



TASK FORCE ON CLIMATE RELATED FINANCIAL DISCLOSURES (TCFD) 2021

raízen

TCFD

As part of our commitment to transparency, we have recently adopted the recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) in our sustainability reporting. We will continue to progress on this agenda, recognizing its importance for our strategic stakeholders and for the resilience of our business.

We have a robust emissions management system in place through which we annually quantify our emissions in accordance with the Greenhouse Gas Protocol and its local counterpart, the Brazilian GHG Protocol Program; since 2015, we have responded to the CDP Climate Change questionnaire (in line with the TCFD recommendations), a financial-sector initiative that has become a global authority for managing climate-change impacts. In 2021 Raízen made the CDP's select climate change A List alongside other companies that are leading the transition to a low-carbon economy. Now, in 2022, we have launched an organized effort to reformulate our practices in line with the TCFD¹ recommendations.

For further information about the risks, opportunities, governance systems and financial impacts described in this report, see [our CDP Climate Change report](#).



¹ This material has been prepared based on the TCFD recommendations and our responses to the CDP Climate Change questionnaire in 2021.



In 2021 we made the
CDP Climate Change
A List

Governance

We have a robust governance structure through which our strategies and plans are extensively discussed—taking account of both risks and opportunities—and adequately communicated across all levels of the organization. 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** | Financial, operational and climate risks are identified and compiled 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 and targets** | The CEO is responsible for approving any public commitments, including greenhouse gas (GHG) emissions reduction targets. Our Strategic Sustainability Plan includes public commitments in support of the United Nations (UN) Sustainable Development Goals (SDGs). In line with efforts to limit global warming, in 2022 we doubled our commitment to reduce our ethanol carbon footprint. Our current target is to achieve a reduction of at least 20% by 2030 from a 2018/2019 crop-year baseline. We have also announced three new targets for the same horizon:

- > Expand our renewable energy capacity and offering by 80%.
- > Increase the share of Renewable Businesses in our adjusted EBITDA by 80%.
- > Reduce GHG emissions intensity in the use of our products by 10%.
- **Monitoring strategic indicators** | Our Strategic Sustainability Plan sets out ambitions for each material topic, including climate change. The CEO follows progress on performance indicators that are reported to him or her on a regular basis. These indicators inform strategic decisions, such as: our recent decision to create a Renewable Energy division dedicated to advancing the transition to a low carbon economy by expanding and diversifying our renewables portfolio; and the decision to set up a Strategy & Sustainability department, combining the Strategy, New Business, M&A and Sustainability functions together to drive improvement in ESG governance and help to incorporate these issues into strategic discussions and decision-making. The CEO also sets a tCO₂ avoided target as a corporate KPI that is factored in the variable compensation of our employees.

The Board of Directors is involved in climate change-related matters and is supported in these matters by several advisory committees, including our Audit Committee and Corporate Social Responsibility Committee. The Audit Committee is responsible for oversight of action plans developed for each identified risk. Our governance approach to climate change-related risks and opportunities is the same as for any other material risk: financial, reputational and operational, for example. Sustainability matters, including climate change, are among the matters addressed by the Corporate Social Responsibility Committee and are submitted to the Board of Directors for discussion. These committees include representatives from our shareholders, our CEO and/or our Vice President for Sustainability Strategy. Our Remuneration Committee has set a GHG emissions avoided target that is factored into employees' compensation.

Among the duties of the CEO, the members of the Executive Board and their advisory committees is providing support in managing risks and opportunities, and ensuring our long-term investment strategy and vision are advancing a low-carbon economy.

We are a world-leading, integrated bioenergy company with a broad portfolio of renewable products

Strategy

In line with our purpose of reshaping the future of energy, we have established a position as an integrated energy company and a global leader in bioenergy, with a broad portfolio of renewable products. We are helping to lead the energy transition to a low-carbon economy through a unique and irreplicable business platform. Our value chain begins in the soil, where we grow sugarcane to produce ethanol, sugar and bioelectricity. Co-products from the process add to our portfolio of renewables, as well as supporting a circular economy. Vinasse and filter cake are used to produce biogas, along with sugarcane bagasse, from which we produce electricity for on-site use and for sale. Sugarcane bagasse is also used as an input in the production of second-generation ethanol (E2G), reducing our carbon footprint by 30% compared to first-generation ethanol, which in turn produces 80% less GHG emissions than gasoline. E2G also means we can produce 50% more ethanol without expanding our sugarcane fields.

