

Nutritious Landscapes: Building Healthy Food Environments in the Metropolitan Periphery of Mexico City

ALEKSANDRA KRSTIKJ

Tecnologico de Monterrey

GRETA LUKOSEVICIUTE

Tecnologico de Monterrey

CHRISTINA ANNE BOYES

Centro de Investigacion y Docencia Economicas

Keywords: food environment, metropolitan periphery, Mexico City, resilience, urban landscape

Based on analysis of factors that determine accessibility, availability, and acceptability of food services, this work explores the food environment in Mexico City’s metropolitan periphery. The method aims to shed light at possible integrated approaches in planning that can promote food security for vulnerable communities. The conceptual redesign of five public areas was presented in an effort to open the discussion on main challenges and opportunities related to implementation of urban garden projects, focusing on four axes: water, biodiversity, mobility and public space. The projects were done by students during the Capstone Projects II architectural studio in Fall 2020 and Spring 2021, and were supported by the Municipal Deputy Director of Urban Planning and Regulation, the Chief of Risk Information Systems of the National Center for Disaster Prevention of Mexico, and a permaculture expert. By enabling critical thinking, setting the base of action on social justice, and encouraging the use of social media, the method turns students into active agents of social change and provides an important contribution to the necessary, but still uncharted, paradigm shift in architectural education from object to people-driven design.

INTRODUCTION

The global trend of increasing overweight and obesity in the population, resulting from an upsurge in processed food intake and the reduction of physical activities, has gradually shifted focus from developed countries toward the urban poor in emerging regions.¹ In Latin America, the absolute annual percentage point change in weighted prevalence of overweight and obesity for women in urban areas is among the highest in the world.² Obesity and overweight are leading causes of several other preventable and noncommunicable diseases, such as diabetes,³ hypertension,⁴ and depression.⁵ Even though some countries are already exploring programmatic and policy measures to face this global health crisis, very few engage in serious planning efforts to mitigate dietary risks.²

There is mounting evidence that the neighborhood food environment, understood as “the interface that mediates one’s

food acquisition and consumption with the wider food system”⁶ strongly influences dietary behavior and obesity.^{7,8,9} The World Health Organization identified food environment interventions as strategies for creating improvements in dietary patterns and weight status.¹⁰ Although geographical patterns of food production and distribution undoubtedly clarify some aspects of the food security problem, wider integration of contextual socioeconomic factors is necessary, especially when researching food environments of the most vulnerable populations living on the urban fringe of emerging regions. The importance of lifestyle, social and community networks, living and working conditions, and general socioeconomic and cultural determinants should be recognized as key aspects of healthy eating.^{6,11}

This article reports on our recent research exploring dietary modernity and underlying mechanisms that influence changes in dietary behaviors in several Mexican cities. The study based on a survey in various metropolitan zones probed the role of factors outside of transportation infrastructure and the prevalence of fast food and convenience stores -measures which are commonly used to address accessibility and availability of food sources- to examine the peri-urban food environment in Mexico and set the course for future research. We focused on availability, accessibility, and acceptability of food that embody inequities and determine health outcomes. Availability is related to the physical presence and walkable proximity to food offered/served in various settings. Accessibility describes food’s availability in a form and location that facilitate its consumption, for example the price of food products in relation to income and the presence and quality of the pedestrian infrastructure to reach food outlets. Acceptability is an indicator of food quality, people’s education related to nutrition, and cultural habits that can affect food choices and determine health outcomes.

Furthermore, we present several design proposals aimed at improving the food environment in the municipality of Atizapán de Zaragoza –part of the northern industrial belt of Mexico City. The proposals were developed for the Capstone Projects II, during the Fall 2020 and Spring 2021, with a participation of 26 students. The inputs for the design proposals were the survey study and the extensive urban analysis performed by the students.

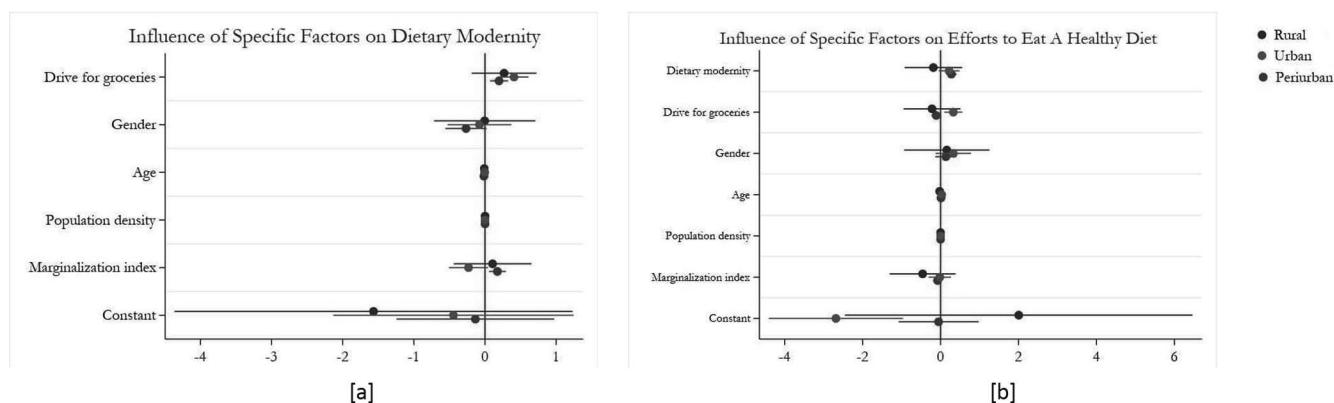


Figure 1. Influence of Specific Factors on Dietary Modernity and efforts to eat a healthy diet. By authors.

The project received support from external experts in municipal urban planning, risk reduction, and permaculture.

The paper has four main sections: section two provides a review of previous literature and the theory driving our research, section three describes the Mexico City's metropolitan periphery with focus on our case of Atizapán de Zaragoza, section four presents the design studio work, and in section five we discuss the possible implications of the research and design.

