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Green economy metrics as a promoter of sustainable development in universities. Case study: El Bosque University

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Abstract. The exchange that occurs in universities when they participate in international rankings is an important space to share and grow in the academic production of teachers and in the training of students. At the beginning, the sustainable social responsibility system was adhered only to the industry due to the increase in large-scale production; however, the academy has taken a voice and vote on this climate phenomenon. This is why projects aimed at sustainability have been proposed in universities that aim at a green economy. Likewise, the UI Green Metric Rankings allows higher education institutions worldwide to measure their sustainable actions in different categories on a voluntary basis.

For this reason, this article presents the best practices of the University El Bosque against the different indicators that the UI Green Metric measures, such as infrastructure, energy and climate change, waste, water, transport and education. Consequently, the concept of sustainability has become a vital element for the development of programs that involve the institution in internationalization through the global recognition generated by being

participants and being able to be in the range of green universities.

As a conclusion of this exchange, Based on responsible production methods with the natural and social environment or **Clean Modalities**, a production cycle is proposed that opens the possibility of integrating with other related production systems that receive their waste as raw materials in a network, this is **Symbiotic Cycle**. To arrive at the approach of a symbiotic disposal of waste as inputs with other production systems in such a way as to consolidate a set of sustainable organizations that collaborate with each other and that continuously recover the value to increase efficiency.

Keyword:
sustainability, green economy, sustainable development

1. Introduction

Sustainable social progress highlights that any human advancement has a set of customary changes due to the interdependence of sustainability in the social, economic and environmental fields. Environmental sustainability drives economic growth and progress, while affirming the natural resource base and environmental services that ecosystems facilitate by reducing damage to the environment.

The paradigm of sustainability in universities faces a challenge in environmental, social and economic considerations in search of opportunities for improvement, the well-being of the university community and a commitment to future generations, through the concordance of economic growth, social progress and the conservation of the environment.

Therefore, the Sustainable Development Goals (SDGs), as promoters of university responsibility towards sustainability, integrate these concepts to take advantage of the opportunities that arise in educational contexts and thus plan sustainable projects, which are correlated with the role that the SDGs play a role in contributing to sustainable development and thus creating shared value.

One of the pillars on which the University El Bosque focuses its strategic objectives is Social Responsibility, seeking to achieve an integration between the environment and society since this relationship is considered a substantive function in the institutional work and thus be able to respond in a pertinent way to the needs presented within the institution, promoting a scenario of social participation and care for the environment.

In this context, the University's Environmental Sustainability Consolidation Program was established for the 2016-2021 Institutional Development Plan, which proposes the implementation of the Institutional Environmental Policy (Adopted through Agreement 13101 of 2015), with the aim of improving the institution's environmental performance, promoting sustainable lifestyles in its community.

Environmental policy in development plans in Colombia are aimed at anticipating or mitigating impacts on natural resources and the environment, conserving or restoring natural resources, or remedying an old environmental problem. Likewise, in the institution

the objective of the environmental policy is oriented towards the planning, organization, assignment, direction and control of all activities related to environmental management within the El Bosque University, aimed at improving university environmental management. Founded on the society-environment relationship and aimed at improving environmental performance.

2. UI Green Metric process for applying sustainability metrics

In order to participate on an international system for measure the level of sustainability, contrasting the inner way of functioning of the environmental system, the status of the process is as follows:

2.1. Performance Of El Bosque University in UI Green Metric

El Bosque University on behalf of the Environmental Management Unit has managed to participate in six versions of UI Green Metric carried out between 2015 and 2020 and currently participates in the 7th UI Green Metric World University Rankings 2021.

Regarding the performance of the institution for the year 2020, at the national level, it obtained the position #10, but at the international level, it has been increasing from being in position 134 to 125, being increasingly closer to the first places. Table 1 relates the scores with those obtained by category of Setting and Infrastructure (SI), Energy and Climate Change (EC), Waste (WS), Water (WR), Transportation (TR), Education and Research (ED).

