

# Chapter 4

## Climate Action: Urban Farming as an Innovative Tool for Regenerating Cities to Be Sustainable—Case of the City of Conegliano, Italy



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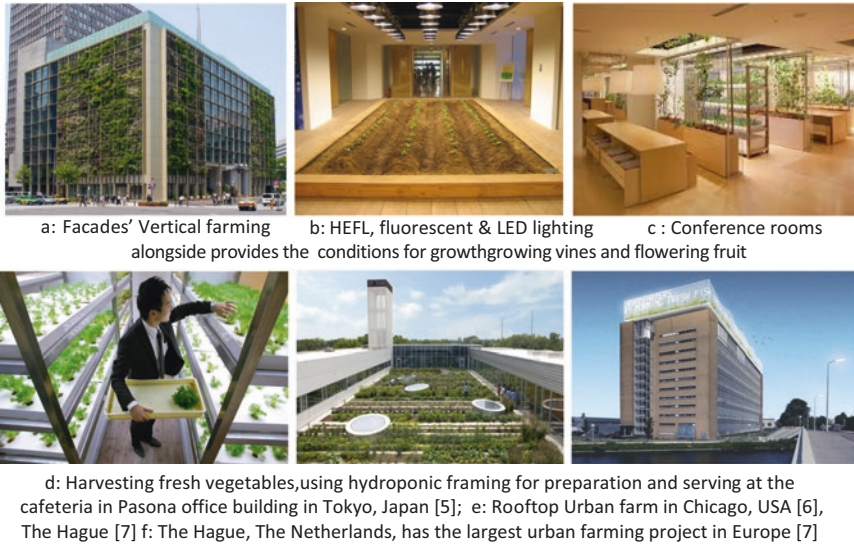
### Introduction

Cities are a major source of resource consumption and GHG emissions due to rapid population increase and urban activities [1]. According to the UN-Habitat, cities are responsible for 50–60% of the global CO<sub>2</sub> emissions and about 75% of the global primary energy with buildings and transport as major contributors [2]. The city of Conegliano, Italy, is experiencing climate change impacts, specifically sustainable urban development; thus, resilience of urban infrastructure is essential in adapting to global climate change risks. In 2003, after 10 years of the evolution of Zoppas-Zanussi to Electrolux group, production has been transferred out of the centre; since then this area was abandoned and turned into a “black hole” that left a huge site (165,000 m<sup>2</sup>) with less economic, social and environmental values [3]. Many proposals for urban regeneration were taken into account, but none is manifested until now; hence, the city of Conegliano should be green and sustainable [3]. Urban agriculture plays an increasingly important role in global food security [4]. It provides a solution for growing needs of cities to expand without harming the ecological balance and produce clean food. Integrating urban farms into the city fabric has many economic, social and environmental benefits. It offers clean food, while improving air quality resulting from carbon emissions and air pollution mitigation. It also helps in creating solutions to wastewater and organic waste in megacities, contributes to creating jobs, supports the economic growth by increasing the GDP and acts as a “zero kilometre” self-sustained economy, healthy communities through providing organic food, in turn, green spot for the city [4].

Urban farming has been extensively exploited to harvest edible plants and vegetables in Europe, particularly in Milan (Stephen Borie), and in many parts of the world including Japan, China, South Korea, the USA and Europe [5–8].

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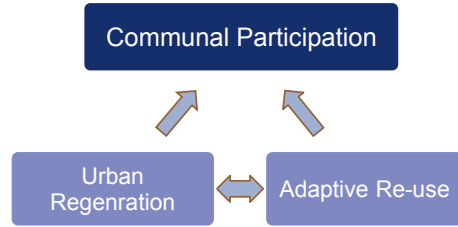
**Fig. 4.1** Examples of urban farming in different cities (Asia [5], the USA [6] and Europe [7]). (Source:<https://asiasociety.org/blog/asia/multimedia-downtown-tokyo-office-farm-takes-green-building-new-heights>)

Figure 4.1 illustrates some of the examples in Europe and Asia. In Pasona building in Tokyo, a total of over 200 species of fruits, vegetables and rice live within Pasona, including lemons, broccoli, salad greens, berries, squash, eggplant and passion fruit [5].

