



## TRANSFORMATIONS IN THE REGULATION OF BIOFUELS IN BRAZIL: HISTORICAL-INSTITUTIONAL PATH AND SUSTAINABLE PERSPECTIVES



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### ABSTRACT

This study analyzes the historical-institutional evolution of the regulatory mechanisms applied to the biofuels sector in Brazil, from the creation of the Sugar and Alcohol Institute (IAA) in 1933 to the consolidation of the National Agency of Petroleum, Natural Gas and Biofuels (ANP). The research, developed in the "Environment and Sustainability" line, examines the paradigmatic transition from an interventionist and centralizing state model to a regulatory structure based on independent agencies, reflecting broader economic, political and social transformations. The work highlights the importance of the constitutional principle of an ecologically balanced environment, established in article 225 of the Federal Constitution of 1988, as a structuring element in the formulation of public energy policies. It also analyzes the fundamental role of the National Alcohol Program (Proálcool) in the development of the Brazilian biofuel industry and its contribution to the diversification of the national energy matrix. The methodology adopted is qualitative, with an inductive approach, based on comprehensive bibliographic and documentary research. The results show that the effectiveness of biofuel regulation depends on the consolidation of an institutional framework that harmonizes legal certainty, technical capacity and commitment to sustainability, contributing to Brazilian leadership in the global energy transition.

**Keywords:** Biofuels. Regulation. Sustainability. Regulatory Agencies. Energy Transition.

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## INTRODUCTION

The Brazilian energy scenario has undergone significant transformations in recent decades, driven by the search for renewable alternatives to fossil fuels and the growing concern with environmental sustainability. In this scenario, biofuels emerge as strategic components for the diversification of the national energy matrix, requiring regulatory structures appropriate to their productive and environmental particularities.

The present paper examines the evolutionary trajectory of the regulatory mechanisms applied to the biofuels sector in Brazil, ranging from the first institutional initiatives, represented by the Sugar and Alcohol Institute (IAA), to the current model based on the performance of the National Agency of Petroleum, Natural Gas and Biofuels (ANP). This investigation is developed within the scope of the research line "Environment and Sustainability", seeking to understand how normative and organizational structures have adapted to contemporary socio-environmental demands.

It should be noted that, although the term "regulatory agency" has been formally incorporated into the Brazilian legal system only since the 1990s, this study uses the term in an expanded way, also covering regulatory bodies that, in previous periods, performed analogous functions of standardization and sectoral inspection.

The proposed investigation seeks to identify and analyze the main legislative and institutional transformations that have configured the regulatory framework of biofuels in the national territory. Special attention is devoted to the fundamental normative frameworks and the growing influence of the constitutional principle of an ecologically balanced environment, established in article 225 of the Federal Constitution of 1988. By examining the institutional path between the IAA and the ANP, as well as contemporary initiatives such as RenovaBio (Law No. 13,576/2017) and legislative proposals in progress, such as Bill No. 1873/2021, this work intends to contribute to the understanding of the normative dynamics that favor legal stability and sustainable development of the sector.

To achieve these objectives, a qualitative methodology is adopted, with a predominantly inductive approach, based on comprehensive bibliographic and documentary research. The analytical corpus includes legal provisions, technical opinions, doctrinal constructions and documents related to sectoral public policies. This methodological itinerary aims not only to offer a consistent theoretical foundation, but also to highlight the relevance of regulatory mechanisms as strategic instruments for the consolidation of biofuels as essential components of the Brazilian energy matrix.



## METHODOLOGY

The methodology used in the article "Transformations in the Regulation of Biofuels in Brazil: Historical-Institutional Path and Sustainable Perspectives" is characterized by its qualitative nature and predominantly inductive approach, based on comprehensive bibliographic research and extensive documentation. The analytical corpus includes several legal provisions (laws, decrees and regulations), technical opinions, doctrinal constructions and documents related to sectoral public policies. This methodological itinerary aims to offer a consistent theoretical foundation and highlight the relevance of regulatory mechanisms as strategic instruments for the consolidation of biofuels in the Brazilian energy matrix. The temporal scope of the historical-institutional analysis extends from the creation of the Institute of Sugar and Alcohol (IAA) in 1933 to the consolidation of the National Agency of Petroleum, Natural Gas and Biofuels (ANP) and recent developments such as RenovaBio (2017). The investigation is part of the "Environment and Sustainability" research line, seeking to understand the normative and organizational transformations that have shaped the regulatory framework of biofuels in Brazil, with special attention to the relevant legal frameworks and the growing influence of the constitutional principle of the ecologically balanced environment.

