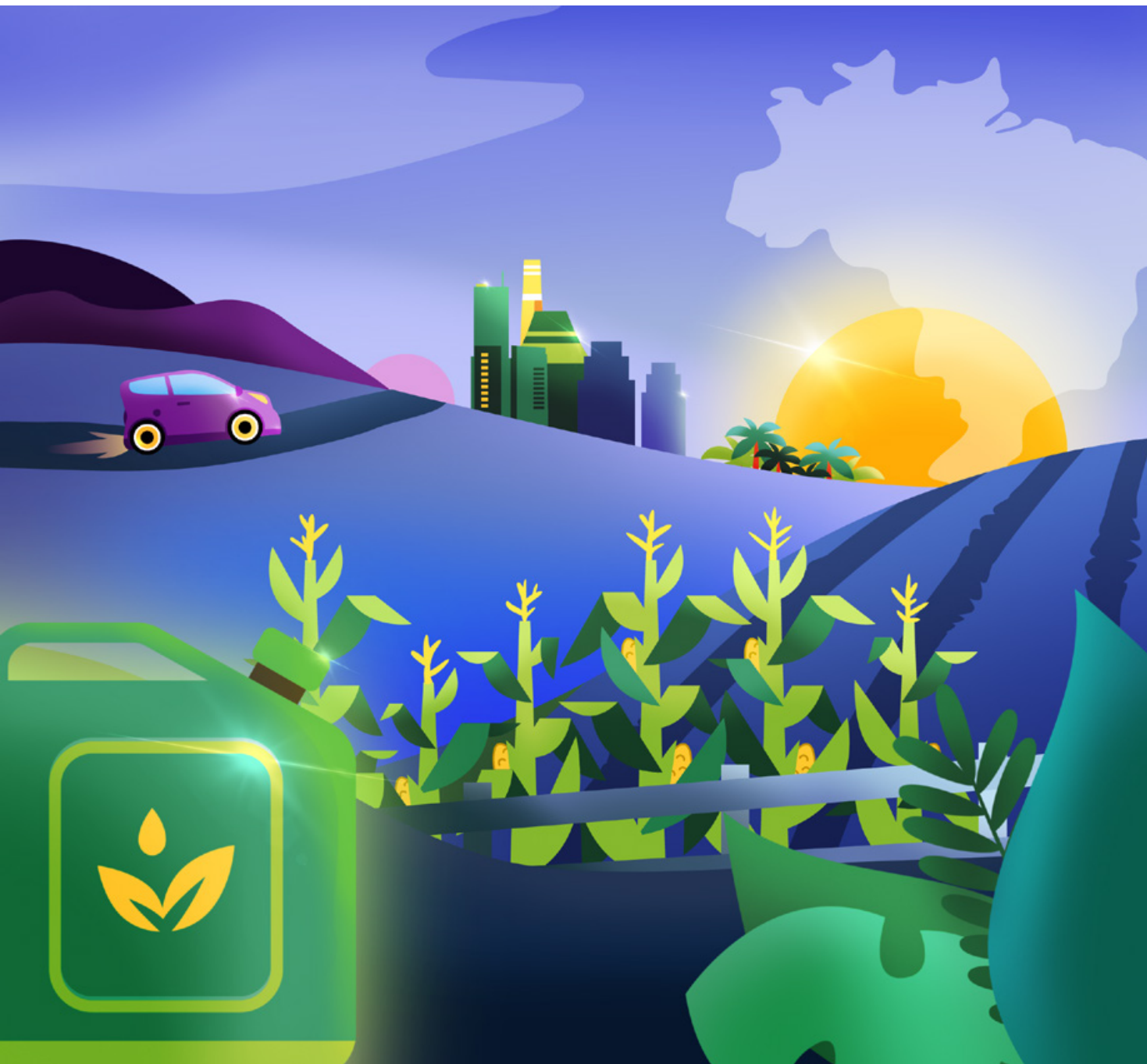


# Brazil

*Biofuels and Decarbonisation Credits in Brazil: An Analysis of the Legislative Process of Brazil's National Biofuel Policy ("RenovaBio")*



# About this study

## Project

Strengthen National Climate Policy Implementation:

Comparative Empirical Learning & Creating Linkage to Climate Finance

The project explores how international climate finance can support the implementation of NDCs in emerging economies and EU countries through comparative analyses and by providing a better understanding of the interface between finance and policy implementation.

## Project coordination

The German Institute for Economic Research - DIW Berlin

## Financial support

The International Climate Initiative (IKI), Federal Ministry for the Environment, Nature Conservation, Nuclear Safety and Consumer Protection

## Study conducted by

The Center for Sustainability Studies (FGVces), São Paulo School of Business Administration (FGV EAESP), Fundação Getulio Vargas (FGV)

## General coordinator

Mario Prestes Monzoni Neto

## Sustainable finance program coordinator

Annelise Vendramini

## Technical team

Camila Yamahaki, Gustavo Velloso Breviglieri

## Cite as

FGVces (2023). Biofuels and Decarbonisation Credits in Brazil: An Analysis of the Legislative Process of Brazil's National Biofuel Policy ("RenovaBio"). São Paulo, SP: Fundação Getulio Vargas Center for Sustainability Studies. 88 p.

## Disclaimer

The views expressed in the 2023 SNAPFI reports are solely those of the authors and do not necessarily reflect the views of their employer, organization, committee or other group or individual.

Supported by:



Based on a decision of the German Bundestag

# Table of Contents

<b>Executive summary</b>	<b>7</b>
How RenovaBio works	8
Research questions and theoretical framework	8
Research findings	9
Multiple policy entrepreneurs and the 'relay race'	
Multiple objectives	
Climate integration	
<b>1. Introduction</b>	<b>13</b>
<b>2. Literature review</b>	<b>17</b>
Advances in flex-fuel motor technology	21
Sugarcane biofuel installed capacity	22
RenovaBio	22
Analysis of the policy process	25
International context	26
Theory of change and analytical framework	30
Multiple Streams Framework	
<b>3. Data and methods</b>	<b>33</b>
Data collection	34
Data analysis	35
Data description	36
<b>4. Research findings</b>	<b>42</b>
Problem stream	44
Indicators	
Focusing events, crises and symbols	
Policy feedback	
Policy stream	51
Anticipation of future constraints	
Technical feasibility	
Value acceptability	
Political stream	60
Organised political forces	
Events within government	

Policy entrepreneurs	65
Claim to a hearing	
Political connections and negotiating skills	
Persistency	
Appreciation for academic knowledge	
Opportunities for improvement	69
<b>5. Discussion</b>	<b>73</b>
RQ1: Drawing on Kingdon's Multiple Streams Framework, what were the major forces at play during RenovaBio's legislative process?	74
Policy window	
Policy's multiple problems/objectives	
Multiple policy entrepreneurs and the 'relay race'	
RQ2: How were concerns with climate change incorporated into the policy process?	78
<b>6. Concluding remarks and recommendations for future studies</b>	<b>80</b>
<b>7. References</b>	<b>83</b>
<b>8. Appendix – interview guide</b>	<b>86</b>

## List of graphs

Graph 1 – Energy-related CO <sub>2</sub> e emissions by sub-sector (%) in Brazil, in 2021	7
Graph 2 – Energy-related CO <sub>2</sub> e emissions by sub-sector (%) in Brazil, in 2021	16
Graph 3 – Inputs for biodiesel production (2021, %)	18
Graph 4 – Production mix: ethanol x sugar	19
Graph 5 – Biofuels production in Brazil, in million m <sup>3</sup> (2012-2021)	20
Graph 6 – Brazilian fleet by fuel type (%)	21
Graph 7 – Variation in the number of sugarcane mills in Brazil	22
Graph 8 – California's LCFS alternative fuels by volume (million gallons of gasoline equivalent)	28
Graph 9 – Interest groups involved in discussions about the draft bill	40

## List of tables

Table 1 – Largest ethanol producers (states, 2019-2021)	20
Table 2 – Annual decarbonisation targets, according to CNPE Resolution No. 13/2022 (in Mt CO <sub>2</sub> eq)	23
Table 3 – Comparison between RFS, LCFS and RenovaBio	29
Table 4 – Number of articles analysed – August 2016 to April 2018	34
Table 5 – Coding scheme for analysis – elements of the framework	35
Table 6 – Coding scheme for analysis: participants of the public policy process	36

Table 7 – Is RenovaBio the main issue discussed in the article?	36
Table 8 – Section in which articles appear	37
Table 9 – Number of citations per element of the MSF	38
Table 10 – Number of citations per participant of the public policy process	39
Table 11 – CIDE-Fuel rates (2011-2018)	50
Table 12 – Presidential vetoes to RenovaBio	52
Table 13 – Aspects mentioned in the interviews contributing to, or jeopardising, the technical feasibility of RenovaBio	56
Table 14 – Organised political forces in the policy process	60
Table 15 – Governmental stakeholders participating in the public policy process	64

### List of figures

Figure 1 – Timeline of the RenovaBio policy process, per policy entrepreneur	10
Figure 2 – RenovaBio concept	25
Figure 3 – The Multiple Streams Framework	31
Figure 4 – Participants outside of the government, streams and processes	41
Figure 5 – Timeline of relevant events in the problem, policy and political streams	43
Figure 6 – Timeline of RenovaBio policy process, per policy entrepreneur	77

### List of boxes

Box 1 – Kingdon's Multiple Streams Framework	8
Box 2 – Political interference and changing rules to RenovaBio	58
Box 3 – Engagement processes in RenovaCalc development	62
Box 4 – Suggestions for RenovaBio, according to the interviewees	72

### List of acronyms and abbreviations

Abramilho	Brazilian Association of Corn Producers
Anfavea	National Association of Automobile Manufacturers
ANP	National Agency of Petroleum, Gas and Biofuels
BMU	Federal Ministry for the Environment, Nature Conservation and Nuclear Safety
CADE	Administrative Council for Economic Defense
CAPEX	Capital Expenditures
CARB	California Air Resources Board
CBIO	Decarbonisation Credit
CI	Carbon Intensity
CIDE	Contribution on Economic Activities
CNPE	National Energy Policy Council
COP	Conference of the Parties

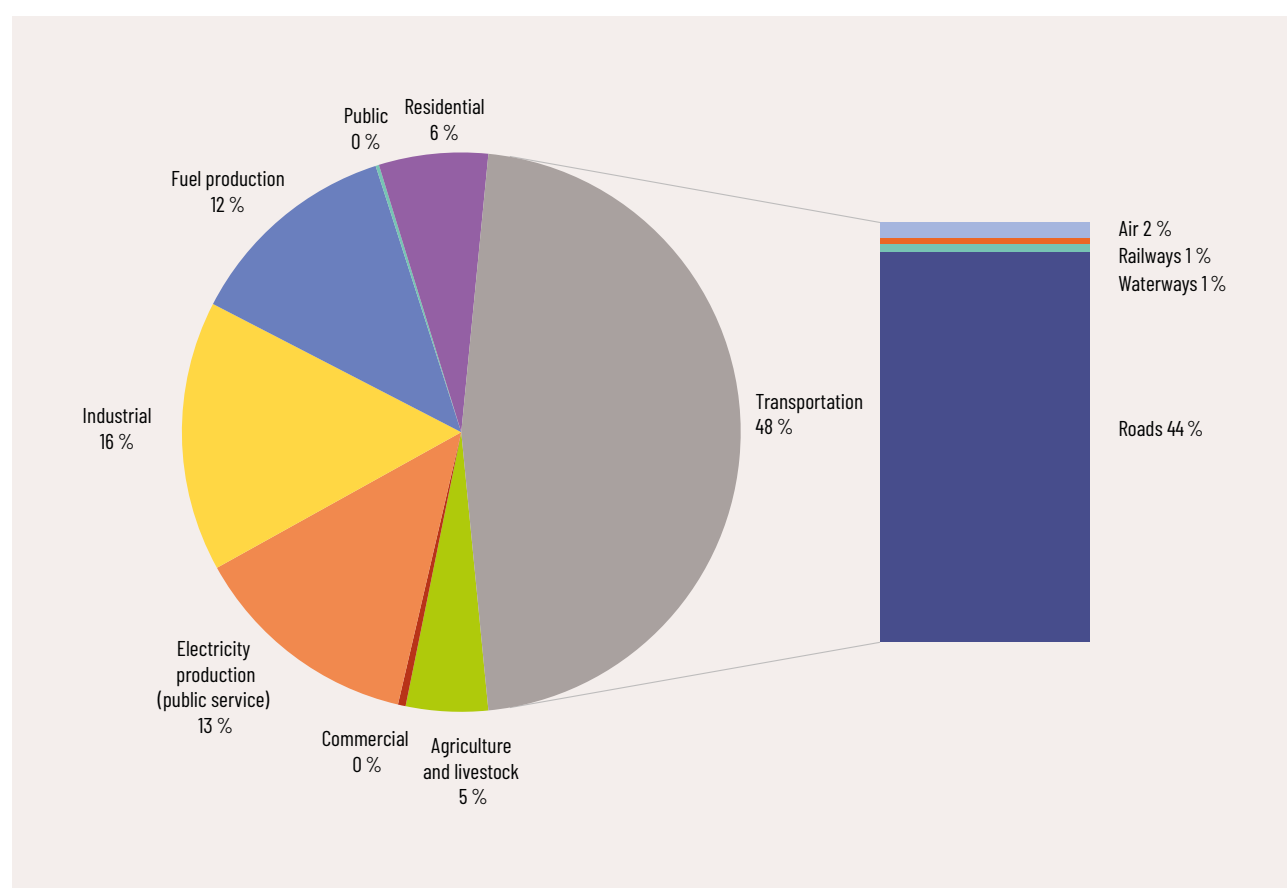
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
Embrapa	Brazilian Agricultural Research Corporation
EPA	Environment Protection Agency
EPE	Energy Research Office
FGVces	Center for Sustainability Studies, Fundação Getulio Vargas
FIESP	São Paulo Industry Federation
GDP	Gross Domestic Product
GHG	Greenhouse Gas
HVO	Hydrotreated Vegetable Oil
ICF	International Climate Finance
IEA	International Energy Agency
IKI	The International Climate Initiative
iNDC	Intended Nationally Determined Contribution
IPCA	Nationwide Consumer Price Index
LCFS	California's Low Carbon Fuel Standard (LCFS)
MME	Ministry of Mines and Energy
MSF	Multiple Streams Framework
NDCs	Nationally Determined Contributions
NGO	Non-Governmental Organisation
OTC	Over-the-Counter
PMR	Partnership for Market Readiness
PNPB	National Program of Production and Use of Biodiesel
Proálcool	National Alcohol Program
Proconve	Air Pollution Program by Automotive Vehicles
PSOL	Socialism and Liberty Party
RED	Renewable Energy Directive
RenovaBio	National Biofuel Policy
RFS	Renewable Fuel Standard Program
RIN	Renewable Identification Number
RVO	Renewable Volume Obligation
SAF	Sustainable Aviation Fuel
SNAPFI	Strengthen National Climate Policy Implementation: Comparative Empirical Learning & Creating Linkage to Climate Finance
TCU	Federal Audit Court
Ubrabio	Brazilian Biofuel and Biokerosene Union
UNFCCC	United Nations Framework Convention on Climate Change
Unica	Brazilian Sugarcane Industry Association

# Executive summary

The main drivers of greenhouse gas (GHG) emissions in Brazil are land use change and forests, contributing to 49% of total emissions in 2021, followed by agriculture and livestock, with 25%, and energy, with 18% (SEEG, 2023).

In the energy sector, tackling the use of fossil fuels in transportation is of climate relevance to Brazil given that, unlike other nations, most GHG emissions<sup>1</sup> come from transportation (48%), not electricity generation (13%)(SEEG, 2023). This pattern is explained by the overreliance on road transportation<sup>2</sup> that is largely fueled by fossil sources (46% diesel, 28% gasoline and 2% natural gas) (EPE, 2022b; Ministério dos Transportes, 2018).

**Graph 1 – Energy-related CO<sub>2</sub>e emissions by sub-sector (%) in Brazil, in 2021**



Source: the authors, based on (SEEG, 2023)

A notable policy that seeks to tackle GHG emissions in transportation is Brazil's National Biofuel Policy ("RenovaBio"), enacted by Statute No 13,576/2017, representing the first public policy with the explicit goal of contributing to attaining the country's climate goals (Simões, 2021).

<sup>1</sup> 94% of GHGs emitted by the energy sector is CO<sub>2</sub> (SEEG, 2023).

<sup>2</sup> In 2015, 2.4 trillion tonne-km in cargo was transported: 65% was moved by trucks; 15% by rail; 11% by maritime cabotage; and 5% via inland waterways. 0.6 billion tonne-km was transported by air (Ministério dos Transportes, 2018)

## How RenovaBio works

RenovaBio has annual national emission reduction targets for a 10-year period, which are then translated into individual targets for all domestic fuel distributors, proportional to their market share of fossil fuel sales in the previous year. To comply with their targets, fuel distributors must buy decarbonisation credits (CBIOs), financial assets<sup>3</sup> traded on the B3 stock exchange and over-the-counter market representing one tonne of avoided CO<sub>2</sub> equivalent emissions<sup>4</sup>, that are issued by biofuel producers. To generate CBIOs, biofuel producers must certify their production process in order to receive an Energy-Environmental Efficiency Score. The difference between the biofuel producer's carbon intensity and that of the fossil fuel substitute (e.g. gasoline to ethanol) will produce their Efficiency Score which will be the basis for the generation of decarbonisation credits. For calculating scores, RenovaBio uses lifecycle GHG accounting ("from well to wheel"). Biofuel from biomass that has been produced in areas that were deforested before December 2018<sup>5</sup> is not eligible to participate in the program.

## Research questions and theoretical framework

In order to learn from RenovaBio's policy process, as well as gather insights for future climate policies, we apply Kingdon's Multiple Streams Framework (MSF) (Kingdon, 2014) to analyse the forces at play during this legislative process. Kingdon's MSF was chosen as the theoretical framework for being widely accepted by academic scholars as useful for understanding public policy processes, particularly in the stages prior to implementation. Two research questions were investigated:

- **RQ1:** Drawing on Kingdon's Multiple Streams Framework, what were the major forces at play during RenovaBio's legislative process?
- **RQ2:** How were concerns with climate change incorporated into the policy process?

### Box 1 – Kingdon's Multiple Streams Framework

In the MSF, changes on the governmental agenda emerge from the joining of three distinct and independent streams:

**Problem stream:** in which issues begin to be seen by policymakers as worthy of action, and hence considered as problems to be solved, for instance, due to the emergence of crises, indicators and feedback from existing programs.

**Policy stream:** in which several public policy proposals (alternatives) are presented, reviewed and combined until a select group of feasible solutions rises to serious consideration, according to technical, budgetary and political aspects as well as the national mood.

**Political stream:** composed by factors such as shifts in the national mood, campaigns carried out by interest groups, electoral outcomes and other modifications in the configuration of the executive and legislative branches of government.

<sup>3</sup> The Brazilian Securities and Exchange Commission CVM classifies CBIOs as financial assets, according to Resolution No. 175/2022.

<sup>4</sup> RenovaBio emission factors are calculated based on the GWP100 values from the IPCC 2013 AR5 report.

<sup>5</sup> This cutoff date was set by Resolution ANP No. 758/2018, which regulates the certification of biofuel producers.



The three streams occasionally converge when a policy window opens, due to a problem (e.g. a crisis) or political event (e.g. a change in government). Policy entrepreneurs are individuals willing to invest their resources (time, money, reputation) to push their preferred solutions or shift the general attention towards the problems they care about most. They play an important role in joining the different streams, attaching solutions to problems, minimising and overcoming restrictions, rewriting proposals and seizing favourable events.

Source: (Kingdon, 2014)

## Research findings

The authors analysed 123 articles from three major Brazilian newspapers (Folha de São Paulo, Estado de São Paulo and Valor Econômico) citing “RenovaBio”, retrieved from the respective newspaper databases, dated between 31 August 2016 (when the President of the Republic took office) and April 6, 2018 (the day after Congress assessed the President of the Republic’s vetoes to the draft bill). To complement the data collection, between 26 January 2023 and 11 April 2023, the authors also conducted eleven online semi-structured interviews with representatives from the federal government (4), civil society (1), fossil fuel distributors (2), ethanol producers (2) and sector associations (2), selected based on their active involvement in the policy process and/or for representing relevant stakeholders to the program.

The research findings indicate that changes in the configuration of the executive branch in a context of growing concerns over energy security and unfavourable market conditions for biofuels, among other problems, seem to have contributed to opening a new policy window.

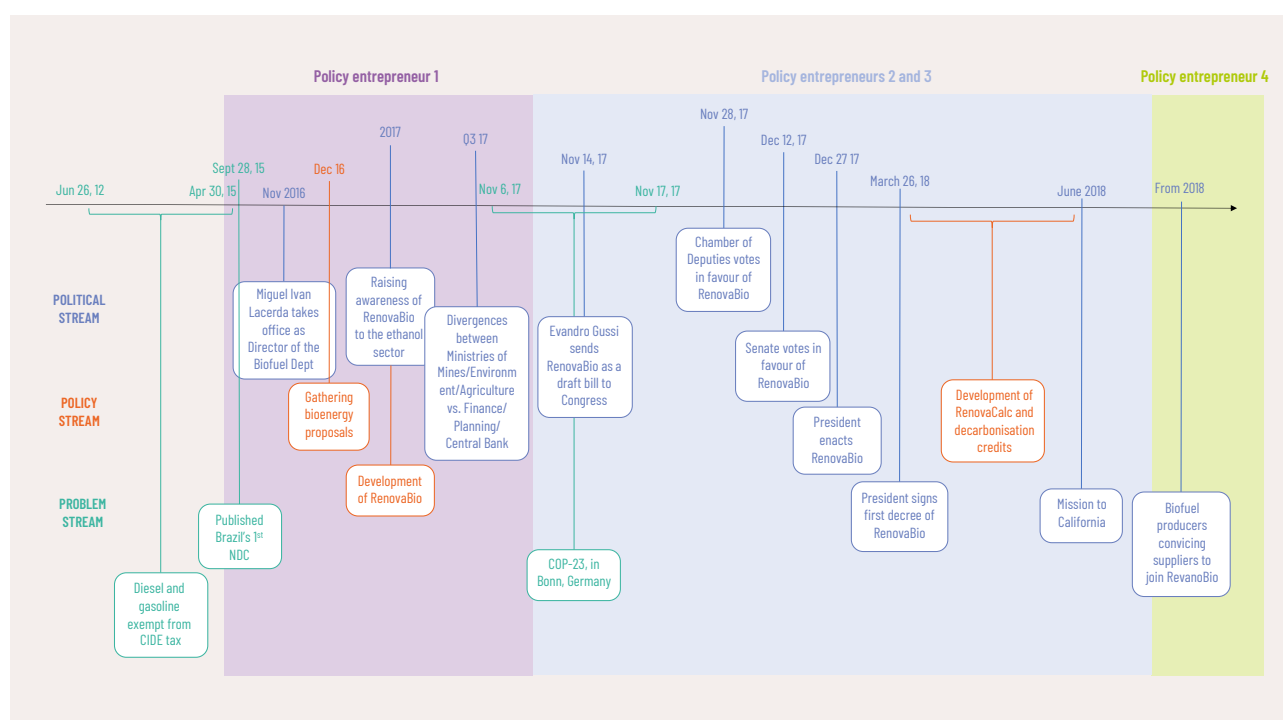
Notably, the appointment, in 2016, of a new director for the Biofuel Department of the Ministry of Mines and Energy (MME) (Policy Entrepreneur 1); an individual with an academic background and previous work experience in environmental issues, who made it possible for RenovaBio to be gradually conceived. Gathering inputs from stakeholders for its design, the Biofuel Department was responsible for conceiving RenovaBio and for engaging intensively with the biofuel sector, including with the Biodiesel Parliamentary Caucus (Policy Entrepreneur 2) and the ethanol association Unica (Policy Entrepreneur 3).

## Multiple policy entrepreneurs and the ‘relay race’

Four stakeholders were identified as relevant policy entrepreneurs in these policy processes. In addition to the MME’s Biofuel Department director (Policy Entrepreneur 1) and the presidents of the Biodiesel Caucus (Policy Entrepreneur 2) and the ethanol association (Policy Entrepreneur 3), biofuel producers were also relevant policy entrepreneurs (Policy Entrepreneur 4).

The existence of multiple policy entrepreneurs in the different stages of the political process, willing to invest their resources at different moments and with complementary skills, helped to speed up RenovaBio’s legislative process, from development to approval to implementation, much like a “relay race”. Once the Biofuel Department director (Policy Entrepreneur 1) encountered difficulties in advancing the policy within the executive branch, with the opposition of ministries concerned with the impacts on fuel prices, he “passed the baton” to Policy Entrepreneur 2, who led the efforts to advance RenovaBio through Congress, while Policy Entrepreneur 3 helped keep the issue prominent in the mainstream media. After the policy was enacted, Policy Entrepreneur 4, motivated by the prospect of CBO revenues, ensured its implementation, engaging their supply chain to take part in the program.

**Figure 1 – Timeline of the RenovaBio policy process, per policy entrepreneur**



Source: the authors

## Multiple objectives

The multitude of objectives targeted by RenovaBio – achieving the country’s climate change commitments, ensuring energy security<sup>6</sup> and improving market conditions for the biofuel sector – likely contributed to the faster-than-usual legislative process undergone by the program, for instance, by creating a large coalition of supporters, with the uncommon alignment of the Agricultural, Biofuel, and Environmental Parliamentary Caucuses. On the other hand, after enactment, the policy seemed to be more vulnerable to criticism given that there is neither a clear priority between its many objectives, nor are there objective indicators to measure its contributions towards attaining each individual goal.

## Climate integration

The issue of climate change was a feature of RenovaBio’s legislative process, particularly in the problem stream. Indeed, the contribution of biofuels toward climate goals was the most frequently discussed concern in news outlets, heightened by Policy Entrepreneurs 2 and 3, even though other problems – such as energy security and the economic difficulties faced by ethanol producers – had greater attention in sectoral discussions and forums.

In the political stream, explicitly linking biofuel policy to Brazil’s climate change commitments gave visibility to the policy and made it costlier reputation-wise to publicly oppose it. However, according to interviewees, criticism from some stakeholders, particularly fuel distributors, still happened “behind closed doors”. As for other stakeholders, there was limited involvement of the climate community or environmental NGOs, with the policy more narrowly discussed by those close to biofuel production and fuel distribution.