## Objectives

The aim of this work is to redevelop the abandoned site of Zoppas-Zanussi to Electrolux group of Conegliano and to improve livability in the city through innovation. The study focuses on the building and surrounding site by virtue of using urban farm incorporated on the building's walls and roof. It also addresses the project's economic sustainability, environmental sustainability and social sustainability to meet Sustainable Development Goals. Figure 4.2 shows the objective and sub-objectives of the study.

**Fig. 4.2** Sub-objectives of the regenerative city



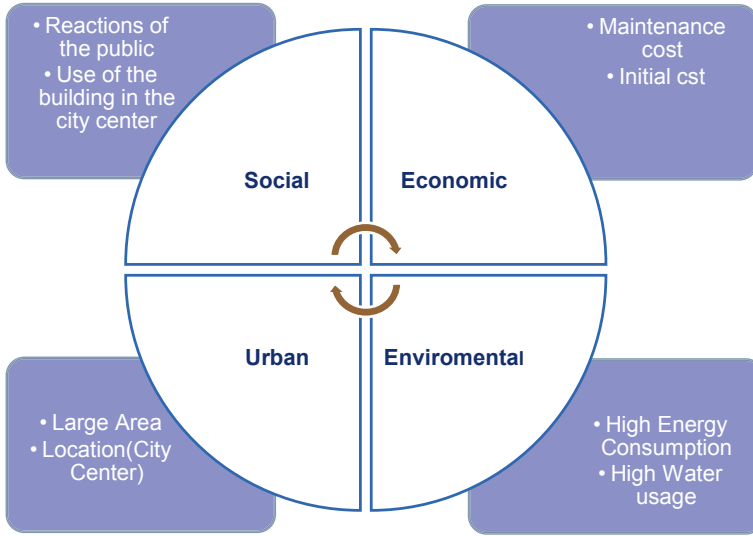
**Fig. 4.3** The site and abundant building of Zanussi factory, city of Conegliano, Italy. (Image (a) source: [www.Google.com/map/](http://www.Google.com/map/), Image (b) and (c) source: <https://site.unibo.it/urban-farm/en/location-2019/conegliano-zanussi-area>)

## Issues and Challenges

The problems of the city are:

- Site and building are a brown field (Fig. 4.3b, c).
- Scarcity of public and green areas.
- Inefficiency in adaptive reuse policies of this abandoned site for more than 10 years.
- Site area is very large reaching more than 165,000 m<sup>2</sup>.

Figure 4.3 shows the site and building before utilizing urban farming, sustainable, smart architectural solutions and technologies in the city of Conegliano, Italy. Urban farming is a challenging design issue for architects and urban designers alike as it tackles a new typology of buildings introduced to the city and its people (Fig. 4.4). Also, urban farming has a high maintenance cost of creating the built environment for plants. Urban farming consumes many resources, thus producing high CO<sub>2</sub> emissions.



**Fig. 4.4** Design challenges of urban farming

## Methodology

The methodology of the study depends on inductive and applied approaches: the first includes a review of the site and assessment. The second applied innovation, solutions and technologies by analyzing the site and building's design approaches that were executed in the project exploiting urban farming and architectural solutions and systems.

## The Site and Architectural Features

### *Site Assessment and Elements*

The abundant Zanussi Factory is located in Conegliano, Province of Treviso, Italy. The site is considered a great asset due to its location near the city centre (Fig. 4.5), located in a viable area surrounded by many bus stations, Conegliano central train station and four main streets (Via Daniele Manin, Via C. Colombo, Via Cesare Battisti, Via Innocente Pittoni), which secures a high flow around this area and thus making it a possible hub for the city as shown Fig. 4.6. In addition, the community garden (Parco Mozart) is located on the northwestern part of the site, acting as an important constrain to the design through its attraction to users as well.



