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FINANCING INFRASTRUCTURE PROJECTS USING PPPs:

THE CASE OF THE 4th GENERATION OF HIGHWAYS IN COLOMBIA

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Abstract

Public-private partnerships (PPPs) have become in a well-know model that is use around the globe for infrastructure development, especially for highways construction and operation. As the private sector becomes responsible for the availability and quality of the infrastructure, there are efficiencies and innovations expected that make the PPP model more suitable than traditional public procurement. Besides, PPPs are expected to evoke performance-based contracting, more solid regulation and are a financing alternative when there are budgetary fiscal constrains. The 4th Generation of highways is an ambitious PPP program developed by the Colombian government to build more than 30 highways in the country in the next 5 years, which contemplates investment of more than EUR 20 billion. This paper aims to analyze in detail the 4G program experience, to assess strengths and weaknesses of the Colombian model that could become on learning points for future PPP projects on emerging markets. Several findings on the lack of financing capacity by private partners, barriers on lending and immaturity of the institutional market, summed up to particular risks and lack of a more accurate planning, have made evident the dependency on public resources. Then, the question arise about the convenience of the PPP model and consideration of other alternatives for the development of the roads that are heavily required to boost the competitiveness of this emerging country.

Keywords: public-private partnerships, infrastructure, highways, Colombia, project finance.

Resumo

As Parcerias Público Privadas tornaram-se num modelo conhecido e utilizado globalmente para o desenvolvimento de infraestruturas, especialmente para a construção e operação de auto estradas. Uma vez que o sector privado é o responsável pela disponibilidade e qualidade das infraestruturas, são esperadas eficiências e inovações que tornam o modelo de PPP mais adequado que os contratos públicos tradicionais. Para além disso, as PPP são esperadas a evocar contratação baseada no desempenho, regulamentação mais sólida e são também uma alternativa de financiamento quando existem restrições fiscais orçamentais. A Quarta Geração de Concessões Rodoviárias (4G) é um programa ambicioso das PPP desenvolvido pelo governo Colombiano, que visa construir mais de 30 estradas no país nos próximos cinco anos, contemplando um investimento de mais de 20 milhões de euros. Esta tese tem como objectivo analisar em pormenor a experiência do programa 4G, de forma a avaliar os pontos fortes e fracos do modelo Colombiano que poderão vir a desencadear pontos de aprendizagem para futuros projetos de PPP em mercados emergentes. Várias conclusões sobre a falta de capacidade de financiamento por parceiros privados, barreiras à concessão de empréstimos e imaturidade do mercado institucional, juntamente com os riscos específicos e falta de um planeamento mais preciso, tornaram evidente a dependência de recursos públicos. Assim, coloca-se a questão sobre a conveniência do modelo de PPP bem como a consideração de outras alternativas para o desenvolvimento de estradas que constituem requisitos fundamentais para reforçar a competitividade deste país emergente.

Keywords: parcerias público privadas, infraestrutura, auto estradas, Colombia, project finance.

To Carlos for his kindliness and love;
To Jorge for his mentoring and sincere friendship;
To my family for their unconditional support and affection.

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ACRONYMS

ANI	National Agency for Infrastructure
ANIF	National Association of Financial Institutions
CCI	Colombian Chamber of Infrastructure
CONPES	Colombian National Committee of Social and Economic Policies
DNP	National Planning Department
EIU	Economist Intelligence Unit
FDN	National Development Financial
GDP	Gross Domestic Product
IDB	Ibero-American Development Bank
INCO	National institution for Concessions
LPVR	Less Present Value of Revenues
MTFP	Medium Term Fiscal Plan
NMF	National ministry of Finance
NMT	National Ministry of Transport
OECD	Organization for Economic Co-operation and Development
O&M	Operation and Maintenance
PPP	Public-Private Partnerships
PSC	Public Sector Comparator
SPV	Special Project Vehicle
VfM	Value for Money

CHAPTER 1: INTRODUCTION

Worldwide, the existence of an infrastructure gap is undeniable (Deloitte, 2009). As worrying as the lack of infrastructure is in both developed and emerging economies, is the lack of public and private investment to close that gap. Intervention of governments is needed to ensure that the infrastructure projects developed are in line with the economic and social objectives of the country, but a series of market and government failures demand the involvement of the private sector, which can contribute with expertise, efficiency and innovation. Around the world, PPPs have become a well-known model to deal with the time inconsistency problem and other difficulties, always that exists a sufficient transfer of risk to the private partners (OECD, 2008).

Colombia, as many other countries in the region, suffers from a high infrastructure gap and has an urgent need to consolidate an optimal national road network that connect the production and consumption centers of the country, with the main ports and frontiers (CONPES, 2013). Despite the fact that total public investment on transportation infrastructure has doubled during the last years, Colombia still needs to invest every year for a decade, 3,1% of the GDP to close the infrastructure gap (Fedesarrollo, 2012).

The 4th Generation of highways is an ambitious program developed by the Colombian government to build more than 30 highways in the country in the next 5 years, which contemplates investment of more than EUR 20 billion and is designed under a PPP model. The Colombian government is having problems ensuring the financing of the projects that have been already approved and is considering different alternatives to construct the highways. Some options imply a higher fiscal risk or the possibility of suffering of the same problems presented in the previous concessions of highways.

Developing a suitable PPP model is the key to ensure the implementation of the projects under the PPP model that the government has been working on during the last 3 years. The objective of this paper is to analyze in detail this PPP model, addressing dimensions like the institutional framework, the risk assignation and the financial instruments. Then, it is intended to assess strengths and weaknesses of the Colombian model that could become on learning points for future PPP projects on emerging markets.

The paper starts with a review of the relevant literature on PPPs for the purpose of this dissertation in Chapter 2. Then, Chapter 3 presents the case of the 4th generation of highways. This section covers details about the previous experiences on PPPs in Colombia, the size of the projects, the institutional framework, financial model and current state of the program. In Chapter 4, the analysis of the 4th generation of highways program is addressed in several dimensions like risk management and financial structure, making a special emphasis on each of the main financing sources. Finally, in Chapter 5, conclusions and considerations for future experiences are provided.

CHAPTER 2: LITERATURE REVIEW

2.1 Infrastructure Development

Around the globe, the existence of an infrastructure "gap" (Deloitte, 2009) is a reality for both emerging and developed economies (Haran, 2013). That infrastructure "gap" has gone hand by hand with a lack of investment on this field (Meaney & Hope, 2012). Globally, total government investment on infrastructure, measured as a proportion over countries' GDP has fell by half, going from 5% to less than 2.5% over the last four decades. On the other side, private investment on infrastructure has increased during the same period but the contribution of the private sector is not enough to leverage the current state of infrastructure investment (Meaney & Hope, 2012). Particularly, during the last years, and due in part to the economic downturn, private investment has fallen dramatically, and instead public funding has slightly increased. Even so, the medium-term outlook for public infrastructurre finance is bleak. (Uppenberg, Strauss & Wagenvoort, 2011).

In the case of infrastructure, leaving the market to act on its own may not end on a socially optimal level of investment because there are market failures that make intervention of the public sector necessary. On the other side, the government acting on its own drives to other failures. Both market and government failures are due, firstly, to the heavy front-loaded sunk costs and the long-term nature of infrastructure projects. Besides, the monopolistic characteristic of massive infrastructure causes possible incumbents to fear about the return of their investment under competition, and entrants to find it too risky to compete due to a possible lack of demand or regulation. On the other hand, there are external factors that could be positive and will not be captured by the investor, or negative, as pollution and noise, which

are socially undesirable[1]. The difficulty of capturing these externalities impact may lead to a suboptimal price on infrastructure investment. (Meaney & Hope, 2012)

In terms of the relations between public and private entities on infrastructure development, the monopolistic nature and cost structure of the projects lead to the time-inconsistency problem that argues that, from a financial perspective, the investor would need an ex-ante guarantee of the recovery of its investments on the long term, considering the incentive for the government and regulatory bodies to drive prices down because the assets have partly become a public good and operations will run until the operator recovers its marginal cost (Helm, 2009). Without a credible commitment, private parties will demand a compensation for the political risk, leading to a higher financial cost. (Meaney & Hope, 2012)

In order to close the infrastructure "gap", the need for infrastructure financing by private parties is greater than ever, but it will only works if governments understand and address the specific incentives, information problems and risks that arise for investors in infrastructure (Uppenberg, Strauss, & Wagenvoort, 2011). In that sense, partnership-based procurement is projected to continue raising over the course of the next decade (Haran, 2013).

2.2 Public-Private Partnerships

Governments need to choose and implement policies that facilitate infrastructure development, at the same time allowing access to financing, reducing waste and corruption, and developing a sustainable operation framework for the infrastructure assets (Delmon, 2010). As seen before, PPPs are one of the possible tools to address these challenges. PPPs, as defined by the OECD, are agreements between the government and one or more private partners in which the latter delivers a service, and in which the alignment of both parties' objectives depends on the sufficient transfer of risk to the private partners (OECD, 2008). It is a contract on a long-term base where normally the investment is financed through time by deferred payments by the government, user-fees or a combination of both.

Risk-transfer mechanisms appear with the establishment of an integral regulation over the quality of the infrastructure service and accomplishment on the delivery levels (Hinojosa, 2010). The long-term nature of the PPPs means that they represent a solution to the time-

[1] Sarmento illustrates this clearly for the case of roads: "…building a road will reduce the travel time of people

inconsistency problem described before, by targeting private sector efficiencies and benefits derived from an efficient risk allocation. (Meaney & Hope, 2012).

There are even more tangible expectations about the PPP model: time performance. According to Hampton (2012), PPPs are considered the most favorable form of procurement in this sense. As several international experiences, mostly in the United Kingdom, have shown, PPPs have a higher accomplishment on time and budget than other models, and they even evidenced cost savings of up to 10% due to the risk transfer from the public to the private firms (Haran, 2013).

One of the main expectations around PPPs is that the private sector will be able to provide services more efficiently and more effectively than the public sector, by achieving reductions on operating costs and maximizing the use of capital expenditure (Dunnigan and Pollock, 2003; Shaw, 2004; Meaney & Hope, 2012). Normally, the private sector becomes responsible for the initial design and construction, operation and maintenance, thereby aligning incentives for low-cost construction and at the same time minimizing lifetime costs of operation (Meaney & Hope, 2012).

Additionally, the PPP model is expected to evoke a more entrepreneurial government, capturing private sector manners such as market-driven competition, performance-based contracting (Bloomfield, 2006) and more solid regulation institutions reducing corruption by the increase in accountability and transparency. PPPs would allow accelerated infrastructure provision transforming public capital expenditure into a flow of ongoing service payments (Liu, Love, Smith, Regan, & Sutrisna, 2014). These expectations follow from the fact that shareholders, who are the residual claimants of any additional profits, are expected to put pressure on management to accomplish lower costs and major efficiencies (Meaney & Hope, 2012).

The problem arise when governments choose PPPs as the model for a project based on reasons such as having neither revenues nor the credit to finance investments in public goods and services such as roads, hospitals or schools. PPPs should not arise on the demand for financial miraculous solutions. On the contrary, PPPs should be a feasible solution[2] among

[2] Appendix A summarizes a list of considerations that could determine the attractiveness of PPPs.

other alternatives, and should only be applied when its advantages for the public sector are proven by a cost-benefit analysis (Trincão, 2014).

The first step on the decision to adopt PPPs is the political discussion. Governments should consider if there is sufficient political and social will to implement PPPs and their implications. Another requirement is a deep analysis of the institutional, regulatory and legal context to determine if government institutions have the needed skills and resources, if financial markets have the capacity and disposition for investment, and if law and regulation encourage the development of PPPs. The third step refers to the design elements of the PPP structure that include cost/benefit analysis, consideration of different sources of financing, commercial agreements needed, suitable participants, and more (Delmon, 2010)[3]. Figure 1 presents a framework for building a successful PPP.

Despite the existence of a broad theoretical support for the use of PPPs, it continues to exist a lack of comprehensive, reliable data on their performance over the lifetime of the contract. It has even been suggested that the absence of clear financial information and accountability allows the government to hide mistakes on the development and procurement of the PPP projects or to justify decisions already taken (Shaoul, 2010).

2.3 Public Provision vs. PPPs and the PPP Premium

According to some authors, the increase on the development of PPP projects is due mainly to the government's intention of evading the possible constrains on the public budget to implement ambitious infrastructure plans (Yescombe, 2011). In addition, some countries face a more specific constrain, which are fiscal rules. In that kind of situations, to leverage the public budget needed, governments are forced to raise taxes, levy user fees, cut spending in other areas, etc. As PPPs do not encumber budgets on the short-term, they become an attractive alternative, or maybe the only one, for infrastructure development (OECD, 2008).

Governments find PPPs so attractive because expenditures are only registered after the construction is complete and are spread over the years of the contract. On PPPs, governments are not obliged to report an increase on expenditures, and undertaking a new project will not

[3] Appendix B proposes a framework for building a successful PPP.

affect public debt during the investment stage. In that sense, PPPs can create the false impression that they are a more affordable model (OECD, 2008). The reality is that, in the short run, PPPs will always tend to reduce the government capital expenditure, but on the long run, this may not be the cheapest option. Depending on the social cost of government transfer and considering the discount rate used to evaluate the projects, PPPs could be a better alternative or not that if the public sector finances the project wholly. After all, it is normally more expensive to raise debt on a project finance basis (Engel, Fischer & Galetovic, 2010). When there are not efficiency gains, PPPs and publicly financed projects will have a similar long-run effect on public finances. If there is not a change on the net present value of the project, investment is not more affordable under PPPs and then, if the government can afford the project under a PPP, it should be able to afford it under public provision. (Funke, Irwin & Rial, 2013).

Actually, PPPs use to show higher transaction costs caused by a more careful project planning, which, together with the complexity of the contracts, is expected to lower the probability of costly renegotiations in the future and to promote that infrastructure will be delivered on time and on budget (Engel, Fischer & Galetovic, 2010). But due to this complexity, PPPs can become more expensive. They require legal, technical and financial advisory and regulation as well as a tight risk management. These costs can reach up to 10% of the total cost of the project (Yescombe, 2007). Due to these transaction costs and risk assignation, several authors talk about the existence of a PPP premium.

It is said that investors would require a premium on the return rate of the project with the intention of recovering costs sooner. That means that the discount rate would be higher. Contracts on PPPs try to mitigate this by providing assurance to investors that they will be able to recover their initial cost (Meaney & Hope, 2012). According to Yescombe (2007), the cost of capital on a PPP is usually 200-300 points higher than the cost of public funds, but the view that PPPs cost more on this sense could be naïve because the cost of capital calculations for the government and for private firms are different. For the government, taxpayers assume the costs of the risk in the end. This idea rests on capital market imperfections that give the government a tax system advantage. On the other hand, private firms have to explicitly recognize the risk and its price. At the end, a possible advantage for the government is not reflecting the funding risk of the project *per se* (Engel, Fischer & Galetovic, 2010). Eduardo Engel (2010) argues that a part of the observed PPP premium may be a reflection of faulty contract design, and therefore it is not an inherent disadvantage of PPPs.

In the end, the evaluation of the best alternative should not depend on the accounting methodology or the government's short-term interests (Trincão, 2014), but on a financial evaluation on the affordability of the project. Methodologies like the "Value for Money" and the "Public-Private Comparator" (PSC) help on that task but they should be used alongside a range of other information (Hinojosa, 2010). The government should take into account that, if it does not have the required skills to construct and operate the project, it should develop the skilled staff to monitor the private partner and manage the risks that were assigned to it (OECD, 2008).

2.4 Project Finance and Financing Sources for PPPs[4]

The growth and spread experienced by PPPs in different countries is closely linked to the development of project finance, a methodology in which investors lend money against the cash flow of a structured project. Project finance takes the form of a specially created project vehicle (SPV) that carries the construction and operation of the infrastructure (Delmon, 2010). In that sense, the assets are specific and illiquid, and so they do not have value in case the project does not work (Wilhelm, 2009). The main guarantee investors can have is the right to be paid from the cash flow of the project. In that case, three main conditions should be accomplished: first, cash flow should be able to offer an attractive profitability for risk capital; second, there should be enough cash-flow guarantees, collaterals and insurances that give confidence to lenders; and third, the financial planning should be able to separate risks and allocate them properly (Hinojosa, 2010).