Table 1. El Bosque University´s UI Green Metric Score

UI GreenMetric Ranking		*SI Ranking*	*EC Ranking*	*WS Ranking*	*WR Ranking*	*TR Ranking*	*ED Ranking*
Country Ranking	**10**	28	4	28	11	5	8
World Ranking	**125**	486	33	314	117	88	131

With respect to 2019, it can be seen that the category that was closest to the maximum score was "Water" with only 200 points of difference and the one that was least was "Environment and infrastructure" being below 775 points, followed by category "Waste" by 775 points. Compared to the categories of "Energy and climate change", "Transport" and "Education" a difference with the ceiling of 425, 350 and 300 points is obtained respectively.

Table 2. Results by category UI Green Metric 2020

CATEGORY	TOP SCORE	SCORE	DIFFERENCE
Setting and infrastruture (SI)	1500	725	775
Energy and Climate	2100	1675	425

Change (EC)			
Waste (WS)	1800	1125	675
Water (WR)	1000	800	200
Transportation (TR)	1800	1450	350
Education (ED)	1800	1500	300

2.2. Annual results by category

Setting and Infrastructure

Within the framework of the Sustainable Development Goals (SDGs), it has been proposed to build resilient infrastructures, promote sustainable industrialization and foster innovation, which is key to technological progress and thus discover lasting solutions to economic and environmental challenges.

At the university, 26.46% of buildings apply smart construction criteria, the design of which includes parameters such as the use of recycled materials, natural climate regulation or natural lighting. In addition, they are equipped with technologies that optimize the use of natural resources necessary for their normal operation.

Energy and Climate Change

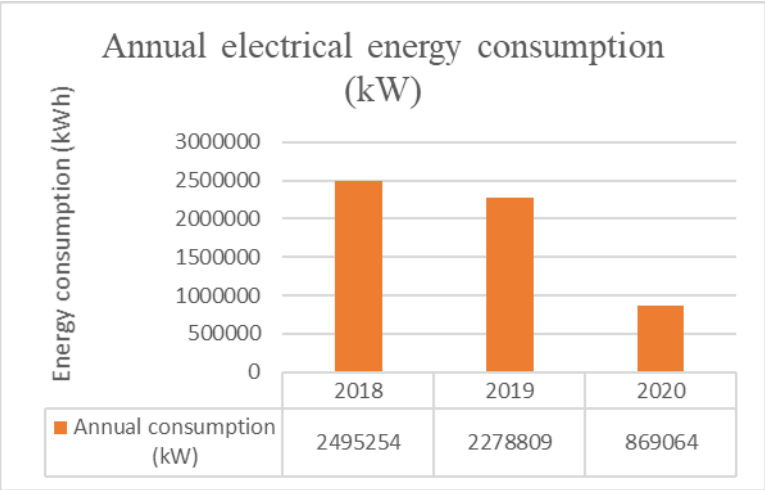
The energy transition is seen as a sustainable development strategy in the face of climate change, due to the reduction of CO_2 emissions emitted into the atmosphere, where renewable and clean sources are used and electricity self-consumption is implemented, for the best use sustainable use of the country's natural resources.

Within the El Bosque University facilities, LED-type luminaires are installed in more than 75% of the campus, which allow energy savings. The institution seeks to reduce electricity consumption as much as possible. This is reflected in actions such as:

Table 3. Actions to reduce electricity consumption at El Bosque University.

Actions to reduce electricity consumption at El Bosque University	The design of its infrastructure seeks to make the most of natural light.
	Implement elements that activate the lights of the spaces through movement, thus avoiding leaving lights on in empty places.
	The implemented luminaires are characterized by their high percentage of savings, which save 44% compared to conventional bulbs.
	The electrical appliances used on campus, such as video beams, refrigerators, microwave ovens, etc., are acquired based on the energy consumption label, where most belong to class A (class with the lowest consumption class).

