

# Fiscal Impact of PPPs in Latin America and the Caribbean

Vicepresidency for Countries

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# Discussion Paper

## PPP Americas 2021

# Fiscal Impact of PPPs in Latin America and the Caribbean

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# About the Discussion Papers

The Discussion Papers - PPP Americas 2021 are a series of documents produced in preparation for the X Edition of PPP Americas, the main forum for Public-Private Partnerships (PPP) in Latin America and the Caribbean (LAC), organized every two years by the Inter-American Development Bank (IDB).

As part of the PPP Americas 2021 edition, eight groups of experts, professionals, consultants and academics directly involved in the planning, identification, structuring and management of PPP projects in the countries of the region met. Under the coordination of IDB specialists, the groups reviewed the main topics of interest and current affairs in the field of PPPs, in order to exchange experiences, discuss success stories and lessons learned in the ongoing projects in the region.

From an open call made in March 2020, to which more than 200 specialists, professionals and academics from the region applied, around 90 people from across the region were selected to be contributors. They actively participated in discussions on the following topics: reliability of State payments, project selection criteria and drivers of value for money, best practices in contract management, diversification of the capital structure, contract termination rules and their consequences for project viability, planning and prioritization in infrastructure development, fiscal impacts of the projects and the role of control bodies.

Each topic explored in the groups led to a Discussion Document, compiling the reflections shared by the specialists in their joint discussions between June 2020 and April 2021. In addition, in January 2021, each group of specialists shared their insights with the other groups, to encourage the development of a richer and deeper conversation, and to take advantage of synergies between the different areas.

This initiative aims to help consolidate an environment for the exchange of experiences and best practices in PPPs for the region. Its main purpose is to serve as an input for the discussions that will take place at PPP Americas 2021—where solutions will be proposed in all directions.

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# Fiscal Impact of PPPs in Latin America and the Caribbean

## Key messages

PPPs can be a key mechanism for the development of infrastructure and the provision of public services; they provide governments better quality and greater efficiency and effectiveness of delivery, while also attracting private equity. This scheme has been heavily used in LAC for several decades. In the last 10 years alone, a total of 1,074 PPP projects have been reported in Latin America and the Caribbean, with an aggregate investment of US\$ 344 billion.

First of all, PPPs are public investment projects just like other traditional public delivery mechanisms and should therefore be subject to the same level of scrutiny. Secondly, and in contrast to other delivery mechanisms, PPPs entail a greater transfer of risks to the private sector over the entire performance horizon of the projects and this raises certain challenges to ensure that they are properly managed from a fiscal standpoint.

Proper fiscal impact management makes it possible to control both short/medium-term commitments (significant in traditional public investment) and medium/long-term commitments, which are significant in PPPs. Factoring in future costs and risks to be assumed over the entire horizon of PPP contracts is critical to assure fiscal sustainability.

The main fiscal costs generated by PPPs tend to be deferred (spread over a long-term horizon) or contingent (associated with risks retained by the government) and are therefore not controlled by traditional medium-term fiscal control mechanisms. With this in mind, several countries have been implementing measures that allow them to better control the risks generated and the fiscal impact of PPP projects.

One of the main measures here is the adoption of IPSAS accounting standards, under which PPP fiscal commitments are recognized on an accrual basis. Traditionally, countries have applied commitment recording on a cash-flow basis, which results in medium- or long-term commitments not being recognized in the fiscal accounts. Brazil, Chile, Colombia, Costa Rica and Peru are now migrating towards the use of IPSAS accounting. In Brazil, moreover, the fiscal regulatory framework establishes that federal subsidized PPP payments be treated as debt.

Colombia and Peru use long-term commitment quantification measures to plan PPP project implementation. Colombia quantifies the net present value of total firm and contingent fiscal commitments under PPP projects over 30 years as part of a long-term budget planning mechanism, while Peru quantifies the present value for the entire life horizon of projects and includes it in the national budget framework.



Within the region, Chile, Colombia and Peru are notable for applying stochastic estimation methodologies for the estimation of contingent commitments. In all three countries, both methodologies and estimates are published for all national PPP projects. Uruguay's regulatory framework also provides for the use of stochastic estimation methodologies for contingent PPP commitments.

To control unforeseen costs arising in PPP projects, Colombia uses a contingency fund to mitigate the impact of contingent commitments. More recently, a liquidity fund was set up in Paraguay whereby provisions must be posted to cover the total amount of firm commitments and 10% of contingent commitments. Eight countries within the region apply fiscal limits for their PPP projects. Furthermore, Brazil and Panama set limits on the current revenues of central or state governments. In Colombia, Panama, Paraguay and Peru, limits are applied to the aggregate of firm and contingent commitments as a percentage of GDP. Mexico applies limits on the percentage of expenses.

Proper management and estimation of PPP commitments is needed to ensure the effectiveness of bidding processes, and good decision-making on how to deliver investment projects.

## Contents

1. Introduction .....	10
2. Fiscal Risks .....	13
3. Fiscal commitments .....	18
4. Budgeting .....	25
5. Fiscal affordability .....	28
6. Reporting and Accounting.....	34
7. Conclusions .....	40
Bibliography .....	42
ANNEX A .....	45
ANNEX B .....	47



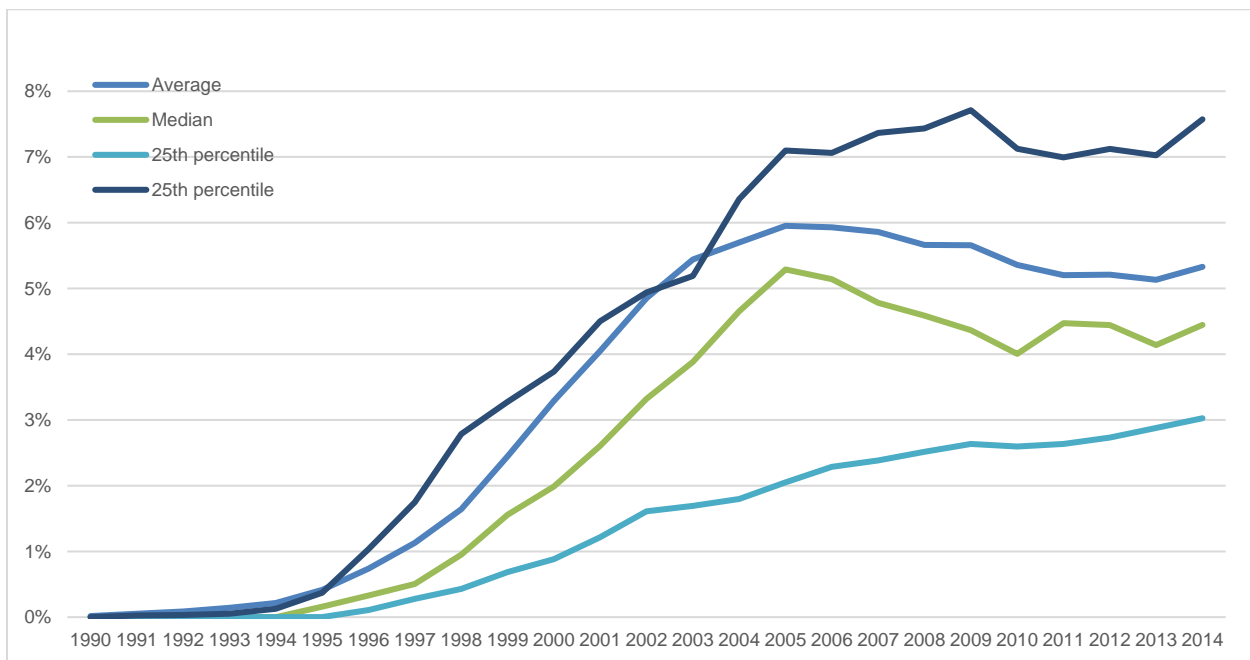
## Acronyms and abbreviations

ANI	National Infrastructure Agency of Colombia
DGC	General Concessions Directorate of Chile
DIPRES	Budgets Department of the Ministry of Finance of Chile
IDB	Inter-American Development Bank
LAC	Latin America and the Caribbean
MEF Peru	Ministry of the Economy and Finance of Peru
MEF Uruguay	Ministry of the Economy and Finance of Uruguay
MFMD	Medium-Term Fiscal Framework of the Ministry of Finance and Public Credit of Colombia
MGMP	Medium-Term Expenditure Framework of the Ministry of Finance and Public Credit of Colombia
MH	Ministry of Finance of Chile
MHCP	Ministry of Finance and Public Credit of Colombia
MMM	Multiannual Macroeconomic Framework of Peru
MOP	Ministry of Public Works of Chile
PROINVERSION	Agency for the Promotion of Private Investment in Peru

# 1. Introduction

Governments rely on the PPP mechanism to bring in private sector expertise in project management and development in a bid to make the development of infrastructure and the provision of services more efficient. According to the World Bank (PPI database), LAC is the region with the highest number of PPP transactions in the world. Between 1995 and 2019, a total of 2,031 PPP projects were registered in LAC for a global investment of US\$ 600 billion. In the last 10 years alone, 1,074 projects were registered with an aggregate investment of US\$ 344 billion — 50% relating to the energy sector and 41% to the transport sector. The following diagram shows the growing use of PPPs in the region since the 1990s, according to IMF data on PPP capital stock.

- **Diagram 1: PPP capital stock in Latin America and the Caribbean (% GDP)**



Authors' own contribution. Source: IMF, Investment and Capital Stock Database 2017. Includes 21 LAC countries.

### Box 1: PPP success stories

#### Colombia

In Cartagena, Colombia, a PPP between the municipal public works department and a private Spanish operator succeeded in increasing coverage of drinking water connections to 99 percent of households in 2005 from 70 percent in 1995, and sewerage connections to 75 percent in 2005 from 55 percent in 1995. In tandem, the new administration sought to reduce fiscal pressure on the city's authorities by improving productivity and raising utility rates though with a cross-subsidy to support low-income segments. Incentives were also set up to link the revenues of the operating partners to the company's financial performance. In addition, the project involved extensive consultation and dialog with local stakeholders and therefore enjoys significant community support, according to the United Nations Development Programme. Meanwhile, in Guatemala, an electrification initiative arranged with a Spanish investor group succeeded in reaching the baseline electrification targets set out in the contract two years ahead of schedule and significantly expanded rural access to electricity.

#### Brazil

The IDB conducted a stakeholder survey on the performance of Brazil's PPP program, revealing several positive outcomes. The two projects most highly rated by public and private agents alike were the Hospital do Suburbio, in Salvador de Bahia, and Line 4 of the São Paulo Subway. The survey identified the main success factors for PPPs cited in the survey, which included good preparation, management and monitoring; government assurance; adequate risk sharing between the public and private sectors; and skilled staff, including the PPP units involved and government commitment. Respondents also cited strong demand and adequate returns for the private sector.

