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Environmental education in environmental places to promote the sustainability of the Tingua Azul wetland

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Abstract: *This article is an interpretive phenomenological analysis that is prepared under the paradigm of social constructivism, whose objective is to analyze, through the triangulation of information, the protection mechanisms that, from Environmental Education in environmental places, promote the sustainability of the Tingua Azul wetland located in Bogotá, Colombia. For this purpose, a semi-structured interview was conducted with 12 eighth and ninth grade students of the Chucua School and an ethnographic observation of activities in 8 sessions in the Tingua Azul wetland, information that was contrasted with the documentary review carried out.*
In the investigation, it was found that Environmental Education in the institution is aimed at promoting environmental awareness and that the students at the School Environmental Committee are the promoters of good practices for the sustainability of the wetland. On the other hand, it was identified that the deterioration of the Tingua Azul wetland is due to several factors such as the drying out of the soil due to construction material, reduction of the environmental place due to the increase in temporary settlements and difficulties in the collection of solid waste due to the differences that can be generated with the homeless people who reside in the wetland.

Keywords: *Environmental Education, Environmental Sustainability, Tingua Azul Wetland*

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I. INTRODUCTION

In the town of Kennedy (southern of Bogotá, Colombia), there are 4 areas considered as wetlands: El Burro, La Vaca, Techo and Tingua Azul (named after the bird with the scientific name *Porphyrio Martinica* of the rail family, which lives in swampy areas of the American continent, and which frequents this wetland during its migrations). The latter has a protected area of 91.82 acres and becomes the largest in the town, occupying 49.17% of the total area, and 4.12% of the Bogotá Urban Wetland Complex (Alcaldía de Kennedy, 2022).

Before being recognized as a wetland, this space did not have a political administration that considered the wetland as a natural reserve, which is why the construction of Villavicencio Avenue was allowed, which, in addition to dividing it into two (eastern and western zones), increased the noise and air pollution rates, affecting several native and migratory species in the sector (Malaver & Rojas, 2023). Examples of these cases are the tingua, the screeching hummingbird, the wild bee, the savanna snake and the tailless long-tongued bat, species that, since massive urban densification and consequent reduction of their natural habitats, have decreased their population (Peña et al., 2022).

The appreciation of the community that lives in the vicinity of different wetlands in the urban territory of Bogotá is that they see these environmental spaces as a body of stagnant water that emits nauseating odors and that is an area that lends itself to the cultivation and subsequent proliferation of vectors such as rodents and insects, among others (Arroyo & Camacho, 2024). On the other hand, it is observed that these spaces have been taken as places to deposit debris because, within the city's garbage and waste collection plan, the collection of construction material is not contemplated, a situation that leads citizens to throw debris in this sector, increasing the impact of deterioration of the territory without realizing the benefits that wetland areas bring for the ecosystem (Díaz & Roa, 2023).

By understanding the connection between the activities of human beings and the effects they generate on the Environment, you can think of different ways to mitigate the environmental footprint left. Given this, (Ardoin et al., 2020) consider Environmental Education as a strategy to reduce the serious crisis faced by different ecosystems due to issues related to environmental pollution and that is evident throughout the planet,

because polluting material created by humans has been found both on the top of the highest mountains (Neelavannan et al., 2022) and in the deepest seas (OECD, 2022).

In the specific case of bodies of water and wetlands, for (Ardoin et al., 2020), Environmental Education in school becomes extremely important because it provides students not only with information and knowledge about the functions of said ecosystems, but also transforms people's consciousness by promoting social and, above all, environmental skills that can help counteract the damage that has been done to the Main Ecological Structure. This is not to mention that projects designed for environmental sustainability can be carried out from the school itself, as is the case of changing fossil energy to the use of renewable energy or clean energy (Travezaño & Deroncele, 2023).

Knowing the importance of Environmental Education for the transformation, protection and conservation of environmental sites, this research is guided by the following research question: What are the protection processes that, from Environmental Education in environmental scenarios, promote the sustainability of the Tingua Azul wetland? Therefore, the main objective is to analyze, through the triangulation of information, the protection mechanisms that, from Environmental Education in environmental scenarios, promote the sustainability of the Tingua Azul wetland.

