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AND THE NEW ENERGY  
FRONTIER OF GREEN HYDROGEN:  
REFLECTIONS BASED ON SOCIAL  
INDICATORS FROM CAMPOS DOS  
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# THE COMMODITY CONSENSUS AND THE NEW ENERGY FRONTIER OF GREEN HYDROGEN: REFLECTIONS BASED ON SOCIAL INDICATORS FROM CAMPOS DOS GOYTACAZES - RJ

## O CONSENSO DAS *COMMODITIES* E A NOVA FRONTEIRA ENERGÉTICA DO HIDROGÊNIO VERDE: REFLEXÕES A PARTIR DOS INDICADORES SOCIAIS DE CAMPOS DOS GOYTACAZES – RJ

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### ABSTRACT

This article analyzes the municipality of Campos dos Goytacazes – RJ based on a set of economic and social indicators. The methodology begins with an exploratory analysis, highlighting social indicators, a literature review on the subject and document analysis, and employs the Latin American historical-structuralist method. Subsequently, it examines the scenario of green hydrogen production in the North Fluminense Mesoregion, which hypothetically occurs in a manner subordinate to the interests of hegemonic countries and groups in the contemporary production system. Thus, this work engages with the perspectives of dependency theory and neo-extractivism in order to list the challenges to be faced in light of this problem, which permeates the current oil cycle in the municipality and deepens processes of social exclusion.

**Keywords:** Underdevelopment, Biofuels, Social Inequality, Açú port, North Fluminense

### RESUMO

Este artigo analisa o município de Campos dos Goytacazes – RJ com base em um conjunto de indicadores econômicos e sociais. A metodologia parte da análise exploratória, destacando indicadores sociais, revisão de literatura sobre o tema e análise documental, e emprega o método histórico-estruturalista latino-americano. Posteriormente, é abordado o cenário da produção de hidrogênio verde na Mesorregião Norte Fluminense que, por hipótese, ocorre de modo subordinado aos interesses dos países e grupos hegemônicos no sistema produtivo contemporâneo. Deste modo, o presente trabalho dialoga com a perspectiva da teoria da dependência e do neoextrativismo, a fim de elencar os desafios a serem enfrentados diante dessa problemática, a qual perpassa o atual ciclo do petróleo no município e aprofunda processos de exclusão social.

**Palavras-chave:** Subdesenvolvimento. Biocombustíveis. Desigualdes sociais. Porto do Açú. Norte Fluminense.

## 1 - INTRODUCTION

This work reflects on the social and economic indicators of the municipality of Campos dos Goytacazes – RJ, highlighting diverse social dimensions of its territory, such as health, education, income and employment, in the light of dependency theory and of the Latin American historical-structuralist method. Starting from this analysis, the article establishes a critical relationship between the ineffectiveness of the application of royalties in fighting social inequalities and the new perspectives opened by the advancement in production of green hydrogen and biofuels at the Açú Port, located in São João da Barra – RJ, and in the North Fluminense Mesoregion, which directly impacts the territories of Campos dos Goytacazes – RJ, that is configured as the central municipality of the region in this context. Therefore, the aim is to develop substantiated reflections on regional planning in light of these structural transformations.

To develop this investigation, the study is structured in three main analytical sections. In the first section, methodological approaches are presented, which include a qualitative analysis based on social indicators, a systematic review of literature and a document analysis, supported by the Latin American historical-structuralist reference. The second section is dedicated to the empirical analysis of social indicators of the municipality, examining data such as population, income, employment and access to education and health, as well as the trajectory of royalties revenue. The comparison between these datasets allows the elucidation of local socioeconomic contradictions and the discussion about the challenges imposed by the transition to a new energy matrix.

In the third chapter, this article seeks to contextualize the emerging scenario: the new energy frontier of biofuels in the North Fluminense Mesoregion, which concentrates the largest share of investments and licensing for the production of green hydrogen (H<sub>2</sub>V) in the State of Rio de Janeiro. It starts from the hypothesis that such enterprises are conditioned by multinational conglomerate demands of industrialized countries, which seek energy sources to maintain their hegemonic productive systems in developing countries. It is known that the central countries do not hold abundant energy sources and demand this commodity from developing countries as a condition to maintain the productive systems. This scenario imposes the need for reflections on regional and urban planning policies that are able to confront historical structures of social exclusion.



In this sense, in light of the Latin American structuralist theory of thought and authors associated to dependency theory, the present article seeks to locate the context of the municipality of Campos dos Goytacazes – RJ within the totality of the Brazilian capitalist production system, highlighting the municipality's place in the capitalist economy cycles, which has historically generated poverty, inequality, environmental impacts and the external appropriation of national and regional economic surpluses, reflecting the contradiction between high incomes and low socioeconomic development indicators.

Thus, this article seeks to contribute to the formulation of public policies directed toward the field of regional planning and at the challenges of current socioeconomic scenarios. It also aims to foster reflection on mitigation strategies of negative effects of the production of green hydrogen under the logic of neo-extractivism, which, according to Svampa (2019), redefines itself cyclically in Latin America, perpetuating income concentration, social inequality and environmental degradation.

## 2 - METHODOLOGY

The methodological construction of this work is developed using the exploratory research method, since this type of research allows “the enhancement of ideas or the discovery of intuitions”, according to Gil (2002). Thus, we will start from the analysis of distinct economic and social indicators and from data that refer to municipal royalties collection, and especially the participation of the municipality of Campos dos Goytacazes.

For this purpose, we selected some dimensions for the analysis of the territory: population, income, inequality, employment, the environment, economy, revenues, poverty, social vulnerability and basic sanitation. Data were collected in the following databases: the Brazilian Institute of Geography and Statistics (IBGE, 2022), the State Audit Court (TCE), the Industrial Federation of Rio de Janeiro (Firjan), the database of the Ministry of Labor (CAGED), the database of Inforoyalties (UCAM), and the National Institute of Applied Research (IPEA).