Source: Taken from Reyes-Tagle (2018a)

IMF (2016) notes that while PPPs are a potential source of increased efficiency in infrastructure provision, they can also be a source of fiscal risk. The author notes that these partnerships create debt-like obligations through the commitments assumed to pay for the services provided, as well as contingent commitments. Reyes-Tagle *et al* (2018a) estimate the impacts of PPP projects in certain LAC economies. As can be seen, the impact as a percentage of GDP in 2022 ranges from 3%-4% for Mexico to 8%-11% in the case of Honduras.

**Table 1: Estimated value of the fiscal impact of PPP portfolio projects (% of GDP)**

	2017		2022	
	Min	Max	Min	Max
Brazil	13%	18%	7%	9%
Colombia	9%	12%	5%	7%
Honduras	13%	17%	8%	11%
Mexico	3%	6%	3%	4%
Peru	11%	15%	7%	9%

Source: Reyes-Tagle *et al* (2018a). The author takes the investment values of PPP projects from 1990-2016 and estimates the payoffs of these investments over the life of the projects. Maximum exposure means increased costs.



Failure to accurately estimate fiscal commitments affects the optimal selection of projects and gives rise to projects that are unsustainable both in operational and fiscal terms. According to the IMF (2016), most countries deviate significantly from best practices in terms of accountability and transparency as well as in measuring and controlling the fiscal implications of PPP projects.

This report seeks to provide further insight into the fiscal implications of PPPs in Latin America, as well as to disseminate some of the policies that can help improve the way they are managed, including a description of the practices followed in certain countries. In the following sections we explain the fiscal commitments and risks associated with PPP projects. We then analyze the following aspects to ensure adequate management of the fiscal impact of PPPs: (1) clear fiscal affordability rules; (2) methodologies for identifying and quantifying fiscal costs and risks; and (3) budgetary frameworks and accounting rules that adequately incorporate the fiscal impact of PPP projects.

## 2. Fiscal Risks

A PPP is “a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance”<sup>1</sup> (World Bank, 2014). Like other public investment or service delivery mechanisms, PPP contracts have financial impacts and generate risks for governments that must be managed effectively.

The IMF (2016) defines fiscal risks as factors that may cause fiscal outcomes (meaning costs or revenues) to deviate from expectations or forecasts. Fiscal risks arise from the materialization of contingent commitments triggered by an uncertain event, or by changes in macroeconomic or other unpredictable variables.

In the context of PPPs, the risks identified and set out in the PPP contract provide the basis for identifying fiscal risks. Project structuring is used to assign responsibilities, rights, and risks to the public and private parties to the contract. For PPPs to perform effectively, risks must be allocated efficiently to ensure the right incentives to the parties and reduce overall project costs (IMF, 2015).

• **Table 2: Effect of different support mechanisms**

		Effect on feasibility for the investor	Effect on feasibility for the lender
Support upon signing	During construction	<ul style="list-style-type: none"> <li>Reduces capital requirements, protects project revenues</li> <li>Directly increases return on capital</li> <li>Offsets higher costs of debt due to Basel III requirements</li> </ul>	<ul style="list-style-type: none"> <li>Reduces nominal amount of debt and debt service without changing project revenues</li> <li>Increases the debt coverage ratio over the life of the project</li> <li>Offsets the debt to short-term loan coverage ratio in response to Basel III liquidity requirements</li> </ul>
	During operation	<ul style="list-style-type: none"> <li>Increases project revenues</li> <li>Directly increases return on capital</li> <li>Offsets higher costs of debt due to Basel III requirements</li> </ul>	<ul style="list-style-type: none"> <li>Increases cash flow available for debt service</li> <li>Increases the debt coverage ratio over the life of the project</li> <li>Offsets the debt to short-term loan coverage ratio in response to Basel III liquidity requirements</li> </ul>
Contingent support	During construction	<ul style="list-style-type: none"> <li>Limits or mitigates construction risk</li> <li>Reduces investor return requirements</li> </ul>	<ul style="list-style-type: none"> <li>Reduces cash flow volatility</li> <li>Reduces lender requirements due to lower cash flow risk</li> </ul>
	During operation	<ul style="list-style-type: none"> <li>Reduces operating risk, keeps cash flows stable</li> <li>Reduces investor return requirements</li> </ul>	

Source: Taken from Reyes-Tagle (2018a)

In Colombia, the government (CONPES<sup>2</sup>) established and published the risk allocation of PPP contracts in four different PPP programs (see table below) launched in 1993, 1997, 2008 and 2013.

<sup>1</sup> World Bank (2014).

<sup>2</sup> National Council for Economic and Social Policy.

In the first generation (known as the first project program), the government assumed most of the risks, including traffic, tolls and fees, environmental and land licenses, and uninsurable force majeure events, and shared the construction and design risk. Meanwhile, the private partner assumed the risks relating to taxation, financing and uninsurable force majeure events. This form of allocation has since been modified in each PPP program. The main changes related to the allocation of construction and design and traffic risks. From the second generation onwards, the private partner was required to assume construction and design risk. Traffic risk was allocated to the private partner in the second generation, but then to the public partner in the third and fourth iterations.

• **Table 3: Allocation of risks in PPP contracts – Colombia**

Risk	First generation (1993)	Second generation (1997)	Third generation (2008)	Fourth generation (2013)
Traffic	Public (Minimum traffic guaranteed)	Private	Public (Expected revenues)	Public (Minimum traffic guaranteed)
Tolls and fees	Public	Public	Public	Public
Construction and design	Shared	Private	Private	Private
Environmental licenses and land	Public	Public	Shared Public: cost overruns Private: management	Shared Public: cost overruns Private: Management and cost overruns
Uninsurable force majeure	Public	Public	Public	Public
Taxes	Private	Private	Private	Shared
Funding	Private	Private	Private	Private
Insurable force majeure	Private	Private	Private	Private

Source: Modified based on MFMP 2019 of the MHCP

In Chile, the government began to rely on concessions in the early 1990s to build and improve the road network. By 2019, the DGC had 74 concession contracts in place with a committed investment stock of approximately US\$ 24 billion. Minimum guaranteed revenue (MGR) is the main contingent fiscal commitment in the case of Chilean concessions. According to Irwin and Mokdad (2010) and González (2015), these guarantees are the main risk mitigation instrument used. The maximum exposure of the 23 concessions with MGR was US\$ 3,687 million for 2019. The expected present value of all concessions with IMG was approximately US\$ 450 in 2019.

Fiscal risks can also arise from other sources not clearly identified in the PPP contract. Changes to the project or contract can also represent a fiscal risk. These can be instigated by either the private or public partner. Reyes-Tagle *et al* (2018a) argue that, in the case of PPPs, the government and the private agent have diverging incentives for both project cost and service quality. In addition, information asymmetries between the parties may lead to increased costs for both parties or to impair project performance. For example, the private partner might try to obtain

higher revenues through renegotiation, given the high political or social cost of having to halt or delay a project. Meanwhile, the government may attempt to reduce profits for the private partner through penalties or late payments. The following table provides examples of information asymmetries in PPPs.

The risk of renegotiation generated a significant fiscal impact on the early generations of projects in Colombia. According to the DNP, renegotiations of highway concessions during the 1993-2010 period generated high fiscal costs. The average renegotiation cost was equivalent to 280% of the initial cost of the contract. In 25 concessions evaluated, a total of 430 contractual amendments were found, entailing fiscal costs of US\$ 56 billion and 131 years of delays. In Chile, the investment budget grew by 35% in transport concessions (Engel *et al* 2009) between 1993 and 2008. According to Irwin (2010), the higher unforeseen costs were a result of renegotiations due to design changes requested by the government and unexpected events during the construction or operation phase. The concessionaire was awarded compensation for these cost increases in the form of direct payments or higher rates, or by extending the contract term.

The IMF's PPP Fiscal Risk Assessment Model (PFRAM) (2019) is a tool for estimating the fiscal costs and risks of PPP projects. The following table outlines the 11 risk categories proposed in the PFRAM, which break down further into various subcategories.

• **Table 4: Fiscal risk categories included in the PFRAM**

1. Governance Includes 3 subcategories: government ability to manage public investment, government ability to manage fiscal risks, and project and PPP contract transparency
2. Construction Includes 19 subcategories. Including risk of relocation of people and activities, land, environmental impact, geological aspects, licensing, project design flaws, changes in project design and scope, and changes in input prices, among others.
3. Demand Includes 10 subcategories. Including payment-services relationship, tariff regulation, type of resources used to finance the project, among others.
4. Operation and performance Includes 7 subcategories. Including transparency of project performance, government ability to monitor performance and technological innovation, among others.
5. Financial Includes 4 subcategories. Including availability of resources, private financing capacity, and interest rate and exchange rate volatility risk, among others.
6. Force majeure
7. Materially adverse government actions
8. Change in laws
9. Economic equilibrium readjustment Includes 3 subcategories.
10. Renegotiation
11. Termination of contract Includes 2 subcategories.

Source: Prepared by the authors based on IMF and World Bank data (2019)

Proper risk identification and quantification is important for governments to decide whether or not to carry out projects through PPPs, to gauge the impact on fiscal finances and also to ensure adequate control and monitoring of these risks throughout the life of the project. Poor management of the fiscal risks and impacts of PPPs can lead to inefficient use of resources. It can also threaten the fiscal stability of countries in the region, where the use of PPP projects is becoming increasingly widespread.

## **Box 2: PPPs and financial crises**

### **Mexico**

Between 1989 and 1994, the government leased more than 5,000 kilometers of federal highways under 52 toll road contracts. The first wave of concessions was plagued by contractual and regulatory problems, which led to several contract renegotiations and in some cases government bailouts. According to the Center for the Public Finance Studies of the Mexican Congress, the 1995 crisis revealed the weaknesses behind Mexico's regulatory framework and the lack of experience in drawing up concession contracts. The problems stemmed from a lack of resources and experience in adequately preparing terms of reference and regulations for concession projects, including the failure to draw up adequate preliminary designs and cost/benefit analyses and accurately estimate demand. There were problems in establishing award criteria, such as the shortest concession period (maximum of 12 years), which meant that tolls were set too high to recover costs in the short term because demand (among drivers) shifted to alternative public roads. In addition, the economic crisis of 1994 significantly reduced traffic demand, thus damaging cost recovery and driving many concessionaires out of business (CEFP, 2007). Faced with this situation, the government took action to improve matters. It extended the original concession terms to a maximum of 30 years, reduced toll rates on 28 strategic roads to increase demand, and launched a financial restructuring program for concessionaires. Despite these measures, the financial problems persisted, especially for those concessionaires that had secured bank loans. These problems ultimately culminated in bailouts for 23 of the 52 toll roads under concession in 1997.