BACKGROUND AND THEORY

Inequality is not a natural phenomenon but a result of societal action, planning, and public policy.¹² Mounting research focused on the relationship between food environment and health outcomes attests to the fact that the social and urban environment, and the lifestyles they promote, result in health inequality.^{13,14,15,16,17} While urban living has undoubtedly improved many aspects of health,^{18,19,20} the disadvantages of urban poverty can be worse than rural poverty.²¹

Availability, accessibility, affordability, food quality, and store characteristics are consistently identified as key determinants of purchasing behaviors that often result in less healthy food choices within community nutrition environments.²² In this paper, the term modern diet refers to the consumption of store-bought vs. homemade meals and processed foods. We define healthy diet as "higher in plant-based foods, including fresh fruits and vegetables, whole grains, legumes, seeds, and nuts and lower in animal-based foods, particularly fatty and processed meats."²³ Poorer neighborhoods, even in developed contexts, often suffer from decreased access to healthy food and lower-quality products.²⁴ Likewise, infrastructure, market access, percentage-working women in urban areas, and norms and institutions significantly influence food consumption in developing contexts.²⁵ Built-up patterns, individual, social, and cultural factors also play a crucial role in determining how individuals interact with their food environment.²⁶

In 2012, 26 million Mexican adults were overweight and an additional 22 million were obese - the second highest global prevalence of obesity in the adult population (30%).²⁷ Thus, concern over health inequality and the food environment are of particular importance in Mexico. Mexican food environments have been studied at various levels of consumption, such as household, school, and community.²⁸ Nevertheless, the food environments of the Mexican peri-urban areas are largely absent from the literature. A recent study by Pineda et al (2021) on the relationship between the retail food environment and BMI in Mexico used food outlet density as a measure.²⁹ The study found that convenience stores that do not have a variety of healthy food options were the most accessible food sources, especially in second lowest, middle, and second highest income households. The authors point out that "as households increase their available income there tends to be a cross-over to a higher availability of food outlets—particularly convenience stores."²⁹

We argued that the Mexican peri-urban areas -with their specific character of fragmented landscape, partial infrastructure, and insufficient services- influence food environments and dietary habits. The peri-urban areas, sometimes called 'edge-cities',³⁰ 'edgeless cities',³¹ or 'post-suburbs',³² are located on the metropolitan periphery but contiguity itself cannot explain the phenomenon.³³ Key features of peri-urban areas are their mediating role in migration between rural and urban and their partially developed infrastructure and services.³⁴ Although researchers and governments have long acknowledged the potential role of peri-urban areas in alleviating food insecurity of urban areas, few studies probe the food environment of peri-urban dwellers. Interrelated challenges of car dependency, poor public transport, and low-density development can hamper healthy food access in edge-cities.³⁵

We specifically argued that peri-urban residents differ from urban and rural dwellers in their attempts to eat healthy and their nutrition is mostly based on a modern diet. Peri-urban residents are frequently commuters to the larger urban centers

their cities border. From the metropolitan periphery to Mexico City, for example, 2.25 million daily trips were registered in 2017 (National Institute of Statistics, Geography, and Informatics of Mexico, 2017). As a result, and contrary to healthy diet and food services, transportation infrastructure is often well-developed in peri-urban areas to reduce the traffic congestion between peri-urban and urban zones. Long commutes and decreased access to unprocessed food may encourage the consumption of meals outside the home as well as processed meals that are easy to prepare, even when peri-urban residents make efforts to eat healthy. Our argument is that, despite attempts to eat healthy and driving for access to better food choices, peri-urban residents face inherent structural disadvantages that make them more vulnerable to the consumption of highly processed and easily prepared foods. We further argue that there is no reason to expect peri-urban residents to have less desire to eat healthy, or to put less effort into doing so, and when they have access to healthy foods, they will make efforts to eat healthy. We therefore arrived at three testable hypotheses:

Hypothesis 1: Peri-urban residents who live in more marginalized areas will be more likely to consume a modern diet than urban residents.

Hypothesis 2: Peri-urban residents who report driving for groceries will be less likely to attempt to eat a healthy diet than peri-urban residents who do not drive for groceries.

Hypothesis 3: Peri-urban residents who consume a modern diet will be likely to put effort into eating healthy.

The data for this study came from a voluntary, non-random survey of 453 participants from more than 70 neighborhoods in 17 Mexican States. It is a convenience sample distributed in the communities of origin of 40 student volunteers from Fall 2020 to Spring 2021. Respondents answered a battery of 57 questions related to their dietary, transportation, and shopping habits. Much of the sample is under 40 years of age. Furthermore, most respondents live in areas characterized by very low to medium marginalization. Notably, the sample is not representative of the general population of Mexico. Despite this shortcoming, it is important to note that the relative homogeneity of this group of respondents could mean that the variations seen in this sample are greater in the general population. Thus, although the results should be seen as descriptive, the data presented can be viewed as a tough case, within which we should see less variation than we would in a representative sample.

The independent variables were driving for groceries, gender, age, population density, and marginalization. The second set of models incorporate the same set of independent variables together with dietary modernity. These controls allow us to address social, transportation infrastructure, socioeconomic factors, and basic demographic characteristics which may impact consumption practices. The dependent variables were dietary

modernity and attempted healthy eating. For dietary modernity, the components include the consumption of processed fruits, vegetables, legumes, meat, poultry, fish, and milk substitutes. Additionally, the index includes having food delivered to one's home, eating out, making purchases based on marketing, publicity, and brand, and purchasing foods based on ease of preparation and shelf life. Ordering food to go and purchasing food in the supermarket were also included. The components for the effort made to eat healthy include unprocessed fruits, vegetables, legumes, fish, meat, and poultry, as well as whole grain cereals, milk products, consuming organic products, and paying attention to health, calories, organic labeling, and the presence of GMOs and preservatives in purchasing decisions.