Furthermore, substantiated by a literature review, the study aims to identify authors that approach themes such as development and underdevelopment, structuralism and neo-extractivism. Based on this research, it was possible to construct a theoretical reference that supports the analyses



and the interpretation of the collected data. To trace a panorama of the green hydrogen scenario, we searched for articles in the Google Scholar platform with the following keywords: I - “*hidrogênio verde*” (green hydrogen), II - “*Hidrogênio verde Norte-Fluminense*” (North-Fluminense green hydrogen), and III - “*Hidrogênio verde e Desenvolvimento Regional*” (Green hydrogen and Regional Development). A rigorous selection criterion was applied to refine the survey, prioritizing recent studies and those that directly discuss the reality of the municipality of Campos dos Goytacazes – RJ with an emphasis on the theories of economic and regional developments. From then on, three articles aligned with these themes were selected.

In addition, the analysis method is also based on the Latin American historical-structuralist social critical thought, under the perspective of Brandão (2019), which is an essential theoretical-methodological framework for the regional studies of Latin American societies, given the historical-structural characteristics of these societies and their processes of insertion into the capitalist system in a way that is conditioned by the process of primitive capital accumulation of hegemonic countries. Thus, the concept of dependency within this perspective is also fundamental, since it is

[...] the fundamental analytical-explanatory category of the conformation of Latin American societies and, through it, we search to define the concrete conditioning character that the dependency relationships between the hegemonic-center and peripheral countries had in the sense of conforming certain specific types of structure in the economies, political and social, late and dependent (Bambirra, 2013, p. 38).

Thus, the methodology incorporates qualitative approaches, allowing for an in-depth and multifaceted analysis of the local socioeconomic reality, aiming to understand the structures that perpetuate inequalities and social exclusion in the context of the municipality of Campos dos Goytacazes - RJ.



### 3 – SOCIAL INDICATORS AND THE DILEMMAS OF CAMPOS DOS GOYTACAZES IN FACE OF THE ABUNDANCE OF ROYALTIES

The municipality of Campos dos Goytacazes – RJ is located in the North Fluminense Mesoregion, which also encompasses other municipalities such as Carapebus, Cardoso Moreira, Conceição de Macabu, Macaé, Quissamã, São Fidélis, São Francisco de Itabapoana and São João da Barra (TCE, 2021). Being considered the biggest Fluminense municipality regarding territorial extension, Campos concentrates a total area of 4,026.7 squared kilometers, bordering several Fluminense municipalities and the Atlantic Ocean, in addition to being crossed by important highways, such as the BR-101, BR-353 and RJ-216.

According to data from the year of 2022 (IBGE, 2022), the municipality has an estimated population of 483,540 people, becoming the 5<sup>th</sup> most populated in the state of Rio de Janeiro, 42<sup>th</sup> in the country and 1<sup>st</sup> in the North Fluminense Mesoregion. Regarding the *per capita* PIB, calculations estimate that it revolves around R\$ 72,243.98 (IBGE, 2021), which positions it as the 427<sup>th</sup> in the country, 2<sup>nd</sup> in the region and 14<sup>th</sup> in the state. Furthermore, the average monthly income in 2022 was 2.2 minimum wages, being the 26<sup>th</sup> in the state and 2<sup>nd</sup> in the region, contrasting with the high numbers shown by the *per capita* PIB data.

Regarding the schooling rates, which comprehend a range from 6 to 14 years old (2022), it is estimated that there is a literacy rate of 98.61%, a value that places the municipality as the 59<sup>th</sup> in the state and 3<sup>rd</sup> in the region. The infant mortality rate (2023) presents an index of 16.63 deaths per one thousand inhabitants, the 28<sup>th</sup> highest in the state, 1,851<sup>st</sup> in the country and 6<sup>th</sup> in the region. Moreover, the IBGE (2022) points out to a populational aging between 2010 and 2022, with a flattening of the age pyramid's base and an increase at the top and the intermediate range, indicating that in the future the number of the elderly might surpass that of young people.

Furthermore, the municipality's basic sanitation system is privatized and managed by the Waters of the Paraíba Group and, according to data from TCE (2021), the municipal water supply index revolves around 97.86 %, with a *per capita* consumption of 1,110.8 L/hab. Regarding sewage, the index value is smaller, with 84.26% of the population having access to this service, indicating a disparity between the accesses to water supply and basic sanitation.



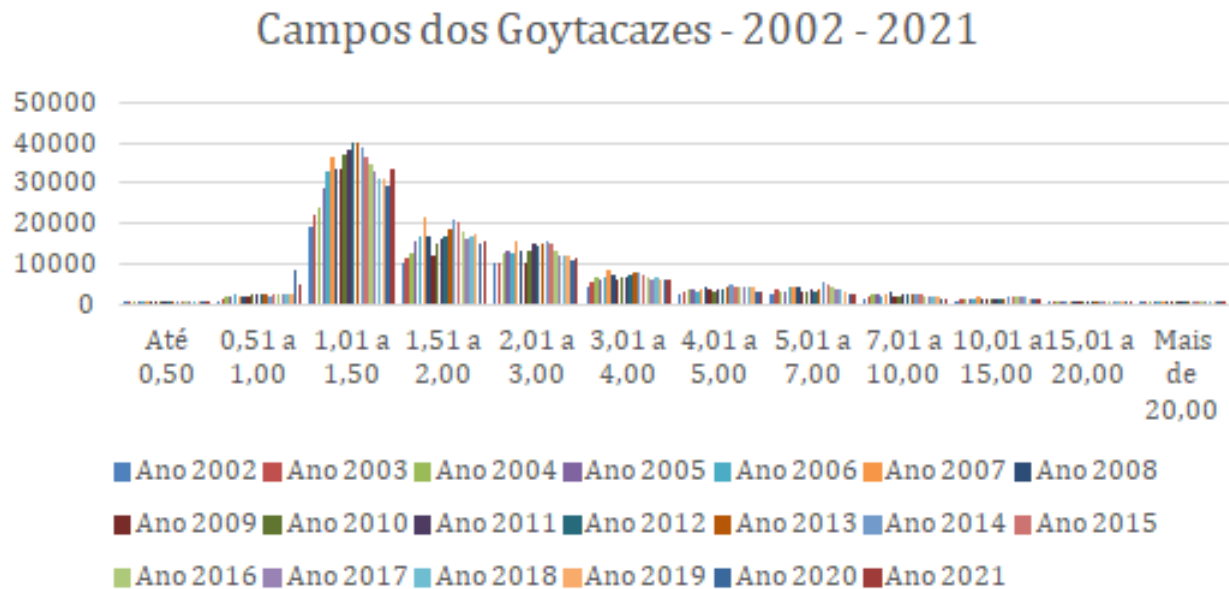
During the 2019/2020 period, the percentage of forest cover reached 8.03 % of its original territory, including 25,719 ha of Atlantic Forest, 20 ha of mangroves and 1,235 ha of Restinga, besides 5,351 ha of floodplain vegetation. According to TCE (2021) there was deforestation during this cycle. In this regard, in the Index of Development of Sustainable Cities (IDSC), organized based on the United Nations Goals for Sustainable Development (ONU), Campos - RJ is placed in 2,364<sup>th</sup> amidst the 5,570 municipalities, with a level of sustainable development that is considered average.

