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A Proposal for Green Financing as a Mechanism to Increase Private Participation in Sustainable Water Infrastructure Systems: The Colombian Case

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Abstract

Many countries, including Colombia, require new financial mechanisms that lead to increased coverage in supplies of drinking water, particularly in rural areas. However, the establishment of such mechanisms demands new public and private policies that promote and increase financial assets in capital markets. This paper examines how green financial mechanisms can lead to increased coverage of potable water through the funding of new water infrastructure systems in Colombia. Achieving this goal requires both private investment and clean financial mechanisms that promote a low-emissions infrastructure. To address this need, this paper proposes a new financing model that involves green financing, capital markets, and the private and public sectors. In addition, it introduces new policies that the Colombian government should plan to implement to foster private participation and the development of infrastructure-related financial assets. As a result, this paper should contribute to increasing the role of the capital markets and private involvement in the development of a sustainable rural drinking water infrastructure.

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1. Introduction

Increasing the coverage of drinking water in the rural areas, specifically those in Colombia, through developing sustainable infrastructure undoubtedly represents a significant challenge for the country. Therefore, we must establish new financial mechanisms that encourage private participation and the establishment of new regulations that lead to the creation of an infrastructure project based on green financing as the key driver for the development of a sustainable infrastructure. Innovative financing mechanisms, which must include sustainability criteria, involve an effort to slow down climate change. Such mechanisms must prevent the temperature from increasing the 2°C limit, as recommended by [3]. Thus, a sustainable financing strategy is critical for enhancing the development of infrastructure projects and investment that will help to avert dangerous climate changes as well as improve the coverage.

Therefore, a greater provision and an appropriate framework for financing and investment are essential for improving the implementation of infrastructure systems at all levels and sectors. It would also positively impact competition [4]. In this regard, the Colombian government enacted the Law 1508 Public-Private Partnerships (PPPs) in 2012, aiming to increase and improve the coverage and the quality of rural water infrastructure systems. The law is based on Project Finance (PF) schemes and establishes mechanisms for the private sector to participate in the development of public infrastructure and maintain and operate existing ones.

This paper examines how the creation of a new financial mechanism could increase the coverage in the drinking water sector, which in turn, could help to bring new challenges on investor behavior and the development of climate-friendly investment. The main problems and gaps in the rural drinking water sector, which were described by [1], suggest that private investors should play a pivotal role in increasing the coverage in this sector. On the other hand, financial resources are becoming increasingly limited; therefore, the primary challenge is in the financing process [2]. In the current situation, with the debt crisis in the developed world, raising financial resources will be harder to obtain; hence, the development of new projects requires finding new sources of financing. [2].

As a result of increasing development of infrastructure projects in Colombia, this paper, which accounts for the relationship between PPPs and PF, aims to systematically integrate the various elements that involve the development of sustainable infrastructure projects in the rural drinking water sector in Colombia. These elements have not yet been addressed explicitly nor combined. For example, elements such as sustainability and financing have never been connected to the goal of developing infrastructure projects for the drinking water sector. This paper does not seek to create or redefine investment valuation criteria by the infrastructure sector, nor does it seek to add new definitions on sustainable infrastructure. On the contrary, this study develops an integrated theoretical framework for sustainable infrastructure financing that could be used in countries that are facing funding problems. The study should encourage private participation in the development of sustainable infrastructure and provide decision-makers with valuable information that they can use to improve the best practices of sectors related to structuring, financing, and management processes.

This paper is divided into the following sections. Section 2 presents the methodology used in the research, and Section 3 introduces the importance of closing the coverage gap through sustainable infrastructure in the rural drinking water sector. Section 4 presents green finance as a mechanism for encouraging investment by the private sector, and Section 5 presents conclusions.

2. Methodology

This research is based on a hypothesis that states the need for identifying new financial mechanisms that help to both close the gaps in the coverage of potable drinking water in rural areas and foster the development of sustainable infrastructure projects in developing countries. To test this hypothesis, we analyze both the main regulations and green financial mechanisms. To encourage private participation and increase the development of sustainable infrastructure projects based on green finance, we propose a new framework for financing projects based on green financing.

