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Article

Improvement of urban spaces, towards a sustainable habitat. BUAP Residential Case, Puebla, Puebla

Renovación de los espacios urbanos, hacia un hábitat sustentable. Caso Residencial BUAP, Puebla, Puebla

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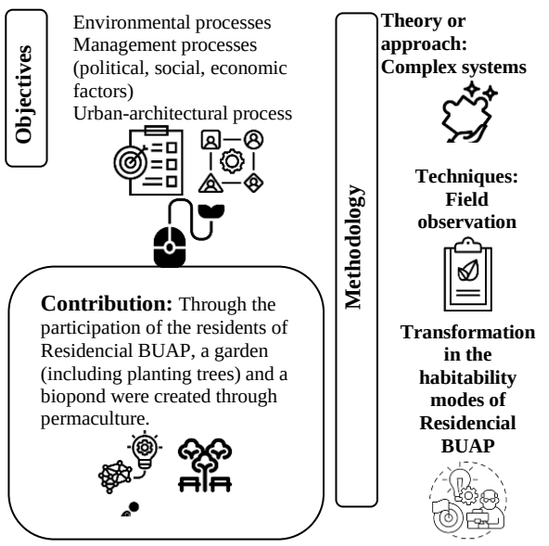
Abstract

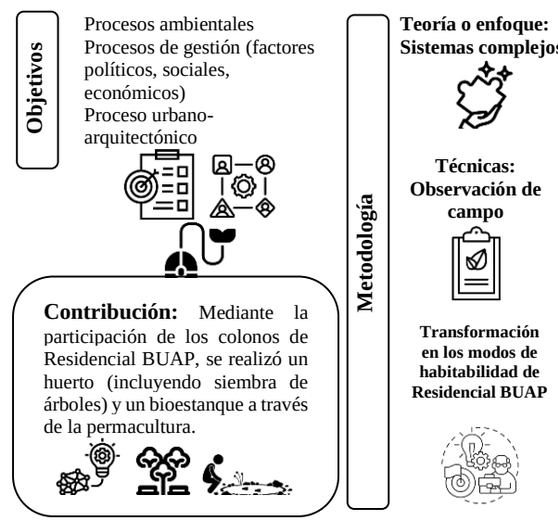
The BUAP residential subdivision, located in the southern area of Puebla, Mexico, currently has several plots of land with serious contamination problems due to lack of intervention. This, in addition to the fact that the interior spaces of the homes are very small and there is not enough green and recreational areas for residents to develop their physical and motor activities, in addition to the fact that there is no integration between neighbors to solve these problems. The research will contribute to the improvement of urban spaces that will function as an extension of the homes to generate a sustainable habitat, through the participation of the same settlers. Based on a methodology, theories or approaches from various authors that support this type of approach will be known, in addition to doing the field research work through the observation process and qualitative research so that the conclusions are finally presented.



Sustainability, Habitability, Urban spaces

Resumen

El fraccionamiento Residencial BUAP, ubicado en la zona sur de Puebla, México presenta actualmente varios terrenos con graves problemas de contaminación por causa de la no intervención, esto aunado a que los espacios interiores de las viviendas son muy reducidos y no se cuenta con la suficiente cantidad de áreas verdes y recreativas para que los habitantes desarrollen sus actividades físicas y motrices, además de que no hay una integración entre los vecinos para dar solución a estas problemáticas. La investigación coadyuvará al mejoramiento de los espacios urbanos que funcionarán como extensión de las viviendas para generar un hábitat sustentable, mediante la participación de los mismos colonos. Con base en una metodología se conocerán teorías o enfoques de diversos autores que fundamenten este tipo de abordaje, además de hacer la labor investigativa de campo mediante el proceso de observación y la investigación cualitativa para que finalmente se presenten las conclusiones.



Sustentabilidad, Habitabilidad, Espacios urbanos

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Introduction

This research is fundamentally about carrying out a study –from the interdisciplinary and transdisciplinary perspective, considering that the topic must be studied, analyzed and/or evaluated with a systemic and sustainable vision, therefore it should not be treated in isolation from its historical, theoretical, social, political, economic, cultural, urban-environmental, technological, etc. context–, in order to improve the habitability and urban spaces located within the Residential Subdivision of the Benemérita Universidad Autónoma de Puebla and thus subsequently justify the need for the proposal of a network of green spaces and recreational areas in different sectors of the settlement, transforming it into a habitable place with low environmental impact so that the inhabitants have good mental and emotional health and have a better quality of life.