II. Methodology

This research is carried out under the paradigm of social constructivism whose focus is interpretive phenomenological analysis because, on the one hand, it aims to recognize and understand the practices that are in favor of the environment based on the realities of the institutional environment, the needs of students and school dynamics. On the other hand, it is a work that promotes transformation where the researcher himself cannot separate himself from said reality and, inevitably, is an actor who is involved in the planning and results of the entire research process (Vera & Finol, 2020).

The methodology is divided into three parts. Firstly, a documentary review of national and international research related to environmental protection from the Environmental Education of the last 6 years is presented. In the second part there is a semi-structured interview with 12 eighth and ninth grade students who belong to the School Environmental Committee. In the third there is the ethnographic observation of the same students at the School Environmental Committee, 2 teachers in the natural sciences area, a counselor from the institution and 3 officials from government entities. All the above will allow for triangulation of data that is presented as a discussion.

For the semi-structured interview, an instrument was constructed with 10 questions, divided into two categories. The first corresponds to the recognition of the functions of wetlands and the impact of human beings on them. The second corresponds to the characteristics associated with Environmental Education in differentiated learning scenarios that are intended for the protection of wetlands. The application of this instrument has an estimated time of 1 hour and 30 minutes. This question questionnaire was validated by 3 experts who evaluated sufficiency, pertinence, clarity and relevance, including observations of the construction of the questions, as indicated by Borjas (2020) and Castillo (2021). After validation of the instrument, it is implemented in the population to be studied.

Regarding the ethnographic monitoring of the eighth and ninth grade students at the School Environmental Committee, it was carried out in 8 meetings within the Tingua Azul wetland, with an approximate duration of 3 hours and 30 minutes per session. Considering Guber (2019), the information was collected through field records, video and audio recordings, and photographs. All this with prior authorization from those attending the sessions and, in the case of students, consent was requested from their parents.

2.1 Research Review

At the international level, there is the research titled Wetlands of International Importance: Status, Threats, and Future Protection carried out by Xu et al. (2019) in Beijing, China, whose objective is to analyze to what extent wetlands are being affected by human actions. To do this, the authors carry out a documentary analysis of the official Ramsar page and the official pages of each nation. They find that wetlands are being affected by four major factors: pollution by solid waste, overexploitation of resources, aquaculture and drying for agriculture. In conclusion, they indicate that wetland care management must be improved, and that future research must propose changes to improve the protection of these spaces.

The work carried out by Endter et al. can also be evidenced. (2020), entitled Protecting wetlands for people: Strategic policy action can help wetlands mitigate risks and enhance resilience, was carried out in the United States of America. Upon discovering that many environmental territories have special protection laws, they found that this does not happen with wetlands, despite the benefits they represent to counteract droughts, floods and climate change. For this reason, they proposed linking wetland protection strategies with risk and natural disaster planning and other social objectives. Based on this, the authors suggest incorporating this type of initiatives into commissions governed by law to mitigate the human impact on wetlands.

Researchers Chun et al. (2019), in Taipei, Taiwan, carried out the work entitled Assessment and improvement of wetlands environmental protection plans for achieving sustainable development, where they found that previous studies investigate the variables that affect wetlands, but do not interrelate them. For this reason, the researchers set out to evaluate, in real conditions, the effects suffered by wetlands to build an environmental management strategy that achieves site protection standards. Thanks to their research, they managed to build a sustainability plan based on the detection of complex relationships and an evaluation laboratory for testing and decision-making.

On the other hand, the work Urban Wetlands: A Review on Ecological and Cultural Values, carried out by Alikhani et al. (2021), in Helsinki, Finland, is a documentary review that seeks to identify the role of wetlands in urban areas worldwide, observing how these ecosystems contribute to sustainability, biodiversity, social perception and recreation. Knowing that wetlands face serious deterioration due to urban expansion, this documentary review indicates that most of the research analyzed recognizes the ecological and cultural value they have in cities and the contributions they make in terms of climate adaptation, urban sustainability and recreation. However, it was also found that, despite the benefits they offer, they do not have the necessary protection from government entities.