**Fig. 4.5** Layout of the city of Conegliano, Italy



**Fig. 4.6** Urban setting and transport network about the site, Conegliano, Italy

### *Architectural Features and Solutions*

This project is considered to be a social and an economic HUB for the city of Conegliano, Italy. Therefore, it is designed to represent this innovative idea in the best possible way (Fig. 4.7). The building is oriented towards the NNW while the longer sides area towards ENE and WSW, which have high solar exposure compared to the other facades. To adapt to this problem, we added Boston ivy plants on a cable trellis system (Fig. 4.7) to help in reducing solar gains, produce oxygen and represent the urban farming growing inside the building on its outside along with double-glazed glass to minimize heat gains (Figs. 4.8 and 4.9).

The internal building is divided into many sections; this distribution of suggested uses inside the existing building's skeleton of the old factory without demolishing any part was thought of in order to minimize the waste in embodied energy. The spaces are distributed according to the convenience of the existing space to the spatial requirements of the new one as shown in Fig. 4.8. The site contains a large unbuilt area in the western part. In this project, it was intended to redesign such area to serve our project and, in turn, the city (Figs. 4.9 and 4.10). The outdoor areas include a main piazza, green areas and a kid's area to emphasize social interaction (Fig. 4.9). In addition, it was intended to create a buffer zone on the northern part of the site by using wind turbines to generate electricity, while creating a barrier from

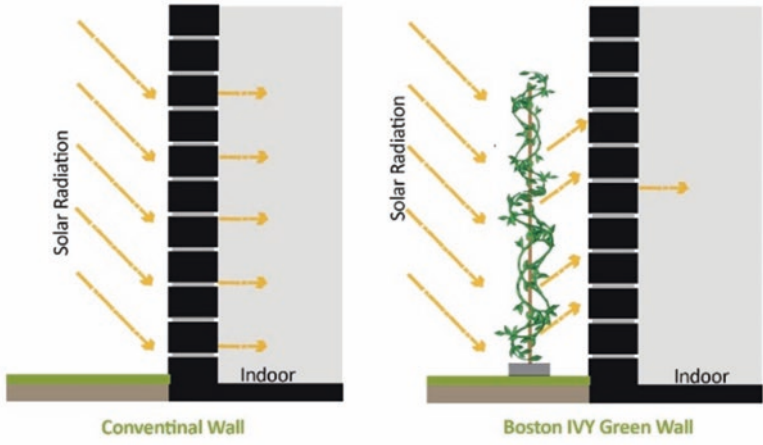
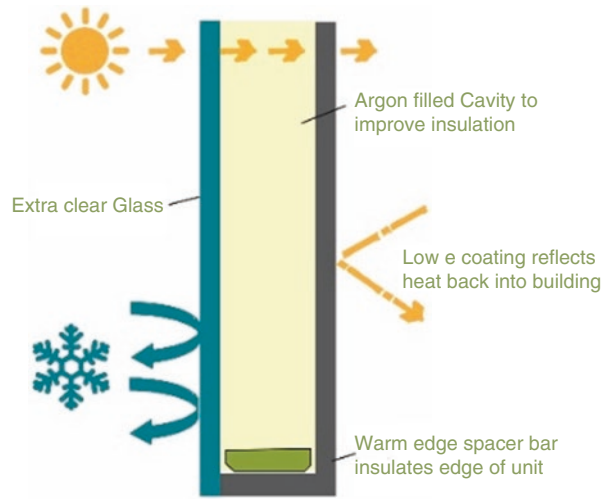


Fig. 4.7 Boston ivy façade. (Source: Credit Authors)

Fig. 4.8 Double-glazed glass. (Source: Credit Authors)



the train railway generated noise as well. In this project, it was realized the importance of having a self-sustained project that can operate for many years with least amount of energy, minimal waste and best possible production as shown in Figs. 4.10, 4.11 and 4.12. It has been decided to use an aquaponic system along with Boston ivy facades in order to minimize water and energy waste in our project (Fig. 4.13).