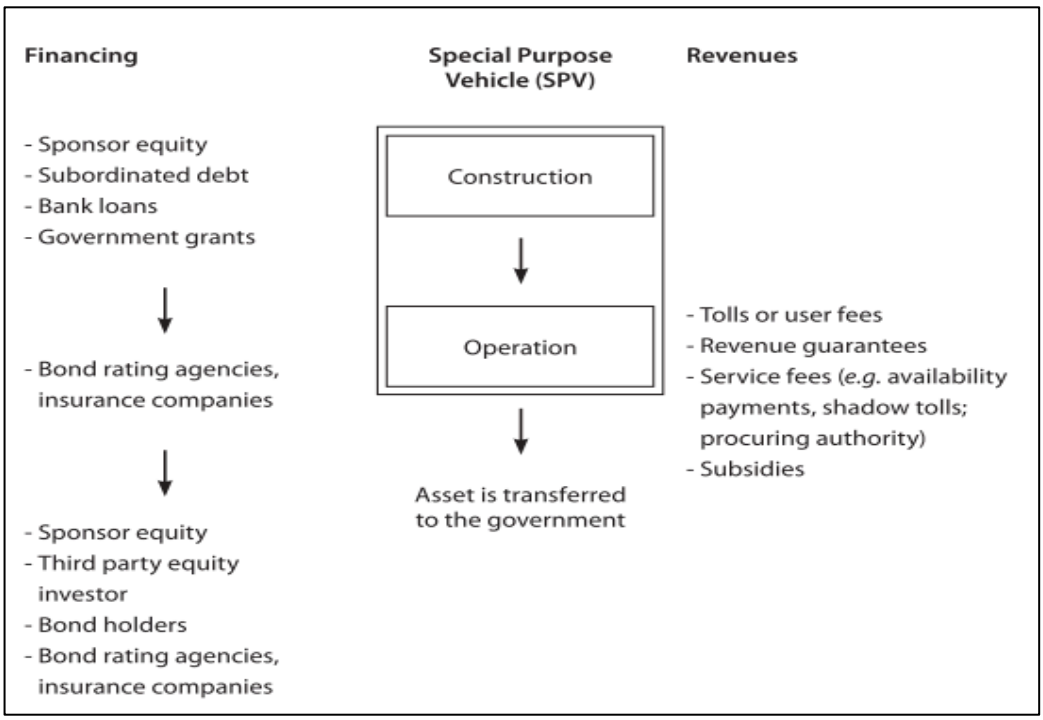
Project financing typically has two components: equity and debt capital. Payments to creditors are contractually defined to be done during the lifetime of the projects, but the cost and the revenue for each partner can be different, depending on each contract. The private partner could have two sources of revenue to overcome the cost of the investment on the infrastructure: payments/subsidies from the public sector that could be direct or contingent liabilities, and/or fees paid by the users, like tolls in the road sector (OECD, 2008). As was mentioned before, one of the main advantages of PPPs is that with the creation of the SPV, expenses are off-balance sheets that will shift the illiquidity risk to the lenders. In that sense,

[4] For a complete list of financing instruments on PPPs, refer to appendix D.

lenders would require a detailed assessment of risks and a higher margin than they will ask in regular corporate lending. The risk associated to the different obligations will be attached to the availability of funding, the cost of funding and the capacity of the project to fulfill the debt service obligations (Delmon, 2010, Meaney & Hope, 2012) .

Sources of financing on PPPs change over the time of the project (figure 1). The different sources are pretended to match the evolution on risk patterns over the life cycle of the infrastructure investment (Yescombe, 2007).

Figure 1. Financial life cycle of PPPs (Engel, 2010)



On the first stage, construction, uncertainty is a substantial cause for major design changes and costs will depend on the ability of the private partner to build the infrastructure according to the studies and plans (Yescombe 2007). The private partner supplies the initial equity of the project and normally it should keep this contribution until the end of the project to create a long-term incentive (Delmon, 2010). This becomes costly for the private partner because its cost of capital is high as it is the last creditor and it is freezing resources that could be invested for other purposes (Engel, Fischer & Galetovic, 2010). Probably, the government would require the SPV to include some local investors to accomplish transfer of technology to the country or to generate jobs and training for local communities. The SPV may be possibly

subjected to public control, for example, through a joint stock company that is common in developing countries (Delmon, 2010).

On this stage, private equity is combined with debt that can come from many sources like bank loans, export credit agencies, bilateral or multilateral organizations and the government. The most common instruments on this stage are bank loans and sometimes government grants in money or in kind. In the case of projects that derive their revenues from user fees, the initial contribution to investment is sometimes supplemented with subsidies from the government (Delmon, 2010).

Over this period, banks will exercise a considerable control over the contracts and private partner behaviors (Yescombe, 2007). They perform a strict monitoring that can mitigate the moral hazard problem. To exercise control, banks only disburse funds gradually as the project stages are completed (Engel, Fischer & Galetovic, 2010). In the midway between equity and debt, there exists the possibility of having mezzanine contributions that have a lower priority than senior debt but higher priority than equity contributions. Subordinated loans and preference shares are examples of mezzanine contributions. On the other hand, one actor that has become important mainly in developing countries is multilateral organizations. These agencies will normally demand strict planning and arrangements, and will also help to mitigate political risks (Delmon, 2010).[5]

After completing construction and starting operation, long-term debt appears to substitute bank lending, and private partner equity is subjected to a possible acquisition by a facilities operator or third-party investors like pension or mutual funds (Wilhelm, 2009). As risk falls when works are completed and the events that can affect cash flows are limited, bond financing becomes more suitable (Engel, Fischer & Galetovic, 2010), and is associated with the appearance of rating agencies and insurance companies (Wilhelm, 2009). Bondholders only have control over situations that may affect significantly cash flows but they are not able to examine the behavior of the private partner or operator (Yescombe, 2007). This type of lenders will not want to bear risks that are more appropriately borne by other parties, but they will be involved in the financial structuring and will exercise their review powers with the support of independent technical and financial auditors (Delmon, 2010). Including debt

[5] For more detail about financing sources on each stage of the Project, refers to appendix C.

holders will demand an attractive project bankability, which is ensured if there is a financial instrument and a legal bound that give them enough confidence, without requiring direct guarantees (Hinojosa, 2010). For example, It has become common for governments to grant revenue guarantees to concessionaires, especially when concessions have a fixed term (Engel, Fischer & Galetovic, 2010).

Another source of finance at the long run are user-fees. For this, the private operator would charge tariffs to the user of the roads. The level at which tariffs are set can be an extremely political issue. They can be subsidized, charged at very low rates or not collected (Delmon, 2010). A critical issue with tariffs is that dependence on user fees becomes unviable when large portions of the users lack the ability to pay (Uppenberg, Strauss, & Wagenvoort, 2011).

Anyway, there are different techniques related with tariffs and use of the infrastructure: on one side, there are the traditional SPVs where toll collection is the main source of revenue for the private partner; and on the other side, there are concessions based on availability where the government pays a periodical fee for the availability of the road and maintenance of service. It is a fixed payment that is independent of demand; payments are attached to the quality of infrastructure, and so there is an incentive for the private partner to promote it. In this case, there is a switch of demand risk from the private partner to the government, that at the end is covered by tax-payers (Trincão, 2014).

A new mechanism has started to be used in the last decade in countries like Colombia and Chile that receives the name of "Less Present Value of Revenues" (LPVR) (Engel, 2008). In this technique, there is a periodical monitoring of the income of the SPV and it is upgraded at the discount rate defined on the contract. The PPP is over in the moment in which the SPV income is equal to the value defined on the contract. In that sense, the partnership does not have a fixed term (Hinojosa, 2010).

2.5 Risk Assessment and Allocation on PPPs

Risk refers to an uncertain event that in case of occurring will have a positive or negative effect over the objectives, time, costs or quality of the project. Among the most important risks on a PPP are technology obsolescence, failures on design, changes on demand, political,

regulatory and macro-economic risks (Hinojosa, 2010). Allocation of these risks should be made in the most cost effective way, transferring each risk to the party that has better capacity, knowledge and experience to deal with it. That way, long-term cost of the project can be reduced and incentives are created to deliver the project on time and achieve more efficient operations (European Commission, 2003). Adding to that, allocation of risk is the main factor that would determine the existence of costly renegotiations in the future (Trincão, 2014).

Under PPPs, the private sector will be better prepared to take care of endogenous risks, most of all commercial risks, leading to technical efficiency. However, the substantial difference that makes PPPs more attractive than traditional public provision is the ability to transfer demand risk to the private sector (Meaney & Hope, 2012). The assignation of demand risk is closely related with the definition of user fees.

It is important to tone that several studies have found that on the project planning, demand is normally overestimated. Bain (2009), for example, found that traffic volumes were 23% below the forecast. Li and Hensher (2010) found that the real demand was 45% below the estimates. Baeza and Vasallo (2008) found that the traffic levels on the long run for Spanish roads tend to be 27% below the forecast. Similarly, it has been found that there is a systematical tendency to underestimate costs. Mixed with overestimation of demand, this results in a high risk around the expected profitability (Meaney & Hope, 2012, Delmon, 2010).

The transfer of risk from the government to the private sector does not involve reductions in the aggregated risk. The difference arises on the financing costs because the private partner prices risks explicitly, and not the government. In that sense, PPPs can bring to light the true riskiness of the project, which may have been disguised under public provision (Meaney & Hope, 2012).

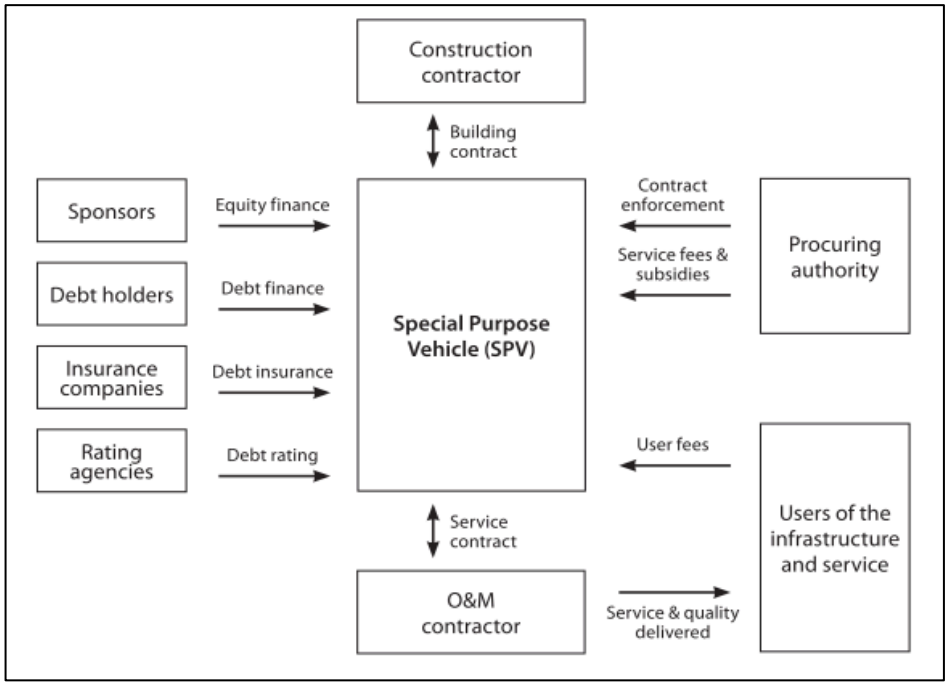
Despite the fact that the private sector may be better at evaluating risks than the public sector, in practice not all the projects have enjoyed a better investment appraisal (Meaney & Hope, 2012). Therefore, a meticulous and structured process of contract design and enforced regulation are crucial to ensure a proper risk assessment and assignation.

2.6 Contracts and Renegotiations on PPPs

The existence of uncertainty makes contracts incomplete by definition, opening the possibility for conflicts. To solve this, contractual theory incorporates two concepts that are extremely important on PPPs: contractual commitment and renegotiations. Under uncertainty there is an asymmetry of information as well, that lead to two relevant agency problems: moral hazard and adverse selection. The private partner has incentives to show higher costs, avoid ex-ante cost savings on financial planning, or even hide information about demand forecast. Contracts should be designed in a way that they motivate the private partner to take actions that are optimal for him but are optimal on a social perspective at the same time (Hinojosa, 2010).

Figure 2 presents all the contractual relations that emerge on a PPP. Each of these contracts is a potential source of conflict. The success of the SPV in dealing with these conflicts, according to Engel (2010), depends on two factors. One is the quality of the legal institutions and laws on which the web of contracts rests. The governance structure of the procuring authority, its degree of independence and the financial condition of the government affect the level of risk perceived by creditors. The second factor is how the participants of each relationship and contract affect risk perceptions by debt holders. On the side of the private partner, for example, its experience, reputation and financial strength are relevant because they determine the ability to credibly bear cost overruns without having to renegotiate the contract (Engel, Fischer & Galetovic, 2010).

Figure 2. Basic Web of contracts on a PPP (Engel, Fischer & Galetovic, 2010).



One way of overcoming the problems created by uncertainty around future outcomes is to build outcome-dependent terms and risk-sharing mechanisms into the contracts. However, this can make the contract increasingly complex and lead to transaction costs. There are three main transaction costs: first, those costs associated with finding a private sector company capable of supplying or operating the infrastructure as required by the public sector, which will also include bidding costs for the private sector companies; second, those costs related to agreeing the terms and conditions of a contract, including the structure of payments, the transfer of risk, and other detailed project specifications; and third, monitoring and enforcement costs (Meaney & Hope, 2012).

The incompleteness of contracts can create a high degree of uncertainty and greater risk in PPPs, which can in turn push up the cost of capital. It can create an incentive for the private partner to take opportunistic actions like engaging in an excessive level of debt and increase the risk of financial distress, and then look for renegotiations to ensure the delivery of service on the builded infrastrucutre (Meaney & Hope, 2012). Faulty design of the contracts has been a huge concern in regions like Latin America and the Caribbean, where renegotiations ocurred in more than 55% of the projects on the first three years after signing the contract (Guasch, 2004).The majority of the requests were made by the private partners and are tipically related to increases in tarrifs, delays on investment obligations and reduction of the obligations of the private partner with the government (Hinojosa, 2010).

Theoretically, a renegotiation brings advantages for this type of contracts. They are long-term contracts, so it is difficult to design complete contracts with all details. Therefore, renegotiations in PPP contracts may become occasionally inevitable (OECD, 2007; Posner, Ryu & Tkachenko; 2009). In fact, “no contract is flexible enough to cover every eventuality” (OECD, 2007). And, on the opposite, an excessively detailed contract may encourage partners to look for opportunistic exits instead of making the contractual relation work. The lack of flexibility may be a problem if terms under initial contracts are misspecified, which is likely in the case where future demand is highly uncertain. For example, the inflexibility of PPPs might not allow the parties to take into account exogenous, unexpected cost shocks (Trincão, 2014). Therefore, there should be a balance between flexibility and strictness (Meaney & Hope, 2012).

2.7 Institutional Investment on PPPs

Institutional investors have tended to include on their portfolio infrastructure assets, which are believed to posses a mix of characteristics in terms of risk return, inflation protection and time horizon. These in turn give place to the development of specialized investment products like infrastructure funds (Haran, 2013), which can give returns up to 14%, almost double the return expected for bonds and stocks in the financial markets (Peng & Newell, 2007). This contradicts the common belief that infrastructure investment has a low level of risk, and then only provides moderate returns (Bitsch, Buchner & Kaserer; 2010). It has been found too that infrastructure investment is not strongly linked to inflation and is not at exponential risk by management inexperience (Uppenberg et al., 2011).

Despite the fact that the involvement of institutional investors on infrastructure vehicles has grown, it remains below 5% globally and remains underrepresented in the PPP market. This, in part, can be attributed to the comparatively small size of PPP projects in institutional investment terms. An example of innovation to deal with this is the "unitization" of "securitizes" PPP investments in the UK[6] that should provide more effective risk-sharing, enables a more diverse range of investors to enter the PPP market and enhances the liquidity of the market. Some investors feel that this type of financial packages are similar to the ones that generated the World Financial Crisis of 2008 and therefore may carry a similar systemic risk (Haran, 2013).

Currently, the composition of international portfolios of PPP projects is confined to a small number of specialist investors. This is expected to change over the next few years as the global PPP market matures and transparency improves. The global economic crisis has shown the overdependence of PPP projects on debt finance. In light of the illiquidity and financial malaise within capital, innovative products and models are urgently required to address and attract big volumes of private sector capital into infrastructure provision (Haran, 2013).

