

Article

Defining a Pedagogical Framework for Integrating Buildings and Landscapes in Conjunction with Social Sustainability Discourse in the Architecture Graduate Design Studio

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Abstract: The primary objective of this research is to define a pedagogy framework for architecture Graduate Design Studio. The proposed pedagogy framework pursues the following three principal objectives: The first objective focuses on buildings and landscapes and the interconnection between them. Such connectivity facilitates a ground for walkability. The second goal is to incorporate green elements within buildings and landscapes with regard to increasing the percentage of available green spaces within contemporary and future cities, which may encourage human respect for nature. The third objective promotes the notion that contemporary and future built environments should be envisioned as environments wherein fresh local food can be cultivated, processed and distributed. It incorporates urban agriculture within buildings and landscapes. The Graduate Studio pedagogy focuses on the concept of social sustainability. The three mentioned objectives of the framework are in line with the core concept of social sustainability, which includes improving the well-being and quality of life of contemporary and future urban dwellers. Overall, the Graduate Studio envisions buildings and landscapes as pedestrian environments, as grounds where green elements are incorporated and local fresh food is cultivated. The mentioned framework has been implemented within the Graduate Studio. Four design project samples are presented as successful precedents.

Keywords: walkability; pedestrian environments; green elements; urban agriculture; pedagogy; architecture design studio



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1. Introduction

The primary aim of this article is to define a pedagogy framework for Graduate Design Studio (ARC 402) in the Department of Architecture at the Faculty of Architecture, Design & Fine Arts at Girne American University. The Graduate Design Studio is based on the following three principal objectives: (1) The Graduate Design Studio focuses on interconnections between buildings and landscapes, and such connectivity facilitates walkable pedestrian environments. The Graduate Studio final design projects should provide necessary infrastructures, such as walking and cycling paths, in order to create walkable environments. By providing walkable environments, current and future urban dwellers are given access to necessary infrastructures for engaging in regular physical activities. (2) The incorporation of green elements within buildings and landscapes is part of the Graduate Studio objectives. By integrating green elements with buildings and landscapes, the percentage of available green spaces within contemporary and future cities can increase. (3) The Graduate Studio design projects should envision environments that are capable of producing local fresh food. In fact, contemporary and future cities should be regarded as grounds where food can be cultivated. The Graduate Studio considers buildings and landscapes as grounds where urban agriculture can be practised.

The concept of social sustainability is part of the Graduate Studio pedagogy framework. Social sustainability focuses on maintaining and enriching the well-being and quality of life of contemporary and succeeding generations [1–3]. An architectural design project can be considered socially sustainable when it is capable of improving the quality of life of its users [2]. Architecture can significantly contribute to the well-being, satisfaction and comfort of its users, so architecture is correlated with the social aspect of sustainability [4]. The Graduate Studio promotes the following notion: by providing walkable pedestrian environments, adding green elements within buildings and landscapes and integrating urban agriculture within buildings and landscapes, the well-being and quality of life of contemporary and future urban dwellers can be enhanced.

1.1. Research Questions

Research question one: in which ways can the concept of walkability affect the architecture design projects within the design studio?

Research question two: in which ways can the concept of urban green spaces affect the architecture design projects within the design studio?

Research question three: in which ways can the concept of urban agriculture affect the architecture design projects within the design studio?

1.2. Review Approach

The Google scholar search engine was used to explore the walkability issue. The specific phrases “walkable environments”, “green walkability mode of transport”, “green walkability mobility”, “designing walkable environments” and “walking and cycling for transport” were included in different orders and combinations. The studies of Southworth, 2005, Forsyth and Southworth, 2008, and Southworth, 2008 were identified as key among search results.

To explore the issue of green spaces in contemporary cities, Google scholar was used. The specific phrases “urban green space”, “urban green space benefits”, “urban green space physical activity” and “urban green space social benefits” were included in various combinations and orders. The works of Zhou and Rana, 2012; Zhou et al., 2018; Kabisch and Haase, 2013, 2014 and Kabisch, 2015 were identified as principal research among the search results.

To explore the concept of urban agriculture, the Google scholar search engine was used. The specific phrases “urban agriculture cities”, “food security urban agriculture”, “urban agriculture community gardens”, “rooftop urban agriculture”, “green elements interior architecture”, and “urban agriculture social benefits” were included in different orders and combinations. The studies of Orsini et al., 2013; Horst et al., 2017; De Zeeuw et al., 2011 and Ackerman et al., 2014 were identified as key research among the search results.

The concepts of social sustainability, social sustainability definition, and social sustainability in architecture education were searched in Google scholar. The works of Ceylan and Soygenis, 2019; Shirazi and Keivani, 2017 and Shirazi and Keivani, 2019 have been highlighted as key research.

The following three sections (Section 1.3 to Section 1.5) focus on the theoretical background concerning the importance of creating walkable environments, adding green spaces and cultivating local fresh food in contemporary and future cities.

1.3. A Vision for Future Cities

Since 2009, for the first time in history, the number of individuals residing in urban centers (3.42 billion) has exceeded the number of individuals residing in rural regions (3.41 billion). It is evident that the world has become more urban than rural; since 1950, there has been rapid urbanization across the world [5,6]. It is estimated that the global population will reach 8.5 billion by the year 2030, and 9.7 billion in 2050 [7]. The urban population is expected to increase by 2.9 billion, and reach 6.3 billion by the year 2050 [5,6]. By 2050, it is expected that 68 percent of the world population will reside in ur-

ban areas [6,8]. It is also estimated that the population will rise dramatically in urban areas, especially in major cities and towns in developing countries. The number of megacities (min 10 million inhabitants) is expected to reach 29 in 2050; megacities will house approximately 10.3 percent of the total world population in 2050 [5]. During the past few decades, cities have grown rapidly, and it is expected that urban growth will continue to accelerate in the following decades [9].

Population growth, migration from rural to urban centers, the reclassification of rural lands into urban centers, and the geographic expansion of urban areas via annexations are key factors that will contribute to urban growth [10,11]. Currently, rural–urban migration represents approximately 40 to 60 percent of annual urban growth in developing countries [11,12]. It is evident that rapid growth in urban populations will place substantial demand on many cities throughout the developing world to improve basic infrastructure and provide essential public services [10]. Sustainable development challenges are expected to concentrate in urban centers with inadequate infrastructure, especially in major cities in developing countries where there is fast urbanization and growth [6]. The growth of cities, especially in developing countries, due to the large-scale rural–urban migration, has led to the growth of unplanned and overcrowded urban environments. It is vital that current and future urban developments are equipped with adequate infrastructures, such as pedestrian pathways, streets, trails, elevated walkways and cycling paths. In this way, the built environment is capable of supporting and enhancing the physical activity of urban dwellers [13]. The planners', urban designers' and architects' task is to create a vision for future cities based on the demands of city-dwellers, such as designing pedestrian environments. A major objective for future cities is that the city-dwellers should be able to walk and cycle in public spaces in relation to their everyday activities [9]. In this regard, future cities should meet walkability requirements.

During the past century, the majority of cities around the world have witnessed a gradual decline in pedestrian access and pedestrian environments. The pedestrian-oriented environment has been degraded due to the advancement in transportation and technology, such as cars, electric cars, highways, super-highways and elevated railways. Auto-oriented cities have contributed to the formation of anti-pedestrian environments, where accommodating cars has been prioritized over providing pedestrian environments [9,14–16]. Modernist planning and design has promoted pedestrian/automobile separation, which has resulted in disrupting free movement on foot and the existing pedestrian network [14,15].

