

raízen

TASK FORCE ON
CLIMATE RELATED
FINANCIAL DISCLOSURES

(TCFD) 2022



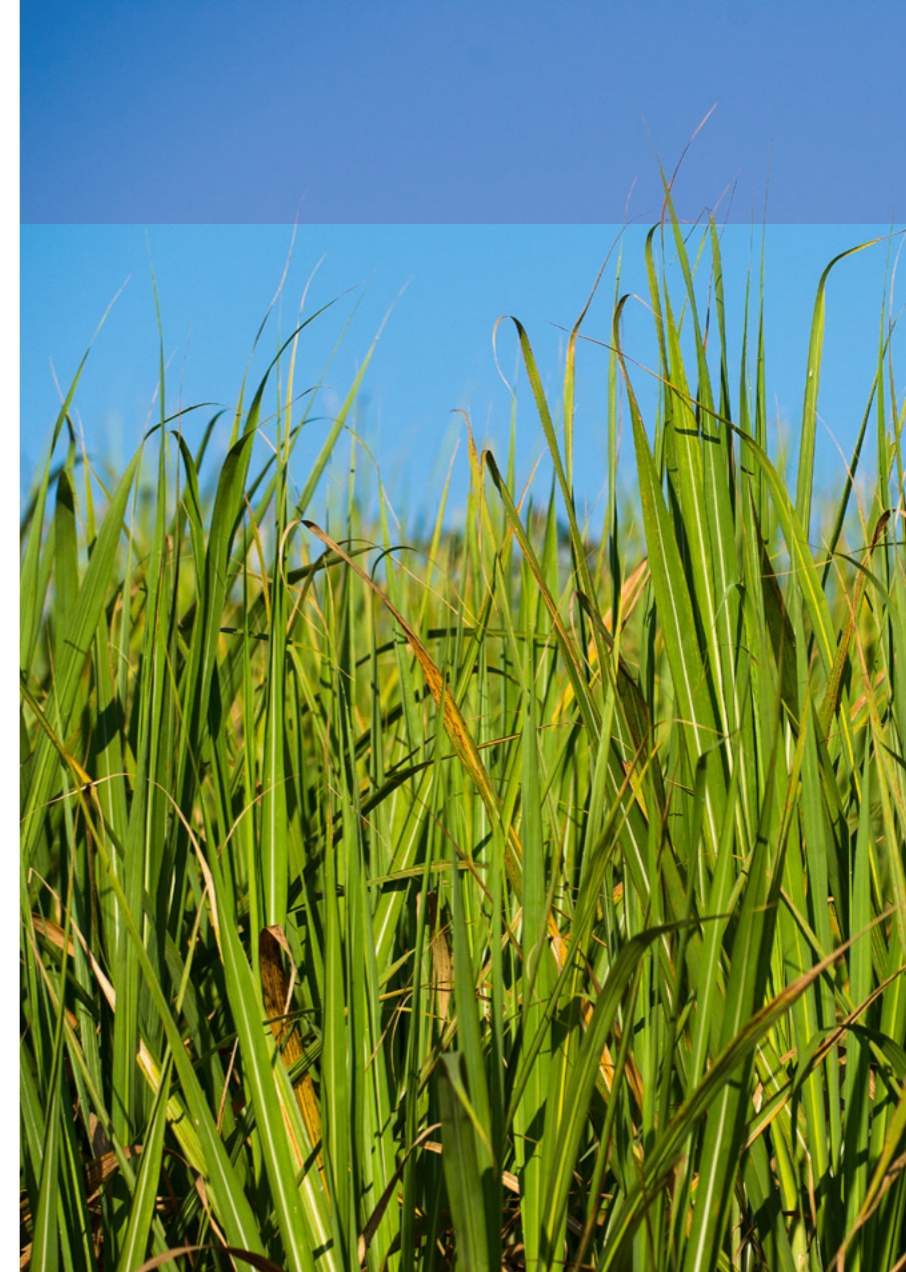
ABOUT THIS PUBLICATION

Since the beginning of our operations in 2011, we have implemented a robust management of our Greenhouse Gas (GHG) emissions. These are quantified annually based on the guidelines of The Greenhouse Gas Protocol and its Brazilian version, the Brazilian GHG Protocol. In 2015, we began responding to CDP Climate Change voluntarily, a financial sector initiative that has become a global benchmark for managing the impacts of climate change. Since 2021, we have maintained a leadership position alongside other companies with the highest questionnaire ratings.