Additionally, the investment community is willing to be involved in the construction phase of projects that deliver higher rates of return in compensation for the greater risk incurred to it. There is as well a growing interest of funds to invest in local infrastructure; however, greater transparency within infrastructure investment markets is required to enable investors to

[6] Grouping a large number of PPP bonds together into a fund and selling stakes in this fund as "units" (Haran, 2013).

benchmark performance relative to other asset classes and to assess (mitigate) investment risk (Haran, 2013). The big question is how to develop a model that capitalizes on private sector innovations at the lower cost for taxpayers, while accomplishing the best value of investment for the public wealth. In determining the best model, key areas should be taken into consideration: flexibility, transaction costs, cost of financing, risk allocation and pricing, and incentives for distortion (Meaney & Hope, 2012).

CHAPTER 3: CASE PRESENTATION

3.1 Past experiences with PPPs in Colombia

Private participation on infrastructure development has been present in Colombia since the 90s, with the launch of the first generation of highways. Since then, private involvement on roads infrastructure has been constant. The first generation of highways, in 1994, included 11 concession projects for a total of 1.649 km of roads, focusing on specific high traffic roads but without any consideration for network effects (CONPES, 2013). In this case, the government assumed the demand risk by establishing some guarantees for the private partner (Hinojosa, 2010). The second generation in 1995, for the intervention of 470 km, incorporated risk and responsibility schemes. This time, a liquidity guarantee was included, and the private partner did the acquisition of lands and obtained the environmental permissions at the beginning of the construction stage (CONPES, 2013). In that way, public investment concentrated on construction, avoiding long-term commitments for the public budget (Hinojosa, 2010). The third generation in 2006 was much more ambitious, going for the intervention of 3.557 km. In this case there were legislative improvements on the rules of renegotiations and additions, as on the selection process and risk assignation, with a specific policy framework for the contractual risk management on PPPs (CONPES, 2013). On this generation, the present value of revenues was introduced, changing the partnership term from fixed to variable. INCO (National Institution for Concessions) was founded to structure and manage the projects (Hinojosa, 2010).

On all the previous generations of highways, there were several over costs on construction, problems on land and environmental management, and important delays on the projects' calendars. All of these problems led to multiple renegotiations and eventually to the financial imbalance of the projects. The selection process was too long, with lots of conflicts and lawsuits

on the assignment process, and absence of homogeneous criteria for the private partner selection. Several cases were taken to the court where flaws on the bidding process where discovered, including under-budgeted proposals and disequilibrium on contracts on benefit of the private company (CONPES, 2013).

The OCDE (2013) analyzed 25 concession contracts in Colombia and found that there were around 20 renegotiations by contract, even just one year after being signed, representing increases of more than 280% of the initial value of the project. The main reasons were improper technical and financial studies, deficient design of contracts and opportunistic behavior by the different actors involved on the web of PPP contracts. A deficient contract design makes it difficult to solve conflicts on the future and define the contributions to be made by all parties, because there is no clear understanding of the economic foundations of the partnership. Besides, it was found that the participation of the private partner in relation to the total investment was low, implicating an excessive leverage of the project on public financing. Moreover, there was a low involvement of institutional investors (CONPES, 2013).

3.2 Institutional Framework

To tackle the problems from previous experiences and new challenges such as the social-environmental impact of the projects, the Colombian government has developed several initiatives[7]. The first one was the creation of a complete PPP law. Its most remarkable contributions were: first, it demanded more maturity on the technical, environmental, social, legal and financial studies, delegating the responsibility of the definitive design to the private company. Second, it allowed disbursements done by the government only with the fulfillment of the specific agreed levels of availability and quality of the infrastructure and service. Projects are divided in functional units (sections) to facilitate financing for each unit independently. Third, it specified better criteria to identify and allocate risks to the party that is better prepared to deal with them. Finally, It introduced new legal instruments for conflict resolution, such as arbitration.

[7] For example, the anti-corruption law to deal with the patronage on the bidding and contracting processes, and the infrastructure law to improve the efficiency on lands acquisition, environmental licenses and conflict resolution on public services transfer to the SPV (DNP, 2013).

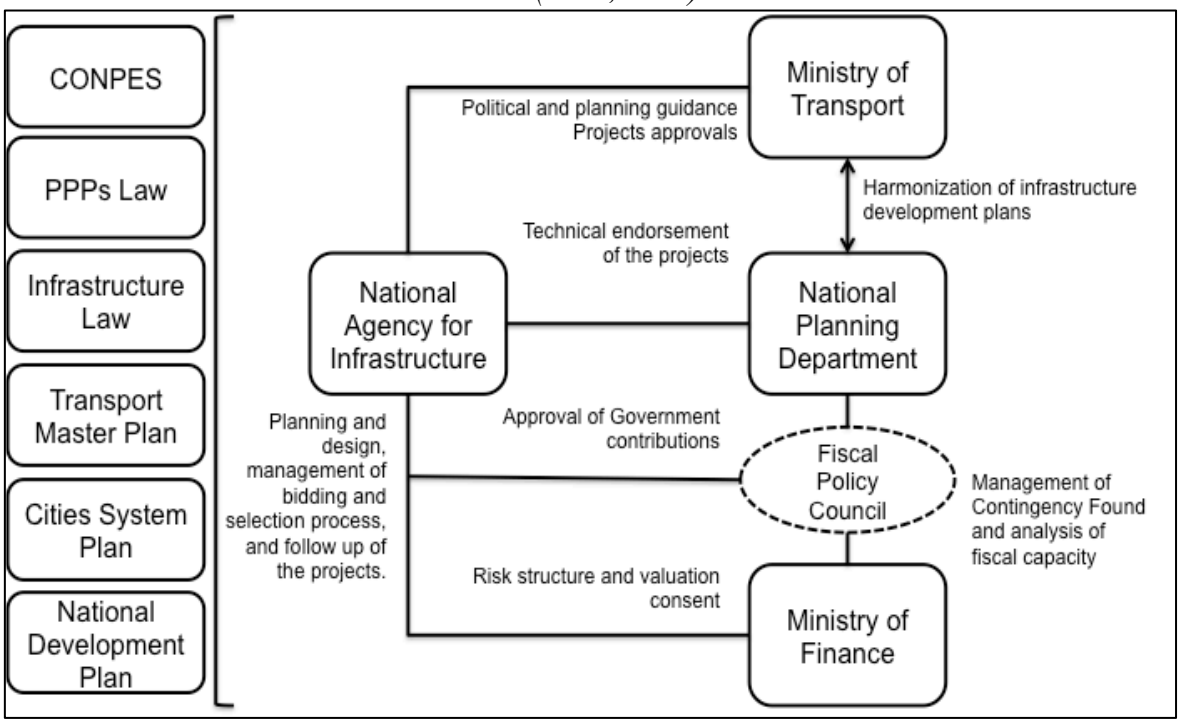
An important innovation of the PPP law was the introduction of two different types of PPP models. On the first one, PPP under public initiative, the responsible for the initial planning and design of the project is the government. Then, a public bidding process is open to find a private partner. In this case there is a limit to the possible additions by the public sector of a maximum of 20% over the value of the contract. On the second model, PPP under private initiative, the private party proposes a project to the government that can or not be accepted, and that can or not ends on the proposer being the winning company for the execution. In this case, the private partner will finance the project with a maximum contribution by the public sector of 20% of the total value of the project[8] (CONPES, 2013).

Besides the legislative initiative, the national planning department (DNP) developed *The Cities System Mission (2012)*, a plan that defines the specific actions to make cities the growth engine of the country, pursuing the regional competitiveness and the citizens' quality of life, taking advantage of urbanization and agglomeration. The National Minister of Transports (NMT) introduced *The Master Transport Plan 2010-2032*, which presented a prioritization of the road projects, based on a flow assignation model that identifies bottlenecks on infrastructure and traffic and the cost/benefit analysis of the projects to be developed. It included projections of demand and capacity analysis. This document concludes that it is necessary to improve 4.800 km of current roads, to pave 3.500 km and to enlarge 3.200 km from single to dual carriageway.

Finally, organizational changes were introduced in the government structure (figure 3). The National Vice-Ministry of Infrastructure was introduced and the old concessions institution was replaced by the National Agency for Infrastructure (ANI), a technical body responsible of ensuring the planning, design and execution of the projects (ANIF, 2014).

[8] For details of the public and private initiative models, refer to appendix K.

Figure 3. Institutional Framework for PPPs in Transport Infrastructure in Colombia (DNP, 2014)



3.3 The 4G Highways Projects

In 2013, only 7,20% of the Colombian road network corresponded to dual carriageway and around 30% of the roads were under a concession model. They are mainly concentrated on the border area of the biggest cities, but the road capacity between the main production and consumption centers is small, transportation costs are too high and production centers are not specialized (CONPES, 2013). According to the cross-border trade index, developed by the magazine Doing Business Global (2013), Colombia decreased 46 positions among 185 economies, to position #91, in relation to transportation costs and times. According to the World Economic Forum (2014), Colombia occupies position #126 among 144 countries on quality of road infrastructure, which is lower than the average position of the countries of the Latin American region.

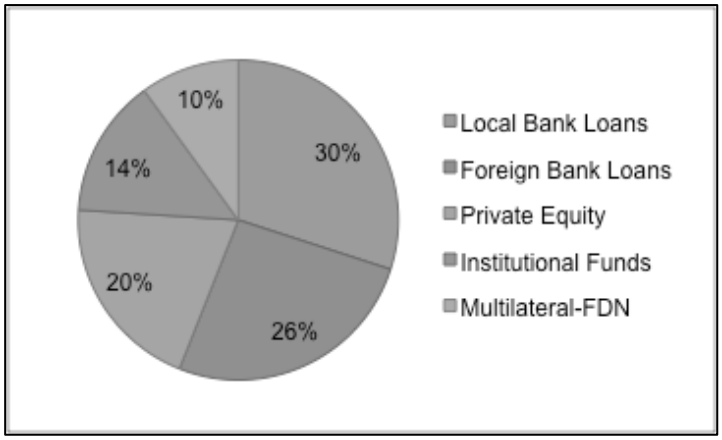
Based on the *Master Transports Plan* and *The Cities System Plan*, the design and structuration of the projects was started, taking into account the financing capacity of the government, the fiscal rule and the potential to involve the private sector. Depending on demand and technical studies, and considering items like travel time savings, transportation cost savings, the

multiplier effect on the economy the new infrastructure may have, and cost/benefit analysis overall, the suitability of each project was defined under the PPP model. The complete program includes more than 40 highways, when private initiatives are considered, for a total investment of more than COP 50 billion and the construction of more than 6.000 km of roads. Appendix E presents the outlook of the National Highways Network when the program is completed. For detailed information on the projects, refer to appendix F and G. These 19 projects account for the development of 3.000 km of roads and a total investment of COP 39 billion, with a CAPEX investment of COP 24 billion to be done over the next 5 years, and an OPEX investment of COP 15 billion to be executed over a period of 25 years, as it is the planned term of the contracts for most of the projects.

3.4 Financial Sources

The financing structure varies for each of the two stages of the project. On the construction stage, the main sources of financing are: local banks (loans), international banks, equity from the private partners, institutional investors like private capital funds attracted to invest on this stage, and, finally, the multilateral organizations and the National Development Fund (FDN) through subordinated debt. (ANIF, 2014)

Figure 4. Distribution of Financing Sources for the 4G of highways (ANIF, 2014)



On the operation and maintenance stage (O&M), three financing sources are contemplated: income based on user-fees, public contributions made by the government, and the resources expected from the involvement of pension funds through the acquisition of infrastructure bonds. (ANIF, 2014)

In the case of Colombia, the approved resources to be disbursed by the government during the O&M stage are future obligations and are accounted on the Medium Term Fiscal Plan (MTFP)[9]. They are a pre-assignation of public resources to fulfill strategic plans for the economic and social development of the country, which will require to be executed during several fiscal periods, like a public transportation system or a long-term education program (CCI, 2014). For the period 2015-2044, the amount approved by the government on this category is COP 62 billion, with 85% intended to finance transport infrastructure projects, which includes airports, trains, roads, ports and public urban transportation systems (ANIF, 2014). These contributions are intended to cover 60% of the total retributions required to pay all the creditors. Besides, according to the PPPs law, the additions by the government cannot be higher than the 20% of the estimated cost of the project stipulated on the contract signed at the beginning of the partnership. The 40% left of the total retributions are planned to be covered by the revenues from user-fees related to the use of the infrastructure over the period of the PPP (CNPSE, 2013).

To facilitate the procurement of resources, the projects are divided into functional units, where one unit corresponds to a section of the project with lengths varying from 40 to 70 km, which corresponds to an investment need per unit of around COP 100.000 million. That way, remuneration is attached to each functional unit according to its availability and fulfillment of quality standards, which are subjected to an ongoing evaluation by independent engineer firms hired by the ANI. Retributions from the public budget are subjected to possible discounts, up to 10% of the agreed value, if the infrastructure does not fulfill all the quality standards (DNP, 2014).

3.5 Current State and Issues

The 4G highways program has experienced difficulties to create the synergies and develop the expertise in the different public and regulation institutions involved, but the financial dimension has become the most matted issue. There is a great concern around long-term financing and the possibility to mobilize resources away from institutional investors and risky capital funds. There is a general concern about the size of the program, which could be overloading a young market

[9] The Ministry of Finance emits the MTFP. It includes estimations of incomes and expenses of the central government over the next 10 years and accounts for all the future obligations that have been approved by the government (CCI, 2014). For more information, refer to appendix E.

like Colombia's (IDB, 2014).

The projects of the first wave have experienced difficulties to capture all the resources needed and the scenario has been even more difficult for the second wave. The main problems experienced are: i) banks are refusing to accept payment periods higher than 8-10 years, when the intended period is of 20-30 years; ii) investors perceive high risks associated to land acquisition, environmental licenses and the acceptance of the projects in local communities; iii) cost increases could result from poor technical studies (CCI, 2014).

The Colombian government is considering alternatives to ensure the resources for the projects. One of them is to execute some of the highways by traditional public provision. Some of the projects are not attractive enough for investors due, in one hand, to the demand risks resulting from uncertainty about the future traffic flows and low levels of traffic in the present; and, on the other hand, due to the technical complexity and costs of construction, taking into account the geological and engineering challenges. This situation is exacerbated by the low investment on the pre-bidding stage (0,2% vs. 3% of the value of the project according to international standards) (ANIF, 2014).

ANIF (2014) has developed an infrastructure index to determine which projects are more suitable for PPPs, which for public provision and which could be executed by any of both alternatives. This index is not based on a financial evaluation as the one suggested by the Public-Private Comparator, but on five prioritized criteria: current and potential traffic, construction risk, investment amount required, relevance of the road, and percentage of the work that corresponds to the construction of new assets[10] (ANIF, 2014).

Following the ANIF's recommendation, 13 of 25 evaluated projects would be suitable for public provision. This would require additional resources of 0,3% of the GDP per year for the next 8 years. With that level of public expense, the deficit goal defined by the fiscal rule would not be accomplished. Then, a tributary reform would be needed to collect more taxes that can cover the need for public resources. The ANIF suggests to exclude capital expenses from the fiscal rule and limit it to debt related with investments, as other countries like Brazil, Ecuador, Honk Kong and Japan have done. In that way, there would be a higher contribution for

[10] Refer to appendix I.

