

Environmental Sustainability of the Higher Education Institution, Unidades Tecnológicas de Santander In Colombia, from the Sustainable Development Goals.

Carolina Hernández Contreras¹ Ricardo Andrés Oviedo Celis², Carlos Alberto Amaya Corredor³, Carlos Alberto Rodríguez Pérez⁴

^{1,2,4} Environmental Engineering Programa, Faculty of Engineering, Unidades Tecnológicas de Santander, Colombia

¹chernandez@correo.uts.edu.co <https://orcid.org/0000-0002-9222-791X>

²raovicel@correo.uis.edu.co <https://orcid.org/0000-0002-4792-7941>

³camaya@correo.uts.edu.co <https://orcid.org/0000-0002-6116-4880>

⁴crodriguez@correo.uts.edu.co <https://orcid.org/0000-0003-2533-822X>

*Corresponding author. Email: camaya@correo.uts.edu.co

Abstract

The current conditions of sustainability within the Unidades Tecnológicas de Santander® (UTS) are studied, based on an analysis that measures the level of contribution to goals in some of the Sustainable Development Goals (SDG), this type of measurement allows the institution to identify those scenarios in which the articulation actions still They are in force and the proper functioning of these, which are not a strength in the UTS, also establishes a reference point for the improvement that the development of its mission as professional training has as a framework for action. For this, information on the normal operation of the UTS was initially compiled. The data was also collected through the application of field instruments to the different actors of the Uteista community, the information was processed and contrasted with the objectives of the SDGs. The results indicate that there are some advances in the actions of the UTS in terms of sustainability, reflected in the environmental aspects, as a result of the role played by the programs in this area of knowledge, the articulation achieved with other training offers, in the management At the level, the ownership of the guidelines Sustainability is also a great contribution, however, there are still significant challenges to achieve a greater impact of the institution in external scenarios in terms of sustainability.

Keywords: Sustainable development objectives, Higher Education, Sustainability.

Introduction

The sustainability of the planet and the processes within it are among the priorities of governments and institutional leaders as a response to the constant levels of inequality in the economic, social and environmental aspects evidenced in the different scenarios of daily life. The origin of this context occurs in the 80's, a period in which there is evidence of an increase in the density of inhabitants, higher emissions of gases into the atmosphere and an increase in the generation of solid waste, among others (Leonard, 2010), which laid the foundations for the worldwide concern for adequate living conditions for the population (United Nations, ONU, 1987a), In 1992, at the Earth Summit held in Rio de Janeiro, Brazil, this concept was adopted by the 187 countries attending, thus giving rise to the concept of Sustainable Development at the governmental level, not only from a conceptual point of view, but also as a goal of the

world society. In this way, a new referent of planetary conscience is established, in view of the evident changes that this has presented, thus demanding a transformation of the vision of world development (Jiménez, 2012).

Higher Education Institutions (HEI, in Colombia IES) generate very high socio-environmental impacts (Jabbour, 2010) (Castro & Jabbour, 2013) and acquire duties with society to work towards sustainability (Ferrer-Balas, et al., 2010). We could say that HEIs in some cases can behave like small cities, taking into account that there are direct and indirect impacts generated by the number of students, teachers and administrative staff (Jabbour, et al., 2013).

HEIs have made a commitment to incorporate sustainable development objectives into their curricula and mission activities, thus recognizing the dependence of human activities on environmental impacts (Alshuwaikhat & Abubakar, 2008) (Jabbour, et al., 2013).

Since the 1990s, Colombia has responded favorably to all initiatives within this framework of international action in the search for a better present and future, as evidenced by the great influence that the 1991 Constitution had on environmental issues, by integrating them transversally in the highest document that governs the destiny of a country (National Environmental System [SINA], 2010). Progress at the national level in this regard is evidenced by the strengthening of legal instruments, the formation of public and private institutions, and the integration of actors, among others, which together materialize actions towards the consolidation of sustainability scenarios in different contexts of space and time.