On the policy stream, RenovaBio was commended for incorporating a market-based approach, with the creation of a market for decarbonisation credits, a design perceived by the program’s stakeholders as more efficient and less costly to society than a carbon tax. It also encouraged ever-increasing climate-related benefits by allowing biofuel producers and their suppliers to assess and improve their management practices aimed towards issuing more CBIOs.

Other aspects identified as contributing to the program’s technical feasibility were the setting of annual environmental targets for fuel distributors (i.e., the quantity of decarbonisation credits they must buy); choosing fuel distributors as the obligated party to allow for the development of a market with several players; the robustness of RenovaCalc for calculating Efficiency Scores, employing lifecycle analysis; and having a solid structure in place to avoid fraudulent transactions, such as certification of CBIOs and their registration on the B3 stock exchange and over-the-counter market. On the other hand, the program lacks certain features commonly found in regulated carbon markets, such as price stability mechanisms, which could have contributed to a greater effectiveness of the program and to less criticism.

---

<sup>6</sup> According to the Ministry of Mines and Energy’s Explanatory Note, the country was importing fossil fuels at an increasing rate, becoming more exposed to geopolitical risks affecting oil supply and price, whilst national refineries and biofuel mills were already operating at maximum capacity.

Based on the research findings, the following four research propositions were developed on the integration of climate and sectoral policy processes:

**Research proposition 1:** *Attaching a solution to multiple problems helps to secure policy approval, but there should be a clear priority between the policy's many objectives to provide a clear direction to it.*

**Research proposition 2:** *The existence of multiple policy entrepreneurs in the different stages of the political process, willing to invest their resources at different stages and with complementary skills, helps to speed up policy processes.*

**Research proposition 3:** *Explicitly tying sectoral policies to climate change, and even framing them as climate policies, increases the visibility of these policies and decreases public opposition to them.*

**Research proposition 4:** *Adopting a market-based approach contributes to policy acceptance, whilst the implementation of best practices commonly found in regulated environmental markets contributes to its effectiveness.*

Finally, it is worth highlighting that this study did not seek to evaluate RenovaBio and its effectiveness. Moreover, it was not the goal to analyse whether the research propositions, if valid, are of positive or negative consequences to the attainment of climate goals or other socially relevant objectives being pursued by the enactment of public policies.



Chapter one

# Introduction

# 1. Introduction

This report is part of the project “Strengthen National Climate Policy Implementation: Comparative Empirical Learning & Creating Linkage to Climate Finance”, which aims at developing studies that contribute to the implementation of Nationally Determined Contributions (NDCs) in Brazil, Germany/ EU, India, Indonesia and South Africa. Coordinated by DIW Berlin and financially supported by the Federal Ministry for the Environment, Nature Conservation and Nuclear Safety (BMU), this project began in July 2019 and has a duration of four years. Each year, the country partners produce a national study on a topic of relevance to the NDC of their respective countries.

The Center for Sustainability Studies at Fundação Getulio Vargas (FGVces) is the project partner in Brazil, and investigates the attraction of financial flows to low-carbon infrastructure. Although the country’s NDC does not have specific climate goals related to transportation – it is committed to reducing greenhouse gas (GHG) emissions in 37% by 2025 for the entire economy and in 50% by 2030 (2005 levels), and to achieve climate neutrality by 2050 – in the Guidelines for a National Climate Neutrality Strategy, the country commits to strengthening the transition to a low-carbon infrastructure, favouring the use of railways and waterways in cargo transportation. It also seeks to increase the participation of sustainable biofuels in the energy matrix, increasing the consumption of biofuels and the supply of ethanol (Ministério do Meio Ambiente, 2021).

In Year 1 of the SNAPFI project (2019–2020), the research team at FGV looked at the drivers and barriers to direct private investments in Brazil’s cargo railway infrastructure, based on semi-structured interviews with 11 stakeholders from the national railway sector. At the time, one of the most cited factors mentioned by interviewees was the need to change the country’s regulatory framework to allow the proposition of new (greenfield) projects by private companies, instead of relying on concessions proposed by the federal government. Since the publication of this study, the legal framework for railways in Brazil has been altered (through Statute No. 14,273/2021) and, as of February 2023, 100 new projects from 49 different proponents have been submitted for approval to the Ministry of Transports, whilst 39 contracts have been celebrated, representing R\$ 223 billion and 13,000 added kilometres of railways (ANTT, 2023).

In Year 2 (2020–2021), drawing on interviews with 14 stakeholders from the Brazilian capital market, the research team identified the drivers and barriers to capital market investments in low-carbon infrastructure, concluding that incentives vary according to the type of investors. Representing one of the main infrastructure investors in the country, retail investors are attracted by the tax exemption granted by Statute No. 12,431/2011 for infrastructure debentures. Domestic pension funds are not driven by this tax exemption as they consider the spread paid by these debentures above Treasury bonds to be low in relation to the risk of debenture issuers. Local structural barriers represent substantial challenges for foreign investors who might be interested in investing in Brazil, especially since they could find more favourable conditions (e.g., investment grade countries with less volatile currencies) in other emerging markets. Still, the appeal of low-carbon, “green-labelled” infrastructure assets and bonds in Brazil were mentioned as attractive to foreign investors, helping to mitigate these barriers (Yamahaki & Breviglieri, 2022).

In Year 3 (2021-2022), the research team focused on cargo maritime cabotage transportation, analysing the policy process of Brazil's maritime cabotage policy (Statute No. 14,301/2022), a piece of legislation encouraging maritime cabotage development and attempting to shift cargo away from roads. The research team analysed data from 259 newspaper articles and official documents concerning the policy processes, and conducted ten in-depth interviews. Drawing on Kingdon's Multiple Streams Framework (MSF), the study found that a policy window was opened by the emergence of a problem (overreliance on road transport), a key event (truck drivers' strike) and changes in the administration (e.g., new Minister of Infrastructure creating the first navigation department), which the Minister of Infrastructure seized by attaching a policy proposal and pushing for its approval until it was converted into law. The study also identified missed opportunities for integrating climate change concerns into this policy process (e.g., untapped support from local environmental NGOs), concluding with recommendations for actors interested in contributing to the transition to a low-carbon economy.

Complementing the study from the previous year, in the final year of the SNAPFI project (2022-2023), the FGV team investigated the policy process of Brazil's National Biofuel Policy ("RenovaBio"), enacted by Statute No 13,576/2017 as the first public policy with the explicit goal of contributing to attaining the country's climate goals (Simões, 2021). This is the topic of the present report.

The main drivers of GHG emissions in Brazil are land use change and forests, contributing with 49% in 2021, followed by agriculture and livestock, with 25%, and energy, with 18% (SEEG, 2023).

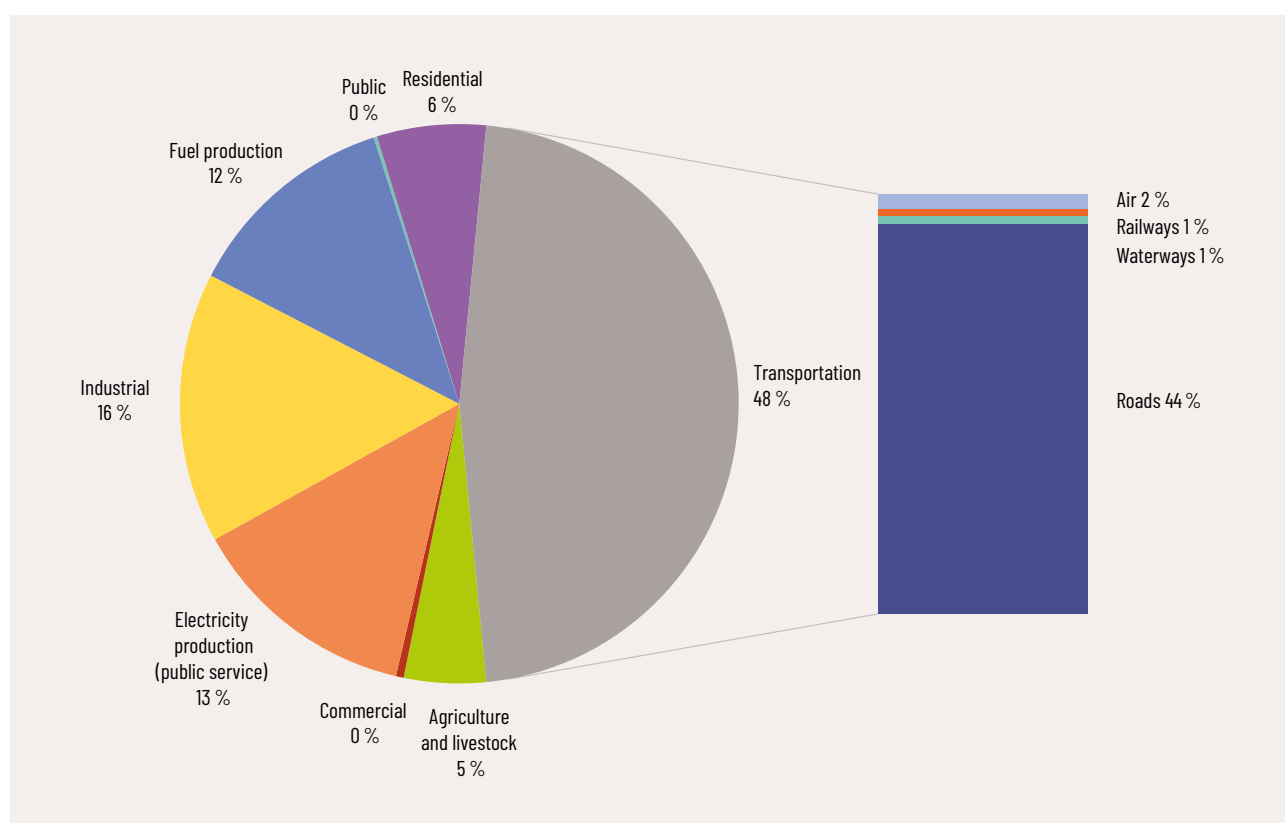
In the energy sector, tackling the use of fossil fuels in transportation is of climate relevance to Brazil given that, unlike other nations, most greenhouse gas (GHG) emissions<sup>7</sup> come from transportation (48%), not electricity generation (13%)(SEEG, 2023). This pattern is explained by the overreliance on road transportation<sup>8</sup> that is largely fueled by fossil sources (46% diesel, 28% gasoline and 2% natural gas) (EPE, 2022b; Ministério dos Transportes, 2018).

---

<sup>7</sup> 94% of GHG emissions produced by the energy sector are CO<sub>2</sub> (SEEG, 2023).

<sup>8</sup> In 2015, 2.4 trillion tonne-km was transported: 65% of all cargo is moved by trucks; 15% by rail; 11% by maritime cabotage; and 5% via inland waterway; 0.6 billion tonne-km was transported by air (Ministério dos Transportes, 2018)

**Graph 2 – Energy-related CO<sub>2</sub>e emissions by sub-sector (%) in Brazil, in 2021**



Source: the authors, based on (SEEG, 2023)

RenovaBio is an interesting public policy to examine because, contrarily to what was observed in Brazil's Maritime Cabotage Policy (Statute No 14,301/2022) (please see national study Year 3), climate change concerns were explicitly incorporated into RenovaBio's policy process. Its discourse highlighted the need for policies toward decarbonisation and the role of biofuels in attaining climate mitigation and the country's climate goals (Lazaro & Thomaz, 2021). Therefore, it is a valuable case study to analyse and from which to draw recommendations for climate policy entrepreneurs interested in integrating climate change concerns into sectoral policy processes.

In this study, the following research questions were investigated:

- **RQ1:** Drawing on Kingdon's Multiple Streams Framework, what were the major forces at play during RenovaBio's legislative process?
- **RQ2:** How were concerns with climate change incorporated into the policy process?

This report is structured as follows: The first section provides an overview of biofuel policy in Brazil and relevant international experiences, explicitly listed as inspirations for RenovaBio. Next, it recaps Kingdon's MSF (Kingdon, 2014). The third section describes the research methods. The following section presents and discusses the research findings, analysing each of the forces at play during the RenovaBio legislative process. The final section concludes and includes possibilities for future research.



A large, stylized number '2' in the background, rendered with a gradient from dark blue to purple. It has a 3D effect with a shadow.

Chapter two

# Literature review

## 2. Literature review

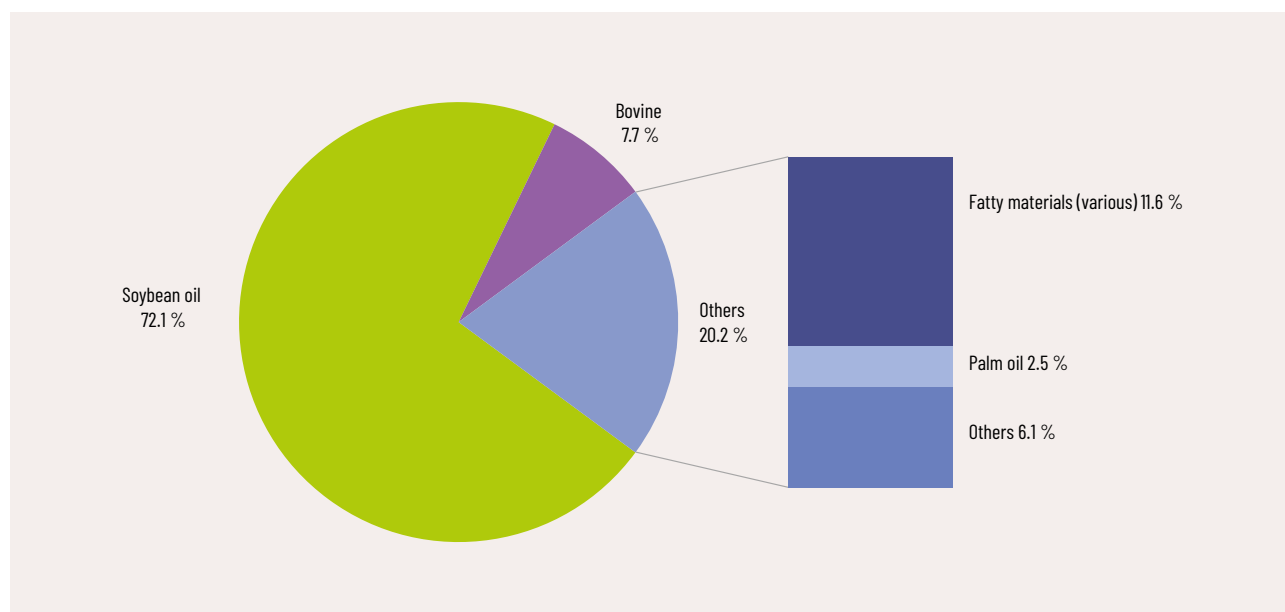
Brazil's history with biofuels policy traces back to the 1970s<sup>9</sup> when the federal government introduced, through Decree No. 76,593/1975, the National Alcohol Program ("Próalcool", in Portuguese) as a response to the first oil crisis, aiming to attain energy security and economic objectives. Indeed, by 1973, approximately three quarters of the country's oil supply was imported (Lima & Toni, 2020).

Ethanol production from sugarcane was encouraged to reduce the country's dependency on imported oil and the resulting trade balance deficit (Grangeia, Santos, & Lazaro, 2022; Lazaro & Thomaz, 2021). For instance, the federal government incentivised the opening of new sugarcane plants via low-interest loans and credit guarantees, and state-owned oil company Petrobras began acquiring ethanol at higher-than-market prices (Lima & Toni, 2020).

In 2005, the government created the National Program of Production and Use of Biodiesel (PNPB, Statute No. 11,097/2005) aiming to "increase, on an economic, social and environmental basis, the participation of biofuels in the national energy matrix" (Brazil, 2005). The PNPB sought to subsidise biodiesel production and ensure the attainment of the national supply targets via public purchase auctions (Grangeia et al., 2022). It also sought to avoid geographical concentration, single crop focus and the exclusion of smallholder farmers, although the latter two were not attained (Lima & Toni, 2020). Over time, the program managed to gradually increase the share of biodiesel blended in diesel oil, from 2% in its inception, reaching 13% in 2021, before being reduced to 10% that same year (Verdélío, 2021). In March 2023, it was increased to 12%.

Today, nearly three quarters of biodiesel is made from soybean oil, with bovine fat being the second most common input (Graph 3).

**Graph 3 – Inputs for biodiesel production (2021, %)**

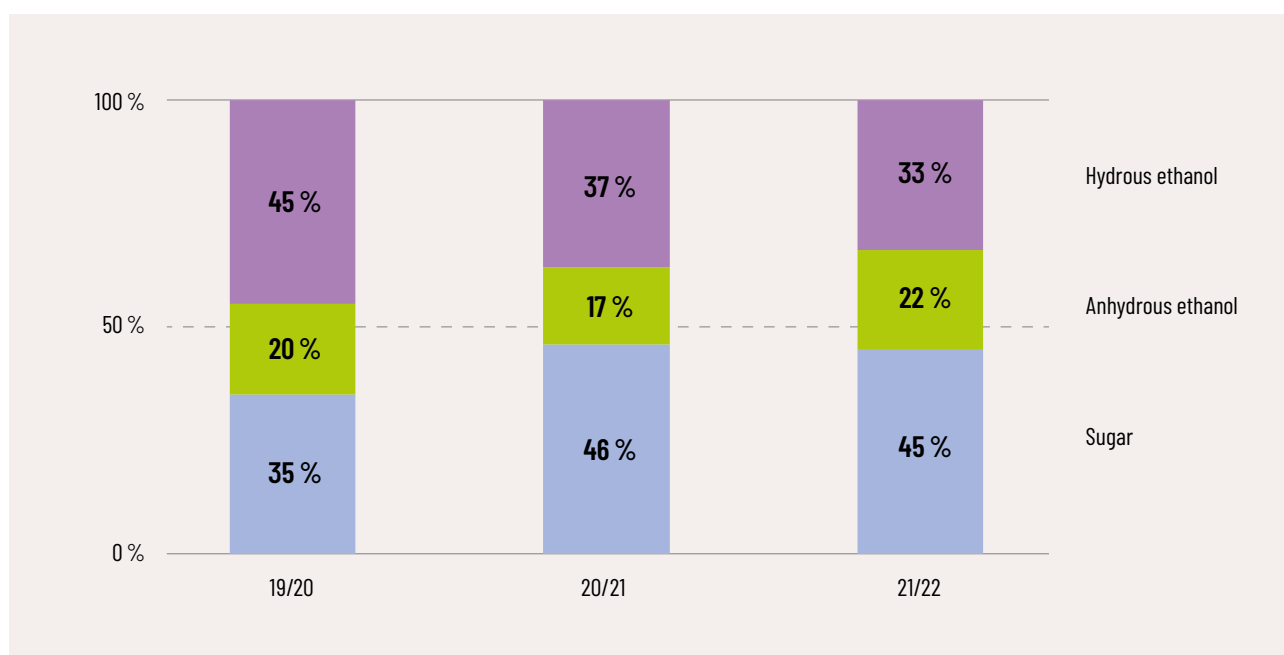


Source: the authors, based on (EPE, 2022a)

<sup>9</sup> Indeed, even in the 1930s, Brazil's federal government required sugarcane ethanol to be blended into gasoline (Lazaro & Thomaz, 2021).

As for ethanol, its blend mandate increased from a 4.5% blend in 1977 to 27% in 2015 (Pavlenko & Araujo, 2019), and today Brazil is the second largest producer of ethanol and world leader in ethanol production from sugarcane (OECD & FAO, 2020). Of all ethanol produced domestically, 89% is derived from sugarcane, accounting for 55% of all sugarcane use (Graph 4). Recently, corn ethanol production has also grown – a 35% increase between 2020 and 2021, and nearly 700% since 2017 – and currently represents 11% of the total ethanol supply (EPE, 2022a).

**Graph 4 – Production mix: ethanol x sugar**



Source: (EPE, 2022a)

Obs: Hydrated ethanol is mixed with 8% water and sold in the petrol stations. Anhydrous ethanol is sold to refineries and mixed with gasoline according to mandatory blend mandates.<sup>10</sup>

<sup>10</sup> Source: <https://g1.globo.com/sp/sorocaba-jundiai/nosso-campo/noticia/2021/06/20/entenda-as-diferencas-entre-etanol-hidratado-e-anidro.ghml>

As for geographical distribution, most of the inputs for ethanol production are concentrated in Brazil's Southeast and Midwest, especially in the states of São Paulo, Goiás and Mato Grosso do Sul (Table 1).

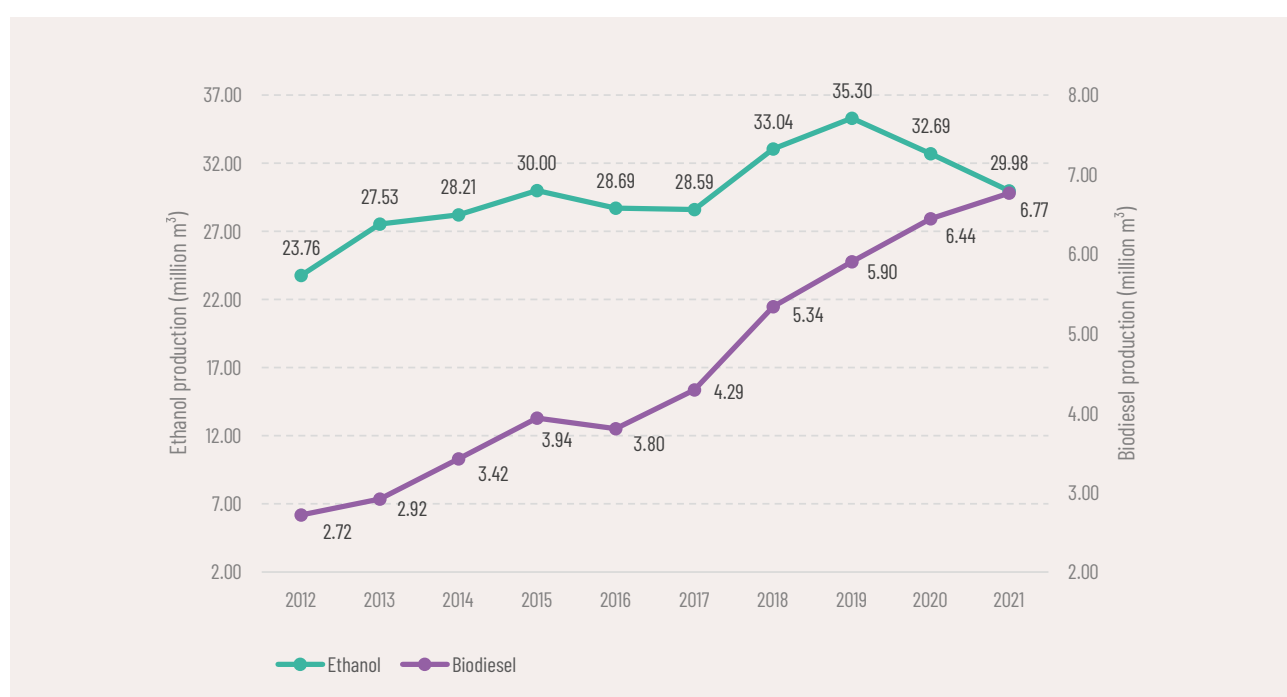
**Table 1 – Largest ethanol producers (states, 2019-2021)**

State	Input (tonne)	%
São Paulo	494,494,637	47.66
Goiás	164,273,885	15.83
Mato Grosso do Sul	105,552,193	10.17
Minas Gerais	93,493,850	9.01
Mato Grosso	51,616,627	4.97
Paraná	46,877,014	4.52
<b>Total</b>	<b>1,037,599,469</b>	<b>100.0</b>

Source: (EPE, 2022a)

Comparing ethanol and biodiesel production, ethanol production has fluctuated in the last ten years, with 2021 recording similar figures to 2015 – approximately 30 billion litres. Biodiesel production has grown nearly 150% in this period, reaching its highest level in 2021 – approximately 6,7 billion litres – largely a reflection of the increase in mandatory blend percentages of biodiesel to diesel, from 5% to 10%. In total, over 36 billion litres of biofuels were produced in Brazil in 2021 (Graph 5).

**Graph 5 – Biofuels production in Brazil, in million m<sup>3</sup> (2012-2021)**



Source: (ANP, 2022)

According to the Energy Research Office (EPE, in Portuguese), the extensive use of liquid biofuels in Brazil was responsible for avoiding 66.9 MtCO<sub>2</sub> in 2021, in comparison with a scenario in which only fossil fuels (gasoline and diesel oil) were consumed (EPE, 2022a).

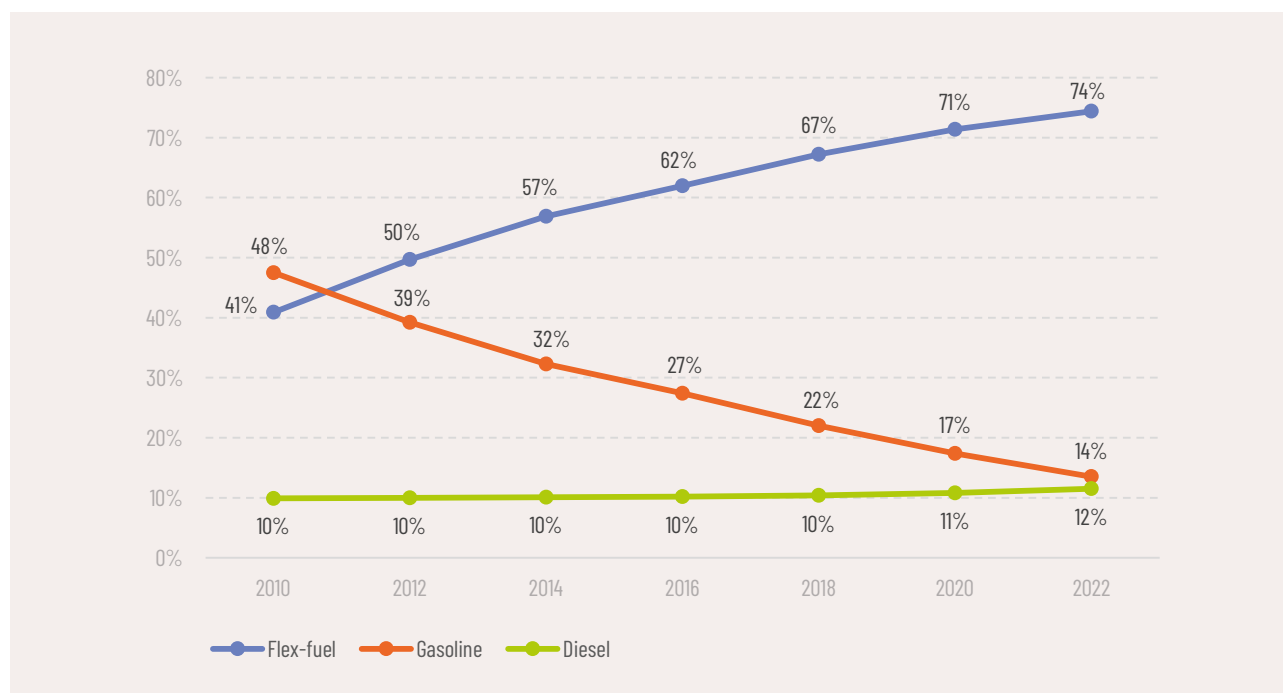
## Advances in flex-fuel motor technology

In tandem with Proálcool, in the 1970s, the Brazilian government also encouraged the development of ethanol-powered cars as well as gasoline-powered ones that could run with the addition of anhydrous alcohol in gasoline (Grangeia et al., 2022; Rei & Cunha, 2021).