Climate scenarios

We have conducted a study on climate scenarios in Brazil based on a global CMIP5 models. We modeled both a long-term horizon (2081-2100) and the immediate horizon (2021-2040) to reconcile long-term impacts with short-term decision-making. The primary variables we considered were average daily and monthly rainfall, temperature, near-surface wind and relative humidity. Projections were made based on representative concentration pathways (RCPs) 4.5 and 8.5, the first of which is more optimistic than the latter in terms of GHG emissions.

After this assessment we determined that Brazil is located in an area of South America that is particularly sensitive to impacts from climate change, in particular higher temperatures and lower rainfall.

We identified related opportunities for our businesses, from sugarcane growing through production of sugar, ethanol and bioelectricity to fuel distribution. The goal is to determine how these factors can affect our business so we can anticipate them and make our portfolio and operations increasingly resilient.

Risks and opportunities

RISKS

The risks we have identified and which we manage include both physical and transition risks with the potential to affect our business. Our operations were already addressing some of these risks due to the magnitude of their impacts, including changes in rainfall patterns in Brazil (physical risks), the implementation of carbon pricing mechanisms, and more demanding markets (transition risks).

- **Carbon pricing mechanisms** | The Brazilian government created RenovaBio in 2020 to reduce the nation's energy dependence and increase the supply and demand for biofuels by selling decarbonization credits (CBIOs). Producing plants generate these credits and fuel distributors purchase quotas. This initiative could elevate operating costs. In addition, in the event that other industry players fail to meet their targets, this could lead to a price imbalance in the market, affecting the margins of compliant players.

We mitigate this risk through a Market Intelligence team dedicated to monitoring the RenovaBio mechanism, in particular supply, demand, and fluctuations in the price of CBIOs. Our goal in these efforts is to anticipate trends and identify the optimal timing to purchase credits in order to minimize impacts from the RenovaBio program on our business.

- **Access to more demanding markets** | A significant portion of our revenue comes from the sale of bioproducts such as sugar, ethanol, and bioelectricity on the international market, where buyers are increasingly exacting in terms of product sustainability, and especially lifecycle emissions. One potential risk is that we could lose market share in global markets that pay a premium for ethanol due to its lower carbon footprint compared to fossil fuels. This could result from regulatory developments in these markets or from protectionist barriers to the entry of Brazilian sugarcane ethanol, including barriers in the form of new methods of calculating GHG emissions.

We mitigate this risk by tracking industry trends, participating in forums that discuss climate change, carbon pricing, emissions, and other related themes. We also keep an updated inventory of our GHG emissions, which will serve as a source for further studies. In addition, we have certifications in line with market requirements, and a team dedicated to monitoring regulatory developments in California and the European Union, for example.

- **Extended droughts** | Raízen is one of the largest agricultural operations in the world, with approximately 1.3 million hectares of cultivated land. The focus of our agricultural operations is on crop yields, which can be adversely affected by any extended droughts, reducing the output of our primary commodities (sugar and ethanol). This impact is measured in terms of ATR/ha (a metric that combines sugar concentration in sugarcane with crop yield).

To mitigate this risk, we continuously monitor the compatibility of the sugarcane variety and the climate conditions in the Brazilian states of São Paulo, Goiás and Mato Grosso do Sul, where our bioenergy operations are located, 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. New water efficiency technologies, such as dedicated irrigation, are also considered and we have now mapped out more than 60,000 hectares of land that are amenable to more efficient irrigation methods.

OPPORTUNITIES

- **Higher demand for low-carbon products** | Whereas, on the one hand, the RenovaBio program has created risks in our fuel distribution operations, it also represents an opportunity in that it provides an incentive for ethanol consumption in both the domestic and in international markets, increasing returns on ethanol production.

Our state-of-the-art facilities allow us to flexibly modulate our product output in response to market trends and drawing on our teams' market expertise. We have a multidisciplinary team of Sustainability, International Relations and Government Relations professionals who monitor public policies and market trends to inform a commercial strategy that delivers optimal financial results.

- **Increased profitability/CBIOs as an incentive for ethanol production** | In addition to the impact from the RenovaBio program on ethanol demand, the initiative also provides an opportunity to produce biofuels and benefit from CBIOs as an added revenue stream, proportional to the volume of ethanol produced and the carbon footprint of each facility. Through our robust emissions management system, we have identified optimal approaches to reducing carbon intensity in our operations. This will support increased revenues from carbon credits as our operations are recertified within the program and improve their efficiencies.