One of the integration scenarios corresponds to the Higher Education Institutions (HEIs), "entities that have, in accordance with legal regulations, official recognition as providers of the public service of higher education in the Colombian territory" (Ministry of National Education [Mineducación], 2018). Under this institutional figure, the country has a registry of 296, of which 83 are public and 213 are private, classified as: Professional Technical Institutions, Technological Institutions, University Institutions or Technological Schools and Universities, being the academic character the aspect that marks the difference between them, which also defines their actions by reason of the development of academic activity and professional training in a specific manner, thus creating value-added conditions that give them relevance in the territories.

However, the mere mass of institutions does not guarantee the quality of the service provided; this sector, like all those that are part of the economic dynamics, has entities with high and low levels of quality, which explains the heterogeneity of the Colombian higher education system (Melo, Ramos, & Hernández, 2017). Reducing this type of gaps within the (HEIs) through internal actions and others of a joint type, is the course that this guild seeks to find, from spaces for the formation of integral human capital, in such a way that it is capable not only of transforming a specific area of knowledge, but equally its social, environmental and economic surroundings (Ospina, et al., 2015).

On this context, the Unidades Tecnológicas de Santander® (UTS) seeks to be a reference in the northeast of Colombia, not only in higher education, its institutional vision links the pillars of sustainability as cross-cutting axes of the training provided to the actors that make up the current and future Uteista community. (UTS, 2020).

As part of this process, the UTS recognizes the Sustainable Development Goals (SDGs) as the appropriate means to achieve comprehensive quality standards that contribute to

the growth of the region, society and the conservation of natural resources, while making use of them.

The study presents an analysis of the level of compliance with 6 specific areas defined to measure sustainability standards in HEIs worldwide, and seeks to determine the current status of the STUs with respect to their actions in favor of sustainability according to the criteria of the methodology, and also how to articulate the results generated to the fulfillment of the goals of the 17 SDGs.

Materials and Methods

Study Site

The study was conducted at the Unidades Tecnológicas de Santander® (UTS), a higher education institution located in the city of Bucaramanga in Colombia, which is public and was founded in 1963. The UTS is located in the sector commune 7 of the city, in a student area with more university education centers (2) and (5) colleges that aggregate about 40 thousand students of basic, middle and technical education.

Research Process

The methodological construction of the work carried out was under descriptive, interpretative (Barraza, 2017) and correlational approach (Hernandez, 2014), from which the conditions of the study environment were identified and the situations found were explained through the elements applied and the possibilities of intervention to improve what was found.

The work was carried out in the Unidades Tecnológicas de Santander® (UTS), a Higher Education Institution located in the city of Bucaramanga, capital of the department of Santander - Colombia, with approximately 13,600 students, of which 70% are of socioeconomic stratum 1 and 2, about 900 teachers and 500 administrative staff.

The study reviewed variables according to the Colombian National Environmental Education Policy (PNEA) of the environmental component of the substantive functions and functional structure of higher education institutions, as well as the Sustainable Development Goals were taken into account (Rieckmann & Mindt, 2017).

In the first phase of the work, the work already developed by the academy was identified, to which environmental aspects of the institution responded. This made it possible to show that there were no guidelines from the institutional management for environmental responsibility, although the academy had been working to improve specific processes to intervene and mitigate possible environmental damage in the institution.

In the second phase, an institutional environmental identity matrix was drawn up for UTS, in which the environmental aspects on which the institution should focus its efforts were specified. This matrix covered technical environmental aspects, articulating them with policies, principles, and general operating objectives. This institutional panorama showed that the academy had developed actions that responded to the institutional environmental commitment.

In a third phase, the work was complemented with external support and focused on reconstructing the advanced work to begin to see it within the concept of environmental sustainability; identifying the areas of work of this environmental sustainability and formulating the structure of the institutional sustainability plan.

The work materialized in the environmental sustainability plan, from which the environmental policy, principles, guidelines and institutional components of sustainability have been established, grouping actions to be executed and articulating the vision of the UTS with the SDGs.

The methodological development led to repeating the work dynamics of the experiences referenced in the document, the UTS began by recognizing their environmental responsibility and evolved into a sustainability plan, which focuses on environmental actions and responsibilities, aligned with the SDG approach.

Results and Discussion

Currently in the Technological Units of Santander there is evidence of evolution in relation to achieving positive changes for the benefit of people and the planet. Progress is being made to achieve a change that allows the university to be an example, and emerge as an institution with environmental policies that contribute to the awareness of students, teachers and managers, but also to the community in general to apply them to their daily lives.