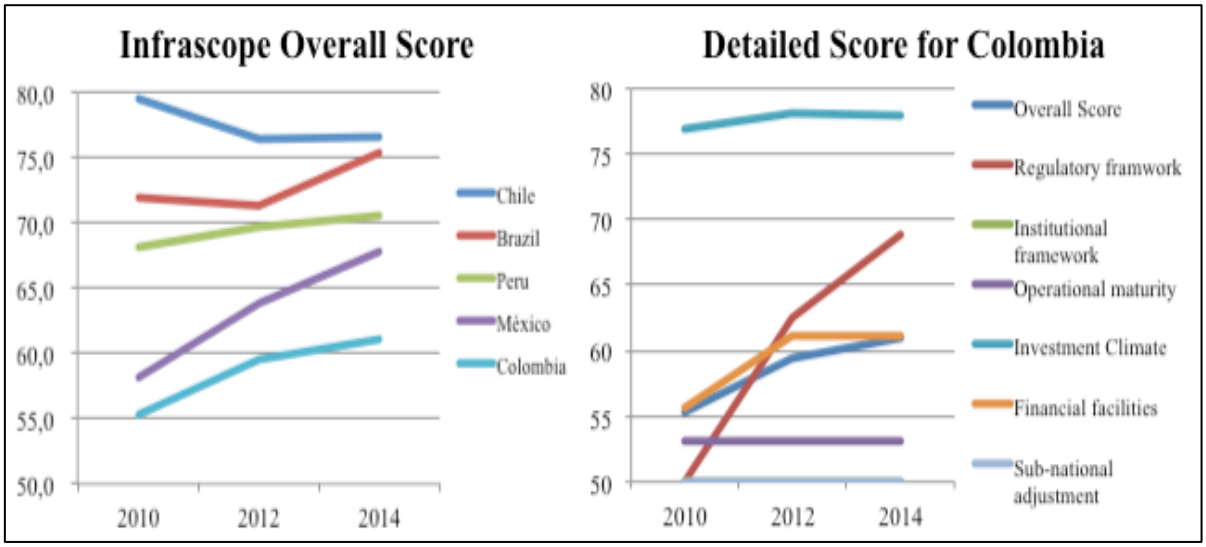
infrastructure projects at the same time that more taxes are collected. According to the ANIF, infrastructure development requires as much attention on the tributary regulation as the PPPs themselves (ANIF, 2014).

CHAPTER 4: ANALYSIS

4.1 Institutional Readiness

Colombia is highlighted as one of the most mature countries for the development of infrastructure projects, among Chile, Peru, Brazil and Mexico (EIU, 2015). Despite that and according to the Infrascope, an infrastructure readiness index developed by the IDB and the EIU, the real improvement on the support framework to infrastructure development in the country has not been as notable as one would think. There are several areas in which the country has not made notable improvements, especially in terms of risk allocation and technical expertise on the design and approval of PPP projects.

Figure 5. Colombia on the Infrascope Index. (EIU, 2015)



The PPP law, approved in 2012, brought several changes that have been implemented over the last 3 years. Table 1 summarizes the most relevant ones.

Table 1. Before and after the PPP law. (DNP, 2013)

Before the PPP Law	After the PPP Law
Payments were done for the work.	Payments are done for the infrastructure services. Concepts of payment for availability and service level are introduced.
Private partners did not contribute with their own capital to the projects.	Private partners must contribute with their own capital to the projects.
Inefficient allocation of risks.	Risk allocation is considered before the selection process.
There were advanced payments made by the government.	Advanced payments by the government are not allowed.
There was place for additions of up to 60% of the value of the contracts, but with renegotiations they could go up to 250% of the initial value.	Additions cannot be of more than 20% of the value of the project and it is not subjected to renegotiations.
There was not a strict analysis of the alternatives to develop the projects.	A proper analysis of alternatives (Vfm analysis) is required.
There was not distinction between investors and constructors.	It is required that the private partners count with legal and financial capacity, and experience on investment and structuration of projects.
The projects did not count with a proper financing design for institutional investment.	Projects should be designed to encourage institutional investment on all stages of the project.

One of the main innovations on the PPP law was the introduction of public and private initiatives. To avoid this mechanism becoming an easy way to skip the public tendering process, if there are public resources compromised, the public tendering should be open, giving the possibility to other parties to gain the right to build the infrastructure if they have a better offer than the proponent.

Another important mechanism to deal with corruption was the timeline created for additions and prorogations. With the PPP law, they can only be made on the first three years after signing the contract and before 75% of the PPP period has passed. PPP contracts cannot be signed at the end of a local government period to avoid the possibility of PPPs being used as a political instrument for the next elections. To avoid money laundering, the real benefactor information of the private companies should be disclosed, even for the pre-qualification process.

Despite this improvement, in reality there are lots of challenges to be addressed. Most of the personnel of the ANI lack project-planning experience. For example, the law mandates a cost-benefit analysis for the selection of PPP projects, including public-private comparison indicators, but in practice the system has a poor record of renegotiating projects, and commercial risks are often passed to the government, irrespective of what has been explicitly laid down in contract agreements. In this sense, creating project preparation and oversight capabilities within the government remains the critical factor (Infrascope, 2015).

In addition, several difficulties appear in the implementation of the PPP law, like the design of the pre-qualification process, which could become a mechanism that favors some private companies. Worrying as well is the definition of the level of service and quality standards that will allow the disbursement of public funds. It is not an easy task to define that criteria *ex-ante* and they can become a manipulated argument to ensure public funding. Another important difficulty arises when extensions and additions are truly needed, for example, caused by a weather phenomenon. According to the law, the private partner has to pay to the government 10% of the required addition in order for the latter to evaluate its authorization. In the end, this could cause an increase on the cost of the project, due to the fact that private companies are going to add that cost to the initial value; or can imply a decrease on the quality of the infrastructure if needed additions are not easy to get.

Other concerns appear specifically around public contributions to the project. Additions and extensions are limited to 20% of the initial value, but it is not clear exactly what is counted as public contribution, and if, for example, land rights[11] or tolls gave up by the state to the SPV are included. In addition, local governments are allowed to make in-kind contributions out of the 20%, but there is no clarity about which kind are these. Appendix I exposes other problems in past experiences and the proposed solutions. Some of them were implemented but others experienced difficulties persist until now.

4.2 Risk Distribution

According to the PPP law, risks should be allocated in the contract to whom has better capacity to manage and mitigate them (CONPES, 2013). In that sense, there are some risks

[11] Under the PPP law, the government transfers environmental licenses and land acquisition responsibilities to the contractors.

that are more suitable for the public sector, like political risk, in which legislation or regulation of several items can change in the near future and affect the projects, and cannot be controlled by the private partner. By contrast, other types of risk related to construction, operation and maintenance are better borne by the private partner (Sarmento & Renneboog, 2014). Finally, there are some risks in which it is not that clear which party is better prepared and, as in the Colombian case, an efficient allocation should consider a mix of variables. The Colombian government has designed mechanisms in which public contributions for shared risks are subjected to some conditions. Table 5 summarizes the mayor risks that have been considered and allocation in the 4G highways program.

Table 2. Allocation of Risks on the 4G Highways Program
(By author, based on CONPES, 2013; ANI, 2014)

Type of risk	Description	Allocation
Lands	Delays on availability of land due to land management	Private
	Over costs on acquisition and compensations for land	Shared
Environmental	Delays on procurement of licenses	Shared
	Over costs on environmental compensations (due to biodiversity loss, use of natural resources or resettlement plans)	Shared
	Additional works required by the environmental authority that are not attributable to the SPV	Public
Social & Political	Delays on social consultancy processes	Shared
	Invasion of the road right of the concession	Public
Network	Relocation of current tolls or impossibility of locating new tolls	Public
	Over costs due to network interference	Shared
Design	Over costs due to problems on studies and design	Private
	Over costs in design due to ANI's decisions	Public
Construction	Over costs due to a bigger larger amount of works	Private
	Over costs due to a bigger larger amount of works in long tunnels with geological risk	Shared
	Variations on input prices	Private
Operation and Maintenance	Over costs due to a bigger larger amount of infrastructure	Private
	Variations on input prices	Private
Commercial / Demand	Lower revenues due to a decrease in toll collection (in terms of NPV)	Public
	Lower revenues due to a decrease in toll collection (in terms of liquidity)	Shared
	Lower revenues due to evasion of toll payments	Private
	Lower revenues due to elution of toll payments	Public
Financial	Disposition of equity and debt resources	Private

Type of risk	Description	Allocation
	Disturbance on the financing commitments acquired due to changes of market variables or project conditions	Private
	Insufficiency of planned resources to cover the intervention (tunnels)	Public
Regulatory	Compensations due to new differential tariffs	Public
	Over costs due to the implementation of new technologies on toll collection mechanisms	Private
	Tributary changes	Shared
	Normative changes, except tributary	Private
	Normative changes on technical specifications	Public
Force Majeure	Idle costs related with the permanence of the infrastructure	Public
	Insurable events	Private
	Non-insurable events	Public

Land risk is associated with the acquisition of lands and the cost of socioeconomic compensation for landowners that arise from the negotiation or expropriation processes. Specifically, for the compensations, there is a partial guarantee given by the ANI and covered by the contingencies fund designated by the government. The same applies for the social compensations that arise from the environmental externalities generated by the projects, such as biodiversity loss and the cost that could result from the interference of other networks such as telecommunications and water. In all these cases, the partial guarantee given by the government is subjected to certain conditions: if compensations or over costs correspond to a value between 100% and 120% of the initial value of the infrastructure, it is assumed by the SPV. If the cost is between 120% and 200%, the guarantee will cover 70% of that. Finally, if it goes above 200%, the cost will be entirely beat by the public sector. There is a specific guarantee related to the construction of long tunnels because they carry a high geographical uncertainty despite the accuracy of technical studies (CONPES, 2013).

According to several authors, demand risks should be allocated to the private sector, which would require extra effort and efficiency from it (Chung, Hensher, & Rose, 2010; Sarmento, 2014). Normally, the private sector is better on calculating demand and fulfilling commercial tasks. Despite this argument, in reality demand risk is allocated to the public or private party, depending on the revenue design of the PPP, due most of all to the uncertainty or inadequacy of the forecasted demand. Political, social or environmental factors can be considered as well in the decision (Sarmento & Renneboog, 2014).

In the 4G highways program, commercial risk[12] is subjected to the traffic forecast, which depends at the same time of macroeconomic variables and is attached to the regional development. All of these are exogenous variables that cannot be controlled by the concession. Then, the public sector is the party mainly responsible for commercial risks, with the exception of decreases in revenues related with evasion of toll payments (where the private party is responsible for implementing an effective collection system) and illiquidity derived from poor concession management. In the Colombian case, there are not alternative roads for most of the cases and there is a stable, consistent demand for roads that are crucial for regional and national connectivity. Although there is not evidence of a direct consideration of this fact on risk allocation, the LPVR should reflect the resulting advantage. The difference between expected and real revenues of the project would be measured periodically. If the negative difference is related to deviations on traffic projections, there is place for compensations from the public contingency fund.

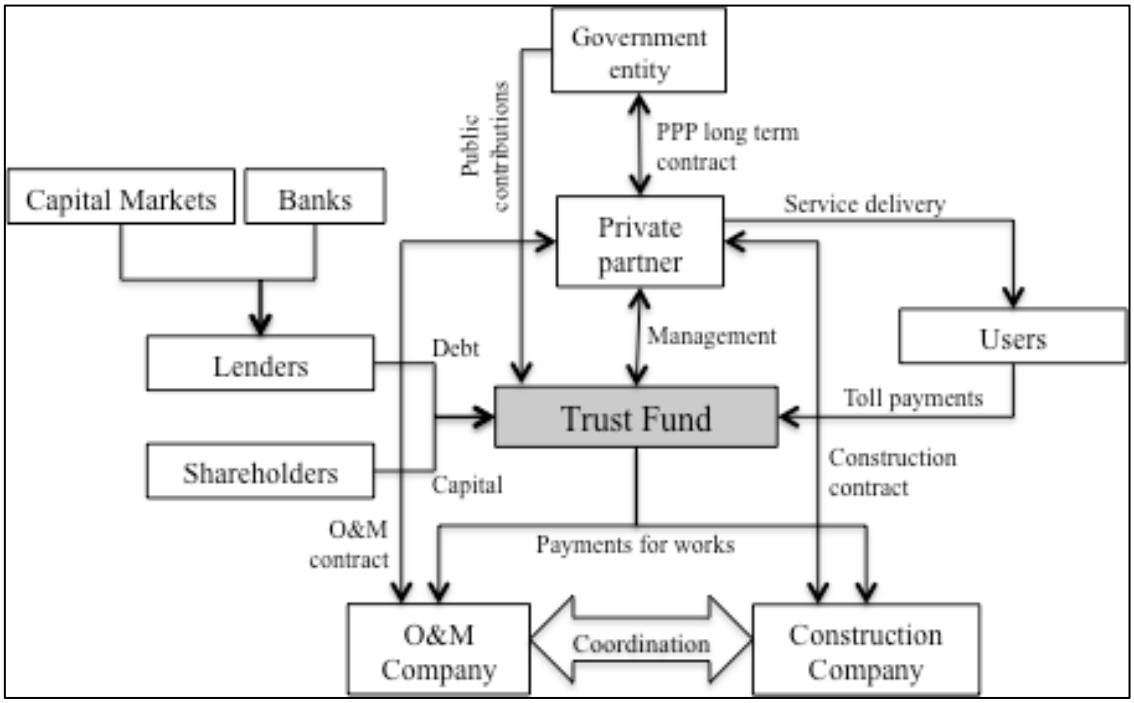
Force majeure risks could be important in the Colombian case, due to the magnitude, complexity and uncertainty around the projects. Another innovation was introduced for this kind of risk: compensation by the public sector only applies for functional units where there is already an 80% or more progress in the construction of complex works such as tunnels less than 2 km long, and 40% for tunnels above this mark. A limit of two years to solve the problems that arise from the force majeure event is established as well. Compensation should be proportional to the initial value of the functional unit under revision and be subjected to deductions to promote problem-solving initiative by the concessionaire.

4.3 Financing Sources and Financing Model

Figure 6 summarizes the sources of financing and the compromises along all the involved parties on the web of contracts of the 4G highways program.

[12] In the design of the PPPs of the 4G highways program there is not a clear distinction of demand risk, being commercial risk the concept used instead. There is an intention of the legislator to encompass all the situations that can have as a consequence a failure to collect the expected revenues coming from the use of the infrastructure. Commercial risk is defined as the deviation between the expected and real present value of toll collection.

Figure 6. Anatomy of the financing and web of contracts of the 4G highways program. (DNP, 2015)



Next, this paper addresses several challenges and difficulties that have arisen for each of the financing sources on the 4G highways program.

I. Equity and Bank Loans.

It is expected that the equity contribution from the private partners sums up a total of COP 10 billion, which represents 20% of the total investment of the 4G highways program. Until now, Colombian construction companies have the majority on the allocation of projects, holding 69% of the contracts by value[13] (BI, 2014). Despite the fact that Colombian firms show less debt than their international competitors, they are much smaller firms that may not have enough financial capacity to deal with the project costs and risks, mainly due to possible illiquidity.

According to the information published by Business Intelligence (2014), revenues in 2013 from the Spanish companies bidding is more than 3 times the revenues of each of the Colombian companies that have been awarded the projects. In the whole comparison, Spanish companies are better as well on assets management, where they are more efficient in turning their assets into revenues. Even so, Colombian firms have a strong debt position where liabilities-to-asset ratios tend to be lower than for Spanish companies. This could give room for maneuvering,

[13] Appendix J exhibits several graphics with comparisons of financial ratios and shares of different companies.

whether that means taking more debt or creating a cushion in case of losses (BI, 2015).

Definitely, financial capacity is not the reason why Colombian companies have been at the front, but their knowledge and comfort working in the Colombian environment and dealing with the specific geographic characteristics of terrains. Sadly, two problems arise with this situation. First, Colombian companies will not be able to apply for the rest of the projects coming out because they are at the limit of their financial capacity. Mario Huertas & Co, the Colombian concessionaire that has obtained the highest portion of the bidden projects, with 29% by value, has already put in sale part of its share of the projects, leading negotiations with companies like Goldman Sachs (Revista Dinero, 2015). Second, the monopoly of Colombian firms can discourage international players to bid again. Colombian companies are not even able to ensure the equity contribution that could probably be filled by international applicants.

Looking in detail at the case of Mario Huertas, several new partners have been included on the SPV, splitting the financing needs between all the parties that account for shares between 10% and 20%. Some of the new partners have been chosen because they have expertise on certain roads or type of construction. The inclusion of financing partners like Goldman Sachs could give positive signals to banks and debt funds. The equity contribution that firms like Mario Huertas & Co are available to make is not greater tan 25%, meaning that they are appealing to other sources to fulfill their quota. Other alternatives such as entering the capital market as a public company are on the table, but they require more time than the expected to start the construction of the projects (Revista Dinero, 2015).