The preliminary results show that driving for groceries increases the likelihood that respondents will eat a modern diet, as does marginalization. Older respondents were more likely to try to eat healthy or to buy healthy food products. Figure 1a shows that peri-urban residents who live in areas characterized by greater marginalization are more likely to eat a modern diet (the vertical axis 0 represents no significance, left side of the graph represents negative correlation while the right side positive correlation). Like their urban peers, peri-urban residents who drive for groceries are more likely to eat a modern diet, as well. As figure 1b illustrates, the impact of specific factors on the effort to eat healthy is nearly uniform across zones of urbanization with one key exception. When we control for dietary modernity, the remaining peri-urban respondents who drive for their groceries are less likely to pay attention to health factors or attempt to eat a healthy diet. However, peri-urban respondents who report eating a modern diet are also more likely to report that they attempt to eat a healthy diet. Based on these results, we find tentative initial support for all our hypotheses. We stress, however, that the results of this study are an invitation to further examination of the impact of peri-urban food environments on individual consumption behaviors and, consequently, health.

THE METROPOLITAN PERIPHERY - ATIZAPAN DE ZARAGOZA

Mexico's economic growth is dependent on extractive industries, which in turn have triggered the accelerated growth of cities and de-peasantization.^{36,37} Mexico City is the fifth-largest urban agglomeration in the world and its influence is observed throughout the whole country, but especially in the central region that is a dense patchwork of urban networks where some of the largest peri-urban zones of Mexico City, Toluca, Cuernavaca, Puebla, Pachuca, and Querétaro converge.³⁶ Peri-urbanization has taken place mainly on agricultural lands, 60% of which were expropriated from collectively owned lands or ejidos.³⁸ Mexico's peri-urban inhabitants face degradation of their livelihoods while conflicts for space with other social groups increase. This results in unequal access and use of urban-rural peripheral spaces, which increases marginalization and spurs the redefinition of lifestyles and dietary habits.³⁸ Local resources are not included in policies addressing the mitigation of urbanization's negative

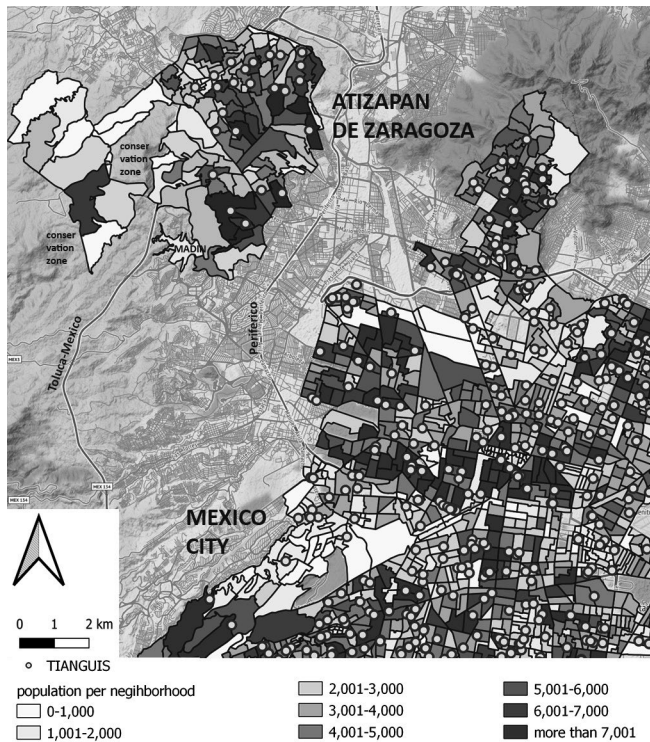


Figure 2. Municipality Atizapan de Zaragoza. By authors.

impacts. For example, agriculture in peri-urban areas is not included in or encouraged as part of policy despite its potential to encourage the consumption of healthier, locally produced foods while improving local livelihoods.³⁸

Atizapán de Zaragoza is a hilly municipality in the northwest Mexico City metropolitan, 23 km from Mexico City's center, undergoing urban consolidation since the 1970s, when it housed only 44,322 inhabitants. Today, urban growth has increased significantly, generating a lack of urban structure to ensure the efficient functioning of the area. By 2015, the municipality had a consolidated urban area of 91 km² and 489,937 inhabitants – 10 times greater than in the 1970s. The zone is largely a commuter municipality, well connected to the city by Periferico and Toluca-Mexico highways. Nevertheless, the lack of efficient and secure public transport only emphasizes the need for services located in walkable proximity to housing. Much of the demand for water is provided from local wells and the Madin dam, located in the south. Nevertheless, the lack of additional water harvesting and management strategies at the municipal level have led to shortages of running water in most neighborhoods in the dry season (November-April) and flash floods during the wet season (May-October). Biodiversity has been gravely affected by the rapid, and in the northern part irregular, urbanization which has diminished natural lands by 70%. There are two natural conservation zones in the central and southwestern part of the municipality that provide ecological services and house most of the wildlife still existent, nonetheless 56% of housing in the marginalized northern zone lacks local parks in walkable proximity.³⁹

Mexican street markets, also known as tianguis, are a common source of fresh, unprocessed and often locally-grown and sourced food products for the residents of the country's urban areas. However, as figure 2 illustrates, peri-urban areas have a significantly lower density of tianguis than their urban neighbors do. In Mexico City, on average there is one street market for every 6,782 people, while in Atizapán de Zaragoza one street market services 18,145 people.

RESULTS

Based on the preliminary research results, the Capstone Projects II studio adopted a research and challenge-based educational concept aimed at developing proposals for improvement of the food environment in Atizapán de Zaragoza. The focus was on the conversion of local and within-walking-range public areas into urban gardens. The local sustainability issues described above framed the architectural/urban intervention concept and defined four principal areas of interest for the intervention: water, biodiversity, mobility, and public space.

The Capstone Projects II studio is based on 90 hours of synchronous work (classwork) and 90 hours of asynchronous work (homework). The work was divided equally between three tasks: exploration, experimentation, and execution. Each included specific subtasks to reach the pre-defined aims with the help of three didactic methods: research, applied knowledge, and networking. The exploration (30/30 hours) was based on research to define the social, natural and built conditions that frame the challenge; the experimentation (30/30 hours) focused on applied knowledge whereby students collaborated with experts in urban planning, social studies and permaculture to develop the initial proposals for an urban garden in a specific location; and the third execution task (30/30 hours) was dedicated to receiving feedback and participating in a critical discussion on the possible implications for the local community development. The course method was designed to respond to the systemic and relational nature of the place-making processes in which small interventions can have implications on larger scales. Therefore, three different territorial scales were tackled through the design: the municipal (L), the neighborhood (M) and the immediate site context (S).