In the 1990s, Brazil's automobile industry introduced flex-fuel motors, which can run on any combination of hydrous ethanol and gasohol (gasoline with an addition of anhydrous ethanol). This development, in conjunction with higher oil prices in the 2000s, led to a resurgence of sugarcane ethanol production (Grangeia et al., 2022; Rei & Cunha, 2021).

The share of flex-fuel vehicles in the country has grown considerably in the 2010s, going from 40.9% in 2010 to 74.4% in 2022 (Graph 7). Today, nearly 35 million vehicles (passenger cars, light commercial vehicles, heavy trucks, buses and coaches) can run on ethanol. In contrast, hybrids and/or electric vehicles represent only 0.2% of the fleet, with 106,600 units in 2022, while those that run on natural gas or exclusively on ethanol make up, respectively, 0.3% and 0.1% of the national fleet (Sindipeças, 2022). As for registered vehicles (passenger cars, light commercial vehicles, heavy trucks, buses and coaches), in 2022, 76.6% were flex-fuel, 19% ran on diesel, 2.5% on gasoline and 1.7% were electric (Anfavea, 2022).

**Graph 6 – Brazilian fleet by fuel type (%)**



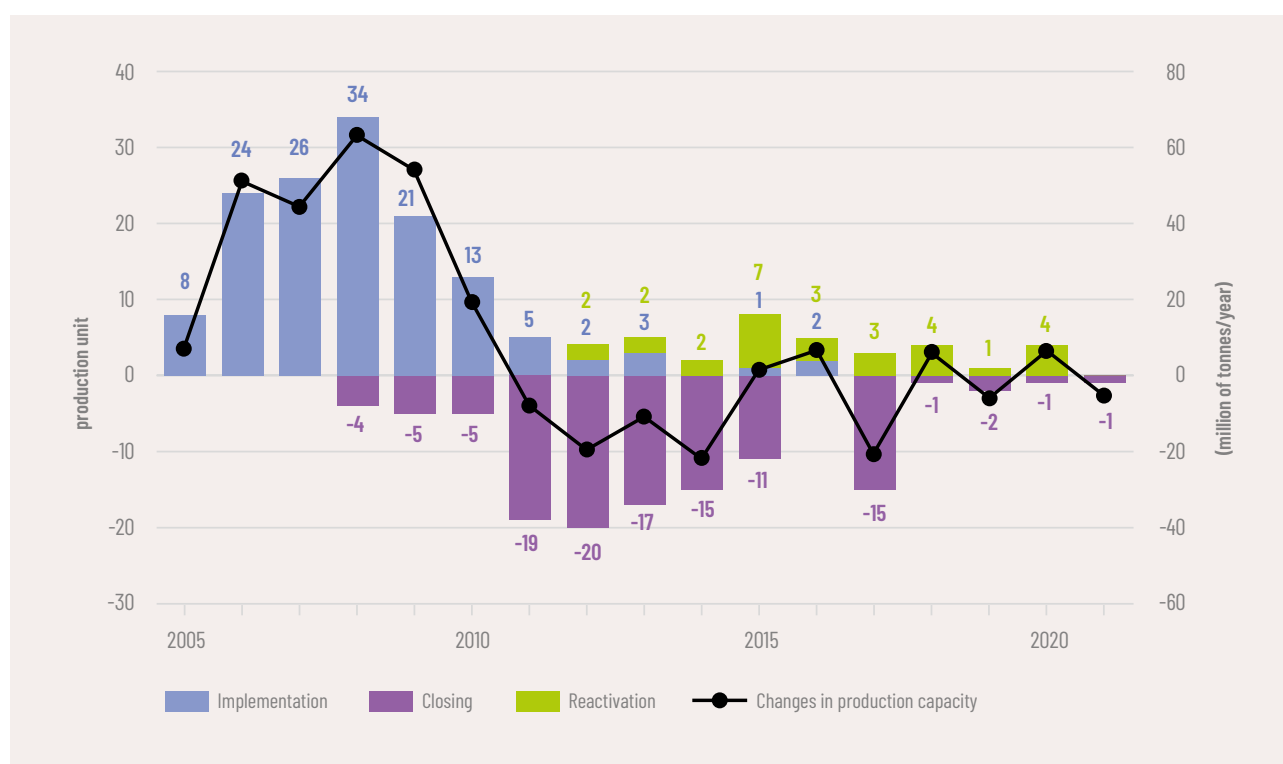
Source: (Sindipeças, 2022)

Obs: Includes passenger cars, light commercial vehicles, heavy trucks, buses and coaches.

## Sugarcane biofuel installed capacity

Despite Brazil's vast experience with biofuels and the large fleet of flex-fuel vehicles, in the 2010s, the sugarcane energy sector faced a period of diminished investments and a number of existing mills either closed or entered a process of judicial recovery (Addington, 2017). Between 2008 and 2018, one-hundred companies left the sector, dealing with high indebtedness, low profitability and investment difficulties (Barbosa, Szklo, & Gurgel, 2022). By December 2021, there were 359 operating ethanol producers, with the capacity to produce 132,000 m<sup>3</sup>/day of anhydrous ethanol and 246,000 m<sup>3</sup>/day of hydrous ethanol (EPE, 2022a).

**Graph 7 - Variation in the number of sugarcane mills in Brazil**



Source: (EPE, 2022a)

## RenovaBio

RenovaBio was first proposed by the Biofuels Directorship of the Ministry of Mines and Energy (MME) in 2016. In February 2017, MME launched a public consultation (ANP, 2021) and, on June 8, the National Energy Policy Council (CNPE) created a working group to formulate the basis of RenovaBio (Addington, 2017).

The draft bill was initially planned to be issued as a provisional measure,<sup>11</sup> but, given the delays from the executive branch in either issuing such measure or sending a draft bill to Congress, Congressman

<sup>11</sup> "Provisional Measures are rules with the force of law, issued by the President of the Republic in situations of relevance and urgency. Despite producing immediate legal effects, the Provisional Measure needs further consideration by the Houses of the National Congress (Chamber and Senate) to become a definitive ordinary law." (Congresso Nacional, 2022)

Evandro Gussi, a representative from the Green Party for the State of São Paulo, and leader of the Biodiesel Caucus in Congress, decided to present RenovaBio as a draft bill (Draft Bill No. 9,086/2017) on November 14, 2017 (Bossle, 2017; Lazaro & Thomaz, 2021).

A character of urgency was requested for the analysis of the draft bill both in the Chamber of Deputies and Senate, receiving only three amendments in the first house and suffering no changes in the second, which passed the bill on December 12, 2017. Hence, after only 28 days from its official proposal – a shorter period if compared to the average 1,263 days that draft bills take to be approved by Congress – the policy was approved in both houses of Congress and enacted by the President on December 27, 2017 (Câmara dos Deputados, 2018; Lazaro & Thomaz, 2021; Senado Federal, 2021).

Considered the only national carbon pricing initiative implemented (Grangeia et al., 2022), RenovaBio (Statute No. 13,156/2017) highlights the following objectives:

- To contribute to the attainment of the country's commitments under the Paris Agreement and the United Nations Framework Convention on Climate Change (UNFCCC);
- To contribute to the adequate relationship of energy efficiency and reduction of greenhouse gas emissions in the production, commercialisation and use of biofuels, including life cycle assessment mechanisms;
- To promote the adequate expansion of the production and use of biofuels in the national energy matrix, with emphasis on the regularity of fuel supply; and
- To contribute to conferring predictability for the competitive participation of the various biofuels in the national fuel market (Brazil, 2017).

RenovaBio is based on three axes (MME, 2023b):

- **Axis 1 – National decarbonisation targets**

Annual national emission reduction targets are set by the CNPE for a 10-year period, which is then translated, by the National Agency of Petroleum, Gas and Biofuels (ANP), into individual targets applied to all fuel distributors, proportional to the amount of fossil fuel traded in the previous year (Ribeiro & Cunha, 2022). CNPE Resolution No. 13/2022 establishes the following annual targets:

**Table 2 – Annual decarbonisation targets, according to CNPE Resolution No. 13/2022 (in Mt CO<sub>2</sub>eq)**

Year	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032
Annual target	37.47	50.81	58.91	66.49	72.93	79.29	85.51	90.67	95.67	99.22
Upper limit	-	59.31	67.41	74.99	81.43	87.79	94.01	99.17	104.17	107.72
Lower limit	-	42.31	50.41	57.99	64.43	70.79	77.01	82.17	87.17	90.79

Source: (MME, 2022)

The three largest distributors – Vibra, Raízen and Ipiranga – are responsible for 64% of total commitments (EPE, 2022a). Non-compliance with the individual targets results in fines proportional to the quantity of decarbonisation credits not acquired, and may vary from R\$ 100,000.00 to R\$ 50,000,000.00 (Brazil, 2017).

In July 2022, through Decree No. 11,141/2022, the government extended the deadline for fossil fuel distributors to comply with the individual targets for 2022 to 30 September 2023 (the previous deadline had been 31 December 2022). For the years to come, distributors will have until 31 March of the subsequent year to comply with their annual targets (Brazil, 2022).

### • **Axis 2 – Voluntary certification of biofuel production and assignment of Energy-Environmental Efficiency Scores**

The participation of biofuels producers and importers in the program is voluntary. Those interested in participating must hire certification firms (previously accredited by the ANP) to validate their Energy-Environmental Efficiency Scores, which reflect their individual contribution to mitigating GHG in relation to the fossil fuel substitute (Grangeia et al., 2022). By June 2022, there were 11 accredited certification firms and 312 certified biofuel producers, of which 85% were first-generation sugarcane ethanol producers (EPE, 2022a).

To calculate the Energy-Environmental Efficiency Scores, RenovaBio uses lifecycle GHG accounting (“from well to wheel”). The calculation tool is RenovaCalc, developed by an interdisciplinary group of scientists from the government, universities and the private sector (Ribeiro & Cunha, 2022), evaluating the following biofuels:

- First and second-generation sugarcane ethanol;
- Corn ethanol;
- Biodiesel;
- Bio-methane; and
- Bio-kerosene.

RenovaCalc calculates total emissions from the different stages of production, which generates the carbon intensity index of the biofuel, in gCO<sub>2</sub>eq/MJ. The difference between the biofuel’s carbon intensity and that of the fossil fuel substitute<sup>12</sup> will produce a final score, which will be the basis for the generation of the decarbonisation credits (Folegatti et al., 2018). Until June 2021, biodiesel had an average Efficiency Score of 65.72 gCO<sub>2</sub>eq/MJ, biomethane 77.38 gCO<sub>2</sub>eq/MJ, anhydrous ethanol 59.86 gCO<sub>2</sub>eq/MJ and hydrous ethanol 58.95 gCO<sub>2</sub>eq/MJ (EPE, 2022a). Biofuel from biomass that has been produced in areas deforested before December 2018<sup>13</sup> is not eligible to participate in the program.

### • **Axis 3 – Generation of decarbonisation credits (CBIOs)**

Decarbonisation credit (CBIO) is the bridge between biofuel producers and fossil fuel distributors. Each CBIO represents one tonne of avoided CO<sub>2</sub> equivalent emissions in each biofuel production chain compared with the conventional fossil fuel alternative (Ribeiro & Cunha, 2022). They are calculated by

---

<sup>12</sup> RenovaCalc uses 87.4 gCO<sub>2</sub>eq/MJ for gasoline and 86.5 gCO<sub>2</sub>eq/MJ for diesel (gov.br, 2023).

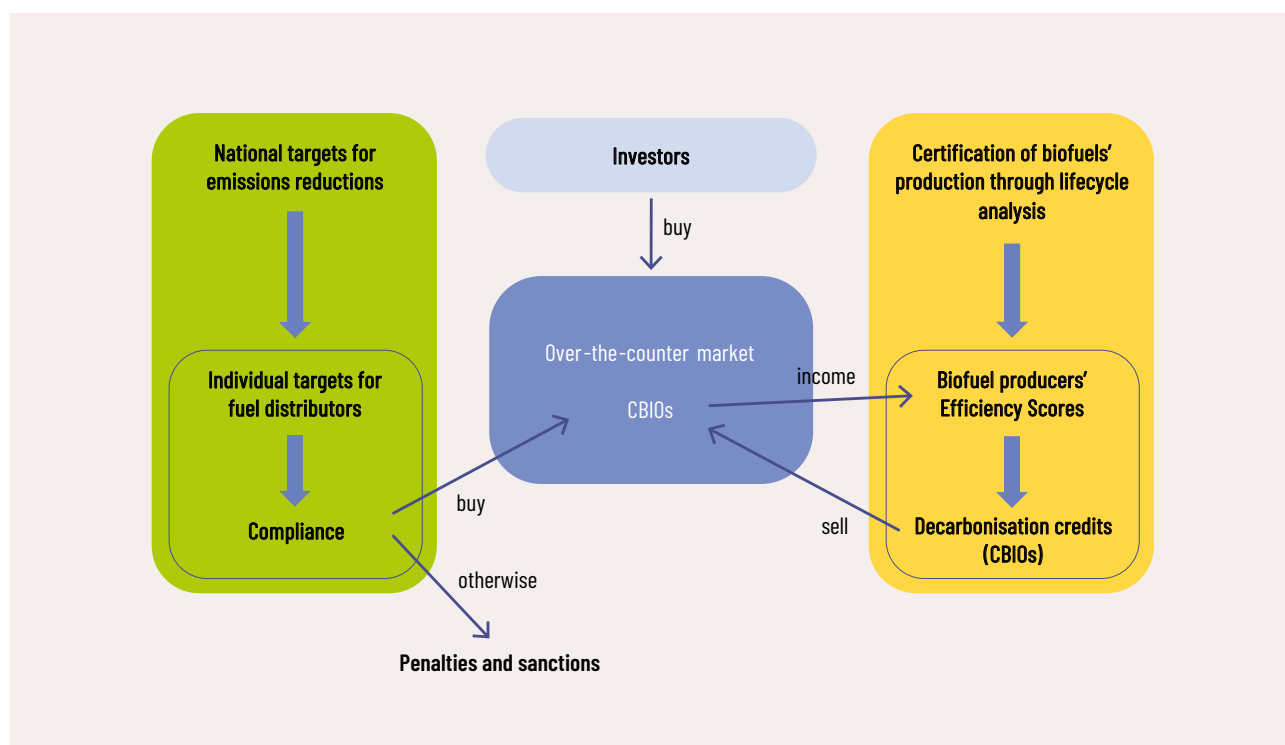
<sup>13</sup> This cutoff date was set by Resolution ANP 758/2018, which regulates the certification of biofuel producers.



multiplying the Efficiency Scores and the volume of biofuels sold by the producer. These CBIOS are attested by certification agencies, and traded, in an over-the-counter (OTC) market, at trading platform B3.<sup>14</sup> In December 2019, the program came into effect and it was possible to purchase CBIOS as of April 2020 (Grangeia et al., 2022).

Figure 2 summarises how the three axes relate to one another:

**Figure 2 – RenovaBio concept**



Source: the authors based on (MME, 2023b)

In 2022, 31.23 million CBIOS were issued, 41.67 million CBIOS were available (issued + in stock) and 16.81 million were retired (used for target compliance). The average price of the CBIOS was R\$ 111.63 (MME, 2023a).

## Analysis of the policy process

Since RenovaBio was sanctioned, there have been a few studies analysing aspects of its policy process.

For instance, in terms of interest groups involved in the process (political stream), Addington (2017) found that the draft bill has received support from different industry associations, most notably from the Brazilian Sugarcane Industry Association (Unica) and the National Association of Automobile Manufacturers (Anfavea), which together signed a memorandum recognising the importance of the new Biofuel Policy as well as the program “Rota 2030”.<sup>15</sup>

<sup>14</sup> [https://www.b3.com.br/en\\_us/products-and-services/additional-services/informational-service/decarbonization-credit-cbio/](https://www.b3.com.br/en_us/products-and-services/additional-services/informational-service/decarbonization-credit-cbio/)

<sup>15</sup> Statute 13,755/2018, which seeks to incentivise, via tax exemptions, research and development activities throughout the automobile industry supply chain among other objectives (Brazil, 2018).

Lima & Fabiano (2020) highlighted the influence exerted by Unica through its lobbying activities in Congress as well as internationally. From within the government, Lazaro & Thomaz (2021) highlighted the support of the Ministry of the Environment, the ANP and the Brazilian Agricultural Research Corporation (Embrapa).<sup>16</sup> Lima & Toni (2020) identified the participation of three main parliamentary caucuses, the Biofuel, the Agriculture and the Environmental Caucuses, the latter two which usually antagonise one another, but were aligned in recognising the sustainability aspects of RenovaBio. In contrast, Lazaro & Thomaz (2021) and Takaes Santos (2020) noted the lack of participation of environmental non-governmental organisations (NGOs), even though water scarcity, soil erosion and food security are relevant issues in bioenergy production.

Still, with RenovaBio sanctioned and being implemented, Rei & Cunha (2021) suggest that the country managed to set up a policy framework that supports and facilitates investments to increase biofuel production, even if fuels for other means of transportation (aviation, rail and water) were not addressed in a similar fashion.

Despite existing studies, to the best of our knowledge, there is a gap in the academic literature concerning an examination of the extent to which climate change concerns were incorporated into this policy process, a gap which this study seeks to fill.

## International context

Historically, biofuel production internationally has been fostered and supported by public policies, such as through blending targets (in fossil fuels), tax exemptions, subsidies, and other financial incentives, in order to reduce countries' dependence on oil imports, to increase the participation of renewables in the energy mix or to provide additional sources of income to the agricultural sector (Sorda, Banse, & Kemfert, 2010).

Two international low-carbon fuel policies can be highlighted: the Environment Protection Agency's (EPA) Renewable Fuel Standard Program (RFS) and California's Low Carbon Fuel Standard (LCFS) (Rei & Cunha, 2021).<sup>17</sup>

The RFS was enacted in 2005, expanded in 2007, and establishes a mandate for biofuels to be blended into the USA's transportation fuel supply, with targets that grow annually, from four billion gallons in 2006 to 36 billion gallons in 2022. Such figures represent the sum of individual annual targets for (i) total renewable fuel, (ii) advanced biofuel, (iii) cellulosic biofuel and (iv) biomass-based diesel (Bracmort, 2020; Lark et al., 2022). After 2022, the EPA must determine the amounts in future rulemakings (Bracmort, 2022). Compliance with the program, by the obligated parties (fuel importers and refiners), is accomplished via surrender of tradable credits, so-called Renewable Identification Numbers (RINs), to the EPA. The RIN system operates as follows:

---

<sup>16</sup> The Brazilian Agricultural Research Corporation (Embrapa) was established in 1973 by the Brazilian Ministry of Agriculture, Livestock and Food Supply to develop the technological foundation for a tropical model of agriculture and animal farming. It focuses on the generation of knowledge and technology for Brazilian agriculture (Embrapa, 2022).

<sup>17</sup> The European Renewable Energy Directive was also mentioned, briefly, in the interviews (see Research Findings). More information about the Directive available at: [https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive\\_en](https://energy.ec.europa.eu/topics/renewable-energy/renewable-energy-directive-targets-and-rules/renewable-energy-directive_en).

1. An RIN is attached to each gallon of renewable fuel upon its production, given that the fuel qualifies for the program;
2. The RIN is separated when the renewable fuel is blended with a fossil fuel (gasoline or diesel); and
3. The separated RIN may be surrendered to the EPA (for compliance), traded or banked for use in the following year (Bracmort, 2020).

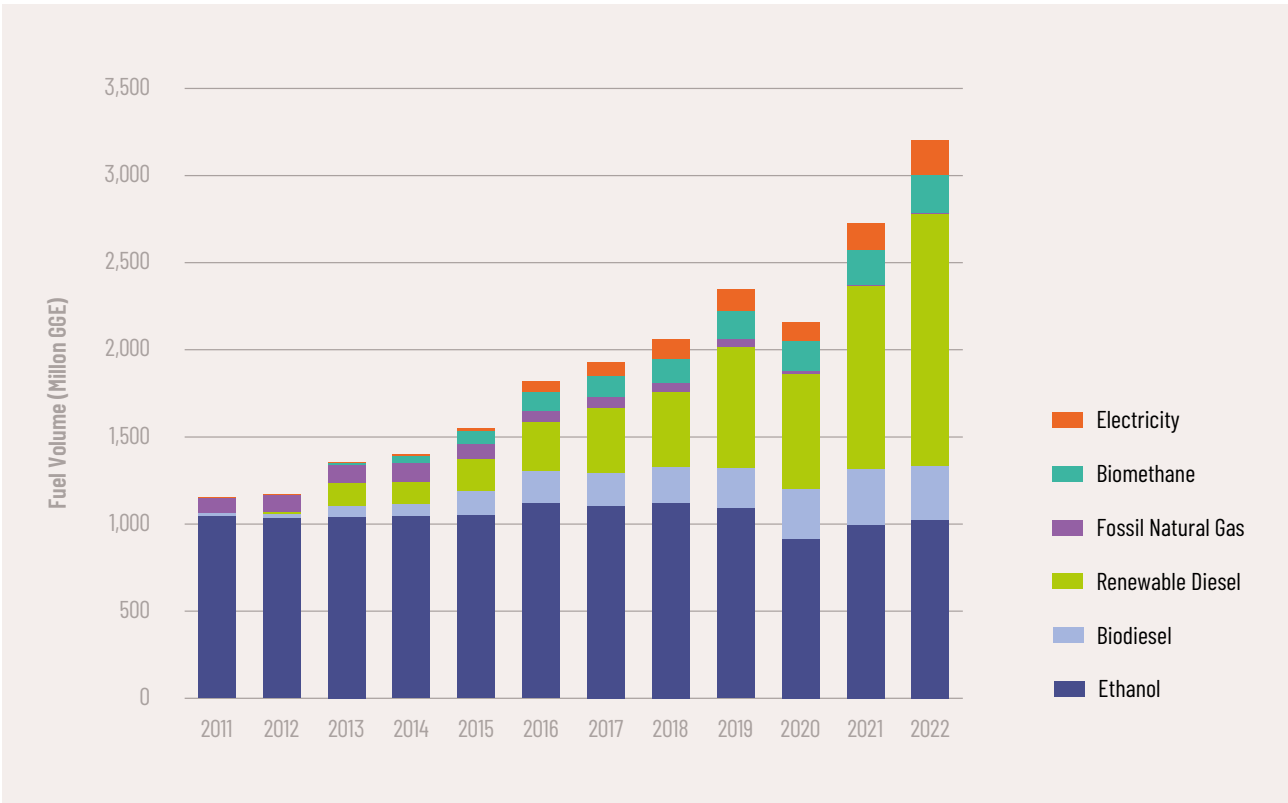
Individual targets for obligated parties, the so-called Renewable Volume Obligation (RVOs), are calculated by multiplying their sales of gasoline and diesel by the annual renewable fuel percentages stipulated by the EPA (Bracmort, 2020). Although the RFS sought to incentivise the production of advanced biofuels (such as those made from cellulosic feedstock), the overwhelming majority of the mandate has been observed with conventional biofuels, mostly corn grain ethanol (Lark et al., 2022). The EPA is the administrator of the RFS, and establishes the amount of renewable fuel that obligated parties must meet based on factors such as the statutory targets, fuel supply, oil prices, feedstock prices and other conditions (e.g. COVID-19 pandemic). Since 2014, the total renewable fuel statutory target has not been met, and total renewable fuel volume has been set by the EPA for the past nine years below the statutory targets, largely due to underproduction of advanced biofuels (Bracmort, 2022).

Established by the governor through an executive order in January 2007 (Breetz, 2017), California's LCFS was originally adopted in 2009, readopted in 2015 and amended in 2018, currently with the goal to reduce the carbon intensity of the state's fuel pool by at least 20% by 2030 (in comparison with 2010). The carbon intensity (CI) of each fuel is based on life cycle analysis, measured by GHG emissions per megajoule of energy ( $\text{gCO}_2\text{e/MJ}$ ), including direct GHG emissions from fuel production, transportation and use, and indirect GHG emissions, for instance, from changes in land use for some biofuels. The CI of each fuel is then compared with the CI benchmark, which decreases annually (CARB, 2020; Witcover, 2018). In short,

*"Fuels and fuel blendstocks introduced into the California fuel system that have a CI higher than the benchmark generate deficits. Similarly, fuels and fuel blendstocks with CIs below the benchmark generate credits. Annual compliance is achieved when a regulated party uses credits to match its deficits."* (CARB, 2020)

Credits can be generated by the introduction of renewable fuels to the fuel pool, as well as by the implementation of projects that reduce emissions in the petroleum supply chain or the deployment of zero-emission vehicle infrastructure, such as hydrogen or electric vehicle charging stations (CARB, 2020). Regulated parties, fuel providers can comply with the program by: i) producing low-carbon fuels; ii) purchasing low-carbon fuels from other producers; iii) purchasing credits; and iv) using banked credits from previous years (Witcover, 2018). Ethanol and renewable diesel are the most relevant biofuels in the program, each representing nearly over one third of all alternative fuels produced (Graph 8).