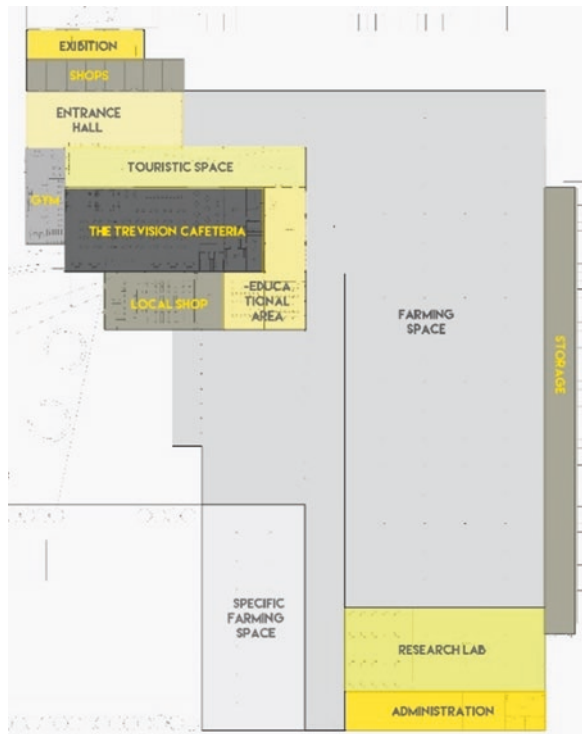
Two types of plants are exploited in the project; each is used for a specific reason (Fig. 4.14):





Fig. 4.9 Main façade view. (Source: Credit Authors)

Fig. 4.10 Project zoning and uses. (Source: Credit Authors)



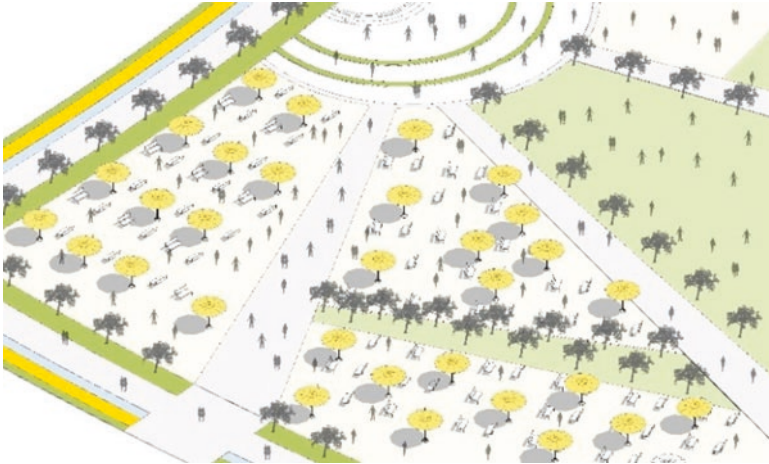


Fig. 4.11 Outdoor piazza. (Source: Credit Authors)