3. The need for developing sustainable infrastructure in the rural drinking water sector in Colombia

Developing a sustainable infrastructure must be an integral aspect of plans for growth in all countries. In fact, because a large part of the current infrastructure is deteriorating, it will have to be replaced in upcoming years, entailing new construction projects [5]. Much is being done to address these aging assets, and many opportunities exist for developing refurbishments and replacements that provide smarter, more efficient, and lower-carbon methods of delivering improved services [6]. In this context, sustainability will play a strategic role in the development of infrastructures; sustainability is supported by the benefits of improving the quality and coverage levels and encourages eco-friendly investment. However, the development of a sustainable project market is a considerable challenge in Latin America, particularly Colombia [5] [7]. Such development requires increasing current levels of investment, boosting infrastructure improvements, and providing higher priority to the implementation of financing mechanisms related to climate change and thus, sustainable development [7].

Investment in infrastructure in Colombia has represented, over the last decade, 3.2% of the GDP [8] on average. Nevertheless, it has to reach the level of 5%, suggested by the Andean Development Corporation CAF [7] and the Inter-American Development Bank [9]. Recent studies also confirm that Latin America needs to reach an investment in infrastructure close to 5% of the GDP [10] [11]. However, because of budgetary constraints and the limited capacity of public sector indebtedness, it may invest only as much as 2.5% [7], which confirms the need to involve the private sector in developing infrastructure systems.

Because of insufficient government investment over the last decades, the rural drinking water sector represents a significant potable water coverage gap. For instance, in 2013, the aqueduct coverage in the Caribbean and Pacific regions was 56.3% and 69.6%, respectively, while the respective coverage in the sewage system was 60.3% and 67.6% [12]. This problem has had several effects on health, especially the health of infants. Polluted water sources and distribution networks in poor conditions are responsible for 7.3% of infant deaths [13]. Studies at a global level have shown that one dollar of investment for improving drinking water and sanitation has a return of between 5 and 28 USD (with only technology and hygiene having higher returns) [13]. This situation calls for increased coverage of potable water, which, in turn, requires the development of a sustainable infrastructure.

By offering access to opportunities for investment in the water sector, we must structure projects that focus on sustainability and quality of service. The project would entail attracting financial resources from various private investors such as pension funds, multilateral banks, and investment funds that are dedicated to encouraging the development of sustainable projects. Attracting investment may prove easier than believed. Most empirical evidence in the literature shows a positive correlation between infrastructure investment and economic growth. However, the economic literature also states that this relationship is neither automatic nor mechanical [14], indicating that the creation of additional infrastructure does not guarantee economic growth; that is, it is necessary but not sufficient *per se* [14]. Therefore, integral to the success of an investment is connecting the creation of infrastructure and economic growth with sustainable development.

For economic growth derived from investment in sustainable infrastructure in Colombia to take place, the government, the private sector, the capital market, and the research community must actively work together to establish and promote a new behavioral model of development based on sustainability. At the same time, it could generate cooperative university-industry-state collaboration on applied research that accounts for financial, academic, and social criteria related to development and sustainability. This context requires identifying innovative solutions and new approaches to the financing and implementation of investment, which means recognizing new ways of combining financial instruments with procedures that will close the gap of financial viability.

Through the creation of more innovative mechanisms and the development of financial instruments to encourage sustainable infrastructure, construction of a new infrastructure is possible [15]. Although evidence has shown a positive relationship between infrastructure investment and economic growth, sustainable investments are not always profitable. One viewpoint about financial and sustainable investment indicates no difference between profitable financial investment and sustainable financial investment because both create social, financial, and environmental value [16]. Moreover, the need for an effective response to an infrastructure market should be aligned with eco-investment

principles that allow the development of projects with the highest quality standards related to social, environmental, and financial elements.

On the other hand, because of population growth and changing consumption pattern, the fundamental needs of today's world have increased, which leads to a greater need for the development of a model based on green financing. Thus, this paper examines main aspects of the development of infrastructure that must be reformulated, changed, or created with the aim of conceiving a new trend and path for sustainable investment.

