

Can Green Bonds Boost the Development of Energy Projects in Colombia? An Opportunity for Responsible and Sustainable Investment

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Abstracts: The excessive exploitation of natural resources brings with it a growing environmental problem, which is largely due to industrial development. Different international treaties, conventions, and protocols try to mitigate the impacts of global warming. However, new tools are constantly needed to achieve the sustainability of economies and the preservation of renewable resources. In response to this, green bonds arise providing a coherent solution that integrates both the industry and the environment. These bonds constitute a financial instrument allowing the collection of resources, with the only requirement of being invested in sustainable projects generating environmental and social well-being. This paper highlights Colombia's potential as an emerging market attractive for investments classified as green. This Colombian green market is expected to grow, due to the low amounts of GHG emissions compared to the industrialized countries and the richness in natural resources of the nation. However, to develop sustainable energy projects in Colombia, special instruments are required to enhance the promotion and financing of energy projects. For this reason, various financing alternatives to the traditional systems for the development of clean energy must be evaluated. This paper emphasizes the potential of green bonds to improve energy projects in Colombia and obtain additional benefits to reduce climate change through the use of sustainable renewable energies. Through a document review exercise in specialized literature and the application of a case study, the advantage of green bonds over other traditional mechanisms for financing initiatives for small and medium enterprises is demonstrated.

Keywords: Green Bonds, Sustainable Development, Voluntary Market, Non-Renewable Resources, Colombian Industry.

1. INTRODUCTION

Caused by the rise of the industrial era, humanity increased its productivity and significantly improved its quality of life. New technologies emerged changing manual and agricultural jobs by the implementation of more specialized machines and tools. New sources of energy were explored to improve transport efficiency since a greater part of the population started to settle in the main cities [1]. The accelerated industrial, economic, political, and social development brought environmental problems, ranging from pollution, waste generation, and depletion of natural resources to the excessive exploitation of fossil fuels (natural gas, coal, oil). The latter constitutes the source of emissions of the so-called Greenhouse Gases (GHG), the main responsible factor for climate change [2].

It is unquestionable that the earth presents a progressive alteration of its climate; while some areas experience high temperatures, droughts, extinction of plants and animals, others show prolonged rains or floods due to rising sea levels and intense winters [3]. Historically, these changes have been attributed to events of natural origin but nowadays, it is widely accepted that humanity has the prime responsibility of them. Causes include the excessive use of non-renewable resources; the burning of fossil fuels and their derivatives, deforestation, and the increase of population (that causes a higher consumption of resources) [4].

Climate change is defined by the United Nations Framework Convention on Climate Change as: "a change in weather attributed directly or indirectly to human activity that alters the composition of the global atmosphere and, adds to the variability natural climate observed during comparable periods of time" [5]. On the other hand,

greenhouse gases (GHG) are produced naturally and allow the Earth to regulate its temperature. The main greenhouse gases are nitrogen (N₂), oxygen (O₂), ozone (O₃), water vapor (H₂O), nitrous oxide (N₂O), methane (CH₄), and carbon dioxide (CO₂). The alteration and high accumulation of these types of gases in the atmosphere, mainly of the latter gas (CO₂), constitute the cause of the increase in the planet's temperature and the subsequent climate change [6].

An active contribution to solving this problem is based on the efforts to reduce and capture GHG emissions, and it is supported by the signing of agreements and treaties such as the Kyoto Protocol (KP) [5]. This sets out clear objectives for the limitation of GHG emissions for both the developed and the developing countries such as Colombia. The participants also can acquire commitments in the so-called "voluntary carbon market" [7]. Voluntary carbon markets emerge as independent alternatives to the regulated market and seek out the voluntary mitigation of greenhouse gas (GHG) emissions. The current concern centers on how to counteract these alterations so that the planet recovers its natural balance [8]. It is important to emphasize international actions promoting the intervention of the industrialized countries, as they are the main producers of pollutant gases. These initiatives search for tangible benefits through the implementation of green projects without the use of non-renewable resources [9].

As a result of research studies, this report seeks to expose the socio-economic benefits of obtaining resources through green bonds for Colombian companies; where the latter can thus develop their operations in a sustainable and responsible way. Initially, the contextualization of the Voluntary Carbon Market at international levels and its development in Colombia is presented. Then, the next section introduces both the concept of Green Bonds and their implementation in sustainable projects. Then, the article focuses on the use of Green Bonds in the Colombian context and shows their applicability for Small and Medium Enterprises (SME) in Colombia through a case study.