Another research done outside of Colombia is Multiple methods confirm wetland restoration improves ecosystem services, carried out by Tomscha et al. (2021) in Wairarapa, New Zealand. The researchers set out to evaluate the ecosystem services provided by restored wetlands on private properties in the area through mapping, landowner surveys and field measurements. From their work, the researchers were able to determine that wetlands that were once used for grazing and livestock and then restored had improvements in water filtration, phosphorus and nitrogen retention, and an increase in native plants and animal species.

In Colombia there is the research called, Environmental education in Colombia, utopia or reality. In this doctoral thesis, which was developed in Santiago de Cali, Henao and Sánchez (2019) emphasize the importance of developing transversal projects in Environmental Education bringing together several areas of knowledge. The main objective of the work was to manage the School Environmental Projects of educational institutions based on the evaluation and diagnosis of 90 proposals made in 22 urban and 13 rural communities. In conclusion, the authors report that it is necessary to give a leadership role to students, involve teachers from other areas, managers and administrative staff since it is noted, on the one hand, that in several institutions activities are carried out in favor of environmental Education, where the main actor (not to say the only one) is the natural sciences classroom teacher.

In the doctoral thesis titled TheNatural Environment as a learning space and pedagogical strategy in the rural school. Strengthening natural science and environmental education competencies in 9th grade students in the municipality of La Unión–Sucre, Colombia, Escorcia et al. (2020) report that the teaching of this area of knowledge has been characterized by the lack of implementation of pedagogical strategies that include scenarios other than regular classrooms. After implementing a teaching strategy, the comparative analysis between the results of the entry and exit tests allowed the authors to conclude that the levels of learning and satisfaction with the teaching-learning methodology increased by 80%.

For his part, Castillo (2020) presents his research titled Green History: 10 years of conservation, restoration, environmental education and research at the Pontificia Universidad Javeriana in Bogotá Colombia. In it, the researcher makes a historical analysis of the urbanization process that the Bogotá Savannah has undergone. Here it is possible to identify that the Main Ecological Structure has been deteriorating. That is why, since 2008, the Pontificia Universidad Javeriana proposed to carry out environmental restoration of the university campus through the Green History project. Activities range from planting days for first-semester university students to the creation of artificial wetlands for biological and ecological studies.

Finally, in national investigations, the work entitled Socio-ecological analysis of a restoration initiative led by environmental authorities in Santander, Colombia can be evidenced, a work carried out by Duarte and Avella (2019). The stages of the research were identification of analysis criteria; characterization and social evaluation based on semi-structured interviews; mixed multidimensional analysis. The perception of those surveyed indicates that there is an improvement in the quality of life because environmental services and economic and environmental valuation benefit the entire community. However, the perception of the recovery of native species is low. Finally, the researchers indicate that these initiatives must start from the school base.

III. FINDINGS

3.1 interview

3.1.1 Human environmental footprint

The interview was transcribed and analyzed with the help of Atlas Ti., from which 115 fragments and 85 codes were extracted. The free quotes from the text gave rise to a thorough analysis of the functions of wetlands, the waste that most affects them along with the urban planning actions that put these environments at risk in

metropolitan areas and the biotic and abiotic factors that allow the natural cycle of wetlands (questions 1, 2, 3, 4 and 5). The following image shows the relationship between the codes that were associated with the theme.