The major factors that encourage the use of private automobiles can be summarized as the following: low-density development; precise detachment of land uses; spatial separation of various destinations; large block sizes, which limit the range of route choice; discontinuous street patterns, such as cul-de-sac or loop patterns (neglecting the interconnected grid street patterns); over-scaled streets with no sidewalks, and reduction in streets to service roads devoid of social life [14–17]. The original functions of public spaces as social/meeting spaces for urban dwellers have been neglected in favor of accommodating car traffic. The dramatic increase in car traffic is squeezing urban life out of the public spaces in cities. In recent decades, planners, urban designers and architects have begun to realize that priority should be given to creating pedestrian environments rather than car traffic; in fact, there has been a shift from auto-centric planning to accommodating pedestrian and cycling environments—in other words, a shift away from modernist urban planning ideals has started [9,14].

As mentioned before, the majority of the urban population currently resides in continuously expanding major towns and cities. Urban growth and densification contribute to the loss of existing urban green spaces [18–25]. The rapid process of urbanization and population growth are changing the green space patterns within the fabric of the cities, and are devouring a large portion of the green spaces at the urban peripheries [26]. Major towns and cities in developing countries are witnessing the conversion of existing urban green spaces into buildings and infrastructures [27]. Various major cities in Asia, such as Hanoi (Vietnam), Mashad (Iran), Karachi (Pakistan), Hong Kong (China), Kuala Lumpur

(Malaysia), and Dhaka (Bangladesh), have witnessed the rapid decrease in urban green spaces during the last few decades [23–25,28–31].

The gradual loss of urban green spaces can contribute to habitat loss, which has a negative effect on biodiversity richness [25,32,33]. Urban growth means that the number of urban dwellers living in human-dominated, nature-barricaded environments is increasing. As more individual lives are bound by urban experiences, there are fewer opportunities for experiencing nature in their everyday life. Disengagement with the natural world can have a negative impact on the health and well-being of urban dwellers [19,34].

Urban green space in this research can be defined as an incorporated area within the city that comprises natural, semi-natural or artificial green lands. Urban green spaces are capable of facilitating manifold benefits for various groups of urban dwellers [26,35]. Any open space located within the fabric of a city, with a fair amount of vegetation that could be inherited from pre-urbanization, such as urban forests or designed landscapes, can be categorized as urban green space [26,36]. In this regard, street trees, private residential gardens, communal gardens, public parks, edges of roads and vacant lands that contain natural vegetation can be considered as urban green spaces [26,37]. Kabisch and Haase [38,39] define urban green spaces as available green spaces within the fabric of cities, such as parks, open green spaces, urban agriculture, residential gardens, rooftop gardens and street trees.

The available green spaces within the fabric of the cities should be considered as assets capable of positively impacting the physical and mental health of urban dwellers; subjecting to urban green spaces relieves stress, brings about relaxation, improves social cohesion and conserves biodiversity within urban ecosystems [18,19,35,38–44]. Urban green spaces are suppliers of fresh air, cooling the environment by providing shade, increasing carbon storage, reducing noise and stabilizing the local climate via air filtration. Urban green spaces can provide ecosystem services that play a major part in counteracting environmental issues caused by urban densification [26,38,39,45,46]. Urban green spaces can contribute to regulating services, such as air purification, water regulation, and stormwater regulation [25,47–52]. Urban green spaces can be regarded as grounds where social interaction among urban dwellers occurs [25,53–55]. In addition, urban green spaces are places where urban dwellers can directly experience natural environments [38,39]. Spending time in nature and closely experiencing it can assist urban dwellers in uplifting their mood, enhance their capacity to direct attention, and reduce psychological arousal. Psychological research has demonstrated that urban green spaces are health assets for city-dwellers [25,35,40]. Maintaining and increasing the percentage of green spaces in urban areas is crucial, since individuals, families and businesses prefer to appear and operate in cities with abundant green spaces [34,56]. The native habitat and local flora and fauna should be integrated in places where city-dwellers reside and work; in fact, humans should cohabit with nature. It is evident that future urban growth contributes to more buildings and infrastructure construction. It is crucial that, in the future, we develop houses with adequate green spaces within the fabric of cities. In this way, city-dwellers can reconnect with nature, which helps preserve biodiversity [34]. As cities become more crowded and densified, the provision of adequate green spaces becomes a major challenge [19,34]. Current and future urban dwellers should be able to interact with green spaces in close proximity to where they live and work [34]. In this regard, greening current and future cities should be a priority in order for cities to be able to support the well-being and health of the urban population (Figures 1–4).



Figure 1. Future cities should incorporate green elements in their buildings and landscapes [57].



Figure 2. Increasing the percentage of green spaces in future cities using the available horizontal and vertical surfaces [57].



Figure 3. Future cities as green cities [57].



Figure 4. Future cities as green cities [57].

1.4. Walking, Cycling and Built Environment

Walkability and designing walkable environments can be regarded as principal elements in reclaiming impersonal modern urban environments; walking and cycling as green modes of transport are the bedrock of a sustainable city [9,15,16]. A sustainable city is based on “green mobility”, where the majority of the transport system is based on traveling on foot, by bike or via public transport [9]. Automobile-oriented cities usually face issues such as congestion, parking issues, air pollution, emissions, resource depletion and road traffic injury [58,59]. The “green mobility” limits emissions, reduces resource consumption, and economically and environmentally benefits the city [9]. Cycling as a form of “green mobility” helps reduce environmental damage, enhances health via physical activity, takes up little space, reduces traffic congestion and provides an affordable mode of transport [60].

Designing walkable environments and communities can promote/support walking and cycling as non-motorized choices of travel over private automobiles. Walkable environments are able to support physical activity, foster social interaction and create safer

environments [16]. A built environment plays a crucial role in limiting or promoting physical activity among city-dwellers. The built environment can house adequate infrastructure and settings to support safe environments for walking and cycling [61]. Interconnected networks of walkways, paths, elevated walkways, trails and cycling paths can promote more walking/cycling as a form of physical activity in a neighborhood or city [62–64]. As an example, during the past two decades, the development of cycling lanes in Denmark contributed to approximately a 50 percent increase in cycling among the city-dwellers [65]. In the cities of Bogota (Colombia) and Sevilla (Spain), over 300 km of protected cycling lanes has been constructed; in both cities, the main goal is to educate city-dwellers, including the young population and the carless, to utilize cycling over motorized travel. Both cities have witnessed a bicycling boom within a few years [60,66]. The design of cycling infrastructure is a key factor in promoting more cycling among city-dwellers. Recently, cities with no history of a cycling culture, such as Paris, Vienna, Barcelona, New York City, London and Chicago, have begun to construct the necessary infrastructure for promoting cycling among city-dwellers. In the mentioned cities, the number of trips by cycling has increased in recent decades [58,60].

Most physical activity, such as walking/cycling, occurs at the neighborhood level [17]. Evidence suggests that individuals who live in walkable environments or densely populated neighborhoods with connected streets, parks, public transport and shops/services in close proximity (less than 0.5 km) are more physically active than individuals who reside in less walkable environments [67,68]. In a research study, the largest to this date, 6822 participants (aged 18–66) from 14 cities (10 countries/five continents) were studied. The purpose of the research was to document the correlation between the neighborhood environment characteristics and the total level of physical activity (moderate to rigorous level) of research participants. The research findings suggest that individuals who reside in activity-friendly neighborhoods undertake 68 to 89 min more physical activity per week than individuals who reside in neighborhoods that are less activity-friendly. The activity-friendly neighborhoods have the following characteristics: high-density residential dwellings, connected streets, public transport access, shops/services access and parks within walking distance. In such neighborhoods, residents are able to walk/cycle to local shops/services, public transport and parks. The number of parks within walking distance (0.5 km buffer) demonstrated a strong association with the physical activity level of residents in all studied neighborhoods [69].

Urban green spaces are capable of positively enhancing the physical and mental health of city-dwellers [70]. The close proximity of urban dwellers to urban green spaces such as urban forests or parks can provide a low-cost opportunity for increasing their physical activity level [71,72]. The likelihood of physical activity is 3 times higher in areas with access to urban green spaces [71,73]. Urban green spaces are ideal landscapes for leisure-time physical activities such as walking, biking and jogging [71,72]. The presence of features such as walkways facilitates physical activity and encourages younger adults to do more physical activity [72].

