Climate Transparency

WHY ELECTRIC MOBILITY SHOULD BE TREATED AS THE MAIN INSTRUMENT OF TRANSPORT CLIMATE POLICY IN THE NEXT ROUNDS OF THE BRAZILIAN NDC

POLICY PAPER

MARCH 2020

KEY MESSAGES

- Brazil has already established a clear policy direction for the biofuels industry and high-capacity transport infrastructure. However, little has been done to develop the electric vehicle (EV) market in the country.
- While biofuels face an increasingly dominant position of EVs among major global players, large infrastructure projects related to high-capacity transport modes must deal with the severe and persistent economic crisis in Brazil.
- Over the next 15 years, Brazil must treat the EV market as a clear national policy instrument to improve the transport sector's capacity to deal with economic uncertainty and instability.

Authors

George V. Goes[1]
Daniel N. S. Gonçalves[1]
Márcio A. D´Agosto[1]
Fernando Araldi[2]

Acknowedgements

[1]Federal University of Rio de Janeiro (COPPE/UFRJ). Transportation Engineering Program. Technology Centre, Block H – Room 117, University City – Rio de Janeiro, Brazil

[2]Brazilian Ministry of Regional Development. Esplanade of Ministries, Block E. Civic-Administrative Zone – Brasília, Brazil

CENTRO CLIMA
CENTRO DE ESTUDOS INTEGRADOS SOBRE MEIO AMBIENTE E MUDANÇAS CLIMÁTICAS - COPPE / UFRJ

WHY ELECTRIC MOBILITY SHOULD BE TREATED AS THE MAIN INSTRUMENT OF TRANSPORT CLIMATE POLICY IN THE NEXT ROUNDS OF THE BRAZILIAN NDC

BACKGROUND

In September 2016, Brazil ratified the Paris agreement, taking the lead by committing itself to reduce carbon emissions by 37% by 2025 and 43% by 2030 compared to 2005 levels. Thenceforward, the country launched or continued policy instruments that contributed to the climate agenda in the transport sector. Examples include stimulating the consumption of biofuels, increasing energy efficiency, and expanding the infrastructure of high-capacity modes of transport (see Figure 1).

In this line, the RenovaBio Program was launched in 2018 to expand the participation of biofuels in the national energy balance. The program is structured around 10-year goals, emission certification standards and decarbonization credits for producers and importers of biofuels. This initiative, in conjunction with previous policy instruments[1], contributed to gradually achieving blending rates of 27% anhydrous ethanol in gasoline (E27) and 13% biodiesel in diesel (B13) in motor vehicles.

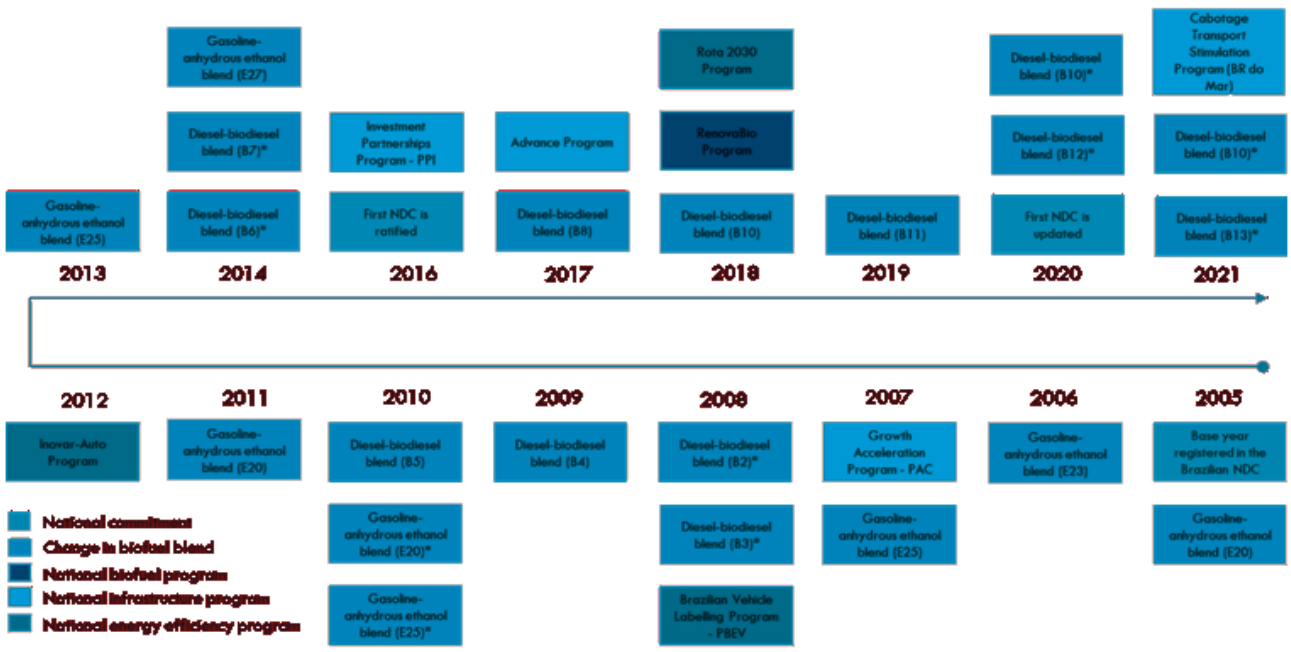
The Rota 2030 Program was launched in 2018, replacing the Inovar-Auto Program (2012-2017), to increase the energy efficiency of light motor vehicles. The mechanism of these programs is based on tax incentives for research and innovation in the automotive industry. Before that, the Brazilian Vehicle Labelling Program (PBEV) was launched in 2008 as a benchmarking system that also sought to improve energy efficiency in light motor vehicles.