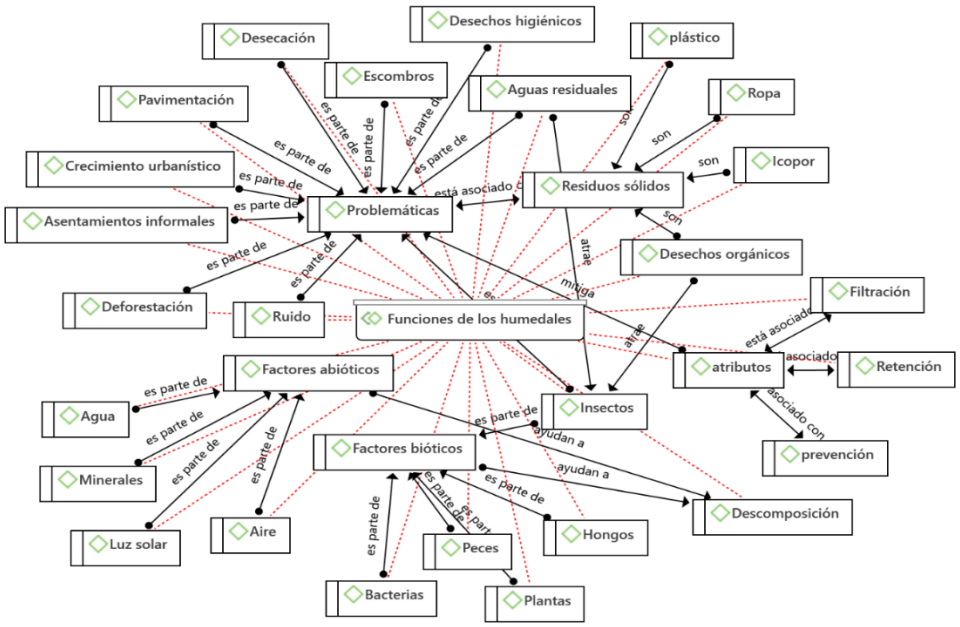

Fig. 1. A Network on wetland functions and risk factors. School Environmental Committee

Note: In the figure you can see networks between several codes that show different problems associated with the deterioration of wetlands. You can also see the functions and factors that make wetlands fulfill their cycle naturally. Preparation for ATLAS.ti.

3.1.2 Environmental Education for Environmental Protection

Another part of the analysis of the information obtained in the interview is directed at the characteristics of the educational actions that are designed to carry out classes in differential teaching-learning spaces, citizen competencies and the abilities and skills that are enhanced when educational activities are carried out in environmental spaces different from the regular classroom. Questions related to the institutional educational projects that are developed and can be linked to the environmental care program were also added to this part (questions 6, 7, 8, 9 and 10). The following image allows you to see the relationship between the codes that were associated with the topic.

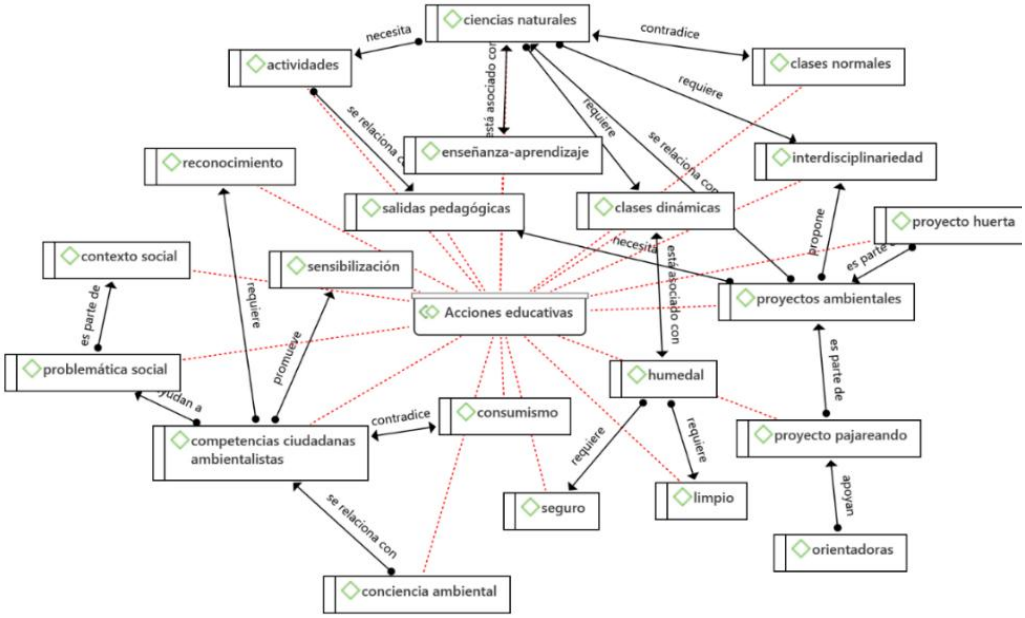

Fig. 2. A Network about the characteristics of educational actions in differential learning spaces. School Environmental Committee

Note: The figure shows the relationship between the codes of the characteristics that the classes that take place in non-conventional learning spaces must have, the educational projects that are added to the environmental care activities and the skills, abilities and citizen competencies that are promoted in the wetland. Preparation for ATLAS.ti.