For the preparation of this article, different readings were reviewed and analyzed, where this type of approach to the present study is based, explaining the sciences or disciplines that contribute to it.

The main cause raised in this research topic is the interruption in the execution of the residential project and due to the change of administration at the university, the current rector has not shown interest in continuing with the progress of the works since it has other political and economic interests, in addition to the dissolution of ties with the construction company responsible for the project.

As a consequence of the situation mentioned above, the habitability and its conditions are considered, which currently present several plots with serious contamination problems due to lack of intervention. This is added to the fact that the interior spaces of the houses are very small and recently the subdivision does not have enough green and recreational areas for the inhabitants to develop their physical and motor activities, in addition to the fact that there is no integration between the neighbors to solve these problems.

It is intended that as a result of this research, a well-founded study will be generated, with clear objectives and proposals and an ethical and participatory vision on the part of the population, through the coordination of the board of directors that invites, raises awareness, integrates, organizes and informs the inhabitants that the actions carried out will be for the benefit of all the neighbors by implementing workshops, cleaning and planting days, etc., that will improve the current state of the subdivision, in addition to awakening the interest of the current rectorship so that it contributes financially and supports with various contributions with the creation of green spaces - comfortable outdoor and auxiliary areas optimal for work, rest, coexistence and hygiene that will allow transit between the settlers and will function as an important part of the extension of the houses and will be complementary to the interior space - resulting in a state of well-being in the inhabitants.

In addition to the political and economic aspects, it is necessary to resort to the social part, which is essential since the collaboration of the settlers' association and the rest of the inhabitants of different ages of the subdivision will be required in different actions for its improvement and in this way generate community life.

Problem statement

Today there is no study in certain peri-urban settlements in the southern area of the capital of Puebla that establishes guidelines or proposals for improving habitability, such is the specific case of the Residential Subdivision of BUAP, which is a forgotten territory due to the lack of interest on the part of the current officials of BUAP and the construction company Eleganza, by not giving continuity to a project designed and directed to university workers, which originally consisted of the projection of three stages that included in turn three housing prototypes, recreational areas, a shopping center and different access routes to the subdivision, leaving this incomplete and only the first section being executed. This last action is considered optimal since by having a smaller number of inhabitants in a certain place, a good organization can be originated to transform it adequately and therefore improve the living conditions, generating a habitable space.

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In addition to the reasons mentioned above, it is worth mentioning that due to the change in the university administration since 2013, the ties with the real estate company in charge of building the properties were dissolved, which abandoned the project immediately and just when the construction of the first houses was finished, subsequently absolving itself of all responsibility.

The above causes the following problems to be raised in terms of the living conditions in Residencial BUAP: Presence of environmental pollution in the territory due to the fact that several vacant lots are left, resulting in physical problems during the rainy and windy season, generating the presence of pests (Figure 1), in addition to a lack of maintenance either in the access to the subdivision (deterioration in the paint, poor lighting, etc.) and the loss of style and typology (change of architectural elements or color on the facades, placement of clotheslines (Figure 2) and shops in the garage or living room area, due to the lack of culture of some inhabitants that causes the absence of functionality in the different spaces of the homes), due to the lack of adequate regulations with norms that regulate how the homes should be maintained and in general contribute to rescuing the aesthetic part and public spaces through their correct use, all this also generated by the lack of control and the lack of integration between its inhabitants of different socioeconomic conditions. (researchers, academics and administrators).

The dimensions of some of the houses are not optimal for families to live there, since the spaces needed for each activity carried out there are not defined based on what the users require. This originates from the beginning because the houses were built without being based on instructions and actions of a housing policy that provides solutions to social problems. Particularly in the present object of research, it is important to implement an adequate design of public spaces (green and recreational areas) in areas that are not being used and in this way they are favorably used as an extension of the houses that were designed in a reduced way.