Trails can be regarded as healthy recreational facilities for adjacent neighborhoods [74]. The construction and development of trails can provide pedestrian-friendly grounds that enable the neighborhood's residents to utilize them for walking, cycling and other forms of physical activity [74,75]. Trail as a permanent fixture can establish/promote a walking/cycling culture within a neighborhood. Abandoned railway beds can be adjusted as trails. Rail-trails can be utilized for recreation and transport-related physical exercise. Rail-trails can knit various neighborhoods, businesses and vital destinations together. Factors that might promote/limit the use of the trail are as follows: travel distance to the trail, easy access from residential areas to the trail, and trail safety [76]. It is evident that the lack of public spaces, such as urban forests, parks, trails and greenways, in the city affects the physical activity level of urban dwellers [74].

A wide range of health benefits can be gained by engaging in regular physical activity [77]. Evidently, urban environments that support physical activity, such as walk-

ing/cycling, provide substantial health benefits for city-dwellers [13]. Walking can be considered as an affordable, reachable and common form of physical activity, and engaging in regular walking has health benefits. Among adult populations, walking is a vital fraction of total physical activity [65,78]. Cycling also has health benefits. The mortality rate is approximately 40 percent lower in city-dwellers who commute by cycling than those who use passive transport [79]. Approximately 23 to 25 percent of city-dwellers in Denmark, China and the Netherlands utilize the bike lane system for cycling to work [65]. Currently, 40% of trips are done by cycling in Amsterdam and Copenhagen [58]. The existence of such cycling infrastructure delivers extensive health benefits for city-dwellers [65]. By integrating cycling into the everyday routine, the level of physical activity can increase, and people who commute by cycling spend on average 30 min cycling [77]. Several studies demonstrate that regular walking and cycling activities have positive effects on all-cause mortality and various diseases [79–81].

Globally, the level of physical inactivity is increasing in various countries. Worldwide, it is estimated that 1.5 billion people, or 3 out of every 10 individuals (aged 15 years and above), do not meet the current physical activity criteria recommended by the World Health Organization, which involve engaging in physical activity of moderate intensity for 150 min per week. Worldwide, among adolescents, it is estimated that four out of five individuals (aged 13 to 15 years) do not meet the current guidelines recommended by the World Health Organization, which involve engaging in physical activity of moderate to vigorous intensity for 60 min per day [65,82,83]. Physical inactivity can have major implications for the general health of the global population. A lack of physical activity can cause cardiovascular disease, coronary heart disease, raised blood pressure, raised blood sugar, diabetes, overweight, some forms of cancer and premature death [65,82]. Physical inactivity as a global pandemic is accountable for approximately 5 million deaths per year. Reduction in non-communicable diseases is one of the major targets of the UN [69,84]. It is essential that the built environment be designed/enhanced in a way that encourages the general public to be engaged in regular physical activity [13]. Built environment design has the capacity to contribute to approximately 68–89 min/week of total physical activity of neighborhood residents [69].

1.5. Architecture, Landscape and Urban Agriculture

As mentioned before, currently, half of the world population lives in urban centers. Cities are constantly growing due to rural–urban migration and other factors. Rapid urbanization in developing countries correlates with the growth of the low-income people population, the growth of urban poverty, and food insecurity. Usually, low-income people suffer from malnutrition and unemployment. Urban agriculture as a possible solution to the mentioned issues is capable of producing local fresh food, increasing urban food supply and improving low-income food security. Urban agriculture can facilitate access to healthy nutrition. Urban agriculture is capable of creating employment, providing income opportunities, building skills and developing communities [85–88].

The majority of low-income people cannot afford to purchase fresh fruits and vegetables due to their lack of financial resources. Urban agriculture can assist low-income people to grow fresh food. Urban agriculture can improve their nutrition security and dietary adequacy [86,89]. It is a common practice among low-income households in developing countries to cultivate food within their dwellings, such as rooftops and balconies. The product is either for self-consumption or sold in the local market [88,90]. Urban agriculture can generate job opportunities for low-income people, and with the upsurge in food demand in urban centers, small-scale farming can be made to flourish and expand to commercial farming [85]. Urban agriculture can contribute to food justice by enabling all urban dwellers, including low-income people, disadvantaged communities (refugees, disabled people, individuals afflicted by HIV/AIDS, unemployed, senior citizens without pension and female-headed household) and food-insecure households, to access land to grow their own food. By converting the available urban land into urban agriculture, urban

dwellers can be made more food self-sufficient. In this way, urban dwellers can obtain affordable, local and nutritious food [87,88].

Urban agriculture, in line with urban green spaces and urban forestry, can improve the urban microclimate by greening the city, reducing urban heat island effects, casting shade, reducing wind speeds, cooling the air, reducing air pollution, reducing dust levels, decreasing stormwater runoff quantities and adjusting humidity. As a response to climate change, increasing the percentage of green spaces in cities is crucial. By producing fresh food in and around cities and by reducing the food transportation distance, the ecological footprint of the cities can also be reduced [88,91–94].

Urban agriculture can be defined as the production of food in urban and peri-urban areas. In this vision, food is produced locally in available open spaces in and on the periphery of urban centers, such as on farmlands, residential gardens, roofs, balconies, patios and window sills [88,92,95]. The general attributes of urban agriculture can be summarized as follows: (1) urban agriculture involves the cultivation of perishable products such as vegetables, fruits, grains, herbs, and medicinal and ornamental crops; it includes aquaculture (raising fish) and small-scale animal rearing (e.g., pigs, rabbits, goats, chickens); (2) it is usually practiced close to the local markets; (3) due to urban land limitation, it is practiced in limited land and confined spaces; (4) it utilizes urban resources such as wastewater and organic solid wastes; (5) it produces fresh local food without additional processing; (6) the final product is usually distributed via farmers market [85,87,92].

Urban agriculture can be practiced at residential, neighborhood and city scales. At the residential level, spaces such as backyards, gardens, balconies and rooftops can be utilized for growing food. At the neighborhood and city scales, spaces and lands such as rooftops, community gardens, parks, children's playgrounds, school gardens, university campuses, paths, streets and roads, railways, areas under power lines, river banks, regions alongside streams, former industrial sites and slope terrains can be utilized for urban agriculture. Vacant or underutilized public lands can be transformed into sites for producing local fresh food [96].

Community gardens can be defined as a series of individual plots arranged in a section of land. Community gardens are usually established in available public green spaces and vacant lands at the neighborhood scales. Community gardens are gardened by organized people from the neighborhood [91,97]. The principal purpose of growing food in community gardens is for self-consumption; urban gardeners usually consume more fresh products (harvested from the community garden) than non-gardeners, and they usually share products with family, friends and food banks [98]. Present-day community gardens became popular and prevalent, particularly across North America, Europe and the United Kingdom, throughout the First and Second World Wars as a response to war-time food scarcity [91,97].

The following benefits can be gained by establishing community gardens: (1) growing food and generating income, (2) consuming more fresh food, (3) increasing physical activity, (4) reducing irritability and mental fatigue, (5) increasing life satisfaction, (6) maintaining neighborhood food security, (7) neighborhood beautification, (8) community involvement, and (9) fostering neighborhood interaction and social ties [91,97–99]. Community gardens can host leisure and recreational activities, educational workshops, and social events [99]. They can contribute to neighborhood enrichment by organizing educational programs and job training workshops (farming, gardening, nutrition and cooking), which can benefit low-income people and marginalized communities [94].

Rooftop agriculture can be regarded as one specific type of urban agriculture. In the dense urban fabric, where vacant parcels are scarce and available growing spaces are lacking, flat roofs can be considered as grounds that can be utilized for urban agriculture. By converting the available rooftops in a city to urban agriculture, a portion of the city's demand for fresh food could be met [95,100]. Rooftop agriculture can be set up in residential, commercial and educational facilities. Households, community members, farmers, NGOs, government sector and educators affiliated with educational facilities can be actively

involved in rooftop farming. The technology used for farming ranges from soil-based systems (containers and pots) to simple hydroponic systems. Greenhouses can also be added to the roofs.