### **Portugal**

The 2008 global financial crisis and the ensuing Eurozone crisis revealed major sustainability issues for PPP projects developed under Portugal's 2003 PPP framework. Highway PPPs were flagged as a source of significant contingent liabilities. As a result, the European Commission, the European Central Bank and the IMF devised an adjustment program that envisioned specific measures to improve the development of PPPs. The program found that planning was poorly coordinated, with little consideration for long-term fiscal sustainability and poor cross-sectoral coordination. In addition, best practices had been omitted, including cost-benefit analyses, comparative public sector analyses, value for money, and mid-term fiscal impact analyses. The enactment of a new PPP law in 2012 updated the country's PPP framework to reflect the lessons learned from the crisis. The new law sought to gain control over the immense fiscal burdens that had accumulated under the previous regime and to prevent any repeat occurrence. The new law set up a PPP Unit to oversee the project cycle within the Ministry of Finance. The unit is known as UTAP (Unidade Técnica de Acompanhamento de Projetos) and reaffirms the Ministry of Finance's remit over PPP processes. The law focused on fiscal sustainability and transparency, implemented the best practices mentioned above, and led to renegotiations of highway projects that had generated an undue fiscal burden.





Source: Based on Reyes-Tagle (2018a)

### 3. Fiscal commitments

Turning to the origin of the funds used to finance a PPP project, we have two types: (1) those where the funds come from user payments; and (2) those where the funds come from government payments. There can also be combinations of both types. In certain LAC markets, such as ports and airports, self-sustaining projects are the norm, where user payments finance the entire project and the concessionaires even share part of the revenues obtained with the government (Suárez-Aleman *et al*, 2018 and 2019). In contrast, in other sectors such as health and education services and infrastructure, existing PPP projects in LAC are typically not self-sustaining and concessionaires receive payments from the government (Suarez-Aleman *et al*, 2020a and 2020b).

The government may assume direct commitments, such as regular payments for services and infrastructure, or contingent commitments, such as contingent payments for retained risks. Direct commitments have a defined amount. They include availability payments or capital grants. Contingent commitments, on the other hand, are payment obligations arising from a specific future event, which may or may not occur and which may be beyond the control of the parties. The occurrence, value and term of the payment are either unknown or cannot be reliably determined. Contingent commitments may be explicit, where they are included in the contract or other document, or implicit, such as where there are social or political expectations of government intervention in certain circumstances. The following table provides examples of the types of fiscal commitment.

• **Table 5: Types of fiscal commitment**

Commitment	Description
<b>Direct commitments</b>	
Capital subsidy	A capital subsidy or grant that can be included in the construction costs as milestones are reached or deducted from capital expenditure.
Availability payment	A periodic payment made during the life cycle of the project, usually contingent on the availability of the service or asset for a contractually agreed amount. The payment may be adjusted to reflect performance-related bonuses or penalties.
Shadow toll or payment per unit	A payment or subsidy per unit or user of a service, such as per kilometer driven on a toll road.
<b>Explicit contingent commitments</b>	
Guarantees relating to specific risk variables	An agreement to compensate the private party or off-taker for a loss of income in the event that a particular risk variable deviates from a contractually specified level. The associated risk is then shared between the government and the private party. For example, this type of arrangement might include demand guarantees to remain above a specified level, or exchange rates to remain within a certain range.
Compensation clauses	For instance, a commitment to compensate the private party for damage or loss caused by certain specific, uninsurable force majeure events.
Cancellation of payment commitments	A commitment to pay an agreed amount in the event that the contract is cancelled due to default by the public or private partner. The amount may depend on the circumstances that led to the non-payment.

Debt guarantees or other credit enhancements	A commitment to repay some or all of the debt used to finance a project. The guarantee may cover a specific risk or event. Guarantees are used to provide further assurance to a lender that their loan will be repaid.
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#### Implicit contingent commitments

Non-contractual obligations arising from public expectations.	For example, financial bailout of a project upon insolvency in socially sensitive cases.
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Source: Author's own contribution, taking most of the concepts and definitions from World Bank et al (2017).

To provide a reference point, in Peru, the total value of fiscal commitments (including contingent commitments) in PPP projects in 2014 was estimated at over US\$ 39 billion or 19.4% of GDP (IMF, 2015). Direct (firm) commitments accounted for 16.7% of GDP and contingent commitments represented 2.7%. In addition, the government recorded expected revenues from such projects totaling 13.9% of GDP.

**Table 6: Nominal value of PPP obligations and revenues (2019) – Peru**

	US\$ million	% GDP
Fiscal commitments	33,980	16.4%
Firm	30,062	14.5%
Direct payment	20,193	9.7%
Deferred payment	9,848	4.8%
Contingent	3,918	1.9%
Non-financial guarantees	2,882	1.4%
Financial guarantees	1,037	0.5%
PPP revenues	28,714	13.9%

Source: Author's own contribution with MEF data (2019 and 2020).

**Table 7: Fiscal contributions to PPP projects**

Region	Guarantees								Tax incentives and deductions	Total
	Construction costs	Debt	Exchange rate	Interest rate	Payments	Minimum revenues	Tariffs /tolls	Other		
Latin America and the Caribbean	0.13%	0.40%	0.13%	-	17.02%	1.45%	-	-	5.15%	24%
East Asia and Pacific	-	-	0.13%	0.13%	24.14%	3.03%	4.49%	-	0.13%	32%
Central Europe and Asia	-	0.26%	0.13%	-	8.58%	1.06%	-	0.26%	-	10%

Middle East and North Africa	-	-	-	-	2.24%	1.19%	-	0.26%	-	4%
South Asia	-	0.13%	-	-	21.5%	0.92%	-	0.13%	0.13%	23%
Sub-Saharan Africa	-	0.13%	-	-	6.46%	0.13%	0.26%	-	-	7%
<b>Total</b>	<b>0.1%</b>	<b>0.9%</b>	<b>0.4%</b>	<b>0.1%</b>	<b>79.9%</b>	<b>7.8%</b>	<b>4.8%</b>	<b>0.7%</b>	<b>5.4%</b>	<b>100%</b>

Source: Taken from Reyes-Tagle (2018a)

The following tables provide some examples of fiscal commitments generated by PPP projects in Ecuador and Chile.

### **Box 3: Challenges within the new regulatory framework – PPP Project: Southern Viaduct at Guayaquil (Ecuador)**

The Organic Code on Production, Trade and Investment in Ecuador establishes three conditions for undertaking a PPP project: (1) it must be shown to be in the public interest; (2) the selected regime or system must be shown to be more efficient than the existing one, through a value-for-money analysis; and (3) the State must not possess sufficient economic resources by itself. In other words, the PPP mechanism can only be chosen if the State does not have the fiscal resources needed to undertake the project through regular public procurement. However, in practice there are PPP projects — mainly in the port and road sectors — that are not self-sustaining and receive public funding during the construction stage or during the subsequent operation of the project.

The Southern Viaduct at Guayaquil has been in the project portfolio of the Ministry of Transport and Works of Ecuador (MTOPE) since 2016. The project includes the construction of a bridge spanning approximately 3 km in length and the construction of roads linking the Port of Guayaquil with the Troncal de la Costa highway, which connects the south of the city with the province of El Oro. In 2009, the MTOPE commissioned studies to plan the construction of the project under a public works arrangement. The studies revealed that the project would require an estimated investment of more than US\$ 1.2 billion. In 2015, the government lacked the resources to press ahead and so it decided to seek out private companies interested in developing private initiatives to undertake the project through a PPP.

The original project has undergone several modifications since then. In 2009, the government conducted studies that presented a benchmark value of US\$ 963 million. After a private initiative was declined in 2017 and a public tender declared void in 2018, in 2020 the government invited bids and a private consortium submitted a PPP proposal with a required investment of US\$ 450 million. This proposal is currently being reviewed by the MTOPE. The differences in the investment values are largely down to the downsizing of the project from four to two lanes, enabling the partners to optimize the investment values, as well as operation and maintenance during its construction. The project would include a firm commitment by the State to contribute some US\$ 300 million during the construction phase to ensure the project is viable.

Due to the complexity of this particular project, its different scopes will command a higher toll level than that used in other concessions currently being structured (US\$1 versus the minimum tolls of US\$3 now being considered for the Southern Viaduct at Guayaquil). Whether this toll is sustainable over time carries

a definite fiscal risk for the government. The contract will include an economic rebalancing formula whereby, in the event of changes in variables beyond the concessionaire's control (including demand), an economic balance will be ensured through state contributions, by adjusting the tariffs or by extending the concession term, either individually or in combination. These concepts also carry risks that could give rise to contingent commitments for the government.

The 2020 Regulations on Public-Private Partnerships govern the management of fiscal risks and contingent liabilities and state that the Ministry of Finance must issue an affirmative opinion before any PPP contract can be entered into.

*Authors' own contribution.*

#### **Box 4: PPP Project: Route 5 Santiago – Los Vilos Section (Chile)**

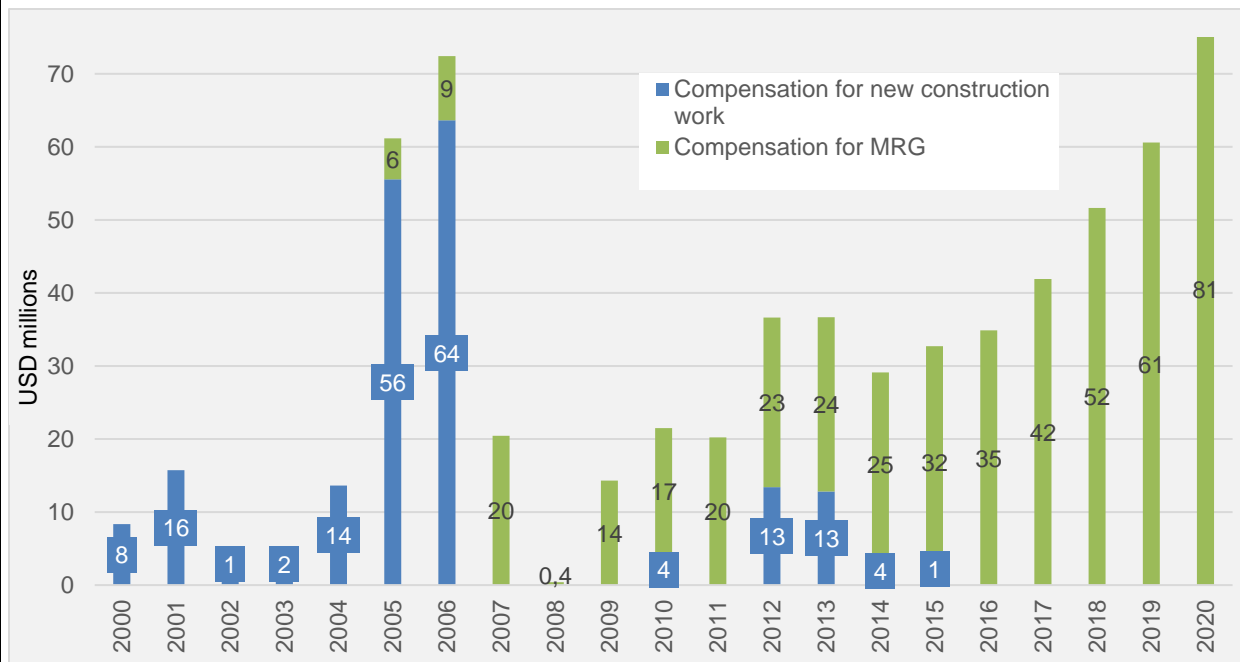
This project encompasses the construction, maintenance and operation of a 218.4 km highway, including carriageways and bypasses. The concessionaire initially had investment commitments totaling CLP 236 million, with the project to be financed through toll collection. The concessionaire was also entitled to a minimum revenue guarantee (MRG). The contract states that the concessionaire is responsible for the final engineering project of the works and bears the risk in the event that the final costs exceed those envisioned in the reference studies. The concession began in 1997 with the construction phase and the highway started to operate in 2001.