Fig. 4.12 Current project vs. traditional farms



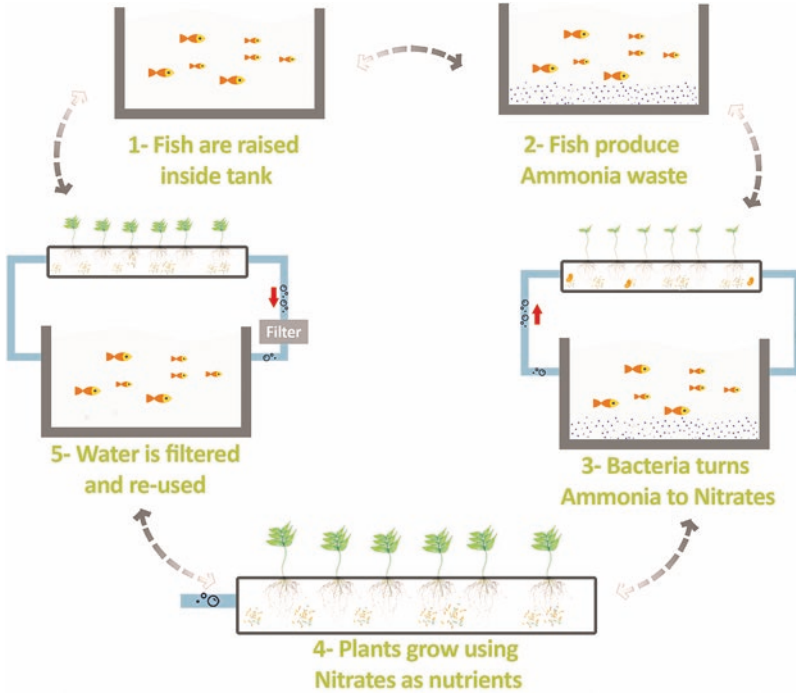


Fig. 4.13 Aquaponic system

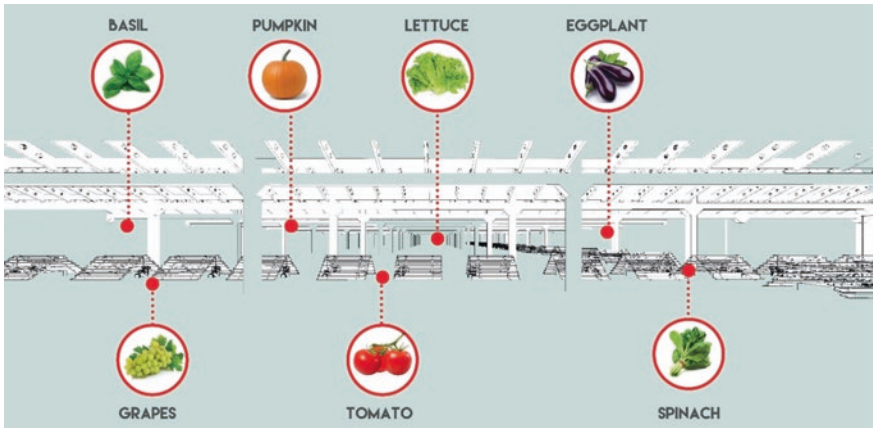


Fig. 4.14 Cultivated vegetables and herbs



**Fig. 4.15** SWOT analysis of the project development in Conegliano, Italy

- Glera grapes (Vitis vinifera “Glera”)*: This type of grapes is the one used to manufacture the well-known *Prosecco wine*. We intended to provide grapes for the wine industry found in Conegliano and its suburbs to help grow the industry, while providing adequate income for the project.
- Tomato, basil, eggplant, lettuce, spinach and pumpkin*: These products can be cultivated easily in an aquaponic system, while also being part of the daily diet of this region. These plants are found in many of the signature dishes of Conegliano.

These plants are found in the daily diet of Italians and can be cultivated in the weather conditions of the area [9].

- *SWOT analysis*

A SWOT analysis on strength, weakness, opportunities and threats was conducted on the different points found in the project. Figure 4.15 depicts the findings of the assessment.

## The Project and Sustainable Development

The main challenge for this site was its huge scale, but at the same time, it was its biggest asset. Since we decided that we wanted to create a new Green Hub, we had to make it as sustainable as we could. Given the size of such project, it was a challenge to address all three pillars of sustainability and balance between them. The following SDGs: SDG 7, affordable and clean energy; SDG 8, decent work and economic growth; SDG 11, sustainable cities and communities; SDG 12, responsible consumption and production; and SDG 13, climate action (Figs. 4.18 and 4.19), were addressed.

### ***Economic Sustainability***

The economical aspect is considered one of the important aspects of sustainability as the cost of the project can determine the feasibility of the project. In this project we decided to distribute the sources of income found in the project in order to help supply the farm with enough money to cover its expenses, while keeping the produce in a considerably low price for the people to buy easily (social aspect). In addition, some services that are found in the project are provided for a considerably low or discounted fee to help serve the community with the least possible charge on the people. The main sources of income in the project are the money earned from the grapes sold to the wine industry and products sold in the local store, the cafeteria and the rented shops.

The variety of income sources helps maintain the project's viability. We wanted to create a project that can be self-sustainable whether economically or environmentally.