Regarding social issues, between the years 1991 and 2010 it is possible to identify an evolution in the Municipal Indexes of Human Development, which are formed from the merging of education, health and income indicators. In 1991, the value for the index was 0.505; in 2000 it increased to 0.618; and to 0.716 in 2010, numbers below the average state and national values, far from Niterói, a petro-rentier municipality, which positions itself in the 1<sup>st</sup> position for the State of Rio de Janeiro with an index value of 0.837. According to the Municipal Development Index (FIRJAN, 2023), Campos – RJ is placed 55<sup>th</sup> in the state and 2,806<sup>th</sup> in the country. Throughout the last years, the municipal evolution was as follows: 2013 – 0.5279; 2014 – 0.5678; 2015 – 0.5572; 2016 – 0.5386; 2017 – 0.5692; 2018 – 0.5744; 2019 – 0.5733; 2020 – 0.5351; 2021 – 0.5620; 2023 – 0.6080.

The Social Vulnerability Index released by IPEA (2010) indicates that in the year of 2000 the value was 0.393 and in 2010 it decreased to 0.303. In 2025, the value of the Social Progress Index (IPS) was 62.19, keeping itself constant when compared to 2024, when the same value was registered. Comparing the IDHM, IFDM, IDSC, IVS indexes and the *per capita* PIB it is possible to point out that, despite the last presenting a value that is considered high for the region, the evolution of the other indexes does not follow the income percentage when compared to the other municipalities of the state and the country.

In Figure 1, extracted from CAGED (2025), it is possible to see a panorama of the employment income range in Municipal Wages. Between 2022 and 2024 there is a great concentration of people that receives between 1 and 3 minimum wages. Moreover, it is important to highlight the growth in the number of people with an income inferior to 1 minimum wage through the last years, pointing out to a rise in poverty and extreme poverty.

**Figure 1** | Income range in wages.

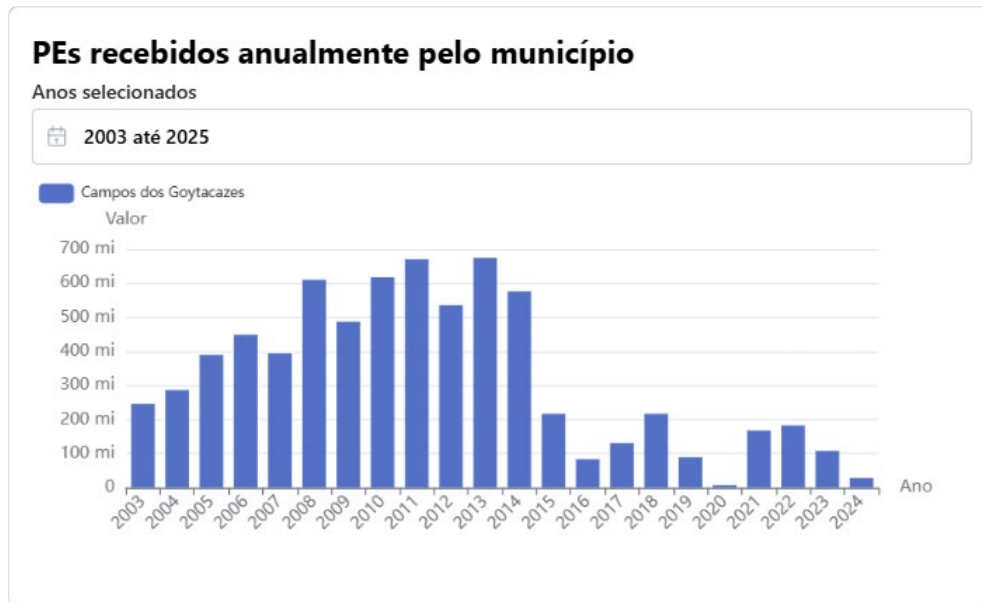


Source:..created by the author

Thus, it is perceivable that the inequality between the sectors that earn a lot and those that earn little did not present great changes through the years. Also, if we look at the revenues that the municipality received through the analyzed period, it is perceptible that there is a scenario of poor distribution and concentration of income.