2. THEORETICAL FRAMEWORK

2.1. VOLUNTARY CARBON MARKET

The KP, signed in 1998, established an international agreement that encourages the industrialized countries to take responsibility for the gases emitted into the atmosphere as a result of their development. At the same time, it sought to reduce by almost 5% (compared to the amount produced in 1990), these emissions in the span of 4 years (2008-2012). In addition, in order to involve the developing countries (which emit these gases in a lower proportion), the Clean Development Mechanism (CDM) was created; through it, strong economies have the possibility of acquiring carbon credits in exchange of green investments made in countries with few emissions [10].

Although Colombia is not included within the industrialized nations that agreed to comply with the agreements in the Kyoto Protocol, the country is interested in voluntarily promoting initiatives to introduce the culture of environmental care. The Colombian government has entities such as the Ministry of Environment and Sustainable Development, which is exclusively devoted to studying the effects of climate on its diverse ecosystems, ranging from the coastal areas to the tropical forests [11]. In addition, on April 22, 2016, Colombia committed to fighting climate change by signing the Paris Agreement, a treaty that sought to strengthen and intensify the actions and investments necessary for a sustainable future and decrease the use of fossil fuels and GHG emissions [12]. Based on these guidelines, the Ministry of Environment and Sustainable Development works together with experienced entities such as the Inter-American Development Bank (IDB). It should be noted that Colombia is venturing into the carbon market with GHG Voluntary Mitigation Mechanisms, led by the Natura Foundation. This is an example of the country's encouragement of the private sector to participate actively in mitigation strategies.

Voluntary Carbon Markets (VCM) appear as an independent alternative to the regulated market. VCM seek the voluntary mitigation of greenhouse gases [13]. Created by citizens, government entities, and the private sector, VCM is characterized by being more innovative, agile, and flexible than the Carbon Market itself. It makes part of the Clean Development Mechanism (CDM), defined according to the Kyoto protocol, as an alternative for the industrialized countries to take responsibility for the gases emitted into the atmosphere [14]. Unlike the regulated market, the voluntary market is not legally based on mandatory reductions to generate demand. As a result, the

market suffers from fragmentation and a lack of widely available impartial information. The fragmented and opaque nature of the voluntary market can, in large part, be attributed to the fact that it is partially composed of agreements negotiated on a case-by-case basis, and that many of these agreements do not require carbon credits to undergo a uniform process certification or verification, nor do they need to register them under any centralizing entity. As a result, there are many types of carbon transactions in the voluntary market and a wide variety of non-profit companies and organizations based on different models that sell countless products, certified under a wide range of standards [15].

VCMs' innovation, flexibility, and lower transaction costs can benefit both buyers and suppliers. When an organization buys carbon offsets to meet a certain need for public or brand relations, factors such as creativity, speed, profitability and the ability to support specific types of projects (for example, those benefiting local communities or biodiversity) can often offer clear and valuable benefits for the company, much more than those achieved through the CDM. Figure 1 shows the differences between the types of Carbon Markets: The Voluntary and the Regulated.

Table 1. Carbon Market: Voluntary Vs Regulated

CARBON MARKET	
VOLUNTARY MARKET	REGULATED MARKET
Citizens, governmental entities and private sectors	Industrialized countries under the Kyoto Protocol (CDM)
Agile, innovative and flexible (includes diversity of projects)	Its accomplishment is mandatory and can be complex (it does not include deforestation projects and forest degradation)
Carbon credits in the voluntary market are called Verified Emission Reductions (VER)	Carbon credits from CDM projects are called Certified Emission Reductions (CER)

Source: Own elaboration based on [16].

2.2. THE CARBON MARKET IN COLOMBIA

Climate change policies and climate change mitigation are relatively new in Colombia. Since the 1990s, the country established a position regarding climate change, and Colombia has become one of the leading countries in Latin America in this regard. The Ministry of Environment and Sustainable Development, created in 1993, is responsible for designing and controlling the environmental standards that local governments must take into account when planning future developments. In addition, as of 2006, climate change mitigation has been actively included in the National Development Plans. In 2000, Colombia ratified and implemented the Kyoto Protocol. In 2016, Colombia signed the Paris Agreement and in June 2017, the Colombian parliament ratified it. In addition, the country has participated in various agreements on climate change such as the Montreal Agreement and the Convention on Biological Diversity [17]. In its National Communication to the United Nations Organization, Colombia points out international markets as the most important factor in stimulating climate change mitigation. The country ratified international climate agreements, through the aforementioned Ministry of Environment and Sustainable Development [18]. In addition, it also highlights the positive role that communities, capital markets, and technological change play in improving climate performance in Colombia.