### ***Social Sustainability and Innovation***

The social aspect in the project was a key element that was addressed in the design process itself. The main factor of success in this project lies on the communal participation as we are aiming to create a new vibrant city in the heart for Conegliano. We wanted to create a project that the people felt that they belong to and are part of. The Green Hub contains many spaces that encourage social interaction: the outdoor piazza, kid's area, gym area and the cafeteria.

All these spaces are designed for the people to come and visit the site on a regular basis to feel that this area became a part of the city fabric once again; thus, this sense of belonging will ensure the livability and viability of this project for years to come.

### ***Environment Sustainability***

Last, the environmental pillar was tackled in the project too. We tried to reach a near-zero energy and waste building through a design of dependent systems that work with each other to minimize the waste of materials or energy. This was designed on many levels: (a) the aquaponic system that helps minimize the water waste and recycles the fish and plant waste as mentioned before; (b) the wind turbines found on the northern part of the site help to generate onsite energy that helps reduce the energy waste and thus minimize the costs; (c) the energy efficient LED lighting, for the facades; and (d) the Boston ivy that requires minimal maintenance and adapts to the cold weather of Conegliano mixed with double-glazed glass to minimize the heat loss in winter and heat gains in summer.

To mitigate GHG emissions mainly CO<sub>2</sub>, attempts were made to reduce the project's carbon footprint and keep the site eco-friendly as much as possible. Another important decision was taken into consideration to keep the current structure,

while retrofitting it to ensure environmental sustainability by reducing the waste, hence the embodied energy.

## Business Model and Feasibility

- **Business Description:**

- The Green Hub® is an upcoming project located in Conegliano, Italy. An urban farm project provides this city with organic produce along with a social hub for the people to enjoy. The products are mainly targeting the local community along with the wine industry.
- The wine industry is one of the largest in this city, and their Prosecco wine is well known both inside and outside Italy.

- **Products and Services:**

- Conegliano is already known for the wine industry found in the area and the presence of the Conegliano School of Wine reflects the importance of such industry. The difference between our project and the other vineyards is that our grapes are organic and produced in monthly cycles to keep constant supply to the wineries as it is cultivated in an induced environment. Also we cover the social aspect for the city as we intend to create a central area for the people to visit and enjoy themselves.
- This area can be used by anyone as a public space that contains various entertainment elements for different age groups.
- The users have different choices upon arriving to the site:

Using the public area (piazza) to enjoy some relaxing or family time

Visiting the Treviso cafeteria that serves local dishes made with fresh products from the farm

Using the public gym area

Shopping at the local store that sells organic products from the farm

Having an educational tour to see the urban farm from inside and learn more about the process

- All these options provide an experience that cannot be found in a traditional vineyard and thus making it having an advantage than any ordinary farm.
- We aim to create a project that the people will like and enjoy spending time with as they feel a sense of belongingness and thus helping to keep this project running for a long time.

- **The Market:**

The wine industry has been in this area for centuries and the Conegliano School of Wine was founded in 1876 due to the importance of this profession [10]. The ex-Zanussi area has been abandoned since 2003, and many of the city officials

have debated over this area, and several purposes of urban requalification have been taken into account, whose the best idea is to use the area for an urban agriculture project promoted by Bologna University International Challenge, UrbanFarm 2019.

• **Competitive Factors:**

The following items and factors are listed to assess in the SOWT analysis against the factors as shown in Table 4.1.

From the above, we might conclude that we are a few steps behind the other competitors; however we are providing healthier produce, better quality and on site social services to contribute more to the community and the city.

***Startup Expense Capitalization***

The initial cost for the startup will be for renovating the site and buying the required equipment and systems for each space according to its design. An investor along with governmental grants and sponsorships that could help the project to start shall cover the costs.

