FinBRAZEEC

Financial Instruments for Brazil Energy Efficient Cities

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List of acronyms

ABRACE	Associação Brasileira de Grandes Consumidores Industriais de Energia e de Consumidores Livres
ACEEE	American Council for an Energy Efficient Economy
ANEEL	Agência Nacional de Energia Elétrica
BNDES	Banco Nacional de Desenvolvimento Econômico e Social
CEF	Caixa Econômica Federal
CIF	Climate Investment Funds
CNI	National Confederation of Industry
CTF	Climate Technology Fund
DPSP	Dedicated Private Sector Programs
EE	Energy Efficiency
ESCOs	Energy Service Companies
ESL	Efficient Public Street Lighting
ESMAP	Energy Sector Management Assistance Program
FinBRAZEEC	Financial Instruments for Brazil Energy Efficient Cities
GCF	Green Climate Fund
GF	Guarantee Facility
GHG	Greenhouse Gas
GIF	Global Infrastructure Facility
IBRD	International Bank for Reconstruction and Development
IEE	Industrial Energy Efficiency
IFC	International Finance Corporation
IPF	Investment Project Financing
MDB	Multilateral Development Bank
NDC	Nationally Determined Contribution
PAD	Project Appraisal Document
PEE	Programa de Eficiência Energética das Concessionárias de Distribuição de Energia Elétrica
PPIAF	Public-Private Infrastructure Advisory Facility

PPP	Public Private Partnership
PROCEL	Programa Nacional de Conservação de Energia Elétrica
SPV	Special Purpose Vehicles
TWh	Terrawatt hours
UNDP	United Nations Development Programme

Executive summary

1. The World Bank's project Financial Instruments for Brazil Energy Efficient Cities - FinBRAZEEC is a good example of how the resources from the Climate Investment Funds (CIF) and the Green Climate Fund (GCF) can complement Multilateral Development Bank (MDB) resources so that blended financing facilities can leverage important investment opportunities. An example where availability of finance has been identified as a bottleneck for a long time is the Brazilian street lighting and industrial energy efficiency sector.

2. The FinBRAZEEC project offers a structured financing facility for investments into energy efficient streetlighting and industrial energy efficiency in Brazil. In order to provide a financing package to private sector agents, the local bank Caixa Econômica Federal (CEF) is designing a loan facility and a guarantee facility combining International Bank for Reconstruction and Development (IBRD) and GCF loans, a GCF grant and a Climate Technology Fund (CTF) reimbursable grant. Beneficiaries are municipalities and private sector entities who want to invest in public street lighting and industrial energy efficiency respectively. The specific combination of climate finance instruments together with a callable loan from IBRD allows the facility to achieve a scale large enough to trigger billion-dollar investments and give rise to the expectation that significant improvements of public service delivery (through street lights) and industrial productivity (through industrial energy efficiency) can be achieved.

3. The example shows that even in Middle Income Countries like Brazil, large amounts of funds are necessary to trigger certain developments. Without the large-scale concessional financing from the GCF and CTF, a multilateral financing initiative for energy efficiency in Brazil would not have been possible on that scale. In fact, the small scale of funding might be one of the reasons why earlier efforts have not led to sustainable energy efficiency improvements in Brazil. Small amounts of grant financing are also very important to build capacity and project pipelines. While the case study shows that blending is helpful to make low-cost capital with long tenors available, it also shows that blending could be much simpler and more synergistic if timelines, templates and monitoring requirements would be harmonized across the financial mechanisms. Still, if these operational challenges can be solved, blending resources across different climate finance mechanisms reduces opportunity costs and risks for each of the funds.

1 Overview of sector and country

4. **Brazil, the seventh largest economy of the world,** has a population of approximately 200 million people. As **an upper-middle-income country it has made significant gains in poverty reduction in recent decades, but inequality and macroeconomic instability have hampered economic growth.** While its economic and social progress between 2003 and 2015 brought 25.4 million people out of poverty, Brazil's economy also experienced a strong depression between 2006 and 2016. Only in 2017, first signs of growth and stabilization showed.[1]

[1] IBRD PAD

5. Availability of finance has been made more difficult with the economic swings, and the full investment strength has not been recovered. While inflation rates have dropped – from 10.7 percent at year-end in 2015 back down to 6.3 percent by end-2016 and 3.6 percent by May 2017, unemployment rates are still high.[2] After the economic crisis in 2014, foreign direct investments fell from US$97.2 to US$74.7 billion in 2015, recovering to US$78.2 billion in 2016, only to fall again to US$70.3 billion in 2017.[3]

6. Infrastructure investments have been identified by the World Bank as one way to stimulate growth and employment, and Public-Private Partnerships (PPPs) are in the focus of Brazil's authorities as private financing is needed to close the investment gap. As a model, PPP is an established modality in Brazil, but private sector project finance is still not coming forward. Instead, the publicly owned development banks Brazilian Development Bank (BNDES) and CEF financed the infrastructure investments – together they accounted for 62 percent of the total investments in infrastructure in Brazil in 2014.[4] BNDES in particular was dependent on the National Treasury as its main creditor since 2009. But with the recession and the macro-fiscal crisis in 2014, the treasury was no longer able to provide low cost funding, which meant that particularly BNDES has incurred lower disbursement rates. A recent policy reform on the lending rates at which BNDES can onlend funds will lead to a rise of BNDES lending rates, and ultimately convergence with the market rates.[5] Attracting private investments into infrastructure, e.g. from pension funds, is now more urgent than ever. Their alternative investment are Brazilian government bonds which also show falling returns. But for long-term fixed income investments they would like to have some de-risking.[6]