Box 1

Figure 1

Improvised court in poor condition and spaces that do not fulfill any specific function

Source: Alonso (2017)

Box 2

Figure 2

Placement of clotheslines in the garage area

Source: Alonso (2017)

Just to mention, apart from what was mentioned above that affects the physical and social environment, another risk situation arises: environmental pollution. This contamination is generated by the presence of sewage and waste carried by the Atoyac River and which flow into a specific natural resource, the Valsequillo Lake, which despite attempts to clean it through three treatment plants, continues to deteriorate (Figure 3).

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Box 3

Figure 3

Pollution of Lake Valsequillo, which generates bad odors and the presence of pests

Source: Alonso (2015)

The problems caused by the uninhabitable conditions mentioned above psychologically affect the well-being of the inhabitants and their health. The most important to address are the lack of well-designed public spaces (green and recreational areas) in addition to the fact that the existing ones are not well maintained. All this with the objective that the users carry out outdoor activities in comfortable outdoor areas where they have contact with nature and that these function as an extension of the houses that in this case are of very small dimensions.

As mentioned above, the problem is the pollution of the environment generated by the Valsequillo lake and the absence of technologies that treat its pollution, therefore, the deterioration of the public spaces in the subdivision is an expression of the habitability not achieved in its entirety. Due to this, it is considered that the object of research is of a complex nature and must be studied from the perspective of other disciplines or sciences such as environmental psychology focused on systems in the area specifically for the improvement of habitability.

The BUAP Residential Subdivision is a peripheral settlement located in the southern region of Puebla that has the advantage of being built in a strategic location, near Lake Valsequillo (a body of water of great importance in the city of Puebla), with a magnificent view of this and other landmarks that are part of a heritage of great value and natural wealth such as the Sierra del Tentzo and the Iztaccíhuatl and Popocatépetl volcanoes.

Regarding the scientific importance of the place, it has not been studied, therefore the research, which is an analysis where the construction of the object of study is intended from the theory of complexity and other disciplines such as environmental psychology, will contribute knowledge by knowing both the conditions that have contributed to generating the deterioration of the public space of the subdivision, as well as the consequences on the living conditions of the residents, all this through documentary and field research. Particularly, to contribute through the evaluation of the aspects of social coexistence, architecture and urban environment and the way in which these have been modified by the actions of the users themselves.

Due to its social importance, the site deserves special attention, so that 'rationally environmentally-based development strategies linked to technology' are proposed that make it a habitable and at the same time sustainable place by proposing, among other vitally important aspects, green areas for recreation and the installation of urban furniture in abandoned public areas, allowing a proposal for landscape design in the subdivision and the improvement of public space, through proposing vegetation native to the place, linked to a method of water treatment in a sustainable way through the implementation of artificial wetlands that contribute to the cleaning of the Valsequillo lake, also generating in this way, with the need for a transdisciplinary approach through the communication and integration of different social sectors, better living conditions among its inhabitants.

The incorporation of other disciplines such as environmental psychology is necessary for the present research topic, since this science defends the environment.

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Thus, the general objective is to show the environmental, socioeconomic, political and cultural processes in order to find out which factors have intervened or affected the development of the BUAP Residential subdivision, such as the pollution generated by harmful urban design; and that through habitable spaces and sustainability, the living conditions of this territory are improved by means of the integration of the same settlers, establishing guidelines or proposals for improving habitability that do not cause an environmental impact; and as specific objectives, it is recommended to contribute to the improvement of habitability based on an epistemic framework through possibilities for transformation in the subdivision that adequately propose alternatives and strategies for the conservation of public areas through community participation and a transdisciplinary approach where different types of inhabitants intervene and contribute to the implementation of recreational and green areas; establish social standards that come from agreements between the residents of the subdivision to avoid visual deterioration by modifying the typology and style planned from the beginning and thus not affect the aesthetic appearance of the houses; and propose alternative solutions to rationally take advantage of what nature offers us through the implementation of sustainable technologies such as rainwater collection cisterns that are later used to water green spaces, certain types of plants to mitigate the proliferation of pests (which is also part of the problem that affects habitability) and the installation of an artificial wetland that contributes to the cleaning of the Valsequillo lake, transforming that territory into a habitable place with less environmental impact that helps not to deteriorate the health of the population.