Since the implementation of the Clean Development Mechanism until 2017, Colombia has registered 129 projects and initiatives before the UN, mostly from activities such as hydroelectric power production (31%), sanitary landfills (24%), prevention of methane production (24%) and reforestation processes (7.8%). Countries like Spain,

Switzerland, the United Kingdom, and the Netherlands are among the main buyers of emission reduction certificates [19]. In addition, Colombia has developed research to identify projects that can be classified within the Clean Development Mechanism. The entity responsible for this management is the Ministry of Environment and Sustainable Development. The criteria used by the mentioned entity for the classification of the proposals are the following [20]:

- Compliance with sectoral standards
- Alignment with state policies
- Contribution to the economic and social welfare of communities. Project executors must commit to investing in the social development of local communities, through activities that improve aspects such as the provision of public services, health, access to water, and environmental preservation. In addition, the project must involve training programs for the local population and identify impacts on the community.
- The implementation of cleaner production systems should include technology transfer processes as much as possible.

Despite this, it should be noted that the implementation of the Clean Development Mechanism initiatives in Colombia has run into several bottlenecks [20]. In the first place (and perhaps, as a key factor), the lack of continuity by the designated national authority given because of the replacement of the main public officials after presidential elections, jeopardizing the continuity of the policies. Secondly, the low priority given to these projects in Colombia brings low remuneration to the employees of the entities in charge of the process. As a result, the tasks are outsourced to be performed by "young and inexperienced staff". Thirdly, due to the lack of technological knowledge, the implementation of new technologies remains problematic. New technologies could lead to greater emissions reductions and positively contribute to community development.

In the core of this scenario, the National Climate Change Policy document considers:

“The use of economic and financial instruments as a means to move towards low carbon and climate-resilient development. The typology of instruments that are prioritized and their scope will be consistent with the economic, social, environmental and institutional dynamics of the country, and they will have, as guiding principles, efficiency, equity, justice and legality” [17].

Within this framework, the governing body of the country's environmental policy will consider different instruments for the management of climate change activities. It is expected that the financial sector and the development banks will contribute to the creation of mechanisms that help finance clean low-carbon technology projects, and improve the profitability of projects with high climate benefits [17].

3. GREEN BONDS AND THEIR APPLICATION IN SUSTAINABLE PROJECTS

Green bonds represent a ground-breaking alternative for the financing of projects that positively impact the environment. They constitute debt instruments through which resources are captured with the sole requirement of investing them in sustainable projects that help reduce global warming [21]. Green bonds are a type of bond with the same characteristics as the traditional ones, that is, they have a fixed interest rate and a term but they only support projects that generate environmental well-being [22]. Investments in renewable energy, sustainable mobility, waste management, energy efficiency, and reasonable land use stand out [19, 22] (See figure 1).

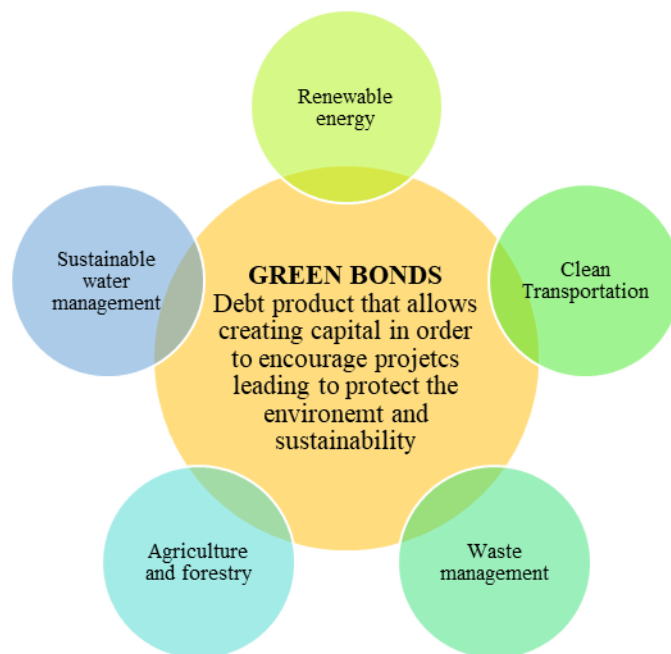


Figure 1. Green Bond Structure. Source: own elaboration

Issuing a green bond is not that simple. The interested entities have to present their financial information to the control entities and adhere to the guidelines established by the Green Bond Principles (GBP) guide; this contains the steps to follow so that a bond can be classified as green and thus, its issuance be reliable. Among the main issuers, there are development banks, public and private sector entities, government, and the financial sector.