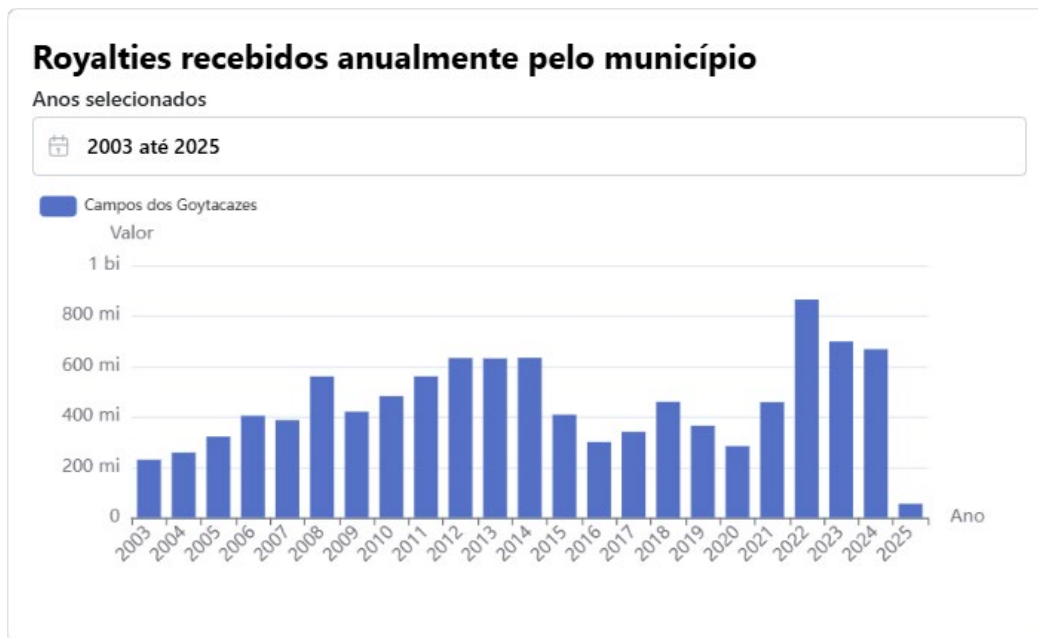
Figures 2 and 3 show that, despite the increase in special participation, there is a reduction in the revenue from royalties over the last years. Several factors contribute to this scenario, such as the depletion of the production capacity of the Campos Basin; changes in the socioeconomic scenario, such as pointed out by Cruz e Terra (2018); and transformations in international and national conjunctures, such as the constant variation in oil prices due to a scenario of geopolitical instability.

**Figure 2** | Special participation between 2003 and 2005.



Source: Inforoyalties, 2025, reproduced

**Figure 3** | Royalty revenues between 2003 and 2025.



Source: Inforoyalties, 2025, reproduced.

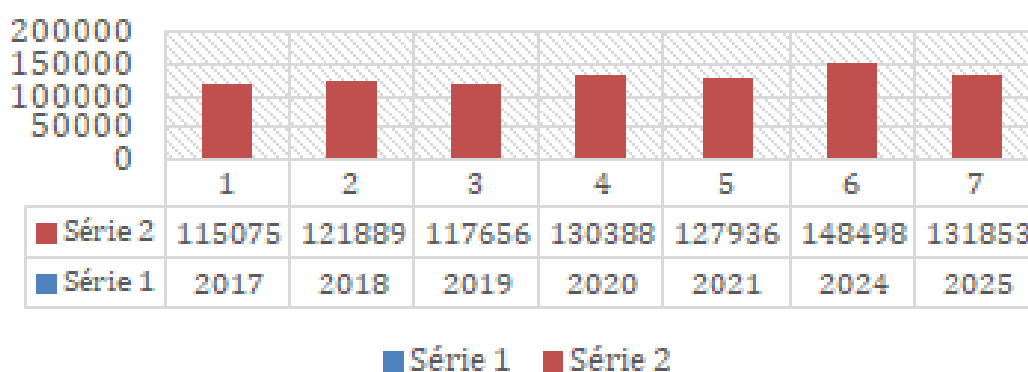
Furthermore, internal political crises have impacted this scenario. Turbulence sources such as the Lava Jato Operation contributed to this fall, since:

In 2015, the national socioeconomic scenario is aggravated due to an increase of political instability caused by the development of the criminal investigation named Lava Jato Operation. In 2016, the crisis of the impeachment of president Dilma Rousseff occurs. This year, retraction continues, but the tendency of falling rates is reversed. In mid-2017, the country presents signs of recovery with a positive growth of the PIB index, even though with rates way below expected. In 2020, with the beginning of the COVID-19 crisis, the PIB becomes negative again (Azevedo e Silva Neto, 2020, p 13).

In such context, Figures 4 and 5 indicate that the city remains marked by income inequality, low incomes in most sectors and a great number of families in the line of poverty and social vulnerability. In addition, such as pointed out by Furtado (2025), the use of natural resources, without rethinking the rhythm of their usage and the consequences of a developmental policy that aims only at economical growth and extracts from the environment in an unrestrained way,

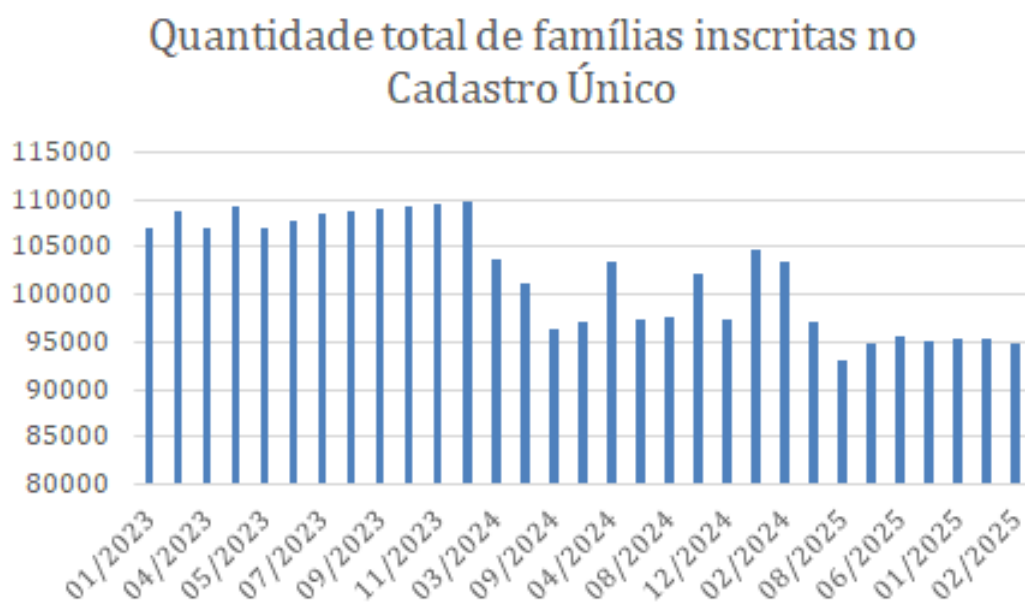
**Figure 4** | Families registered at the Bolsa Família program.