It was established that the institution is executing actions towards the fulfillment of some goals of the SDGs: 4, 7, 11 and 12, which is evidenced in specific actions such as: environmental focus programs towards energy saving and efficient use of energy, reduction and management of solid waste and Program for saving and efficient use of water. These programs are considered relevant because of the level of use they have within the institution, where normally some 15,000 people, including students, administrative staff, contractors and others who enter the facilities, demand use that has direct implications on the conservation and future availability of these and other natural resources.

Regarding Goal 4: Ensure inclusive, equitable and quality education and promote lifelong learning opportunities for all.

UTS has integrated these aspects into its institutional master documents, with the aim of translating them into specific actions to reduce the current social gaps, which have had a great impact on the student community and other external actors. The institution seeks to become a reference not only for education at the technological and university level, its projection from its headquarters and those located in some of the regions, is to consolidate a higher level pedagogical model where all social actors have a full place and guarantees to be trained and to realize their life projects, having as a means to this end the academic offer currently in force.

An example of this is the admission and graduation of the first professional in public accounting with a hearing disability, the inclusion as an active student of a member of the Wuyu indigenous community, and other experiences at the gender level, which have been successful in the integration of these social expressions in university life. In this process UTS has had the support of important institutions such as Niagara College and

the Pacific Alliance, which, with the program More Employment Opportunities for the Caribbean Region, created spaces for dialogue, for the creation of a scenario of participation without social limitations, which allowed the formulation of the gender equity plan, which ratifies the commitment to be an inclusive HEI.

The Institutional Welfare department has an education program that allows opening channels of attention to students, teachers and administrative staff, leading to the expansion of knowledge, teachings and interaction with the vulnerable population from an active intervention allowing to meet the various needs identified in the processes of care.

It also has a wide variety of technical, technological and professional programs, attached to two faculties known as the Faculty of Socioeconomic and Business Sciences (FCSE) and the Faculty of Natural Sciences and Engineering (FCNI).

In the Faculty of Socioeconomic and Business Sciences (FCSE) most of the careers do not include in their academic programs subjects directly related to the environment and sustainability, of this academic offer, only two of the careers have a subject emphasizing the environment and sustainability, established in the academic curriculum. In this way it can be mentioned that these careers are Technology in Marketing and Commercial Management, in which Environmental Marketing is located in the second semester, which is defined as the commercial strategy of a company dedicated, normally, to the sale of ecological products, as well as any other type of product that has been prepared to reduce its impact on the environment (Fernandez, 2016).

There is also the Technology in Agroindustrial Management, where the subject known as Sustainable Production is offered, expressed clearly and precisely as the use of agricultural resources, where students develop content related to crop rotation, implementation of silvopastoral systems, with approaches to sustainable use and management of natural resources that allow families in the rural sector to meet basic needs such as food, and general welfare of the members of the productive units.

It should be noted that within the subjects offered as electives in each of the careers, some integrate aspects of environmental character, but they are not mandatory, on the contrary, the student has the power to choose or choose other topics different from this one.

The professional careers of this faculty do not have subjects whose emphasis is on environmental issues or sustainability, which is worrying because although the academic offer is not directly related to the environment, it should include subjects that focus the students on the importance of it, the changes evidenced today; and the need to seek alternatives and raise awareness of the various problems in the territorial scenarios, becomes an opportunity to contribute from these areas of knowledge to the construction of solutions, thus creating a space for participation that strengthens the actions of environmental authorities and ratifies the social commitment as a pillar of sustainability.

In the Faculty of Natural Sciences and Engineering (FCNI), with respect to the relationship between academic offerings and subjects of an environmental and sustainability nature, in this faculty the academic programs of Technology in Environmental Resources Management and Technology in Geotechnical Studies stand out as the careers that have this type of subjects.

Technology in Environmental Resources Management, specializes directly in these topics, so its curriculum incorporates throughout the semesters and abundantly related subjects such as environmental ecology, environmental legislation, water, soil and air resources, their respective laboratories, as well as the subject of identification of environmental effects among others, while the Technology in Geotechnical Studies, couples environmental impacts, as the only subject based on environmental issues.