7. On the other hand, Brazil also needs to invest in energy efficiency in order to meet its greenhouse gas (GHG) targets. In its Nationally Determined Contribution (NDC), Brazil expresses the intention to commit to GHG emission reductions by 37 percent below 2005 levels in 2025. To ensure this, the (i)NDC declares that emissions intensity shall be reduced by 66 percent until 2025, and by 75 percent by 2030, in comparison to 2005. In the energy sector alone, energy efficiency gains of 10 percent (105 TWh) are envisioned. For industry, new standards for clean technology, further energy efficiency measures and low carbon infrastructure are envisioned to reach this objective.[7] So far, the American Council for an Energy Efficient Economy (ACEEE) ranks Brazil last under the 16 economies in terms of industrial energy efficiency, implying that the sector has enormous potential for cost-effective energy savings.[8] Over the last decade, the energy intensity of the Brazilian economy has been more or less stable with a slight upward trend while the global trend is downward.[9]

8. The project builds on earlier efforts by Brazil to enhance energy efficiency. The program PROCEL has been implemented under the purview of the national utility Electrobras since the 1990s. Between 2001 and 2007, PROCEL was also partially supported by an IBRD programme financed by a GEF grant. That grant provided mainly technical assistance in the form of a testing lab and some awareness raising activities. Another more recent energy efficiency programme is the PEE (Programa de Eficiência

[2] IBRD PAD
[3] https://www2.deloitte.com/br/en/pages/doing-business-brazil/articles/evolution-of-foreign-investment.html
[4] IBRD PAD page 55
[5] IBRD PAD page 56
[6] McKinsey / Levy interview
[7] iNDC of Brazil
[8] IBRD PAD
[9] PAD, page 61

Energética das Concessionárias de Distribuição de Energia Elétrica), in which utilities under regulation of the national power sector authority (ANEEL) have to invest 0.5 percent of their revenues into energy efficiency projects.[10] The Energy Efficiency Plan of 2011 established a special tariff to finance these energy efficiency investments.[11] In order to fill gaps in these plans with respect to energy consuming groups that have not been able to benefit from these programs, the FinBRAZEEC programme supports energy efficiency efforts in municipalities and industry.

1.1 Municipal street lighting

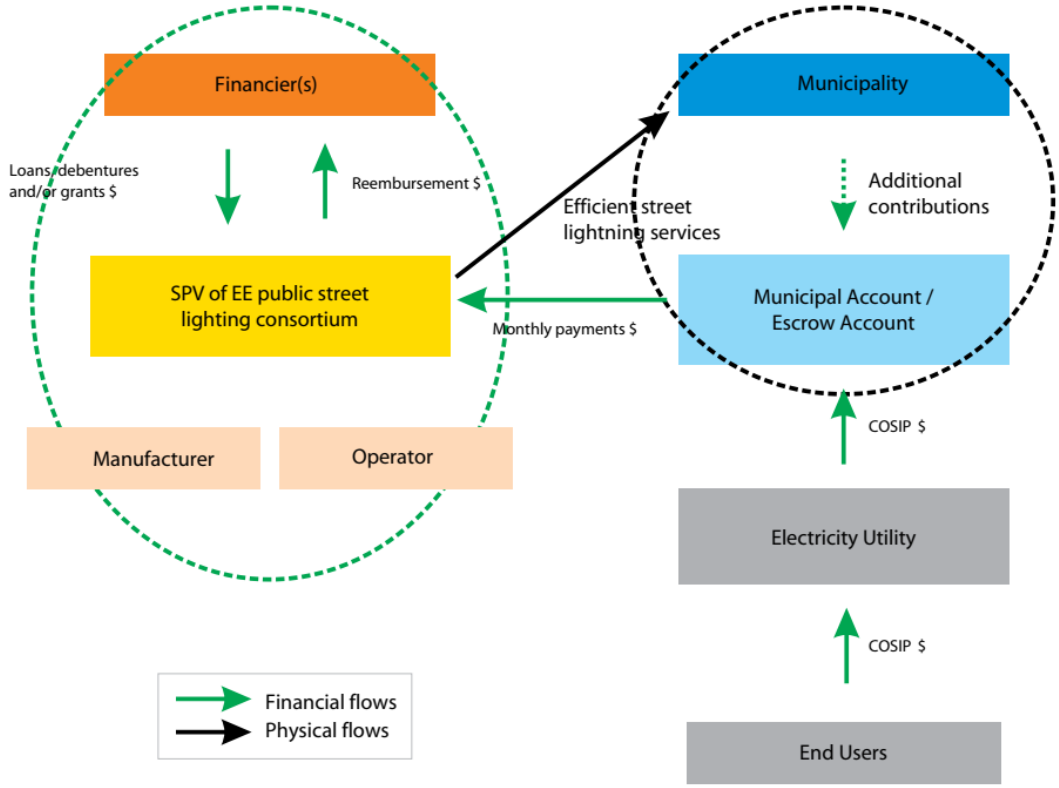
9. Brazil has more than 18.5 million light-points which cause about 3 to 4 percent of total electricity consumption in Brazil, and about 5 percent of peak consumption.[12] The prevailing technology is high-pressure sodium and mercury vapor lamps. By using LEDs, cities could save between 50 and 80 percent of electricity and 40 percent of operation and maintenance (O&M) costs.