4. Green finance as a mechanism for encouraging the development of a sustainable infrastructure in the rural drinking water sector

As stated above, numerous opportunities for developing projects exist in the rural drinking water sector. However, financial resources from public entities are limited, so we must create new mechanisms that foster private sector involvement in developing a stronger infrastructure in terms of finance, society, and the environment.

Initially, we should ensure that the private sector is aware that the use of green finance as a strategy for financing infrastructure projects does not necessarily guarantee a profit. In addition, the use of PF schemes does not guarantee that projects would have financial resources available for their development; thus, they may not have operation profitability, measured by the Return on Assets (ROA) or equity profitability, measured by Return on Equity (ROE). Consequently, wise investors seek a higher ROE than ROA.

The development of rural drinking water projects in places that lack potable water represents one of the biggest challenges for the Colombian government. In an effort to encourage the involvement of private investors on these particular projects, this paper proposes a novel green financial mechanism that leads to increased potable water coverage in this sector. The main incentive for proposing this financial framework, which could represent a new business model, is based on the need for a new method that combines the financial climate, capital markets, and PPPs focusing on the development of social infrastructure projects. This framework should account for long-term financing issues and cover the three main elements related to sustainable projects: economic, social, and environmental issues, described by [2] and [16]. Additionally, another motivation for this proposal is that sustainability-related investments have been excluded [16] for two reasons. First, it is not clear how to value or measure the subjective and abstract cash flows associated with such investment; and second, standard finance and economics textbook theories implicitly include sustainability in the investments because they apply to all investments [16].

As the infrastructure can reduce carbon emissions [18], this paper proposes a framework involving the creation of new policies or redesign of current investment and finance laws. In this framework, actors with a high credit rating could consolidate funding requests into groups and structured debt securities, possibly green bonds, so they conform to the new regulatory conditions [12] and trends pertaining to reducing greenhouse gas emissions. Thus, investors could consider environmental and market variables as well as social and private externalities derived from the processes of the adaptation and mitigation of climate change. As the water sector is difficult to finance using only user charges, this framework entails various income sources [19]. In addition, an investment in water can be seductive because the demand for water is certain to grow as the population increases and the water supply decreases [19].

The following graph, based on the cash flow waterfall, shows the proposed framework with the main drivers/challenges for encouraging the involvement of private investors in the rural drinking water sector with the aim of increasing regional coverage through sustainable infrastructure projects.