3.2 Field Records

3.2.1 Environmental Education for Environmental Protection

The human impact was one of the aspects that was considered in the field records that the researcher compiled during the visits of the students and other interveners in the wetland. Part of this analysis is directed at the deterioration suffered by this body of water due to various human factors. On the other hand, the interventions of the people who attend this site in search of the improvement of their functions were observed.

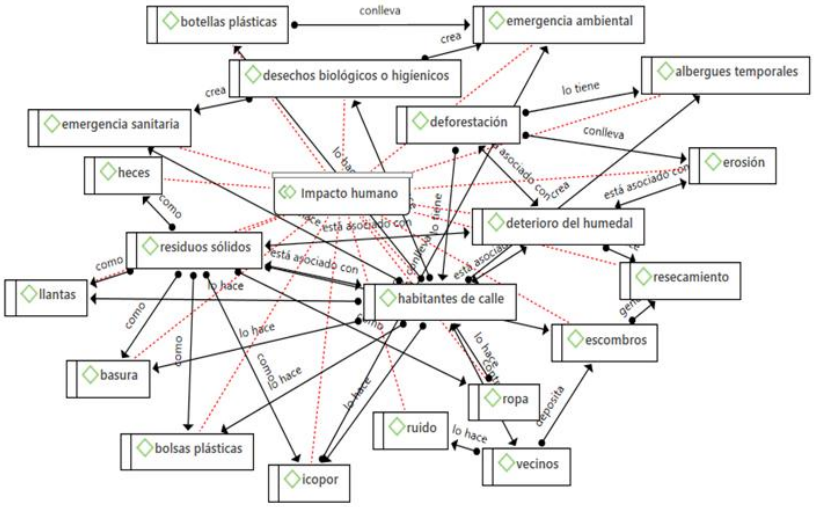

Fig. 3. A Network on human impact and risk factors for deterioration of urban wetlands. Field records

Note: The figure shows the relationship between several codes that show different risk factors that are seen in the wetland. In turn, population groups emerge that impact the wetland directly and are the main cause of the deterioration of the environmental site. Preparation for ATLAS.ti.

3.2.2 Environmental education for environmental protection

The next part of the analysis that was carried out on the information obtained in the field records corresponds to the teaching-learning actions that are carried out in the Tingua Azul wetland and how this environmental scenario has become an unconventional learning space, not only for the students of the La Chucua I.E.D. school. but for the other people who go there to practice recovery and decoration of the space.

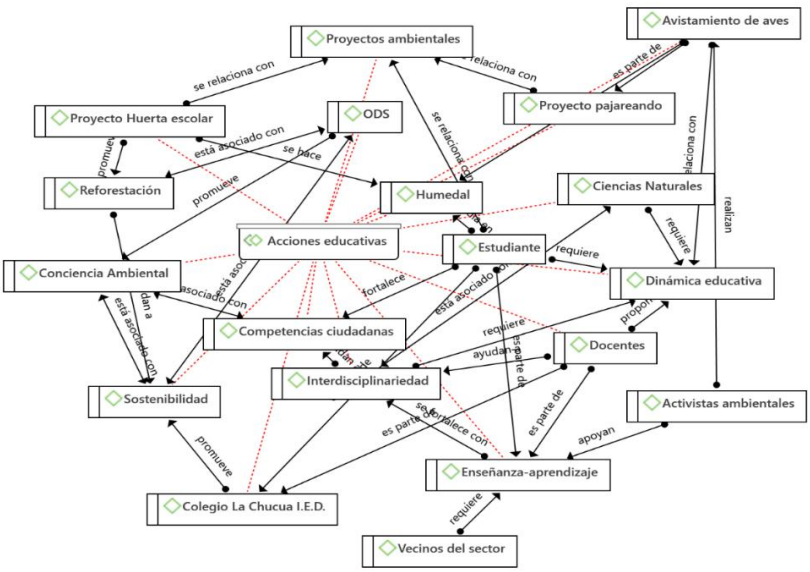

Fig. 4. A Network about the characteristics of educational actions in non-conventional learning spaces. Field Records

Note: In the figure you can see the codes related to the characteristics of the teaching-learning actions that are carried out in non-conventional learning spaces, the educational projects that are allied to the care of the environment and the skills, abilities and citizen competencies that are promoted with the activities that are developed in the wetland. Preparation for ATLAS.ti.