10. A number of analyses and test cases, including through the Energy Sector Management Assistance Program (ESMAP), the Public-Private Infrastructure Advisory Facility (PPIAF) and the International Finance Corporation (IFC) advisory, have taken a deeper look at the challenge of making street lighting more efficient in Brazil. LED technology costs have come down sufficiently to make these investments economically viable. But new regulations require municipalities to take on street lighting assets that used to be owned and operated by the electricity distribution companies. This puts another financial burden on the backs of municipalities. Constrained municipal balance sheets, including strict limitations on borrowing, become a new and significant barrier for efficient street lighting operations. The analyses and a pilot in Belo Horizonte supported by the World Bank's ESMAP programme demonstrated that a private sector concession model for public street lighting is feasible if it is implemented by private Special Purpose Vehicles (SPVs) or public private partnerships under a long-term service or concession contract.

11. Yet, commercial banks will not be able to provide loans in line with the concession period of 15 years, and they will also not provide project (loan) financing without some kind of credit enhancement. The challenging macroeconomic environment, the potential of default by the municipalities, and high preparation costs make this investment opportunity too costly and risky at current market conditions. The ESMAP study proposes several options for financial support. Figure 1 is an example that would be able to provide low cost capital, as well as also some technical support for developing the special purpose vehicle and the technical specification for each municipality. FinBRAZEEC is designed building on these considerations, supporting specifically the Financier to the SPV with the means to lend to SPVs.

[10] GCF project document, page 21
[11] GCF project document, page 21
[12] "Lighting Brazilian Cities," Meyer et al.: http://documents.worldbank.org/curated/en/679281521548635917/Lighting-Braziliancities-business-models-for-energy-efficient-public-street-lighting

Figure 1 A possible private investment structure for municipal street lighting in Brazil



Source: Meyer et al 2017

1.2 Industrial energy efficiency

12. With respect to industrial EE, consultations with the industry association National Confederation of Industry (CNI) have identified more than 150 projects which are ready for financing but cannot be funded, among other things due to the high capital costs.[13] They include automation in furnaces, regenerative burners, heat recovery efficient motors, frequency-controlled pumps, and other examples. Most of these have short payback periods (up to 3 years) and high Internal Rates of Return (IRRs). There are also options for more capital-intensive projects, such as co-generation, which may have longer paybacks of 7 years and lower IRRs (e.g. 20 percent).[14] Potential for EE should also be significant in medium and small industries and commercial establishments.

13. But there are multiple challenges to implementing these projects including but not limited to financial barriers: industrial companies are focusing on their "core businesses", including for a tight funding situation and significant debt exposure, even if these companies might have sufficient net operating income to pay off the investment in energy efficiency opportunities with short payback periods. Investors and banks perceive large industrial projects as rather risky, including for a lack of knowledge about the technologies.

[13] World Bank PAD
[14] World Bank PAD, page 60

2 Context and timeline of CIF and GCF interventions

14. Efficient Public Street Lighting (ESL) and Industrial Energy Efficiency (IEE) are sectors with comparatively low construction and safeguard risks and comparatively high energy savings. The public banks can leverage significant amounts of capital with a credit enhancement structure that provides long-term financing at attractive costs of capital.[15]

15. In order to prepare the project, it was necessary to develop deep understanding of municipal electricity consumption and savings opportunities. This was supported by an ESMAP grant[16] as well as a PPIAF grant[17] that allowed to collect first-hand experiences with concession models in two Brazilian cities – Belo Horizonte and Rio de Janeiro – which were analyzed with an ESMAP methodology to understand the potential energy savings.[18] The study recommended a public private partnership for Belo Horizonte, associated with investments of US$100 million. When this solution was ultimately implemented, the overall contract caused Belo Horizonte US$130 million less in costs than what they had planned to spend.[19] Similarly, based on the recommendations of the study, Rio de Janeiro is now working with IFC to structure and launch a PPP tender for street lighting.

16. On this basis, ESMAP provided further funds to study street lighting infrastructure and needs of further cities and ultimately the whole sector in Brazil. [20] The ESMAP study showed for example that without any external support, 90 percent of the cities representing 50 percent of the light points would introduce LEDs to their public lighting systems very slowly as they had to rely on self-financing. Financial instruments, including new business and concession models but also including the provision of financial means and de-risking tools were the interventions that were identified as the most effective ways to mitigate the investment delay. [21]

17. In the IEE sector, the project builds on work already done by ABRACE[22] as well as earlier PPIAF-funded technical assistance to understand investment opportunities. Energy Service Companies (ESCOs), i.e. contracting out some of the energy improvements in performance-based contracts to specialized energy efficiency and investment companies, have been identified as one of the solutions.

[15] IBRD PAD page 17
[16] https://www.esmap.org/node/57541
[17] https://ppiaf.org/activity/brazil-financing-options-municipal-energy-efficiency-projects-city-rio-de-janeiro
[18] https://www.esmap.org/node/57541
[19] https://www.esmap.org/node/57541
[20] https://www.esmap.org/node/57541
[21] "Lighting Brazilian Cities," Meyer et al.: http://documents.worldbank.org/curated/en/679281521548635917/Lighting-Braziliancities-business-models-for-energy-efficient-public-street-lighting
[22] The Brazilian association of large industrial energy users, Associação Brasileira de Grandes Consumidores Industriais de Energia e de Consumidores Livres

Table 1 Timeline for ESMAP Study and FinBRAZEEC

Date	ESMAP	FINBRAZEEC		
		GCF	CTF	IBRD
2013	TRACE assessments of Belo Horizonte, Rio de Janeiro			
June 2016	Forum on "Business Models for Energy Efficient Public Lighting" held in São Paulo in June 2016			Project preparation
April 2017	Full Report "Lighting Brazilian Cities"			
16 Oct 2017		Submission to GCF		
26 Feb 2018			Submission to CTF	
March 2018		Approval of GCF component		
April 2018			Comments of CTF Board members	
May 2018			Approval of CTF Trust Fund Committee[23]	
29 June 2018				Approval of IBRD component
January 2019			Implementation start	
December 2033			Implementation completion	