The exploration focused on the analysis at the L and M scale (figure 3). The students used quantitative and qualitative data collected from 14 census documents -shapefiles from INEGI, 2015, and three official planning documents: the CPI report for Atizapán de Zaragoza, 2018; the Municipal Development Plan 2015 and the State of Mexico Development Plan 2015. The main instrument for the analysis was QGIS 3.16, which was a useful tool to correlate different indicators and produce interpretative maps of various aspects of the territoriality, such as:

- Productive Landscape Map (land uses + natural resources + economic dynamics)

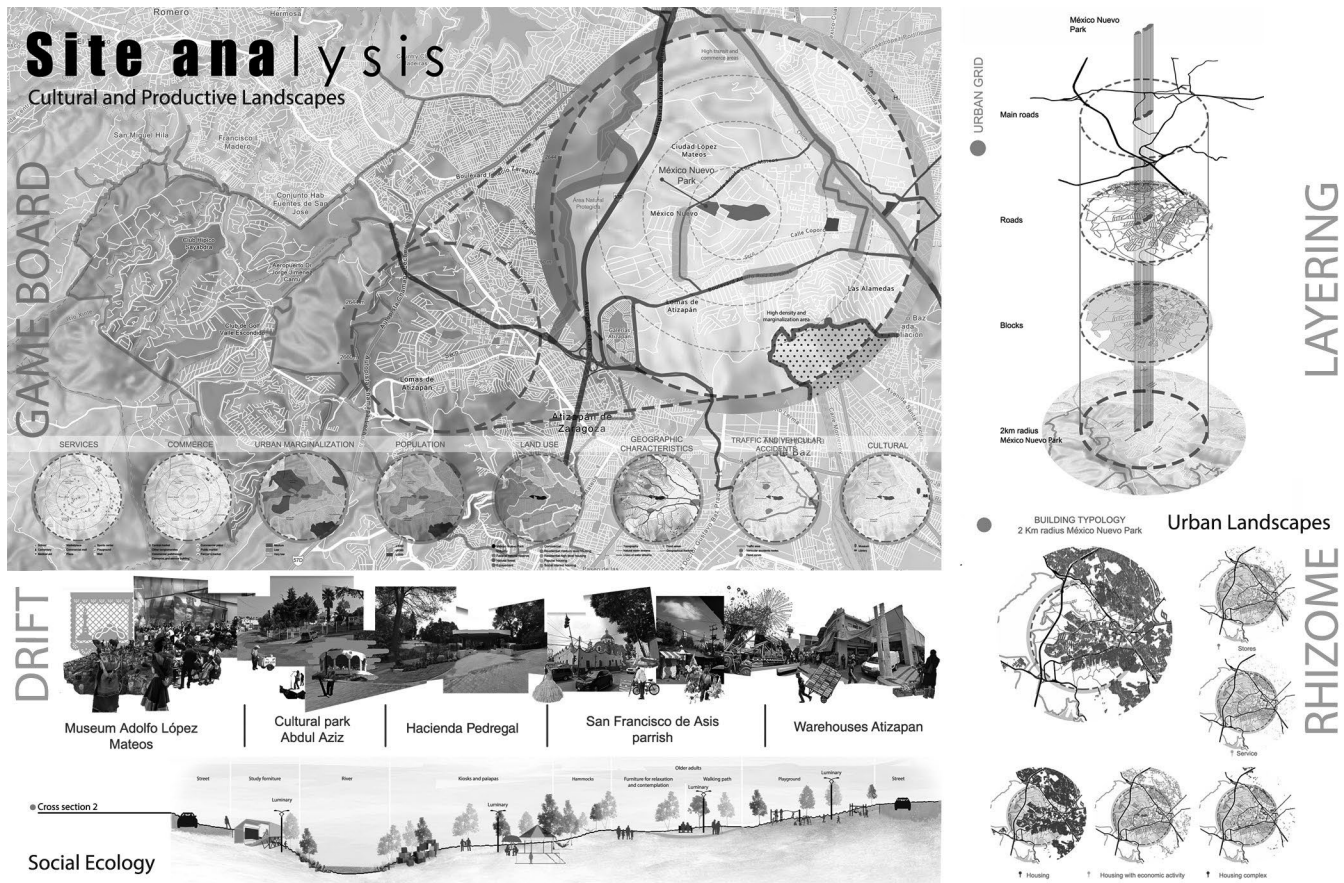


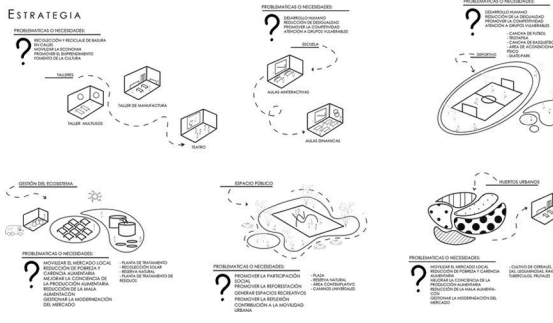
Figure 3. Exploration task example, Urban Analysis of Park Mexico Nuevo. By students Ivy S. Carranza and Sandra Gil.

- Social Ecology Map (social dynamics + public space + services)
- Cultural Landscape Map (nature + socio-economic dynamics + heritage & meaning)
- Urban Landscape Map (figure/ground diagrams + building typology + marginalization)

The tool for the visual representation of the narratives derived from this research was based on Corner’s Cartographic Operations of drift, layering, game-board, and rhizome.⁴⁰ The students identified five public spaces that could be used for reconversion into urban gardens. One location was a large, abandoned junkyard where the main challenge was the lack of fertile and uncontaminated soil. The junkyard is located in the densely populated northern zone, surrounded by marginalized communities with irregular housing and deficient infrastructure. Another three are sub-utilized parks with some urban furniture, which are poorly maintained and prone to flooding in the rainy season. The parks are surrounded by medium to low-income housing. Finally, the fifth space is a hill in the high-income zone, in the arid part of the municipality that has low density housing. All zones have few access points and no, or deficient, pedestrian infrastructure to connect them with the housing.