Lastly, the Cabotage Transport Stimulation (2021), Advance (2017), and Investment Partnerships – PPI (2016) programs, which essentially replaced the Growth Acceleration Program – PAC (2007), were implemented to stimulate public and private investments in strategic infrastructure projects. These initiatives have focused on regional transport, especially on high-capacity modes such as rail and water (cabotage and inland navigation).

The implementation of such policy instruments has been responsible for advances in some areas, notably in the biofuels industry. In 2020, biofuels accounted for 24% of energy use in the transport sector. This result already exceeds the country's commitment under the United Nations Framework Convention on Climate Change (UNFCCC), at the 21st Conference of the Parties (COP21), through its first Nationally Determined Contributions (NDC)[2]. Nevertheless, the sector remains highly dependent on mineral diesel, mainly freight transport[3].

While biofuels are registered as the main mitigation measure in the sector, complementary options have not made significant progress. Battery electric and plug-in hybrids vehicles have a negligible market share (less than 0.1% of annual sales), well

Figure 1: **Evolution of mitigation measures in the Brazilian transport sector**



Note. (*) Increase or decrease in biofuel content in the same year.

[1] Biodiesel–petroleum diesel blends were introduced in Brazil in 2008 at a rate of 2% (B2). In turn, the anhydrous ethanol-petroleum gasoline mixture dates from the 1930s, while the use of hydrous ethanol (E100) in motor vehicles dates from the 1970s.

[2] In its first version, the Brazilian NDC pledged to increase the share of bioenergy in the Brazilian energy balance to 18%. At the end of 2020, however, the Brazilian government updated the NDC, removing several sectoral targets, including this one.

[3] In 2020, mineral diesel (not including biodiesel) accounted for 86% of energy use in freight transport. In passenger transport, almost all Brazilian buses are diesel-powered.

below the global and emerging countries figures (2.6% and 0.7%) (IEA, 2021; PNME, 2021). Despite ongoing attempts to reallocate resources and incentives to more efficient modes of transport, the Brazilian modal split is still unbalanced[4].

Hence, investigating the obstacles and barriers that delay current programs and future mitigation measures becomes an essential activity for the development of a path consistent with the objective of the Paris Agreement. To identify and select the main barriers to sustainable transport policies, literature reviews and interviews with key stakeholders were conducted (see the Appendix for details). Feasible ways to implement additional measures in the Brazilian transport sector to accelerate the transition to a low carbon economy are also provided in this policy brief.

OBSTACLES AND BARRIERS TO CLIMATE POLICY IN THE BRAZILIAN TRANSPORT SECTOR

- ***Public transport***

Over the last few decades, public transport has been losing its attractiveness and competitiveness to individual motorized transport[5] and even to illegal passenger transport. Lately, services arising from new technologies, such as ride-hailing applications, have been offered as low-cost alternatives for users, competing with public transport on profitable short-distance trips.

The lack of attention given by decision-makers to the factors that affect price and quality of service may justify the drop in demand for public transport in Brazil. In most cities, transport fares are unaffordable for most urban dwellers due to long and poorly drafted concession contracts (which has given rise to legal uncertainty in several cases). The massive presence of basic buses[6], the lack of inspection and the lack of assertive technical-economic-environmental studies are other serious obstacles to the improvement of sustainable mobility policies.