From 1999 through to 2019, 30 amendments were made to the original contract in the form of supplementary agreements, Ministry of Public Works resolutions and Finance Ministry resolutions. The main ones include the change of design and the inclusion of new sections. The increased costs were paid via toll increases and direct compensation from the government. The following diagram shows the aggregate effects of all changes in the fiscal commitments. As can be seen, under the original terms, the government would pay only MRG compensation from 2005 onward, steadily increasing as of 2014. The modifications gave rise to direct payments in the years 2000-2006, 2010, 2012-2015, peaking in 2005 and 2006 at US\$ 56 and US\$ 64 million, respectively.

The compensation payable for the new construction work amounts to US\$ 195 million. The project's investment budget increased by 118%, climbing from US\$ 236 million to US\$ 514 million. Note that the project is financed by toll collection and direct compensation from the government. Toll revenues reached US\$ 31 million in 2019, 213% above 2009 levels. The aggregate payment for MRG reached \$461 million in 2019, with an annual payment of \$61 million that same year.

The 2007 Report on Contingent Liabilities drawn up by the Finance Ministry considered a maximum contingent exposure for MRG of US\$ 729 million measured in net present value (NPV). The NPV of MRG compensation payable during that period was US\$ 308 million.

• **Diagram 2: Change in fiscal commitments of PPP Route 5 Santiago – Los Vilos (US\$ million)**



Source: Ponce de Leon (2021)

Authors' own contribution.

## Methodologies for assessing contingent liabilities

Measuring fiscal commitments is essential if governments are to make good decisions when choosing and structuring PPP projects and thus making efficient use of public resources. In contrast to the calculation of firm commitments, calculating contingent costs poses a complex challenge. Changes in estimated contingent commitments can have a significant impact on project sustainability. The following table shows the challenges still involved in measuring minimum traffic guarantees in the Brazilian transport sector.

### Box 5: Contingent liabilities for demand risk in Brazil

The Brazilian government undertook numerous projects in the country ahead of the World Cup in 2014 and the Olympics in the city of Rio de Janeiro in 2016, and on various occasions it failed to use a proper fiscal cost estimation and management framework (Brandao, 2020). Several projects in Brazil relied on risk mitigation mechanisms that generated firm and contingent liabilities. Examples here include the São Paulo Metro lines 4, 5, 6, 17 and 18, the VLT Carioca and the Vial TransOlimpica project in Rio de Janeiro, and the Salvador – Itaparica Bridge project in Bahia.

For the concession of line 4 in São Paulo, Brazil, by the central government in 2006, the State provided a fixed subsidy and a minimum demand guarantee (MDG). The MDG was there to mitigate demand risk for the private sector and entice more companies to bid for the project. While Brandao et al (2012) argue that the

government faced a methodological challenge in valuing these guarantees, this type of arrangement also generated incentives that reduced the risk of the project and consequently increased its value.

More recently, in 2019, the government awarded the PPP project for the construction, operation and maintenance of the Salvador – Itaparica road bridge located in the state of Bahia, Brazil, which is set to become the second longest bridge in Latin America, spanning 12.4 km. The project required the posting of consideration and a demand guarantee. The bridge is expected to be brought into service in 2025.

Under the guarantee, the government must compensate the concessionaire in the event that actual traffic is below 80% of the expected level, whereas the concessionaire must pay the government compensation if the actual traffic exceeds 110% or more of the estimated level. The government estimated payments to the concessionaire in the range of US\$ 29 to US\$ 65 million, depending on whether actual traffic is greater than 80% and less than 90% of the expected value, or less than 80% of the expected value.

According to Brandao et al (2021), the government's estimates are extremely optimistic, fail to rely on adequate measurement methodologies and fail to factor in the correlation of regional traffic routes. Using probabilistic analysis, the authors estimate that the government's expected costs will reach US\$ 326 million, a figure well above the government's estimates.

*Authors' own contribution.*

Under certain conditions, best practice for measuring contingent commitments is to use non-traditional methods, such as probabilistic analysis or option pricing methods. Chile, Colombia and Peru in particular have amassed considerable experience in applying stochastic methodologies to estimate contingent commitments. In 2015, the Peruvian Ministry of Economy and Finance published its "Guidelines for the valuation of quantifiable contingent commitments and the flow of revenues arising from the operation of PPP projects", along with the "Guidelines to determine the probability that a non-financial guarantee will require the use of public funds in the framework of a self-sustaining PPP". Meanwhile, in 2020 the Colombian General Directorate of Public Credit and National Treasury (DGCPTN) attached to the Ministry of Finance and Public Credit (MHCP) published its "Methodology for the valuation of contingent obligations for infrastructure projects"<sup>3</sup>. In 2017, the Uruguayan Ministry of Economy and Finance published a methodology for estimating contingent liabilities to help ensure compliance with the PPP Act (Law 18,786). The following table shows the methodologies (explained at greater length in Annex A at the end of the document) used in the relevant countries.

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<sup>3</sup> An initial paper on the subject was published in 2012.

**Table 8: Estimation of contingent commitments**

<b>Country</b>	<b>Methodology</b>	<b>Most recent report with estimates</b>
Chile	Stochastic methods	Contingent Liabilities Report – 2020
Colombia	Stochastic and econometric methods / 2020	Medium Term Fiscal Framework – 2020
Peru	Stochastic and econometric methods / 2015	Multiannual Macroeconomic Framework – 2020
Uruguay	Stochastic and other methods / 2017	N/A

*Authors' own contribution.*



## 4. Budgeting

Ideally, PPP projects should be made part of the government's medium-term fiscal framework, investment strategy, national public investment systems, and budget cycle in the same way as capital investment projects. During budget planning, programs and projects should be prioritized so as to ensure that government policies focus on the right areas. Those countries that do not follow a rigorous approach to budgeting for PPPs or integrating them into planning processes have seen their fiscal problems compounded (Reyes-Tagle *et al* 2018a).

Budgeting for PPPs means securing the necessary resources to cover any costs that the government may have agreed to meet over the contractual life of the project. The budgetary authority, be it the ministry of finance or other, is responsible for ensuring fiscal solvency in the short, medium, and long run. It is therefore also responsible for ensuring a balance between the use of PPPs and budgetary flexibility in the short and medium term. According to Shendy *et al* (2014), the first step in this responsibility is to ensure that PPP projects are fully integrated within the national investment strategy and to ensure that contracting agencies make investment decisions based on principles set out in the national investment system rather than the procurement method. The same authors point out that there are several approaches to incorporating PPPs into budget planning that can be considered best practice, such as (1) treating PPPs as any other investment project within the national public investment system; (2) commitment budgeting, where not only annual expenditures but also money committed for subsequent years is approved; and (3) two-stage budgeting, where in a first stage all projects are approved on the assumption that they will receive public funding, and in a second stage the method of delivery — PPP or other — is decided.

In Colombia, PPPs are part of the budget process through Future Payment Obligations (FPOs). As part of its budget planning, the Ministry of Finance includes the FPOs to be paid in the next fiscal budget. Once the budget is approved by Congress, the Ministry of Finance issues a decree allocating the budget among each of the agencies and departments that have the budgetary resources to pay the FPOs. Operationally, agencies and departments are required to budget annual payments to cover FPOs. Although the Ministry of Finance is responsible for ensuring the availability of funds, FPOs are non-discretionary payments and are approved by multiple government entities, including the High Council for Fiscal Policy (CONFIS). Once funds have been allocated to the relevant agencies or departments, payments are made in accordance with the concession contract.

Australia and Canada initially budget PPPs as traditional public investments (TPIs), meaning that PPPs are treated as a procurement process for public infrastructure rather than as a stand-alone investment plan. In these countries, PPPs are managed like any other capital investment. For major projects, they take shape through planning stages. This is partly because early planning for infrastructure projects takes place before a procurement decision is made. Similarly, capital

expenditures for PPPs are often included within future estimates when the project receives budget approval (Reyes-Tagle 2018a).

In Brazil, infrastructure planning is a shared responsibility between federal, state and municipal governments. As such, there is no centralized system that gathers information when selecting, prioritizing, coordinating and approving infrastructure projects at country level. Provincial and local government initiatives are not formally integrated within a national program. While these jurisdictions make significant efforts to communicate and discuss best practices, there is no agreement to standardize methodologies or practices for procurement. In recent years, the government has developed certain mechanisms to address this gap between jurisdictions. Most infrastructure projects are handled by subnational government entities and, as such, most of the projects are planned and carried out with little to no involvement by the national government. The country has an interconnected system of national and subnational public investment systems tasked with project execution and budgeting.

The budget process is crucial in PPP projects to secure the necessary funding without threatening fiscal sustainability. According to Funke *et al* (2013), the budget process for PPPs should include the following principles: (1) project selection should follow public policy priorities and be guided by a cost-benefit analysis; (2) expenditure decisions should be consistent with long-term fiscal sustainability; and (3) the choice between PPPs and traditional public financing should be based on value for money. Therefore, the choice of a project should be independent of the delivery mechanism, except where the delivery mechanism affects value for money.

Budgeting for payments to be made during the early years of the project, such as capital contributions, is relatively straightforward. However, budgeting for long-term firm commitments or contingent commitments raises a challenge as budget frameworks typically cover two to three years. This may generate budget appropriation risk, meaning the risk of future obligations not being budgeted in the year in which they are due to be paid. Long-term budgeting mechanisms or liquidity or contingency funds can be used to mitigate this problem.

Most countries in the region do not typically use budgeting mechanisms for long-term commitments. In Brazil, at federal level, Law 101 of 2000 requires that PPP subsidy payments be treated in the same way as debt service payments. In other words, they are automatically appropriated. According to APMG (2016), this means that once the subsidy or grant is approved the necessary appropriations require no further legislative approval.

#### **Box 6: PPP selection and traditional public delivery**

Under certain conditions, PPPs can generate significant savings when compared with the traditional public delivery of infrastructure and services, especially when these suffer delays, cost overruns, corruption or insufficient maintenance (Irwin *et al*, 2018). As in the case of projects undertaken through traditional public investment mechanisms, PPPs are not always efficient. This will ultimately depend on multiple variables. However, a government with institutional weaknesses in carrying out projects through

traditional procurement will also have a hard time in ensuring the success of PPPs. There is mixed evidence on the efficiency of PPPs relative to traditional public delivery<sup>4</sup>. In some cases, PPPs are used to circumvent budget constraints and implement low-quality, fiscally costly projects that through proper screening would have been excluded from an investment plan.