The primary objectives of rooftop agriculture can be summarized as follows: (1) domestic food production (small-scale farming); (2) commercial food production (large-scale farming); (3) involvement of community/neighborhood in shared activities such as farming; (4) educating the young generation regarding farming [90]; see Table 1.

Table 1. Urban rooftop and elevated agriculture agenda (developed by authors).

	Urban Rooftop Agriculture		
	Building Type		
	Residential	Commercial (Restaurants, Hotels, Office Buildings and Public Buildings)	Educational (School and University Campuses)
Farming type	family-based garden	community garden/commercial farm	educational farm
Technology/structure	soil-based system (containers, pots, bins, bags, boxes, racks), simple hydroponic system, greenhouse structure	soil-based system (containers and pots), simple hydroponic system, greenhouse structure	soil-based system (containers and pots), simple hydroponic system, greenhouse structure
Primary goals	domestic food production	commercial food production and community involvement for shared activities	knowledge and skills sharing

Two distinct systems can be utilized in rooftop plant production: soil-based and hydroponic systems. Soil-based systems use containers filled with soil and compost. The depth of the container varies between 5 cm to 25 cm, based on the crop type. A variety of plants comprising leafy vegetables (e.g., basil, swiss, celery, chard, lettuce), roots (e.g., beet, carrot, turnip, radish), bulbs (e.g., onion, garlic, potato), fruits (e.g., eggplant, pepper, tomato, cucumber) and medical, ornamental and aromatic plants can grow in containers. Roof farming requires irrigation; the roof needs to be equipped with irrigation systems, such as drip-lines or micro-sprinklers [101]. A hydroponic system is a soilless system, which means the growing media (plants) are put directly into a nutrient solution. The hydroponic system is an alternative solution for cities where agricultural land is limited. Hydroponic systems require limited space, and are affordable. In comparison to traditional soil-based farming, a hydroponic system requires less water and fertilizers; it offers faster plant growth and yields more harvest per year. Low-income people can utilize hydroponic systems to create self-employment, generate income and improve diet. Simplified hydroponic systems, such as the nutrient film technique, float hydroponics and column systems, are popular for small-scale farming [101].

A green house as a protecting feature can be added onto a building's rooftop. The principal function of a greenhouse is to shield the crop against hostile conditions such as wind, rain and unfavorable temperatures. The location, orientation, structure and covering material are vital issues that should be considered during the design phase of the greenhouse. The following factors are vital in the design of the greenhouse: (1) east to west orientation should be prioritized over north to south orientation; (2) the greenhouse should permit maximum transmission of natural light inside; (3) neighboring buildings might cast shadow, and mechanical systems installed on the roof might cast shadow; (4) the greenhouse structure can be made of a steel structure; (5) the following materials can be selected for the covering of the greenhouse: glass, plastic and polycarbonate [102].

A green roof can be defined as a roof with some type of vegetation/plants cultivating on it. Green roofs can be incorporated in residential, educational, commercial and industrial buildings. Green roofs can be categorized as intensive, semi-intensive and extensive. A

minimum substrate thickness of 20 to 50 cm is recommended for intensive green roofs. Various vegetation, plants, small trees and shrubs can be grown on them. Intensive green roofs require high capital to construct. They require regular maintenance, such as irrigating and weeding. Due to the soil thickness, the building structure should be able to support the roof's weight. Semi-intensive roofs refer to any roof covered with 10 to 20 cm of soil. Small plants, shrubs and grass can be planted on semi-intensive roofs. Extensive green roofs are covered with 5 to 8 cm of soil. Usually, sedums and moss can be planted on them. Extensive roofs usually require less maintenance compared to other green roof systems [103,104].

The green wall concept is based on the notion that instead of growing plants on the ground level and roofs, plants can be grown vertically on wall surfaces in order to save space. The wall surfaces can be regarded as a medium for growing vegetations [103]. A living wall system is a specific type of green wall that consists of regular panels, such as planter boxes. Each panel contains soil or artificial growing medium. In this connection, living wall systems utilize hydroponic systems (nutrient solution delivering water and nutrition for plants). Various plants such as evergreen, flowers and edible plants can be grown in the mentioned system [105].

Indoor green spaces should be considered as part of the totality of urban green spaces. Incorporating green elements in indoor spaces has a positive effect on the mental and physical health of the building's users. Individuals approximately spend up to 80% of their time inside buildings on a daily basis [41]. In this regard, it is crucial to deliver high air quality to the residents. Green elements can purify the indoor air, remove indoor pollutants and have a positive impact on the well-being of the occupants [106,107]. In addition, interior spaces equipped with plants are perceived as more pleasant, inviting, attentive and less stressful than interior spaces furnished with other aesthetic features [107,108].

Incorporating green elements with interior architecture can have a positive effect on the stress reduction of users [109]. In the case of office space, the presence of plants can enhance the perception of the workplace quality, and affect staff mood and productivity [110]. Green elements in indoor spaces can be categorized as potted plants and green walls. Green elements are kept in various buildings and settings, such as residential buildings, office buildings, hospitals, department stores, and other settings of everyday life [41,103]. Green elements can be situated in various indoor spaces, such as entrance spaces, foyers, atriums, corridors, stairways, window sills, patios and interior courtyards [103].

2. Social Sustainability Concept within the Graduate Studio

Various environmental, societal, cultural, socio-economic and socio-political transformations are changing the fabric of societies globally. Academia needs to provide the education that would assist young architects in responding to contemporary and future transformations. The mentioned changes demand the design of a studio pedagogy as a learning system, in order to readjust its goals and objectives and more comprehensively respond to current and future changes [111].

In this context, the Graduate Studio avoids placing considerable emphasis on the formal aspects of architecture. The principal intention of the Graduate Studio is to be responsive to real problems that exist in the real world. The design studio's aim is to expose young architects to the real-world problems and engage with them. The Graduate Studio aims to raise young architects' awareness of contemporary environmental and socio-cultural issues [111].

The concept of sustainability is part of the Graduate Studio design framework. The term sustainability has been widely used in the discipline of architecture [112,113]. In fact, there is a direct relationship between architecture and the environment; both architecture and the environment play a crucial role in facilitating basic human needs [112,114]. The subject of sustainability in the discipline of architecture is an outcome of several activities, and fulfils several criteria of designing buildings and landscapes. A successful outcome that meets the sustainability criteria can assist in providing aid to humanity and the environment [112].

The origins of sustainability in the 20th century can be traced back to the early years of the 1970s. The perception of the environment began to change in the 1970s, as a result of the growing literature on environment degradation. The fundamental premise of the published literature in the mentioned era can be summarized as follows: infinite growth grounded on the utilization of finite global natural resources and material is simply out of reach; industrial activities at the global level have begun to alter the environment in unrecoverable ways, and human activities in total are increasingly reducing the Earth's life support capacity [115–120].

Concern for environmental degradation as a vital global issue and the introduction of sustainability as a response emerged in the United Nations Conference on Human Environment that was held in Stockholm in 1972. Afterward, the UN Environment Programme (UNEP) was founded in Nairobi, Kenya, with the objective of inspiring partnership in caring for the environment, by providing information and empowering nations and humanity to improve their quality of life without compromising that of the next generations [118]. As concerns for environmental degradation and the negative impacts of humans on the environment were spreading, the UNEP established the World Commission on Environment and Development. The aim of the mission was to propose practical and realistic solutions to environmental degradation and the negative impacts of development on the environment. The mission, as stated in their report, which is also known as the Brundtland Report, specifies sustainable development as “the development that meets the needs of the present without compromising the ability of future generations to meet their own needs” [121]. In fact, the outcomes of unsustainable growth and the unsustainable utilization of nature can contribute to lowering the living standards of future generations, and deprive them of key benefits that the current generation enjoys [119,122].