Hypothesis

The existence of conditions of environmental awareness of man (environmental psychology), will be achieved through a process of community participation among the settlers of Residencial BUAP to improve it, appropriating their territory and becoming its managers through participatory workshops (social cartography workshops and similar), which have their techniques and instruments to facilitate reflection and cause their actions in the subdivision to be conscious and not imposed by someone or by some, promoting respect for the environment and for others (the neighbors, the different) through a social pact agreed by them, to ensure the preservation of that site or transform it rationally, through possible alternatives and strategies for the maintenance of public spaces that contribute to an improvement of the appearance of the subdivision, transforming it into an aesthetic, functional, habitable and sustainable space.

Theories on urban spaces, habitability, sustainability and complex systems

Below is a general description of the main theories regarding habitability, sustainability, urban spaces and complex systems. One of the urban planning models that has influenced global urban praxis is the French school of Marxist urban sociology. The main exponent of this school is Henri Lefebvre, who, through a critical analysis of the Charter of Athens, shows that its criteria for zoning the city into functions only caricatures life, and states that homo urbanicus is something more complex than just living, working, moving around and entertaining himself, since he has other needs to cover and discover, such as desire, play, the symbolic, the imaginative, in short, infinite and innumerable desires that arise as society develops its productive forces and its daily life (Gasca, 2017).

The aspects that affect habitability and the causes are considered, carrying out an analytical and critical discourse, subsequently incorporating other concepts that help to epistemologically construct the object of study.

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Alcalá conceptualizes habitability in urban space as: a housing condition where housing is physically integrated into the city, with good accessibility to services and facilities, surrounded by a quality public space, and this is lacking when the housing, even if in good condition, is located in a vulnerable, marginal and difficult-to-access area. Therefore, from the housing point of view, it is necessary to analyze urban policies that could have a direct impact on the improvement of housing conditions, which would have as areas and axes of action: inter-neighborhood spaces or areas, the road system, public space inside and outside the neighborhoods, infrastructure, services and public transportation, green spaces, functional enrichment of residential areas, programs aimed at creating new centralities (diverse activities and uses) and common reference spaces (Moreno, 2008) (Figura 4).

Box 4

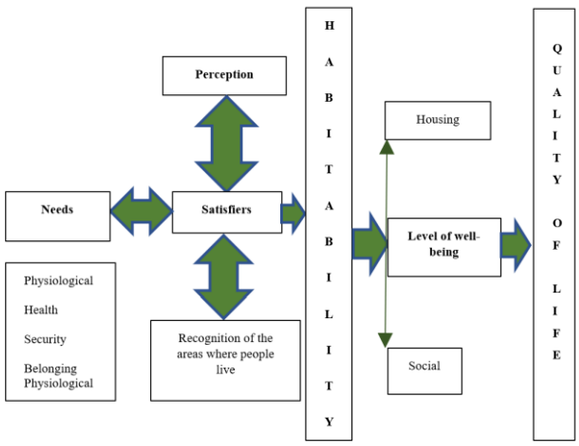

Figure 4
Needs, satisfiers, habitability, quality of life
Source: Moreno (2008)

Rolando García's explanation regarding complex systems is important, a theory that underpins the research. Rolando García explains that: To solve environmental problems it may be necessary to resort to knowledge that comes from various disciplines (chemistry, physics, biology, specific production technologies). However, in the conception that García sets forth, this pluri (or multi) discipline does not give the study characteristics of an interdisciplinary research.

Some situations correspond to complex problems, where the physical-biological environment, production, technology, social organization, and economy are involved. Such situations are characterized by the confluence of multiple processes whose interrelations constitute the structure of a system that functions as an organized whole, which has been called a complex system (García, 2006) (Figure 5).

Box 5

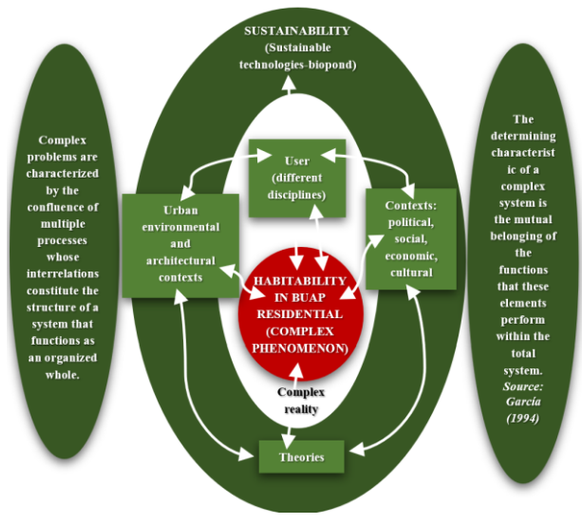

Figure 5
Habitability scheme, a complex system
Source: Alonso (2023)