To bolster our commitment to transparency to our stakeholders and advance the climate agenda, which is essential for business resilience, for the second consecutive year we have followed the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) in the preparation of this material. This report specifically focuses on presenting the progress of our governance regarding climate change risks and opportunities.

Further information about this report's contents is detailed in our submission to CDP Climate Change (available [here](#)). If you have any questions or feedback about our report, please write to fale@raizen.com or call 0800 728 1616. After all, your feedback can help us to continue to reshape the future of energy, together!

For the second year, we have followed TCFD recommendations to enhance transparency in our management of climate-related risks and opportunities.



GOVERNANCE

The Executive Board, in the person of our CEO, is directly involved in matters relating to climate change, in particular the following:

- Annual reviews of our risk matrix** | Under the leadership of their Vice Presidents, all our business units are responsible for mapping their processes and identifying risks and opportunities inherent in their operations, which are grouped into the following categories: (1) Strategic, (2) Operational, (3) Financial and/or Market, (4) Regulatory, Legal & Compliance, (5) Information, (6) Image. Climate-related factors are classified within these categories as they impact operations and shape strategic and regulatory factors. They are consolidated with other factors into a risk matrix, which is approved by the Audit Committee. Progress on action plans developed for each risk in the matrix is also periodically reported to the Executive Board.
- Public commitments made** | Both the Board of Directors, supported by the Corporate Social Responsibility Committee, and the CEO approve any public commitment and monitor the action plans developed to achieve corporate targets. Our 2030 Strategic Sustainability Plan includes the following public commitments related to climate change:

- Increase renewable power output by 80%.
- Reduce ethanol carbon footprint by 20%.
- Have 80% of Adjusted EBITDA derived from renewable products.
- Reduce product carbon intensity by 10%.
- Monitoring strategic indicator** | Supported by the Corporate Social Responsibility Committee, the Board of Directors and CEO monitor the progress of strategic indicators, which are reported to them periodically. Strategic decisions rely on this information, such as the creation of the Renewable Energy department, dedicated to promoting the low-carbon economy through the expansion and diversification of our renewable portfolio. We also set a tCO₂ avoided target as a corporate KPI that is factored in the variable compensation of our employees.

Climate-related topics are referred to the Board of Directors through advisory committees, with the Corporate Social Responsibility Committee playing a key role. In addition to various other matters, this committee is responsible for evaluating and steering

our sustainability initiatives, including climate change. Meetings address the reporting and monitoring of the priority topics of the Sustainability Strategic Plan and the strategy for major carbon pricing programs, such as Renovabio. There is also the Audit Committee, tasked with monitoring the action plans developed for each identified risk, and the Remuneration Committee, which among other things has defined the emissions avoided target as a parameter for the remuneration of all teams. These committees are composed of members from our Executive Board and shareholders.

From operations to the Board, all levels of the team address climate-related issues.

STRATEGY

We aim to redefine the future of energy by expanding the supply of clean and renewable sources through technological innovation. Due to its investment intensity, our strategic planning is frequently monitored by the Corporate Social Responsibility Committee and the Finance Committee, in addition to regular meetings involving shareholders, CEO and CFO. Progress towards our public commitments, which are part of our Raízen ESG Agenda, is reported quarterly to shareholders and other stakeholders.

Our climate positioning reinforces our strategic planning and guides how we intend to aid society's transition to a low-carbon economy, having been extensively discussed and approved by the Executive Board and the Board of Directors. Feedback for its construction was gathered at regular meetings with the Vice Presidency of Strategy and Sustainability, along with input from the CEO and other executive officers.



