly, by providing local produce, these farms reduce the city's dependence on external supply chains and increase the city's economic sustainability. The operation of the farms not only creates jobs in the community but also boosts the local economy. This economic vitality helps improve the livelihoods of community residents and enhances overall social stability. Community farms improve food security in the city by providing fresh, organic, local produce. Residents can trust and enjoy locally produced food more and reduce energy consumption and carbon emissions from food transport. At the same time, these farms promote healthy eating habits and provide the community with more nutritious food choices, helping to alleviate health problems and reduce healthcare expenditures. In addition, community farms inspire residents to care about agriculture and the environment and foster a sense of sustainable development. By participating in agricultural activities, residents gain the deeper understanding of the food production process, contributing to a more agriculturally and ecologically sustainable society.<sup>[7]</sup> This cultivation of awareness helps to drive the city in a more environmentally friendly and sustainable direction, meeting society's need for a sustainable future.

## **6. Conclusion**

As global urbanisation continues to advance, the demand for sustainable living and life quality is becoming more and more prominent. Under this backdrop, the green, sustainable community has been a popular issue for future people living environment. These communities organically combine environmental protection, social equity, and economic prosperity, aiming to create livable, eco-friendly, and economically sustainable living spaces. The community farm planning concept described in this paper incorporates different sustainable community design elements aimed at improving and building the Poplar neighbourhood in East London. The design proposal not only aims to provide the community with a unique agricultural economic model but also promotes community cohesion and social responsibility among the low-income, socially marginalised residents of the Poplar district of East London by growing organic vegetables, organising community activities, and improving children's multi-purpose craft workshops. On the other hand, sustainable transportation facilities and beautiful coastal cycling landscapes will help reduce car use and promote the community's shift to greener modes of

transportation. Together, this series of measures builds a community planning framework with sustainability as a core concept, providing a viable pathway for future development in Poplar and an example of how to improve the lives of East London. (The result is shown in Figure 14).

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