## Número de famílias atendidas pelo Programa Bolsa Família - Campos dos Goytacazes



Source: created by the author.

**Figure 5** | Families registered at the Cadastro Único.



Source: created by the author.

The analyses of the indexes mentioned above indicate the necessity of taking into account the fact that from the 483,540 inhabitants (IGBE, 2002), around 95 thousand are in a poverty or below poverty situation, indicating a percentage of 19.64 % of the population. Such indicators point out to a municipal structural contradiction in face of one of the biggest revenues from the state, which concentrates in its shores the biggest oil production basin of the country: that of this big production not resulting in changes in the structural condition of social and income inequalities in the mesoregion, because while the *per capita* PIB is one of the highest in the region, the average wage of the citizens remains at 2.2 minimum wages and the human development and social indexes remain below the ideal.

Therefore, it is possible to emphasize that the aforementioned contradiction is anchored in the capitalist productive system, because the commodities production and the capital accumulation from the over-exploitation of the surplus value in the peripheral countries drains the revenue to the central countries, in addition to removing qualified jobs and resources from territories such as Campos dos Goytacazes - RJ. Thus, data such as those from Firjan, IDHM and IPS allow us to infer that the great production of commodities lives with and feedback the contexts of poverty and municipal inequalities, perpetuating the cycle of economic and structural dependency.

#### 4 – THE NEW FRONTIER OF GREEN HYDROGEN IN THE NORTH FLUMINENSE REGION

In face of the finiteness of natural resources that are the raw material for the production of energy in the contemporary world and the potential damage to the environment caused by the use of these energy sources, new renewable fuels become topics of discussion in society. One such example is the production of Green Hydrogen as a way to mitigate the damaging effects to the environment and supply the energy needs for maintaining the lifestyle currently reproduced by humanity under the capitalist financial-industrial mode of production.

According to the Law nº 14,948, from August, 2<sup>nd</sup>, 2024 (Special Secretariat for Legal Affairs, Brazil, 2025), green hydrogen is produced by the process of water electrolysis, using renewable energy sources such as wind, solar and biomass. The process of combustion using green hydrogen to generate energy produces water as a byproduct, emitting no polluting gases into the atmosphere. Its production is still expensive due to the large amount of energy needed for the electrolysis process and also due to being highly flammable, needing sophisticated means of storage and transport.

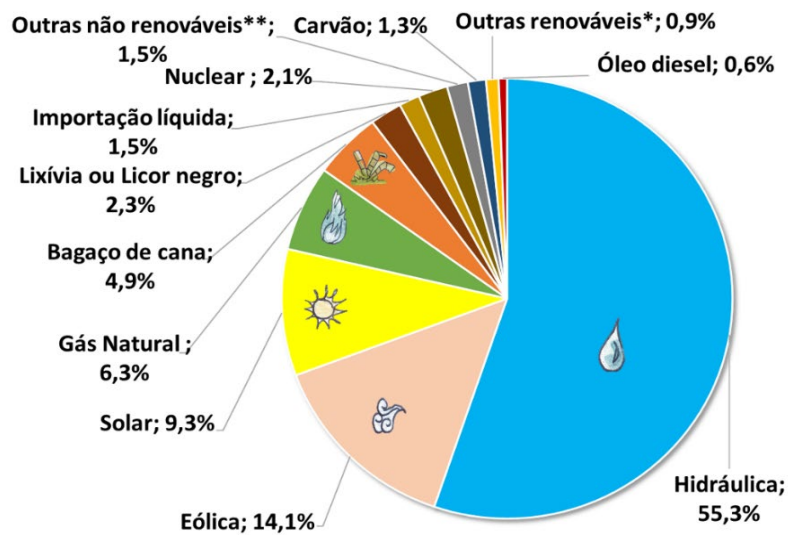
Regarding the green hydrogen positive externalities, according to De Lara and Ritcher (2023), each kilogram of green hydrogen contains approximately 2.4 times more energy than natural gas and produces zero emissions of greenhouse gasses. Moreover, when produced in an environmentally sustainable way, it allows for the reduction of the emission of polluting gasses into the atmosphere, especially in the industry and transport sectors. Furthermore, its production is in consonance with the UN's Sustainable Development Goals (SDGs) and with the energy matrix decarbonization goals established in the Paris Agreement. It must also be considered that:

The versatility of hydrogen is related to the fact that it can be transformed in electricity or synthetic fuels with commercial, industrial or mobility purposes. On the other hand, this source still presents a high cost and a higher energy expenditure. Furthermore, hydrogen is a very volatile and flammable element, demanding high security requirements to avoid leaks and explosions (Fernandes *et al*, 2023, p. 3).

Considered a commodity of the future, green hydrogen is already produced in diverse regions of the world. Brazil has a great potential in this scenario, given the fact that the infrastructure of the country's electric matrix originates from clean sources in its majority (Figure 6). The production of green hydrogen in Brazil arises associated to the growth of wind and solar energy production, sources that have been exponentially growing in the country. Thus, the production also starts to spread through Brazilian regions, with highlights to the Northeast, South and Southeast.