CLIMATE SCENARIOS

We conducted a study on climate change scenarios in Brazil for a long-term window (2081-2100) and a nearer window (2021-2040). For this purpose, we used 24 Global Climate Models from IPCC AR5. The primary variables we analyzed were average daily and monthly rainfall, temperature, near-surface wind and relative air humidity. Climate projections were made based on the new generation of scenarios called Representative Concentration Pathways (RCPs) - Scenario 4.5 (optimistic) and Scenario 8.5 (pessimistic). Climate change projections based on the average of the climate model defined by IPCC5 indicate temperature rises throughout South America.

Various indices were evaluated to deepen the analysis to factor in the impacts on our operations, sugarcane cultivation and our employees and surrounding communities. These include extreme climate indices, which increase the number of consecutive dry days and reduce the number of rainy days, leading to an increase in extreme precipitation events, among others. Additionally, indices such as regional climate changes, socio-climatic vulnerability, and thermal stress were considered.

The projected temperature range for Brazil based on the average defined by IPCC5 is between 1-2°C (2021-2040) and 2-3°C (2081-2100) for RCP scenario 4.5, and between 2-3°C (2021-2040) and over 5°C (2081-

2100) for RCP scenario 8.5. Regarding the equivalent concentrations of CO₂, scenario 4.5 corresponds to approximately 650 ppm in 2100, and scenario 8.5 to about 1370 ppm in the same timeframe.

The scenario is mainly designed to illustrate how the world can achieve net-zero CO₂ emissions in energy and industrial processes by 2050, with a focus on the global energy sector. The analyzed parameters accordingly focused on population, Gross Domestic Product (GDP), energy, and CO₂ prices.

The scenario also assumes that the population will grow by around 750 million by 2030 and nearly 2 billion people by 2050, following the median variant of the United Nations projections (UNDESA, 2019).

From 2022, the GDP growth trend approaches the pre-pandemic rate of around 3% per year on average. By 2030, the global economy is about 45% larger than in 2020, and by 2050, it is more than double.

For CO₂ prices, an average increase to USD 130 per ton (tCO₂) is expected by 2030, and to USD 250/tCO₂ by 2050. In Brazil, CO₂ prices in these sectors are expected to rise to around USD 200/tCO₂ by 2050.

RISKS AND OPPORTUNITIES

RISK 1 | CARBON PRICING MECHANISMS

Carbon pricing and taxation mechanisms for companies operating in the fuel distribution sector present risks that must be managed, as the costs associated with implementing a carbon pricing program can be significant, mainly due to market price volatility and the possible lack of commitment from other industry players.

In 2016, the Brazilian Ministry of Mines and Energy (MME) launched Renovabio, which aims to expand the production of biofuels through the sale of decarbonization credits (CBios). Producing plants generate these credits and fuel distributors purchase quotas. However, this initiative could increase operational costs and impact the margins of the companies involved.

The financial impact was calculated assuming a scenario where competitors do not pass on the value of CBios to final fuel prices, forcing us to absorb this cost to remain competitive. We therefore use the average price of CBios, as using historical prices is more reliable from a risk management perspective due to their high volatility. So, the average CBio price multiplied by our CBio purchase target would be approximately R\$ 498 million.

We manage this risk differently from other distributors because we also generate CBios, which

has a smaller impact on our statement of financial position. In 2022, we were obliged to acquire over 8,302,549 CBios while having the opportunity to sell around 3,100,600 CBios from our bioenergy operations. Our trading desk, responsible for CBio purchases, also therefore trades these carbon credits, allowing us to reduce the financial impact at the end of the financial year. The annual cost of controlling this risk amounts to R\$ 5,960,000, which includes maintaining the trading team, compliance monitoring tools, and antitrust consultancy contracts.

RISK 2 | CHANGES IN RAINFALL PATTERNS AND TYPES (RAIN, HAIL, SNOW/ICE)

In our sugar, ethanol and bioenergy production operations, we have influence over one of the largest agricultural areas in the world, with over 1,330,450 thousand hectares of arable land. To ensure the successful production of these products, we constantly strive to increase our productivity, both in terms of cane area and quality (sucrose content in the cane). Adverse weather conditions can affect the quality and sucrose content of the cultivated sugarcane per area, resulting in a lower sugar and ethanol production, which depend on sucrose content.