**Table 4.1** List of competitive factors and indicative results for the SWOT

Items factor	Our project	Strength	Weakness	Competition	Importance
Products	Grapes, vegetables and leisure services	Variety of products and services	Risk of being distracted with different aspects	Provide only grapes	Critical
Price	Above average pricing	Price/quality ratio is very good	Higher pricing than usual for the buyers	Lower pricing but also lower quality	Critical
Quality	Organic produce with highest quality control	Highest quality in the market for excellent wine		Non-organic	Critical
Supply	Monthly supply due to induced environment	All-year supply for the buyers		Seasonal supply	Very important
Expertise	Medium experience	Contains scientists and professionals who provide training at the beginning	Team working is just starting	Very high experience	Very important
Location	In the city centre	City centre is in the middle distance between all wineries	Long distance for supply and delivery	Located near the wineries	Important

### ***Twelve-Month Profit and Loss Projection***

- In the first year, it is planned to provide no less than 20 wineries with the needed supply of grapes. During that time, the marketing team should assess the actual market share and the users' feedback on our products and services.
- **Four-Year Profit and Loss Projection:**

By that time, we intend for the project to cover most of the wineries in the area with long-term contracts as more stability is achieved. In addition, our products will be improved with time after receiving the feedback. We intend on covering at least 40–60% of the project initial cost by that time.

## **Results**

The project provides benefit to the city of Conegliano in Italy whether economically, socially and environmentally. In terms of economic viability, the project would provide many jobs on year by year calculations as shown in Fig. 4.16. The anticipated new jobs due to the project are 240 after 10 years. This indicates how the project is economically viable and achieving the social sustainability. It increased from 28 jobs in phase 2 (42 jobs) by 50% from year 1 (28 jobs), whereas it would increase in phase 3 (70 jobs) after 3 years by 67% and then would increase in phase 4 (100 jobs) by 43%, in total, an increase after 10 by 257% from starting the project and operation (Fig. 4.16).

The reduction of CO<sub>2</sub> emissions due to the use of urban farming compared to conventional buildings without urban farming in cities is illustrated in Fig. 4.17. The CO<sub>2</sub> emission is mitigated by 79%, if the site and building to be designed as a business as usual (BaU) way [11–13]. This indicates the environmental viability of the project in contributing to the city of Conegliano's footprint.

Urban farms could have a huge impact on the urban fabric introduced to the city, but if applied properly with consideration of urban and social factors. It could act as a catalyst for its surrounding as well as strong asset in adaptive reuse of abandoned buildings. Urban farms provide food security, job opportunities and green lungs in the heart of the cities if designed correctly. This project won the public voting award for the UrbanFarm 2019 competition along with the Conegliano municipality bonus for the innovative ideas provided to create a successful marriage between urbanism and agriculture in cities [14]. It also achieved the third ranking project. The project's sustainable solutions are depicted in Figs. 4.18, 4.19, 4.20 and 4.21.



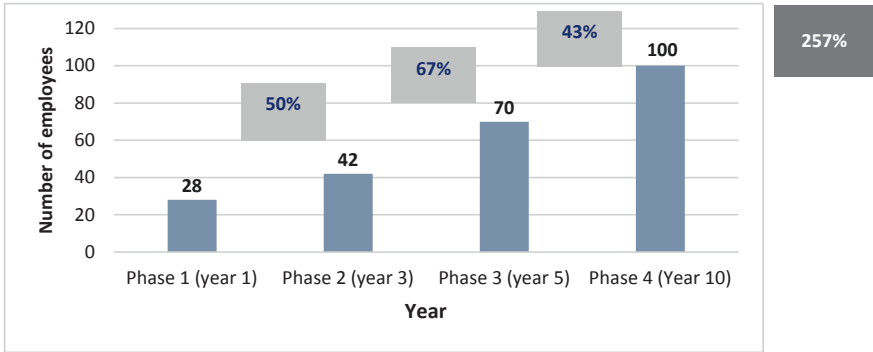


Fig. 4.16 Jobs generated year by year due to urban farming in 10 years

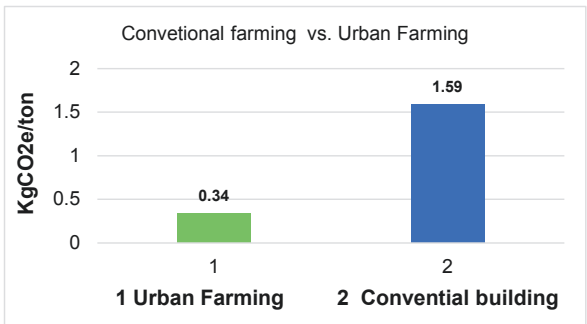


Fig. 4.17 CO<sub>2</sub> emission mitigation by urban farming compared to conventional buildings