IV. DISCUSSION

4.1 Human environmental impact

Despite the initiatives that educational institutions and other governmental and non-governmental entities must take care of wetlands, there is another group of people who seek exactly the opposite. Xu et al. (2019) point out that some wetlands have suffered intentional deterioration whose purpose is to give them other uses such as grazing and agriculture. However, this type of work is not evident in the local wetlands. On the other hand, the information collected in this research agrees with the findings made by Alikhani et al. (2021), where it is stated that urban wetlands tend to disappear primarily due to premeditated desiccation for urban expansion.

The wetland has also seen the accumulation of other solid waste such as single-use plastics, hygienic and biological waste that, for health reasons, ordinary people are not allowed to collect, much less students. The officials of the companies Aguas de Bogotá, Ciudad Limpia and the Special Administrative Unit of Public Services, oversee this. As these are tasks that are not done regularly, it is easy to find more and more of this material in the field, which produces side effects such as the proliferation of rodents and disease-carrying insects, as explained by Luna et. al (2024).

The detriment that bodies of water suffer from at the hands of human beings, which is not seen maliciously but does greatly affect their natural state, is pollution due to the accumulation of solid waste. This can be seen in people who, unconsciously, throw garbage in the streets with the aim not of harming the environment, but of getting rid of this waste. Asomani (2019) points out that these types of practices occur, in part, due to the lack of implementation of strategies that promote environmental awareness in the community.

In addition to the above, there is another type of population that, due to its socioeconomic condition, makes urban settlements in public spaces, invading all types of territories including forest reserves, protected wetlands and natural parks. The above is stated by González et al. (2022), who also indicate that illegal urbanizations are the types of human settlements that have occupied the most wetland-type environmental areas in the last 10 years, this being the main cause of loss of these environmental territories.

Some waste that can be collected by the people who visit the wetland does not do so because of the fear generated by facing the street dwellers and people in a state of destitution who bring all kinds of garbage to this ecosystem and who inhabit and surround the sector. Likewise, officials from the companies that provide wetland protection services and carry out waste collection activities suggest not approaching these types of people and trying not to touch the waste they carry to avoid altercations.

Rodríguez et al. (2022) consider that, despite the self-regulation and regeneration of their ecological structure, urban wetlands cannot cope with the carrying capacity due to the disorderly urban growth and environmental pollution to which they are subjected. This has also been noted by the students at the School Environmental Committee of Chucua school and other members of the educational community, who report that, despite the efforts made to recover the space and have it in good condition, these are tasks that do not bear fruit because more and more spaces are being occupied by street dwellers, who carry with them a large amount of garbage that is not easy to collect and remove from the wetland.

In addition to identifying the problem due to anthropogenic activities within the area, Sarmiento (2022) points out that the construction of highways that surround and divide the wetland into two parts, affects the natural cycles of water and carbon and disables the function of being a refuge and shelter for native and migratory fauna. The same researcher mentions that, since the construction of Villavicencio Avenue in 2000, the life of the flora and all the native animals of the region has been put at risk, including that of the wetland itself.

4.2 Environmental Education for Environmental Protection

In the search to maintain a sustainable environment, the government of Colombia, through national policies, has wanted to include environmental awareness programs in educational institutions, both private and state. That is why, since January 1995, the environmental education project was instituted to contribute to the resolution of environmental problems that arise in the immediate vicinity of educational centers (Decree 1743, 1994). This government act required schools in Colombia to include in their school activities the School Environmental Project that seeks, among other things, to generate citizen environmental awareness from the earliest ages.

Unlike what Chía and Pinza (2023) state, where they indicate that several of the School Environmental Projects that the institutions have are proposals that serve to meet the requirement proposed by the Ministry of National Education of Colombia but are not transcendental, the information collected indicates that the

environmental project of the La Chucua school is a staging of what is learned at school and the activities that are carried out in the environmental environment, it has attracted the attention of various levels of the institution, to the point that They have linked members of the educational community on their own initiative, as is the case of the institution's counselor.