This faculty should incorporate to the academic programs a greater offer of subjects concerning environmental topics, since, its denotation is centered on nature, resulting in a greater number of subjects of this nature, in the programs, reflecting the opposite, except for Environmental Engineering and Technology in Environmental Resources Management who contribute with the great majority of subjects.

The above is partly in agreement with what was postulated by Castañeda and Quintero in 2015 where they state that the training of professionals should include challenges of human civilization in each of the disciplines, contain interdisciplinary courses that address sustainability issues, that these courses should highlight challenges and problems. They also suggest that research and development activities should be relevant to the problems associated with sustainability, such as renewable energies, poverty and childhood diseases, among many others (Castañeda & Trujillo, 2016).

The UTS is working on SDG 7: sustainable and non-polluting energy, The program in Saving and efficient use of energy for this particular item, making a visual analysis of the facilities of the Technological Units of Santander, it can be mentioned that since 2014, when the South building was inaugurated, it was first implemented the installation of LED bulbs throughout the building, placing them in all sectors of the building, from offices and classrooms, to the corridors, indicating that for the latter, motion sensors were installed, which allow the bulbs to turn on when they detect the movement of people in this place, as well as automatically turn off when it is empty. This led in 2017 to change the lighting in the North building in its classrooms, installing light bulbs of this type, focused on reducing energy consumption, which in 2019 was maintained, inaugurating the last building of the UTS (new building), which was modernized throughout its infrastructure, with significant changes, increasing the number of classrooms, following the line of the South building, where LED bulbs were installed, both in classrooms and hallways.

This has led to a decrease in the university's energy consumption and therefore energy savings, highlighting this aspect as important in the replacement of electrical appliances, focused on reducing the carbon footprint and thus contributing to the institution's energy saving program.

It is important to mention that old computers and air conditioners have been replaced and small solar panels have been implemented to produce renewable energy, located at strategic points to generate energy to charge cell phones and computers, as well as other devices that require this function.

Similarly, refrigerators and microwave ovens have been modernized, as well as the heated food counters that operate in the cafeterias, replacing the previous ones that consumed more energy, allowing a reduction in consumption, but with a more efficient operation.

On the other hand, the established proportion of energy consumption by the population of the institution is quite low, since an average person in the UTS consumes

approximately 1.86 kWh/month*inhabitant, which is very low, since Empresas Públicas de Medellín® (EPM), the service provider in the area, establishes 38 kWh/month, i.e. 36.14 kWh/month less than what is established. Corroborating what was postulated by Callejas in his document "Environmental commitment of higher education institutions in Colombia" (Callejas, et al., 2018).

Another sustainable development goal taken into account at UTS is SDG 11: Make cities more inclusive, safe, resilient and sustainable.

For this item, the ratio of vehicles (cars and motorcycles) to the campus population was taken into account. The institutional repository of projects was used as secondary information support. Thus, it is established that UTS has a population of approximately 19,000 students, plus 995 people between managers and teachers, and it was found that 6.5% of the campus population uses its own vehicle as a means of transportation; this is equivalent to approximately 1,235 people and 31.7% of the campus population uses its own motorcycle as a means of transportation. This is equivalent to 6021 people approximately (Anaya & Roa, 2019).

At the second Latin American Congress of Engineering, which took place in Cartagena de Indias, a proposal was presented by the university to reduce the generation of Greenhouse Gases (GHG), called "Proposal for the reduction of contributions of greenhouse gases associated with transport systems, used by the academic community of the Technological Units of Santander, UTS, in Bucaramanga, Santander, Colombia", where proposals for the management of mobility were exposed, highlighting: Train the community to migrate to low or zero GHG generation transportation systems. Establish a plan to reduce the use of vehicles, through voluntary regulation, either by reducing or sharing vehicles and motorcycles, minimizing the emission of pollutants into the atmosphere. Establish traffic regulation in the vicinity of the UTS, establishing arrival points for traditional transportation, generating a perimeter around the university, decongesting traffic and reducing gas emissions (GHG), thus generating healthy habits in the community by forcing them to walk a specific route of no less than 1 km to access the campus. In this way, important alternatives were established to limit or reduce private vehicles on campus, as expressed in the strategies mentioned above. (Amaya, et al., 2019).