The productivity and sucrose content of sugarcane are mainly influenced by climatic conditions such as rainfall and temperature. Therefore, a change in rainfall

patterns in Brazil's Center-South, which houses our bioenergy operations, especially an increase in dry periods, could trigger a reduction in the amount of sucrose per planted area, impacting the final volume of sugar and ethanol produced and potentially causing revenue drops for this business line.

The financial impact resulting from changes in rainfall patterns can exceed R\$ 195 million. To estimate this financial impact, a 1% decrease in TRS/ha (sucrose per ton of cane/hectare) was assumed, based on the variation of TRS/ha over the last 11 years, which would result in a proportional decrease in sugar and ethanol production and revenue generated by these products in the results.

To manage this risk, we continuously monitor the compatibility of the sugarcane varietal and the climate conditions in the Brazilian states of São Paulo, Goiás and Mato Grosso do Sul, and make adjustments based on the conditions found. Furthermore, best practices in crop management ensure increased resilience. This includes analyzing the optimum time to plant, fertilize, and harvest the sugarcane, favoring water capture.

RISK 3 | CHANGE IN CONSUMER BEHAVIOR

A significant portion of our revenue stems from bioproducts such as sugar, ethanol and bioenergy, and advanced products like second-generation (2G)

ethanol, biomethane and biogas, which are sold to international markets that are increasingly stringent in terms of product sustainability, including emissions.

The growing concern of international markets regarding the level of emissions associated with products can pose a risk to our portfolio if we fail to follow this trend and manage our emissions effectively.

Aligned with the risk of intense competition in our business, failure to maintain the sustainability attributes (emission management, traceability, among others) of our products could lead to a loss of competitiveness compared to peers in these relevant markets.

To calculate the financial impact of this risk, we simulated the decline in EBITDA related to the sale of our ethanol in markets without sustainability requirements, as opposed to stricter markets. This market shift would result in the loss of premiums provided by special markets such as California, Europe and Japan for low-carbon footprint products. The financial impact calculated based on these three key markets accordingly amounts to R\$ 43,750,000.00.

Considering this risk, we maintain continuous contact with the entity responsible for environmentally assessing our products, aiming for better understanding of their demands and ensuring transparency for the continuity of our relationship,

while also maintaining our certification strategy. We understand the importance of staying well-informed about market trends and actively participating in discussions on globally relevant topics such as climate change, carbon pricing and greenhouse gas emissions, to name a few.

The main cost associated with managing this risk consists of certification and inspection expenses required by international markets, which account for over 58% of total certification and inspection expenses (equivalent to R\$ 1,336,700.00).

The risks related to climate change are consolidated in our matrix, approved by the Audit Committee.

OPPORTUNITIES

Carbon pricing mechanisms such as Renovabio incentivize ethanol production and consumption, which is expected to push up ethanol prices in the domestic and international markets, positively impacting our revenue.

To estimate the financial impact of this opportunity, we considered a 2.5% to 10% increase in ethanol prices.

Additionally, with 35 bioenergy operations under the Renovabio program, we have the opportunity to establish ourselves as one of the largest generators of decarbonization credits (Cbios) in the country, with a positive financial impact estimated at R\$ 186,036,000.00.

Furthermore, the realm of opportunities provides the potential for us to expand our presence in demanding markets such as California and the European Union, which highly value low-carbon products. Our ethanol, produced from sugarcane, already has a reduced average carbon footprint (55gCO₂ / MJ) compared to corn-based ethanol (79.9gCO₂ / MJ) - the primary type of ethanol produced in the United States. Moreover, we are continuing to decrease the carbon footprint of our products, thereby increasing their added value.

The estimated financial impact of this opportunity was based on the difference between the average carbon intensity values of sugarcane ethanol (55 gCO₂/MJ) and corn ethanol (79.9 gCO₂/MJ) from the California Air Resources Board (CARB), the volume of ethanol, and an estimated price ranging from R\$ 15.9 to R\$ 26.5 per ton of carbon. We consequently estimated the potential minimum (R\$ 5,701,104.00) and maximum (R\$ 9,501,840.00) financial impact of this opportunity.