- **Greater value attached to low-carbon products in demanding markets** | Sugarcane ethanol has a smaller average carbon footprint than corn ethanol, the main type of ethanol produced in the US, for example. Attributes like these make our product more attractive in the more demanding markets that value low-carbon products, such as California and the European Union.

To capitalize on this opportunity, we will continue to certify our plants to export ethanol to these markets, while continuing to monitor developments in regulations and approaches to reducing carbon intensity in our operations.

A focus on strategy

We design our product and service strategy for the coming years with an eye to both risks and opportunities, gradually expanding production of renewable energy and biofuels in line with the energy transition, changes in market patterns, and reduced incentives for fossil fuels. An example of this is our recent investment in E2G plants, solar farms and a biogas plant to produce electricity and biomethane in Guariba-SP. We have deployed an innovation hub to support and accelerate the development of projects that can increase the efficiency and productivity of our operations. We have also become more critical when it comes to managing our supply chain, focusing on traceable sugarcane, biomass, and chemicals, encouraging socioenvironmental best practices.

We have continued to
enhance governance
across the value chain



Managing risks and opportunities

In managing the risks and opportunities associated with Climate Change, we use the same guidelines as those used in our financial and business areas, given that since 2017/2018 we have mapped the main impact of climate change on each business front, as described on page five. To bring the outcome closer to our reality, we “tropicalize” the data, cross-referencing it with the characteristics of the regions where our facilities are located. The methodology used includes interviews with those in charge of each operation and for our expansion strategy, and also looks at global market and industry trends.

Consolidation of these analyses allows us to map the risks and opportunities associated with all our operations in light of the future climate scenario, both in terms of their physical impact as well as their reputational and market impact. In incorporating these risks into our risk matrix, we use the same methodology to determine risk relevance and identify substantial risks (medium or high impact—exceeding R\$ 50 million).

We use the same approach to managing climate change-related risks and opportunities as we do to managing financial and business aspects

During the course of the year, our financial and corporate controls teams assess each substantial risk and measure the impacts of our businesses, broken down by short-, medium- and long-term impacts. Risks are also ranked on a scale of “magnitude of impact” and “likelihood of occurrence” in the risk matrix, which is annually reviewed and aligned with our five-year business plans, with support from the leadership team. For every risk factor, we develop scenarios and work plans which are periodically simulated and the results reported to the Executive Board.

Metrics and targets

As part of our approach to addressing climate change, we work to manage and reduce emissions from our energy portfolio. We achieve this by incorporating efficiency and innovation in each of our processes and in our value proposition, ensuring that our renewables portfolio delivers high levels of emissions reduction. In 2022 we set **new climate targets** to be achieved by 2030:

- Expand our renewable energy capacity and offering by 80%. **(New)**
- Reduce our ethanol carbon footprint by 20%. **(Updated – in 2021 the reduction target was 10%)**
- Increase the share of Renewable Businesses in our adjusted EBITDA by 80%. **(New)**
- Reduce GHG emissions intensity in the use of our products by 10%. **(New)**

To achieve our carbon footprint reduction target, we will continue to pursue the primary avenues affecting carbon emissions: reducing the use of synthetic fertilizers; minimizing fossil fuel consumption in our farm operations; increasing sugarcane yields in metric tons of sugarcane per hectare (TCH); and implementing agricultural innovation projects—such as precision agriculture—to drive savings on inputs and improve productivity and yields.



We manage our emissions using two main methodologies: annual emissions inventories, which provide a detailed account of the emission sources in our operational activities; and product lifecycle analysis, which assesses the emissions inherent in our production process.

Emissions inventories are developed using an integrated system in which the Sustainability function receives operational data on a monthly basis that are automatically translated into emissions. Inventories are audited by an independent third party and are prepared in accordance with the Brazilian GHG Protocol Program. For further information, refer to our [public CDP reports](#) and our [Annual Sustainability Report](#).

The second method analyzes the product lifecycle in annual assessments carried out in accordance with ISO 14040, using a cradle-to-gate approach (i.e. accounting for all emissions involved in the production process up to the gate of our bioenergy operations). In the previous year we measured the carbon footprint of our primary products (1G and 2G ethanol, sugar, cogeneration, biogas and pellets) to provide a detailed view of the most significant stages in the process and guide our emissions reduction efforts.

Click [here](#) to learn more.