Sustainability has been defined in various ways since the Brundtland Report was published. The core elements that nearly all definitions of sustainability hold can be summarized as follows: (1) Sustainability presents a specific perspective of environmental issues in conjunction with society and the economy. In this vision, economic growth and social development cannot take ecological underpinnings for granted. There is an interconnection between the economy, society and the environment, and the systematic interconnections between the mentioned elements matter. In sustainability discourse, the mentioned elements reinforce and support one another in a reciprocal relationship. (2) Sustainability at its core focuses on intergenerational equity. Contemporary society needs to incorporate novel responsibilities in order to safeguard the well-being and the welfare of future generations. (3) Sustainability at its core attempts to work beyond the contemporary existing regulations and laws. Innovative solutions in sustainability require innovative thinking beyond the existing laws. (4) Sustainability at its core tries to define the concept of nature and establishes an appropriate ethical relationship between human beings and nature. The sustainability concept regards humans and nature holistically; in this vision, human beings are part of the biosphere and totally unified with it. The sustainability concept stands in contrast with the dominant paradigm that regards nature as a vast resource containing raw materials ready to be extracted by humans, nature as an environment that could be utilized for recreational purposes, or nature as a landfill that is capable of processing pollutants [119].

Beyond the mentioned common elements, there is less agreement as to what factors or dimensions should be incorporated into existing definitions of sustainability. Existing definitions may put more emphasis on one or a series of dimensions, or may discard one or a series of dimensions totally. The existence of various definitions of sustainability should not be considered as an issue. Shifting definitions are expected due to the fact that nature is a dynamic and complex system, with current issues appearing that affect the comprehension of the system holistically [119]. In this regard, the discourse of sustainability should be regarded as a journey, not a fixed destination [123].

The extensive understating of sustainability and various definitions of sustainability provides scholars from various disciplines with the opportunity to approach the related problems from their own perspectives, and make their own unique interpretations [120,124].

The concept of sustainability is generally considered as the crossroad of the three following principal spheres: ecology, economy and society [125–128]. The classic triad structure of sustainability has received various critiques and revisions. In regard to the critiques received, there are two major categories, of reformist and revisionist. The reformists accept the classic tripartite sustainable structure; however, they call for a holistic, efficient and intensive balance between the three dimensions in order to achieve greater sustainability. In this context, sustainability is achievable if a strong interaction and dialogue exists among the three dimensions in sustainability discourse. The revisionist, on the contrary, questions the accuracy and comprehensiveness of the classic tripartite structure, and suggests defining an entirely new format or multi-pillar formulation. Both reformists and revisionist approaches, despite their different viewpoints, consider the social aspect of sustainability as a vital and integral component of sustainable development. Both approaches acknowledge and underline the significance of the social dimension [127,128].

In terms of defining social sustainability, no single definition or a single blueprint exists. Social sustainability can be considered as a concept in a state of chaos [128–131]. Multiple definitions exist according to the disciplines' specific criteria, or the specific scope within a particular discipline [132]. It should be mentioned that individuals' viewpoints on social sustainability determine the way it is defined [128].

Shirazi and Keivani [127] underline the following seven key principles for social sustainability: equity; democracy, participation and civic society; social inclusion and mix; social networking and interaction; livelihood and sense of place; safety and security, and human well-being and quality of life. Equity is concerned with human rights and can be considered as the foundation of a society that is socially sustainable. Democracy, participation and civic society focus on citizen's rights to practice democratic processes and take part in communal and political activities. Achieving people-oriented governance is the principal goal here. Social inclusion and social mix points to the importance of valuing social and cultural diversity in a society. Culturally and socially diverse groups of people should be able to cohabit with each other. Social networking and interaction is capable of making a particular society socially connected and cohesive. Sense of livelihood and sense of place focuses on providing a decent livelihood for all people, and creating a shared sense of place among the entire population. Safety and security points to the importance of achieving political stability in a society. Human well-being and quality of life concerns with the individual's happiness, health, dignity and well-being [127].

Quality of life is denoted as a crucial principle when pursuing the development of sustainable societies. The World Health Organization (WHO) defines quality of life as "individuals' perception of their position in life in the context of the culture and value systems in which they live and in relation to their goals, expectations, standards and concerns" [3,133]. It should be mentioned that due to the subjective nature of the concept, a common definition is difficult to reach [128,134]. Quality of life acts as an umbrella term that covers various concepts and fields, such as physical and mental health, happiness, standard of living, environmental quality, economic prosperity, urban services, and housing. It is a broad concept that encompasses various aspects of urban life, such as environmental, physical, social, psychological and economic [128,135]. Well-being is also considered an important factor for achieving sustainable societies [136]. Well-being can refer to the state of being healthy and content in regard to physical, psychological and social standing [131,136,137]. Both physical and mental health are considered vital for an individual's satisfaction [136].

In the discipline of architecture, sustainability is considered as an essential requirement that should be considered during the design process. The architecture discipline is responsible for the design of the built environment, therefore neglecting the sustainability discourse during the design phase could have negative consequences for the environment. In the discipline of architecture, the sustainability discourse is mainly focused on ecological

aspects, and as a result sustainable architecture is generally regarded as designing energy-efficient buildings. The majority of existing definitions of sustainable architecture overlook the economic and social aspects of sustainability. The discourse of sustainability within the discipline of architecture should consider social and economic aspects of sustainability in order to create an effective sustainable approach. In fact, in the discipline of architecture, social sustainability needs to be underlined [120].

The concept of social sustainability is part of the Graduate Studio pedagogy framework. Social sustainability focuses on maintaining and enhancing the well-being of current and future generations [1,2]. Social sustainability can be considered as a condition and process that improves a society's quality of life [3]. It is a specific growth that is consistent with the harmonious progress of the society. It creates an environment in which socially and culturally diverse groups of people can cohabit. It is the goal of social sustainability to enhance the well-being and quality of life of the entire segment of the society [3,138]. A design project can be considered socially sustainable when it is capable of improving the quality of people's lives, reduces social inequality, and creates harmonious living environments [2].

The discipline of architecture is responsible in terms of the social aspect of sustainability, since architecture can contribute significantly to the well-being, comfort and satisfaction of individuals who experience and occupy it [4]. Architecture is also accountable in terms of accommodating public functions. As a place for social gatherings, architecture has a vital impact on the habits and behaviors of the users, and the society at large. Architecture's role with regard to social sustainability is to provide spaces that support social and cultural life [120].

Urban green space can provide social benefits for urban dwellers. Zhou and Rana [26] mention the following six social benefits of urban green spaces: (1) providing recreational opportunities, (2) rendering aesthetic enjoyments, (3) promoting physical health, (4) adjusting psychological well-being, (5) enhancing social ties, and (6) providing educational opportunities. With regard to providing recreational opportunities, urban green spaces can be vibrant and attractive places for urban dwellers. Concerning rendering aesthetic enjoyments, urban green spaces facilitate a unique sense of colors, textures, and sounds, which changes according to the season and weather conditions. By regularly visiting nature, urban dwellers can acquire pleasure, gratification and aesthetic enjoyment. By being in close contact with urban green spaces, urban dwellers can benefit in terms of improving their physical health. Urban green spaces can urge individuals to participate in more outdoor physical activities. Adjusting psychological well-being means that urban dwellers, by being in close contact with nature, improve their psychological well-being. Urban green spaces provide emotional relief, reduce stress, and offer restorative experiences. Urban green spaces can enhance social ties. Preferable environments, such as urban green spaces, can enhance social interactions. Outdoor green spaces that are accessible to urban dwellers can act as grounds where social interaction occurs. Urban green spaces can provide educational opportunities, especially for children. Scientific studies, such as animal science, vegetation and ecology, can be conducted in urban green spaces [26]. As mentioned before, the provision of urban landscapes (green spaces and open spaces) is vital in contemporary congested urban environments. The mentioned spaces can act as a buffer zone that facilitates public interaction and social gatherings [1,2].