In the analysis of energy consumption for the institution, the reduction in electricity consumption for 2020 is evidenced by approximately 62% compared to 2019 and by 65% compared to 2018, data that support the effective management of this energy source within the University.

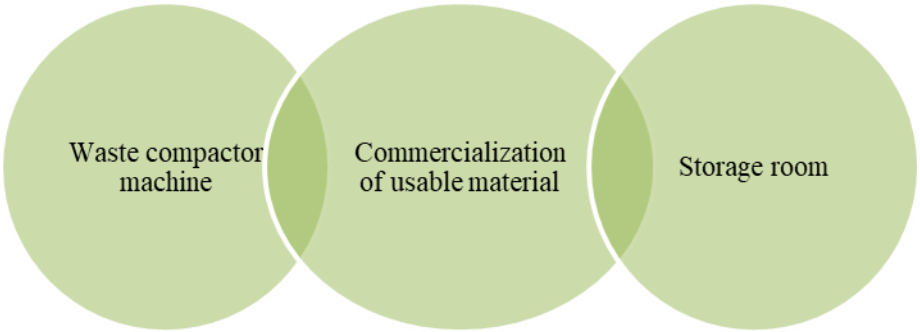


Waste

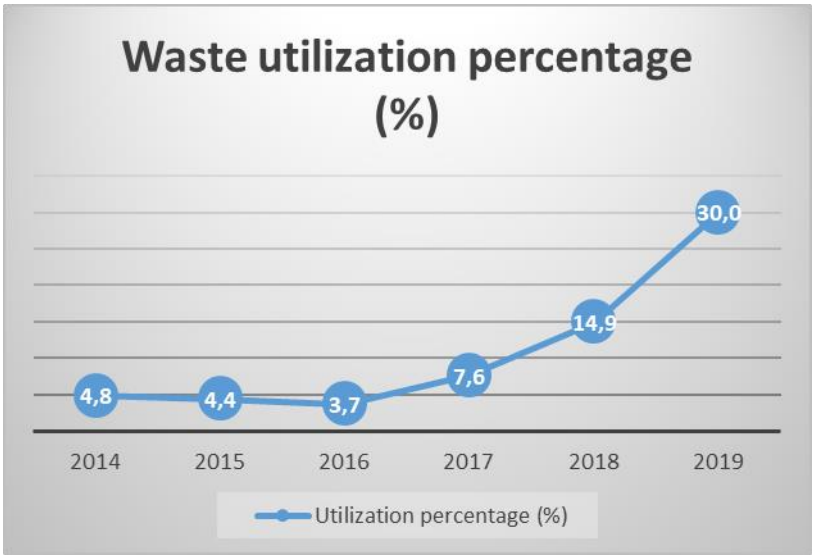
Solid waste management is a key issue in the concept of green economy, where the increase in the volume and complexity of waste has been reflected in economic growth, this is how sustainability projects and programs control the contribution to the production of greenhouse gasses (GHG).

The world market for recyclable waste is estimated at US $ 410 billion per year, which does not include the informal collection segment in developing countries. This represents only 25% of the total waste generated, the rest is deposited in incinerators or sanitary landfills (in the best of cases), (appointment) it is here, where a key point is established with goals and indicators (economic, operational , environmental, training, participation, among others), in which the progress of the programs that are managed in favor of process optimization and good management by university entities is measured.

For this reason, the institution focuses on avoiding the generation of waste, but is also concerned with including recycling within the life cycle of products. To achieve this, the University has invested in tools such as:



All these strategies have made it possible to increase recycling by up to 30% in these years, as can be seen in the following graph.