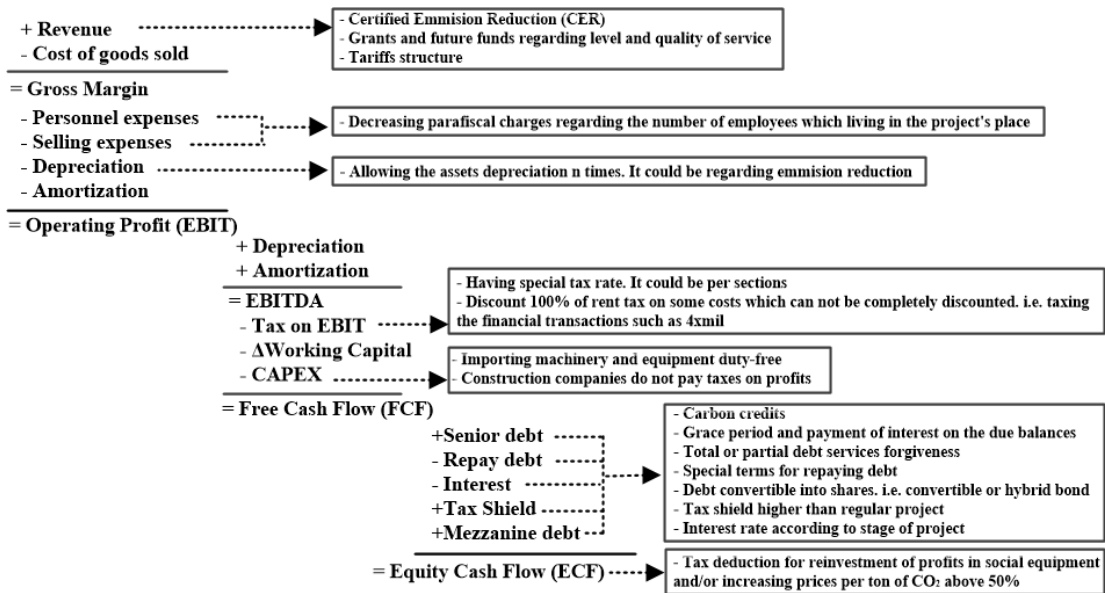


Fig. 1. Cash flow waterfall with the main challenges faces by the Colombian government.

The need for a framework corresponds to a need for research in new theories about innovations in financing strategic infrastructures in an effort to create of new financing systems, as indicated in [20]. Moreover, the scientific literature on investment and finance that addresses climate change is still limited and knowledge gaps substantial [17]. Therefore, the creation of a new business model for developing sustainable infrastructure provides an opportunity to establish a market for climate derivatives. Colombia currently has no organized market or over-the-counter (OTC) derivatives related to the environment [21]. Thus, climate change represents a challenge for development, so integrating environmental and social dimensions into the process of generating infrastructure should start with planning [18].

Promoting the implementation of innovative models, particularly in the social infrastructure sector (where coverage gaps are wide and no incentives are offered for the private sector involvement) will articulate the environmental variables related to climate change. As a result, supporting the capital market and investing in the mitigation of climate change have become the main challenges in Latin America, particularly in Colombia. Other important aspects that the Colombian government should consider when developing a new business model in this sector are as follows:

- Creating tax stability contracts and establishing permanent free zones
- Forgiving land, property, and equity taxes.
- Raising future funds that exceed 20%.
- Reactivating tax laws about productive fixed assets.
- Exempting construction contracts from taxes, especially the IVA (added value tax).
- Creating a low-carbon market based on infrastructure assets for developing sustainable infrastructure.

With the main goal of promoting a market based on low-carbon for the drinking water rural sector, finding solutions to the following problems is critical. These problems, listed in the table below, are expected to be accounted for in the definition of new policies and regulations leading to primary and secondary markets of sustainable infrastructure projects.

Table 1. Issues based on the creation of a low-carbon market.

Issue	Proposed solution	Infrastructure market impact
Regulation for investing in sustainable infrastructure	To create grants and tax-deduction regulation based on the level of investment, impact on climate measured by reducing CO2 emissions, quality of water, and coverage reached.	Due to financial benefits, investors could consider sustainability elements in the design and financing stages, which would encourage sustainable development infrastructure.
Encouraging investment portfolio of institutional investors and specialized investors in sustainable projects.	Regulatory changes to encourage the inclusion of institutional investors at different stages of the sustainable projects. These new regulations should allow them to exceed the maximum allowable by the current laws on infrastructure investments, which is currently 5% of its portfolio.	Institutional investors, such as pension funds and insurance companies, would increase their investment in infrastructure projects because they would not have constraints for investing in sustainable projects.

Thus, climate change, an opportunity for economic transformation of infrastructure, is based on the generation of financial instruments and business models in line with environmental and sustainable development criteria. Additionally, generating new market rules leading to long-term investment will help reduce greenhouse gas emissions by improving the quality of life. This initiative mobilizes financial and technological resources, which requires PPP schemes that link players in the private sector and prompt them to develop public infrastructure and provide financial strategies aligned with environmental interests.

Based on the framework presented above, this paper also proposes the Green Benefits concept for the estimation of WACC (Weighted Average Cost of Capital). Previously discussed, when projects raise financial resources from green sources, they provide a benefit of lowering the interest rate (i.e., it is lower than that of a project financed without this kind of funding, see Fig. 2). In this way, if a sustainable project has a Net Present Value (NPV) higher than zero, it has created corporate value for investors and positively impacted social and environmental aspects. Hence, investments that do not add value are not sustainable and, therefore, should not be carried out [16]. As a consequence, investors will always seek projects that are in the region I, where NPV is higher than zero (see Fig. 2). In the future, this new business model could lead to the development of new financial concepts associated with low-carbon investment and the real options approach (e.g., NPV low-carbon as an assessment criteria of sustainable projects).