MANAGING RISKS AND OPPORTUNITIES

Climate risk and opportunity management is integrated into our financial and business risk management and follows the same guidelines. Climate opportunities and risks are presented in a matrix that classifies them into quadrants based on the impact vs. probability axes, categorized as:

- **Low:** less critical for business value, it requires a focus on defining acceptable levels of loss from events and actions that prevent the level of impact from increasing over time.
- **Medium:** moderately critical for business value, it requires regular monitoring to continuously direct mitigation strategies and/or contingency plans.
- **High:** highly critical to business value, it requires prioritization and monitoring of demands, and prioritized action plans to eliminate or reduce severity and/or frequency.

The impact axis considers qualitative and quantitative elements such as: Low up to R\$ 50 million; Medium up to R\$ 400 million and High above R\$ 400 million. The Probability axis takes into account elements such as historical occurrence, external influence and risk management. In other words, the more deficient the management, the higher the probability of occurrence.

Risks with medium and high impact and probability are considered substantial due to their greater sensitivity, i.e., they require closer management and more urgent action. Although managed, risks with low impact are less sensitive.



Our methodology is detailed in our Risk Management Policy, available [here](#).



METRICS AND GOALS

In order to spearhead the transition to a low-carbon economy, we are on a path that involves pursuing operational efficiency and innovation in all processes to offer products derived from renewable sources with excellent potential to diminish the carbon footprint of our customers and consumers.

This journey is guided by publicly pledged goals that we aim to achieve by 2030:

- Expand our renewable energy production by 80%.
- Reduce our ethanol carbon footprint by 20%.
- Increase the share of Renewable Businesses in our adjusted EBITDA by 80%.
- Reduce GHG emissions intensity in the use of our products by 10%.

These goals will be achieved as we decrease the use of synthetic fertilizers and fossil fuels in agricultural operations, increase the metric ton of cane per hectare (TCH) in our sugarcane fields, and invest in innovation



projects in agriculture, such as precision farming, which tend to generate cost savings in input usage and increase productivity.

This movement is directly related to the continuous improvement of our production processes, increasing sugarcane yields, advancing the circular economy, optimizing energy efficiency and streamlining our logistics. The SER+ (Raízen Excellence System) has been implemented and expanded to all our

bioenergy plants since 2021/2022. Based on the Lean philosophy, which encompasses various management and resource optimization methodologies, this initiative aims to enhance value-added actions and eliminate waste, elevating our level of performance by involving our employees.

We are also advancing in the production of second-generation ethanol (E2G), which is chemically similar to first-generation ethanol (E1G) but has a different

production method: E2G is manufactured from waste materials such as bagasse and trash, increasing our potential for biofuel production by 50% without the need to expand cultivated areas, and reducing our carbon footprint compared to the processing required for E1G production. We are the only commercial-scale producer of E2G from sugarcane in the world, and we aspire to build 20 E2G generation plants by 2030, all connected to our sugar and ethanol facilities. Five new plants are currently under construction, and three of them will be operational by 2024.

Our renewable portfolio also includes biogas, biomethane, solar energy and other integrated sources within our ecosystem. Our renewable solutions currently supply the market with more than 70 billion megajoules (MJ) of clean energy per year.

We measure our greenhouse gas (GHG) emissions to ascertain the true impact of our operations and devise effective reduction initiatives and strategies. Raízen has prepared Annual Emissions Inventories since it started operating, based on The Greenhouse Gas Protocol and its local version, the Brazilian GHG Protocol Program. We also conduct an annual Life Cycle Assessment (LCA) of our products, which measures potential environmental impacts associated with the manufacturing and use of our key products (first- and second-generation ethanol and bioelectricity). The methodology we use accounts for all GHG emissions, cradle to gate.



We voluntarily answer Carbon Disclosure Project (CDP) questionnaires and sustained our leadership position in 2022, which is exclusive to companies with the highest questionnaire evaluation, reflecting our trajectory of continuous progress. We have also joined the CDP Supply Chain to advance alongside our suppliers in the decarbonization journey and climate change management maturity.



For further information see our 2022/2023 Integrated Report, available [here](#).



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