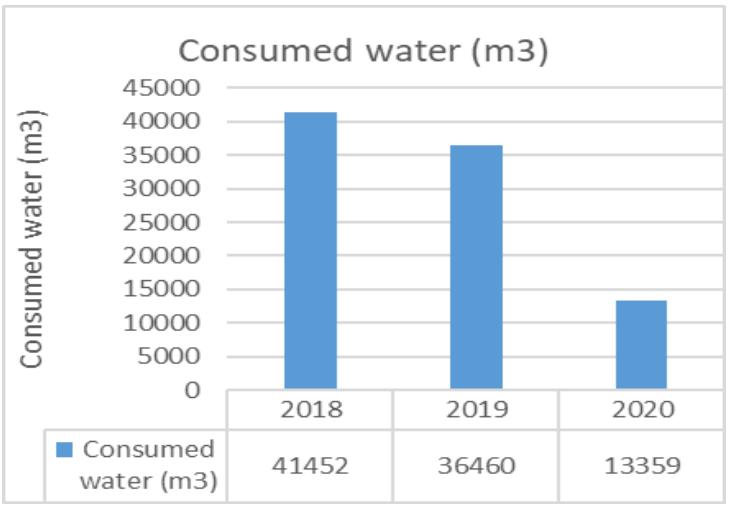
Water

The Rio + 20 Declaration of the United Nations Organization emphasizes the need to establish a green economy to achieve sustainable development while protecting and enhancing the world's natural resources. Likewise, the green economy deals with productivity in relation to limited natural resources, such as water, and good management of it depends a lot on an integrated approach with the formulation of coordinated actions to achieve economic efficiency, social equity and environmental sustainability. [1]

At El Bosque University, all buildings have a separate sewage system, for wastewater and for clean water (rainwater). The campus buildings use potable water supplied by the aqueduct for human consumption, while the toilets, irrigation systems, water mirrors and the like use recycled rainwater, collected on the roofs of the building, recycled rainwater, collected on the roofs of the building and carried to a tank in the basement.

Likewise, the inclusion of water saving devices has made it possible to save up to 10% of the water consumed. The university has the System of Saving and Rational Use of Water, in charge of reducing the consumption and responsible use of this resource. One branch of this is dedicated to creating communication plans that sensitize people about their water consumption and that prevent toxic waste from being disposed of in the sewers.

Regarding consumption, compared to 2019, where the total water consumption was 36,460 m^3, it is evidenced that there was a reduction of 63.4% compared to 2020 whose consumption was 13,359 m^3.



Transportation

The importance of sustainable transport is linked to planned urban development and transport, where alternative means are taken into account for the benefit of communities, reduction of GHG emissions and it is where it plays an important role for climate change due to the current fight against global warming.

Within the green logistics that is handled within the universities, a series of benefits can be reported due to an optimized transport, that is, that generates less costs and can reduce the pollution that is produced by using conventional transport. The above should be understood as a strategy for change to encourage the use of an alternative means for universities, which reduces the levels of CO_2 expelled into the atmosphere, which are mostly produced by conventional transport.

At El Bosque University, the following programs are managed:

Table 4. Programs El Bosque University.

Program	Description
THE FOREST WELCOMES YOU	It is a program that is offered to the institutional community, where students who live far from the university campus can access a shared house or rent a house at an affordable cost and that is close to the institution and thus be able to move around in means such as bicycles. , skateboarding or walking.
SHARE THE CAR	In this program, students, administrators and other communities can publish their routes in order to carry out carpooling (shared vehicle) and minimize the impact generated by moving in a private car.
PUBLIC TRANSPORTATION STATION	The location of the university is strategic since it is close to a public transport station "transmilenio" (the main means of public transport in Bogotá). Likewise, it is surrounded by public bus stations that come from different parts of the city, this facilitates access to the facilities.
MOBIENDONOS PROGRAM	El Bosque University has created "Mobiendonos El Bosque", with the aim of formulating and executing strategies, actions and proposals aimed at sensitizing the

	university community and generating responsible behavior on issues of mobility, road safety and citizenship.
LA SABANA TRAIN	This service allows students to access the two university campuses, due to the large number of people that can be transported in this way, the environmental impact is reduced compared to the private car.
BICYCLE PARKING	Bicycle parking is completely free, currently there are 300 bike parking spaces.