## RESULTS AND DISCUSSION

### THE ORIGINS OF THE SUGAR AND ALCOHOL INSTITUTE: CONTEXT AND ATTRIBUTIONS

The constitution of the Institute of Sugar and Alcohol (IAA) is intrinsically related to the process of modernization of the Brazilian state, particularly during the administration of Getúlio Vargas. According to Guimarães (2012, p. 140), "the Sugar and Alcohol Institute was created by Decree-Law No. 23,501, of November 27, 1933, as a government response to the turbulence that affected the national sugar-alcohol complex, characterized by market fluctuations, production surpluses and precariousness in labor relations".

The historical context of the creation of the IAA is intrinsically related to the Revolution of 1930 and the subsequent consolidation of the Estado Novo, a period characterized by the concentration of powers and intensification of state intervention in the economy, as analyzed by Guimarães (2012). The IAA thus represented a concrete manifestation of the developmental and centralizing policy that characterized that historical moment.

Natale Neto (2005) describes that the IAA had broad regulatory powers over the sugarcane production chain, including production organization, establishment of production



limits, price control, export incentives and supervision of labor conditions in the sector. The agency acted simultaneously as a normative body and as an executor of public policies aimed at structuring and modernizing the sector, seeking to overcome the scenario of disorganization that characterized the sugar industry in previous periods.

In addition to strictly economic functions, the IAA incorporated responsibilities of a social and labor nature. The institution prepared normative guidelines for labor relations in the sugarcane sector, establishing wage parameters, working conditions and assistance mechanisms for rural workers. However, it is necessary to recognize that, in practice, the effectiveness of many of these provisions was compromised by the hierarchical social structures and land concentration predominant in the Brazilian rural context of that period.

According to Gordinho (2010), the strategic importance of the IAA was amplified during periods of global energy instability, especially in World War II and the oil crisis of the 1970s, when the institute coordinated the production of ethanol as an alternative to petroleum products. In both circumstances, the Institute played a fundamental role in coordinating the production of ethanol as an energy alternative to petroleum products, configuring itself as one of the first public institutions to incorporate fuel alcohol as a strategic element of the national energy policy.

According to Natale Neto (2005, p. 87), "the National Alcohol Program (Proálcool), instituted in 1975, represented a milestone in Brazilian energy policy, with the IAA exercising sophisticated national planning functions and acting in close articulation with the program during the military regime". This program had as its main objectives the diversification of the Brazilian energy matrix and the reduction of external dependence on oil. In this context, the IAA has assumed a strategic position in programmatic management, regulating ethanol production and ensuring its adequate distribution.

However, with the process of redemocratization and the rise of neoliberal-oriented economic policies at the end of the twentieth century, the interventionist model represented by the IAA began to face growing questions regarding its efficiency and adequacy to the new global economic context. According to Stanisci and Ferreira (2015, p. 112), "the Sugar and Alcohol Institute was officially extinguished by Decree No. 99,244 of 1990, during the administration of Fernando Collor de Mello, as part of a broad movement to restructure state agencies and liberalize the economy".

The dissolution of the IAA opened space for the emergence of a new regulatory paradigm, based on agencies with greater autonomy and the expansion of market self-regulation mechanisms. The National Agency of Petroleum, Natural Gas and Biofuels (ANP), established in 1997, partially incorporated the functions previously assigned to the



IAA, but from a different perspective, guided by principles of market efficiency and broader environmental and energy objectives.

## THE INSTITUTIONAL TRANSITION: FROM THE IAA TO THE ANP

The transition of the regulatory mechanisms applied to biofuels in Brazil, from the Institute of Sugar and Alcohol (IAA) to the constitution of the National Agency of Petroleum, Natural Gas and Biofuels (ANP), represents a paradigmatic transformation in the model of state intervention in the energy and agro-industrial sectors. This process transcends mere administrative reorganization, reflecting an institutional reconfiguration driven by broad-spectrum economic, political, and social transformations.