Fig. 4.18 Impression of the site and building solutions after improvement, Conegliano

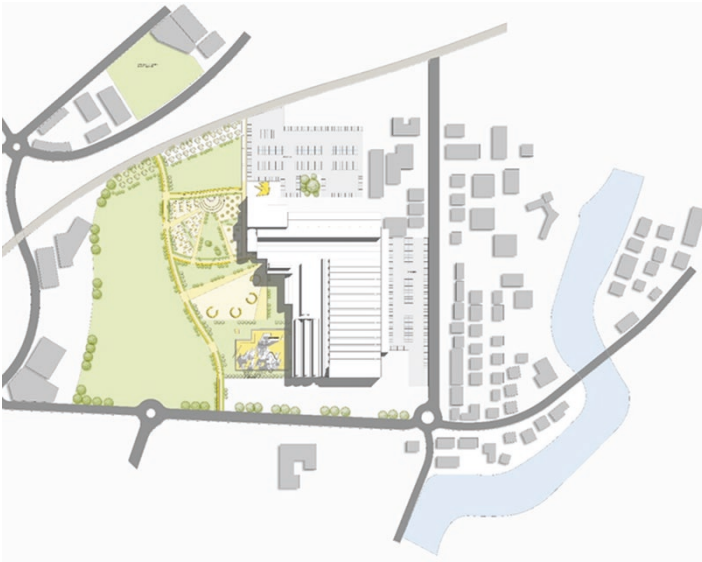


Fig. 4.19 Site layout after development, Conegliano, Italy

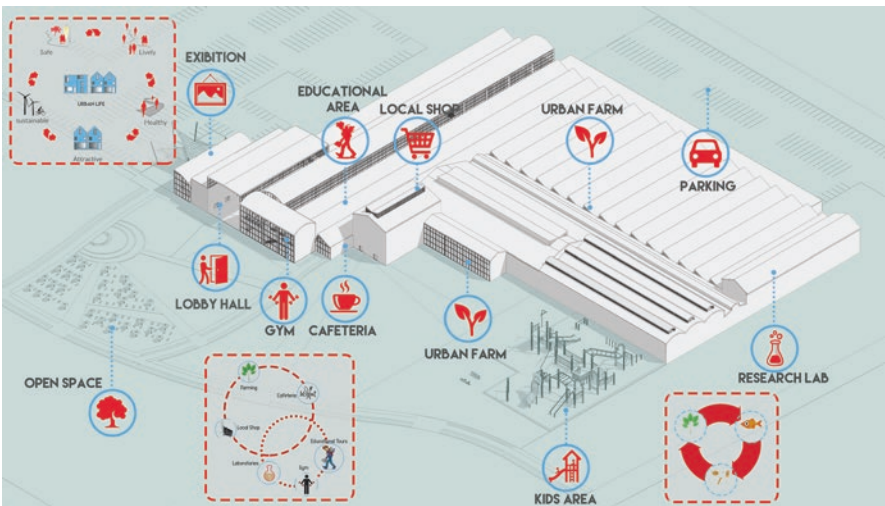


Fig. 4.20 Project's outcomes, Conegliano, Italy



Fig. 4.21 Project's enhancement to achieve SDGs. The project linked to Sustainable Development Goals 7, 8, 11, 12 and 13

## Conclusion

The Green Hub<sup>®</sup> is a project that aims to integrate the urban farm with its surrounding urban context to create a living heart for the city of Conegliano. This project covers all three pillars of sustainability: environmental, social and economic aspects, to achieve a self-sustained project. For us communal participation was a key factor in the design, so we were keen to create various social spaces beside the urban farm to attract more people to the area. We believe this project helps to create a livable, healthy and sustainable urban environment in the city of Conegliano and to be an exemplary model for others. The project development contributes in achieving Sustainable Development Goals (SGDs) 7, 8, 11, 12 and 13.

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