One of the reasons for this study is to consider recommendations to transform the BUAP Residential subdivision into a habitat with low environmental impact and a tendency to become sustainable. Carlos Priego González de Canales of the Institute of Advanced Social Studies IESA-CSIC in his article: 'New ways of understanding urban nature. Green areas in cities' mentions that: the international conference that took place in Singapore under the motto 'Sustainable housing: tracing new frontiers', advocated that cities be redesigned to advance towards new models of more sustainable cities both economically, socially and environmentally. In this sense, the challenge of the European Union is to incorporate sustainability into the existing city, betting on new urban developments, where urban green spaces play a primary role in increasing the quality of life of the population (Priego, 2011).

It is recommended that the regulations regarding sustainable housing really be taken into account for the design of housing in the country, since in reality the opposite is observed.

ISSN-On line: 2414-4827
RENIECYT-CONAHCYT: 1702902

For Mexico, sustainability in its buildings is no longer a luxury or an amenity, but a requirement demanded by both users and the market, and in this sense it must have a holistic and comprehensive approach, where the environment is cared for and an optimal way of living is also guaranteed to the inhabitants of the homes.

Regarding the issue of urban spaces, it is necessary to consider that public areas in today's cities have lost their value as spaces for enriching encounters with the population's usual activity, and their reflection in the citizen's sense of belonging. In this context, urban public space, as a physical space, acquires great relevance to promote and maintain the integration of the community and the individual into it, avoiding alienation and manipulation, favoring the defense of identity, the flow of communication and collaboration on common issues. The territory of the public, in our society, is increasingly narrowing for the benefit of the private, even the existing public space is authorized for the benefit of a few. Within the aforementioned urban green spaces, those areas that, due to their size and/or function, do not allow for social uses were not considered, although it is recognized that they contribute to improving the urban environment, both visually and environmentally: medians of streets and avenues, roundabouts, gardens on sidewalks, gardens in plazas, etc. These types of areas, if they have a design appropriate to their function, play an important environmental role: as part of the urban landscape and in the improvement of microclimatic conditions: absorbing noise, capturing dust and rainwater. They also allow the use of vegetation as an architectural element to delimit, zone, prioritize and articulate public open space (Capitanachi, 2023).

The research addresses the characteristic object of study of environmental psychology, which is the interaction between people and their environments, and that this interaction is necessarily framed within a social context (or social interaction), so the 'products' of this interaction between person and environment (including the person and the environment) must be considered first and foremost as 'psycho-socio-environmental' products.

It is in these terms that the question raised allows us to reconsider environmental psychology as environmental social psychology, although social psychology is only one of the sources from which our discipline draws. However, the delimitation of what environmental psychology is has not always taken into consideration the same perspective since, as Altman and Rogoff (1987) point out, there are several positions when it comes to understanding the person-environment interaction (Valera, 1996).

As has been seen, various personal factors -whether psychological or demographic- influence the appearance and maintenance of environmental protection behaviors, also taking into account the educational system as an inducer of ecological behaviors that translate into changes towards caring for the environment. Therefore, it is pertinent to develop critical environmental thoughts, attitudes and skills that allow individuals to counteract the effects of environmental myths in order to make responsible and mature decisions, based on the ethical principles of environmental education. It is worth mentioning that the satisfaction of material needs is an element of great importance in determining the quality of life, but that it does not reduce it to this. Full well-being is possible within the framework of a life endowed with meaning that integrates the value system in the inhabitant of the subdivision (García, 2005).

Methodology

The research is a study based on the complexity approach that covers the following stages: the first one presents the theory or approach of complex systems considering habitability as the main concept to be addressed, since it is part of the construction of the object of study; the research, being of a transdisciplinary nature, takes into account the contribution of other different disciplines and concepts such as quality of life, sustainability, complex systems and habitable urban spaces, environmental psychology, etc., on which the study is based. In the second stage, field research is done through the observation process, which is carried out in the territory where the study area is located.