- ***Electrification of motor vehicles***

The EV market is still very immature in Brazil. This stems from economic and political issues. From an economic point of view, the country has faced in recent years a progressive increase in the unemployment rate and a drop in the population's average income and foreign direct investments. The Brazilian real (BRL) has been one of the most volatile currencies in the world, especially after the COVID-19 pandemic. In addition, the domestic vehicle industry is shrinking, while it remains dedicated to internal combustion engines. The absence of adequate infrastructure, financial mechanisms and prioritization measures are also critical barriers. These circumstances have affected the price of EV and their components, as well as the local purchasing power, delaying market penetration.

Policy barriers appear to arise from the lack of awareness, interest, or involvement of some authorities. The most emblematic examples are the successive incentives to encourage the use of fossil fuels[7]. Another related obstacle is the conventional market lobbying activities against electric mobility. They are reinforced by the still limited knowledge about the economic and social benefits of electrification and the lack of standards and regulations. Finally, no measurement, reporting and verification tool to understand where we are and where we want to go has been fully implemented.

- ***Energy efficiency***

Here, only barriers to improving energy efficiency in the transport sector unrelated to the electrification of road vehicles are addressed. The current national eco-labelling program (PBEV) does not include heavy trucks and buses. The same is true for the Rota 2030 program. The lack of benchmarking standards regarding heavy vehicles may decrease the sense of urgency for proactive behaviours. Yet, all these measures need to compete with an increasingly outdated fleet.

In rail transport, all Brazilian freight locomotives are equipped with diesel-electric propulsion systems. Obstacles to upgrading freight railways with overhead wires to carry high-voltage electricity along the lines and to replace diesel locomotives with electric motors arise from several structural factors. In this line, we highlight the lack of local railway builders and suppliers, poorly prepared bids, and the lack of specific credit lines.

- ***High-capacity modes of transport***

Structural strategies to accelerate the decarbonization of the Brazilian transport sector stumble on an unbalanced modal split. The performance of rail freight transport is even more affected due to the high presence of inactive or underutilized railroads[8]. Cost overruns in transport infrastructure projects and unfinished works also create an unstable environment for long-term planning.

The lack of alternative corridors between the main import/export and production/consumption zones causes logistical bottlenecks and loss of efficiency. This is especially true for water transport,

[4] Road transport currently accounts for 91% of passenger activity and 54% of freight activity (Goes et al., 2020).

[5] The focus of Brazilian authorities on the motor vehicle industry dates to the 1950s and continues to the present day. For example, between 2008 and 2012, the Brazilian government reduced the Tax on Industrial Products (IPI) on motor vehicles to stimulate their commercialization (ANPTrilhos, 2018). The Inovar-Auto and Rota 2030 programs have continued this economic policy.

[6] Buses with chassis and body structures not suitable for passenger transport.

[7] In 2020, the federal government exempted from import taxes an annual quota of 0.75 billion litres of anhydrous ethanol from the United States (ANP, 2020). As this biofuel is conventionally mixed with petroleum gasoline, this policy not only stimulated the consumption of gasoline, but also reduced the competitiveness of the domestic biofuel industry. More recently, in 2021, the government reduced the federal tax burden on diesel (Brazil, 2021).

[8] Only about 30% of Brazilian freight railways are actually used (Gonçalves et al., 2020).

which faces heavily congested ports concentrated in a few cities. Part of this is due to the higher levels of bureaucracy compared to other modes. Also, water transport faces higher pilotage and operating costs compared to the global average, in addition to the low availability of ships for cabotage (CNT, 2018).

- ***Biofuels***

The main barrier to the strong ethanol and biodiesel markets has been the aforementioned controversial decisions by local authorities. In 2021, for the first time, the government approved a 3% reduction in the biodiesel content in diesel blends (CNPE, 2021). The purpose of this measure was to reduce the final price of the product.

Other biofuels such as Hydrotreated Vegetable Oils (HVO), biomethane, biokerosene and bio-oil face a lack of political interest and engagement among local decision-makers[9]. The slow pace of development of these alternative energy sources reflects the high research and implementation costs seen to date.

WHAT SHOULD BRAZILIAN POLICYMAKERS DO?