Social, economic, and especially environmental benefits are associated with the use of green bonds; the World Bank, for example, has been a pioneer in supporting these types of projects in countries such as Tunisia, China, Indonesia, Mexico, and Colombia. In 2014, Indonesia implemented a renewable energy generation system with the intention of reducing 1.1 million tons of CO₂ each year [23], taking advantage of the geographical potential of the territory and benefiting communities that currently do not have access to energy resources. From a purely economic point of view, green bonds present a low investment risk, because their rating in the Colombian market is “AAA”¹, where resources are liquid or easily accessible and interest payment is fixed according to the expiration time. Additionally, the investor diversifies its portfolio and increases the organizational and reputational profile.

3.1. Figures Around Green Bonds

The green bond market has been expanding since 2007 when the first issues were made by the most experienced development banks in the world, such as the World Bank (IBRD), the African Development Bank (AFDB), the European Investment Bank (EIB), and the International Finance Corporation (IFC). The collected resources have the sole purpose of supporting projects encouraging environmental care to constitute more sustainable and long-lasting economies in the long term [22].

The experience and reliability of these multilateral banks have led to exponential growth in the green bond market and also have encouraged government and private institutions to active participation. According to figures from the Climate Bond Initiative, an international organization that mobilizes about USD \$ 100 billion worldwide in the green bond market, the global green bond market in September 2017 amounted to USD \$ 895 million, from which 68% is issued by the sovereign or sub-sovereign government, followed by corporate or large companies

¹ “AAA rating indicates that the ability to timely repay capital and interest is extremely high. It is the highest category in investment grades” (Financial Superintendence of Colombia, 2019).

and finally and in equal proportions composed of financial corporations and supranations [24] Figure 2 graphically demonstrates the overall composition classified by the issuer, according to the Climate Bond Initiative data [24].

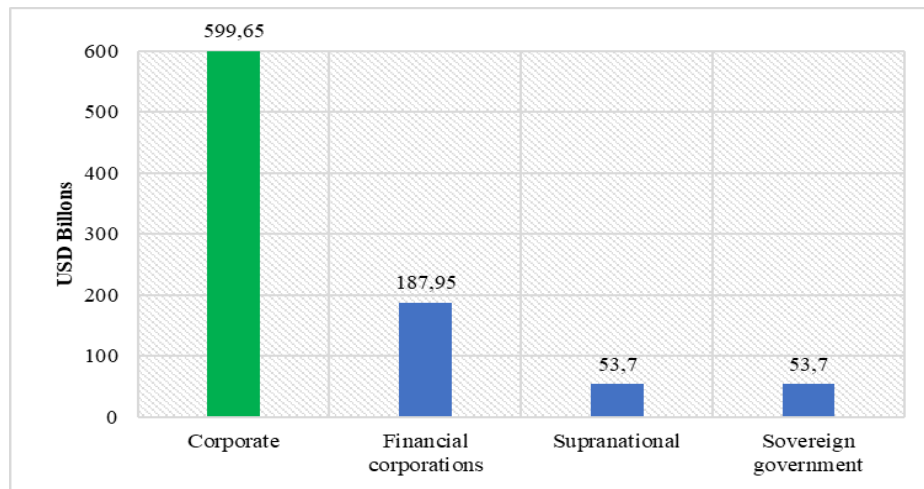


Figure-2. Overall composition by issuer. Source: Own elaboration; data taken from the Climate Bonds Initiative website²

The worldwide structure of the green bond market distributed by economic activity has a varied composition, with ranges from sectors such as transport, energy, water, and polluting waste, to agriculture and forestry. Transport is the sector with the highest percentage of participation (61%), which denotes more than 1242 bonds in circulation (China being one of the main issuers). Energy is positioned in second place (19%) as a very attractive sector to make sustainable investments due to the high emission rates of greenhouse gases (caused by the constant burning of fossil fuels in energy generation). Then, there are the emissions by the so-called "multi-sector" (13%), which is composed entirely of development banks and financial entities. Finally, within the range of 1% to 3%, there are emissions from sectors such as water, buildings, and industries, waste, pollution, agriculture, and forestry. Figure 3 allows the green bond market to be sized by economic sectors.