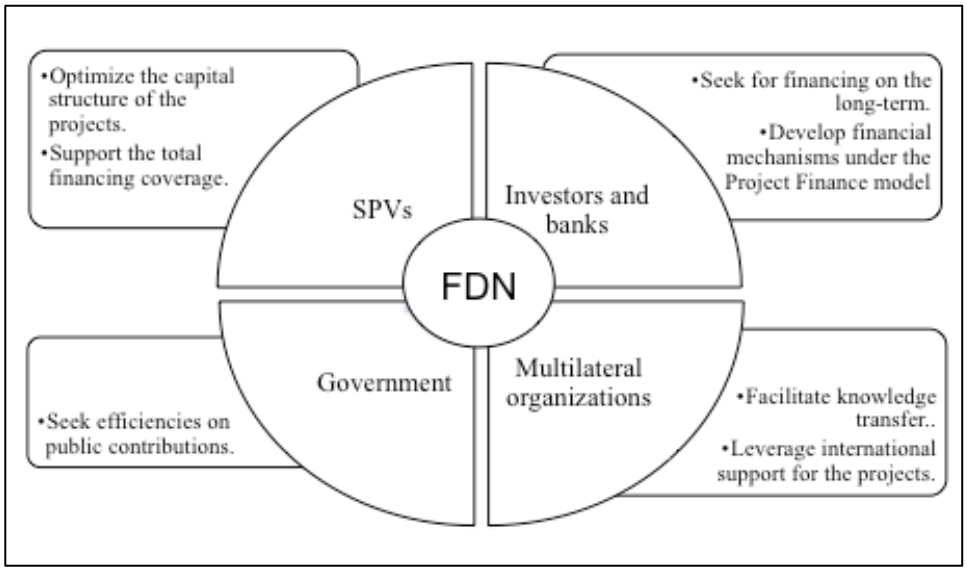
To deal with the lower contributions of equity from the bidders, the Colombian government has worked in several debt fronts that include expected contributions of COP 17.4 billion from local banks, COP 2.5 billion in debt funds, COP 7.8 billion from foreign partners (banks) and COP 3.5 billion from FDN (BI, 2015). Local banks are willing to support the projects but are not open to consider financing terms longer than 10 years. For local banks, betting on the 4G highways program is not an easy consideration since current infrastructure bank debt in Colombia is COP 8 billion and they are expected to grant loans for more than double that sum, in a project financing model in which there are not specific assets or guarantees of recovering the money (Revista Semana, 2015). On the other hand, foreign banks may be doubtful to enter the Colombian market due to the political and economic risk

they may perceive in the country. Finally, the FDN does not count, for now, with the resources mentioned. They are expected to come from privatization of some public companies but there have been several problems with that and a lack of support from the population.

II. Public Contributions

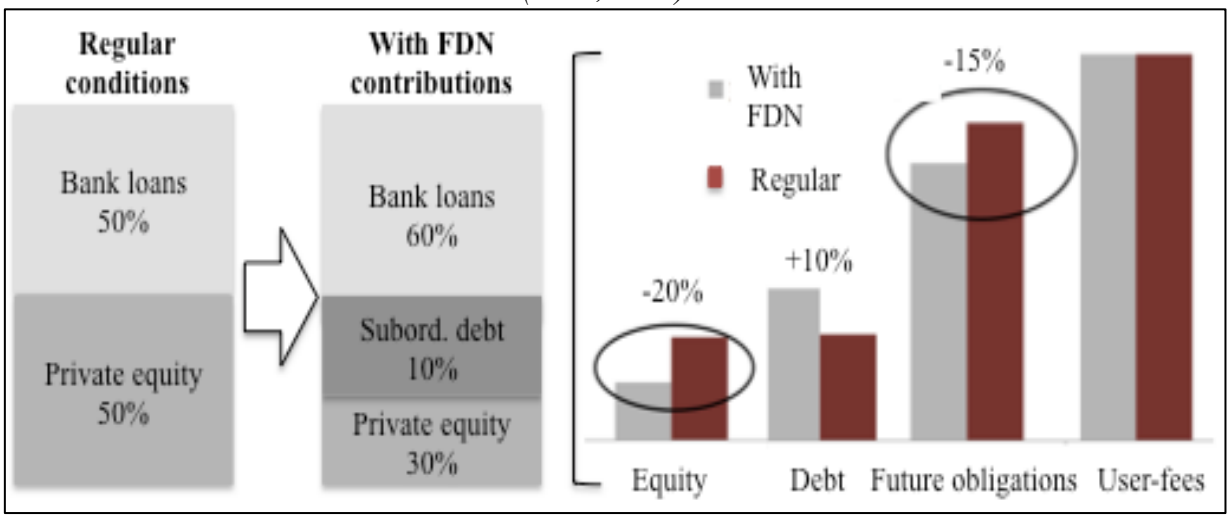
The introduction of the FDN was one of the main institutional innovations. Figure 7 exposes the FDN working fronts, as an advisory and investment public body.

Figure 7. FDN working fronts. (DPN, 2015)



On the short term, the main public sources of resources for the projects are the FDN contributions, where the multilateral organizations account for 30% share of the entity. The FDN would grant subordinated loans and liquidity guarantees, and at the same time could finance the structuration of projects and advice regional governmental entities. Introducing a 10% subordinated debt over the total value of the 4G highways program is expected to change positively the financing structure of the projects, as figure 8 shows.

Figure 8. Effect of the FDN contributions on the financing structure of the 4G program (DNP, 2014)



The government designed a special legal framework that allows the FDN to give financing and guarantees above the limits established for other credit entities, as long as the project is not directly financed with resources from tax-payers. According to international standards, laws and regulations, credit entities should establish prudential limits for big clients or group of clients that imply high risk, and more when there are several groups of clients for which there exists a bundled effect. Those limits should be based on the financial self-reliance and legal independence of credit holders. In most of the countries, the limits to grant credits are between 10% and 40% of the credit entity equity. A limit below 10% is not realistic with market needs, but more than 25% can generate a perception of a relaxed supervision.

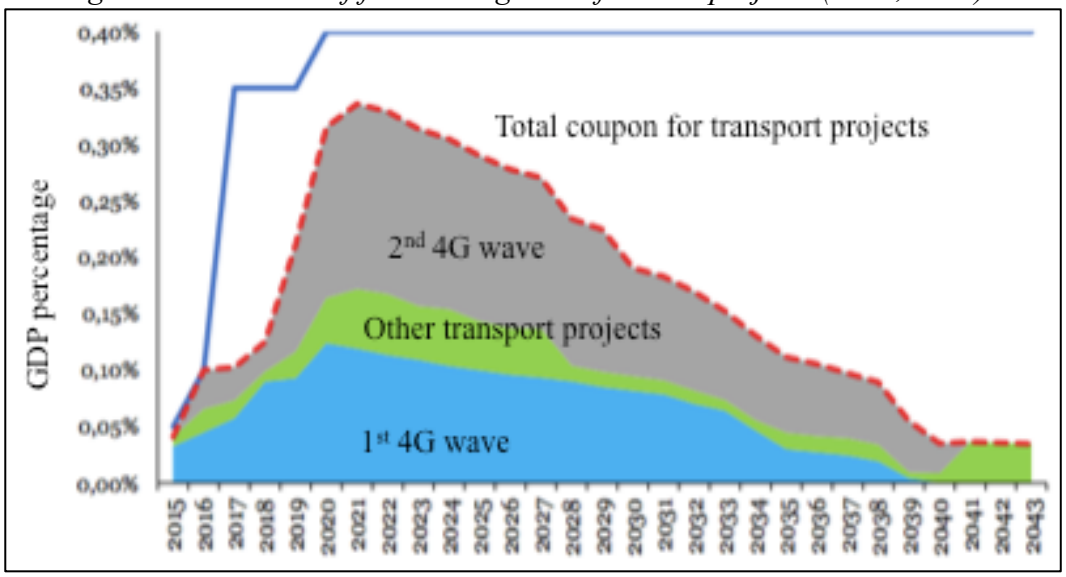
Currently, the equity of the FDN is of about COP 500.000 million, with a limit to credits of 10%, which means that the entity can grant credits for only COP 50.000 million. This amount corresponds to 1% of what is expected to be contributed from multilateral organizations on the 4G highways program. The available resources from the FDN are less than insufficient. In that sense, FDN would not be able to give the guarantees that are needed as a backup for the loans that are being demanded from local banks. The lack of equity contributions, insufficiency of FDN resources, and prevention from banks to grant loans under a project financing model for such huge amounts of money has complicated the financing of the construction stage.

On the long term, there are two sources of financing: the contingencies fund that would cover over cost or extra resources needed due to risk occurrence, conflicts between the parties or unexpected situations; and future obligations that are one of the two main retribution sources to

the SPV. The flow of future obligations has been designed according to the medium-term fiscal framework, which defined as maximum coupon for investments in PPPs the next values: 0,05% of PIB for 2015, 0,10% for 2016, 0,35% for 2017-2019 and 0,4% between 2020 and 2044 (CNPSE, 2013).

As figure 9 shows, the total coupon allocated for transportation projects on the period 2015-2043 is already full with the two current waves of projects of the 4G highways program and is still missing the 3rd wave. As was pointed out by the ANIF (2014), there is no extra fiscal space on future obligations for the 4G highways program under the current fiscal rule. Then, two different fronts can be addressed: collecting more taxes and modifying the fiscal rule to give more space to extra budget from the public treasure.

Figure 9. Allocation of future obligations for PPP projects (DNP, 2013)



III. User-Fee Based Income

An optimal pricing on tolls could reduce the need to use tax revenues from other sources for the financing of roads. This may improve efficiency further, because these other taxes are often distortionary. It may also help in overcoming problems of public acceptability of road pricing. The resulting scheme is likely to be perceived as fair, since only the users of a road pay for its availability, and transparent, since there are not hidden transfers surrounding the financing of roads (Newberry, 1989). User-fees in the Colombian case are categorized by type of vehicles. Prices for tolls could be a significant socioeconomic problem in Colombia since most of the population does not count with a high enough income and there are not alternative suitable

roads for local and regional mobility. In that sense, the optimal financing approach cannot be made independently of an analysis of the population's ability to pay (Uppenberg et al., 2011).

Toll collection in the 4G highways program is expected to generate resources not only for O&M but to cover part of the retributions of the complete PPP. Appendix K shows the retributions expected for each project in terms of public contributions and user-fees, which represent around 45% of the total. Retributions account in average for 263% of the investment value with return rates that go from 80% to even 234% in some cases. There is a huge disparity on road lengths, types of construction interventions, number of functional units and CAPEX investment, and in that sense, a huge disparity on investment and retributions values.

IV. Institutional Investment

The Colombian government has worked over the last two years making the institutional arrangements for infrastructure bonds emission. It is expected that the pension funds can contribute through this mechanism with 10% of their savings, which go up to COP 250 billion, meaning additional funding for the 4G highways program of around COP 25 billion. The emission of these bonds is subjected to the completion of each functional unit with the intention of lowering the overall financial risk. According to the World Bank (2012), the investment portfolio of pension funds in Colombia is composed by 44% of public debt, 8% of private debt titles, 31% share on owned investments and 17% on international investments. There is no record of investments on securitized asset titles such as infrastructure bonds.

On the literature there are several arguments in favor of institutional investment on infrastructure, such as the enhancement of the country's international competitiveness, the development of local capital markets and the long-term match of infrastructure assets and pension liabilities. Infrastructure investment is much more tangible than other complex financial products, and expected returns are attractive enough, with an annualized return rate of 9,5%, in second place after private equity investments[14]. There are arguments against it as well, such as a possible misallocation of resources, political interventionism, and agency problems and, most of all, corruption, which can arise with incentives generated on tax advantages or guarantees. Infrastructure can be an integral element of the assets portfolio of

[14] For more details of returns on different asset classes, refer to appendix O.

institutional investors but it would require high standards of governance, risk management and supervision inside pension funds management companies (Inderst, 2009).

On the international experience on infrastructure bonds, several difficulties have appeared: first, the lack of knowledge and experience from managers and advisers on the design of these instruments; second, the shortage of information and data to measure the risk profile and performance of infrastructure bonds; and finally, the lack of experience of pension funds on asset classes and private equity investments (Inderst, 2009).

The huge effort to attract institutional investment for the 4G program is conditioned by the guarantees that the government could give to pension funds. It is the FDN responsibility to give that guarantees and leverage public resources to put the infrastructure bonds on the market. As showed before, the FDN does not count with the needed resources and the government was expecting to capitalize the entity through the sale of ISAGEN, the biggest public energy company in Colombia. On may 2015, the State Council stopped the selling process, due to a demand on course that argued about the inconvenience for the public interest due to a loss of value on the long run over the assets and incomes of the State. The government has insisted on the benefits on the sale of ISAGEN, but the truth is that is a promising profitable company and the return over the 4G program counts with a complex risk profile and considerable uncertainty. With that, the FDN would not receive around 5.5 COP billion, which were supposed to leverage more than 20 COP billion in bonds.

This situation has put in evidence several difficulties and weakness of the PPP model developed for the 4G Highways Program: first, it has exposed the dependency of the PPPs on public contributions, despite the fact that PPPs are supposed to allow the government to relax the financing requirement to develop the projects. Second, it could put en evidence that the PPP model has not been chosen for being the most sustainable option but for the short-term convenience of linking the private sector. Third, it shows the political dimensions that was discusses before on this paper in which there is still a lack of institutional agreement on the projects. Finally, it can highlight the possible oversizing on the 4G program. To this point, seems that the government has limited options, but this could be a call to redefine incentives and put higher responsibility on the private sector, financial institutions and institutional investors to get involved on the projects and exercise the control and inspection needed.

CHAPTER 5: CONCLUSIONS

The analysis of the Colombian case has pointed out critical points on the design and preparation of PPPs for the development of massive infrastructure projects. It highlighted the importance of the political discussion and the need of reaching sufficient politician and social will for implementation and implications' acceptance by different stakeholders. Besides, it exposed the fragility and dependency of financing sources over public contributions and guarantees, when financial capacity by the private sector is insufficient and financial sector is not willing to assume considerable risk. Overall, it highlighted the importance of considering several alternatives for infrastructure development, as ANIF well suggested, and bet to PPPs for being a feasible solution and not based on reasons such as fiscal budgetary constrains or to justify decisions already taken. In addition, the Colombian case bring into the discussion the importance of developing the institutional readiness and expertise to monitor private partner behavior and manage the risk that were assigned to both parties. Moreover, the current difficulties experienced by the Colombian government with the prohibition to sale ISAGEN, highlight how the participants of the PPP can affect risk perception, as well as the degree of independent and financial condition of the government structure.

In term of risks management, the 4G program exposes the complexity of risk assessment and allocation, which increase when specific geographical, environmental, network and land risks are taken into account. Specially, referring to demand risk, it discloses the dependence of the project sustainability on demand forecast. The LPVR is a promising alternative to ensure the alignment between both parties' incentives since the private partner is obtaining the promised retribution and the impact of the projects over the public budget can be damped.

In relation to financing sources, several problems are identified: the lack of capacity of the selected companies, the lack of founding by government agencies and the dependency carried for investment guarantees, the poorness of banks involvement and the possible over dimension of the program. As the Colombian highways projects promise an attractive return rate, better job can be done in terms of risk allocation, putting higher responsibility on private parties and financial sector to finance the roads. Giving a higher weight to the revenues from user-fees or reducing the fiscal restriction for additional public debt are alternatives too, considering always that the risk associated to the different future obligations will be attached to the availability and cost of funding, and the capacity of the project to generate future cash-flows.