Shikida and Perosa (2012) analyze that the IAA operated as the main regulatory entity of the sugar-alcohol sector for about six decades, exercising full control over the production chain and supervising labor relations in the sector, in a model that reflected the state interventionism characteristic of the period. Its attributions covered the integral control of the production chain, including productive, distributive and commercial aspects, in addition to the supervision of sectoral labor relations. However, with the progressive implementation of neoliberal-oriented economic policies in the 1990s, the model of direct state intervention began to be systematically questioned, gradually giving way to regulatory structures more aligned with the principles of economic liberalization.

The extinction of the IAA in 1990, as analyzed by Stanisci and Ferreira (2015), was part of a broad set of reforms implemented during the Collor government, which aimed to resize the state apparatus and redefine the government's role in the economy. This measure was part of a broader movement of resizing the state apparatus and redefining the governmental role in the economic sphere, guided by the search for administrative modernization and increased productive competitiveness. The dissolution of the Institute, however, generated a significant regulatory gap, particularly in a strategic sector such as energy, highlighting the need to develop new institutional structures endowed with technical and administrative capacity to keep up with the growing complexity of the fuel market.

In this scenario, as Assis, Borges and Squeff (2024, p. 45) point out, *"the creation of the National Petroleum Agency (ANP) in 1997, through Law No. 9,478, inaugurated a new phase in the regulation of the Brazilian energy sector, establishing a modern regulatory framework for fuels in the country"*. The ANP was conceived as an autarchic entity endowed with administrative, technical and financial autonomy, capable of regulating, inspecting and fostering economic activities related to oil, natural gas and, later, biofuels in the national territory.



In contrast to the centralizing approach characteristic of the IAA, the ANP incorporated a regulatory conception based on principles of efficiency, transparency, and promotion of competitiveness. Costa (2020) highlights that the ANP was structured as an autarchic entity with administrative, technical, and financial autonomy, with the capacity to regulate, supervise, and foster economic activities related to oil, natural gas, and biofuels throughout the Brazilian territory. This institutional transition represented a significant inflection in the conception of the state's role, which evolved from direct action as producer and manager to a predominantly regulatory and supervisory function.

One of the most significant transformations resulting from this transition was the substantial expansion of the regulatory scope. While the IAA focused its activities specifically on the sugar and alcohol sectors, the ANP began to fully regulate the fuel chain, covering petroleum products, natural gas and biofuels. This expansion required the development of sophisticated technical instruments for assessing environmental impacts, granting operational authorizations, establishing qualitative standards, among other technical-administrative skills.

In addition, the implementation of the National Biofuels Policy (RenovaBio) in 2017 represented, according to Pereira (2020), a concrete manifestation of the ANP's orientation towards sustainability and energy security, incorporating ethanol and biodiesel into national decarbonization strategies. This orientation was concretely manifested in the incorporation of ethanol and biodiesel in national decarbonization strategies, particularly from the implementation of the National Biofuels Policy (RenovaBio), instituted in 2017.

The professionalization of regulatory functions and the strengthening of institutional governance mechanisms have provided greater legal stability and predictability for sectoral economic agents. Nevertheless, significant challenges persist, such as the vulnerability of the ANP in the face of conjunctural political interference, budgetary constraints and the need for constant regulatory updating to keep up with technological innovations and growing global environmental demands.

## THE CONSTITUTIONAL PRINCIPLE OF SUSTAINABILITY AND ITS REGULATORY INFLUENCE

Sustainability was built at the international level from the publication of the report 'Our Common Future', in 1987, with the construction of the concept of sustainable development, which would be the focal point of the United Nations meeting that would take place in Rio de Janeiro, celebrated in 1992, called the United Nations Conference on Environment and Development, recognized for establishing the need to seek a balance



between economic growth and environmental protection and the search for social justice (SOARES, 2003).

At the domestic level, attention to the environment also dates back to the 1980s, more specifically with the enactment of Federal Law No. 6,938/81, establishing the National Environmental Policy and creating the National Environmental System. However, the idea of sustainability only came from the adoption of the 1988 Constitution (BENJAMIN, 2002), which, according to Oliveira (2011), undeniably reflects the assimilation of the principles established at the International Environmental Conferences and anticipates the Brazilian alignment with the commitments later formalized at Rio-92.