As an emerging market, Latin America has the potential to become one of the most attractive markets for investments classified as green [19]. Brazil and Mexico are the countries with the highest participation in the issuance of green bonds, representing approximately 63%. It should be noted that development banks such as the Inter-American Development Bank, the World Bank, and ICF have been participants in this growth through the financing of resources. Figure 4 represents the participation of Latin American countries in the green bond market.

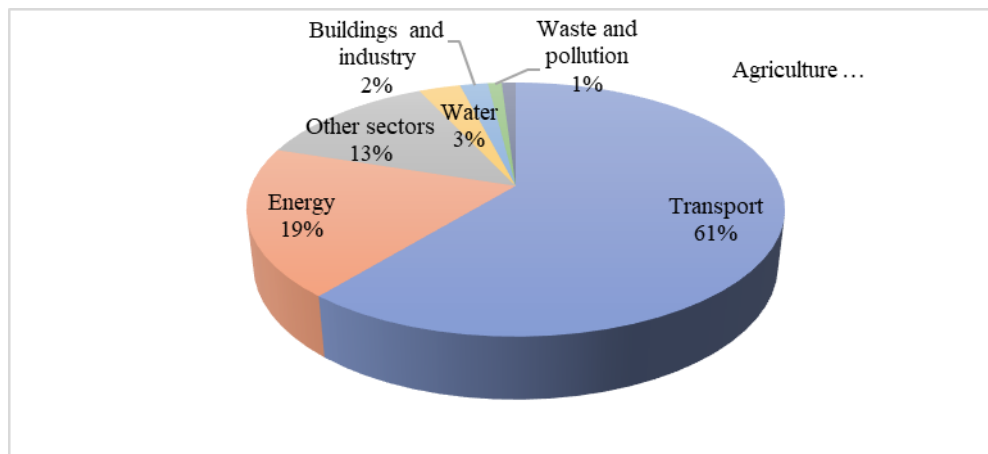


Figure 3. Sectorial context of the green bond market. Source: Own elaboration based on data from [24].

² <https://www.climatebonds.net/resources/reports>
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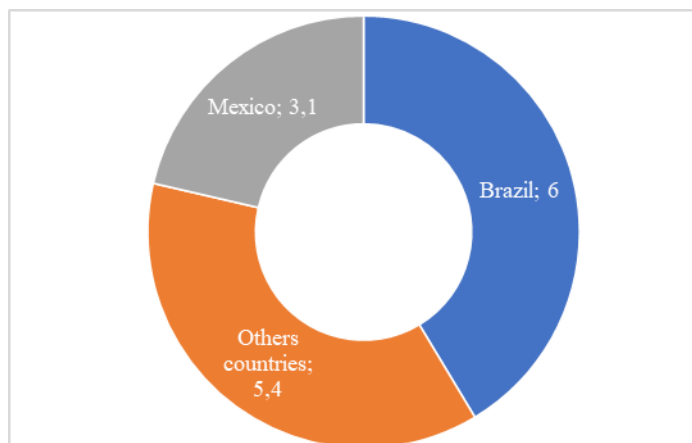


Figure 4. Green bonds in Latin America. Source: Own elaboration; data taken from the Climate Bonds Initiative website³; figures in billions of dollars.

4. GREEN BONDS AND THEIR APPLICATION IN SUSTAINABLE PROJECTS

In Colombia, the implementation of the green bond market is at an incubation stage [25]. Thanks to the issuance of bonds made by banks such as Bancoldex (a Second-tier bank that drives business growth), Bancolombia, and Davivienda, bonds have achieved dynamism and interest for generating more green businesses has arisen. In the same way, the creation of the voluntary carbon market ratifies the country’s commitment to reduce greenhouse gases and consolidate a more resilient economy.

In August 2017, the Natura Foundation, the Exchange Stock, and the Chamber of Commerce of Bogotá, with the support of the Inter-American Development Bank IDB (US \$ 10.5 million), launched the Voluntary Carbon Market in Colombia. This platform was designed with the objective of encouraging the Colombian industrial sector (not obliged to reduce its emissions) to voluntarily purchase carbon credits aiming at reducing half a million tons over a period of four years. In this way, the expansion of projects that mitigate long-term environmental impacts and promote sustainable development for communities will be encouraged [26].