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APPENDIXES

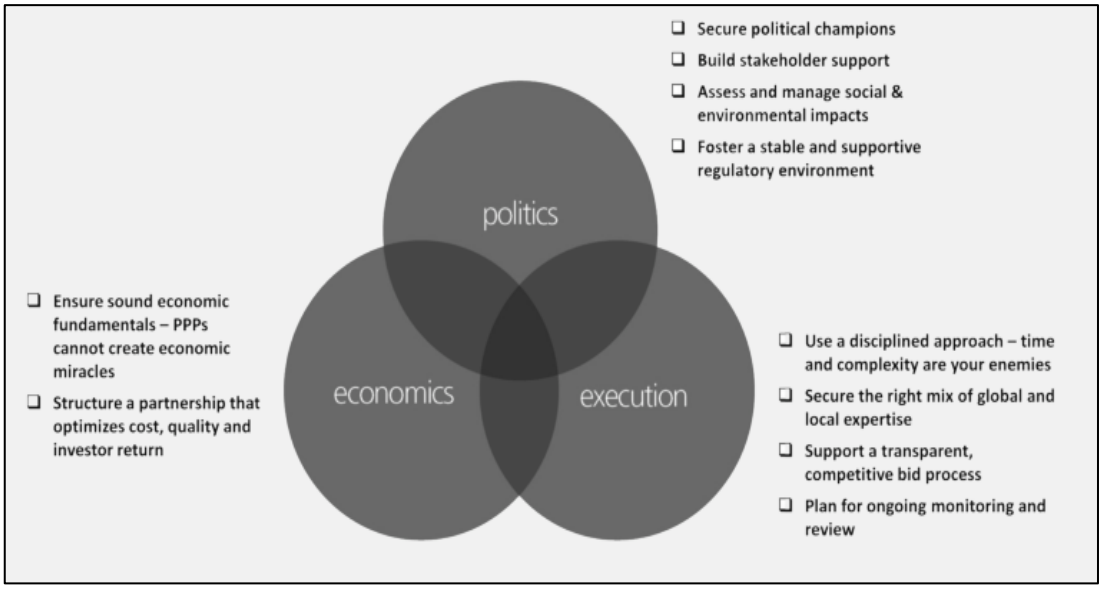
Appendix A. Attractiveness of PPPs

Attractiveness of PPPs (Akintoye, 2005; Hinojosa, 2010)

Expected positive effects	Possible negative effects
Risk transfer to the private sector	Lack of experience and knowledge of the private sector to manage public projects
Maximum price for service costs	Excess on restrictions and conditions
Reduction of operation costs for the public sector	Increases on user fees
Reduction of financial costs for capital investments	Excessive risk transfer to the private sector
Overcoming of public budgetary constrain	Lack of fulfillment of the government objectives
Reduction of total cost of the project	Possible increase on the total cost of the project
Acceleration on the project timeline	Delays on the project timeline due to political situations
Improvements on the construction process	Extensive and costly negotiations
Improvements on the quality of work	Reduction on the accountability of the project
Incentives for innovation	

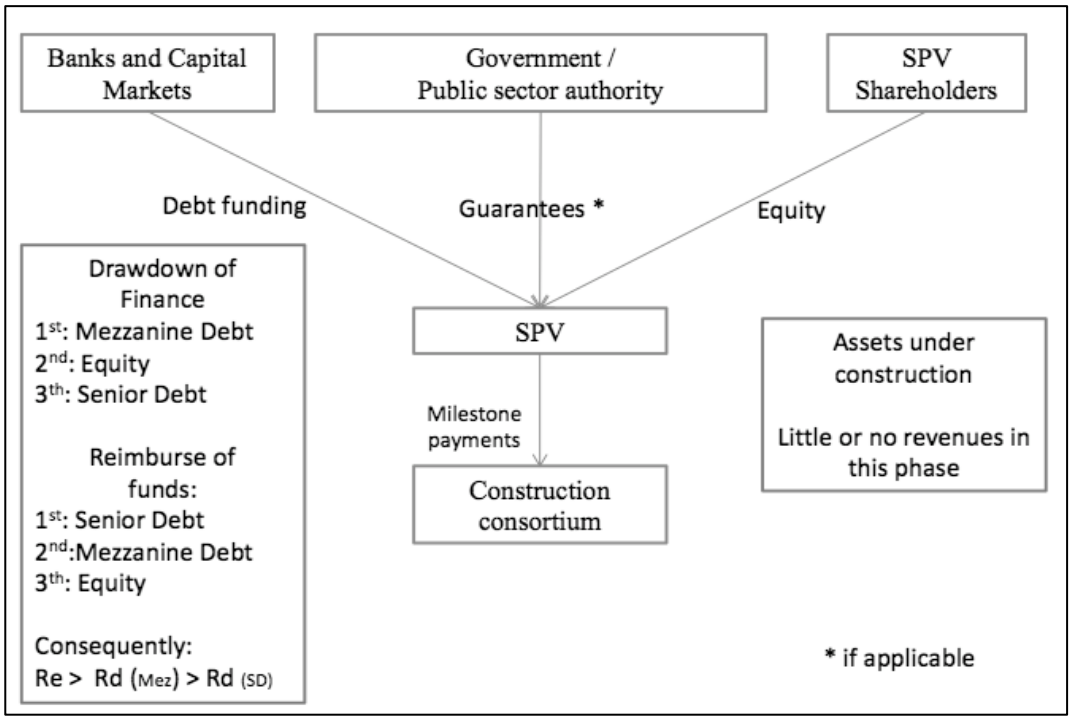
Appendix B. Framework for building successful PPPs

Framework for building successful PPPs (Florizone & Carter, 2013).

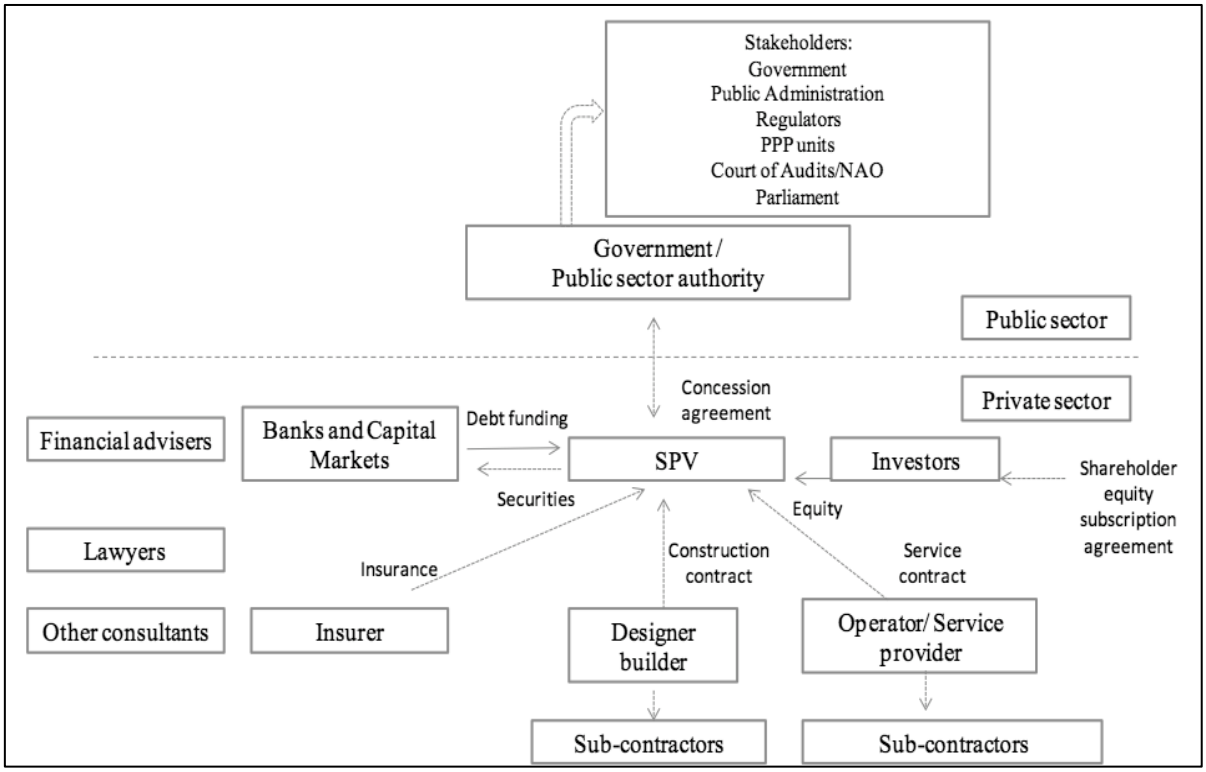


Appendix C. PPP financing and structure

PPP finance during the construction stage. (Sarmento & Renneboog, 2014)



A typical PPP structure (Sarmento & Renneboog, 2014)



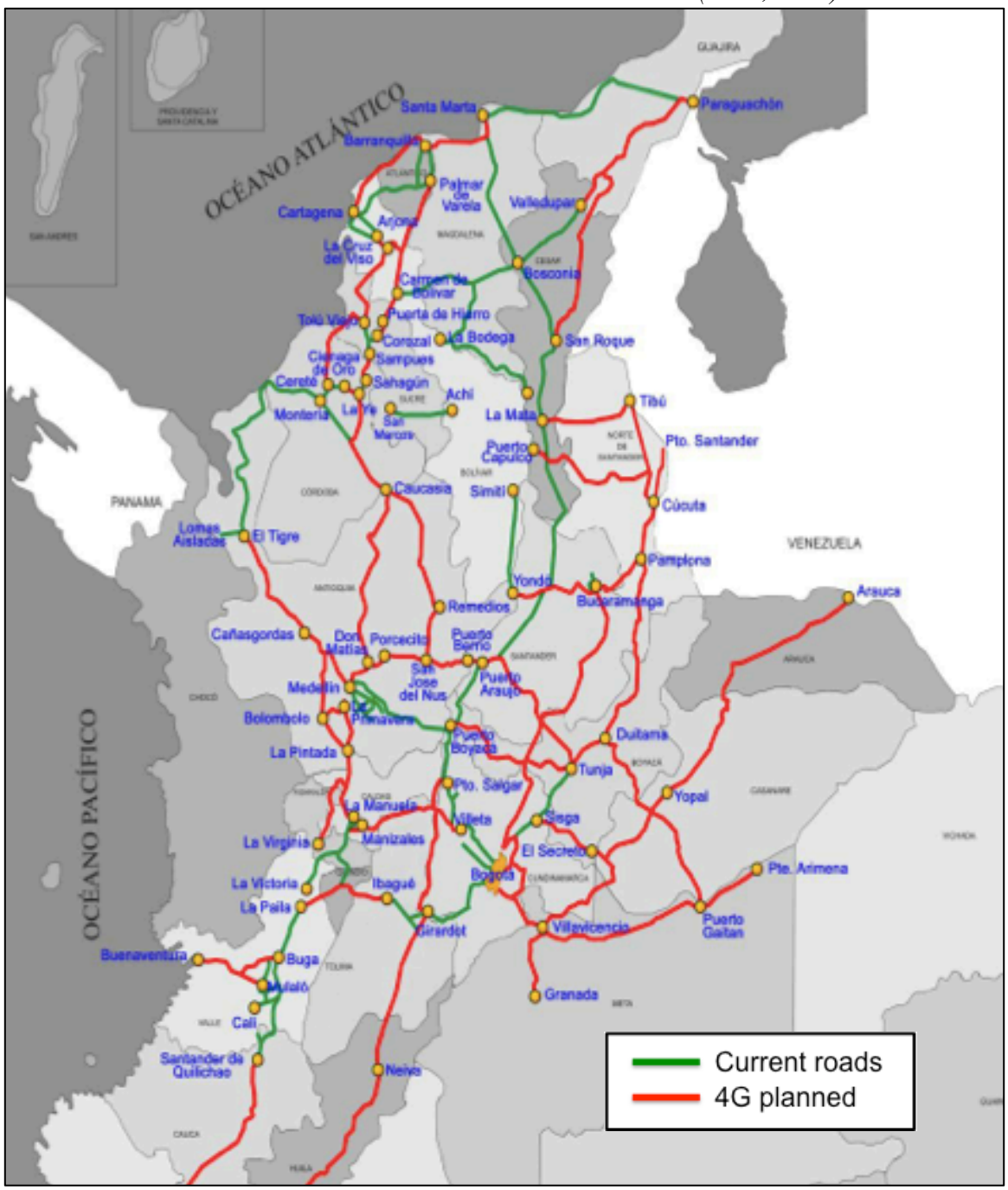
Appendix D. Financial instruments used in PPP road projects

Financial instruments used in PPP road projects (World Bank, 1999)

Financing Means			Private Funding	Public Funding
General funding			None	Common tax
Specific funding			None	Earmarked tax
Equity			Common stock	
Mezzanine finance	**Equity type**		Preferred stock, stock with selling option, etc.	
	Debt type		Subordinated loan, subordinated bonds, convertible bonds	
Debt	**Loans**		Commercial loans (syndicated loans)	Loans from government or international financing agencies, regional development banks
	Bonds	**Private placement**	Project Bonds	Government guaranteed bonds, municipal bonds, public corporation bonds, bonds guaranteed by international financing agencies
		Public Offering		
Guarantees			Guarantee by commercial bank, credit line, standby facility, monocline insurance	Guarantee by government, govt. financing agencies, international agencies, regional agencies
Project Income			Toll revenue, income from supplemental projects	
Retained earnings			Retained surplus, retention fund	
Asset securitization			Bond	None
Stock increase of capital			Stock market flotation	None
Value Capture; partial use of profit from development due to the project			None	Increased tax on real estate, benefit assessment, special impact fee, dedication, assessment district, space lease, tax increment financing

Appendix E. Colombian National Roads Network

Colombian National Roads Network – Planned (DNP, 2013)



Appendix F. Financial details of the projects

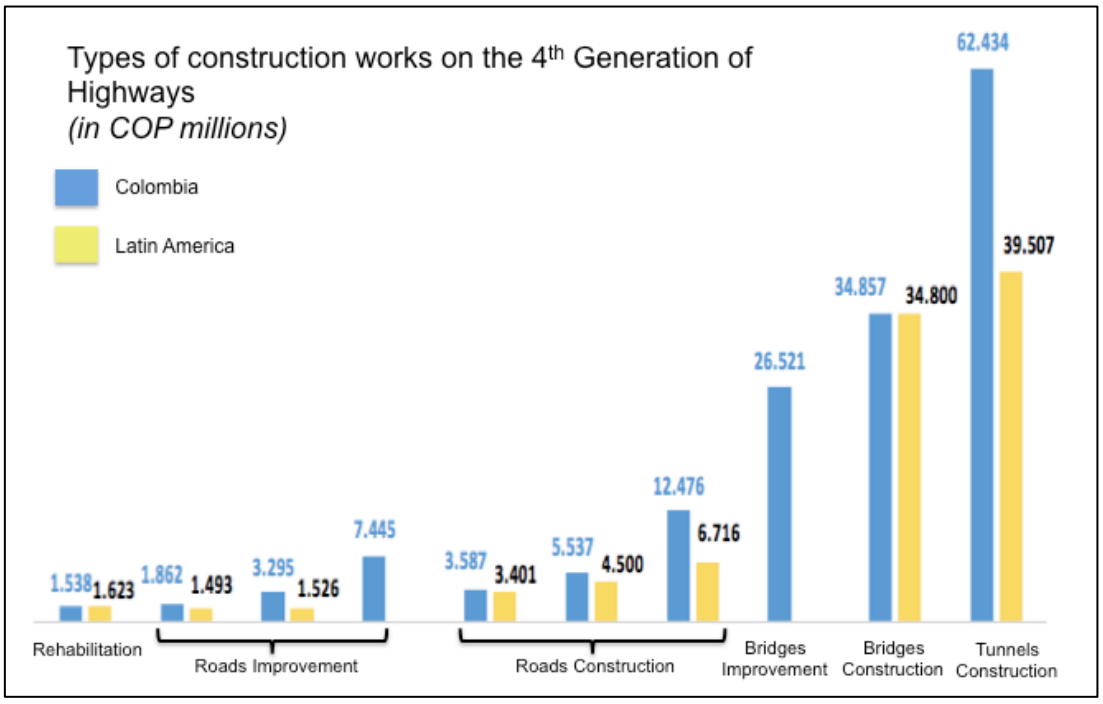
Values for approved projects by April 2015 (4th Generation of Highways, Colombia)