Weaknesses when appraising the project or choosing the right delivery mechanism can mean that, in practice, a PPP project is not the most advisable option but is used instead to circumvent fiscal rules. In the case of PPP projects based on payments by the government, PPP project commitments are not recorded for accounting purposes, as they are for traditional public investment projects, unless IPSAS-like standards are applied. This generates a bias toward carrying out projects in the form of PPPs, simply because the financing is captured by the private sector and recorded on a private sector balance sheet (that of the SPV). Fiscal limits could be used to mitigate the bias and restore some degree of control by not including the asset on the balance sheet. Meanwhile, if the government is nearing the limit established for PPPs, this situation could generate a bias towards traditional public work, even though it might be more efficient to undertake the project as a PPP.

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<sup>4</sup> In Australia, the APP framework generated savings of 30% in a rail project when compared with a traditional public delivery mechanism. The Chilean Ministry of Health commissioned a study to compare traditional procurement models with APP models in the sector. In that study, Saint-Pierre *et al* (2017) indicate that the average construction price for APP projects is 22% lower than the price of construction work carried out via traditional mechanisms. The construction time was also 35% quicker. APP contracts in Chile include non-clinical services such as toilets, food and security/surveillance. The operating cost of a PPP contract proved to be 9% less costly than in the case of traditional procurement, with a contract that ensures compliance with standards; something that was not the case under traditional management.

## 5. Fiscal affordability

Fiscal affordability means the ability of governments to honor their commitments. According to the OECD (2012), an investment project is affordable if the expenditure and contingent liabilities it generates for the government can be accommodated within current and future levels of government revenue and expenditure. Assessing the fiscal affordability of a PPP project allows one to verify the government's ability to honor the commitments generated by the project. Shendy *et al* (2014) propose the following: (1) including estimated costs in the projected budget; (2) assessing the impact on debt sustainability; and (3) verifying compliance with limits on commitments. Verifying that the commitments assumed can be covered by the budget is the most fundamental step of an affordability analysis. This requires the use of projections that cover the life of the PPP contract, since the medium-term budgets of the countries from the region cover less than five years.

Because PPP commitments are considered debt (Irwin *et al* 2018, IMF 2016, S&P 2014), it is advisable for budgetary authorities to treat PPP obligations as they would debt obligations as part of the government's aggregate debt obligations. Cebotari (2008) notes that PPPs are financially comparable to a lease and therefore those countries whose debt limits include guarantees or lease-type contracts could include PPP obligations subject to those limits. The following table provides some examples of affordability indicators.

**Table 9: Examples of fiscal affordability indicators**

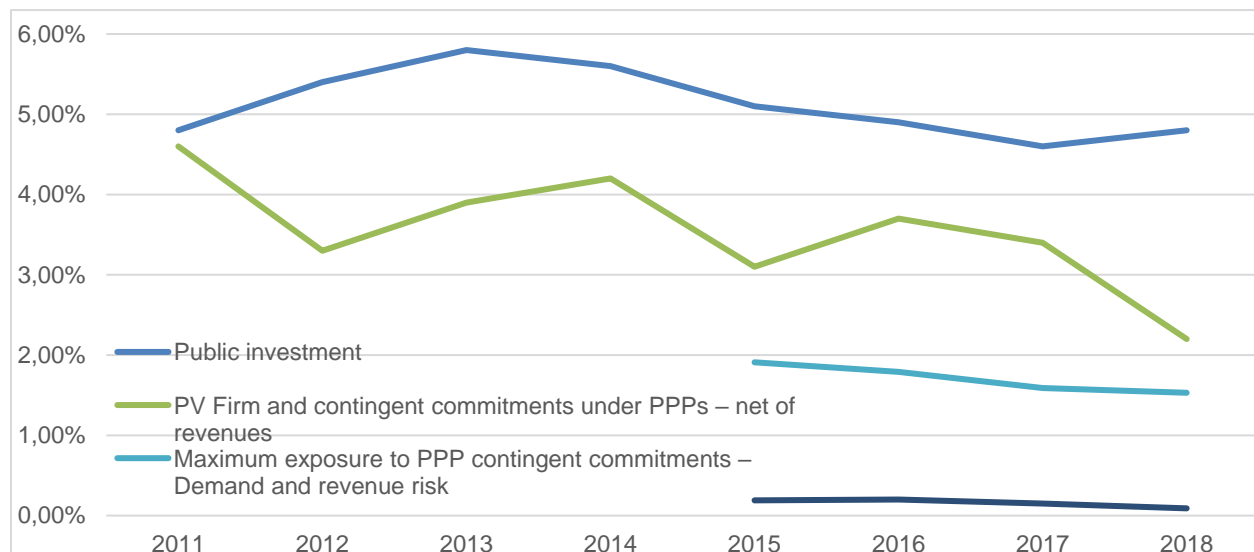
<b>Fiscal commitments</b>	<b>Cost</b>	<b>Fiscal affordability indicator</b> (Includes medium-long term projections)
Direct commitments	- Estimated annual payments - NPV	- Cost as a percentage of annual national or sectoral or national ministry/agency revenue or annual deficit - Cost as a percentage of national public debt
Guarantees	- Estimated annual payments or average expected payments - NPV (Scenarios)	- Cost as a percentage of a contingency line - Cost as a percentage of public debt - Cost as a percentage of GDP
Cancellation payment	- Estimated worst-case scenario payment or average expected payment - NPV	- Cost as a percentage of a contingency line - Cost as a percentage of the national budget - Cost as a percentage of GDP
Other fiscal risks	- Estimated worst-case scenario payment or expected average payment - NPV (Scenarios)	- Cost as a percentage of annual national or sectoral or national ministry/agency revenue or annual deficit - Cost as a percentage of a contingency line - Cost as a percentage of GDP

*Author's own contribution based on Shendy et al (2014) and Ponce de León (2018).*

In Peru, the medium-term fiscal framework (MMM, 2020) shows changes in the present value of firm and contingent PPP commitments net of revenues generated over the 2008-2018 period (see diagram below). In 2018, this value accounted for 2.2% of GDP. The maximum contingent liabilities exposure in 2019 was 1.5% for demand and revenue risks and 0.09% for cost risks.

Further, the maximum exposure for financial guarantees (also considered contingent commitments) was 0.53% in the same year.

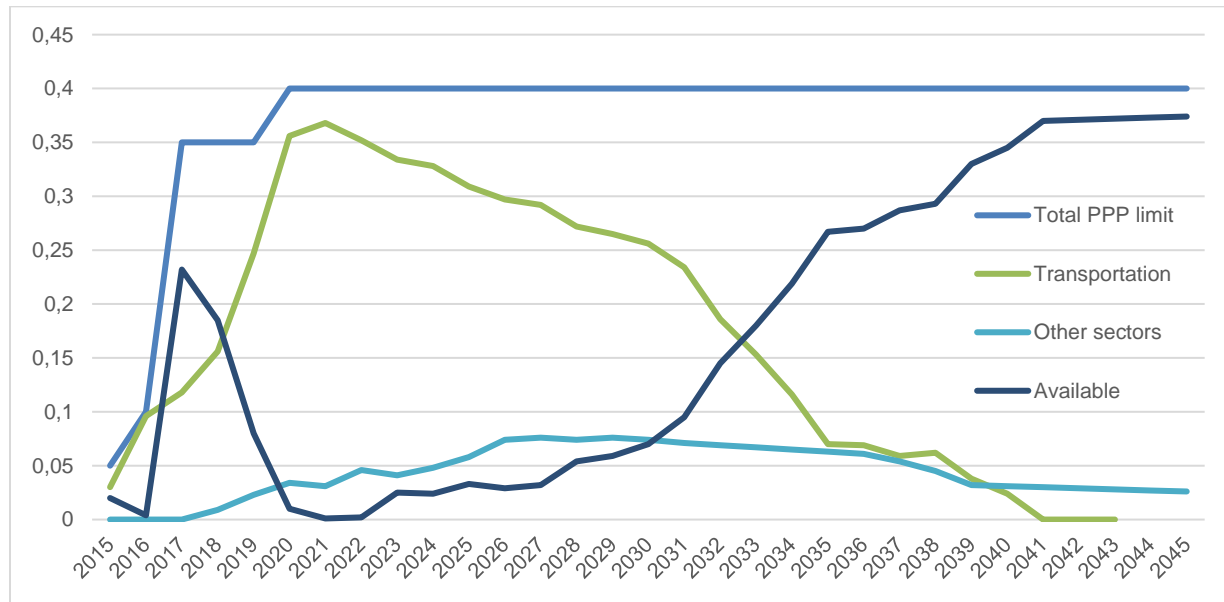
**Diagram 3: Changes in Public Investment, PPP Commitments, and Maximum Exposure for Contingent Liabilities (% of GDP) – Peru**



Source: Author's own contribution, with data from MMM (2020) of the MEF.

In Colombia, the concept of firm commitments is used to budget for long-term projects within the budget. The Colombian medium-term fiscal framework, MFMP (2019), includes an analysis of the trend and 35-year projections for public finances and assesses their sustainability. The report contains an analysis of medium- and long-term commitments, including data on firm PPP commitments, as well as contingent PPP commitments under the fiscal risk management policy. The following figure shows the trend in firm commitments (known as *vigencias futuras*) of PPPs as a percentage of GDP since 2015, including projections from 2019. The figure includes the annual limit of firm commitments (0.4% of GDP from 2020) and the available amount (limit less commitments effectively used).

**Diagram 4: Fiscal limit on PPPs – Colombia**



Source: Author's own contribution, with data from MFMP (2019) of the MHCP.

Firm commitments for PPPs accounted for 10% annually of the nation's general budget for the 2012-2019 period (MFMP, 2019). Within the total of authorized firm commitments (i.e. US\$ 23.3 billion<sup>5</sup>) at 2019 for the 2020-2048 horizon, the transport sector accounted for 89%, the housing sector 4.8% and others 5.9%. As of 2018, scheduled contributions for contingent liabilities under PPP projects initiated prior to 2013 (known as first, second and third generation) for the 2019-2030 period amounted to US\$ 60 million, while the balance in the contingency fund for such projects amounted to US\$ 397 million. Scheduled contributions for fourth generation PPP projects amounted to US\$ 1,655 million, while the balance in the fund amounted to US\$ 449 million<sup>6</sup>. Overall, scheduled contributions for the 2019-2030 period account for 0.53% of GDP. Meanwhile, scheduled contributions for the 2019-2043 period represent 0.83% of GDP. Contingent liability payments for highway concessions made through the FCEE between 2008-2018<sup>7</sup> amounted to US\$ 339 million, of which 60% corresponded to land risk, 19% to geological risk, 12% to design risk, 7% to structural failure risk and 3% to other risks.