Urban agriculture can contribute to social sustainability. Urban agriculture is capable of providing a ground for educational programs, learning experiences and youth development. Urban agriculture can be part of the educational curriculum [139,140]. The available agricultural facilities within cities are capable of serving as avenues for adults and children to acquire essential skills regarding cultivating fresh local food [139]. Children can spend time in urban farms and assist their parents to cultivate plants, and by doing that they can enhance their knowledge on agricultural practices. In this way, traditional knowledge and practices can be transferred from seniors to the young generation [85]. Urban agriculture can be considered as a vital means for integrating various social groups and

disadvantaged individuals, such as disabled people, senior citizens, unemployed people and immigrants [85]. Urban agriculture can contribute to educational programs, such as skills development and job training, which are beneficial for the mentioned disadvantaged social groups [94]. It can facilitate their participation in society and improve their living conditions. They can also collectively engage in urban farming, and by doing so, their interpersonal relations can be strengthened [85]. A community garden or a rooftop garden is a place where individuals can meet for mutual benefits [94]. For some urban farmers, the urban garden is a place for organizing social meetings within their neighborhood. In this regard, the urban farm provides social cohesion and psychological health [141]. Globally, it is predicted that approximately 65% of urban farmers are women. It is argued that urban agriculture provides a platform for female farmers to better integrate into the texture of the society [85]. Urban agriculture can contribute to civic engagement, and individuals who practice it are usually more engaged in their communities and are more willing to volunteer for community services compared to the general public [139]. Thus, it is capable of fostering community empowerment [94].

In this context, architecture, urban green landscapes and urban agriculture should be able to offer spaces for urban dwellers where social and cultural life can occur. Overall, the Graduate Studio focuses on the concept of social sustainability, with an emphasis on enhancing the quality of life and well-being of urban dwellers.

3. Results: Developing a Framework for Walking/Cycling and Green Spaces/Urban Agriculture in Graduate Studio

The principal goal of the Graduate Studio is to shift from solely focusing on designing isolated individual buildings to considering the interrelations between buildings and common spaces around them [9,142]. The Graduate Studio goal is to focus on buildings, landscapes, and the interrelations between buildings, landscape, neighborhoods and the city at large. In this vision, the buildings and landscapes are interconnected, and such connectivity provides a ground for walkability by providing necessary infrastructure such as walking/cycling paths and trails. The Graduate Studio's goal is to create walkable zones within the fabric of the city. The Graduate Studio projects should provide walkable ground for the adjacent neighborhood's residents; in this way, the urban dwellers are equipped with the necessary infrastructure for engaging in regular physical activity. Considering the design of walkable zones, the following points are implemented within the Graduate Studio design framework:

- Establishing maximum number of walkable paths in buildings and landscape;
- Creating a cycling lane around the perimeter of the landscape;
- Creating sitting spots and semi-open spaces within the landscape;
- Establishing a connection to existing street networks;
- Connecting buildings with the landscape and creating indoor walking environments;
- Connecting the building's roof with the landscape and utilizing the roof as a walking path;
- Utilizing elevated walkways and connecting the building and landscape with the fabric of the city;
- Connecting the buildings and landscapes with local nearby trails via walking/cycling routes;
- Connecting the buildings and landscapes with nearby urban parks via walking/cycling routes.

As mentioned before, urban growth and densification results in a reduction in the percentage of green spaces in contemporary cities. The Graduate Studio aims to encourage the young architect to design environments that are capable of connecting city-dwellers with nature. Urban dwellers should be able to experience nature in their everyday life. In this way, the well-being and health of urban dwellers can be enhanced. In order to complete the mentioned tasks, green elements should be incorporated with buildings and landscapes.

The Graduate Studio encourages young architects to envision environments that are equipped to produce local fresh food. This vision regards future cities as grounds where food is cultivated. The Graduate Studio considers buildings and landscapes as places able to cultivate food, contribute to urban food supply, improve disadvantaged communities' food security and access to nutritious food, and create employment for low-income urban dwellers via practicing urban agriculture. In relation to incorporating green elements into architecture and landscape, the following points are implemented within the Graduate Studio design framework:

- Incorporating green elements such as green walls into indoor spaces, such as entrance spaces, foyers, atriums, corridors, stairways, window sills, patios and interior courtyards;
- Incorporating hydroponic systems into available indoor spaces such as basement, interior gardens and balconies;
- Incorporating the green wall concept within building envelopes. The building envelope can be regarded as a medium for growing various plants;
- Converting a section of the roof to rooftop urban agriculture (rooftop container gardens or hydroponic systems);
- Adding a greenhouse structure to the roof;
- Adding green roof systems (intensive, semi-intensive and extensive) to the roof;
- Converting part of the site into a community garden;
- Converting as much of the site as possible into green spaces.

3.1. Graduate Studio Ecological Notions

In line with the above-mentioned framework, the Graduate Studio, within its teaching and learning pedagogy, contains ecological concerns. The Graduate Studio attempts to facilitate a teaching and learning pedagogy that shifts from anthropocentric design to ecocentric design principles. Principally, anthropocentrism restricts value to humanity alone, while ecocentrism design perceives and protects value all over nature as the main design approach [143]. Transitions from anthropocentrism to ecocentrism assist young architects to develop and even change their mindsets to be more sensitive, responsive and mindful toward ecological concerns that have recently overwhelmed the earth, such as climate change, biodiversity loss, wildlife habitat loss and increasing environmental pollution. The mentioned ecological issues require a serious re-evaluation of our approach toward our contemporary lifestyle and consumer culture.

In other words, there is an environmental crisis taking place on the planet, and young architects in the design studio are reminded that human beings, with their contemporary lifestyle, should not be regarded as part of the problem. In fact, human beings with their contemporary lifestyle are the core of the ecological problem. To mitigate environmental problems, humankind needs to revisit its lifestyle and life standards.

One of the challenges that young architects encounter within the Graduate Studio is to understand and redefine an existing common perception concerning contemporary human civilizations. The common perception has defined an illusionary picture where humans as intellectual beings are the master of the Earth, and intellectually stand above all wildlife, hence claiming the right to alter life on the planet. Martin Heidegger in his own terms describes the role of humankind in the mentioned illusionary picture as: "man, precisely as the one so threatened, exalts himself to the posture of lord of the earth. In this way the impression comes to prevail that everything man encounters exists only insofar as it is his construct. This illusion gives rise in turn to one final delusion: It seems as though man everywhere and always encounters only himself" [27,144].

As mentioned previously, young architects are encouraged to integrate green elements within their design projects. The Graduate Studio considers green elements as "the lungs of the city". In this vision, green elements facilitate habitats for wildlife. Plants as green elements function as an energy source for wildlife, such as insects and birds [145]. The young architects must also integrate various local flora and fauna into their design projects

in order to enrich biodiversity. The Graduate Studio encourages the young architects to envision projects that satisfy human needs, as well as those of other creatures. Therefore, during the architectural design process, young architects are encouraged to go beyond the mentioned common mindset (human beings as the master of the Earth/anthropocentric vision) and envision a design that is principally ecocentric. The young architects are required to envision the potential opportunities that arise in their design projects in order to benefit other living entities and related wildlife.

Increasing green surfaces and areas, as mentioned above, will attract other living entities including wildlife, which may ecologically help to sustain urban developments. It may offer a better quality of life for both humans and animals. Meanwhile, it can benefit local animals and immigrant birds. Reducing vehicle-based transportation and replacing it with more eco-friendly transportation provides an environment more favorable to animals, with lower casualty rates in urban spaces.

3.2. An Overview of Graduate Studio Projects

The below design project samples were developed according to the above-mentioned Graduate Studio frameworks.