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As a researcher, you go to the workplace for some time to identify the existing problems through different techniques such as photographic surveys, interviews, qualitative research through surveys (application of a questionnaire to the residents of the site), graphs, etc., to learn about the main needs of the users and thus be able to implement the best solution strategies to solve the problems of the subdivision. Being a resident of Residencial BUAP and having interaction with the residents, allows having references that help to know more accurately the reality of the observed object. "To collect reliable information, certain instruments such as the questionnaire are applied". The sample size was approximately a universe of 30 inhabitants, from which people with different socioeconomic levels and therefore different needs were chosen. According to this and since it is a study related to the subject of habitability and other disciplines such as environmental psychology, the questions asked to the residents of the subdivision were of a qualitative nature (Figure 6).

The following graph shows the problems indicated by the users through the interview as a percentage. The purpose of this instrument was to consider a universe of 30 residents, interviewing in an equitable manner the same number of men (fifteen) and women (fifteen) of different age ranges between 35 and 60 years.

Box 6

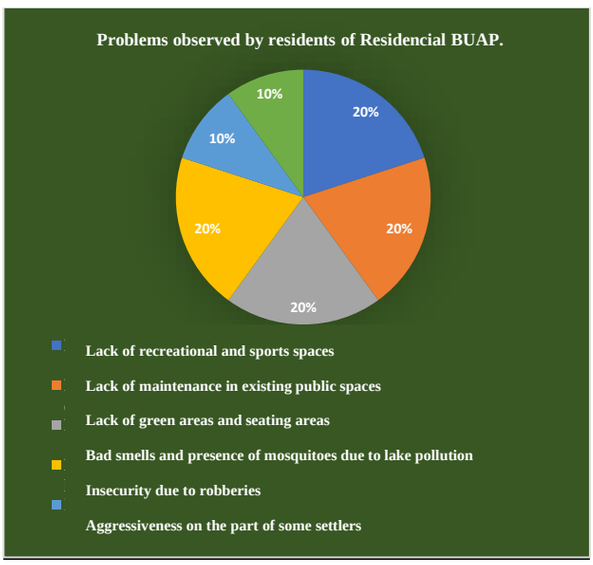

Figure 6

Chart of problems observed by residents of Residencial BUAP

Source: Alonso (2017)

In the third stage, results are presented and in the fourth stage, conclusions are shown and recommendations are suggested to solve the problems observed, resulting from the interviews applied to the different users. It is important to suggest from the first instance that there is an optimal community integration between the inhabitants of Residencial BUAP (it is a subdivision with few inhabitants and the objective can be achieved), and in this way agreements are reached between the Board of Directors and the residents of the subdivision to establish a regulation dictated in common agreement that responds to the knot of problems already mentioned. The regulations established based on a dialogue of knowledge, will set standards for the hiring of trained security personnel and the installation of security systems and in this way the theft rates are minimized; to achieve these objectives, the residents will contribute with the punctual payment of their monthly maintenance fee. In addition, the design of public spaces that includes the installation of lighting will help minimize insecurity. Some alternatives are pointed out related to the application of technologies for the creation of green areas and the implementation of a system called artificial wetland to contribute to the cleaning of the lake, eco-ponds, as well as some options as urban design solution strategies for recreational areas in the BUAP Residential Subdivision. The different problems that require a proposal for technological and sustainable innovation in the subdivision are addressed, transforming it into a functional, aesthetic, habitable territory that does not cause environmental impact. As previously mentioned, the BUAP Residential Subdivision is a set of urban, social and environmental scenarios. With the organization and participation of the residents of the subdivision, through forestation days and being up to date with their monthly fees, more vegetated areas will be promoted in the abandoned vacant lots of the subdivision.

Results

In January 2019-2021, through the participation of the residents of Residencial BUAP, a garden was created including afforestation (planting trees) and a biopond through permaculture: "Permaculture is the art of designing living spaces, functional territories, professions and lives rich in meaning, inspired by nature.

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It also takes care of human beings, the earth and sharing equitably", which is part of the project: Huerto Valsequillo whose motto is 'saving and rescuing the body of water of the Balsas River and the Atoyac River, its tributary' being on the riverbank of the same, in a park already proposed in Residencial BUAP next to the Valsequillo dam, with the participation of the Neighborhood Committee and the coaching of Sembrarte, who collectively propose to make a world betting on life. In 2022, there were situations that contributed to affecting the project (cutting off the water supply, etc.), which fortunately did not stop community participation but on the contrary, the group of neighbors was strengthened and currently in 2024 they are still active (Figures 7 and 8).