Graph 8 – California’s LCFS alternative fuels by volume (million gallons of gasoline equivalent)



Source: (CARB, 2023)

**Table 3 – Comparison between RFS, LCFS and RenovaBio**

Characteristics	Renewable Fuel Standard (US)	Low-Carbon Fuel Standard (California)	RenovaBio (Brazil)
Enactment	2005	2007	2017
Regulated parties	Fossil fuel refineries and importers	Fuel providers	Fossil fuel distributors
Requirements for regulated parties	Comply with individual targets to purchase tradable credits, calculated by multiplying the volume of produced fuel by EPA's annual fuel percentage.	Must produce low-carbon fuels; purchase low-carbon fuels from other producers; purchase credits; and/or use banked credits from previous years.	Comply with annual targets to purchase decarbonisation credits, calculated by multiplying the national annual GHG reduction target by the distributor's market participation (%).
Alternative fuels covered	Total renewable fuel; Advanced biofuel; Cellulosic biofuel; Biomass-based diesel.	Ethanol; Biodiesel; Renewable diesel; Fossil natural gas; Biomethane; Electricity.	First and second-generation sugarcane ethanol; Corn ethanol; Biodiesel; Bio-methane; Bio-kerosene.
Calculation of biofuel emissions	-	Life cycle analysis, including indirect GHG emissions	Life cycle analysis, excluding indirect GHG emissions. Biofuel from biomass that has been produced in areas deforested before December 2018 is not eligible to participate in the Program.
Supervisory entity	EPA	California Air Resources Board (CARB)	ANP

Source: (Bracmort, 2020; CARB, 2020; Lark et al., 2022; MME, 2023b; Witcover, 2018)

## Theory of change and analytical framework

This study follows the approach pursued in National Study Year 3 and, therefore, is based on the same theory of change and analytical framework. Below, we provide a brief summary of John Kingdon's Multiple Streams Framework (MSF).<sup>18</sup>

### Multiple Streams Framework

In the MSF, changes on the governmental agenda emerge from the joining of three distinct streams:

- **Problem stream:** stream in which issues begin to be seen by policymakers as worthy of action, and hence considered as problems to be solved. Crisis (caused by discrete events, such as disasters), indicators (such as price indices and mortality rates), and the monitoring and feedback from governmental problems are some of the factors that contribute to turning an issue into a problem;
- **Policy stream:** in which several public policy proposals (alternatives) are presented, reviewed and combined until a select group of feasible solutions rises to serious consideration, according to technical, budgetary and political aspects as well as the national mood. Events in this stream tend to be led by experts who seek to persuade others about the merits of their preferred policies; and
- **Political stream:** composed by factors such as shifts in the national mood,<sup>19</sup> campaigns carried out by interest groups, electoral outcomes and other modifications in the configuration of the executive and legislative branches of government. Changes in this stream emerge from bargaining processes destined to form winning coalitions (Kingdon, 2014).

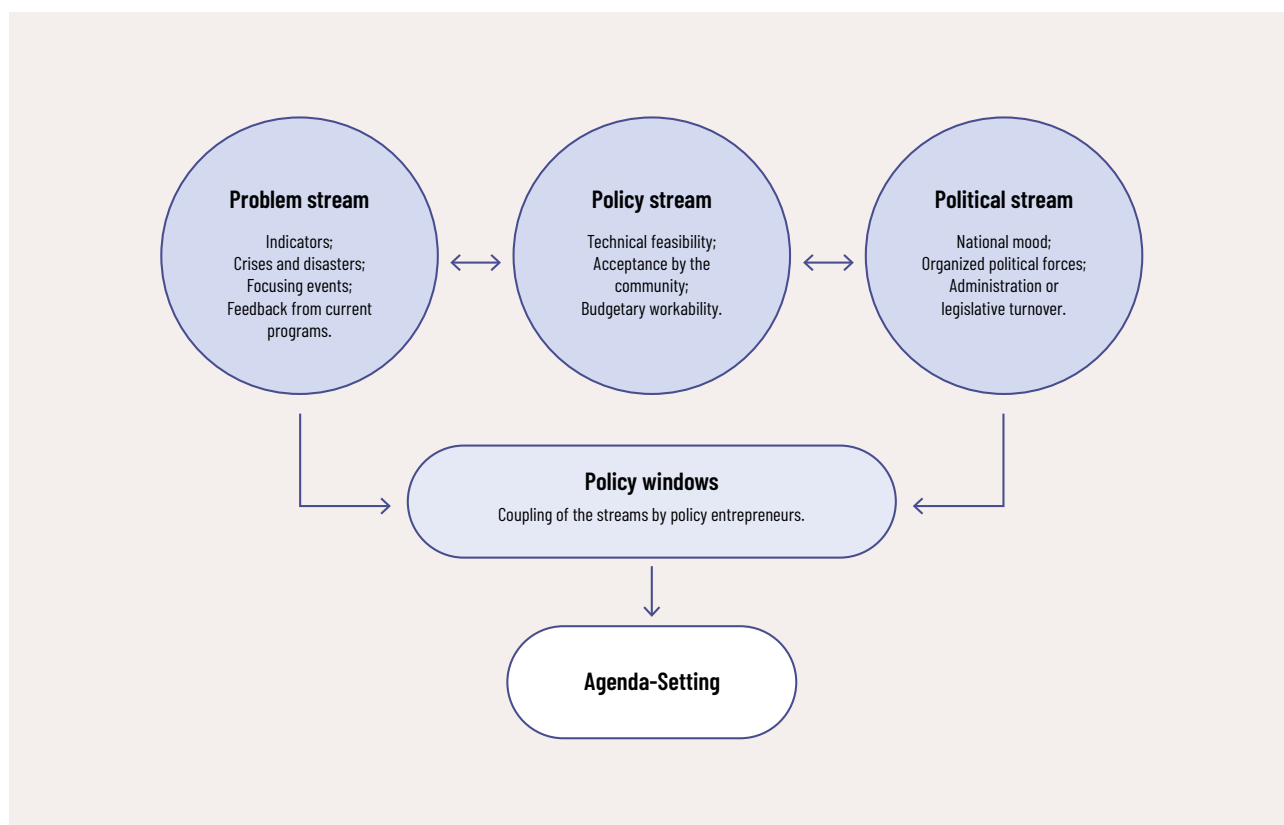
For analytical reasons, at least, the streams can be considered as independent amongst themselves, but occasionally converge during critical moments, thereby opening a policy window for certain actors ("policy entrepreneurs") to push their preferred solutions or shift the general attention towards the problems they care the most about, as summarised in Figure 4.

---

<sup>18</sup> Taken from the same section on the previous report.

<sup>19</sup> Understood as "the notion that a rather large number of people out in the country are thinking along certain common lines" (Kingdon, 2014, p. 146).

**Figure 3 – The Multiple Streams Framework**



Source: Capella (2006)

The governmental agenda is mostly influenced by the events in the problem and political streams, while alternatives (solutions) are mostly affected by happenings in the policy stream and can be attached to existing problems or introduced when the agenda shifts. Once a policy window opens, participants in the public policy process adjust their behaviours accordingly; however, the window may close if no viable alternatives are available (Farah, 2018).

The opening of a policy window affects the decision agenda, for instance, by thrusting a proposal for legal enactment, legislative approval or presidential decision. When an item reaches the decision agenda, relevant actors usually display greater flexibility and willingness to bargain for a solution, whereas in other moments they generally remain firm in their positions and behind their preferred policies (Kingdon, 2014).

Finally, “policy entrepreneurs” play an important role in joining the different streams, attaching solutions to problems, minimising and overcoming restrictions, rewriting proposals and seizing favourable events (Capella, 2006). They can be seen as champions of specific proposals or of the importance of a given idea (Kingdon, 2014) and are usually experts on a given issue, occasionally occupying a position within government. They can aptly represent the ideas of different groups, and therefore manage to create an environment in which their ideas are well received by other participants in the public policy process (Almeida & Gomes, 2018).

Although the MSF focuses on the agenda-setting stage of the public policy process, even if an item rises on the agenda and a decision is made, it can still suffer from implementation failure (Zahariadis & Exadaktylos, 2016). On this point, Flores (2017) proposes that not only is the “ripeness” of the streams necessary, but wide support from several actors may be necessary to increase the probability of the policy being enacted as well as implemented.

For a complete review of MSF, see the Literature Review section of National Study Year 3.



A large, stylized letter 'S' in the background, composed of two overlapping curved shapes. The top shape is a lighter blue, and the bottom shape is a darker blue/purple. The entire background has a gradient from dark purple at the top to a lighter blue at the bottom.

Chapter three

# Data and methods

### 3. Data and methods

Following other studies with an exploratory character that adopt Kingdon's Multiple Streams Framework to analyse public policies, this study employs content analysis from newspaper articles and official documents as well as complementary semistructured interviews with sector representatives as methods for data collection and analysis, as detailed below.

#### Data collection

From secondary sources, 123 articles from three Brazilian newspapers/newsletters that contain the expression "RenovaBio" were collected from the newspaper databases, dated between 31 August 2016 (when the President of the Republic took office) and 6 April 2018 (the day after Congress assessed the President of the Republic's vetoes to the draft bill) so as to analyse the main forces at play during the policy process, according to Kingdon's MSF.

The newspaper Folha de São Paulo was selected because it was rated number one in newspaper sales in 2020, with a monthly average of 343,522 newspapers (print and digital) sold in the country. In this ranking, Estado de São Paulo<sup>20</sup> had the largest print circulation of all newspapers in the country in the middle of 2021 (75,322). Valor Econômico was in sixth position, and number one among business-focused newspapers (poder360, 2021).

**Table 4 – Number of articles analysed – August 2016 to April 2018**

Newspapers	2016 (from August 31)	2017	2018 (until April 06)	Total
Folha de São Paulo	0	14	6	20
Estado de São Paulo	1	24	11	36
Valor Econômico	0	47	20	67
<b>Total</b>	<b>1</b>	<b>85</b>	<b>36</b>	<b>123</b>

Source: the authors based on newspaper articles

We also analysed RenovaBio's Explanatory Note, written by the Ministry of Mines and Energy, a 138-page document with comprehensive arguments for the creation of the National Biofuel Policy, a description of its main elements, and an analysis of the drawbacks of alternative public policies, such as carbon tax and direct subsidies to biofuel production.

20 We focused on newspapers from the state of São Paulo as 50% of ethanol production takes place in the state, as shown in Table 1.

We complemented secondary data analysis with in-depth, semistructured interviews with 11 stakeholders, representing the federal government (4), civil society (1), fossil fuel distributors (2), ethanol producers (2) and sector associations (2), selected based on their active involvement in the policy process and/or for representing relevant stakeholders to RenovaBio. Conducted online between 26 January 2023 and 11 April 2023, the interviews were recorded (except for one case where the interviewees did not allow it, in which case extensive notes were taken) and transcribed for content analysis. For an academic perspective, the authors discussed the preliminary research findings with three representatives from academia, experts in the Multiple Streams Framework or biofuel policies, to refine the Discussion section.

The interview guide is in Appendix 1. All references to interview results are presented anonymously in the Research Findings section.

## Data analysis

Documents were coded independently by two researchers familiar with MSF, using Atlas T.I. The primary codes used were the main concepts from MSF (problem, policy, politics and policy entrepreneur). The texts were then classified as subcodes according to the framework's elements (Table 5).

**Table 5 – Coding scheme for analysis – elements of the framework**

Elements of the framework	
Problems	Focusing events
	Indicators
	Policy feedback
Political	National mood
	Organised political forces
	Events within government
Policy	Technical feasibility
	Value acceptability
	Anticipation of future constraints
Policy Entrepreneurs	Claim to a hearing
	Political connections and negotiating skills
	Persistency

Source: Kingdon (2014), adapted by the authors.

The documents were also coded according to the participants involved in the events portrayed (Table 6).

**Table 6 – Coding scheme for analysis: participants of the public policy process**

Participants of the public policy process	
Inside the government	President
	Public servants
	Congress
Outside of the government	Interest groups
	Researchers, academics and consultants
	Political parties and elections-related actors
	Media
	Mass public

Source: (Kingdon, 2014)

## Data description

Across the sample, RenovaBio was the main topic in 33% of the articles.

**Table 7 – Is RenovaBio the main issue discussed in the article?**

Valor Econômico			Folha de São Paulo		Estado de São Paulo		Total	
	N	%	N	%	N	%	N	%
Yes	28	42%	6	30%	6	17%	30	33%
No	39	58%	14	70%	30	83%	83	67%
Total	67	100%	20	100%	36	100%	123	100%

Source: the authors based on newspaper articles

As for the sections of the newspapers where the articles were found, in Valor, most articles were found in the Agribusiness section, whereas, in Folha and Estado, most articles were found in the Economy section.

**Table 8 – Section in which articles appear**

Valor Econômico			Folha de São Paulo		Estado de São Paulo	
	N	%	N	%	N	%
<b>Agribusiness</b>	36	54%	1	5%	0	0
<b>Politics</b>	10	15%	0	0	0	0
<b>Brazil general</b>	11	16%	0	0	1	3%
<b>Companies</b>	6	9%	0	0	0	0
<b>Opinion</b>	2	3%	0	0	4	11%
<b>Economy, finance, market</b>	2	3%	15	75%	27	75%
<b>Other</b>	0	0	4	20%	4	11%
<b>Total</b>	<b>67</b>	<b>100%</b>	<b>19</b>	<b>100%</b>	<b>36</b>	<b>100%</b>

Source: the authors based on newspaper articles

A total of 298 passages were coded.

With regard to the MSF elements, the processes within the problem stream (112 citations) and, most notably, the use of indicators (87 citations), had the largest coverage in our sample (Table 9). In second place, processes in the policy stream received attention (52 citations), due especially to the anticipation of future constraints, such as possible impacts of the policy on fuel prices (37 citations, see more below). Finally, processes within the political stream were mentioned in 44 passages, with no citations referring to the national mood.

From the passages, two policy entrepreneurs were identified: the president of the Biodiesel Parliamentary Caucus, Deputy Evandro Gussi, and the president of Unica, Elizabeth Farina. In particular, the passages highlight their political connections and negotiation skills (20 citations), although both have their claim to a hearing (eight citations), due to the authoritative positions they occupied within and outside of government (Table 9). From the interviews, we identified two other policy entrepreneurs, Marcelo Ivan Lacerda, director of the Biofuel Department of the Ministry of Mines and Energy, and the biofuel producers responsible for creating awareness and buy-in of the program along their supply chain.

**Table 9 – Number of citations per element of the MSF**

Participants of the public policy process		Number of citations
<b>Problem</b>	Focusing events	14
	Indicators	87
	Policy feedback	11
<b>Political</b>	National mood	-
	Organised political forces	22
	Events within government	21
<b>Policy</b>	Technical feasibility	9
	Value acceptability	6
	Anticipation of future constraints	37
<b>Policy Entrepreneur</b>	Claim to a hearing	7
	Political connections and negotiating skills	21
	Persistency	3

Source: the authors

Obs.: citations often received more than one code.

The participants most frequently mentioned within our sample were the different interest groups (72 citations), voicing their opinions and preferences with regards to the policy (Table 10), in particular the ethanol industry (59% of the citations) and biodiesel producers (13% of the citations)(Graph 8). Within government, the MME, who initially conceived of the proposal, was the most cited actor (32 citations), although other ministries, the President of the Republic, and Congress also featured in our sample.

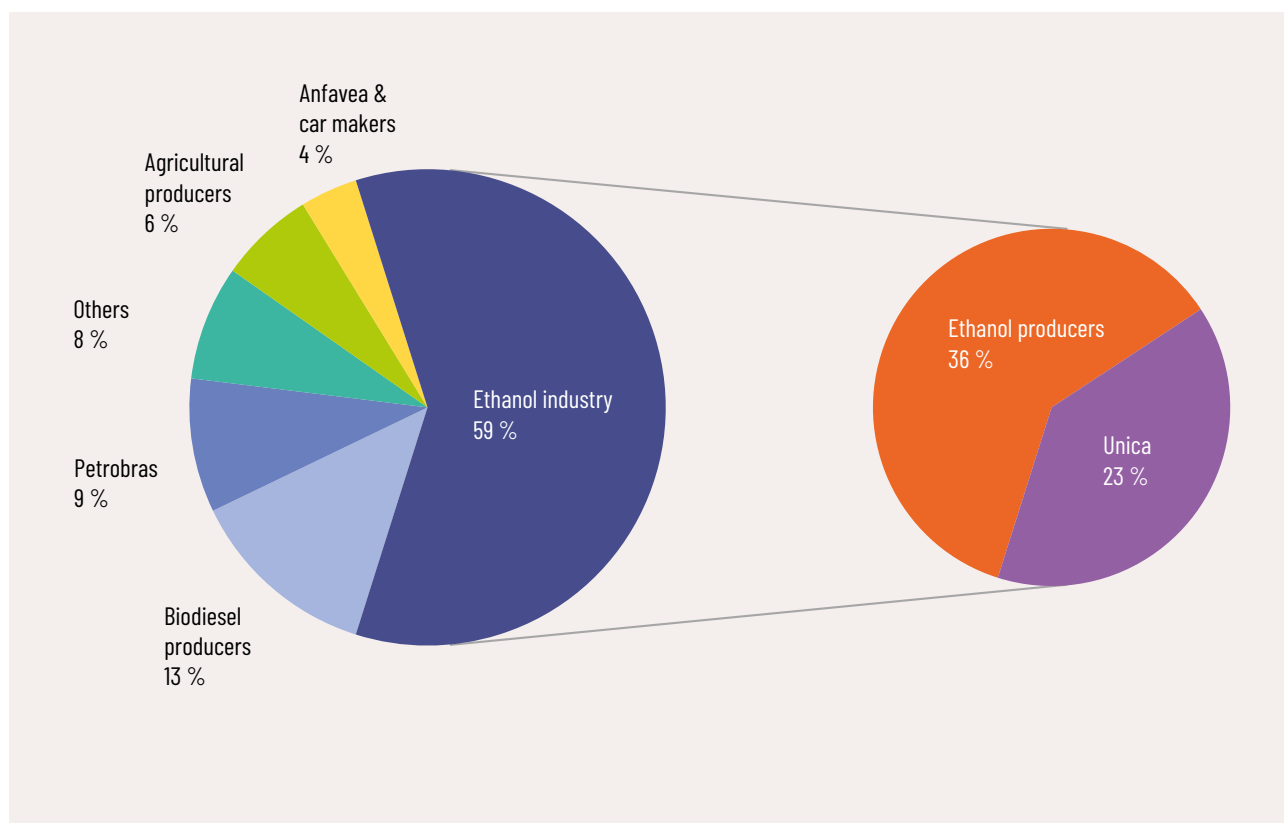
**Table 10 – Number of citations per participant of the public policy process**

Participants of the public policy process		Number of citations
<b>Inside the government</b>	President of the Republic	21
	Public servants – Ministry of Mines and Energy	32
	Public servants – Ministry of Finance	20
	Public servants – Executive Office	19
	Public servants – Ministry of Planning	10
	Public servants – Ministry of the Environment	9
	Public servants – Energy Policy National Council	5
	Public servants – National Oil Agency	3
	Public servants – Ministry of Agriculture	3
	Public servants – Other <sup>i</sup>	10
	Congress – Biofuels Parliamentary Caucuses	14
	Congress – Chamber of Deputies	13
	Congress – Senate	4
	Congress – Agribusiness Parliamentary Caucus	3
<b>Outside of the government</b>	Interest groups	72 (see Graph 8)
	Researchers, academics and consultants	27
	Political parties and elections-related actors	-
	Media	-
	Mass public	-

Source: the authors

i: Ministry of Science; Ministry of External Relations; São Paulo Agriculture Secretary; Governor of the State of São Paulo; Congressmen from the Northeast region; Interministerial Committee on Climate Change; EPE; Brazil's Central Bank; and the RenovaBio working group.

**Graph 9 – Interest groups involved in discussions about the draft bill**



Source: the authors based on newspaper articles

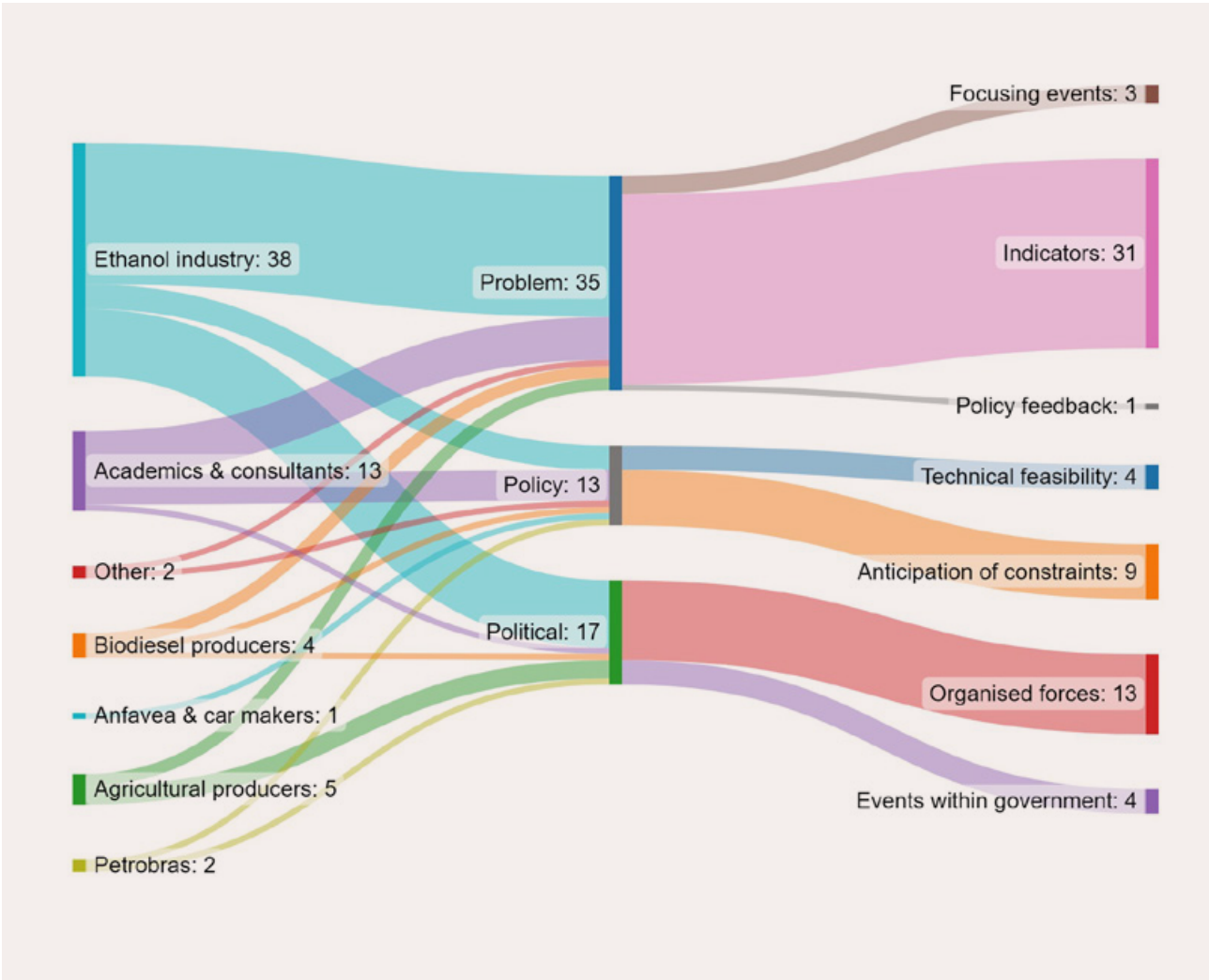
Others: Environmental NGOs; Chemical industry; Financial sector; Electric vehicles industry.

Finally, Figure 5 displays the streams in which the participants from outside the government were most found and the processes within these streams that are more relevant for this group of participants. While the ethanol industry is present in all streams, they appear most in the problem stream, where the use of indicators is preponderant.

Other participants appear less frequently, with the exception of academics and consultants, present in nearly half of all citations concerning the policy stream. As expected, the participation of interest groups in the political stream is associated with their role as an organised political force, having their influence recognised by participants within the government.



Figure 4 – Participants outside of the government, streams and processes



Source: the authors, with SankeyMATIC.



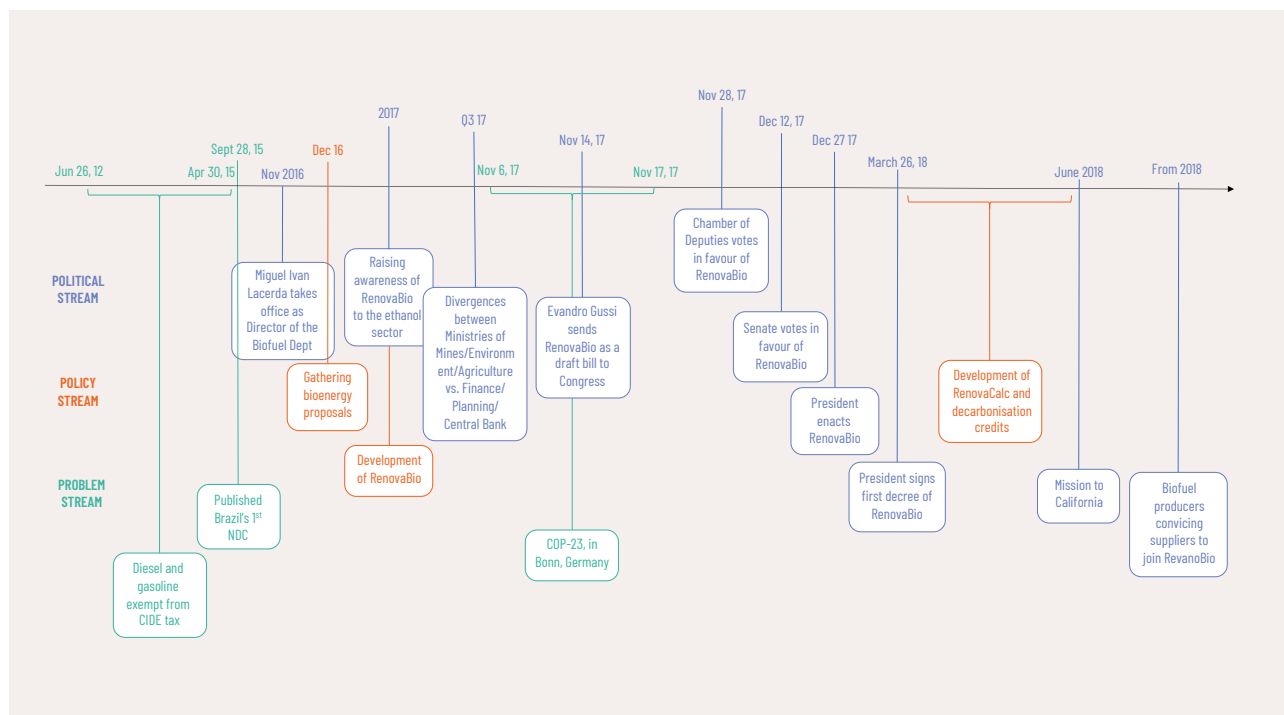
Chapter four

# Research findings

## 4. Research findings

The timeline of relevant events around RenovaBio's policy process is highlighted in the figure below.