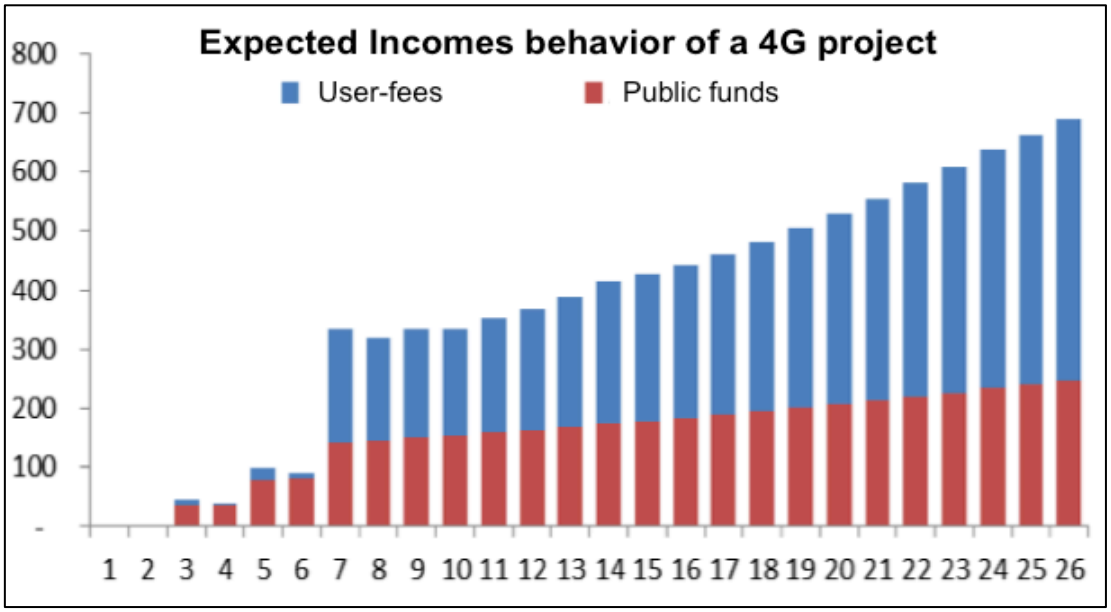
Project	Length (Kms)	# of functional units	PPP term	CAPEX*	OPEX*	Total Investment*
First Wave	**1.103**	**NA**	**NA**	**$ 10.394.803**	**$ 6.332.287**	**$ 16.727.090**
Girardot-Puerto Salgar	190	6	25	$ 854.333	$ 910.016	$ 1.764.349
Perimetral de oriente	153	5	25	$ 1.076.264	$ 578.744	$ 1.655.008
Cartagena - Barranquilla	146	6	25	$ 959.321	$ 750.044	$ 1.709.365
Corredor Pacífico 1	49	4	25	$ 1.788.117	$ 675.540	$ 2.463.657
Corredor Pacífico 2	98	5	25	$ 912.640	$ 603.600	$ 1.516.240
Corredor Pacífico 3	146	9	25	$ 1.257.507	$ 826.916	$ 2.084.423
Conexión Norte	145	3	25	$ 982.640	$ 864.262	$ 1.846.902
Corredor Magdalena 2	144	4	25	$ 1.368.170	$ 612.856	$ 1.981.026
Mulalo - Loboguerrero	32	5	25	$ 1.195.811	$ 510.309	$ 1.706.120
Second Wave	**1.969**	**NA**	**NA**	**$ 13.265.200**	**$ 8.639.483**	**$ 21.904.683**
Neiva-Girardot	194	4	25	$ 1.347.452	$ 1.063.960	$ 2.411.412
Santana - Neiva	444	9	25	$ 1.502.868	$ 1.466.713	$ 2.969.581
Rumichaca - Pasto	84	3	25	$ 1.633.017	$ 683.110	$ 2.316.127
Popayan - Santander de Quilichao	76	3	25	$ 1.190.892	$ 511.895	$ 1.702.787
Transversal de Sisga	137	4	25	$ 491.611	$ 437.838	$ 929.449
Villavicencio - Yopal	261	6	25	$ 1.884.729	$ 1.054.592	$ 2.939.321
Puerta de Hierro - Palmar	204	5	25	$ 448.834	$ 791.994	$ 1.240.828
Bucaramanga - Yondó	154	5	25	$ 1.774.099	$ 1.032.039	$ 2.806.138
Corredor del mar 1	176	4	25	$ 1.456.824	$ 959.693	$ 2.416.517
Corredor del mar 2	239	5	16	$ 1.534.874	$ 637.649	$ 2.172.523
TOTAL	**3.072**	**NA**	**NA**	**$ 23.660.003**	**$ 14.971.770**	**$ 38.631.773**

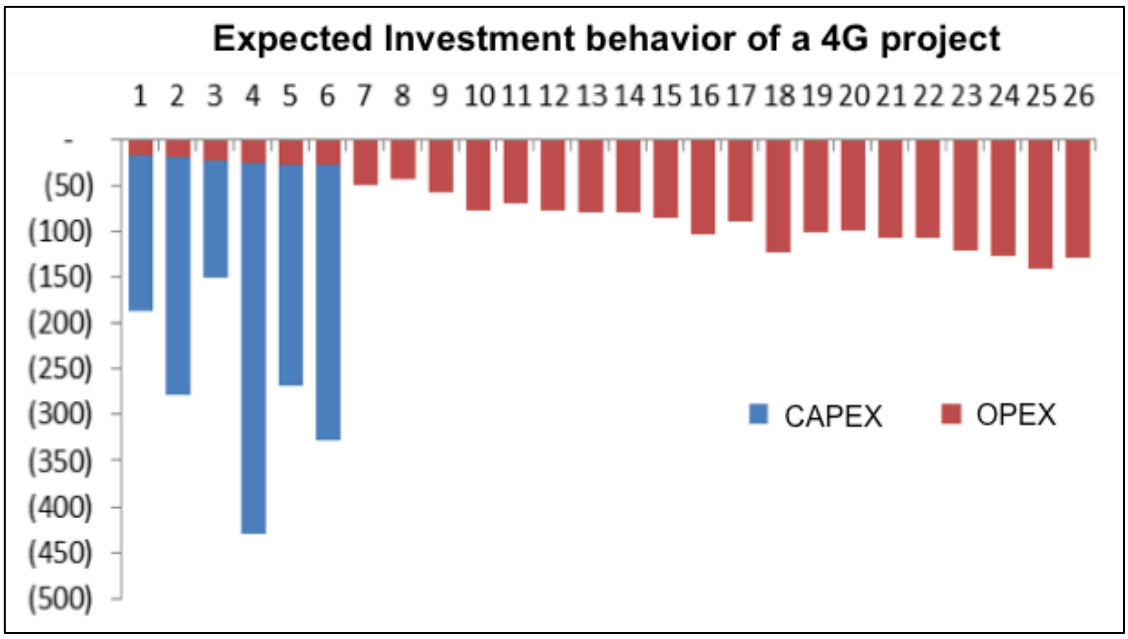
**Values are in COP millions.*

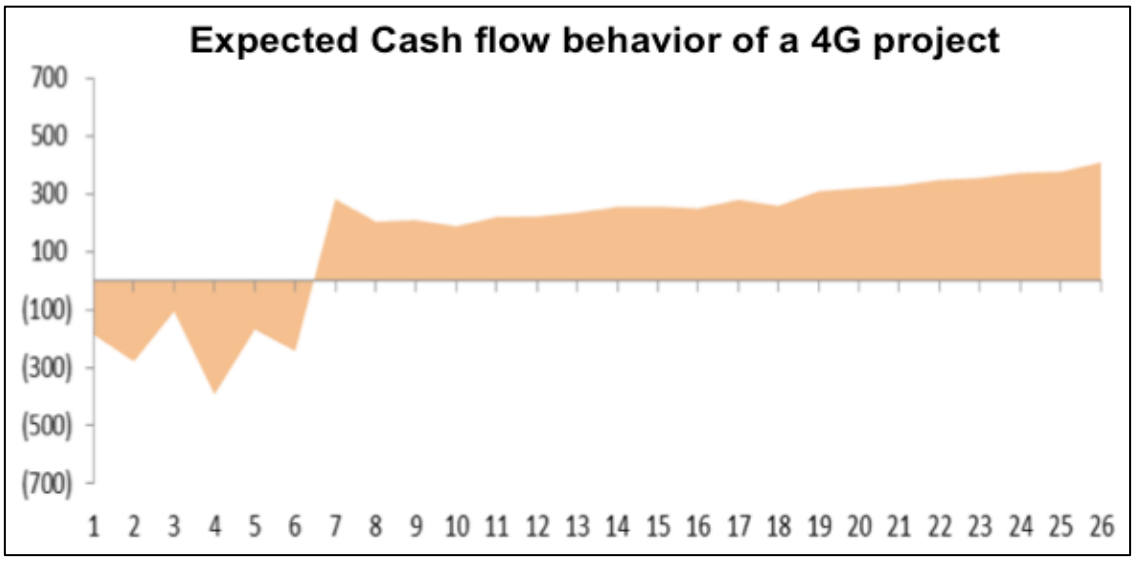
Sources: DNP, 2013; ANI, 2013; DNP, 2014; ANI, 2014.

Appendix G. Financial details of the projects



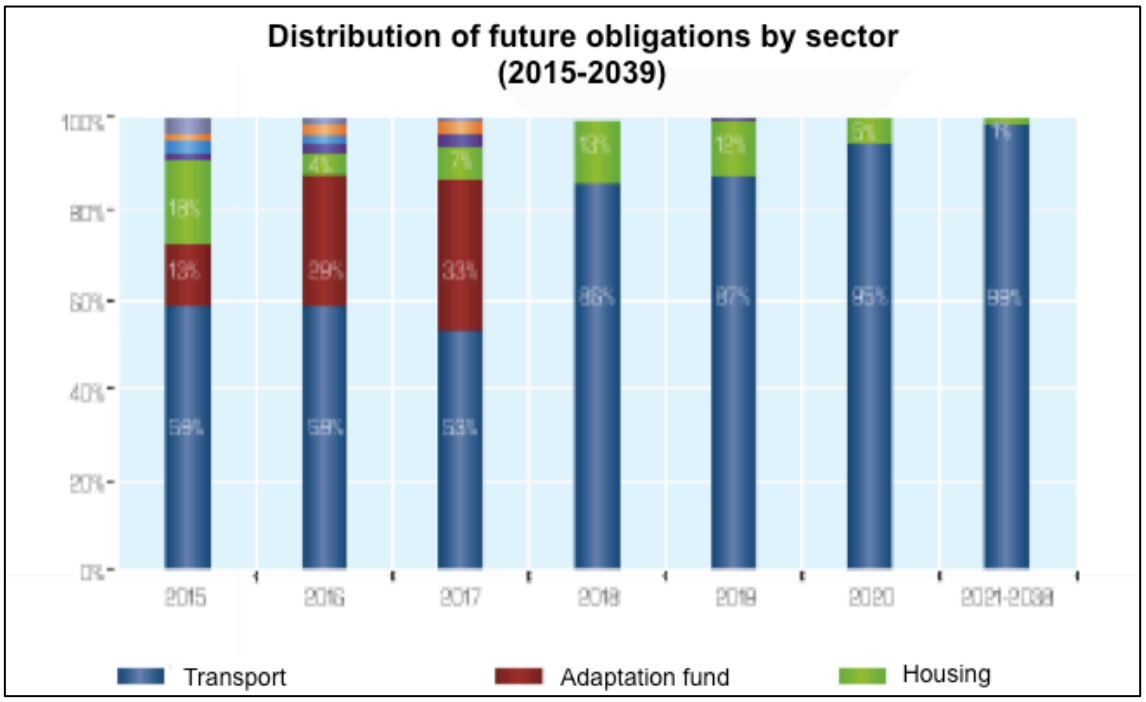






Source: ANI, 2014.

Appendix H. Future Obligations of the Central Government, Colombia.



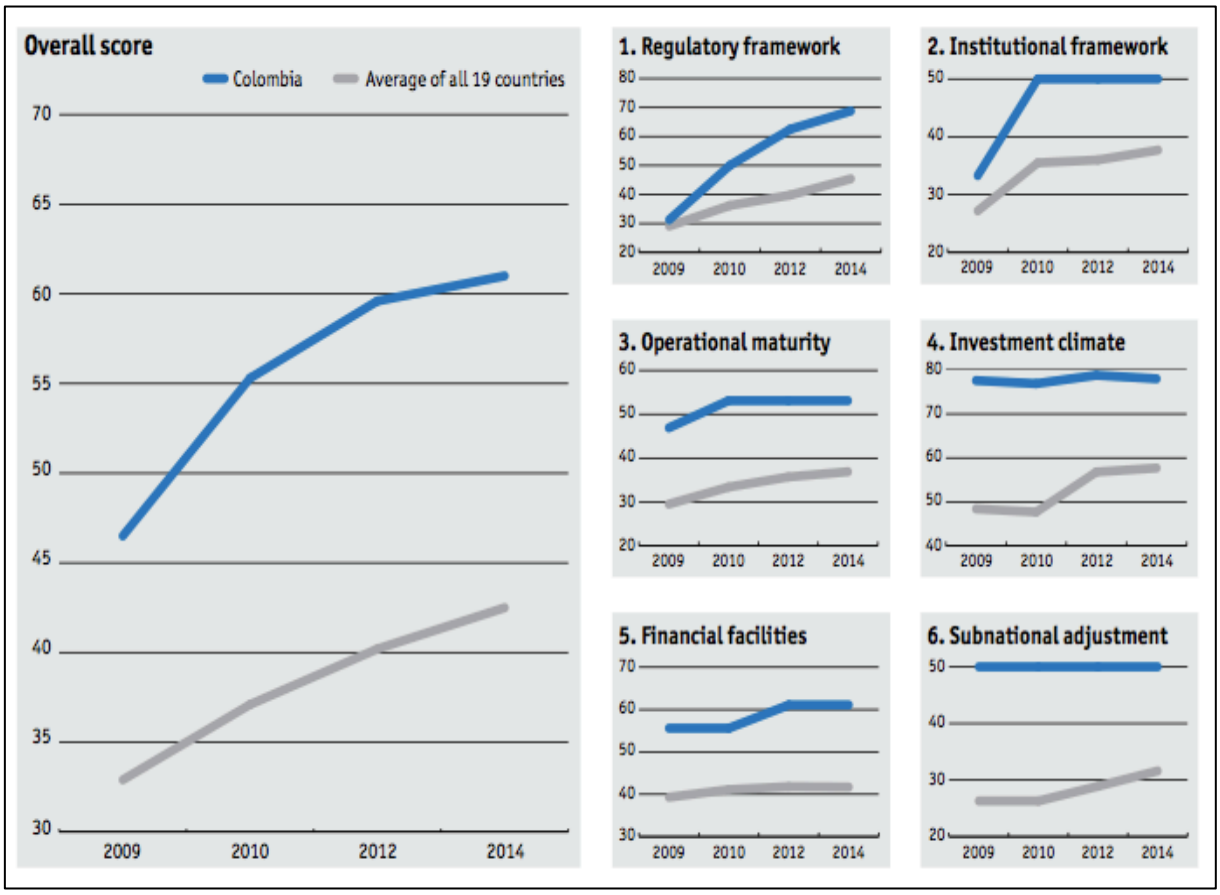
Source: CCI, 2013.

Appendix I. Infrastructure Index

Variable	Source of judgement	Weight (%)
Current traffic	INVIAS	15,0
Potential traffic	INVIAS, ANIF	20,0
Construction risk	CCI	30,0
Investment amount	ANI	12,5
Relevance	ANIF	20,0
% of New assets	ANIF	12,5

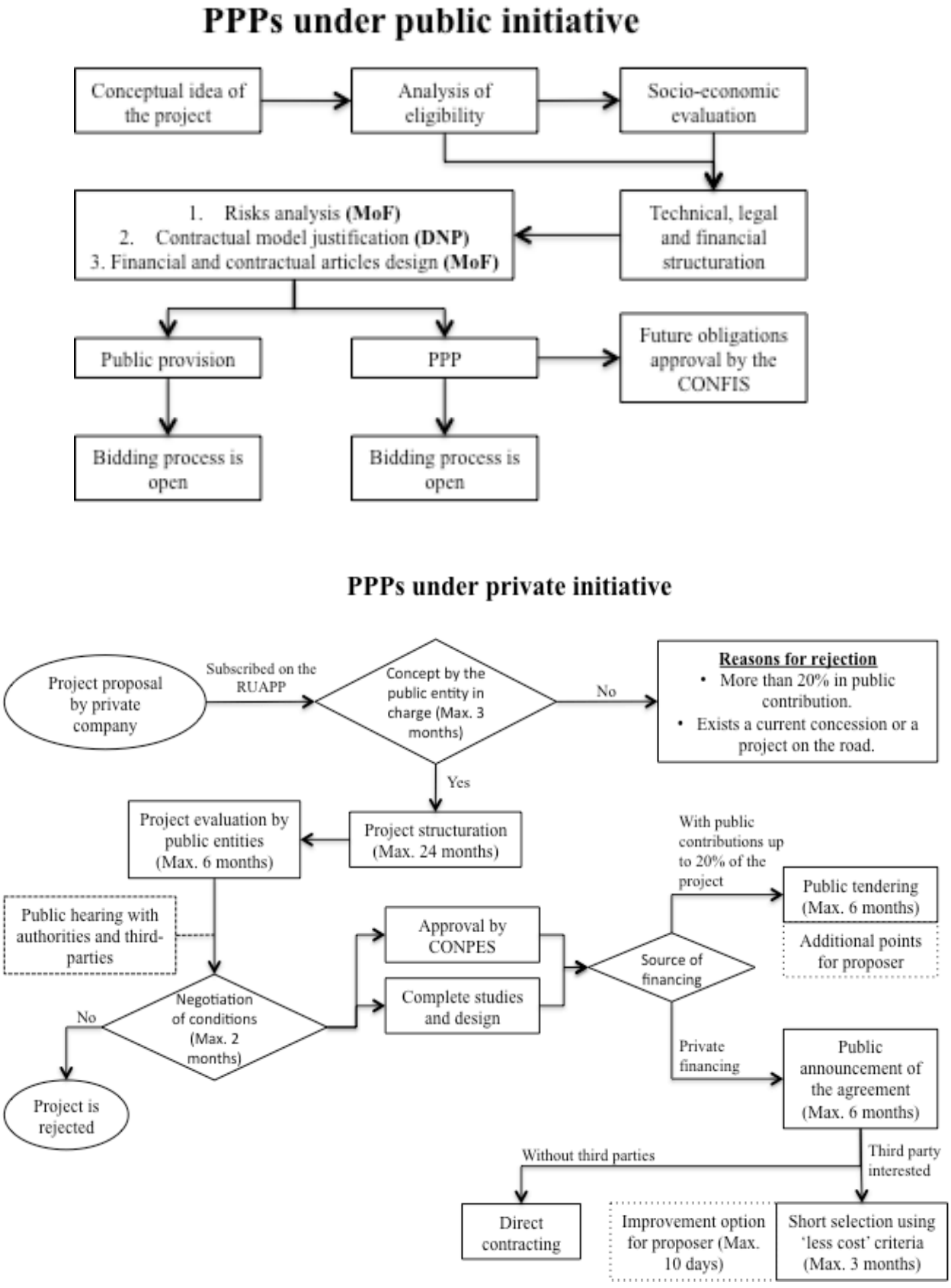
Source: ANIF, 2014.