Box 7

Figures 7

Construction process of the biopond at BUAP Residential Complex

Source: Alonso (2019)

Box 8

Figures 8

Final result of the construction process of the biopond at BUAP Residential Complex

Source: Alonso (2019)

Since 2016, awareness has been raised among students of the Bachelor of Architecture degree at the Faculty of Architecture of the Benemérita Universidad Autónoma de Puebla (subjects: Architectural urban design criteria/Landscape architecture workshop/Architecture and environmental development/Bioclimatic design) to consider habitability as an important element and generate sustainable urban design projects.

Conclusions

The concrete contribution of this research to the dominant paradigm of recursion (apathy and disinterest on the part of the inhabitants of Residencial BUAP who believe they are in their comfort zone) will be achieved by raising awareness among the settlers, generating a new paradigm shift that will cause their interest and availability to improve the habitability of the subdivision through the transformation of urban spaces with the implementation of decent green and recreational areas that function as an extension of the homes. From the interdisciplinary field of (environmental) psychology that focuses on the interaction between people and their context, whether it be nature or the built environment (urban-architectural) and social, environmental education is recommended in the subdivision to improve its urban habitability, through the organization and participation of the neighbors, which has already begun to be implemented with previous forestation activities and the creation of the biopond where principles of the integral concept of permaculture have been implemented. The implementation of artificial wetlands that contribute to the cleaning of Lake Valsequillo is also recommended (Figure 9).

Box 9

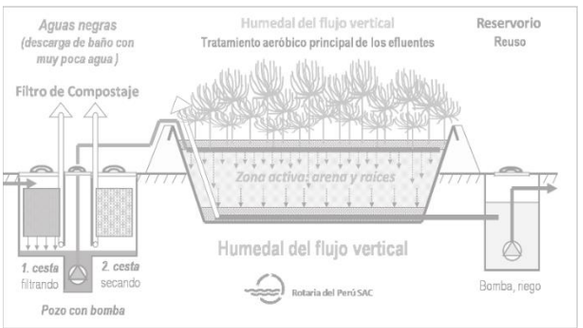

Figure 9

Artificial wetland

Source: Rotary of Peru SAC. Sustainable sanitation solutions (2017)

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The green areas will provide comfort and health benefits to the inhabitants of the BUAP subdivision, in addition to preventing soil erosion and creating healthy environments as an extension of the homes. The untouched lands in the study area where the green areas will be implemented are located in the southern perimeter just adjacent to the Valsequillo lake and in the central area of the subdivision (Figure 10).

Box 10

Table 1

Context of benefits of urban green areas

Strategies	Process	Benefit
Shade	Reduces interior temperature	Reduces energy requirements
Organic cover	Suspended particle capture	Reduces health problems caused by pollution
Evapotranspiration	Rainwater harvesting	Reduces surface runoff
Water retention		
Successional dynamics	Reduction of areas with solar radiation	Increase in local fauna (avifauna)
Solar energy absorption		

Source: López (2012)

For the transformation of the territory, the implementation of a management instrument (internal regulations) in the subdivision is recommended, which will contribute to its few inhabitants, whether they are owners or not, in common agreement and through the dialogue of knowledge, comply with the established norms for the good use and maintenance of public and private spaces and thus generate good behavior and a friendly atmosphere among the inhabitants of the subdivision.

The regulations will establish norms to avoid modification of the typology and color of the houses, to hire trained security personnel and to install lighting and security systems and in this way to minimize theft rates; to achieve these objectives, the settlers must be up to date with the payment of their monthly maintenance fee.

Declarations

Conflict of interest

The author declares that he has no conflict of interest. He has no known competing financial interests or personal relationships that could have appeared to influence the work reported in this article.

Author contribution

Alonso-Pérez, Carlos: Contributed to the project idea, research method and technique.

Availability of data and materials

The data obtained in this research are available.

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Abbreviations

BUAP	Distinguished Autonomous University of Puebla
IESA	Institute of Advanced Social Studies

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