Recently, related to the capital structure in the water sector in projects with less than 5,000 users, the involvement of equity investment and debt was on average 70.3% and 29.7%, respectively [22], which indicates that the water sector requires new strategies for raising financial resources, especially debt instruments. In addition, in these projects, the WACC were on averaged 12.76% [22].

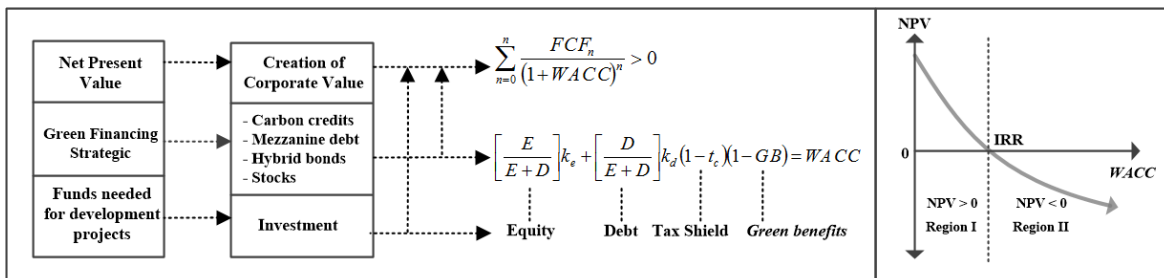


Fig. 2. Green benefits concept and regions of NPV according to WACC

5. Conclusion

The increasing development of infrastructure in Colombia will require not only the inclusion of new actors and the mobilization of financial resources but also the linking of environmental variables to the structuring of projects, especially to the funding process. Consequently, the concerns about the construction of sustainable infrastructure, which are resilient to climate change, must transform the way private sector policies are determined. Such policies must lead to redirecting investment and financing to market mechanisms that involve the generation of innovative financial products with elements promoting sustainable development. Therefore, the transition to the development of sustainable infrastructure projects must be correlated with the design of policies that address climate change by adding financing mechanisms that align with sustainable development.

To develop an infrastructure that minimizes greenhouse gas emissions without compromising financial viability, we must develop mechanisms for investment and/or financing. Such a goal is supported by the National Development Plan 2014-2018, which encourages research and development that contribute to sustainable development and promote green growth through new mechanisms and instruments [23]. Thus, Colombia is responding to the global challenge to reduce greenhouse gas emissions [24], which should improve coverage in rural regions lacking drinking water.

This research shows that factors such as financing and investment should be treated directly, which allows decision makers to analyze such factors holistically and obtain information about each process, particularly financing. Market-led mechanisms such as benefits, taxes, grace periods, debt forgiveness, duty-free machinery, and new regulations could also drive an infrastructure market based on low carbon and thus the creation of a primary and secondary market of stocks and debts issued by infrastructure projects. Such actions would allow the expansion of investment options through the Integrated Latin American Market (MILA). The implementation of financial markets based on low-carbon investments can eventually influence other sectors such as transportation, energy, and telecommunications.

As discussed above, future research about green financing should involve the assessment of flexibility of making sustainable projects by the Colombian Government as a strategic tool for encouraging private investment through PPPs schemes in which private investors and the public sector develop projects that consider sustainability, accessibility, and reliability on a potable water supply. These analyses should account for the sensitivity and dynamics of available financial resources, both debt and equity, on the Equity Internal Return rate and its impact on coverage, and improve the quality of service and social externalities in the rural water sector. For this proposal, the real options theory would capture aspects related to the capacity of a project that relates to green financial resources. Additionally, future research should involve the implementation of green mechanisms that includes the integration of hybrid financial instruments.

Finally, increasing coverage in the rural water sector in Colombia requires new regulations and a project assessment process that include green benefits, especially in the estimation of WACC. The discount rate, therefore, would be subject to the risk of cash flow and, in turn, reflect the true cost of raising financial resources.

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