Experimentation focused on designing the spatial conversion strategy for the five locations through an Urban Program Proposal and a Master Plan for the site (S scale), where environmental sustainability (water-soil-energy nexus), accessibility, and zoning of functions were key aspects (figure 4). Each group’s Master Plan contained annexed documents regarding access and mobility improvements, as well as a detailed urban program Inventory. Online conferences were arranged with the Municipal Deputy Director of Urban Planning and Regulation, the Chief of Risk Information Systems of the National Center for Disaster Prevention of Mexico, a permaculture expert, and a social scientist that works on appropriation of public space with local communities, who offered feedback on different questions that arose during the planning. The program varied according to each location’s physical and social conditions. For example, the program for the junkyard included a strategy for soil decontamination and enrichment through phytoremediation - a cost effective use of plants and soil microbes to reduce the concentrations or toxic effects of contaminants in the environment, with a research center focused specifically on that problem located on the site. The production of food was envisioned through hydroponic processes located in converted containers while the soil is undergoing enrichment. When the soil is suitable for planting, the containers would be used for workshops and events for the

JUNKYARD REDEVELOPMENT PROJECT



PROGRAMA ARQUITECTÓNICO		TIPO DE ESPACIO	ÁREA CONSTRUIDA (M ²)	% COBERTURA	ÁREA LIBRE (M ²)	% LIBRE	CARACTERÍSTICAS	USOS	VEGETACIÓN	ACQUÍFERO	ÁREA POR PERSONA (M ²)	ÁREA POR ESPACIO (M ²)
PROBLEMAS O NECESIDADES	¿Cómo recuperar y revalorizar el espacio público?	ESPACIO PÚBLICO	10000	100%	0	0%	...	...	...	...	...	...
PROBLEMAS O NECESIDADES	¿Cómo generar espacios privados de calidad?	ESPACIO PRIVADO	5000	50%	5000	50%	...	...	...	...	...	...
PROBLEMAS O NECESIDADES	¿Cómo generar espacios comunitarios de calidad?	ESPACIO COMUNITARIO	2000	20%	8000	80%	...	...	...	...	...	...

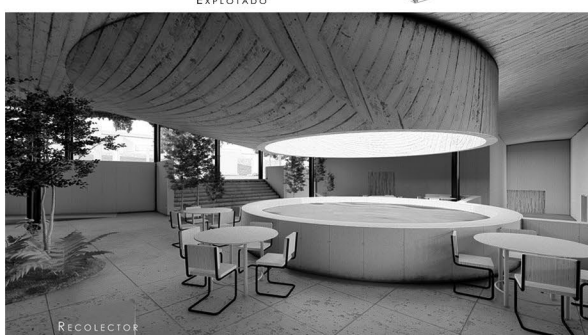
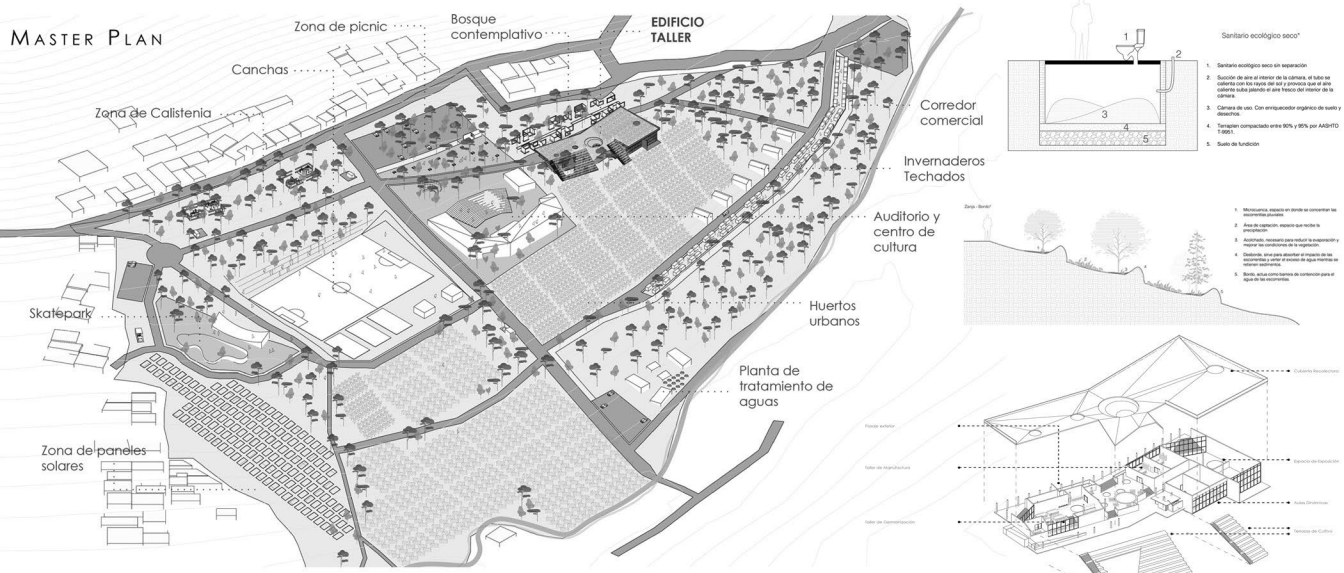


Figure 4. Experimentation task example, Junkyard Redevelopment Project. By students Fernando A. Ortúzar and Brayan H. Rodríguez.

local community. The other three parks developed a Keyline hydrological design of the land to reduce the effects of flooding and erosion. The parks would be equipped with dry toilets that function as nutrient supply for the garden. Additionally, the public spaces would be improved with tree plantings, semi-open workshops, and public kitchen with dining for communal use. Finally, the fifth park was designed as a new urban zone with housing, services, and urban gardens to promote sustainable, place-based development. The lack of water was tackled through strategies for rainwater and fog harvesting, which in this mountainous region with steep temperature changes could be considered a viable option.