It is also identified that the institution does not have its own transportation service, so students who do not have a vehicle for their daily commute, resort to public transportation in the city. This increases the atmospheric pollution indexes due to the use of public transportation, since many of the students must use these means several times a day and at the same time it can be presented as an economic affectation.

Speaking of parking areas, we can say that due to the remodeling of the physical infrastructure at UTS and the sector where it is located, there are currently no parking areas of its own, so students and most teachers use private parking lots that have sprung up in the vicinity to meet this need. These places are located in the Roberto García Peña Skating Rink, Plaza Mayor, the Acrópolis Shopping Center and the surrounding schools. However, it is planned that by 2020, the construction of the institutional parking lot will be completed and approximately 150 parking spaces for vehicles and motorcycles will be available in the basement of the new building.

Regarding the use of bicycles with respect to the campus population, it is found that 5.1% of the campus population uses bicycles as a means of transportation. This is

equivalent to approximately 969 people. UTS has a campus that is mostly vertically structured, so it is difficult for bicycles to be transported adequately in the institution however, it does have small parking areas established for this purpose, as well as pedestrian areas that allow the flow of people comfortably through each of the places available to the institution for its student population.

According to Callejas et al., 2018 where they expose that higher education institutions in Colombia show less progress in campus mobility.

Analyzing how the institution is with respect to compliance for Objective 12: Responsible production and consumption,

It was found that the institution has the formulation and current execution of the Integral Solid Waste Management Plan (pgirs) of the Unidades Tecnológicas de Santander® (UTS), Bucaramanga headquarters" of 2017, with the purpose of taking advantage of the solid waste generated to incorporate it back into the productive cycle. For this particular case, a minimization program is clearly specified, which specifies the creation of responsible consumption habits in the institutional population, in order to reduce the generation of solid waste and thus give them a second useful life, with short, medium and long term goals. The final goal is to establish a 15% reduction in generation, formulating for paper and plastic reuse strategies, training on responsible consumption and sale of recycling for use by companies that meet this purpose, thus achieving reuse of materials and mitigating the impact generated by the production and use of these materials, generating awareness in the university. (UTS, 2020).

It is important to emphasize that indirectly the professors and students of the UTS have established their own strategies to reduce the use of paper in the institution, through the use of technological tools, thus avoiding the need to print, or if necessary to print double-sided and share it among the students, thus reducing its generation and thus reducing the impact of its consumption on the environment.

With respect to the management of toxic waste, UTS works on the management of hazardous waste by means of signaling the disposal points, since they are generated mainly in the area of the laboratories, destined for the Environmental careers, by placing red-heat bins, as well as for their subsequent disposal in bags of the same color. These are disposed of in the collection areas established by the university to be deposited later in the sanitary landfill. Beyond this, there is no specific treatment for this type of waste. It is worth highlighting that only 1% of the waste produced by the institution is hazardous. (UTS, 2020).

Speaking of organic waste treatment, it can be established that the university complies with the separation of waste at the source, through the implementation of colored bins, but no clear management alternative is given for its use, and even in the institutional PGIRS there is no mention of any methodology for its reuse, since it focuses to a greater extent on inorganic waste. As a result, this waste is simply disposed of in a sanitary landfill in the Bucaramanga metropolitan area.

The above corroborated by Callejas et al., 2018 where they expose that 91.7% of higher education institutions in Colombia have plans for the adequate treatment of solid waste. (Callejas, et al., 2018).

Considering the disposal of wastewater, the institution does not have an established program that allows performing some type of treatment to the wastewater generated in it. For such reason this type of waste simply goes to the public sewer, which

subsequently reaches a treatment plant owned by the Empresa Pública de Alcantarillado de Santander® EMPAS S.A E.S.P, which performs the various processes for its decontamination, this is in an area in another municipality of the metropolitan area of Bucaramanga, far from the university, specifically in the ring road, in the PTAR of Rio Frío, approximately 9.6 km away.