Design project sample one: The project focuses on revitalizing the historic railway track in Gaziantep city in Turkey. The aim of the project is to convert the abandoned historic railway track into an urban green landscape. The design proposal offers walking and cycling paths for urban dwellers (adults and children); it also offers various educational and entertainment facilities for children. The project's vision is to improve children's mobility within Gaziantep city. Children should be able to discover the city, and enjoy freedom of movement and gather/play in public spaces. In fact, public spaces within a city should be responsive to the needs of children as a distinct group. The project also establishes community gardens for children. The active participation of children in community gardens can enhance their knowledge about environmental education and science. Community gardens, as an educational facility that facilitates informal learning, engage children who are living in urban centers. In addition to the mentioned objectives, as much of the site as possible is dedicated to green spaces in order to increase the percentage of available green spaces in Gaziantep city (Figures 5 and 6).



Figure 5. Converting the historic railway track into urban green landscape in Gaziantep City, Turkey [146].

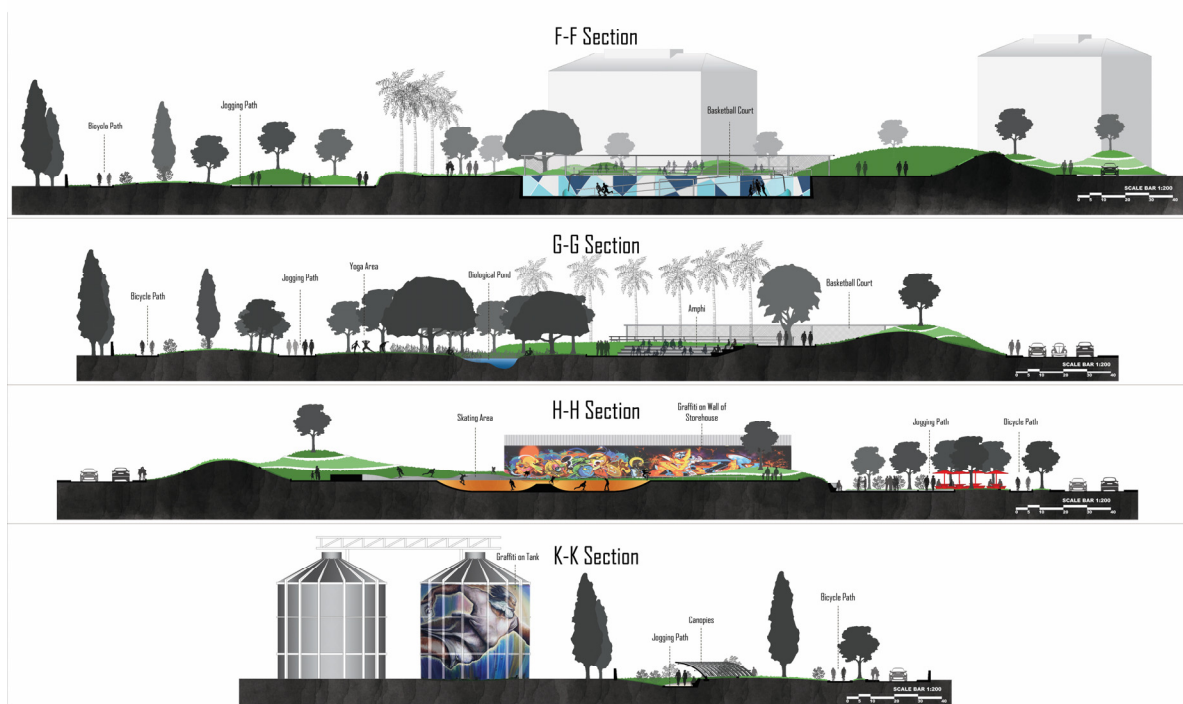


Figure 6. Four sections illustrating children playgrounds and walking/jogging paths [146].

Design project sample two: In order for the contemporary city to cope with the impacts of climate change and environmental problems such as air pollution, it is vital to integrate green spaces with urban buildings and landscapes. The aim of the design project is to integrate green elements with existing buildings and landscapes in the city of Bishkek in Kyrgyzstan. The design project proposes maximizing the amount of available green spaces in the city in order to reduce the air pollution and improve local ecology in the city of Bishkek. The project's vision is to integrate innovative forms of urban agriculture, such as vertical gardens, rooftop gardens, rooftop greenhouse gardens, indoor garden/farming and community gardens, with available buildings and landscapes in Bishkek. The project focuses on facilitating urban agriculture for low-income people in order to improve their food security and access to healthy nutrition, and create employment for them (Figure 7).

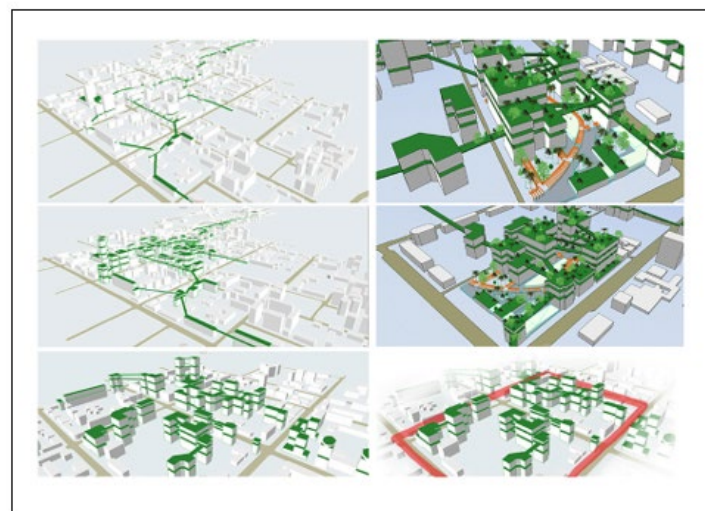


Figure 7. Integrating green elements within existing buildings and landscapes in the city of Bishkek, Kyrgyzstan [147].

Design project sample three: The aim of the design project is to revitalize the riverbank at the city of Mosul in Iraq, and make it accessible for urban dwellers. The project envisions the Mosul riverbank as a public space. The riverbank, in this project, is envisioned as an urban green landscape that facilitates walking paths, cycling paths, pedestrian bridges, community gardens, green spaces and recreational facilities. The walking and cycling paths and pedestrian bridges connect both sides of the riverbank, and create a unified urban green landscape. In addition, urban dwellers (adults and children) can cross the river via safe pedestrian walkways and bridges, and in this way both sides of the city are more unified (Figures 8 and 9).



Figure 8. The plan of the urban green landscape in Mosul, Iraq [148].