**Figure 5 – Timeline of relevant events in the problem, policy and political streams**



Source: the authors, with SankeyMATIC.

We note that the arguments presented below were found in the data sources consulted. They neither represent our views nor did we analyse their accuracy.

## Problem stream

### Indicators

Different data sources highlighted different problems being addressed by RenovaBio. In the newspaper articles, the need to attain Brazil's climate goals was the most stressed; in MME's Explanatory Note, it was ensuring energy security; in the interviews, it was both achieving the country's climate change commitments and ensuring more stable market conditions for the biofuel sector. These will be further discussed below.

On this point, however, Interviewee 5 claimed that RenovaBio "needs to sit on a therapy couch [and figure out] whether it is indeed a decarbonisation program or one to incentivise the production of biofuel". They further stressed that such a definition is important, since it has implications over how the policy could be improved and how it is supposed to be evaluated.

#### Need to attain climate change commitments

In the newspaper articles, the need for the country to achieve their climate change commitments and to reduce GHG emissions by 37% until 2025 was the most cited problem<sup>21</sup> (45 citations). Statements using the climate mitigation argument were found both inside and outside government. Within government, the administration in office defended ethanol as an "easy, cheap and available solution" to promote the immediate reduction of GHG emissions in the transportation sector in large scale (Estado, 11/11/2017). The MME stressed that the country's climate objectives could not be achieved without large-scale use of bioenergy, whilst the Secretary of Oil, Natural Gas and Renewable Energy asserted that the MME was dedicated to making RenovaBio one of the "star" initiatives associated with the Paris Agreement (Valor, 15/09/2017). In Congress, the leader of the Sugar and Energy Parliamentary Caucus, Alexandre Baldy, mentioned that he expected RenovaBio would be approved by October 2017 (it was approved two months later), claiming that the government should confer a character of urgency to the issue if it is concerned with attaining the Paris Agreement goals (Valor, 02/10/2017).

From outside government, Unica president Elizabeth Farina stressed the role of RenovaBio in contributing to the country's achievement of the Paris Agreement goals and to unlocking investments in the ethanol sector (Valor, 14/05/2017). Regarding a future electric transition, she argued that electric cars will come in many forms and that there is potential to develop hybrid cars that run on ethanol or flex-fuel motors as there should be many solutions available to the Paris Agreement challenge (Estado, 11/11/2017). A representative from academia highlighted that ethanol emits only 11% of the GHG emissions in comparison to gasoline (Estado, 24/12/2017).

Although the Paris Agreement was the most cited problem linked with RenovaBio in newspaper articles, there were only four pages in RenovaBio's Explanatory Note (p. 39, 94, 111-112) mentioning that the program would contribute to achieving Brazil's commitments. The Explanatory Note mentions the country's Intended Nationally Determined Contribution (iNDC), from 2015, with the commitment to increase "the share of sustainable biofuels in Brazil's energy mix to approximately 18% by 2030, expanding biofuel consumption, increasing ethanol supply (...) and increasing the share of biodiesel in

---

21 When RenovaBio was being formulated, Brazil's NDC did not have the goal to reduce GHG emissions in 50% by 2030 (2005 baseline).

the diesel mix” (Federative Republic of Brazil, 2016). We note that the updated 2022 NDC no longer has sectoral objectives, but economy-wide ones (Federative Republic of Brazil, 2022).

In the interviews, Interviewee 10 argued that reducing the carbon intensity of Brazil’s transportation matrix was the first objective of the program, while Interviewees 3, 6 and 8 highlighted that the only concrete case of a regulated carbon market in Brazil is RenovaBio. Interviewees 8 and 9 recognised that increasing the use of biofuels was in Brazil’s NDC, that incentives would be necessary to do so and that the program plays a role in helping the country transition away from fossil fuels.

Interviewee 3 explained that the program generates ever-increasing climate-related benefits because RenovaBio’s calculation tool, RenovaCalc, helps suppliers to monitor their agricultural inputs (e.g. fertilisers, diesel) and better assess their management practices, identifying opportunities to reduce GHG emissions and obtain higher Environmental Efficiency Scores in the re-certification process that is mandatory every three years.

Moreover, since the Environmental Efficiency Scores are public,<sup>22</sup> different suppliers have the ability to compare themselves with their peers, creating a competitive environment for better Efficiency Scores and CBO revenues. Interviewees 6 and 8 complemented that there has been an increase in the number of biofuel plants requesting voluntary certification (i.e. before the three-year legal requirement), with improved data, and stressed that Brazil is the only country in the world where biofuel plants measure the carbon intensity of the biofuel they produce.

Interviewee 3 added that, since corn ethanol production is growing, producers will also become more attentive to the corn supply chain. However, they noted that the traceability process will be more complicated: whereas ethanol producers often have their own sugarcane crops, corn is usually bought from third parties, making it more difficult to trace its origin, especially when bought from cooperatives which trade commodities from different producers. In addition, corn producers must allocate the share of inputs (e.g. diesel, fertilizers) adequately for corn and soy production – it is a common practice in Brazil for rural producers to rotate corn and soy crop cultivation, which also contributes to reducing the carbon footprint of corn ethanol. On this point, Interviewee 8 mentioned that traceability is even harder for biodiesel from soy, since producers commonly purchase extracted soy oil rather than soybeans, thus requiring information on the origin of the oil and its inputs.

### **Unfavourable market conditions**

In the newspaper articles, there are 35 citations highlighting the role of RenovaBio in improving market conditions for the increase in investments and production of the ethanol sector.

The president of Unica argued that RenovaBio would bring more predictability for the sector to increase biofuel production (Valor, 27/12/2017) and that recovering investments in the industry “will not happen without this program” (Valor, 21/11/2017). Likewise, the leader of the Biodiesel Caucus, Evandro Gussi, claimed that RenovaBio is strategic for resuming investments in the biofuel industry (Valor, 29/11/2017). The president of the ethanol group São Martinho added that, besides offering more predictability to the commodity, RenovaBio also establishes the role of ethanol in the energy matrix

---

22 All Efficiency Scores are available at RenovaBio’s Dynamic Panel: <https://app.powerbi.com/view?r=eyJrJoiMzIzYzE5OWItZWMyOC00ZDMzLWI5Mzct-M2U1NGNjNzYxNTAwIiwidCI6IjQ0OTImNGZmLTIOYTtNGIOMiIiN2VmLTEyNGFmY2FkYzIxMyJ9>

(Estado, 22/01/2018), while a consultant noted that RenovaBio would also generate a more predictable scenario for the financial sector in making investments in ethanol companies (Valor, 26/09/2017). The more favourable business environment was also cited in two pages of Renovabio's Explanatory Note (p. 115-116). Citing a study from the Energy Research Office (EPE), it is estimated that RenovaBio will add R\$ 1.4 trillion in investments to the sector until 2030, including investments in new industrial plants, in the cultivation of new areas and operational expenses. It is also expected that 24 new ethanol production units will be built and 31 existing units will be expanded.

Interviewee 7 defended the need for more predictability, an argument echoed by Interviewees 8 and 9, recounting how the sector struggled in the past decades:

In the 1970s, [there was] the oil crisis, there was no petrol. The government stimulated [the production of] ethanol. In the end of the 1980s, oil prices dropped. The stimulus that was given [to the sector] became expensive and the governmental structure associated with ethanol was disassembled (...). Then, the sector went through a difficult period. In the 2000s, flex fuel vehicles were launched and 'ethanol would save the world'. The sector doubled in size. Eight years later, the government started controlling gasoline prices to combat inflation. Once again, an unprecedented crisis [in the sector]. Of the 120 plants that opened earlier in the decade, 100 closed. (Interviewee 7)

Interviewee 3 argued that RenovaBio contributed to bringing more stability to the sector, partially due to the revenues derived from CBIO: ethanol producers calculate and add CBIO revenues in the financial analysis of new investment projects, whilst CBIO revenues can also be used to finance CAPEX projects. As they explained:

Last year, we generated and traded XX million CBIOs. If you take the average price of CBIO, R\$30 to R\$ 35, we are talking about R\$ XX million. I think anyone would like to have an extra R\$ XX million. Also, the effort [related to generating CBIO] is about controlling, auditing. You do not need to buy new equipment. It is more about recognising that practice, more an intellectual type of effort, right?" "It is a few million reais that you can revert into investments..." (Interviewee 3, numbers concealed by the authors)

Interviewee 7 noted that, although CBIO revenues only represent 2 to 3% of the revenues of the sugarcane ethanol sector, the contribution of CBIO to other biofuels could be more significant, citing biomethane from sugarcane residue, whose CBIO revenues could represent 10 to 15% of revenues, thus contributing significantly to the feasibility of this new biofuel.

In contrast, Interviewee 11 does not believe that RenovaBio contributes to bringing more stability to the ethanol sector, arguing that predictability depends on three market conditions: (i) international oil prices, (ii) exchange rate and (iii) political interference with fuel prices. Whereas biofuel producers could hedge against changes in the international oil prices and exchange rate, ensuring the predictability of these variables for up to two years (at most), they would still be subject to eventual political interference. Moreover, since ethanol producers can easily switch between sugar and ethanol production, Interviewee 11 recalled that the supply of ethanol production is negatively impacted by higher international sugar prices: the higher the sugar prices, the higher the incentive for sugar production and the lower the interest in producing ethanol.

In terms of the use of proceeds, Interviewee 4 noted that, since there is no legal requirement in the program's rules that CBIO revenues be used to increase ethanol production capacity, the interviewee regards it as an income transfer program to the biofuel sector.

## **Energy insecurity**

The role of RenovaBio in reducing energy insecurity and the need to import fossil fuels was highlighted in six citations of newspaper articles.

The vice-president of the Brazilian Association of Corn Producers (Abramilho) argued that RenovaBio would ensure a domestic supply of fuels to the national fleet (Estado, 19/12/2017). The vice-president of the São Paulo Industry Federation (FIESP) maintained that the country has two choices: to create the conditions that enable attraction of private investments in biofuels or to continue being a fossil fuel importer, thereby spending US\$ 20 billion yearly on imports (Folha, 06/10/2017). The president of the Brazilian Biofuel and Biokerosene Union (Ubrabio) claimed that approximately 300 billion litres of gasoline and diesel imports would be avoided by 2030, reducing external dependency on fuel (Folha, 30/11/2017).

Although only briefly touched upon in the newspaper articles, energy insecurity was the most emphasized in RenovaBio's Explanatory Note, appearing on 19 pages (p. 10-13, 16-18, 25-27, 30-38). According to the Explanatory Note by the Ministry of Mines and Energy, the country was importing fossil fuels at an increasing rate, becoming more exposed to geopolitical risks affecting oil supply and price, whilst national refineries and biofuel mills were already operating at maximum capacity. Hence, the document pointed to risks of low fuel supply. According to estimates of gasoline production and demand for the 2016-2026 period, for the country to be self-sufficient or an importer of only small quantities of gasoline, Brazil must expand ethanol production significantly. Otherwise, with no plans to promote fossil fuel or biofuel production, there will be a significant increase in fossil fuel imports. To become independent from imports of gasoline and diesel, the document concludes that the country should either increase fossil fuel production through the construction of new refineries, or increase production of ethanol and biodiesel. On this point, building new mills is quicker than building refineries: one to two years (although the sugarcane cycle takes four to five years) versus, at least, four years for refineries.

Interviewee 7 also indicated that concerns over the country's growing dependence on imported fuels was one of the driving factors behind RenovaBio, while Interviewee 8 recognised that there are often talks about reindustrialising the country, including with regards to fuel production. Interviewee 10 argued that, according to estimates from the MME, a 10% reduction in the carbon intensity of the Brazilian transportation matrix through biofuel use (which is RenovaBio's target) would end the country's dependence on imported gasoline and would significantly reduce national dependence on imported diesel, whilst also maintaining the domestic market for Brazilian fossil fuel refineries. The latter was a concern of the administration in office in 2018 when a few assets of Brazil's state-controlled oil company Petrobras were put on sale, and investor attractiveness depended on having a local fuel market. Interviewee 7 further explained that, in the ethanol or biodiesel sector, CAPEX investments require a long period of maturity, 10 to 15 years, and history shows the need for more clarity on the role of biofuels in the transport matrix.

On the other hand, Interviewee 11 highlighted that, since RenovaBio was enacted, the increase in ethanol capacity was motivated by an economically favourable scenario for corn ethanol production. Using corn cultivated in the country's mid-west region at low cost, ethanol is produced by fermenting corn stalk, with high-protein animal feed produced as (a lucrative) residue of the process. In contrast, in sugarcane production, there has been no changes in volume produced in the last ten years. Therefore, to date, RenovaBio and CBIO revenues have not been perceived as drivers for an increase in ethanol production capacity.

### **Health impacts of pollution**

In the newspaper articles, the potential health benefits that a transition to ethanol could promote was mentioned in six citations. The president of Ubrabio defended that RenovaBio could even have been an initiative originated in the public health sector, since a reduction in pollution-related diseases would lead to reduced overcrowding in hospitals, benefiting the lower income population (Folha, 30/11/2017). The president of Unica also argued that RenovaBio could improve people's health (Folha, 12/12/2017), while a member of academia noted that the use of sugarcane ethanol reduces air pollution and, consequently, lung diseases (Estado, 24/12/2017).

In RenovaBio's Explanatory Note, 17 pages are dedicated to discussing the impact of fossil fuel pollution on human health (p. 94-109, 112, 113), highlighting, for example, that in the city of São Paulo, approximately 4,000 people die annually due to problems caused by air pollution, with a cost of US\$ 1.5 billion.

### **Need to increase competition**

There were three citations mentioning the need to increase the sector's competition and to promote further openness in the industry to new players, even though there is resistance from large companies operating in the sector (Valor, 25/07/2017).

### **Income inequality**

In RenovaBio's Explanatory Note, the positive impact of RenovaBio on income was stressed in four pages (p. 113-116), under the argument that ethanol production contributes to regional development, job creation and income generation, improved GDP per capita, and growth of supporting sectors, such as logistics, sales of machinery and equipment, among others.



## Focusing events, crises and symbols

The Conference of the Parties (COP23) in Bonn, Germany, has likely helped accelerate the policy process of RenovaBio. From the articles analysed, there were 14 citations highlighting the expectations of the biofuels sector and of the Ministry of the Environment that the proposal would be sent as a Provisional Measure to Congress before COP23, held in 6–17 November 2017 (Valor, 13/10/2017; Valor, 09/11/2017). The Ministry of the Environment was particularly interested in disseminating climate-friendly initiatives on the occasion. As observed by the Ministry's Climate Change and Forests Secretary:

The Ministry of the Environment is committed to demonstrating, in COP23 in Bonn, the initiatives that reinforce Brazil's commitment to implementing the Paris Agreement. It would be very positive if we could announce concrete measures such as RenovaBio at COP. (Valor, 09/11/2017)

In October 2017, the President of the Republic himself announced to the biofuels sector that the provisional measure would be sanctioned before COP23 (Valor, 24/10/2017). However, as noted earlier, this did not happen and, as a result, Congress member and leader of the Biofuels Caucus Evandro Gussi submitted the proposal as Draft Bill No. 9,086/2017 to Congress on 14 November, thereby using the event to engage an international audience and gather momentum (Estado, 29/11/2017). On this point, Interviewee 5 argued that there was a perceived need for Brazil's government to signal publicly that it intended to work towards decarbonising its economy.

To add to the biofuel agenda, during COP23, the Biofuture Platform, representing Brazil and 18 other countries, presented its Vision Declaration,<sup>23</sup> stating that the proportion of bioenergy needs to be doubled in volume by 2030, and the proportion of biofuels needs to be tripled to limit global warming to 2 degrees Celsius (Estado, 29/11/2017; Estado, 03/04/2018).

---

23 More information at: <https://biofutureplatform.org/wp-content/uploads/2022/09/Biofuture-Platform-Vision-Declaration.pdf>

During the RenovaBio policy process, there was criticism toward public policies from the previous administration (under President of the Republic Dilma Rousseff) that reduced taxation on gasoline and diesel (Table 11) and controlled gasoline prices. The tax mentioned was CIDE Fuels (Contribution on the Intervention on the Economic Domain), a tax imposed on import and trading activities of oil, natural gas and derivatives, and ethanol (gov.br, 2021). As shown below, gasoline and diesel were exempt from CIDE between 2012 and 2015.

**Table 11 – CIDE-Fuel rates (2011-2018)**

Statute	Rate (R\$/litre)	Duration
<b>Decree No. 7,570/2011</b>	0.192 – gasoline (decrease)	27/09/11 – 31/10/11
<b>Decree No. 7,591/2011</b>	0.191 – gasoline (decrease) 0.047 – diesel (decrease)	01/11/11 – 21/06/12
<b>Decree No. 7,764/2012</b>	0.000 – gasoline (decrease) 0.000 – diesel (decrease)	22/06/12 – 30/04/15
<b>Decree No. 8,395/2015</b>	0.100 – gasoline (increase) 0.050 – diesel (increase)	01/05/15 – 30/05/18

Source: (Leroy, Barbosa, Júnior, & Ávila, 2017)

The Minister of Mines and Energy and the vice-president of FIESP assessed that the sugar and ethanol sector was one of the most to suffer in the past nine years due to energy policies that favoured gasoline (Folha, 06/10/2017; Estado, 17/12/2017). The Director of the Brazilian Infrastructure Centre argued that these policies compromised the competitiveness of ethanol, and the sector was impacted with an increase in debts, reduced investments and diminished production, causing dozens of mills to close due to financial problems (Estado, 08/04/2017). In another article, he defended that CIDE Fuels should be treated as an environmental tax, since they contribute to improving atmospheric conditions (Estado, 28/01/2017). Unica's technical director noted that, at the end of 2017, it was economically beneficial to consume ethanol in only five states: São Paulo, Goiás, Minas Gerais, Paraná and Mato Grosso (Folha, 25/12/2017).

RenovaBio's Explanatory Note also touched upon the negative impact of lower gasoline prices on the ethanol sector, explaining that lower profits affect investments in sugarcane cultivation and in technology development.

In the interviews, Interviewee 7 explained that, since the launch of flex-fuel technology, the ethanol sector became totally dependent on gasoline prices. This is because if, in the past, consumers bought gasoline- or ethanol-fueled cars based on the relative prices of fuels, with flex-fuel vehicles, consumers can make this decision immediately after gasoline price changes.

Interviewee 1 noted that the public approval rates of the federal government are very sensitive to gasoline prices. Hence, when international oil prices rise, the government tends to reduce the taxes levied on gasoline so that prices do not increase locally. As gasoline prices become more competitive against ethanol, the biofuel sector is harmed. Interviewees 1 and 7 recalled that, during the Dilma Rousseff administration, gasoline prices were controlled via reduced taxation, causing the sector to “enter a unprecedented economic crisis” and nearly half of the sugarcane mills, or about 100 mills, to go bankrupt.

Another fossil fuel legislation that was subject to criticism in the newspaper articles was Provisional Measure No. 795/2017, later converted into Statute No. 13,586/2017, offering tax benefits for oil producers to import inputs for activities related to oil, natural gas and hydrocarbon exploration, production and development. At COP23, national and international NGOs awarded Brazil the ironic trophy “Fossil of the Day” for the provisional measure (Estado, 16/11/2017).

## Policy stream

According to the newspaper articles analysed, the inspiration for RenovaBio were the initiatives found in the USA and California, with RenovaBio’s CBIOS being modelled after the credits traded under the EPA’s Renewable Fuel Standard Program (RFS) and California’s Low Carbon Fuel Standard (LCFS). However, Interviewee 1 argued that this was not the case, recounting that the RenovaBio program had two main inspirations. The first was the theory developed by economist Ronald Coase, who posits that externalities like air pollution are reciprocal in nature and, if there are costs involved in carrying out market transactions, the pricing system will be unable to deliver a socially optimal solution to the problem of which actor has to bear the burden of reducing the negative externality. In these instances, the legal delimitation of rights impacts the amount and distribution of both private and social costs (and benefits), and should seek to ensure an optimal level of pollution.<sup>24</sup>

The second inspiration was a conference article by researchers at the Brazilian Agricultural and Livestock Company (Embrapa), which conducted a lifecycle analysis of Brazilian sugarcane (Picoli et al., 2016).

According to Interviewees 7 and 8, there was a third and initial source of inspiration. In December 2016, the Biofuel Department was welcoming public policy proposals related to bioenergy, receiving many contributions, one of which was a market-based proposal by Unica, drawing on Californian’s LCFS. Interviewee 7 noted that the ethanol sector had been assessing international experiences in low-carbon fuel programs in the United States and Europe in the previous 2-3 years and a market-based proposal seemed the most suitable for addressing the problem of unstable market conditions. From this initial proposal, the interviewee claimed that the Biofuel Department started unpacking the design of the program.

In addition, in June 2018, there was an international mission to California with representatives from the MME, ANP, Embrapa, Agroicone, Unica and a few certification bodies to benchmark the American initiatives. Hence, it appears that the Biofuel Department was, at least, indirectly influenced by the American experiences since the initial proposal conceived by Unica drew on the Californian program.

---

<sup>24</sup> See Coase (2013)

Interviewee 8 added that not only the American initiatives, but also the Renewable Energy Directive (RED) from the European Union, were analysed to help conceive and develop RenovaBio's technical elements, although properly contextualised and adapted to Brazil's characteristics, considering hydrous ethanol and flex-fuel vehicles.

More generally, Interviewee 9 argued that the idea for RenovaBio emerged from several sources, with several individuals engaged in conversations, hence, the policy "started in a rather diffuse way" until it was seized by the Ministry of Mines and Energy, in particular by the Department of Biofuels, that further mobilised their academic and political connections in order to better structure a proposal. Discussions concerning the contents of the policy were less frequent in the media, while the proposal was approved without changes in both houses of Congress. Interviewee 10 mentioned that the only political party that voted against the draft bill was the Socialism and Liberty Party (PSOL) for not including antideforestation measures in the statute, even though the party was generally in favour of the program and acknowledged its merits.

Nevertheless, six articles were partially or totally vetoed by the President of the Republic, without major complaints by Unica and the ethanol industry (Valor, 27/12/2017). Interviewee 10 noted that the vetoes referred to side issues and did not compromise the main tenets of the program. The vetoes, which were maintained in Congress,<sup>25</sup> were as follows:

**Table 12 – Presidential vetoes to RenovaBio**

Article, Item	Content	Reason for the veto
<b>Article 6, Item II</b>	To include considerations about the positive impacts on trade balance, logistical infrastructure, jobs and income generation in the definition of (national) annual GHG emissions reductions targets.	The inclusion would divert the policy from its original goals.
<b>Article 23, Paragraph 3</b>	To grant access to the electronic invoice database in order to monitor the movement of sold fuels.	To preserve tax confidentiality (of the producers).
<b>Article 26</b>	To give six months for the producer or importer to recertify their production in case the previous inspecting firm ceases its activities or loses its registration with the government.	The topic would be better addressed in subsequent regulations of the law and producers should not be penalised for problems with the inspecting firm.
<b>Article 8, Item Ib</b>	To reduce individual targets for fuel distributors who purchase biofuels from the North and Northeast regions of the country.	This benefit would distort the market, compromise the competition between producers and could act against the objectives of the policy.
<b>Article 8, Item II</b>	To reduce individual targets for fuel distributors who purchase locally-produced fossil fuels with lower GHG emissions in their lifecycle in comparison with foreign producers.	This benefit would act as a non-tariff barrier to imports and could decrease competition, leading to possible impacts in fuel prices (to the consumer).
<b>Article 19, Paragraph 2</b>	To require that certificates for imported biofuels be presented for each purchase.	This requirement would increase costs and bureaucracy on importers and could impact final prices (to the consumer).

Source: (Casa Civil 2017)

<sup>25</sup> Available at: <https://www.congressonacional.leg.br/materias/vetos/-/veto/detalhe/11603>

## Anticipation of future constraints

As a consequence of the mandatory decarbonisation targets and, consequently, the need for fuel distributors to purchase CBIOs, the most frequent topic discussed in the policy stream, as reported in our sample of articles, was the policy's possible impacts on fuel prices, as summarised by the economist Samuel Pessoa:

This obligation will increase the cost of [fuel] distributors, who will pass this increase on to their products, whether gasoline or ethanol. The price of both fuels will increase. (Folha, 26/11/2017)

While participants such as the Ministry of Finance (Estado, 28/11/2017), the Executive Office and the President of the Republic (Valor, 09/11/2017), the Central Bank (Valor, 02/10/2017; Estado, 02/10/2017) and academic researchers (Folha, 26/11/2017, 14/12/2017) voiced their concerns about fuel prices, representatives from the ethanol industry, and the Ministries of Mines and Energy and of the Environment sought to either downplay these concerns or to address them, for instance, by:

- Indicating the possibility of adding limits to the issuance of CBIOs in the event of "inflationary pressures" (Valor, 03/11/2017);
- Pointing to the gradual character of the targets to be observed, which would give sufficient time for increases in the production of biofuels (Folha, 14/12/2017);
- Providing studies demonstrating that impacts on inflation indices were likely to be small (Valor, 13/10/2017).

Still, such issue was a major contributor for the Executive Power's delay in sending a provisional measure or draft bill to Congress:

President Michel Temer repeatedly postponed the publication of a provisional measure for lack of consensus within the government – the Ministry of Finance was resisting due to a possible increase in inflation. (Valor, 24/01/2018).