Table-2. Entities issuing green bonds in Colombia

GREEN BOND EMISSION IN COLOMBIA				
Issuing entity	Emission Amount	Payment Term	Rate	Buyers
Bancoldex – IDB	200	5 years	7.10%	* Pension and severance funds * Fiduciaries * Insurers * State entities * Multilateral organisms * General public
Bancolombia – IFC	350	7 years	IBR + 2.2%	
Davivienda – IFC	433	10 years	IBR + 2.13%	
Figures expressed in COP thousands of millions				

Source: own elaboration

For entities with solid financial capacity, it is easier to participate in the green bond market. However, how does the small and medium businessman benefit from it? Well, they can obtain more competitive costs, flexibility in payments and agile access to resources through the green lines promoted by the financial sector, as long as the project to be executed has a positive impact on the ecosystem. Nevertheless, one of the great obstacles to the use

³ <https://www.climatebonds.net/resources/reports>

of these resources lies in the lack of knowledge of their existence. In Colombia, there is an economy composed mostly by SMEs and, paradoxically, they have the least access to such stimuli. Given this, it is necessary to encourage the use of smart capital in this segment to create more resilient societies.

Therefore, the following case of study presents a broader view on this issue and illustrates the benefits via the rate that a company would obtain by financing its resources through the green lines of Bancolombia Group; one of the most sustainable Colombian banks.

4.1. CASE OF STUDY: FINANCING SOLAR PANELS

The ABC company finances a solar panel installation project through Bancolombia Group worth USD \$ 100 million for a period of 60 months or 5 years, indexed in the DTF rate. Since this is a funding operation through bonds ("green" marking), fixed fee payment is established. To carry out the procedure with the entity, the ABC company must present the following documents:

- Due diligence
- Chamber of commerce registry (not less than 30 days)
- Authorization certificate for the legal representative, when the value exceeds the attributions.
- To fill out the active operation form (for each disbursement) and the DTF promissory note.

The aforementioned information rests on the entity's website. Table 2 shows the rate quoted behavior with ordinary resources and green bonds. It is determined that the project with ordinary resources, that is, conventional credits of the entity, obtains a rate of 9.55%EA. If the quotation is made with green bonds, it shows a rate of 8.47% E.A. The difference in the calculation of the rates responds to the environmental purpose of the project and therefore, the financial entity makes a cost reduction of 100 basis points below those established by the Bank of the Republic. In addition, it is important to note that, under both scenarios, the entity obtains profits.

Table 3. Comparison between ordinary resources and green bonds

Accumulated result	Ordinary resources	Green Bonds
Date	29/08/2019	29/08/2019
Economic Value Added	40.96	40.7
ROE	52.35%	52.33%
Indexing rate	DTF	DTF
Purchase option	10%	10%
Spread	4.50%	3.53%
Rate	4.02%	4.02%
Margin	3.79%	3.80%
Canon value	19.514	18.996
Rate EA	9.55%	8.47%
Financing	USD 100,000,000	USD 100,000,000
Credit term	5 years	5 years
Credit fee	USD 26,077,155	USD 25,356,670

Source: own elaboration

The project's amortization plans comparison (See table 3) allows us to confirm that the ABC company generated a saving of USD \$ 3,602,527 in the financing of its solar panels. This means that it can properly use its resources in the long term when dealing with environmental impact projects.

CONCLUSIONS

Environmental preservation has brought new ways to transform the industry by making it increasingly a figure that uses natural resources in a responsible way. Thus, it is clear that the green bond market is not only a necessity but also a trend that is increasing worldwide. In Colombia, there is great potential for the implementation of projects with ecological benefits given the natural wealth of the country. However, there are still only a few companies that actively participate in this market.

With the case of the study presented, it is concluded that entrepreneurs can access more favorable costs to finance projects that promote sustainable development; this allows them to make savings in their payment projections that would not be possible with other means of financing. On the other hand, the results of this project highlight the importance of applying green bonds in Colombia for projects related to clean transport, renewable energy, sustainable waste management, water, agriculture, and afforestation and thus obtain benefits that support a sustainable economy. Green bonds represent an innovative alternative to finance projects that positively impact the environment since they are constituted as a debt instrument through which resources are collected with the sole purpose of investing them in sustainable projects that help reduce global warming.

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