The execution consisted of developing dissemination materials for web platforms and online seminars to discuss the value of the proposals and possible implications for local development. The proposals were shared through social platforms such as Facebook, Instagram, and Behance to spark a public discussion and critically assess aspects of the projects that are of public interest (figure 5). Some of the proposals received more attention than others. For example, the three parks located in the middle-income dense neighborhoods received significant social media attention while the junkyard in the low-income and the hill in the high-income zone did not generate as many comments. This could be since low-income citizens do not have sufficient access to internet service or lack time/interest to engage in such discussions due to history of discrimination and low trust. On the other hand, high-income communities impose their own strict zoning laws and show little interest in intervention proposals that originate outside of their community. This confirms Pineda et al's (2021) conclusions that healthy eating in Mexico is largely a middle-income issue.²⁹ The specialists invited to the online seminar discussion positively evaluated the applied knowledge in the proposals and pointed out the need to further involve local communities in adapting certain aspects of the program for better appropriation and management results.

DISCUSSION

The results of the preliminary analysis based on the survey have significant theoretical and practical implications. We highlight the importance of considering development patterns of peri-urban zones not only as a potential or constrain in providing healthy food for the nearby city, but also as important factors in providing healthy food environments for peri-urban dwellers. Our study supports the fact that the biggest shifts in dietary modernity can be found in lower to middle-income neighborhoods. What our study adds to the discourse of food environments in Mexico is the spatial aspect of this phenomena linked to urban development patterns and a push to evaluate not only what exists in the urban periphery, but what does not. While transportation infrastructure may allow easier egress from peri-urban zones for commuters, it may accompany greater reliance on processed foods and dining out. To avoid such impacts, simultaneous investment in local markets and agriculture could potentially benefit residents by offering nearby access and availability of

healthy food sources and supporting local agricultural producers whose livelihoods vanish as urbanization increases.

Dascalu (2013) argues that architecture can play a significant role in social change by building social capital through trust.⁴¹ For this to be possible, architecture must be understood as an open-ended process that involves a myriad of aspects such as use, function, regulations, policies, practices, community involvement, among others, rather than a finished product. Through this work, the effectiveness of the pedagogical method that combined research, challenge-based learning, and community engagement using social media was evaluated. The results were evaluated using the following parameters: 1) ability to respond to main issues defined in the preliminary research, 2) ability to form partnerships and cooperation, 3) social media impact, 4) combination of ideas and resources to create new support mechanisms for social change, 5) focus on reducing inequality, 6) project cohesion, 7) the originality of products, 8) the self-satisfaction of achievements, and 9) perceived better understanding of sustainable development. The data regarding satisfaction from the course and understanding of sustainable development was gathered with a survey answered by the students at the end of the course. As a control variable, a previous studio group where the pedagogical method was not applied was evaluated with the same parameters and identical self-evaluation survey.

We concluded that the new pedagogical method improved the social construction of solutions with the tools based on social media that fostered participation and inclusion in the collective imagination of "what the place could be". In fact, one of the most remarkable results of the new method was the potential to form horizontal collaborative networks between students, experts in different fields, local authorities, and community actors, and to utilize this collective wisdom to produce better context-based places. Nevertheless, the inclusion of marginalized groups remains questionable and new tools are needed to promote a more inclusive process. The spatial strategies, master plan, and architectural interventions responded much better to the pre-existing urban conditions and social needs. The students also felt more engaged in the process and enjoyed working on social problems. However, the overall understanding of the project's impact on local sustainable development remained weak and requires further investigation.

The pedagogical method used in this project was able to "assist students in enabling them to make decisions about what value means in architecture".⁴² By enabling critical thinking, setting the base of action on social justice, and encouraging the use of social media, the method turns students into active agents of social change and provides an important contribution to the necessary, but still uncharted, paradigm shift in architectural education from object to people-driven design. In areas where local governance and policymaking do not provide tools for collective imagination of public place, this method could help strengthen inclusiveness in the place design.