Interviewee 10 agreed that the Executive Office did not want to be responsible for sending the proposal as a draft bill to Congress or issuing it as a provisional measure, fearing future impacts on fuel prices; whereas the MME was unable to estimate such impact, given that there were neither certified plants, nor estimates of certification costs or of C BIO market prices. Nevertheless, Interviewee 9 mentioned that the Energy Research Office made itself available to the MME to run simulations and estimate the magnitude of these impacts.

On a related note, Interviewee 5 highlighted that, when the program was being conceived and approved, it was "trivially assumed" that revenues from the program would be reinvested in greater ethanol production and use and, consequently, minimise negative impacts on fuel prices. Thus, they argued that this aspect could have been further discussed and better anticipated. Furthermore, the interviewee explained that, historically, and even after RenovaBio came into force, ethanol prices are not very attractive to consumers and do not follow production costs, but move in tandem with gasoline prices. Interviewee 10 noted that there is a 98% correlation between gasoline and ethanol prices.

On a positive note, other future constraints discussed with regards to RenovaBio were the fact that it would not increase public expenditures and the country's fiscal deficit, given that public funds would neither be transferred to producers nor would tax exemptions be granted (Estado, 17/12/2016, 05/08/2017).

Another concern resided in the role of biofuels in a world that is increasingly directed toward electric vehicles, although both experts in the field of energy (Estado, 11/11/2017) and representatives of the ethanol industry (Valor, 06/02/2018) mentioned the possibility of coexistence between the two technologies, either by focusing on different means of transportation or favouring hybrid flex fuel cars instead of electric vehicles (as candidates for preferential tax treatment). Interviewee 11 argued that biofuels are key in the country's energy transition, while Interviewee 8 mentioned that new developments, such as hybrid flex-fuel vehicles, i.e., hybrid cars that run on ethanol have already been developed.

Interviewee 11 also highlighted the role of biomethane – produced from agricultural production and agricultural/sanitation waste – in replacing diesel, natural gas and as input for green hydrogen in Brazil. Internationally, Interviewee 11 noted that there has been an interest in ethanol as input for sustainable aviation fuel (SAF) and for green hydrogen, and to blend with conventional fuels. The question, though, is the extent to which biofuels will contribute to the global energy transition, given that there are only three large ethanol producers (US, Brazil and India), whereas the transition implies a full replacement of fossil fuels.

Another possible constraint for the future role of RenovaBio, as mentioned by Interviewees 2 and 7 and still unaddressed, relates to the interaction of the decarbonisation credits CBIOS with other markets and schemes for carbon credits, including international initiatives such as the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). According to Interviewee 2, it remains unclear whether CBIOS are fungible or not with other carbon credits. On this point, Interviewee 5 remembered that carbon credits are not eligible for use in RenovaBio either, and that discussions concerning carbon markets in Brazil appear to be separated and disconnected from the program.

Indeed, Interviewee 8 argued that, since Brazil did not have a carbon market and that, at the time, Article 6 from the Paris Agreement was yet to be regulated, CBIOS were conceived without concern over their possible interaction with carbon markets and other instruments. According to Interviewee 7, the exception was the Ministry of Finance, working with The World Bank on the Partnership for Market Readiness (PMR) and discussing the feasibility of developing carbon pricing in Brazil, who suggested that CBIOS be (nominally) equivalent to a tonne of CO<sub>2</sub>eq so that the fungibility of CBIOS with a future carbon market could later be discussed. Interviewee 10 criticised the lack of incentive to biofuel production in carbon markets, arguing that they “lose the opportunity to decarbonise through biofuel just because of the additionality criteria, which is a concept that ‘ties down’ projects too much”.

Nonetheless, Interviewee 7 indicated that there are several draft bills in Congress for creating a regulated carbon market and that there should be one in Brazil in the near future. Therefore, they argued that it will be important to discuss how the different sectors will participate, given that the larger the market the more efficient it tends to be. According to Interviewee 8, adjustments could be made so that CBIOS would more closely resemble a carbon credit, but these would require additional legislation. Another issue that was discussed was RenovaBio's economic efficiency aspects. Interviewee 7

explained that, in the initial discussions about the program, the idea was that on the demand side, fossil fuel distributors would meet their goals by calculating their carbon intensity and compensating these emissions through buying renewable fuels. However, distributors complained, arguing that it would not make sense from an economic and environmental standpoint to purchase ethanol to sell, for example, in the northernmost region of the country, given that it would be too costly and carbon intensive to transport it by road<sup>26</sup>. Hence, to create a more economically efficient mechanism that would ensure that biofuel consumption take place where it is less costly, CBIOs were created. Rather than demanding that distributors buy biofuels, they are required to buy credits issued based on biofuel production, consequently stimulating biofuel production.

More generally, Interviewee 5 noted that, even though RenovaBio has large impacts on relevant sectors of the Brazilian economy, it was not the target of a Regulatory Impact Analysis,<sup>27</sup> which could have prevented some of the corrections that took place discretionarily after the program's implementation (see Box 1 below).

## Technical feasibility

With regards to the technical feasibility of the National Biofuel Policy, the most relevant discussion in newspaper articles concerned its implementation and monitoring costs (still, only cited 6 times). While Unica recognised that differentiated fuel taxes were easier to implement, the decarbonisation credits had the advantage of readily adjustable prices (according to supply and demand) (Folha, 14/12/2017). Researchers and consultants engaged in a discussion in Folha: an economist claimed that the program would have high compliance costs due to the need for certification by biofuel producers, particularly if compared with a simpler tax on fossil fuels (Folha, 26/11/2017; Folha 14/12/2017), while a researcher specialised in energy issues suggested that the policy could help reduce tax evasion in the fuel sector (Folha, 01/12/2017).

Another technical aspect did not involve RenovaBio *per se*, but the possibility that the policy be accompanied by increasing mandates for blending ethanol in gasoline. On this point, doubts were raised regarding the capacity of (non-flex fuel) automotive engines to properly function with blends as high as 40% ethanol (Valor, 24/11/2017). Such idea, proposed by the Executive Office, was contested and ultimately abandoned (Estado, 26/03/2018).

In the interviews, the interviewees identified aspects contributing to, or jeopardising, the technical feasibility of RenovaBio (see Table 13).

---

<sup>26</sup> As shown in Table 1, most of the ethanol production takes place in the Southeast and Midwest of the country.

<sup>27</sup> The Interviewee mentioned that it was only in 2019 that the country enacted a statute (Statute 13,874/2019) requiring that the enactment or adjustment of major rules be subjected to Regulatory Impact Analysis.

**Table 13 – Aspects mentioned in the interviews contributing to, or jeopardising, the technical feasibility of RenovaBio**

Aspects contributing to technical feasibility	Aspects jeopardising technical feasibility
<ul style="list-style-type: none"> <li>• Market approach</li> <li>• Setting of environmental targets</li> <li>• Responsibility of an interministerial body (CNPE) for setting annual targets (governance)</li> <li>• Fossil fuel distributors as the obligated parties</li> <li>• Robustness of RenovaCalc, employing lifecycle analysis</li> <li>• Structure in place to avoid fraudulent transactions</li> </ul>	<ul style="list-style-type: none"> <li>• Biofuel producers do not have mandatory targets</li> <li>• No incentives for an increase in biofuel production capacity</li> <li>• Lack of time frame for biofuel producers to put CBIOs on sale from the date of C BIO issuance</li> <li>• No established limit to the volume of CBIOs bought by a single distributor</li> </ul>

Source: the authors

As a positive aspect, Interviewee 10 claimed that having a market mechanism is more efficient and less costly to society than a carbon tax. According to MME's estimates and assumptions, to produce the same level of incentive to biofuel producers through a carbon tax, the impact on fuel prices to end consumers would be five times higher than through RenovaBio. Interviewee 11 also argued in favour of RenovaBio in contrast to carbon tax, claiming that the latter generates revenues for the government that are not necessarily spent efficiently.

Secondly, Interviewee 1 highlighted the setting of environmental targets for fossil fuel distributors, arguing that the private sector does not allocate resources efficiently and only reducing transaction costs would not ensure that negative externalities (i.e., GHG emissions) be reduced. Interviewee 10 complemented that the targets were set to induce changes that would not have happened without a public policy. The rationale adopted was that, in the first half of the 10-year period, the targets could be achieved without increases in biofuel production capacity, whereas the second half would require greenfield investments, with this first period promoting a learning curve before new investments were required.<sup>28</sup>

On the governance of environmental targets, Interviewee 7 argued that ascribing the responsibility for setting these targets to the National Energy Policy Council (CNPE)<sup>29</sup> contributed to reducing the possibility of political interference, since the council is formed by multiple ministers and sets the targets after a public consultation period.

Interviewee 7 also noted that having fossil fuel distributors (rather than fossil fuel refiners) as the obligated entities (demand side) was the most suitable for the Brazilian market, explaining that, at the time of the proposal, there was only one fossil fuel refinery in Brazil, making it impossible to build an environmental market. Therefore, the logic of the program was extended to fossil fuel distributors to whom fuel producers were mandated to sell fuel, since legislation did not allow producers to sell fuel directly to petrol stations.<sup>30</sup>

28 Interviewee 10 complemented that MME experience in modelling that was gained in developing these targets helped when the covid-19 crisis caused a massive reduction in fuel demand and the annual targets had to be revised to suit the new context.

29 Since, 2023, CNPE is presided by the Minister of MME, and composed of the Ministers of the Executive Office; External Relations; Finance; Transport; Agriculture and Livestock; Science, Technology and Innovation; Environment and Climate Change; Regional Development; Cities; Institutional Security, Development, Industry, Trade and Services; Agrarian Development and Family Agriculture; Planning, Ports and Airports; Indigenous People and EPE (Gov.br, 2023)

30 Statute No. 14,367/2022 allows producers and importers of hydrous ethanol to sell it to distributing agents, fuel retailers and the foreign market.



Interviewees 2 and 10 highlighted the focus on biofuels' carbon footprint (through lifecycle analysis) as another important feature of RenovaBio, bringing the policy framework closer to the more advanced discussions in society on the environmental impacts of fuel usage, which extend beyond emissions at the vehicles exhausts. On this point, Interviewee 6 complimented Embrapa for the quality and robustness of RenovaCalc, noting that the tool has not been questioned at any point by the fossil fuel distributors who criticised the program.

Moreover, Interviewee 7 noted that calculating the avoided emissions of industrial plants rather than calculating avoided emissions of technological routes, as in the Californian program, makes RenovaCalc simpler to use, while Interviewee 8 added that this decision also provides the correct incentive for biofuel producers to seek improvements and become more efficient over time. Despite these differences, Interviewee 9 mentioned that some biofuel producers already had experience with certification processes for the Californian and European policies, and were able to offer contributions to RenovaBio's design in this regard.

Finally, Interviewee 7 stressed RenovaBio's structure as successful for avoiding fraudulent transactions, even if with higher transaction costs. They explained that this structure is comprised of three layers: (i) requiring an auditing process by a third-party body, (ii) the publication of the Efficiency Scores for a period of 30 days to allow for societal monitoring (according to Resolution ANP No. 758/2018), and (iii) the validation of the process by the regulating agency ANP. They also highlighted that financial institutions were involved in the underwriting of CBIOS due to their robust compliance and monitoring processes. Even though comprehensive, they argued that the transaction costs are not significant, representing approximately R\$ 3 per C BIO.

As for negative aspects, Interviewees 4 and 5 argued that not only should fossil fuel distributors have mandatory targets, but also biofuel producers – or the participation of both should be voluntary. As claimed by Interviewee 4, having requirements only for distributors causes C BIO demand to be higher than C BIO supply – it is estimated that there will not be enough CBIOS in 2024 – increasing C BIO prices. Interviewee 11 also noted the insufficient supply of CBIOS, arguing that, while the targets for distributors were low and attainable in 2020 and 2021, C BIO supply is expected to be equivalent to demand in 2023 and lower in 2024, whereas, thus far, RenovaBio has not encouraged an increase in biofuel production capacity.

Interviewee 4 noted that not having a time frame for biofuel producers to put CBIOS on sale from the date of C BIO issuance increases price volatility, as biofuel producers can withhold the credits until there is a low supply in the market and prices rise. Interviewee 5 mentioned that the possibility of biofuel producers to hold CBIOS until the price is more favorable for them, allows them to “squeeze” the demand (as this phenomenon has been dubbed by market participants), since fuel distributors have to comply with their targets and deadlines, which are publicly known. In addition, they cautioned that some players are both producers of biofuels and fuel distributors and, hence, they are able to time their sales of CBIOS according to their needs to attain decarbonisation targets, something that was not anticipated while the policy was being designed, but that may confer a commercial advantage to these players.

Interviewee 10 pointed out that there is a fossil fuel distributor currently under investigation by the Administrative Council for Economic Defense (CADE) for allegedly using C BIO as a tool against its

competitors. Though not detailed by the interviewee, they recounted that the distributor caused CBIO prices to double, forcing its competitors to reduce their profit margins or to transfer this added CBIO cost to their consumers, hence reducing their market share. Interviewee 10 noted that this investigation was motivated by a formal complaint made to the MME, which was then forwarded to CADE for investigation.

Interviewee 5 stipulated that RenovaBio could have gone through a trial phase before sanctions were imposed in order to allow all involved parties to better understand it and for adjustments to be made prior to full implementation. Indeed, they argued that recent interferences could have been prevented if the program had progressed more slowly from enactment to implementation. Moreover, they claimed that clear and stable rules are only in place for fuel distributors.

Finally, although it was not possible to avoid through a better program design, Interviewee 1 noted as a bad example of institutional instability the political interference of the Ministry of Mines and Energy, which we discuss in Box 2 (below).

## **Box 2 – Political interference and changing rules to RenovaBio**

Interviewee 10 noted that the changes made by the MME to RenovaBio's annual target dates, by when fossil fuel distributors must comply with their individual goals – they were postponed from December 2021 to September 2022, and, afterwards, from December to March of the following year (Decree No. 11,141/2022) – were motivated by two factors.

The first was the decision of the administration in office to reduce fuel prices for end consumers, a decision that had implications for many fuel-related policies, including for RenovaBio. Interviewees 1, 3, 6 and 7 criticised these changes, arguing that they compromised the stability of the policy. As Interviewee 6 put it:

[...]there was an arbitrary interference from the Ministry of Mines and Energy and of the President [through] a decree which basically 'turned' the year into a 21-month period. The decree did that. A year is no longer a 12-month period, but a 21-month period when the target to be achieved between January 1, 2022, and December 31, 2022, can now be achieved until the end of September 2022.

Interviewee 4 observed that this change was made by the federal government to reduce CBIO prices, which it did, but also caused an increase in RenovaBio's degree of legal uncertainty. According to Interviewee 6, the MME claimed that postponing the target date would decrease diesel price by R\$ 0.07/litre, but no study was released demonstrating how this figure was estimated. Additionally, the interviewee noted that International Energy Agency (IEA)'s Executive Director Fatih Birol questioned these changes to the program, which they consider "the world's largest transport decarbonisation program". Interviewee 6 defended the role of free prices in carbon markets, arguing that higher CBIO prices encourage more biofuel production, the generation of more CBIOs and more investments to improve energy efficiency, whereas interfering in price compromises regulatory stability.

The second reason provided by Interviewee 10 was the investigation of the fossil fuel distributor who was allegedly using CBIO as an anticompetition tool, as discussed above, and causing an increase in CBIO prices.

Furthermore, Interviewee 10 noted that the Minister of Mines and Energy in office in 2022 was seeking to make substantial changes to RenovaBio, such as changing the obligated parties from fossil fuel distributors to fossil fuel refineries, that would strip the program from its original characteristics. The interviewee criticised this proposal as it was not based on a formal evaluation of the policy.

### Value acceptability

Finally, one of the favourable attributes of RenovaBio, reflected in the opinions of a few actors, was its greater reliance on markets, rather than on the State's direct intervention on fuel markets (Estado, 17/12/2016). Indeed, the president of Ubrabio wrote in an opinion piece that RenovaBio is:

[...] a policy to ensure energy and food security, promote efficiency gains, technical dissemination of best practices and bonuses via the market for the most modern plants. It puts the most efficient free market principles in the same basket. (Folha, 30/11/2017)

Interviewee 6 highlighted RenovaBio's market approach for encouraging higher levels of environmental efficiency in the biofuel sector, arguing that it should be considered in climate-related programs.

Similarly, President Michel Temer called the program "a new chapter and an ample modernisation agenda" for the renewables sector (Estado, 14/03/2018). On this point, Interviewee 2 deemed the program as "something almost revolutionary regarding energy policies in Brazil", given its clear definition of targets and reliance on a market mechanism in order to achieve them. Similarly, Interviewee 11 noted that the program is "different from everything that has been done in terms of public policy for biofuels", contrasting it with the National Biodiesel Program and Proácool and arguing that RenovaBio's market mechanism of pricing environmental externalities through a robust lifecycle analysis methodology is the program's strength.

In addition, Interviewee 5 highlighted that Brazil already had experience with policies seeking to incentivise biofuel production and consumption, making similar efforts more easily accepted by relevant stakeholders.

## Political stream

### Organised political forces

As recounted by Interviewee 1, a few players of the ethanol sector were initially not in favour of RenovaBio, preferring instead to increase gasoline tax CIDE. To change the sector's perspectives and convince them of RenovaBio's advantages, MME's Biofuel Department attended several events from the agricultural and ethanol industry to present and argue in favour of RenovaBio. The team also had private meetings with Congressman Evandro Gussi and consultant Plinio Nastari to explain the details of RenovaBio, the former later became one of the policy entrepreneurs of the proposal. As an economist and academic, Interviewee 1 argued that the CEO of Unica (and policy entrepreneur), Elizabeth Farina, was also soon convinced of the benefits of the program.

According to newspaper articles, the ethanol industry in conjunction with biodiesel producers were the most relevant actors outside of the government, trying to create a political environment conducive to the speedy approval of RenovaBio, and responsible for 75% of the citations regarding interest groups in the political stream. Table 14 summarises the positions occupied by the biofuel sector as well as other interest groups as organised political forces in the political stream.

Given the organisation of the relevant sectors, in particular the biofuel industry, within Congress, and through its caucuses, the positions of stakeholders were often internalised in the discussions within the government itself (see below).

**Table 14 – Organised political forces in the policy process**

Stakeholder	Position/Stake
<b>Ethanol industry &amp; biodiesel producers</b>	<p>The biofuel industry, both ethanol and biodiesel producers, were in favour of the policy and exerted pressure on the government to expedite its approval. For instance, the strategy of presenting a draft bill in Congress was seen as "an attempt by the sugar and alcohol sector to put pressure on the government to issue a provisional measure on the subject" (Valor, 29/11/2017).</p> <p>The influence of the sector on government officials is often made explicit in the sample of articles, for example, with "President Temer promising the sector to issue a provisional measure to create RenovaBio" (Estado, 29/09/2017). The fact that the sector is related with several congressman and possess an "active" caucus in Congress meant that they could support other important proposals for the administration (Estado, 14/03/2017).</p> <p>Indeed, on a few occasions the President of the Republic or the President of the Chamber of Deputies met with industry representatives to discuss the policy and offer a timeline for its enactment (Valor, 09/08/2017; 12/09/2017; 21/11/2017).</p> <p>It is worth noting that ethanol producers from the Northeast region of the country fought for preferential treatment for locally produced ethanol, to support regional development. However, such treatment was vetoed by President Temer (Valor, 27/12/2017). Interestingly, the signing of the Decree regulating RenovaBio took place in the city of Ribeirão Preto, in the State of São Paulo, in a ceremony to celebrate the new sugarcane harvest (Valor, 14/03/2018).</p>

<b>Agricultural producers</b>	Agricultural producers were also supportive of RenovaBio and, in meetings with the President of the Republic and the Governor of the State of São Paulo, advocated for its approval as a way to help the country fulfil its commitments under the Paris Agreement (Valor, 12/09/2017; 13/10/2017).
<b>Petrobras</b>	The state-owned oil company Petrobras was seen as a critic of RenovaBio, suggesting that the policy “could be improved” and arguing that the use of biofuels may “lead to greater production of secondary pollutants” (Valor, 26/04/2017). Given the requirement for purchasing decarbonisation credits, the company advocated for “realist targets” (Valor, 09/11/2017) and was publicly criticised by the sugar and ethanol industry (Valor, 26/04/2017).

Source: the authors based on newspaper articles.

Interviewee 1 also cited the Automotive Vehicle Association (Anfavea) as a supporter of RenovaBio, since local automakers were interested in encouraging ethanol production with the aim of continuing the production of flex-fuel vehicles, specific to Brazil’s needs, thus maintaining this market reserve. Still, Interviewee 2 noted that automakers were more focused in the events surrounding policies directly targeted at them, such as the “Rota 2030” program,<sup>31</sup> and were barely involved in discussions around RenovaBio.

As for opposition groups, Interviewee 1 mentioned that fossil fuel distributors did not put too much pressure against the proposal, possibly because they did not expect RenovaBio to be approved and sanctioned. Interviewee 1 added that, during that period, one of the largest fuel distributors, BR Distribuidora (previously owned by Petrobras and later renamed Vibra), had just been privatised, had other, more pressing, concerns and did not give much attention to the potential implications of RenovaBio.

Interviewee 1 also recalled that a Technical Note released by Petrobrás criticised the proposal and climate policies, but it was soon withdrawn as criticising RenovaBio seemed to be criticising the science of climate change. Interviewee 6 argued that the only significant demand from the distributors was to reduce the maximum fine for non-compliance from R\$ 500 million to R\$ 50 million in the statute. On the other hand, Interviewee 7 claimed that fossil fuel distributors were strong critics of the program in behind-closed-doors meetings. Interviewee 5 suggested that the design of the program was influenced by the greater political pressure exerted by biofuel producers, for instance, with their participation being voluntary, a feature not found in other (regulated) carbon markets.

Interviewee 2 noted that the impacts of the program would likely fall on consumers, which are harder to mobilise during policy discussions. In this sense, a few visible and organised actors could be perceived as “losers” if the policy were to be approved. Indeed, Interviewee 5 recognised that fuel distributors are able to shift most if not all of the policy’s burden to consumers and, thus, discussions about the program must be (and still are) based “on a conversation with civil society [...] so that they are aware of it”.

---

<sup>31</sup> Federal program, sanctioned in 2018, that seeks to incentivize R&D projects in the entire supply chain of the automobile industry (Ministério da Economia, 2022).

Interviewee 2 disclosed that, generally, environmental groups tend to be wary of policies related to biofuels due to their proximity with agribusiness interests, but, in the case of RenovaBio, some organisations did not monitor discussions closely, maintaining more focus on other topics (such as deforestation and wind and solar power) and only sought to make suggestions to improve the program rather than oppose it. Ultimately, Interviewee 2 posited that the policy had its merits and that it “did not make sense for those fighting to reduce GHG emissions and for [the fulfilment of] climate goals to be against it”.

However, they highlighted that the policy process around the program was restricted between government officials and biofuel producers, making it difficult for other aspects, such as broader sustainability concerns, to be explored. The interviewee suggested that this closed aspect probably contributed to some constraints and concerns failing to be addressed by RenovaBio, for instance, regarding the fungibility of CBIOS with other carbon markets/mechanisms. Interviewee 5 agreed that the program could have been better discussed, but they did not attribute its post-implementation problems, such as volatile CBIO prices, to a lack of debate.

It is worth noting that the implementation of the policy, for instance, in the construction of RenovaCalc was deemed transparent, according to Interviewee 8 (see Box 3).

### **Box 3 – Engagement processes in RenovaCalc development**

Interviewee 8 recounted that the process to conceive RenovaCalc started with a technical analysis of international experiences (California, USA, European Union) and the identification of the differences between those programs and Brazil’s needs and circumstances. In some instances, multiple methodological choices were technically defensible and, in those cases, a political decision was made by the MME and other relevant authorities.

Throughout the entire process, several open meetings were held, with more than 20 workshops between 2017 and 2019, in order to listen to stakeholders’ concerns and suggestions, including fossil fuel distributors. In this fashion, RenovaCalc was built with a large degree of transparency, with the data being publicly available. Indeed, the interviewee mentioned that an open version of the RenovaCalc tool is still available on ANP’s website for anyone to download, analyse and suggest improvements.

### **Events within government**

According to Interviewee 10, Marcelo Ivan Lacerda was appointed Director of the Biofuel Department in the beginning of the mandate of President Michel Temer, in 2016. Whereas the previous administration did not adopt an innovative approach, Interviewee 10 highlighted that the Director proposed “to modernise the public policy approach for biofuels” through a market-based approach, and attract investments to the biofuel sector by attaching value to biofuels’ environmental services. Being a career civil servant from Embrapa, Interviewee 9 noted that they were particularly concerned with combatting climate change and deforestation. Hence, a change in administration was crucial to the start of RenovaBio’s formulation.

Within ministries, before the draft bill was sent to Congress, there were ongoing disagreements between two government groups on whether to convert the RenovaBio proposal to a provisional measure.

On one side, the Ministries of Mines and Energy, Environment and Agriculture supported the conversion to a provisional measure (Valor, 09/08/2017), which would cause the proposal to take effect immediately and be considered by Congress within 60 days (Câmara dos Deputados, 2022). According to Interviewees 1 and 9, the Minister of Mines and Energy in office was a strong supporter and “embraced” the program.

On the other side, the Ministries of Finance, Planning and the Executive Office questioned the possible economic impacts of incentivising biofuel consumption, particularly inflation, which could incur costs for the whole economy whilst benefitting one sector (Valor, 09/11/2017). Representatives from the Executive Office also questioned the “urgency and relevance” of RenovaBio, prerequisites for issuing a provisional measure, suggesting that it be sent to Congress as a draft bill instead (Estado, 04/09/2017). The president of the Chamber of Deputies was also against converting it to a provisional measure due to the large number of similar measures already in-house (Valor, 09/11/2017; Valor, 14/11/2017). Interviewee 6 argued that a few representatives from the Executive Office and of the Ministry of Finance were against RenovaBio due to a lack of understanding the draft bill, and that some level of commitment – in terms of self-study – was required from them to understand the policy’s sophistication as well as the processes that the program would foster:

“In fact, I think it lacked some dedication to a real study [from them]. There was very robust documentation [about RenovaBio], that was very sophisticated and, upon reading it, one reached those conclusions, we all reached the same positive conclusions about the program.”  
(Interviewee 6)

Interviewee 1 complemented that, although against RenovaBio at first, the Executive Office was in a weak position given the political moment in which the President of the Republic Michel Temer was replacing the impeached President Dilma Rousseff and did not count on the full support of Congress.