Source: project documents for IBRD, CTF, GCF; IBRD project website; ESMAP Annual Report 2012

18. Building on these analyses, the project FinBRAZEEC supports private investments in the areas of efficient street lighting and industrial energy efficiency. **The Project has two components** (cf. Figure 2**)**. Component 1 consists of a facility for energy efficient public street lighting. It supports the local partner CEF in providing syndicated loans together with and commercial lenders, supported by credit enhancement from a Guarantee Facility (GF) which is also managed by CEF. In component 2, technical

[23] https://www.climateinvestmentfunds.org/projects/dpsp-iii-financial-instruments-brazil-energy-efficient-cities-finbrazeec

assistance will be provided to CEF to strengthen its internal capacity for implementing the project, support the startup costs of the EE Facility, and help develop a pipeline of high-quality subprojects.[24]

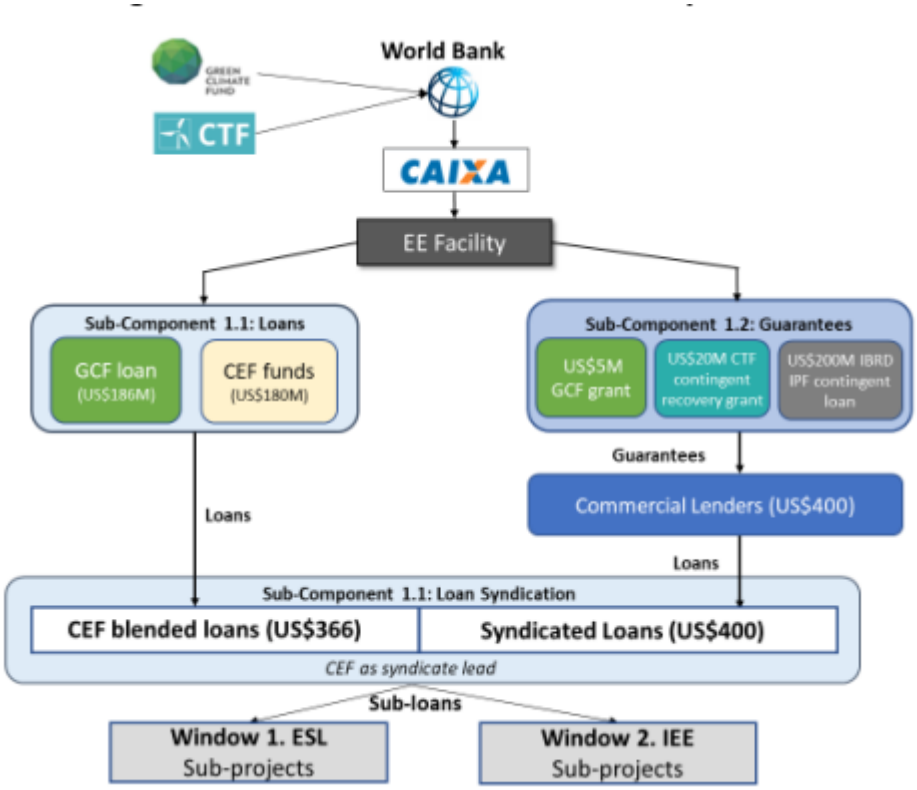
Table 2: FinBRAZEEC Sources of Funding by Component

Project components	Total	IBRD IPF loan	GCF Loan	GCF grant	CTF contingent grant	CEF funds	Commercial lenders	Equity	Bank executed TA
Component 1: EE Facilty	**1319**	**200**	**186**	**5**	**20**	**180**	**400**	**328**	**-**
*Sub-component 1.1: Loan syndication**	1094	-	186	-	-	180	400	328	-
Sub-component 1.2: GF	225	200	-	5	20	-	-	-	-
Component 2: TA	**5**	**-**	**-**	**4**	**-**	**-**	**-**	**-**	**1**
Total Project Funding	**1324**	**200**	**186**	**9**	**20**	**180**	**400**	**328**	**1**

** This includes $766 of sub-loan debt from the EE facility, as well as $328 of sponsor equity expected to be part of the sub-project financing*

Source: PAD

Figure 2: Indicative FinBRAZEEC EE Facility Structure



Source: PAD

19. The facility expects to leverage a total investment in energy efficient streetlighting and industrial energy efficiency of US$1,096 million. Of this, US$328 million will be contributed by the equity sponsors, and US$366 million will be loans financed from the GCF (US$186 million) and CEF (US$180 million). The remaining US$400 million of debt financing will be sought from several commercial banks through the syndication of loans. In order to de-risk these funds further, the CTF reimbursable grant

[24] IBRD PAD, para 19

of US$20 million and a callable loan from IBRD (a US$200 million IBRD Investment Project Financing) will be the basis for a guarantee facility. Neither one would have sufficed without the other. This subcomponent will also benefit from the US$5 million GCF non-reimbursable grant (cf. Table 1). US$4 million from the GCF grant and around US$1 million from already secured Bank-executed GIF and ESMAP trust funds will be available for technical assistance.