Education

The university has a minimum of 130 subjects related to sustainability, some of which are taught in different professional careers, doubling the aforementioned number (preparation of bachelor's degrees, specializations, masters, doctorates, post-doctorates). Adding the electives, language courses, research courses, vacation courses, and courses carried out throughout the year and continuous training, for example, the Project Management Diploma under the good practices of the PMI, it can be established that the University has a minimum of 250.

The El Bosque University sustainability report is available, accessible and is updated annually. This report has been prepared in accordance with the Global Reporting Initiative - GRI4 standard, an essential option. Currently, the sustainability report for the year 2019 is in preparation for its subsequent publication at the end of 2020. It is important to clarify that, every two months; the environmental management unit of El Bosque University prepares environmental management reports that allow the preparation of the annual sustainability report.

3. Summary

In the evolution of the concept of Green University, El Bosque University and the Choc Izone Cleaner production, research group has reached the construction of the Symbiotic Life Cycle for the Circular Economy that applies to different regions of production such as:

- Sustainable construction
- Electronic and chemical industry
- Healthy food
- Sustainable tourism
- Clean transportation
- Education for sustainability

The figure [5] shows how, based on responsible production methods with the natural and social environment or **Clean Modalities**, a production cycle is proposed that opens the possibility of integrating with other related production systems that receive their waste as raw materials in a network, this is **Symbiotic Cycle**.

The symbiotic cycle begins with the **Provision and the Selective, participative and fair Supply**; executing the manufacturing phase that seeks to systematically recycle, reuse and connect the product lines with each other, stimulating greater efficiency, this is **manufacturing with sustainability principles**; promoting a distribution of the good or service through transportation with renewable energy reducing the use of fossil fuels, with people who use respectful language and promote a responsible attitude such as lifestyle

habits, that is, **clean distribution and delivery with energy efficiency**.

For the solid approach to the consumption process that promotes sustainable life habits, it is important to verify that the consumer **knows** the way in which the production process develops in harmony with the natural and social environment; **perceive**s the consequences of their actions in that natural and social environment and redefines them to reduce the negative impact; **values** the responsible behavior of himself and his peers, giving it a meaning for the acquisition of conscious learning that promotes and consolidates habits of sustainable behavior; **acquires commitments** to redefine consumption such as obtaining the supply without degrading nature and society in symbiosis with the natural system, taking from the environment what is necessary and in turn giving back to the environment what is beneficial for its conservation and preservation, establishing a reciprocal relationship with the planet - what makes sustainable the meaningful relationship of the nascent and young generations.

Finally, the person understands and accepts that its capacity, knowledge and position in society allow it **to take responsibility** for his waste and efficient added value, minimizing its negative impact on society and nature; therefore, the person acquires greater responsibility and sense of relational commitment to the environment and for the environment:

- Behavior that minimizes the possibility of contamination
- Activities that improve the functioning of the ecosystem
- Habits of proper use of the territory
- Decrease in the use of harmful agents
- Incorporation of natural techniques that control and regulate production systems in a balance way
- Preservation of ancestral knowledge and valuable ancient traditions.

To arrive at the approach of a symbiotic disposal of waste as inputs with other production systems in such a way as to consolidate a set of sustainable organizations that collaborate with each other and that continuously recover the value to increase efficiency.

For this, it is important to study, recover and treasure the inherited and jointly constructed knowledge from productive experiences.

As final contribution of this paper, the conclusions are the following:

- Sustainable growth is a central component of environmental, economic and social benefits, where the social part is significantly affected by the health and integral well-being of people. Currently, the epicenter of the COVID-19 pandemic has caused great vulnerability in the region, due to the high levels of labor informality, urbanization, poverty and inequality, which constitutes an important risk for social cohesion and sustainable development.
- El Bosque University is consolidated with the green economy, in the sense that it involves within its policies, green growth, understood as a continuous improvement for the well-being of the university community, through socio-environmental projects and programs, thus significantly demonstrating progress in its management, in which progress is still under construction and which is demonstrated each year in the annual international classification of sustainability performance of UI Green Metric universities.