Furthermore, as Veiga (2010) understands, even though it is not explicitly named in the constitutional text, the concept of sustainable development is intrinsically present in the essence of article 225, especially when establishing intergenerational links in environmental protection. After all, article 225 of the Federal Constitution establishes that *"Everyone has the right to an ecologically balanced environment, a good for the common use of the people and essential to a healthy quality of life, imposing on the Government and the community the duty to defend and preserve it for present and future generations"* (BRASIL, 1988).

In any case, as Canotilho (1999) recognizes, the Brazilian Democratic Constitution is a historical milestone in the institutionalization of environmental law in the national legal system by explicitly incorporating environmental protection as a shared responsibility between the State and society. In fact, this is why *"this right [is] of collective ownership and of a transindividual nature"* (BRASIL, 2008), as stated in the judgment of ADI 3540/DF by Justice Ayres Britto, since everyone in society has the duty to preserve and act for its maintenance. More than that, as Moura (2016) points out, the 1988 Constitution promoted the decentralization of environmental management, attributing concurrent competencies to the federative entities (art. 23, items VI and VII), which strengthened the Brazilian cooperative federalism model in environmental matters.

Thus, it is clear that sustainable environmental protection has acquired a structuring normative character in the Brazilian constitutional context, transcending the mere orientation for legislative elaboration and demanding not only from people, but also from the State an action that harmoniously integrates economic development, environmental protection and social equity (RAMMÊ, 2012). Therefore, as Pereira (2020) argues, the new constitutional order began to support several normative and programmatic instruments, from the Environmental Crimes Law (Law No. 9,605/1998) and the reinterpretation of the National Environmental Policy (Law No. 6,938/1981), to the recent National Biofuels Policy – RenovaBio (Law No. 13,576/2017).



In view of this, it is imperative to elucidate, in more detail, a success story that, after the introduction of the 1988 Constitution, proved to be an important basis for the insertion of the perspective of sustainability in the country: the National Alcohol Program (Proálcool), as highlighted below.

## THE NATIONAL ALCOHOL PROGRAM AND ITS REGULATORY IMPACTS

The National Alcohol Program (Proálcool), instituted by the Federal Government in 1975, represents a historic milestone in Brazilian energy policy. According to Biodiesel-BR (2012), the program was configured as "one of the most ambitious Brazilian initiatives aimed at the partial replacement of fossil fuels by renewable energy sources, with emphasis on ethanol derived from sugarcane". Its conception took place in an international context of significant energy instability, particularly after the 1973 oil crisis, which highlighted Brazil's vulnerability resulting from its high dependence on imported oil (NOVACANA, 2013).

As established in the original text of Decree No. 76,593, of November 14, 1975, Proálcool was officially implemented "aiming to meet the needs of the domestic and foreign markets and the automotive fuel policy" (BRASIL, 1975, Art. 1). The program has established the following fundamental objectives:

"[...] the promotion of alcohol production as an alternative to gasoline, the strengthening of national energy security and the stimulation of the development of the sugar-alcohol sector" (BRASIL, 1975).

According to Moraes and Bacchi (2015), the program was structured in two main phases. The first, between 1975 and 1979, prioritized the use of anhydrous alcohol as an additive to gasoline in progressively increased proportions. The second phase, which began in 1979 after the second oil shock, was characterized by the expansion of the production and use of hydrated alcohol as an autonomous fuel, driving the development of vehicles exclusively powered by ethanol (ANFAVEA, 2023).

The implementation of Proálcool required the articulation of several regulatory instruments and government incentives. As Santos and Garcia (2021, p. 45) point out: "*The program mobilized subsidized financing for the expansion of production capacity, guarantees of minimum prices for ethanol, tax incentives for the acquisition of adapted vehicles, and the establishment of mandatory percentages of blending with gasoline.*"

This incentive structure was fundamental for the rapid expansion of alcohol production. Historical data compiled by Shikida et al. (2022) demonstrate that production has evolved from approximately 600 million liters in 1975 to more than 11 billion liters in 1985, representing exponential growth in just one decade.