20. Caixa Econômica Federal (CEF), the implementer, is the second largest state-owned bank and the third largest bank in Brazil. The World Bank will support CEF in the implementation of the Project, on the one hand considering CEF's compliance with international banking regulations, and on the other with technical assistance funds under Component 2 – these will be utilized to help structure the Guarantee Facility, build capacity at CEF, and build a pipeline of projects.[25]

21. With this construct, the facility will enable local private sector actors to receive loan funding for investing in industrial energy efficiency, and in streetlighting, in public-private partnerships with the municipalities who are able to provide contracts with a duration of 15 years. One important aspect is the ability of CEF through FinBRAZEEC to make capital available at longer tenors and lower interest rates than currently available in the market. High capital requirements have been identified as an important barrier to revamping municipal street lighting systems with LEDs.[26] Municipalities would slowly replace burned-out lamps in the existing inventory with LEDs. Major overhaul or reinvestments would take place only in a very slow and limited fashion, as funds would be limited by constraints on municipal funding. With the project, the affordability barrier will be reduced, and private sector funds will be brought into this investment – on the side of equity investors but also commercial lenders through the syndicated loans that CEF will be structuring.

3 Findings regarding synergies

22. In this project, concessional loans and grants from the GCF, and grants from the CTF, ESMAP, and GIF converge with callable loans from the IBRD to provide the optimal composition from long-term and comparatively low-cost capital and financial products for the necessary investments in Brazil. Synergies on the level of the financial mechanisms and MDB complement synergies locally at the second biggest bank of Brazil. The overall financing package makes it possible for local private sector actors to have access to an appropriate range of loans and guarantees for investments into energy efficiency infrastructure and industrial energy efficiency.

3.1 Synergies on the level of the project outcomes and stakeholders

23. **This project blends a GCF loan, a GCF grant, an IBRD contingent loan, and a CTF (reimbursable) grant in order to make available loans with acceptable interest rates and long tenor, provide a guarantee facility, and minimize the cost of its operation.** The obvious synergy of the different sources of climate finance here is that the interest rates and conditionalities of the different funding sources can be

[25] PAD, para 65
[26] PAD

blended together in such a way that the resulting cost of capital for the borrowers is affordable, their credit risk is mitigated through the risk facility, and the funding is used in the most efficient way.

24. The experts estimate that the internal rate of return of efficient street lighting concessions could be around 12 percent. Industrial energy efficiency, on aggregate, might yield an internal rate of return of 17 percent. The concessions for the municipal street lighting typically have a contract duration of 15 years. Table 3 shows the results of the business case from the viewpoint of the investor into such a concession. "Without the benefit of the GCF concessional loan, the cost of debt would increase by approximately 20 percent and the tenor would be shorter, compromising the viability of the subprojects."[27] Pure private sector financing in Brazil would be available at maybe 17 percent, and blended with CEF resources would bring this potentially down to 15 percent. Through blending with concessional funding from GCF, it is possible to reduce this to 13 percent.

Table 3: Economic and Financial Appraisal Summary – Aggregated EE Facility Portfolio

Sub-sector	Economic Analysis			Financial Analysis			
	Investment	Expected lifetime GHG reductions	EIRR (real)	Investment	Financial NPV	IRR (real)	Payback period
	US$ M	*$MtCO_2e$*	*%*	*US$ M*	*US$ M*	*%*	*years*
ESL	479.8	3.9	39%	767.3	148.9	12%	6.1
IEE	295.5	8.6	37%	328.3	112.2	17%	1.5
Total	775.3	12.5		1,095.6	261.1		

Source: World Bank PAD page 30

The base case assumes average annual sub-loan default rates of 10 percent and capital reserve requirements of 15 percent of the total annual value at risk (estimated requirement to achieve BBB credit rating 24).

25. For the guarantee facility the project combines funds from CTF and GCF and IBRD with special conditions which allow the IBRD loan to serve as a backstop for the partial risk guarantee. During the design phase, IBRD invested significantly in optimizing this fund structure by testing several setups in a thorough sensitivity analysis. One of the cases investigated was to use the IBRD loan could for the loan capital, but instead the project uses it as callable capital to back the partial risk guarantee. While Brazil is willing to take out such a loan, as a Middle-Income Country it has a limited IBRD envelope at its disposal. The use of a callable loan minimizes the cost of capital for Caixa.

26. For the Guarantee Facility to be effective, it needs to have low fees associated with it. By holding a high minimum reserve, a de facto credit rating of up to AAA can be achieved which lowers the costs of operating the facility. But drawing down on the IPF loan for providing the minimum reserve would require collecting about US$ 10 million in additional fees from the borrowers. Instead, the project uses the CTF contingent recovery grant (US$ 20 million) and the GCF grant (US$ 5 million) complemented by backstopping the facility with the IBRD IPF loan. The GCF grant and then the CTF contingent recovery grant, can absorb some of the earliest risks and defaults, supporting CEF in bringing the risk level of the structure to a level that is acceptable to the CEF Board and the Government of Brazil. This minimizes the fee and enhances the viability of the business case for the investors.

[27] World Bank PAD para 58

27. This deliberate placement of each type of finance thus brings out the optimal characteristics of each of them, serves to distribute risks according to the risk appetite of the various instruments, and to lower the total costs of loans and guarantees.[28] Without these two aspects – providing concessional loans and a sophisticated guarantee facility – the costs of capital would significantly reduce the pipeline as fewer attractive investment opportunities would be viable under a higher fee regime. Specifically, without the GCF contribution, insufficient capital would have compromised the scale and impact of the project, and the CTF contingent recovery grant helps cover the expected first-loss gap which is estimated to be 5 percent of the total investment.[29]

28. Last but not least, the **availability of grant financing for Brazil is very limited**, even including grants from climate finance mechanisms. The project demonstrates how to utilize these grants for activities that will not directly generate an income flow (like feasibility assessments or capacity building with the CEF) and thus trigger projects that would not be developed without these funds. CEF's capacity to develop a guarantee facility, a dedicated lending line and a syndication work stream, will be much stronger with the grants from the GCF, ESMAP and the GIF.