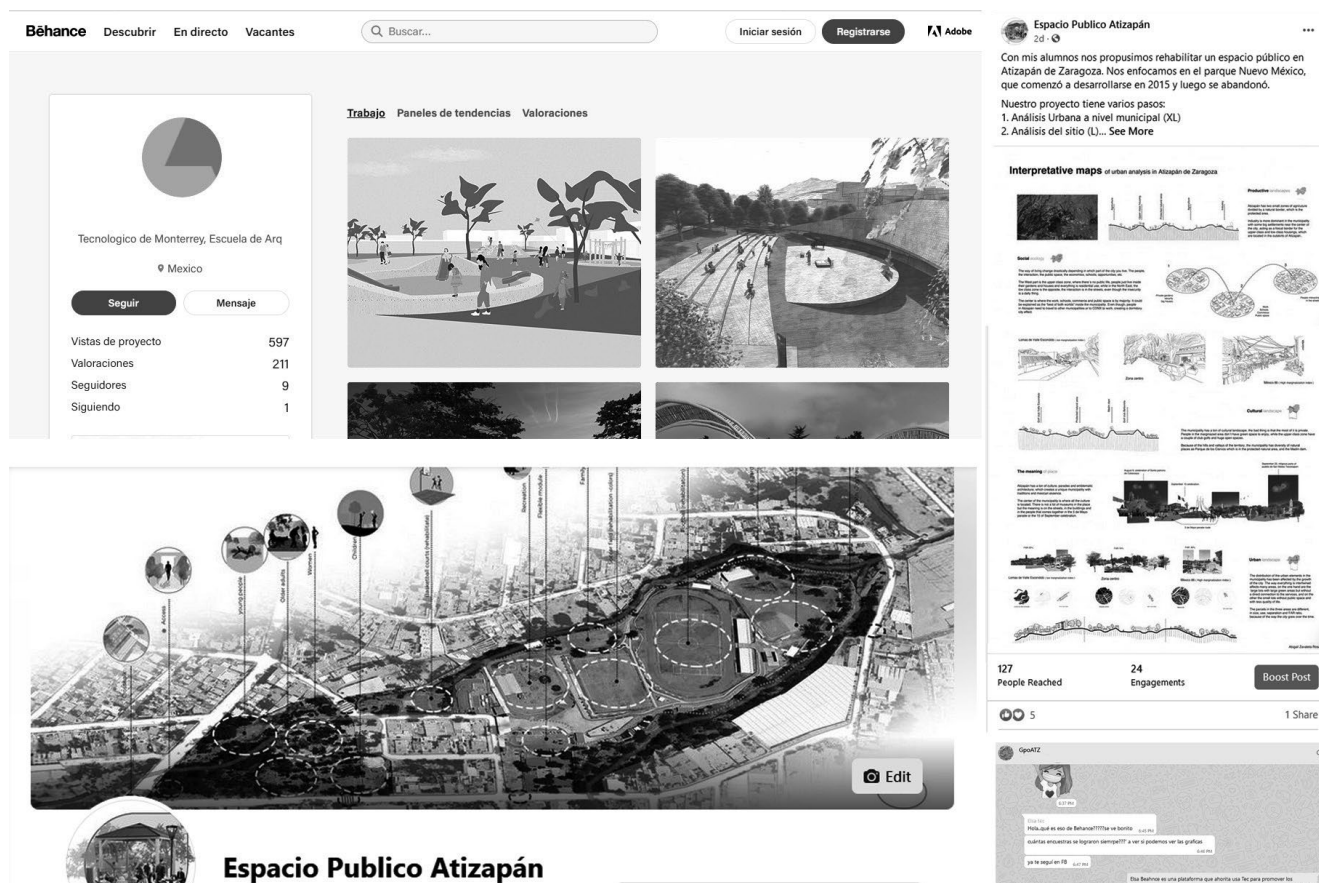


Figure 5. Diffusion of projects through social platforms. By authors

ENDNOTES

- Barry M Popkin, "Global nutrition dynamics: the world is shifting rapidly toward a diet linked with noncommunicable diseases," *Am J Clin Nutr.* 84(2), Aug., 2006: 289-98. doi: 10.1093/ajcn/84.1.289.
- Barry M Popkin, Linda S Adair and Shu Wen Ng, "Global nutrition transition and the pandemic of obesity in developing countries," *Nutr Rev.* 70(1), Jan., 2012: 3-21. doi: 10.1111/j.1753-4887.2011.00456.x.
- Jean-Pierre Felber and Alain Golay, "Pathways from obesity to diabetes," *Int J Obes* 26, 2002: 39-45. <https://doi.org/10.1038/sj.ijo.0802126>
- Gino Seravalle and Guido Grassi, "Obesity and hypertension," *Pharmacological Research* 122, 2017: 1-7. ISSN 1043-6618, <https://doi.org/10.1016/j.phrs.2017.05.013>.
- Katja Preiss, Leah Brennan and Diana Clarke, "Obesity and depression," *Obes. Rev.* 14, 2013: 906-918. <https://doi.org/10.1111/obr.12052>
- Michelle Holdsworth and Edwige Landais, "Urban food environments in Africa: Implications for policy and research," *Proceedings of the Nutrition Society*, 78(4), 2019: 513-525. doi:10.1017/S0029665118002938
- Leslie A Lytle and Rebecca L Sokol, "Measures of the food environment: A systematic review of the field, 2007-2015," *Health Place* 44, Jan., 2017:18-34. doi: 10.1016/j.healthplace.2016.12.007.
- Thomas W Crawford et al, "Conceptualizing and comparing neighborhood and activity space measures for food environment research," *Health Place* 30, Oct., 2014: 215-25. doi: 10.1016/j.healthplace.2014.09.007.
- Katrina Giskes et al, "A systematic review of environmental factors and obesogenic dietary intakes among adults: are we getting closer to understanding obesogenic environments?," *Obes.Rev.* 12(501), 2011: 95-106. doi: 10.1111/j.1467-789X.2010.00769.x.
- Stefanie Vandevijvere, Clare Dominick, Anandita Devia and Boyd Swinburna for International Network for Food and Obesity/non-communicable diseases Research, Monitoring and Action Support, "The healthy food environment policy index: findings of an expert panel in New Zealand," *Bulletin of the World Health Organization*, 93(5), 2015: 294-302. <https://doi.org/10.2471/BLT.14.145540>
- Patricia Gálvez-Espinoza et al, "Comemos así porque...". Entendiendo las conductas alimentarias de mujeres chilenas de bajos recursos," *Revista médica de Chile*, 146(8), 2018: 882-889. <https://dx.doi.org/10.4067/s0034-98872018000800882>
- Commission on Social Determinants of Health, "Closing the Gap in a Generation: Health Equity through Action on the Social Determinants of Health", Final Report of the Commission on Social Determinants of Health, Geneva, Switzerland: World Health Organization, 2008.
- Caitlin Caspi et al, "The local food environment and diet: a systematic review", *Health Place* 18 (5), 2012: 1172-1187. doi: 10.1016/j.healthplace.2012.05.006
- Jing Feng et al, "The built environment and obesity: a systematic review of the epidemiologic evidence", *Health Place* 16 (2), 2010: 175-190. doi: 10.1016/j.healthplace.2009.09.008
- Bridget Kelly, Victoria M Flood and Heather Yeatman, "Measuring local food environments: an overview of available methods and measures", *Health Place* 17 (6), 2011: 1284-1293. doi: 10.1016/j.healthplace.2011.08.014.
- Sharon I Kirkpatrick et al, "Dietary assessment in food environment research: a systematic review", *Am. J. Prev. Med.* 46 (1), 2014: 94-102. doi: 10.1016/j.amepre.2013.08.015.
- Karen Glanz et al, "Measures of retail food Store environments and sales: review and implications for healthy eating initiatives", *J. Nutr. Educ. Behav.* 48 (4), 2016: 280-288, (e281). doi: 10.1016/j.jneb.2016.02.003
- David E. Bloom and David Canning, "The health and wealth of nations", *Science* 287(5456), 2000: 1207-1209. doi 10.1126/science.287.5456.1207
- World Health Organization, "Cities and Public Health Crises: Report of the International Consultation", 29-30 October 2008 Lyon, France. Geneva, Switzerland: World Health Organization; 2009. <https://apps.who.int/iris/handle/10665/70465>
- Max Roser, Esteban Ortiz-Ospina and Hannah Ritchie, "Life Expectancy", Published online at OurWorldInData.org in 2013. Retrieved on October 19, 2021 from: '<https://ourworldindata.org/life-expectancy>' [Online Resource]
- Ellen Van de Poel, Owen O'Donnell and Eddy Van Doorslaer, "Are urban children really healthier? Evidence from 47 developing countries", *Soc Sci Med.* 65(10), 2007: 1986-2003.