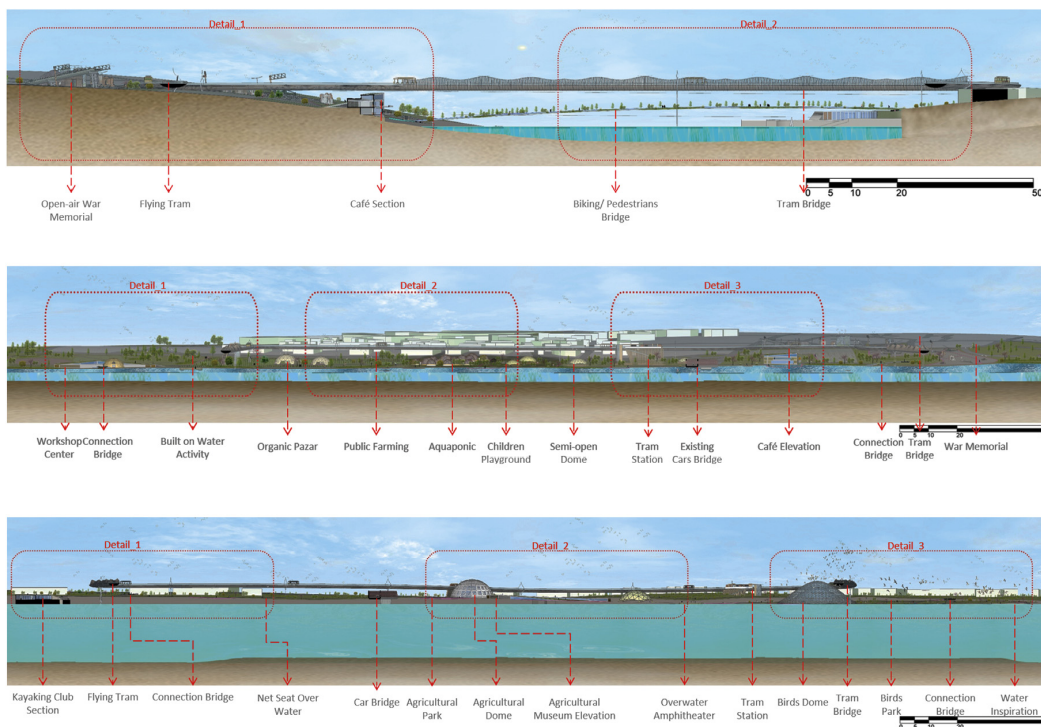


Figure 9. Three sections illustrating pedestrian bridges that connect both sides of the riverbank [148].

Design project sample four: The aim of the design project is to design an urban landscape in order to increase the amount of available green space in the city of Hatay,

Turkey. In order to enrich the local habitat and biodiversity, the project proposes developing a green urban landscape project. Urban green spaces should be accessible to urban dwellers, thereby creating pedestrian walkways that connect various surrounding neighborhoods with the green urban landscape (Figure 10).



Figure 10. Adding urban green landscape to the city of Hatay, Turkey [149].

Here we address research question one, “in which ways can the concept of walkability affect the architecture design projects within the design studio?” The concept of walkability affects the design of buildings and landscapes in the following ways: (1) the proposed landscape design is equipped with walkable paths and cycling lanes; (2) the proposed buildings are equipped with walkable indoor ground, and the roofs are utilized as walkable grounds; (3) the proposed buildings and landscapes are connected with the fabric of the city by designing walkable paths, cycling lanes and elevated walkways; (4) walkable paths, cycling lanes, and elevated walkways link the intended buildings and landscapes to surrounding urban green areas. Regarding research question two, “in which ways can the concept of urban green spaces affect the architecture design projects within the design studio?”, the concept of urban green spaces influences the design of landscapes and buildings in the following ways: (1) the proposed landscape layouts contain green spaces; (2) interior and exterior spaces are equipped with green elements; (3) green walls are installed on building envelopes; (4) the proposed roofs are converted to green roofs.

Regarding research question three, “in which ways can the concept of urban agriculture affect the architecture design projects within design studio?”, by incorporating the concept of urban agriculture, the design of landscapes and buildings is affected in the following ways: (1) landscapes and buildings are regarded as grounds where food can be cultivated; (2) by incorporating innovative technologies for food cultivation, such as hydroponic systems, food can be cultivated in indoor spaces; (3) the proposed landscapes and buildings are equipped with greenhouses for cultivating food; (4) the proposed landscapes are equipped with community gardens.

3.3. The Proposed Framework Limitations

Designing pedestrian environments, providing urban green spaces, and cultivating food in urban areas all pose obstacles. The following problems linked with developing pedestrian environments, providing urban green areas, and cultivating food in urban centers should be considered by young designers throughout the design process. Creating barrier-free pedestrian environments for the elderly, children, and handicapped is a

challenge. The pedestrian environment should be designed for individuals with diverse abilities and ages [150]. Pedestrian environments require adequate infrastructures, such as walking paths, cycling paths, furniture, trees, shading devices, lighting features, and marked pedestrian crossings [15].

Providing new green spaces in dense urban environments is a major issue. The lack of available land that can be allocated to urban green spaces in compact cities is a challenge. Narrow streets, high pedestrian flow, lack of sunlight, and poor soil are major issues regarding greening contemporary cities [20,25,151,152].

Several issues are associated with practicing urban agriculture in various cities in developing and developed countries. (1) In most developing countries, urban agriculture is regarded as rural activity; therefore, it is considered illegal. (2) The practice of urban agriculture is regarded as making minor contributions to the urban economy. (3) Individuals practicing urban agriculture usually have little say in or influence on the activities of the city council. (4) The practice of urban agriculture can involve potential health hazards. Various health issues can occur when wastewater is used for irrigation, or when solid waste is utilized. As a major contaminant, lead in soil and air can be absorbed in leafy vegetables. Chemical fertilizers can pose potential environmental issues. (5) The land utilized for urban agriculture can be used for developing urban housing. (6) Considering the lack of available land, individuals who are eager to cultivate are therefore not able to practice [153,154].

The integration of innovative technologies for cultivating food within interior spaces, exterior spaces, and rooftops requires considering the following practical issues: (1) The production of food in indoor spaces requires utilizing artificial lighting, which consumes electricity; (2) Hydroponic systems utilize industrial fertilizers to enhance the yield. Exposure to fertilizers might cause human health risks; (3) There is little acceptance in society regarding cultivating food using soilless systems such as hydroponics. People are usually critical of this production method and its products. They prefer naturally produced foods; (4) In the case of rooftop agriculture, cultivated food can be by urban air pollution; (5) Integrating urban agriculture with present buildings requires considering the building's structural capacity to carry the extra load; (6) Installing hydroponic systems and greenhouses requires initial investment, which can be costly for low-income practitioners; (7) Installing greenhouses and rooftop gardens requires accessibility to the rooftop, which can be an issue [155].

4. Discussion

The human urban population has been on the rise in recent decades, which can contribute to future urban growth. It is evident that current and future urban development will need to be equipped with adequate infrastructures to support the well-being of urban dwellers and enhance their quality of life.

The principal vision of the Graduate Studio is to consider and be responsive to the problems that exist in the real world. The objective of the Graduate Studio is to familiarize the young architect with, and expose them to, the real environmental and societal problems, and engage them with them [111]. The Graduate Studio attempts to focus on the concept of social sustainability, which includes improving the well-being and quality of life of urban dwellers.

Designing walking/cycling zones by integrating buildings with landscapes is part of the Graduate Studio policy. The Graduate Studio design projects should create walkable zones in interior spaces, semi-open spaces, rooftops and adjacent landscapes. The design projects should be connected to the fabric of the city by utilizing pedestrian and elevated walkways, and available trails. In this way, future urban dwellers will have access to the necessary infrastructures for engaging in regular physical activity. By engaging in regular physical activities, their well-being and quality of life can be enhanced.

On the other hand, urbanization has undergone a global rising trend. The trend may lead to the decline of available green spaces within urban centers. Urban development over a long period of time may significantly change the urban fabric, and negatively affect

its environmental quality. Urban green spaces provide crucial habitats for wildlife, and valuable resources for the recreational purposes of urban dwellers [22]. As a response to the mentioned issue, the Graduate Studio policy is to encourage young architects to incorporate green elements within their design projects. By integrating green elements with buildings and landscapes, future urban dwellers will be able to experience nature in their everyday life. In this way, their well-being and quality of life can be improved.

Merging urban agriculture within the built environment is also part of the Graduate Studio policy. In this vision, future cities can produce local fresh food. Cultivating food in urban environments can contribute to the urban food supply, generate employment for low-income people, and improve the disadvantaged communities' food security and access to nutritious food. Urban agriculture is capable of enhancing the quality of life and well-being of contemporary and future urban dwellers.

Overall, the Graduate Studio, at the Faculty of Architecture, Design & Fine Arts, is attempting to redefine its goals and objectives. Instead of focusing on designing isolated buildings and solely focusing on aesthetics/formal dimensions, the design studio has shifted to a holistic approach, which encompasses the current and future needs of the urban dwellers and preserves the natural habitat. Notably, these dwellers include humans as well as the wildlife that coexist in urban areas.

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