Although the leaders of School Environmental Projects are usually teachers in natural sciences and environmental education (González, 2024), the issue of environmental sustainability and care for the environment concerns all human beings on the planet and, in that sense. has permeated other areas of knowledge (Arias, 2024). At the Chucua school it is no different, since personnel who work in other areas have been linked to the projects that are related to environmental sustainability. Each of them has the intention of, on the one hand, providing knowledge to strengthen environmental projects. On the other hand, acquire knowledge in environmental education to multiply it with the rest of the educational community.

As well as the project presented by Tobar et al. (2019), at the Chucua school, a work plan has been organized around environmental education where students, parents, teachers of the institution, administrative members, cleaning and security personnel actively participate in the execution of pro-environmental activities that aim to reduce the human footprint in the green spaces that surround the school, including the Tingua Azul wetland, a site that the School Environmental Project recognized as the environmental site that requires greater attention. These activities are collection and separation of solid waste for the use of plastics and metals; planting ornamental, medicinal, aromatic and native plants; bird watching and recognition of school environments.

The activities carried out with the students of the Chucua School Environmental Project, within the wetland, seek, in principle, to generate a transformation in the environmental awareness of the participants to change bad consumption habits and result in the mitigation of the human footprint on nature. On the other hand, rethink the strategies of protectionist activities trying to attack the consequences, without making an evaluation of the origin of the problem, that is, find a way for students to begin by addressing the origin of the situations that put the natural environment at risk and from there take care of the sanitation of environmental territories.

V. CONCLUSIONS

After collecting information and subsequent analysis, it is recognized that the deterioration of this environmental site is due to several factors. One of them is the use of land to dump construction waste, which apparently seeks to dry out the land for the subsequent construction of buildings, as is the case with other environmental sites. Another corresponds to hygienic and biological waste that, for health reasons, is not removed by natural people but by specialized companies. The same applies to solid waste in general, which is sometimes not collected because "it belongs to the temporary inhabitants of the wetland." These three types of waste are all caused by humans.

Some of the contaminating material found in the wetland is collected by the different groups that attend to the wetland to preserve it and guarantee its ecosystem qualities. This is the recovery strategy that members of the educational community consider the most effective. The enclosure of the space has also been used to prevent access, a strategy that students consider has worked to mitigate the human footprint in the sector, but others consider that, although positive results can be obtained, it is not the most appropriate because it is invasive and privatizes public spaces.

The initiative to confront the problem of the destruction of environmental sites in urban environments, more specifically the Tingua Azul wetland, has emerged from the environmental educational proposal in conjunction with companies specialized in the sustainability of the wetland. This alliance has achieved that, from the outset, the local and district mayor's office directs its gaze to this ecosystem and sees it as an environmental scenario that is part of the Main Ecological Structure of Bogotá. Secondly, the government allocates an item so that students from the School Environmental Committee and state companies can manage sessions that invite reflection and thus propose changes in citizen behavior that affect nature.

Most wetland conservation proposals focus on the immediacy of the problem because they have seen and experienced the consequences of underestimating the functions of these bodies of water in urban areas and therefore, they think about the actions that can be taken to recover it. However, they do not have a retrospective look at the reasons for the events, that goes to the origin of the problems, that allows them to be addressed from there and once this is done, work is proposed that addresses the multiplicity of problems that prevent the degradation of this ecosystem.

For this reason, Environmental Education from the School Environmental Project of the Chucua school within the wetland focuses, first, on recognizing the environmental scenario as a space where you can learn about science and other subjects. Secondly, to raise awareness among students about the functions of the wetland and the importance it has in the urban area. This is a task that has been managed by the institution's natural sciences teachers themselves, who have obtained the support of officials from public and private companies specialized in the sustainability of different environmental spaces such as wetlands and who call on

teachers from other areas so that, based on their knowledge, they can provide support to the care of Tingua Azul.

What is intended with this is that the students of the School Environmental Committee of the La Chucua school are the ones who take the voice and are empowered by the sustainability of the Tingua Azul wetland, that they are multipliers of knowledge, that they are proactive in facing the causes of environmental deterioration in the area, that they are reflective with the problems they face and that they are critical of their actions and that of others with the Environment.

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