Cutting carbon emissions in the transport sector beyond the commitments made is a challenging but feasible task. Brazil has already made meaningful progress in implementing policies for promoting biofuels. Although relatively expensive, productivity improvements in high-capacity modes have been seen in recent years. However, the lack of promising policies to overcome barriers to electric mobility has limited the transport sector's ability to deal with economic uncertainty and instability.

Despite cooperation between the government and the private sector in studies to stimulate the emerging EV market, it has not become a national policy (in contrast to the national biofuels and modal infrastructure programs). Brazilian policymakers should then seriously consider electric mobility as an official (and relatively cheap) mitigation measure, launching an official action plan on the matter.

Furthermore, clear policy guidance, financial resources and institutional integration are needed to harness the potential synergies between the different areas of the transport sector (public transport, logistics, etc.). The current National Climate Change Plan (NCCP) (Brazil, 2008) does not meet these requirements, as it does not outline complementary strategies and responsibilities for each area. Considering the current barriers and obstacles, a feasible action plan[10] for the holistic transformation of the Brazilian transport sector should include at least the following overarching objectives:

- ***Short-term (up to 2025)***

Short-term efforts need to focus on reducing the negative externalities in public transport generated by the Brazilian economic crisis before and during the COVID-19 pandemic. The government should assist the EV market penetration in public transport and reduce barriers to entry. Here, a broader appreciation of public transport is needed, starting with a review of current contracts (especially regarding tariff modalities[11]). Public transport system planners should consider reviewing concession contracts to seek a better balance between demand, supply, and quality of service, with tariff equity and a focus on customer service. This process must also consider specific contractual clauses for electric mobility, due to the inherent attributes of electric buses (from the charging infrastructure to the vehicle lifespan)[12].

At the same time, policymakers must develop and enforce missing standards and regulations to ensure legal certainty for investors and consumers[13]. With greater legal security and guarantees, financial agents can offer more affordable credit lines for efficient vehicles and more expensive for the most polluting ones. Prioritization schemes for buses and electric trucks should also be encouraged in large metropolitan areas (urban road tolls, exclusive lanes, load/unload spaces, etc.).

- ***Mid-term (2025-2030):***

During this period, the Rota 2030 and PBEV energy efficiency programs should include heavy freight vehicles. Furthermore, an integrated policy between such programs and private certification schemes[14] can enhance the energy efficiency of freight vehicles through electrification and good practices.

[9] For example, Brazil has not signed up for the voluntary phases of the Carbon Offsetting and Reduction Scheme for International Aviation – CORSIA (Brazil, 2018).

[10] Considering the Brazilian economic and political context. 11Tariffs in Brazilian cities and states generally coverall costs and expenses, with little scope for efficiency improvements or government subsidies.

[12] This may include shifting ownership of the vehicle from the operator to another entity. Then, the operator would only be concerned with providing service.

[13] This includes not only the EV market, but also strengthening the rail and water regulatory frameworks.

The network of charging stations should be substantially expanded, also covering medium-sized cities and interstate highways. At this time, the government must guide efforts to strengthen the national EV industry and smart grid, reducing the negative effects of exchange rate volatility. The electrification of freight railways can then be a complementary task.

Additionally, the government should address the use of biofuels for specific market segments, for example, approving higher blends and dedicating the supply of biodiesel and HVO to heavy freight vehicles[15]. Ethanol production must be progressively replaced by advanced biofuels, mainly biokerosene and bio-oil, to be consumed by other types of vehicles such as aircraft and watercraft.