29. Thus, the combination of concessional finance from both, the GCF and the CTF, and its complements in the form of grants, are highly synergistic. What is more: without them, the municipalities would probably not be able to finance energy efficient city lighting.

3.2 Synergies on the level of the climate finance mechanisms and agencies

30. The interplay between the technical assistance facilities and the climate finance funds also deserves a short discussion. **The project incorporates lessons learned from the implementation of similar projects and instruments.** Similar efforts to promote EE investments with guarantee facilities have also been funded from GEF funds, including IFC's China Utility Energy Efficiency Program and the World Bank's India Partial Risk Sharing Facility for Energy Efficiency project (P128921) which includes cofinancing from GEF and the Green Climate Fund. The World Bank is also implementing several technical assistance activities to support the Government of Brazil on energy sector reform and carbon markets. These include an advisory project on the power and gas sector reforms, a proposal to restructure the US$ 50 million technical assistance lending programme for the implementation of the energy reform agenda, and some advisory services under the World Bank's Partnership for Market Readiness with respect to carbon pricing instruments that can create an additional incentive mechanism for energy efficiency in Brazil. By pooling the knowledge from all these interventions, the World Bank can link the global and local experiences and best practices and adapt them to the situation on the ground.

Box 1 Justification for the combination of funding streams from the GCF funding proposal[30]

- Concessional lending to private partners is required in the current context of high local interest rates in Brazil, the high volatility of the exchange rate which triggers high hedging costs, as well as municipal credit risk in the case of public street lighting. Working with GCF also attracts the interest

[28] IBRD PAD, page 61
[29] IBRD PAD, page 109, para 70
[30] Quoted from GCF funding proposal

of local financial institutions and provide a "seal of approval" on the quality and perception of climate-friendliness of investments, attracting interest from other financiers.

- The World Bank IPF contingent loan is needed to improve the credit rating of the facility to attract a wider range of investors and to reduce the facility's cost of funding (including loans and potentially green bonds). It will provide liquidity to the facility and help with the crowding-in of investors when CEF seeks other financiers to participate in the facility. In this facility, the IPF contingent loan plays the role of a guarantee, but with additional flexibility – a more agile process within the World Bank, faster disbursement in case of a lack of liquidity at the facility, and more flexible financial terms to better suit the specific needs of the borrower at the time of disbursement.
- Grant funding of $5 million is needed to support essential technical assistance (including training for CEF personnel) and early operational costs, for which no bank or private investor is willing to invest. In the case of Industrial EE, these funds will be used to support technical studies and operational costs during the initial labor and investment- intensive months of operation, before revenues are sufficient to support these functions. In the case of street lighting, grant funding will be used to support cities' preparation of high-quality sub-projects. The World Bank will contribute $1 million to support these technical assistance activities, with the remainder being provided via a GCF grant.
- The participation of private financiers is an important outcome of the FinBRAZEEC project, in order to demonstrate the viability of private sector investment in urban EE sectors in Brazil at risk-adjusted returns and create a new asset class for energy efficiency.

31. In addition, **the World Bank in this case was able to draw on significant internal funding for technical and prefeasibility assessments**. So far, in addition to the study of ESMAP, the World Bank's Global Infrastructure Facility (GIF) has provided US$ 0.5 million to help preparing a pipeline of public street lighting PPP projects which, later on, have the possibility to apply for financing from the EE Facility. The GIF is supporting the preparation of prefeasibility studies in selected cities as well as developing the first stage of a toolkit for PPP street lighting in Brazil. GIF is ready to provide a total of 4 million.[31]

3.3 Local institutions

32. The facility will be implemented by CEF, which is one of the main public providers of funding for municipalities and businesses. CEF will be responsible for the identification, appraisal, analysis of credit risks, approval, and investment (and/or credit enhancements) of a pipeline of EE sub-projects in the industrial and public street lighting sectors. CEF is familiar with the World Bank lending process and with many of the facility's potential clients and has decentralized technical skills to identify and appraise projects. **Building on this basis, the grant funding from the GCF will help CEF to develop a refined and complex financial product and build up a portfolio of investments.** CEF staff will be trained so that they will be capable of assessing and implementing innovative financial transactions. If the facility is successful, this training will be an important instrument to also help minimize the need for the guarantee facility to pay out risk coverage. If that is the case, i.e. if the grants can provide enough support so that the loans and guarantees are "priced right", in the long run, the guarantee facility might not be needed anymore for street lighting or industrial energy efficiency and it might be possible to use the same funds for a similar risk mitigation structure for another energy efficiency investment target.

[31] https://www.globalinfrafacility.org/sites/gif/files/GIFBriefs_PDA_April2018_Brazil%20Streetlight.pdf

4 Conclusions

4.1 Type of synergy: Blending from different funds

33. **The multitude of funding sources was necessary to achieve the overall size of financing required to bring this project across a critical threshold**. Specifically, as IBRD lending envelopes for middle income countries are restricted, and IBRD lending rates are comparatively high, the Green Climate Fund was able to provide a sufficiently large amount of money, to build the core of the facility.