The program represented a significant innovation in Brazilian energy policy, laying the foundations for the development of a technologically advanced and economically competitive biofuels industry. In addition to the energy benefits, Proálcool generated significant socioeconomic impacts, including *"the creation of jobs in the agro-industrial sector, the development of specific automotive technologies, and the reduction of external dependence on oil, with consequent savings in foreign exchange"* (UNICA, 2019, p. 32).

However, the program also faced significant challenges. As Biodiesel-BR (2008) observes: *"Particularly from the second half of the 1980s, when the reduction in international oil prices, associated with the fiscal crisis of the Brazilian State and the scarcity of resources to maintain subsidies, compromised its economic sustainability."* In addition, ethanol supply problems in the late 1980s affected consumer confidence. According to Agrolink (2012), this crisis *"resulted in a significant reduction in the demand for exclusively alcoholic vehicles"*, temporarily compromising the continuity of the program.

Despite these conjunctural obstacles, Proálcool has laid the foundations for Brazil's current role in the biofuels sector. According to Farina et al. (2019), the experience accumulated during its implementation contributed to the development of technological skills, production and logistics infrastructure, and institutional arrangements that later enabled the revitalization of ethanol as a strategic component of the national energy matrix, particularly after the introduction of flex-fuel vehicles in the early 2000s.

From a regulatory point of view, Proálcool represented a laboratory for the development of public policy instruments aimed at promoting sustainability itself beyond renewable energies. As Leite and Leal (2020, p. 78) conclude: *"The experiences, both positive and negative, accumulated during its implementation have significantly influenced the design of subsequent initiatives, such as the National Program for the Production and Use of Biodiesel (PNPB) and, more recently, the National Biofuels Policy (RenovaBio)."*

## CONCLUSION

The analysis of the normative and institutional evolution of the regulatory agencies of the biofuels sector in Brazil reveals a process of profound transformation in the relations between the State, market and society. The trajectory that extends from the Sugar and Alcohol Institute (IAA) to the current National Agency of Petroleum, Natural Gas and Biofuels (ANP) demonstrates not only changes in public management models, but also the progressive incorporation of constitutional values related to sustainability and balanced development.



The transition from an interventionist and centralizing model, characteristic of the IAA period (1933-1990), to a regulatory paradigm based on independent agencies, represented by the ANP (1997), reflected broader economic, political and social transformations that occurred in Brazil. This institutional change followed the evolution of the concept of the State itself, which went from producer and direct manager to regulator and inspector, adopting more flexible and technically oriented instruments for the promotion of the public interest.

The Federal Constitution of 1988 emerges as a fundamental milestone in this process, by enshrining the principle of an ecologically balanced environment and establishing the basis for a regulation that harmonizes economic development and environmental protection. The constitutionalization of sustainability has given a new direction to public policies in the energy sector, directly influencing the formulation of programs such as RenovaBio and other normative instruments aimed at the decarbonization of the Brazilian energy matrix.

The National Alcohol Program (Proálcool), in turn, represents an essential chapter in this history, demonstrating Brazil's ability to respond to global energy crises with innovative solutions adapted to national potential. Its developments over the decades highlight both the successes and the challenges of implementing long-term public policies in the biofuels sector.

It is concluded that the effectiveness of biofuel regulation in Brazil depends on the consolidation of an institutional framework that combines legal certainty, technical capacity and commitment to sustainability. The advances observed in recent decades, although significant, still face obstacles such as the institutional fragility of environmental agencies, economic pressures for regulatory flexibility, and the need for constant updating in the face of technological innovations.

The research points to the need for continuous improvement of regulatory mechanisms, with an emphasis on transparency, social participation and coordination between different government spheres. The strengthening of environmental and energy governance is an essential condition for Brazil to consolidate its position of global leadership in the biofuels sector, reconciling economic competitiveness, social justice and environmental responsibility.

Finally, this study contributes to the field of Environmental and Energy Law by systematizing the historical evolution of biofuel regulation in Brazil, offering subsidies for the understanding of contemporary challenges and for the improvement of sectoral public policies. It is recommended that future research deepen the comparative analysis between



different international regulatory models and investigate the concrete impacts of recent regulatory innovations, such as RenovaBio and Bill No. 1873/2021, on the promotion of the sustainable energy transition.



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