22. Erin Pitt et al, "Exploring the influence of local food environments on food behaviours: a systematic review of qualitative literature", *Public Health Nutr.* 20(13), 2017: 2393-2405. doi: 10.1017/S1368980017001069.
23. Hellas Cena and Philip C Calder, "Defining a Healthy Diet: Evidence for the Role of Contemporary Dietary Patterns in Health and Disease", *Nutrients* 12(2), 2020: 334. <https://doi.org/10.3390/nu12020334>
24. Christina Black et al, "Variety and quality of healthy foods differ according to neighbourhood deprivation", *Health Place* 18(6), 2012: 1292-9. doi: 10.1016/j.healthplace.2012.09.003.
25. Bhartendu Pandey et al, "Urbanization and food consumption in India", *Sci Rep* 10, 2020: 17241. <https://doi.org/10.1038/s41598-020-73313-8>
26. Sean C Lucan, "Concerning limitations of food-environment research: a narrative review and commentary framed around obesity and diet-related diseases in youth", *J Acad Nutr Diet* 115(2), 2015: 205-12. doi: 10.1016/j.jand.2014.08.019.
27. Antonio Barrera-Cruz, Arturo Rodríguez-González and Mario Antonio Molina-Ayala, "Escenario actual de la obesidad en México", *Rev Med Inst Mex Seguro Soc.* 51(3), 2013: 292-99
28. Jose B Rosales Chavez et al, "Relationship between different levels of the Mexican food environment and dietary intake: A qualitative systematic review", *Public Health Nutrition*, 23(11), 2020: 1877-1888. doi:10.1017/S1368980019004294
29. Elisa Pineda et al, "The retail food environment and its association with body mass index in Mexico", *Int J Obes* 45, 2021: 1215-1228. <https://doi.org/10.1038/s41366-021-00760-2>
30. Joel Garreau, *Edge City: Life on the New Frontier*, New York, Doubleday, 1991.
31. Robert Lang, *Edgeless Cities: Exploring the Elusive Metropolis*. Washington, DC: Brookings Institution Press, 2003
32. Nicholas A Phelps and Andrew M Wood, "The New Post-suburban Politics?", *Urban Studies* 48(12), 2011: 2591-2610. doi.org/10.1177/0042098011411944
33. Beniamino Murgante, Giuseppe Bartolomeo Las Casas and Maria Danese, "The periurban city: geostatistical methods for its definition", in *Urban and Regional Data Management*, Eds: Massimo Rumor, Volker Coors, Elfriede M. Fendel, Sisi Zlatanova, CRC Press, Taylor & Francis, London, 2007.
34. David L laquinta and Axel W Drescher, "Defining Periurban: Rural-Urban Linkages and Institutional Connections", Published by the Partnership Programme of the Food and Agriculture Organization of the United Nations (FAO), available online: <http://www.fao.org/3/x8050t/x8050t02.htm>. accessed: 3 July 2021
35. Maureen Murphy et al, "Local Food Environments, Suburban Development, and BMI: A Mixed Methods Study", *International journal of environmental research and public health*, 15(7), 2018: 1392. <https://doi.org/10.3390/ijerph15071392>
36. Victoria Ruiz Rincón, Joan Martínez-Alier and Sara Mingorria, "Environmental Conflicts Related to Urban Expansion Involving Agrarian Communities in Central Mexico", *Sustainability* 11(23), 2019: 6545. <https://doi.org/10.3390/su11236545>
37. Farshad A. Araghi, "Global Depeasantization, 1945-1990", *Sociol. Q.* 36, 1995: 337-368. <https://doi.org/10.1111/j.1533-8525.1995.tb00443.x>
38. Héctor Ávila-Sánchez, "Socio-territorial changes in peri-urban food production spaces in Central Mexico", *Noroi*, 221, 2011: 39-51. <https://doi.org/10.4000/noroi.3738>
39. Aleksandra Krstikj et al, "Planning the equitable distribution of services in emerging regions: Atizapán de Zaragoza, Mexico and Yinchuan, China", in *Covid-19 And Cities: Experiences, Responses, And Uncertainties*, eds Miguel Angel Montoya, Aleksandra Krstikj, Johannes Rehner and Daniel Lemus-Delgado, Springer International Publishing, November 2021, ISBN 978-3-030-84133-1
40. James Corner, "The Agency of Mapping: Speculation, Critique and Invention", In *The Map Reader*, eds M. Dodge, R. Kitchin and C. Perkins, John Wiley & Sons, Ltd, New Jersey, 2011, ISBN:9780470742839 <https://doi.org/10.1002/9780470979587.ch12>
41. Dragoş Dascălu, "Architecture as Tool for Building Social Capital", *Acta Technica Napocensis: Civil Engineering & Architecture*, 2013, Volume 56(3), pp. 204-220
42. Benjamin Clavan, "Embracing the Social Art of Architecture", in *Design For A New Age: Teaching The Social Art Of Architecture*, ed. Benjamin Clavan, Manuscript - Draft 1: 15, October 2015, last accessed: 11th of December 2020.