The MFMP also includes contingent liabilities, which are estimated and then included in a state-level contingency fund (FCEE, Fondo de Contingencia para Entidades Estatales, Act 448/1998 and Decree 423/2001). Scheduled contributions to the FCEE for the fourth generation of PPP projects represent 0.52% of GDP for the 2019-2030 horizon and 0.82% of GDP for the 2019-2043

<sup>5</sup> 86.5 billion Colombian pesos in constant terms in 2019.

<sup>6</sup> The original figures are published in constant 2018 pesos and were converted to US\$ by the authors.

<sup>7</sup> Figures for March 2019.



horizon. Scheduled contributions to the FCEE for other PPP projects represent 0.03% of GDP for the 2019-2030 horizon and 0.04% of GDP for the 2019-2043 horizon.

The fund was set up in 1998 with the aim of improving the management of contingent liabilities of state-owned companies. Its rules apply to PPPs and state that all state entities must include in their debt service budgets the necessary provisions to cover possible losses on contingent liabilities for which they are liable. There is also a contingency fund, administered by the General Directorate of Public Credit and National Treasury of the MHCD<sup>8</sup>, which also approves and monitors the valuation of contingent liabilities and trends in risks covered by the FCEE and raises or lowers it accordingly.

In Paraguay, the PPP law set up a liquidity fund (Fideicomiso de Administración y Pagos del Fondo de Garantía y Liquidez para Contratos APP, known as "Fondo Fiduciario") administered by the AFD on the mandate of the Ministry of the Economy. This fund holds, invests and manages the money it receives, which will be used only for the fulfillment of the obligations derived from the firm and contingent quantifiable commitments and liabilities assumed by the State and the costs of resolving disputes in connection with the signing and performance of PPP contracts. Such firm and quantifiable contingent commitments and liabilities are determined by the Contracting Authority, verified by the Ministry of Finance and notified to the Trustee. As required under the PPP Act, the Trust Fund must cover 100% of the next calendar year's Firm Liabilities and at least 10% of the accrued quantifiable contingent liabilities.

#### **Box 7: PPP framework and fiscal sustainability in Paraguay**

The PPP Law (No. 5102) of 2013 and its regulations set out the responsibilities of the Ministry of Finance (MHP) to ensure the fiscal sustainability of PPP projects. More precisely, it envisions the need to: (i) evaluate the allocation of expected risks and fiscal impacts when studying and drawing up contracts for public-private participation projects; (ii) issue prior binding opinions on public-private participation projects, on the allocation of risks and fiscal impacts and on project feasibility; and (iii) ensure the fiscal consistency of the quantifiable firm and contingent future payments under these projects, in accordance with the terms of this Act.

The MHP keeps a record of all future, firm and contingent payments. The PPP law also imposes quantifiable limits for exposure to firm and contingent quantifiable commitments: "the cumulative amount of firm and contingent quantifiable payments, net of contingent revenues, assumed under public-private partnership contracts, calculated at present value, may not exceed 2% of GDP for the immediately preceding year. Likewise, the assumed amount of firm and contingent payments quantifiable annually may not exceed 0.4% of GDP for the immediately preceding year. The MHP may review these limits.

The Act also sets up a Trust Fund with the aim of managing the funds needed to honor all obligations, including the cost of resolving disputes under PPP contracts. This Fund must have sufficient funds with which to cover 100% of firm obligations and 10% of quantifiable contingent obligations. As at 2020, the fund provided no coverage for contingent liabilities.

<sup>8</sup> Originally administered by private trustee La Previsora, and as of 2019 by the MHCP.

The PPP projects for (urban roads) 2 and 7 were awarded in 2016 to the same Sacyr-Mota Engil-Ochoa consortium. The consortium must build, operate and maintain the two roads over a term of 30 years. The project has been financially structured such that 64% of the funding will come from toll collection, while the remaining 36% will take the form of direct payments from the government.

*Authors' own contribution.*

It was also found that eight countries in the region applied fiscal limits to PPP projects: Brazil, Colombia, Honduras, Mexico, Panama, Paraguay, Peru and Uruguay. In Brazil, the law sets a limit on direct PPP commitments: the flow of direct PPP expenditures cannot exceed 1% for the federal government and 5% for subnational governments of the total annual fiscal revenues of those entities (net current revenues). In Colombia, there is also a quantitative limit on the flow of new PPP obligations. To limit the costs and fiscal risks of PPPs, the MFMP includes a limit on future cash allocations related to PPP contracts. The CONPES sets a maximum annual amount of authorizations for implementing projects under the PPP regime; currently capped at 0.4% of GDP. There is no limit on the stock of PPP obligations.

In Paraguay, the PPP Act establishes quantifiable limits for exposure to firm and contingent quantifiable liabilities, stating that: "The cumulative amount of firm and contingent quantifiable payments, net of contingent revenues, assumed under public-private partnership contracts, calculated at present value, may not exceed 2% of GDP for the immediately preceding year. Likewise, the assumed amount of firm and contingent payments quantifiable annually may not exceed 0.4% of GDP for the immediately preceding year. The Ministry of Finance shall review the appropriateness of these limits and, if deemed necessary, draw up a proposal for legislative reform" (Act No. 5102/13).

Peru also applies fiscal limits to PPP commitments. The government estimates the NAV of public commitments related to PPPs at around 4% of GDP. This measurement does not consider all possible risks (e.g. risks related to land acquisition) and is calculated net of expected revenues, which in turn may suffer from a significant optimistic bias. In 2014, the overall nominal gross value of firm and contingent commitments was about 20% of GDP. Further, the PPP law sets a limit of 12% of GDP on the net present value of firm commitments and contingent liabilities related to PPPs. This limit applies to exposures net of expected revenues and with contingent liabilities adjusted for realization risk. The following table shows the limits applied to PPP obligations or investments in the region.



• **Table 10: Fiscal limits on PPP projects**

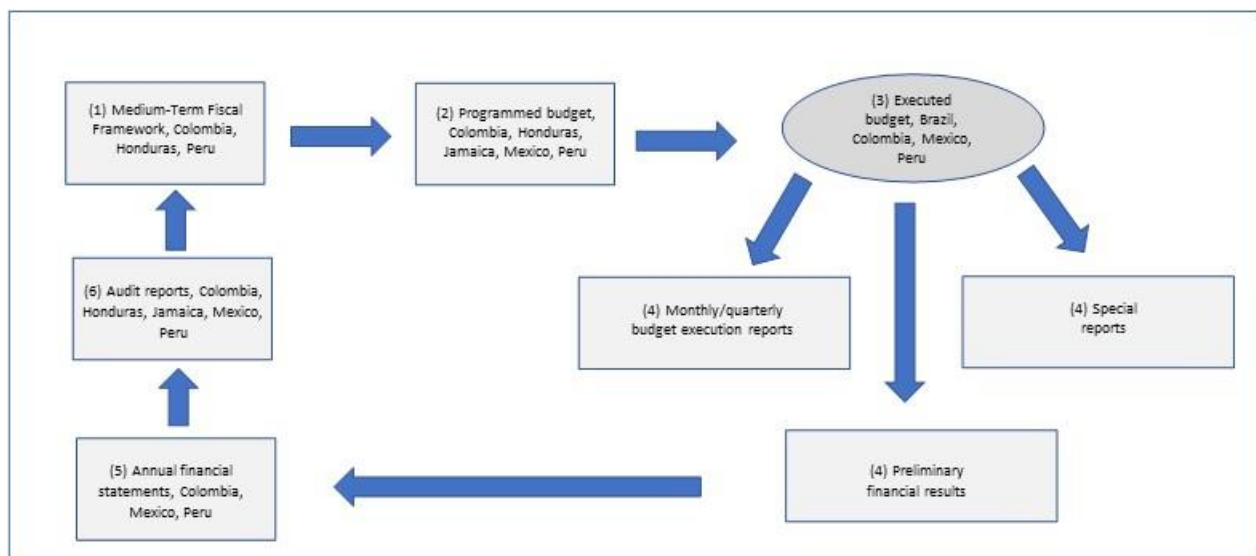
Country	Limits on PPP commitments
Brazil	The limit applies to the total amount of investment allowed in PPPs each year as a percentage of current expenditures and tax revenues. The federal government may enter into a PPP contract if the sum of the current expenditures of the contracts signed in the previous year has not exceeded 1% of the net current revenues for the fiscal year and if the annual expenditures of the contracts in force in the following 10 years do not exceed 1% (5% for state governments) of the projected net revenue for the respective fiscal years.
Colombia	Annual limit on central government firm commitments (0.4% for the 2020-2050 period)
El Salvador	-
Honduras	The sum of firm and contingent PPP commitments may not exceed 5% of GDP
Mexico	The annual PPP budget may not exceed 10% of the average planned CAPEX expenditures for the next five years (excluding those of state-owned oil company PEMEX)
Panama	The sum of firm and contingent PPP commitments of (national) public entities may not exceed 30% of actual investment in the previous year, or 30% of the investments under the Five-Year Investment Plan. The sum of firm and contingent PPP commitments of local governments may not exceed 10% of current revenues from the previous year, or 20% of the funds available for investment over the following five years. The present value of total firm and contingent PPP commitments may not exceed 7% of GDP
Paraguay	The cumulative amount of quantifiable firm and contingent payments, net of contingent revenues, calculated at present value, may not exceed 2% of GDP for the immediately preceding year. The assumed amount of firm and contingent payments quantifiable annually may not exceed 0.4% of GDP for the immediately preceding year.
Peru	The present value of contingent and non-contingent obligations may not exceed 7% of GDP
Uruguay	The total of firm and contingent liabilities under PPP contracts, calculated at net present value, may not exceed 7% of GDP. Annual PPP commitments may not exceed 5% of GDP for the immediately preceding year.

*Authors' own contribution. Source: Reyes-Tagle et al and PPP law in Brazil, Panama, Paraguay, Peru and Uruguay*

## 6. Reporting and Accounting

Governments should record the commitments made in reports and financial statements, both for the sake of transparency with the agents involved and to enable better monitoring and control. The diagram below depicts the reporting of information on PPPs within the fiscal cycle, based on the IMF (2009) government finance statistics formats. As observed in the cases of Colombia, Honduras, Mexico and Peru, PPP information is included in early and final stages of budget planning, such as in the medium-term fiscal framework and programmed budget, as well as in annual financial statements and audit reports. However, information on the progress of PPP projects is not reported within the fiscal years, such as in monthly status reports or preliminary financial statements.

**Figure 1: PPP reporting within the fiscal cycle**



Source: Adapted from Reyes-Tagle et al (2018a) and IMF (2009)

How and when PPP obligations are recognized is critical because these considerations determine whether such commitments affect fiscal budget and debt targets. In addition, the costs generated by PPP projects must be reliably reported so as not to create any bias toward PPPs versus other types of public delivery and investment mechanisms, whose resulting expenditures and debt traditionally receive greater scrutiny.