34. **Each of the funds is utilized according to their respective comparative advantages and combined so that optimal concessionality can be achieved for the local borrowers.** The highest concessionality is associated with the grants (from CTF, GCF, GIF, and ESMAP) which are used judiciously and overall constitute 2.3 percent of the total project value of US$ 1.3 billion. They are the equivalent of 2.7 percent of the energy efficiency investments on the ground. They constitute 5 percent of the overall external finance package, or 14percent of the climate-specific finance package, consisting of GCF funds and CTF grant. They are needed to cover costs of technical assistance, setting up the Guarantee Facility, training staff at CEF, building a pipeline for lending, and buying down transaction costs. The concessional loans are provided at scale from the loan facilities of IBRD and GCF.

35. **Last but not least, from the viewpoint of the financing mechanisms, a project setup that uses multiple funds reduces the risk to each of the individual facilities**. For any project, all financing sources – the GCF, the CTF and the IBRD – run the risk of misallocating funds if no effective climate action can be done in the projects. In this case, if the CTF would not have been able to contribute US$ 20 million, the GCF would have had to allocate more funds. This would increase the risk of loss to the GCF. Even if the projects would achieve all its objectives, implementation takes a long time – and for this period, in this case 20 years, the GCF funds cannot be used for other projects. This means, the GCF is incurring opportunity costs. Potentially faster and more effective climate action could have been undertaken with these funds. Allocating fewer funds reduces the opportunity costs for the GCF – and in fact, the co-financing minimizes these opportunity costs for each of the participating facilities. Similarly, the risk of failure is shared between the funds, while the benefits are attributable equally to every one of them.

4.2 Technical assistance is still a key ingredient

36. **The climate finance and banking tools could not have done it alone.** Complex projects and refined financial structures and products – like the ones offered and developed in this case – require a large amount of preparatory work in addition to thorough technical and financial expertise and local knowledge. In this case, the World Bank was able to use ESMAP resources, and build on significant technical work financed by ESMAP, IFC Advisory, PPIAF and GIF. In addition, the Brazil project benefits from the experiences of the World Bank Group with similar facilities in China and India. However, it is not a given that such resources are available in all situations, and in fact only few institutions can provide this type of internal knowledge and the associated resources.

37. **GCF grants are mandatory for ensuring effectiveness.** Even though the programme has been sufficiently prepared for approval, and even though the PPP approach in municipal lighting has been

tested in Brazil, further analysis and structuring is needed for each investment project. The details of the Guarantee Facility need to be worked out and contracts need to be designed, during the implementation period of the project. The GCF grants will be used to cover these capacity building and transaction costs which ultimately helps to provide lending at competitive rates and keep financing fees low for the borrowers. It should also increase the attractiveness of the facility for CEF as well as for the borrowers.

4.3 Challenges for blending funds from different mechanisms

38. **Large amounts of funding are needed to make climate finance relevant in large countries.** In the last 25 years there were already two GEF interventions in the area of energy efficiency in Brazil, one with the IBRD and one with UNDP. Both did not make the necessary impact on the ground. In fact, Brazil is the only country in Latin America with rising levels of energy intensity and specific carbon emissions. It was not possible to identify how these three interventions were connected – but it is easy to assume that over two and a half decades, the funding was simply spread too thinly to have a meaningful effect and not all barriers have been removed. For a more thorough discussion of barriers and challenges in financing energy efficiency, several other studies are available, including from the Climate Investment Funds. For this project, the only way to bring together the critical amount of funding at the right levels of concessionality was a complicated blend from more than three different mechanisms.

39. **The approval process in this case might seem comparatively fast given that so many funds were involved.** The CTF funding was proposed through Phase III of the Dedicated Private Sector Programs (DPSP), which took a thematically based programmatic approach (as opposed to country-based investment plans, more commonly found for CIF programming). In this approach, CTF MDBs work together with the CIF Administrative Unit to build a CTF pipeline based on the country and MDB priorities. In the case of FinBRAZEEC and DPSP III, the process of approval by the CTF Trust Fund Committee was exceptionally expeditious: it took about three months to develop the project concepts and pipeline for the DPSP III Proposal, which was endorsed by the CTF Trust Committee at its meeting in December 2017. Following the approval by the GCF Board at its meeting in March 2018, FinBRAZEEC was then submitted to the CTF Trust Fund Committee for a two-week decision-by-mail on a no-objection basis. After exchanges of comments and responses by mail, the CTF Trust Fund Committee approved funding for FinBRAZEEC in May 2018. Subsequently, the World Bank team finalized project appraisal, negotiated with the Government, and in June 2018 FinBRAZEEC was approved by the World Bank Board. Often climate funding approval takes much longer, and this good example should be highlighted. But it might still be too slow for leveraging some fast-moving opportunities.

40. **Even here, the co-financing and co-leveraging of different funding streams is plagued by different policies between the funds.** While this project was approved within comparatively short time it still suffered from the need to harmonize review cycles and processes between the different institutions. Two very different sets of documents had to be developed for the IBRD and GCF approvals.[32] In particular the application of safeguards as well as the reporting and monitoring requirements were not aligned. While similar policies are asked of the project, the documentation needs to be provided

[32] For the CTF, the documentation is fully integrated into World Bank documentation.

separately and significant work needed to be put into the clarification of the safeguards for and with the GCF. As of this writing, the GCF funding is approved by all sides but not signed with the country, because the model contracts between the GCF and the IBRD were under negotiation between these two parties at the time of writing. However, the biggest challenge that needs to be resolved is a challenge with respect to supervision standards: While the World Bank requires biannual supervision and reporting while the loan is open (i.e. 15 years), the GCF requires tight monitoring until the GCF loan is paid back,[33] i.e. 5 years longer. This will require specific reporting arrangements with CEF.