The MME argued against concerns over increased fuel prices, claiming that RenovaBio would have a 79% chance of actually lowering fuel prices (Valor, 26/09/2017), while the leader of the Biodiesel Caucus asserted that the program would have a lower impact on inflation measures than a tax increase (Valor, 24/10/2017). Given the lack of consensus among government actors, as mentioned earlier, deputy Evandro Gussi presented the proposal as a draft bill to Congress (Valor, 24/01/2018), according to Interviewee 6, with the support of the Agricultural Caucus, Environmental Caucus, the biofuel sector, the Senate and the Chamber of Deputies.

Interviewee 7 added another reason why the Ministry of Finance opposed RenovaBio. They explained that, in the beginning of discussions, the Ministry was also discussing carbon pricing mechanisms together with The World Bank under the PMR. However, between 2016 and 2017, the government was facing a public deficit and was looking for sources of revenue, one of which could be a carbon tax. In Table 15, we provide a more comprehensive account of the governmental stakeholders involved in the discussions leading up to the sanctioning of RenovaBio, according to the newspaper articles analysed.

**Table 15 – Governmental stakeholders participating in the public policy process**

Stakeholder	Position/Stake
Agriculture Parliamentary Caucus	The Agriculture Parliamentary Caucus was in favour of the legislative approval of RenovaBio, and the matter has been discussed by the Caucus leader with the President of the Republic (Valor, 10/10/2017).
Biofuels Parliamentary Caucuses	The Biodiesel Parliamentary and the Sugar and Energy Parliamentary Caucuses were strongly supporting RenovaBio. They expected the Executive Office to send the proposal to Congress as a provisional measure (Valor, 24/10/2017). However, as there was no consensus within government, on 14 November 2017, the proposal was submitted to Congress as a draft bill by the Biodiesel Caucus leader, who had already negotiated this move with representatives from the MME, the Executive Office and the president of the Chamber of Deputies (Valor, 14/11/2017). Together with representatives from the biofuel sector, the Biodiesel Caucus negotiated with the president of the Chamber of Deputies for the character of urgency <sup>[1]</sup> of the draft bill to be voted on (Valor, 21/11/2017). As a result of the strong pressure imposed by the Caucuses, the character of urgency was approved, and the draft bill was voted on and passed in the Chamber of Deputies on 28 November 2017 (Valor, 28/11/2017).
Chamber of Deputies	The president of the Chamber of Deputies was against converting the RenovaBio proposal as a provisional measure due to the large number of similar measures already in-house, but was in favour of sending it as a draft bill (Valor, 09/11/2017; Valor, 14/11/2017). Negotiating with the rural caucus and representatives from the biofuel sector, the president of the Chamber of Deputies allowed the character of urgency of the draft bill to be voted eight days after the proposal was submitted to Congress by the Biodiesel Caucus leader (Valor, 21/11/2017).
Energy Policy National Council (CNPE)	The CNPE was responsible for engaging with the government, civil society and private sector to formulate RenovaBio (Estado, 25/09/2017). At the time, CNPE was coordinated by the MME, with the participation of eight ministries, including Finance and Planning, as well as the Energy Research Company (EPE) and civil representatives (Valor, 02/02/2018).
Executive Office	The Executive Office did not send the RenovaBio proposal to Congress due to divergences within government (Valor, 22/11/2017). Representatives from the Executive Office also questioned the “urgency and relevance” of RenovaBio, prerequisites for issuing a provisional measure, suggesting that it be sent to Congress as a draft bill instead (Estado, 04/09/2017).
Ministry of Agriculture	Together with the MME and the Ministry of the Environment, the Ministry of Agriculture was supportive of RenovaBio (Valor, 08/09/2022).
Ministry of Finance	Together with the Ministry of Planning and the Executive Office, the Ministry of Finance was questioning the urgency of implementing goals for fossil fuel distributors and the economic impacts of the program, such as inflation, given that the costs of certificates could be passed on to consumers (Valor, 09/08/2017; Valor, 02/10/2017; Valor, 03/11/2017). Instead, the Ministry defended that this mechanism be voluntary (Valor, 09/08/2017) and that a tax over fossil fuel GHG emissions be created (Valor, 16/10/2017).
Ministry of Planning	Together with the Ministry of Finance, the Ministry of Planning questioned the inflationary impacts of RenovaBio (Valor, 09/11/2017; Valor, 14/11/2017).
Ministry of the Environment	The Ministry of the Environment was interested in RenovaBio being sent to Congress before COP23, in Bonn, so that it could be introduced as one of the country's actions toward the Paris Agreement (Valor, 13/10/2017; Valor, 09/11/2017). A technical note developed by the Ministry calculated that the decarbonisation credits could have a 0.02% to 0.16% on the IPCA inflation index (Valor, 13/10/2017).
President of the Republic	In October 2017, the President of the Republic stated that RenovaBio would be sent as a provisional measure to Congress before COP23 (Valor, 24/10/2017). When the President signed the decree that regulated RenovaBio, in March 2018, he indicated that this may have been the most important act of his administration (Estado, 03/04/2018).
Senate	The Senate voted in favour of the draft bill on December 12, 2017 (Folha, 12/12/2017).

Source: the authors based on newspaper articles

[1] Draft Bills deemed as urgent do not have to go through all the different parliamentary commissions and are voted on directly by deputies (Agência Senado, n.d.).



Interviewee 1 mentioned that the Parliamentary Caucuses are often organised according to the private interests of particular industries or groups, all of which have short-term economic goals, making it more difficult to pass legislation related to climate change. However, in the case of RenovaBio, the interests of different caucuses (e.g. automotive, environmental, agricultural) converged and they joined to approve the program.

## Policy entrepreneurs

From the sample of articles and interviews, four stakeholders were identified as relevant policy entrepreneurs:

- **Policy Entrepreneur 1:** Career public servant Marcelo Ivan Lacerda, director of the Biofuel Department of the Ministry of Mines and Energy;
- **Policy Entrepreneur 2:** Congressman Evandro Gussi, from the Green Party of the State of São Paulo, president of the Biodiesel Parliamentary Caucus;
- **Policy Entrepreneur 3:** Elizabeth Farina, president of Unica, “the representative body of a wide group of companies that produce sugar, ethanol and bioelectricity in the Mid-Southern region of Brazil”<sup>32</sup>.
- **Policy Entrepreneur 4:** the biofuel producers who engaged their supply chain in the program.

Policy Entrepreneur 1 was responsible for conceiving RenovaBio and for engaging intensively with the biofuel sector, including with Policy Entrepreneurs 2 and 3, to convince them of the benefits of the program, as well to gather inputs for its design. As Interviewee 10 recounted, coming into MME’s Department of Biofuels, Policy Entrepreneur 1 vowed “to modernise the public policy approach for biofuels”, arguing that biofuels provide an environmental service (i.e., decarbonisation) that was not being remunerated and that a carbon tax would be inefficient for encouraging the increase in biofuel production as it does not promote security for the sector to make new investments. Therefore, Policy Entrepreneur 1 proposed to develop a biofuel policy that would incorporate the certification of biofuel producers, remuneration linked to carbon credits, measurement of avoided emissions based on life cycle analysis and a dynamic modelling for setting the environmental targets. In addition, Interviewee 9 suggested that concerns with deforestation held by Policy Entrepreneur 1 were due to his previous experience at Embrapa.

Policy Entrepreneur 2 was responsible for presenting the draft bill in Congress and a key negotiating figure for expediting its approval. After his mandate as a federal deputy for the State of São Paulo ended in 2019, Evandro Gussi became the president of Unica.

Policy Entrepreneur 3 was the most frequent voice found in the articles representing the interests from ethanol producers from outside of the government (with nearly 40% of all citations from the ethanol industry). Given that from inception RenovaBio was already attached to the problem of climate change, Policy Entrepreneurs 2 and 3 were particularly important in creating a favourable political environment to ensure that the policy be considered and approved.

---

<sup>32</sup> Available at: <https://unica.com.br/en/history-and-mission/>

Policy Entrepreneur 4 were the biofuel producers who were responsible for creating awareness and informing their supply chain about the program, and for convincing their suppliers to join. According to one of the interviewees who was representing a biofuel producer, the company engaged the supplier associations with which they worked, giving presentations on RenovaBio and how it would work. According to this interviewee:

“We explained the difference between primary data, standard data and the big question [from suppliers] at the time was ‘what am I going to gain from this?’ and I remember we frequently answered ‘if you don’t join, I am sure you are not going to gain anything. If you do join, you are possibly going to gain something’”.

Interviewee 9 highlighted that these efforts by Policy Entrepreneur 4 were made despite the uncertainties still surrounding the program upon its inception, for instance, with CBIOs not even being legally regulated at the time.

### Claim to a hearing

Both Policy Entrepreneurs 2 (Mr. Gussi) and 3 (Ms. Farina) occupied positions of relevance in any discussions surrounding biofuels and biofuels policy. Still, that aspect of their participation in the processes leading up to the approval of RenovaBio was exclusively highlighted in seven citations in our sample of articles, all regarding Ms. Farina. Indeed, due to her position, the president of Unica was invited:

- by Brazilian academics in the United Kingdom to talk about sustainability, where she defended RenovaBio’s approval (Valor, 14/05/2017);
- to speak at an event held by the MME, attended by the President of the Republic (Estado, 17/12/2017); and
- to comment on the policy by media reporters (Valor, 09/06/2017).

Regarding future changes, amendments and revisions to RenovaBio, Interviewee 5 argued that Policy Entrepreneur 1 remains the ideal candidate to begin such discussions, since they were the program’s original proponent and remain responsible for its implementation. On this point, Interviewee 10 mentioned that the Federal Audit Courts audited RenovaBio in 2022 and recommended that the MME develop KPIs to monitor and assess the program.

### Political connections and negotiating skills

The most frequent aspect found in newspaper articles about Policy Entrepreneurs 2 and 3 was their capacity to negotiate on behalf of the biofuels industry, in particular Mr. Gussi in the capacity of a member of Congress, and president of the biodiesel caucus (identified in 16 of the 21 citations). On this point, after the delays from the Executive Power in presenting a provisional measure or draft bill, Policy Entrepreneur 2:

“today filed a bill that creates the RenovaBio program [...] The deputy’s initiative was agreed upon with technicians from the Ministry of Mines and Energy (MME), the Executive Office and with the president of the Chamber [of Deputies], Rodrigo Maia, after months of uncertainty regarding how the program would be directed” (Valor, 14/11/2017).

Moreover, the project was given a character of urgency in order to expedite its approval,

“as negotiated with the author of the project, deputy Evandro Gussi (PV-SP), president of the Biodiesel Joint Parliamentary Front, so that the proposal goes straight to plenary without having to go through several committees” (Valor, 21/11/2017).

Finally, some articles suggest that the proposal and the support from members of the Caucus (as well as representatives related to the biofuels and agribusiness sectors) may have played a bargaining role concerning other topics discussed in Congress at the time, such as the Social Security reform (Estado, 28/11/2017) and an impeachment process against the President of the Republic (Valor, 24/10/2017).

Policy Entrepreneur 3, on the other hand, was more involved in negotiating the contents of RenovaBio’s infralegal decisions and related proposals, after its approval, such as the:

- Tax treatment to be conferred to electric vehicles (Valor, 06/02/2018);
- Ambition of the national decarbonisation targets (Valor 02/02/2018); and
- Blending mandates for ethanol and biodiesel (in gasoline and diesel, respectively) (Folha, 13/03/2018).

Interviewee 9 also highlighted Policy Entrepreneur 3’s capacity to exert pressure and mobilise members of Congress to expedite the approval of the policy as well as demand further regulations that were necessary to ensure RenovaBio’s implementation.

As noted earlier, Interviewees 1 and 6 acknowledged the efforts made by Policy Entrepreneur 1, and the MME’s Biofuel Department technical staff, in convincing the sector about the benefits of the program, particularly in convincing Policy Entrepreneurs 2 and 3. Interviewee 9 added that Policy Entrepreneur 1 was also able to mobilise his academic connections in order to conceive of the policy. Furthermore, two of the interviewees recounted the intense efforts of ethanol producers (Policy Entrepreneur 4) and their industry associations to engage with their suppliers and convince them to join RenovaBio.

## Persistency

According to Interviewee 1, it took strong persistency for MME's Biofuel Department to take the RenovaBio proposal forward. As purported by Interviewee 1, there are not incentives for public servants to proactively propose new public policies as they are often discouraged from changing the status quo. Interviewee 1 recounted that federal public servants are exceptionally well-qualified and many have PhDs in their fields. However, they are not encouraged – and could even be demoted or retaliated – for proposing new policies, especially those that go against dominant views. As a result, many civil servants go on international assignments to learn about good examples of public policies and initiatives abroad, but the only outcomes are often the writing of a white paper and/or a seminar documenting the benchmark.

In the newspaper articles, the persistency of Policy Entrepreneurs 2 and 3 was mentioned only in three instances and were highlighted on their own:

“According to deputy Evandro Gussi (PV), president of the Biodiesel Parliamentary Front, the promise was made at a meeting between him and Padilha last Wednesday, the 1st. ‘I have always defended that it be a provisional measure. If we favoured a draft bill, we from Congress would already have presented it’ he said” (Valor, 03/11/2017).

And

“Unica should remain focused this year on monitoring RenovaBio, which will now go through the regulatory phase, with the definition of greenhouse gas emission targets. After all, the degree of incentive for investments in the sugar and ethanol sector will largely depend on these goals, according to Farina.” (Valor, 06/02/2018)

In the interviews, Interviewee 6 highlighted the persistent character of Policy Entrepreneur 2 who noted that, as soon as he was convinced of the program, he committed to helping it be implemented.

## Appreciation for academic knowledge

Interestingly, a characteristic that Policy Entrepreneurs 1, 2 and 3 shared was an appreciation for academic knowledge. As previously noted, Policy Entrepreneur 1 designed RenovaBio based on two academic references, Coase's theorem and a conference paper from researchers at Embrapa on the lifecycle analysis of sugarcane, as well as being indirectly based on international low-carbon fuel markets.

As purported by the interviewees, Policy Entrepreneur 1 could more easily discuss the features of the program with professionals with an economic and/or academic background as was the case with Policy Entrepreneurs 2 and 3. Previously the president of Unica and an academic lecturer, Policy Entrepreneur 3 is now a Senior Professor in the Economics department at University of São Paulo. Policy Entrepreneur 2 dedicated extensive time to studying the program's documents and discuss with MME's Biofuel Department the particularities of the program. According to Interviewee 6, if similar

efforts and commitment were employed by other stakeholders, such as by some representatives from the Executive Office, to understand the program, there would be more support to RenovaBio:

“There were smart people, who meant well, not malicious people with ulterior motives, but these people did not understand the purpose of RenovaBio, what it meant, the processes it encouraged, the institutional framework. There was some sophistication there that really needed some hours of dedication and that had not happened.” (Interviewee 6)

## Opportunities for improvement

Given that RenovaBio has already been implemented, we also asked the interviewees about opportunities for improving the program. The interviewees listed the following:

### 1. Improve RenovaCalc:

**1a. Improve standard data:** According to Interviewees 3 and 8, there are ongoing discussions about improving standard data in RenovaCalc, i.e., secondary data that is used when biofuel producers do not have primary data of their operations. This includes improving data to account for regional differences, given that different regions have different production practices and efficiency levels. Indeed, Interviewee 8 highlighted that several updates already took place to account for new and improved data.

**1b. Expand lifecycle analysis:** According to Interviewees 1 and 6, there is room for expanding lifecycle analysis of biofuels both ways: upstream, the calculation should also include land use measurement and, downstream, the analysis should include GHG emissions from vehicle production and use. In particular, Interviewees 2 and 6 also suggested that the program should include GEE emissions from both direct and indirect land use change from biofuels production. On the other hand, Interviewee 8 mentioned that the policy is still new and, thus far, the eligibility criteria seem to be working to prevent the use of biomass from deforestation.

**1c. Include other biofuels:** According to Interviewee 3, although sugarcane ethanol is the most comprehensive in terms of data availability, there is still room to include other biofuels, such as second-generation biofuels, biogas and aviation biokerosene. Interviewee 5 agreed and suggested that, for instance, Hydrotreated Vegetable Oil (HVO) could also be included in the program. Interviewee 8 also voiced that the program must constantly account for new sources of biomass and biofuels and new technological routes for existing ones, but highlighted that procedures are already in place to do so, for instance, with palm oil biodiesel being incorporated to RenovaCalc. Interviewee 11 cautioned, though, that “reformed fossil fuels” should not be considered.

**2. Increase possibilities for CBO issuance:** Whereas only biofuel sold in the domestic market generates CBOs, Interviewee 3 defended that there should be other alternatives for generating CBOs. For example, selling biofuels to be used in international flights should also be eligible for issuance.

**3. Discuss fungibility:** Interviewee 1 added that there should be a discussion to include CBIO in international carbon markets. Interviewee 2 agreed, however, they cautioned that carbon credits commonly have to be additional, that is, the project would not be feasible in the absence of the credit, whilst RenovaBio does not ensure this additionality. On this point, Interviewee 5 indicated that, in order for CBIOs to be fungible with carbon credits, RenovaCalc and its logic, based on efficiency of biofuel production (rather than avoided emissions) would have to be reassessed. Interviewee 8 also believes that additional legislation would be necessary to make CBIOs equivalent to carbon credits. More generally, Interviewee 7 defended that national carbon markets could trade with each other and “maybe the distributor could meet its goals buying credits from another sector, and the mandated party from another sector could buy CBIOs. We have to think about how to integrate these things”. Similarly, Interviewee 5 suggested that fuel distributors be allowed to purchase carbon credits in order to comply with their targets.

**4. Review CBIO taxation:** According to Interviewee 1, the accounting and taxation of carbon markets in Brazil must be defined. Moreover, Interviewee 7 explained that CBIOs are taxed 15% as income tax plus 9.25% for PIS/COFINS, which they consider an unfair treatment when compared to other financial assets, which are only taxed 15% of income tax and do not have environmental benefits attached, a concern shared by Interviewee 8.

**5. Promote equal treatment:** Interviewees 4 and 5 defend that the rules of RenovaBio should be mandatory for both biofuel producers and fossil fuel distributors, or voluntary for both. Interviewee 5 also noted that some players act both as biofuel producers and fuel distributors and are thus able to enjoy competitive advantages.

**6. Adopt price stability measures:** Interviewee 4 defends that there should be a timeframe for when CBIOs are put into the market from the issuance date. Interviewee 4 also recommends that a maximum price cap be adopted in the program, similarly to what was implemented in the Californian low-fuel program. Interviewee 5 defended that there should be a price stability mechanism, also citing the example of the Californian program, explaining that, when the asset price reaches a certain limit, the government issues the credit without an underlying climate mitigation benefit (“by fiat”) and put in the market, later re-buying it when there is a credit superavit, hence avoiding a lack of credit supply in the market.

**7. Reduce legal uncertainty:** Although Decree No 11,141/2022 (which postponed the target dates for fuel distributors to comply with their CBIO purchase targets) helped reduce CBIO prices, according to several interviewees (Interviewees 4, 5, 6 and 11), the measure contributed to increasing legal uncertainty in the market. They defended that these measures should be avoided as clear and predictable rules are necessary to guide both investment by biofuel producers and market strategies by fuel distributors. Interviewee 11 also mentioned the changes to the distributors’ annual targets as creating legal uncertainty, arguing that frequent changes to RenovaBio’s rules cause excessive volatility in CBIO prices and weaken the program. Interviewee 10 defended that there should be changes in the program only after an evaluation of the public policy.

**8. Establish limits to the purchase of CBIOs:** Since there is no limit to the volume of CBIOs bought by a single distributor, Interviewee 4 explained that there is the risk that one distributor buys all the supply available in the market, causing CBIO prices to go up. They suggested that there be a cap, proportional to total fossil fuel sales.

**9. Forbid intermediaries from participating:** Interviewee 4 explained that other stakeholders (e.g. those interested in reselling CBIOS) are allowed to purchase CBIOS, but they argue that it should be banned as it is detrimental to the supply available to distributors.

**10. Improve accountability:** According to Interviewees 4 and 5, since there is no monitoring of whether CBIOS revenues are being used by biofuel producers to increase biofuel production, RenovaBio can be equaled to an income transfer program to the biofuel sector. Interviewee 5 further suggested that, if the program is targeted towards decarbonisation, mechanisms should be in place to ensure that revenues by producers from the sale of CBIOS be compulsorily reinvested in, increasing the efficiency and volume of biofuel production.

**11. Ensure adherence to other socioenvironmental aspects:** Interviewee 2 mentioned that RenovaBio is lenient with deforestation, allowing biofuels to be produced in recently deforested areas (before 2018). Moreover, enrolment in the program is not prohibited for producers that (hypothetically) fail to comply to other laws, for instance, with regard to the use of slave labour. However, Interviewee 8 cautioned that a new law could not retroact and impose restrictions prior to its date of implementation.

**12. Ensure better monitoring and enforcement of rules in the fuel distribution sector:** Interviewee 5 noted that the fuel distribution sector in Brazil is notorious for tax frauds and evasion, with punishments for non-compliance (with other laws) often being slow and insufficient to prevent illegal practices. On this point, they mentioned that discussions were held at MME in 2022 to shift the point of regulation from fuel distributors to refineries, which are easier to monitor and inspect.

**13. Develop a futures market of CBIOS:** Interviewee 7 argued that there should be a futures market for CBIOS in order to provide more dynamism to the market and because future prices would signal scarcity of CBIOS. For example, if the price of CBIOS were high now, but the future price of CBIOS within ten months were low, it would mean that there was no structural lack of CBIOS in the market.

**14. Integrate sectoral policies:** Interviewees 7 and 8 suggested that public policies that are goal-aligned be integrated to promote synergistic impacts, citing as examples of policies that are aligned with RenovaBio the energy efficiency policies of the automotive sector, like the Air Pollution Program by Automotive Vehicles (Proconve), from the Ministry of the Environment, and Route 2030, from the Ministry of Development, Industry and Foreign Trade.

**15. Develop KPIs for RenovaBio:** Interviewee 10 suggested that key performance indicators (KPIs) must be developed for RenovaBio to assess whether the objectives of the program are being attained, how the program is impacting the biofuel sector and whether it is contributing to increase biofuel production capacity. Interviewee 10 complemented that, after the auditing process of the Federal Audit Court (TCU), which is responsible for auditing all public policies under development, the body also recommended that KPIs be developed for the program.

**16. List CBIOS in the Brazilian stock market:** Interviewee 11 defended that CBIOS be listed in the stock market in the future so that there are risk management mechanisms in place, lower market arbitrage, more transparency and CBIOS liquidity, features which are not protected in an over-the-counter market.

#### Box 4 – Suggestions for RenovaBio, according to the interviewees

- Improve RenovaCalc, such as expanding lifecycle analysis and including other biofuels
- Increase possibilities for CBIO issuance
- Discuss fungibility
- Review CBIO taxation
- Promote equal treatment
- Adopt price stability measures
- Reduce legal uncertainty
- Establish limits to the purchase of CBIOs
- Forbid intermediaries from participating in the CBIO market
- Improve accountability
- Ensure adherence to other socioenvironmental aspects
- Ensure better monitoring and enforcement of rules in the fuel distribution sector
- Develop a futures market for CBIOs
- Integrate sectoral policies
- Develop KPIs for RenovaBio
- List CBIO in the Brazilian stock market

Interviewee 1 noted that the MME's Biofuel Department left a strategic plan with areas to improve RenovaBio, including some of the points mentioned above. However, they noted that there are numerous challenges for existing public policies to be maintained or improved, including the fact that, when new government representatives are in office, many try to enact different policies to create their own legacy, compromising the continuity of existing policies.





Chapter five

# Discussion

## 5. Discussion

RenovaBio is an interesting policy to analyse because it has explicitly incorporated climate change concerns into its policy processes. Based on Kingdon's MSF, we respond to the study's research questions below:

### RQ1: Drawing on Kingdon's Multiple Streams Framework, what were the major forces at play during RenovaBio's legislative process?

#### Policy window

Although discussions on the need for a new biofuel policy may be a recurring matter in the country, changes in the configuration of the executive branch of the federal government seem to have contributed to opening a new policy window. Notably, the appointment of a new Director for the Department of Biofuels at the MME, an individual with academic knowledge and previous work experience in environmental issues, made it possible for RenovaBio to be gradually conceived, inspired by different sources. In this regard, our findings seem to corroborate Kingdon's assertion that the "turnover of key participants, such as a change of administration, has powerful effects on policy agendas" (Kingdon, 2014). A similar event was also found to be relevant in the case of Brazil's maritime cabotage policy "BR do Mar" (FGVces, 2022).

#### Policy's multiple problems/objectives

RenovaBio targeted multiple problems. Newspaper articles emphasised the role of biofuels in achieving the country's climate change commitments, whereas the MME's Explanatory Note and the interviews also stressed ensuring energy security and more stable market conditions for the biofuel sector. This multitude of objectives likely contributed to the faster-than-usual legislative process undergone by the program, for instance, by creating a large coalition of supporters, with the uncommon alignment of the Agricultural, Biofuel, and Environmental Parliamentary Caucuses.

However, after enactment, the policy seems to be more vulnerable to criticisms given that there is neither a clear priority between its many objectives, nor are there objective indicators to measure its contributions in attaining each individual goal. Moreover, the interviewees noted that there are no mechanisms in place for encouraging an increase in biofuel production capacity, compromising the future supply of CBIOS for fossil fuel distributors to comply with their targets, or the creation of more stable market conditions for the ethanol sector, which are dependent on other factors, such as international oil prices and exchange rate fluctuations.

Indeed, we wonder whether having multiple objectives makes public policy direction diffuse and less clear. Although it is known that public policies may add multiple objectives to gather enhanced political

support (e.g. Wunder, Engel, & Pagiola, 2008), the fact that there is not a clear priority between the policy's many objectives may make policy design choices more challenging and compromise the intended results (Taylor & Morris, 2015). On this point, Chindarkar et al. (2017) note that successful policy-making for multi-faceted problems demand high levels of policy capacity (i.e., organizational and analytical competences) from government officials and bureaucracies.