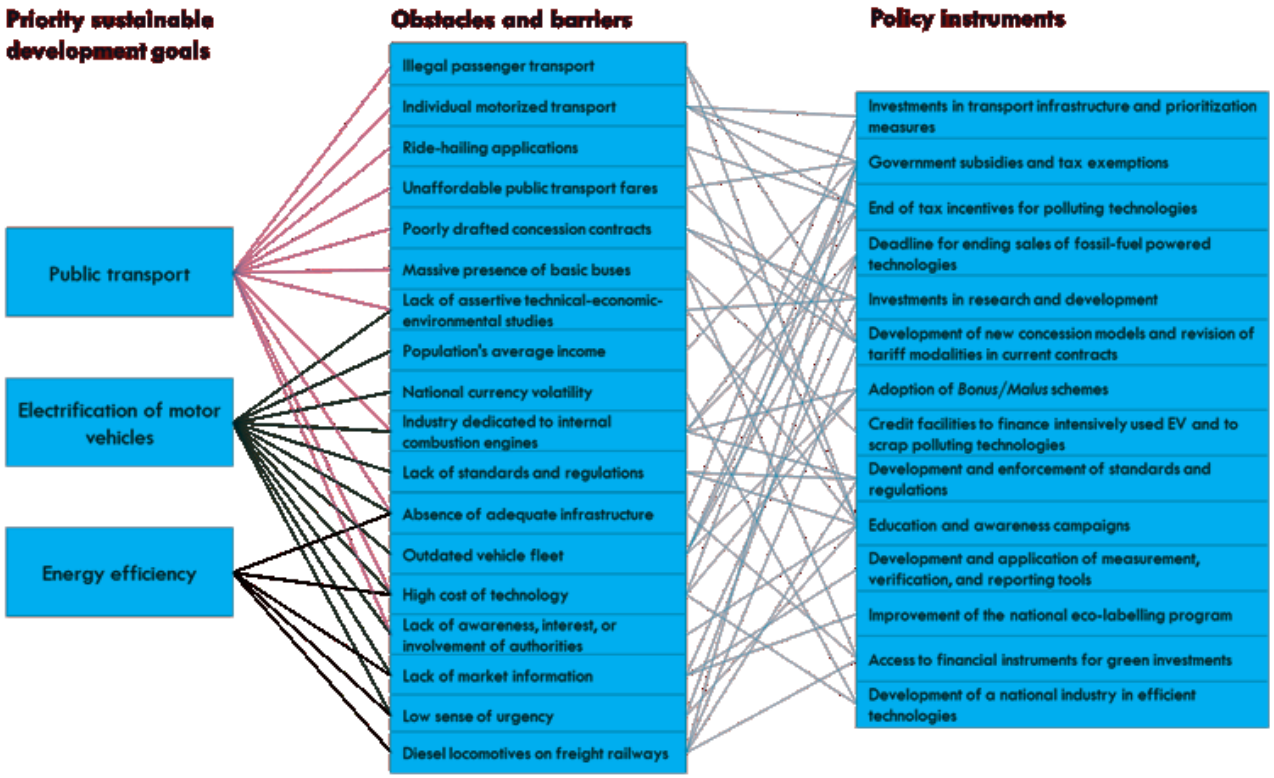
- ***Long-term (2030-2035):***

In the long-term, the government should focus on accelerating market penetration of EVs in individual mobility, starting with intensively used vehicles from ride-hailing and car-sharing services. A deadline for the end of sales of non-electric cars, buses and light trucks must be established. The surplus biofuels should be destined for heavy trucks, industry and power generation sectors.

Promising new technologies should be evaluated considering the environmental, economic, and social aspects of sustainability, and eventually incorporated into the national action plan. The plan should be periodically updated considering the NDC's 5-year submission cycles.

Figure 2 summarizes the relationship between the macro-objectives, their barriers, and the proposed instruments.

Figure 2: **Challenges and instruments to address necessary and feasible mitigation measures in Brazil**



[14] Such as the Brazilian Green Logistics Program (PLVB) or the Global Logistics Emissions Council (GLEC).

[15] It is highly likely that the battery range of electric trucks will still be contraindicated for continental travel in emerging countries.

REFERENCES

ANP – National Agency of Petroleum, Natural Gas and Biofuels (2020). Quarterly Price and Fuel Volume Bulletin. Available at: http://anp.gov.br/. Accessed on 10 June 2021.

ANPTrilhos – National Association of Passenger Carriers on Rails. Proposals for the Advancement of National Urban Mobility. Available at: https://anptrilhos.org.br/. Accessed on 10 June 2021.

Brazil, MMA – Ministry of the Environment (2008). National Climate Change Plan (NCCP). Available at: https://antigo.mma.gov.br. Accessed on 10 June 2021.

Brazil, MCT – Ministry of Science, Technology, and Innovation (2017). Annual Estimates of Greenhouse Gas Emissions in Brazil. 4th Edition, Brasilia.

Brazil. Ministry of Infrastructure (2018). Action Plan for the Reduction of CO2 Emissions from Brazilian Civil Aviation. Available at: https://anac.gov.br. Accessed on 10 June 2021.

Brazil. Ministry of Economy (2021). Government reduces taxes on cooking gas and fuels. Available at: https://gov.br. Accessed on 10 June 2021.

CNPE – National Energy Policy Council (2021). Establishes the reduction of the mandatory mixture content of biodiesel in fossil diesel from 13% to 10%, in the 79th Biodiesel Auction. Available at: https://gov.br. Accessed on 10 June 2021.