**Figure 6** | Brazilian electric matrix.



Source: Energy Research Company, 2025, reproduced.

In light of this scenario, the most viable way in Brazil, according to Fernandes *et al.* (2023), has been the production of green hydrogen associated to the use of offshore wind energy, since, facing the installed capacity of this energetic source the country may become an important actor in the global production scenario over the next decades. In this context:

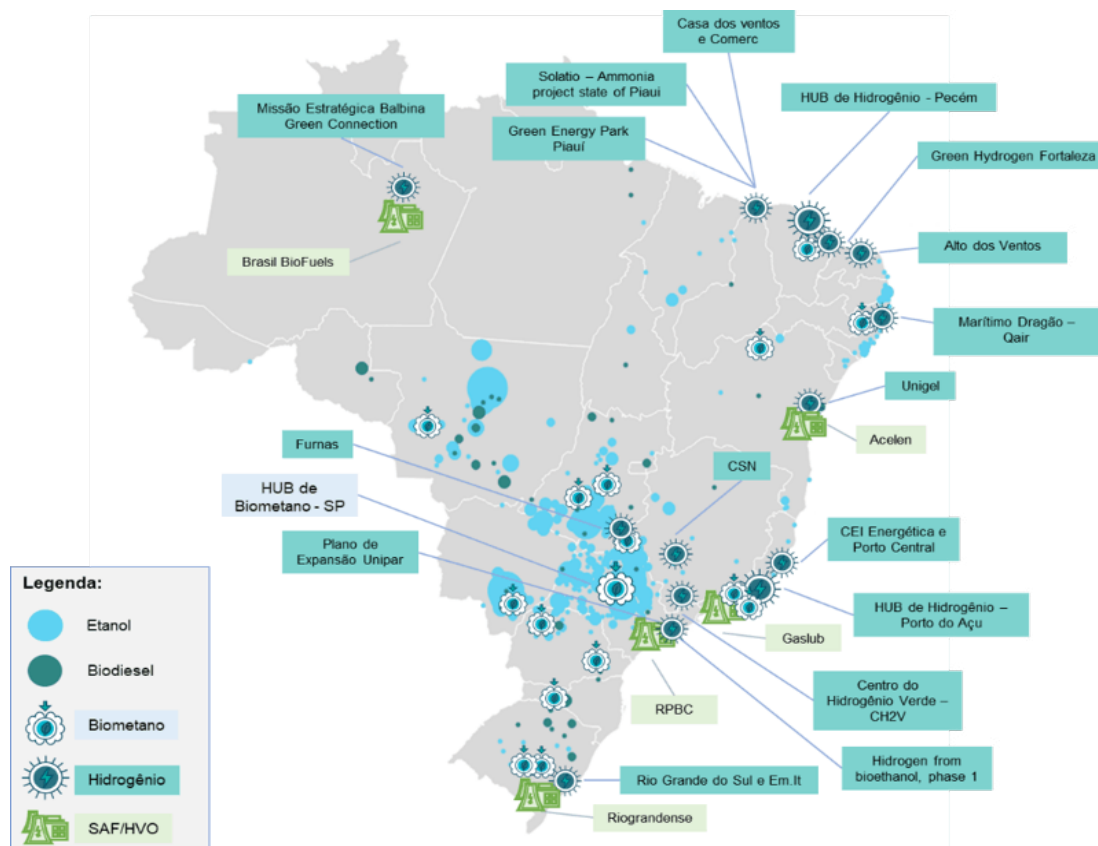
At least three hubs for green hydrogen production start to take shape on the country. These centers orbit around the ports of Pecém (CE), Suape (PE), and Açu (RJ), which already signed memoranda of understanding with big international groups. The initial objective is exportation (Fernandes *et al.*, 2023, p. 6).

Thus, the green hydrogen production process has been followed by a recent regulation, with highlights to the Law nº 14,948, from August 2<sup>nd</sup>, 2024. From then on it is established what green hydrogen is and the regulation policy under the National Agency of Oil, Gas and Biofuels (ANP), as well as its governance structure. The law also establishes the special regime of incentives for hydrogen production, emphasizing the production goals, the need to preserve national interest, reduce the emission of pollutants in the atmosphere and to allow a competitive insertion of Brazil on the global market.

In the State of Rio de Janeiro this production is also spreading, associated, among other factors, to the production of offshore wind energy, above all on the North Fluminense region, where there is already countless working industries and installations of energy production. According to data from Werner (2025), there are already over 16 projects operating in the State of Rio de Janeiro, most of them concentrated

at the north of the state and linked to international groups. The highlight of the region is the production that already begins in the Açú Port, which has been establishing itself as a green hydrogen production center in the country. Figure 7 exemplifies the scenario of diversity and distribution of energy production in Brazil, divided by macroregions. As it shows, there is a concentration of H2V production in the State of Rio de Janeiro and in the North Fluminense Mesoregion.

**Figure 7** | Map of the green hydrogen national production.



Source: Brazil Energy, 2025, reproduced.

Starting from Werner’s (2025) survey, between the main groups operating in the North Fluminense region, some are highlighted: Aciona Energia do Brasil Ltda., controlled by funds from Norway and the United States of America; Prumo Logística, controlled by investment funds dedicated to energy and attached to the sovereign wealth of the Arab Emirates; Projeto Ventos do Atlântico, also controlled by international funds and a project linked to the State, Energy and Economy of the Sea of Rio de Janeiro State, also at the Açú Port.