41. **In theory, it would be conceivable that a Direct Access Entity structures such a funding proposal.** However, in practice it would be even harder for the Direct Access Entity to do this, not only because the access is currently limited to one fund. The sheer size of this project makes this a very daring endeavor for any national entity. CEF was not approved as an accredited institution for direct access at the time of the project preparation so that the World Bank was critical for accessing GCF funds as well as combining them with the other funds in the most efficient manner, making use of the new IBRD IPF contingent loan instrument.

42. And finally, even with this amount of concessional funding, **the resulting cost of capital for borrowers from the facility is still comparatively high.** The expected financial rates of return for the municipal lighting investment opportunities are considered to be 12 percent, and rather close to the lending rates of the facility. But it is a rate of return that would be feasible for a number of mitigation and adaptation options that have even longer-term and less profitable investments needs, including for example grid and railway infrastructure. While it would have been possible – and potentially preferable to make energy efficiency investments attractive – to blend the grants into the loan funding for a lower interest rate, the project found the grants more valuable for the support of the local bank, and of prefeasibility, feasibility and legal costs for the setup of the investment vehicles, as well as for the credit enhancement mechanisms, all of which helps private sector lending. This clearly shows that the concessional lending of the GCF is needed but might not be sufficient enough by itself to effectively tap important GHG mitigation opportunities.

5 References

BP (2018). BP Energy Outlook: Country and regional insights – Brazil. Retrieved from: https://www.bp.com/content/dam/bp/en/corporate/pdf/energy-economics/energy-outlook/bp-energy-outlook-2018-country-insight-brazil.pdf

CEF (2016). Annual Report 2016 – supporting capacity development for finance officials in South East Europe through training. Retrieved from: https://www.cef-see.org/assets/files/CEF_AR_2016_web.pdf

ESMAP (2014). Lighting Brazilian Cities: Business Models for Energy Efficient Public Street Lighting. Retrieved from: http://documents.worldbank.org/curated/en/679281521548635917/pdf/ESM-P150942-PUBLIC-LightingBrazilianCitiesReportENGLISHFINAL.pdf

[33] Acc. to interview with IBRD Task Team Leader. This was the situation at the time of writing this case study in September 2018 and might be resolved by now.

Federative Republic of Brazil (n.d.). Intended Nationally Determined Contribution Towards Achieving the Objective of the United Nations Framework Convention on Climate Change. Retrieved from: http://www4.unfccc.int/submissions/INDC/Published%20Documents/Brazil/1/BRAZIL%20iNDC%20english%20FINAL.pdf

GIF (2018). BRAZIL Streetlighting Modernization Development. Retrieved from: https://www.globalinfrafacility.org/sites/gif/files/GIFBriefs_PDA_April2018_Brazil%20Streetlight.pdf

IBRD (2013). 2012 Annual Report. ESMAP – Energy Sector Management Assistance Program. Retrieved from: https://www.esmap.org/sites/default/files/esmap-files/ESMAP_2012_AnnualReport.pdf

Martinez Romero, Silvia and Meyer, Megan. Interview by Christine Wörlen. Telephone interview. September 11, 2018.

Meyer et al. (2017). Lighting Brazilian Cities: Business Models for Energy Efficient Public Street Lighting. Retrieved from: https://openknowledge.worldbank.org/bitstream/handle/10986/29537/ESM-P150942-PUBLIC-LightingBrazilianCitiesReportENGLISHFINAL.pdf?sequence=1&isAllowed=y

McKinsey (2016). The Brazilian experience in financing infrastructure – A former finance minister makes the case for openness and discusses "de-risking". Retrieved from: https://www.mckinsey.com/industries/capital-projects-and-infrastructure/our-insights/the-brazilian-experience-in-financing-infrastructure

UNDP (2015). Market Transformation for Energy Efficiency (EE) in Buildings – PPGM. Project Implementation Review – PIMS 3665.

World Bank (n.d.). Helping Brazilian Cities Reduce Emissions by Switching to Energy-Efficient LED Street Lights. Website / news release. https://www.esmap.org/node/57541. Accessed Oct 1, 2018.

World Bank (2007). Implementation Completion and Results Report (Loan/Credit No 047309). Report No: ICR0000184. Retrieved from: http://documents.worldbank.org/curated/en/960361468227648857/pdf/ICR0000184.pdf

World Bank (2017). Understanding the Effects of the Taxa de Longo Prazo (TLP) Reform in Brazil. World Bank Staff Note. Retrieved from: http://documents.worldbank.org/curated/en/597021501583059929/pdf/117812-WP-PORTUGUESE-AND-ENGLISH-PUBLIC-UnderstandingtheEffectsofTLPReforminBrazil.pdf

World Bank (2018a). Financial Instruments for Brazil Energy Efficient Cities – FinBRAZEEC. Project Appraisal Document. Report No: Pad2657.

World Bank (2018b). Funding Proposal for the Green Climate Fund. FP065: Financial Instruments for Brazil Energy Efficient Cities (FinBRAZEEC).

Annex I.

Table 4: Funding Volumes for Brazil Energy Efficient Cities (FinBRAZEEC)

Funding	Grant	Loan	Equity
World Bank	US$ 200 (2017) US$ 35.891 (2017) US$ 163.515 (2018) US$ 0.5 mio.	World Bank US$ 200 mio.	
ESMAP	US$ 0.5 mio.		
GCF	GCF US$ 9 mio.	GCF US$ 186 mio.	
CTF	US$ 20 mio.		
Caixa Econômica Federal		US$ 180 mio.	
Commercial Financing		US$ 400 mio.	
Concessionaries			US$ 328/ 330 mio.

Annex II.

Figure 3 Timeline FinBRAZEEC