Within this same objective 12 we find that the Santander Technological Units do not have an established program for water conservation. That said, it can be said that the institution has taken some measures to reduce water consumption, guaranteeing the protection of natural resources and the environment. This is mainly due to the conservationist approach and the action of teachers and students belonging to the Technology and Environmental Engineering careers that even in the absence of a program as such, promote the protection of the resource and understand the value it has for the planet and life on it, socializing through some campaigns sharing on the university website, some measures to be taken into account to meet this end.

On the other hand, some implements have also been installed in the bathrooms to reduce consumption, mainly in the buildings that were inaugurated in 2014 and 2019 respectively, with state-of-the-art batteries.

By conducting an observation study in the UTS facilities, it was determined that the greatest source of water consumption of the institution is in the areas of the bathrooms located in the south and north buildings, where there are toilets, urinals and sinks, which work with push systems for the most part, These systems are used to save water and therefore reduce water consumption, but there are also faucets and stopcocks in the bathrooms, cafeteria, laboratories, consulting rooms and some offices, as well as emergency showers distributed in the chemistry laboratories, which increase consumption, since they are not established as water-saving systems.

It should be noted that in the north building, although the vast majority of the sinks have push systems, some of them are damaged and others have been replaced by stopcocks, affecting the indicator being evaluated, regarding the use of efficient devices for water consumption. (Arenas & Rincon, 2019).

Below is the distribution of water consuming equipment in the south and north building, with their respective system. It is worth mentioning that building C does not have batteries or another system for water distribution, since it is attached to the south building and therefore uses the same sanitary batteries.

The university currently does not have any system for collecting rainwater or piped water, which prevents it from being obtained in various ways, so that it is not consumed only from the faucet and thus has several means of supply. This is a considerable problem, since the implementation of a system of this type would benefit the campus in many aspects, by making it available for various activities, replacing drinking water, reducing the impact on the environment and improving the economy of the institution, in addition to being an example to the population and other institutions of higher education.

Conclusions

The university lacks a comprehensive vision for environmental sustainability, so it is necessary to implement a comprehensive environmental management plan, which includes corrective measures to strengthen environmental actions, promote the protection of natural resources and engage the institution in sustainable development.

The institution has research groups that must strengthen their processes for the integral environmental management of the institution, thus generating the specific corrective measures needed to bring about sustainability on campus, bearing in mind that this responsibility does not fall only on the students and teachers of the Environmental Engineering and Environmental Resource Management Technology careers, but on all the careers so that they interact in a multidisciplinary manner and can create large-scale solutions to strengthen the environmental performance of the UTS.

The need arises to implement the system of indicators and monitoring of sustainability conditions at UTS, which will serve as a reference for permanent measurement of the execution of actions and the environmental improvement of the institution, since this program brings with it advantages that make it possible to generate exemplary environmental behavior on the part of the institution, gaining recognition and making it a local, regional, national, and international reference on the basis of urban sustainability. Therefore, the implementation of this system is established as a fundamental pillar, in order to strengthen research management and technological progress for the care and protection of the environment, based on academic training for university sustainability.

REFERENCES

1. Alshuwaikhat, H. M., & Abubakar, I. (2008). An integrated approach to achieving campus sustainability: assessment of the current campus environmental management practices. *Journal of Cleaner Production*, Pages 1777-1785, Volume 16, Issue 16. <https://doi.org/10.1016/j.jclepro.2007.12.002>.
2. Amaya, C. A., Díaz, A. L., Lugo, D. C., Sánchez, D. C., , .., & , .. (2019). Proposal for the reduction of greenhouse gas emissions associated with the transportation systems used by the academic community of the UTS in Bucaramanga, Santander, Colombia.. In A. C. ACOFI, *Memorias, Retos en la formación del ingeniero en la era digital* (pp. 275-280). Bogota, Colombia: Opciones Gráficas, editores Ltda. ISSN: 2665-5918.
3. Arenas, D., & Rincon, j. (2019). Formulation of the Energy Saving and Efficient Use Plan at the UTS. Bucaramanga: UTS.
4. Barraza, M. A. (2017). The Construction Of Research Questions Within Qualitative Methodology With An Interpretative Orientation. *Praxis Investigativa ReDIE*, ISSN 2007-5111, 68-74.
5. Callejas, R. M., Sáenz, Z. O., Plata, R. Á., Holguín, A. M., Mora, P. W., & . (2018). The environmental commitment of higher education institutions in Colombia. *Journal de Investigación y Pedagogía, Praxis & Saber*, 197-220, <https://doi.org/10.19053/22160159.v9.n21.2018.8928>.
6. Castañeda, Á. M., & Trujillo, Q. H. (2016). University and sustainability: a theoretical approach for implementation. *AD-minister*, 149-163, ISSN 1692-0279, DOI: 10.17230/ad-minister.26.7.
7. Castro, R., & Jabbour, C. C. (2013). Evaluating sustainability of an Indian university. *Journal of Cleaner Production*, Volume 61, Pag 54-58, <https://doi.org/10.1016/j.jclepro.2013.02.033>.