The IPSAS (*Public Sector Accounting Standard*), GFSM (*Government Finance Statistic Annual*) and ESA (*European System of National and Regional Accounts*) contain international standards for public accounting and statistics of PPP commitments, which include contingent commitments. According to Hemming (2006), IPSAS contains rules that considerably reduce potential bias towards PPPs. IPSAS 32 includes both transactions that are financed with government funds and those that are financed by user tolls or tariffs. In both cases, it recommends that the assets be

recorded on the government's balance sheet when two conditions are met: (1) the government controls or regulates (prices and terms of provision) the services that the private partner must provide with the assets; and (2) the government retains some residual interest in the assets at the end of the term of the arrangement. The following table shows the key features of IPSAS for PPPs.

• **Table 11: Treatment of PPPs in government accounts under IPSAS 32**

Transaction	Accrual basis accounting		Cash basis accounting
	Impact on government deficit/surplus	Impact on government balance sheet	Impact on government deficit/surplus
Service concession asset (Construction) with government funds or user charges			
Recognition of non-financial assets and liabilities	Increase in the total value of the non-financial asset	Increase in the total value of the liability (gross debt)	None
PPP Contract with government funds			
Payments to the operator (operating costs)	Increase, spending on acquisitions	Reduction, less cash (equity)	Increase, spending on acquisitions
Payments to the operator (amortization of liabilities)	None	Reduction, depreciation/amortization (gross debt)	None
Depreciation/amortization of non-financial assets	None	Decrease, consumption of fixed capital (equity)	None
PPP Contract with user charges			
Revenue recognition and reduction of liabilities	Reduction, revenue allocated	Reduction, amortization of liabilities (gross debt) Increase, revenue allocated (equity)	None
Depreciation/amortization of non-financial assets	None	Decrease, consumption of fixed capital (equity)	None

Source: Author's own contribution, based on Reyes-Tagle et al (2018a) and Jin and Rial (2016).

Thus, the use of IPSAS allows for adequate impact control by treating PPP commitments as debt, and monitoring these obligations in aggregate with traditional debt and through accounting reports provides transparency. In those countries where PPP obligations are not recognized as debt, it is advisable to report PPP obligations either through specific reports or as part of accounting, budgetary or other statements or reports.

While Brazil, Chile, Colombia, Costa Rica and Peru are migrating to the accrual basis of accounting for the effective recognition of fiscal commitments, it is unclear how much progress they have made in this regard. As noted by the IMF (2018), Colombia's balance sheet contains only limited information on PPP liabilities as it is not yet fully compliant with the IPSAS 32 methodology. The National Infrastructure Agency (ANI) — the main infrastructure agency that uses PPP contracts — is working to adopt international accounting standards for the fourth generation. The accounting records for third generation contracts (from 2011 to 2015) will also be reviewed in accordance with IPSAS 32; however, the accounting treatment of first and second generation contracts, awarded up to 2011, will not change.



Broadly speaking, PPP commitments within the region are not fully recognized in the budgets. For example, in Brazil, the IMF (2017) notes that there are annual investments in PPPs, estimated at 1.1% of GDP, that are not reflected in the country's fiscal accounts or statistics. In Colombia, the IMF (2018) estimates PPP obligations not included in fiscal accounts at 1.4%. In Peru, the IMF (2015) notes that PPP obligations are significantly underestimated. Failure to adequately measure the fiscal impacts of PPPs can affect the sustainability of individual projects, as well as the long-term fiscal sustainability of countries.

According to the IMF (2017), there are complementary ways of ensuring transparency regarding the use of PPPs, such as having them included in the government's balance sheet and disclosing information on fiscal implications. The first proposal is to treat PPPs as public investments for accounting purposes, even though, from a legal standpoint, they are financed and maintained by a private company. This approach is IPSAS-compliant if the criteria relating to project control and the allocation of project risks and rewards are met. The second proposal (which may be complementary to the first) is to disseminate information on the rights and obligations that each project creates for the government, and to publish projections of government revenues and payments over the life of each contract. When projects are not recorded on the balance sheet, the risks they create can be controlled to some extent, which has the effect of limiting the obligations that the government can incur in PPPs.

The IMF's Fiscal Transparency Code provides minimum content for PPP fiscal risk reporting and breaks the content down into three levels of transparency: basic practice, good practice and advanced practice. Basic practice involves disclosure of the government's rights and obligations for each PPP project or program of projects. In addition, budget documents and annual financial statements should provide information on: total future service payments and receipts (e.g. operating lease concessions and rates), details of contract provisions that give rise to direct or contingent payment obligations or receipts (e.g. operating lease concessions and rates, guarantees, shadow tolls, profit-sharing arrangements, or events triggering contract renegotiation). It is also recommended that governments disclose information on the amount and terms of financing and other support for public-private partnerships through government loans or through publicly owned or controlled financial institutions. The level of good practice requires, in addition to the above, provisions for government payments and revenues over the life of the PPP contracts. The information disclosed should cover annual payments and receipts for services (e.g. concessions and operating lease rates) over the life of the PPP contract, details of contract provisions (e.g. guarantees, shadow tolls, profit-sharing arrangements, and events triggering contract renegotiation) that give rise to annual contingent payments or receipts, and also amount and terms of the financing and other support provided. Advanced practice requires, in addition to the above, that the government impose a legal limit on the cumulative obligations assumed under PPPs.

### **Box 8: Report on PPP obligations in Brazil**

The “Fiscal Reporting Manual” of the Ministry of Economy establishes rules related to compliance with PPP expenditure limits, and transparency, such as the publication of existing contracts and the amounts assumed under contractual obligations, risks without provisions, guarantees granted and other contingent liabilities. It also imposes the obligation to publish all executed expenditures, both current and capital, for the current year and 10-year projections.

The PPP Act also insists that firm and contingent commitments under PPP contracts be included in: (1) multi-year fiscal planning (federal and state) and goals to be followed over a four-year period; (2) the goals and priorities for the following fiscal year under the Budget Guidance Act; and (3) the annual budgets and annual authorized expenditures for each year. The PPP Act also states that PPP contracts must contain a clause on the sharing of risks, which should be allocated to the parties best able to manage them.

While there is no legal mandate that requires the economic and financial quantification of the risks assumed or describes how this should be done, the Fiscal Reporting Manual does define the frequency and formats for publishing information on total liabilities and potential liabilities under PPP projects, according to the following structure:

1. Total PPP project liabilities: Obligations arising from assets set up by the SPE: records the counterparty of the assets formed by the SPE; PPP provisions: records the value of term liabilities or uncertain amounts related to demand, construction, availability or other risks arising from PPP contracts; and other liabilities: records amounts arising from the non-payment of consideration for services and obligations upon materialization of the risk.
2. Records of contingent liabilities: Contractual obligations: records the expected value of future payments. It should reflect both the part relating to the incorporation of the asset and the part relating to the services; risks without provisions: records the amount of contingent liabilities related to risks assumed as a result of guarantees granted to the private partner or for its benefit, which have not been recorded under PPP Provisions; Guarantees granted: records the amount of guarantees granted in favor of the private partner to cover possible non-payments by the public partner; and Other contingent liabilities: records the amount of contingent liabilities that have not been recorded under the previous headings.

State-owned enterprises that operate with autonomy (such as state-owned water and sanitation companies) are an exception. In their case, expenditures are reported but not accounted for in the PPP spending limits.

*Authors’ own contribution.*

Colombia’s MHCP regularly publishes detailed information on explicit contingent liabilities in the Mid-Term Fiscal Framework (MFMP), as well as the methodology used for their estimation. The Fiscal Transparency and Accountability Act (2003) requires the MFMP to contain an assessment and valuation of the main contingent liabilities and non-explicit debts. Since 2004, the MFMP has contained a detailed chapter on contingent liabilities, with a section also on exposure due to civil servant dismissals and pension obligations (non-explicit debt). The contingent liabilities covered include those arising under PPP contracts, public credit guarantees, legal actions against the state and capital payable to international financial institutions.

Peru’s annual MMM periodically reports information on firm commitments and contingent PPP liabilities for the next three years, while the annual debt report presents some information on

financial guarantees and PPP exposure. In addition, Peru publishes the methodology for estimating the probability of triggering contingent PPP obligations, and publishes consolidated PPP financial information, including the net value of obligations and assets, and the values of payment commitments over the life of the projects.

The aggregate value of firm commitments under PPP projects was US\$ 33,553 million, representing 14.5% of GDP. In addition, the MMM publishes a stock of PPP commitments — aggregate value of commitments and contingent liabilities, excluding financial guarantees or disputes— totaling US\$ 36,769, equivalent to 15.89% of GDP; as well as a stock of net commitments —deducting revenues generated by the projects— totaling US\$ 4,721 million, equivalent to 2.04% of GDP. It also includes a breakdown of firm commitments and contingent liabilities under the PPPs. The maximum exposure for PPP disputes was 0.52% of GDP in 2019. Explicit contingencies include financial guarantees and contingent commitments. Aggregate PPP contract contingent liability exposure was 1.9% in 2019, amounting to some US\$ 4.4 billion. Contingent liabilities are divided into financial guarantees in effect or to be requested (US\$ 1,157 million; 0.50% of GDP), contingent commitments for demand risk under eight transportation projects (US\$ 2,268 million; 0.98% of GDP); contingent commitments for demand risk under four sanitation projects (US\$ 787 million; 0.34% of GDP); and contingent commitments for cost risk (mainly geological for emergency maintenance) under 14 projects (US\$ 162 million; 0.07% of GDP).

In Mexico, the IMF (2018) notes that financial liabilities under PPPs are not reported. In 2018, there was a portfolio of 22 projects in progress under PPP arrangements, generating liabilities equivalent to about 0.2% of GDP. Currently, there is no reporting on PPPs in the financial statements or fiscal reports. In Chile, DIPRES is required by law to draw up annual reports containing estimates of commitments that generate contingent liabilities (contingent commitments), including infrastructure concessions. This report contains those liabilities generated through government guarantees in general. However, no reports are published on firm PPP commitments or their fiscal impact.

In the Brazilian case, Siqueira and Reyes-Tagle (2017) analyze the control mechanisms of fiscal impacts in PPP projects. These include the recording and periodic publication of tax impacts, which represent a control in and of themselves due to the need to ensure the transparency of commitments and specific limits and rules to reduce the ability of governments to assume various types of commitments. The Fiscal Statements Manual requires governments to draw up and publish a specific statement on PPP contracts on a bimonthly basis as part of the Budget Execution Reports.

The MDF (“*Manual de Demonstrativos Fiscais*”) calculates the impact of PPP projects as the difference between revenues less expenditures generated by PPP projects within the current budget and projected nine-year budget of government entities. Meanwhile, the BSPN 2019 (“*Balanco do Setor Público Nacional*”) shows the sum of all obligations and provisions for recurring risks under PPP projects. In 2019, annual short-term obligations amounted to US\$ 384

million, medium-term obligations stood at US\$ 451 million, and long-term provisions came to US\$ 101 million. It should be noted that obligations under state contracts represented 89% of the total, while those of municipalities represented 11% of the total. No national government (“Uniao”) contracts were recorded.