In dialogue with Werner's (2025) perspective, Rio de Janeiro State and the municipality of Campos dos Goytacazes are dependent on the revenues from royalties of the oil and gas productive chain to maintain its expenses. Despite this energetic exploration frontier carrying along deep impacts to the territory since the 1970s, the activity constitutes itself with an enclave character, since the changes did not alter the social structure marked by inequalities, which in some cases have even been amplified. However, the production of green hydrogen

[...] may alter the dependency of the state from the oil economy in the future, making it a territory that produces new renewable energies, aspect that justifies governmental initiatives in favor of new energies. In its turn, in the name of decarbonization, the exploration of new renewable sources is illustrative of the dynamics of modern capitalist accumulation, which penetrates even further on little explored spaces, destroying common riches and plundering territories [...] (Werner, 2025, p 16).

Thus, in Werner's (2025) perspective this process has been oriented by the acting of foreign companies and investment funds in the bidding and licensing processes of the activity. This would be, then, a process of international agency that is in course in the state, linking the green hydrogen production to the interests of these groups that, not only possess the capital for funding, but also fabricate the base equipment used for production, such as turbines for generating offshore wind energy that are built associated to the green hydrogen chain. In this regard,

[...] There are no foreseen changes in structural conditions that confer the State of Rio de Janeiro its role as a subordinate in the global market of energy offer, reinforcing its neo-extractivist character. Such affirmation is justified, given the framing that is in course on the market of renewable energies, expressed as setbacks regarding the appropriation of public funds; the omissions and absences in the proposed regulation of royalties; the predominance of foreign companies in the proposal of offshore projects, with an emphasis on oil companies and investment funds; the foreign technological predominance; and the international influence over the landmark design of regulatory marks and public policies. The bond between offshore wind energy generation and green hydrogen reinforces the trend of the neo-extractivist subordinate insertion and its manifest in a subnational scale, given the interest for fuel in the external market (Werner, 2025, p 18).

In agreement, dos Santos (2020) points out that the economies of developing countries constantly go through production restructurings with the aim of meeting the demands of the capitalist system on a global scale, a structural trait present throughout the history of Latin American countries. As an example to what happened during the economical cycles of the sugarcane and oil, the data aforementioned indicate that the production of green hydrogen starts a new cycle of dependency and neo-extractivism under the historical-structural basis of the North Fluminense Mesoregion, with impacts over the territory, because



[...] the international capital might bring the machinery, a production system, and a technology that the capital did not possess from the exterior. But it rarely wills to bring the resources for its functioning on the local economy. On the contrary, it searches to support itself over the internal savings of the countries in which it was invested with the goal of funding its installation (Dos Santos, 2020, p. 65).

Another factor that corroborates this hypothesis is that the projects of production of H2V are concentrated at the Açú Port in São João da Barra – RJ, indicating that possible production chains might be off of the political administrative limits of Campos dos Goytacazes – RJ; and that few might irradiate in the context of the whole North Fluminense Mesoregion. At this conjecture, such as for the oil cycle started in the decade of 1970 – marked by a production model anchored on the interests of external capital and the dependency without significant change over social indicators, such as pointed out in the previously mentioned indexes – the cycle of H2V tends to repeat the same unequal and exploitative logic.

With that in mind, it is necessary to take into account that the growth of commodity exports alone does not reverse the scenarios of social exclusion, underemployment, low wages and subordination, being necessary regional planning strategies that are anchored on territorial needs, since that for dos Santos (2020) the dependent capitalist development is the mode through which Brazil and the North Fluminense region have been placing themselves in the dynamics of international commerce, without ensuring structural changes such as the increase of average income, the improvement in quality of life and the valuing of labor. As seen in the indicators of the previous chapter, there is a tendency to concentrate and amplify the problems and inequalities. Therefore, it is essential to emphasize the need to advance in the production of clean energy, nonetheless this production should guide a new development cycle that takes into account the economic and social structures and the need for overcoming the subordination and dependency conditions.



## 5 – REFLECTIONS ON THE CONCEPT OF DEVELOPMENT IN THE LIGHT OF THE LATIN AMERICAN STRUCTURALIST THOUGHT

In speeches, announcements of the discovery of energy sources, journals and academic studies, the concept of development constantly appears linked to economic growth or to reaching a stage of economic evolution in developing countries under the logic of the capitalist production mode of hegemonic-central countries. This understanding has its base on the process of development from the capitalist production mode of the United States of America and Europe. Thus, “the ‘delay’ of underdeveloped countries was explained by the obstacles to their full development or modernization that existed within them” (Dos Santos, 2020, p. 15).

However, in the years after the 1929 crisis, several Latin American countries searched for their way of development through an industrialization process via the replacement of imports, fueled by several theories that aimed to create models for development and

It was under this basis that prospered, in the decade of 1950, the different so-called developmental currents, which supposed that the economic and social problems which affected the social formation of Latin America had their origins on the insufficiency of the capitalist development and that its acceleration would suffice to make it disappear (Marini, 2022, p. 26).

Notwithstanding, after the 2<sup>nd</sup> World War the Brazilian and Latin American industries found themselves in a scenario of stagnation and extreme dependency from external capital, in spite of the efforts made in the previous years. Explanations that try to bring new insights from a Latin American perspective to the phenomenon of delay marking the ascension of new theoretical directions arose in this context.

This group of new studies lead to a reformulation of the global theoretical order and demanded an analytical methodology that situates the history of Latin America on the context of expansion of the global capitalist system and that visualizes, therefore, the emergence of these economies as a specific modality of expansion from capitalism on a global level. This specific modality redefined itself in each country, in each region, in each location, according to the economic and social structures found by the colonizers, which came to implant these exporting economies (Dos Santos, 2020, p. 71).

In this scenario dependency theory gains strength when comprehending the phenomenon of underdevelopment as a “historical result of the development of capitalism, as a world system that produced at the same time development and underdevelopment” (Dos Santos, 2020, p. 15). Thus, the problems of the economies of the subcontinents and their particularities came to be understood within a broader historic and structural process that took into account the dependent, concentrating and exclusionary character of the structure of Latin American countries. In addition,



These characteristics got exacerbated in the decade of 1980, under the impact of the globalization commanded by the international financial capital for the payment of external debt and the new phase of strong currencies and privatizations of the decade of 1990, under the mark of the Washington Consensus (Dos Santos, 2002, p. 33).