8. Fernandez, M. A. (2016, 02 16). ¿What is green marketing? Retrieved from <https://mglobalmarketing.es/>: <https://mglobalmarketing.es/blog/marketing-verde-ecologico-como-se-aplica-y-beneficios/>
9. Ferrer-Balas, D., Lozano, R., Huisingh, D., Buckland, H., Ysern, P., & Zilahy, G. (2010). Going beyond the rhetoric: system-wide changes in universities for sustainable societies. *Journal of Cleaner Production*, Volume 18, Issue 7, Pages 607-610, <https://doi.org/10.1016/j.jclepro.2009.12.009>.
10. Hernandez, S. R. (2014). *Research Methodology*. MEXICO: MAC GRAW HILL.
11. Jabbour, C. J., Sarkis, J., Jabbour, A. B., Govindan, K., .., & .. (2013). Understanding the process of greening of Brazilian business schools. *Journal of Cleaner Production*, Volume 61, Pages 25-35, <https://doi.org/10.1016/j.jclepro.2013.05.001>.
12. Jabbour, J. C. (2010). Greening of business schools: a systemic view. *International Journal of Sustainability in Higher Education*, , Vol. 11 No. 1, pag 49-60, <https://doi.org/10.1108/14676371011010048>.
13. Jiménez, H. L. (2012). Sustainability as a process of dynamic equilibrium and adaptation to change. *Journal of economics*, ISSN: 0019-977X, 65-84.
14. Leonard, A. (2010). *The Story of Stuff. How our Obsession with Stuff is Trashing*. Buenos Aires, Argentina : Free Press, de Simon & Schuster, Inc.Fondo de Cultura Económica de Argentina, S.A.
15. Melo, B. L., Ramos, F. J., & Hernández, S. P. (2017). Higher Education In Colombia: Current Situation And Efficiency Analysis. *Desarrollo y Sociedad*, 59-111, <https://doi.org/10.13043/DYS.78.2>.
16. Ministerio de Educacion Nacional MEN. (2019, 07 15). Ministry of National Education www.mineduacion.gov.co. Retrieved from https://www.mineduacion.gov.co/1759/w3-article-231240.html?_noredirect=1
17. Ospina, L. M., Canavire, B. G., Bohórquez, S., Cuartas, D., .., & .. (2015). Tertiary Education Expansion and its Effects. *Desarrollo y Sociedad*, 317-348, DOI: 10.13043/DYS.75.8.
18. Rieckmann, M., & Mindt, L. (2017). Developing competencies for sustainability-driven entrepreneurship in higher education: A literature review on teaching and learning methods. *Revista Interuniversitaria*, 129-159, ISSN 2386-566,0 DOI: 10.14201/teoredu291129159.
19. SINA, Sistema Nacional Ambiental. (2010, 08 13). National Environmental System <https://www.minambiente.gov.co>. Retrieved from <https://www.minambiente.gov.co/index.php/ordenamiento-ambiental-territorial-y-coordinacion-del-sina/sistema-nacional-ambiental-sina/lo-que-hacemos>
20. United Nations, ONU. (1987a). Report of the world commission on environment and development. Ginebra, Suiza: ONU.
21. UTS, U. T. (06 de 2020). PEDI, Plan Estratégico de Desarrollo Institucional. Institutional Development Strategic Plan. Take to uts.edu.co: <https://www.uts.edu.co/sitio/wp-content/uploads/planeacion/Doc-PEDI-%202021-2027.pdf?t=1612990464>.