### **Box 9: Risk management and reporting**

#### **Brazil**

At state level, the Ministry of Finance conducts a feasibility analysis of PPPs being considered for approval. Under the PPP law, the fiscal risks of contracts must be reported semi-annually in the budget execution report. In addition, contingent liabilities arising from PPPs should be reported in the fiscal risk annex to the annual budget plan. Contingent liabilities are estimated based on their probability of occurrence, though the report does not include mitigation actions or strategies in the event that these liabilities do materialize. Typically, fiscal risk analysis focuses on the impact of specific events on public sector finances. Thus, PPP assessments focus on the risks retained by the government, specifically construction and demand risk. Contingent liabilities that the government has traditionally assumed in the past include minimum revenue guarantees (MRG), exchange rate guarantees, renegotiations, and early termination of contracts. In the case of early termination, the government deposits all unamortized net disbursements made toward the project to the private party. The government has no specific strategies for mitigating the risks.

#### **Colombia**

In the late 1990s, the country passed a law to govern the budgetary management of contingent liabilities. Currently, the Ministry of Finance is responsible for identifying, managing and mitigating any implicit or explicit risks that may affect public finances. The PPP process requires a macro- and micro-level risk analysis for each project, including the task of calculating the probability of risk occurrence and potential impacts. The methodology employed includes simulation and parametric models to value contingent liabilities for those projects with substantial or high-impact risk. Contingent liabilities include revenue guarantees (e.g. minimum revenue guarantee), currency risk and geological risk. It must also be determined whether each project requires a contribution to the Contingency Fund, which is supervised by the Ministry of Finance.

*Source: Reyes-Tagle 2018a*

## 7. Conclusions

PPPs can be a key mechanism for the development of infrastructure and the provision of public services; they provide governments better quality and greater efficiency and effectiveness of delivery, while also attracting private equity. PPP projects should be subject to the same fiscal scrutiny as other types of public investment projects. However, in practice the nature of PPPs can make them difficult to manage in fiscal terms. In contrast to other types of delivery mechanisms, PPP contracts entail the transfer of risk to the private partner over the entire project implementation horizon.

PPPs constitute public investment projects just like any other traditional public delivery mechanisms and should therefore be subject to the same level of scrutiny. However, because PPPs entail a greater transfer of risk to the private sector than other traditional public investment mechanisms, their fiscal impact must be measured by further measures to complement traditional fiscal frameworks.

Adequate fiscal impact management makes it possible to control both short- and medium-term commitments (significant in traditional public investment) as well as medium- and long-term commitments (significant in PPPs). Factoring in future costs and risks to be assumed over the entire horizon of PPP contracts is critical to achieve fiscal sustainability. In Brazil, the IMF (2017) estimated PPP assets and liabilities for 2014 at 4.6% of GDP, divided between central government (2.2%) and subnational governments (2.4%). In Peru, the accumulated stock of firm commitments under PPP projects through to 2019 accounted for 14.5% of GDP, while contingent commitments represented 1.4% of GDP. In Colombia, the MHCP has reported that future PPP obligations accounted for 10% annually of the nation's general budget from 2012 to 2019 (MFMP, 2019). In 2019, these commitments represented 0.28% of GDP. Meanwhile, aggregate contingent commitments amounted to 0.86% of GDP.

The main fiscal costs generated by PPPs tend to be deferred (spread over a long-term horizon) or contingent (associated with risks retained by the government) and are therefore not controlled by traditional medium-term fiscal control mechanisms. In response to this, several countries have been implementing measures to better control the fiscal impact of PPP projects.

Responsible fiscal impact management requires: (1) clear fiscal affordability rules, (2) methodologies for identifying and quantifying fiscal commitments (costs and risks), (3) budgetary frameworks and accounting or reporting rules that adequately incorporate the fiscal impact of PPP projects, and (4) monitoring of direct costs and risks over the life of the project.

One of the main measures here is the adoption of IPSAS accounting standards, under which PPP fiscal commitments are recognized on an accrual basis. Traditionally, the countries have applied cash flow-based commitment recording, which has resulted in medium- and long-term commitments not being recorded in the fiscal accounts. Brazil, Chile, Colombia, Costa Rica and Peru are now migrating towards the use of IPSAS accounting. In Brazil, moreover, the fiscal



regulatory framework insists that federal subsidized PPP payments be treated as debt. PPP commitments are still not adequately recognized in the budgets, which could lead to distortions in the selection of PPPs relative to other public delivery mechanisms. In Brazil, the IMF (2017) estimates that annual investments in PPPs equivalent to 1.1% of GDP are not reflected in any fiscal accounts or statistics. In Colombia, the IMF (2018) estimates PPP obligations not included in fiscal accounts at 1.4%. In Peru, the IMF (2015) notes that PPP obligations are significantly underestimated. Failure to adequately measure the fiscal impacts of PPPs can affect the sustainability of individual projects, as well as the long-term fiscal sustainability of countries. While Brazil, Chile, Colombia, Costa Rica and Peru appear to be migrating to the accrual basis of accounting for the effective recognition of fiscal commitments, it is unclear how much progress they have made in this direction.

Colombia and Peru rely on long-term commitment quantification measures to plan the implementation of PPP projects. In Colombia, the net present value of the total firm and contingent fiscal commitments under PPP projects is quantified over 30 years as part of a long-term budget planning mechanism, and in Peru the present value is quantified for the entire life horizon of the projects and included in the national budget framework.

Within the region, Chile, Colombia and Peru are notable for applying stochastic estimation methodologies for the estimation of contingent commitments. In all three countries, both methodologies and estimates are published for all national PPP projects. Uruguay's regulatory framework also provides for the use of stochastic estimation methodologies for contingent PPP commitments.

To control unforeseen costs in PPP projects, Colombia uses a contingency fund to mitigate the impact of contingent commitments. More recently, a liquidity fund was set up in Paraguay whereby provisions must be posted to cover the total amount of firm commitments and 10% of contingent commitments. Eight countries within the region apply fiscal limits for their PPP projects. Furthermore, Brazil and Panama set limits on the current revenues of central or state governments. In Colombia, Panama, Paraguay and Peru, limits are applied to the sum of firm and contingent commitments as a percentage of GDP. Mexico applies limits on the percentage of expenses.

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# ANNEX A

## Methodologies for estimating contingent commitments

In Colombia, the methodological guide draws a distinction between the valuation for risks in the pre-operational stage from those in the operational stage. The methodologies consider different cases, depending on the availability of information. In general terms, the methodology for the pre-operational stage envisions the definition of the case based on available information, the definition of parameters (minimum, expected and maximum), the calibration of the corresponding PERT function to be modeled, and the calculation of the risk value. The methodology for the operational stage involves, depending on the information available, applying an econometric model with the aim of obtaining long-term projections and scenario analysis. The guide also explains how to estimate demand risk, differentiated tariff risk, non-collection risk and risks related to revenue generation, among others.

In Chile, MRGs (minimum revenue guarantees) are the main contingent commitment in Chilean concessions. Irwin and Mokdad (2010) and Gonzalez (2015) remark that such guarantees are the main risk mitigation instrument used. MRGs guarantee concessionaires a minimum level of revenue for a certain number of years throughout the operation phase of a transport project. If the revenue generated in a given year is less than the MRG stipulated in the contract, the Ministry of Public Works pays the difference the following year. Each year the Budget Department (DIPRES) publishes the 2019 Contingent Liabilities report, listing all contingent commitments generated under MRGs, by project, and those generated by arbitration proceedings. The Liabilities Report describes the methodology for calculating contingent commitments.

Maximum exposure per MRG is estimated by reference to a scenario with no traffic where the Ministry of Public Works pays the maximum theoretically possible. The maximum exposure under the 23 concessions with MRG was US\$ 3,687 million as at 2019. A model comprising two main elements is used to estimate the expected cost value of a MRG: a mathematical representation of the form of payment of the guarantees, and a stochastic model of the traffic revenues used to make the projections. The model requires assumed revenue growth rate parameters, revenue volatility and correlations between revenues for different roads. The main outputs of the model are: the expected value of future MRG payments, the variability of payments, the probability distribution of payments, and the present value of payments, taking into account their timing and risk characteristics. The expected present value of all concessions with MRG was approximately US\$450 in 2019.

In Peru, the methodological guidelines envision three steps for estimating contingent commitments: estimation of the underlying value, estimation of the trigger value, and estimation of the contingent commitment. Whether and when these steps are taken will depend on the information available. The underlying is a security modeled as a function of multiple variables.



The activation value depends on the conditions set out in the contract to generate payment of the commitment. Lastly, the value of the contingent commitment is obtained by defining the underlying value after running Monte Carlo simulations.

In 2017, the Uruguayan Ministry of Economy and Finance (MEF) published a methodology for estimating contingent liabilities in a bid to ensure compliance with the provisions of the PPP Act (Act 18,786). This particular methodology consists of a qualitative analysis to identify the most material risks. For these risks, a quantitative assessment of the probability and level of impact is also required. If the associated liability is linked to an underlying variable traded in any market (e.g. foreign exchange hedge or interest rate), the Black-Scholes formula is used. If the underlying variable is not an asset or financial instrument, a simulation is run assuming a triangular distribution where there is no information on the distribution function of the variable, or through the Monte Carlo model where the distribution function of the variable to be estimated is known.

## ANNEX B

### Examples of information asymmetries in PPPs

Private partner (concessionaire)	Public partner (government)
<p>The capacity, competence or skills of the company to carry out the PPP project and the nature of its actions. For example, risk allocation may be affected by the negotiation skills of the parties involved, with ultimately unsatisfactory results for the project.</p> <p>The degree of effort made by the company. The government observes the output of the PPP project, though in the event of low output it cannot tell whether this is due to a lack of effort on the part of the private partner or due to factors beyond the control of the private partner (moral hazard).</p> <p>Technical aspects and project feasibility. For example, the stability of the land, or the quality of the inputs used to build the asset.</p> <p>The private developer maximizes its profits, while social surplus is not maximized. Therefore, the impact of decisions on consumer surplus is ignored. The public entity may rely on assessments carried out by the private partner, whose objectives may not be aligned with the public interest.</p> <p>The operator may have an incentive to strategically default if the benefit of not repaying the loan outweighs loss of control of the asset.</p>	<p>The true scope of the project. The government may have incentives to expand or modify the project once the implementation phase has begun. For example, to scale up the size of the project once approved, also known as the illusion of affordability (European Court of Auditors, 2018).</p> <p>The government may have no incentive to invest the full investment cost in the budget to avoid checks and balances from Congress or external audit units (moral hazard).</p> <p>Officials may refuse to complete a project, as it may involve political costs that symbolize weakness or lack of management control.</p> <p>The soft budget constraint arises where a sector ministry's expenditure to revenue ratio is relaxed because the overspending will be paid for by some other institution or body, typically the Ministry of Finance. The decision maker expects such help with a high degree of probability, which therefore influences his behavior.</p> <p>Additional requirements that will likely lengthen the procurement process by creating delays and offsetting efficiencies identified in the early stages of the project.</p>

Source: Taken from Reyes-Tagle et al (2018a).