CNT – National Confederation of Transport (2018). Transport moves Brazil: CNT proposal to candidates. Available at: https://repositorio.itl.org.br/. Accessed on 10 June 2021.

Goes, G. V., Gonçalves, D. N. S., Márcio de Almeida, D. A., La Rovere, E. L., & de Mello Bandeira, R. A. (2020). MRV framework and prospective scenarios to monitor and ratchet up Brazilian transport mitigation targets. Climatic Change, 162(4), 2197-2217.

Gonçalves, D.N.S.; Goes, G.V.; D'Agosto, M. de A (2020). Energy transition in Brazil: Paris Agreement compatible scenario for the transport sector up to 2050. Available at: https://ibts.eco.br. Accessed on 10 June 2021.

IEA – International Energy Agency (2021). Global EV Outlook 2021 – Accelerating ambitions despite the pandemic. Available at: https://iea.org. Accessed on 10 June 2021.

PNME – National Electric Mobility Platform. 1st Brazilian Yearbook of Electric Mobility. Available at: https://pnme.org.br. Accessed on 10 June 2021.

APPENDIX

The process of identifying, selecting, and refining the main obstacles and barriers that delay current programs and future mitigation measures were assisted by experts from a wide range of transport-related activities (Table 1). This activity was preceded by an extensive literature review on the subject.

Table 1: **List of consulted institutions.**

Institution	Nature of business
Esense	Consulting company
Campinas State University (UNICAMP)	Education and research
Getulio Vargas Foundation (FGV)	
Federal University of Rio de Janeiro	
University of Lisbon	
Paranaense Energy Company (COPEL)	Energy utility
National Bank for Economic and Social Development (BNDES)	Financial agent
Inter-American Development Bank	
Ministry of Regional Development	Government
Ministry of Science, Technology, and Innovations	
Ministry of Economy	
Brazilian Industrial Development Agency (ABDI)	
National Agency of Petroleum, Natural Gas and Biofuels (ANP)	
Build Your Dreams (BYD)	Manufacturer
Eletra Industrial	
Bosch	
WEG	
Mercedes-Benz	
Porto Alegre City Hall	Municipality
Belo Horizonte City Hall	
Campinas City Hall	
Volta Redonda City Hall	
São Paulo Transport (SPTrans)	
National Association of Urban Transport Companies (NTU)	Sectoral association
Brazilian Electric Vehicle Association (ABVE)	
Federation of Passenger Transport Companies of the State of Rio de Janeiro (FETRANSPOR)	
World Resources Institute (WRI)	Non-governmental organization
Institute for Transportation and Development Policy (ITDP)	
Greenpeace	
IBTS	
Itaipu	Power supply company
Petrobrás	Public oil company
PLVB	Recognition program
Brazilian Association of Technical Standards (ABNT)	Regulatory body
National Institute of Metrology, Quality and Technology (INMETRO)	
Magazine Luiza	Retail company
AMBEV	

Climate Transparency is a global partnership with a shared mission to stimulate a 'race to the top' in climate action in G20 countries through enhanced transparency. It convenes partners from Argentina (Fundación Ambiente y Recursos Naturales), Brazil (CentroClima/COPPE UFRJ), China (Energy Research Institute), France (The Institute for Sustainable Development and International Relations), Germany (Germanwatch, HUMBOLDTVIADRINA Governance Platform, NewClimate Institute), India (The Energy and Resources Institute), Indonesia (Institute for Essential Service Reform), Mexico (Initiativa Climática de México), South Africa (Energy Research Center/University of Cape Town) and the UK (Overseas Development Institute). Climate Transparency is funded by the ClimateWorks Foundation, Stiftung Mercator and the World Bank and supported by the European Climate Foundation.

This project is part of the International Climate Initiative (IKI). The Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU) support this initiative based on a decision adopted by the German Bundestag.

CentroClima/LIMA, linked to the Energy Planning Program (PPE), is part of COPPE, at the Federal University of Rio de Janeiro (UFRJ). Since 1997 CentroClima/LIMA was responsible for the execution of around 250 research projects, many of which for international institutions. Throughout this period, agreements, partnerships, cooperation agreements and contracts were signed with public bodies of the federal, state and municipal administration, as well as companies and non-governmental organizations. These research activities led to the publication of approximately 320 scientific papers, 75 articles in national and international journals, 70 books or book chapters, 140 papers in Annals of Congresses and 25 articles in magazines and newspapers. In addition, they provided material for the preparation of more than 80 Master's dissertations and 39 PhD thesis.

Supported by:

based on a decision of the German Bundestag