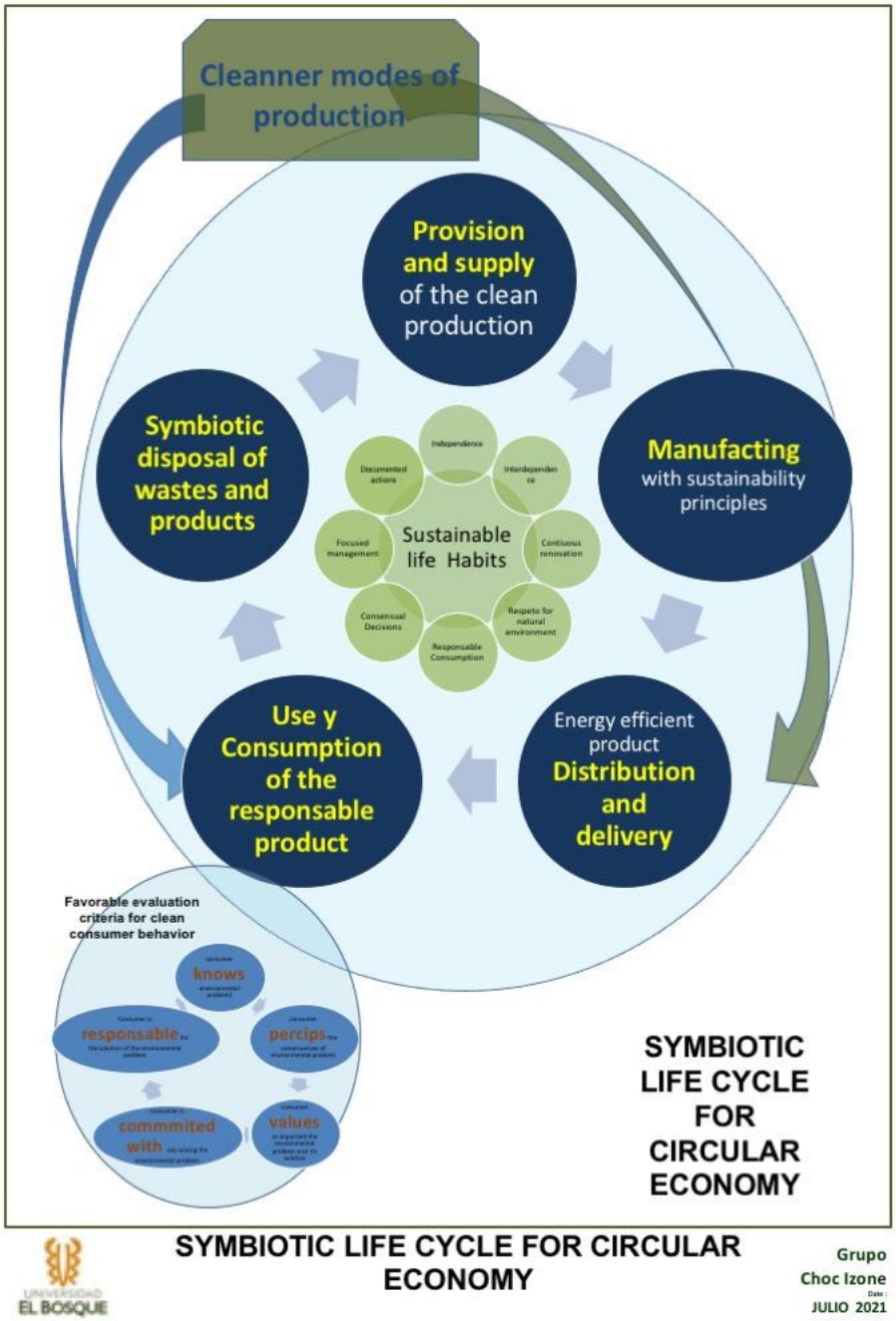


Figure 5. Symbiotic life cycle for circular economy

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