For instance, if climate mitigation were the main objective of RenovaBio, there would be more incentives, for example, to create mandatory goals for biofuel producers and stricter rules forbidding players to speculate with CBIOs. If the main objective were enhancing the country's energy security, there could be rules to ensure that CBIO revenues be channelled to increase biofuel production capacity. Contrarily, if creating improved market conditions for the biofuel sector were the primary goal, concerns over how CBIO revenues are employed would be less relevant.

**Research proposition 1:** *Attaching a solution to multiple problems helps to secure policy approval, but there should be a clear priority between the policy's many objectives to provide a clear direction to it.*

## Multiple policy entrepreneurs and the 'relay race'

As shown in the Literature Review section, Brazil has a history of enacting public policies that support the development and use of biofuels that dates to the 1970s. Therefore, not only may similar efforts be more easily accepted by policy actors and the society as whole, but there was also a powerful interest group willing to advocate for and ensure the enactment of RenovaBio. Indeed, the president of the Biodiesel caucus was responsible for presenting the draft bill in Congress and the industry association Unica helped keep the issue prominent in mass media.

The research findings indicate that several policy entrepreneurs, committed to all stages of the policy process and with complementary skills, contributed to the journey being covered rapidly, from development to approval to implementation, as follows:

### Starting line

Career civil servants from the Biofuel Department of the MME identified a primary problem to be solved – the country's energy insecurity – and a potential solution that was technically feasible and aligned with societal values (i.e., reliance on markets and price systems), with inspirations for the program design based on academic sources and suggestions from biofuel players, including Policy Entrepreneur 3, who drew their proposals from international low-fuel initiatives.

Policy Entrepreneur 1 then invested his time, resources and reputation seeking to convince other players about the merits of the program, based on technical arguments. In particular, they managed to engage two other players known for their academic profiles, though occupying political positions, Policy Entrepreneurs 2 and 3.

## **The middle of the race**

The passing of the baton from Policy Entrepreneur 1 to Policy Entrepreneurs 2 and 3 through convincing them of the technical robustness of RenovaBio resulted in the emergence of two new leaders who advocated in favour of the program in two new arenas: in Congress and in the media. Such efforts largely focus on two additional problems which RenovaBio vowed to help solve: the need to attain the country's climate commitments and the need to create stable market conditions for the ethanol sector.

Encouraging biofuel production raised concerns around the impact of the policy on fuel prices, a fact that has stalled the executive branch, giving prominence to the legislative branch, with Policy Entrepreneur 2 sending the draft bill to Congress and having it approved one month later. Even concerns over the impact of fuel prices were not sufficient to preclude RenovaBio's approval.

In sum, Policy Entrepreneurs 2 and 3 were successful in creating a favourable policy environment in which several players were willing to publicly defend the proposal formulated by Policy Entrepreneur 1 and, more importantly, few were willing to bear the costs of being publicly against it.

## **The final sprint**

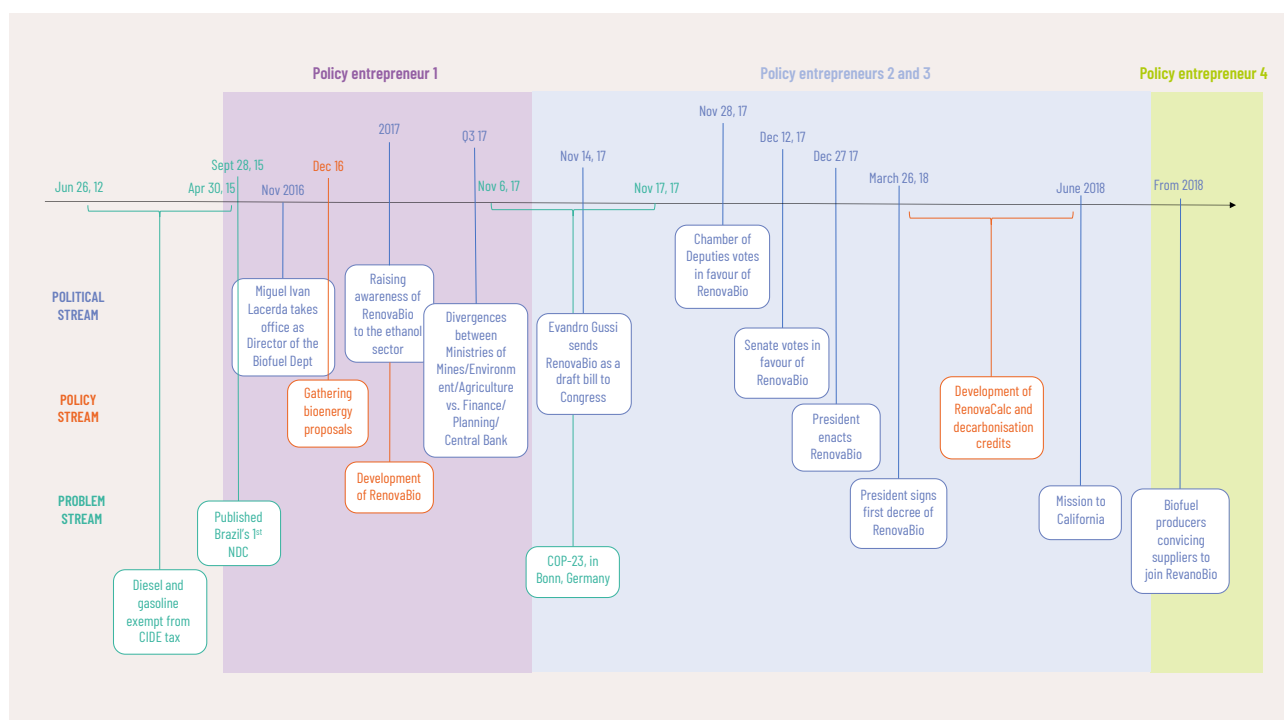
After the Program was sanctioned, another entrepreneur came into play to ensure that RenovaBio be implemented. Since by design, CBIQ supply depended on the voluntary participation of biofuel producers and biofuel lifecycle analysis, the implementation of RenovaBio partially relied on biofuel producers (Policy Entrepreneur 4) convincing their suppliers to gather primary data of biofuel production processes (given that RenovaCalc's standard data lowers Efficiency Scores). In conclusion, having a group of players that benefit from the policy has likely facilitated its continuing support and effective implementation.

The research findings highlight the importance of having policy entrepreneurs in the different stages of the political process with the necessary abilities and competences to make the proposal advance in the stages of policy development, approval and implementation. In this case:

- Policy Entrepreneur 1 employed academic and engagement skills to develop a technically robust program and convince biofuel players of its merits;
- Policy Entrepreneurs 2 and 3 employed their leadership profile and negotiation skills to create a favourable political environment and make the proposal move in Congress until it was approved; and
- Policy Entrepreneur 4 used their influence in the biofuel supply chain to contribute to effective policy implementation.

Therefore, the research findings indicate that several policy entrepreneurs, committed in all stages of the policy process and with complementary skills, contributed for the journey take place rapidly, from development to approval to implementation.

**Figure 6 – Timeline of RenovaBio policy process, per policy entrepreneur**



Source: the authors

**Research proposition 2:** The existence of multiple policy entrepreneurs in the different stages of the political process, willing to invest their resources at different moments and with complementary skills, helps speed up policy processes.

## RQ2: How were concerns with climate change incorporated into the policy process?

RenovaBio is the first case of a sectoral public policy with the explicit goal of contributing to Brazil's efforts under the Paris Agreement. Therefore, the issue of climate change was a feature of its legislative process, particularly in the problem stream. Indeed, biofuels' contribution towards climate goals was the most frequently discussed concern in newspapers, heightened by Policy Entrepreneurs 2 and 3, even though other problems, such as energy security and the economic difficulties faced by ethanol producers, had greater attention in sectoral discussions and forums. Additionally, COP23 brought momentum to the program, with the Minister of the Environment mentioning the draft bill and Policy Entrepreneur 2 sending it to Congress while the conference was taking place.

In the political stream, Kingdon (2014) posits that transport policy is often less visible to the general public. On this point, explicitly linking biofuel policy to Brazil's climate change commitments gave visibility to the policy and made it reputationally costlier for the public to oppose it. In effect, in the newspaper articles, some of the more vocal opponents to the policy were often academics and consultants who were concerned with the implementation and monitoring costs of the program, as well as its likely impacts on fuel prices. However, according to the interviewees, criticism from other stakeholders, in particular fuel distributors, still happened "behind closed doors". As for the involvement of different stakeholders in the design of the policy, there was limited involvement of the climate community or environmental NGOs. In effect, several interviewees considered that the policy was narrowly discussed by stakeholders close to biofuel production and fuel distribution.

On the policy stream, RenovaBio was commended for incorporating a market-based approach, considered by the participants in the policy process as a more efficient and less costly solution to society than a carbon tax. It is also deemed to encourage ever-increasing climate-related benefits by allowing biofuel producers and their suppliers to assess and improve their management practices using RenovaCalc. Other aspects identified as contributing to the program's technical feasibility were the:

- Setting of environmental annual targets (clear incentives);
- Choice of fuel distributors as the obligated party to allow for the development of a market with several players (market scale);
- Robustness of RenovaCalc, employing lifecycle analysis (clear MRV processes); and
- Robust structure in place to avoid fraudulent transactions, such as the certification of CBIOs and their registration at B3 (infrastructure).

On the other hand, the program lacks certain features commonly found in regulated carbon markets, including in the Californian and American low-fuel programs, such as:

- Price stability mechanisms (e.g. price cap);
- Limits to the carrying of credits for later use (banking);
- Expiration dates for the credits; and
- Use of offsets to partially comply with the regulation's targets (Fankhauser & Hepburn, 2010b, 2010a).

Moreover, another limitation of the policy is due to the fact that CBIOs were conceived under different assumptions and, thus, are not fungible with carbon credits.

**Research proposition 3:** *Explicitly tying sectoral policies to climate change, and even framing them as climate policies, increases the visibility of these policies and decreases public opposition to them.*

**Research proposition 4:** *Adopting a market-based approach contributes to policy acceptance, whilst the implementation of best practices commonly found in regulated environmental markets contributes to its effectiveness.*



Chapter six

# **Concluding remarks and recommendations for future studies**



## 6. Concluding remarks and recommendations for future studies

The SNAPFI project explores how transformative change can be enabled by international climate finance through domestic policies in developing countries. Globally, the attainment of climate goals requires GHG emission reductions in the transport sector. In this regard, the policy process of RenovaBio is a unique case study for two reasons: (i) it was approved in a short period of time, with only 28 days between submission of the draft bill for voting and Congress approval; and (ii) it has the explicit goal of contributing to achieving the country's climate goals under the Paris Agreement.

The research findings indicate that:

**Research proposition 1:** *Attaching a solution to multiple problems helps to secure policy approval, but there should be a clear priority between the policy's many objectives to provide a clear direction to it.*

**Research proposition 2:** *The existence of multiple policy entrepreneurs in the different stages of the political process, willing to invest their resources at different stages and with complementary skills, helps to speed up policy processes.*

**Research proposition 3:** *Explicitly tying sectoral policies to climate change, and even framing them as climate policies, increases the visibility of these policies and decreases public opposition to them.*

**Research proposition 4:** *Adopting a market-based approach contributes to policy acceptance, whilst the implementation of best practices commonly found in regulated environmental markets contributes to its effectiveness.*

As to the goals of this research, it is worth highlighting that we did not seek to evaluate RenovaBio and its effectiveness. Moreover, it was not our goal to analyse whether the research propositions above, if valid, are of positive or negative consequences to the attainment of climate goals or other socially relevant objectives being pursued by these policies.

Since the interviewees suggested several opportunities for improvement, future studies could analyse the effectiveness of RenovaBio. For instance, we recommend that the actual and additional climate contribution of RenovaBio be properly assessed, for instance, by measuring the increased use of biofuels in the country promoted by the program in comparison with a business-as-usual scenario. Also, as suggested by the interviewees, RenovaBio (and biofuels policy) may need revisions or updates. On this point, policy processes tend to be continuous and the feedback from RenovaBio may signal to new problems worthy of public attention, then part of other policy processes deserving in-depth exploration.

In addition, we suggest that other public policy case studies in which climate change has been explicitly integrated be analysed in order to assess whether the research propositions are supported. Similarly, other case studies in which several policy entrepreneurs interacted with each other, "passing the baton" throughout the different stages of the policy process, could be analysed to better understand their capacity to speed up the approval of the policy.

More generally, while not the immediate focus of the present report, it is worth highlighting that international climate finance (ICF) can contribute, in different capacities, to the development and implementation of sectoral, climate-aligned domestic policies (FGVces et al., 2021). Thus, future studies could prospectively identify possible entry points, in each of the three streams of (domestic, sectoral) policy processes, for ICF to create an enabling environment and help certain issues and climate-related solutions to rise in the governmental agenda.



Chapter seven

# References

## 7. References

- Addington, B. (2017). *RenovaBio: A Paradigm Shift for Biofuels in Brazil*. Rockville, MD, USA.
- Agência Senado. (n.d.). Regime de urgência.
- Almeida, L. de A., & Gomes, R. C. (2018). Processo das políticas públicas: revisão de literatura, reflexões teóricas e apontamentos para futuras pesquisas. *Cadernos EBAPE.BR*, 16(3), 444–455. <https://doi.org/10.1590/1679-395164108>
- Anfavea. (2022). Anuário da Indústria Automobilística Brasileira.
- ANP. (2021). Linha do Tempo Renovabio.
- ANP. (2022). Dados estatísticos: Produção de biocombustíveis.
- ANTT. (2023). Autorizações ferroviárias. Retrieved April 18, 2023, from <https://www.gov.br/antt/pt-br/assuntos/ferrovias/autorizacoes-ferroviarias-1>
- Barbosa, P. I., Szklo, A., & Gurgel, A. (2022). Sugarcane ethanol companies in Brazil: Growth challenges and strategy perspectives using Delphi and SWOT-AHP methods. *Biomass and Bioenergy*, 158, 106368. <https://doi.org/10.1016/j.biombioe.2022.106368>
- Bossle, R. (2017). RenovaBio é apresentado no Congresso como Projeto de Lei. NovaCana.
- Bracmort, K. (2020). The Renewable Fuel Standard (RFS): An Overview. Washington, DC.
- Brazil. (2005). Lei No 11.097, de 13 de janeiro de 2005. Brasília, DF: Presidência da República.
- Brazil. (2017). Lei No 13.576, de dezembro de 2017. Brasília, DF: Presidência da República.
- Brazil. (2018). Lei No 13.755, de 10 de dezembro de 2018. Brasília, DF: Presidência da República.
- Brazil. (2022). Decreto No 11.141, de 21 de julho de 2022. Brasília, DF: Presidência da República.
- Câmara dos Deputados. (2018). PL 9086/2017.
- Capella, A. C. N. (2006). Perspectivas Teóricas sobre o Processo de Formulação de Políticas. *Revista Brasileira de Informações Bibliográficas Em Ciências Sociais*, 87–124.
- CARB. (2020). Low Carbon Fuel Standard - Basic Notes. Sacramento, CA: California Air Resources Board.
- CARB. (2023). LCFS Data Dashboard. Retrieved July 11, 2023, from <https://ww2.arb.ca.gov/resources/documents/lcfs-data-dashboard>
- Casa Civil. (2017). Mensagem no 576. Brasília, DF.
- Chindarkar, N., Howlett, M., & Ramesh, M. (2017). Introduction to the Special Issue: "Conceptualizing Effective Social Policy Design: Design Spaces and Capacity Challenges." *Public Administration and Development*, 37(1), 3–14. <https://doi.org/10.1002/pad.1789>
- Coase, R. H. (2013). The Problem of Social Cost. *The Journal of Law & Economics*, 56(4), 837–877.
- Congresso Nacional. (2022). Medidas Provisórias | Em tramitação.
- Embrapa. (2022). About Embrapa. Retrieved October 18, 2022, from <https://www.embrapa.br/en/sobre-a-embrapa>
- EPE. (2022a). Análise da conjuntura dos biocombustíveis - ano 2021. Retrieved from <https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/analise-de-conjuntura-dos-biocombustiveis>
- EPE. (2022b). Balanço Energético Nacional - ano base 2021.
- Fankhauser, S., & Hepburn, C. (2010a). Designing carbon markets, Part II: Carbon markets in space. *Energy Policy*, 38(8), 4381–4387. <https://doi.org/10.1016/j.enpol.2010.03.066>
- Fankhauser, S., & Hepburn, C. (2010b). Designing carbon markets. Part I: Carbon markets in time. *Energy Policy*, 38(8), 4363–4370. <https://doi.org/10.1016/j.enpol.2010.03.064>
- Farah, M. F. S. (2018). Abordagens teóricas no campo de política pública no Brasil e no exterior: do fato à complexidade. *Rev. Serv. Público*, December, 53–84.
- Federative Republic of Brazil. (2016). Intended Nationally Determined Contribution. Retrieved April 6, 2020, from <https://www.gov.br/mre/pt-br/arquivos/documentos/clima/brasil-indc-portugues.pdf>
- Federative Republic of Brazil. (2022). Nationally Determined Contribution (NDC).
- FGVces. (2022). Cabotage Navigation in Brazil: An Analysis of the Legislative Process of Statute No. 14,301/2022 ("BR do Mar") Using Kingdon's Multiple Streams Framework.
- FGVces, NewClimate Institute, ITB, TERI, University of Cape Town, & Vivid Economics. (2021). International Climate Finance and support to national climate policy processes in emerging markets. Retrieved from [https://www.diw.de/documents/dokumentenarchiv/17/diw\\_01.c.821395.de/snapfi\\_intl\\_climate\\_finance\\_2021.594220.pdf](https://www.diw.de/documents/dokumentenarchiv/17/diw_01.c.821395.de/snapfi_intl_climate_finance_2021.594220.pdf)
- Flores, I. (2017). Proposing a methodology for the operationalisation of Multiple Streams Approach, using the Inner-City Technology Colleges as an empirical example. <https://doi.org/10.31219/osf.io/ua79y>
- Folegatti, M. I. da S. M., Seabra, J. E. A., Chagas, M. F., Scachetti, M. T., Morandi, M. A. B., Moreira, M. M. R., ... Bonomi, A. (2018). RenovaCalc: A calculadora do Programa RenovaBio. VI Congresso Brasileiro Sobre Gestão Do Ciclo de Vida. Brasília.
- gov.br. (2021). O que é a CIDE Combustíveis? Retrieved October 20, 2022, from <https://www.gov.br/infraestrutura/pt-br/assuntos/portal-da-cide/informacoes-gerais-1/o-que-e-a-cide-combustiveis#:~:text=A Contribuição de Intervenção no,fiscal e de arrecadação vinculada.>

- gov.br. (2023). RenovaCalc. Retrieved June 20, 2023, from <https://www.gov.br/anp/pt-br/assuntos/renovabio/renovacalc>
- gov.br. (2023). Composição do CNPE. Retrieved from <https://www.gov.br/mme/pt-br/assuntos/conselhos-e-comites/cnpe/composicao-do-cnpe/composicao-do-cnpe>
- Grangeia, C., Santos, L., & Lazaro, L. L. B. (2022). The Brazilian biofuel policy (RenovaBio) and its uncertainties: An assessment of technical, socioeconomic and institutional aspects. *Energy Conversion and Management*: X, 13, 100156. <https://doi.org/10.1016/j.ecmx.2021.100156>
- Kingdon, J. W. (2014). *Agendas, Alternatives, and Public Policies* (2nd ed.). Harlow: Pearson.
- Lark, T. J., Hendricks, N. P., Smith, A., Pates, N., Spawn-Lee, S. A., Bougie, M., ... Gibbs, H. K. (2022). Environmental outcomes of the US Renewable Fuel Standard. *Proceedings of the National Academy of Sciences*, 119(9). <https://doi.org/10.1073/pnas.2101084119>
- Lazaro, L. L. B., & Thomaz, L. F. (2021). Stakeholder participation in the formulation of Brazilian biofuel policy (RenovaBio). *Ambiente & Sociedade*, 24. <https://doi.org/10.1590/1809-4422asoc20200056r2vu202114de>
- Lima, A. S., & Toni, F. (2020). Renovabio: Innovation and Sustainability at the New Brazilian Biofuels Policy or The Emperor's New Clothes? *European Journal of Environment and Earth Sciences*, 1(5). <https://doi.org/10.24018/ejgeo.2020.1.5.74>
- Ministério da Economia. (2022). Rota 2030 - Mobilidade e Logística.
- Ministério do Meio Ambiente. (2021). Diretrizes para uma Estratégia Nacional para Neutralidade Climática. Retrieved from <https://www.gov.br/mma/pt-br/diretrizes-para-uma-estrategia-nacional-para-neutralidade-climatica.pdf>
- Ministério dos Transportes. (2018). Política Nacional de Transportes - Resumo Executivo. Retrieved from [http://www.infraestrutura.gov.br/images/2018/POLITICA\\_PLANEJAMENTO\\_TRANSPORTES/documentos/resumo\\_executivo\\_PNT\\_portugues.pdf](http://www.infraestrutura.gov.br/images/2018/POLITICA_PLANEJAMENTO_TRANSPORTES/documentos/resumo_executivo_PNT_portugues.pdf)
- MME. (2022). Resolução CNPE no 13/2022. Brasília, DF: Presidência da República.
- MME. (2023a). Balanço RenovaBio. Retrieved April 18, 2023, from <https://www.gov.br/mme/pt-br/assuntos/secretarias/petroleo-gas-natural-e-biocombustiveis/renovabio-1/balanco-renovabio>
- MME. (2023b). RenovaBio (English). Retrieved February 13, 2023, from Ministério de Minas e Energia website: <https://www.gov.br/mme/pt-br/assuntos/secretarias/petroleo-gas-natural-e-biocombustiveis/renovabio-1>
- OECD, & FAO. (2020). OECD-FAO Agricultural Outlook 2020-2029. <https://doi.org/10.1787/1112c23b-en>
- Pavlenko, N., & Araujo, C. (2019). Opportunities and risks for continued biofuel expansion in Brazil.
- Picoli, J. F., Matsuura, M. I. S. F., Chagas, M. F., Cavalett, O., Barrantes, L. S., Chiumento, G., ... Costa, K. R. (2016). Adaptação de inventários de ciclo de vida de cana-de-açúcar para o contexto brasileiro. V Congresso Brasileiro Em Gestão de Ciclo de Vida. Fortaleza.
- poder360. (2021). Grandes jornais registram queda de 12,2% na circulação impressa no 1o semestre. Retrieved February 26, 2022, from <https://www.poder360.com.br/brasil/grandes-jornais-registram-queda-de-122-na-circulacao-impressa-no-1o-semester/>
- Rei, F., & Cunha, K. (2021). The fruition of climate change law in Brazil: the RenovaBio program. In A. Gonçalves, D. Freire, & F. Rei (Eds.), *Governança global: desafios e complexidade* (pp. 155-170). Santos, SP: Editora Universitária Leopoldianum.
- Ribeiro, C. H., & Cunha, M. P. (2022). The economic and environmental impacts of Brazilian National Biofuel Policy. *Biofuels, Bioproducts and Biorefining*, 16(2), 413-434. <https://doi.org/10.1002/bbb.2326>
- SEEG. (2023). Total emissions. Retrieved June 19, 2023, from [https://plataforma.seeg.eco.br/total\\_emission](https://plataforma.seeg.eco.br/total_emission)
- Senado Federal. (2021). Projeto de Lei da Câmara nº 160, de 2017.
- Simões, A. F. (2021). Interrelationships between policies to encourage biofuels, energy efficiency and climate change mitigation: A synergistic analysis focusing on the Brazilian RenovaBio Program. *Latin American Journal of Energy Research*, 8(1), 46-58. <https://doi.org/10.21712/lajer.2021.v8.n1.p46-58>
- Sindipeças. (2022). Relatório da Frota Circulante. São Paulo, SP.
- Sorda, G., Banse, M., & Kemfert, C. (2010). An overview of biofuel policies across the world. *Energy Policy*, 38(11), 6977-6988. <https://doi.org/10.1016/j.enpol.2010.06.066>
- Takaes Santos, I. (2020). Confronting governance challenges of the resource nexus through reflexivity: A cross-case comparison of biofuels policies in Germany and Brazil. *Energy Research & Social Science*, 65, 101464. <https://doi.org/10.1016/j.erss.2020.101464>
- Taylor, B. D., & Morris, E. A. (2015). Public transportation objectives and rider demographics: are transit's priorities poor public policy? *Transportation*, 42(2), 347-367. <https://doi.org/10.1007/s11116-014-9547-0>
- Verdêlio, A. (2021). Presidente aprova mistura de 10% de biodiesel no óleo diesel. Agência Brasil. Retrieved from <https://agenciabrasil.ebc.com.br/economia/noticia/2021-12/presidente-aprova-mistura-de-10-de-biodiesel-no-oleo-diesel>
- Witcover, J. (2018). Status Review of California's Low Carbon Fuel Standard, 2011-2018 Q1. Davis, CA.
- Wunder, S., Engel, S., & Pagiola, S. (2008). Taking stock: A comparative analysis of payments for environmental services programs in developed and developing countries. *Ecological Economics*, 65(4), 834-852. <https://doi.org/10.1016/j.ecolecon.2008.03.010>
- Yamahaki, C., & Breviglieri, G. V. (2022). Atração de investimentos privados para infraestrutura no Brasil. *Revista de Administração Pública*, 56(3), 413-425. <https://doi.org/http://dx.doi.org/10.1590/0034-761220210403>
- Zahariadis, N., & Exadaktylos, T. (2016). Policies that Succeed and Programs that Fail: Ambiguity, Conflict, and Crisis in Greek Higher Education. *Policy Studies Journal*, 44(1), 59-82. <https://doi.org/10.1111/psj.12129>



Chapter eight

# **Appendix – Interview guide**

## 8. Appendix – Interview guide

1. What was the inspiration/origin of the proposals suggested in RenovaBio?
2. Who were the most active stakeholders (both supportive and adversarial) during the legislative process of RenovaBio?
3. What was your organisation's stance on RenovaBio?
4. In your view, will RenovaBio contribute to further develop the biofuel market in Brazil? Why?
5. Do you have any suggestions for further improvement of RenovaBio?
6. Can you draw any lessons from RenovaBio's policy process for the development of future climate-related policies?