Furthermore, dependency theory takes into account that, in spite of the efforts of Latin American countries through developmental projects implemented by sectors of the national bourgeoisie through the first decades of the XX century and the scientific and technological advances, there is a persistence of the division between countries that establish themselves as dynamic centers of the economy, technology and culture and, on the other hand, a periphery that remains subordinate and dependent of the central countries. Such process was deepened during the last decades of the XX century, both because of the recent rise of neoliberalism, and because of the path prepared beforehand, because

[...] the military regime created in 1964 originated a modernization based on the alliance and integration of this bourgeoisie to the multinational capital, establishing a type of dependent industrial development, subordinate to the modalities of expansion and of organization of the international capitalism that submitted the centers of local accumulation to the logic of expansion of the world hegemonic center (Dos Santos, 2020, p 74).

Corroborating this thesis, Vânia Bambilra (2013) considers that the Latin American industrialization was historically oriented by the interests of the hegemonic foreign capital. The conceptions under the hegemony of these sectors constantly reconfigure the economy of developing countries based on each new cycle of new commodities and raw materials required by the industry and financial system of the central countries. Therefore,

This new characteristic of the dependent capitalist development, besides not resolving existing economic and social contradictions, exacerbates them and generate new ones, whose results are a situation of generalized deep crisis, which manifests itself in every level of the life in Latin American societies (Bambilra, 2013, p. 33).

In addition, according to Svampa (2019), in the XX century this neo-extrativist process incorporated new dimensions by keeping the possible benefits of development through means of the extractive pathways in the mentality and structure of South American development. This opens space for a new developmental illusion that arises linked to the commodities boom experienced by the Latin American countries, in huge part under the governance of progressive groups in the region. However, this process occurs as a part of a moment in which the “[...] social metabolism of capital within the framework of advanced capitalism requires ever-increasing quantities of raw materials and energy for its maintenance,



which translates into an even greater pressure over natural assets and territory” (Svampa, 2019, p 28).

According to Dos Santos (2002), the relevance of structuralist analyses is undeniable, especially when comparing quality of life and human development indexes to the abundance of energy and financial resources present in the territory of Campos dos Goytacazes, as indicated by the set of indicators presented above. The energetic abundance present in the municipality is intertwined to a logic of spoliation conducted by the interests of the large international capital, therefore limiting the possibilities of an endogenous development and a break with the dependency logic, imposed since the first steps of the Brazilian colonial formation. In this context:

Increasingly distanced from the centers of academic, technological and cultural production, the developing countries are put inside the trap of economical growth without jobs, not seeing the expansion of works in education, health, culture, leisure and other activities typical of the scientific-technological revolution (Dos Santos, 2002, p. 33).

In face of the exposed, the perspectives of Dependency Theory constitute themselves as an important theoretical and methodological framework in the thinking of social sciences, even with all efforts undertaken during the end of the century to surpass its reflections. Thus, it constitutes itself as a “[...] scientific practice aimed at a concrete analysis of social processes as historical continuity and as dialectically interacting structures” (Dos Santos, 2002, p. 95).

Two points help to corroborate the aforementioned affirmation, especially when we understand the dynamics of energy industries, particularly those of oil, gas and biofuels as component parts of a broader global system: 1) the permanence of a global economic system divided into central or dominant countries and the peripheral or dependent ones; and 2) the payment of high interest rates on public debt that export the surplus of national production to central countries, keeping our condition of dependency (dos Santos, 2002).

Besides that, in the context of the industrial and financial phase of the capitalist production mode, the subordination condition of the developed countries is tightly connected to their “contribution to the formation of a market of industrial raw materials, whose importance grows in line with the same industrial development” (Marini, 2022, p.7). In the author’s perspective, this insertion is fundamental for the maintenance of the production system, since the relative added value that allows the preservation of the production structures in the hegemonic countries is taken from the surplus of over-exploitation of labor in the developing countries. Thus, overcoming Latin America’s underdevelopment would depend on



breaking with these structures.

Therefore, in accordance with dos Santos (2020), a process of change in this scenario might be long and complex, however, “the advance of biotechnology, for example, might become extremely favorable to a more rational use of the biodiversity that is concentrated in the tropical regions” (Dos Santos, 2020, p. 83). Thus, the production of H2V within the North Fluminense Mesoregion must be permeated by a deep questioning of the structural-economic order in light of the economic framework disseminated globally through the world hegemony from Europe and the United States, which reaffirms the international division of labor, producing profound contradictions between the over-exploitation of labor and the large-scale production of commodities.

## 6 – FINAL CONSIDERATIONS

Given the scenario presented above, it is possible to identify several issues that constitute challenges for regional planning, such as the permanence of low human development indicators and low wages; high poverty and inequality indexes; and the high volume of revenues from the oil cycle. Thus, it is possible to point out that such cycle did not reverberate structural changes in the municipality of Campos dos Goytacazes – RJ and, on a broader sense, the North Fluminense Mesoregion. In some cases such as the wage and income inequalities, it is possible to perceive the maintenance of this condition.

In addition, it is possible to observe the growth of the new energy frontier of H2V under the productive bases of the region, arising linked to the interests of international investment funds, business groups and state-owned enterprises from other countries, operating under the same historical conditions reproduced during the oil and sugarcane cycles, marked by subordination to international capital, social exclusion and over-exploitation of labor.

Therefore, the analysis indicates the need of overcoming the economic-structural dependency condition and the affirmation of an endogenous development project, permeated by transformations that allow a productive diversification, the reduction of social inequalities and respect for the environment in the context of the North Fluminense Mesoregion, since, according to dos Santos (2002), the production of renewable fuels, such as the green hydrogen, wind and solar energies might prove beneficial, as long as it is produced under other structural conditions in the Brazilian productive system.



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