Appendix J. Evolution of the Infrascope Index



Source: EIU, 2015.

Appendix K. Public and private initiatives under the PPP law



Source: DNP, 2014.

Appendix L. Problems and solutions on the Colombian PPPs in the past

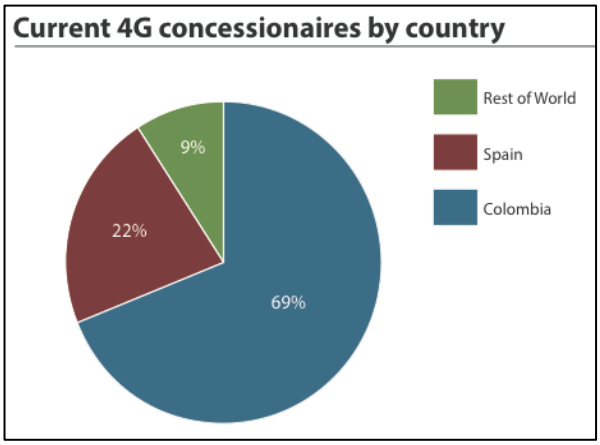
Problem and solutions on Colombian PPPs in the past. (Fedesarrollo, 2012)

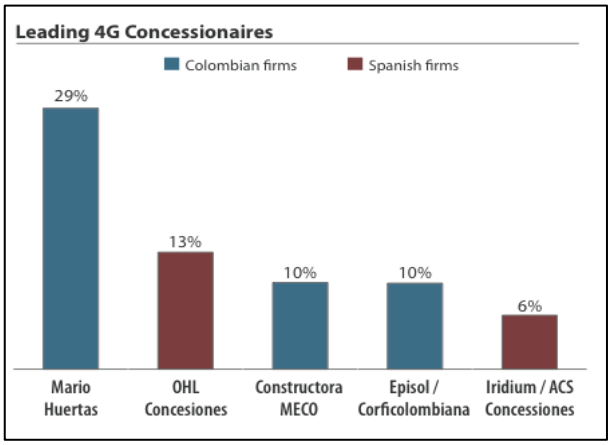
Problems in Past Experiences	Implemented Solutions
• Uncertainty • Wrong estimations • Improper risk allocation • Cost increases and renegotiations	Technical studies and design should be in an advanced stage of development before signing the contract, eliminating the possibility of substantially modifying the design.
• Lack of a proper due diligence on the projects. • Insurances and guarantees that are difficult to collect by the beneficiary. • Insufficient guarantees.	Insurances and guarantees can only be emitted by renowned insurance companies with high ratios of capital and coverage.
• Non-completion of the projects. • Delays on construction. • Embezzlement of public resources.	Implementation of payments for availability and quality of the infrastructure.
• Insufficient funding. • Embezzlement of public resources.	The SPV is obligated to manage resources using an independent trust fund.
• Insufficient time to structure the proposals.	Establishment of a time period that is technically defined as the time needed by the proposers to develop all the activities that the development of the proposal requires.
• Good proposals are eliminated because they do not fulfill some minor required formalities.	Establishment of a difference between fulfillment of criteria and accreditation with the latter not being a reason to eliminate a proposal, giving to the proposers the possibility of getting all the required accreditations if the proposal is to be considered.

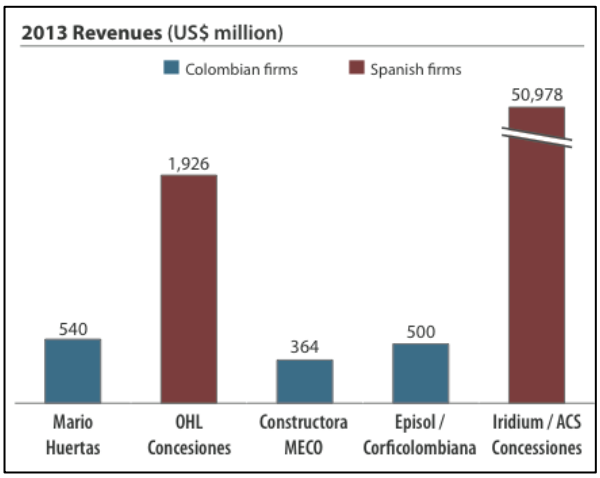
Problems not solved and difficulties on Colombian PPPs in the past (Fedesarrollo, 2012)

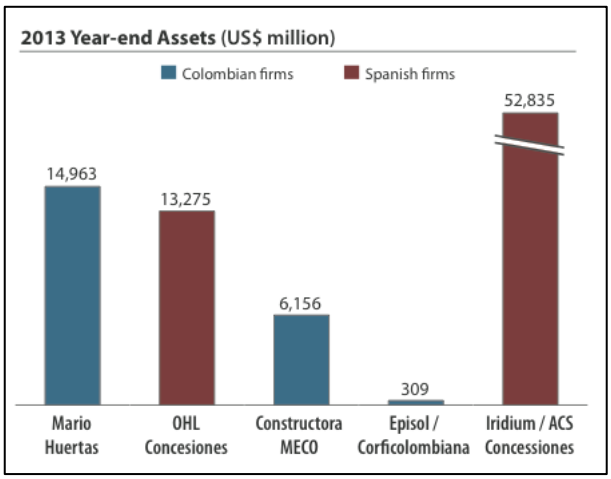
Problems in Past Experiences	Possible Solution	Difficulties
On construction • Non completion • Insufficient financing	Additional guarantees by the SPV to investors in case of failing in doing the private contributions to the project on the amount and the moment that was promised. The private partner should contribute around 30% of the investment needed.	Private partners lack resources from the beginning, so there is no guarantee that can protect investors in that case. Multiple construction companies are doing partnerships to apply for the projects and demonstrate enough financial capacity, but they cannot even get to 25% of the investment amount needed.
On selection process • Collusion • Moral hazard problems	Adjudge the project to the proponent that ensures the less economic value: who pays more to the government or requires fewer resources.	A selection based on the less economic value gives incentives to manipulate proposals for the best offer. There are other criteria that are important to ensure that the project is delivering the best socio-economic value.

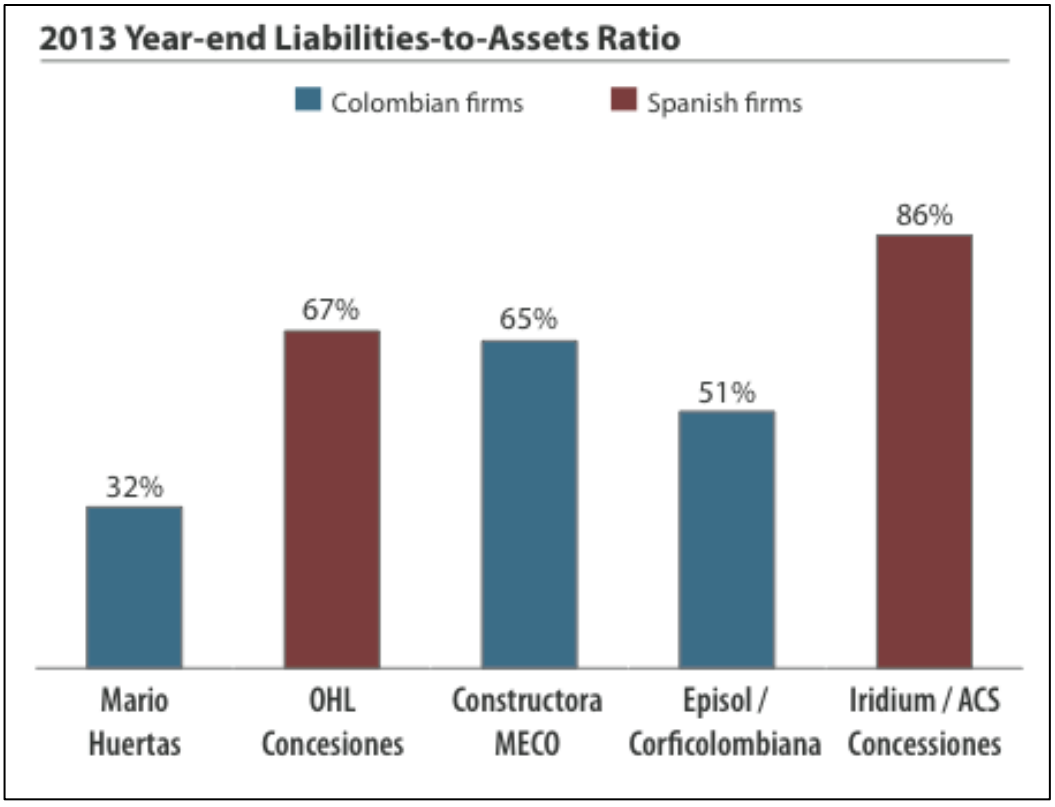
Appendix M. Financial ratios of different applicant companies for 4G projects.











Appendix N. Costs and retribution for the 4G program.

Project	CAPEX*	OPEX*	Total Investment*	Future Obligations	User-fees	Total Retributions	Return Rate
First Wave	**$ 10.394.803**	**$ 6.332.287**	**$ 16.727.090**	**$ 23.572.149**	**$ 19.220.000**	**$ 42.792.149**	**156%**
Girardot-Puerto Salgar	$ 854.333	$ 910.016	$ 1.764.349	$ 1.462.000	$ 1.850.000	$ 3.312.000	88%
Perimetral de oriente	$ 1.076.264	$ 578.744	$ 1.655.008	$ 2.514.000	$ 1.640.000	$ 4.154.000	151%
Cartagena - Barranquilla	$ 959.321	$ 750.044	$ 1.709.365	$ 2.251.448	$ 1.860.000	$ 4.111.448	141%
Corredor Pacífico 1	$ 1.788.117	$ 675.540	$ 2.463.657	$ 3.410.000	$ 3.390.000	$ 6.800.000	176%
Corredor Pacífico 2	$ 912.640	$ 603.600	$ 1.516.240	$ 2.252.000	$ 2.500.000	$ 4.752.000	213%
Corredor Pacífico 3	$ 1.257.507	$ 826.916	$ 2.084.423	$ 3.170.000	$ 3.180.000	$ 6.350.000	205%
Conexión Norte	$ 982.640	$ 864.262	$ 1.846.902	$ 2.316.449	$ 1.540.000	$ 3.856.449	109%
Corredor Magdalena 2	$ 1.368.170	$ 612.856	$ 1.981.026	$ 2.849.765	$ 1.950.000	$ 4.799.765	142%
Mulalo - Loboguerrero	$ 1.195.811	$ 510.309	$ 1.706.120	$ 3.346.487	$ 1.310.000	$ 4.656.487	173%
Second Wave	**$ 10.273.502**	**$ 7.042.141**	**$ 17.315.643**	**$ 21.663.227**	**$ 25.103.209**	**$ 46.766.436**	**170%**
Neiva-Girardot	$ 1.347.452	$ 1.063.960	$ 2.411.412	$ 3.129.382	$ 2.250.574	$ 5.379.956	123%
Santana - Neiva	$ 1.502.868	$ 1.466.713	$ 2.969.581	$ 2.576.971	$ 3.654.479	$ 6.231.450	110%
Rumichaca - Pasto	$ 1.633.017	$ 683.110	$ 2.316.127	$ 4.178.705	$ 3.558.331	$ 7.737.036	234%
Popayan - Std de Quilichao	$ 1.190.892	$ 511.895	$ 1.702.787	$ 2.960.718	$ 2.655.685	$ 5.616.403	230%
Transversal de Sisga	$ 491.611	$ 437.838	$ 929.449	$ 1.432.734	$ 1.354.177	$ 2.786.911	200%
Villavicencio - Yopal	$ 1.884.729	$ 1.054.592	$ 2.939.321	$ 3.476.879	$ 5.712.668	$ 9.189.547	213%
Puerta de Hierro - Palmar	$ 448.834	$ 791.994	$ 1.240.828	$ 933.922	$ 1.178.472	$ 2.112.394	70%
Bucaramanga - Yondó	$ 1.774.099	$ 1.032.039	$ 2.806.138	$ 2.973.916	$ 4.738.823	$ 7.712.739	175%
TOTAL	**$ 20.668.305**	**$ 13.374.428**	**$ 34.042.733**	**$ 45.235.376**	**$ 44.323.209**	**$ 89.558.585**	**163%**

**Values are in COP millions.*

Sources: DNP 2013; DNP 2014; CNPSE 2013; CNPSE 2014; ANIF, 2015.

Appendix O. Return over infrastructure investment

Infrastructure Risk-adjusted Performance Analysis 1995-2006 (Peng/Newell, 2007)

Asset class	Average Annual Return	Annual Volatility[a, b]	Sharpe Index	Performance Rank[c]
Composite Infrastructure	22.38%	16.03%	1.05	3
Infrastructure	24.89%	23.42%	0.83	6
Toll Roads	25.65%	24.39%	0.82	7
Airports	8.05%	30.67%	0.08	10
Utilities	21.93%	15.65%	1.05	4
Unlisted Infrastructure	14.11%	5.83%	1.47	2
Direct Property	10.90%	1.46%	3.67	1
LPTs	13.75%	7.92%	1.04	5
Stocks	12.91%	10.97%	0.67	8
Bonds	7.20%	4.28%	0.39	9

Source: Authors' calculations from UBS (2006), PCA/IPD (2006)
Note:
a Annual volatility is the annualised standard deviation of the respective quarterly returns
b Property volatility has not be adjusted for valuation-smoothing
c Performance rank is based on the Sharpe index

Expected Returns and Correlation of different asset investments (Morgan Stanley, 2007)

ASSET RETURNS	EXPECTED RETURN[3]	ANNUALIZED VOLATILITY[4]	WORST 5% RETURNS[5]		
Bonds (5-year duration)	5.2%	4.4%	3.1%		
Equities	8.1%	18.2%	1.1%		
Real estate	7.0%	9.5%	(1.3)%		
Infrastructure	9.3%	7.9%	(1.5)%		
Private equity	10.0%	30.2%	(7.3)%		
CORRELATIONS[6]	**BONDS**	**EQUITIES**	**REAL ESTATE**	**INFRASTRUCTURE**	**PRIVATE EQUITY**
Bonds	100%	11%	40%	20%	6%
Equities		100%	8%	15%	34%
Real estate			100%	21%	5%
Infrastructure				100%	12%
Private equity					100%

Source: Morgan Stanley Asset-Liability model
Data as of May 2007
There can be no assurance that estimated returns or projections can be realized or that actual returns or performance results will not be materially lower than those estimated herein. The expected returns do not reflect the performance of any Morgan Stanley Investment Management investment.